COUNCIL OF THE EUROPEAN UNION

Brussels, 12 March 2013

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ATO 29
CADREFIN 54

COVER NOTE

from:	Secretary-General of the European Commission, signed by Mr Jordi AYET PUIGARNAU, Director
date of receipt:	8 March 2013
to:	Mr Uwe CORSEPIUS, Secretary-General of the Council of the European Union
No Cion doc.:	SWD(2013) 59 final
Subject:	Commission Staff Working Document: EU Decommissioning Funding Data Accompanying the document: Communication from the Commission to the European Parliament and the Council on the use of financial resources earmarked for the decommissioning of nuclear installations, spent fuel and radioactive waste

Delegations will find attached Commission document SWD(2013) 59 final.

Encl.: SWD(2013) 59 final

EUROPEAN
COMMISSION

Brussels, 8.3.2013
SWD(2013) 59 final

COMMISSION STAFF WORKING DOCUMENT

"EU DECOMMISSIONING FUNDING DATA"

Accompanying the document

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the use of financial resources earmarked for the decommissioning of nuclear installations, spent fuel and radioactive waste

{COM(2013) 121 final}

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1. INTRODUCTION

1.1. BACKGROUND

In October 2004, the Commission presented its first report to the European Parliament on the use of financial resources earmarked for the decommissioning of nuclear power plants[1]. The 2004 report was generally well received and led to an own-initiative report[2] from the European Parliament. It was acknowledged within the report that decommissioning was a complex issue and that more detailed information was required in order to progress the issues. With this in mind the Commission has initiated an extensive dialogue with experts of the Member States.

Subsequently, in 2006, the Commission adopted a Recommendation[3] on decommissioning funds following consultation with Member State experts taking advantage of its research in the field.

In December 2007, the Commission presented its second report to the European Parliament and the Council, comparing EU nuclear operators' and Member States' funding practice with the criteria detailed in the Commission Recommendation. Whereas the 2004 report was limited to power reactors, the second report covered all nuclear installations with an emphasis being placed on those which were at greatest risk should the topic of decommissioning funding be inadequately addressed.

Since the presentation of the second report in December 2007, the legal environment was decisively changed with the adoption of Council Directive 2011/70/Euratom of 19 July 2011, which established a Community framework for the responsible and safe management of spent fuel and radioactive waste[4]. This Directive, which requires to be transposed in Member States' national law by 23 August 2013, foresees in its Article 9 that "Member States shall ensure that the national framework requires that adequate financial resources be available when needed for the implementation of national programmes referred to in Article 11, especially for the management of spent fuel and radioactive waste, taking due account of the responsibility of spent fuel and radioactive waste generators".

This principle, which is shared with the Recommendation, is now binding law which must be transposed by all Member States. In order to comply with the obligations arising from the Directive, national programmes are expected to cover all waste types and all management stages from generation to disposal as well as a sufficiently detailed basis for estimating long-term cost as input to build up adequate waste management funds. The obligation to cover all management stages, beginning with the generation of waste, means that the national programmes will be required to cover a large portion of the decommissioning activities in the forefront related to spent fuel and waste management.

It is the view of the Commission that the national spent fuel and radioactive waste programmes should provide a detailed cost estimate of all waste management steps up to

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1 Report on the use of financial resources earmarked for the decommissioning of nuclear power plants, COM(2004)719 final of 26.10.2004

2 European Parliament resolution on the use of financial resources earmarked for the decommissioning of nuclear power plants (2005/2027(INI)), P6_TA-PROV(2005)0432

3 OJ L 330 (28.11.2006)

4 OJ L 199, 2.8.2011, p. 48

disposal including the associated activities, such as research and development. The national waste management programme has also to provide information on the financing of the programme.

Should a national programme consider only long-term interim storage, but no disposal, a utility would save a considerable amount of money which it could then use for other investment and to strengthen its market position in relation to a competitor in another Member State where funding of a disposal facility is foreseen as a mandatory element. Such a situation could be seen as a clear distortion of competition. Some estimations come to a potential cost advantage in the order of 3.5-4.0 percent of the assumed total generating cost[5].

Apart from Article 9, the Directive also contains binding rules regarding financing schemes and transparency, which also reflect basic principles of the Recommendation.

Through the obligation on Member States to keep their national programmes updated and subject to peer reviews, the Directive increases the transparency and quality of the funding mechanisms of spent fuel and radioactive waste management and decommissioning, which will further help to avoid market distortions.

The Directive not yet being transposed, the present report does not yet analyse its consequences but is, as in the past, based on the continuous work carried out by the Member States and the Commission for the implementation of the Recommendation, in particular within the Decommissioning Funding Group. It aims to present a comprehensive overview of the situation in the Member States. In particular, it looks at the advances in the alignment of the national decommissioning financing regimes with the Commission Recommendation.

1.2. METHODOLOGY

In 2004 the Commission set up an ad-hoc expert group - Decommissioning Funding Group (DFG) - in order to assist the EC in:

- Promoting a clear understanding of the decommissioning policies and strategies and the attendant tasks and activities;
- Providing an up-to-date knowledge on decommissioning cost estimates and the management of the provisions/funds;
- Exploring possible ways ahead in terms of further co-operation and harmonisation at European level.

The DFG is the only body in the EU which brings together Member States and the Commission for common reflection and discussion of decommissioning funding issues. Therefore neither ENSREG, the European Nuclear Safety Regulators Group, nor ENEF, the European Nuclear Forum, have formed subgroups dealing exclusively with decommissioning funding issues.

The national experts forming the Decommissioning Funding Group developed, together with the Commission, guidelines which explore in detail the different aspects of decommissioning financing, reflected in the Commission's 2006 Recommendation[3] on decommissioning

[5] COMMISSION STAFF WORKING DOCUMENT, Accompanying document to the revised proposal for a COUNCIL DIRECTIVE (Euratom) on the Management of Spent Fuel and Radioactive Waste IMPACT ASSESSMENT COM(2010) 618, Chapter 2.3.3.

funding. On the basis of these guidelines, the DFG elaborated, again in cooperation with the Commission, a questionnaire for Member States.

The questionnaires were sent to all Member States in September 2010, and the majority of Member States sent their completed documents during the first months of 2011. A first discussion of the findings took place during the 2011 DFG meeting on 16 March 2011. The collection of answers continued during 2011. Some Member States were also asked individually to complete certain data which were considered unclear or missing.

During the DFG meeting of 12 March 2012, the first draft of the Commission Staff Working Document was discussed in detail. A majority of the countries who assisted in the meeting provided updates, corrections and additions to the draft document, in particular concerning the chapter describing their respective decommissioning funding system in place.

2. EU MEMBER STATE OVERVIEW:

This chapter summarises the decommissioning funding situation within the EU and is based preliminary upon the information contained in the completed questionnaires, reflecting the situation at the end of 2010. More recent information was provided by the Member States in the wake of the Decommissioning Financing Group meeting of 12 March 2012. In some cases, where necessary, information is supplemented with that taken from the second report to the European Parliament and the Council. In addition to the information on the financing, there is a short description of the other relevant aspects of decommissioning.

TABLES[6]

Table 2.1: Power reactor closure status and prediction

Country	before 1986	1986-2009	2010-2025	later or unknown	Total
Belgium		1	7		8
Bulgaria		4		2	6
Czech Republic				6	6
Denmark					0
Finland				4	4
France	3	6		60	69
Germany*	6	13	17	0	36
Greece	0	0	0	0	0
Hungary				4	4
Italy	1	3	0	0	4
Latvia	0	0	0	0	0
Lithuania		2			2
Poland				not defined	not defined
Romania	0	0	0	4	4
Slovakia	1	2		6	9
Slovenia	0	0	1*	0	1*
Spain	0	2	6	2	10
Sweden	1	2		10	13
The Netherlands		1		1	2
United Kingdom	2	24	18	1	45
TOTAL	**14**	**59**	**38**	**104**	**208**

[6] The tables were established on the basis of the information provided by Member States during the preparatory work for the report.

Table 2.2: Research reactors in the European Union

	Research Reactors			Decommissioning status				
Country	total	operational	shutdown	not specified	ongoing	safe enclosure	modified use	dismantled
Austria	1	1						
Belgium	5	3	2		1			1
Bulgaria	1						1	
Czech Republic	4	3	1					1
Denmark	3					1		2
Finland	1	1						
France	26	7	19		8	0		11
Germany	46	9	37		5	2	2	28
Greece		1		1				
Hungary	2	2		2				
Italy	14	5	9	4				5
Latvia	1		1		1			
Lithuania	0	0	0	0	0	0	0	0
Poland	5	1	4				1	3
Portugal								
Romania	2	1	1		1			
Slovakia								
Slovenia	1	1	0	0	0	0	0	0
Spain	3	0	3	0	0	0	0	3
Sweden	6		6		2			4
The Netherlands	3	2	1		1			
United Kingdom	19		19		2	5		12
Total	140	37	103	7	20	7	4	71

Table 2.3 Type of nuclear fuel cycle facilities in the EU

Country	Fuel Fabrication	Fuel reprocessing	Fuel Storage	total
Belgium	2	1	2	5
Bulgaria			1	0
Czech Republic			4	4
Denmark	1			1
Finland			3	3
France	11	5	5	21
Germany	2	0	16	18
Greece	0	0	0	0
Hungary			1	1
Italy	6	2	1	9
Latvia	0	0	0	0
Lithuania			2	2
The Netherlands	0	0	0	0
Poland			2	2
Romania	1	0	6	7
Slovakia			1	1
Slovenia	0	0	0	0
Spain	1	0		3
Sweden	1		1	2
United Kingdom	1	2		17
Total	26	10	45	96

Table 2.4: Operational and decommissioning status of the nuclear fuel cycle facilities

	Nuclear Cycle Facilities			Decommissioning status		
Country	Total	Operational	shutdown	not specified	ongoing	dismantled
Belgium	5	3	2		2	
Bulgaria	-	-	-	-	-	-
Czech Republic	4	4				
Denmark	1		1		1	
Finland	3	3				
France	27	12	16		14	2
Germany	31	20	11		4	7
Greece	0	0	0	0	0	0
Hungary	1	1		1		
Italy	9	1	8	1	4	4
Latvia	0	0	0	0	0	0
Lithuania	1	1				
The Netherlands	0	0	0	0	0	0
Poland	-	-	-	-	-	-
Romania	14	11	3		1	
Slovakia	1	1	-			
Slovenia	0	0	0	0	0	0
Spain	5	3	2		SAELICES	FUA
Sweden	2	2				
United Kingdom (NDA & Westinghouse)	17	12	5		5	
TOTAL	121	74	48	2	31	13

Table 2.5 Decommissioning funds accumulated in relation to expected total costs of future decommissioning of nuclear installations in the European Member States

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs [€ million]	Provisions accumulated by end 2009 (unless otherwise stated) [€ million]	Percentage of required provisions accumulated [%]	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets [€ million]	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
Belgium	Doel 1	NPP	231.1	182.8	79%	85.0%	2009			
	Doel 2	NPP	231.1	182.8	79%	85.0%	2009			
	Doel 3	NPP	512.8	301.8	59%	67.5%	2009			
	Doel 4	NPP	555.6	295.8	53%	60.0%	2009			
	Tihange 1	NPP	453.4	350.7	77%	85.0%	2009			
	Tihange 2	NPP	562.2	304.6	54%	65.0%	2009			
	Tihange 3	NPP	592	301.8	51%	60.0%	2009			
	Spent fuel	Fund		3.653			2009			
	Belgonucléaire	Fuel fabrication		222.6	100%	100%	2006			
	FBFCi	Fuel fabrication	34.5	22.9	67%		2006			
	SCK•CEN	Research institute	57.4	53.9	94%		2006			
Bulgaria	Kozloduy1	Special cases								
	Kozloduy2	Special cases								
	Kozloduy3	Special cases								
	Kozloduy4	Special cases								
Czech Republic	Dukovany1	NPP	690 (price basis 2008. does not	187	27	63				

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		
	Dukovany2		include costs of RW/SF disposal)							
	Dukovany3									
	Dukovany4									
	Temelin1	NPP	583 (price basis 2009. does not include costs of RW/SF disposal)	63	11	25				
	Temelin2									
	ISFS Dukovany	Spent fuel storage	0.49	0.057	12	20				
	SFS Dukovany	Spent fuel storage	0.49	0.029	6	6				
	SFS Temelin	Spent fuel storage	0.51	0	0	0				
	LVR-15	Spent fuel storage	5.8	1	17	81				
	SF storage NRI Rez	Spent fuel storage	0.17	0.056	33	37				
Germany	Gundremmin-gen A	BWR				100				
	M-Kärlich	PWR				100				
	Lingen	BWR				100				
	Obrigheim	BWR				100				
	Stade	PWR				100				
	Würgassen	BWR				100				
		All	11,672	2,529	21.66					
Denmark	DR1	Res. Reactor	0.8	0.8	100	100				

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		
	DR 2	Res. Reactor	4	4	100	100				
	DR3	Res. Reactor	56	56	100	100				
	Hot Cell	Hot Cells	3	3	100	100				
	Technology hall	fuel fabrication	0.01	0.01	100	100				
	Waste treatment plant	Waste treatment	34	34	100	100				
Estonia	Nothing									
Finland	Loviisa 1&2	NPP	330 (in 2011)	321	97	66				
	Olkiluoto 1&2	NPP	183	179	98	53				
	TRIGA	Research reactor	6	6	100	97				
France	Name of the nuclear facility	Kind of facility	Total estimated decommissioning	Provisions	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]				
			costs	accumulated by end 2009 (unless otherwise stated)	[%]					
			[€ million]	[€ million]						
			(basis 2009 and not corrected for inflation)							
				Up to value year 2009)						

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		
	EDF	69 power reactors (included 58 in operation)+7 other installations	60 718 M€	27 563 M€	40%	various		17 407 M€	11 441 M€	66%
	CEA	36 civil installations, including reactors, laboratories and others	6 053 M€	3 912 M€	65%	various		3 912 M€	1291 M€	33%
			(civil installations only)	(civil installations only)	(civil installations only)			(civil installations only)	(civil installations only)	(civil installations only)
	Groupe AREVA	18 installations (principaly linked to the fuel cycle)	10277 M€	5306 M€	52%	Various		5306 M€	5379 M€	101%
Greece	-	_	_	_	_	_	_	_	_	
Hungary	Paks NPP	NPP	1184 M euro	115,9 M euro	27.40%[7]	≈52%[8]				

[7] Since the 115,9 M euro gives the accumulated assets already in the fund by the end of 2009, the "Percentage of required provisions accumulated" was calculated on the basis of the present (discounted) value of the "Total estimated decommissioning costs" (1184 M euro), that is 423 M euro.

[8] The CNFF was set up in 1998, and the annual payments into the Fund are calculated year by year on the basis, that until the shutdown of the units of the Paks NPP all costs – including those of decommissioning of the NPP and the Interim Spent Fuel Storage Facility – shall be covered. It is therefore not correct to compare the availability of funding what percentage of the required provisions is accumulated with respect to the expired lifetime of the NPP.

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		
	ISFS	SF storage	28.6 M euro (included in the costs of the NPP)	0,15 M euro	27,4%	≈18%				
	Budapest	resear.	3.27 M euro	none[9]		≈ 79%				
	reactor	reactor								
	Training	resear.	1.78 M euro	none		≈70%				
	reactor	reactor								
Italy	Caorso NPP	NPP	339,8 (3)	NA	NA	Early closure				
	Trino NPP	NPP	229,2 (3)	NA	NA	Early closure				
	Latina NPP	NPP	699,9 (3)	NA	NA	Early closure				
	Garigliano NPP	NPP	348,3 (3)	NA	NA	Early closure				
	EUREX	Repr.	572,1 (3)	NA	NA	Not Applicable				
	Bosco Marengo	Fabr.	22,5 (3)	NA	NA	Not Applicable				
	Casaccia	Fabr. –	284,5 (3)	NA	NA	Not Applicable				
	ITREC	Repr.	316,4 (3)	NA	NA	Not Applicable				
	Avogadro	Interim storage	Not yet available (4)	-4	-4	95%				
				NA	NA					

[9] In case of the decommissioning of the Budapest Research Reactor and the training reactor, these are financed from the State budget, the State budget will come up for the costs when it is due. (So no provisions are accumulated.)

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		
	LENA	RR		No decommissioning plan, no cost calculations, no						
	Triga II			provisions yet. Public budget will be allotted when shut down						
	ENEA									
	TrigaII,									
	Tapiro									
	Palermo									
	University									
	AGN-201									
	LENA									
	Subcritical									
	Assembly									
Lithuania	Ignalina Unit 1	NPP	2400 MEUR	153 MEUR*	N/A	100%;				
	Ignalina Unit 2	NPP			N/A	100%;				
Latvia	Salaspils research reactor	Research reactor	10.6	no	No	100				
The Netherlands	Facilty 1	NPP	Confidential		-	-				
	Facilty 2	RR	Confidential		-	-				
	Facilty 3	RR	Confidential		-	-				
	Facilty …	RR	Confidential		-	-				

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		
Poland	nothing reported									
Romania	Cernavoda U1	NPP	247 (2006 estimate: 320 MUSD)	6.604	2.67	32.5				
	Cernavoda U2	NPP	247 (2006 estimate: 320 MUSD))	6.238	2.53	5				
	Horia Hulubei, Magurele, Bucharest	RR	27	N/A (Budgetary planning)	0	100				
	TRIGA, Mioveni, Pitesti	RR	77	N/A (Budgetary planning)	0	60				
	CNU Bihor	Uranium mine	N/A	0	0	100				
	CNU Banat	Uranium mine	N/A	0	0	100				
	CNU Suceava	Uranium mine	N/A	0	0	-				
	CNU Feldioara	Milling facility for uranium ore	N/A	0	0	-				
	FCN, Mioveni, Pitesti	Fuel fabr. plant	N/A	0	0	-				
Sweden	F1, F2, F3	NPP	2 692	1 364	51	52-60				
	O1, O2, O3	NPP	1 982	1 026	52	42-65				
	R1, R2, R3, R4	NPP	2 785	1 480	53	56-71				
	B1, B2	NPP	1 089	589	54	100				

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		
Slovenia	Krško Nuclear	NPP	1,149.30	145	12,6 %	67,5 %				
	Power Plant		(undiscounted)	(at the end of 2009)	(undiscounted)					
			338.5 (EUR 2002)		42.8 %					
			(discounted)		(discounted)					
	TRIGA Mark II	RR	5.47 (EUR 2007)	0	0.00%	88,0 %				
			(undiscounted)							
	Central interim	storage of	Not calculated yet	0	0.00%	Not decided yet				
	storage of	institutional								
	radioactive waste	radioactive								
	in Brinje	waste								
	Zirovski Vrh	Uranium	Not known	0	0.00%	100 %				
	Uranium Mine	Mine and Mill								
	and Milll; Waste									
	Pile Jazbec									
Slovakia	JE V1	NPP	547,953 (2011)	313,042	57,13%	100%				
	JE V2	NPP	732,379 (2011)	386,414	52,76%	62,5%				
	EMO 1,2	NPP	674,549 (2011)	231,703	43,35%	30%				
United Kingdom	Sizewell A	Power reactor	916 + proportion of 493 (Magnox South central costs)			100				

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		
	Bradwell	Power reactor	724 + proportion of 493 (Magnox South central costs)			100				
	Berkeley	Power reactor	608 + proportion of 493 (Magnox South central costs)			100				
	Dungeness A	Power reactor	879 + proportion of 493 (Magnox South central costs)			100				
	Hinkley Point A	Power reactor	890 + proportion of 493 (Magnox South central costs)			100				
	Hunterston A	Power reactor	671 + proportion of 366 (Magnox North central costs)			100				
	Olbury	Power reactor	954 + proportion of 366 (Magnox North central costs)			98				
	Chapelcross	Power reactor	804 + proportion of 366 (Magnox North central costs)			100				
	Trawsfynydd	Power reactor	796 + proportion of 366 (Magnox North central			100				

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		
			costs)							
	Wylfa	Power reactor	964 + proportion of 366 (Magnox North central costs)			95				
	Capen hurst	Fuel cycle facility	645							
	Windscale	Research reactor	987			100				
	Sellafield	Fuel cycle facility	23,537			(Calder Hall 100)				
	Dounreay	Research reactor	2,396			100				
	Harwell and Winfrith	Research reactor	1,203			100				
	Springfields Fuels Ltd	Fuel cycle facility	687							
	Low Level	Radioactive waste disposal facility	290							
	Waste	Fuel cycle facility	687							
	Repository	Radioactive waste disposal facility	290							
	Geological	Radioactive waste disposal facility	3,767							
	Disposal									
	Facility	Radioactive waste disposal facility	3,767							

COUNTRY	Name of nuclear facility	Kind of facility	Total estimated decommissioning costs	Provisions accumulated by end 2009 (unless otherwise stated)	Percentage of required provisions accumulated	Percentage of operational lifetime expired [%]	specified year	Base provisions (updated to the year 2009) to be covered by dedicated assets	Value of the dedicated assets to cover the provisions (end 2009)	Ratio between the provisions and their cover by dedicated assets
			[€ million]	[€ million]	[%]			[€ million]		

Countries are listed in order of the relative share of nuclear energy production:

2.1. FRANCE

2.1.1. Overview

The regulatory situation and organisation of nuclear decommissioning and waste management in France underwent profound change in 2006 with the adoption of new legislation on nuclear waste research and management ("*New Waste Law")*[10].

The French legislative framework defines a specific category of nuclear facilities, called "Basic nuclear installations" (or INB – "*installations nucléaires de base*"). It covers all facilities that present a significant risk for the workers or for the environment, due to a nuclear activity (including all nuclear reactors), or due to the use of nuclear materials.

Basic Nuclear Installations are subject to a specific legislative and regulatory framework, which includes the issue of funding of long term liabilities (decommissioning and radioactive waste management)[11].

Given the scale of the sums required and the time-frames involved for decommissioning nuclear installations and managing radioactive waste, the creation of a specific legislative system became necessary to secure the required funding. Although measures of this type already existed, they had no legislative or regulatory basis.

Key articles of the new "Law on the Programme Relative to the Sustainable Management of Radioactive Materials and Wastes" include the legal requirement to elaborate a "National Plan for the Management of Radioactive Materials and Wastes" and a "National Inventory of Radioactive Materials and Wastes". Both have to be updated every three years.

2.1.2. Decommissioning funding

The decommissioning financing regime is based on two types of funds:

- The nuclear operators set up internal restricted funds covered by dedicated assets managed under separate accountability; these funds shall account for all future costs related to decommissing as well as waste management and shall be entirely set up from the beginning of operations of each given nuclear installation.
- The National Radioactive Waste Management Agency (ANDRA) has to set up two additional internal restricted funds**,** whose purpose is to finance exclusively some of the waste management operations that ANDRA has responsibility for conducting:

10 Loi de programme relatif à la gestion durable des matières et des déchets radioactifs, 15 June 06

11 Planning Act No. 2006-739 of 28 June 2006 Concerning the Sustainable Management of Radioactive Materials and Waste (especially its article 20); Decree n°2007-243 of 23rd February 2007 for securing the funding of nuclear liabilities; Order of the 21st March 2007, for securing the funding of nuclear liabilities.

– the “research fund” is for the financing of research works related to the future storage facility dedicated to long lived high and medium level wastes**;**

– the “construction fund” is for the construction and operation of the future storage facility dedicated to long lived high and medium level wastes**.**

These two funds are fed by payments from the operator’s internal funds**,** at the time when ANDRA is required to conduct operations. Specific details about how and when the payments from the operator’s internal funds are made may vary: payments to the “research fund” are collected through a tax, whereas future payments to the “construction fund” might be settled under bilateral conventions. In both cases, from the point of view of the operators, these paiements can be seen as transfers from their internal fund to an external segregated fund managed by ANDRA.

- Currently, the research fund is the only of these two funds to be fed, as the construction of the storage facility for long lived high and medium level waste facility will not start before at least 2025.
- Furthermore, other payments are made from the operators' internal funds to the ANDRA general budget, to finance operations related to the storage facilities for short lived medium level wastes. Payments details are setteld under bilateral conventions. From the point of view of operators, such payments can be seen as transfers from their internal segregated fund to an external non-segregated fund managed by ANDRA.

A "National Financing Evaluation Commission of the Costs of Basic Nuclear Installations Dismantling and Spent Fuel and Radioactive Waste Management", comprising representatives of the National Assembly and the Senate and a number of experts that have to be independent of the nuclear operators and the energy industry, oversees the system.

Partial privatisation led key nuclear players AREVA and EDF to advance the reorganisation of their back-end provisions and accountancy practice. AREVA was the first to cover provisions by dedicated assets. The two companies have now set up restricted internal funds for the financing of future backend charges. Due to the increasing constraints in government budgets, nuclear research agency CEA has however been exempted from setting up a fully liquid fund. At the end of year 2011, 75% of the fund was filled with a guarantee of future financing.

The new waste law stipulates that the operators of basic nuclear installations shall "build up provisions in a prudent manner, for the costs of decommissioning of their installations or for their radioactive waste storage facilities, the final shut down, maintenance and surveillance costs”. In addition the law requires operators to “earmark specific assets exclusively to cover these provisions”.

These assets have to be accounted for separately and they have to present a “sufficient degree of security and liquidity in order to serve their objective”. Their market value has to be at least as high as the provisions to be covered. The assets are protected by law and nobody, besides the state, in the execution of its right to enforce the operators’ obligations to decommission their facilities and to manage their spent fuel and radioactive waste, can claim any right over

the assets.[12] This aims at protecting the assets in case of insolvency or bankruptcy of an operator, while at the same time leaving them with the operator who has a level of freedom to control and access them.

The new law stipulates that any operator of a nuclear installation must carry out a prudent assessment of the cost of decommissioning and of managing its spent fuel and radioactive waste. An assessment such as this constitutes the foundation for any secure funding mechanism. The level of assets must be at least equal to the discounted cost from the time of commissioning.

In addition, the funds are under the supervision of the State (through the Administrative Authority), who can impose corrective measures to the operators, including imposing the payment of any required amount to the dedicated fund in ANDRA's account. The operators of nuclear installations produce a detailed report at least every three years, presenting an assessment of these costs, their anticipated schedule and the value of the reserve set up in the balance sheet in accordance with applicable accounting rules. This report is submitted to the competent administrative authority for examination (services of the Ministry for Economy and Energy on the advice of the nuclear safety authority) which could if necessary provide for specific measures if it felt that the assessment produced was inadequate.

Nuclear operators are required to report every three months on their portfolio of dedicated assets, and have to report every year (or when there is a significant change) on the cost assessment and their financial provisions in the accounts. These regular reporting requirements allow shortfalls to be addressed in an adequate timeframe.

2.1.3. Decommissioning strategy

Since 2003, the French regulations allow for the immediate or slightly deferred dismantling of nuclear facilities.[13] The French nuclear safety authority is clearly in favour of immediate dismantling under the condition that a full scale dismantling strategy is available prior to the start of the operations. The strategy is elaborated by the operator but is required to be authorised by the safety authorities, not only from their technical point of view but also on the level of their financial feasibility.[14] The position of the safety authority was instrumental in the shift from deferred to immediate dismantling as the reference strategy.

Dismantling operations can take more than a decade in case of more complex nuclear facilities, often after several decades of operation. The safety authorities consider that the risk of the loss of memory on the conception and the operation is "very significant"[15]. This is one of the key reasons why the immediate dismantling approach has been adopted in France. The safety authority specifically requests in most of the cases the development of means to

12 Art.20 II of the New Waste Law stipulates: « A l'exception de l'Etat dans l'exercice des pouvoirs dont il dispose pour faire respecter par les exploitants leurs obligations de démantèlement de leurs installations et de gestion de leurs combustibles usés et déchets radioactifs, nul ne peut se prévaloir d'un droit sur les actifs mentionnés au premier alinéa du présent II, y compris sur le fondement du livre VI du code de commerce.

13 ASN, DGSNR, « Procédures réglementaires relatives au démantèlement des installations nucléaires de base », Révision de la note SIN/PARIS 16310/90 du 9 novembre 1990, DGSNR/SD3/N°/0095/2003, Fontenay aux Roses, letter dated 17 February 2003, Note n° SD3-DEM-01, Indice 1 du 3 February 2003 (see Annex 8)

14 However, in practice human resources to do so remain limited within the Safety Authorities.

15 Autorité de sûreté, DGSNR, « Rapport Annuel 2005 », p.414

preserve the memory of the past presence of a nuclear facility on a given site and to restrict the scope of its use.

2.1.4. Radioactive waste management

The French nuclear industry is based upon a closed fuel cycle. There are two commercial reprocessing plants at La Hague (Normandy). The choice of the reprocessing option had considerable impact on the definition of the current waste management scheme in France. In 1969 a “low and medium level” waste final disposal site, the "Centre de Stockage de la Manche" (CSM) was opened up adjacent to the La Hague reprocessing plant and operated until 1994 by the CEA. The site, now under surveillance by the National radioactive waste management agency ANDRA, contains over 527,000 t of radioactive waste and hundreds of tons of heavy metals. After closure the site was covered with a multi-layer cover in order to avoid the intrusion of water. In February 2003 the site officially entered the surveillance phase. In 1992, the low and intermediate level waste repository (CSFMA) took over from the Manche repository, taking full advantage of operating experience feedback gained from it. Licensed by decree in September 1989, this installation, located in Soulaines-Dhuys (Aube département) offers a storage capacity for 1,000,000 m3 of waste located in 400 storage units.

In 2003 was also opened a disposal facility (CSTFA) for very-low-level waste in Morvilliers (Aube Department). This facility is also managed by ANDRA and offers a capacity of 650 000 m^3.

2.2. SLOVAKIA

2.2.1. Overview

Slovakia operates four nuclear reactors, two at Bohunice V2 NPP and two at Mochovce NPP. Bohunice V1 Units 1 and 2 were shut down respectively in 2006 and 2008, in line with the obligations arising from the Treaty of Accession to the European Union. A specific protocol of this Treaty contained a commitment of significant European Union assistance for their decommissioning.

The privatisation of Slovenske Elektrarne (SE), in which ENEL of Italy has a majority stake, has led to a major reorganisation of operating and shutdown facilities. A new government owned group –JAVYS- now assumes responsibility for the Bohunice V1 facilities and most of the waste management facilities as well as the Interim Spent Fuel Storage. At Mochovce, in addition to the two operating units, there are also two partially completed VVER 440 reactors whose completion is foreseen for October 2012 and June 2013 for units 3 and 4 respectively.

2.2.2. Decommissioning funding

Prior to specific legislation in 1995, there was no requirement to create a dedicated fund with costs being borne directly from the treasury account.

The "National Nuclear Fund" (NNF) is a specific State fund which was established by the Act No. 238/2006 Coll. The purpose of the NNF is to acumulate and to manage the finances determined for the back-end of Slovak nuclear power. The highest body of NNF is the Board of Governors. Activities of NNF are controlled by the Supervisory Board nominated by several ministries and the Nuclear Regulatory Authority of SR.

The financial means of the Fund can be used only for activities related to the back-end of the peaceful use of nuclear energy; decommissioning is a part of this. The level of the payments is defined by the Act in such a way as to be accumulated in sufficient amounts when needed.

If there are insufficient financial resources for safe decommissioning in the National Nuclear Fund, the State may enforce a special additional fee to the price of electricity to the operator of the transmission system and send this to the Nuclear Fund[16]. The Act No. 238/2006 clearly defines the sources of the Fund (level of contributions), the Fund management rules, the form of the Fund use, as well as conditions for its use.

In recognition of the financial burden that Slovakia's early closure commitment for the V1 reactors created, the European Union has foreseen significant financial assistance in a specific protocol to the Treaty of Accession. This assistance will amount to a total of approximately €613 million up to the end of 2013. EU assistance was not only foreseen for decommissioning of the reactor units but also for issues related to security of supply. The amounts fixed for this assistance were not based on a specific proportion of the estimated costs, but recognise the significant burden placed on Slovakia by the shutdown commitment, and are an expression of solidarity between the Union and Slovakia. While the Community assistance is significant, the specific conditions of its use are that it may not be used for the decommissioning of other facilities. For 2014-2017, a further and final European Union commitment is in preparation.

The total value of historical debt (in 2010 price level) is app. 2,7 billion €. Concerning the full decommissioning of NPP A1, including disposal of decommissioning wastes (in near surface or deep repository) and part of the decommissioning of NPP V1 and V2 costs, including management of the spent fuel, aliquot to production of electricity before establishing the NNF. As of 30.06.2011, the value of the National Nuclear Fund was 930,56 million €.

2.2.3. Decommissioning strategy

In accordance with the approved document "Nuclear Energy Back End Strategy", the areas of nuclear power plants Jaslovské Bohunice and Mochovce will be used for future commercial activities after decommissioning. After the shutdown of a nuclear power plant, the area is not considered for agricultural purposes or for the purposes of residential construction. From the viewpoint of radiological background, the site will be a "brownfield", from the viewpoint of the (in)existence of physical constructional obstacles. This means the site will be able to be used for industrial or nuclear purposes. It also means that the final radiologicitalyal status of the site is less restrictive than for a greenfield in terms of radiology.

2.2.4. Radioactive waste management

The near surface National Radwaste Repository for low and intermediate level waste is operational since 1999. The waste which is not acceptable for the National Repository Mochovce shall be stored at the sites of the power plants. A feasibility study and technical documentation for the enlargement of this repository or an alternative construction of a VLLW repository is being financed primarily through Community financial assistance.

Options to construct a deep geological repository are being assessed with a view to have an operational facility by 2038.

[16] §28 sect.3 letter h/ and §31 sect. 2 letter w/ Act No. 251/2012 Z.z. on Energetic

2.3. BELGIUM

2.3.1. Overview

Belgium has two sites with operating commercial nuclear power plants at Doel and Tihange, both operated by Electrabel. In addition to the seven reactors at the two sites, there is a fuel fabrication plant at Dessel. The only NPP which is shut down in Belgium is BR-3, a prototype reactor subject of a decommissioning pilot project within the European Commission's research programme. Other decommissioning projects include several SCK-CEN waste facilities and the former Eurochemic pilot reprocessing plant.

2.3.2. Decommissioning funding

In Belgium, the decommissioning financing regime is based on two funds, one for waste management and the other for decommissioning tasks and the spent fuel management tasks.

A subsidiary of Electrabel, Synatom, is responsible for establishing and managing the provisions for the decommissioning and the management of spent fuel of the commercial power plants. The decommissioning fund is therefore segregated but internal. It is overseen by a surveillance committee, the Nuclear Provisions Commission. The State holds a "golden share" in Synatom which gives it the power to veto certain decisions. 75% of the provisions can be lent back to the operators. A change of the law in 2007 made it possible to use 10% of the remaining 25% of the funds for loans to other power sector investments unrelated to nuclear decommissioning.

The State is responsible for ensuring that adequate financial resources are collected for the former liabilities from non-commercial nuclear programmes such as Eurochemic. This is financed through a levy on electricity sales which are held in a fund managed by the "National Agency for Radioactive Waste and Enriched Fissile Materials" (ONDRAF/NIRAS). The agency is responsible for all waste management, and all radioactive waste must be transferred to it. In parallel, it holds the fund for waste management, which is fed from industry contributions. Synatom has to transfer the financial means for the waste once it is transferred to ONDRAF/NIRAS.

For all nuclear power plants, the obligation to constitute adequate reserves for future liabilities stems from the generally applicable accounting regulation. The basic assumption is that the net present value has to be available at any time during the operation of the nuclear power plants.

Since 2003, the existence of a supervising committee charged with the control of the mechanisms for the decommissioning provisions for nuclear power plants and spent fuel management, is a legal requirement. The supervising committee is composed of high level individuals in the administrations and the banking world. The change of law of 2007 made it possible that 3 delegates of the decommissioning fund, a subsidiary of the nuclear operator, sit in the Nuclear Provisions Commission, the controlling body. ONDRAF/NIRAS is specifically responsible for collecting information related to the decommissioning programmes, approving these programmes, and eventually executing the programme at the request of the operator. Decommissioning provisions and costs are revised every three years for the nuclear power plants and every five years for other facilities.

In practice, provisions are created by trimestrial endowments of the electricity producers during the 40 years of operation of the NPP. Effectively, the trimestrial endowment for the

decommissioning of the nuclear power plants is the interest on the gathered provisions at a rate of 5% given that the net present value of decommissioning is already constituted. The total collected amount for the decommissioning at the end of 2010 is €2231 million.

From the financial point of view, all nuclear fuel remains always the property of Synatom, being effectively lent to the nuclear power plant for the production of electricity. The costs related to the nuclear fuel cycle are paid to Synatom from the revenue generated through electricity sales, with a portion of this payment being set aside for the constitution of the provisions for the future management of spent fuel. The provisions for the management of spent fuel are managed by Synatom in the same way as the decommissioning provisions of the nuclear power plants. The cost estimate for the provisions of spent fuel management is based on the most expensive scenario for the back-end of the nuclear fuel cycle, which is reprocessing. The costs are furthermore increased with an uncertainty margin. For this purpose, €3923 million was constituted by the end of 2010.

The state finances the decommissioning of older R&D-facilities, the so-called "nuclear liability programme". Since 2003, the dismantling of the EUROCHEMIC pilot reprocessing plant and the former waste management site of SCK/CEN is financed by a levy on the electricity consumption. The other SCK/CEN facilities which existed before 1989 are still financed by the state. In practical terms, it is for ONDRAF/NIRAS to manage these projects.

Every 3 years, there is a review of the cost calculations and the financial planning for the commercial power plants by the Nuclear Provisions Commission.

The safety of the investments is assured through regular reviews and checks. If it is found that the provisions are no longer sufficient, regardless of the reasons, the operators have to pay a supplement to the fund to cover the deficit.

2.3.3. Decommissioning strategy

Immediate decommissioning with green field end status was estimated to be the most expensive dismantling strategy and therefore chosen as a reference scenario for nuclear power plants in order to make sure that adequate financial resources will be available independent from the future strategy choice of the operator. Financial resources are therefore calculated for a greenfield endpoint.

There is however no specific national policy and no obligation regarding decommissioning up to greenfield or brownfield. This is indeed established on a site by site basis.

2.3.4. Radioactive waste management

ONDRAF/NIRAS is responsible for the management of all radioactive waste in Belgium and all radioactive waste has in the end to be transferred to it from the producer or owner. Upon transfer, the producer or owner pays to ONDRAF/NIRAS the amount which covers the future management costs. These provisions are managed by ONDRAF/NIRAS. The decommissioning waste management cost is included in the decommissioning cost estimate of the facility.

In 2006, Belgium selected its site (Dessel) for a low level waste repository, where most of the decommissioning waste will be deposited. An extensive R&D programme is aimed at assessing the possibilities for a geological repository for medium, high level and long-lived waste. This programme is expected to result in a site selection, between 2010 and 2020,

followed by a preliminary safety report to be submitted to the safety authorities by around 2025. Currently, a first authorisation will be requested for the construction of a disposal facility limited to non-heating waste**.**

2.4. SWEDEN

2.4.1. Overview

Sweden's nuclear facilities are made up of 13 commercial power reactors, 5 older and permanent shut-off research reactors, a spent fuel store, a repository for short-lived operational radiological waste, a fuel fabrication plant and several other related nuclear installations. Three power reactors and all research reactors are in the state of permanent shut-down. The total decommissioning cycle has been succefully completed for 3 out of 5 research reactors. The two commercial power reactors at the Barsebäck site – near the city of Malmö - which were closed down in 1999 respectively 2005 as part of Sweden's nuclear phase out policy that prevailed at that time were initially foreseen for immediate dismantling. However, these plans have been delayed due to the absence of a waste repository for decommissioning waste. Initially such a repository should have been licensed in 2010, but the plans have been delayed and now the acutal plan is 2023. In conjunction with the decommissioning plans Sweden – like most other countries within the EU – faces a challenge to develop regulations for landfills for the waste bulk of materials from decommissioning projects, for the waste routs for VLLW, materials for free release and hazardous waste etc.

2.4.2. Decommissioning funding

The "Nuclear Activity Act" stipulates that the licence holder of any nuclear facility shall be responsible for all measures required for ensuring safe management and disposal of nuclear waste, as well as safe closure and dismantling of permanent shut-off nuclear power plants in which activities are no longer necessary.

Power reactor decommissioning costs must be established during the first 40 years (plus and additional period of 0-6 years so that the residual time always remains at least 6 years) of operation and are backed up by two guarantees relating to early closure and unforeseen waste management costs. The funds are set up as external segregated funds with considerable oversight especially with respect to fund investment.

The legal framework on decommissioning imposes the licence holder to pay a fee per delivered kWh of electricity to the "Nuclear Waste Fund". The size of the fee is based on a 40-year earning period per reactor. The purpose of the Fund is to cover all expenses incurred for the safe handling and disposal of spent nuclear fuel, as well as dismantling nuclear facilities and disposal of the decommissioning waste. The Fund is also obliged to finance research and development carried out by the "Swedish Nuclear Fuel and Waste Management Company" (SKB). The fund inludes future governmental costs as well.

Updated cost calculations, including decommissioning costs are to be carried out jointly by the operators and submitted to the Swedish Radiation Safety Authority for approval every 3 years. Based on a proposal from the Authority, the Government establishes the fees. The withdrawals from the Fund are subject to regulatory review by the Authority.

The management of the Nuclear Waste Fund is the responsibility of a separate government agency, the Nuclear Waste Fund. The Fund is in principle administered as a number of individual funds corresponding to the operators' liabilites and are managed jointly. The total

cost estimate for managing all nuclear waste and for dismantling nuclear power plants in the future is approximately 9 700 million €. As of the end of 2011, 4 115 million € had been collected in the fund. During 2011, the fund capital increased by 328 million €. The fee is reassessed every third year and is individual. In addition to the fees paid to the Nuclear Waste Fund, the nuclear power utilities must provide two forms of guarantees. Guarantee I should cover the shortfall should a reactor be finally closed down before it has reached its earning period of 40 years. Guarantee II should cover contingencies if expenses for future nuclear waste management become higher than expected, if these expenses have to be met earlier than expected, or if the actual amount in the Fund is lower than was estimated. The sizes of these guarantees are €963 million and €3,17 billion, respectively.

The financing of the historical liabilities, e.g. older nuclear installations previously owned by the state, in particular the facilities at Studsvik, the Ågesta reactor and the closed uranium mine in Ranstad, and other miscallaneous radioactive waste for the early days of the Swedish nuclear era are dealt with separately. The basic requirement imposes for all three nuclear power utilities equally to pay a fee to a dedicated fund ad valorem to the generated kWh of electricity. It is forecasted that the fund may be fully built up by the end of 2017. The fee is reassessed annually andequal for each contributor. This fund is also managed by the Nuclear Waste Fund. The future liabilities from 2012 and onwards, to the beginning of the 2040´s is assessed to be around €175M. The working hypotesis is that sufficient funds are to be collected by 2017.

2.4.3. Decommissioning strategy

The operator decides the decommissioning strategy but it is subject to the regulatory authorities' approval. No binding time limits for decommissioning are set in the current Swedish legislation or operating licenses for nuclear facilities. Storage facilities for decommissioning waste must however be available before dismantling of the facilities can take place. The standpoint of the regulating authority - the Swedish Radiation Safety Authority - from a safety and a radiation protection view is that a decommissioned power reactor should be dismantled, demolished and the site cleared for unrestricted use in a timeframe of around a half generation in the normal case, provided that storage facilities for the decommissioning waste are construced, built, licenced and put into operation. For the case of twin reactors with common safety systems, deferral could be justified if only one of the two reactors is shut down at a given time.

2.4.4. Radioactive waste management

The Swedish policy is clear and states that all that radioactive waste that has arisen in Sweden should be managed and disposed of within the borders. An exemption may be granted by the government in particular cases. There is so far no repository licensed for decommissioning waste. Shallow land burials are licensed only for short-lived very low level waste, but there is at present no up-dated regulations in this field. There are plans to re-license the repository for short-lived low and intermediate level operational waste to allow for disposal also of short-lived decommissioning waste in an extension to the existing facility. There is no disposal facility licensed for long-lived low and intermediate level radioactive waste. According to current plans, a repository for long-lived low and intermediate level waste will be in full operation around 2045. The applications for a permit to build a final repository for spent nuclear fuel, and an associated encapsulation plant, were submitted in March 2011 by SKB. SSM has launched a preliminary review of the need for any development of the application as by November 2012.

2.5. BULGARIA

2.5.1. Overview

Bulgaria has four VVER 440 and two VVER 1000 nuclear reactors at the Kozloduy plant. After the upgrade of the two VVER 1000 units, their operational lifetime extension is a declared priority. A decision in principle was taken in 2012 to undertake preparatory activities for the construction of a new nuclear capacity on Kozloduy site. Spent fuel is currently shipped back to the Russian federation for reprocessing. The construction of a national repository for low and intermediate level waste is at a stage of Technical Design and ISAR development . Construction works are expected to start in 2013.

The four Kozloduy Units, being first generation Soviet design reactors, were closed before the end of their design lifetime, in 2002 and in 2006 respectively, in line with Bulgaria's commitment made in the Treaty of Accession to the European Union. In order to help alleviate the consequences of early closure of these 4 units, significant Community assistance was made available: The total contribution for Bulgaria is foreseen to reach €867,78 million by the end of 2013, with the commitments for 2012 still to be implemented and the ones for 2013 being subject to the approval of the Budgetary Authority (decommissioning activity support and mitigating measures in the energy sector). A further European Union contribution is envisaged for the period 2014-2017.

2.5.2. Decommissioning funding

Segregated external funds were created in 1999 to cover decommissioning and waste liabilities: The "Nuclear Installations Decommissioning Fund" (IYaSE) and the "Radioactive Waste Safety and Storage Fund" (BSRAO). The main source of funding is from a levy on the electricity sold by the operator.

The "Radioactive Waste Fund" and the "Nuclear Installations Decommissioning Fund" were established as the legal successors to the abovementioned funds under the "Safe Use of Nuclear Energy Act" adopted in 2002.

The funds are the main financial instruments used for the implementation of the national policy for the safe management of radioactive waste, including its disposal, and the decommissioning of nuclear installations. They were established with the special purpose of guaranteeing the implementation of specific long-term activities (over a period of more than 300 years) relating to the management of radioactive waste and the decommissioning of nuclear installations.

The decommissioning of nuclear installations is financed by the Nuclear Installations Decommissioning Fund under the authority of the Minister of Economy, Energy and Tourism.

The operators of nuclear installations pay a monthly fee into the budget of the Nuclear Installations Decommissioning Fund. The monthly fee is calculated as a percentage of the average price of electricity sold. The percentage is calculated on the basis of the project lifecycle of the installation. At present, the installments of the operator to the Nuclear Installations Decommissioning Fund amount to 7.5% of the electricity sales, and another3% of the electricity sales are directed to the Radioactive Waste Fund.

In accordance with Article 30(1) of the EU Accession Treaty, Kozloduy Units 1 and 2 were shut down on 31 December 2002 and Units 3 and 4 on 31 December 2006. Due to the early

shutdown, the funds raised from relevant fees into the budget of the Nuclear Installation Decommissioning Fund are insufficient to cover the full decommissioning costs. To partially contribute towards this funding gap the Kozloduy International Decommissioning Fund was established and managed by the EBRD. The European Commission is the principal donor and has a decisive vote. The agreed Community financial assistance for the period until the end of 2013 is 867,78 million EUR.

Kozloduy Units 1 and 2 were declared as radioactive menagement facilities and transferred to the State Enterprise for Radioactive Waste (SERAW). The transfer of Units 3 and 4 to SERAW is under preparation.

As of the 31st December 2011 a total of 146.3 million BGN had been raised from fees paid into the budget of the Radioactive Waste Fund.

2.5.3. Decommissioning strategy

Bulgarian law envisages specific steps for the decommissioning of all nuclear installations following their shut-down.

The Strategy for the management of spent nuclear fuel and radioactive waste until 2030 as updated in 2011 envisages the full decommissioning of Units 1 to 4 of the Kozloduy Nuclear Power Plant based on a continuous dismantling concept. In the long term, the sites of the decommissioned Kozloduy Units 1 to 4 are to be re-cultivated up to brownfield status.

A separate programme and financial plan will be developed for the decommissioning of each subsequent installation.

2.6. SLOVENIA

2.6.1. Overview

Slovenia has one nuclear power plant, a research reactor, a waste storage and a uranium mine. A detailed decommissioning strategy and decommissioning funding plan exists for the nuclear power plant. A draft decommissioning strategy and decommissioning funding plan exists for Research Reactor TRIGA Mark II. Decommission of the uranium mine is complete.

The Krško Nuclear Power Plant (Krško NPP) is co-owned by the States of Slovenia and Croatia, which share in equal part the plant's benefits and liabilities. The nuclear power plant has an operational licence until 2023, with investigations which foresee a possible life-time extension of 20 years. Croatia has joint responsibility with Slovenia for the decommissioning and waste management liabilities relating to the Krsko NPP. In 2003, the governments of Slovenia and Croatia signed an Agreement on the status and other legal issues related to investment, exploitation, and decommissioning of the Nuclear power plant Krško. In this agreement, both countries agreed on assuring funds for decommissioning by financing in equal shares, developing a new decommissioning program, costs and timetable for decommissioning, and requiring each country to establish its own fund for the management and collection of financial resources for its share of decommissioning.

2.6.2. Decommissioning funding

The financial resources for the decommissioning and disposal of all radioactive waste and spent fuel must be available before the end of the nuclear power plant's operation. As Krško

NPP is co-owned in 50:50 share by Slovenia and Croatia, two independent funds must be established. In Slovenia, an external fund, a legal entity managed by a dedicated agency, was established in 1995 to gather half of the required resources and to ensure their availability according to the decommissioning and radioactive waste & spent fuel management program. The owner contributes monthly to the fund via a levy on the produced electricity (0.3 eurocent per kWh). The levy is periodically reassessed based on available technical data and other inputs. Both the decommissioning program and the spent nuclear fuel and radioactive waste management program shall be updated and revised every 5 years.

The Croatian decommissioning financing scheme will be addressed within the next issue of this report, as Croatian EU membership is only anticipated from 1 July 2013. A proposal for legislation on the Croatian fund has been drafted during Croatia's accession negotiations.

In Slovenia, the financial resources for the decommissioning and disposal of all radioactive waste must be available before the end of the nuclear power plant's operation. The total cost of decommissioning is estimated at €1.2 billion. The Slovenian fund amounted to € 145 million at the end of 2009.

2.6.3. Decommissioning strategy

Immediate decommissioning is the preferred strategy in order to exploit to the maximum the experience of the personnel, economical factors and political aspects. If no lifetime extension is granted, the dismantling of the plant is expected to be finalised by 2037 with "green field" as the end point.

2.6.4. Radioactive waste management

It is assumed that all low and interim level radioactive waste will be disposed of in a near-surface repository, expected to become available before the start of decommissioning activities and a site selection process is ongoing. The design of the repository should be modular, with sufficient capacity to accommodate all future LILW waste arising in Slovenia.

In the long term, a decision about the construction of a final repository is expected. The spent research reactor fuel will be sent back to the country of origin.

2.7. GERMANY

2.7.1. Overview

Despite its recent decision to phase out all nuclear power plants by 2022, Germany still has a significant nuclear industry with 9 commercial nuclear power plant units still in operation. For 8 nuclear power plant units the authorisation to generate power expired in 2011 when the 13th Act amending the Atomic Energy Act took effect. Altogether, 19 nuclear power plant units are under decommissioning or have already been decommissioned, one of them still containing fuel. From these, 15 nuclear power plants are currently being dismantled, two nuclear power plants are in safe enclosure and two plants have already been completely dismantled. Furthermore, there were 46 research reactors of which are 8 in operation, 10 were shut down or are in the process of decommissioning and 28 already fully dismantled and numerous other nuclear cycle facilities such as fuel fabrication plants, spent fuel storages and other facilities.

In Germany, the decommissioning financing regime is determined by the Atomic Energy Act (Atomgesetz, AtG) and statutory ordinances promulgated on the basis of the AtG, commercial law and tax law, as well as general administrative provisions: Following the 'Polluter Pays Principle', the licensees are responsible for all decommissioning activities. They are free to decide on the decommissioning strategy they would like to follow, and have to bear the respective costs. On the corporate group level, the corporate groups to which the private operators belong set up provisions according to international accounting standards. There are no restrictions with regard to the investment of these internal funds.

Germany has considerable experience of nuclear decommissioning, and its operators have built up significant funds for the financing of such operations.

2.7.2. Decommissioning funding

The way funds are set aside for financing decommissioning activities differs between the purely publicly-owned nuclear installations, nuclear installations with mixed ownership, and nuclear installations belonging to private companies (nuclear power plants, fuel cycle facilities, etc.):

In general, decommissioning of publicly owned nuclear facilities is financed from the current budget. There are no provisions made for future payments. For most projects, the Federal Government covers the bulk of the costs. For some projects, part of the cost is covered by the State Governments ("Länder"). For facilities with mixed ownership, special arrangements are required to clarify the proportion of the costs to be borne by the public and that by the private organisations.

The private owners of nuclear facilities build up internal non-segregated funds according to German commercial law based on their liabilities according to the Atomic Energy Act. On the corporate group level, international accounting standards are applied. The obligation to set up provisions (internal, unrestricted decommissioning funds) starts with the beginning of operation, however the complete amount is not required at this time. According to German tax law, decommissioning provisions for nuclear reactors in German tax balance sheets have to be set up according to the following principles:

- Provisions for spent fuel management are allocated according to their "burn-up" over the period they are used in the reactor. Discounting takes place in a layered procedure over five years. Provisions for the management of the core are allocated over the first 19 years of operation.
- As long as the final shut down of a nuclear facility is not exactly determined, provisions for dismantling, decontamination and demolition have to be accumulated in equal instalments over the first 25 years of operation.
- Provisions for management of radioactive waste from operation are made according to the waste generated. Claims of future interest on advance payments for a final disposal site have to be balanced with the liability which says that operators have to contribute to financing costs of a final disposal site.
- Since 1999, provisions for nuclear decommissioning have to be discounted at a nominal discount rate of 5.5%. However, the discounting period is limited to the period during which the provisions are accumulated. In contrast to IAS/IFRS, the discounting period does not cover the whole time between generation of the kWh which causes the liability and start of the respective decommissioning activity.

- For changes in the size of decommissioning provisions caused by the new German tax law in 1999, a ten years transition period has been granted.

The net provisions given in commercial balance sheets on 31.12.2010 totalled approximately €28.726 million and this provides for a recognised major source of internal finance. The cost estimates on which the provisions are based are regularly updated. Investments are made such that there will be sufficient fund liquidity when needed. However, there is no direct link made between provisions and liabilities.

2.7.3. Decommissioning strategy

Germany has considerable experience in dismantling of nuclear power plants and other nuclear installations. Operators are responsible for the choice of the decommissioning strategy taking radiation protection, employment, knowledge and financial aspects into account. In the past, after having removed all spent fuel, for several nuclear facilities the 'safe enclosure' option was chosen, while for other plants, direct dismantling was preferred. The German law includes both options.

2.7.4. Radioactive waste management

The German policy is aiming at minimising radioactive waste and at recycling and reuse of materials. In this context, the release of materials, buildings and sites from nuclear regulatory control is of high importance. The German Radiation Protection Ordinance includes a comprehensive and consistent set of quantitative and radionuclide specific data for the release of materials, buildings and sites from nuclear regulatory control. In practice, the implementation of such an approach requires a great number of measurements, in particular by the operator, in order to demonstrate compliance with legal requirements.

Although the costs of performing clearance are non-negligible – the costs for decontamination and preparation of the material as well as for performing the clearance and control measurements etc. – the costs for treating this material as radioactive waste and bringing it to final disposal would be considerably higher.

Since July 1, 2005, the Atomic Energy Act forbids transport of spent fuel elements from power reactors to reprocessing (this does not affect spent fuel from research reactors). Prior to this date, reprocessing was an option used by many NPPs in Germany.

Since 2002, the operators of NPPs are required to ensure that an interim storage facility is constructed within the enclosed site or in the vicinity of the installation and that the irradiated nuclear fuel is stored there until it is surrendered to a disposal facility. Accordingly, such local interim storage facilities for spent fuel have been constructed during the last few years at the NPP sites in Germany. Therefore, in principle the shipment of spent fuel from the NPPs to the existing centralized interim storage facilities does no longer occur.

2.8. CZECH REPUBLIC

2.8.1. Overview

The Czech Republic operates six pressurized water reactor units, four VVER-440/213 reactor units at Dukovany and two VVER-1000/320 reactors at Temelín. Taking into account anticipated lifetime extensions, the expected shutdown dates for these units are between 2025-2028 and 2042-2043 respectively. There are also two operational research reactors, one school reactor, four spent fuel storages and three LLW/ILW repositories in use.

In addition to the remedial efforts for the environmental legacies from already closed and operational uranium mining sites, the decommissioning of the commercial NPPs sites will constitute the bulk of decommissioning effort and expense.

2.8.2. Decommissioning funding

In the Czech Republic, two separate funds are set up. The first one for decommissioning and the other one for waste disposal. The former being an internally managed blocked account and the latter an external fund managed by the Ministry of Finance.

Nuclear law requires that in case an estimate of total costs of decommissioning exceeds 300 000 CZK, the licence holder has to make provisions for decommissioning of the respective nuclear installation or category III or IV workplace steadily, so that financial resources deposited on a blocked account will be available for preparation and performance of decommissioning, at the required time and in the required amount, in line with the programme of decommissioning approved by the "State Office for Nuclear Safety" (SONS).

While this bank account is maintained by the licensee, payments can be effectuated solely for decommissioning purposes, subject to the approval of the "Radioactive Waste Repository Authority" (RAWRA). The latter monitors the account and verifies the decommissioning cost estimate on the basis of both publicly available information and expert estimates. The decommissioning plan and the relevant cost estimate of each nuclear installation or workplace shall be updated at least every 5 years.

The most recent decommissioning cost estimates covering the technical decommissioning amounted to €690 million for NPPs Dukovany 1-4, and €583 million for Temelin 1-2 (2009 prices). Liabilities resulting from spent-fuel management (e.g., costs for on-site interim storage) and all costs related to final nuclear waste disposal are not covered by these estimates. Estimated decommissioning costs are based on undiscounted decommissioning cost estimates which must be updated every five years.

The cost for the disposal of all spent fuel and high level waste is borne by the waste producers via their contributions to the so-called "Nuclear Account", a dedicated external fund held at the Czech National Bank and managed by the Ministry of Finance. The "Radioactive Waste Repository Authority" monitors the adequacy of the Nuclear Account.

The contribution of nuclear power plants to the Nuclear Account is based on their electricity production at the rate of 2 €/MWe. Waste producers operating nuclear research reactor contribute on the basis of heat generation at the rate of 0,6 €/MWt.

Small producers pay when their waste is accepted for disposal.

2.8.3. Decommissioning strategy

The adopted decommissioning strategy for both nuclear power plant sites involves a 35-40 year safe enclosure period following spent fuel removal and facility preparation (deferred decommissioning). The installation is then decommissioned over a ten year period. A green field state is not an absolute requirement. The timescale for research reactor decommissioning is more rapid but subject to optimisation for economic reasons.

2.8.4. Radioactive waste management

The waste resulting from the decommissioning process will be processed by standard technologies, which are presently available and which are or will be used in the Dukovany nuclear power plant and the Temelin nuclear power plant.

Radioactive waste repositories are available for the nuclear power plants' decommissioning waste and for the waste arising from decommissioning of other nuclear installations and workplaces.

The decommissioning waste that does not meet the waste acceptance criteria for disposal in existing repositories is planned to be disposed of in a deep geological repository. Investigations are on-going to select an appropriate site for a deep geological repository.

2.9. FINLAND

2.9.1. Overview

Finland has four existing power reactors, two boiling water reactors at Olkiluoto, operated by TVO and two pressurised water reactors at Loviisa, operated by Fortum Power and Heat. A European Pressurised Water reactor (EPR) is under construction at Olkiluoto and is expected to become operational in 2014. A project for a new nuclear power plant has been put forward by Fennovoima at the Pyhäjoki site. Two decisions-in-principle were made by the Finnish Government and ratified by the Parliament in 2010 concerning a fourth reactor in Olkiluoto for TVO and a reactor in Pyhäjoki for Fennovoima. VTT Technical Research Centre of Finland has decided to close the small Triga Mark II research reactor in Espoo after 50 years of operation. Decommissioning is expected to start in the next few years, preceded by an environmental impact assessment. The exact closure date of the reactor has not yet been decided.

2.9.2. Decommissioning funding

Since 1988, financing of nuclear waste management and decommissioning has been regulated by the provisions included in the "Nuclear Energy Act" and the "Decree on the State Nuclear Waste Management Fund".

The operators of NPPs are responsible for the management of all nuclear waste. The operators have to take care of their waste including that of decommissioning until the waste has been disposed of in a manner accepted by the authorities. Responsibilities cover planning, research and implementation including the costs.

The "State Nuclear Waste Management Fund" is a special-purpose fund, segregated from the State budget. Its task is to collect, hold and invest in a secure way the funds needed to guarantee the future management of nuclear waste. The Ministry of Employment and the Economy (MEE) controls that the operation of the Fund complies with the legislation. The Fund does not pay for the waste management measures but keeps in safe the money corresponding to the costs of the remaining measures. Theoretically, all the funds have been returned to the operators when they have carried out all the necessary waste management operations. For these reasons, the Fund could be described as a guarantee fund.

The Fund's capital consists of the contributions determined annually by the MEE and paid by the utilities and the operator of the research reactor. The waste management and decommissioning costs shall be evaluated in nominal terms following the current cost level, without discounting. If a significant part of the costs are not dependent on the amount of nuclear waste the system allows distribution of costs over the first 25 years of plant operation against full securities. Also, the funding of major increases in liability may be distributed over five years.

In 2011 the State Nuclear Waste Management Fund amounted to about € 2120 million, adequate to cover 97% of the future financial liabilities. These arise from the conditioning and disposal of the current amount of waste and decommissioning of the facilities. The collection of assets will continue in order to cover the remaining liability and that due to additional accumulation of nuclear waste. At each moment, the amount of liabilities which is not yet covered by the fund has to be covered by securities supplied by the licensees. To provide for unforeseen costs, the Government can decide on an extra security of up to 10 % of the total liability.

The licensees are entitled to borrow money from the Fund against securities. These loans may not exceed 75% of the confirmed fund holding of the loan-taker at a time. The State has a right to borrow the sum not borrowed by the contributors. The remaining funds are invested by the Fund.

For ensuring that the cost estimates for waste management and decommissioning are realistic, the owners of the NPP's are obliged to update cost estimates for carrying out nuclear waste management, including decommissioning, every three years. A plan for the decommissioning of nuclear facilities, which includes technical details, shall be updated at six year intervals. The authorities review these technical plans and cost estimates. The last updates for technical plans were published in 2009 and for cost estimates in 2010.

2.9.3. Decommissioning strategy and radioactive waste management

Management of spent nuclear fuel from the NPPs is based on disposal into a geological repository, planned to be operational around 2020. Low and intermediate level waste from the NPPs will be disposed of into already existing licensed onsite repositories.

The decommissioning plan for the Loviisa NPP is based on immediate dismantling after 50 years of operation. The spent fuel storage remains on site after the plant is decommissioned until all spent fuel has been transported to Olkiluoto for final disposal. The decommissioning plan for the Olkiluoto NPP units 1 and 2 is based on deferred dismantling after a safe storage period of 30 years. The decommissioning strategy of the unit OL 3 is immediate dismantling. Dismantling of all the units at Olkiluoto site is expected to be done in one campaign. The onsite repositories for operational low and intermediate level waste will be extended to

accommodate the waste from decommissioning. The strategy in Olkiluoto is justified by the decrease of the activity of the contaminated circuits and because of the continuation of the nuclear activities at the site is foreseen towards the end of the century. The strategy in Loviisa is justified by the feasibility of decontamination of the primary circuit, availability of experienced workers and by the need of the site for new electricity generation capacity.

2.10. SPAIN

2.10.1. Overview

Spain has 8 operating power reactors, two shutdown reactors (one in safe enclosure), a fuel fabrication plant and one nuclear research center, currently under decommissioning, and around 1,200 radioactive instalations in the field of the industry, medicine and research generating LILW. None of its Uranium mines is operational, all of them being already environmentally restored. The "Spanish Radioactive Waste Management Organisation" (ENRESA), a state company set up in 1984, is responsible for spent fuel, radioactive waste management and decommissioning activities. Since the endorsement of the Law 11/2009, the management of radioactive waste, including spent nuclear fuel, and the dismantling and decommissioning of nuclear facilities was qualified as an essential public service corresponding exclusively to the State (commissioned to ENRESA).

2.10.2. Decommissioning funding

A Royal Decree 1349/2003 on the ordering of the activities of ENRESA requires the conclusion of contracts between ENRESA and the companies owning nuclear power plants and other facilities generating radioactive waste. The major objective of these contracts is to establish the conditions for the reception of radioactive waste during the operating life time and the decommissioning of the installations.

The regulation on the provision of funds for waste management and decommissioning was originally based on a general fee on the electricity tariff; but since the approval of Royal Decree-Law 5/2005, a revised system is applied where nuclear utilities bear the bulk of the expenses (last amendments by Law 11/2009 and Law 2/2011).

These amounts are allocated to the build-up of a fund, managed by ENRESA, the revenues of which arise from:

The amounts collected via the supply and access fees proportional to electricity sales. The percentages to be applied, established by the Law 11/2009, can be modified by the Government. By these means, funds are collected for the management of waste generated in NPPs that ceased their operation before 1st of January 2010, as well as waste generated by other reasons (eg. research activities, unexpected shutdown of a NPP, etc.).

Fees to the licensees of the nuclear power plants of a certain amount, which results from multiplying the gross kilowatt-hours generated by each plant in each calendar month by a unit value specific to each plant established by the Law, that can be modified by the Government. This system, in force since 1st of January 2010, is applied to cover the management of spent fuel and waste generated by NPPs in operation.

Fees collected for the management of radioactive wastes arising from the manufacturing of fuel assemblies and for the dismantling of the facilities at which such fuel assemblies are manufactured.

Billing to the operators of radioactive facilities generating radioactive wastes and involved in medicine, industry, agriculture and research, to be directly collected to the operators via tariffs approved by the Law, that can be also modified by the Government.

The financial management of the fund by ENRESA is governed by the principles of security, profitability and liquidity. The total amount shall cover the costs related to the activities contemplated in the General Radioactive Waste Plan GRWP. For nuclear power plants, a 40 years service lifetime is assumed in the calculation. The average value of the yearly incomes estimated to finance the future costs of decommissioning and end fuel cycle burdens represents around €6.69/MWh of nuclear origin (2011 value).

The GRWP includes activities regarding the management of radioactive waste, spent fuel as well as dismantling and decommissioning of both nuclear and radioactive facilities. It also addresses the uranium mining and milling activities performed prior to 1984. The GRWP is revised every four years or more frequently upon the request of the Ministry of Industry, Energy and Tourism. In addition to this, during the first six months of every year, ENRESA draws up an updated economic-financial study of the costs of the activities contemplated in the GRWP. Furthermore, each year a technical-economic assessment is submitted to justify the suitability of the annual budget for the next financial year and to provide forecasts for the next three years, with respect to the provisions of the updated economic-financial study of the costs.Total decommissioning and waste management costs are estimated at €16.8 billion (2011 value), including disposal. The dismantling of nuclear power plants is estimated at €3.18 billion (2011 value). The total amount of money collected in the fund as of 31st December, 2010 was €2.913 million, i.e. roughly 24% of the future stimated cost.

2.10.3. Decommissioning strategy

The GRWP set up as the national selected strategy is one of immediate dismantling except for the Vandellós I nuclear power plant, which is already decommissioned to stage 2 as of the beginning of 2003 and which is due to remain in safe enclosure state for 30 years. The immediate decommissioning strategy is to be initiated three years after definitive shutdown and following removal of the spent fuel. The end-point of decommissioning is the free release of the site, e.g. “green field”.

2.10.4. Radioactive waste management

The handling, storage and disposal of radioactive waste are the responsibility of ENRESA, the Spanish radioactive waste management agency. The radioactive waste management services offered by ENRESA to the operators of nuclear and radioactive facilities are governed by contracts based on corresponding type-contracts and the fees established by the Law. Once the radioactive waste is removed from the facilities, ENRESA becomes responsible for its management until its definitive disposal.

In accordance with the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management the seven nuclear power plant sites in Spain are also radioactive waste management facilities.

2.11. UNITED KINGDOM

2.11.1. Overview

In the United Kingdom there are three main nuclear operators, British Energy (BE), British Nuclear Fuel (BNFL), and the UK Atomic Energy Authority (UKAEA). BE is a private company while BNFL and UKAEA belong to the public sector. The UK's decommissioning plans are advanced and well documented, because the UK was a pioneer in the field of nuclear power generation and already has many retired nuclear facilities that need to be decommissioned. The UK government's Nuclear Decommissioning Authority (NDA) was set up in 2005 to take over the sites previously owned by BNFL and the UKAEA and is also expected to manage the decommissioning of British Energy's sites.

The total cost of decommissioning Britain's civil nuclear facilities is currently estimated to be in excess of €100 billion, although it is widely expected that this figure will rise. The cost estimates are dominated by two sites, Dounreay and Sellafield, which account for approximately 75% of the total liability.

Due to its operational independence, the NDA is considered to be a useful model for other countries to follow for the management of decommissioning once the facilities have been closed. However, the funding mechanisms that resulted in identifiable funds representing only 1 percent of current liabilities, needs to be carefully addressed in order to avoid possible repetitions. In addition, the funding arrangements for NDA give some cause for concern in that the government share (currently 50%) is based upon a short term commitment period which can be seen as inappropriate for long term decommissioning planning.

2.11.2. Decommissioning funding

The NDA has contributed to transparency by publishing a vast amount of useful and accessible material on its decommissioning plans and the estimated costs through the 'Lifecycle Baselines' it drafts for each of its main facilities. A similar remark cannot be made for the government underwritten BE fund.

There have been a number of major changes in the way decommissioning provisions for the civil nuclear power plants have been collected. Provisions were initially set up as internal unsegregated provisions, however these were not passed on to successor companies. A consumer subsidy was introduced in the 1990s – Fossil Fuel Levy (FFL) – in order to finance inter-alia, decommissioning costs. The absence of any segregated fund, and the creation of NDA has seen the main part of this subsidy used by the government for purposes other than nuclear decommissioning.

BE operates the AGR reactors and the Sizewell B PWR. Approximately €350 million of the FFL was passed on to BE and placed in a segregated fund which did not address stage 1 decommissioning. This and the very long deferral periods mean BE was required to only provide relatively small discounted contributions. Subsequently, under the EC approved restructuring package, the former fund was subsumed within the new Nuclear Liabilities Fund (NLF). BE makes periodic contributions into the NFL, aimed at covering all stages of decommissioning and uncontracted liabilities. While BE is making an effort to cover the decommissioning costs of its power stations, there can be no guarantee that the assets in the segregated fund will be sufficient. Therefore, the fund is underwritten by the UK Government to ensure safety and environmental protection. Nevertheless, the Government can initiate at specific intervals, the first of which is 2015, a 'Fund Review' if it believes the assets of the

Fund will outstrip the liabilities by 125%. If the Review confirms that position, the Government has a right to extract the excess funds from the NLF.

BE's nuclear liabilities are estimated in the companies accounts for the year ending 31st March 2003 at €1.5 billion for decommissioning, €5 billion for Contracted Spent Fuel Liabilities and €1.5 billion for uncontracted Spent Fuel Liabilities. BE is also responsible for future (post Jan 2005) spent fuel liabilities. Under the EC approved restructuring plan, BE contributes to the NLF in the following ways: a fixed contributions of €35 million per annum; €412 million of new bonds; €225,000 per tonne/uranium of fuel loaded into Sizewell B reactor; and 65 % of BE's free cash flow. The value of the segregated fund as set out in 2004 annual accounts was €660 million.

2.11.3. Decommissioning strategy

By international standards, UK timescales for decommissioning are long: completion of final clearance for nuclear power plants is not expected until up to 130 years after plant closure. NDA has an objective to reduce this to 25 years, which will tend to increase undiscounted costs and massively increase discounted costs. While the NDA has a supervisory role over plans to decommission British Energy's plants, it is not entirely clear whether it is able to require British Energy to reduce the timescales for its plants, which on current plans assume site clearance is not complete until nearly 100 years after plant closure.

2.11.4. Radioactive waste management

The UK has disposal facilities for low and very low level radioactive wastes. Pending decisions on a long-term solution, interim and high level waste is stored on site. The NDA's strategy for dealing with radioactive waste is dependent on the outcome of wider reviews initiated by the UK Government.

2.12. ROMANIA

2.12.1. Overview

Romania operates two pressurised heavy water reactor units in Cernavodã, operated by SN Nuclearelectrica SA. In addition, Romania has a dual core TRIGA research reactor in Pitesti, operated by Institute for Nuclear Research (SCN) and a shutdown WWR-S type reactor in Bucharest, currently in the second stage of decommissioning, owned by "National Institute of Physics and Nuclear Engineering – Horia Hulubei" (IFIN-HH).

The "Nuclear and Radioactive Waste Agency" (AN&DR) is responsible for the disposal of radioactive waste (RW) and spent nuclear fuel (SNF), and to ensure at national level the coordination of the nuclear installations decommissioning process. AN&DR is a specialized body of the central public administration, with legal personality, under the coordination of the Ministry of Economy, Trade and Business Environment.

2.12.2. Decommissioning funding

In 2007 the Government of Romania adopted a decision regarding the way of establishment and of management of the financial resources necessary for the safe management of radioactive waste and for the decommissioning of the nuclear and radiological facilities.

The purpose of this decision was to determine the amount of contributions that must be paid by the licence holders that hold nuclear units, in order to constitute the necessary financial resources to cover the costs for the decommissioning and the safe management of radioactive waste generated by the operation and the decommissioning of these facilities, as well as the way of administration and management of the financial accumulations achieved in this way.

Therefore, in 2007 two segregated funds were established: one to cover the costs of the disposal of SNF and RW generated by the operation and the decommissioning of the nuclear facilities, the "Waste Management Fund" (WMF) and the second one to cover the costs of the decommissioning of nuclear facilities, the "Decommissioning Fund" (DF). The waste generators are required to make annual contributions to both funds, which are administrated by AN&DR.

SN Nuclearelectrica SA, the main contributor of both funds, pays a levy on energy production at the rates of 1.4 Euro/MWh for WMF and 0.6 Euro/MWh for the DF. The funds are constituted by the State Treasury into interest bearing accounts. The Cernavoda reactor units have a design lifetime of 30 years with possibility to be extended to 50 years after a major refurbisment (25 of operation +1.5 years of refurbishment+25 year of operation). According to the current estimations, the refurbishment process for Cernavoda NPP Unit 1 will take place between 2022-2023. Following shutdown, decommissioning costs are to be incurred over a period of 70 years and are estimated to be around of €250 million per reactor unit.

The funds earmarked for decommissioning of research reactors will be ensured from the State Budget.

2.12.3. Decommissioning strategy

The existing Preliminary Decommissioning Plan (PDP) for Cernavoda NPP Units 1 and 2 is under review and has to be completed by the end of year 2012. Cernavoda NPP units 3 and 4 issued in 2010 the first version of PDP which was endorsed by AN&DR.

The immediate dismantling strategy was selected for decommissioning the WWR-S reactor. The implementation of the strategy is based on the decommissioning plan and the project management.

2.12.4. Radioactive waste management

According to the law, the predisposal management of the radioactive waste (handling, storage, treatment and conditioning) is under the responsibility of the waste generators. As shown in the Romanian Report to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the three nuclear facilities sites in Romania have their own radioactive waste management installations.

The implementation of the Romanian national strategy for radioactive waste management aims to create an operating repository for low - and intermediate - level radioactive waste by 2020. The facility will be suitable to accommodate short-lived radioactive waste, with long-lived radionuclides in limited quantities originating form operation and decommissioning of four units at Cernavoda NPP. The concept proposed for disposal of the waste is a near-surface repository with multiple barrier system.

The disposal of institutional radioactive waste is performed in the National Repository for Low and Intermediate Level Wastes (DNDR), operated by IFIN-HH.

For the management of the SNF and long-lived RW, Romania is developing a preliminary programme for establishing a geological repository along with the cost estimation.

2.13. HUNGARY

2.13.1. Overview

There are four nuclear facilities in Hungary: The Paks Nuclear Power Plant, the Budapest Research Reactor at the KFKI Atomic Energy Research Institute, the training reactor at Budapest University of Technology and Economics and an Interim Spent Fuel Storage (ISFS) Facility.

Other facilities, in which radioactive materials are produced, processed, used, handled, stored or disposed, are non-nuclear facilities. Nuclear facilities fall under the regulatory jurisdiction of the "Hungarian Atomic Energy Authority" (HAEA), non-nuclear facilities are licensed by the "National Public Health and Medical Officer Service".

For the Paks NPP, the initial design lifetime was 30 years, however a lifetime-extension of 20 years is currently under discussion. This will require a licence from the regulatory body. (Concerning the first unit, the lifetime extension licence application was submitted to HAEA by the licensee in 2011.)

2.13.2. Decommissioning funding

The "Central Nuclear Financial Fund" (CNFF) was established on 1 January 1998. It is a separate Treasury account made up of the contributions of the nuclear facilities operators and the waste producers. It is designed for financing the construction and operation of disposal facilities for the final disposal of radioactive waste, as well as for interim storage of spent nuclear fuel and closure of the fuel cycle (according to the present reference scenario: final disposal of spent fuel), and decommissioning of nuclear facilities. CNFF is managed by the HAEA. The state is responsible for preserving the value of CNFF by making annual contributions with a sum that is calculated on the average assets of the Fund in the previous year using the average base interest rate of the central bank in the previous year.

It is important to add that the CNFF (being a separate, segregated state fund) is on a separate account in the Hungarian State Treasury, and falls under the control of the "State Audit Office of Hungary" (SAO). Year by year, when giving opinion on the budget appropriation bill of the Republic of Hungary, SAO reviews also the proposed budget of CNFF as part of the central budget.

The nuclear power plant at Paks is obliged to make annual contributions to the fund covering the total cost of waste and spent fuel management and decommissioning until the end of its operation. The payment is determined annually by the "Public Agency for Radioactive Waste Management" (PURAM) in discussion with the HAEA, the Hungarian Energy Office as well as a special committee of the CNFF, and approved by the Minister disposing over the Fund. Finally, as the research and training reactors are state-owned, the cost of their decommissioning will be paid into the CNFF by the state when the time comes. The Act on Atomic Energy requires that nuclear facilities pay during their life-time into the Central Nuclear Financial Fund the cost of all activities to cover radioactive waste and spent fuel management as well as decommissioning. The calculations are updated anually.

In total the decommissioning cost of the Paks Nuclear Power Plant and the Interim Spent Fuel Storage Facility was estimated as 330 billion HUF given in 2011 year price, which is about € 1,182 million (calculated with the 2011 year average exchange rate: 279 HUF/Euro).

2.13.3. Decommissioning strategy

PURAM is responsible for the decommissioning and waste management activities, including preparation of the long term plans and calculation of the related costs. The plans, after supervision by the HAEA, are approved by the Minister supervising the HAEA.

The first study report discussing the decommissioning of the nuclear facilities (Paks NPP and the ISFS facility as well) was prepared by DECOM Slovakia Ltd in 1997. Then DECOM Slovakia Ltd and TS-ENERCON Ltd jointly prepared the first version of the preliminary decommissioning plan of the ISFS in 2003.

The present, accepted decommissioning strategy is deferred dismantling with a safe enclosure period of 20 years contained in the preliminary decommissioning plan (actualised in 2008). It has been worked out for the “green field” option as the end point of decommissioning.

The preliminary decommissioning plan is updated with a 5 years period, but its cost estimates are reviewed annually.

2.13.4. Radioactive waste management

Non-nuclear power plant wastes are disposed of in the existing Radioactive Waste Treatment and Disposal Facility, operational since 1976. The Interim Spent Fuel Storage Facility is available for spent fuels from the nuclear power plant.

In addition, a project is on-going to construct a low and intermediate level waste repository at Bátaapáti (National Radioactive Waste Repository; NRWR) for the operational and decommissioning waste of the NPP. A referendum held in July 2005 demonstrated the existence of a very high level of public acceptance at local level for this project. As the first phase of the construction of the repository, the surface facilities were completed in 2008, which enables to temporarly store of a part of solid waste from the NPP. The first disposal gallery will be installed and commissioned in the underground disposal area of Bátaapáti NRWR by the end of 2012.

Finally, a site for a deep geological repository is being examined for the final disposal of high activity wastes and spent fuel.

2.14. NETHERLANDS

2.14.1. 2.14.1 Overview

The Netherlands has one operational power reactor (Borssele) which has recently been subject to a lifetime extension up to 2033. A second power reactor (Dodewaard) was shutdown in 1997 and is currently in safe enclosure. An enrichment facility (URENCO) is in operation at Almelo and the country contains several operational research reactors and waste storages.

There has been a general understanding that the "polluter pays principle" applies. Consequently, the operators of the NPPs had made financial reservations for

decommissioning on a voluntary basis. The decommissioning funds were managed by the utilities.

Since April 2011 the owners of nuclear facilities have the legal obligation to set up a decommissioning fund, in order to fully cover the decommissioning costs. Also for the countries research reactors decommissioning funds have been established.

2.14.2. Decommissioning funding

In principle the licensee is responsible for all aspects of decommissioning. According to the latest revision of the Nuclear Energy Act, in force since April 2011, a nuclear facility shall be decommissioned directly after final shut down[17]. The new legislation also requires the licensee to make available adequate financial resources for decommissioning at the moment that these are required. Therefore, the licensee will have to calculate the costs of all the activities described in the decommissioning plan, and provide for a financial provision offering sufficient security that all costs are covered at the envisaged start of decommissioning. The licensee is free to choose the form of the financial provision: however, it shall be approved by the authorities. At the moment of writing this report, the licensees have prepared their financial provisions, and are discussing them with the authorities.

2.14.3. Decommissioning strategy

Decommissioning implies the implementation of all administrative and technical measures that are necessary to remove the facility in a safe manner, and to create an end state of 'green field'. Therefore, during the operational phase, the licensee is required to develop a decommissioning plan, describing all the necessary measures to safely reach the end state of decommissioning, including the management of radioactive waste, record keeping, etc. This decommissioning plan shall be periodically updated every five years, and shall be approved by the authorities. The decommissioning plan finally becomes part of the decommissioning licence.

At the end of decommissioning, the licensee can apply for withdrawal of the licence, after presenting an end report to the authorities proving that the decommissioning was completed. After withdrawal of the licence, records will be stored at the "Central Organisation for Radioactive Waste" (COVRA).

In May 2002 a licence was granted to GKN, the operator of the NPP Dodewaard, to bring and keep the plant in a safe enclosure until 2045. One of the requirements in the licence for safe enclosure is to keep a record system of the inventory of all radioactive materials and components, which have become contaminated or activated during operation, and to update it every five years. In July 2005 the stage of safe enclosure was realised. Another requirement in the license is that the licensee shall commence dismantling in 2045. The licensee will have to apply for a dismantling licence in due time.

For the nuclear power station in Borssele the government has reached an agreement with the operator on immediate dismantling after closure (scheduled in 2033).

The Low flux (research)Reactor at Petten has been shut down in 2010, and currently the decommissioning is being prepared.

17 [1]The NPP Dodewaard, brought into state of safe enclosure in 2005, is excluded from this requirement.

2.14.4 Radioactive waste management

The Nuclear Energy Act stipulates that a licensee can dispose of waste only if disposal is specifically approved in a license, or by handing it over to the authorised waste management organisation. As such, the Central Organisation for Radioactive Waste, COVRA, is the only organisation authorised by the Government of the Netherlands. COVRA N.V. is a State owned company and is responsible for the treatment and storage of all kinds of radioactive waste (LLW, ILW, HLW, spent fuel). This comprises also the waste associated with dismantling of a nuclear facility. Storage takes place in a single location in the south-west of the country, for a period of at least 100 years. After that period, geological disposal in salt or clay is foreseen.

The government policy on spent fuel management is that the decision on whether or not to reprocess spent fuel is in the first place a matter of the operators of the Borssele NPP. In the past, the operators have decided in favour of reprocessing their spent fuel for economic reasons. This decision was endorsed by the government. The operator of the Borssele NPP has recently extended the contract with the reprocessing facility at la Hague, France. As the NPP Dodewaard is concerned, all spent fuel has been reprocessed in the past.

A centralised storage facility for HLW and spent fuel from research reactors, the HABOG facility, is available at Borssele.

2.15. LITHUANIA

2.15.1. Overview

Lithuania had two nuclear reactors located at the Ignalina Nuclear Power Plant, close to the town of Visaginas. Before closure, these reactors constituted up to 70-80% of the country's electricity generating capacity. In line with obligations enshrined in the Treaty of Accession to the European Union, Unit 1 was permanently shutdown on 31 December 2004 and Unit 2 on 31 December 2009. In order to mitigate the effects of the obligation to shut down the country's only nuclear power plant, a European Union assistance programme was established.

Lithuania is currently planning to build a new NPP at Visaginas, in the vicinity of the Ignalina NPP. For decommissioning funding, the Lithuanian Law on Nuclear Energy requires that the operator of the nuclear installation shall ensure the accumulation of resources in a fund for decommissioning of the nuclear installation, including safe decommissioning of the nuclear installation and safe management of radioactive waste. The detailed legislation on the Decommissioning Fund for future NPPs is currently being drafted, in line with the Commission Recommendation on the management of financial resources for the decommissioning of nuclearinstallations, spent fuel and radioactive waste.

2.15.2. Decommissioning funding

The Ignalina reactors are foreseen for immediate dismantling with completion by 2030. The total cost of decommissioning is estimated at €2,4 million (2011), based on the immediate dismantling strategy.

There are presently three different sources available for funding of decommissioning: direct European Union assistance; the Ignalina International Decommissioning Support Fund (IIDSF) to which the European Union is the largest contributor (~95%); and a National Fund.

The main source of the National Fund was an annual contribution amounting to 6% of the plant's revenue from the sold electricity. The closure of the unit 2 reactor in 2009 led to a shortfall in the national fund, there being no longer any revenue to be taxed. This problem is currently being addressed by the manager of the fund, who has developed a plan for corrective measures to fund the shortfall.

By 2013 the total support to Lithuania will reach approximately €1.4 billion via either direct European Union contributions or the IIDSF. However, this assistance is not only foreseen for decommissioning of the reactors. Issues related to security of supply (replacement capacity) and the maintenance of an adequate safety culture and retraining at the plant are also addressed. It is also to be noted that a significant proportion of the State Fund has been used for non-nuclear projects relating to replacement capacity. An additional European Union contribution is envisaged for the period 2014-2017.

2.15.3. Decommissioning strategy

The Final Decommissioning Plan, the result of intensive discussions, is based solely upon the selected strategy of immediate dismantling. The immediate decommissioning strategy is planned to reach the "brown field" state, with possible re-use of the site as an industrial facility or for new energy production. The decommissioning project is expected to be completed by 2030.

Dismantling requires appropriate radioactive waste management facilities (as a minimum landfill disposal site and free release measurement facility) however, dismantling of non-contaminated or slightly contaminated parts of the plant has started in 2008.

2.15.4. Radioactive waste management

At present, only operational waste facilities are available in Lithuania. A landfill buffer facility for short-lived very low level radioactive waste and a dry storage facility for spent fuel are under construction. The construction of a near surface repository and a land fill facility for low and medium level radioactive waste are foreseen to start by 2013/2014. A final waste repository is expected to become available in 2050.

2.16. AUSTRIA

2.16.1. Overview

In 1978, the Austrian electorate decided in a referendum not to start the operation of the completed nuclear power plant in Zwentendorf. Subsequently, Austria's statute as a nuclear free country was introduced in the constitution and enforced in the regulatory framework.

Only one nuclear installation exists in Austria: A TRIGA research reactor, which is operated by the Vienna University of Technology (Institute of Atomic and Subatomic Physics).

The two other nuclear installations, the ASTRA research reactor in Seibersdorf and a zero power research reactor in Graz, have been shut down and decommissioned.

2.16.2. Decommissioning funding

Vienna University of Technology has reserved financial resources for a back-end management for spent fuel return. The Austrian state will take over the costs for decommissioning of the facility at the end of the operating life of the reactor.

Since the beginning of 2003, all holders of radioactive waste and orphan sources for disposal are obliged to make contributions to a fund for final disposal. When the radioactive waste is delivered to "Nuclear Engineering Seibersdorf GmbH" (NES) for treatment and interim storage, a charge ("Vorsorgeentgelt") has to be paid. This charge comprises the estimated costs for interim storage, pre-disposal treatment and transport to the final repository as well as for disposal and long term management of the final repository. The final disposal fee is calculated using cost estimates based upon the comparison of costs on existing foreign repositories. The contributions of the producers go into a special separated fund which is not part of the state budget and is administered by Austrian national authorities. This fund is exclusively dedicated for financing the future final disposal in an appropriate repository.

2.16.3. Radioactive waste management

The low and intermediate level waste resulting from the decommissioning of the ASTRA research reactor has been treated, conditioned and placed in interim storeage at NES. The quantity of radioactive waste that originated from the reactor decommissioning was 160 tons of low level waste and less than 1 ton of intermediate level waste.

NES has in total a storage capacity of 3000 m^3 for LILW. Around 2100 m^3 of LILW are stored in the interim storage facility.

The question regarding the final storage of radioactive waste is still open. Currently, there are no plans to construct a final repository in Austria in the near future. Austria being a small country without nuclear power plants sees an international co-operation for the disposal of radioactive waste as the most reasonable solution and is therefore interested in common, shared repositories for radioactive waste.

2.17. ITALY

2.17.1. Overview

Following the Chernobyl accident and subsequent 1987 referendum, the governmental body - "Interministerial Committee for the Economical Planning" - in charge of the strategic decisions on nuclear power plants decided in 1990 on the definitive closure of all nuclear plants. At the same time Italy's largest power company ENEL, was requested to commence planning for a deferred decommissioning strategy leading to the eventual unconditional release of the site.

In the context of privatisation and liberalisation, between 2000 and 2005, the liabilities of former ENEL, FN and ENEA facilities were transferred to the company SOGIN which in turn has been transferred 100% to the Italian Ministry of Treasury. While total decommissioning liability is estimated at approximately € 4 billion ENEL has only accumulated provisions of €800 million prior to the re-organisation. Thus, considerable decommissioning costs are to be borne by the current generation through a levy on the price of electricity.

The only operating nuclear facilities today in Italy are research and waste management facilities. One pilot fuel fabrication facility has been already completely dismantled.

On 23 July 2009, the Italian Parliament approved the Law n.99 "*Provisions for the development and internationalization of enterprises, and energy*", setting the foundations for re-entering the production of electricity from nuclear power plants. Law 99/2009 contains the fundamental principles of the new Italian nuclear legal framework, including for example a Government entitlement to establish legislative procedure for the Italian nuclear power plants siting, the creation of an independent Nuclear Safety Agency, the reorganization of SOGIN and the promotion of innovation in the nuclear sector.

In 2010, a decree on the localization and operation of facilities for the production of nuclear and electric power, the fabrication of nuclear fuel and storage systems of irradiated fuel and radioactive waste as well as compensation measures and information campaigns was issued. It appoints SOGIN as the company responsible for the decommissioning of the new plants. At the end of the life of the plant, SOGIN shall proceed with the safety enclosure of the newly established plants and the decommissioning activities to convert the site to other purposes. Such activities will be exclusively financed by the holders of the sole authorization through a specific decommissioning fund.

At the moment, however, the nuclear new build programme is suspended, awaiting the results of the European safety evaluation plan of the European NPPs following the nuclear accident in Fukushima, Japan in April 2011.

2.17.2. Decommissioning funding

ENEL, the Italian operator, accumulated funds until the 1987 Italian nuclear referendum (about €800 million). Since then, decommissioning funds have not been accumulated, but costs are covered through a direct levy on the Italian electric bill. A ministerial decree of January 2000 established an instrument for financing the cost of decommissioning by introducing a levy on the price of electricity paid from final users. The decree concerns only those nuclear installations, which were in one way or another involved in the production of electricity (for example: nuclear power plants, fuel fabrication facilities and reprocessing facilities). The levy is fixed by the National Authority for the Electricity and Gas on the basis of SOGIN's annual program of activities. Between 2002 and 2004, €156 million was added annually to the decommissioning fund. The levy is transferred to a national fund for later transfer to SOGIN in order to finance decommissioning costs. This national fund is maintained as an internal unrestricted state fund, the operation of which does not appear to be particularly transparent. As with all such funds, the state is free to use the money for any purpose of public interest and not only nuclear decommissioning.

As a consequence of the public financing of the activities and of the creation of a single company, SOGIN, to carry out the Italian decommissioning, a system of checks and evaluation has been put in place. The adequacy of the decommissioning and spent fuel management costs is evaluated by the "Italian Regulatory Authority for Electricity and Gas" (AEEG), on the basis of a preliminary budget submitted by SOGIN, by the 31st of December of the year preceeding the one for which the preliminary budget refers. The expenses are then certified and approved, once incurred, by the 31st of March of the following year. The budgets are revised and updated periodically.

Every three years the AEEG approves the updated overall decommissioning budget (up to a Greenfield status of the sites) inclusive of an estimate of the costs of final disposal of all materials to the National Repository.

Any shortfall is typically addressed through the raising of the A2 levy on the electrical bill. Such adjustments can be made every three months during the regular update of the electrical bill components. In order to allow for adequate planning, SOGIN communicates to the AEEG, at the beginning of every year and then through bi-monthly updates, an overview of its financial needs based on the progress of the decommissioning activities.

The total decommissioning cost for all the nuclear facilities were estimated in 2004 at €4,029 million. Information on the SOGIN managed fund is well documented in its annual report.

The decommissioning policy for future NPPs has to be reformulated by the Parliament at the end of the current post-Fukushima moratorium.

2.17.3. Decommissioning strategy

In 1999, the original deferred decommissioning strategy was revised and a decision to move to immediate decommissioning was made. Three main objectives were also set, namely to treat and condition all liquid and solid radioactive waste currently in on-site storage within a period of 10 years; also within 10 years, to select and construct a national repository for low and intermediate level wastes which can also be used as temporary storage for high level long lived wastes, in particular spent fuel and wastes resulting from reprocessing; and finally to start immediately the nuclear power plants' decommissioning and complete it by 2020. In fact, all Italian nuclear installations will have to be decommissioned by 2016-2020 (Garigliano NPP by 2017, Caorso NPP by 2017, Latina NPP by 2020, Trino NPP by 2016, the EUREX and the ITREC pilot reprocessing facilities by 2016, the Casaccia pilot MOX fuel fabrication facility by 2016 and finally the FN fuel fabrication facility by 2016). The 2020 deadline was subsequently extended to 2024 due to delays in the selection of the site for a national repository.

The decommissioning policy for future NPPs has to be reformulated by the Parliament at the end of the current post-Fukushima moratorium.

2.17.4. Radioactive waste management

In the absence of a national repository, most of the radioactive waste, including spent fuel, is at present stored in temporary facilities on the sites where they have been generated. A process for choosing the site for the national repository is on-going. Until now, there exists neither a site for final waste disposal nor a centralised interim storage facility for spent fuel and high level waste.

Following the political decision to stop nuclear power activities, shipments of spent fuel to reprocessing facilities abroad were practically suspended. Following the political decision to stop nuclear power activities, shipments of spent fuel to reprocessing facilities abroad were suspended.

The issue of the remaining spent fuel will be addressed either by a instigation of a new reprocessing contract or possibily via on-site storage in casks. The remaining fuel will be covered by a new reprocessing contract currently under negotiation. SOGIN is also considering the possibility of on-site storage in casks.

2.18. LATVIA

2.18.1. Overview

There was only one fully State-owned nuclear installation in Salaspils Latvia, which was permanently shut down in 1998. The Latvian Environment, Geology and Meteorology Centre (LEGMC) is responsible for the facility and has been performing decommissioning activities since 1999. Decommissioning is fully financed from the state budget.

2.18.2. Decommissioning funding

A decommissioning cost estimate was provided with the initial decommissioning plan, and approved together with the decommissioning concept. The state is liable for the decommissioning costs, which are planned in the multi-annual state investment programme. The financial commitment is made in the annual state budget.

The completion of the decommissioning activities is foreseen by 2013. According to the revised decommissioning concept, the site will subsequently become available for nuclear use or for other applications involving radioactive material.

2.18.3. Radioactive waste management

LEGMC also manages a near surface radioactive waste repository at Baldone. It is planned to modernise and extend the radioactive waste repository in order to ensure the disposal of all radioactive waste arising from the decommissioning of the Salaspil research reactors.

In total, it is expected that 1032 tons of radioactive waste will require disposal.

2.19. ESTONIA

2.19.1. Overview

Estonia inherited a number of installations from Russia related to the nuclear industry, amongst them Paldiski, a former Soviet nuclear submarine training centre, the only site under decommissioning.

2.19.2. Decommissioning funding

The decommissioning project is financed by the state and its implementation was entrusted to the Estonian Radioactive Waste Management Agency. To that end, EEK52 million (approximately €3.3 million) was budgeted during the financial years 2000-2004.

2.19.3. Radioactive waste management

The disposal of radioactive waste is a major concern in Estonia given that some sites store considerable quantities of radioactive waste, in particular the Sillamäe Metal and Chemical Production Plant. The site, the largest phosphate-uranium operation in the former Soviet Union, stores 8 million metric tons of hazardous waste (6.3 million metric tons of uranium processing residues and 150,000 m^3 of uranium mill tailings).

The targeted projects needed to address these historical liabilities are not foreseen as yet in terms of financial or technical planning.

The management of radioactive waste being the major concern, the final goal of decommissioning is to remove all radioactive material from the Paldiski site and its release for unrestricted use. Firstly, the operational waste, the contaminated components, building materials, etc. are to be disposed of in an interim waste storage facility.

The total capacity of the interim radioactive waste storage is 1200 m^3

The complete free release of the site could only be envisaged if a final radioactive waste repository was constructed in Estonia. The preparations for the selection of the site for the final repository are ongoing.

2.20. POLAND

2.20.1. General introduction

Poland at the moment does not have nuclear electrical generation capacity, since the past project to build an NPP was abandoned in 1990. However, Poland took the decision to introduce a nuclear power programme in 2009, for which an appropriate legislative framework is established. The legislation concerning the safety of radioactive waste and spent fuel management activities and facilities does exist in Poland under the Atomic Law Act (established 2000, last amended 2011 with regard to the Council Directive 2009/71/EURATOM of 25 June 2009), as well as appropriate secondary legislation upon radioactive waste and spent nuclear fuel (established 2002). A review is prepared due to the entrance into force of the Council Directive 2011/70/EURATOM of 19 July 2011, nevertheless the existing regulation does cover the majority of safety issues within its scope, as the supervision over the radioactivity use does exist in Poland.

Currently, there is one research reactor in operation (one has been decommissioned to the brownfield) at Świerk site near Warsaw, operated by the "National Centre for Nuclear Research" (formerly: "Institute of Atomic Energy and Andrzej Soltan Institute for Nuclear Studies"). There is one organization responsible for and licenced to dispose the radioactive waste and spent nuclear fuel – "Radioactive Waste Management Plant", a State-owned company, which activities are subsidized from the State budget. It owns and operates RW/SNF facilities, including two SNF wet storages, as well as the National Radioactive Waste Repository in Różan – the only repository in Poland, of surface type.

Supervision (from nuclear safety, radiation protection and nuclear security point of view) over any activities and facilities within the scope of RW/SNF management is performed by the President of the "National Atomic Energy Agency" (NAEA) – a State nuclear regulatory authority.

2.20.2. Decommissioning policy and funding

In Poland, radioactive waste originates from research reactors, scientific and educational institutions, industry and medical facilities. The costs of decommissioning of research reactors as well as RW/SNF disposal from the aforementioned waste streams are attributable to the State's budget. The state has a general responsibility for making available adequate financial resources for its decommissioning. The operator is responsible for preparing the decommissioning plan and for the implementation of the project, subject to the authorization of the President of the NAEA.

Regarding the nuclear facilities, along with the 2009/71/EURATOM Directive, appropriate series of requirements have been set up for the decommissioning of nuclear facilities. It sets up, inter alia, licensing procedures and requirements for issuing and updating decommissioning plans: before applying for the licence to build, commission or operate a nuclear facility, the head of an organization shall draw up a nuclear facility decommissioning programme to be submitted to the nuclear regulatory authority for approval along with the application for granting the licence. In the course of nuclear facility operation, the said programme shall be updated at least once every five years or immediately if the nuclear facility is closed under circumstances unaccounted for in the programme. An updated nuclear facility decommissioning programme shall be submitted to the President of the NAEA for approval along with the estimates of the nuclear facility decommissioning cost.

The amendment of the Atomic Law Act in line with the 2009/71/EURATOM Directive sets up a series of requirements for providing appropriate resources for funding the NPP decommissioning, as well as the final management and disposal of radioactive waste and spent nuclear fuel arisen from the operation and decommissioning of nuclear power plant. The funds for decommissioning of an NPP and RW/SNF management have to be saved quarterly to a distinguished special found with a dedicated bank account assigned, referred to as a "decommissioning fund". The payment shall be made for every megawatt-hour produced by the nuclear power plant. The head of organization authorized to operate or decommission a nuclear power plant may withdraw funds from the decommissioning found only following a favourable opinion of the President of the NAEA and can use them only to finance decommissioning activities.. Every three months the head of operating organization shall submit a report on the amount of collected funds. In a case of a minimum eighteen-month-long delay in continuing savings, the President of the NAEA may stop the NPP operation.

2.20.3. Radioactive Waste and Spent Nuclear Fuel Management

Poland has a surface repository for low and short-lived intermediate level radioactive waste. The site is also available for the temporary storage of long-lived radioactive waste. Average annual amount of the conditioned radioactive waste ready for disposal constitutes about 100m^3.

Along with introducing the principles of Global Threat Reduction Initiative (GTRI) and International Program of Russian Research Reactor Fuel Return (RRRFR) by the Republic of Poland and after undertaking appropriate activities, shipments of HEU SNF to the Russian Federation took place in 2009, 2010 and 2012. Some of HEU fuel is still being used; nevertheless the majority has been already shipped to the country of its origin. By this opportunity the transport of SNF of EK-10 LEU fuel type was arranged (on separate funding as well as other conditions between Russia and Poland). The program is expected to be finished in 2016 as the remaining reserve of HEU assemblies will be shipped.

The decommissioning project of the nuclear research reactor at the National Centre for Nuclear Research in Otwock-Swierk estimates the amount of RW to be produced in the course of decommissioning activities to be 109 m^3.

2.21. GREECE

Greece has only one research reactor (GRR-1) operated by the Institute of Nuclear Technology and Radiation Protection (INTRP) of the National Centre for Scientific Research "Demokritos", a state organization. GRR-1 is currently running an extensive modification and

refurbishment project, financed by the state. GRR-1 is a state facility and therefore the Greek state is responsible for the cost of decommissioning. All decommissioning activities will be financed from the state budget.

A detailed decommissioning strategy and funding plan do not exist for GRR-1, at this moment. However, a GRR-1 decommissioning plan is under preparation, in accordance to the national, European, and international norms and conventions and will take into consideration the safety of workers and of the general public. The Plan will become part of the revised/updated PSAR to be submitted for licensing the restart of the reactor. The GRR-1 decommissioning plan will take into account both radioactive and conventional toxic waste.

2.22. MALTA

Malta has not responded to the questionnaire. The situation in Malta was described in the 2nd report as follows: "Malta reported that it had no relevant activities or installations to be covered in the present communication. Nevertheless, it is foreseen to set up a centralised storage facility for long lived radioactive waste."

2.23. CYPRUS

Cyprus has not responded to the questionnaire. For the 2nd report, Cyprus reported that it had no relevant activities or installations to be covered in the present communication.

2.24. DENMARK

2.24.1. Overview

In 2000, after 40 years of nuclear research, Denmark decided to close down all nuclear facilities except for the Waste Management at Risø National Laboratory namely the research reactors DR 1, DR 2, and DR 3 and the Hot Cells. In 2003 the Danish Parliament decided that the research facilities should be decommissioned to a status of "green field" during a maximum period of 20 years.

By 2005 the reactor DR 1 was decommissioned and the building was released free without restrictions (green field). By 2007 the reactor DR 2 itself was decommissioned. The reactor hall is still in use in connection with the decommissioning of the other nuclear installations.

2.24.2. Decommissioning funding

All nuclear installations have been shut down. Since al facilities are 100% State owned,all costs are covered through govermnent budgets. The estimated decommissioning costs are fully covered by the provisions accumulated by end 2009.

2.24.3. Radioactive waste management

Finally the Waste Treatment Plant should be decommissioned when a Danish final repository has been established.

2.25. IRELAND

Ireland has reported to have no relevant activities or installations to be covered in the present communication.

2.26. LUXEMBOURG

Luxembourg has reported to have no relevant activities or installations to be covered in the present communication.

2.27. PORTUGAL

Portugal has reported to have no relevant activities or installations to be covered in the present communication.

2.28. EUROPEAN UNION: JOINT RESEARCH CENTRE (JRC) OF THE EUROPEAN UNION

2.28.1. General introduction

Under the Euratom Treaty, the JRC has to manage its nuclear heritage and in particular decommission installations that have been shut down. A budget heading has been created for this purpose by joint agreement between the European Parliament and the Council. In 1999, the Commission decided to launch without further delay a programme for decommissioning its obsolete nuclear installations, called the D&WM programme (decommissioning and waste management).

The follow-up of the D&WM programme has been reported through regular Communications from the Commission to the Council and to the European Parliament (SEC(2004)0621 and COM(2008)903). A new related Communication is currently in preparation.

2.28.2. Decommissioning funding

The JRC has full responsibility on the operation and decommissioning of its nuclear facilities in Ispra (IT), Karlsruhe (DE), Petten (NL) and Geel (BE). The facilities were for the large part built and put into operation in the early 1960s or 1970s. Since the historical liability arising from the use of those installations cannot be considered to be current research within the meaning of the term currently used in connection with the various framework programmes, separate financial arrangements are made through the JRC D&WM programme.

Only in the case of the Petten High Flux Reactor, provisions covering a part of the decommissioning costs are put aside from an operational budget (currently trough successive Supplementary Research Programmes, i.e. outside of the JRC budget).

At the end of 2008, the JRC carried out its latest reported analysis of its "historical" and "future" liabilities (as presented in COM (2008) 903). The total amount was put at € 1,221.7 million[18]. The total cost of € 1,221.7 million[19] is split among the four sites as follows:

- 55.3% for Ispra (€676 million);
- 35.0% for Karlsruhe (€427 million);
- 5.7% for Petten (€69 million);
- 3.4% for Geel (€42 million);
- 0.6% for contingencies (€8 million).

A new update of the budget is in preparation in 2012 and will be presented in the next related Communication.

The indicative duration of the programme is 1999 until around 2030. The objective reasons explaining the increase of the budget (as compared to the original estimations) were explained in the Communication. A new Communication from the Commission is in preparation in 2012.

Decommissioning funds are managed by the JRC on the basis of a multi-annual schedule approved by the budgetary Authority with audits by the internal services of the Commission and by the Court of Auditors in order to ensure the appropriate use of the funds.

The D&WM programme and its estimated total budget are reviewed by external experts on a periodic basis and are followed regularly by a Group of Independent Experts from various Member states.

[18] in constant 2003 prices
[19] in constant 2003 prices

3. COMPARISON OF FUNDING PRACTICE WITH THE COMMISSION RECOMMENDATION[20]

3.1. SECTION 3: DECOMMISSIONING OF NUCLEAR INSTALLATIONS

3.1.1. "All nuclear installations should be decommissioned after permanent shutdown and the management of waste should be properly addressed."

All Member States agree with the principle that after permanent shutdown, nuclear installations should be decommissioned and the management of waste should be properly addressed. Different countries have chosen quite different routes to achieving this: For decommissioning, some Member States opt for immediate decommissioning while others prefer deferred decommissioning with safe enclosure. There is also no uniform policy when it comes to the final status of the site, with some aiming at "Greenfield" and others at "Brownfield" end states.

Each nuclear installation should be covered by a Decommissioning Strategy aligned with a Decommissioning Policy. A detailed decommissioning strategy and funding plan exists in most Member States. In some Member States (e.g. Estonia, Greece, Lithuania, Romania and Slovakia), the strategy and plan seem to be established in principle while the exact details remain to be defined in certain cases.

The term "waste" is understood to encompass radioactive, toxic and all other forms of waste resulting from decommissioning and operation, including that arising from the former use of the site. In this context, it is apparent that a large majority of Member States takes the resulting conventional toxic waste also into account for the decommissioning costs.

3.1.2. "Decommissioning activities should be carried out without undue risk to the health and safety of workers and the general public."

To fulfil this recommendation, all Member States have adopted legislation based on a number of EU legislative acts based on the Euratom Treaty, such as:

Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation[21].

Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel[22].

Council Directive 2003/122/Euratom of 22 December 2003 on the control of high-activity sealed radioactive sources and orphan sources[23].

Moreover, under Article 37 of the Euratom Treaty, Member States provide the Commission with such general data relating to any plan for the disposal of radioactive waste in whatever forms will make it possible to determine whether the implementation of such plan is liable to

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20 OJ L 330 (28.11.2006)
21 OJ L-159 of 29/06/96 page 1
22 OJ L-337 of 05/12/2006 page 21
23 OJ L-346 of 31/12/2003 pages 57-64

result in the radioactive contamination of the water, soil or airspace of another Member State. The Commission delivers its opinion within six months after notification, after consulting the group of experts referred to in Article 31 of the Euratom Treaty.

3.1.3. "The polluter pays principle should be fully applied throughout the decommissioning of nuclear installations. In this regard, the primary concern of nuclear operators should be to ensure the availability of adequate financial resources for safe decommissioning by the time the respective nuclear installation is permanently shut down."

All Member States agree in principle with the "polluter pays principle". In those Member States having commercial nuclear operations, elaborate systems have been set up obliging the licence holder to accumulate adequate financial means before the end of lifetime of the installations in order to assure that they are available when needed for decommissioning of their facilities.

For each nuclear facility the binding individual responsibilities must be clearly identified. In all Member States it is clear that the licence holder is responsible and also who the licence holder is.

Since the last report on decommissioning financing, there has been encouraging progress on the implementation of this recommendation. There appears to be common agreement on the objectives which will allow the Commission to address itself more to the technical details in the future.

In the UK, an exception is made for the private operator of NPPs British Energy, whose decommissioning costs are to a large extent paid by the State. The reason was that, despite the creation of a segregated nuclear liabilities fund at the time of BE's privatisation in 1991, and as a consequence of the fall of BE's revenues immediately after privatisation, there were never sufficient financial means available to cover all of BE's nuclear liabilities. The exception was made after the bankruptcy and rescue of British Energy by setting up a new fund financed largely from public funds. The new arrangements were approved as restructuring aid by the Commission after a comprehensive State aid investigation (case C 52/03[24]).

3.1.4. "The financial resources available should be aimed at covering all aspects of decommissioning activities, from technical decommissioning of the installation to waste management."

This recommendation focuses on the fact that waste management costs are also to be considered as part of the decommissioning activities.

In terms of the methodology to achieve this recommendation, the Commission, together with the Nuclear Energy Agency NEA, has proposed the "Yellow book" approach. This is not a mandatory procedure but could help to guide and reinforce the methodology in some countries. Recently, the "International Structure for Decommissioning Costing" (ISDC), published by the OECD/NEA in 2012 (NEA No. 7088), has updated and replaced the "yellow book".

For the Member States with substantial commercial nuclear programmes (compared to the size of the population), it can be said that there are credible, robust costing methodologies in

[24] OJ C-180 of 31.7.2003 page 3

place which cover all aspects of decommissioning activities. The same can be said in principle for the costs of the management of nuclear waste, albeit with a higher degree of uncertainty given that most countries are at an early stage of preparations in respect of final disposal.

In this context, it is interesting to see that some Member states have set up separate financing regimes or bodies for decommissioning and for waste management (e.g. Belgium, Romania, Czech Republic, Bulgaria, and Spain).

3.2. SECTION 4: INSTITUTIONAL AND PROCEDURAL ASPECTS

3.2.1. *5. "Without prejudice to the provisions of Article 41 of the Treaty and the Regulations in force with regards to its implementation (1), persons and undertakings should report on the planned decommissioning funding regime in the context of the procedure provided for under Article 41 of the Treaty concerning the construction of new nuclear installations. In the review of the proposed decommissioning funding regime the Commission will — subject to the requirements of Article 44 of the Treaty — consult the Decommissioning Funding Group (DFG)."*

This principle was generally respected in the most recent notifications under Article 41 to the Commission. However, it must be said that the notification does not always contain a sufficiently detailed, fully developed decommissioning funding regime enshrined in legislation and in force at the time of the notification. This would require a description of the investment projects together with information pertaining to the planned decommissioning funding regime (amount, plan for constituting the assets in the fund, modalities of fund management…). In the case of the latest notification of a NPP from Lithuania, the documents presents only a commitment that such a regime is being developed and will be in line with the Commission Recommendation.

It would be desirable if each Article 41 notification of the Treaty presented a detailed description of the proposed decommissioning funding regime covering the future installation, ideally in the form of a law which would come into force before the completion of the construction of the respective installation. This would make it possible to consult the DFG on the proposal. In fact, this is the most important recommendation concerning the DFG as it explicitly refers to and attributes a role to the DFG. It provides the basis for the work of the group: The Terms of Reference and criteria on which the DFG should give its opinion shall be worked out within the DFG based upon a proposal from the Commission.

3.2.2. *6. "Where not already provided for, Member States should set up or appoint a national body capable of providing an expert judgment on fund management and decommissioning cost matters. This body should be independent as regards the contributors to the fund. The national body should annually review the financial resources gathered and periodically, at least every five years, the decommissioning cost estimates. Any shortfall between cost estimates and resources gathered should be addressed in good time. Member States should report annually on the conclusions of the proceedings of the relevant national body mentioned above to the Commission."*

The national body should possess both technical and financial expertise to perform its functions. In the case of a missing expertise, the national body should hire this from outside (e.g. advice on fund management from banking or accountancy sector).

National bodies with expert knowledge exist in the large majority of Member States. In the most elaborate cases, a dedicated organisation was set up and entrusted with the task of independent control of the fund. In other Member States, the national body functions are performed by the competent Ministry or, as in Germany, by highly specialised independent auditors. In some Member States, it is not fully clear from their answers to the questionnaire who acts as national body (Bulgaria, Denmark, Lithuania) or if the necessary competences are available.

Concerning the independence of the national body, it did not become fully clear from some answers who actually performs the control functions independently of the fund (Finland, Slovakia). In Belgium, the management of the fund has seats on the board of the controlling body, which could undermine its independence of the license holder. A similar situation seems to exist in Bulgaria and Romania. In general, the question of independence of the national body should be elaborated further in the future work of the DFG and future reports.

All Member States which answered in detail concerning the body's competences reported that the national body does have the authority to enforce corrective measures, in particular in case of a shortfall of resources. Operators (license holders) do in general have an obligation to fill any gap in resources which is discovered by the national body.

All Member States' national bodies exercise periodic controls of decommissioning costs estimates. The frequency of checks is at least every five years, while many Member States have more frequent controls, either every three years or even every year.

The Commission does for the moment not receive on a regular basis, the annual reports on the conclusions of the proceedings of the relevant national body mentioned above. A system of standardised reporting could be developed by the time next report is due. However, a large majority of Member States spoke out against any additional international reporting obligations in the decommissioning field.

3.3. SECTION 5: DECOMMISSIONING FUNDS

3.3.1. 7. "Nuclear installations should set up adequate decommissioning funds on the basis of the revenues obtained from their nuclear activities during the designed lifetime".

The systems in all Member States with commercial nuclear operations are based on the model of setting up adequate decommissioning funds on the basis of the revenues obtained from their nuclear activities during the designed lifetime. In the Member States without commercial operations, the installations are fully State owned and decommissioning and waste management are paid in one form or the other from the State budget.

In general, the reserves accumulated so far appear adequate for dismantling. Most of the Member States with large commercial nuclear programmes (e.g. Germany, Sweden, France, Finland, Czech Republic) have collected substantial amounts, in one case even 100% of the necessary amount. In a number of Member States, the collected sums compared with the necessary total, lag slightly behind the installations' percentage of spent lifetime. This may in some cases be due to on-going negotiations on the topic of lifetime extension, which would allow for an additional period of funds collection. The expectation of a lifetime extension should however not lead to lower collection efforts, which might worsen the situation.

The time frame for the build-up of funds could extend over the whole expected exploitation period. Shorter periods are however not excluded, and are in fact a means of safeguarding against unforeseen cases such as early closure.

For early closures due to political decisions, it is in general up to the political body responsible of the decision to cover the shortfall in the decommissioning fund caused by it. In the case of accidents, the international liability regime based on the respective international Conventions applies.

Considering that in some Member states, there have been long periods of shutdown of NPPs without money flowing into the fund, a shorter accumulation period (25 years) could be seen as advantageous. In the case of longer accumulation periods, additional guarantees can increase the adequacy of the funding (e.g. France).

In some Member States, for historical reasons, there are exceptions to the rule that funds must be collected from revenues obtained from the nuclear activities:

- In Italy, an early shutdown of the commercial nuclear installations (state decision) after the Chernobyl accident stopped the revenues at a very early stage. A system for collection of funds from the consumption of electricity in general has put in place instead.
- In some countries, no funds from revenues existed prior to their accession to the EU. All Member States concerned were required to collect the funds during the remaining lifetime of the installations, which proved difficult. The problem was most acute in Lithuania, Bulgaria and Slovakia, which were required by the terms of their accession treaties to shut down certain facilities on safety grounds, leading to an immediate stop of the flow of revenue to the fund. The European Union has set up a system of funds from which the decommissioning of the installations concerned is supported. In this context, it should be recalled that while the EU gives its assistance for solidarity, it remains in principle the responsibility of the licence holder and the respective State to collect the money for decommissioning and waste management. Additional efforts in this regard are required where funds are not sufficient to cover the total decommissioning costs.
- In the UK, the bankruptcy of British Energy led to the situation where decommissioning costs are to a large extent, paid by the State.

3.3.2. 8. "A segregated fund with appropriate control on prudent use should be the preferred option for all nuclear installations. The review of the national body provided for in this Recommendation should play a key role in ensuring proper management and use of the funds".

The solutions adopted by Member States vary to a large extent, but the criterion of a segregated fund with appropriate control on prudent use is followed by a large majority of Member States:

- One variety is the segregated internal fund, meaning it is kept by the operator of the NPP but as a separate budget which can only be touched for decommissioning purposes and under the control of the national body. Funds of this type exist for example in France, Belgium, and Czech Republic.
- Another solution, the segregated external fund, meaning external to the operator of the NPP, exists in Finland and Sweden, where it is also external from the state budget, and

Hungary, Romania, Slovakia and Bulgaria. In those Member States, however, the funds are somehow internal to the State budget.

- Non-segregated internal funds exist in Germany, where the Commercial Law requires the companies operating NPPs to build up substantial reserves in their balance sheets in order to cover the future decommissioning and waste management costs.

While a segregated fund is the recommended option, it is neither a necessary nor a sufficient criterion for the objective of ensuring proper management or use of the funds. For example, in Germany, a safe system was built with highly controlled non-segregated funds. On the other hand, in Belgium and Finland, the financial means collected by segregated funds (an internal one in the first and an external one in the latter case), can also find their way back into the treasury of the licence holders in the way of lending back the money (maximum 75%). Such systems obviously need an increased degree of control by an independent body, in particular to address for the possible case of bankruptcy of the licence holder.

When performing the review, the national body must be fully independent of the operator and have the necessary and sufficient authority to assure that any proposed corrective actions are implemented. Such authority might be put into doubt if representatives of the license holder have a right to nominate representatives to the board of the national body, as is the case in some Member States.

An overview of the funds existing in EU Member States can be found in table 2, Chapter 6 of this document.

3.3.3. 9. "New nuclear installations should set up segregated decommissioning funds with appropriate control on prudent use".

The terms "prudent use", should be more accurately understood as "prudent management". Such prudent management should aim to achieve a fully adequate financial value for the fund at the time when the fund is required - with "adequacy" equating to "sufficient to perform the decommissioning of the facility". With a view to achieving this situation, both low-risk assets and high-risk assets may be permissible, with constraints on the prudent risk exposure and the level of diversification.

As a consequence of the current sovereign debt crisis, it could be appropriate for Member States to revisit their definitions of prudent management and to reassess their funds robustness to financial shocks.

It is clear that Member States planning to build new nuclear installations, and in particular new nuclear power plants, should establish robust decommissioning financing regimes at least in detailed draft form, by the time of the decision to invest. In some cases an existing and fully functioning regime already exists in the country at the time when a new installation is decided, as for example recently in Finland and France.

In the UK, an external and segregated fund will be created for future new build while for the existing installations a substantial part of funding comes from the State budget through the Nuclear Liabilities Fund (NLF).

Lithuania, which currently has no operating commercial nuclear installations, is currently developing a funding regime associated with its plan to build a new NPP.

3.4. SECTION 6: ESTIMATION OF DECOMMISSIONING COSTS

3.4.1. 10. "In view of the differences in the use of the decommissioning funds gathered, technical decommissioning of the installation, on the one hand, and waste management, on the other, should be addressed separately, on the basis of separate cost calculations".

The requirement for identifiably separate costing lines for both decommissioning and waste management does not actually request nor necessitate the establishment of separate funds. In estimating the full decommissioning costs, account should be taken of the long-run management costs (e.g. the issue of "disposal" in the scope for radioactive waste and spent fuel should be addressed).

The principle of separate cost calculations for decommissioning of the installation and waste management is accepted in all Member States, some of which have set up general, segregated but separate funds for decommissioning and waste management (e.g. Sweden, Belgium, Bulgaria, Czech Republic and Romania).

The calculations of waste management costs tend to have a higher degree of uncertainty than those for decommissioning, due to the early stage of planning of final repositories in many Member States. The sums involved can be expected to be significant given that it concerns one of the most costly phases of waste management. With increased future knowledge and experience it is expected that the uncertainties in the cost of waste management will be reduced.

The transposition of Council Directive 2011/70/Euratom of 19 July 2011, which established a Community framework for the responsible and safe management of spent fuel and radioactive waste[25], will lead to substantial progress in financial planning for waste management costs.

3.4.2. 11. "In order to ensure that adequate financial resources are available, cost calculations should be based upon a prudent choice from the realistically available alternatives and subject to the external supervision and agreement of the national body foreseen in this Recommendation".

As mentioned above, the Commission, together with the Nuclear Energy Agency NEA, has developed and proposed the "Yellow book" methodology to decommissioning costing to assist with the methodology for cost estimates. This is not a mandatory procedure but could help to inform and reinforce the methodologies in some countries. Recently, the "International Structure for Decommissioning Costing" (ISDC), published by the OECD/NEA in 2012 (NEA No. 7088), has updated and replaced the "yellow book".

From some answers, e.g. the ones from Lithuania, it could not be established that the national body also reviews the cost estimates, which it should do.

3.4.3. 12. "All cost estimates should be site-specific and based upon best available estimates".

In relation to the term "site specific", and within the context of accuracy and transparency, the costs for multiple nuclear unit sites should be broken down to the unit level. The concept of a "fleet approach" to costs may be relied upon where appropriate for cost estimation purposes.

[25] OJ L 199, 2.8.2011, p. 48

In such cases it should be demonstrated that the unit or site in question conforms to the set of the fleet. For single or multiple sites the specific and particular issues related to the site should be considered separately and in detail.

It is clear from a comparison of the answers to the questionnaire with earlier reports that there is a general tendency in the Member states to move from generic to site-specific cost estimates. Most Member states have already reached full compliance with this criterion, which is a very positive development.

3.4.4. 13. "If during implementation the decommissioning project proves to be more expensive than the approved cost estimates, the operator should cover the additional expenses. This aspect should be carefully addressed should the operator change during or beyond the lifetime of the nuclear installation".

The national body has an important role to play in reviewing the adequacy of the fund and the level of the decommissioning liabilities at such times. Should the costs of decommissioning increase during the operational life of the facility the operator shall be held responsible for these increased costs and should make a correction to the fund to cover the full liability.

It is clear from the information in the answers to the questionnaire that Member States take this point very seriously. For increased confidence, it is recommended that the national bodies play an even more important role in this field. The emphasis should be on the frequency of review and on the speed of the correction measures if they are deemed necessary.

3.4.5. 14. "Due attention should be paid to cases arising for historical reasons where a special solution is the most appropriate. This case-by-case approach should be transparent and with the full involvement of the national body provided for in this Recommendation".

This recommendation shall only apply to existing historical cases and may not be invoked in the case of new facilities.

It was already mentioned above that special cases exist for historical reasons in some Member States which fall into a range of different categories (Italy, with its early shutdown of all NPPs; the Member States which had to change their economic systems in the early 1990s, some of which receive EU assistance (Lithuania, Bulgaria and Slovakia); the UK with the bankruptcy of British Energy).

Concerning the situation in Lithuania, Bulgaria and Slovakia, there is a recognised funding gap due to the lack of accumulated resources and an early shutdown commitment for certain facilities. For reasons of solidarity, the EU is assisting those countries with their decommissioning efforts. However, it remains the responsibility of the licence holder and the respective State to collect the money for decommissioning and waste management. Additional efforts in this regard are required where funds are not sufficient to cover the total decommissioning costs.

Member States described their special regimes in detail, which is both helpful and laudable. It can be said that all special existing regimes are justified by the specific situation which caused them to become necessary.

It must, however, also be clear that for future installations, the funding regime must be fully in line with the Recommendation and the Directive 2011/70/Euratom for waste management.

3.5. SECTION 7: USE OF DECOMMISSIONING FUNDS

3.5.1. 15. Financial resources should be used only for the purpose for which they have been established and managed. In this context, due consideration should be given to transparency. All commercially non-sensitive information should be publicly available.

Decommissioning funds may only be used for the detailed purpose for which they have been established as defined in the final decommissioning plan and not for any other purpose. In respect of the issue of transparency, the national body retains an important function during the decommissioning phase, in monitoring and reviewing that the funds are used correctly.

On this point, the answers to the questionnaire were rather imprecise. This could probably be due to the fact the majority of funds have not yet reached their disbursement phase. The issue requires to be followed closely in the future.

3.5.2. 16. A secure risk profile should be sought in the investment of the assets, ensuring that a positive return is achieved over any given period of time.

For a secure risk profile, low-risk assets should be eligible but high-risk assets could also be permissible, with constraints on the risk exposure and the level of diversification. The fund's asset build-up strategy should take into account reasonable assumptions regarding inflation and the anticipated rate of return. The management strategy should aim to match the full decommissioning cost and to ensure its availability at the time when it is needed. The national body should verify that the fund conforms to the concept of a secure risk profile and that the underlying assumptions are reassessed at regular intervals or in the light of changing conditions.

The asset constitution strategies of the funds have the common objective of achieving a satisfactory return on the capital while at the same time avoiding excessive risk. Member states try to achieve this in different ways, reflected in the different legal frameworks of the fund investments: In Belgium and Finland, the fund can lend a maximum of 75% of the capital back to the operator who in return must pay a government-fixed interest. In France, the fund must always cover the discounted provisions and eligible assets are defined by decree, but the operators decide freely on that basis. In Sweden, the fund also has restrictions concerning the eligibility of some assets and must aim for the highest possible return under these conditions. In a number of Member States (e.g. Hungary, Bulgaria, Slovakia), the fund is held or established by the State treasury. In these cases it is not fully clear from the answers to the questionnaire how the capital is invested.

A general feature of the legislation on eligible assets is the emphasis on government bonds as safe assets. Many Member states require funds to invest to a high degree in government bonds in order to avoid risks. While this policy is understandable given the assessment of risk of different types of assets in the past, recent events in the financial markets have put serious doubts on the general safety of all types of government bonds. It may be advisable to revisit the implicit assumptions underlying the existing legislation in this respect and take into account the risk of State bankruptcies. Typically only investment grade bonds are acceptable.

3.5.3. 17. As the operator has no influence on the financial management of an external decommissioning fund, the value of the investments should be guaranteed by the State in order to ensure that adequate funds are available when required, even if a nominal loss is made by the independent manager of the invested amounts by the

time these financial resources are to be used. In such cases, the funds should not be supplemented with an amount higher than the loss in the investment.

This recommendation addresses the issue of external funds. By definition the operator has (or at least should not) have any management control or influence over an external fund. Where a shortfall exists between the value of the fund and the decommissioning liabilities, the entity managing the fund could be held responsible for the shortfall. This said, the entity managing the fund may not hold sufficient resources to compensate for the shortfall and in this case the Member State could be prepared to guarantee the shortfall.

The only case where a guarantee system of an external decommissioning fund is apparent is Sweden: The Swedish regime foresees that the nuclear power utilities themselves must provide two forms of guarantees to the Nuclear Waste Fund. Guarantee I should cover the shortfall should a reactor be finally closed down before it has reached its earning period of 40 years. Guarantee II should cover contingencies if expenses for future nuclear waste management become higher than expected, if these expenses have to be met earlier than expected, or if the actual amount in the Fund is lower than was estimated.

A State guarantee can, however, be assumed in a Member States' regimes where the State was chosen as the holder of the fund in one way or the other.

3.5.4. 18. If the management of an internal fund underperforms, the operator should be responsible for ensuring that adequate funds are available when needed.

The identification of a shortfall between the value of the fund and the decommissioning liabilities should give rise to an immediate definition of corrective measures to be implemented in the short-term, with a view to ensuring that adequate funds are available for decommissioning at the moment when they are needed. In this respect, the annual review of the accumulated funds, as well as the review of the cost estimates by the national body, is of the utmost importance with a view to detecting possible shortcomings at the earliest possible stage.

This principle is well implemented in all Member States which chose to set up internal fund regimes (e.g. Belgium, France, Germany, and Czech Republic). In all cases, there is periodic control by the national body for this essential requirement. It is an example of a well-implemented principle.

3.5.5. 19. In the case of nuclear installations whose main purpose is other than the sale of products or services, decommissioning should be properly planned and budgeted so as to allow adequate funding to be available for the safe and timely decommissioning of such installations.

The facilities addressed here are typically social service facilities such as medical centres, research centres, isotope production facilities and particle accelerators. Given that such facilities are typically, albeit not always, under state responsibility, the state may consider financing the decommissioning of such facilities from the national budget. Such facilities should nevertheless prepare a final decommissioning plan detailing the scale of their liabilities and associate costs which should be considered by the national body.

The information given in the answers to the questionnaire can be summarized in a way that this principle is not forgotten by the Member States. Those who have commercial nuclear installations have set up separate systems for the funding of the decommissioning of other

nuclear installations. The other Member States, who only possess such installations, have set up plans for their decommissioning or are in the process of setting them up.

In general, it can be said that those installations in all cases belong to the State, directly or via State-owned universities, institutes, etc. The decommissioning is therefore paid from the State budget in one way or another.

3.5.6. 20. Budgetary planning should be subject to the review of the national body provided for in this Recommendation. In the absence of such a national body, Member States may request the Commission to provide advice concerning the measures to be taken.

Budgetary planning is to be understood as "establishing a financial plan of decommissioning liabilities and their associated financial value". In the case where the member state addresses itself to the EC, the EC shall at no time replace the function of the national body.

It can be concluded from the answers to the questionnaire that this principle is well implemented in the Member States. The national bodies in general do carry out periodic reviews of the budgetary planning of decommissioning and waste management. There have not been any requests for advice from the Commission so far.

4. SUMMARY OF FINDINGS

The good co-operation between the Commission and the Member States, in particular within the DFG, for the implementation of the Recommendation has led to considerable progress in the alignment to its main principles. Looking at all the different criteria of the Recommendation, developments towards closer alignment can be seen everywhere.

For instance, all Member States clearly state to adhere to the polluter pays principle. And this principle is also regularly inserted in the new legislation being implemented in the field of decommissioning financing. There are many examples of good practice which can be mentioned in this context (please see chapter below).

All Member States have national bodies in place which control the decommissioning fund management and the cost estimates. The exact role and the procedures still vary considerably between the countries, but there is constant progress to be noted, e.g. it was reported that all national bodies regularly check decommissioning costs estimates and have the authority to enforce corrective measures in case of shortfalls of resources.

Regarding the decommissioning funds existing in Member States, there is still a great variety when it comes to the questions of them being internal/external, segregated or not, public or private. Moreover, many Member States have different funds for decommissioning and waste management funding.

Also, the funds often only exist for the commercial nuclear installations while the decommissioning of the mostly State-owned research installations is paid by the State budget. The most important principle, that adequate funds be set up which are fed by contributions from nuclear activities, is however adhered to by all Member States so that the differences only concern the way how to achieve this.

For the estimation of decommissioning costs, there is a lot of progress regarding the pure decommissioning costs. For example, most Member states now have site-specific cost estimates.

Concerning waste management, however, the early stage of planning leads to a much higher degree of uncertainty about the costs. A lot of progress in this field is expected from the on-going transposition process of the Council Directive 2011/70/Euratom of 19 July 2011 which established a Community framework for the responsible and safe management of spent fuel and radioactive waste[26], which includes obligations to provide national plans with cost estimates for waste management.

A very difficult question to answer is the adequacy of the funding. Accurate cost estimates, safe investing of the fund's finances and constant reassessment over the lifetime of the installations are key to achieving adequate funding.

Since the last report, many assumptions about safe investing had to be put in question in the wake of the financial crisis of 2008 and the on-going sovereign debt crisis. This has serious consequences for the fund management strategies in Member States, who must react with

[26] OJ L 199, 2.8.2011, p. 48

their respective policies to these challenges. The awareness about this is clearly there in the Member States.

A very important element of decommissioning financing systems is transparency, as it allows the public to be informed about the situation and gives it the possibility to check if the funding regime is correctly put in place. It is clear from the information received that the degree of transparency varies between Member States, not least for cultural and historic differences. While there are many good examples, there is still room for improvement in this regard. The existence of adequate funding for decommissioning is a question of great interest for the public and people have a right to check if there is enough money available or not. Transparency is also important for the public's acceptance of nuclear activities. The in-transparency that was seen in a few cases will no longer be acceptable once the Nuclear Waste Directive is transposed.

5. GOOD PRACTICE EXAMPLES

The following examples are meant to illustrate legal situations Member States characterised with a high degree of alignment to the Recommendation's principles. They are not meant to be exhaustive. Most good practice examples were chosen because of recent progress in the respective Member State:

- Polluter pays principle: In the Netherlands, the latest revision of the Nuclear Energy Act, in force since April 2011, introduced a clear legal obligation to set up a decommissioning fund in order to fully cover the decommissioning costs. While there had been an understanding in the past that the polluter pays principle applies and funds had been set up on a voluntary basis, it is now a clear legal obligation. In France, where such legislation was adopted in 2006, there are now concrete plans to also set up also a fund for the decommissioning of the State-financed research installations. In Spain, recent changes in law have further shifted the decommissioning cost-bearing from a general fee towards licence-holder contributions.
- Transparency: Of many possible examples of good practice in this regard, there is the situation in Sweden, where the national fund publishes its very detailed report containing all relevant information annually on its website in Swedish and English language: http://www.karnavfallsfonden.se/. The site of the UK's NDA, http://www.nda.gov.uk/, may also be cited as a good example.
- Availability/secure risk profile: As an example of good practice in fund investment one can mention here France, where very detailed rules exist for the eligible asset classes and where a review is under way.
- Adequacy of the fund: Comparing the sums collected for the fund with the cost estimate for decommissioning, Finland is probably the Member State where the highest percentage of the required amount has already been collected: 97% of the means required are in the fund and the collection goes on.
- New nuclear installations: In Poland, the legislation for the decommissioning funding regime has recently been adopted, well before the pending decision on the building of the planned NPP(s).

TABLES[27]

6. TABLE 1: ILLUSTRATING POINT 3.2.2. ON NATIONAL BODIES

ITEM 6

Country	BE	BG	CZ	EE	FI	FR	DE	EL	HU	IT	LV	LT	NL	PL	RO	SK	SI	ES	SE	UK
NB exists	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Judgement on fund management	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Judgement on Cost estimates	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Independent of license holder	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	N	N	Y	Y	Y	Y
Annual review of financial resources	Y	Y	Y	N	Y	Y	Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Periodic review of cost estimates (maximum every 5 years)	3	5	5		3	3	1		1		1	3	5		5	5	5	1	3	5
Shortfall addressed in good time	Y	Y	Y		Y	Y	Y		Y	Y	Y	Y	Y	N	N		Y	Y	Y	Y
Readiness for annual reporting to EC from NB	N	N	N	N	N	N	N	N	N	Y	N	Y	N	N	Y	N	Y	N	N / Y	N

[27] Please note that some Member States do not figure in the tables due to the limited size of their nuclear infrastructure (no commercial nuclear infrastructure).

6.1. TABLE 2: Illustrating point 3.3.2. on the types of funds existing in Member States

ITEM 8

Country	BE	BG	CZ	EE	FI	FR	DE	EL	HU	IT	LV	LT	NL	PL	RO	SK	SI	ES	SE	UK
Segregated fund	Y	Y	Y		Y	Y	N		Y	N		Y		Y	Y	Y	Y	Y	Y	Y
Review of national body	Y	Y	Y		Y	Y	Y		Y			Y	Y	Y	Y		Y	Y	Y	Y

Country	Type of fund
BE	Decom fund – internal segregated Waste fund – external
BG	External funds managed by state, separate ones for decommissioning and waste
CZ	Decom - Internal segregated Waste – external fund
EE	No fund
FI	External segregated – separate from state budget
FR	Internal segregated
DE	Internal non-segregated
EL	No fund
HU	External segregated – internal segregated from state budget
IT	No fund
LV	No fund
LT	External segregated – managed by MoFinance
NL	Internal fund
PL	Internal segregated decommissioning fund
RO	Waste fund - external fund (state budget account ?) Decom fund – external fund (state budget account ?)
SK	External segregated fund
SI	External fund
ES	External fund
SE	External segregated – government supervised and administered
UK	New build – external segregated

6.2. TABLE 3: Illustrating point 3.4.4. on which organisation holds ultimate responsibility in the case where unexpectedly high decommissioning costs are realised.

Country	BE	BG	CZ	EE	FI	FR	DE	EL	HU	IT	LV	LT	NL	PL	RO	SK	SI	ES	SE	UK
License holder RESPONSIBLE	Y	Y	Y		Y	Y	Y						Y	Y	Y		Y		Y	Y
State RESPONSIBLE								Y	Y	Y		Y						Y		Y