Generic design assessment
UK EPR nuclear power plant design by AREVA NP SAS and Electricité de France SA

Assessment report
Solid radioactive waste (LLW and ILW)

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Protective status	This document contains no sensitive nuclear information or commercially confidential information.
Process and information document[1]	The following sections of Table 1 in our process and information document are relevant to this assessment: 2.1 – a description of how radioactive wastes will arise, be managed and disposed of throughout the facility's lifecycle 2.4 – design basis estimates and substantiation of annual arisings of solid radioactive waste during operation and decommissioning 1.5 – an analysis should be provided that includes an evaluation of options considered and shows that the best available techniques will be used to minimise the production and discharge or disposal of waste
Radioactive substances regulation environmental principles[2]	The following principles are relevant to this assessment: RSMDP3 - Use of BAT to minimise waste RSMDP8 - Segregation of wastes RSMDP9 – Characterisation RSMDP10 – Storage RSMPD15 - Requirements and conditions for disposal of wastes
Report author	Saffron Price-Walter

1. Process and Information Document for Generic Assessment of Candidate Nuclear Power Plant Designs, Environment Agency, Jan 2007.

   http://publications.environment-agency.gov.uk/pdf/GEHO0107BLTN-e-e.pdf

2. Regulatory Guidance Series, No RSR 1: Radioactive Substances Regulation - Environmental Principles (REPs), 2010.

   http://publications.environment-agency.gov.uk/pdf/GEHO0709BQSB-e-e.pdf

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1 Summary

1 This report presents the findings of our assessment of the UK EPR's solid radioactive waste (low level waste (LLW) and intermediate level waste (ILW)) based on information submitted by EDF and AREVA in their Pre-Construction Environmental Report (PCER) and supporting documents.

2 We conclude that:

a) In their submission, EDF and AREVA describe how LLW and ILW will be generated, managed and disposed of throughout the facility's lifecycle.

b) EDF and AREVA have identified all LLW and ILW waste streams that a UK EPR will typically produce.

c) Waste will be treated and conditioned using proven and recognised techniques. However, the Health and Safety Executive (HSE) will be looking at EDF and AREVA's plans for the conditioning of waste produced by a UK EPR in more detail as part of its Step 4 assessment, and our final decision will be informed by this work.

d) The design is not expected to produce LLW or ILW for which there is no foreseeable disposal route. However, the regulators need more information on the potential for degradation of ILW over the longer term that might affect its disposability and safe storage. EDF and AREVA provided information in February and March 2010, which was considered in our assessment report on disposability of ILW and spent fuel (Environment Agency, 2010d). HSE is reviewing this information in its Step 4 assessment. We will continue to work with HSE on this, and this work will inform our decision document.

e) EDF and AREVA have provided estimates for the annual arisings (during operations and decommissioning) of LLW and ILW. These arisings (during operations) are consistent with those of comparable reactors around the world (Isukul, 2009). The arisings of LLW and ILW are below the European Utility Requirement objective of less than 50 m^3 per 1000 MWe plant-year of operation (EUR, 2001).

f) EDF and AREVA have provided basic evidence of how they will minimise the disposal of LLW and ILW.

3 However, our conclusion is subject to the following four other issues:

a) Disposability of ILW following longer term interim storage pending disposal.

b) If smelting of any LLW is pursued at site-specific permitting, a demonstration that the conditions of acceptance of any available smelting facilities can be met.

c) If incineration is pursued at site-specific permitting for steam generator blow down system (SGBS) ion-exchange resins (without regeneration), evaporator concentrates, pre-compacted operational waste and operational waste, a demonstration that the conditions of acceptance of any available incineration facilities can be met.

d) Provision of evidence at site-specific permitting that the specific arrangements for minimising the disposals of LLW and ILW for each site represents best available techniques (BAT).

4 Our findings on the wider environmental impacts and waste management arrangements for the UK EPR reactor may be found in our consultation document (Environment Agency, 2010e).

2 Introduction

5 Guidance on our generic design assessment (GDA) process was published in January 2007 (process and information document (P&ID) (Environment Agency, 2007)). Table 1, section 2.1 of the P&ID requires the requesting parties (RPs) to provide a description on how radioactive waste will arise, be managed and disposed of throughout the facility's lifetime. Table 1, section 2.1 of the P&ID states that:

"A description of how radioactive wastes will arise, be managed and disposed of throughout the facility's lifecycle. This should include:

a) sources of radioactivity and matters which affect wastes arising;

b) gaseous, liquid and solid wastes;

c) discharge points for gaseous wastes and discharge routes for liquid wastes;

d) disposal routes for solid wastes (including any proposals for incineration of combustible waste).

6 Table 1, section 2.4 of the P&ID requires the RPs to propose design basis estimates and substantiation of annual arisings of solid radioactive waste. Table 1, section 2.4 of the P&ID states that:

> "*Design basis estimates and substantiation of annual arisings of solid radioactive waste during operation and decommissioning. Wastes should be identified in terms of category (high level waste (HLW), ILW, LLW), physico-chemical characteristics and proposed disposal route (if any). Quantification should be in terms of activity of key individual radionuclides and overall groupings of radionuclides (e.g. total alpha), mass and volumes.*
>
> *The requesting party should obtain, and provide, a view from the Nuclear Decommissioning Authority (NDA) (as the UK authoritative source in providing such advice) on the disposability of any proposed arisings of ILW or HLW*."

This P&ID requirement includes all radioactive wastes arisings, including those from operations and decommissioning, and includes waste arising from all activities, both routine and reasonably foreseeable non-routine activities (e.g. breakdown maintenance). This information is required:

a) in support of the waste and spent fuel strategy and BAT analysis which is the subject of P&ID requirements 1.4, 1.5 and 2.1;

b) in support of the assessment of the impact of any proposed direct disposal of waste (for example by on-site incineration);

c) to provide a basis for indicative limit setting where appropriate;

d) to provide confidence that wastes will not be generated for which there is no foreseeable disposal route.

7 Table 1, section 1.5 of the P&ID requires the RPs to provide an analysis that includes an evaluation of options considered and show that BAT will be used to minimise the production and discharge or disposal of waste. Table 1, section1.5 of the P&ID states that:

> "*An analysis should be provided that includes an evaluation of options considered and shows that the best available techniques will be used to minimise the production and discharge or disposal of waste. This should include:*
>
> – *a description of the means used by each significant waste generating and management process to minimise waste arising and discharged or disposed of and a demonstration that these are the best practicable;*

- *a review of design features, including those of fuel usage, such as burn-up and rating, that facilitate minimisation of arisings and disposal of waste during operation of the reactor;*
- *a review of design features that facilitate decommissioning and minimise the arisings of decommissioning waste.*

Reference should be made to:

- *all periods of "operation", for example at power, shutdown, maintenance and refuelling (including related tasks such as fuel and flask handling);*
- *transitory periods (e.g. returning to power following shutdown);*
- *issues relating to minimising radioactivity source terms (for example materials of construction and coolant chemistry);*
- *abatement issues (for example optimising resin types and usage in treatment systems);*
- *process control and monitoring arrangements including fault detection;*
- *the selection of materials and physical features to minimise activation and contamination, facilitate decontamination, removal of components etc;*
- *practices at other existing and proposed facilities.*"

8 We are carrying out our assessment in two stages:

a) preliminary assessment – we examine the outline details of the requesting party's submission to find out if further information is needed, if there are any issues that are obviously unacceptable, or if there needs to be any significant design modifications;

b) detailed assessment – we examine the submission in detail to decide initially if we might issue a statement of design acceptability. We will only make our final decision after we have consulted the public and considered the responses we receive.

9 EDF and AREVA submitted their UK EPR design for GDA in August 2007. We published the findings of our preliminary assessment in March 2008 (Environment Agency, 2008).

10 We found that the submission did not contain the level of information we needed to carry out a detailed assessment but EDF and AREVA committed to providing further information. In fact they provided a completely revised submission, their pre-construction environmental report (PCER) with supporting documents. They have published the PCER and other documents on their website (http://www.epr-reactor.co.uk) .

11 Our detailed assessment of the information contained in the revised submission on solid radioactive waste (low level waste (LLW) and intermediate level waste (ILW)) is documented within this assessment report. The assessment of disposability of ILW is the subject of a separate assessment report (Environment Agency, 2010d). The assessment of spent fuel and non-radioactive wastes are also documented within other assessment reports (Environment Agency, 2010b and Environment Agency, 2010c).

12 Our findings on the wider environmental impacts and waste management arrangements for the UK EPR reactor may be found in our Consultation Document (Environment Agency, 2010e).

3 Assessment

3.1 Assessment Methodology and Process

13 The basis of our assessment was to:

a) review appropriate sections of the PCER and its supporting documents;

b) hold technical meetings with EDF and AREVA to clarify our understanding of the information presented and explain any concerns we had with that information;

c) raise Regulatory Observations (ROs) and Technical Queries (TQs) where we believed information provided by EDF and AREVA was insufficient;

d) assess the techniques proposed by EDF and AREVA to prevent and minimise production of solid radioactive waste using our internal guidance and regulatory experience;

e) decide on any GDA Issues or other issues to carry forward from GDA.

14 In undertaking our assessment, we have worked closely with HSE. We have also had discussions with other regulators; the Radiation and Nuclear Safety Authority of Finland (STUK) and the United States Nuclear Regulatory Commission (NRC).

15 As detailed in our preliminary assessment report (Environment Agency, 2008), EDF and AREVA's submission received in August 2007 did not contain the level of information that was needed to carry out a detailed assessment on LLW and ILW. Therefore, as a result a Regulatory Issue (RI) was raised in February 2008.

16 In November 2008, EDF and AREVA provided additional information; a pre-construction environmental report (PCER) with supporting documents. We assessed information contained in the PCER but found that while much improved from the original submission it still lacked detail on some aspects of LLW and ILW arisings. Subsequently, two Regulatory Observations (ROs) were raised jointly by the Environment Agency and HSE; one requesting a standalone strategy for waste management and the other a disposability case for spent fuel and ILW.

17 Additionally, several TQs were also raised.

18 The following table provides information on the RI, ROs and TQs that were raised which are relevant to LLW and ILW:

RI/RO/TQ number and title	Reason for raising	Comments on response
RI-EPR-0001 Information required by the Environment Agency for the detailed assessment stage	Limited information received in August 2007 submission.	EDF and AREVA provided a commitment (to which we assigned the unique number CM-EPR-1) to provide information to comply with the P&ID requirements identified in the schedule to RI-EPR-001 within several future submissions.

RI/RO/TQ number and title	Reason for raising	Comments on response
RO-EPR-033 RO-EPR-033.A01 RO-EPR-033.A02 RO-EPR-033.A03 RO-EPR-033.A04 Integrated Waste Strategy	Limited information received in August 2007 submission and November 2008 information. Hence RO asked for a comprehensive integrated waste strategy and documentary evidence that BAT has been used.	Documentation provided but the radioactive waste strategy is a 'reference case' based on the waste and spent fuel management practices and arrangements of the UK EPR reference plant at Flamanville 3 so changes to the 'reference case' for the site-specific strategy and evidence that the site-specific strategy achieves the same objectives shall be provided at site- specific permitting.
RO-EPR-48: Disposability of Spent Fuel and ILW	The Regulators consider that EDF and AREVA should show how and when the matters identified in the radioactive waste management directorate disposability assessments will be addressed.	The response to this RO was considered in our assessment report on disposability of ILW and spent fuel (Environment Agency, 2010d)
TQ-EPR-149: EPR Environment Design Review and Environment Committee	Limited information on BAT received in August 2007 submission and November 2008 information. Hence TQ asked for documentation from the "EPR Environment" design review held in 2004 and minutes from the "Environment Committee".	Documentation provided.
TQ-EPR-163: EPR Decommissioning LLW	EDF and AREVA's agreement in principle from the low level waste repository (LLWR) only covered operational LLW. Hence, TQ asked for confirmation that decommissioning waste will also be disposable.	Response states there is no reason for decommissioning wastes to be radiologically different to those in operation. Also, at the time of decommissioning, the availability of the current LLWR facility is questionable so the statement that completing the Form D1s has limited value is reasonable.
TQ-EPR-162: EPR LLW Proposed for Incineration	EDF and AREVA outline options for incineration of LLW in their November 2008 information. Hence, TQ asked them to identify the available incinerators and provide evidence that the LLW proposed is within their conditions for acceptance (CFA).	No evidence on how the fingerprint / chemical make-up of the waste proposed to be incinerated meets the CFA of currently available incinerators. Hence TQ-EPR-341 was raised for waste oils.

RI/RO/TQ number and title	Reason for raising	Comments on response
TQ-EPR-341: Disposability of EPR Waste Oils	No information received in August 2007 submission and November 2008 information. Hence, TQ asked for waste category and management arrangements for waste oils and if incineration is proposed, evidence that waste can meet the relevant incinerator's CFA.	Justification provided that oil can go to a French incinerator. Also, confidence provided that oil can go to a UK one.
TQ-EPR-159: Solid Radioactive Waste Estimates	The data provided in the November 2008 PCER is based on an estimate that EDF and AREVA assume is a significant reduction in the volume of operational waste produced compared to feedback from the French and German units. It states that the estimated volume of solid waste was determined by combining the best quartile for each type of waste (and not per site). Hence, TQ asks for justification that the estimates are realistic for the UK EPR.	No justification given that using the best quartiles for solid radioactive waste estimates is realistic since no quantitative information provided on waste minimisation initiatives etc. This TQ links with a TQ raised by HSE (TQ-EPR-124). After a presentation by EDF in September 2009 on their processes for recording and analysing information on radioactive wastes at its sites, three additional TQs were raised (TQ-EPR-468, TQ-EPR-469 and TQ-EPR-470).
TQ-EPR-221: Storage of EPR Low Level Waste	This TQ asks for further details on the short term buffer storage of LLW in the waste treatment building, e.g. the capacity of the store.	In principle it provides assurance. Regulators will visit a waste store in 2010 to confirm details of the TQ and our final decision will be informed by this work.
TQ-EPR-172: EPR ILW Decay to LLW	This TQ asks for information on the management of ILW that may decay to LLW during storage.	Information provided but some further details required at site-specific permitting, e.g. confirmation that LLWR would accept wastes that have been decay stored.
TQ-EPR-409: Update on EPR Environment Design Review Recommendations	The information provided in November 2008, referred to some recommendations made in 2004 to minimise wastes and discharges. Hence, this TQ asks for an update on these.	Update on recommendations given.

RI/RO/TQ number and title	Reason for raising	Comments on response
TQ-EPR-468: QA Arrangements of Solid Waste Data	In response to TQ-EPR-124, EDF and AREVA provided a number of averaged inventories for different waste types. This did not provide enough detail for our assessment. Hence, this TQ asks for a list of the categories of physical nature that are used to describe waste. In addition, this TQ asks for details of any QA procedures and audits (both internally and external bodies) to indicate the level of confidence there is in the data.	Information provided.
TQ-EPR-469: Solid Radioactive Waste Date	To provide confidence that the estimates in the PCER and in response to TQ-EPR-124 are realistic for the UK EPR, further information was requested by this TQ.	Information provided.
TQ-EPR-470: Large, Solid Radioactive Waste Items	No information received in August 2007 submission and November 2008 information. Hence this TQ asks for demonstration that large one-off items, such as reactor pressure vessel heads and steam generators that could need replacing during operation can be stored, conditioned for disposal and are disposable.	Basic information provided.

19 A final revision of the PCER was received in March 2010 and this is published along with other documents on the EDF and AREVA website (http://www.epr-reactor.co.uk). These documents incorporate the relevant information in the RO and TQ responses.

3.2 Assessment Objectives

20 We started our assessment with some key questions to answer:

a) Have all the sources of LLW and ILW been identified?

b) How will LLW and ILW be treated and conditioned?

c) Have all the disposal routes of LLW and ILW been identified?

d) Have the arisings of LLW and ILW been quantified?

e) Has BAT been applied to minimise the arisings of LLW and ILW?

3.3 EDF and AREVA Documentation

21 The PCER is divided into chapters and sub-chapters (provided as separate documents) and has supporting documents. We referred to the following documents to produce this report:

Document reference	Title	Version number
UKEPR-0003-030	PCER – Chapter 3 – Aspects having a bearing on the environment during operation phase	02
UKEPR-0003-050	PCER – Chapter 5 – Design principles in relation to the decommissioning	03
UKEPR-0003-062	PCER – Sub-chapter 6.2 – Details of the effluent management process	03
UKEPR-0003-063	PCER – Sub-chapter 6.3 – Outputs for the Operating Installation	03
UKEPR-0003-064	PCER – Sub-chapter 6.4 - Effluent and waste treatment systems design architecture	03
UKEPR-0003-065	PCER – Sub-chapter 6.5 – Interim storage facilities and disposability for UK EPR	02
UKEPR-0003-080	PCER – Chapter 8 – Best Available Techniques	01
UKEPR-0011-001	GDA UK EPR-BAT Demonstration	03
NXA/10488242	GDA: Summary of Disposability Assessment for Wastes and Spent Fuel arising from Operation of the UK EPR	Sept 09
ELI0800226 A BPE	Dry Interim Storage facility for ILW	A
ELIDC0801302 A BPE	EPR UK – Decommissioning waste inventory	A
UKEPR-0010-001	GDA UK EPR – Integrated Waste Strategy Document	02
ELI0800226	Longer Term ILW ISF	A
NESH-G/2008/en/0123	Solid Radioactive Waste Strategy Report (SRWSR)	A
UKEPR-0008-001	Longer Term ILW Interim Storage Facility	1
REG EPR00182N (Appendix)	Critique of the NDA RWMD Disposability Assessment	25/09/09
TQ-EPR-124	Changes to waste characteristics over the life of the EPR	17/06/09
TQ-EPR-159	Solid Radioactive Waste Estimates	17/06/09
TQ-EPR-469	Solid Radioactive Waste Data	05/00/09

Document reference	Title	Version number
TQ-EPR-341	Disposability of EPR Waste Oils	16/11/09
TQ-EPR-222	EPR Intermediate Level Waste	27/11/09
UKEPR-0012-001	Radioactive Waste Management Case	00

22

23 We use short references in this report, for example:

a) PCER sub-chapter 6.2 section 1.2.1 = PCERsc6.2s1.2.1;

b) BAT demonstration section 3.2 = EPRBs3.2;

c) IWS = GDA UK EPR Integrated Waste Strategy Document;

d) SRWSR = UK EPR Solid Radioactive Waste Strategy Report.

3.4 Creation of Solid Waste

24 EDF and AREVA identify and quantify the solid radioactive waste that will arise during the operational phase (PCERsc3.3). They state that solid radioactive waste resulting from normal operation (including maintenance) arises either in the nuclear island or in the waste treatment building (ETB). They say that the UK EPR will produce three types of solid radioactive waste (PCERsc6.2):

a) waste known as 'process' waste, associated with generating power. This results from treating fluids, in order:

   i) to limit the contamination and reduce its activity, so that workers are not exposed to radiation;

   ii) to reduce the activity of discharged effluent, whether aqueous or gaseous.

   The process waste from treating gaseous effluent is made up of mainly filters and iodine traps. From aqueous waste treatment, the process waste consists of filters, concentrates and ion-exchange resins.

b) dry active waste from maintenance work (mending faults, repairs, replacement of radioactive equipment, etc.). It comprises mainly of compactable materials, such as vinyl, gloves, adhesive tape, papers, trunking for exhaust fans, etc.

c) other waste, generally from so called sundry incidents (for example, contaminated oils).

25 Additionally, during the operation of the UK EPR, some core components used to control or measure neutron activity may need to be replaced during outages. These include neutron absorber rods and rod cluster control assemblies.

26 In the PCER and supporting documentation, the types of solid radioactive waste are described as shown in the table below:

	Types of waste
Process waste	Ion-exchange resins from the nuclear island
	Low activity steam generator blow down system (SGBS) ion-exchange resins (without regeneration)
	Wet sludges (sumps, tanks)
	Water filters from effluent treatment
	Evaporator concentrates
	Air and water filters
Operational waste	Pre-compacted and non compactable dry active waste (DAW)
	Oils (and solvents)
	Scraps
	Operational waste

27 EDF and AREVA state that the volume of solid radioactive waste depends on the process and on the management of the systems by the operator. PCERsc3.3 Table 2 and PCERsc6.3 Table 1 provide, by volume, the annual estimated production of raw waste (before conditioning) for each type of waste for one UK EPR unit. PCERsc6.3 Table 5 gives the distribution of LLW and ILW in terms of volume of packages to be disposed of or stored per year. This shows that the volume of conditioned LLW to be disposed of per year is 24.5 m^3, which, assuming the UK EPR design is for a single, pressurised water reactor (PWR) capable of generating in total 1735 MWe of electricity, is equivalent to 14.1 m^3 per 1000 MWe plant-year of operation. This table also shows that the volume of conditioned ILW to be disposed of per year is 46.2 m^3, which is equivalent to 26.6 m^3 per 1000 MWe plant-year of operation.

28 Further information is given in PCERsc6.3. This includes the characteristics of the reference case packaged wastes. Additionally, waste stream datasheets for ion exchange resins, spent filters, dry active waste, tank sludges, evaporator concentrates, low activity resins, air and water filters, oils and metal maintenance waste are given in EDF and AREVA's solid radioactive waste strategy report (SRWSR). These list data on waste origin, waste physical description, nature of radioactive material, annual arising, total arising, waste classification at time of generation, main radionuclides and hazardous substances.

29 EDF and AREVA have estimated the volume of solid radioactive decommissioning waste to be expected after a designed service life of 60 years. An estimated volume of conditioned low level waste (LLW) and very low level waste (VLLW) from decommissioning is around 25,000 m^3 (PCERsc5.2s4.4). The waste is from the following sources:

a) primary circuit;

b) nuclear steam supply system equipment;

c) balance of nuclear island (BNI) equipment;

d) concrete due to clean up of BNI.

30 Estimated volumes of ILW from decommissioning are given in PCER chapter 5 and the SRWSR. Contaminated ILW, which consists of ion-exchange resins used during the full decontamination of the primary circuit, amounts to around 30 to 40 m^3. Activated ILW consisting of metallic and concrete waste from the

dismantling of the activated components near the reactor core amount to approximately 450 te of raw solid metallic waste and 180 te of concrete. An estimated volume of conditioned ILW from decommissioning is around 1400 m^3 (PCERsc5.2s4.4). The ILW waste is from the following sources:

a) primary circuit;

b) decontamination.

31 The estimates for operational waste in EDF and AREVA's submission for the volumes of operational LLW and ILW appear to be reasonable for the UK EPR. These estimates were derived by EDF and AREVA using 15 years worth of waste arisings data from across the whole French fleet. The estimates used data from the EDF tracking system which records the characteristics of every solid waste package produced on the 19 sites in France. (PCERsc6.3s3.1).

3.5 Management and Disposal of Low Level Waste

32 In this section we cover our assessment of the management and disposal of low level radioactive wastes (LLW). LLW is defined in the UK as 'solid radioactive waste having a radioactive content not exceeding 4 GBq per tonne (GBq te^{-1}) of alpha or 12 GBq te^{-1} of beta/gamma activity', but we also consider here some liquid waste such as contaminated oils. These types of low level waste are usually suitable for disposal at the low level waste repository (LLWR) near Drigg, disposal by on or off-site incineration, or transfer off-site for recovery (for example, of metals).

33 Having minimised the overall production of radioactive waste, the application of BAT to minimise the activity in gaseous and aqueous discharges tends to transfer activity to low (and intermediate – see below) level solid waste. This is in line with the principle of preferred use of 'concentrate and contain' over 'dilute and disperse' (DECC, 2009). There is little opportunity to reduce the activity of this waste, except by decay storage when the waste contains radionuclides with short half-lives. However, the volume of LLW requiring final disposal can be reduced by using techniques such as waste sorting and segregation, compaction, incineration, removal of surface contamination, re-use and recycling.

34 EDF and AREVA state in PCERsc6.2 that solid radioactive waste is segregated at source in each area as it arises, both in terms of activity and its chemical and physical characteristics (for example, combustible, compactable and non-combustible / non-compactable). Activity assessment is determined by measuring with handheld monitors and applying a nuclide fingerprint applicable for the source.

35 For the reference case, the treatment of solid radioactive waste will be carried out by two solid radioactive waste treatment systems; the TES unit system and the 8TES system located in the UK EPR waste treatment building (ETB). The TES unit system will handle the filter replacement and the transfer of resins from the nuclear auxiliary building (NAB) to the ETB. A filter handling machine will remove the used filters and place them in a concrete enclosure. Spent resins will be pumped to the 8TES storage tanks of the ETB by the 8TES handling system. The 8TES system will comprise of effluent storage facilities for the resins and evaporator concentrates and conditioning facilities for the raw solid radioactive waste from the nuclear island and the ETB that results from normal operation. Resins, filter contents, evaporator concentrates and other operational radioactive waste will be encapsulated in concrete enclosures and there will be an installation for compacting low-activity operational waste. All conditioned waste will then be kept on site for interim storage before being sent off site to a final storage location or to a treatment plant for additional processing (for example, incineration, smelting etc). The treatments, conditioning and packaging of operational solid radioactive waste is presented in PCERsc6.3 Table 3 and detailed in PCERsc6.4. EDF and AREVA provide further

information on other potential waste management arrangements in the ETB in the SRWSR to accommodate different operators.

36 The following packaging will be used for LLW:

a) metallic drum 200 litres: These drums will mainly be used for the packaging of LLW to be shipped directly to the LLWR;

b) plastic drum 200 litres: These drums have been developed specifically for the incineration process and they are directly introduced to the furnace;

c) metallic boxes 1 m^3: These boxes will be used to collect and ship metallic waste and cut scraps for melting.

37 EDF and AREVA claim that the storage capacity of the reference ETB is enough to ensure buffer storage of LLW for more than one year of operating, including maintenance operations, even in the case that two UK EPR units share the ETB. (PCERsc6.4s4.2.4.1.5).

38 EDF and AREVA state in PCERsc6.5 and in the SRWSR that during the timescale for disposal of ILW to a disposal facility, it is possible that some waste may decay below the ILW threshold limits. Although initially stored as ILW, these waste streams can be re-categorised, removed from the interim storage facility and shipped as LLW.

39 Disposability of operational LLW is discussed in PCERsc6.5 of the PCER. EDF and AREVA will dispose of LLW promptly after it has been generated to the low level waste repository (LLWR). EDF and AREVA have completed LLWR form D1s (Request for agreement in principle to dispose of radioactive waste at the low level waste repository) for each of the UK EPR LLW streams (except waste oils). These forms describe the nature of the process producing the waste, the type of radioactive waste generated and the physical and chemical form of the waste and its radiological characteristics.

40 Although D1 forms have been completed for all UK EPR operational LLW (except waste oils), EDF and AREVA have identified waste streams that are likely to be suitable for incineration and smelting to minimise the waste sent to the LLWR.

41 EDF and AREVA have provided us with signed form D1s from the LLWR, giving agreement in principle for the treatment / disposal of the following LLW:

a) ion exchange resin;

b) ion exchange beads;

c) spent filter cartridges;

d) air filters and water filters;

e) maintenance and operational very low level waste;

f) stainless steel waste;

g) maintenance and operational low level waste;

h) sludges;

i) concentrates.

42 The LLWR recognises that EDF and AREVA's form D1 applications represent assumed waste disposals at some point in the future and, as such, it cannot guarantee future capacity today. However, the LLWR has assessed EDF and AREVA's application against their current arrangements and can give agreement in principle on the basis that this waste would be suitable for treatment / disposal against their current arrangements.

43 EDF and AREVA state that contaminated waste oils and oily, solvent or greasy rags produced by maintenance will be incinerated. They provide evidence that this

waste will meet the conditions for acceptance at the Centraco facility in France. They also provide confidence that these types of waste would be accepted at the Tradebe incinerator in the UK. (PCERsc6.2s3.4.1.2)

44 Smelting is also considered for LLW metals as described in PCERsc6.3. However, EDF and AREVA have not carried out a review of this waste stream against the conditions of acceptance of any available smelting facilities to show that they can be met.

45 Incineration is also considered for SGBS ion-exchange resins (without regeneration), evaporator concentrates, pre-compacted operational waste and operational waste as mentioned in PCERsc6.3. However, EDF and AREVA have not carried out a review of this waste stream against the conditions of acceptance of any available incineration facilities to show that they can be met.

46 EDF and AREVA have considered the treatment and disposal of large, one-off solid radioactive waste items that could need replacing during the operation of the UK EPR. They consider steam generators and reactor pressure vessel heads. EDF and AREVA state that these items will be LLW and that one method of treatment and disposal will be to cut them into pieces, place pieces in containers and send containers for disposal at the LLWR. (PCERsc6.3s3.2.6)

47 EDF and AREVA expect decommissioning waste will produce similar waste types as the operational phase and, therefore, assume it will be compliant with the LLWR acceptance criteria. The SRWSR assumes that the LLW produced during the dismantling of a reactor is conditioned by packing in half height ISO (HHISO) containers. EDF and AREVA provided a document detailing their decommissioning waste inventory evaluation (ELIDC0801302A).

48 EDF and AREVA state in PCERsc6.3 that they currently envisage reducing the sources of solid waste volume compared with the existing plants' feedback as follows:

a) designation at the design stage of clean-waste zoning, enabling sorting of waste at source and segregating of conventional waste from non-contaminating work in the restricted area;

b) better control of source term through carefully selecting materials in contact with the primary coolant, which then leads to reduced production of corrosion products (a reduction in cobalt 60 activity in particular);

c) optimisation of the chemical treatment of primary coolant;

d) a greater surface area on the chemical and volume control system (CVCS) purification filters than on the 1300 MWe and N4 units (predecessors to the UK EPR), through using multi-cartridge baskets and not single cartridge.

49 EDF and AREVA state that it should be noted that the volume of solid waste depends on the balance between environmental discharges and packaged waste generation in managing the installation, and may, therefore, change according to the various effluent treatment methods.

50 EDF and AREVA state in PCERsc6.5 that in order to minimise the inventory of waste consigned to LLWR, where the characteristics of LLW streams or packages are such that they could be treated as VLLW, LLWR have confirmed that they will offer services to dispose of such waste.

51 EDF and AREVA state in PCERsc8.2 that an 'EPR environment' design review took place in October 2004. One recommendation from this was to reduce the volume of solid waste, in particular by optimising the room zoning and a detailed analysis of the operating procedures and waste inventory of the existing units. They claim that they will reduce the volume of solid waste by ensuring waste is segregated as it is generated, mainly during maintenance operations in the nuclear buildings. (PCERsc8.2s2.3)

52 In PCERsc8.2, EDF and AREVA describe how they consider that BAT has been applied to each significant waste steam. EDF and AREVA claim in their BAT demonstration report (EPRB) that BAT is being applied in the design of the UK EPR to minimise radioactive waste at source and to minimise the impacts of the disposal of waste into the environment.

53 The SRWSR states that the UK EPR design will enable decommissioning to be performed to minimise radiation doses to workers and minimise the amount of radioactive waste generated. The SRWSR discusses the following features that have been incorporated into the design:

a) choice of materials of construction to minimise activation;

b) optimisation of neutron shielding;

c) optimisation of access routes to nuclear areas;

d) reactor systems design;

e) ease of removal of major process components;

f) submerged disassembly of reactor pressure vessel;

g) modular thermal insulation;

h) fuel cladding integrity;

i) design for decontamination;

j) prevention of contamination spread;

k) minimisation of hazardous materials.

54 EDF and AREVA claim that improvements and provision are included in the UK EPR design based on feedback experience, in order to avoid replacing during the UK EPR's 60 years of operation large one-off items such as reactor pressure vessel heads and steam generators. They also claim that good chemistry management during operation should prevent the build up of crud and activity due to contamination in the steam generators over their operating life. (PCERsc6.3s3.2.6)

3.6 Management and Disposal of Intermediate Level Waste

55 In this section we cover our assessment of the management of intermediate level radioactive waste (ILW). ILW is waste with activity levels exceeding the upper boundaries for low level waste, but which does not require heat generation to be accounted for in the design of disposal or storage facilities. There are currently no final disposal facilities for ILW in the UK. However, the Government has stated (BERR, 2008) that it is satisfied that:

a) a geological disposal facility (GDF) would provide a possible and desirable mechanism for disposing of higher level waste (both from a new nuclear programme and existing legacy waste);

b) there are feasible and long-term mechanisms through the Managing Radioactive Waste Safely (MRWS) (Defra et al, 2008) programme for identifying a suitable site and for constructing a geological disposal facility.

56 Although a permit for final disposal may not be required for a considerable time, we expect EDF and AREVA to show now whether the waste is:

a) likely to be suitable for disposal in a geological repository;

b) will be appropriately managed in the interim, so as not to prejudice its ultimate disposal.

57 EDF and AREVA state in PCERsc6.2 that solid radioactive waste is segregated at source in each area as it arises, both in terms of activity and its chemical and

physical characteristics (such as combustible, compactable and non-combustible / non-compactable).

58 For the reference case, the treatment of solid radioactive waste will be carried out by two solid radioactive waste treatment systems; the TES unit system and the 8TES system located in the UK EPR waste treatment building (ETB). The TES unit system will handle the filter replacement and the transfer of resins from the NAB to the ETB. A filter handling machine will remove the used filters and place them in a concrete enclosure. Spent resins will be pumped to the 8TES storage tanks of the ETB by the 8TES handling system. The 8TES system will comprise effluent storage facilities for the resins and evaporator concentrates and conditioning facilities for the raw solid radioactive waste from the nuclear island and the ETB that results from normal operation. Resins, filter contents, evaporator concentrates and other operational radioactive waste will be encapsulated in concrete enclosures and there will be an installation for compacting low-activity operational waste. Conditioned waste will then be kept on site for interim storage before being sent off site to a final storage location. The treatments, conditioning and packaging of operational solid radioactive waste is presented in PCERsc6.3 Table 3 and detailed in PCERsc6.4. EDF and AREVA provide further information on other potential waste management arrangements in the ETB in the SRWSR to accommodate different operators.

59 The characteristics of decommissioning conditioned waste are given in PCER chapter 5 and in the SRWSR.

60 C1 and C4 concrete containers (these containers are 15 cm thick and have the physical capability to last and confine radioactivity for more than 300 years) are used for packaging ILW in the reference case (PCERsc6.3). Other options for packaging ILW in stainless steel and cast iron containers for disposal are mentioned in the SRWSRs7.4.2.

61 ILW will be stored on the UK EPR sites in dedicated building(s) until a final disposal site for ILW is opened in the UK. The radioactive decay during interim storage of ILW due to its composition of short-lived radionuclides can reduce the final quantities of ILW to be disposed of. Some of this waste could be reclassified as LLW. The ILW interim storage facility will be designed to be in operation for up to 100 years after first fuel loading.

62 Design information on possible option(s) regarding interim storage facilities for ILW is provided in PCERsc6.5 and in the SRWSR. Designs for two ILW storage options are described. These can be adapted to store additional ILW that is generated during decommissioning.

63 EDF and AREVA's proposals for storage of ILW are based on current practice. However, the Regulators have requested further information about the proposed storage facilities to support the long-term safe storage of ILW and to ensure ILW does not degrade over the long storage period.

64 Disposability of operational ILW is discussed in PCERsc6.5. In order to assess the disposability of ILW, EDF and AREVA provided the Nuclear Decommissioning Authority (NDA) with a datasheet for each of the UK EPR waste streams. Each datasheet included information on the nature of the waste stream, rate of arising, proposed matrix, package type, physical and chemical composition and radionuclide inventory, package heat output and external dose rate. EDF and AREVA have provided us with datasheets for the following operational waste types:

a) spent resins (ILW) raw waste;

b) spent cartridge filters (LLW + ILW);

c) operational waste (LLW + ILW);

d) wet sludges (LLW + ILW);

e) evaporator concentrates (LLW + ILW).

65 EDF and AREVA have provided us with datasheets for the following decommissioning waste types:

a) lower internals from EPR pressure vessel: heavy reflector, lower support plate, lower heavy reflector support;

b) upper internals: upper support columns and upper core plate. Lower internals: core barrel, flow distribution device;

c) reactor vessel: parts from the reactor vessel near the core.

66 EDF and AREVA have obtained and provided a view from the Radioactive Waste Management Directorate (RWMD) of the Nuclear Decommissioning Authority (NDA) (as the UK authoritative source) on the disposability of their proposed arisings of ILW. RWMD concluded that compared with legacy waste, no new issues arise that challenge the fundamental disposability of the waste expected to arise from operation of the UK EPR.

67 The Regulators requested further information on the volume and radionuclides / activity for waste, including rod cluster control assemblies (RCCAs); redundant irradiated control rods; neutron source assembly and poison rod assemblies, including evidence that they will be disposable. EDF and AREVA confirmed that they consider RCCAs and redundant irradiated control rods to be the same and would be ILW, and that poison rod assemblies are not used. Burnable poison, gadolinium, is mixed with uranium dioxide in some fuel assembly rods with low uranium 235 enrichment. EDF and AREVA provided information on the volume and radionuclides / activity, and on interim storage proposals and packaging for disposal. EDF and AREVA claim this waste will be disposable in a geological disposal facility.

68 The Regulators requested further information from EDF and AREVA in December 2009 on the disposability of spent fuel and ILW. We received EDF and AREVA's response in February and March 2010. Our assessment report on disposability of ILW and spent fuel (Environment Agency, 2010d) considers both EDF and AREVA's opinion of the RWMD assessment, and the RWMD assessment. It concludes that subject to a satisfactory demonstration that ILW can be stored safely for the necessary period of time without significant degradation, there should be no reason at this stage to believe that any ILW will not be disposable in a suitably designed and located GDF. Please refer to this report for more information.

69 HSE is reviewing information on long term storage of ILW in its Step 4 assessment. We will continue to work with HSE on this, and this work will inform our decision document.

70 EDF and AREVA state in PCERsc6.3 that they currently envisage reducing the sources of solid waste volume compared to feedback experience as follows:

a) designation at the design stage of clean-waste zoning, enabling sorting of waste at source and segregating conventional waste from non-contaminating work in the restricted area;

b) better control of source term through carefully selecting materials in contact with the primary coolant, which then leads to reduced production of corrosion products (a reduction in cobalt 60 activity in particular);

c) optimisation of the chemical treatment of primary coolant;

d) a greater surface area on the CVCS purification filters than on the 1300 MWe and N4 units (predecessors to the UK EPR), through using multi-cartridge baskets and not single cartridge.

71 EDF and AREVA state that it should be noted that the volume of solid waste depends on the balance between environmental discharges and packaged waste

generation in managing the installation and may, therefore, change according to the various effluent treatment methods.

72 EDF and AREVA state in PCERsc8.2 that an 'EPR environment' design review took place in October 2004. One recommendation from this was to reduce the volume of solid waste, in particular by optimising the room zoning and a detailed analysis of the operating procedures and waste inventory of the existing units. They claim that they will reduce the volume of solid waste by ensuring waste is segregated as it is generated, mainly during maintenance operations in the nuclear buildings. (PCERsc8.2s2.3)

73 In PCERsc8.2, EDF and AREVA describe how they consider that BAT has been applied to each significant waste steam. EDF and AREVA claim in their BAT demonstration report (EPRB) that BAT is being applied in the design of the UK EPR to minimise radioactive waste at source and to minimise the impacts of the disposal of waste into the environment.

74 PCER chapter 5 and the SRWSR states that the UK EPR design will enable decommissioning to be performed to minimise radiation doses to workers and minimise radioactive waste generation. They discuss the following features that have been incorporated into the design:

a) choice of materials of construction to minimise activation;

b) optimisation of neutron shielding;

c) optimisation of access routes to nuclear areas;

d) reactor systems design;

e) ease of removal of major process components;

f) submerged disassembly of reactor pressure vessel;

g) modular thermal insulation;

h) fuel cladding integrity;

i) design for decontamination;

j) prevention of contamination spread;

k) minimisation of hazardous materials.

75 EDF and AREVA claim that improvements and provision are included in the UK EPR design based on feedback experience, in order to avoid replacing during the UK EPR's 60 years of operation large one-off items such as reactor pressure vessel heads and steam generators. They also claim that good chemistry management during operation should prevent the build up of crud and activity due to contamination inside the tubes, over the steam generators' operating life. (PCERsc6.3s3.2.6)

3.7 Compliance with our REPs

76 The following REPs were considered in our assessment of EDF and AREVA's LLW and ILW:

a) Principle RSMDP3 – Use of BAT to minimise waste: The best available techniques should be used to ensure that production of radioactive waste is prevented and where that is not practicable minimised with regard to activity and quantity.

b) Principle RSMDP8 – Segregation of wastes: The best available techniques should be used to prevent the mixing of radioactive substances with other materials, including other radioactive substances, which might where such

mixing compromise subsequent effective management or increase environmental impacts or risks.

c) Principle RSMDP9 – Characterisation: Radioactive substances should be characterised using the best available techniques so as to facilitate their subsequent management, including waste disposal.

d) Principle RSMDP10 – Storage: Radioactive substances should be stored using the best available techniques so that their environmental risk and environmental impact are minimised and that subsequent management, including disposal is facilitated.

e) Principle RSMPD15 – Requirements and conditions for disposal of wastes: Requirements and conditions that properly protect people and the environment should be set out and imposed for disposal of radioactive waste. Disposal of radioactive waste should comply with imposed requirements and conditions.

77 The table below summarises whether these REPs have been addressed in EDF and AREVA's submission:

REP number	REP title & Information in submission
RSMDP3	**Use of BAT to minimise waste** See descriptions in 'Management and Disposal of Low Level Waste' and 'Management and Disposal of Intermediate Level Waste' sections above. EDF and AREVA have provided basic evidence of how they will minimise the disposal of LLW and ILW. This includes appropriate characterisation and segregation. Further detailed evidence is required at site-specific permitting.
RSMDP8	**Segregation of wastes** EDF and AREVA state in PCERsc6.2 that solid radioactive waste is segregated at source in each area as it arises, both in terms of activity and its chemical and physical characteristics (i.e. combustible, compactable and non-combustible /non-compactable).
RSMDP9	**Characterisation** See 'RSMDP3' and 'RSMDP8' above.
RSMDP10	**Storage** See descriptions in 'Management and Disposal of Low Level Waste' and 'Management and Disposal of Intermediate Level Waste' sections above. EDF and AREVA have described their buffer storage arrangements for LLW and their storage arrangements for ILW prior to disposal. Waste will be treated and conditioned using proven and recognised techniques. However, HSE will be looking at EDF and AREVA's plans for the conditioning of wastes produced by a UK EPR in more detail as part of its Step 4 assessment, and our final decision will be informed by this work.

REP number	REP title & Information in submission
RSMPD15	**Requirements and conditions for disposal of wastes** See descriptions in 'Management and Disposal of Low Level Waste' and 'Management and Disposal of Intermediate Level Waste' sections above. The design is not expected to produce LLW for which there is no foreseeable disposal route. EDF and AREVA have demonstrated that the waste steams would meet the criteria for disposal in a LLW facility. If smelting of LLW is pursued at site-specific permitting, then we require demonstration that the conditions of acceptance of any available smelting facilities can be met. If incineration is pursued at site-specific permitting for SGBS ion-exchange resins (without regeneration), evaporator concentrates, pre-compacted operational waste and operational waste, then we require demonstration that the conditions of acceptance of any available incineration facilities can be met. The design is not expected to produce ILW for which there is no foreseeable disposal route. However, the regulators need more information on the potential for degradation of ILW over the longer term that might affect its disposability and safe storage. EDF and AREVA provided information in February and March 2010. Our assessment report on disposability of ILW and spent fuel (Environment Agency, 2010d) concludes that subject to a satisfactory demonstration that ILW can be stored safely for the necessary period of time without significant degradation, there should be no reason at this stage to believe that any ILW will not be disposable in a suitably designed and located GDF. HSE is reviewing EDF and AREVA's information in its Step 4 assessment. We will continue to work with HSE on this, and this work will inform our decision document. EDF and AREVA have obtained and provided a view from the NDA (as the UK authoritative source in providing such advice) on the disposability of their proposed arisings of ILW. RWMD concluded that compared with legacy wastes, no new issues arise that challenge the fundamental disposability of the wastes expected to arise from operation of the UK EPR. Further information on the disposability of ILW can be found in our assessment report on disposability of ILW and spent fuel (Environment Agency, 2010d).

3.8 Compliance with Table 1 in our Process and Information Document

78 Sections 2.1, 2.4 and 1.5 in Table 1 of the P&ID were considered in our assessment of EDF and AREVA's LLW and ILW. The table below summarises whether these requirements have been addressed in EDF and AREVA's submission:

Section number	Description of requirement & Information in submission
2.1	**A description of how radioactive wastes will arise, be managed and disposed of throughout the facility's lifecycle.** See 'Creation of Solid Waste' section above. This shows that EDF and AREVA have provided a description of how radioactive solid wastes will arise. All LLW and ILW waste streams that a UK EPR will typically produce have been identified by EDF and AREVA. See 'Management and Disposal of Low Level Waste' and 'Management and Disposal of Intermediate Level Waste' sections above. This shows that EDF and AREVA have provided a description of how radioactive solid wastes will be managed and disposed of. The design is not expected to produce LLW for which there is no foreseeable disposal route. EDF and AREVA have demonstrated that the waste streams would meet the criteria for disposal in a LLW facility. If smelting of LLW is pursued at site-specific permitting, then we require demonstration that the conditions of acceptance of any available smelting facilities can be met. If incineration is pursued at site-specific permitting for SGBS ion-exchange resins (without regeneration), evaporator concentrates, pre-compacted operational waste and operational waste, then we require demonstration that the conditions of acceptance of any available incineration facilities can be met. The design is not expected to produce ILW for which there is no foreseeable disposal route. However, the regulators need more information on the potential for degradation of ILW over the longer term that might affect its disposability and safe storage. EDF and AREVA provided information in February and March 2010. Our assessment report on disposability of ILW and spent fuel (Environment Agency, 2010d) concludes that subject to a satisfactory demonstration that ILW can be stored safely for the necessary period of time without significant degradation, there should be no reason at this stage to believe that any ILW will not be disposable in a suitably designed and located GDF. HSE is reviewing EDF and AREVA's information in its Step 4 assessment. We will continue to work with HSE on this, and this work will inform our decision document. EDF and AREVA have obtained and provided a view from the NDA (as the UK authoritative source in providing such advice) on the disposability of their proposed arisings of ILW. RWMD concluded that compared with legacy wastes, no new issues arise that challenge the fundamental disposability of the wastes expected to arise from operation of the UK EPR. Further information on the disposability of ILW can be found in our assessment report on disposability of ILW and spent fuel (Environment Agency, 2010d). EDF and AREVA have considered decommissioning radioactive solid waste.

Section number	Description of requirement & Information in submission
2.4	**Design basis estimates and substantiation of annual arisings of solid radioactive waste during operation and decommissioning. Wastes should be identified in terms of category (HLW, ILW, LLW), physico-chemical characteristics and proposed disposal route (if any). Quantification should be in terms of activity of key individual radionuclides and overall groupings of radionuclides (e.g. total alpha), mass and volumes.** See 'Creation of Solid Waste', 'Management and Disposal of Low Level Waste' and 'Management and Disposal of Intermediate Level Waste' sections above This shows that EDF and AREVA have provided estimates of annual arisings of solid radioactive waste during operation and decommissioning. Wastes have been identified in terms of category, physico-chemical characteristics and proposed disposal route. Quantification is in terms of activity of key individual radionuclides and overall groupings of radionuclides (e.g. total alpha), mass and volumes. The estimates in EDF and AREVA's submission for the volumes of LLW and ILW appear to be reasonable for the UK EPR. These estimates were derived by EDF and AREVA using 15 years worth of waste arisings data from across the whole French fleet as detailed in TQ-ERR-159 and TQ-EPR-124. The supplementary information given in TQ-EPR-470 provides confidence that the estimates are realistic for the UK EPR. The estimates used data from the EDF tracking system which records the characteristics of every solid waste package produced on the 19 sites in France (PCERsc6.3s3.1). The Environment Agency and HSE attended a presentation by EDF in September 2009 on their processes for recording and analysing information on radioactive wastes at their sites to gain further confidence. These arisings of LLW and ILW are consistent with those of comparable reactors around the world (Isukul, 2009). The arisings of LLW and ILW are below the European Utility Requirement objective of less than ≤ 50 m^3 per 1000 MWe plant-year of operation (EUR, 2001).
2.4	**The requesting party should obtain, and provide, a view from the Nuclear Decommissioning Authority (NDA) (as the UK authoritative source in providing such advice) on the disposability of any proposed arisings of ILW.** See descriptions in 'Management and Disposal of Low Level Waste' and 'Management and Disposal of Intermediate Level Waste' sections above. EDF and AREVA have obtained and provided a view from the NDA (as the UK authoritative source in providing such advice) on the disposability of their proposed arisings of ILW. RWMD concluded that compared with legacy wastes, no new issues arise that challenge the fundamental disposability of the wastes expected to arise from operation of the UK EPR. Further information on the disposability of ILW can be found in our assessment report on disposability of ILW and spent fuel (Environment Agency, 2010d).

Section number	Description of requirement & Information in submission
1.5	**An analysis should be provided that includes an evaluation of options considered and Shows that the best available techniques will be used to minimise the production and discharge or disposal of waste.** See descriptions in 'Management and Disposal of Low Level Waste' and 'Management and Disposal of Intermediate Level Waste' sections above. EDF and AREVA have provided basic evidence of how they will minimise the disposal of LLW and ILW. This includes appropriate characterisation and segregation. Further detailed evidence is required at site-specific permitting.

4 Public comments

79 One comment on ILW was received from the public involvement process relating to the UK EPR design during our detailed assessment stage. The comment asked whether the UK EPR design adequately caters for the encapsulation, storage and disposal of ILW. EDF and AREVA responded with information that is available in their submission, that is that ILW is encapsulated in concrete containers and that final ILW packages will be placed in an interim storage facility before their disposal in the proposed GDF.

5 Conclusion

80 We conclude that:

a) In their submission, EDF and AREVA describe how LLW and ILW will be generated, managed and disposed of throughout the facility's lifecycle.

b) EDF and AREVA have identified all LLW and ILW waste streams that a UK EPR will typically produce.

c) Waste will be treated and conditioned using proven and recognised techniques. However, HSE will be looking at EDF and AREVA's plans for the conditioning of waste produced by a UK EPR in more detail as part of its Step 4 assessment, and our final decision will be informed by this work.

d) The design is not expected to produce LLW or ILW for which there is no foreseeable disposal route. However, the Regulators need more information on the potential for degradation of ILW over the longer term that might affect its disposability and safe storage. EDF and AREVA provided information in February and March 2010, which was considered in our assessment report on disposability of ILW and spent fuel (Environment Agency, 2010d). HSE is reviewing this information in its Step 4 assessment. We will continue to work with HSE on this, and this work will inform our decision document.

e) EDF and AREVA have provided estimates for the annual arisings (during operations and decommissioning) of LLW and ILW. These arisings (during operations) are consistent with those of comparable reactors around the world (Isukul, 2009). The arisings of LLW and ILW are below the European Utility Requirement objective of less than 50 m^3 per 1000 MWe plant-year of operation (EUR, 2001).

f) EDF and AREVA have provided basic evidence of how they will minimise the disposal of LLW and ILW.

81 However, our conclusion is subject to the following four other issues:

a) Disposability of ILW following longer term interim storage pending disposal.

b) If smelting of any LLW is pursued at site-specific permitting, a demonstration that the conditions of acceptance of any available smelting facilities can be met.

c) If incineration is pursued at site-specific permitting for SGBS ion-exchange resins (without regeneration), evaporator concentrates, pre-compacted operational waste and operational waste, a demonstration that the conditions of acceptance of any available incineration facilities can be met.

d) The provision of evidence at site-specific permitting that the specific arrangements for minimising the disposals of LLW and ILW for each site represents BAT.

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Abbreviations

BAT	Best available techniques
BNI	Balance of nuclear island
CFA	Conditions for acceptance
CVCS	Chemical and volume control system
DAW	Dry active waste
EPRB	GDA UK EPR – BAT demonstration, document UKEPR-0011-001 issue 03
EPRB 3.5s1.2	EPRB form 3.3 section 1.2 (example reference)
ETB	Effluent treatment building
GDA	Generic design assessment
GDF	Geological disposal facility
HHISO	Half height ISO
HLW	High level waste
HSE	The Health and Safety Executive
ILW	Intermediate level waste
IWS	GDA UK EPR – Integrated waste strategy document UKEPR-0010-001 issue 02
LLW	Low level waste
LLWR	The national Low level waste repository, near Drigg, Cumbria
MRWS	Managing Radioactive Waste Safely
NAB	Nuclear auxiliary building
NDA	Nuclear Decommissioning Authority
NRC	The United States Nuclear Regulatory Commission
P&ID	Process and information document
PCER	Pre-construction environmental report
PCERsc3.3s4.1	PCER sub-chapter 3.3 section 4.1 (example reference)
PWR	Pressurised water reactor
RCCAs	Rod cluster control assemblies
REPs	Radioactive substances environmental principles
RI	Regulatory issue
RO	Regulatory observation
RP	Requesting party
RWMD	Radioactive Waste Management Directorate (of NDA)
SEPA	Scottish Environment Protection Agency
SGBS	Steam generator blow down system
SRWSR	Solid radioactive waste strategy report
STUK	Säteilyturvakeskus - The Radiation and Nuclear Safety Authority of Finland

TQ	Technical query
VLLW	Very low level waste

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