

## Generic design assessment

# AP1000<sup>®</sup> nuclear power plant design by Westinghouse Electric Company LLC

**Final assessment report**

**Monitoring of radioactive  
disposals**



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**Published by:**

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[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

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## Generic design assessment

### AP1000<sup>TM</sup> nuclear power plant design by Westinghouse Electric Company LLC

#### Final assessment report - monitoring of radioactive disposals

**Protective status** This document contains no sensitive nuclear information or commercially confidential information.

**Process and Information Document<sup>1</sup>** The following sections of Table 1 in our Process and Information document are relevant to this assessment:

1.5 – show that the best available techniques will be used to minimise the production of waste

2.6 – describe the sampling arrangements, techniques and systems proposed for measuring and assessing discharges and disposals of radioactive discharges.

**Radioactive Substances Regulation Environmental Principles<sup>2</sup>**

The following principles are relevant to this assessment:

RSMDP 13 – Monitoring and Assessment: The best available techniques, consistent with relevant guidance and standards, should be used to monitor and assess radioactive substances, disposals of radioactive wastes and the environment into which they are disposed.

ENDP10 – Quantification of Discharges: Facilities should be designed and equipped so that best available techniques are used to quantify the gaseous and liquid radioactive discharges produced by each major source on a site.

**Report author** Rowe, J. E., and Allott, R.

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 covers the assessment of the sampling arrangements, techniques and systems proposed for measuring and assessing discharges and disposals of radioactive waste for the Westinghouse AP1000™ design as required in Table 1 section 2.6 of our process and information document (P&ID) (Environment Agency, 2007). This assessment covers both gaseous and aqueous effluents, and solid waste.

2 It is noted that much of the requested information has not been provided as the designs have not yet been completed.

3 The process for nuclear new build can be divided into; early design, detailed design, procurement, construction or commissioning phases and it has become apparent from the information provided that many of the details requested will only be available at a later stage.

4 The conclusions from this report therefore focus on those matters that need to be incorporated in the early design stage to avoid costly retrospective correction.

5 As the process moves into the detailed design and construction, more information will be required on the general monitoring facilities, the samplers / instruments used and measures taken to obtain a representative sample. Then, moving into commissioning and operations, information will be required on analysis, maintenance, management arrangements and quality assurance.

6 Our conclusions are unchanged since our consultation, however, we have reworded our assessment finding.

7 **We are unable to conclude that overall the AP1000 utilises the best available techniques to measure and assess radioactive disposals.**

8 As part of our assessment, we identified the following assessment finding:

a) Future operators shall provide:

- i) During the detailed design phase, the location and arrangement of sampling and monitoring facilities for solid, gaseous and aqueous wastes supported by an assessment that these represent BAT and will provide representative sampling and monitoring, and meet the requirement for independent sampling and monitoring;
- ii) during the detailed design phase and before final equipment selection, the details of equipment and techniques to be used for analysis of gaseous, aqueous and solid wastes supported by an assessment that these represent BAT for monitoring (AP1000-AF13).

9 Our findings on the wider environmental impacts and waste management arrangements for the AP1000 reactor may be found in our Decision Document (Environment Agency, 2011).

## 2 Introduction

- 10 We originally published this report in June 2010 to support our GDA consultation on the AP1000 design. The consultation was on our preliminary conclusions. It began on 28 June 2010 and closed on 18 October 2010.
- 11 We undertook additional assessment in response to consultation responses. This report is an update of our original report covering assessment undertaken between June 2010 and the end of March 2011 when Westinghouse published an update of its submission. Where any paragraph has been added or substantially revised it is in a blue font.
- 12 We expect the design to use the best available techniques (BAT) to measure and assess discharges of radioactive waste to the environment. This will enable any operational AP1000 to:
- a) confirm that discharges are as predicted by the designer;
  - b) assess compliance with limits;
  - c) provide good quality data for dose assessments.
- 13 We set out in our P&ID the requirements for a requesting party to provide information. Section 2.6 of the P&ID requires a description of and supporting reasoning for the sampling arrangements, techniques and systems proposed for measurement and assessment of discharges and disposals of radioactive waste. This included whether these are sufficient and adequate to determine all discharges and disposals from the facility at the levels of detection specified in EU Commission recommendation 2004/2/Euratom (EC, 2004) and showing that they represent the best practicable means for such analyses.
- 14 In this report we assess the techniques Westinghouse use in the AP1000 to monitor radioactive disposals. Westinghouse submitted its AP1000 nuclear power plant design for generic design assessment (GDA) in August 2007.
- 15 We found that the submission did not contain the level of information we needed to carry out a detailed assessment but Westinghouse committed to providing further information. In January 2009, Westinghouse provided this additional information; revision 1 of its Environment Report (ER) with supporting documents.
- 16 Although the information provided was generally much improved it was still not complete in regard to the monitoring of radioactive disposals and hence technical queries (TQ-AP-1000-212 (liquid) and TQ-AP1000-213 (gaseous)) were issued. A final version of the ER was received in March 2011 (revision 4), which incorporates the TQ responses which is published along with other documents on the Westinghouse website ([https://www.ukap1000application.com/ap1000\\_documentation.aspx](https://www.ukap1000application.com/ap1000_documentation.aspx)).
- 17 The initial submission lacked detail and it became apparent through the responses to technical queries (TQs) that in relation to gaseous discharges, the detailed design of the main stack and the associated monitoring arrangements for the AP1000 are not yet finalised. In relation to aqueous discharges the monitoring arrangements (equipment and procedures) for the AP1000 will not be specified until later stages during site licensing. Detailed information was not provided on monitoring of solid waste.
- 18 Our assessment of the information contained in the revised submission on monitoring of radioactive disposals is documented within this assessment report. This is essentially the same as that provided in the first issue of this assessment report but updated, where appropriate, to reflect our consideration of any consultation responses relevant to this topic.
- 19 Our findings on the wider environmental impacts and waste management arrangements for the AP1000 reactor may be found in our [Decision Document \(Environment Agency, 2011\)](#).

20

We have published the consultation responses submitted in regard to our preliminary conclusions for the AP1000 design on our website (see: <https://consult.environment-agency.gov.uk/portal/ho/nuclear/gda>).

### 3 Assessment

#### 3.1 Assessment methodology

21 The basis of our assessment was to:

- a) review appropriate sections of the ER and its supporting documents;
- b) hold technical meetings with Westinghouse 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 Westinghouse was insufficient;
- d) assess the techniques proposed by Westinghouse for the monitoring of radioactive disposals;
- e) [consider any consultation responses relevant to this topic](#);
- f) decide on any GDA Issues or assessment findings to carry forward from GDA.

#### 3.2 Assessment objectives

22 The assessment considered:

- a) The sampling arrangements, techniques and systems proposed for measurement and assessment of the discharges and disposals of radioactive waste.
- b) The specific nuclides to be monitored and whether systems are adequate to meet the levels of detection specified in EU Commission recommendation 2004/2/Euratom (EC, 2004).
- c) Whether the arrangements represented Best Available Techniques (BAT).
- d) How monitoring proposals compared to our Technical Guidance Notes (TGNs) M1, M11 and M12, and whether any commitment to our MCERTS (Monitoring Certification Scheme<sup>1</sup>) was given (Environment Agency, 2010a, 1999a, 1999b and, 2008, respectively).

#### 3.3 Westinghouse documentation

23 We referred to the following documents to produce this report:

Document reference	Title	Version number
UKP-GW-GL-790	UK AP1000 Environment Report	4
UKP-GW-GL-029	AP1000 Generic Design Measurement and Assessment of Discharges.	0

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

- a) ER = Environment report;
- b) MAD = AP1000 Generic Design Measurement and Assessment of Discharges.

<sup>1</sup> MCERTS is the Environment Agency's Monitoring Certification Scheme. It provides the framework for businesses to meet our quality requirements. If Operators comply with MCERTS we can have confidence in the monitoring of emissions to the environment. You can read about how MCERTS is used to approve instruments, people and laboratories by visiting [www.mcerts.net](http://www.mcerts.net).

### 3.4 Monitoring of gaseous disposals

- 25 Measures for monitoring discharges are described in chapter 6 of the ER and in the document titled 'AP1000 Generic Design Measurement and Assessment of Discharges'.
- 26 For the main plant vent, monitoring will be carried out for: particulates, iodine and noble gases, using continuous sampling and an isokinetic sampling nozzle. Grab samples can also be taken for laboratory analysis.
- 27 The key radionuclides for the monitoring of aerial discharges were identified as tritium, carbon-14, krypton-85, iodine-131 and other particulate (for example cobalt-60 and caesium-137). Originally it was stated that tritium and carbon-14 monitoring were not included in the design of the continuous monitoring system. This was taken up in the technical query (TQ) and Westinghouse responded and updated the ER accordingly - see below.
- 28 The proposed limits of detection will not meet those required by EU Commission Recommendation 2004/2/Euratom (EC, 2004) for iodine-131, strontium-90 and caesium-137 (MAD Table 3). The future operator will need to demonstrate that they meet these requirements.
- 29 Monitoring of tritium and carbon-14 will be required and Westinghouse stated in ER section 6.2.1.1 that a bubbler system for sampling tritium and carbon-14 will be incorporated into the design of the main stack monitoring system.
- 30 Westinghouse carried out a review detailed in its MAD report, against Technical Guidance Note M11 (Environment Agency, 1999a) requirements with broad consistency being claimed, and with reference to conforming to American National Standard ANSI N13.1-1969 (ANSI, 1969) although evidence was not provided. Westinghouse stated that some of the differences were to be addressed at future stages of the design and authorisation process. We will expect arrangements to meet the British and European standards, for example ISO2889:2010 and EN15259:2007.
- 31 No formal BAT assessment was carried out by Westinghouse when considering the monitoring options. This is required before the commissioning phase. Westinghouse stated the process is underpinned by conforming to US standards and the use of equipment utilised in the US. MAD Table 11 compares proposed equipment with UK practice – there are differences in analytical techniques.
- 32 A technical query was issued to confirm the location and facilities for the monitoring, sampling and flow measurement of gaseous effluent discharges from the AP1000. Also, at this early design stage, to confirm that the design includes provision for adequate facilities to allow for monitoring to our required standards. Further, we intend to extend the application of our MCERTS Monitoring Certification Scheme to radioactive discharges in the future. Therefore we expect that the AP1000 design will be able to comply with these future requirements.
- 33 The design of the stack monitoring system is still being developed and equipment specifications have not been completed. When the instrument to be used for flow rate measurement has been specified, Westinghouse states in ER section 6.2.1.1 that it will review the MCERTS register to see if a suitable instrument is available. Information on monitoring and flow measurement points and upstream and downstream disturbances and the location of filtration have not yet been determined.
- 34 The updated ER section 6.2.1.1 indicates that a bubbler system for sampling of tritium and carbon-14 was being incorporated into the design of the main stack monitoring system.
- 35 There are requirements for the area surrounding the monitoring locations to provide safe access and sufficient room for the Westinghouse monitoring requirements. The design of this area is still being developed, but Westinghouse states in ER section 6.2.1.1 that industry codes and standards along with Technical Guidance Note M1

(Environment Agency, 2010a) will be considered. We will require these standards to be met.

36 Westinghouse states in ER section 6.2.1.2 that the AP1000 will have on-site laboratory facilities, but that specification of equipment and implementation of processes necessary to gain accreditation to ISO17025 (BSi, 2005) is operator specific.

37 We have assessed the information Westinghouse provided on the AP1000 design for determining gaseous discharges against the requirements of M1 (Environment Agency 2010a) and M11 (Environment Agency 1999a) and other best practice for monitoring.

### 3.4.1 Other issues for monitoring of gaseous disposals

38 Information is still required on the location of monitoring and flow measurement points. Westinghouse recognises that the sampling point needs to be where flow is well mixed and has a relatively constant velocity profile, however, no information has been provided on how this will be achieved / proven. Westinghouse will need to establish uniform flow and gases homogenous at the chosen sample point. When quoting velocities Westinghouse states it assumes uniform flow, but no evidence was provided on the measures being taken to ensure this. This information will be required and assessed by us at the detailed design phase.

39 No information was provided on any physical and chemical properties of the inputs to the stack which could affect monitoring requirements. This information will be required and assessed by us at the detailed design phase.

40 Only one sample point is being included in the design of the sampling system, with the exact design not having been determined. Therefore our requirement for additional connections or probes, to allow for replacement equipment, if there is a failure during operational periods, and independent sampling, is not being met. Westinghouse states that facilities in the preliminary design allow for grab samples to be taken during system failures or for independent samples to be taken. The availability of a working area for Regulator requirements was stated by Westinghouse to need a review. This information will be required and assessed by us at the detailed design phase.

41 A long vertical drop of 18 to 24 m is being proposed between the monitoring point and sample system (located in the uppermost floor of the auxiliary building) – although no detailed design is available. This is stated by Westinghouse to be balancing control of the environment of the sampling equipment and long pipe run. However, since the requirements of TGN M11 (Environment Agency, 1999a) call for the length of pipe work between probe and sample collector to be as short as possible, this matter will need to be addressed and assessed by us at the detailed design phase.

42 The detectors for monitoring noble gases, iodines and radioactivity associated with particulate matter (including cobalt-60) have not been determined, and no information on what Westinghouse intends to require in terms of precision, bias, retention / capture characteristics has been provided. This information will be required and assessed by us before the procurement phase.

### 3.5 Monitoring of aqueous disposals

43 Measures for monitoring discharges are described in chapter 6 of the ER and in the document titled 'AP1000 Generic Design Measurement and Assessment of Discharges'.

44 There are three discharge streams for aqueous radioactive effluents: the liquid radwaste, waste water and service water systems. The latter two could contain low levels of radionuclides and are minor discharge routes under normal conditions. All three streams are released through the same pipeline. For the liquid radwaste stream, there will be continuous on-line monitoring for caesium-137 in the discharge pipe.

- Additionally, samples from the discharge tank will be collected and analysed before discharge – tanks will be mixed thoroughly before sampling. Westinghouse has similar arrangements for the minor discharge streams. Westinghouse states that the key nuclides for monitoring are tritium and a fission product, for example caesium-137, but it only intends to monitor for caesium-137 and its limit of detection for this meets the EU Commission Recommendation 2004/2/Euratom (EC, 2004) required value. Westinghouse states that it could determine the other EU Commission recommended radionuclides that is tritium, cobalt-60 and strontium-90 by grab samples if required.
- 45 A comparison between TGN M12 (Environment Agency, 1999b) and the proposed monitoring arrangements was carried out by Westinghouse. Westinghouse states that its arrangements broadly conform with M12 objectives and principles, with some of the differences expected to be addressed at future stages of the design and licensing process.
- 46 No formal BAT assessment was carried out when considering the monitoring options. Westinghouse stated the process is underpinned by conforming to US standards and the use of equipment utilised in the US. MAD Table 12 compares proposed equipment with UK practice – there are differences in analytical techniques.
- 47 A technical query was issued to confirm the location and facilities for the monitoring, sampling and flow measurement of aqueous effluent discharges from the AP1000. Our Nuclear Sector Plan (Environment Agency, 2009) intends to extend the application of the MCERTS monitoring scheme to radioactive discharges in the future. Westinghouse states in the updated ER section 6.2.1.2 that the instrument for flow rate measurement has not been specified, but when it has, Westinghouse states that it will review the MCERTS register to see if a suitable, certified instrument is available.
- 48 Westinghouse has indicated in ER section 6.2.1.2 that the design will be able to accommodate both grab sampling as well as proportional sampling to obtain a representative sample (including provision for separate proportional samplers that can be secured to provide independent measurement) on the discharge lines – proportional sampling will be required.
- 49 We expect as BAT, that sampling and monitoring equipment to be protected from the weather and interference by unauthorised personnel and for analysis to achieve ISO17025 (BSi, 2005) and MCERTS accreditation. Westinghouse states in ER section 6.2.1.2 that all sampling and monitoring equipment will be housed in weather shielded buildings and will be located in areas where access is controlled. Westinghouse also states there will be an on-site laboratory with the capability to be accredited by the United Kingdom Accreditation Service (UKAS) to ISO17025, but it was noted these would be operator responsibilities.

### **3.5.1 Other issues for monitoring of aqueous disposals**

- 50 Prior to tank discharge, grab samples are taken – Westinghouse states that pump suction is taken from the bottom of the tank and returned as quickly as possible to the top minimising the time needed for mixing. Westinghouse states this is to ensure that the tank is fully mixed and that representative samples are obtained. Evidence that the mixing is sufficient to ensure representative sampling will be required by us at the detailed design phase.
- 51 Information was not provided on whether the radiation monitor being put in the common discharge line is going to be located above or below the point at which the cooling water return of the circulating water system (CWS) is mixed in.
- 52 For the monitors on the discharge lines, no specification for the precision, bias and availability / reliability has been provided. This information will be required and assessed by us before the procurement phase.

53 The method for determining how the alarm threshold will be set for the monitors on the discharge lines has also not been determined. This information will be required and assessed by us before the procurement phase.

54 The instrument for flow rate measurement has not been specified – no information was provided on the minimum specification for accuracy and availability. This information will be required and assessed by us before the procurement phase.

### 3.6 Monitoring of solid waste disposals

55 Westinghouse has provided some limited information on the monitoring of solid waste. More information is required about how Westinghouse intend to undertake the initial detailed characterisation on each waste stream to determine the complete waste fingerprint. Furthermore, information is required as to how clearance monitoring will be undertaken to ensure that items believed to be clean are, thus ensuring radioactive waste is not inadvertently released to the environment.

### 3.7 Monitoring of radioactive disposals – review of consultation responses

56 An individual respondent (GDA26<sup>2</sup>) provided the following response to our consultation: *'I believe that a thorough and open system of monitoring and reporting the disposal of radioactive waste is very desirable to instil confidence in residents around the site and over a wider area'*.

57 Maldon Town Council (GDA59) said: *'We note that no assessment has been carried out to date.'*

58 West Somerset Council and Sedgemoor District Council (GDA154) said: *'We are concerned that an effective monitoring, management and intervention programme is established to consider the potential cumulative effects on the surrounding receptors and ensure that findings are clearly and concisely communicated to the local communities surrounding reactor sites.'*

59 The Institution of Mechanical Engineers (GDA146) said that monitoring equipment is vital to reassure the public and gain acceptance of future stations.

60 Ingleby Barwick Town Council (GDA39) said that it is important that adequate monitoring takes place of radioactive waste.

61 An individual respondent (GDA14) said: *'The picture seems to be 'they haven't got the detail yet and we'll interrogate them thoroughly when they have' - which seems to encapsulate EA's role'*. We require further information and we have reflected this in our conclusions on monitoring of radioactive disposals.

62 Horizon Nuclear Power (GDA128) provided the following response: *'We note the EA's conclusion and recognise that the monitoring of radioactive disposals will be addressed in more detail during site specific permitting. We would, however, also note that information on monitoring techniques provided during site specific permitting will need to be appropriate to the development of the design at the time of application. It is Horizon's view that initial information will relate more to principles. As the programme develops and we get closer to construction of the relevant parts of the plant, further details on specific techniques and equipment will become available.'* We require information at an early stage to ensure BAT has been considered so that the AP1000 early design does not rule out the most suitable options for monitoring. For example,

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<sup>2</sup> We list the names of all the organisations that responded to the consultation in Annex 7 of the Decision Document (Environment Agency, 2011a). We have not given names of individuals or members of the public. The list gives a GDA number to each response (for example, GDA76 is for the Health & Safety Executive), so that the documents can be searched to allow all respondents to see where their responses have been considered. Where we quote consultation responses in this document, we have not corrected spelling or grammar.

from current guidance on sampling lines, there are requirements that need to be met (which will not be subject to technological change) and these need to be appropriate from the outset (for example; short sampling lines, isokinetic flow, access to sampling ports). We agree that individual instrumentation is advancing and would not expect this to be specified at this early stage.

63 Several respondents, including; an individual respondent (GDA85), the Nuclear Technology Subject Group of the Institution of Chemical Engineers (GDA71), Springfields Site Stakeholder Group (GDA97), and the Committee on Medical Aspects of Radiation (GDA130) said that they were satisfied with our conclusions on monitoring of radioactive disposals and recognised our requirement for more information.

64 Westinghouse UK (GDA110) said that it agrees with our preliminary conclusions and that it is committed to resolving any outstanding issues within the GDA process.

### 3.8 Compliance with our REPs

65 Our radioactive substances regulation environmental principles (REPs) (Environment Agency, 2010b) were considered in our assessment of Westinghouse's monitoring of radioactive disposals (see above). The table below summarises the position in regards to those REPs considering information from the Westinghouse submission:

REP number	REP title	Information in submission
RSMDP13	Monitoring and assessment	No formal BAT assessment was undertaken when considering the monitoring options. Westinghouse's stated process is underpinned by conforming to US standards and the use of equipment utilised in the US.
ENDP10	Quantification of discharges	Westinghouse stated there will be an on-site laboratory with the capability to be UKAS accredited to ISO17025, but it was noted that these would be operator responsibilities.

## 4 Public comments

66 The public involvement process remained open during our detailed assessment stage (see <http://www.hse.gov.uk/newreactors/publicinvolvement.htm>). We did not receive any public comments on the monitoring of radioactive disposals by this route.

67 Responses made to our public consultation for the AP1000 design in regard to our preliminary conclusions on monitoring of radioactive disposals are considered above and in our decision document, where relevant.

## 5 Conclusion

68 Section 2.6 of the P&ID requested a description of and supporting reasoning for the  
sampling arrangements, techniques and systems proposed for measurement and  
assessment of discharges and disposals of radioactive waste.

69 The information provided by Westinghouse on the AP1000 design for the  
determination of both gaseous and aqueous discharges has been assessed against  
the requirements of Technical Guidance Notes M1, M11 and M12 (Environment  
Agency, 2010a, 1999a, and 1999b, respectively) and other best practice for monitoring  
(for example, Environment Agency, 2008).

70 The process for nuclear new build can be divided into; early design, detailed design,  
procurement, construction or commissioning phases and it has become apparent from  
the information provided that many of the details requested will only be available at a  
later stage.

71 The conclusions from this report therefore focus on those matters that need to be  
incorporated in the early design stage to avoid costly retrospective correction.

72 As the process moves into the detailed design and construction, more information will  
be required on the general monitoring facilities, the samplers / instruments used and  
measures taken to obtain a representative sample. Then, moving into commissioning  
and operations, information will be required on analysis, maintenance, management  
arrangements and quality assurance.

73 **We have concluded that for the monitoring of gaseous disposals:**

- a) **No formal BAT assessment has been undertaken for the monitoring of gaseous disposals.**
- b) **The single sampling point for gaseous disposals does not allow the requirement for independent sampling to be satisfactorily met.**
- c) **Not enough information has been provided on the location of the monitoring and flow measurement points, and evidence has not been provided to back up statements about how representative samples would be achieved. Therefore, we cannot assess appropriateness of monitoring of gaseous disposals at this stage.**
- d) **We could not make an assessment on the suitability of the sampling lines. The information is pointing to them being too long as they descend from the sampling points in the stack to the monitoring equipment in the auxiliary building.**

74 **We have concluded that for the monitoring of aqueous disposals:**

- a) **No formal BAT assessment has been carried out for monitoring aqueous disposals.**

75 Westinghouse has not provided any detailed information on monitoring of solid waste.  
This matter needs to be closed-out by submission of appropriate evidence at the  
detailed design stage.

76 Overall, our conclusions are unchanged since our consultation, however, we have  
reworded our assessment finding.

77 **We are unable to conclude that overall the AP1000 utilises the best available  
techniques to measure and assess radioactive disposals.**

78 As part of our assessment, we identified the following assessment finding:

- a) **Future operators shall provide:**
  - i) During the detailed design phase, the location and arrangement of sampling and monitoring facilities for solid, gaseous and aqueous wastes supported by an assessment that these represent BAT and will provide representative

sampling and monitoring, and meet the requirement for independent sampling and monitoring;

- ii) during the detailed design phase and before final equipment selection, the details of equipment and techniques to be used for analysis of gaseous, aqueous and solid wastes supported by an assessment that these represent BAT for monitoring (AP1000-AF13).

## References

- (ANSI, 1969) ANSI N13.1-1969: Guide to sampling airborne radioactive materials in nuclear facilities, American National Standards Institute, February 1969.
- (BSi, 2005) General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)
- (BSi, 2010) ISO2889:2010: Sampling airborne radioactive materials from the stacks and ducts of nuclear facilities
- (EC, 2004) Commission Recommendation of 18 December 2003 on standardised information on radioactive airborne and liquid discharges into the environment from nuclear power reactors and reprocessing plants in normal operation (*notified under document number C(2003) 4832*)  
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While every effort has been made to ensure the accuracy of the references listed in this report, their future availability cannot be guaranteed.

## Abbreviations

ANSI	American National Standards Institute
AP1000™	AP1000 is trademark of Westinghouse Electric Company LLC
BAT	Best available techniques
CWS	Circulating water system
ER	UK AP1000 environment report
ERs*.*	Environment report section reference e.g. 3.2.2.2
GDA	Generic design assessment
MAD	AP1000 generic design measurement and assessment of discharges report
MCERTS	Monitoring Certification Scheme
P&ID	Process and information document
REPs	Radioactive substances regulation environmental principles
RO	Regulatory observation
TQ	Technical query
UKAS	The United Kingdom Accreditation Service
WEC	Westinghouse Electric Company LLC

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