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11.1 INTRODUCTION

This sub-chapter introduces the purpose and scope of the Environmental Protection chapter in the generic Small Modular Reactor (SMR)-300 Generic Design Assessment (GDA). Interfaces with other chapters and assumptions made in the development of this chapter have also been outlined.

11.1.1 Purpose and Scope

During the construction, commissioning, operation and decommissioning stages, the generic SMR-300 has a potential to cause a range of radiological and non-radiological environmental impacts on the public and environment. At the GDA stage, likely effects are set out based on a generic design which could be used to support site-specific environmental permit applications for the new nuclear power station in England or Wales at a later stage.

This chapter describes how the Fundamental Objective (see sub-chapter 11.2) will be achieved in the development of the environmental case. This chapter also describes the interfaces between the Preliminary Safety Report (PSR) and Preliminary Environment Report (PER) and summarises the environmental aspects for the generic SMR-300 GDA, including an overview of relevant legislation and policy.

A master list of definitions and abbreviations relevant to all PSR chapters can be found in Part A Chapter 2 General Design Aspects and Site Characteristics [1].

11.1.2 Assumptions

There are no specific assumptions applicable to this chapter. The assumptions made within environmental topics can be found in individual PER chapters.

11.1.3 Interfaces with other PER Chapters

This chapter interfaces with multiple topic areas across the Safety, Security and Environmental Case (SSEC). Table 1 below presents the primary linkages between this chapter and other chapters in the PER.

Table 1: Interfaces with Other Chapters in the PER

SSEC Chapter	Interface
PER Chapter 1 Radioactive Waste Management Arrangements [2]	This chapter presents the management arrangements and strategy for radioactive waste and spent fuel arising over the lifecycle of the plant.
PER Chapter 2 Quantification of Effluent Discharges and Limits [3]	This chapter presents the estimated quantities and limits of liquid and gaseous effluents discharged during normal operation.
PER Chapter 3 Radiological Impact Assessment [4]	This chapter presents the methods and data for assessing the prospective environmental dose impact from discharges, of gaseous and aqueous liquid effluents.
PER Chapter 4 Conventional Impact Assessment [5]	This chapter presents the information relating to conventional aspects of the generic SMR-300 design which have the potential to result in conventional environmental impacts, as well as the consideration of sustainability.
PER Chapter 5 Monitoring and Sampling [6]	This chapter provides the sampling and monitoring arrangements for solid, liquid and gaseous wastes arising during normal operation of the generic SMR-300 design.

SSEC Chapter	Interface
PER Chapter 6 Demonstration of BAT [7]	This chapter presents the information relating to the demonstration of Best Available Techniques (BAT) throughout the generic SMR-300 design, including relevant interfacing SSEC chapters.

11.2 CLAIMS, ARGUMENTS AND EVIDENCE

The PER chapters have been developed to support the accomplishment of the PER Fundamental Objective:

The PER presents the environmental standards, criteria and management arrangements to provide confidence that the design, construction, operation and decommissioning of the generic Holtec SMR-300 design protects people and the environment from harm and applies Best Available Techniques (BAT), incorporates relevant good practice and operating experience.

The primary purpose of a Claims, Arguments and Evidence (CAE) approach is to capture the golden thread of a safety case and environmental case narrative demonstrating how plant design and operational experience (OPEX) is brought together to support the Fundamental Objective.

The overarching SSEC claims are presented in Part A Chapter 3 [8] and CAE Model Report [9]. This chapter, alongside the PER and relevant PSR, links to the overarching claims through Claims 3 and 4:

Claim 3: Environmental Principles - Environmental principles are implemented such that the generic Holtec SMR-300 design meets the Environmental Objective.

Claim 4: Environmental Protection - The generic Holtec SMR-300 design is developed, so far as is reasonably achievable, to provide optimal protection of people and the environment.

Claim 3 is supported by two sub-claims:

Sub-claim 3.1: Regulatory Principles and Requirements - The generic Holtec SMR-300 design identifies relevant regulatory principles and requirements to meet the Environmental Objective.

Sub-claim 3.2: Full Lifecycle Assessment - The generic SMR-300 Environment Case addresses relevant regulatory principles and requirements across the entire reactor lifecycle.

Claim 4 is supported by seven sub-claims:

Sub-claim 4.1: Generation of Radioactive Wastes - The generation of all radioactive wastes is prevented where achievable or otherwise minimised.

Sub-claim 4.2: Quantity of Radioactive Wastes - Where prevention is not possible, the mass and/or volume of radioactive wastes, including discharges, disposals and transfers to other premises is minimised.

Sub-claim 4.3: Activity of Radioactive Wastes - The activity of radioactive wastes from discharges, disposals and releases to the environment is minimised.

Sub-claim 4.4: Impacts of Radioactive Wastes - The impacts of radioactive wastes including discharges and disposals from the generic SMR-300 have been minimised. Radiation doses to any individual member of the public and the population as a whole are as low as reasonably achievable. Non-human species are adequately protected against exposures to ionising radiation.

Sub-claim 4.5: Non-Radioactive Aspects of Radioactive Wastes - Potentially adverse non-radiological impacts of radioactive wastes are precluded or, where this is not possible, minimised.

Sub-claim 4.6: Conventional and Non-Radioactive Impacts - Conventional environmental impacts from the generic SMR-300 are in compliance with all relevant legislation, taking into account BAT Reference Notes (BREFs) where relevant.

Sub-claim 4.7: Monitoring and Sampling - The generic SMR-300 includes appropriate monitoring and sampling arrangements for measuring and assessing discharges, disposals and transfers to other premises of radioactive waste to demonstrate compliance with the proposed limits and provide an indication of plant performance.

Claims and sub-claims presented within this chapter are substantiated by a suite of arguments to connect the claims to evidence, in line with the GDA scope and commensurate in detail for a 2-Step GDA. The PER chapters, as well as relevant PSR chapters identified in Table 1, collectively contribute to the development of the environmental case within the GDA process, and the substantiation of these environment claims.

The CAE route map for the environmental case is summarised in Appendix A. PER Chapter 6 [7] provides the arguments and appropriate evidence on the generic SMR-300 design in line with the Holtec SMR-300 GDA Approach and Application to the Demonstration of BAT.

11.3 ENVIRONMENTAL LEGISLATION AND POLICY

This section outlines the regulatory context, legislation and policy set out across the environmental case, which the generic SMR-300 must adhere to in order to protect people and the environment from harm throughout the lifecycle of the plant.

11.3.1 GDA Regulatory Context

The GDA process was developed by the Environment Agency (EA) and Office for Nuclear Regulation (ONR) to ensure high standards are met when designing new build nuclear power stations in Great Britain. Further details regarding the GDA process for new nuclear power stations built in Great Britain are described in [10].

During the GDA process, before a Radioactive Substances Regulations (RSR) permit application, the GDA Requesting Party (RP) can utilise the RSR: Objectives and Principles [11] and RSR Generic Development Principles: Regulatory Assessment documents [12] which would underpin the permit conditions within a future site-specific RSR permit. Within the GDA process, relevant RSR principles have been considered in the development of the PER. Further details can be referred to in the individual PER chapters, see Table 1.

11.3.2 Relevant Legislation and Policy

International Basic Safety Standards for Radiation Protection are based on the recommendations of the International Commission on Radiation Protection (ICRP) [13]. The recommendations of the ICRP are incorporated into European Union (EU) Law via Council Directive 2013/59/EURATOM [14].

Internationally the ICRP recommendations form the basis for the International Atomic Energy Agency (IAEA) standards, including IAEA International Basic Safety Standards [15] and IAEA General Safety Guide (GSG) Section 9 [16], which are widely used by governments, regulatory bodies, and operators to ensure that discharges are minimised to reduce harm to the workers, public and the environment.

The EA and Natural Resources Wales (NRW) are responsible for regulating:

- Discharge of aqueous and gaseous effluents and disposal of solid waste under Schedule 23 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (EPR16) [17].
- Conventional plant including auxiliary boilers, combustible waste, and discharges to surface water and groundwater can be regulated under EPR16 [17].
- Storage and use of substances under the Fluorinated Greenhouse Gases (F-gases) Regulations 2015 [18] and the Ozone-Depleting Substances (ODS) Regulations 2015 [19].
- Control of Major Accidents Hazards (COMAH) Regulations [20] relating to safe storage of hazardous substances on site.

11.4 THE ENVIRONMENTAL IMPACTS OF THE SMR-300 GDA

11.4.1 Compliance of GDA Information Requirements

GDA guidance for Requesting Parties [10] describes the required information that should be prepared for at a Step 2 assessment. Table 2 presents the requirements and description of the SMR-300 GDA submission that provides demonstration that the requirements have been met.

Table 2: Compliance of GDA Information Requirements

Requirement Category	Information Requirements	SMR-300 GDA Submission
General information about the Requesting Party and the design	Details about the RP, including its company structure and its experience of reactor design and plants in service.	Part A Chapter 1 [21] introduces the RP's nuclear experience and company structure.
	A simple, outline description of the design including schematic diagrams.	Part A Chapter 2 [1] provides a general description of the SMR-300 design.
	A brief history of the design, identifying predecessor plant and the main design changes from this plant.	Part A Chapter 2 [1] summarises the history of the design evolution, main design changes in the design evolution, and introduces the deployment of the Holtec Palisades SMR-300 as the first dual-unit plant at an existing nuclear site.
	Information from other regulatory assessments including findings and recommendations.	All PER chapters provide reference to other regulatory assessments where relevant information is available.
	Identification of discharge points to the environment for gaseous and aqueous radioactive wastes.	PER Chapter 5 [6] identifies discharge points to the environment for gaseous and aqueous radioactive wastes.
	A summary of the proposed discharges of radioactive waste and their potential impact on members of the public and non-human species at the generic site.	PER Chapter 3 [4] summarises the Radiological Impact Assessment. PER Chapter 2 [3] estimates radiological discharges associated with the generic SMR-300 and proposes suitable limits.
	A summary of the conventional environmental impacts of the facility.	PER Chapter 4 [5] provides the technical description of the systems and processes bearing on the conventional environmental impacts of the facility.
	A description, and the characteristics, of the generic site (or sites) that the Requesting Party will use for its assessment of radiological and conventional impacts on people and the environment.	Part A Chapter 2 [1] summarises the descriptions of the generic site.
	A summary document that provides a high-level description of the nuclear power plant design that will help the public understand the RP's environmental case.	A high-level description of SMR-300 design is summarised in Part A Chapter 2 [1].
Description of the RP's management arrangements and responsibilities	Developing the design, including the RP's design process.	Part A Chapter 4 [22] covers the design management and explains how the Requesting Party will manage the design development and configuration of SSCs during and after the GDA.
	Managing the GDA project, including the assumptions and commitments made.	Part A Chapter 4 [22] presents the process for management of the SSEC and the GDA project delivery arrangements. Part A Chapter 5 [23] presents the GDA commitments.

Requirement Category	Information Requirements	SMR-300 GDA Submission
	Managing and controlling contractors and others involved in the GDA.	Part A Chapter 4 [22] summarises the management and control of contractors and other parties in the GDA.
	Establishing the methodology used for identifying BAT and making sure they are used in the design.	PER Chapter 6 [7] summarises the BAT demonstration approach and methodology implemented. Other key arrangements include: Holtec SMR-300 GDA Approach and Application to the Demonstration of BAT [24] and SMR-300 GDA RSR-BAT Guidance [25].
	Producing and maintaining the submission.	Part A Chapter 4 covers the document management process [22].
	Ongoing communications with the regulators and matters raised by them during GDA.	Part A Chapter 4 [22] covers the management of interfaces with the regulators.
	Maintaining records of design and construction.	Part A Chapter 4 [22] covers management of records, including design records.
	Controlling and documenting design modifications, both during and after completion of GDA.	Part A Chapter 4 [22] covers design control and the management of design changes during and beyond the GDA. Part A Chapter 5 [23] presents the GDA commitments.
	Transferring information to prospective operators and providing ongoing support to them throughout the nuclear power plant reactor's lifecycle.	PER and PSR Chapters will be available to the prospective operator.
Detailed information about the design	A technical description of the facility's main plants, systems and processes, supported by process diagrams.	Detailed information about generic SMR-300 design is available in following chapters within relevant PSR and PER, including: • Part B Chapter 1 [26] provides information on Reactor Coolant Systems and Engineered Safety Features of the generic SMR-300. • Part B Chapter 2 [27] provides information on reactor fuel and core design. • Part B Chapter 5 [28] provides information on auxiliary systems, steam and power conversion systems, and HVAC systems. • Part B Chapter 13 [29] provides information on liquid, gaseous and solid radioactive waste systems. • Part B Chapter 19 [30] provides information on mechanical engineering design of SSCs. • Part B Chapter 20 [31] provides information on civil engineering design. • Part B Chapter 24 [32] provides information on fuel transport and storage design. • PER Chapter 1 [2] provides information on liquid, gaseous and solid radioactive waste management arrangements. • PER Chapter 5 [6] provides information on in-process and discharge monitoring and sampling systems.
	A technical description of the plants, systems and processes which have a bearing on radioactive waste (solid, liquid and gaseous) generation, treatment, measurement, assessment and disposal.	PER Chapter 1 [2] and Part B Chapter 13 [29] describe design and operational arrangements of gaseous, liquid, and solid radioactive waste processing systems. PER Chapter 5 [6] describes how monitoring and sampling systems measure and assess gaseous, liquid and solid radioactive wastes for further treatment or disposal.

Requirement Category	Information Requirements	SMR-300 GDA Submission
	Consideration of the potential for the creation of hazardous waste and the presence of hazardous substances and other pollutants in waste streams.	PER Chapter 1 [2] covers the generation and management of pollutants arising in hazardous waste.
	A technical description of the plants, systems and processes which have a bearing on the conventional environmental impacts of the facility.	PER Chapter 4 [5] provides the technical description of the systems and processes bearing on the conventional environmental impacts of the facility.
	A description of the philosophies, principles, policies, strategies, plans, methodologies, codes and standards used by the Requesting Party in developing, substantiating and specifying the design, especially those that are relevant to, or underpin, the environmental case.	Part A Chapter 2 [1] provides the general description of design requirements and principles, reference design for GDA and United States (US) reference plant, the selection principles and overview of relevant codes and standards.
	Assurance that the generic design is compatible with relevant UK approaches for management of radioactive wastes, decommissioning and long-term interim storage of spent fuel and final disposal of waste and spent fuel.	PER Chapter 1 [2] addresses the compatibility of the generic design with the UK context for radioactive waste management. The demonstration of how radioactive waste management systems, decommissioning and spent fuel management is compatible with UK context is detailed in Part B Chapter 13 [29], Part B Chapter 24 [32] and Part B Chapter 26 [33].
Detailed description of radioactive waste management arrangements	Identifying the strategic considerations for radioactive waste management which underpin the design.	PER Chapter 1 [2] and Part B Chapter 13 [29] describe waste strategies for managing radioactive waste during the SMR-300 lifecycle.
	A description of radioactive wastes, more challenging wastes and spent fuel arisings throughout the nuclear power plant's lifecycle, including sources of radioactivity and other matters affecting radioactive waste arisings – lifecycle includes commissioning, operation and decommissioning.	
	A description of the proposals for the management and disposal of all radioactive wastes, including solid, liquid and gaseous wastes and spent fuel, throughout the nuclear power plant's lifecycle - including commissioning, operation and decommissioning.	
	A description of how the production, discharge and disposal of radioactive waste and spent fuel will be managed to protect the environment and people.	
	A description of the optimisation process used to identify and justify the proposed techniques are BAT.	PER Chapter 6 and Holtec SMR-300 GDA Approach and Application to the Demonstration of BAT [24] document describe the optimisation process applied to justify proposed techniques in line with BAT [7] [24]. BAT worked examples at Step 2 included: Holtec SMR-300 GDA - Non-Fuel Waste Packaging BAT Workshop Output Report (worked example) [34] and Holtec SMR-300 GDA BAT Statement - Prospective Design Change CES & CS.
	For Step 2, a worked example demonstrating the application of the RP's optimisation process.	
	The justifications for each of the techniques that have been identified as BAT.	
	The justifications for how each of the techniques have been implemented or will be implemented in the design so that they are BAT.	

Requirement Category	Information Requirements	SMR-300 GDA Submission
	The optimisation process for BAT should take account of: • The technology to be used and the way the facility is designed and will be built, maintained, operated and dismantled. • The wastes arising throughout the lifetime of the facility. • The potential radiological impact of wastes on people and the environment and how this is used to prioritise optimisation of the design. • Preventing and minimising (in terms of radioactivity) the creation of radioactive waste. • Minimising (in terms of radioactivity) discharges of gaseous and aqueous radioactive wastes. • Minimising the impact of those discharges on people and adequately protecting other species. • Minimising (in terms of mass and volume) solid and non-aqueous liquid radioactive wastes and spent fuel. • Selecting optimal disposal routes (taking account of the waste hierarchy and the proximity principle) for those wastes. • The full range of anticipated feeds into the radioactive waste management systems, consistent with the Source Term.	PER Chapter 6 [7] summarises the BAT demonstration approach and methodology implemented. Other key arrangements include: Holtec SMR-300 GDA Approach and Application to the Demonstration of BAT [24] and SMR-300 GDA RSR-BAT Guidance [25].
Quantification of radioactive waste disposals	• Quantitative estimates of waste arisings for normal operation are required including: • Discharges of gaseous and aqueous radioactive wastes. • Arisings of combustible waste and disposals by on-site or off-site incineration. • Arisings of other radioactive wastes - by category and disposal route (if any) - and spent fuel.	PER Chapter 2 [3] provides estimates of waste arisings for normal operation, monthly estimates of gaseous and aqueous discharges and significant radionuclides.
	For gaseous and aqueous radioactive waste, the Requesting Party must estimate the monthly discharges: • On an individual radionuclide basis for significant radionuclides. • On a group basis (for example 'total alpha' or 'total beta') for other radionuclides. • Via each discharge point and discharge route.	
	Significant radionuclides are those which: • Have a radiological impact on people or non-human species. • Discharge high quantities of radioactivity. • Have long half-lives, may persist or accumulate (or both) in the environment, and may contribute significantly to collective dose. • Are indicators of facility performance and process control.	
	For combustible and other radioactive wastes, the Requesting Party must estimate the annual arisings and disposals during operation and give an indication of the likely arisings during decommissioning.	PER Chapter 1 [2] covers quantification of arisings of combustible waste and disposals by on-site or off-site incineration. PER Chapter 1 covers arisings of other radioactive wastes (by category and disposal route).

Requirement Category	Information Requirements	SMR-300 GDA Submission
	The Requesting Party must identify wastes in terms of their: • Category: High Level Waste, Intermediate Level Waste, Low Level Waste, Very Low-Level Waste. • Physico-chemical characteristics. • Proposed management and disposal route.	
	The Requesting Party must quantify the activity of important individual radionuclides and overall groupings of radionuclides (for example, total beta), together with mass and / or volume.	PER Chapter 1 [2] covers quantification of arisings of combustible waste and disposals by on-site or off-site incineration. PER Chapter 2 [3] covers quantification of liquid and gaseous radwaste discharges.
	Estimates of discharges and disposals should clearly show the contribution of each constituent aspect of normal operations, including: • Routine operation (typically, the design basis or 'flowsheet design' and the minimum level of disposals). • Start-up and shutdown. • Maintenance and testing. • Infrequent but necessary aspects of operation, for example, plant start-up, trips, maintenance, shutdown and refuelling. • Foreseeable (based on a fault analysis), unplanned events during normal operation that remain consistent with using BAT, for example, occasional fuel pin or plant failures.	PER Chapter 2 [3] quantifies aqueous and gaseous discharges during normal operations as described to the left.
	The Requesting Party must support estimates with performance data from similar facilities, where such facilities exist. They must also explain, where relevant, how changes in design or operation from those facilities affect the expected discharges and disposals.	PER Chapter 2 [3] estimates discharges and limits which are compared to relevant OPEX.
	The Requesting Party must demonstrate that discharges and waste arisings will not exceed those of comparable power stations across the world (as required by UK government policy). Some information on discharges and wastes arisings from other power stations is published in chemical discharges issue 1.	PER Chapter 2 [3] provides demonstration that discharges and waste arisings do not exceed levels of comparable power stations, as required by UK policy.
	The Requesting Party must provide proposed limits for: • Gaseous discharges. • Aqueous discharges. • Disposal of combustible waste by on-site incineration (if proposed).	PER Chapter 2 [3] details the proposed limits for liquid and gaseous radwaste discharges, including annual limits for gaseous and liquid discharges. On-site incineration is not applicable to the generic SMR-300.
	The Requesting Party must provide proposals for: • Annual site limits (on a rolling 12-month basis) for gaseous and aqueous discharges. • Monthly limits for disposals by on-site incineration (if proposed).	
	The Requesting Party must describe how they derived these limits. They can also propose limits to reflect an operating cycle (campaign limits).	

Requirement Category	Information Requirements	SMR-300 GDA Submission
Sampling arrangements, techniques and systems for measuring and assessing discharges and disposals of radioactive waste	The Requesting Party must provide details of their arrangements for: • In-process monitoring. • Monitoring final discharges of gaseous and aqueous wastes. • Monitoring disposals of non-aqueous liquid and solid wastes.	PER Chapter 5 [6] provides details of the sampling and monitoring arrangements for solid, liquid and gaseous wastes including in-process and discharge locations. Independent sampling and monitoring arrangements are also discussed.
	The Requesting Party must demonstrate that their proposals represent BAT for monitoring.	
	The Requesting Party must describe the facilities provided for independent periodic sampling (by the regulator) of final discharges of gaseous and aqueous wastes.	
	The Requesting Party must confirm that the sensitivity is sufficient to: • Readily demonstrate compliance with the proposed limits. • Meet the levels of detection specified in 2004/2/Euratom, which is considered to be good practice.	
Prospective radiological assessment at the proposed limits for discharges and for any on-site incineration	The Requesting Party must provide a radiological assessment of proposed limits for: • Annual dose to most exposed members of the public for liquid discharges. • Annual dose to most exposed members of the public for gaseous discharges (separately identify the dose associated with on-site incineration where applicable). • Annual dose to the most exposed members of the public for all discharges from the facility. • Annual dose from direct radiation to the most exposed members of the public.	PER Chapter 3 [4] covers the radiological assessment for proposed limits on discharge and includes dosage rates to people and the environment. Models are specified within the chapter detailing why these are appropriate.
	The Requesting Party must also provide: • Annual dose to the representative person for the facility. • Potential short-term doses, including via the food chain, based on the maximum anticipated short-term discharges from the facility in normal operation. • A comparison of the calculated doses with the relevant dose constraints. • An assessment of whether the build-up of radionuclides in the local environment of the facility, based on the anticipated lifetime discharges, might have the potential to prejudice the activities of other legitimate users or uses of the land or sea. • Collective dose truncated at 500 years to the UK, European and world populations. • Dose-rate to non-human species.	
	The Requesting Party must state which models they have used to calculate these doses and why the models are appropriate. They must set out all the data and assumptions they have used as input to the models, together with reasoning as to why these assumptions are appropriate.	

Requirement Category	Information Requirements	SMR-300 GDA Submission
Information relating to other environmental regulations	**Water use and abstraction** For water use and abstraction, the Requesting Party must provide details and estimates of: • Freshwater requirements for the design. • Cooling water requirements for the design relevant to the generic site. The Requesting Party should include its consideration of: • Seawater or river water abstraction. • Use of conventional cooling towers or hybrid cooling towers. • Abstraction inlet fish deterrent schemes. • Fish return systems.	PER Chapter 4 [5] covers the environmental regulations governing water use and abstraction, discharges to surface water, groundwater, operation of combustion installations, F-gases and ODS.
	Discharges to surface water For discharges to surface water the Requesting Party must provide a description of how aqueous waste streams will arise, be managed and disposed of throughout the facility's lifecycle, including: • Sources and quantities of contaminants (including disinfectant and biocides), highlighting any priority substances as specified in the Priority Substances Directive. • Identifying effluent and surface water runoff streams contributing to the overall discharge and how they are controlled. • Potential options and the associated environmental impact for the disposal of each individual effluent stream. • The means of control if unplanned radioactive (or other) contamination of the discharge is detected. • The options for beneficial use of the waste heat produced. • The environmental impact of thermal discharges.	
	Discharges to groundwater If there are planned discharges to groundwater, the Requesting Party must describe the nature and quantity of those discharges and provide an assessment of the impact on groundwater. Discharges to groundwater are not normally permitted. The Requesting Party must describe how accidental discharges of radioactivity to land and groundwater will be prevented in the detailed information they provide about their radioactive waste management arrangements.	

Requirement Category	Information Requirements	SMR-300 GDA Submission
	Operation of installations (combustion plant and incinerators) The Requesting Party must identify the combustion plant that is provided in their nuclear power plant design, for example standby generators or auxiliary boilers. If the aggregate rated thermal input of all combustion plant is greater than 50 Megawatts (MW), they must provide a comparison of the proposed technology against the relevant guidance. If the aggregate rated thermal input of all combustion plant is greater than 20 MW, they must describe how they will monitor greenhouse gas emissions. If the design includes an on-site incinerator with a capacity of 1 tonne or more per hour, they must provide a comparison of the proposed technology against our sector guidance.	
	Operation of medium combustion plant and specified generators The Requesting Party must identify the medium combustion plant that is provided in their nuclear power plant design, for example standby generators. If the aggregate rated thermal input of all medium combustion plant is more than or equal to 1 MW and less than 50 MW, they must provide a comparison of the proposed technology against the relevant guidance and our sector guidance.	
	Control of Major Accident Hazards Regulations The Requesting Party must identify whether they will store quantities of substances on site that are above the qualifying thresholds in COMAH 2015 Regulations. They must describe the measures taken in the design to prevent a major accident to the environment if they exceed a COMAH threshold.	
	Fluorinated greenhouse gases and ozone-depleting substances The Requesting Party must identify whether any equipment included in the design will contain fluorinated greenhouse gases or ozone-depleting substances – as defined in the Fluorinated Greenhouse Gases Regulations 2015 and Ozone Depleting Substances Regulations 2015. If so, they must describe the measures taken in the design to prevent and minimise the leakage of such substances.	

11.4.2 Summary of the Environmental Case

11.4.2.1 Demonstration of BAT

BAT applies across the full lifecycle of a nuclear facility. PER Chapter 6 [7] lays out the methodology for the application of BAT as well as regulatory principles and requirements applicable to BAT in the context of the generic SMR-300.

PER Chapter 6 [7] provides arguments and appropriate evidence on the generic SMR-300 design to substantiate the claims made in sub-chapter 11.2. It demonstrates that the generic SMR-300 design can be BAT to meet regulatory requirements and expectations, OPEX and Learning from Experience (LfE).

11.4.2.2 Radioactive Waste Management Arrangements

PER Chapter 1 [2] presents the proposed arrangements for the management of radioactive waste and spent fuel arising over the lifecycle of the generic SMR-300. Descriptions of each of the anticipated waste streams are provided along with descriptions of the waste management systems, which describe how each waste will be managed from generation to disposal.

Beyond GDA, the management of radioactive waste and spent fuel will continue to develop in line with the developing maturity of the generic SMR-300, as well as the requirements of site license and environmental permits.

11.4.2.3 Quantification of Effluent Discharges and Limits

PER Chapter 2 [3] describes the methodologies and approaches for assessing and reporting prospective effluent (aqueous and gaseous) discharges from the normal operation phases of the generic SMR-300 design, as well as the methodologies for setting limits for effluent discharges.

This chapter includes the regulatory context, explanation of the source term and how it has been developed. It sets out how significant radionuclides have been identified in line with EA guidance and presents the method for calculating estimates of the discharges of these significant radionuclides to the environment and the subsequent results.

Based on the estimated discharges, the method for calculating proposed limits for these significant radionuclides is presented, including consideration of expected events. Discharge estimates are used to propose limits for discharge of significant radionuclides from the generic SMR-300, which will be refined at the site-specific stage. The proposed limits are input data for the radiological impact assessment described in sub-chapter 11.4.2.4.

Estimated discharges are compared to previous GDAs and OPEX from comparable Pressurised Water Reactors (PWRs), demonstrating that discharges from the generic SMR-300 will not be in excess of similar plants.

11.4.2.4 Radiological Impact Assessment

PER Chapter 3 [4] details the methodology and results of the assessment of radiological impact to members of the public and environment during normal operation of the generic SMR-300, for the generic site presented in the Generic Site Envelope Report [35]. At this stage of design, data requirements have been identified in order to conduct an initial impact assessment, with further assessments to be completed at the UK site-specific stage. The EA's Initial Radiological Assessment Tool 2 (IRAT2) calculation spreadsheets are employed to undertake the assessment of dose from aqueous and gaseous effluent discharges to the most exposed members of public, and the representative person. Dose rates to non-human species are also considered.

[REDACTED]

The generic SMR-300 design is under development, and discharge source terms are being developed as the aqueous and gaseous effluent treatment systems are designed. The underlying assumptions, parameter values, operating experience data and engineering design presented in this report are subject to change following further assessments.

11.4.2.5 Conventional Impact Assessment

In line with GDA guidance [10], PER Chapter 4 [5] is developed to address the conventional environmental aspects including:

- Water use and abstraction.
- Discharges to surface water.
- Discharge to groundwater.
- Operation of installations.
- Operation of medium combustion plant and specified generators.
- COMAH Regulations.
- F-gases and ODS.

Due to the early stage of design development and limitations of the GDA scope, the assessment of conventional impact in this chapter is high-level. Conventional environmental aspects will be assessed in greater detail following completion of the GDA.

This chapter also details how sustainability is currently considered in the generic SMR-300 design.

11.4.2.6 Monitoring and Sampling

PER Chapter 5 [6] presents the approach to monitoring and sampling of radioactive gaseous, aqueous and solid/non-aqueous liquid wastes in the generic SMR-300 design. Suitable arrangements for discharge and in-process monitoring for gaseous and aqueous effluents are presented which will allow the operator to demonstrate that discharges are within discharge limits proposed in PER Chapter 2 [3].

The chapter provides demonstration that the arrangements, locations, design and equipment represent BAT for the current stage of design maturity and will facilitate the collection of representative samples. It also demonstrates that the arrangements will adhere to recommendations for safe and suitable access to equipment for personnel, and independent sampling requirements.

11.4.2.7 Future Evidence and GDA Commitments

Where evidence in the SSEC is not available due to the current stage of design maturity, future evidence has been identified in the chapter to demonstrate the awareness that further work is required to fully substantiate claims and arguments.

GDA Commitments (as defined by Part A Chapter 4 [22]) are a stated intent or undertaking made by the RP that affects the SMR-300 design intended for deployment to a UK site. Commitments may require additional safety / environmental analysis, a change to the design or operational procedures. Commitments are described in the applicable PER chapter. Table 3 provides a full list of commitments across the PER.

Table 3: GDA Commitments

[REDACTED]

11.5 REFERENCES

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11.6 LIST OF APPENDICES

Appendix A PSR Part B Chapter 11 CAE Route Map

Table 4: PSR Part B Chapter 11 CAE Route Map

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