



**Preliminary detailed assessment of
strategic considerations for radioactive
waste management for General Nuclear
System Limited's UK HPR1000 design -
AR02**

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Executive summary

This report covers our Generic Design Assessment (GDA) of General Nuclear System Limited's (GNSL's) submission on strategic considerations for radioactive waste management for the United Kingdom Hualong Pressurised Reactor design (UK HPR1000) as required in Table 1, Item 4 of our Process and Information Document (P&ID) (Environment Agency, 2016).

Our assessment has considered GNSL's submission in relation to relevant UK policy, legislation and guidance, including the Environment Agency's Radioactive Substances Regulation (RSR) Environmental Principles (REPs) (Environment Agency, 2010), the main ones being: RSDMP1 (radioactive substances strategy), RSDMP3 (use of 'best available techniques' to minimise waste), DEDP1 (decommissioning strategy) and DEDP2 (decommissioning plan).

Our preliminary conclusions are that:

- General Nuclear System Limited has provided an acceptable waste strategy for all waste streams in the scope of the GDA that a UK HPR1000 would be expected to produce. The details underpinning the Integrated Waste Strategy (IWS) in this respect are considered in greater detail in our relevant assessment reports for individual waste streams and disposability (Environment Agency, 2021a, 2021b, 2021c)
- General Nuclear System Limited's IWS, together with its other submissions, will help to ensure proper protection of people and the environment. The details underpinning the IWS in this respect are considered in greater detail in our assessment report on the assessment of doses to the public and to wildlife (Environment Agency, 2021d)
- the IWS is consistent with government policy statements (DECC, 2014) and current regulatory expectations (subject to RQ-UKHPR1000-0946)

We have not identified any GDA Issues.

Any strategy that relates to how aspects of a nuclear facility should be operated, which is included in a submission for GDA, has limitations where the submission relates to a generic site and does not identify a future operator of that site. It is unreasonable to expect these issues to be fully addressed at the GDA stage.

We have identified an Assessment Finding that we will expect a future operator to address:

Assessment Finding 2: If a future site operator has multiple sites, an assessment of BAT should be produced which covers all of its sites, noting the proximity principle, economies of scale and other efficiencies in disposal of solid and incinerable liquid wastes. The assessment should form part of a future operators submissions for its second and subsequent environmental permit applications.

We will continue to review these preliminary conclusions as GNSL's design for the UK HPR1000 develops and our assessment progresses.

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1. Introduction

This report provides our detailed assessment of GNSL's submission in relation to strategic considerations for radioactive waste management in the UK HPR1000 design for GDA purposes.

This report is based on information received up to and including 30 June 2020. Any subsequent or updated information will be assessed alongside the responses to our consultation. Our final assessment results will be published in our Decision Document at the end of GDA. We are targeting completing GDA in early 2022.

We use a 2-stage process to carry out GDA: initial assessment, followed by detailed assessment. The findings from our initial assessment are set out in the [Initial assessment: Statement of findings](#) published in November 2018. Our conclusion from the initial assessment, at the principle level, was that strategic considerations for radioactive waste management required further development. The Requesting Party needed to demonstrate how the UK strategic considerations have been addressed in the UK HPR1000 design.

This detailed assessment has built on that initial assessment and is based on additional submissions and ongoing technical engagement with GNSL (the Requesting Party (RP)). The assessment method, findings and preliminary conclusions are presented in this 'preliminary detailed assessment report'.

The guidance on our generic design assessment (GDA) process that we used for this assessment was our 'Process and Information Document for Generic Assessment of Candidate Nuclear Power Plant' (P&ID) published in October 2016 (Environment Agency, 2016). Table 1, Item 4 of the P&ID requires the Requesting Party (RP), among other things, to:

- identify the strategic considerations with respect to radioactive waste management which underpin the design
- describe how radioactive wastes and spent fuel will arise throughout the facility's life cycle (including decommissioning) and plans for how they will be managed to encompass:
 - sources of radioactivity and matters which affect wastes arising
 - gaseous, aqueous and other wastes

We expect new nuclear power plant designs to be developed in line with a radioactive waste and spent fuel strategy that seeks to:

- minimise the production of radioactive waste
- manage unavoidable wastes and spent fuel so as to achieve an optimal level of protection for people and the environment

Our Radioactive Substances Regulation Environmental Principles (REPs) (Environment Agency, 2010) set out the matters that this type of strategy should take into account. For new nuclear power plant designs, the strategy also needs to be consistent with government policy statements (DECC, 2014) in that:

- the disposal of intermediate level radioactive waste (ILW) to a future geological repository, from any new nuclear power plants, is unlikely to occur until late this century
- any nuclear power plant that might be built in the UK should proceed on the basis that spent fuel will not be reprocessed

In preparing its Integrated Waste Strategy, GNSL has made reference to the specification and guidance published by the Nuclear Decommissioning Authority (NDA) (NDA, 2012). This document provides guidance on how to develop an integrated waste strategy that describes an optimised approach to waste management, the waste streams generated throughout the life of the site and ongoing improvements to how waste is managed. Despite it not being a requirement for GNSL follow the NDA specification and guidance, it is considered to be appropriate to use as a guide in the preparation of an Integrated Waste Strategy for the UK HPR1000.

The Integrated Waste Strategy (GNSL, 2020c) includes other strategic level plans relating to decommissioning and spent fuel.

For decommissioning, in line with government policy (DECC, 2009b, 2011 & 2014) and our REPs (Environment Agency 2010), we expect:

- the radioactive waste and spent fuel strategy to address decommissioning
- the design to use the best available techniques (BAT) to:
 - facilitate decommissioning
 - minimise arisings of decommissioning waste
 - minimise the impacts on people and the environment of decommissioning operations and the management of decommissioning waste

For spent fuel, we expect the strategy to be in line with government policy (DECC 2011 & 2014) and our REPS (Environment Agency 2010).

There are a number of documents in GNSL's submission that were assessed (see Appendix 1). This report is mainly based on our assessment of the Integrated Waste Strategy document the RP submitted (GNSL, 2020c). At the time of writing, the current version is Revision F. The development of an Integrated Waste Strategy is introduced in PCER Chapter 4 'Radioactive Waste Management Arrangements' (GNSL, 2020d). The 'Integrated Waste Strategy' document (GNSL, 2020c) is a supporting document to Chapter 4 of the PCER (GNSL, 2020d). It is important to note that there are significant overlaps with some of our other assessment reports, most notably 'Solid waste, spent fuel and disposability - AR05' (Environment Agency, 2021c) and 'Best available techniques for minimising production and disposal of radioactive waste - AR03' (Environment Agency, 2021a).

We set up an agreement with GNSL to carry out a GDA of the UK HPR1000 design, which came into effect in January 2017. Revision 000-1 of the 'Pre-Construction Environmental Report (PCER), Chapter 4, Radioactive Waste Management Arrangements v0' was submitted in November 2018 (GNSL, 2018) and the assessment of this submission and the supporting documents (including the original version of the Integrated Waste Strategy) generated a number of Regulatory Queries (RQs). A table summarising these and later RQs and ROs specifically related to this assessment of strategic considerations is provided in Appendix 2. Subsequent responses to these RQs and ROs and discussions at meetings with the Requesting Party (RP) have been incorporated into the later revisions of the 'Integrated Waste Strategy document', the current version at time of writing is Revision F. (GNSL, 2020c).

2. Assessment

2.1. Assessment method and process

The basis of our assessment was to:

- examine and gain understanding of the IWS and its supporting documents
- hold technical meetings with GNSL (the RP) to clarify and improve our understanding of the information presented and to identify and explain any concerns that we had with that information
- raise Regulatory Observations (ROs) and Regulatory Queries (RQs) where we believed information provided by the Requesting Party was insufficient or needed clarifying. At the time of writing, we have not issued any ROs in relation to the IWS
- assess the IWS the RP provided using available guidance and regulatory experience and decide if the chosen strategy will minimise the production of radioactive waste and manage unavoidable wastes so as to ensure proper protection of people and the environment
- decide on any GDA Issues or Assessment Findings to carry forward from GDA

Our, and ONR's, detailed assessment process will continue through and beyond the period of Environment Agency public consultation, and consequently our work on this topic is ongoing.

2.2. Assessment objectives

We started our assessment with 3 main questions:

- Does the IWS cover all waste streams that a UK HPR1000 would be likely to produce?
 - The details underpinning the IWS in this respect are considered in greater detail in our relevant assessment reports for individual waste streams and disposability (Environment Agency, 2021a, b & c)
- Will the IWS help to ensure proper protection of people and the environment?
 - The details underpinning the IWS in this respect are considered in greater detail in our relevant assessment report on the assessment of doses to the public and to wildlife (Environment Agency, 2021d)
- Is the IWS consistent with government policy, regulatory expectations and current industry good practice?

2.3. Assessment limitations and scope

We have carried out a detailed review of the RP's IWS and the documents that support it. The purpose of an IWS is to set the strategy for how wastes will be managed at all stages of a nuclear power plant's life cycle, from construction, through commissioning and operation, to final decommissioning.

Any strategy that relates to how aspects of a nuclear facility should be operated, which is included in a submission for GDA, has limitations where the submission relates to a generic site and does not identify a future operator or specific location of that site. In the case of waste management, there are 2 main areas where the information submitted for GDA is, by necessity, likely to be less detailed than we would expect for an operational facility.

Firstly, proximity of disposal. As the submission for GDA relates to a generic site, it could never be clear where the most suitable disposal facility for a given waste stream is relative to the UK HPR1000 in geographical terms. For example, for low level radioactive waste (LLW), it is possible that a suitable disposal facility may be located closer to the eventual site than the Low Level Waste Repository (LLWR) near Drigg in Cumbria. Secondly, there are commercial factors which may influence the choice of disposal route for a particular waste and questions like “does a future operator have multiple, similar plants?”, “are there economies of scale to be considered in a holistic demonstration of BAT?”, “could a future operator enter into a commercial arrangement to secure more proximate disposal?” have to be considered. Clearly for a ‘generic site’ for GDA, it is unreasonable to expect these issues to be fully resolved. Therefore, we consider the following Assessment Finding to be appropriate:

Assessment Finding 2: If a future site operator has multiple sites, an assessment of BAT should be produced which covers all of its sites, noting the proximity principle, economies of scale and other efficiencies in disposal of solid and incinerable liquid wastes. The assessment should form part of a future operators submissions for its second and subsequent environmental permit applications.

Non-radioactive solid wastes are out of scope of GDA but have been included in the Integrated Waste Strategy to ensure it adequately integrates radioactive and non-radioactive wastes. We consider this approach of including non-radioactive wastes in this part of GDA to be good practice as it results in a more meaningful GDA for this topic area.

The IWS sets out, in broad strategic terms, how the RP intends to comply with legal obligations and industry good practice as they relate to waste management. The strategy considers the requirements of environmental legislation such as the Environmental Permitting Regulations 2016 and industry good practice, such as applying the waste hierarchy. GNSL has set out its waste hierarchy in the Integrated Waste Strategy document and this is reproduced below in Figure 1.

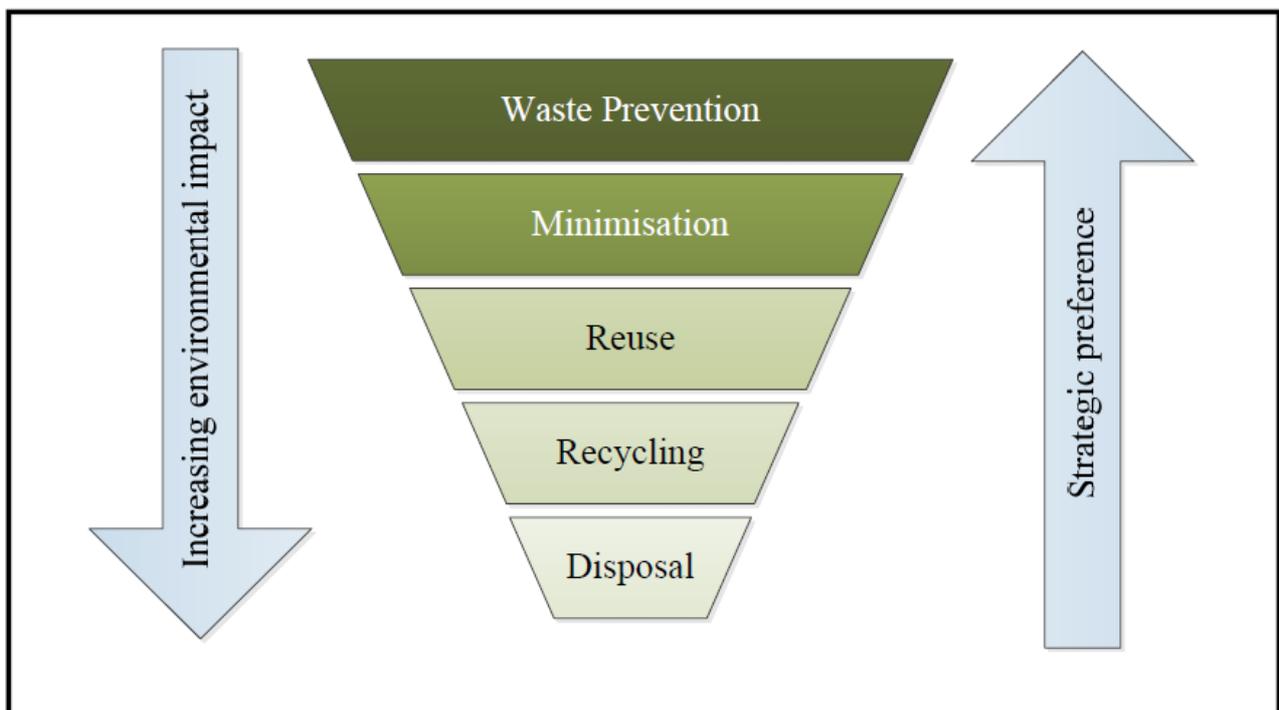


Figure 1. Schematic representation of the waste hierarchy (GNSL, 2020c)

2.4. Integrated Waste Strategy

The RP's IWS outlines its current strategy for managing radioactive and non-radioactive waste, including spent fuel arising from the construction, operation and decommissioning of the UK HPR1000. The strategy is supported by:

- radioactive waste management arrangements
- a decommissioning plan
- methods to assess BAT and to define the approach to optimisation
- impact assessments for humans and wildlife

The UK HPR1000 IWS has been derived for a single reactor unit situated at a generic site. This approach is consistent with previous GDAs.

GNSL covers the following aspects in the scope of its IWS (GNSL, 2020c):

- the facilities that generate, store, treat and process the wastes and waste packages
- design features that have been incorporated to prevent or minimise waste arising
- design features that have been incorporated to monitor and minimise the radioactive and non-radioactive discharges
- UK HPR1000 waste management principles and how they align with UK national policies and regulatory context
- outline of UK HPR1000 waste management organisation and arrangements to ensure that the wastes can be managed safely and in an environmentally responsible way
- engagements with external stakeholders in developing this integrated strategy
- how the approach to waste management is developed and optimised in an integrated way
- strategy for managing all radioactive, non-radioactive waste and spent fuel, from construction through operation to decommissioning
- links to other underpinning documents and references
- areas requiring further development

The extent of the strategy covers:

- non-radioactive solid, liquid and gaseous construction wastes
- radioactive solid, liquid, gaseous and airborne wastes generated during operation (including spent fuel)
- non-radioactive solid, liquid, gaseous and airborne wastes generated during operation
- radioactive solid, liquid, gaseous and airborne wastes generated during decommissioning (including spent fuel)
- non-radioactive solid, liquid, gaseous and airborne wastes generated during decommissioning

Both the scope and extent of the IWS described above are in line with our expectations based on the available guidance outlined in section 1 above (Introduction).

The first principle of the RP's IWS is to apply the waste management hierarchy to all wastes and that this should be fundamental when considering subordinate strategies and

processes. The IWS then goes on to outline 10 general waste management principles that apply to all wastes and 12 additional principles that apply to radioactive waste only.

The general principles include using BAT to minimise the impact of discharges and disposals, and the importance of good characterisation, sorting and segregation at source to ensure subsequent effective management and disposal.

The radioactive waste-specific principles include the main principles of waste minimisation, optimisation of decay storage to reduce the activity of radioactive wastes and using the 'concentrate and contain' principle. 'Concentrate and contain' involves trapping the radioactivity in a solid, concentrated form for storage and eventual disposal rather than the 'dilute and disperse' option that involves the direct discharge of gaseous or liquid radioactivity into the environment (DECC, 2009a).

The waste management principles presented by the RP are appropriate for a nuclear power plant's Integrated Waste Strategy.

We, and ONR, have issued a number of Regulatory Queries (RQ) throughout the GDA process to date. GNSL has incorporated the majority of these into revisions of the IWS, which have all led up to the current Revision F.

ONR issued RQ-UKHPR1000-0107 on 24 May 2018 (see Appendix 2) with environment as a related technical topic (please note that this related to an earlier revision of the IWS). The response to the RQ answered the question posed by confirming that the IWS would be independently developed to comply in the UK rather than evolving from a strategy that complies with Chinese requirements. Our review of Revision F has found that the IWS is compliant with the UK requirements for an IWS. The RQ response also identified the main differences between the UK and Chinese practice and presented a number of potential design modifications. ONR issued a subsequent Regulatory Observation (RO-UKHPR1000-0005) in October 2018 which deals with the gaps/differences between UK practices and UK HPR1000 design/Chinese practices in radioactive waste management (see Appendix 2). This is assessed more fully in our report 'Solid waste, spent fuel and disposability - AR05' (Environment Agency, 2021c).

We issued 2 RQs on 18 November 2019 which were linked to our assessment of PCER 04 and the IWS.

1. RQ-UKHPR1000-0550 questioned how the RP had covered risk and opportunity management in the IWS (See Appendix 2). The RP's response (10 January 2020) provides us with confidence that risk will be managed. The RP states that the assumptions within the IWS will be managed by the requirements/assumptions management process, which is currently being developed to hand over to a future operator. The RP states that the main radioactive waste opportunities for improvement relate to developing future techniques within the supply chain for treating and conditioning wastes. The RP will manage opportunities for improvement as commitments and these will be reviewed regularly. The response meets our expectations as being appropriate for GDA.
2. RQ-UKHPR1000-0552 sought clarification on how the RP is dealing with our 'Guidance on Requirements for Release from Radioactive Substances Regulation' (GRR) in its documentation (See Appendix 2). GRR is our process for surrendering a nuclear site environmental permit at the end of operation and decommissioning. The RP's response (10 January 2020) made the commitment to incorporate it into the next revision of the Preliminary Decommissioning Plan. The same question was raised in a subsequent RQ (RQ-UKHPR1000-0946 - see Appendix 2) to ensure reference to GRR is also made in the 'Integrated Waste Strategy' Document (GNSL, 2020c). At the time of writing, we have not yet received a response to this RQ.

We are content with the proposal made in response to RQ-UKHPR1000-0552 and will assess how GRR is incorporated into the Preliminary Decommissioning Plan when the next revision is submitted.

We will assess the response to the question related to GRR in RQ-UKHPR1000-0946 when it is submitted (see below for further detail on this RQ).

The IWS document has developed throughout the GDA process to the current version (Revision F) which was submitted in 30 May 2020. We have engaged with the RP throughout the GDA process and provided comments to help it develop the strategy. Having reviewed Revision F, we sent a number of questions, mainly related to the management strategy for non-radioactive waste, in RQ-UKHPR1000-0946 on 10 July 2020 (See Appendix 2). We will assess the responses to these queries, along with how the RP intends to incorporate them into the IWS, when we receive them.

Higher activity solid radioactive waste will be stored on site in dedicated buildings pending disposal at an appropriately permitted facility, which will be the geological disposal facility (GDF) once that is available. In the case of lower activity solid radioactive waste, disposal will be to an appropriately permitted facility as soon as is practicable.

2.5. Matters specific to decommissioning strategy

The IWS includes consideration of decommissioning and introduces the decommissioning strategy. The details of the decommissioning strategy are developed in a number of supporting documents, which include a Preliminary Decommissioning Plan (GNSL, 2019a) and a Decommissioning Waste Management Proposal (GNSL, 2020b).

The Preliminary Decommissioning Plan (GNSL, 2019a) presents the optioneering work carried out by the RP to determine that an immediate, rather than deferred, decommissioning strategy is the preferred option.

The Decommissioning Waste Management Proposal (GNSL, 2020b) provides more detail on specific waste streams. In this document, the RP acknowledges that the majority of the decommissioning wastes will be different from the operational waste streams generated throughout most of the plant's life cycle. However, it should be noted that some waste streams will remain the same between operational and decommissioning phase (that is, ion exchange resins and filters). The proposal document covers the following waste streams:

- radioactive gaseous and airborne wastes
- radioactive liquid wastes
- radioactive solid waste, which includes:
 - spent resins
 - spent filter cartridges
 - reactor pressure vessel and intermediate level waste concrete
 - reactor pressure vessel internals
 - lower activity waste

Non-radioactive solid wastes (being out of scope of GDA) are only covered in the main IWS documents (GNSL, 2020c) and are not developed any further in the supporting documents, which focus on radioactive decommissioning wastes only.

Our assessment of decommissioning wastes is also covered in 'Solid waste, spent fuel and disposability - AR05' (Environment Agency, 2021c).

2.6. Matters specific to spent fuel strategy

The spent fuel management strategy that has been adopted is not to reprocess, but to store, package and appropriately dispose of spent fuel when a disposal route becomes available. This approach is consistent with the UK government 'base case' (DECC, 2011).

The strategy presented by the RP in the IWS document consists of the following 3 stages:

- short-term storage in the spent fuel ponds
- interim dry storage on-site
- off-site disposal in a geological disposal facility

Our assessment of spent fuel considered to be waste is also covered in 'Solid waste, spent fuel and disposability - AR05' (Environment Agency, 2021c).

2.7. Matters for a future operator

The IWS presented as part of GDA is intended to carry through to a site-specific stage. The RP does, however, state that this does not prevent a future operator from selecting alternative methods or choosing its own arrangements based on BAT (and ALARA).

The RP states (in section 7.2 of the IWS) that information records relating to the management of radioactive waste start during the GDA phase and need to continue throughout the whole life cycle of the plant. The RP will need to ensure that records related to the IWS created during GDA pass effectively to any future operator(s).

In the IWS, the RP also identified some specific actions to pass to a future operator. These are reproduced in Table 2.

Table 2 - Follow up actions identified by GNSL in the IWS

Follow-up actions identified by GNSL
Determine BAT disposal routes for LAW, HAW and spent fuel
Detailed design and relevant safety case demonstration of the waste auxiliary building, ILW interim storage facility and spent fuel interim storage facility.
Establish the agreement in principle to ensure disposability acceptance of the LLW.
Assess the proposals of ILW and spent fuel through the RWM's disposability assessment process, in order to ensure the compliance with GDF (this is also applicable to GDA phase).
The development of the 'Radioactive Waste Management Case' (RWMC), which takes into account the long-term safety and environmental performance for management of ILW, HLW and spent fuel.

These follow up actions, which were identified by GNSL, are at quite a high level, but we consider this level of detail appropriate for this generic assessment. We expect the development of the IWS to continue into the site-specific stage and, as it does, for the level of detail to increase.

2.8. Compliance with Environment Agency requirements for GDA

Compliance with the requirements for GDA are summarised in table 3 below.

Table 3 - Compliance with Environment Agency requirements for GDA

Requirements from P&ID and REPs	Comments
P&ID Item 4	The necessary information has been supplied in the form of the IWS and supporting documents.
RSMDP1 - Radioactive Substances Strategy	The Radioactive Substances Strategy forms part of the Integrated Waste Strategy.
RSDMP3 - Use of BAT to minimise waste	This requirement is primarily being assessed in assessment reports AR03 (BAT) & AR05 (Solid waste, spent fuel and disposability).
DEDP1 - Decommissioning Strategy	The IWS contains specific information relating to the Decommissioning Strategy.
DEDP2 - Decommissioning Plan	Subject to our assessment of the revised version of the 'Preliminary Decommissioning Plan' , we can cautiously conclude, at the time of writing, that the IWS contains a level of detail appropriate for GDA - although this will need to be carried through to site-specific permitting stage for further development.

3. Public comments

GNSL received no public comments up to 30 June 2020 concerned directly with the strategic considerations for radioactive waste management.

4. Conclusion

Assessment work on the IWS continues, and at this stage there is one outstanding RQ (RQ-UKHPR1000-0946) (See Appendix 2). Further assessment of these responses will be necessary before we can come to any final conclusions. We also have some other linked areas of work that are still under assessment which are covered in our other assessment reports on 'BAT' (AR03) and 'Solid waste, spent fuel and disposability' (AR05). Any relevant comments made during the public consultation will be carefully considered in coming to our final conclusions.

Our preliminary conclusions are that:

- General Nuclear System Limited has provided an acceptable waste strategy for all waste streams in the scope of the GDA that a UK HPR1000 would be expected to produce. The details underpinning the Integrated Waste Strategy (IWS) in this respect

are considered in greater detail in our relevant assessment reports for individual waste streams and disposability (Environment Agency, 2021a, 2021b, 2021c)

- General Nuclear System Limited's IWS, together with its other submissions, will help to ensure proper protection of people and the environment. The details underpinning the IWS in this respect are considered in greater detail in our assessment report on the assessment of doses to the public and to wildlife (Environment Agency, 2021d)
- the IWS is consistent with relevant guidance, government policy statements (DECC, 2014) and current regulatory expectations (subject to RQ-UKHPR1000-0946)

We have identified one Assessment Finding:

Assessment Finding 2: If a future site operator has multiple sites, an assessment of BAT should be produced which covers all of its sites, noting the proximity principle, economies of scale and other efficiencies in disposal of solid and incinerable liquid wastes. The assessment should form part of a future operators submissions for its second and subsequent environmental permit applications.

We will continue to review these preliminary conclusions as GNSL's design for the UK HPR1000 develops and our assessment progresses.

References

Author	Reference
DECC. 2009a	'Statutory Guidance to the Environment Agency concerning the regulation of radioactive discharges into the environment' Department of Energy and Climate Change and Welsh Assembly Government, 2009
DECC. 2009b	'UK Strategy for Radioactive Discharges' Department of Energy and Climate Change, the Scottish Government, Welsh Assembly Government, and Department of the Environment (Northern Ireland), July 2009 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249884/uk_strategy_for_radioactive_discharges.pdf
DECC. 2011	'The Energy Act 2008, Funded Decommissioning Programme Guidance for New Nuclear Power Stations' 2011 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42628/3797-guidance-funded-decommissioning-programme-consult.pdf
DECC. 2014	'Implementing Geological Disposal, A Framework for the long-term management of higher activity, 2014' https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/332890/GDF_White_Paper_FINAL.pdf
Environment Agency. 2010	'Radioactive Substances Regulation – Environmental Principles, Version 2, 2010' https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296388/geho0709bqsb-e-e.pdf
Environment Agency. 2016	'Process and Information Document for Generic Assessment of Candidate Nuclear Power Plant Designs' (Environment Agency, version 3, October 2016)
Environment Agency. 2018	'Initial assessment of General Nuclear System's UK HPR1000 design: Statement of findings' Version 1, 2018 https://www.gov.uk/government/publications/new-nuclear-power-stations-initial-assessment-of-general-nuclear-systems-uk-hpr1000-design
Environment Agency. 2021a	'Best available techniques for minimising production and disposal of radioactive waste - AR03'

Author	Reference
Environment Agency. 2021b	'Gaseous and liquid discharges of radioactive waste - AR04'
Environment Agency. 2021c	'Solid waste, spent fuel and disposability - AR05'
Environment Agency. 2021d	'Generic site description and the assessment of doses to the public and to wildlife - AR07'
GNSL. 2018	'Pre-Construction Environmental Report Chapter 4 - Radioactive Waste Management Arrangements' HPR/GDA/PCER/0004, Revision 000-1, November 2018 (V0)
GNSL. 2019a	'Preliminary Decommissioning Plan' GHX71500004DNFF03GN, Rev. E
GNSL. 2020a	'Pre-Construction Environmental Report Chapter 4 - Radioactive Waste Management Arrangements' HPR/GDA/PCER/0004, Revision 001, January 2020 (V1)
GNSL. 2020b	Decommissioning Waste Management Proposal' GHX71500009DNFF03GN, Rev. E
GNSL. 2020c	'Integrated Waste Strategy' GHX00100070DNFF03GN, Rev. F
GNSL. 2020d	'Pre-Construction Environmental Report Chapter 4 - Radioactive Waste Management Arrangements' HPR/GDA/PCER/0004, Revision 001-1, October 2020 (V1.1)
GNSL. 2020e	Pre-Construction Safety Report Chapter 23 - Radioactive Waste Management' HPR/GDA/PCSR/0023, Revision 001, 2020
NDA. 2012	'ENG01 - Specification and guidance on the content and format of an integrated waste strategy'

Abbreviations

<i>Acronym</i>	<i>Meaning</i>
BAT	Best available techniques
CoRWM	Committee on Radioactive Waste Management
GDA	Generic design assessment
GDF	Geological disposal facility
GNSL	General Nuclear System Limited
GRR	Guidance on requirements for release from Radioactive Substances Regulation
HAW	High activity waste
ILW	Intermediate level waste
IWS	Integrated Waste Strategy
LAW	Low activity waste
LLW	Low level waste
LLWR	Low level waste repository
NDA	Nuclear Decommissioning Authority
ONR	Office for Nuclear Regulation
P&ID	Process and Information Document
PCER	Pre-Construction Environmental Report
REPs	Radioactive Substances Regulation - Environmental Principles
RI	Regulatory Issue
RP	Requesting Party
RO	Regulatory Observation

<i>Acronym</i>	<i>Meaning</i>
RQ	Regulatory Query
RWM	Radioactive Waste Management Limited
RWMC	Radioactive waste management case
SEPA	Scottish Environment Protection Agency
UK	United Kingdom

Appendix 1: GNSL documentation

The following GNSL documentation was reviewed for this assessment.

Title	Document No.
Integrated Waste Strategy (IWS)	GHX00100070DNFF03GN, Rev F (GNSL, 2020c)
Pre-Construction Environmental Report Chapter 4 - Radioactive Waste Management Arrangements V0	HPR/GDA/PCER/0004, Rev 000-1 (GNSL, 2018)
Pre-Construction Environmental Report Chapter 4 - Radioactive Waste Management Arrangements V1	HPR/GDA/PCER/0004, Rev 001 (GNSL, 2020a)
Pre-Construction Environmental Report Chapter 4 - Radioactive Waste Management Arrangements V1.1	HPR/GDA/PCER/0004, Rev 001-1 (GNSL, 2020d)
Pre-Construction Safety Report Chapter 23 - Radioactive Waste Management	HPR/GDA/PCSR/0023 Rev 001 (GNSL, 2020)
Preliminary Decommissioning Plan	GHX71500004DNFF03GN, Rev E (GNSL, 2019)
Decommissioning Waste Management Proposal	GHX71500009DNFF03GN, Rev E (GNSL, 2020)

Appendix 2: Regulatory Queries and Observations relating to the strategic considerations of radioactive waste management

The following tables summarise the RQs and ROs that are most relevant to the strategic considerations for radioactive waste management for the UK HPR1000 (There are no Regulatory Issues [RIs] relevant to this topic area).

Regulatory Queries

RQ/RO/RI	Date issued	Title and summary
RQ-UKHPR1000-0107	24-May-2018	RQ issued by ONR Gaps and differences between Chinese and UK practices in management of solid radioactive wastes and development of the Integrated Waste Strategy (IWS). <ul style="list-style-type: none"> GNSL was requested to provide further information on how the strategy would be developed to address the main differences between UK and Chinese practices.
RQ-UKHPR1000-0550	18-Nov-2018	Managing opportunities in relation to radioactive waste <ul style="list-style-type: none"> GNSL was requested to provide further information on risk and opportunity management related to assumptions made in the radioactive waste submissions.
RQ-UKHPR1000-0552	18-Nov-2018	Release from radioactive substances regulation <ul style="list-style-type: none"> GNSL was requested to provide further information on how the GDA submission relates to our 'guidance on requirements for the release from radioactive substances regulation'.
RQ-UKHPR1000-0946	10-July-2020	Integrated Waste Strategy <ul style="list-style-type: none"> GNSL was requested to provide further information on a number of queries related specifically to the Integrated Waste Strategy document. The majority of the queries related to non-radioactive waste management.

Regulatory Observations

RQ/RO/RI	Date issued	Title and summary
RO-UKHPR1000-0005	26-Oct-2018	RO issued by ONR <ul style="list-style-type: none"><li data-bbox="740 315 1442 508">• The aspect of this RO relevant to this assessment area relates to the analysis of the gaps/differences between UK practices and UK HPR1000 design/Chinese practices in radioactive waste management.

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