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| **Assessment Report** | | | |
| **Unique Doc. ID:** | ONR-NR-AR-21-037 | **Issue No.:** | 1 |
| **Record Reference:** | 2022/0018569 | | |
| **Project:** | Sizewell C (SZC) Nuclear Site Licence Grant | | |
| **Site:** | Sizewell C | | |
| **Title:** | Management of Nuclear Matter and Liabilities (SLC5) | | |
| **Nuclear Site Licence No.:** | N/A | | |
| **Licence Condition(s):** | Licence Condition 4 “Restrictions on nuclear matter on the site”  Licence Condition 5 “Control of Nuclear Matter”  Ionising Radiations Regulations 2017 | | |
| **ONR Assessment Rating (Mandatory):** | N/A | | |

Table 1: Step-based document review

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Step | Description | Role | Name | Date | Revision No.[[1]](#footnote-2) |
| 1 | Initial Draft, including identification and mark-up of SNI/CCI |  |  | 23 March 2022 | 1-4 |
| 2 | Main editorial review |  |  | 5 May 2022 | 5 |
| 3 | Acceptance review in accordance with  NS-PER-GD-016 |  |  | 5 May 2022 | 2022/28125 |
| 4 | Report Sign-off |  |  | 5 May 2022 | 5 |
| 5 | Factual Accuracy Review |  |  | 26 May 2022 | 6-7 |

Table 2: Document acceptance

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Role | Name | Position | Signature | Date | CM9 reference for review |
| Author |  |  |  | 5 May 2022 | N/A |
| Acceptance[[2]](#footnote-3) |  |  |  | 5 May 2022 |  |

Table 3: Revision history

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Issue No.: | Date | Author(s) | Reviewed By | Accepted By | Description of Change |
| 0 | 5 May 2022 |  |  |  | First formal issue for factual accuracy checks |
| 1 | 26 May 2022 |  |  |  | First form issue post factual accuracy checks |

Table 4: Circulation list

|  |  |
| --- | --- |
| Organisation | Name |
| Office for Nuclear Regulation |  |
| Environment Agency |  |
| NNB GenCo SZC |  |

Sizewell C (SZC) Nuclear Site Licence Grant

Management of Nuclear Matter and Liabilities (SLC5) Assessment

Assessment Report Ref.: ONR-NRD-AR-21-037

Issue No.: 1

Date: April 2023

# Executive Summary

This report presents the findings of the Office for Nuclear Regulation (ONR) Nuclear Liabilities Regulation specialist inspector’s assessment for the ‘Management of Nuclear Matter and Liabilities’ (SLC5) technical topic. The SLC5 technical topic forms part of the ‘Site activities and compliance arrangements’cornerstone. This assessment focuses on the Nuclear Site Licence application presented by NNB Generation Company Ltd (NNB GenCo) to construct and operate a nuclear power station comprising two UK (EPRTM) reactors at Sizewell C (SZC) in Suffolk.

The focus areas of the assessment undertaken in support of SLC5 topic include the arrangements for compliance with Licence Condition (LC) 4 ‘Restrictions on nuclear matter on site’ and LC 5 ‘Consignment of nuclear matter’, and the aspects related to the Decommissioning Waste Management Plan (DWMP).

For the arrangements for compliance with LC 4 ‘Restrictions on nuclear matter on site’ and LC 5 ‘Consignment of nuclear matter’ the assessment considers the Land Quality Management (LQM) arrangements and controls (receipt and storage) of radioactive (industrial) sources. The assessment includes consistency with the Ionising Radiations Regulations 2017, with advice and guidance provided by the ONR Radiological Protection specialist inspector.

Overall, I am satisfied that NNB GenCo SZC has adequate arrangements for compliance with LC 4 ‘Restrictions on nuclear matter on the site’ and LC 5 ‘Consignment of nuclear matter’ in place at the point of licensing. For LQM NNB GenCo SZC has provided adequate evidence of the baseline for the SZC site, which indicates it would be disproportionate for ONR to target further regulatory activities on LQM due to the low magnitude of the radiological hazard on the site at the point of licensing.

At the time of producing this report the SZC DWMP has not been accepted in full by Department for Business, Energy and Industrial Strategy (BEIS), which is responsible for approving the wider Funded Decommissioning Programme (FDP), including the DWMP. The FDP is a separate process which does not need to be approved for licensing, but should be in place for the start of nuclear safety-related construction. For transparency and as a record for future assessments only, two aspects, related to the phased approach to the SZC site boundary and Intermediate Level Waste (ILW) containers, are captured here.

As a result of my assessment I have raised the following recommendation:

* Recommendation 1: Based upon the evidence assessed in the scope of the SLC5 ‘Management of Nuclear Matter and Liabilities’ technical topic, ONR should issue the nuclear site licence to NNB GenCo for the Sizewell C site.

# List of Abbreviations

ACoP Approved Code of Practice

ALARP As Low As Is Reasonably Practicable

BEIS Department for Business, Energy and Industrial Strategy

CNI Chief Nuclear Inspector

CoW Cut-off Wall

DWI Drinking Water Index

DWMP Decommissioning Waste Management Plan

FDP Funded Decommissioning Programme

GDA Generic Design Assessment

HOW2 ONR’s Management System Platform

HPC Hinkley Point C

ILW Intermediate Level Waste

IRR17 Ionising Radiations Regulations 2017

ISFS Interim Spent Fuel Store

LC Licence Condition

LCO Land Contamination Overview

LoC Letter of Compliance (from Radioactive Waste Management Ltd)

LoD Limit of Detection

LQM Land Quality Management

NNB GenCo NNB Generation Company Limited

NOAK Next of a Kind

NSL Nuclear Site Licence

ONR Office for Nuclear Regulation

PAR Project Assessment Report

PCSR3 Pre-construction Safety Report 3

RGP Relevant Good Practice

RL ONR SAP series on land quality management

RMP Radiological Monitoring Plan

RPA Radiological Protection Advisor

RPS Radiation Protection Supervisor

RSR Radioactive Substances Regulation (part of the Environmental Permitting Regulations 2016)

RWA Radioactive Waste Advisor

SAP Safety Assessment Principle(s)

SLC5 Management of Nuclear Matter and Liabilities technical topic

SQEP Suitably Qualified and Experienced Persons

SZA Sizewell A (nuclear licensed site)

SZB Sizewell B (nuclear licensed site)

SZC Sizewell C (proposed nuclear licensed site)

TAG Technical Assessment Guide(s) (ONR)

TEA08 The Energy Act 2008

TIG Technical Inspection Guide(s) (ONR)

WHO World Health Organisation

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Introduction

## Background

NNB Generation Company Ltd (NNB GenCo) applied to the Office for Nuclear Regulation (ONR) on 30 June 2020 for a Nuclear Site Licence (NSL) to construct and operate a nuclear power station comprising two UK (EPRTM) reactors at Sizewell C (SZC) in Suffolk.

To reduce costs and project uncertainty, NNB GenCo’s strategy for SZC is to derive value from a ‘Next of a Kind’ (NOAK) series approach. This includes duplicating, wherever possible, the Hinkley Point C (HPC) plant and adopting a systematic approach to capturing, quantifying and applying lessons learned to SZC. Some aspects of the design will not be replicated due to site specific features. Further details on ONR’s assessment of the replication strategy for SZC can be found in ‘Strategy Paper - New Reactor Construction - Sizewell C - Replication Assessment Strategy’ (Ref. 1).

ONR’s publication ‘Licensing Nuclear Installations’ (Ref. 2) provides guidance on the licensing process and the factors that ONR may take into account when reviewing a NSL application. ONR has defined a strategy outlining the approach that ONR will take to assess the NNB GenCo SZC licence application in order to inform a decision by the Chief Nuclear Inspector (CNI) on granting a licence (Ref. 3) .

This report presents the findings of the ONR Nuclear Liabilities Regulation specialist inspector’s assessment for the ‘Management of Nuclear Matter and Liabilities’ (SLC5) technical topic. The SLC5 technical topic forms part of the ‘Site activities and compliance arrangements’cornerstone (Ref. 3). Further details on the scope for SLC5 is presented in section 1.2. This assessment focuses on the specific NSL application for SZC, not the replication of the safety case from HPC to SZC. Therefore this report is not an assessment of the NNB GenCo SZC safety case, but of the adequacy of NNB GenCo’s arrangements relevant to initial site licensing for SZC.

The assessment was undertaken in accordance with the requirements of the ONR Management System (HOW2). The ONR Safety Assessment Principles (SAPs) (Ref. 4), together with supporting Technical Assessment Guides (TAGs) (Ref. 5) and Technical Inspection Guides (TIGs) (Ref. 6), have been used as the basis for this assessment.

## Scope

The scope of this report covers the findings of the assessment of the Management of Nuclear Matter and Liabilities (SLC5) technical topic. Further guidance on the definition of ‘Nuclear Matter’ can be found in the appendices of NS-INSP-GD-004 Licence Condition (LC) 4 ‘Restrictions on Nuclear Matter on the Site’ (Ref. 6). To summarise, nuclear matter can be taken as meaning any fissile material or any material on the nuclear licensed site that is or has been made radioactive intentionally, or otherwise. In the context of SLC5, ‘Liabilities’ refers to the radioactive waste and spent fuel generated from the operation and decommissioning of the two UK (EPRTM) reactors at SZC.

Consistent with the communications with NNB GenCo SZC (Ref. 7) the focus areas for the SLC5 topic include:

* Arrangements for LC 4 ‘Restrictions on nuclear matter on site’ and LC 5 ‘Consignment of nuclear matter’. Taking lessons learnt from the HPC early construction work, this aspect focuses on NNB GenCo SZC’s Land Quality Management (LQM) arrangements. The objective is to ensure adequate arrangements are in place for the management of these materials under LC 4 and LC 5, should any land contaminated with radioactivity be identified during construction activities.

Adequate arrangements for the management of radioactive sources under LC 4, which are consistent with the Ionising Radiations Regulations 2017 (IRR17). I have sought advice and guidance from the ONR Radiological Protection specialist inspector on the arrangements for compliance with IRR17, which is captured in this report.

* Decommissioning Waste Management Plan (DWMP). The DWMP comprises of the technical aspects of the Funded Decommissioning Programme (FDP), which is a requirement of The Energy Act 2008 (TEA08) for Operators of new nuclear build reactors (Ref. 8). The DWMP sets out the steps involved in decommissioning a new nuclear power station and managing and disposing of hazardous (including radioactive) waste and spent fuel. In line with statutory consultation requirements, the Department for Business, Energy and Industrial Strategy (BEIS) requested comments on the DWMP from ONR to ensure it is consistent with regulatory expectations. NNB GenCo has applied replication between the HPC and SZC DWMPs. Therefore the assessment in this report targets differences in the technical aspects important to safety that should be considered once the NSL has been granted.

## Methodology

The methodology for assessment follows ONR’s guidance on the mechanics of assessment, NS-TAST-GD-096 (Ref. 5), noting this report has been identified as a “routine report” in line with ONR’s guidance on production of report for permissioning, NS-PER-GD-015 (Ref. 9).

Taking into consideration this is a “routine report” (Ref. 9) the ONR assessment report template has been modified to suit the purpose and scope of this assessment.

Assessment Strategy

The assessment strategy for the SLC5 topic is set out in this section. This identifies the scope of the assessment and the standards and criteria that have been applied.

Standards and Criteria

The relevant standards and criteria adopted within this assessment are principally the SAPs (Ref. 4), ONR TAGs (Ref. 5) and TIGs (Ref. 6), relevant national and international standards, and Relevant Good Practice (RGP) informed by existing practices adopted on UK nuclear licensed sites. The key standards and criteria are detailed within this section.

Safety Assessment Principles (SAPs)

The key SAPs (Ref. 4) applied within the assessment are included within Table 5 of this report.

Technical Assessment Guides (TAGs)

The following TAG has been used as part of this assessment (Ref. 5):

NS-TAST-GD-083 Land Quality Management

Technical Inspection Guides (TIGs)

The following TIGs have been used as part of this assessment (Ref. 6):

NS-INSP-GD-004 LC 4 – Restrictions on Nuclear Matter on the Site

NS-INSP-GD-005 LC 5 – Consignment of Nuclear Matter

### National and International Standards and Guidance

The following national and international standards and guidance have been used as part of this assessment:

* Licensing Nuclear Installations (Ref. 2)
* The Energy Act 2008, Funded Decommissioning Programme Guidance for New Nuclear Power Stations (Ref. 8)
* IRR17 Approved Code of Practice (ACoP) and guidance (Ref. 10)
* Regulatory Expectations for successful Land Quality Management at Nuclear Licensed Sites (Ref. 11)

## Integration with Other Assessment Topics

This report will contribute to a Project Assessment Report (PAR) by means of the relevant cornerstone report (Ref. 12). The PAR will draw together assessments by ONR’s specialist inspectors on NNB GenCo SZC’s readiness to become a nuclear site licensee, as well as site-specific safety case elements applicable to initial licensing.

## Out of Scope Items

1. The following items are outside the scope of the assessment.

Aspects relevant to other cornerstones, including, but not limited to, the licensing and legal aspects relevant to the security of tenure and site boundary definition.

Control / management of non-radioactive hazardous materials (for example asbestos).

Security and safeguards.

Relevant NNB GenCo Documentation

Consistent with the scope of this report, as set out in section 1.2, the following section provides a summary of the NNB GenCo SZC arrangements under the three focus points (Ref. 7):

* LQM arrangements;
* radioactive source procedures; and
* the DWMP.

Land Quality Management (LQM) Arrangements.

NNB GenCo SZC has provided a number of submissions, the interrelationships between which have been summarised by NNB GenCo SZC in Figure 1 (Ref. 13). Summaries of each of the key references assessed are captured below:

‘Land Quality Management Standard’ (Ref. 14). This document outlines NNB GenCo SZC’s approach and high-level arrangements for developing a system for the management of contaminated land during all stages of the SZC site’s lifecycle. This is not limited to land contaminated with radioactivity, but also considers the arrangements should non-radiological contaminants be identified, which are outside the scope of this assessment.

‘Land Quantity Management Strategy’ (Ref. 13). This document provides information on the implementation of LQM activities on the SZC site, including minimising the risk of land quality liabilities now and in the future.

‘Control of Contaminated Land and Groundwater Procedure’ (Ref. 15). This document captures NNB GenCo SZC’s arrangements for the control and management of land and groundwater contamination, if identified, on the proposed nuclear site and associated developments.

‘SZC Land Contamination Overview’ (Ref. 16). The Land Contamination Overview (LCO) provides a summary of the available land quality information for the SZC site. Available data has been summarised from ground investigations undertaken by NNB GenCo SZC (and its contractors) at the site between 2008 and 2020. This includes soil, leachate, groundwater, surface water, radiological chemical testing results and ground gas monitoring data.

‘Sizewell C Radiological Monitoring Plan’ (Ref. 17). The Radiological Monitoring Plan (RMP) includes information used by NNB GenCo SZC to determine whether material, including groundwater and excavation material, may be released from any further regulatory controls on the basis of radiological protection considerations and permitting / licensing requirements.

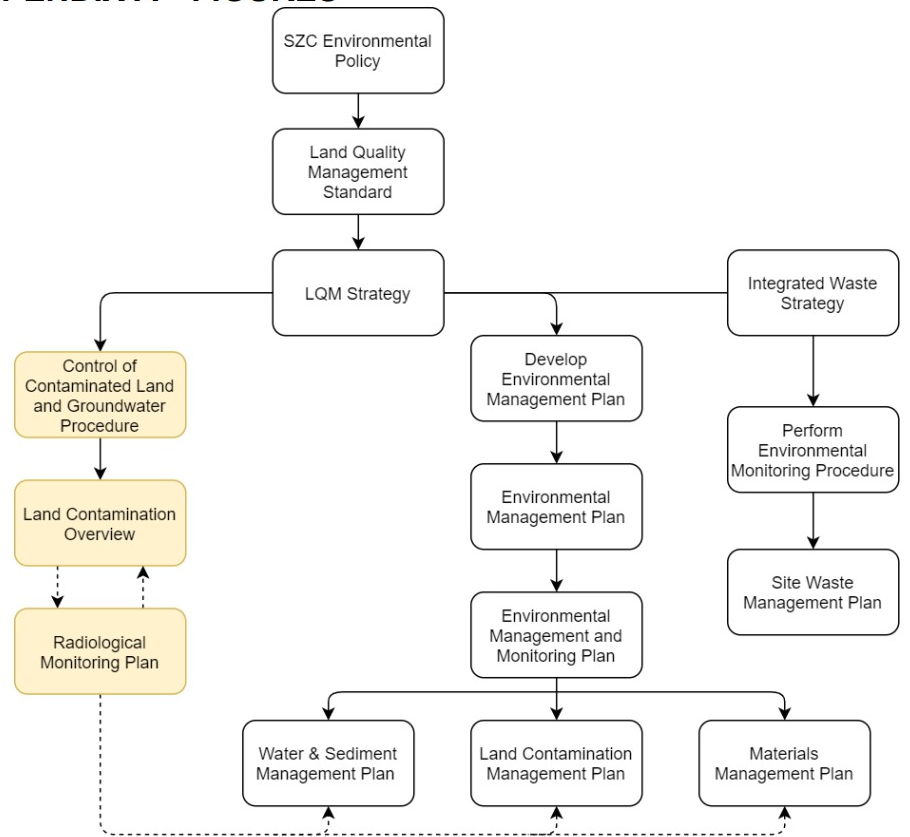


Figure 1: Overview of Interrelationships between documents within the SZC land quality management arrangements

Radioactive Source Procedures

NNB GenCo SZC has put in place separate arrangements to those for contaminated land for controls of nuclear matter which are sub-categorised as “excepted matter” as defined by the Nuclear Installations Act 1965 (as amended) and the Nuclear Installations (Excepted Matter) Regulations 2017 (Statutory Instrument 2017/920). Relevant to this assessment is the ‘Company Procedure - Control of Nuclear Matter (SZC)’ (Ref. 18) document, which focuses on the arrangements for the receipt, storage and consignment off site of radioactive sources which may be used during construction activities. Radioactive (industrial) sources are examples of “excepted matter”.

Decommissioning Waste Management Plan (DWMP)

The SZC DWMP (Ref. 19) was provided to ONR by BEIS for comment prior to publication online. At the time of producing this report the SZC DWMP has not been accepted in full by BEIS, which is engaging with NNB GenCo SZC on the financial aspects which are outside the scope of ONR’s regulatory activities. ONR will be informed should any changes be made to the technical content of the DWMP as a result of consideration of financial aspects.

This report captures key technical aspects important to safety, including those SZC site-specific aspects which differ to those implemented at HPC. I noted two aspects that I consider to be relevant to future regulatory activities, which I communicated to BEIS / NNB GenCo SZC. They are documented here for transparency, and to serve as a record for any future regulatory activities:

Storage of spent fuel on the SZC site and the interface with the phased licensing strategy being implemented at the SZC site.

Intermediate Level Waste (ILW) package selection which has been modified for HPC since the HPC DWMP was published (Ref. 20).

# ONR Assessment

Land Quality Management (LQM) Arrangements

Background

Taking lessons learnt from the construction activities on the HPC site, the focus for NNB GenCo SZC is to ensure adequate knowledge and understanding of the land quality characteristics of the site and surrounding area, as relevant to radioactive contaminants at the point of licensing. This is to enable the licensee to ensure they have adequate arrangements in place for the identification and management of radioactive contamination. Development of a baseline, against which to identify any subsequent changes to the characteristics of the land, is also consistent with the regulatory expectations outlined in the relevant ONR TAG on LQM (NS-TAST-GD-083) (Ref. 5), the supporting guidance document ‘Regulatory Expectations for Successful Land Quality Management at Nuclear Licensed Sites’ (Ref. 11) and ONR’s SAPs on LQM (see Table 5).

NNB GenCo SZC has provided evidence of the baseline characteristics for the SZC site in the ‘SZC Land Contamination Overview’ (Ref. 16) and the ‘Sizewell C Radiological Monitoring Plan’ (Ref. 17). These are supported by an advice note by the NNB GenCo SZC Radioactive Waste Advisor (RWA) (Ref. 21), which considers the NNB GenCo SZC position on the radiological risk profile of the SZC site as the site boundary varies. The SZC licensing strategy includes at least two stages in defining the site boundary. The first is an initial, smaller site boundary and the second stage will be the final site boundary, which will include an area of land currently on the Sizewell B (SZB) nuclear licensed site, as presented in Figure 2.

Overall, NNB GenCo SZC has identified no radioactive contaminants (in soils or groundwater) in the SZC site baseline which meet the requirement to be ‘in scope’ of the Radioactive Substances Regulation (RSR) permit regulated by the Environment Agency (Ref. 17). Therefore during construction activities on the SZC site no radioactive wastes (solid or liquid) are expected to be generated. Specific information on how this relates to the groundwater, radiological surveys and soil samples, and my assessment of the interface with the nuclear site licence are presented below.

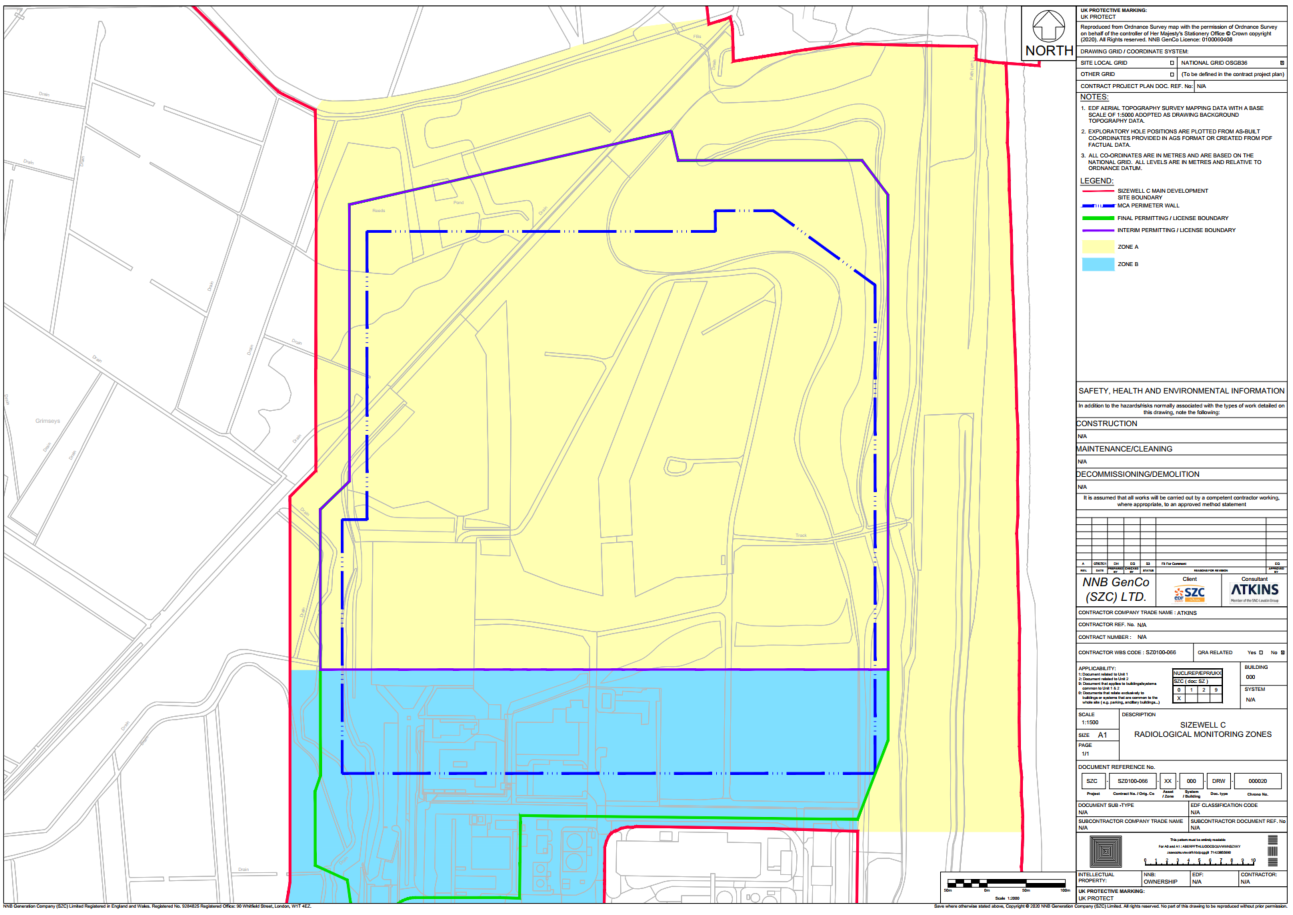


Figure 2: Sizewell C Radiological Monitoring Zones (Ref. 17)

LQM Characteristics and SZC LQM Arrangements

* + - 1. Groundwater

Analyses of groundwater samples are consistent with / less than World Health Organisation (WHO) and Drinking Water Index (DWI) screening values for non-naturally occurring (anthropogenic) radionuclides (Ref. 17). The gross alpha and gross beta activity associated with the screening values (0.1 Bq/l and 1.0Bq/l, respectively) are lower than the Limit of Detection (LoD) for some of the techniques used to analyse samples. Where the LoD is above the screening values the result is recorded as ‘less than’ the LoD. Results are only investigated by NNB GenCo SZC when they exceed the LoD.

It is noted that the SZC site includes a Cut-off Wall (CoW) (Ref. 22), unlike the HPC site. Dewatering and excavation activities will be required to enable the installation of the CoW, in a similar manner as was implemented at HPC for the installation of the relevant nuclear island concrete. Once installed the CoW acts as an impermeable barrier to any contaminated material in groundwater that may be leached from the adjacent sites. Therefore early on in the construction activities for SZC the risk of drawing contamination in groundwater from adjacent sites is eliminated for a large portion of the site where the nuclear island concrete activities are taking place (Ref. 21), unlike at HPC.

* + - 1. Radiological Surveys

Radiological surveys were carried out across the site in 2010 and 2020. NNB GenCo SZC reports the measured gamma dose rates are consistent with the established background levels for the area (Ref. 17). Two areas were identified to have slightly elevated dose rates of up to 0.078 mSv/yr (calculated assuming a construction worker is on site for 2000 hours per year). These remain below the 1 mSv/yr public dose limit legal limit, as captured in Numerical Target 3 of the ONR SAPs (Ref. 4). This does not remove the requirement for NNB GenCo SZC to demonstrate that the risks are reduced to As Low As Is Reasonably Practicable (ALARP) for any further activities. NNB GenCo SZC attributed the elevated dose rates to external radiation (shine) from the SZB outage store, which will be removed to for the final SZC site boundary to be put in place, and construction materials on walkways. Soil samples in these areas did not indicate elevated levels of radioactivity (Ref. 17), see section 4.1.2.3.

* + - 1. Soil Samples

Soil sampling and radiological analysis were carried out across the site in 2011, 2019 and 2020 (Ref. 17). Any positive results (i.e. above the LoD) were ‘out-of-scope’ of the RSR permit requirements, with no evidence found to indicate the presence of either elevated levels of anthropogenic radionuclides or enhanced concentrations of naturally occurring radionuclides. The samples confirmed the elevated gamma dose rates measured during the radiological surveys were attributable to construction materials and not contamination in the ground.

* + - 1. Site Boundary Changes

NNB GenCo SZC has recognised the increase in the risks associated with LQM activities due to the future changes to the nuclear site boundary. The changes include an area currently on the SZB site which is used to store radioactively contaminated items (in the SZB outage store), referred to as the ‘storage compound’. Therefore the LQM arrangements (Ref. 17) identify two zones; ‘Zone A’ and ‘Zone B’, shown in Figure 2. ‘Zone B’ is the land which will be removed from the SZB nuclear site and includes the areas which have been historically used to store radioactively contaminated items.

The ‘SZC Land Contamination Overview’ (Ref. 16) provides a record of the history of uses of the land, supported by additional evidence on incidents on both the SZB and Sizewell A (SZA) sites. Incidents have been considered by NNB GenCo SZC to determine whether these may result in radioactive contamination being identified on the SZC site (Ref. 21). It is noted that the strategy is for SZB to maintain responsibility for the decommissioning and demolition of the facilities on the SZB land (‘Zone B’) prior to transfer to SZC and changes to the site boundaries. This will remove the bulk of any radioactive contamination. However, as with all decommissioning and demolition activities of radioactively contaminated structures, there is an increase in the risk of transferring contamination to the air, soils or groundwater which may have effects on the SZC site once the boundary changes. NNB GenCo SZC has distinguished between Zones A and B due to this risk.

The NNB GenCo SZC monitoring scheme to be implemented on the site is documented in the RMP (Ref. 17). It identifies aspects such as enhanced engagement / oversight by Suitably Qualified and Experienced Persons (SQEP) for planning and undertaking of any activities in ‘Zone B’ (Ref. 23, Ref. 24). The RMP (Ref. 17) also captures key activities on the SZC site which may lead to the need to update the document. This does not take away any responsibility for SZB to undertake decontamination / monitoring activities during the removal of contaminated structures, but enables SZC to provide evidence for the baseline of ‘Zone B’, and to identify if there are any changes from the SZC LQM baseline during the SZC construction activities.

In the event that land contaminated with radioactivity is identified, NNB GenCo SZC has produced a set of arrangements on the control of contaminated land and groundwater during construction activities, including excavation and ground investigations (Ref. 15). The arrangements are consistent across ‘Zone A’ and ‘Zone B’, but there is enhanced oversight of activities in ‘Zone B’ in recognition of the increased likelihood of needing to implement these arrangements in this area of land.

Regulatory Opinion

Taking into account the risk associated with solid and liquid wastes created as a result of conventional construction activities on the SZC site which are ‘out-of-scope’ of the RSR permitting regulations, and that groundwater samples have radioactivity levels below or close to the WHO and DWI screening levels, in my judgement it would be disproportionate for ONR to focus regulatory attention on NNB GenCo SZC activities with respect to LQM. The WHO and DWI screening values used by NNB Genco SZC are considered RGP in NS-TAST-GD-083 on LQM (Ref. 5) as a benchmark for groundwater quality for licensees, recognising there is no de-minimis value for the definition of ‘Nuclear Matter’ on a nuclear licensed site. The gross alpha and gross beta activity associated with the screening values (0.1 Bq/l and 1.0Bq/l, respectively) are lower than the LoD. NNB GenCo SZC’s approach of only investigating results when they exceed the LoD is a similar to that implemented across the industry, including on the HPC site. It is therefore my judgement that NNB GenCo SZC is using a consistent set of LQM arrangements which apply the standard employed on a similar nuclear licensed site in Great Britain.

In my opinion, the adoption of the LoD approach for samples taken at the SZC site, ensures the control of any consignment of nuclear matter is proportionate to the risk posed. It also reduces the burden of the generation of records required for LC 5 (2) ‘Consignment of nuclear matter’. Evidence to underpin the NNB GenCo SZC assertion that any contamination detected is consistent with permitted disposals from other nuclear licensed sites or the natural background in the areas is recorded in the ‘SZC Land Contamination Overview’ (Ref. 16). The records generated on the original condition of the SZC site, the monitoring records (groundwater, soils and air) and consignment records for compliance with LC 5 are, in my opinion, adequately captured in arrangements by means of the record retention schedule (Ref. 25). The record types are also consistent with the expectations of ONR SAP RL.7 ‘Records for radioactively contaminated land’.

The low levels of contamination present at licensing do not negate the expectation for NNB GenCo SZC to maintain an adequate understanding of the baseline for the site to enable identification of any subsequent changes during, or due to, the construction or reactor operations on the site. In my opinion the characterisation undertaken by NNB GenCo SZC is consistent with the expectations in ONR SAPs RL.4 ‘Characterisation of radioactively contaminated land’ and RL.5 ‘Survey, investigation, monitoring and surveillance’. The monitoring scheme outlined in the RMP (Ref. 17) ensures there is oversight of the characteristics of the site throughout construction activities.

I consider NNB GenCo SZC has adequate arrangements to support the control of contaminated land and groundwater in place, in the event that there is a change from the SZC site baseline during construction activities. This includes the implementation of enhanced oversight during activities within ‘Zone B’ in recognition of the increased risk of identifying contamination. In my opinion, this is consistent with the expectations of ONR SAP RL.2 ‘Identifying radioactively contaminated land’. This ensures NNB GenCo SZC will have adequate arrangements in place to ensure that no nuclear matter (in this case soils or ground water contaminated with radioactivity) is brought onto the site expect in accordance with adequate arrangements made for that purpose, as required by LC 4 (1) ‘Restrictions on nuclear matter on the site’.

Conclusions

NNB GenCo SZC has provided adequate evidence of the baseline for the SZC site which indicates the radiological hazard on the site at the point of licensing is low and thus that it would be disproportionate for ONR to target this area any further at this stage. NNB GenCo SZC has adequately recognised the differences in the risks associated with the inclusion of SZB land (‘Zone B’ in the final nuclear site boundary for SZC), and has put in place proportionate arrangements to ensure adequate oversight of activities in this area of land by SQEP resource.

Overall, in my opinion NNB GenCo SZC has adequate arrangements in place for compliance with LC 4 ‘Restrictions on nuclear matter on the site’ and LC 5 ‘Consignment of nuclear matter’ at the point of licensing for LQM activities.

Radioactive Source Procedures

The following paragraphs provide a summary of the engagement between NNB GenCo SZC and ONR on radioactive source procedures, including the ONR Radiological Protection specialist inspector, in technical topic sub-stream SLC5A ‘Radiological Protection Arrangements’ (Ref. 26).

1. Radiological risks on the SZC site at the point of licensing, are limited to the presence of equipment such as postal x-ray, nuclear density gauges, explosives detectors and also the potential presence of radioactively contaminated land (see Section 4.1). Sources used in or arising from current activities meet the definition of “excepted matter” and are therefore out-of-scope of the requirements of LC 5(1). The SZC arrangements (Ref. 27) also recognise that SZC employees are visiting radioactively controlled areas on other nuclear licensed sites, for example SZB.

Recognising these risks, and in order to ensure compliance with IRR17 is maintained, NNB GenCo SZC has:

Appointed a Radiological Protection Advisor (RPA) for the SZC site (Ref. 28)

Engaged with contractors to provide radiation protection specialist support as construction activities progress, including on aspects such as Radiation Protection Supervisor (RPS) roles and technical work such as radon risk assessments (Ref. 26).

Developed arrangements for compliance with LC 4 and LC 5(2), including a ‘Radiological Protection Policy’ (Ref. 29), ‘Radiological Safety Standard’ (Ref. 27), ‘Dosimetry Code of Practice’ (Ref. 30) and the ‘Control of Nuclear Matter’ company procedure (Ref. 18).

Regulatory Opinion

Relevant to the nuclear site licence application, ONR raised a number of queries relevant to the ‘Control of Nuclear Matter’ company procedure (Ref. 18), to which NNB GenCo SZC provided satisfactory responses (Ref. 31). The company procedure (Ref. 18) identifies the arrangements for the receipt and storage of radioactive (industrial) sources, as required by LC 4(1) and 4(2). In my opinion, the records generated on the consignment of radioactive sources for compliance with LC 5(2) are adequately documented in NNB GenCo SZC’s arrangements by means of the record retention schedule (Ref. 25)

The overall opinion of the ONR Radiological Protection specialist inspector was that the relevant LC 4 and LC 5 arrangements in place for licensing are proportionate to the activities planned to be undertaken on the site once licensed. The arrangements also meet the requirements for compliance with IRR17. Iterations of the arrangements will be required as the radiological risks on the site change, and regular ‘Radiological Protection’ Level 4 engagements have been arranged to maintain regulatory oversight.

Conclusions

NNB GenCo SZC has in place adequate arrangements for compliance with LC 4 and LC 5 to manage radioactive sources on the SZC site during early construction activities, as required for initial nuclear site licensing. These arrangements also meet the requirements for compliance with IRR17. Iterations of the arrangements will be required as the radiological risks on the site change, which is considered as part of routine regulatory engagement activities.

Decommissioning Waste Management Plan (DWMP)

Due to the replication strategy between HPC and SZC, the SZC DWMP includes updates to key technical aspects, including those important to safety, which are either SZC site-specific or are updates to the HPC DWMP (Ref. 20) which have not been published.

ONR provided comments to BEIS on the DWMP, to ensure the technical aspects are consistent with regulatory expectations. Satisfactory responses to the comments were received from NNB GenCo SZC via BEIS (Ref. 32). This is a separate process from licensing, with ONR guidance on ‘Licensing nuclear installations’ (Ref. 2) stating explicitly that the FDP, which the DWMP forms part of, does not need to be approved for licensing but should be in place for the start of nuclear safety-related construction.

Therefore the approval of the DWMP has no bearing on my assessment for nuclear site licensing, but this report identifies two key differences to HPC as a record. These relate to:

Storage of spent fuel on the SZC site and the interface with the licensing strategy being implemented on the SZC site.

Intermediate Level Waste (ILW) package selection which has been modified for HPC since the HPC DWMP was published (Ref. 20).

Storage of spent fuel on the SZC site and the interface with the licensing strategy being implemented on the SZC site.

It is noted that until the SZC nuclear site boundary is in its final position, as shown in Figure 2, it is my judgement that there is inadequate space on the SZC site for the management of radioactive waste and accumulation of spent fuel within the Interim Spent Fuel Store (ISFS). This is due to the fact that the relevant facilities will be built in the area of land which is currently part of the SZB nuclear licensed site.

Once the final site boundary is in place, it is my opinion the site layout includes adequate space for the safe management of radioactive waste and the accumulation of spent fuel from the operation and decommissioning of the two UK (EPRTM) reactors on the SZC site.

In my opinion this interface is adequately documented in the DWMP and is therefore transparent to both ONR and the Environment Agency, and other relevant stakeholders (Ref. 19). The final site boundary should be in place prior to the placement of first structural concrete for buildings which have nuclear safety significance, in order to ensure consistency with the regulatory expectations in the ONR ‘Licensing Nuclear Installations’ guide (Ref. 2) in relation to the FDP, including the DWMP.

Intermediate Level Waste (ILW) package changes which are part of ONR’s ongoing engagement with HPC.

During the optioneering / optimisation process undertaken by NNB GenCo HPC, it was concluded that the 500 litre (unshielded) drum was the preferred option for packaging of ILW in preference to the C1 / C4 containers selected during the Generic Design Assessment (GDA). The Letter of Compliance (LoC) was obtained for the packaging of the majority of ILW in 500 litre drums generated from the operation and decommissioning of HPC. Ion exchange resins from HPC will be packaged in C1 drums to maintain compatibility with the existing (French) resin treatment equipment. This will be replicated on SZC.

For completeness it is noted that, while the HPC DWMP references the alternative C1 / C4 ILW containers, ONR has previously considered the change to the ILW strategy to reflect the new packages, and the impact on the safety case, as part of the 2016 Pre-Construction Safety Report 3 (PCSR3) which was judged to be adequate (Ref. 33). The assessment of the change to the ILW packages has thus not been revisited for this assessment, but the difference in the DWMPs is noted here for transparency.

# Conclusions and Recommendations

## Conclusions

1. This report presents the findings of the ONR Nuclear Liabilities Regulation specialist inspector’s assessment for the ‘Management of Nuclear Matter and Liabilities’ (SLC5) technical topic. The SLC5 technical topic forms part of the ‘Site activities and compliance arrangements’cornerstone (Ref. 3).
2. To conclude, I am satisfied that NNB GenCo SZC has in place adequate arrangements for the management of nuclear matter and liabilities, proportionate to the risk at the point of nuclear site licensing. This includes relevant arrangements for compliance with LC 4 ‘Restrictions on nuclear matter on the site’ and LC 5 ‘Consignment of nuclear matter’.

## Recommendations

1. My recommendation is as follows:

* Recommendation 1: Based upon the evidence assessed in the scope of the SLC5 ‘Management of Nuclear Matter and Liabilities’ technical topic, ONR should issue the nuclear site licence to NNB GenCo for the Sizewell C site.

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Table 5: Relevant Safety Assessment Principles (SAPs) considered during the assessment

| SAP No. | SAP Title | Description |
| --- | --- | --- |
| NT.1 | Assessment against target: Target 3 Normal operation – any person off the site | Safety cases should be assessed against the SAPs numerical targets for normal operational, design basis fault and radiological accident risks to people on and off the site.  (Target 3) The target and a legal limit for effective dose in a calendar year for any person off the site from sources of ionising radiation originating on the site are:  BSL(LL): 1 mSv  BSO: 0.02 mSv  Note that there are other legal limits to tissues and parts of the body (IRR17). |
| RL.2 | Land quality management: Identifying radioactively contaminated land | Steps should be undertaken to identify any areas of radioactively contaminated land on or adjacent to the site. |
| RL.4 | Land quality management: Characterisation of radioactively contaminated land | Radioactively contaminated land should be characterised to facilitate its safe and effective control and remediation. |
| RL.5 | Land quality management: Survey, investigation, monitoring and surveillance | Radiological surveys, investigation, monitoring and surveillance of radioactively contaminated land should be carried out such that its characterisation is kept up to date. |
| RL.7 | Land quality management: Records for radioactively contaminated land | Arrangements should be made and implemented for recording and preserving information needed for the safe and effective control and remediation of radioactively contaminated land now and in the future. |
| RL.8 | Land quality management: Construction on radioactively contaminated land | Radioactively contaminated land should be remediated and controlled as appropriate before any construction of new facilities upon it. |

1. CM9 revision to be identified upon completion of activity and incorporation of any changes to document. [↑](#footnote-ref-2)
2. Hard-copy of document signed-off, CM9 version updated with authors / approver / acceptor names and dates and record finalised [↑](#footnote-ref-3)