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| ONR Assessment Report  External hazards proportionate reassessment of an application by Sizewell C Limited for a Nuclear Site Licence |



ONR Assessment Report

**Project Name**: Sizewell C Licensing

**Report Title**: External hazards proportionate reassessment of an application by Sizewell C Limited for a Nuclear Site Licence

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# Executive Summary

This report presents the findings of the external hazards aspects of the Sizewell C Limited (SZC Ltd) application for a nuclear site licence to construct and operate two UK EPR™ reactors at Sizewell C (SZC).

An initial assessment was completed in June 2022. This report presents the findings of a proportionate reassessment, focused on matters that have changed, and does not repeat the earlier assessment. This proportionate reassessment has examined documentation produced or revised since the 2022 assessment, progress in relation to the external hazards regulatory issues, progress in relation to the external hazards advice points raised in the 2022 assessment, and the proposed revision to the station milestones.

The assessment is based on evidence obtained during interactions with SZC Ltd on specific topics and arrangements, including key project enabling activities. It also draws on the significant cross cutting work carried out by the Office for Nuclear Regulation (ONR) as part of the delivering the proportionate reassessment.

The main points from this work are:

* SZC Ltd has progressed work on the external hazards regulatory issues. The issues are not required to be addressed for nuclear site licensing and they have identified routes to closure.
* A regulatory issue has been raised to ensure that SZC Ltd provides adequate justification for its revised credible maximum climate change scenario for extreme still seawater level. This is not considered to challenge nuclear site licensing, as it will need to be addressed prior to the finalised detailed design of the sea defences, which is not required for nuclear site licensing.
* SZC Ltd has proposed revisions to its station milestones. ONR will engage with SZC Ltd as part of normal regulatory business on the potential impact on its safety case and design, including external hazards.
* Following consideration of SZC Ltd’s work since the 2022 ONR assessment, nothing has been identified that fundamentally undermines site suitability for external hazards.

Taking these points into account, the overall judgement is that, from an external hazards perspective, it is recommended that a nuclear site licence is granted to SZC Ltd to construct and operate a nuclear power station at Sizewell C.

# List of Abbreviations

ALARP As Low As Reasonably Practicable

CCAF Climate Change Adjustment Factor

BS British Standard

CFS Capable Faulting Study

CWS Cooling Water System

DBE Design Basis Earthquake

EVA Extreme Value Analysis

HCDF Hard Coastal Defence Feature

HVAC Heating, Ventilation and Air Conditioning

IAEA International Atomic Energy Agency

ISFS Interim Spent Fuel Store

NNB GenCo (SZC) NNB Generation Company (SZC) Ltd

NSL Nuclear Site Licence

OD Ordnance Datum

ONR Office for Nuclear Regulation

PAR Project Assessment Report

R&D Research and Development

RCP Representative Concentration Pathway

PSHA Probabilistic Seismic Hazard Analysis

RGP Relevant Good Practice

RI Regulatory Issue

SAP Safety Assessment Principle(s)

SCDF Soft Coastal Defence Feature

SDSR Site Data Summary Report

SSCs Structures, systems and components

SSSI Site of Special Scientific Interest

SZB Sizewell B

SZC Sizewell C

SZC Ltd Sizewell C Limited

TAG Technical Assessment Guide(s) (ONR)

TQ Technical Query

TSC Technical Support Contractor

UKCP09 UK Climate Projections 2009

UKCP18 UK Climate Projections 2018

WENRA Western European Nuclear Regulators’ Association

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# Introduction

1. This report presents ONR’s findings from its proportionate reassessment of the external hazards aspects of an application by Sizewell C Limited (SZC Ltd) for a nuclear site licence (NSL) to install and operate a twin EPR™ nuclear power station at Sizewell C (SZC) in Suffolk.
2. This is a routine report, produced in line with NS-TAST-GD-108 [1]. A routine report was considered appropriate, as this report covers the developments since the 2022 major assessment report [2], with the majority of ONR’s NSL assessment being reported within [2].

## Background

1. On 30 June 2020, SZC Ltd (then known as NNB Generation Company (SZC) Ltd) applied to ONR for a NSL to install and operate a nuclear installation at a site located at Sizewell on the east coast of England, near Leiston, Suffolk.
2. ONR’s assessment of the evidence provided with the licence application was undertaken during the period from July 2020 to May 2022. That assessment is set out in a series of ONR assessment reports and summarised in a Project Assessment Report (PAR). These reports are all published on ONR’s website ([Sizewell C Licensing Assessment](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c.htm)) and are listed in Appendix 1 of this document.
3. A statement issued on the ONR website on 11 July 2022, noted that:

* the licence assessment concludes that the application has met almost all the regulatory requirements set out in regulatory guidance; and
* there are two outstanding matters which require resolution prior to the formal granting of a licence.

1. The first of those matters related to the ownership (security of tenure) of the land intended for the licensed site area. Our regulatory guidance [Licensing Nuclear Installations](https://www.onr.org.uk/licensing-nuclear-installations.pdf) [3] states that a nuclear site licensee is expected to have ‘full rights of access to and control of’ the site upon which the nuclear site will operate. At that time SZC Ltd did not have such rights to the land proposed for the SZC development and this therefore needed to be resolved prior to licence grant.
2. The second issue relates to the then current shareholder agreement. As the licensee should be able to exercise effective day-to-day control over all activities on the licensed site, it is essential there is clarity on how that responsibility can be exercised. The then current shareholder agreement for the development phase of the SZC project placed control of key policies relating to safety and security with NNB Holding Company (SZC) Ltd, rather than the licence applicant. This is inconsistent with our regulatory expectations, and we would require control of such policies to rest with the applicant prior to the granting of a licence. Consequently, SZC Ltd provided ONR with a commitment letter, which sets out how it intends to address this shortfall [4].
3. The ONR statement went on to note that when those matters are resolved, ONR would carry out a proportionate reassessment of the application, focused on the two outstanding matters and any other relevant matters relating to licensing that may emerge during the intervening period. Due to further development in the external hazards area, this topic has been included under the ‘other relevant matters’ part of the reassessment.
4. This report sets out ONR’s findings from its reassessment of the external hazards area. The report’s findings will inform the PAR which will summarise ONR’s conclusions from its reassessment work and will make a recommendation to the Chief Nuclear Inspector on whether the licence should be granted.

## Scope

1. The scope of this assessment is limited to the external hazards areas relevant to NSL [3] that have progressed or changed since the 2022 external hazards assessment of an application by NNB Generation Company (SZC) Ltd for a nuclear site licence [2]. The scope and sampling strategy for the 2022 external hazards SZC NSL assessment is detailed in Section 2 of [2].
2. The aim of this assessment is to review whether the recommendation within [2] that, from an external hazards perspective, a nuclear site licence should be granted remains appropriate.
3. The external hazards reassessment scope, therefore, includes:

* Site Data Summary Report (SDSR) update to revision 5. This reassessment focuses on updates related to the in-scope external hazards NSL items identified within Section 2 of [2].
* Progress on regulatory issues (RI). The RIs were raised within [2] to address identified shortfalls. Whilst it was judged that the RIs could be addressed post nuclear site licensing, given the time elapsed since [2], it is considered proportionate to review progress and determine whether this judgement remains valid. The RIs include:
  + RI 10805 – Seismic hazards
  + RI 10806 – Coastal flood hazard, covering:
    - Extreme still seawater level
    - Waves
    - Tsunami
    - Platform height observations
  + RI 10807 – Lightning hazard
* Progress in relation to ONR advice points [2]. Whilst the advice points were not considered significant for NSL, progress made by SZC Ltd has been included in the scope of the reassessment to provide a more complete view for NSL. The advice points relate to:
  + Pluvial flooding hazard
  + High air temperature hazard, including interface with mechanical engineering RI 10802 – adequacy of heating, ventilation and air conditioning (HVAC) safety related system design to meet SZC site challenge
  + High sea temperature hazard
  + Low seawater level hazard
* Revised station milestones. SZC Ltd has proposed revised station milestones. Given that these will update timescales against which judgements were made within [2], they have been included in the scope of this assessment.

1. The following aspects are out of scope of this assessment:

* Detailed design of the sea defences – consideration of a site’s flood hazard is a fundamental part of ONR’s assessment of site suitability and is included within ONR’s external hazards NSL assessment [2]. Ensuring that there is confidence that sufficient defences against flooding can be constructed, is similarly important and is included within ONR’s civil engineering NSL assessments [5] [6], in line with ONR’s Licensing Nuclear Installations [3].

It is important to recognise that civil engineering design is often an iterative process. Confidence that sufficient defences against flooding can be constructed to protect the site can be provided by earlier design phases, with the detailed design required prior to the construction of sea defences. ONR’s civil engineering assessment confirms that ONR has confidence that the sea defence classification and outline design can be viably delivered to protect the site from wave overtopping. Therefore, the detailed design of the sea defences is not required for ONR’s NSL assessment and is considered out of scope of this external hazards assessment.

ONR is aware that SZC Ltd commenced detailed sea defence design in Quarter 3 2023 and that this is currently ongoing. ONR will continue to engage with SZC Ltd in this area and will consider the detailed sea defence design as part of future submissions post-NSL, prior to its construction.

* Turbine disintegration – consideration of the turbine disintegration hazard is included in the internal hazards assessment [7] and is therefore explicitly excluded from this assessment.
* Groundwater – this is covered by the civil engineering RI 10838 and the civil engineering assessment [6].
* Organisational capability – this is covered within other ONR assessments [8]. External hazards has not directly inputted into this area as part of the proportionate reassessment; see [2] for the external hazards consideration.
* External hazards areas addressed in [2] that have not changed.
* Snow hazard – the most recent Site Data Summary Report contains updated snow load values. Snow load is not typically considered for NSL, as it is not usually the governing load case for civil structures. Snow was not considered within the NSL sample in [2] and has, therefore, not been assessed as part of this proportionate reassessment.

# Assessment Standards and Interfaces

1. ONR has a range of internal guidance to enable inspectors to undertake a proportionate and consistent assessment of nuclear safety cases.   
   This section identifies the standards which have been considered in this assessment. This section also identifies the key interfaces with other technical topic areas.

## Standards

1. The relevant standards and criteria adopted within this assessment are principally the Safety Assessment Principles (SAPs) [9], internal Technical Assessment Guides (TAGs) [10], relevant national and international standards and relevant good practice (RGP) informed from existing practices adopted on UK nuclear licensed sites. The key guidance is identified below and referenced where appropriate within Section 4 of this report. RGP, where applicable, has also been cited within the body of this report.

### Safety Assessment Principles (SAPs)

1. The key SAPs applied within the assessment are included within Appendix 2 of this report.

### Technical Assessment Guides (TAGs)

1. The following TAGs have been used as part of this assessment [11]:

* NS-TAST-GD-013, External Hazards (Rev 9)

NS-TAST-GD-013 was updated in October 2023. This update has not fundamentally changed any of ONR’s expectations for external hazards. However, it should be noted that terminology has been clarified to better align with the ONR SAPs as follows:

* + Design Basis Event: A conservatively defined 1 in 10,000 year return period hazard definition that meets the intent of SAP EHA.4. This is the minimum level a Basis of Design is expected to meet for design of structures, systems and components (SSCs).
  + Basis of Design: A representation of the Design Basis Event that is the primary input into the design process for substantiating SSCs.

Note that the ‘site challenge’ terminology used by SZC Ltd aligns with ONR’s Design Basis Event. The ‘design value’ terminology used within [2] aligns with the NS-TAST-GD-013 Basis of Design.

* NS-TAST-GD-051, The Purpose, Scope and Content of Nuclear Safety Cases (Rev 7)

### National and International Standards and Guidance

1. The following standards and guidance have been used as part of this assessment, aligning with the topics sampled; they should not be considered a complete list of guides and standards relevant to external hazards:

* International Atomic Energy Agency (IAEA), Site Evaluation for Nuclear Installations, Specific Safety Requirements, Safety Standards Series No. SSR-1 [12]
* IAEA, Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations, Specific Safety Guide, Safety Standards Series No. SSG-18 [13]
* Western European Nuclear Regulators Association (WENRA), Guidance Document Issue TU: External Hazards – Head Document: Guidance for the WENRA Safety Reference Levels for External Hazards [14]
* WENRA, Guidance Document Issue TU: External Hazards – Guidance on External Flooding [15]
* British Standard (BS) EN 62305 Protection against lightning [16]
* ONR, the Environment Agency, Natural Resources Wales (NRW), Scottish Environment Protection Agency (SEPA), Use of UK Climate Projections 2018 (UKCP18), Position Statement [17]
* ONR and the Environment Agency, Principles for Flood and Coastal Erosion Risk Management [18]

## Integration with Other Assessment Topics

1. External Hazards has interfaced with several other topic areas as part of the SZC NSL proportionate reassessment. The main interface areas, are:

* Civil engineering – the external hazards input into the sea defence design, groundwater and seismic hazards.
* Mechanical engineering – in relation to RI 10802 and the external hazards input into the HVAC design.

## Use of Technical Support Contractors

1. Technical support contractors (TSCs) provided independent advice in support of the 2022 external hazards SZC NSL assessment [2], in addition to the ONR Expert Panel on Natural Hazards.
2. Given the targeted scope of this reassessment, TSC support was not considered necessary. I have utilised the ONR Expert Panel in relation to RI 10805 (seismic hazards) closure and for relevant aspects of RI 10806 (coastal flood hazard). I note that engagement with the expert panel relating to coastal flooding is ongoing at the time of writing.

# Dutyholder’s Submission

1. This reassessment considered the revised versions of the documents submitted as part of SZC Ltd’s NSL original application dossier.
2. The key references related to external hazards within SZC Ltd’s original NSL application are outlined in [2]. The information is not duplicated here, and [2] should be referred to for a full understanding of the dutyholder’s application and ONR’s external hazards assessment.
3. This assessment considers the key external hazards related documents that have been updated or produced since the 2022 ONR NSL assessment [2]. Documentation outlining progress and changes since 2022 is also captured within this assessment.

## Site Data Summary Report

1. SZC Ltd updated its SDSR to revision 5 in July 2022 [19]. This superseded revision 4, considered as part of the 2022 external hazards assessment [2]. Revision 5 updated outputs/values for:

* The design basis earthquake (DBE)[[1]](#footnote-2). This update is considered under Section ‎3.2.1.
* The extreme still seawater level hazard, including the climate change adjustment for extreme still seawater level. This update is considered under Section ‎3.2.2.
* The snow load site challenge. This update is considered out of scope of this assessment; see Section ‎1.2.

## Documentation related to regulatory issues

### RI 10805 – Seismic hazards

1. SZC Ltd provided the following documentation in order to support closure of RI 10805:

* SZC DBE Definition report rev. 4 [20] – SZC Ltd updated its SZC DBE Definition document from rev. 3 to rev. 4 in 2022. Rev. 3 was considered within [2]. The update incorporated the revised offshore DBE. The offshore DBE presented in rev. 4 aligns with the onshore DBE for minimum DBE checks, i.e. it broadly envelopes the mean 10-4 and 10-5 uniform hazard spectrum (UHS) scaled to 0.1g at 100Hz horizontally.
* SDSR rev. 5 [19] – which includes the updated DBE spectra.
* SZC CFS & PSHA Addendum [21] – SZC Ltd issued an addendum to its Capable Faulting Study (CFS) and Probabilistic Seismic Hazard Analysis (PSHA) in 2023. The addendum consists of five appendices which address the CFS comments raised by the ONR Expert Panel in SZC-SH-EP-2022-1 [22].

### RI 10806 – Coastal flood hazard

1. SZC Ltd provided the following documentation in relation to RI 10806:

* SDSR rev. 5 [19] – which includes the updated extreme still seawater level, the associated reasonably foreseeable climate change adjustment and the credible maximum scenario value for climate change.
* Additional support for extreme sea level characterisation at Sizewell C [23] – this 2022 report by EDF R&D UK Centre supersedes and extends the 2020 report extreme sea level analysis [24] and supports the SDSR rev. 5 extreme still seawater update. The report incorporates more recent observational data at Lowestoft up to 2022, considers the effect of large historical surge events (1900-1964) in the modelling, and compares the magnitude of high still seawater level events between Lowestoft and Sizewell (since 2009, using the Sizewell B (SZB) tide gauge data).
* Response to Technical Queries 1, 2 & 3 Letter [25] – this 2024 SZC letter provides a response to ONR in relation to technical queries (TQ) 1, 2 and 3 that were raised by ONR during the 2022 external hazards SZC NSL assessment [2].
* SZC Ltd RI 10806 Progress Statement [26] – SZC Ltd provided a progress statement on RI 10806 in February 2024. This summarises completed and ongoing work in relation to RI 10806.

### RI 10807 – Lightning hazard

1. SZC Ltd provided the following documentation in relation to RI 10807:

* Sizewell C Lightning Hazard Characterisation [27] – this 2023 report, produced by Atkins, provides a recommended SZC lighting hazard characterisation and site challenge. A review of relevant national and international codes and standards is included, with the approach to deriving the site challenge based on BS EN 62305 [16], CIGRE 63 [28] and CIGRE 549 [29].
* SZC Ltd RI 10807 Progress Statement [30] – SZC Ltd provided a progress statement on RI 10807 in February 2024. This summarises completed and ongoing work in relation to RI 10807.

## Documentation and updates related to ONR advice points

1. SZC Ltd provided a summary of progress [31] in relation to the ONR advice points raised in [2] and the intention for future SDSR rev. 6 updates.

### Pluvial flooding hazard

1. SZC Ltd has informed ONR that EDF Research and Development (EDF R&D) UK has commenced a study for SZB (and SZC) for the use of the UKCP18 2.2 km rainfall data in the evaluation of future rainfall [31]. This study is intended to indicate the feasibility of using UKCP18 2.2 km rainfall data. Further cases are likely to be required for the approach to be adopted in defining the SZC site challenge.

### High air temperature hazard

1. SZC Ltd has provided two further reports on high air temperature hazard, that use a different methodology to that assessed as part of [2]:

* Extreme high air temperature at SZC for the present climate [32] – this EDF R&D UK Centre report from February 2023 presents an extreme value analysis (EVA) for high air temperature for SZC based on the mean-variance approach, for different averaging periods (daily maximum temperature, 12-hour and 24-hour average, and 2-, 3-, 4- and 5-day average).
* High air temperature at SZC (future) [33] – this EDF R&D UK Centre report from October 2023 updates [32] by adding climate change adjustment factors in the analysis to account for the future climate change.

1. SZC Ltd has informed ONR that it intends to incorporate the updated EVA into SDSR rev. 6 [31].
2. The related ONR mechanical engineering regulatory issue on the adequacy of HVAC safety related system design to meet the SZC site challenge (RI 10802) remains open.

### High sea temperature hazard

1. SZC Ltd provided further information on its justification for the use of the selected SZB sensor for its high sea temperature site challenge via:

* High seawater temperature email [34] – SZC Ltd provided a response to the high sea temperature hazard ONR advice point in [2] inJanuary 2023 (note that in an earlier draft version of [2] the advice point was referred to as Recommendation 6).

1. SZC Ltd has communicated its intent to ONR for the existing hazard characterisation report [35] to be updated to incorporate this clarification, and to be referenced in SDSR rev. 6, if available at the time of the SDSR update [31].

### Low seawater level hazard

1. SZC Ltd has informed ONR of a study that it has commissioned to evaluate extreme low seawater levels at SZC. SZC Ltd intends to summarise and reference this within SDSR rev. 6 [31].

## Station Milestones

1. SZC Ltd provided the following communication on its station milestones:

* Sizewell C Consolidated Station Milestones Letter [36] – SZC Ltd issued a letter to ONR confirming its proposed revised station milestones to be used in all future safety case documentation. The proposed revised dates associated with SZC station lifetime milestones have been updated to align with the latest project schedule. The letter states that:
  + An Open Point has been raised to understand the impact of implementing these updated milestone dates on both the safety case and the design.
  + The coastal defences had previously been specified for an operational design life of 2030 – 2140, but the proposed revised milestone dates have been evaluated and the existing design remains appropriate.
  + The adoption of the consolidated station lifetime milestone dates will be formalised in 2024 as a Referential Change (RES), as will the other updates to the SZC SDSR Revision 6.
* SZC Ltd 2024 emails regarding sea defence design life [37] [38] – SZC Ltd provided confirmation in January and March 2024 that it has initially designed the sea defence hard coastal defence feature (HCDF) to 2140. The SZC Ltd communication states that *“the option to provide localised flood protection of the ISFS [interim spent fuel store] is being looked at, we note for the avoidance of doubt that, although this is not consented, the existing HCDF design is valid (for its durability)**for a 2160 date”*. In relation to the soft coastal defence feature (SCDF), SZC Ltd states that it *“is confident that the SCDF can be maintained until 2160 and is committed to do so”*.
* SZC Ltd email regarding Open Point GEN-S2-020 [39] – SZC Ltd provided the Open Point text referred to in the Station Milestones Letter [36] via this February 2024 email.

# ONR Assessment

## Assessment Strategy

1. ONR’s strategy for the proportionate reassessment of SZC Ltd’s licence application [40] affirms that the principles by which ONR would undertake and reach a conclusion on its reassessment would be the same as those applied during the original 2020-22 assessment; see Section 2 of [41]. It notes that, as we have already undertaken a robust and extensive assessment of SZC Ltd’s case for licence grant, in undertaking a reassessment we will target our re-examination only on the outstanding maters and those areas of the application where we consider that there are or may be:

* changes in the applicant company impacting the basis for aspects of our previous licensing judgement (e.g., resource, capability, arrangements, tools etc); and/or
* new information that may warrant a re-examination of relevant areas of the application, including relevant operational experience (OPEX) from other EPR™ or relevant new reactor projects.

1. The reassessment strategy is supplemented by a licensing assessment plan [42]. This document provides information and guidance to ONR’s specialist inspectors involved in the assessments, including a timetable for production of reports required to inform the PAR.
2. This report covers the proportionate reassessment of the external hazards area.

## Assessment

### Seismic hazards (RI 10805)

1. The seismic hazard RI 10805 was raised during the 2022 external hazards NSL assessment [2]. I reviewed the material provided by SZC Ltd in relation to RI 10805 and closed the RI on the basis that the shortfalls identified in [2] were adequately addressed, given that:

* The updated SZC offshore DBE (both horizontal and vertical) meets the same RGP that was used to judge the onshore DBE as adequate within [2].
* The relevant documents [19] [20] completed SZC Ltd governance and formally include the revised design basis earthquake definitions within the SZC safety case.
* The SZC CFS & PSHA Addendum [21] adequately addressed the ONR Expert Panel’s CFS comments raised in SZC-SH-EP-2022-1 [22].

#### Nuclear Site Licence consideration – seismic hazards

1. The 2022 recommendation that, from an external hazards perspective, a nuclear site licence should be granted is not undermined by SZC’s work on seismic hazards. This is because the shortfalls against ONR expectations identified in [2] have been addressed.

### Coastal flood hazard (RI 10806)

1. The coastal flood hazard RI 10806 was raised during the 2022 external hazards NSL assessment [2]. Engagement on this topic is ongoing and the RI remains open. Sections ‎4.2.2.1 to ‎4.2.2.4 focus on each of the actions associated with RI 10806.

#### Extreme Still Seawater Level

1. SZC Ltd has revised its high extreme still seawater level site challenge in SDSR rev. 5 [19] from that presented in [43] and assessed in [2]; see Table 1. I have considered the present day extreme still seawater level and climate change adjustment factor (CCAF) revisions separately.

Table 1: Update to the SZC high extreme still seawater level

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| Report | Present Day Extreme Still Seawater Level [2017] (mOD)  10-4/yr 84th percentile | Reasonably Foreseeable Climate Change Adjustment Factor (m)  UKCP18 RCP 8.5 | Site Challenge (mOD)  Present day + reasonably foreseeable CCAF |
| **SDSR Rev.4** | +4.34 | 2110:  +1.23 (95th percentile) | 2110:  +5.57 |
| 2140:  +1.75 (95th percentile) | 2140:  +6.09 |
| **SDSR Rev.5** | +5.01 | 2110:  +1.05 (84th percentile) | 2110:  +6.06 |
| 2140:  +1.48 (84th percentile) | 2140:  +6.51  (CCAF value rounded up) |

Present day extreme still seawater level

1. The present day extreme still seawater level value, with a baseline year of 2017, is revised within [19] and [23], see Table 1, and has been updated to take account of:

* more recent data from the Sizewell tide gauge;
* large historical storm surge events that occurred before 1964 – when the Lowestoft tide gauge became operational; and
* examination of comparative high water levels measured at Lowestoft and Sizewell in more detail.

1. SZC Ltd also provided a formal response to ONR Technical Query (TQ) 1, 2 and 3 [25]. The TQs were recorded in Appendix D of [2]. TQ1 and 2 were raised as it was not clear that that the best available relevant data had been used, as per the intent of SAP EHA.2, or that the methodology used resulted in a conservatively derived site challenge, in line with EHA.4. TQ3 was raised, given the limited justification provided for the EVA approach used.
2. I reviewed SZC’s response to the TQs within [44] and I consider that they have been adequately addressed and are closed, given that:

* A reasonable explanation as to why Felixstowe data has not been included in derivation of the SZC high extreme still seawater level is provided, with further justification provided for the use of Lowestoft data.
* Additional observational data has been included in the derivation of the SZC high extreme still seawater level, including more recent Lowestoft data, historical storm surge events, and a comparison of Lowestoft and SZB tide gauge data.
* The SZC high extreme still seawater level site challenge has been aligned to the Lowestoft 10-4/yr event, rather than an adjustment factor being applied, resulting in a lower value for Sizewell than Lowestoft.
* Further justification for the use of the skew surge joint probability method, which utilises the threshold exceedance EVA approach, is provided.

1. I have raised a further technical query related to the astronomical tide component of the Sizewell C hazard derivation [45], as part of my consideration of RI 10806, to ensure the intent of SAP EHA.2 is met.
2. Overall, I recognise that the present day high extreme still seawater level has increased by 0.67 m. I judge that SZC Ltd’s revised approach to deriving the high extreme still seawater level aligns with the intent of SAP EHA.4, noting the further query raised in relation to EHA.2.

Reasonably foreseeable climate change

1. A climate change adjustment of UKCP18 Representative Concentration Pathway (RCP) 8.5 at the 95th percentile was used in SDSR rev. 4 when characterising the extreme still seawater level site challenge. Within SDSR rev. 5, SZC Ltd has revised this to RCP 8.5 at the 84th percentile; see Table 1.
2. SZC Ltd’s definition of reasonably foreseeable climate change is given in Section 3.1.3 of the SDSR [19] as the UKCP18 scenario RCP 8.5 incorporating at least 50% of the uncertainty (50th percentile), for the full lifetime of the plant. Within [2] I judged that this was an adequate definition of reasonably foreseeable climate change that aligns with SAP EHA.11 paragraph 259. Therefore, whilst opting for the 84th percentile, as opposed to the 95th percentile, reduces conservatism, it is still a more onerous CCAF than SZC Ltd’s definition of reasonably foreseeable climate change. I, therefore, consider that the CCAF for the revised extreme still seawater level still meets the intent of SAP EHA.11.
3. In addition, I recognise that the high extreme still seawater level including reasonably foreseeable climate change for both 2110 (+6.06 mOD) and 2140 (+6.51 mOD) are bounded by the +7.3 mOD platform height, and the planned top deck level of the permanent site of special scientific interest (SSSI) crossing at +8.65 mOD[[2]](#footnote-3) [+8.515 to +8.732 mOD range] (referred to as the permanent access bridge in Figure 1) [46]. Therefore, for reasonably foreseeable climate change, the adaptive sea defence height and the overland flood barriers are not expected to be required prior to the end of main site decommissioning date of 2120, based on SZC Ltd’s proposed revised station milestones. See Section ‎4.2.8 for my consideration of the proposed revised station milestones.

Credible maximum climate change

1. Credible maximum scenarios are peer-reviewed, high end, plausible scenarios of climate change [17]. These scenarios help to inform managed adaptive approaches, should climate change be greater than is reasonably foreseeable. The credible maximum scenario used to inform previous SZC studies, e.g. [47], was based on the H++ scenario from the UK Climate Projections 2009 (UKCP09). SDSR rev. 5 now defines the credible maximum scenario for climate change for extreme still seawater level as an overall allowance of +2.8m for 2110. Both 2110 credible maximum scenarios are summarised in Table 2.

Table 2: Comparison of the SDSR rev. 5 and the previous 2110 credible maximum scenarios for SZC, including the different components

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Report | Mean sea level rise (m) | Downward land movement (m) | Extreme skew surge increase (m) | Credible maximum 2110 (m) [Total] |
| **SZC Coastal Flooding ALARP – Main Study Report** [47] | +2.12  (includes downward land movement) | | +1.0 | **+3.12** |
| **SDSR Rev.5** [19] | +2.4 | +0.1 | +0.3 | **+2.8** |

1. To support the revised credible maximum scenario, SZC Ltd referenced two reports [48] [49]. However, SZC Ltd has not provided evidence for how it has derived the different components for the overall 2110 credible maximum value. I do not consider that SZC Ltd has provided adequate justification for its revised values, in line with the intent of SAP SC.2 paragraph 97 and SAP SC.4 paragraph 100 (c). Therefore, I have raised RI 11960, to ensure that SZC Ltd adequately defines and justifies its credible maximum scenario for extreme still seawater level.
2. For the 2140 credible maximum, SDSR rev. 5 states that a larger allowance approaching +4.0m may be considered (subject to review). Whilst a 2140 credible maximum scenario value has not previously been confirmed, SZC Ltd has stated that the sea defences are designed considering both reasonably foreseeable and credible maximum climate change to 2140 [50]. I have included defining the credible maximum scenario for appropriate timescales, to support the design of the sea defences and protective site measures, within the scope of RI 11960.
3. Overall, whilst I do not consider that the revised credible maximum scenario for extreme still seawater level has been adequately justified, I am cognisant of:

* Sea defences – SZC Ltd has not completed its detailed design of the sea defences [26]. The sea defence will take account of credible maximum climate change via its adaptive height crest [19]. Therefore, there is time for SZC Ltd to adequately justify its credible maximum scenarios prior to completion of the detailed design, and/or demonstrate that the design will have sufficient adaptable height margin.

Further, based on the sea defence adaptive design height of +16.4 mOD, margin exists to account for a greater value than +4 m for the 2140 credible maximum scenario. The sea defence design height for reasonably foreseeable climate change is +12.6 mOD, meaning there is +3.8 m adaptive height. As the proposed 2140 credible maximum scenario of +4 m is +2.52 m greater than the 2140 reasonably foreseeable value of +1.48 m, there is still >1 m margin left when +2.52 m is taken from +3.8 m, notwithstanding potential wave height changes.

* Overland flood barriers – SZC Ltd has committed to install overland flood barriers should climate change be worse than is reasonably foreseeable [51], to protect the site from extreme still seawater level; see Appendix 3 Figure 1. The role of the overland flood barriers is to ensure that water surrounding the site is less than the platform height, ensuring that the SZC site remains protected; see [51] and [52]. Whilst the height of these barriers has been estimated, see Table 3, if they are required, their detailed design will be several decades into the future, when the climate change trajectory is better understood and they can be sized accordingly.
* Trigger points – The identification of “trigger points”, for when the overland flood barriers and the adaptive sea defence crest construction will need to commence, is being tracked as platform height observation 14; see Section ‎4.2.2.4.
* ONR Expert Panel on Natural Hazards – The Expert Panel has indicated that the revised credible maximum scenario 2110 value appears to broadly align with current literature [53]. However, I will seek the Expert Panel’s advice on SZC Ltd’s justification of the revised credible maximum scenario values, to inform my position on closure of RI 11960.

1. For the purposes of my NSL assessment, I have identified nothing that fundamentally undermines site suitability. From my engagement with ONR civil engineering, I am content that structures can be designed to protect the site from the extreme still seawater level hazard, including climate change. I consider that the outstanding items can be addressed post-licensing, in conjunction with detailed design of the sea defences, the overland flood barriers and the permanent SSSI crossing. I will seek the ONR’s Expert Panel on Natural Hazards expert advice to inform my position on credible maximum climate change, RI 11960 and RI 10806.

Table 3: Summary of the 2110 and 2140 climate change values added to the SDSR rev. 5 SZC high extreme still seawater level present day (2017) value, including the structures that will protect the site under reasonably foreseeable climate change or a credible maximum climate change scenario.

|  |  |  |
| --- | --- | --- |
| Timescale/structure | Reasonably foreseeable climate change (mOD)  *\*10-4/yr 84th percentile present day + UKCP18 RCP 8.5 84th percentile* | Credible maximum climate change (mOD)  *†10-4/yr 84th percentile present day + SDSR rev. 5 credible* maximum [19] |
| **2110** | +6.06  *\*[+5.01* ***+*** *+1.05]* | +7.81  *† [+5.01* ***+*** *+2.8]* |
| **2140** | +6.51  *\*[+5.01* ***+*** *+1.50 (+1.48 rounded up)]* | +9.01  *† [+5.01* ***+*** *+4 (subject to review)]* |
| **Platform height** | +7.3 | |
| **Overland flood barriers** |  | * Northern barrier: +10 * Southern barrier: +9   Estimated minimum crest height in [52] |
| **Sea defence height** | +12.6 |  |
| **Sea defence height, including adaptive crest height** |  | +16.4 |

#### Waves

1. SZC Ltd has not yet submitted its updated wave analyses to ONR, although it is expected shortly, around Quarter 1 2024.SZC Ltd has confirmed that the results will be key inputs to the temporary and permanent sea defence designs and will be incorporated into SDSR rev. 6 [26].Given that no new information has been submitted to ONR, my assessment and judgement within [2] remains valid for this assessment. I consider that the shortfall can be addressed after NSL, on the basis that the updated wave analyses will feed into the detailed sea defence design [26].

#### Tsunami

1. SZC Ltd has not yet submitted a review of, or provided further rationale for, its selected still seawater level used in combination with tsunami hazard, as raised in [2]. SZC Ltd intends to submit an update of the tsunami report [54] to ONR in Quarter 1 2024. Given that no new information has been submitted to ONR, my assessment and judgement within [2] remains valid for this assessment. I consider that the shortfall can be addressed after NSL, prior to the detailed sea defence design, on the basis any potential update to the hazard could feed into the detailed sea defence design [26].

#### Platform height observations

1. The platform height observations recorded as open within [2] remain open. SZC Ltd has confirmed its intent for the First Safety Related Structure (FSRS) report to address all of the outstanding observations [26]. I am aware that SZC Ltd is progressing several areas of work that aim to address the platform height observations [26]. My 2022 [2] judgement that these can be addressed post-NSL, prior to the final design of the related SSCs remains valid, given that detailed design of the key related structures has not yet completed.

#### Nuclear Site Licence consideration – coastal flood hazard

1. The 2022 recommendation that, from an external hazards perspective, a nuclear site licence should be granted, is not undermined by SZC Ltd’s work on coastal flooding. I have not identified anything that fundamentally undermines site suitability. I acknowledge that SZC Ltd has further work to undertake in relation to the credible maximum climate change, wave analysis, tsunami hazard and in relation to the platform height observations (RI 10806 and RI 11960). However, as recognised in the 2022 assessment [2], I am content that the outstanding items can be addressed post-licensing, prior to the finalisation of the design of relevant SSCs. This judgement is based on the detailed design of the sea defences being conducted post ONR’s licensing assessment, allowing the relevant outstanding items to be addressed prior to the construction of the sea defences [26], and that, from a civil engineering perspective, there are credible engineering options that do not preclude the site as suitable [6].

### Lightning hazard (RI 10807)

1. SZC Ltd has shared an updated Lightning Hazard Characterisation report [27] with ONR. This revises the site challenge from 200 kA to 224 kA. SZC Ltd has confirmed its intention to include the revised site challenge values within SDSR rev. 6. SZC Ltd has also informed ONR that it intends to retain the 200 kA design value. I have reviewed the updated report and consider that it provides a clearer explanation of the lightning hazard characterisation, with claims and arguments supported by appropriate evidence, aligned with the intent of SAP SC.4 paragraph 100 (c). I have asked SZC Ltd to provide a response to queries that arose from my review [55], particularly in relation to the data used (SAP EHA.2), which is limited to the same 11 years of data used in the previous lightning hazard report [56] [2].

#### Nuclear Site Licence consideration – lightning hazard

1. The 2022 recommendation that, from an external hazards perspective, a nuclear site licence should be granted, is not undermined by SZC Ltd’s work on lightning. An increased lightning site challenge does not preclude the site as suitable, as it can be addressed via further substantiation work/justification, or a revised design value. RI 10807 remains open and I will expect adequate justification for retaining the 200 kA design value to be provided as part of the SDSR rev. 6 update, or the design value to be revised, and this will be considered post-NSL.

### Pluvial flooding hazard

1. SZC Ltd has recognised the advice point raised within [2] in relation to reviewing the UKCP18 rainfall 2.2 km x 2.2 km resolution data and determining whether its rainfall CCAF should be updated. As recognised in Section ‎3.3.1, SZC Ltd is involved in work to understand the 2.2 km dataset effect on rainfall characterisation.

#### Nuclear Site Licence consideration – pluvial flooding hazard

1. The 2022 recommendation that, from an external hazards perspective, a nuclear site licence should be granted, is not undermined by SZC Ltd’s work on pluvial flooding. I have not identified anything that would undermine my judgement in Section 4.1.4.3 of [2]. I expect the work on pluvial flooding to be progressed as part of normal business.

### High air temperature hazard

1. SZC Ltd commissioned a new study into high air temperature at SZC [32] [33]. The new study uses a different EVA method, the mean-variance approach, to that used within the previous high air temperature study [57] [2]. The mean-variance approach has been developed by EDF R&D and is being applied to high air temperature studies at multiple UK sites by EDF R&D. I, in conjunction with other external hazards inspectors, have identified that the outputs of the methodology raise questions of its suitability for use in calculating extreme values, and whether the intent of SAP AV.3 is met, such as:

* The present day daily maximum best estimate 10-4/yr value for a site [not SZC] was reached in August 2022 and almost met in 1990 (within 0.2°C).
* The SZC 85th centile 2-day, 3-day and 4-day average 10-4/yr values are less than the 5-day average 10-4/yr value.

1. I am continuing engagement with EDF R&D and SZC Ltd on the mean-variance approach. I have also secured an EVA expert review of the methodology by the Met Office, to inform my judgement, which is due to commence in May 2024.
2. For SZC Ltd, the mean-variance approach results are broadly similar to those derived from the previous SZC EVA. However, the 2110 daily maximum (84th percentile) is 43.1°C, compared to the 45.7°C value given by the previous study. The SZC Ltd daily maximum design value (basis of design) is 44°C and so would bound the mean-variance 2110 output.
3. As I have not yet formed a judgement on the adequacy of the mean-variance approach, given my intent to seek expert advice, the mechanical engineering issue RI 10802 remains open. RI 10802 relates to the adequacy of the HVAC safety related system design to meet the SZC high air temperature and enthalpy site challenge. My review of the mean-variance approach will inform ONR’s position on RI 10802.

#### Nuclear Site Licence consideration – high air temperature hazard

1. The 2022 recommendation that, from an external hazards perspective, a nuclear site licence should be granted, is not undermined by SZC Ltd’s work on high air temperature. Whilst high air temperature is considered as part of site suitability, I am confident that the high air temperature hazard at SZC can be adequately designed against. As summarised in [2], SZC Ltd is proceeding with the risk that HVAC redesign will be required, should an adequate demonstration of HVAC withstand against the SZC site challenge not be possible. ONR’s review of the EVA mean-variance approach will be progressed as part of normal business, post-NSL. The adequacy of the HVAC safety related system design to protect against the SZC site challenge is being tracked as part of RI 10802.

### High sea temperature hazard

1. SZC Ltd recognised the advice point raised within [2] in relation to the sensors used to derive the high sea temperature hazard. SZC Ltd provided further clarity on why the cooling water system (CWS) TG2 sensor was selected, particularly over the CWS TG1 sensor [34]. The CWS TG2 sensor had fewer outliers in its data and, therefore, was selected due to there being higher confidence in it, which was evidenced by graphs included in [34]. I consider that SZC Ltd has provided adequate justification for its use of the selected SZB sensor and I judge that the intent of SAP EHA.2 has been met. SZC Ltd intends to update its hazard characterisation report to incorporate clarification regarding use of the CWS TG2 sensor [31].

#### Nuclear Site Licence consideration – high sea temperature hazard

1. The 2022 recommendation that, from an external hazards perspective, a nuclear site licence should be granted, is not undermined by SZC’s work on high sea temperature, with ONR’s advice point having been adequately addressed.

### Low seawater level hazard

1. SZC Ltd has recognised the advice point raised within [2] for SZC Ltd to ensure that derivation of the low seawater level 10-4/yr annual frequency of exceedance event uses best available relevant data sources and methodologies that align with RGP. SZC Ltd has informed ONR that EDF R&D has undertaken a new study on low sea water level and, once finalised, SZC Ltd intends to incorporate it into the SDSR rev. 6 update. The report has not currently been shared with ONR.

#### Nuclear Site Licence consideration – low seawater level hazard

1. The 2022 recommendation that, from an external hazards perspective, a nuclear site licence should be granted, is not undermined by SZC Ltd’s work on low seawater level. I have not identified anything that would undermine my judgement in Section 4.1.6.2 of [2]. I expect the work on low seawater level to be progressed as part of normal business.

### Proposed revised station milestones

1. SZC Ltd. has proposed revised station milestones [36]; see Table 4. SZC Ltd has stated that the adoption of the proposed revised station milestone dates will be formalised in 2024 as a Referential Change (RES) covering this and other updates to the SZC SDSR rev. 6. SZC Ltd has also raised an Open Point [39] to understand the impact of implementing these updated milestone dates on both the safety case and the design.

Table 4: Proposed revised SZC station milestones, as communicated in [36]

|  |  |  |
| --- | --- | --- |
| Milestone | Proposed Revised Milestone Date  (to be used consistently) | Existing Milestone Date  (used typically but not consistently) |
| Fuel delivery to site / fuel load | 2035 | 2030 |
| End of Generation | 2095 | 2090 |
| End of main site decommissioning | 2120 | 2110 |
| End of ISFS operation and spent fuel storage on site | 2160 | 2140 |

Sea defences and overland flood barriers

1. SZC has confirmed that it has initially designed the sea defence HCDF to 2140 [37] [38], noting that it is valid for a 2160 date. SZC Ltd has also confirmed that it is confident that the SCDF can be maintained until 2160 [37]. I recognise that SZC Ltd has not specified that the sea defences (HCDF and SCDF) would be valid to 2160 for a credible maximum climate change scenario. However, SZC Ltd confirms that the option to provide localised flood protection to the ISFS is being considered. I expect SZC Ltd to provide confirmation of the station milestone/timescales the sea defences will be designed to, including for credible maximum climate change, as part of the detailed sea defence design (see RI 11960). In principal, provided that the nuclear material on site is confined to the ISFS, local protection appears proportionate, provided that there is adequate access. ONR will consider local protection of the ISFS in detail, if it is progressed by SZC Ltd.
2. In addition to the HCDF and SCDF, I expect SZC Ltd to clearly identify any implications from the revised station milestones for the overland flood barriers. Should climate change be greater than is reasonably foreseeable, overland flood barriers are intended to be installed to protect the site from extreme still seawater level. Given the revised station milestones, SZC Ltd needs to clarify under which scenarios the overland flood barriers may be required. This is related to platform height observations 13 and 14, which remain open and are being tracked as part of RI 10806; see Section ‎4.2.2.4 for consideration of the platform height observations for NSL.

Climate change adjustment factors

1. I am cognisant that SZC Ltd has considered CCAFs to 2110 and 2140 for a range of external hazards. The CCAF dates were dependent on site activities, for example, the high air temperature CCAF values were defined to cover the period up to the end of power generation operations on site plus a 20-year allowance to transfer fuel to the ISFS. Therefore, I expect the CCAF values to be revised to align with the proposed revised station milestones for all relevant external hazards.
2. As part of the Open Point [39], SZC Ltd has recognised the need to understand the impact of the proposed revised station milestones on its safety case and design, including external hazards. When defining the external hazards for future timescales, I advise SZC Ltd to consider how the external hazard site challenge may be impacted by any future revisions to station milestones. For example, should SZC Ltd seek to extend the operational lifetime of its reactors beyond 60 years, or there are unforeseen delays in reaching a station milestone. This would align with the managed adaptive approach, the aim of which is to build flexibility into options and decisions today so that they can be adjusted depending on what happens in the future [18].

#### Nuclear Site Licence consideration – proposed revised station milestones

1. I am aware that the proposed revised station milestones have not yet been formalised [36]. I also recognise that SZC Ltd has an extant Open Point to understand the impact of the proposed revised station milestones on its safety case and design, including external hazards [39]. It is my judgement that the revised station milestones implications can be addressed by reviewing the external hazards CCAFs and, although SZC Ltd is proceeding with the risk that further engineering measures may be required to protect the site in the future, this does not undermine site suitability. Therefore, I consider that engagement with SZC Ltd on the CCAF alignment with station milestones can be progressed as part of normal business and I do not consider that this undermines the 2022 recommendation that, from an external hazards perspective, a nuclear site licence should be granted.

# Conclusions and Recommendations

## Conclusions

1. This report presents the proportionate reassessment of the external hazards area of SZC Ltd’s application for a NSL.
2. My conclusions are that:

* Following consideration of SZC Ltd’s work since the 2022 ONR assessment, I have not identified anything that undermines site suitability for external hazards. Therefore, I judge that the 2022 recommendation that, from an external hazards perspective, a nuclear site licence should be granted, remains valid.
* RI 10806 on coastal flood hazard remains open. SZC Ltd has progressed work in relation to all areas of the RI. This RI will need to be closed prior to construction of the sea defences, with some aspects required for the detailed sea defence design.
* RI 10807 on lightning hazard remains open. SZC Ltd has progressed work to address the RI. The intent is for this RI to be addressed as part of the next SDSR revision.
* RI 11960 has been raised to ensure that SZC Ltd provides adequate justification for its revised credible maximum scenario for extreme still seawater level.
* I am aware of the proposed revised station milestones, that they have not yet been formalised, and that SZC Ltd has raised an Open Point [39] to address the potential impact on its safety case and design, including external hazards. Whilst I consider it appropriate for this to be managed via normal business, as part of this, I expect SZC Ltd to:
  + Provide confirmation of the station milestone/timescales the sea defences will be designed to, including for credible maximum climate change, as part of the detailed sea defence design.
  + Clearly identify any implications from the proposed revised station milestones for the overland flood barriers and clarify under which scenarios the overland flood barriers may be required. This is related to platform height observations 13 and 14 which remain open and are being tracked as part of RI 10806.
  + Review its CCAF values to ensure that they align with the proposed revised station milestones for all relevant external hazards.

1. My overall conclusion, therefore, is that SZC Ltd is ready to be granted a NSL for the proposed development at Sizewell C.

## Recommendations

1. Based on my proportionate assessment of the external hazards area, I recommend that a licence is granted to SZC Ltd to permit the construction and operation of a twin EPR™ power station at SZC.

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# Appendices

Appendix 1 – ONR licensing assessment 2020/22

ONR assessment reports available at [www.onr.org.uk/civil-nuclear-reactors/sizewell-c/assessment-reports.htm](file:///C:/Users/CPotter/AppData/Local/Microsoft/Windows/INetCache/Content.Outlook/I9QLS3DL/www.onr.org.uk/civil-nuclear-reactors/sizewell-c/assessment-reports.htm)

1. [Electrical engineering assessment - ONR-NR-AR-21-001](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-001.docx)
2. [Mechanical engineering assessment - ONR-NR-AR-21-003](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-003.docx)
3. [External hazards assessment - ONR-NR-AR-21-005](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-005.docx)
4. [Civil engineering assessment - ONR-NR-AR-21-006](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-006.docx)
5. Nuclear site [health and safety/life fire safety assessment - ONR-NR-AR-21-007](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-007.docx)
6. [Assessment of the safety case delivery strategy - ONR-NR-AR-21-008](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-008.docx)
7. [Site activities and licence compliance - ONR-NR-AR-21-009](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-009.docx)
8. [Organisational capability assessment - ONR-NR-AR-21-010](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-010.docx)
9. [Licensing and legal assessment - ONR-NR-AR-21-011](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-011.docx)
10. [Internal hazards assessment - ONR-NR-AR-21-035](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-035.docx)
11. [Management of nuclear matter and liabilities - ONR-NR-AR-21-037](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/ONR-NR-AR-21-037.docx)
12. [Security arrangements assessment - ONR-CNSS-AN-22-002](https://www.onr.org.uk/civil-nuclear-reactors/sizewell-c/onr-cnss-an-22-002.docx)

Appendix 2 – Relevant SAPs Considered During the Assessment

|  |  |
| --- | --- |
| SAP No. | SAP Title |
| EHA.2 | Data sources |
| EHA.4 | Frequency of initiating event |
| EHA.11 | Weather conditions |
| SC.2 | Safety case process outputs |
| SC.4 | Safety case characteristics |
| AV.3 | Use of data |

Appendix 3 – Flood barrier and permanent access bridge locations, taken from [52]

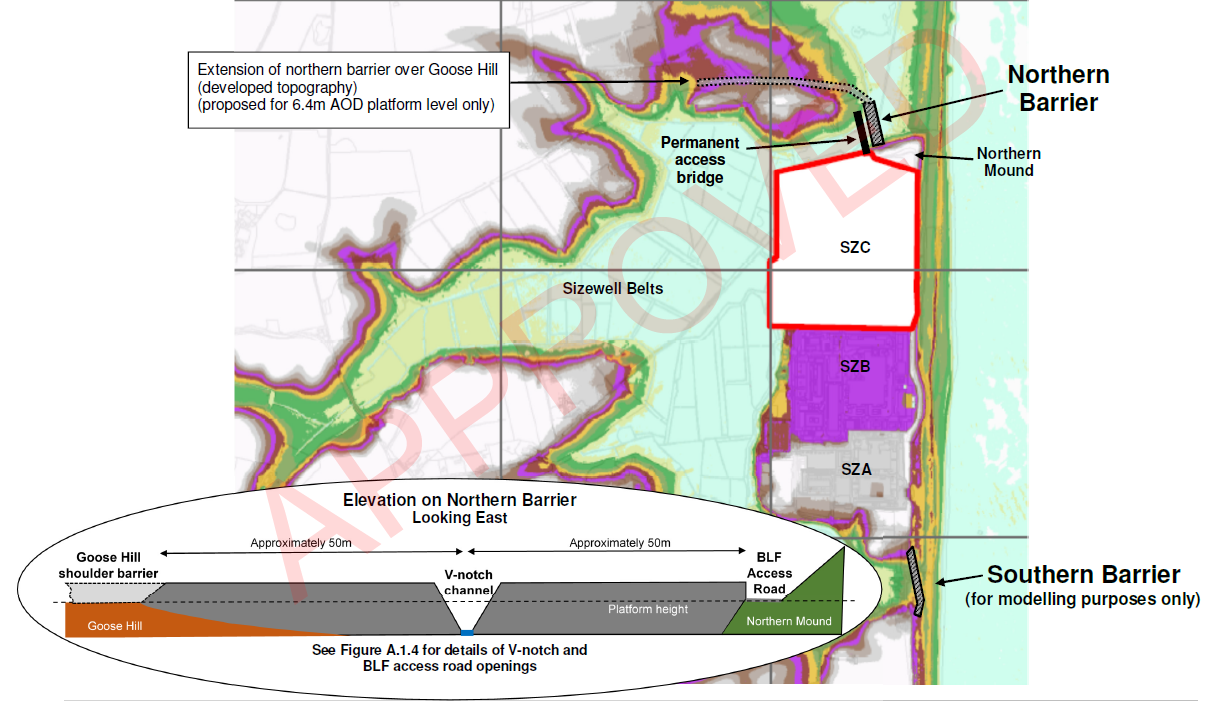


Figure 1: Location of the northern barrier, southern barrier and the permanent access bridge. Figure taken from the Flood Level Analysis report [52] which supported NNB GenCo’s (now SZC Ltd) decision to select a platform height of +7.3 mOD.

1. Note, the DBE is aligned to the ONR Basis of Design term, see Section ‎2.1.2 for more information. [↑](#footnote-ref-2)
2. The planned top deck level ranges from +8.515 mOD at the nuclear island side of the crossing to +8.732 mOD at the temporary construction area (Goose Hill) side of the crossing. [↑](#footnote-ref-3)