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Environment Agency

**Wendy McKay**

**Our Ref:** 20026727

**Your Ref:** EN010012

**Date:** 23 July 2021

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**By email only**

Dear Ms McKay

**Planning Act 2008 – Section 88 and the Infrastructure Planning (Examination Procedure) Rules 2010 – Deadline 5: Comments on Coastal Geomorphology Reports**

**Application by NNB Generation Company (SZC) Limited for an Order Granting Development Consent for the Sizewell C Project**

For Deadline 5 (23rd July) the Examining Authority (ExA) have requested comments on additional reports submitted up to NNBGenCo (SzC) Ltd Deadline 3. We wish to provide feedback on the following reports:

- TR544: Preliminary design and maintenance requirements for the Sizewell C Coastal Defence Feature (Version 2)
- TR545: Storm erosion modelling of the Sizewell C Soft Coastal Defence Feature using the XBeach modelling suite

These comments represent the Environment Agency's view on these Technical Reports. Natural England is the Statutory Nature Conversation Body for DCO advice; the comments in Appendix A are not intended to fetter Natural England in HRA matters.

Yours sincerely

[redacted]

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# Appendix A: Environment Agency comments on Coastal Geomorphology Reports

**TR544 Preliminary design and maintenance requirements for the Sizewell C Coastal Defence Feature (Version 2)**

Please consider these comments in conjunction with the comments provided on TR544v1 at Deadline 3. Comments on individual sections of TR544v2 that have not been changed since version 1 have not been reproduced here.

| Reference | Comment | Suggestion / recommendation |
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| Exec Summary, p.3 | *'The worst-case predicted SCDF erosion from a single event was for a 1:107 year storm7 with 2099 sea levels and receded lateral shorelines (which exacerbate SCDF erosion at the northern and southern extents) in the 2D sand model, but the high erosion (82 m3/m) was only across a short (5 m long) localised section at the permanent Beach Landing Facility (BLF) abutment. At that one location approximately half of the SCDF was eroded, meaning that HCDF exposure would require two such rare events with no intervening recharge, which can be considered highly unlikely because of the return intervals, the commitment by SZC Co. to recharge the SCDF and the predicted lack of change in the Sizewell wave climate (UKCP18; Lowe et al., 2018).'*<br><br>These events would currently be considered rare, but perhaps not in 2099. We know that return intervals will and are changing for extreme storms, and we expect them to continue to do so. Moreover, there is evidence to suggest that clustering of storm events may be increasing in recent decades. Is it reasonable to assume therefore that as a worst case it will continue to increase as a problem in the future?<br><br>With this in mind, we would question whether this scenario should really be considered 'highly unlikely'. | Further information is required to support this assertion, in particular around the potential for increases in occurrence of severe events in the future, and potential the risk of increased clustering of storms. We would encourage the addition of more severe scenarios in the next stage of modelling. |
| Exec summary, p.3 | It is encouraging to see further work proposed, particularly to extend the model period from the end of the operation phase in 2099 to the end of the decommissioning phase. | Provide details on all proposed additional work, including when it would be expected to be shared with us and other MTF members. We understand from the Issue Specific Hearing that the publication date may be Deadline 7. It |

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| | | would be beneficial for the EA to see the scope for this work in advance, so that we might identify any omissions prior to completion of the work. |
| 1.1 p. 7,<br><br>2.3.1 p. 16,<br><br>2.3.2 | We would question whether a high crest is indeed a valid erosion resistant feature as stated here. Artificially raised crests can actually exacerbate erosion and net sediment loss by preventing natural translation of the barrier crest in response to pressures like storms and sea level rise.<br><br>EDF have stated (in the MTF of 02/07/21) that there will be an opportunity for further discussion about SCDF geometry, as design is still at a preliminary stage. We would welcome the chance to discuss this issue further. | Encourage further discussion about the precise geometry of the SCDF at detailed design stage, in particular crest height. |
| 1.1, P.7 | *'…restoring the supratidal area would allow potential re-colonisation (which doesn't occur where supratidal deposits are lost).'*<br><br>This is a slightly misleading statement. Vegetation is capable of naturally recolonising areas stripped during erosion events, under the right conditions. The issue at Sizewell is that it is unlikely the beach will be able to recover its full extent and regain an element of stability – particularly under future sea level scenarios – due to the fixed landward baseline (the HCDF and station). This is not a natural scenario. | It should be made clear that the expected inability of vegetation to naturally recover following erosion events at Sizewell without the presence of the SCDF is a result of the HCDF, and not a natural phenomenon. Without any intervention, it's likely the beach would recede landwards in response to erosion and reform, with vegetation subsequently recovering. |
| 2.3.1, p. 18 | The use of RCP4.5 (mid-range severity) SLR scenario is probably appropriate for the duration of this work (to 2099), but we would recommend modelling (even if just for sensitivity testing) more severe scenarios as part of the work to cover the complete lifetime of the development (e.g. using the EA's exploratory projections to 2300). | Request confirmation of planned work to model and assess risk out to cover the complete lifetime of the development would be helpful. We recommend use of more severe projections beyond 2099 given inherent uncertainties around emissions and sea level, particularly beyond the end of the century. |
| 3.1.2, p. 31 | The additional modelling work undertaken in TR545 (particularly the addition of XBeach-G model runs) has strengthened this section of TR544 considerably by improving the reliability of the erosion projections and increasing confidence in the conservatism of the figures to be used to inform detailed design of the SCDF. | Comment for info / clarity. We look forward to receiving the next stage of assessment out to cover the complete lifetime of the development, and would welcome an early indication of the likely |

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| | However, there is a significant caveat to this, which is that the work to date extends to 2099, and so does not cover the full lifecycle of the station. The planned further work is therefore required to provide us with confidence of the assessments for the full duration of the project. | scope of this work to help us identify any potential omissions prior to completion of the reports. |
| 3.1.2.2, p. 32 | *'…the 2D modelling considered all three storms in the Beast from the East (BfE) storm sequence37, which is a 1:107 year return interval event in terms of cumulative wave power (see Appendix B of BEEMS Technical Report TR543). Statistically speaking, such a storm would not be expected more than once within the operational phase of Sizewell C.'*<br><br>This assessment of the statistical frequency is potentially misleading. It is widely acknowledged that the current return period of events will change with the impacts of climate change, meaning an event which is currently a 1:107 year return period may become more statistically likely (i.e. may occur more frequently) by the end of the century. We are broadly satisfied that the degree of conservatism in the modelling here is sufficient to mitigate for this risk, but a more clear assessment will be necessary for the next stage of modelling (to cover the complete lifetime of the development). | The applicant must be clear when referring to return periods that the statistical risk is likely to change with the impacts of climate change. Evidence should be provided to demonstrate that this has been (or will be in the next stage of modelling) considered when assessing risk. |
| 3.1.2.3, p.37 | *'The buffer volume of 120 m³/m was chosen in Section 3 to represent a highly unlikely occurrence of three sequential BfE style events occurring before the SCDF could be recharged (which is considered to be precautionary). However, in this scenario, which is specific to the BLF abutment where SCDF volumes are smallest, the potential maximum loss of 82 m³/m would leave only enough sediment within the buffer volume for one sequential event of the magnitude of the BfE (Figure 14). However, the return interval of such an event makes this an unlikely occurrence and the modelling used in these calculations is conservative, overpredicting erosion. These results highlight that the permanent BLF abutment area is prone to erosion and at greatest risk of HCDF exposure. Therefore, rapidly recharging this relatively short section of coast will be important to prevent erosion following an unlikely second BfE style storm sequence.'*<br><br>This is an important point, and it should be a point of focus in the CPMMP. It's also not clear whether the assessment that 'the occurrence of three sequential | Further work is needed to explore the potential for more extreme events to occur more frequently in the future in the next stage of modelling. |

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| | BfE style events occurring before the SCDF could be recharged' takes into account the expectation that events which are currently severe (and have low return intervals) will occur more frequently by the end of the century. In other words, is this scenario only unlikely given current conditions, and thus may be more likely by the mid-late century? | |
| 3.1.2.4, p.39 | *'Overall the conclusions from this modelling indicate that , the coarser SCDF composition proposed in Sections 2.4.2 and 2.4.3 will increase the longevity of the SCDF and reduce recharge frequency.'*<br><br>Whilst this is logical on engineering grounds, it bears remembering that coarsening the dominant particle size fraction in the exposed section of the SCDF is not desirable on environmental grounds due to the potential for gradual change to the morphology, and possibly also impacts on designated interest features (such as vegetation species which colonise the natural shingle substrate). It may be more acceptable as a buried layer within the SCDF, providing there is confidence that this is highly unlikely to be exposed. | Comment for consideration during detailed design stage. |
| 3.1.3, p.40 | *'This method also appears to neglect the smaller (but continual) contributions of lesser storm events year-in, year-out, which contribute to the observed trends over periods of years or decades. However, such estimates are based on observed changes in the volume of the active beach face, which is sub-tidal for at least part of every day – the SCDF, by contrast, is expected to be supra-tidal for the majority of the time, particularly the early part of the operational period.'*<br><br>This is a point which will require further examination when modelling beyond 2099 (i.e. when the SCDF might be expected to become more active due to higher sea levels and potentially also more severe storm events). | Comment for consideration during detailed design stage. |
| 3.1.2, p.42 | *'The estimates in this report will be refined and incorporated into the Coastal Processes Monitoring and Mitigation Plan following more detailed modelling (longer time scales, more sea level cases, more particle size cases) and model improvements once additional calibration datasets have been secure. Large variances in RIs due to changing SLR's highlight the need for regular monitoring and revision of not only how sea level rise progresses, but also how the SCDF frontage responds. An examination of real-world performance every decade against the predicted SLRs, SCDF volume changes and RIs should allow improved forecasting and, if needed, adaptation.'* | This is a sensible approach, and one which we support. |

**TR545: Storm erosion modelling of the Sizewell C Soft Coastal Defence Feature using the XBeach modelling suite**

| Reference | Comment | Suggestion / recommendation |
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| 2.2.1, p.19 | *'However, to ensure the model domain was of a size that could be feasibly managed in XBeach, the offshore boundary was actually placed landward of the Sizewell-Dunwich sandbank, at the equivalent water depth. Some frictional dissipation and even breaking of the largest waves would occur over the sandbank (-5.8 m ODN crest elevation), but is not accounted for in this study as the sandbank is not present in the model domain. Therefore, the beach response predicted by the model is considered to be conservative (i.e. more erosive than in reality), as the cumulative wave energy reaching the shore is likely to be larger than in reality under storm wave conditions.'*<br><br>The model effectively discounts the influence of the Sizewell – Dunwich bank entirely. This addresses concerns relating to the possibility for future evolution (namely reduction in height) of the bank. | This is a welcome clarification on the previously asserted conservatism of the modelling work, which we had initially questioned. |
| 2.4, p. 34 | The use of XBeach-G as sensitivity testing for particle size positively addresses EA comments on previous Technical Reports. | N/A |
| 2.4.4, p. 36 | The parameters described here would seem to be appropriately conservative. This is likely to go some way to addressing previous EA comments regarding the degree of conservatism in the modelling of TR531 in particular. | N/A |
| 4.3.2, p. 63 | Examining different particle sizes is useful sensitivity testing, but it should be noted that the preference from an environmental perspective would be to maintain an SCDF consisting of particle sizes within the natural grading for the Sizewell frontage. In addition to avoiding deviating from the native morphology (and morphodynamics) of the frontage (e.g. shifting to a steeper cobble barrier profile) this would reduce the risk of affecting the designated interest features in the area, e.g. by affecting vegetation colonisation.<br><br>Moreover, from a morphological resilience perspective, increased wave runup which periodically reaches and/or overtops the crest of the SCDF should not necessarily be considered a problem, since this is a natural process which is critical to the adjustment of gravel beach profiles to changing conditions and ultimately aids sediment retention. The SCDF, it should be remembered, is not a | No specific action required at this stage. We look forward to further discussion about this area to support the detailed SCDF design. |

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| | flood defence in itself, but rather a sacrificial erosion protection measure designed to broadly mimic the natural beach.<br><br>Coarsening the particle size in the SCDF reduces its ability to nourish adjacent beaches, and therefore slow the rate of adjacent shoreline recession. | |
| 4.4 p. 64 | *'However, the simulations also suggest that sediment from the SCDF will feed the shorelines north and south of the SCDF, and as erosion of the SCDF is predicted to increase with SLR, it is also probable that the additional supply of sediment introduced by the SCDF to the wider beach will increase. The SCDF is therefore expected to act as a source of sediment available to reinforce both the SCDF frontage and the adjacent natural beaches.'*<br><br>To what extent is this dependent on the currently bimodal wave climate (in terms of direction)? If this were to change towards a single more dominant direction through time, we would expect to see a net increase in erosion to one end of the SCDF frontage and decrease to the other. Is this considered a credible scenario? If so, has it been considered? | Seek clarification regarding the potential for changes to wave bimodality due to the impacts of climate change, and whether this has been / will be assessed. |
| 4.6.2, p. 66 | Is there scope and intention to run the model with different crest elevations in order to examine the effect this may have on erosion rates? We generally advise against significantly increasing crest elevation (and thus freeboard) above the natural level since this risks promoting offshore sediment movement by preventing onshore transport due to overtopping / overwashing. It would be helpful to explore whether a lower, more natural crest elevation and more frequent overtopping would increase or decrease the required rate of recharge, for example. | Clarification of any intended further work regarding precise SCDF design. |