The Rt Hon Therese Coffey, 8/1/2023 Revised with additions 9/1/2023

How Sizewell C could be subject to severe flood risk as early as 2050.

On Friday 6th January I emailed you, copy ONR, a coastal flood map in general circulation. The data used by the map are unknown to me.

The following represents my own work.

The mapping tool used below has been developed by the University of Liverpool. It is specific to nuclear sites. I used this mapping tool in my original paper REP2-393. See https://arcoes-dst.liverpool.ac.uk/

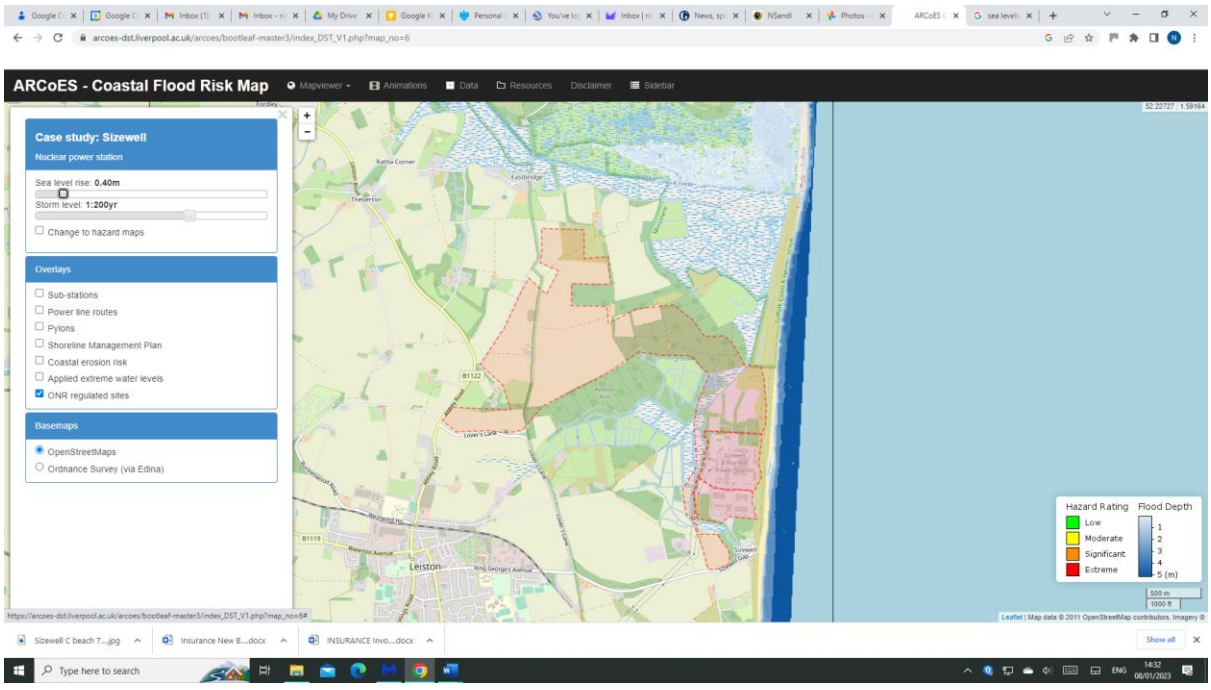
Notes on data:

1) Climate change sea level rise from IPCC information:

The International Panel for Climate Change (IPCC) specific projections for the East Atlantic states 1.5-2.0C and 2.5C (RCP4.5 and RCP8.5 respectively) for dates between 2040 and 2060. *See Table 15.2, Chapter 15, Page 15-58 (IPCC) 6th Assessment Report, Epage 2717 of 3676.* RCP8.5 95 percentile suggests the plausibility of more than 0.4m sea level rise.

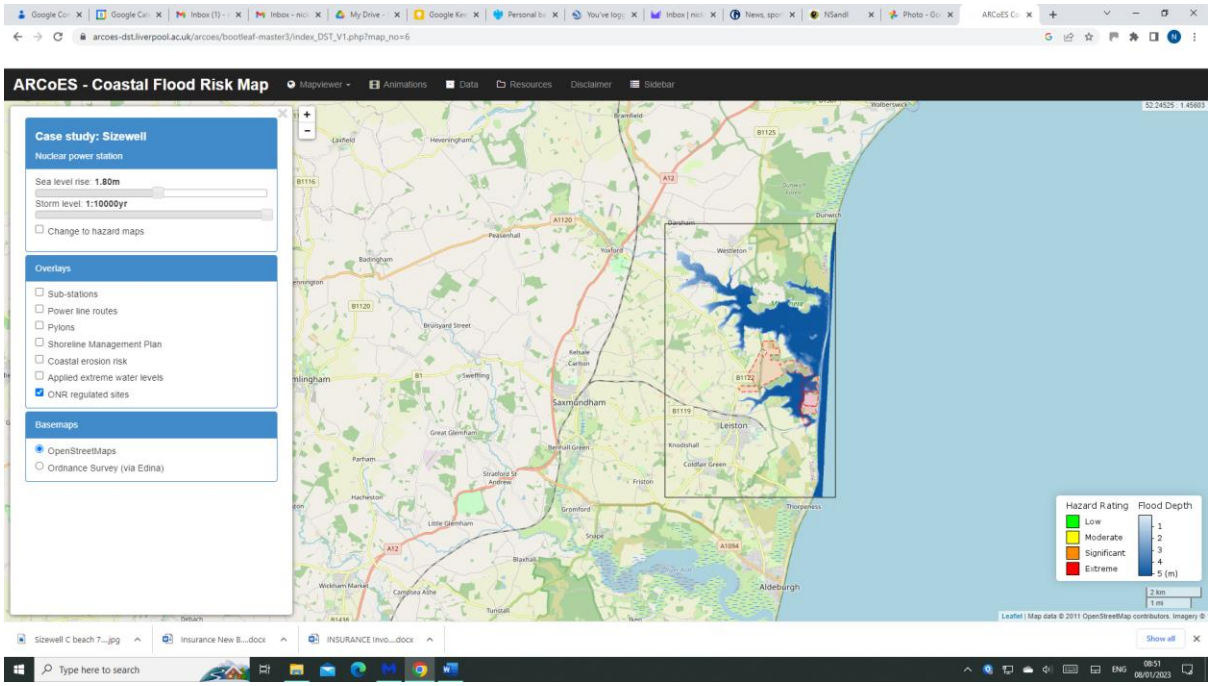
2) Surge event data defined by chainage point 4192 Sizewell (Beems TR319):

The chart below uses the 1:200 surge event of 3.13m, significantly less than the 1953 flood level, but represents an annual occurrence after consideration of the IPCC statement that '*Once per century surges are predicted to occur at least once per year by 2050'.* The 3.13m is more than justified by empirical data in that there were, in fact, *four* storms in the twentieth century averaging 3.19m. See note 1.



Note: this map only reflects still water levels. In my view this represents an approximation to annual still water flood risk for 2050 as obtained from authoritative data including the IPCC.

So, for a more conservative assessment we could allow a 1.8m sea level rise (H+) and a 1:10,000 surge which is necessary for ONR site licence:



Note: this map only reflects still water levels. This map, in my view represents a relatively modest conservative view—the 1:10,000 level is plausible being only 0.6m more than the 1953 flood level and any significant melt of the three major icesheets (GRIS, EAIS WAIS) will result in much greater climate change sea level rise than the H++ 1.9m at 2100 which is the scenario *'recommended for planners'*—no H++ data have been provided beyond 2100. See REP2-393.

Although it is important to study the still water surge levels it is necessary to recognise that this illustrates only a partial aspect of the overall flood risk to Sizewell C.

1) Waves are not considered in the above flood risk projections. The significant 1:100 offshore wave heights are 7.3- 7.8m from the N –NNE sector. Wave heights to 4.7m are a regular occurrence. These waves are currently broken to approximately 2.2-2.4m by the Dunwich bank and further dispersed by the nearshore, longshore bars, its 'daughter sandbanks', before reaching the nuclear coastline. Hence the current shoreline stability.

   In the event of loss of the Dunwich bank *(which is made only of sand, has dropped up to 2m in the last decade and will be subjected to climate-change sea level rise and hence reshaped hydraulic forces)* these offshore waves might be expected to reach the nuclear shoreline unbroken.

2) Coastline erosion is also not considered in the above maps and could be extreme with loss of the Dunwich bank because:

   - unmitigated (unattenuated) offshore waves would now reach the nuclear shoreline;
   - the first 80m or so of the existing nuclear coastline is soft, recently accreted material (1836-1920) and hence particularly vulnerable;
   - storm frequency is expected to increase with climate change. This will result in an increase in the *overall accumulated energy* delivered to shorelines.

These reflections force us to consider sea defences along the coast (littoral) of the Greater Sizewell Bay to cover the Minsmere levels (plus Sizewell Gap) and, as a reasonable, conservative Plan B, sea defences fully surrounding SzC. It also suggests re-appraisal of the main nuclear platform height. The nuclear safety case is obliged to be based on conservative assessment. It is not at all clear to me that this is currently the case.

Kind regards Nick Scarr

Notes:

1)
The IPCC (Intergovernmental Panel on Climate Change) report of 24 September 2019 stated that extreme sea level events that are rare (once per century) are projected to occur much more frequently by 2050 in many places. According to the IPCC report:

- *"Sea level continues to rise at an increasing rate.* ***Extreme sea level events that are historically rare (once per century in the recent past) are projected to occur frequently (at least once per year)*** *at many locations by 2050 in all RCP (Representative Concentration Pathway) scenarios, especially in tropical regions (high confidence). The increasing frequency of high-water levels can have severe impacts in many locations depending on exposure (high confidence). Sea level rise is projected to continue beyond 2100 in all RCP scenarios."*

The applied extreme still water level data at 4192 (Sizewell), which do not incorporate any climate change sea-level rise, are:

1:1	2.21m
1:200	3.13m (3.24m Beems TR139)
1:500	3.36m (3.45m Beems TR139)
1:1,000	3.55m (The 1953 level was 3.44m/3.5m) (3.61m Beems TR139)
1:10,000	4.21m

See BEEMS TR319 page 14 or BEEMS TR139 page 120 for detail

With regard to empirical data, EDF, in the Main Development Site Flood Risk Assessment Document reports four main storm surges in the twentieth century:

> *"• 1927 with tide level of 3.10m AOD;*
> *• 1938 with tide level of 3.25m AOD;*
> *• 1949 with tide level of 3.00m AOD; and*
> *• 1953 with tide level of 3.44m AOD."* There was also a major similar storm in 1897.
> DCO: Main Development Site FRA, op cit., Page 65, Paragraph 5.14. AOD = Above Ordnance Datum
>
> BEEMS TR139 page 138 states: *"…the 1953 and 1897 surge events cannot be considered as especially extreme in the longer-term historical context."*

Average: 3.19m. These storm surges are similar to the 1:200 level but have occurred 4 times in the last century. We can expect then, at least this level to *occur annually by 2050.*

2)
I have confirmed with the International Panel of Climate Change (IPCC) legal office in Geneva that I may cite or quote from their documentation.

3)
Sizewell (C) beach 07/1/2023 showing profound recent change.

4)
Offshore Wave heights.
"The largest waves recorded by a Waverider buoy deployed offshore from the Sizewell-Dunwich Bank complex (SDBC) in 18m of water from 11 February 2008 to 24 February 2011 had a mean direction… of 155° (the direction of travel), a significant wave height, Hm0, of 4.71m and peak period, Tp, of 9.1s (wave power, Pw, 1.54 x 105J/m/s), BEEMS (2012). The Halcrow (2001a) wave hindcast study estimated a maximum 1 in 100 year offshore Hm0 value of 7.8m for waves from the N – NNE sector." 'Thorpeness Coastal Erosion Appraisal Final Report December 2014', Mott Macdonald, Page 15.

According to Pye and Blott, *"Coastal Processes and Morphological Change in the Dunwich-Sizewell Area, Suffolk"*, the 1:100 wave heights would be 7.3- 7.8m. These predictions predate IPCC climate change scenarios which do not particular suggest higher waves, but *more frequent occurrence* of storm waves. (It is important to note that wave height is the difference between the crest and the trough and therefore cannot simply be added to the still water level). See also REP2-393 for more detailed information.