MAES MAWR SOLAR FARM

Environmental Statement: Appendix 8.2 – Climate Risk

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Overview

1.1 This appendix to Chapter 8: Climate Change summarises potential changes in climatic parameters at the Proposed Development location and considers whether there is potential for likely significant environmental effects.

1.2 Besides climate risks to the Proposed Development itself, there are potential inter-relationships between climate change and several other environmental topic areas reported in other chapters of the Environmental Statement (ES), most notably flood risk. The climate projections summarised in this appendix have been provided to all ES chapter authors in order that any changes in the future baseline or sensitive receptors due to climate change can be evaluated if relevant to the respective impact assessments.

Climate Change Projections

1.3 The Met Office Hadley Centre (MOHC) publishes both probabilistic climate change projections and downscaled global circulation model outputs for the UK at various spatial scales. This is called the UKCP18 dataset, first published in November 2018 and at v2.6.0 (MOHC, 2021) at the time of writing. The projections are based on representative concentration pathway (RCP) scenarios used by the Intergovernmental Panel on Climate Change, thereby giving a low-high range in potential global GHG reduction initiatives and resulting rate of climatic effects over a given time period.

1.4 The probabilistic projections published at 25 km grid cell scale are considered the most useful for this assessment, being designed to show a range of projection values that reflect uncertainty in modelled outcomes. The CP18 Overview Report (MOHC, 2018a) and supporting factsheets (MOHC, 2018b) for the wider regional and UK context have also been drawn from.

1.5 The Proposed Development is expected to have an initial 40 year design operating lifetime. Average climate change projections for the period 2040-2069 has therefore been considered.

1.6 The Overview Report and factsheets indicate that in general, warmer, wetter winters and hotter, drier summers are predicted, though of course still with natural variations in that pattern from year to year. No clear trend in wind speeds or storminess is predicted, though the data currently published cannot make projections for local conditions and wind gusts.

1.7 Within the last two decades, annual average temperature and precipitation records have been consistently set in the UK relative to the preceding baseline period, although generally wetter rather than drier summers have been seen in this period. In the near future, roughly the next years to decade, these natural variations will likely continue to be the most visible year-to-year changes in climate but in subsequent decades, within the Proposed Development's operating lifetime, the anthropogenic climatic changes are expected to become more apparent.

1.8 Table 8.1 shows potential climatic changes from the UKCP18 probabilistic dataset averaged over the 2040-2069 period relative to the 1961-1990 baseline for the 25 km grid square in which the site is located. The data presented here is for the emissions pathway RCP8.5, which is a high-emissions scenario assuming 'business as usual' growth globally with little additional mitigation. This is a conservative (worst-case) approach for the assessment.

1.9 In summary, the data within Table 8.1 shows increased intensity in seasonal precipitation trends: precipitation is predicted to increase during the wettest season and decrease during the driest season. Temperatures are anticipated to increase across the year, both during the coldest and hottest seasons and months. Additionally, cloud cover is anticipated to decrease which may result in increased anticipated annual yields.

Table 8.1: Climate Parameter Projections 2040–2069

Parameter†	Units	10th percentile	Median value	90th percentile
Precipitation – annual average	%	-1.18	3.08	7.17
Precipitation – driest season	%	-50.36	-24.07	5.01
Precipitation – wettest season	%	-2.69	14.24	34.04
Precipitation – driest month	%	-48.38	-19.87	14.71
Precipitation – wettest month	%	-9.18	14.56	40.43
Temperature – annual average	ºC	1.07	2.11	3.28
Temperature – hottest season average	ºC	0.96	2.71	4.55
Temperature – coldest season average	ºC	0.54	1.92	3.40
Temperature – hottest month maximum	ºC	0.60	2.87	5.36
Temperature – hottest month average	ºC	0.96	2.99	5.21
Temperature – coldest month minimum	ºC	0.35	2.20	4.20
Temperature – coldest month average	ºC	0.63	1.92	3.29
Cloud cover change	%	-8.64	-4.04	0.55

† daily mean, maximum or minimum, as applicable, averaged over time period specified
n.b. 10th and 90th percentile and median values for scenario RCP8.5

1.10 No clear trend for change in wind speed during this time period is shown in the regional projections data. Probabilistic projections do not provide wind speed data.

Climate Risk and Resilience Scoping

1.11 Based on the information available for the Proposed Development, a high level risk assessment has been undertaken, considering the hazard, potential severity of effect on the development and its users, probability of that effect, and level of influence the development design can have on the risk. The severity of effect score considers the potential consequences of the hazard and the sensitivity of the receptor(s) affected. Each element of the risk assessment has been scored on a scale of one to three, representing low, medium or high; the scores are then summed to give a total risk score. Table 8.2 defines each of these terms.

1.12 Given the variability in the nature of the potential effects of climate change on the development, receptors have been identified on a risk-specific basis, whereby all receptors relate to the continued safe and effective operation of the Proposed Development. In line with IEMA (2020) guidance, the vulnerability and susceptibility have been considered in determining the severity of risk.

1.13 A risk score of five or more has been defined as a risk that could lead to a significant effect of or on the development, prior to mitigation, as this is the minimum score where at least two elements of the risk assessment score are above ‘low’.

1.14 By considering the good practice design measures incorporated into the Proposed Development, professional judgement is used in determining whether the potentially significant effects would result in significant adverse of beneficial effects.

Table 8.2: Severity, Probability and Influence Factor Definitions

Factor	Score definitions

Severity: the magnitude and likely consequences of the impact should it occur.	**1 =** unknown or low impact: for example, low-cost and easily repaired property damage; small changes in occupiers' behaviour.
	2 = moderate impacts with greater disruption and/or costs
	3 = severe impact, e.g. risk to individual life or public health, widespread property damage or disruption to business
Probability: reflects both the range of possibility of climatic parameter changes illustrated in CP18 projections and the probability that the possible changes would cause the impact being considered	**1 =** unknown or low probability of impact; impact would occur only at the extremes of possible change illustrated in projections
	2 = moderate probability of impact, plausible in the central range of possible change illustrated in projections
	3 = high probability of impact, likely even with the smaller changes illustrated as possible in the projections
Influence: the degree to which design of the proposed development can affect the severity or probability of impacts	**1 =** no or minimal potential to influence, outside control of developer, e.g. reliance on national measures or individuals' attitudes/actions; or hypothetical measures would be impracticable
	2 = moderate potential to influence, e.g. a mixture of design and user behaviour or local and national factors; measures may have higher costs or practicability challenges
	3 = strong potential to influence through measures that are within the control of the developer and straightforward to implement

1.15 Table 8.3 shows the climate change risks to the proposed development that have been identified and the risk scores assigned, following the approach set out in paragraph 1.11 and Table 8.2.

Table 8.3: Risk Scores for the Proposed Development

Risk	Severity	Probability	Influence	Total score	Potentially significant?	Embedded mitigation
Flooding of site Flooding of access routes to site	Flood risk is assessed as part of the planning application via a standalone Flood Consequence Assessment and Drainage Strategy.					
Structural damage to panel surfaces and mounting structures from extreme weather events, i.e. high wind speed gusts or high intensity hail.	2	1	2	5	Yes	Panel surfaces and mounting structures are designed to withstand high wind speeds during storm events. Although there is potential for storm events with gales to increase in frequency, the climate projections do not indicate a likelihood of higher peak wind speeds or evidence of intense convective storm events with unusual hail requiring additional mitigation.
High winds causing significant damage to distribution and transmission lines and resulting in more than temporary loss of export capacity for the development.	2	1	1	4	No	Network operators have a statutory requirement to keep overhead power lines clear of vegetation for public safety reasons. Since 2006, operators have also been required to undertake a risk-based programme of resilience vegetation management. Within the proposed development site, intra-array connections would be made with buried cables which are not at risk.
Increased ambient temperatures leading to solar panel and inverter efficiency losses.	1	2	1	4	No	n/a
Transmission and distribution line de-rating (from increased ambient temperatures) leading to development output capacity constraints.	1	1	1	3	No	n/a

1.16 The Climate Change Risk & Adaptation Response for UK Electricity Generation (Energy UK, 2015) concluded that risks to energy infrastructure from climate change remain relatively low. Climate change does not introduce any significant new risks which energy infrastructure developments do not already manage. It does, however, increase the likelihood and severity of such risks.

1.17 Short-term weather events may present more of a risk to the proposed development than long-term climate trends. Furthermore, the industry identifies engineering-related faults as more of a risk to losses in generation than changing weather patterns.

1.18 The most significant risk from climate change to the proposed development arises from flooding. This is assessed as part of the planning application via a standalone Flood Consequence Assessment and Drainage Strategy. Appropriate flood management and resilience measures have been provided.

1.19 With the potential exception of flood risk, the impacts of climate change are unlikely to pose significant risk to the development over the course of its lifetime. Projections of future cloud cover change may result in beneficial impacts, with increased output from the solar farm over its lifetime as cloud cover decreases.

1.20 Network operators have a statutory requirement to keep overhead powerlines clear of vegetation that is a risk in storms and since 2006, operators have also been required to undertake a risk-based programme of resilience vegetation management.

1.21 Overall, it is considered that the potentially significant risks screened in Table 8.3 do not represent new or unexpected issues, and that best practice for the safe operation of electricity generation facilities would mitigate against the likelihood of significant adverse effects thereby reducing the effect to negligible.

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