EAST PARK ENERGY

East Park Energy

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Preliminary Environmental Information Report
Volume 2 – Technical Appendices

Appendix 15-2: Climate Baseline

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Version 01

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1.0 INTRODUCTION

1.1.1 This Baseline Assessment outlines the current climate baseline in the vicinity of the Scheme, based on UK Meteorological Office (Met Office) historical climate averages and regional profile descriptions. In addition, the future climate baseline for the area has been quantified based on the latest UK Climate Projections (UKCP). The findings are used within the ***PEIR Volume 1 Chapter 15*** and other supporting appendices within the PEIR.

1.2 Site Location and Scheme

1.2.1 The Site is located to the north-west of the town of St Neots, and is across two administrative areas; Bedford Borough Council, and Huntingdonshire District Council. The Site location is shown on ***PEIR Volume 3 Figure 1-1***.

1.2.2 The Site area extends to approximately 769 hectares (ha), as shown on ***PEIR Volume 3 Figure 1-2***. The Scheme Boundary includes all land for the solar development areas, BESS, substation, landscaping, cabling, access and grid connection. The elements of the Scheme are described in full in ***PEIR Volume 1 Chapter 2***.

2.0 CURRENT BASELINE CLIMATE

2.1.1 The current climate baseline at the Site has been determined based on Met Office historical climate averages data from the period 1991-2020, from the closest meteorological station with this historical data, Bedford (approximately 6 km to the south-west of the Site in a straight line) and Met Office UK regional climate summaries from the same time period for Eastern England[1] and the Midlands[2]. The Site is located within the Eastern England region. However, as it is close to the western boundary of the region, the Midlands region has also been summarised.

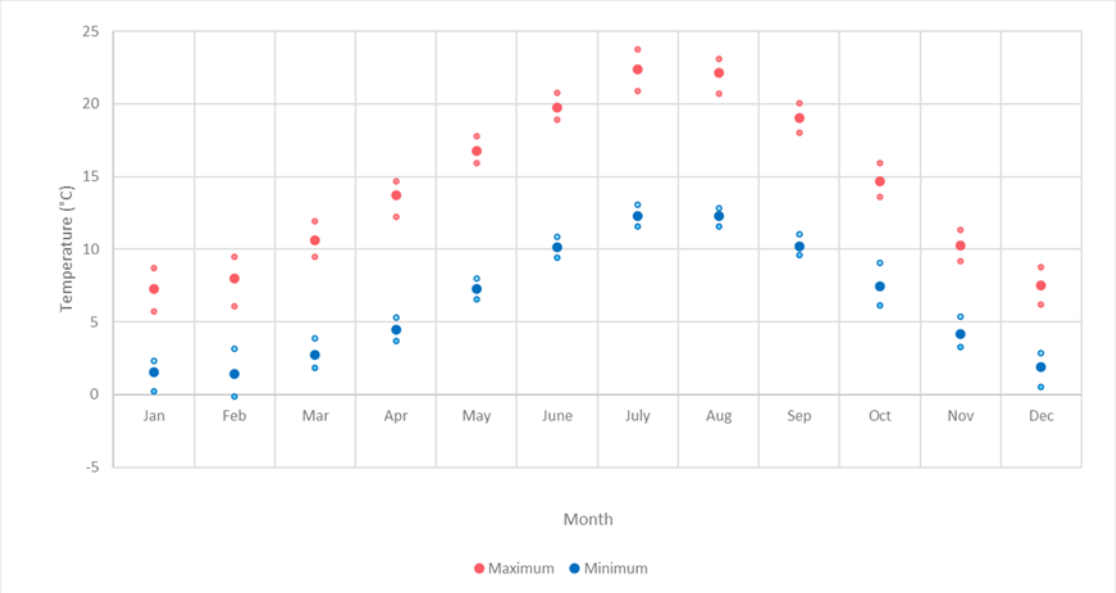
2.1.2 Within this analysis, winter refers to the months of December, January and February, and summer refers to the months of June, July and August.

2.2 Temperature

2.2.1 The long-term annual mean at Bedford is 10.4°C. Temperature shows both a seasonal and a diurnal variation, with January being the coldest months and July being the warmest month.

2.2.2 The long-term mean temperature during winter recorded at Beford is 4.6°C and the long-term mean temperature during summer is 16.5°C. The maximum mean temperature during winter is 7.6°C and the maximum mean temperature during summer is 21.4°C. It should be noted that temperatures presented are means, and there will be individual days where the temperature will be greater (or lower) than this each year. Figure 1 graphically shows the temperature trend for Bedford from 1991 to 2020.

Figure 1: Long term temperature trend recorded at Bedford 1991 – 2020



Source: *https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcrws0hwg*

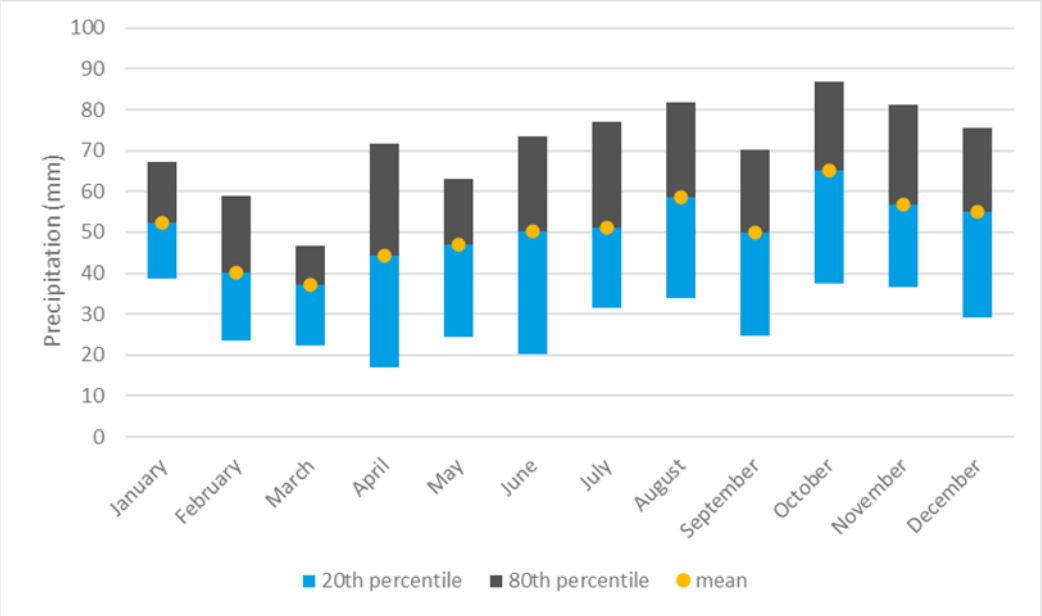
2.3 Precipitation

2.3.1 Across the UK, rainfall tends to be associated with Atlantic depressions or with convection. The Atlantic lows are more vigorous in autumn and winter

and bring most of the rain that falls in these seasons. In summer, convection caused by solar surface heating sometimes forms shower clouds and a large proportion of rain falls from showers and thunderstorms. A further factor that greatly affects the rainfall distribution is altitude. Moist air that is forced to ascend hills can be cooled below the dew point to produce clouds and rain.

2.3.2 Within the Eastern England and Midland regions, there is a much more even distribution of rainfall throughout the year than in most other parts of the UK. This is due to the higher ground to the west acting as a 'rain shadow' from winter Atlantic depressions and a higher frequency of convective rainfall in summer. The mean annual precipitation at Bedford is 50.7mm, reflecting the low precipitation of the region. For context, the UK mean annual precipitation in 2023[3] was 1,290mm. Long-term data from Bedford shows that there tends to be higher rainfall over summer and autumn than the winter and spring. Long term seasonal means recorded at Bedford are 53.4mm in summer and 49.2mm in winter. Figure 2 graphically shows the precipitation trend for Bedford from 1991 to 2020.

Figure 2: Long term precipitation trend recorded at Bedford 1991 – 2020



Source: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcrws0hwg

2.3.3 The regional climate profile for Eastern England mentions some noteworthy severe storms in the region. However, these events caused the most extensive damage nearer the coast in Norfolk and Suffolk. No notable storms were mentioned in the Midlands regional climate profile.

2.3.4 The number of thunderstorms in a year can make a significant contribution to the total annual rainfall. They can occur throughout the year but are more frequent during the summer months on the eastern side of the UK. In some thunderstorms or heavy showers, the precipitation may be in the form of hail. However, the Met Office regional climate profiles for Eastern England and the Midlands does not refer to any noteworthy hail storms or thunderstorms near to the Site.

2.3.5 The occurrence of snow is linked closely with temperature, with falls rarely occurring if the temperature is higher than 4°C. For snow to lie for any length of time, the temperature normally has to be lower than this. Snowfall is not included within the historical climate average data from Bedford. However, the Met Office regional climate profile for Eastern England states the average number of days with snow falling each year ranges from under 20 days in the south east of the area to over 30 days on higher ground. The Met Office climate profile for the Midlands states the number of days with snow falling a year varies greatly due to differences in altitude across the region. The number of days with snow fall varies from about 20 days per year in the lower Severn valley to over 35 days in upland areas such as the Peak District. As the Site is in low lying, sheltered land, the Site is unlikely to get a significant number of days with snow fall.

2.4 Wind

2.4.1 Eastern England and the east of the Midlands are generally quite sheltered parts of the UK, since the windiest areas are to the north and west, closer to the track of Atlantic storms. The strongest winds are associated with the passage of deep depressions across or close to the UK. The frequency and strength of these depressions is greatest in the winter months.

2.4.2 The long term annual mean wind speed at Bedford, recorded at 10m height, is 8.9 knots, with some annual variation showing higher wind speeds in January and February. Wind speed is also sensitive to local topographic effects, with places sheltered by hills or wooded/urban areas having lower wind speeds.

2.4.3 Wind direction tends to blow from the south or south-west, as Atlantic depressions pass the UK, and later comes from the west or north-west as the depression moves away. The range of directions between south and north-west accounts for the majority of occasions and the strongest winds nearly always blow from this range of directions. Springtime tends to have a maximum frequency of winds from the north-east.

2.4.4 A day of gale is defined as a day on which the wind speed attains a mean value of 34 knots or more over any period of 10 minutes. Most of the Midlands and Eastern England regions experience no more than two days of gale each year, with only exposed areas having more than this.

2.5 Summary

2.5.1 A summary of the baseline has been included in Table 1.

Table 1: Existing baseline conditions

Item	Units	Baseline (Bedford (1991-2020
Mean annual temperature	°C	10.4
Mean winter temperature	°C	4.6
Mean summer temperature	°C	16.5
Mean in winter precipitation	mm	49.2
Mean summer precipitation	mm	53.4

3.0 FUTURE BASELINE CLIMATE

3.1.1 The future climate baseline at the Site has been defined using the latest UK Climate Projections (UKCP) which provides the most up-to-date assessment of how the UK's climate may change in the future. The latest version is UKCP18.

3.1.2 UKCP18 has predictions based on different emissions scenarios. These are determined by the Representative Concentration Pathways (RCPs), which specify concentrations of GHGs that will result in total radiative forcing (the difference between the incoming and outgoing radiation at the top of the atmosphere). Radiative forcing targets for 2100 have been set at 2.6, 4.5, 6.0 and 8.5 watts per square metre (w/m^2) to span a wide range of plausible future emissions scenarios. Each scenario includes many assumptions regarding population growth, economic development, technological innovation and attitudes to social and environmental sustainability. This assessment has used the data produced by using the high emissions scenario (RCP8.5). This is the worst-case scenario as this is based on a massive increase in col use across the world but is recommended for use by IEMA unless a cast can be made for using a different, lower emission scenario. In UKCP18, the probabilistic projections provide local low, central and high changes across the UK, corresponding to 10%, 50% and 90% probability levels. This assessment has used the central estimate, which is considered to be the level at which as much evidence points to a lower outcome as a higher one. The 10^{th} and 90^{th} percentiles reflect the lowest and highest 10% of the model runs - the value at which 10% of the model runs fall at or below (10^{th} percentile) or at and above (90^{th} percentile) fall at or above. These have been considered where the direction of change is predicted to vary at each level. The predictions also cover a range of spatial resolutions. The data scenario from which the future baseline has been calculated and is summarised in Table 2.

3.1.3 The UKCP18 regional profiles are based on the UK administrative regions and therefore, vary slightly from the Met office regional profiles. Within the

Met office regional profiles, the Site falls just within Eastern England; however, within the UK administrative regions, the Site falls within the East of England. Therefore, the East of England region has been used for the future climate predictions.

Table 2: Future climate change data scenario summary

Parameter	Choice
Projection	UKCP18
Emission scenario	RCP8.5
Percentile	50th, 10th and 90th (where appropriate)
Climate area	East of England
Baseline time	1981 – 2000
Time horizon for future climate	2060 - 2079

3.1.4 The identified changes have been incorporated into the current baseline from Bedford to give a local prediction of future climate.

3.1.5 It is noted that the baseline from which the predicted changes are based is not the same as the baseline climate data from Bedford. Therefore, some of the results may be slight over or under estimations. Nevertheless, they offer an estimate sufficient for this assessment to determine likely significant effects.

3.2 Temperature

3.2.1 Climate change is projected to lead to hotter summers and warmer winters. Probabilistic projections show that there is more warming in summer than winter, and a more pronounced north-south contrast in summer. This trend is projected in the low, central and high estimates. The projected changes in

mean temperature as a central estimate are an overall annual increase of 2.9°C, an increase of 2.4°C in winter and an increase of 3.6°C in summer.

3.3 Precipitation

3.3.1 Over land, projections indicate a move towards wetter winters and drier summers as a central estimate. However, there is some variation in the projections. The change in winter precipitation for the low estimate is projected to decrease, but for the central and high estimate this is projected to increase. The change in summer precipitation for the low and central estimate is projected to decrease, but for the high estimate is predicted to increase. Projections also show that it is likely that more rain will fall during intense or extreme events.

3.3.2 The projected change in mean precipitation during winter is for an increase of 15% as a central estimate (the 50th percentile). Projected change in mean precipitation during summer is for a decrease of 22% as a central estimate.

3.4 Wind

3.4.1 There is large uncertainty in projected changes in wind and air circulation across the UK and it is difficult to represent regional extreme winds for the future. However, projections indicate there will be an increase in near surface wind speeds over the UK and more significant impacts of wind will be experienced in the winter months, including an increase in frequency of winter storms.

3.5 Summary

3.5.1 Table 3 shows the variations in projections at the low, medium and high estimates.

Table 3: Future baseline climate condition variables

Item	Units	Low estimate – 10th %ile	Central estimate – 50th %ile	High estimate – 90th %ile
Mean annual temperature	°C	1.6	2.9	4.2
Mean winter temperature	°C	0.9	2.4	4.2
Mean summer temperature	°C	1.7	3.6	5.5
Mean in winter precipitation	mm	-3	15	37
Mean summer precipitation	mm	-52	-22	9

3.5.2 It should be noted that predictions are a general trend. Due to natural variations, there will still be cold winters, dry winters, cooler summers and wetter summers. Table 4 summarises the future baseline climate conditions at Bedford.

Table 4: Future baseline climate conditions at Site

Item	Units	Baseline (Bedford 1981 – 2010)	Predicted change (UKCP18)	Future baseline (at Bedford 2040 – 2059)
Central (50th %ile estimate)				
Mean annual temperature	°C	10.4	2.9	13.3
Mean winter temperature	°C	4.6	2.4	7.0
Mean summer temperature	°C	16.5	3.6	20.1
Mean in winter precipitation	mm	49.0	15.0%	56.0
Mean summer precipitation	mm	53.0	-22.0%	41.0
Central (90th %ile estimate)				

Item	Units	Baseline (Bedford 1981 – 2010)	Predicted change (UKCP18)	Future baseline (at Bedford 2040 – 2059)
Mean summer precipitation	mm	53.0	9.0%	58.0
Central (90th %ile estimate)				
Mean summer precipitation	mm	49.0	-3.0%	48.0

4.0 REFERENCES

[1] Met Office (2016). *Eastern England: Climate.* Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/eastern-england_-climate---met-office.pdf [Last Accessed: 08 August 2024]

[2] Met Office (2016). *Midlands: Climate.* Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/regional-climates/midlands_-climate---met-office.pdf [Last Accessed: 08 August 2024]

[3] Met Office (2024). *Annual Summary 2023.* Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/summaries/uk_climate_summary_calendar_year_2023.pdf [Last Accessed: 08 August 2024]