EAST PARK ENERGY

East Park Energy

EN010141

Environmental Statement
Volume 2 – Technical Appendices

Appendix 15-3: Climate Resilience Assessment

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1.0 INTRODUCTION

1.1.1 This climate resilience assessment details the extent the Scheme is vulnerable to, and how it will be resilient to, the effects of climate change. The methodology is set out in **ES Volume 1 Chapter 15: Climate Change [EN010141/DR/6.1]**.

1.1.2 The resilience of the Scheme has been assessed for the following vulnerable receptors:

- Operational equipment (solar PV modules, BESS, transformers, inverters, substation, and cabling);
- Vehicular access to Scheme; and
- On-site workers.

1.1.3 This has considered the following projected changes to climate as identified in **ES Vol 2 Appendix 15-2: Climate Baseline [EN010141/DR/6.2]**:

- Increased winter precipitation;
- Decreased summer precipitation;
- Increase in temperatures;
- Increased frequency and magnitude of storms; and
- Changes in cloud cover.

2.0 INCREASED WINTER PRECIPITATION

2.1.1 As set out in **ES Vol 2 Appendix 15-2: Climate Baseline [EN010141/DR/6.2]** the UKCP18 predictions are that there will be a move to wetter winters. As a central estimate it is predicted that mean precipitation during winter will increase by 9% by 2060-2079 from existing levels. This predicted increase in precipitation will increase the potential for flooding.

2.2 Operational equipment

2.2.1 Flooding within the Order Limits has the potential to result in the damage of equipment resulting in a loss of electricity generation. The extent of flooding will determine the level of damage which could be caused.

2.2.2 **ES Vol 2 Appendix 8-1: Flood Risk Assessment [EN010141/DR/6.2]** provides full details of the flood risk within the Order Limits and includes consideration of the potential for fluvial, surface water, groundwater and reservoir flooding. As set out only small areas within the Order Limits are located within fluvial Flood Zones 2 and 3, and the main electrical equipment will be located in areas at the lowest possible risk of fluvial flooding (i.e. Flood Zone 1). Small areas of solar PV panels will be located within the identified pluvial (surface water) flood zone. However, it is proposed that all panels are elevated above predicted flood levels on piled supports. The land within the Order Limits is not at risk of flooding from reservoir failure events or groundwater. To manage the risk of surface water flooding an **outline Surface Water Management Plan (oSWMP) [EN010141/DR/7.13]** has been developed to ensure a neutral or beneficial effect on-site and on third party surface water flood risk. The calculations within the oSWMP include the climate change allowance recommended by the Environment Agency. Therefore, although the risk of surface water flooding may increase as a result of increased precipitation there are measures in place to mitigate the effects (i.e. the increased risk of surface water flooding) on the Scheme.

Sensitivity

2.2.3 The sensitivity of the operational equipment to flooding is deemed to be medium for the following reasons:

- The value of the receptor is high as the operational equipment have a high monetary value.
- The vulnerability is considered to be moderate as there are small parts of the site that are within Flood Zones 2 and 3 and surface water flooding may be exacerbated as a result of climate change.
- The susceptibility is deemed to be low as the following effective mitigation measures are in place to allow the Scheme to withstand the projected increases in rainfall and associated flooding events:
    - All electrical infrastructure is located in areas at the lowest possible risk of fluvial flooding, i.e. in Flood Zone 1.
    - Small areas of solar panels are within areas identified as being at risk from pluvial flooding according to national scale pluvial flood mapping. However, in these areas, it is proposed that all panels are elevated above predicted flood levels on piled supports.
    - The solar PV panels will be fixed at an angle with a maximum height of 3m and a minimum height of 0.8m above existing ground levels along the top edge and along the bottom edge of the array, respectively. This will allow surface water to flow under the panels similar to pre-development/baseline conditions.
    - A climate change allowance has been included in the oSWMP as recommended by the Environment Agency, therefore there are measured in place to mitigate any increased pluvial flooding.
    - The existing design specifications at Eaton Socon Substation means the probability of failure due to flooding is minimal. Therefore, it is unlikely that the operation of the Scheme would be affected.

Magnitude

2.2.4 The overall magnitude of effect is small for the following reasons:

- The probability of increased rainfall is high and this is projected to occur in both the central and high estimate, but the probability of increased flooding within the Order Limits is low as the main electrical equipment will be located in areas at the lowest possible risk of flooding, and an oSWMP has been developed which includes an allowance for climate change.
- The consequence of serious flooding would be damage to electrical equipment and disruption to the export of electricity from the Scheme until flooding subsides and the equipment has been repaired. However, electricity could be supplied from other sources connected to the national grid.

Significance

2.2.5 As a result, it is considered that the predicted increase in precipitation leading to the increased potential for flooding would be of slight significance to the operational equipment.

2.3 Vehicular access

2.3.1 Flooding within the wider area has the potential to result in the disruption of access to the Scheme. The extent of flooding will determine the level of disruption caused. However, the Scheme could continue to operate if the equipment is not damaged and flooding is limited to the wider area.

Sensitivity

2.3.2 The sensitivity of the vehicular access to the Scheme to increased precipitation is deemed to be medium for the following reasons:

- The value of the receptor is high as the vehicular access is required for full-time and maintenance workers.

- The vulnerability is considered to be moderate because the local access routes which may be at risk of flooding and the risk of flooding is likely to increase throughout the lifetime of the Scheme.
- The susceptibility is deemed to be low as there are effective mitigation measures in place to clear any flooding of access routes into the Site and alternative routes can be taken and the Scheme.

Magnitude

2.3.3 The overall magnitude of effect is small for the following reasons:

- The probability of increased rainfall is high and this is projected to occur in both the central and high estimate, but the probability of increased flooding to vehicular access routes is medium as most roads are designed to be tolerant to flooding.
- The consequence of flooding on vehicular access is the workers' commutes will be disrupted, but the plant could still operate if infrastructure was not damaged. Additionally, during the operational phase there are less workers required on-site. Maintenance works could be re-arranged if necessary.

Significance

2.3.4 As a result, it is considered that the predicted increase in precipitation leading to the increased potential for access route flooding would be of slight significance.

2.4 On-site workers

2.4.1 Increased rainfall linked to climate change can impact on-site workers by resulting in dangerous working conditions. However, there are mitigation measures built into the design including the use of Risk Assessment Method Statements (RAMS). Staff will be equipped with the correct PPE (that is also appropriate for the weather), trained in on-site health and safety. Workers

would not be able to or be expected to work in areas of the Site that are flooded.

3.0 DECREASED SUMMER PRECIPITATION

3.1.1 As set out in **ES Vol 2 Appendix 15-2: Climate Baseline [EN010141/DR/6.2]** the UKCP18 predictions are that there will be a move to drier summers. As a central estimate it is predicted that mean precipitation during summer will decrease by 22% by 2060-2079 from existing levels. This predicted decrease in precipitation could increase the risk of drought. This could lead to water shortages.

3.1.2 The water supplier for the area is Anglian Water. Anglian Water understands that the region they cover is the driest and lowest lying in the UK, with over 1,200km of coastline, making it more vulnerable than most to the effects of climate change. Anglian Water's Strategic Direction Statement sets out a number of measures to overcome the climate challenges. This includes a commitment to a Water Resources Management Plan to transform the resilience of the network to drought and to ensure customers a supply of water.

3.1.3 The Applicant is proposing rainwater harvesting tanks within East Park Site D at the East Park substation and the storage, operations and maintenance building. The roofs of these buildings are likely to cover a large area, with an estimate (as set out under Design Principle 1.3 of Section 5 of the **Design Approach Document [EN010141/DR/5.7]**) that in an average year the total rainfall that could potentially be captured by the roofs would be up to 1,116,130 litres. Utilising a proportion of this harvested rainwater would reduce demand on mains water supply, providing greater resilience for future changes in climate during times of drought.

3.2 Operational equipment

3.2.1 The Scheme does not need a water supply to operate. However, water is used for cleaning the solar PV modules and for firefighting purposes.

3.2.2 The BESS will be located within Cambridgeshire and following initial discussions with Cambridgeshire Fire and Rescue Service it was agreed that

on-site water storage tanks will be provided. The water storage tanks will reduce the reliance on a fixed supply for firefighting purposes.

Sensitivity

3.2.3 The sensitivity of the operational equipment to water shortage as a result of decreased summer precipitation is deemed to be low for the following reasons:

- The value of the receptor is high as the operational equipment have a high monetary value.
- The vulnerability is considered to be low as water is not required for the Scheme to operate but the solar PV modules will work less efficiently when they are not cleaned.
- The susceptibility would be low as:
    - Anglican Water has effective mitigation measures in place to ensure a reliable supply.
    - Fire water storage tanks and rainwater harvesting will be provided to reduce the reliance on a fixed supply.

Magnitude

3.2.4 The overall magnitude of effect is small for the following reasons:

- The probability of decreased summer precipitation is high, but due to the mitigation measures committed to by Anglian Water and the fire water storage tanks and rainwater harvesting, the probability of reduced water supply is low.
- The consequence would be that the solar PV modules would work less efficiently until they are next cleaned.

Significance

3.2.5 As a result, it has been considered that decreased summer rainfall leading to the increased potential for drought and lack of water supply would be of negligible significance to the operational equipment.

3.3 Vehicular access

3.3.1 The projected decrease in precipitation and increased risk of water shortages is not expected to affect vehicular access to the Scheme.

3.4 On-site workers

3.4.1 The projected decrease in precipitation and increased risk of water shortages is not expected to affect on-site workers. The measures set out by the water supplier would ensure that a supply for welfare facilities is secured and this allows for the effects of climate change.

4.0 INCREASE IN TEMPERATURES

4.1.1 As set out in **ES Vol 2 Appendix 15-2: Climate Baseline [EN010141/DR/6.2]** the UKCP18 predictions are that there will be an increase in temperature across the UK. Probabilistic projections show that there is likely to be more waring in summer than winter. The projected change in mean temperature (as a central estimate) is an overall increase of 2.9°C, with an increase of 3.6°C in summer by 2060-2079 from existing levels.

4.2 Operational equipment

4.2.1 The predicted increase in temperatures has the potential to cause materials to be heated up to higher temperatures than currently which could cause damage to equipment and reduce the efficiency of the Scheme.

Sensitivity

4.2.2 The sensitivity of the operational equipment to increased temperatures is deemed to be low for the following reasons:

- The value of the receptor is high as the operational equipment have a high monetary value.
- The vulnerability is moderate as the materials have the potential to be affected by extremes in temperatures.
- The susceptibility is low as the materials used are tolerant for a range of temperatures well within the projected temperatures for the UK. Although the candidate equipment has not been chosen yet, the equipment is likely to have specifications like below:
    - The BESS will likely have a temperature controlled forced air cooling system which will be used to stabilise temperature and humidity to maintain a stable minimum temperature optimising performance. The BESS will likely be designed to operate safely between -35°C and 60°C.
    - The operating temperature for the solar PV modules is likely to be between -40°C and 85°C.

- The solar PV substructure will likely be made of galvanised steel with piles driven into the ground. Galvanized steel mounting support can withstand very large range of ~-50°C to 100°C.

Magnitude

4.2.3 The overall magnitude of effect is small for the following reasons:

- The probability of increased temperatures is high, but the probability of temperatures high enough to damage the operational equipment is low.
- The consequence is the operational equipment may undergo damage but only at very high temperatures (outside the likely temperatures in the UK), but this would be repairable at the operators cost and impacts would be short term.

Significance

4.2.4 As a result, it has been considered that the predicted increase in temperatures would be of negligible significance to the operational equipment.

4.3 Vehicular access

4.3.1 The projected increase in temperatures is not expected to affect vehicular access to the Scheme.

4.4 On-site workers

4.4.1 Projected increases in temperatures can impact on-site workers by resulting in dangerous working conditions. However, there are mitigation measures built into the design including the use of Risk Assessment Method Statements (RAMS). Staff will be equipped with the correct PPE (that is also appropriate for the weather), trained in on-site health and safety and informed about protecting themselves from the dehydration and the sun. In addition, air-conditioning will be provided in indoor areas where staff could be expected to be present.

Sensitivity

4.4.2 The sensitivity of the on-site workers to increased temperatures is deemed to be medium for the following reasons:

- The value of human life is high.
- The vulnerability is considered to be moderate as it is likely that temperatures will increase on-site, and workers have the potential to be affected by this.
- The susceptibility is deemed to be low, as mitigation measures would be in place such as access to appropriate PPE, education and appropriate ventilation. However, on-site workers may still be impacted by the increase in temperatures, but they would be exposed to these in their everyday life.

Magnitude

4.4.3 The overall magnitude of effect is small for the following reasons:

- The probability of increased temperatures is high. However, this will apply to the ambient air which on-site workers would be exposed to in their everyday life. The probability of regular negative impact to the on-site workers from extreme high temperatures is medium.
- The consequence of increased temperatures causing heat stroke would result in staff absences. However, high heat occasions would only occur in summer and for a few days at a time and appropriate measures to mitigate the effects will be in place.

Significance

4.4.4 As a result, it has been considered that the predicted increased temperatures leading to the increased potential for uncomfortable working conditions for the on-site workers would be of slight significance.

5.0 INCREASED FREQUENCY AND MAGNITUDE OF STORMS

5.1.1 As set out in **ES Vol 2 Appendix 15-2: Climate Baseline [EN010141/DR/6.2]** there is a large uncertainty in projected changes in wind and air circulation across the UK. However, projections indicated there will be an increase in frequency and magnitude of storms. The predicted increase in extreme events could increase precipitation rates and high wind speeds. The effects as a result of the predicted increase in precipitation has been covered in Section 2.0. This section will focus on the effect of wind gusts. The UKCP18 projections predict that wind speeds will increase, but do not quantify what the increase will be.

5.2 Operational equipment

5.2.1 Gusts in wind could cause structural damage to the operational equipment. The projected increased frequency of these events can result in damaged to operational equipment.

Sensitivity

5.2.2 The sensitivity of the operational equipment to increased frequency and magnitude of winds is deemed to be medium for the following reasons:

- The value of the receptor is high as the operational equipment has a high monetary value.
- The vulnerability is moderate. The area is likely to experience higher wind speeds which the operational equipment will be exposed to. Additionally, increased wind speeds could cause branches and other objects to fall and damage the operational equipment.
- The susceptibility is low as the operational equipment, including PV panels, mounting structure and containerised electrical infrastructure will have the ability to withstand high wind speeds. As an example, a candidate PV panel can withstand a wind load of up to 2,400 pa.

Magnitude

5.2.3 The overall magnitude of effect is small for the following reasons:

- The probability of increases in extreme events is high, however, the probability of the operational equipment being damaged is low as the equipment will be designed to withstand strong winds.
- The operational equipment may undergo damage if branches are to fall on it. The damaged solar PV modules would work at a lower efficiency until they are replaced, and the electrical equipment could potentially be temporarily out of action depending on the size of the object.

Significance

5.2.4 As a result, it has been considered that the predicted increase in extreme events leading to the potential increase in wind damage would be of slight significance to the operational equipment.

5.3 Vehicular access

5.3.1 Gusts in wind could cause road blockages as a result of fallen trees. The projected increased frequency of these events can result a greater number of days where access could be disrupted.

Sensitivity

5.3.2 The sensitivity of the vehicular access to road blockages caused by fallen trees is assessed to be medium for the following reasons:

- The value of the receptor is high as the vehicular access is required for full-time and maintenance workers to enter and leave the Site.
- The vulnerability is moderate, as it is possible that part of the vehicular access route could be blacked by trees and branches that have fallen as a result of higher wind speeds.
- The susceptibility is deemed to be low as there are effective mitigation measures in place to clear any blockages or provide alternative routes.

Magnitude

5.3.3 The overall magnitude of effect is small for the following reasons:

- The probability of increased extreme events is high, but the probability of this impacting the vehicular access routes is medium, as the Highways Agency are responsible for clearing blockages on strategic roads quickly and any onsite roads can be cleared when conditions are suitable.
- The consequence of blockages to access routes and the workers' commutes will be disrupted but the plant could still operate if infrastructure was not damaged.

Significance

5.3.4 As a result, it is considered that the predicted increase in frequency of storms as a result of changes to climate would be of slight significance to the vehicular access to the Scheme.

5.4 On-site workers

5.4.1 Increased wind speeds can increase the risk to hazards such as equipment, and debris being shifted by wind gusts, coming loose and falling on workers. Regular inspections and preventative maintenance will reduce the risk to on-site workers. The projected increased frequency of these events can result a greater potential for damage to occur.

Sensitivity

5.4.2 The sensitivity of the on-site workers to increased safety risks as a result of increased frequency of high wind speeds is deemed to be medium for the following reasons:

- The value of human life is high.
- The vulnerability is considered to be moderate as it is likely that wind gusts will increase and workers on-site may be affected by this.
- The susceptibility is deemed to be low, as the on-site workers have access to appropriate PPE and education. Preventative maintenance and regular inspections and RAMS will be in place to ensure on-site worker safety.

Magnitude

5.4.3 The overall magnitude of effect is small for the following reasons:

- The probability of increased extreme events is high, however the probability of this impacting on-site workers in low due to the imbedded mitigation measures.
- The consequence of increased frequency of high wind speeds is injury to or death of workers.

Significance

5.4.4 As a result, it has been considered that the predicted increase in frequency of high wind speeds leading to increased risk to on-site workers would be of slight significance.

6.0 CHANGES IN CLOUD COVER

6.1.1 Just as clouds affect climate, changes in the climate affect clouds. This relationship is known as cloud-climate feedback and it a challenging research area in climate science. Climate scientists predict that as Earth's climate warms, there will also be fewer clouds to cool it down. This would result in an increase in solar radiation and result in increased temperatures.

6.2 Operational equipment

6.2.1 Whilst increased solar radiation would result in more energy generation from the Scheme, there would also be an associated increase in temperature which has the potential to damage operational equipment.

Sensitivity

6.2.2 The sensitivity of the operational equipment to increases in solar radiation and temperature as a result of changes to cloud cover is deemed to be medium for the following reasons:

- The value of the receptor is high as the operational equipment has a high monetary value.
- The vulnerability is moderate as the materials have the potential to be affected by extremes in temperatures, but increased solar radiation would result in more energy generation from the Project.
- The susceptibility is low as the operational equipment will have the ability to withstand increases solar radiation. Although the candidate equipment has not been chosen yet, the equipment is likely to have specifications like below:
    - Whilst BESS are susceptible to overheating which can lead to degraded performance, shortened lifetime and fire risk. A temperature controlled forced air cooling system will likely be used to stabilise temperature and humidity to maintain a stable minimum temperature optimising performance. A candidate BESS is

designed to operate safely between -35°C and 60°C. It is unlikely that temperatures in the UK would exceed this range.

- The operating temperature for the candidate solar PV modules will likely be between -40°C and 85°C. It is unlikely that temperatures in the UK would exceed this range.
- The solar PV substructure will be made of galvanised steel with piles driven into the ground. Galvanized steel mounting support can withstand very large range of ~-50°C to 100°C.

Magnitude

6.2.3 The overall magnitude of effect is small for the following reasons:

- The probability of reduced cloud cover is medium.
- The consequence of reduced cloud cover is that solar PV modules will generate more electricity as they will be exposed to more sunlight and the resultant increase in temperature in unlikely to have significant impacts on the operational equipment.

Significance

6.2.4 As a result, it has been considered that the predicted changes in cloud cover would be of slight significance to the operational equipment.

6.3 Vehicular access

6.3.1 The predicted changes in cloud cover are not expected to impact vehicular access at the Scheme.

6.4 On-site workers

6.4.1 Projected changes in cloud cover can impact on-site workers by resulting in dangerous working conditions. However, staff will be equipped with the correct PPE (that is also appropriate for the weather), trained in on-site health and safety and informed about protecting themselves from the dehydration

and the sun. The risk to on-site workers is similar to that associated with the projected increase in temperatures as set out in Section 4.4.