The Great Grid Upgrade

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Bramford to Twinstead Reinforcement

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Executive Summary

This Technical Note has been produced to provide justification for the core working hours defined in Schedule 3, Paragraph 7 (Construction Hours) of the draft Development Consent Order (DCO) (**document 3.1(C)**), which states that:

- *(1) Subject to sub-paragraphs (2) and (3), work may only take place between 0700 and 1900 Monday to Friday and between 0800 and 1700 on Saturdays, Sundays and Bank Holidays (the core working hours), unless otherwise approved by the relevant planning authority.*

Two scenarios requested in LIRs have been modelled to show the impact of reducing the working hours on the baseline construction schedule:

- Scenario 1: a reduction in weekend working using the core working hours of 07:00 to 19:00 on weekdays and 08:00 to 13:00 on Saturdays, with no working on Sundays. In this scenario both Outage 4 and Outage 6 would be missed by seven weeks, leading to all subsequent outages being missed.
- Scenario 2: a reduction in weekday and weekend working using the core working hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays, with no working on Sundays. In this scenario both Outage 4 and Outage 6 would be missed by seven months, leading to all subsequent outages being missed.

In both scenarios the required 2028 completion date would not be achieved. As set out in the Need Case [**APP-161**] there is '*an urgent need to reinforce the network in the East Anglia area by 2028. This is to enable connection of multiple contracted generation customers; ensure these future connections of generation can be made without incurring significant constraint costs; support the facilitation of UK Government net zero ambitions; and meet National Grid's transmission licence obligations*'. Therefore, the Applicant considers that the construction working hours currently proposed in the draft DCO are justified.

1. Introduction

1.1 Purpose of this Technical Note

1.1.1 This Technical Note has been produced to provide the supporting information necessary to explain the rationale and justification behind the proposed core working hours for construction.

1.1.2 Braintree District Council (BDC) and Essex County Council (ECC) in paragraph 17.4.6 of their Local Impact Reports (LIR) [REP1-039] requested the following working hours:

- *08:00-18:00 Monday to Friday and 08:00-13:00 Saturdays with no working on Sundays and Bank Holidays.*

1.1.3 Suffolk County Council (SCC) in paragraph 17.69 of their Local Impact Report (LIR) [REP1-045] requested the following working hours:

- *08:00-13:00 on Saturdays with no working on Sundays and Bank Holidays.*

1.1.4 Two programme scenarios have been modelled that show the impact that would occur to the project programme as a result of restricting the core working hours to those highlighted above.

1.2 Background to this Technical Note

1.2.1 Construction working hours are proposed in Schedule 3, Paragraph 7 (Construction Hours) of the draft Development Consent Order (DCO) (**document 3.1 (C)**), which states that:

*(1) Subject to sub-paragraphs (2) and (3), work may only take place between **0700 and 1900 Monday to Friday and between 0800 and 1700 on Saturdays, Sundays and Bank Holidays** (the core working hours), unless otherwise approved by the relevant planning authority.*

(2) The following operations may take place outside the core working hours referred to in sub-paragraph (1)—

- *trenchless crossing operations including beneath highways, railway lines, woodlands or watercourses;*
- *the installation and removal of conductors, pilot wires and associated protective netting across highways, railway lines or watercourses;*
- *the jointing of underground cables (save for the cutting of underground cables);*
- *the completion of operations commenced during the core working hours which cannot safely be stopped;*
- *any highway works requested by the highway authority to be undertaken on a Saturday, Sunday or a Bank Holiday or outside the core working hours;*
- *the testing or commissioning of any electrical plant installed as part of the authorised development;*

- *the completion of works delayed or held up by severe weather conditions which disrupted or interrupted normal construction activities;*
- *activity necessary in the instance of an emergency where there is a risk to persons or property;*
- *security monitoring; and*
- *surveys.*

(3) The core working hours referred to in sub-paragraph (1) exclude start up and close down activities up to 1 hour either side of the core working hours.

1.2.2 Justification for working outside of the core hours for each of the operations listed Schedule 3, Paragraph 7, Sub-Section 2 of the draft DCO (**document 3.1 (C)**) above has been provided in the response to paragraphs 17.72 to 17.74 of Suffolk County Council, Babergh and Mid Suffolk District Councils LIR [**REP1-045**].

1.2.3 Environmental Statement (ES) Appendix 4.2 Construction Schedule [**APP-091**] sets out the durations and phasing for the construction stage that has been assumed when undertaking the environmental impact assessment (EIA). The EIA has considered two indicative construction schedules for the assumptions used within the ES as follows:

- The baseline construction schedule – this assumes that the grid supply point (GSP) substation is constructed in advance of development consent, pursuant to the planning permission under the Town and Country Planning Act (TCPA) and associated works pursuant to the Electricity Act 1989; and
- The alternative scenario – this assumes that the GSP substation construction is included as part of the main works delivered pursuant to the DCO. This would mean that works at the GSP substation would commence subject to the successful granting of the DCO.

1.2.4 It should be noted that construction of the GSP Substation has already commenced pursuant to the existing consents and therefore this Technical Note focuses on the baseline construction schedule.

1.3 Electricity Transmission System Outages

1.3.1 To enable construction works to be undertaken on the Electricity Transmission System it is necessary to 'switch off' that part of the System that needs to be worked on, for example a transmission line between two substations, for safety reasons. When a part of the System is switched off, this is described as being on 'outage' i.e. that part of the system is out of service.

1.3.2 As it is necessary to ensure that the electricity system is kept intact during these works to ensure that there is no disruption to electricity supplies, it is required to carefully assess the impact that switching off one part of the system might have on another part of system, particularly where other parts of the system may also be switched off to facilitate other maintenance or construction works.

1.3.3 This is a complex process as there can be many interactions between different parts of the electricity system. For this reason, outages are usually planned well in advance (several years) of the actual works taking place and they are co-ordinated with other planned works that are being undertaken on the electricity system to ensure that all of the planned works can be undertaken without putting the electricity supply at risk.

1.3.4 Once an outage is planned it is not usually possible to change an outage on short notice due to the interactivity that the outage may have with other planned works. Therefore, if an outage date is missed for some reason e.g., delayed construction works, it may not be possible to re-schedule the missed outage for a number of years.

2. Discussion

2.1 Construction Schedule

2.1.1 The baseline construction schedule shown in illustration 2.1 of ES Appendix 4.2: Construction Schedule [**APP-091**], which would achieve the 2028 delivery date, has been developed on the assumption that works can be carried out using the core construction working hours requested in Schedule 3, Paragraph 7 (Construction Hours) of the draft DCO (**document 3.1(C)**), which states that:

(1) Subject to sub-paragraphs (2) and (3), work may only take place between 0700 and 1900 Monday to Friday and between 0800 and 1700 on Saturdays, Sundays and Bank Holidays (the core working hours), unless otherwise approved by the relevant planning authority.

2.1.2 This programme includes a risk allocation which is essential to provide flexibility and contingency to recover any delays, to ensure the critical path programme can be delivered. Delays may occur for a number of reasons during the works, for example due to poor weather conditions, encountering unexpected ground conditions, supply chain issues, low productivity, or any restrictions resulting from any future unforeseen events (e.g., global pandemic).

2.1.3 This risk allowance has been factored into the programme by primarily scheduling works to be undertaken only on alternating Saturdays and Sundays. Whilst works may have to occur on consecutive weekends, ordinarily this would be in order to recover delays. Ongoing progress will be measured and additional work planned using the short term (4 week) look ahead schedule and construction schedule, to start immediately recovering these delays. It is however generally anticipated that only alternate weekends would be worked in any specific geographical location (noting that the overhead line works and underground cable works would be in different locations and with different contractors), save where they meet / overlap, (such as the cable sealing end (CSE) compounds), due to standard work shift patterns, which would reduce disruption from construction activities. The expectation therefore is that such alternate weekend working by one contractor (for example for overhead line works), would generally be in different geographical areas (for example when compared to the underground cable works). Hence there might be work undertaken each weekend, but in different locations and hence with different receptors.

2.1.4 The Need Case [**APP-161**] provides a detailed justification of why the project is required and summarises in paragraph 4.1.11 that there is '*an urgent need to reinforce the network in the East Anglia area by 2028. This is to enable connection of multiple contracted generation customers; ensure these future connections of generation can be made without incurring significant constraint costs; support the facilitation of UK Government net zero ambitions; and meet National Grid's transmission licence obligations*'.

2.1.5 The Electricity Systems Operator Network Options Assessment indicates the National Electricity Transmission System and Security and Quality of Supply Standard compliance issues described by the Need Case [**APP-161**] should be resolved by 2028. Firstly that, without reinforcement the capacity of the East Anglia existing network is insufficient to accommodate the connection of the proposed new power sources. Secondly, it would not be possible to operate the system without restrictions to prevent adverse impacts on generators or the network following faults.

2.1.6 Delays to the programme, specifically that impact on the critical path and the completion of works that must be finalised ahead of an outage on the transmission system occurring, would lead to not only that outage but the whole series of subsequent planned outages to be missed. This would result in significant delays to the 2028 delivery date. Each individual outage in this series would have to be completed in order and all must be completed to commission the new transmission lines. The availability of transmission system outages must be co-ordinated with other outages taking place across the UK transmission system, and these are normally co-ordinated years in advance, with the outage dates for this project, starting in March 2027, already having been agreed. Following preliminary discussions with the National Grid Electricity System Operator, it has been indicated that should the 2027 outages not be met the next available outages would not be until 2032.

2.1.7 If there were to be an increase in programme duration due to a reduction in working hours, this would also result in a greater number of days over which the impacts of construction would occur. It should be noted that the bulk of the civils construction activities, including the new underground cables and overhead lines, are scheduled to be undertaken in 2025/26. Other than the transposition works which occur in 2027, works before and after this date are focused around enabling and finishing works, respectively which by their nature would be less disruptive.

2.1.8 Two scenarios have been modelled to show the impact of reducing the working hours on the baseline construction schedule. Scenario 1 shows the impact of reducing the weekend hours to those requested by BDC and ECC in paragraph 17.4.6 of their Local Impact Reports (LIR) [**REP1-039**] and by SCC in paragraph 17.69 of their Local Impact Report (LIR) **[REP1-045**]. Scenario 2, in addition to the impact of the weekend hours used in Scenario 1, modelled the impact of reducing the weekday hours to those requested by BDC and ECC in paragraph 17.4.6 of their Local Impact Reports (LIR) [**REP1-039**]:

- Scenario 1: a reduction in weekend working has been modelled using core working hours of 07:00 to 19:00 on weekdays and 08:00 to 13:00 on Saturdays, with no working on Sundays; and
- Scenario 2: a reduction in weekday and weekend working has been modelled using core working hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays, with no working on Sundays.

2.1.9 Table 2.1 below shows key dates and comparison between the baseline construction schedule and reduced working hour schedule Scenario 1 and Scenario 2.

Table 2.1: Comparison of the Baseline Construction Schedule and Reduced Working Hour Schedule Scenarios

Activity Name	Baseline	Scenario 1	Scenario 2
HV / AC Testing Complete Circuit 2 (Southern Circuit)	19-Oct-26	19-Jan-27	05-Jun-27
HV / AC Testing Complete Circuit 1 (Northern Circuit)	25-Nov-26	01-Mar-27	26-Jul-27
Reinstatement Complete / Demobilise from Site	06-May-27	19-Aug-27	18-Feb-28
HV / AC Testing Complete Circuit 1 (Northern Circuit)	13-Oct-26	11-Jan-27	26-May-27
HV / AC Testing Complete Circuit 2 (Southern Circuit)	13-Oct-26	11-Jan-27	26-May-27
Commissioning works to Circuit 1 and 2 (final activity to be completed before Outage 4 Start)	08-Mar-27	29-Apr-27	29-Sep-27
Commissioning works to Circuit 1 and 2 (final activity to be completed before Outage 6 Start)	29-Jul-27	18-Sep-27	02-Mar-28
Reinstatement Complete / Demobilise from Site	19-Mar-27	01-Jul-27	14-Dec-27
All OHL Foundations Installed	21-Feb-26	16-Apr-26	10-Jul-26
Outage 4 Start (fixed date)	09-Mar-27		
Outage 4 Finish (fixed date)	24-May-27		
Outage 5 Start (fixed date)	04-Jun-27		
Outage 5 Finish (fixed date)	22-Jul-27		
Outage 6 Start (fixed date)	30-Jul-27		
Outage 6 Finish (fixed date)	08-Sep-27		
Outage 7 Start (fixed date)	30-Jul-27		
Outage 7 Finish (fixed date)	21-Oct-27		
Outage 8 Start (fixed date)	04-Apr-28		
Outage 8 Finish (fixed date)	31-May-28		
Whole of Project Complete	25-Aug-28	~Post 2028 delivery date - dependent on unknown outage availability	

2.1.10 The outcome of the scenarios presented in Table 2.1 above are as follows:

- Scenario 1: These working hours would result in the commissioning works that must be complete to undertake the works required within Outage 4, being completed on the 29 April 2027, seven weeks after the current planned Outage 4 start date of 09 March 2027. Additionally, these working hours would result in the completion of the commissioning works required for works to be undertaken in Outage 6 being completed on the 18 September 2027, seven weeks after the planned Outage 6 start date of 30 July 2027. Both Outage 4, Outage 6 and all subsequent planned outage dates would therefore be missed. This would mean the required 2028 completion date would not be achieved.

- Scenario 2: These working hours would result in the commissioning works that must be complete to undertake the required works in Outage 4, being completed on the 29 September 2027, over seven months after the planned Outage 4 start date of 09 March 2027. Additionally, these working hours would result in the completion of the commissioning works required for Outage 6 being completed on the 02 March 2028, over seven months after the current planned Outage 6 start date of 30 July 2027. Both Outage 4, Outage 6 and all subsequent planned outage dates would therefore be missed. This would mean the required 2028 completion date would not be achieved.

2.2 Construction Sequencing and Shift Patterns

2.2.1 The construction works are largely linear and would not occur along their entire length of the project for the full duration of the construction programme. Rather there would be periods of higher and lower intensity working in each specific geographical area as crews and contractors responsible for different elements of construction, work their way down the line.

2.2.2 Varying shift patterns for workers and construction crews means that downtime would occur at specific locations within the working week. However, as these shift patterns would be rolling, with workers not undertaking a 5-day working week, the day on which downtime may occur would vary from week to week. It is therefore necessary to include a provision in the core working hours requested in the dDCO (**document 3.1 (C)**) for working over weekends to account for these working patterns. Shift patterns would vary between crews responsible for constructing the different elements of the work but may be for example consist of working 11 days on and three days off.

3. Conclusion

3.1.1 This Technical Note shows that reducing the core working hours used to develop the baseline schedule shown in illustration 2.1 of ES Appendix 4.2: Construction Schedule [**APP-091**], to those requested by BDC and ECC in paragraph 17.4.6 of their LIR [**REP1-039**], and SCC and BMSDC in paragraph 17.69 of their LIR [**REP1-045],** would cause extensive delays to the current 2028 delivery date. This baseline construction schedule, has been developed on the assumption that works can be carried out using the core construction working hours requested in the draft DCO (**document 3.1 (C)**).

3.1.2 Following preliminary discussions with the National Grid Electricity System Operator, it has been indicated that should the 2027 outages not be met the next available outages would not be until 2032.

3.1.3 Meeting the 2028 delivery date is required to enable connection of multiple contracted generation customers, ensure these future connections of generation can be made without incurring significant constraint costs, support the facilitation of UK Government net zero ambitions and meet the Applicant's transmission licence obligations.

3.1.4 Two scenarios requested in LIRs have been modelled to show the impact of reducing the working hours that were used to develop the baseline construction schedule:

- Scenario 1: a reduction in weekend working using the core working hours of 07:00 to 19:00 on weekdays and 08:00 to 13:00 on Saturdays, with no working on Sundays. In this scenario both Outage 4 and Outage 6 would be missed by seven weeks, leading to all subsequent outages being missed.
- Scenario 2: a reduction in weekday and weekend working using the core working hours of 08:00 to 18:00 on weekdays and 08:00 to 13:00 on Saturdays, with no working on Sundays. In this scenario both Outage 4 and Outage 6 would be missed by seven months, leading to all subsequent outages being missed.

3.1.5 In both scenarios the required 2028 completion date would not be achieved.

3.1.6 The baseline construction schedule working hours includes a risk allocation which is essential to provide flexibility and contingency to recover any delays, to ensure the critical path programme can be delivered. Delays may occur for a number of reasons during the works, for example due to poor weather, encountering unexpected ground conditions, supply chain issues, low productivity, or any restrictions resulting from any future unforeseen events (e.g. global pandemic).

3.1.7 This risk allowance has been factored into the programme by primarily scheduling works to be undertaken only on alternating Saturdays and Sundays. Whilst works may have to occur on consecutive weekends, ordinarily this would be in order to recover delays. Ongoing progress will be measured and additional work planned using the short term (4 week) look ahead schedule and construction schedule, to start immediately recovering these delays. It is generally anticipated that only alternate weekends would be worked in any specific geographical location (noting that the overhead line works and underground cable works would be in different locations and with different contractors), save where they meet / overlap, (such as the CSE compounds), due to standard work shift patterns, which would reduce disruption from construction activities. The expectation therefore is that such alternate weekend working by one contractor (for example for overhead line works), would generally be in different geographical areas (for example when compared

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