Appendix 10 - Rothes III Aviation Lighting Scheme Review

July 2024

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1 Current Lighting scheme

The consented Rothes III wind farm consists of 28 turbines, of which:

- three (Turbines 9, 13 and 14) would have blade tip heights of 149.9 metres above ground level (m agl);
- eight (Turbines 1, 2, 3, 4, 5, 6, 7 and 29) would have blade tip heights of 200m agl; and
- seventeen (Turbines 8, 10, 11, 12, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 and 28) would have blade tip heights of 225m agl.

All turbines with blade tip heights of 150m agl or more are subject to mandatory visible lighting under Article 222 of the Air Navigation Order (ANO). Accordingly, all turbines in the consented layout with the exception of Turbines 9, 13 and 14 were subject to the lighting requirements of the ANO.

In order to reduce the night time visual impact of the Development, the applicant submitted a proposal to the CAA for the fitting of appropriate visible lighting to selected turbines on the perimeter of the wind farm only – Turbines 1, 5, 8, 17, 20, 27, 28 and 29. The Proposal was accepted by the CAA on 20th August 2020.

The applicant has asked Mr Macolm Spaven of Aviatica to review the Proposed Development which is to increase the blade tip height of Turbines 9, 13 and 14 to 200m agl. This brings those turbines into the scope of ANO Article 222, requiring visible spectrum lighting.

Mr Spaven has worked on many wind farm visible lighting schemes and his CV is attached at Appendix 11. He has prepared this report in respect of the visible lighting requirement for the Proposed Development.

The aviation safety implications of increasing the tip height of Turbines 9, 13 and 14 such that they require visible lighting have been assessed by applying the lighting design criteria set out in CAA guidance CAP 764 (including a March 2024 draft revised edition); the CAA Policy Statement on *Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level*; and the underpinning Standards and Recommended Practices set out in International Civil Aviation Organisation (ICAO) Annex 14.

The proposed re-design of the wind farm consists solely of an increase in the tip heights of Turbines 9, 13 and 14. The tip heights of all other turbines will remain as per the consent, and all 28 turbines will remain in the same positions as the consented layout. Consequently, there will be no change in the shape of the perimeter of the wind farm. Turbines 13 and 14 are within a straight line between the two closest lit turbines marking the perimeter (Turbine 5 and Turbine 17). Turbine 9 is 40 meters outside the straight line between Turbines 5 and 17. This is sufficiently close to the lit perimeter to meet regulatory requirements. Therefore, the increase in tip heights of T9, 13 and 14 does not generate a requirement, from the perspective of providing aircrew with the

ability to identify the lateral perimeter of the wind farm, for any of those turbines to be additionally lit.

In addition to the provisions for lighting turbines to mark the horizontal perimeter of a wind farm, ICAO Annex 14 article 6.2.4.3 recommends that “within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located”. “Significantly higher elevation” is not defined by ICAO. However, the draft revised edition of CAP 764 provided that “if the height of other turbine nacelle(s) in the wind farm exceed the height of a plane extending at an elevation of 10 degrees above the horizontal from the nacelle of a turbine that is required to be lit, then obstacle lighting must be fitted and operated on these wind turbines.”

With an increased blade tip height of 200m agl, Turbine 9 will be the highest turbine in the Rothes III development, with blade tips 579m AOD. Turbine 14 will become the second highest turbine in the Development, with blade tips 569m AOD. It is proposed that Turbines 9 and 14 – positioned between the lit turbines T5 and T17 - will remain unlit. The elevation angles from the nacelles of T5 and T17 to the nacelles of T9 and T14 are shown in Table 1. It can be seen that in all cases the elevation angles from the nearest lit turbines are significantly less than 10°. Consequently, the increased tip heights of T9, 13 and 14 will not lead to a requirement to provide additional visible spectrum lighting on any of those turbines.

Table 1: Elevation angles to T9 and T14

Turbine no.	*Elevation angle to T9*	*Elevation angle to T14*
5	2.48°	0.70°
17	2.24°	2.44°

2 CONCLUSION

It is concluded that the proposed re-design of the Rothes III development, involving the raising of the blade tip heights of Turbines 9, 13 and 14 to 200m agl, will not lead to any regulatory or aviation safeguarding policy requirement to revise the wind farm lighting scheme approved by the CAA on 20 August 2020.

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