Bute Energy

Aberedw Energy Park

Appendix 2.6:

Aviation Assessment

Wind Power Aviation Consultants Ltd

Aviation Technical Appendix for Aberedw Energy Park V2.0

Our Reference: WPAC 024/25
Your Reference: Aberedw Energy Park EIA

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Scope

1. This report has been prepared by Wind Power Aviation Consultants Ltd on behalf of Aberedw Energy Park Ltd (hereinafter referred to as the 'Applicant'). This report is designed to be included in the Environmental Statement as a technical appendix and will inform the ES in relation to any aviation issues.

Introduction

2. Wind turbines have the potential to affect civil and military aviation infrastructure and activities. This report covers the methodology used to undertake the aviation safeguarding assessment, lists the aviation guidance and data sources used and describes the aviation baseline condition, consultation responses and potential mitigation needed. It assesses the potential for the Proposed Development to affect aviation communications, navigation and surveillance infrastructure in the vicinity of the site, and focusses on identifying where there could be an effect and if so, how this will be mitigated.

Legislation and Guidance

3. There are a number of aviation publications relevant to the interaction of wind turbines and aviation containing guidance and legislation, which cover the complete spectrum of aviation activity in the UK as shown below.

- Civil Aviation Authority (2020). Safeguarding of Aerodromes, Version 3, CAP738 CAA;
- Civil Aviation Authority (2010). Safe Operating Practices at Unlicensed Aerodromes, Ed 1, CAP 793 CAA;
- Civil Aviation Authority (2016) Policy and Guidance on Wind Turbines Version 6, CAP764 CAA;
- Civil Aviation Authority (2017). CAA Policy Statement: 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 CAA;
- Civil Aviation Authority (2023). Manual of Air Traffic Services, Part 1, Ed 11.0, CAP 493 CAA;
- Civil Aviation Authority (2021). UK Flight Information Services, Ed 4, CAP 774 CAA;
- Civil Aviation Authority (2019). ATS Safety Requirements, Version 3, CAP 670 CAA;
- Civil Aviation Authority (2022). Licensing of Aerodromes, Version 12, CAP 168 CAA;
- Civil Aviation Authority (2020). Parachuting, Ed 5, CAP660 CAA;
- Civil Aviation Authority (2022). Implementation of Safeguarding of Instrument Flight Procedures (IFPs) in the UK, Ed 2, Version 2, CAP 785B CAA;

- Civil Aviation Authority (2021) 'Guidance to crane users on aviation lighting and notification' CAP 1096 CAA:
- Ministry of Defence (MoD) (2022). Military Aviation Authority Regulatory Article 2330 (Low Flying) and:
- Future Wales: National Plan 2040 Policy 18 (8)

Scope of the Assessment

4. The assessment of effects of the proposed turbines will be based upon the guidance laid down in CAA Publication CAP 764 *Policy and Guidelines on Wind Turbines* Version 6 Dated February 2016. Consultation criteria for aviation stakeholders is defined in Chapter 4. These distances inform the size of the study area and include:

- Airfield with a surveillance radar – 30 km;
- Non radar licensed aerodrome with a runway of more than 1,100 metres – 17 km;
- Non radar licensed aerodrome with a runway of less than 1,100 metres – 5 km;
- Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP);
- Unlicensed aerodromes with runways of more than 800 metres – 4 km;
- Unlicensed aerodromes with runways of less than 800 metres – 3 km;
- Gliding sites – 10km ; and
- Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.

5. CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders.

6. It is necessary to take into account the aviation and air defence activities of the Ministry of Defence (MOD) as safeguarded by the Defence Infrastructure Organisation (DIO).

7. It is also necessary to take into account the possible effects of wind turbines upon the National Air Traffic Services En Route Ltd (NERL) communications, navigation and surveillance (CNS) systems – a network of primary and secondary radars and navigation facilities around the country.

8. In addition to examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations, using the criteria laid down in CAP 168 Licensing of Aerodromes, to determine whether a proposed development will

breach obstacle clearance criteria. In this case, there are no physical safeguarding issues associated with the Proposed Development.

Assessment Methodology

9. Radar modelling has been undertaken using specialist propagation prediction software (Rview Version 5). Developed over a number of years, it has been designed and refined specifically for the task. RView uses a comprehensive systems database which incorporates the safeguarding criteria for a wide range of radar and radio navigation systems. RView models terrain using the Ordnance Survey (OS) Terrain 50 digital terrain model, which has a post spacing of 50m and has a root mean square (RMS) error of 4m. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of 3 arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified and consistent results assured. RView models the refractive effects of the atmosphere on radio waves and the First Fresnel Zone. A feature of RView is that as well as performing calculations in the manner believed to be most appropriate, it also allows comparison with results from simpler models. For example, RView can perform calculations using the true Earth Radius at the midpoint between the radar and the wind turbine or the simplified 4/3 Earth Radius model. If needed, RView is also capable of modelling a range of atmospheric refractive conditions. RView models the trajectory of radar signals at different elevations enabling modelling of both volume surveillance and pencil beam radars as well as the effects of angular sterilisation as applied, for example, in Met Office radars.

10. The following data sources were consulted to inform the assessment:

- UK Military Aeronautical Information Publication (MIL AIP);
- UK Aeronautical Information Publications (AIP);
- CAA 1:250,000 VFR and 1:500,000 Charts;
- UK Military Low Flying Charts; and
- WPAC in-house databases.

Assessing Significance

11. Assessing significance in an aviation context is highly controversial as there is no agreed definition of significance. This is due to the fact that whilst technical effects on communications, navigation and surveillance (CNS) systems are simple to identify and evaluate, operational and flight safety effects can be subjective and are often challenged by third parties. It is enough in this context to identify any technical effects and then, taking into account the statements in CAP 764 regarding the status of aviation stakeholders, in general to accept the judgement of those stakeholders in assessing the significance of the effects. For example CAP 764 states: "*Where an ANSP determines that it is likely that a planned wind turbine development would result in any of the above effects on their CNS infrastructure, this may not, in itself, be sufficient reason to justify grounds for rejection of the planning application. The ANSP must determine whether the effect on the CNS infrastructure has a negative impact on the provision of the ATS. The developer should pay for an assessment of appropriate mitigating actions that could be taken by the ANSP*

and/or wind energy developer to deal with the negative impact. The position of an ANSP at inquiry would be significantly degraded if they had not considered all potentially appropriate mitigations."

12. Therefore, taking the above into account, it is not considered to be appropriate for the Applicant to be making an assessment of significance of an effect in relation to aviation interests. It is also often the case that different Air Navigation Service Providers (ANSP) can take a different view of the same scenario and may disagree with the assessment findings leading to the need for further post submission consultation to confirm the findings of the assessment and/or agree to the need for and extent of mitigation.

Turbine Details

Turbine	Easting	Northing	Indicative Hub Height	Tip Height	Indicative Disc Dia
1	308846	250156	124.45	200	163
2	308501	250450	124.45	200	163
3	308220	250783	124.45	200	163
4	308814	251167	124.45	200	163
5	308325	251350	124.45	200	163
6	308491	251930	124.45	200	163
7	310120	250040	124.45	200	163
8	310411	250677	124.45	200	163
9	310159	251095	124.45	200	163
10	310100	251608	124.45	200	163
11	309624	251861	124.45	200	163
12	309120	252122	124.45	200	163
13	309749	252329	124.45	200	163
14	310439	252304	124.45	200	163
15	310791	252015	124.45	200	163
16	311040	252796	124.45	200	163
17	311417	252520	124.45	200	163
18	311496	251990	124.45	200	163

Table 1 Turbine Locations

Aviation Baseline Conditions

13. The site is located as shown in Figures 1 to 3. Figures 2 and 3 show the location in an aviation context with Figure 2 showing the airspace up to 5000ft and Figure 3 up to 19500 ft. In a military context, the site is located 85km to the south-west of RAF Shawbury and 140km to the south-east of RAF Valley on Anglesey. Additionally the site is located 80km to the east of Aberporth Range Control Radar and 7km to the north-east of the Sennybridge Danger Area, designated D203 and marked on Figures 2 and 3 with a purple hashed boundary.

14. In civil airspace terms, the site is just underneath Class A controlled airspace marked with thick purple boundaries on Figure 3. It is designated as the PEPZE Control Area (CTA) with a base of Flight Level (FL)155 (approximately 15500ft). The closest major airports are at Cardiff, Bristol and Birmingham, all are more than 80km from the Proposed Development. In general this is a remote area from an aviation perspective.

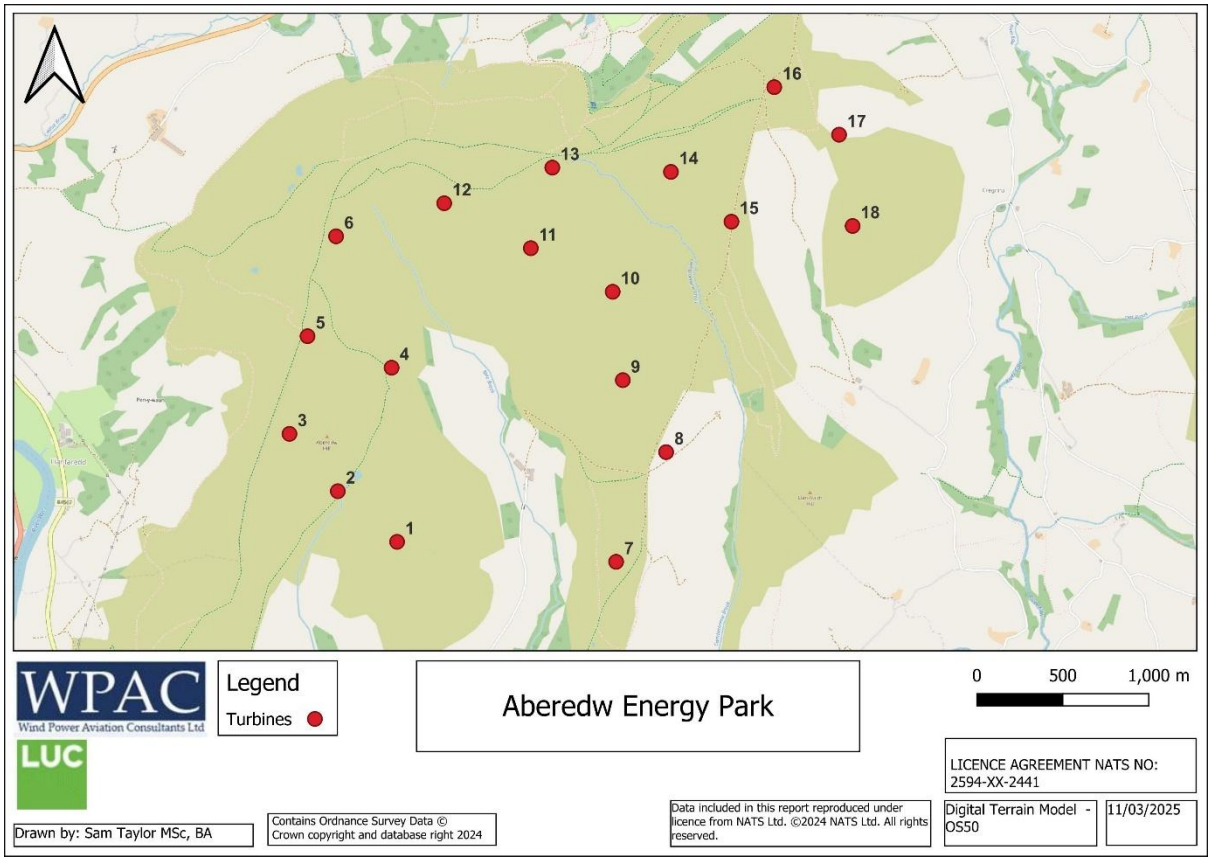


Figure 1

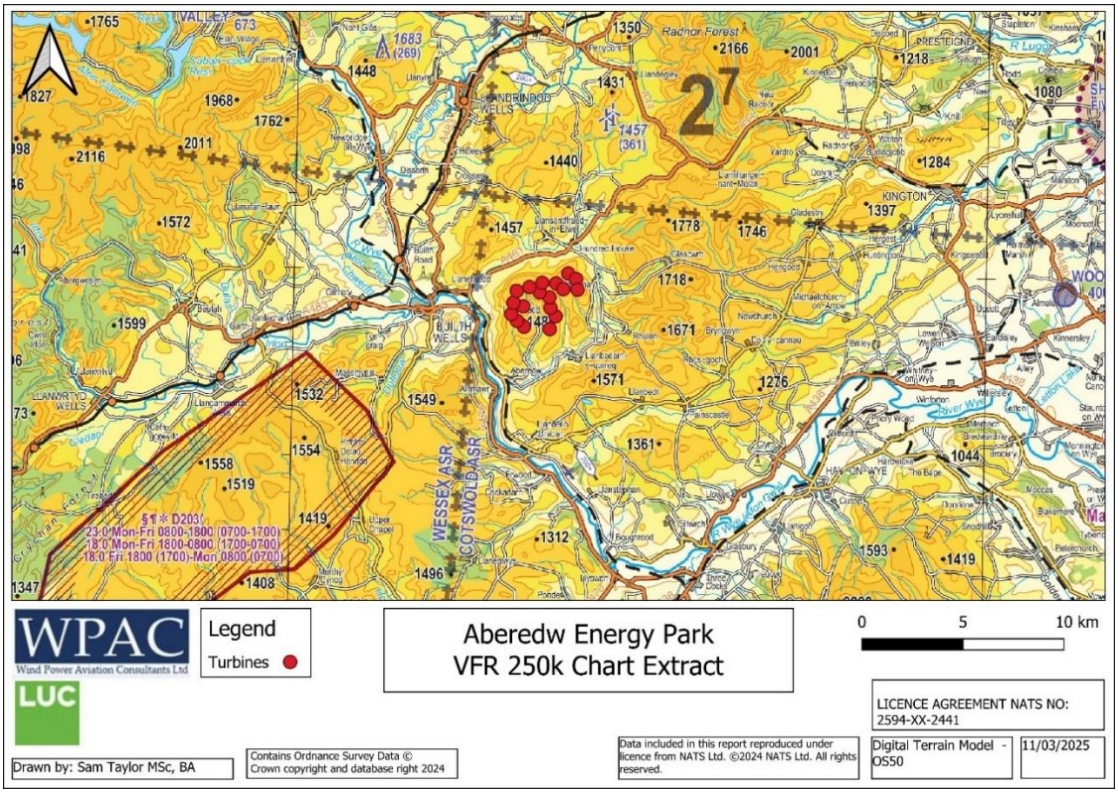


Figure 2

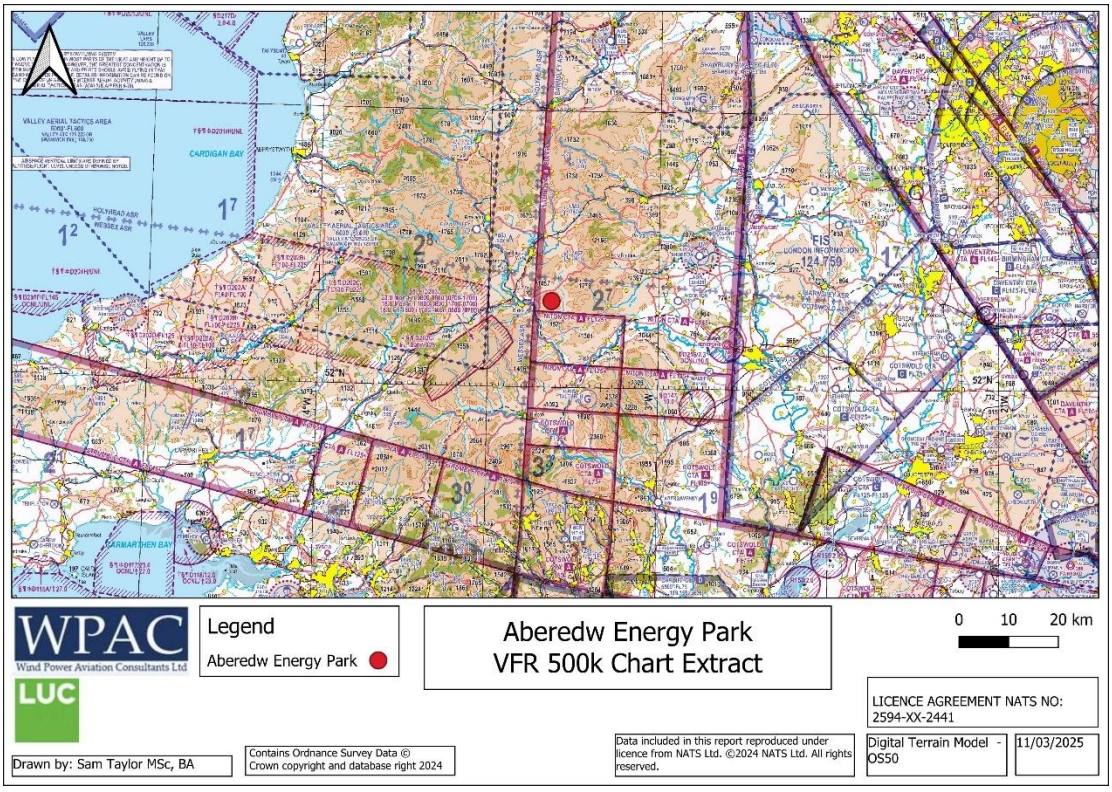


Figure 3

Assessment of Effects

Military ATC Radars

15. MOD – the closest MOD ATC radar is at RAF Shawbury. It is the centre for helicopter training for the Armed Forces and is a high intensity flying unit. However examination of Figure 3 shows that the southern boundary of their Area of Intense Air Activity (AIAA), marked by a blue diamond line is well to the north of the Aberedw site. Almost all of Shawbury's traffic operates inside that area. Radar modelling also shows that all the turbines are screened by terrain. There is no possibility of the radar being affected and this is confirmed by the MOD scoping response (DIO 10061109 dated 31 Jan 2024) which does not list Shawbury or any other military ATC radars as a cause for concern

Turbine	Distance (km)	Radar Line of Sight (m AGL)	Turbine	Distance (km)	Radar Line of Sight (m AGL)
1	84.93	834.2	**10**	83.034	830.7
2	84.866	809.1	**11**	83.073	812.2
3	84.737	824.4	**12**	83.124	817.1
4	84.093	827	**13**	82.611	810.1
5	84.203	832.8	**14**	82.264	822.5
6	83.626	831.5	**15**	82.324	818.5
7	84.358	834.7	**16**	81.529	814
8	83.663	822.1	**17**	81.566	759.8
9	83.439	809.3	**18**	81.977	807.8

Table 2 RAF Shawbury Thales Star 2000NG Radar Results

Military Air Defence Radars

16. The closest military air defence radar is located at Portreath in Cornwall. Radar modelling shows that there is no possibility of this or any other air defence radar being affected by the Proposed Development.

Military Low Flying

17. The Proposed Development is within MOD Low Flying Area (LFA) 7 but is not within Tactical Training Area (TTA) 7. It is also 7km from the Sennybridge Range. To provide a strategic overview, MOD Low Flying Operations Squadron (LFOS) has published a Low Flying vs Wind Farm Map to aid wind energy developers in their planning. The map is colour coded Red, Amber, Blue and Green in descending order of low flying priority. The published map is quite basic (see extract below); the map held by the MOD is in fine detail and confirms that all Aberedw wind turbines are in a 'Blue' area, defined as '*a low priority military low flying area less likely to raise concerns*.'

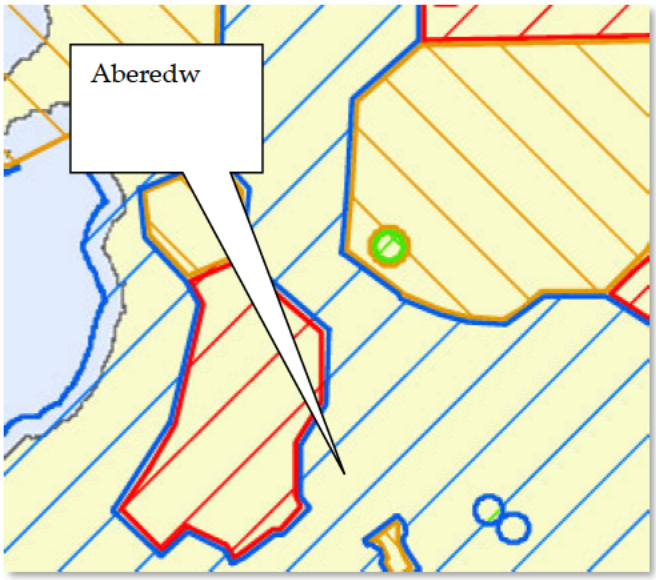


Figure 4 Low Flying Vs Windfarm Airspace Map

MOD Infra-Red Lighting Requirements

18. There will be a requirement for MOD approved IR lights. This issue is addressed in the separate Aberedw Energy Park Aviation Lighting and Mitigation Technical Appendix.

MOD Consultation

19. The MOD were consulted about the Proposed Development in 2022 and again at scoping in 2023. Their response ((DIO 10061109 dated 31 Jan 2024) confirmed that the only issue of concern was in relation to aviation lighting and low flying; this is addressed in the separate Aberedw Energy Park Aviation Lighting and Mitigation Technical Appendix. The MOD response will be confirmed once they are consulted formally when the full planning application is submitted as per the standard MOD process.

UK Met Office Radars

20. The Met Office safeguards its network of rainfall radars out to a distance of 20km. In this case the closest radar is at Clee Hill, over 57km to the north-east. There will be no effect on the Met Office radar network.

CAA Licensed Radar Equipped Airports

21. There are no CAA licensed radar equipped airports within or even close to consultation distance. Radar modelling also confirms that there will be no effect on any airport radars at any distance. Radar line of sight for Cardiff Airport is in excess of 700m AGL and for Bristol it is over 650m AGL.

CAA Licensed Non-Radar Equipped Airports

22. There are no non-radar equipped aerodromes within or even close to the CAA approved consultation distances. The closest is at Shobdon, over 36km to the north-east. Consultation for this type of airfield is recommended within 5km. The Proposed Development will not affect Shobdon and consultation is not required.

Unlicensed Aerodromes and Airstrips

23. There are no known unlicensed aerodromes or airstrips within the 3km consultation distance recommended in CAP 764 for unlicensed airstrips.

NATS En Route Ltd (NERL)

24. The closest NERL radar is at Clee Hill in Shropshire. Radar modelling has been undertaken with the results shown in Table 3 below.

Turbine	Distance (km)	Radar Line of Sight (m AGL)	Turbine	Distance (km)	Radar Line of Sight (m AGL)
1	57.74	125.5	**10**	55.946	119.1
2	57.902	64.2	**11**	56.248	146.3
3	57.993	113.5	**12**	56.575	157.9
4	57.288	134.3	**13**	55.921	167.5
5	57.636	166.9	**14**	55.32	153.9
6	57.222	166	**15**	55.144	151.5
7	56.684	194.1	**16**	54.56	177
8	56.119	191.5	**17**	54.355	171.8
9	56.138	128.1	**18**	54.535	92

Table 3 NATS Clee Hill Radar

25. The results confirm that every turbine will be in radar line of sight of the Clee Hill radar. In their response to scoping, NATS stated under reference SG36655 dated January 2024 that the effect would be unacceptable and that they would object to the proposal.

26. The Applicant has had extensive discussions and meetings with NATS and it is clear that this issue also affects a significant number of other wind farm developments in Central Wales. NATS have

stated an intention to replace the Clee Hill radar with a wind farm tolerant radar as part of a major radar replacement program and discussions have focused on when the Clee Hill radar will be replaced given the large number of wind farm developments that are affected by this issue. NATS are confident, based upon their experience of installing and operating a wind farm tolerant radar at Lowther Hill in south-west Scotland that the capability to mitigate the effect of the turbines is effective. The Clee Hill radar will be replaced with a radar similar to that at Lowther Hill and NATS are therefore able to accept that a planning condition to provide a radar mitigation scheme is appropriate in this case. NATS will be able to withdraw their objection once the Applicant agrees a Statement of Common Understanding (SOCU) or signs a radar mitigation contract. Discussions with NATS remain ongoing in order to fully resolve this issue.

Potential Construction Effects

27. There are no technical effects on aviation interests during construction. The only aviation issues are those associated with the operation of large cranes which will be the subject of standard conditions for crane operations as laid down in CAA CAP1096 'Guidance to crane users on aviation lighting and notification'.

Potential Decommissioning Effects

28. There are no technical effects on aviation interests during decommissioning. The only aviation issues are those associated with the operation of large cranes which will be the subject of standard conditions for crane operations as laid down in CAA CAP1096 'Guidance to crane users on aviation lighting and notification.

Additional Mitigation and Enhancement

Aviation Lighting

29. Wind turbines with a tip height in excess of 150 m are required to be illuminated with medium-intensity red aviation obstruction lights installed on the turbine hub in accordance with the Civil Aviation Authority Policy Statement: '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'. The Applicant provided a reduced lighting scheme that fulfils the requirements for flight safety whilst minimising environmental (visual) effects and gained approval from the CAA for the design (see Aviation Lighting Technical Appendix to the ES for details of the proposed mitigation). This sets out the arrangement of the aviation lights, together with an assessment of the intensity of the visible lights at selected viewpoints assessed in the LVIA (see: Appendix 5.8 Landscape and Visual Impact Assessment) and provides an estimate of the percentage of time that the lights will be at full power and at 10% intensity based on historical Met Office records of visibility and cloud base in the region. As noted above, the Proposed Development will be fitted with MOD specification IR lighting to mitigate effects on military low flying. The implementation of the proposed lighting scheme (both visible and infrared) will be subject to a suspensive planning condition to the consent if granted.

Conclusion

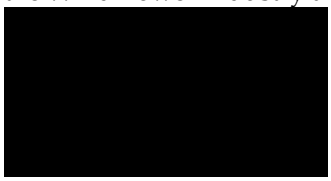
30. The Proposed Development has been examined using the guidelines provided in CAP 764 and best practice developed over the past ten years or more. The report finds that in this case, there is only likely to be one aviation issue to overcome, that is, the effect of the turbines on the NATS Clee Hill

radar. Discussions have already taken place between the Applicant and NATS to find a solution which has now been identified as an Indra Lanza 3D radar. In common with several other wind turbine proposals across the region the new radar's capabilities can be used as the basis for a suitably worded suspensive condition. Aviation lighting will be required and this is fully addressed in the Aviation Lighting Technical Appendix.

Authors

Cdr John Taylor RN (Ret) – after a career in the Royal Navy specialising in Air Traffic Control (ATC), Airspace Management and Air Defence which culminated in leading both the ATC and Fighter Control Specialisations, John worked for Lockheed Martin UK for three years as a Principal Consultant and Business Area Manager responsible for Air Traffic Management Consultancy, including the provision of advice to wind farm developers. In 2008 he founded WPAC Ltd and since then he and his team have provided aviation advice in relation to over 2000 wind farm and wind turbine sites, given evidence at a number of planning inquiries and enabled many sites to overcome aviation objections where it was feasible to do so. He and his team have also provided advice to a number of Local Planning Authorities, Renewable UK and the Aviation Fund Management Board, including organising workshops and the provision of guidance documents. John also advises planners and developers in relation to physical and technical safeguarding of non-wind farm developments in the vicinity of aviation facilities.

Sqn Ldr Mike Hale RAF (Rtd) has over 45 years, piloting, instructing and examining experience on numerous military fast jet aircraft through to a range of civilian and military general aviation training aircraft and gliders. He has held many posts including Flying Instructor, Training Officer, Flight Commander, Squadron Commander and Principal Tornado AD Force Examiner. He has amassed over 10,000 flying hours of experience when operating at many locations around the world. In parallel to his flying duties, Mike held the post of Officer Commanding the MOD Low Flying Operations Squadron (OC LFOS). In this post he was both Low Level Airspace Manager for the MOD & Wind-Farm Subject Matter Expert for the Defence Infrastructure Organization (DIO). During that period, he assessed over 14,000 wind-farm pre-applications and 2000 full applications against low flying, weapons range, specialist airspace, local community and aerodrome safeguarding criteria. Mike also instigated two Qinetiq ground based Infra Red obstruction lighting trials. These were followed by instigating and managing the MOD Infra Red/Low Intensity (Henlow) flight trials and the CAA/MOD/Trinity-House/RUK off-shore IR/Morse (North Hoyle) flight trials. In conjunction, Mike organised numerous and various supporting trials including night vision equipment compatibility and detailed lighting beam overspill analysis (where light is emitted outside the required specification envelope). In 2012, he was awarded an MBE for generating a proactive and mutually successful working relationship between the Wind Power Industry and the MOD Air Staff.



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Appendix A – Abbreviations and Definitions

ADSB……..……..Automatic Dependent Surveillance Broadcast
AGL.....Above Ground Level (Height)
AIAA……...Area of Intense Air Activity (MOD)
ANO.....Air Navigation Order
ANSP……..……..Air Navigation Service Provider
AMSL.....Above Mean Sea Level (Elevation)
ASG.....Aviation Steering Group
CAA.....Civil Aviation Authority
CAP.....Civil Aviation Publication (Refers to Specific Documents)
CNS……Communications, Navigation and Surveillance Systems
cd.....Candela, a measure of light intensity
DIO.....Defence Infrastructure Organisation
HNTA.....Helicopter Night Training Area
IFP……..….Instrument Flight Procedure
In Flight Visibility.....The distance a pilot can see ahead to fly & navigate the aircraft
IR.....Infra-Red
Kts.....Knots: a measure of airspeed (10 kts = 12mph = 19 kph)
LED.....Light Emitting Diode
LFOS……Low Flying Operations Squadron RAF
MOD.....Ministry of Defence
mW/sr.....milliWatts per steradian: electromagnetic energy output related to solid angle
NATS……..National Air Traffic Services Ltd
NERL…… ……..NATS En Route Ltd
Nm.....Nautical Mile
NVD .....Night Vision Devices - Aircraft Mounted
NVG.....Night Vision Goggles - Operator Worn
Radar Altimeter.....An altimeter that uses radar to accurately measure height above ground
QFE .....Setting on Altimeter that gives Height above Airfield
RoAR.....Rules of the Air Regulations
Rule 5.....The Low Flying Rule – part of RoAR
Rule 28.....VFR Rules Outside Controlled Airspace – part of the RoAR
ReUK.....Renewables UK – The UK Wind Industry Body
SAR Box.....Night Training Area for Search and Rescue Helicopter Units
SSA.....Sector Safety Altitude
SSR…… …….Secondary Surveillance Radar
TTA……Tactical Training Area (MOD Low Flying)
UKAB.....United Kingdom Air Prox Board – Investigates Aircraft Near Misses
VFR.....Visual Flight Rules (Flight without ATC on a see-and-be-seen basis)
VMC.....Visual Meteorological Conditions (Weather suitable for VFR flight)