Norfolk Vanguard and Boreas Wind Farms

Vanguard and Boreas Wind Farms

Options Appraisal (Phase 2– Full)

Including Safety Assessment

Authorship

Action	Role	Date
Produced	**Airspace Change Specialist** NATS	September 2020
Reviewed Approved	**Manager, Airspace Change Compliance and Delivery** NATS	September 2020
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Reviewed Approved	**Aviation Consultant** Osprey Consulting Services	October 2020

References

Ref No	Description	Hyperlinks
1	Norfolk Vanguard and Norfolk Boreas Wind Farms CAA web page –progress through CAP1616	link
2	Stage 1 Assessment Meeting Presentation	link
3	Stage 1 Assessment Meeting Minutes	link
4	Stage 1 Design Principles	link
5	Stage 2 Design Options	link
6	Stage 2 Design Principle Evaluation	link
7	Stage 2 Options Appraisal (Initial) & Safety Assessment	link

Publication history

Issue	Month Year	Change Requests in this issue
Issue 1.0	October 2020	First issue released to CAA.

Contents

1. Introduction

1.1 This document forms part of the document set required in accordance with the requirements of the CAP1616 airspace change process.

1.2 This document aims to provide adequate evidence to satisfy Stage 3 Consult Gateway, Step 3A Options Appraisal (Phase 2 Full), including Safety Assessment.

2. Change Level

2.1 This proposal is confirmed by the CAA as Level 2B.

2.2 In line with the requirements for a Level 2B change the environmental impact assessment has been conducted on the basis of aviation-related CO_2 emissions.

3. Options Appraisal

3.1 This document is an update of the equivalent Stage 2 document.

3.2 This Airspace Change Proposal (ACP) originally considered the baseline do-nothing option and four alternatives which could be used to provide appropriate mitigation against the impacts of Wind Turbine Generators (WTGs) associated with Norfolk Vanguard and Norfolk Boreas developments. Under Stage 2, three of the four options were discounted, progressing only the preferred Option D, described as a Simplified polygon Transponder Mandatory Zone (TMZ) "rubber banded"[1] around proposed wind farm locations extended to include a 2 NM buffer.

3.3 Base line (Do nothing) Option

3.3.1 The do nothing option assumes that the wind farms are constructed and the changes proposed in the Airspace Change Proposal (ACP) are not implemented. Table 1 indicates the effects on communities and stakeholders should this be the case.

[1] Rubber banded- Shortest perimeter fully enclosing the wind farm developments. It is used to smooth an irregular perimeter.

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	Qualitative	There are no proposed changes to air traffic patterns so there will be no impact for noise. The designated area is approx. 47 kilometres (km) from the Norfolk coast.
Communities	Air quality	Qualitative	No changes to aircraft trajectories below 1,000 feet (ft).
Wider society	Greenhouse gas impact	Monetise and quantify	With no mitigation scheme there will be no change in aviation greenhouse gas emissions due to trajectory changes. However, the wind farms are anticipated to provide CO_2e benefits of c. 6.3 million tonnes (MT) per annum, over its 25-year life. [2] This benefit will only be realised if the airspace change is implemented. (note: with no mitigation solution, under Condition 34[3] the wind farms would be unable to progress. As such the expected CO_2e benefits of c. 6.3 MT per annum would **not** be realised.)
Wider society	Capacity/ resilience	Qualitative	Radar clutter could increase ATC workload and impact ATC capacity, leading to a reduction in ATC resilience.
General Aviation	Access	Qualitative	There would be no change in access for GA aircraft from today.
General Aviation / commercial airlines	Economic impact from increased effective capacity	Qualitative	There would be no increase in effective capacity.
General Aviation / commercial airlines	Fuel burn	Qualitative	No change from today
Commercial airlines	Training cost	Qualitative	N/A – There would be no associated airline training costs.
Commercial airlines	Other costs	Qualitative	N/A – There would be no associated airline costs.
Airport/ Air navigation service provider	Infrastructure costs	Qualitative	N/A – There would be no associated infrastructure costs.
Airport/ Air navigation service provider	Operational costs	Qualitative	N/A – There would be no associated changes in operational costs.
Airport/ Air navigation service provider	Deployment costs	Qualitative	N/A – There would be no associated deployment costs.

Table 1: Options Appraisal (CAP1616 E2) – Do Nothing Option

[2] Calculated using https://www.renewableuk.com/page/UKWEDhome and https://group.vattenfall.com/uk

[3] Condition 34 is a Suspensive condition that prohibits the construction of the windfarm without first putting in place a suitable PRMS.

3.4 Design Option D, preferred option

3.4.1 Table 2 indicates the effect on communities and stakeholders should Option D be implemented.

Group	Impact	Level of Analysis	Evidence
Communities	Noise impact on health and quality of life	Qualitative	There are no proposed changes to air traffic patterns so there will be no impact for noise. The designated area is approx. 47 km from the Norfolk coast.
Communities	Air quality	Qualitative	No changes to aircraft trajectories below 1,000 ft.
Wider society	Greenhouse gas impact	Monetise and quantify	The introduction of a RAG Blanking and TMZ Primary Radar Mitigation Scheme (PRMS) will have no impact on transponder equipped aircraft. All commercial aircraft and the majority >99% of General Aviation (GA) aircraft are transponder equipped and will remain unaffected. The introduction of the wind farms is anticipated to provide CO_2e benefits of c. 6.3 MT per annum[2], which is a benefit of this project. This environmental benefit negates any disbenefit caused by increased track millage of any non-transponder equipped aircraft avoiding the proposed TMZ and will only be realised if the airspace change is implemented.
Wider society	Capacity/ resilience	Qualitative	This option will have no anticipated impact.
General Aviation	Access	Qualitative	For GA aircraft equipped with an operating transponder there would be no change in access due to the proposed TMZ. Aircraft without an operational transponder would be restricted from entering the TMZ without first being granted access to the TMZ from TMZ controlling Authority. Without this clearance they would be required to fly a route avoiding the TMZ. GA users without an operating transponder wanting to access the TMZ without obtaining access from the controlling authority will have a one-off cost implication (approx. £2,000) to purchase a transponder.[4] Given the offshore location (47 km from Norfolk coastline), the demand for GA aircraft without a transponder wanting to fly over this area is minimal. The vast majority of GA aircraft, >99%, are transponder equipped and will not be impacted by this airspace change.
General Aviation/ commercial airlines	Economic impact from change in effective capacity	Qualitative	There would be no change in effective capacity.

[4] A rebate of up to £250 for new Electronic Conspicuity (EC) devices are now available thanks to funding from the Department for Transport (DfT) aimed at encouraging more adoption of EC. https://www.caa.co.uk/General-aviation/Aircraft-ownership-and-maintenance/Electronic-Conspicuity-devices/

General Aviation/ commercial airlines	Fuel burn	Monetise	No expected change to fuel burn for commercial airlines as flight plannable routes will remain unchanged and they will be able to route through the TMZ as currently. GA users may incur increased fuel burn if they are forced to reroute around the TMZ if they do not have the relevant equipage. However, the likely volume of non-transponder equipped aircraft which may pass through this area and any potential increase in fuel burn as a result would be negligible (estimate ~ 1 per day, see para 3.5 below).
Commercial airlines	Training cost	Qualitative	N/A – there are not expected to be any airline training cost associated with this development.
Commercial airlines	Other costs	Qualitative	Updates to FMS and flight planning systems will by the routine AIRAC updates. There are no other known costs which would be imposed on commercial aviation.
Airport/ Air navigation service provider	Infrastructure costs	Qualitative and quantitative	There would be no associated infrastructure costs. The developer has agreed to cover all engineering costs for implementation of the Radar RAG Blanking.
Airport/ Air navigation service provider	Operational costs	Qualitative	N/A – this proposal would not lead to changes in operational costs.
Airport/ Air navigation service provider	Deployment costs	Qualitative	N/A – no costs for the ANSP anticipated for the deployment of the TMZ.

Table 2: Options Appraisal (CAP1616 E2) –Option D

3.5 The region's PSR and SSR returns were analysed for 1st to 14th August 2019. There was a total of 9855 tracks within this period. This was comprised of 9840 SSR tracks and 15 PSR-only tracks passing through the region. This equates to <0.16% or ~1 PSR-only flights per day, it should be noted that there are no identifiable features available from PSR-only information. Therefore, we cannot determine how many aircraft would be affected, or confirm that these 15 tracks result from a small number of individual aircraft with repeated flights, or up to 15 different aircraft transiting the region.

3.6 PSR-only tracks tend to be historic/ vintage aircraft. Summer months are typically busier than winter months for general aviation and therefore we believe this to represent a higher than average proportion of PSR-only tracks. We therefore contend that any impact on CO_2 emissions as a result of this airspace change would be negligible.

3.7 The implementation of a TMZ will have no effect on commercial traffic growth or military aircraft as they are all transponder equipped. GA traffic is difficult to forecast as there are no regular flights, no requirement to file a flight plan or communicate with to ATC in uncontrolled airspace. Owing to the negligible numbers of aircraft that may be affected by the implementation of a TMZ, ~1 flight per day, it would not be proportionate to attempt a WebTAG greenhouse gas monetisation workbook for this proposal, given the negligible aviation impact.

4. Safety Assessment

4.1 Note: the assessment below is unchanged from the equivalent Stage 2 document.

4.2 Options Appraisal Safety Assessment – Do nothing

4.2.1 If the wind farms were constructed with no mitigation scheme against radar clutter/ interference implemented, there would be the following impacts:

- WTGs will cause clutter on radar displays (up to 180 WTGs in each development).
- The clutter will make ATC Tracking and identification of non-transponder equipped aircraft in the cluttered area impossible.
- The clutter will make ATC Tracking and identification of transponder equipped aircraft in the cluttered difficult due to obscuring.
- Interference & saturation of radar processing due to excessive radar returns can degrade radar performance across the whole operating area of the radar.

4.2.2 Due to the above impacts the suspensive condition 34 requires that an appropriate PRMS is put in place before the Vattenfall developments can be constructed. Hence "Do nothing" is not a viable option.

4.3 Options Appraisal Safety Assessment – Option D (preferred)

4.3.1 The Option D "RAG blanking of the wind farm locations with a simplified polygon TMZ "rubber banded" around proposed wind farm locations extended to include a 2 NM buffer" is proposed as the optimum solution to mitigate the impact of the Norfolk Vanguard and Boreas WTGs on the Cromer primary surveillance radar system.

4.3.2 This option will provide:

- Effective suppression of all primary radar clutter associated with the WTGs.
- The promulgation of a TMZ over the RAG blanked area will ensure that aircraft within the RAG Blanked area must be transponder equipped and hence will be visible to ATC via secondary surveillance radar.
- The dimensions of the TMZ include a 2 NM buffer which is adequate to ensure that ATC have sufficient time to identify when an infringement of the TMZ is taking place and take appropriate action.

4.3.3 Experience from previous wind farm developments has demonstrated that the implementation of radar RAG blanking coupled with an associated TMZ provides safe and effective mitigation against radar issues associated with WTGs.

4.3.4 Initial qualitative assessment from NATS Safeguarding has confirmed that the proposed Option D design would provide adequate mitigation to fulfil the requirements required of the NERL Cromer: PSR Mitigation Scheme.

4.4 Safety Assessment Conclusion

4.4.1 The proposed Option D TMZ coupled with RAG blanking provides safe and effective mitigation against the radar issues associated with WTGs.

4.4.2 Detailed safety analysis will be undertaken in due cause by NATS based on the outcome of this consultation.

5. Conclusion and Next Steps

5.1 Option D, **RAG blanking of the WTG locations and associated simplified polygon TMZ "rubber banded" around proposed wind farm locations, extended to include a 2 NM buffer**, will provide a suitable PRMS for the impact of WTGs on the Cromer PSR.

5.2 It is our preferred solution and the only option which will be consulted on under stage 3 of this proposal.

5.3 The overall aviation impacts resulting from the implementation of this ACP are likely to be minimal/ negligible.

End of Document

