Moray Offshore Wind Farm (West) Ltd

Moray West

Gateway documentation:

Stage 2 Develop and Assess

2B: Options Appraisal

(Phase 1 Initial)

Including Safety Assessment

Action	Role	Date
Produced	[redacted] - **Airspace Change Specialist** NATS	7th July 2020
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Publication history

Issue	Month/Year	Change Requests in this issue
Issue 1.0	July 2020	First issue released to SARG.

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 2 Develop and Assess Gateway, Step 2B Options Appraisal (Phase 1 Initial), including the Safety Assessment.

1.3 It is advised to read this document alongside the Stage 2A(i) Design Options Document which gives diagrams and descriptions of each option and the Stage 2A(ii) Design Principle Evaluation, Options Assessment which evaluates each of the design options against the Design Principles described in the Stage 1B Design Principle document.

2. Change Level

2.1 The changes in this ACP only impact flights over the sea (22.5 km offshore). Hence in accordance with the Levels as defined in CAP1616, it is expected that this proposal is categorised as a Level 2B change.

2.2 In line with the requirements for a Level 2B change the environmental impact assessment has been conducted on the basis of CO_2 emissions. Owing to the location of this airspace change, there would be no perceptible change to noise impacts to stakeholders on the ground; hence no noise analysis has been undertaken.

3. Options Appraisal

3.1 The wind turbines comprising the Moray Offshore Wind Farm (West) Ltd (MOWWL) could be detectable by the Allanshill primary surveillance radar and would result in significant 'clutter' on radar displays. This would affect an air traffic controller's ability to identify aircraft via primary radar returns and hence introduce the risk of failing to detect a potential conflict between aircraft. A large number of turbines, up to 85 in this case, could also interfere with radar tracking and lead to a saturation of the radar processing systems.

3.2 MOWWL is to be built adjacent to the Beatrice Offshore Windfarm Ltd (BOWL) and Moray Offshore Wind Farm (EAST) Ltd (MOWEL) developments. These windfarms have each required a Primary Radar Mitigation Scheme (PRMS) to be in place prior to construction. It was agreed in these two cases that radar Range Azimuth Gating (RAG), commonly known as Radar Blanking, complemented with a Transponder Mandatory Zone (TMZ) was a suitable mitigation scheme.

3.3 This ACP is proposing an analogous Radar Blanking mitigation solution for MOWWL. Deployment of RAG over the wind farm area, prior to construction commencing, will remove the interference caused by the wind turbines from the radar display. However, radar blanking will also remove primary radar returns of aircraft within the blanked area. To prevent non-transponding aircraft disappearing from the radar, a Transponder Mandatory Zone (TMZ) will need to be established in the same area, restricting access these aircraft. Aircraft transiting the windfarm, will require an operating transponder and will remain visible to ATC using secondary surveillance radar (SSR).

3.4 The 'Do Nothing' option does not provide any mitigation against radar clutter. It assumes that the wind farm would be built but there would be no changes implemented to prevent radar clutter and interference. The evaluation of the Do Nothing option against each Design Principle (DP) concluded that three DPs would not be met, due to the anticipated clutter/ interference. This included the high priority safety DP, DP1 (Maintain or enhance current levels of safety).

3.5 This ACP has proposed three alternative options which could be used to provide appropriate mitigation against the impacts of wind turbine generators (WTGs) associated with MOWWL:

1. Option A: RAG Blanking of wind turbines and TMZ with no buffer implemented over the proposed wind turbine locations not covered by the BOWL and MOWEL TMZs.
2. Option B: Option A with a 2 NM TMZ buffer (as per the existing BOWL and MOWEL TMZs).
3. Option C: Option B with TMZ extended to align with existing and planned TMZ boundaries. (preferred)

3.6 The detailed makeup of the above options is described in the Moray Offshore Wind Farm (West) Ltd Gateway documentation: Stage 2 Develop and Assess Stage 2A(i): Airspace Change Design Options.

3.7 Evaluation of the design options is detailed in the Stage 2 Develop and Assess Stage 2A(ii): Design Principle Evaluation, Options Assessment.

3.8 Do Nothing (Baseline) Option

3.8.1 The Do Nothing option assumes that MOWWL is constructed and none of the mitigating design options are implemented alongside. Table 1 indicates the effects on communities and stakeholders should this be the case.

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. 22.5 km from the Caithness coast.
Communities	Air quality	Qualitative	No changes to aircraft trajectories below 1,000ft.
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 farm is anticipated to provide CO_2e benefits of c. 1 million tonnes per annum[1], equating to an estimated cost value of £1,144,441,843 (£1.14bn) over 25 years. This benefit will only be realised if the airspace change is implemented. *(Note: with no mitigation solution, under Condition 23 the wind farm would be unable to progress. As such the expected CO_2e benefits of c. 1.0 million tonnes 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	No change 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

[1] Calculated using https://www.renewableuk.com/page/UKWEDhome and https://www.moraywest.com/

3.9 Design Options: Implementation of a TMZ

3.9.1 The design proposal is for the implementation of radar blanking, alongside a transponder mandatory zone (TMZ). There are three design options identified with varying possibilities for the size and parameters of the blanked area and TMZ. Most of the impacts are the same for all three options. The only differences between the options in Table 2 below is regarding the Capacity/resilience. This is identified by the grey shading in Table 2 which identifies the expected impact of the design proposal for all three options:

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. 22.5 km from the Caithness coast.
Communities	Air quality	Qualitative	No changes to aircraft trajectories below 1,000ft.
Wider society	Greenhouse gas impact	Monetise and quantify	The introduction of the wind farm is anticipated to provide CO_2e benefits of c. 1 million tonnes per annum[1], which is a benefit of this project. The estimated cost value of this CO_2e benefit is £1,144,441,843 (£1.14bn) over 25 years[2]. This will only be realised if the airspace change is implemented.
Wider society	Capacity/ resilience	Qualitative	Option A will increase ATC workload and impact on capacity leading to a reduction in ATC resilience. Options B & C 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 and would be required to fly a route avoiding the TMZ. GA users without an operating transponder wanting to access the TMZ will have a one-off cost implication (approx. £2,000) to purchase a transponder. Given the offshore location (22.5 km from Caithness 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 increased effective capacity	Qualitative	There would be no increase in effective capacity. Relative difference in capacity between each of the options is small and would not be likely to affect ATC sector monitor values[3].
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 <2 per week).

[2] Calculated using WebTAG

[3] Sector Monitor Values indicate the approximate number of aircraft per hour that an ATC sector can accommodate. If traffic demand rises above the monitor value, flow restrictions can be implemented to ensure that ATC are not overloaded to maintain safety. The imposition of flow restrictions can result in delays to aircraft.

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) –Options A-C
(Note: rows where there is a difference between options are coloured grey.)

4. Safety Assessment

4.1 Options Appraisal Safety Assessment – Do Nothing

4.1.1 Construction of the wind farm without any mitigation against the resulting radar clutter/ interference in place would have the following impacts:

- WTGs will cause clutter on radar displays (~85 WTGs in the MOWWL development)
- This clutter will:
  - Make ATC tracking & identification of non-transponder equipped aircraft in the cluttered area impossible;
  - Make ATC tracking & identification of transponder equipped aircraft in the cluttered area difficult due to obscuration.
- This clutter could cause interference & saturation of radar processing due to excessive radar returns which could degrade radar performance across the whole operating area of the radar.

4.1.2 Due to the above impacts, the suspensive Condition 23 requires that appropriate mitigation is put in place. Hence, Do Nothing is not a viable option.

4.2 Options Appraisal Safety Assessment – Option C

4.2.1 The Option C RAG Blanking of wind turbines and TMZ with 2 NM buffer extended to align with existing and planned TMZs, is proposed as the optimum solution to mitigate the impact of the WTGs on the Allanshill radar system.

4.2.2 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 TMZ area must be transponder equipped and hence will remain visible to ATC via secondary radar.
- The dimensions of the TMZ will include a 2 NM buffer which is adequate to ensure that ATC have sufficient time to identify when an infringement of the TMZ has occurred and to take appropriate action.

4.2.3 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 the radar issues associated with WTGs.

4.2.4 Initial qualitative assessment from NATS safeguarding has confirmed that the proposed Option C TMZ design will provide adequate mitigation to fulfil the requirements required of the NERL Allanshill: PSR Mitigation Scheme.

4.2.5 Detailed safety analysis will be undertaken in due course by NATS based on the TMZ Option C proposed herein.

4.3 Safety Assessment Conclusion

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

5. Conclusion and Next Steps

5.1 All 3 options proposed would have the same impacts on communities and stakeholders, except with respect to the capacity/resilience as presented in Table 2 above. Option A would have a negative impact whereas Options B and C would have no anticipated impact. The CO_2e benefits which the proposed wind farm will provide annually far outweigh any potential fuel burn costs to GA aircraft which will be negligible.

5.2 Option C (RAG Blanking of wind turbines and TMZ with 2 NM buffer extended to align with existing and planned TMZs) is preferable to Option B due to the simpler TMZ shape produced when the existing Moray Firth TMZs are considered. As such, Option C is the only option which will be carried forward to consultation.

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