Safety Case Part 4 – Operation and Support

Clash Gour Airspace Change Proposal

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Executive Summary

EDF Energy Renewables Ltd (EDFER) and Force 9 Energy (Force9) are jointly proposing the Clash Gour Wind Farm development, the site of which is located approximately 12 nautical miles (NM) southwest of Royal Air Force (RAF) Lossiemouth and 15 NM southeast of Inverness Airport. It has been identified that the presence of the Clash Gour Wind Farm will affect Air Traffic Service (ATS) operations at both locations, thereby requiring a change to the arrangements and procedures in the airspace over and in the vicinity of this Wind Farm.

As part of a scheme for mitigation of the predicted wind turbine effects on the RAF Lossiemouth and Inverness Airport Primary Surveillance Radars (PSR), EDFER and Force9 are progressing with an Airspace Change Proposal (ACP) in accordance with Civil Aviation Authority (CAA) Civil Aviation Publication CAP1616. Work to date on the ACP had revolved around a range of design options, but this has now been progressed down to the single option – the implementation of a Transponder Mandatory Zone (TMZ) over the Clash Gour Wind Farm site. Associated with this will be two-dimensional blanking of PSR returns within the boundary of the TMZ over the geographic definition of the Clash Gour site. The proposed airspace solution (TMZ) only needs to be operational at the point where turbines are being erected and are being brought into testing and operation. It is currently anticipated that turbines will be delivered to site and begin being erected in approximately Q3 2026, so the TMZ only needs to start operation from that point.

Civil Air Publication (CAP) 1616 requires a robust Safety Management process to be an integral part of any proposed airspace change. Moreover, Inverness Airport, RAF Lossiemouth and the Civil Aviation Authority Safety and Airspace Regulation Group (CAA SARG) require assurance that the changes introduced by this Airspace Change will result in safe air operations at all stages of the project lifecycle.

This document is the Safety Case Part 4 (Operation and Support) for the Clash Gour TMZ and presents evidence as to how the implementation of the Clash Gour TMZ shall be maintained and supported through its in-service life, thus ensuring the safety claims stated in the Safety Case remain valid.

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1 Introduction

1.1 Background

EDF Energy Renewables Ltd (EDFER) and Force 9 Energy (Force9) are jointly proposing the Clash Gour Wind Farm development, the site of which is located approximately 12 nautical miles (NM) southwest of Royal Air Force (RAF) Lossiemouth and 15 NM southeast of Inverness Airport.

The effects of wind turbines on aviation interests have been widely publicised but the primary concern is one of safety. There are innumerable subtleties in the actual effects of the wind turbines, but there are two dominant scenarios, that lead to objections from aviation stakeholders:

- Physical: Wind turbines can present a physical obstruction at or close to an aerodrome.
- Radar/Air Traffic Services: Turbine clutter appearing on radar display can affect the safe provision of air traffic services as it can mask unidentified aircraft from the air traffic controller and/or prevent him from accurately identifying aircraft under his control. In some cases, radar reflections from the turbines can affect the performance of the radar system itself.

As part of a scheme for mitigation of the predicted wind turbine effects on RAF Lossiemouth and Inverness Airport Primary Surveillance Radars (PSR), EDFER and Force9 are progressing with an Airspace Change Proposal (ACP) in accordance with Civil Aviation Authority (CAA) Civil Aviation Publication CAP1616 [Ref. 01]. This is to enable exploration of airspace-based mitigation options to successfully mitigate what is considered by the airports to be the unacceptable operational impact created by the wind farm on RAF Lossiemouth and Inverness Airport. In this case, the option being taken forward is the implementation of the Clash Gour Transponder Mandatory Zone (TMZ), with associated PSR blanking.

The proposed airspace solution (TMZ) only needs to be operational at the point where turbines are being erected and are being brought into testing and operation. It is currently anticipated that turbines will be delivered to site and begin being erected in approximately Q3 2026, so the TMZ only needs to start operation from that point.

1.2 Purpose and Scope

CAP 1616 states that a Safety Assessment is one of four key compliance areas that the CAA will review when making its decision at Stage 5 of the seven-stage Airspace Change Proposal (ACP) process. The form of this assurance is an operationally focused four-part Safety Case. The route map for the Safety Case is included in the Clash Gour Transponder Mandatory Zone (TMZ) Airspace Change Safety Programme Plan (SPP) [Ref. 02].

The purpose of this Safety Case Part 4 is to demonstrate that Claim 2.4, as stated in the SPP [Ref. 2] “The use of the Clash Gour TMZ will remain acceptably safe during its operational life” is satisfied and maintained.

It is understood that RAF Lossiemouth will be the Controlling Authority for the Clash Gour TMZ.

1.3 Structure of this Document

This document is structured as outlined below:

- Section 1 – Introduction.
- Section 2 – TMZ Configuration and implementation characteristics.
- Section 3 – Maintenance and support arrangements.
- Section 4 – Clash Gour TMZ authorities.
- Section 5 – Organisation and Safety Management.
- Section 6 – Limitations and shortcomings.
- Section 7 – Conclusions and recommendations.

2 TMZ Configuration

2.1 Overview

A TMZ is airspace of defined dimensions wherein aircraft wishing to enter or fly within the defined area, will be required to have and operate Secondary Surveillance Radar (SSR) equipment or receive authorisation (approval) to enter, via radio, from the TMZ Controlling Authority.

The concept of Transponder Mandatory Airspace, in the form of a TMZ, has been developed by the CAA to cater for overriding safety reasons where the airspace classification would not normally require aircraft to carry a transponder. This SSR equipment must include a pressure altitude reporting transponder capable of operating in Mode A and Mode C and have the capability and functionality prescribed for Mode S Elementary Surveillance.

The Clash Gour TMZ provides Air Traffic Control (ATC) at both Inverness Airport and RAF Lossiemouth with assured positional identification and Commercial Air Traffic (CAT) operators with collision avoidance mitigation through the cooperative use of Airborne Collision Avoidance System (ACAS). It will also maintain current levels of safety while radar services are provided using SSR data-only in the wind farm. Aircraft flying through the Clash Gour TMZ will be required to be equipped and operate SSR equipment or to have established two-way radio communications with RAF Lossiemouth, the Clash Gour TMZ Controlling Authority.

The airspace classification of the Clash Gour TMZ remains unchanged as Class G. Hence, the ATS available within and around the TMZ will continue to be applied in accordance with UK FIS through the assured provision of SSR data to the controller.

2.2 Implementation of the Clash Gour TMZ

2.2.1 PSR performance over the Clash Gour TMZ

The wind turbine clutter is removed from the ATC displays at both Inverness Airport and RAF Lossiemouth by way of PSR blanking within the area of Clash Gour TMZ. Each organisation is responsible for maintaining this to their local surveillance systems.

Inverness Airport Technical Approach to PSR Blanking (TBD – STAR2000/STAR-NG/Terma)

DETAILS TO BE INSERTED ONCE PSR APPROACH IS FINALISED

RAF Lossiemouth Approach to PSR Blanking (TBD – Watchman/STAR-NG)

DETAILS TO BE INSERTED ONCE PSR APPROACH IS FINALISED

2.2.2 Clash Gour TMZ design

Due to the proximity of the existing Berry Burn and Berry Burn 2 wind farms, the Clash Gour TMZ encompasses the turbines at these sites.

The design of the Clash Gour TMZ is a simplified polygon – shown in red in Figure 1 - surrounding the locations of 3 wind turbine arrays, Clash Gour, Berry Burn and Berry Burn 2.

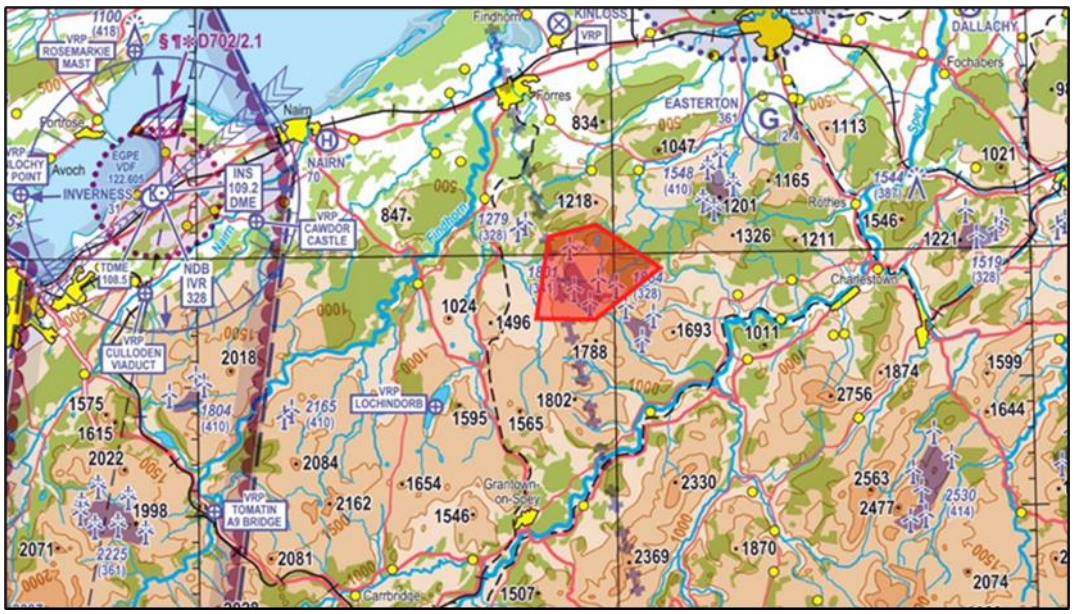

Figure 1 - Clash Gour TMZ design

2.3 Hours of Operation of the Clash Gour TMZ

Under normal UK Integrated Aeronautical Information Package (IAIP) arrangements, the operating hours of a particular airspace segment established for ATS purposes are linked to the operating hours of the associated ATS Unit. In this case it will be those of the nominated Controlling Authority, RAF Lossiemouth.

H24 (based on current promulgated operation of Moray TMZ, where RAF Lossiemouth are the Controlling Authority)

This information was captured within the UK IAIP/MIL AIP to be published on INSERT DATE HERE, detailing the frequency to be used, the boundary of the Clash Gour TMZ and timings.

3 Support Arrangements

3.1 Overview

This section sets out the maintenance and support arrangements necessary to ensure the continued safety of the Clash Gour TMZ during its in-service life.

The implementation of the Clash Gour TMZ required parameters to be modified on the radar displays and in the radar data processing systems at Inverness Airport and RAF Lossiemouth:

- The boundary of the Clash Gour TMZ is displayed on the radar displays at Inverness Airport.
- The boundary of the Clash Gour TMZ is displayed on the radar displays at RAF Lossiemouth.
- The PSR at Inverness Airport is subject to blanking over the area of the Clash Gour wind farm, as defined by the Clash Gour TMZ.
- The PSR at RAF Lossiemouth is subject to blanking over the area of the Clash Gour wind farm, as defined by the Clash Gour TMZ.

In respect of this, the following support arrangements are necessary to ensure the continued safety of the Clash Gour TMZ during its in-service life.

3.2 PSR Maintenance Requirements

Will depend on PSR installations in operation, but detail to be added on who is responsible for maintenance and the schedules for preventative maintenance.

Inverness Airport - TBC

RAF Lossiemouth – TBC

3.3 Operational Interface

Detail to be added on the reporting of unserviceability's and any associated procedure(s) – Ops & Engineering.

Detail to be added on reporting of prolonged periods of unserviceability.

Inverness Airport – TBC (MATS Part 2) [Ref. 6]

RAF Lossiemouth – TBC (ATCOB/Defence Aerodrome Manual) [Ref. 7]

3.4 Applicable Warranty and Support Arrangements

Will depend on PSR installations in operation.

Inverness Airport

RAF Lossiemouth

3.5 Clash Gour Shutdown Protocol

TBD.

4 Clash Gour TMZ Authorities

4.1 Overview

This section sets out the maintenance and support arrangements necessary to ensure the continued safety of the Clash Gour TMZ during its in-service life.

The implementation of the Clash Gour TMZ required parameters to be modified on the radar displays and in the radar data processing systems at Inverness Airport and RAF Lossiemouth:

- The boundary of the Clash Gour TMZ is displayed on the radar displays at Inverness Airport.
- The boundary of the Clash Gour TMZ is displayed on the radar displays at RAF Lossiemouth.
- The PSR at Inverness Airport is subject to blanking over the area of the Clash Gour wind farm, as defined by the Clash Gour TMZ.
- The PSR at RAF Lossiemouth is subject to blanking over the area of the Clash Gour wind farm, as defined by the Clash Gour TMZ.

In respect of this, the following authorities are to be notified should any changes to the configuration be required.

4.2 Surveillance System Design Authorities

Inverness Airport

State the design authority for the PSR.

State the design authority for the display system.

RAF Lossiemouth

State the design authority for the PSR.

State the design authority for the display system.

4.3 Implementation Engineering Authorities

Inverness Airport

State the implementation design authority for the PSR blanking.

RAF Lossiemouth

State the implementation design authority for the PSR blanking.

TBC from RAF Lossiemouth will identify any changes in the Operational and/or Regulatory Environment that may affect the suitability of the Clash Gour TMZ.

Should any engineering changes be required {the TBC from previous statement} will seek the advice of the ……, and all changes are to be subject to the {expected to be the Junction of Maintenance}.

5 Organisation and Safety Management

5.1 Training and Competence

5.1.1 Inverness Airport

ATC

ATC familiarisation was undertaken to address the changes in the presentation of the primary radar data within the Clash Gour TMZ and associated PSR blanking. This ATC training took place between INSERT DATES and {state results}.

Changes to operational procedures – insert MATS Part 2 details.

ATE

Detail any ATE training.

5.1.2 RAF Lossiemouth

ATC

ATC familiarisation was undertaken to address the changes in the presentation of the primary radar data within the Clash Gour TMZ and associated PSR blanking. This ATC training took place between INSERT DATES and {state results}.

Changes to operational procedures – insert MATS Part 2 details.

If applicable include details on any briefing associated with the Clash Gour shutdown protocols[1].

ATE

Detail any ATE training.

5.2 Change Control

Notwithstanding the requirement to consult with the relevant Authority, as stated in section 4, before making any changes to the equipment all changes to the implemented configuration are to be subject to an appropriate risk requirement, in accordance with the HIAL Safety Management System (SMS) [Ref. 8] and the Safety Management Manual (SMM) [Ref. 9] applicable to RAF Lossiemouth.

5.3 Equipment Manuals

The Senior Air Traffic Engineer at Inverness Airport shall ensure that any amendments issued by the PSR System/Design authority are incorporated in the issued versions of the manufacturer supplied manuals and documentation held on site.

The Senior Air Traffic Engineer responsible for RAF Lossiemouth shall ensure that any amendments issued by the PSR System/Design authority are incorporated in the

[1] Assumed to apply only to the Controlling Authority.

issued versions of the manufacturer supplied manuals and documentation held on site.

5.4 Clash Gour TMZ Safety Performance Monitoring

The RAF Lossiemouth surveillance system that supports the display of the Clash Gour TMZ and associated PSR blanking is subjected to safety monitoring in accordance with the RAF Lossiemouth SMS [Ref. 9].

The Inverness Airport surveillance system that supports the display of the Clash Gour TMZ and associated PSR blanking is subjected to safety monitoring in accordance with the HIAL SMS [Ref. 9].

6 Limitations and Shortcomings

6.1 Limitations

The introduction of the Clash Gour TMZ and associated PSR blanking at RAF Lossiemouth and Inverness Airport is in mitigation to the adverse effects of the Clash Gour wind farm on the PSRs. Any other wind farm development(s) must be subject to a separate mitigation strategy and subsequent safety assurance programme.

6.2 Shortcomings

The Clash Gour TMZ and associated PSR blanking effectively masks the impacts of the Clash Gour wind turbines on the performance of the RAF Lossiemouth PSR and Inverness Airport PSR. It does not mitigate against some other effects of the wind turbines on the PSR.

7 Conclusions & Recommendations

7.1 Overview

This Safety Case demonstrates that the ATS at RAF Lossiemouth and Inverness Airport achieves an acceptable level of safety subsequent to the introduction of the Clash Gour TMZ into operational use, and throughout its in-service use. This is achieved by way of a Safety Argument and compliance with derived safety requirements.

7.2 Satisfaction of Safety Argument

The overarching, top-level Safety Claim (Claim 0) is that the implementation of the proposed Clash Gour TMZ shall permit the continued provision of an acceptably safe ATS to be provided from Inverness Airport and RAF Lossiemouth, throughout its in-service usage.

Claim	Satisfied?
Claim 1: The provision of an ATS within the extant airspace is acceptably safe.	Yes, evidence presented in Safety Case Part 2 [Ref. 4].
Claim 2: The provision of an ATS within the revised airspace will be acceptably safe and will continue to be so.	See sub claims below
Claim 2.1: All hazards pertaining to the introduction of the Clash Gour TMZ have been identified and understood, including those involving other airspace users, adjacent airports, and aviation organisations.	Yes, evidence presented in Safety Case Part 2 [Ref. 4].
Claim 2.2: The submitted design of the Clash Gour TMZ is deemed acceptably safe and agreed by the CAA.	Yes, evidence presented in Safety Case Part 2 [Ref. 4].
Claim 2.3: The Programme for transitioning the TMZ into operational use is planned and acceptably safe.	Yes, evidence presented in Safety Case Part 3 [Ref. 10].
Claim 2.4: The use of the TMZ will remain acceptably safe during its operational life.	Yes, evidence presented in the Safety Case Part 4 (this document).

Table 1 - Satisfaction of Safety Argument

7.3 Compliance with Safety Requirements

The Safety Case Part 1 [Ref. 3] derived Safety Requirements that reduce the risks associated with the implementation of the Clash Gour TMZ to an ACCEPTABLE level.

Compliance with these Safety Requirements is demonstrated in the Safety Case Part 2 [Ref. 4] and Safety Case Part 3 [Ref. 10].

7.4 Conclusion

To ensure that the safety claims remain valid, the Safety Case Part 4 sets out how the Clash Gour TMZ, and associated PSR blanking at RAF Lossiemouth and Inverness Airport, will be maintained and supported throughout the operational life of the Clash Gour TMZ.

This Safety Case document, in conjunction with the corresponding Safety Case Part 1 [Ref. 3], Safety Case Part 2 [Ref. 4] and Safety Case Part 3 [Ref. 10] supports the claim that the implementation of the Clash Gour TMZ is acceptably safe when introduced into service and will continue to be so.

SUBJECT TO THE ADDITIONS AND EVIDENCE BEING INCORPORATED INTO ALL SAFETY ARTEFACTS.

7.5 Recommendations

As with the Safety Case Part 2 and Safety Case Part 3, this Safety Case Part 4 shall be revisited once the approach to the PSR blanking at RAF Lossiemouth and Inverness Airport is known. This includes identifying the PSR system(s) blanking is to be applied to.

8 References

Ref	Title	Origin
[Ref. 01]	CAP 1616 Airspace Design: Guidance on the regulatory process for changing airspace design including community engagement requirements. V4 Issued March 2021[2]	CAA
[Ref. 02]	Safety Programme Plan Clash Gour Airspace Change Proposal 71609 013, Issue 1, 5th January 2022	Osprey
[Ref. 03]	Safety Case Part 1 - Safety Requirements Clash Gour Airspace Change Proposal 71609 018, Issue 2 Draft, 30th April 2024.	Osprey
[Ref. 04]	Safety Case Part 2 – Design Substantiation Clash Gour Airspace Change Proposal 71609 027, Draft A, 30th April 2024	Osprey
[Ref. 05]	Hazard Identification Record Clash Gour Airspace Change Proposal 71609 015, Issue 3, 18th March 2022	Osprey
[Ref. 06]	Inverness Airport MATS Part 2	HIAL
[Ref. 07]	RAF Lossiemouth ATCOB	RAF Lossiemouth
[Ref. 08]	HIAL Safety Management System	HIAL
[Ref. 09]	RAF Lossiemouth Safety Management Manual	RAF
[Ref. 10]	Safety Case Part 3 – Transition into Service Clash Gour Airspace Change Proposal 71609 028, Draft B, 30th April 2024	Osprey

[2] Email from CAA 15 December 2023 confirmed that CAP1616 Version 4 shall apply to this ACP until it is concluded.