Llŷr Offshore Wind Farm

Hartland Point PSR Mitigation Proposal

January 2026

Document:

P10-LLY-4.2.3-PLA-0004

Table of Contents

1. Purpose of this Proposal 3
2. Policy and Background 3
3. The Llŷr project Commitment 3
4. Mitigation Proposal and Radar Replacement Options 3
5. Proposed Mitigation Solution – Deployment of a Hensoldt ASR-NG 5
6. Interim Measures 6
7. Conclusion 6
8. Appendix 1 - Hensoldt ASR-NG specification 7

Table of Figures

Figure 1 - 120 and 42 NM range options 4
Figure 2 - ASR-NG features and benefits 5

1. PURPOSE OF THIS PROPOSAL

This document provides a proposal that would mitigate the identified impacts to the Ministry of Defence's (MoD's) Primary Surveillance Radar (PSR) at Hartland Point from the Llŷr Offshore Wind Farm. The proposal seeks to ensure continued effective radar coverage, acknowledging operational requirements of the MoD and the policy environment informing the interaction between wind energy development and aviation infrastructure.

This proposal specifically puts forward the replacement of an existing end-of-life Watchman PSR with a new, wind farm tolerant radar.

2. POLICY AND BACKGROUND

The Hartland Point PSR was excluded from Project Marshall and, as per a Freedom of Information (FoI) response in 2015[1], was previously intended to be decommissioned by 2018. The MoD subsequently reversed this decision, opting to maintain PSR coverage at Hartland Point. Consequently, this radar has not benefited from replacement by a Thales STAR-NG or the Watchman Enhancement (upgrades delivered to the remainder of the MoD Watchman fleet) under Project Marshall.

The Llŷr project assumes that this policy reversal – the decision to retain rather than decommission the Hartland Point PSR - has prompted the MoD's objection to the permit application. Notably, the MoD did not object to the nearby Erebus or Whitecross floating offshore wind projects who equally impact the radar coverage.

Given the policy direction established in Project Marshall, the MoD should logically assume responsibility for replacing this end-of-life PSR, having retained it for sovereign tactical purposes (regardless of windfarm development in the region). This position aligns with the recently adopted National Policy Statement (NPS) EN-1, especially sections 5.5.4, 5.5.27 and 5.5.28. Section 5.5.28 in particular stipulates that Communications, Navigation and Surveillance (CNS) owners and operators should deploy wind turbine tolerant replacement technologies when infrastructure reaches end-of-life, thereby futureproofing aviation safety against further wind development.

3. THE LLŶR PROJECT COMMITMENT

The Llŷr project is prepared to pay the MoD's reasonably and demonstrably incurred costs of mitigating the impacts of the Llŷr project on the Hartland Point PSR. It is, however, acknowledged that wind turbines are now part of the UK's established built environment and energy baseline, a fact explicitly acknowledged by the MoD in NPS EN-1 section 5.5.27 and that any Radar Mitigation Scheme (RMS), applicable to the Llŷr project will require detailed provisions on mitigation deployment and cost sharing between beneficiary developments and the MoD (given the MoD's evolving baseline requirement).

The Llŷr project should therefore contribute, rather than provide sole funding, to the capital costs of replacing the sovereign surveillance infrastructure. Where mitigation results in broader regional benefit beyond the Llŷr Floating Wind project, implementation costs should be shared equitably amongst all beneficiary sites and the MoD (as per National Policy Statement EN-1).

4. MITIGATION PROPOSAL AND RADAR REPLACEMENT OPTIONS

It is recommended that the current Hartland Point PSR, which is at end of life, is replaced by a new PSR with windfarm tolerance capabilities. We have considered a number of PSR system options (presented below) that have previously been deployed by the MoD and/or have been tested or evaluated as part

[1] FOI 2015/07745

of the Project Marshall or other similar applications. The replacement options considered are as follows:

- Hensoldt ASR-NG – a 3D S-band PSR with a 120 NM range;;
- Thales STAR-NG – a 2D S-band PSR with a 60 NM plus range - and activation of its Wind Farm Filter;
- BAE Watchman Enhancement – a 2D S-band PSR with a 60 NM plus range - and activation its of inbuilt windfarm tolerance;
- Terma Scanter 4002 – a 2D X-band PSR with an instrument range of either 42 NM or 60 NM and which has been widely deployed as a windfarm tolerant approach PSR at numerous UK civil airports.

The above replacement radar options can be incorporated into the MoD's existing operational aerial picture with existing communications infrastructure, and the ASTERIX feed would be directly interoperable with the Thales TOP-SKY Tracker, which it is understood is already in use under Project Marshall. Based on the interface requirements, the feed could also be accessible to No. 78 Squadron at Swanwick by way of integration into NATS En-Route Multi-Radar Tracker (MRT).

As confirmed by the MoD, the Hartland Point location is being retained. Replacement of the radar at this location ensures that the land is already available to the MoD, and will not require new installation security, or access to new power and communications services.

Alternatively, Manorbier is a possible site for deployment of a replacement PSR with windfarm tolerance capabilities, if Manorbier remains an operational MoD site. It is noted that Manorbier PSR was not included in Project Marshall . A Terma Scanter 4002with an instrumented range of 42 NM, could be viably deployed at Manorbier (28 NM from the Llŷr Wind Farm).

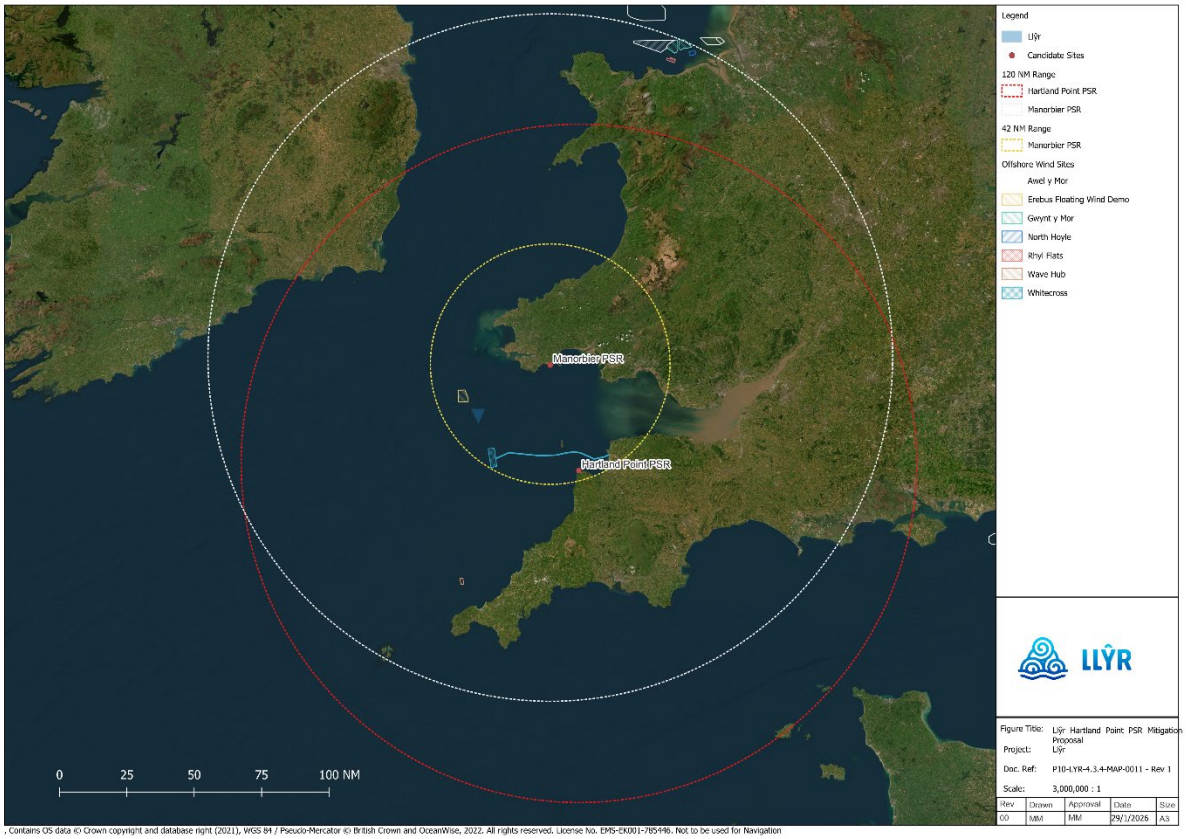


Figure 1 - 120 and 42 NM range options

The 120 NM and 42 NM ranges from the Hartland Point PSR and Manorbier locations are shown in Figure 1. The Llŷr Project Array Area is shown as the blue triangle.

The Llŷr projects proposed system, based on our understanding of the MoD's requirements is outlined in the following section. However, the MoD has knowledge of all four potential systems and may reasonably select another system.

5. PROPOSED MITIGATION SOLUTION – DEPLOYMENT OF A HENSOLDT ASR-NG

The Llŷr project proposes that the MoD deploy a Hensoldt ASR-NG as the replacement for the end-of-life Hartland Point Watchman PSR.

The ASR-NG is a 3D S-band PSR with up to 120 NM of range, which would significantly improve the surveillance capabilities for the MoD in the Celtic Sea and the southwest of the UK. Radar line-of-sight analysis also indicates that the radar will have coverage down to approximately 1,800ft amsl at 120NM in on the radial of the Llŷr Array.

A key benefit of the ASR-NG is its provision of 3D coverage, which allows optimisation of the air picture while limiting any necessary reduction in low-level coverage in the immediate vicinity of turbines. The 3D capability distinguishes the Hensoldt ASR-NG from the other candidate S-band replacement PSR. While the Scanter 4002 is also a 2D PSR, it has the advantage of a 6m range cell but on balance, the Applicant considers the ASR-NG to be more likely to fulfil the MoD's operational requirements .

The Hensoldt ASR-NG has also been shown to exhibit good windfarm mitigation capacity in the turbine rich operational environment around Vienna Airport.

It is understood that the MoD has also evaluated these abilities in Marshall deployable models of the ASR-NG. The ASR-NG would offer adequate ranges for regional mitigation, not only for the Llŷr project, but for future Crown Estate Round 5 sites (as would the Thales STAR-NG and Watchman Enhancement).

The ASR-NG features and benefits, taken from the Hensoldt website, are shown in Figure 2 and are also provided in the attached Hensoldt ASR-NG specification.

Figure 2 - ASR-NG features and benefits

6. INTERIM MEASURES

It is expected that a windfarm-tolerant PSR can be selected and installed before the first turbine is commissioned. However, should operation start before the implementation of the new radar and an interim solution is needed, the approach proposed by the Llŷr project is to use a radar blanking and Transponder Mandatory Zone (TMZ) solution, as successfully adopted across UK offshore wind development to date.

7. CONCLUSION

The Llŷr project proposes replacing the Hartland Point PSR with a new Hensoldt ASR-NG system (or the MoD's preferred equivalent system), which will mitigate the impacts of the Llŷr Offshore Wind Farm whilst minimising radar coverage loss. Should the project be operational before the new radar is deployed, the Llŷr project is willing to implement a temporary radar blanking and TMZ solution.

The Llŷr project will contribute to the reasonably and demonstrably incurred costs of mitigation, recognising that the MoD retains ultimate responsibility for replacing this end-of-life sovereign tactical asset. Given the broader regional benefit of the proposed radar upgrade, implementation costs should be shared equitably across beneficiary sites.

The Llŷr project remains committed to constructive engagement with the MoD in order to reach a suitable and equitable mitigation strategy.

8. APPENDIX 1 - HENSOLDT ASR-NG SPECIFICATION

HENSOLDT **ASR-NG**

Military Airport Surveillance Radar

The airspace is shared between civil and military users and between operational and general air traffic. To provide safe air traffic management for all users and to avoid safety-crucial situations, the state-of-the-art ASR-NG® delivers excellent detection performance covering different aircraft sizes. Modern radars also have to be capable of differentiating between slow-moving rotary-wing aircraft and fast-moving military supersonic fighters without any significant blind speed gaps. The awareness of non-cooperative air traffic, especially in airspace used by the military, reduces the risk of near-miss incidents and increases flight safety for all aircraft under control.

Increase your flight safety

- Detection range up to 120 NM and 50,000 ft
- 3D height information of non-cooperative targets
- Dynamic clutter cancellation
- Proven wind farm mitigation
- NATO IFF Mode 5

www.hensoldt.net

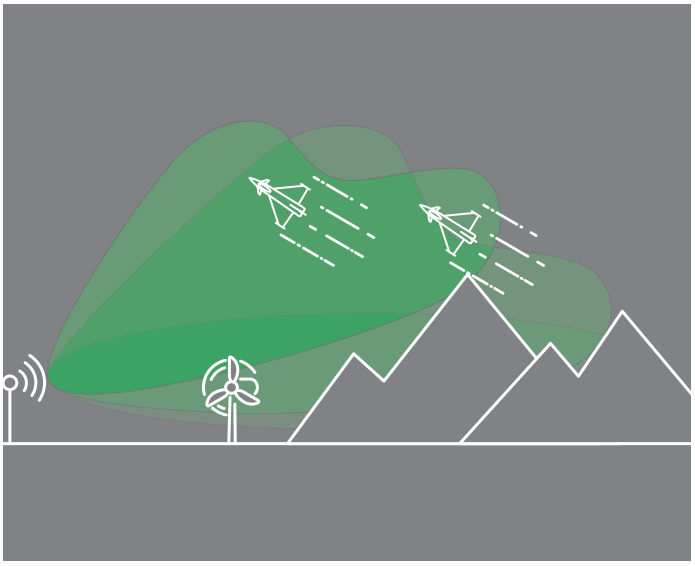
HENSOLDT
Detect and Protect.

Future-proven 3D technology

Given the rapidly growing presence of disturbing factors such as wind farms or telecommunication influences, it is of utmost importance for air traffic control radars to be able to cope with highly dynamic clutter environments and to resist 4G/LTE impacts.

Using a three-horn antenna feed, ASR-NG also provides the unique feature of 3D target detection. This third beam allows the measurement and calculation of altitudes of non-cooperative targets, for example aircraft without Identification Friend-or-Foe (IFF) signals or a transponder.

The three-horn antenna solution



Triple beam

Situational awareness

- Dynamic clutter cancellation
- Proven automatic wind farm mitigation
- 3D height information

Surveillance

- S-band primary surveillance radar
- Dual redundant monopulse secondary surveillance radar
- IFF Mode 5

Reliability

- Remote monitoring and control
- Reduced preventive maintenance
- Service life extension programme

Type	Data
Operational frequency range	2.7-2.9 GHz (PSR); 1030 MHz and 1090 MHz (SSR)
Transmitter	Solid-state GaN
Coverage volume	0.2 NM … 120 NM / up to 50,000 ft
Scan rate	12 rpm / 15 rpm
Antenna beams	3 beams – 2 $Cosec^2$ high beams and 1 pencil low beam
Number of operational frequencies	4 selectable frequencies
Plot accuracy – Range / Azimuth	< 60 m / < 0.1°
Resolution – Range / Azimuth	< 150 m / < 2.9°
Subclutter visibility	≥ 60 dB
Processing channels	Three-channel architecture with coherent processing
Weather detection	Six-level intensity classification according to US NWS – ASTERIX CAT008
Number of tracks	Up to 1,200
Secondary radar	Modes 1, 2, 3 A/C, 4, 5, S
Application layer protocols	ASTERIX (categories 007, 008, 017, 021, 034, 048, 253), NTP

HENSOLDT

Detect and Protect.

HENSOLDT AG
info@hensoldt.net
www.hensoldt.net