PAGERPOWER

Case Study 19:

Fallago Rig Wind Farm

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CONTENTS

1 INTRODUCTION

Fallago Rig Wind Farm received planning consent in 2010 and was officially opened in 2013 by the Duke of Roxburghe and Scottish Energy Minister Fergus Ewing[1]. The 48 wind turbines have a combined electrical capacity of 144 Megawatts.

The planning application was opposed by the Ministry of Defence (MOD) because of the predicted impact of the wind farm on the RAF Air Defence radar at Brizlee Wood, located on the coast of north east England. This radar is used to detect unknown aircraft and also to direct intercepting aircraft. It has a range of over 100 kilometres and provides coverage in UK and international airspace.

Pager Power provided technical support, advice and expert evidence for both the original project developer (North British Wind) and the subsequent builder and operator (EDF ER).

Figure 1: Fallago Rig Wind Farm

[1] http://www.edf-er.com/News/LatestNews/tabid/613/entryid/28/scottish-energy-minister-opens-edf-energy-renewables-fallago-rig-wind-farm.aspx

2 BACKGROUND

North British Wind submitted its planning application for the Fallago Rig Wind Development in May 2005. Initially there was no objection from the MOD – however a relatively late objection was received due to the development's predicted impact on the air defence radar at RAF Brizlee Wood.

This objection arose partly due to the MOD's changing policy to wind farms at this time - these policy changes being due to the MOD learning more about the effects of wind turbines on radar, and due to the rapidly rising number of wind farm planning applications at this time.

The wind farm application was subject to two separate public local inquiries in February 2008, and August 2010 led by reporter Karen Heywood in Volunteer Hall Duns.

The MOD issue was key to the eventual granting of planning consent, and hinged not on whether the Brizlee radar would be affected by the wind farm, but rather on whether the effects of the wind farm could be mitigated technically.

Figure 2: RAF Brizlee Wood Radar

3 THE CHALLENGE

The MOD's position at the time of the appeal was that the wind farm's effects on the radar could not be tolerated, and that the wind farm should not be given permission to go ahead.

The developer's position was that the effects of the wind farm could be acceptable to the MOD, and that these effects could be mitigated in the event that they were deemed to be unacceptable by the reporter.

It was necessary to present well researched strong evidence which would withstand cross examination, by the barrister appointed by the MOD, and legal scrutiny.

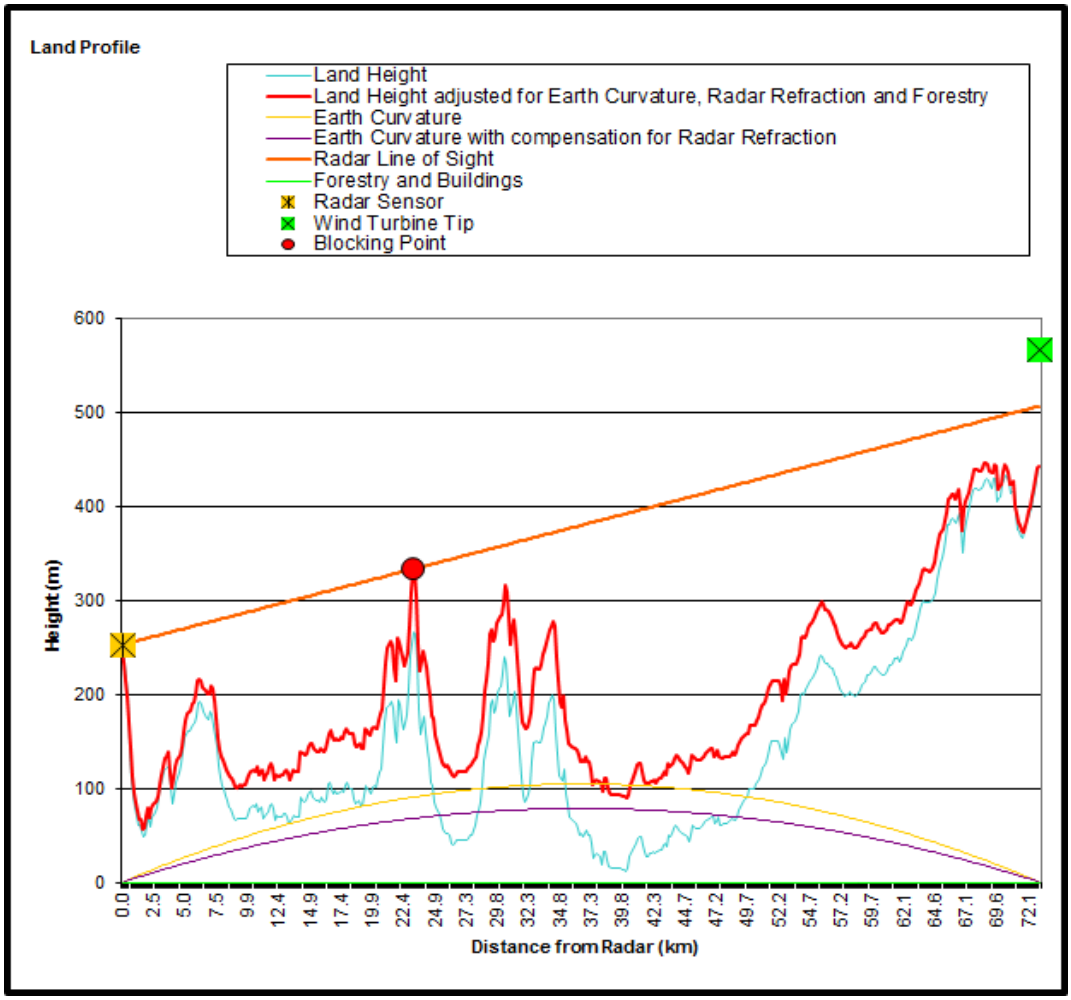

Figure 3: Radar Line of Sight Chart from RAF Brizlee Wood to Fallago Rig

4 THE RESULT

Michael Watson of Pager Power delivered expert evidence at the 2008 local public inquiry over a period of two days, with robust cross examination by the MOD legal team. The public inquiry also included a visit to the radar at RAF Brizlee Wood.

A further public inquiry was convened in 2010, with an eventual decision to approve the wind farm by the Scottish Government Energy Consents unit. The permission was granted subject to a condition, requiring a radar mitigation scheme to be implemented prior to the wind farm becoming operational.

An excerpt from the decision letter of 9 November 2010[2] is reproduced below:

Consideration

The Scottish Ministers have considered fully and carefully the Application and accompanying documents, the objections and representations received and the evidence produced to and submissions made at the inquiry. Ministers have also considered the two public inquiry reports and agree and adopt the findings of the reporter relevant to this Application. They agree with and adopt the reporter's consideration of issues raised, findings and reasoning (including reasons for the imposition of conditions) and the conclusions she reached in relation to this Application as set out in the reports. The Reporter's reasoning and recommendations are summarised at chapter 7 of the report dated 5th August 2010, read with chapter 6 of the report dated 11 August 2008.

The Environmental Statement and supplementary information submitted by the Company was assessed in respect of national and local economic benefit. The Scottish Ministers consider the Development will make a valuable contribution towards achieving renewable energy targets which aim to combat the effects of climate change. It was also considered that the development accords with Scottish Government policy to grow the Scottish economy and with Scottish Planning Policy.

Determination

Subject to the conditions set out in Part 1 of Annex 2, Scottish Ministers grant consent under section 36 of the Electricity Act 1989 for construction and operation of the Fallago Rig wind powered electric generating station near Duns, in the Scottish Borders, as described in Annex 1.

[2] http://www.gov.scot/Resource/0045/00452721.pdf

Subject to the conditions set out in Part 2 of Annex 2, Scottish Ministers direct under section 57(2) of the Town and Country Planning (Scotland) Act 1997 that planning permission be deemed to be granted in respect of the Development described in Annex 1.

In accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Amendment Regulations 2008, you must publicise this determination for two successive weeks in the Edinburgh Gazette and one or more newspapers circulating in the locality in which the land to which the Application relates is situated.

Yours sincerely

Jamie Hume Deputy Director

Head of Renewable Energy

A member of the staff of the Scottish Ministers

5 THE EVIDENCE

The Summary Precognition presented as expert evidence at the 2008 public inquiry is reproduced below:

Introduction

1. My name is Michael Watson and I am the owner and managing director of Pager Power Limited. The company's business is the assessment of the effects of wind turbines on radars and communications systems and aviation operations.

Effects of Fallago Rig on Brizlee Wood radar

2. For these effects, the MoD rely on evidence deriving from trials they conducted in 2004 and 2005. But there are a number of reasons why the effects of Fallago Rig on Brizlee Wood are likely to be different and less significant.

3. Extrapolation from the trials at 57km to any distance relies on the assumption that the ratio between the Radar Cross Sections ("RCS") of turbines and aircraft remains constant at any range. The Earth's surface is curved meaning that turbines effectively lean more as they get further away from the radar. The Fallago Rig development is 16km further from the radar than the site of the trials, increasing the angle of the turbine towers by 0.14 degrees. Applying research by Alenia-Marconi Systems suggests a corresponding reduction of 86% in RCS.

4. Radar signals are attenuated as they pass over intervening landform between the radar and the target. Comparison of the terrain suggests that there will be significantly greater attenuation for Fallago Rig than there was for the trials in Wales.

5. The trials were based on a single windfarm comprising old-style turbines. The materials and shape of modern turbines will result in a different RCS.

6. The conclusions of the trials make clear that the effects observed on one of the key features of Air Defence ("AD") radars was believed to be attributable to the techniques used by the T101 to calculate heights and may not be applicable to other AD radars, such as the T93 at Brizlee Wood.

7. In the trials of 2004 there was insufficient evidence to rule out the possibility that the overhead obscuration observed might have been the result of the impact of weather clutter over the ridge on which the turbines were located. The 2005 trials concluded that the overhead obscuration in both trials was highly anomalous, leading to the possibility of an error in the data collection methodology or a fault in the radar set under test.

8. The US Congressional Report cited by the MoD notes that the trials "do not provide a sufficiently robust statistical database to enable quantitative computations to be

performed in terms of actual reduction in probability of detection, increase in probability of loss of track, and increase in probability of false alarms".

9. No empirical evidence has been provided to confirm the hypothesis that the effects observed in the trials will be caused by Fallago Rig.

Effects on radar

10. The clutter effect of wind turbines on radar systems is well documented and understood. None of the many documents published by the MoD suggest that wind farm related clutter is a problem for AD radar.

11. Overhead Obscuration due to wind farms has been known to the UK wind farm and radar community since 2004. However, the phrase 'Overhead Obscuration' does not appear in the Civil Aviation Authority guidance on wind farms and radar published in July 2006.

12. I have yet to meet a Controller or know of a Controller (military or civilian) who has actually noticed any Overhead Obscuration effects from an existing wind farm in an operational environment.

13. Neither the CAA Manual of Air Traffic Services nor the Manual for Military Air Traffic Services appear to give specific guidance on operations in the vicinity of wind farms or the effects of Overhead Obscuration. One might therefore assume that there are no significant effects in practice or that radar coverage is often 'patchy' and controllers regularly deal with this as part of their normal activities.

Effects on the Recognised Air Picture

14. The MoD accept that it is not any effects on the radar which are important, but rather the impact such effects may have on operations. A key concept in those operations is the Recognised Air Picture ("RAP").

15. There are two AD radar that provide RAP coverage in the airspace above Fallago Rig. These are Brizlee Wood and Buchan in Aberdeenshire. Buchan will not be affected by Fallago Rig but has unobstructed coverage of the airspace above it down to a minimum altitude of some 2,200ft above ground level.

16. The UK trials concluded that the most significant effect of wind farms was the obscuration observed throughout the full height range used for the trials (2,000ft - 24,000ft). In the case of Fallago Rig, the effects on the RAP will be limited to about 2,200 feet.

17. With respect to the mitigation of windfarm effects generally, the MoD have indicated that the absence of 'dead air' above 10,000ft would remove a key element of their concerns. There will be no 'dead air' at Fallago Rig above 2,200ft. This would reduce the effect by 99%; the residual volume affected would be 60% smaller than that hoped for by the MoD as a successful outcome to mitigation.

18. Low-level coverage is relevant for the detection of low-flying aircraft seeking to evade the radar by flying 'beneath' it. The MoD routinely advise that their own aircraft fly down to 100ft above ground level. However, the onshore coverage from Brizlee Wood to the north at this level is limited to a narrow sector of approximately 14° for a distance of approximately 80km; Fallago Rig is located in the far corner of this coverage.

19. The volume of airspace affected by Fallago Rig – if there are any noticeable effects – will be very small.

Effects on Air Traffic Control operations

20. Any effects of Fallago Rig on routine Air Traffic Control ("ATC") operations will be minimal and can be mitigated by normal procedures

21. During the whole of 2006 the total number of launches of Quick Reaction Alert intercept aircraft in response to incidents was just six, throughout the UK.

22. Interception of 'hostile' military jets normally occurs over the sea before the hostile aircraft reach UK airspace. The interception itself is unlikely to take place over the wind farm.

23. No evidence has been provided by the MoD as to the effects (if any) on ATC operations from existing operational wind farms that are visible to the AD radar.

24. I conclude that any effects on ATC operations cannot be significant.

Effects on Air Surveillance operations

25. Potential effects on operations to detect and identify hostile aircraft will be limited to the airspace overhead Fallago Rig below 2,200ft.

26. The MoD have stated that aircraft already detected at a distance are unlikely to be problematic and that there is anyway a fairly high chance that aircraft flying over a windfarm of this size will be gone before they create a problem.

27. Fallago Rig lies in a remote area at the far corner of the narrow sector of lowlevel coverage from Brizlee Wood. If undetected low-flying aircraft do not enter this sector, they will remain undetected and Fallago Rig will have no impact on air surveillance; if they do enter this sector, Fallago Rig can only delay their detection or accelerate their disappearance by a few km.

28. In the context of these existing limitations, any effects of Fallago Rig on air surveillance operations will be marginal and not significant.

29. There are existing operational windfarms of similar design to Fallago Rig which lie in line of sight to Brizlee Wood at a distance similar to that of Fallago Rig. The MoD have not provided any evidence with regard to the actual effects of those windfarms on their operations.

National Security

30. At the end of 2005 the MoD held a conference with representatives of Europe and the USA to share evidence on the impacts of windfarms on radar; as a result the MoD speculated that there might be changes in the policies of other countries. As reported in the second half of 2006, however, the windfarm policies of other NATO countries in Europe assume that the effects of windfarms will not be significant at distances substantially smaller than 74km.

31. I do not believe that the state of the UK's AD capability is such that any limited effects of Fallago Rig could represent any significant prejudice to National Security.

Further mitigation and suspensive condition (if required)

32. However, even if this conclusion were not accepted, any concerns of the MoD can be addressed by a suspensive condition to the effect that no 'problem' turbines should be constructed until adequate mitigation is in place with respect to those turbines.

33. Mitigation can be identified in the T102, which is scheduled to be operational at Brizlee Wood in the second half of 2008. This is a specific solution with a specific timetable. The MoD have themselves confirmed that the identified new software mitigation techniques should result in a dramatic reduction in overhead obscuration and resolve the vast majority of windfarm concerns. The manufacturer is reasonably confident that the T102 will meet its objectives. At the lowest, therefore, there are reasonable prospects that the T102 will be installed and will provide the mitigation required.

Conclusions

34. The MoD have based their assessment of the likely effects of Fallago Rig on the radar trials of 2004 and 2005. The trial findings have a number of significant uncertainties. Namely that effects could be due to weather, the trial radar requires to be tested to confirm it was working correctly and there is commentary from the US Government making it clear that not enough data was collected to make useful predictions.

35. There are a number of factors that the MoD have failed to take into account in their assessment of Fallago Rig. Had these factors (Earth Curvature, Terrain Shielding and Landform Attenuation) been considered the calculated impact would have been much smaller. No account has been taken of the different windfarm design and turbines or of the different radar type.

36. Overhead Obscuration can reduce the operational usefulness of the radar for aircraft in the affected volume of airspace. The radar becomes less useful in this airspace – it does not become useless.

37. The volume of airspace of concern to the MOD is very small. They have indicated that the absence of obscuration above 10,000ft is a key element in desirable mitigation

for the effects of wind turbines. However, in this case their objection relates to any effects below 2,200ft. There are many larger volumes of airspace where there is no radar coverage at all.

38. Given in particular the compensating coverage above low level and the location of Fallago Rig in remote moorland at the far corner of the narrow sector of existing low-level coverage, I have concluded that the magnitude of any effects will be very limited and not significant. I do not believe that the state of the UK's air defence capability is such that any limited effects of Fallago Rig could represent any significant prejudice to National Security.

39. Even if this conclusion is not accepted, any concerns of the MoD can be addressed by a suspensive condition to the effect that no 'problem' turbines should be constructed until adequate mitigation is in place. The T102 is expected to provide such mitigation and to become operational at Brizlee Wood before the end of 2008.

40. On 19th November 2007 the Prime Minister re-emphasised the threat of climate change and the need to increase generation from renewables: the government would do more to remove the obstacles that are currently holding renewables back; and, in particular, Ministers had been asked to identify and test technical solutions to the potential difficulties that wind farms pose to air traffic and defence radar. I believe this is a clear case of a wind farm which should not be held back on the grounds of any effects on AD radar.