

Appendix 2 – Ruaig Site Justification Report

Introduction

Since 2003 Tiree Development Partnership has been promoting the idea of a community-owned wind energy project for the island, of a scale capable of making a significant economic contribution to local life. The resulting proposal is to install a single wind turbine of output 850-900kW in the Ruaig Sliabh area, near the B8069 (Caolas) road. The 3-blade wind turbine (see Fig 1) would be connected to the main Tiree electricity grid via underground cable, and would generate power for sale by the community.

The choice of site comes as the outcome of a long process of technical assessment and public consultation. Despite the open landscape and low population density, there are many constraints to siting a wind turbine on Tiree, and TDP has worked hard to achieve the best compromise. This has not always been easy, requiring a balance between interests as diverse as nature conservancy, airport safety, radar interference, visual impact and noise.

The ideal location on Tiree from a technical standpoint may be quite unacceptable from an environmental one, and *vice versa*. In addition, there is an overriding need for a community generator to be economically viable, which introduces another layer of locational constraints related to the costs of grid connection and road access. The present report, then, is a summary of the process that led to the choice of the Ruaig Sliabh site.

Initial study

The first site assessment exercise was carried out in 2004 in an initial study funded by ALIEnergy [1]. Its scope was to examine the entire island for suitable sites for a community wind project, with regard to both economic viability and environmental acceptability. A first step was to identify the main constraints that might limit site selection, namely:

- Environmentally sensitive areas
- Areas with important bird populations
- Tiree Airport
- CAA radar (Ben Hynish)
- Noise and habitation

Ecological constraints

Due to the ecological importance of Tiree, both SNH and RSPB were consulted from the outset. SNH provided a detailed map of all areas with formal designations including SSSI, SAC, SPA, and Ramsar sites. These are the principal conservation areas on Tiree in relation to important bird species or botanical interests.

In addition RSPB supplied maps indicating areas of high bird concentration outside formally designated areas. These were compiled over several years using information from local RSPB and SNH observers. Some of the areas included protected species (particularly corncrakes and barnacle geese); others indicated high densities of more common species eg gulls and waders.

Some designated areas, such as the corncrake SPA, were regarded as simply too sensitive for further consideration. Others, eg the Hough Bay-Ballevullin SSSI, where the designation mainly relates to plant species, were regarded as potentially suitable but not to be regarded as a high priority. The approach taken was not to treat such areas as exclusion zones, but initially to focus the search effort outside them.

Aviation and radar constraints

One of the main technical constraints was Tiree Airport, which is operated by HIAL according to national safety procedures issued by the CAA. The guidelines have tightened considerably in recent years and include the limits on the height of structures that can be built within a certain radius of the airport, or under the runway take off and approach paths.

We used the CAA guidelines to identify exclusion zones for the community wind project, and met with HIAL in Inverness to ensure that our understanding of the rules was correct. This exercise narrowed down the available areas significantly and essentially ruled out any sites within a 4km radius of Tiree Airport, with a possible limitation on sites further out than this, depending on turbine height.

In parallel with this, the advice of NATS was sought regarding the en-route radar on Ben Hynish. Their response at this stage indicated a fairly relaxed attitude to wind turbine developments on Tiree on the grounds that they were likely to be sited at lower elevation than the radar set, and in areas where their effect would not be critical (the main purpose of the radar is to track aircraft at high level crossing the Atlantic). Formal submission to NATS was delayed until the preferred site was chosen.

Noise and habitation

At the outset of the site assessment process a simple rule was adopted that a wind turbine should be at least 400m from any inhabited dwelling to avoid potential noise nuisance. The actual distance would depend on more detailed noise analysis once the turbine type and location were selected.

Outcome of initial study

The outcome of the initial scoping study included a map of those areas *not* subject to the environmental or technical constraints outlined above, hence suitable for more detailed appraisal. This map is reproduced below in Figure 2 with the relevant areas shaded yellow, and it should be stressed that these are simply what was left from the first screening process, and not by necessarily suitable wind turbine sites. Note also:

- (a) At this stage the 10km avoidance zone around Ben Hynish radar had not been identified.
- (b) The 400m dwelling-separation rule is not applied in Figure 2, but any potential turbine sites examined within the shaded areas would be subject to it.
- (c) The Hough Bay SSSI is included (see below).

- (d) Within the shaded areas in Figure 2 some locations were obviously unsuitable for other reasons: these include the top of Ben Hynish, and the golf course near Vault.

On the basis of these findings a more detailed site selection process was instigated. Simultaneously, feedback from the wider Tiree community indicated a preference for the project to be sited on land west of Beinn Hough, where it would be relatively hidden. This land falls on the border of the Hough Bay SSSI, but SNH and RSPB agreed that a single turbine development might be acceptable in this area, subject to assessment. On this basis the west of Beinn Hough was included in the search areas.

Detailed assessment

At the same time as the detailed appraisal was begun, SNH commissioned a landscape sensitivity study to assess the visual impact of wind turbines on Tiree, independent of other considerations. Their report was completed in October 2004 and included recommendations on which areas were best suited to wind turbines, and the number of machines that might be accommodated. Their findings included the map reproduced below in Figure 3, in which the shaded areas A-F indicate areas deemed visually suitable for windfarm development.

Considering other constraints, however, areas C and D are completely ruled out due to their proximity to the airport: both lie well within the 4km Inner Horizontal Surface (IHS) and would be unacceptable to HIAL. A large part of area B is also under the IHS, while area E lies partly within the IHS and partly within the SPA/Ramsar designated site northeast of Balephetrish Bay. Taking these factors into consideration the suitable areas remaining are limited to A, F, and a small part of B. These are shown in Figure 4 shaded blue.

On assessing these areas in more detail the following were concluded:

- Area A, west of Beinn Hough, was most popular with the community, due to its low visibility and distance from dwellings. Though marginally within Hough Bay SSSI it was potentially acceptable to both SNH and RSPB, subject to bird studies and an appropriate assessment given its status as part of a Natura (European designated) site. Some wind shadowing from the hill was expected, but not thought to be significant. Proximity to Ben Hynish radar was at the time believed to be acceptable. This location was recommended as the preferred site for a final appraisal.
- Area B, in the region of Moss, was acceptable to SNH in terms of landscape character. Proximity to houses along the main road was, however, expected to severely restrict developments on the grounds of noise and/or visual intrusion. In addition, although the area lies outside the 4km IHS, it is still subject to airport height restrictions that would make the project unattractive (see below). Overall this site was considered unfavourable.
- Area F, near Ruaig, was found to be suitable from most technical points of view, but less popular than Beinn Hough due to the greater visual impact a turbine would have. Ruaig was considered potentially more economic to develop than Beinn Hough due to better road access and proximity to the grid, and was recommended as the fallback option should Beinn Hough prove to be uneconomic.

Beinn Hough assessment

On the basis of the preceding work, a full project appraisal began for the site west of Beinn Hough towards the end of 2005. This involved more detailed consultation on technical and environmental aspects and included the following:

- Acquisition of an anemometer mast and instruments, and application for planning permission to erect it on land west of Beinn Hough.
- Commissioning a 12-month bird study for the relevant area.
- Applying for a grid connection quotation from Scottish Hydro Electric (SHEPD) for a maximum wind generation capacity of 1200kW.

Due to the significant cost of the above measures (several thousand pounds) only the Beinn Hough site was taken forward. In principle the entire exercise could have been duplicated at Ruaig, but funds were not available to do this, and HIE would not have supported such a move given the competition for their resources.

By March 2005 the following were forthcoming from the Beinn Hough assessment:

- SHEPD had completed their network study and issued a formal quotation for the grid connection, at an all-works cost of £581k. The proposed works included new underground cables between the turbine site and Tiree substation at Crossapol.
- A formal response had been received from NATS indicating that, because the site lay within 10km of Ben Hynish radar, they would be likely to object to a planning application.
- Preliminary assessment of the project construction costs suggested that the new access track from the public road to the wind turbine site could cost in excess of £150k.

At this point, therefore, the site began to look significantly unfavourable due to a combination of technical and economic factors. Subsequent discussions with SHEPD focussed on cheaper connection options, but the location of the site relative to the main 11kV system made it an inherently expensive option. Dialogue with NATS indicated that a turbine might in principle be acceptable inside the 10km radius if its radar cross-section could be demonstrated to be sufficiently low, but the difficulty in so doing is considerable.

Taking the above points together it seemed clear that Beinn Hough represented a relatively high-risk site in the sense that (a) construction costs would be very high and (b) planning consent might be difficult to achieve. These factors would have precluded it from consideration by HIE for the pre-development funds needed to progress the project, and hence made it inevitable that a change of site would be needed. In March 2005, therefore, the focus of effort was shifted to the fallback site at Ruaig.

Number and size of wind turbines

Although the present proposal at Ruaig is for a single wind turbine, the SNH landscape assessment expressed a preference for groups of up to 5-7 machines on visual grounds, and

various informal discussions have indicated that a group of three turbines may be preferable to a singleton: the project on Gigha is referred to as a good example. The issue of turbine number is linked, however, to several other factors, namely:

- Commercial availability of suitable machines
- Overall project cost and risk
- Environmental impact

Taking these points in turn:

Commercial availability

There are currently no wind turbines available from mainstream manufacturers in the output range 100-330kW. The definition of 'mainstream' here is a company with proven track record, able to offer a bankable warranty on its products. The turbine must also be certified IEC Class I, suitable for high wind sites. A decade ago there was a range of suitable products from eg Vestas, Bonus, Nordex, and Micon, but since then the industry trend has been to scale up to serve the principle markets, ie large scale and offshore windfarms.

Cost and project risk

The smallest machine available new is the Enercon E33/330kW and in principle a project at Ruaig could comprise three such machines, but the installed cost would be significantly greater (by at least £150k, but probably much more) than that of a single more powerful machine. In addition the minimum tower height on the E33 is 45m, while that of the Vestas V52/850kW is 44m, so the visual impact of three Enercon machines could arguably be greater than that of the single V52.

The community windfarm on Gigha did use smaller machines, in the form of three Vestas V27/225s, and it may be argued that a similar project would be right for Tiree. As noted above, however, this wind turbine is no longer in production and Tiree would have to follow the Gigha example and order second-hand. This might be considered, and the unit cost of the turbines would certainly be attractive, but the risk would potentially be higher on Tiree.

Second-hand turbines come with only limited warranties (or none, as on Gigha) and the purchaser is then exposed to a higher breakdown risk. The purchase condition of the turbines may also be subject to question. In the case of Gigha these risks were reduced because the machines were from a UK windfarm with a known track record, and had been maintained by Vestas since commissioning. The Gigha site is also highly accessible from Vestas' base in Campbeltown should a problem arise.

On Tiree the wind turbines will not only be more remote from mainland support, but also subject to higher wind speeds, than on Gigha. Technical risk is therefore higher, and the best way to minimise it would be to use new equipment. A new Vestas V52 can be supplied, for instance, with a 5-year warranty and performance guarantee. Ultimately the project must be (at least) as economically robust as it is visually acceptable, for both the

banks, and for HIE, who will potentially take an initial shareholding stake to get the project off the ground.

Environmental impact

Despite possibly better aesthetic qualities, in other respects a group of three or more wind turbines would have a higher environmental impact than the single machine. For example:

- Three turbines would result in greater land take due to the additional requirement for access tracks, hardstanding, and other infrastructure. Whilst Ruaig has been selected as a less ecologically sensitive site, on an island like Tiree it still makes sense to minimise loss of habitat.
- A single wind turbine offers potentially lower bird collision risk than three smaller ones of the same net output. There is only one tower and rotor to avoid, and blade rotational speed is also significantly lower (maximum rotor speed of Vestas V52 is 26 RPM, of Enercon E33, 45 RPM).
- Greater separation from dwellings can be maintained with a single machine. A broad rule is that multiple turbines should be positioned at least 5 rotor diameters apart, so referring again to the E33, a project of three machines would require 165m spacing between them. At Ruaig this would result in one or more turbines being closer to the nearest house than if a single machine were to be used.

References

- [1] Assessment of Community Wind Energy for the Isle of Tiree, July 2004.
- [2] Tiree Wind Energy Study: Landscape Sensitivity and Capacity, SNH Landscape Advisory Group, October 2004.
- [3] Tiree Community Wind Energy Project Site Selection Exercise: Final Report, January 2005



Figure 1



Figure 2

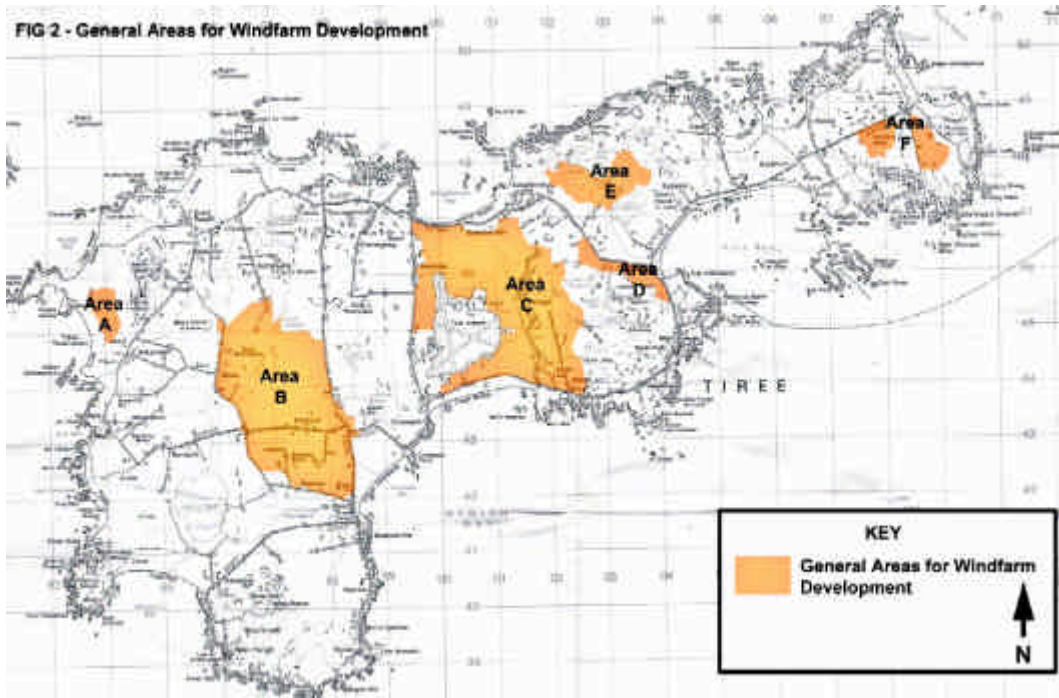


Figure 3



Figure 4