

## **4. SITE SELECTION AND ALTERNATIVES**

### **4.1 Introduction**

4.1.1 This chapter outlines the applicant's site selection process and provides an overview of the site design considerations and evolution of the application layout based on the description provided for the consented Tangy III Wind Farm in the Tangy III Environmental Statement (ES) (2014). The Tangy III ES (2014) considered a range of alternative turbine heights and layouts. The description of the 'reasonable alternatives', and the main reasons identified for the selection of the chosen option in the ES (2014), are considered to remain valid for the proposed development as required under Schedule 4 of the EIA Regulations. The only additional alternative considered in the context of this EIA is the proposed increase in tip height.

### **4.2 Approach to Site Selection**

- 4.2.1 The proposed development is one within a wider programme of development by the applicant. Site selection factors taken into account during identification of sites include a range of criteria, such as wind speed, access to grid connection, landscape and recreational designations, site topography, ecological sensitivities, ornithological interests, noise and water features.
- 4.2.2 At Tangy, the site benefits from the presence of an existing local turbine tower manufacturing factory, upgraded harbour facilities, and an existing operational wind farm with exceptional wind resource, and associated infrastructure.
- 4.2.3 There is also the opportunity to increase the efficiency of the current wind farm through replacement of the existing turbines. Turbine technology has significantly advanced since Tangy I and Tangy II became operational, with early turbine models having been superseded by much more efficient machines. In addition, since the original development of Tangy I and Tangy II there is now an opportunity to extend the site into neighbouring landownerships.
- 4.2.4 The proposed development is designed to utilise the important resource at Tangy of a high wind speed over coastal moorland, combined with the benefits of using an existing wind farm site and associated existing infrastructure.

### **4.3 No Development Alternative**

4.3.1 The 'no development' scenario is considered to represent the current baseline situation as described in the individual chapters of this EIA Report. In the 'do nothing' alternative scenario, either the current operational Tangy I and Tangy II Wind Farm would continue generating electricity (potentially through an application to extend the duration of the existing consent), or the consent for Tangy III (consented August 2018<sup>1</sup>) would be implemented. In line with the scoping opinion (Scottish Government, 2017) the baseline taken for the purposes of the EIA is the current operational site conditions with Tangy I and Tangy II in operation.

### **4.4 Alternative Technologies Considered**

4.4.1 Section 4.2 notes that the site was identified as being suitable for repowering through a formal site selection process by the applicant. A wind farm is considered to be the most suitable renewable energy technology for the Tangy site due to its location, the wind resource available and the presence of the existing Tangy I and II Wind Farm.

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<sup>1</sup> Planning permission for 15 turbines with tip height of 130 m granted in August 2018 by Argyll and Bute Council

## 4.5 Design Strategy and Design Evolution

### *Overview of Approach*

- 4.5.1 The purpose of a wind farm is to harness the energy of the wind and convert this to electricity. The process of turbine siting is a balance between maximising energy yield and minimising potential for negative environmental effects. The main environmental parameter affecting design is often landscape and visual effect, but other factors such as noise, ornithology and ecological effects can also carry considerable weight.
- 4.5.2 Changes made as a consequence of the design process are considered 'embedded' mitigation. The design of the wind farm layout is a vital part of the EIA process, as it is the stage where the biggest contribution can be made to prevent or mitigate potential effects.
- 4.5.3 The submitted design for Tangy IV is the same final 16 turbine layout as proposed for Tangy III in the Tangy III ES (2014). The Tangy III layout was developed through a series of iterations, informed by the baseline environmental surveys, technical considerations and consultations to ensure that it is appropriate for the site. The Tangy IV layout has been informed by updated baseline environmental surveys, however no changes to the layout were deemed necessary by the applicant from those selected as part of the Tangy III EIA process.
- 4.5.4 The design development process can be summarised in three key stages of design evolution, as set out from Paragraph 4.5.5. Further information with regard to environmental and technical considerations is then provided from Paragraph 4.5.23 to 4.5.43.

### *Design Evolution*

- 4.5.5 Figures 4.1a-c summarise the six iterations of the Tangy III Wind Farm design evolution. The following paragraphs summarise the key design changes.
- 4.5.6 The Tangy III Wind Farm was redeveloped from August 2012 to August 2018. A range of alternative turbine layouts, heights and densities were considered. Following an appraisal of environmental constraints and opportunities, along with an evaluation of technical and economic factors, a planning application<sup>2</sup> was made in 2015 for a wind farm with a generation capacity less than 50 MW, comprising 16 turbines at 125 m tip height.
- 4.5.7 Tangy III Wind Farm was granted planning permission in June 2015. While the Tangy III ES (2014) assessed a 16 turbine scheme, consent was granted for a 15 turbine scheme (with Turbine 8 removed). In addition, the Tangy III ES (2014) was based on the forestry on the site being clear felled. Following the consent, agreement was reached with Forestry Commission Scotland to clear fell the existing forestry on the site and replant to a key hole design.
- 4.5.8 Subsequently the applicant applied to vary<sup>3</sup> the conditions of the consent for the Tangy III wind farm in April 2018, increasing the tip height by 5 m to 130 m. Argyll and Bute Council granted planning permission for the 15 turbines at 130 m tip height in August 2018.
- 4.5.9 The proposed Tangy IV development has now been optimised using currently available technology so as to realise the potential generation capacity from the exceptional wind resource available at the site. The applicant is now seeking to increase the tip height to 149.9 m, thus increasing the generation capacity to more than 50 MW, with potential to deliver more than four times the current energy generation than the existing site. As a result, the applicant is now applying for consent under s36 of the Electricity Act 1989. The proposed post-consent changes include:
- turbine 8 is reintroduced, resulting a total of 16 turbines;
  - maximum wind turbine tip height is increased from 125 m to up to, but not exceeding 149.9 m;
  - and

<sup>2</sup> Under the Town and Country Planning (Scotland) Act 1997, as amended

<sup>3</sup> under section 42 of the Town and Country Planning (Scotland) Act 1997 as amended

- indicative wind turbine rotor diameter increased from 105m to approximately 130m.

- 4.5.10 Following further assessment of turbine 8 (T8), review of previous consultation feedback and previous comments from the Argyll and Bute Council planning committee in support of including T8, it was determined that there was no significant benefit to the removal of T8 with respect to reducing environmental effects, therefore the decision was made to include it in the scope of this EIA Report and application.
- 4.5.11 Figures 4.2, 4.3 and 4.4 illustrate the difference between the previously consented 125 m turbines (consented June 2015) and the proposed 149.9 m turbines. For comparative purposes, the figures show the baseline panorama (showing the existing Tangy I and Tangy II Wind Farm), with a wireline of the Tangy I and Tangy II Wind Farm, a wireline of 2014 EIA Layout (i.e. the 16 turbine layout at 125 m tip height) and a wireline of the proposed development (i.e. a 16 turbine layout at 149.9 m tip height) (Sheet 2), and a photomontage of the proposed development (Sheet 3).
- 4.5.12 In addition, the post consent changes include some minor changes to track alignment and the relocation of a temporary construction compound. All other aspects of the proposed development, such as turbine locations, hardstanding's and access track layout remain unchanged from the ES (2014), Figure 4.1c.

### ***Ornithological Considerations***

- 4.5.13 MacArthur Green commenced ornithological surveys in April 2012 and two full years of ornithological data were collected with surveys finishing in March 2014. These surveys indicated a number of important bird species were present at or around the proposed development, with the most important being Greenland white-fronted goose due to its association with the nearby Kintyre Goose Roosts SPA. Hen harrier, merlin, herring gull and greylag geese were also recorded a number of times and usually within particular areas. Other important species that were recorded (but only very rarely) were peregrine and short-eared owl. Curlew and oystercatcher were the only notable wader species to breed within the study area.
- 4.5.14 Ornithological considerations have informed the design from a very early stage in the project development. For instance, due to the presence of an established Greenland white-fronted goose flight path to the east of the proposed development to their main roosting location at Lussa Loch (north-east of the site), an eastern limit was placed on the extent of the proposed development in order to maintain a buffer distance between the site and the goose flight path (so that the flight path is not obstructed by any wind turbines) and thereby limit any potential effects. Furthermore, the removal of three potential turbines on the western extent of the proposed development has also meant an area of concentrated raptor and gull activity has been avoided.

### ***Landscape and Visual Considerations***

- 4.5.15 Landscape and visual considerations have driven the layout design from an early stage. Project landscape architects ASH have worked closely with the applicant and statutory consultees to shape the design of the proposed development.
- 4.5.16 Early landscape and visual considerations included site analysis, comparison of turbine scale and geometry, identification of sensitive viewpoints, landscapes and potential receptors and the review of local and national guidance documents. This led to advice which then shaped the description of the proposed development which was included in the scoping report.
- 4.5.17 Following receipt of the scoping opinion for the proposed Modified Tangy III Wind Farm (now referred to as the proposed Tangy IV wind farm), additional consultation was undertaken to discuss landscape and visual matters with ABC and SNH. Comments from all consultees have been taken into consideration in developing the layout design (see Chapter 7).

### ***Other Environmental Considerations***

- 4.5.18 Potential environmental constraints were identified through an initial desk-based analysis of the site using a Geographical Information System (GIS) to map any environmental designations. Additional constraints were identified as part of the EIA process through desk based assessment, consultation and site surveys.
- 4.5.19 GIS mapping has been used to define the application boundary which has taken into account environmental designations. There are no national or international designations which fall within the application boundary. Local designations (or non-designated sites of local value) which were identified within or in the vicinity of the application boundary include cultural heritage features.

#### *Terrestrial Habitats*

- 4.5.20 As a design principle, ecologically sensitive areas have been avoided as far as possible, and loss of habitat has been minimised by careful design of the access track layout and utilisation of existing access tracks where possible. This has been informed by detailed surveys, specifically Phase 1 Habitat survey and NVC survey. The survey data were used to determine sensitivity classification of terrestrial habitats in accordance with guidance from SEPA and SNH. This included consideration of habitats consistent with those on Annex 1 of the European Union Council Directive 92/43/EEC (EC Habitats Directive), UKBAP priority habitats and habitats which are considered by SEPA to be Groundwater Dependent Terrestrial Ecosystems (GWDTEs). Further details can be found in EIA Report Chapter 10 (Ecology and Nature Conservation).

#### *Watercourses*

- 4.5.21 The minimisation of watercourse crossings and avoidance where possible of works in close proximity to watercourses was a key objective of the site layout. Accordingly, all known watercourses as shown on 1:10,000 OS mapping were identified (and confirmed where possible during site survey), and a 50m 'buffer' applied. Although this is more than would generally be necessary as a means of pollution control, it ensures the layout does not unnecessarily encroach on sensitive habitats adjacent to watercourses and provides the maximum practicable buffer whilst allowing some degree of flexibility for micrositing (i.e. without encroaching on the watercourses). Further details on the assessment on potential effects on watercourses can be found in EIA Report Chapter 12 (Surface Water).

#### *Cultural Heritage*

- 4.5.22 Cultural heritage features were included in the GIS analysis, with files sourced from the National Monuments Record of Scotland (NMRS), Scottish Sites and Monuments Record (SMR) and West of Scotland Archaeology Service (WOSAS). In addition, 1st edition OS maps, pre-1850s maps from the National Library of Scotland and aerial photographs from the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) were checked. Further details can be found in EIA Report Chapter 13 (Cultural Heritage and Archaeology).

#### *Noise*

- 4.5.23 The noise environment in the area surrounding the site is characterised by 'natural' sources, such as wind disturbed vegetation, birds, animals, water flow noise and also from the existing Tangy I and II Wind Farm. Road traffic noise from the A83 also contributes to baseline background noise at residential properties within the vicinity of the site (refer to Chapter 14: Noise).
- 4.5.24 Potential noise impacts of the proposed development have been a consideration since the initial design stages, and the proposed layout has been developed to ensure compliance with acceptable limits for wind turbine operational noise as defined in ETSU-R-97.

### ***Technical Considerations***

#### *Distance from Public Roads*

4.5.25 A typical safety set back from public roads is 1.5 times the height of the proposed turbine (224.85 m). The nearest turbine to a public road is at a distance of approximately 1.2 km.

#### *Spacing*

4.5.26 Spacing of turbines is a key consideration during wind farm layout development; turbines are generally arranged at a minimum distance apart to limit the effect of wake turbulence which can lead to increased fatigue loads. In order to minimise these fatigue loads, turbine spacing is normally bigger along the prevailing wind direction than across it. The minimum spacing varies from site to site and between turbine models (depending on manufacturer guidance). The spacing chosen at this site is based on modelling assumptions and is designed to maximise the energy yield from the wind farm while keeping fatigue loads within the turbines' design envelope. The proposed turbine spacing for the proposed development remains unchanged from the consented Tangy III Wind Farm.

#### *Wind Capture*

4.5.27 Wind capture (i.e. the ability to harness energy from wind) is affected by various issues such as wind speed, the prevailing wind direction, and local topography. A range of computer software analyses were undertaken to optimise the design of the proposed development where possible to ensure that the selected turbine locations maximise the opportunity to harness wind energy.

#### *Ground Conditions*

4.5.28 The suitability of ground conditions was considered during development of the site layout, with areas of peat and steep gradients identified. Peat depth was determined through four phases of preliminary site Ground Investigation (GI) including peat probing. Five phases of peat probing were undertaken to inform the design development:

- Phase 1 in September 2013, based on the scoping layout.
- Phase 2 in November 2013 based on the post-scoping layout A.
- Phase 3 in March 2014 based on the post-scoping layout B.
- Phase 4 in June 2014 to capture final design refinements.
- Phase 5 Additional peat probing was undertaken in March 2018 (to recent guidance) to determine final location of the temporary construction compound, turbine positions and refined access to T8 and T10.

4.5.29 Peat probes were taken across the site, particularly along potential access tracks routes, at proposed turbine locations and potential compound and substation locations. The majority of the site is recorded to have peat depths of 0 - 0.5m as shown on Figure 1.6 of Appendix 11.1: Peat Stability Risk Assessment (PSRA). The calculated mean peat depth across the recorded deposits is 0.55 m, with a maximum recorded peat depth of approximately 3.6 m in a deep pocket of peat recorded on the north-eastern boundary of the study area. The proposed development has been designed to avoid/minimise interaction with peat as far as practicable. As described above, the principal design changes that have been made to avoid interaction with areas of deep peat are the relocation of access tracks and other project infrastructure (e.g. construction compound).

4.5.30 Where wind farm infrastructure is proposed in areas where peat is present, data have been augmented by the peat probing. The results of the desk-based assessment, GI and gradient analysis informed a peat stability assessment and enabled the site layout to be refined to avoid, where possible, known areas of high risk using a risk matrix. Figures 4.1a-c illustrates the evolving turbine design, access track layout and other site infrastructure layout. Appropriate mitigation measures have been developed to reduce peat slide risk. Details on the assessment of peat

stability are contained in EIA Report Chapter 11 (Geology, Soils and Peat) and Appendix 11.1 (Peat Stability Risk Assessment (PSRA)).

- 4.5.31 The access track layout was developed to be technically feasible for use by both construction and operation vehicles, taking into consideration the existing environmental constraints, and using available mapping data to ensure that gradients were less than 1:11. As noted previously, a primary design requirement was to use as much of the existing infrastructure as possible to maximise synergies with other land uses and to avoid or reduce environmental effects.

#### **4.6 References**

Scottish Government (2017) Energy Consents Unit Scoping Opinion on behalf of the Scottish Ministers under the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, SSE Generation Limited, Tangy IV Wind Farm, 16 October 2017.