PREFACE

This Non Technical Summary (NTS) has been prepared to support a planning application for the development of Den Brook wind farm near North Tawton in West Devon.

The NTS makes up Volume 1 of the Environmental Statement (ES) which is contained within three separate volumes:

Volume I – this volume is a Non Technical Summary of the Environmental Impact Assessment.

Volume II – contains the full Environmental Impact Assessment containing technical and supporting information in appendices

Volume III – contains figures and plans referred to in the text of Volume II.

A separate Planning Policy Statement has also been prepared to accompany the planning application.

The ES has been prepared by RES Developments Ltd, a subsidiary of Renewable Energy Systems UK Ltd (RES) in consultation with West Devon Borough and Mid Devon District Councils and in collaboration with the following specialist consultants:

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Copies of the full ES are available from RES priced £150 each. A loan copy of the full ES can be supplied free of charge for limited duration. Copies of the non-technical summary are available free of charge. The non technical summary can also be viewed on the RES Den Brook website web page www.den-brook.co.uk. Requests for either document should be made in writing, including payment if purchase of the full ES is required, to Renewable Energy Systems UK Ltd at the address above.

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Volumes I and II of this ES and the Planning Policy Statement are printed on recycled paper.

INTRODUCTION

The Application

RES Developments Ltd (RES), a subsidiary of Renewable Energy Systems UK Ltd, is applying to West Devon Borough Council for full planning permission to construct a wind farm of 9 wind turbines on farmland, approximately 11 km north east of Okehampton, West Devon. The site (centred on grid ref: E269130 N100120) lies on agricultural land to the south east of North Tawton, and south west of Bow, see Figure 1.

The proposal is for the installation of a wind farm comprising nine wind turbines and associated electrical transformers, an electrical sub-station and control building, a permanent freestanding lattice wind monitoring mast and on-site infrastructure (being underground cabling, access tracks and crane hardstandings) linking the turbines, for a period of twenty five years (see Figure 2).

Each turbine will have three blades and a tapered tubular tower. The overall height to blade tip will not exceed 120m. Based on 2MW capacity turbines the Den Brook wind farm would produce sufficient electrical energy to satisfy the average annual requirements of approximately 10,064 to 13,140 homes, equivalent to approximately 49-65% of the annual consumption of all the houses in West Devon (2001 UK census data).

The proposal is the culmination of a two year programme of work by RES during which time the site's suitability and detailed environmental interests have been assessed and number of design iterations have been explored.

The Applicants

RES is one of the world's leading wind energy companies and is part of the Sir Robert McAlpine Group, a British, family owned construction firm. At the time of writing, RES has successfully developed and/or constructed 35 wind farms worldwide and operates and maintains several others.

From long term involvement in the wind industry, RES has evolved a high level of expertise in the technical, environmental and financial disciplines essential for the development of a successful wind farm. This was recently acknowledged by RES being awarded a Queen's Award for Enterprise in the Sustainable Development category recognising RES's 'comprehensive approach to the environmental and social impact assessment prior to the commencement of every wind farm project' and RES's award winning eco-friendly headquarters and education centre in Kings Langley, Hertfordshire.

RES also operates a number of regional offices in key markets worldwide, including one in Moretonhampstead in Devon.

Need for the Project

Climate Change

There is clear evidence that the global climate is changing as a result of human activities, primarily as a consequence of burning fossil fuels. Carbon dioxide (CO_2) levels have risen by more than a third since the industrial revolution and are now rising at an increasing rate.

The science of climate change is addressed by the work of the International Panel on Climate Change (IPCC), which suggests that observed changes in regional climate over the past 50 years have already affected biological and hydrological systems in many parts of the world. Projections suggest further adverse effects of climate change will occur in the coming century for much of the world, and that the greater the cumulative emissions of greenhouse gases, the greater the scale of global warming will be.

Current climate models such as those developed by the IPCC and by the Hadley Centre for Climate Prediction and Research, show that temperature rise observed in the past decade lies outside the range of natural variability. These models generally predict that global temperatures and mean sea levels will rise further by the end of the 21st Century.

In the UK, rainfall amounts and frequency are expected to change. Heavy winter precipitation will become more frequent, but the amount of snow could decline. In the longer term, the risks of major climate disruption become more likely including changes to the North Atlantic Ocean circulation which gives the UK its relatively mild climate, melting of the Greenland and West Antarctic Ice Sheets, each of which would raise sea levels by several metres and the release of methane from melting permafrost which would fuel further warming.

Sir David King, the government's Chief Scientific Advisor (2004) has said that climate change is the most severe problem facing the world and that to address this, immediate action is required. He expanded on this to say that the UK must substantially increase the use of renewable resources and that delaying action for decades, or even years, is not a serious option.

Since production of electricity from wind energy has no gas emissions, there is no contribution to climate change (global warming) or acid rain. By displacing polluting fuels, renewable energy sources help to meet international, national and regional targets that have been set to combat climate change.

Pollution Savings

Annually, by displacing fossil-fuel generation, between 37,291 and 40,681 tonnes of CO_2, 433 to 473 tonnes of SO_2 and 130 to 142 tonnes of NO_x would be prevented from entering the atmosphere by the Den Brook wind farm.

Other Benefits

The benefits of using renewable forms of energy are not confined to tackling climate change. Environmental costs of conventional generation are avoided, including the health implications associated with poor air quality, the damage to the natural and built environment caused by acid rain and radiation related health and safety problems. In terms of energy-security, renewable energies such as wind are inexhaustible, being free are not subject to fuel-price uncertainty, are not subject to the vagaries and politics of the international fuel markets, and have no requirement for fuel transportation, drilling, or mining. Furthermore wind farms are easily and quickly decommissioned, leaving no significant adverse legacies.

The Resource

To help the Government plan for its target of obtaining 10% of electricity from renewable sources by 2010, the Regional Renewable Energy Assessments Report was produced in February 2002 by OXERA Environmental and ARUP Economics & Planning[1]. The Government invited all regions of England along with Northern Ireland, Scotland and Wales to make an assessment of the potential for renewable energy generation in 2010.

The south west region has a target of generating a minimum of 11-15% of its electricity from renewable sources by 2010, equating to 555-693MW of installed capacity. The target is based upon the expectation that 286-418MW will come from onshore wind power. Devon has a target of 151MW of installed renewable electricity capacity expressed within its structure plan. This figure is based on the assumption that onshore wind is likely to contribute around 103MW. Devon's installed capacity of wind energy is currently only 3MW.

[1] Oxera Environmental & ARUP Economics and Planning (2002) *Regional Renewable Energy Assessments* –Report to DTI&DTLR

International, EU and UK Policy on Renewables

The effect that industrial societies' emissions of greenhouse gases are having on the atmosphere and global climate were recognised in the 1992 United Nations Framework Convention on Climate Change (UNFCCC, 2002) which resulted from the Earth Summit held in Rio de Janeiro, and was ratified by over 150 countries. This treaty, put into force by the UK in March 1994, recognised that human-induced changes to the atmosphere were affecting the climate and set out to ensure that the so-called greenhouse gases are stabilised at a safe level.

The UNFCCC established a foundation upon which specific actions and targets could subsequently be constructed. The key building block that has been added so far is the Kyoto Protocol of 1997. The Kyoto Protocol sets legally binding targets and timetables for cutting emissions from developed countries, the aim being for a basket of emissions to be reduced by 5% over 1990 levels by 2010. In February 2005 the treaty came into force making it legally binding with 141 countries, including the UK, committing to reducing their emissions.

The European Union has a target to cut emissions of greenhouse gases by 8%. Within the EU, it has been decided that targets should be distributed non-uniformly in recognition that some countries are currently more polluting than others, whilst some are less developed industrially. The UK has been set a target of a 12.5% reduction, although the government has repeatedly stressed that it plans to achieve a more ambitious 20% cut in CO2 emissions.

In 2001, the EU issued its Renewable Energy Directive[2]. The aim of the EC Directive is to achieve an increase in the renewables share of the total energy consumption across the community from 6% to 12% by 2010. This will increase the share of renewable electricity generation to 22.1%. The directive sets the UK an indicative target of increasing the percentage of electricity production derived from renewables from a 1997 level of 1.7% (the second lowest level in the EU) to 10% by 2010 (a significant increase but by that time still expected to be the fourth lowest level in the EU).

The 2003 UK Energy White Paper 'Our energy future – creating a low carbon economy' was published in February 2003. The Energy White Paper sets a goal of cutting the UK's CO_2 emissions by 60% by around 2050, with real progress to be made by 2020. In addition it sets the target of achieving 10% of electricity production from renewables by 2010 and proposes that renewables share of electricity generation in 2020 should be double the 2010 target and set at 20%.

The Energy White Paper goes on to state that to meet the 10% target by 2010 we need to install approximately 10,000MW of renewables capacity by 2010, an annual build rate of over 1250MW.

The Paper goes on to state that the priority to reduce carbon emissions will be to strengthen the contribution of energy efficiency and renewables, and that they will both have to achieve far more in the next 20 years than previously. It goes on to note that technologies such as onshore and offshore wind and biomass are potentially the most cost effective renewable energy sources for limiting carbon emissions in the longer-term.

Local Policy

At a regional level, the Regional Policy Guidance RPG10 for the South West identifies that impacts from climate change could be felt across the region, from potential changes in flood risk, water resources, the natural environment and biodiversity to influences on tourism, business and infrastructure. The guidance goes on to say that we cannot afford to put off taking action until all the questions of uncertainty have been answered.

The climate change strategy of Devon County Council developed by the South West Climate Change Impact Assessment Partnership recognises that climate change is likely to be one of the key drivers of change within the community this century, stating that:

[2] European Union, (2001). Renewable Energy Directive (2001/77/EC)

"We share the concern being expressed globally over the issue of climate change and accept the case that there is now incontrovertible evidence that most of the warming of the past 50 years is attributable to human activity. We support taking action now on climate change" .

The potential changes in Devon, based on a buisiness as usual UKCIP scenario states that the temperature rise by the 2050s may be between 1.4 and 2.3°C, accelerating thereafter to up to 4.0°C by the 2080s. In the same time frame, summers may become up to 55% drier.

As the report explains below, the need for action to reduce emissions is imperative.

"Any action we take today to reduce emissions will not have an impact on climate until mid 21st century and thus the longer we delay the societal shift to a low carbon economy the more likely are our progeny to experience the more extreme and potentially dangerous scenarios of the 2080s."

Public Opinion

Many public attitude surveys have been conducted throughout the UK at existing wind farms. The evidence is that there is clear general, and site-specific support for wind farms. Local support increases following the construction of a wind farm, once people experience the operation of the wind farm for themselves suggesting that opposition groups may generate needless concerns amongst the wider population. (RBA, 1998[3] and Scottish Executive Social Research, 2003[4]).

An opinion poll, conducted by MORI on behalf of Regen SW, of public attitudes to renewable energy in early 2003, confirmed that public attitudes in the South West were favourable, in line with national trends. The poll found that 89% supported the use of renewable energy in the South West of England, and 2% were opposed. It also found that 84% supported the use of wind power in the region and only 4% were opposed.

An independent survey by MORI into public attitudes to renewable energy in Devon during October 2004 found that 71% of rural residents questioned, support the use of wind power in Devon.

Public Consultation

RES has worked with the South West Renewable Energy Agency (RegenSW) to establish a protocol for community engagement for wind energy projects using their South West Public Engagement Protocol for Wind Energy (SW Renewable Energy Agency, 2004). RES has trialed the protocol during the development of the Den Brook proposal and RegenSW have been monitoring the protocol's effectiveness. The protocol encourages good practice in community consultation and supports RES's view that it is important to engage with the community at an early stage in the project.

Public consultation activities have included distribution of two project newsletters to local homes and businesses, local exhibitions held in Bow (July 2004, November 2004), North Tawton and Spreyton (November 2004), presentations to Parish Councils and a website dedicated to the Den Brook proposal. RES has also worked closely with the North Tawton Development Trust to set up a stakeholder group and to establish the basis for a community fund which would receive at least £1,500 per MW installed capacity per annum from the wind farm.

[3] Robertson Bell Associates for National Wind Power, (1998). Novar - Public Opinion Survey (Leeds: RBA).
[4] Scottish Executive Social Research, (2003). *Public Attitudes to Wind Farms.* MORI Scotland. www.scotland.gov.uk/socialresearch/

DESCRIPTION OF THE PROJECT

Site Selection and History

RES has undertaken site selection studies of different regions of the UK for potential wind farm sites. The outcome of these searches is a number of sites being identified in each region and the selection of offshore sites around the coast of the UK. Site identification and grading has involved a comprehensive review and map-based site sift of England that has recognised environmental, technical and economic constraints. This process ultimately led to the selection of a number of potential sites in each region of England. The south west region was further subdivided and the region covering the Den Brook site consisted of West Devon, North Devon, and the area of Mid Devon west of the M5.

The large amount of data that is needed for consideration in such a regional analysis was handled using Geographic Information System (GIS) mapping software utilising a criteria based approach. Only the sites which best match the criteria for that region will stand out as viable locations. Constraints to development would include: proximity to houses and environmental designations such as National Parks. Once the main absolute constraints have been removed from the search area, a ranking criteria is applied to each point within the remaining area.

After processing and ranking for proximity to criteria such as designated landscapes and ecologically sensitive areas, 16 potential sites remained viable and were manually investigated in more detail.

Further investigation was undertaken on the high scoring sites. This included site visits, contacting landowners, further desk-top research and, where appropriate, preliminary consultation with the planning authority. As a result of these activities, sites were dropped because of technical unsuitability or downgraded because of lack of landowner interest or proximity to designated areas. One large (> 5 turbines) site, Den Brook, remained as potentially suitable.

RES had considered a number of different layouts for the wind farm during the evolution of the design. The proposed layout of 9 turbines has taken into account what RES has learnt from an environmental impact assessment and from the consultation processes. A constraint map was developed to guide the siting of turbines.

Land Take

The land take from a wind farm development is small. The wind turbines have of necessity to be spaced apart, so as not to interfere aerodynamically with one another (array losses). The actual permanent land take is limited to the area of the towers themselves, the access tracks leading to them, the crane hardstandings (which are partly covered with topsoil post construction), the control building and the substation, typically totaling approximately 2% of the site area.

The Turbines

Each turbine would begin generating power automatically at a wind speed of around 3.0 m/s (6.75mph) and would shut down at a wind speed of around 25 m/s (56mph). A diagram of a typical 2MW wind turbine is illustrated in Figure 3. Also illustrated is the transformer unit that is located at the base of each turbine. The colour and finish of the wind turbines would be agreed with the planning department, but is likely to be a pale grey semi-matt finish.

Grid Connection

The on-site substation is proposed adjacent to the level crossing, north of the railway line near to Turbine 8 in the middle of the site. All electrical cabling between the turbines and the wind farm sub-station on the site would be underground.

The connection to the electricity grid is proposed to be made to the north west of the site into the new sub-station at North Tawton, next to the cheese factory. The 33kV connection from the wind farm substation could go under ground (installed by trenching) by the side of the Dartmoor railway line then either under ground or overhead on wooden poles to the new substation. The specific route would be determined by the utility company. If the cables are buried the wind farm would not create any additional overhead cabling.

Construction

Construction of the wind farm will take up to 12 months. This period is somewhat weather dependent and could be affected by ground conditions found at the site. Site working would be Monday to Saturday from 7.00am to 7.00pm or till dusk. The expected sequence of events for the construction programme would be:

- Construct road improvements along the chosen access route to the site as required
- Construct site entrance and track to construction compound
- Construct temporary construction compound
- Construct the railway level crossing and railway siding
- Construct the site access tracks and crane hardstandings, field gates, temporary fencing (if required) including any watercourse crossings (culverts) where required
- Excavate and construct the turbine foundations
- Construct the substation and install the grid connection
- Excavate the trenches and lay the power and instrumentation cables
- Erect the turbines
- Commission the turbines
- Carry out land reinstatement, remove temporary accommodation, reinstate temporary compound and crane hardstandings and clear the site.

Best construction, health-and-safety and environmental practice would be followed at all times.

On-Site Access Tracks

A new network of tracks would be built to provide access to each turbine (see Figure 2). The access tracks will be approximately 4.5m wide with widening on bends and at passing places and would be made of crushed and graded stone.

The access tracks have been designed to run along existing farm tracks where possible in order to minimise environmental disturbance and land take. Where new track is required, it has been designed to run along the edge of field boundaries to avoid disruption to farming activity where practicable. The routing recognises environmental constraints.

Foundations

It is anticipated that the foundations for the turbine would be of gravity base design and would characteristically comprise between 200-300m^3 of concrete reinforced by between 50-60 tonnes of steel bar, in a tapered octagonal block of approximately 13-16m diameter and from 2-3.5m depth. Each turbine base would require up to 50 concrete deliveries (based on 6m^3 of concrete in a truck), which would be brought to the site by local ready mix suppliers. Each base would be poured over the course of a day and generally one base would be poured per day.

The foundation surface lies up to 1m below the normal ground surface and is back filled with soil and reinstated. All rock and most spoil that is excavated would be put back on top of the foundations. Any excess spoil would be spread in areas that are not environmentally sensitive and agreed with the landowner and local authority. Within these areas, spoil would be layered into the contours of the existing topography and re-seeded as required.

Operation

Wind farms are operated remotely from a central computer system. Because of this a large amount of infrastructure is not required. The wind farm site would not be permanently manned, but there would be traffic limited to small maintenance vehicles with typically four maintenance crew visits per month. In addition a local person would be employed to regularly inspect the wind farm site, generally on a weekly basis.

Each turbine would have its own internal control system interfaced to a central control system located in the sub-station. The turbines would be automatic in their everyday operation. Were a fault to develop which required an operator to intervene then the supervisory control system would make contact with on-duty staff via a mobile messaging system. The operators would be able to shut down one or all of the wind turbines remotely.

Decommissioning

The expected operational life of the wind farm is twenty five years from the date of commissioning. At the end of this period a decision would be made as to whether to refurbish, remove, or replace the turbines.

If a decision were to be taken to decommission the wind farm this would entail the removal of all the turbine components, transformers, the substation and associated buildings. Some of the access tracks could be left on site to ensure the continued benefit of improved site access for the landowners, or they could be reinstated. It is not usual to remove the buried concrete foundations from the site as this would cause more land damage than leaving them in situ. The entire foundation would be graded over with soil.

One advantage of wind power generation over other forms of energy production is the ease of decommissioning. A wind farm can be easily and quickly dismantled and the site restored, leaving no visible trace of its existence, and no pollution for future generations.

LANDSCAPE AND VISUAL ASSESSMENT

The landscape and visual assessment was undertaken by Entec UK Ltd. The assessment of the proposal has shown that there would be effects upon the landscape character of the nearby surrounding area and some of the views of it. Predicted effects would range from negligible to substantial in terms of significance.

The only loss of landscape resources will be some areas of pastoral grassland with no loss of woodland, hedgerows or other mature trees. The main cause of the change in landscape character would be due to the introduction of nine tall, pale coloured turbines and the movement of their blades in what is a primarily rural landscape.

Within and immediately around what is an isolated site the turbines would be the dominant landscape features and this would be reflected in the formation of a new, small landscape character zone in which they would have a substantial effect upon the landscape. Where visible, between approximately 1 and 2.5 km from the site, the turbines would be prominent features that along with other features such as topography, field boundaries and tree cover, would have a substantial/moderate or moderate effect upon the landscape character. Between 2.5 and 7 km from the site, the turbines would generally form an important but not defining component of the landscape resulting in generally moderate effects upon existing landscape character. Beyond approximately 7 km the turbines would be smaller scale landscape elements allowing other elements to be more prominent and they would only have a slight effect upon landscape character. A local landscape designation (an Area of High Landscape Value) is located within ~2 km of the site and the Dartmoor National Park's northern edge lies some ~5 km to the south. The assessment concludes that these national and local designations will not be significantly affected by the turbines.

The surrounding area has a considerable number of Conservation Areas, Listed Buildings, sites in the English Heritage Register of Historic Parks and Gardens and archaeological features that are Scheduled Ancient Monuments. Nevertheless with the exception of a single listed building it is assessed that the setting of none of these features would be significantly affected by the turbines.

Overall the effects upon local landscape character have been assessed as being significant and will necessitate some modification to the landscape character zones as currently defined by Devon County Council. Nevertheless any landscape evolves and gradually changes and the level of change likely to be temporarily caused by the turbines is acceptable in the local and district context. This is due to several factors including the semi-regular layout of the turbines; the comparatively low elevation of the site; the site's relative isolation and the levels of mature tree cover within and around the site.

There would be significant visual effects upon an estimated forty four isolated residential properties and five footpaths and publicly accessible routes within 2.5 km of the site during operation of the wind farm. During the construction period this number would reduce to seven of these isolated residential properties. These residential properties are scattered to the west, north and east of the site and tend to share the characteristics of being in slightly elevated locations in relation to the site and possessing good views towards the site with low levels of nearby planting that could screen the turbines.

There would be no significant visual effects upon any of the nearby settlements including North Tawton and Bow. For many settlements such as North Tawton their location in valleys or hollows will result in views being blocked by higher intervening ground, whilst the dense building layout in some other settlements prevents outward views towards the site for most of the people who live within them. Likewise there will be no significant effects upon any of the long distance footpaths or key main roads that are located within 30 km of the site.

A key issue is the views of the turbines that could be available to people living or visiting the Dartmoor National Park. Also important is the potential for the turbines to intrude into views to the National Park from locations to the north and north-east of the site. Using computer software programmes the assessment calculates that under ideal viewing conditions the turbines will be theoretically visible from a maximum of 7% of the area of the National Park, mainly the elevated northern edge. Photomontages have been produced to show how the turbines will look from three of the most elevated and popular locations in the northern part of the National Park. These show that when the turbines are seen at distances of between 9 and 18 km they will form a tight group which lies below the frequently hazy northern horizon and that they will be too small-scale to cause substantial visual change. As with all views the visibility of the turbines over distances in excess of 15 km will be strongly influenced by the prevailing weather conditions.

With regard to potential disruption of existing views towards the National Park the assessment concludes that this situation will only apply to a small number of people. Where they are located close to the site the turbine layout is sufficiently spread out so that only one or two turbines are directly in line and they do not block the views. Where people have longer distance views of both the turbines and the National Park they are usually in elevated locations. In their views the turbines will form a tight group that is well below the section of the horizon formed by the National Park's elevated northern edge and the turbines are very small-scale compared with the mass of Dartmoor and the panoramic views.

If the Yelland Wind Farm that is proposed for a site some 18 km to the south-west were to be permitted there would be minimal cumulative visual effects. The two wind farms would rarely be seen in the same field of view and where this will occur the distance between them would result in the turbines at one wind farm always being very small-scale elements in the view.

ECOLOGICAL ASSESSMENT

A protected species and ornithological survey and assessment was undertaken by Andrew McCarthy Associates based in Exeter, which involved surveys for breeding and wintering birds, bird roost-flight surveys, bats, Badgers, Dormouse and a habitat survey between April 2004 and May 2005.

The ecological study area comprised a core turbine zone and 500 m buffer. The results enabled establishment of an 'ecological baseline' against which the impact assessment was carried out.

The site is predominantly improved agricultural land, including both pasture and arable, of low floristic diversity. A small number of pastures are semi-improved and of higher floristic richness; several are designated as County Wildlife Sites (CWS), including one (lower tier) Local Wildlife Site (Itton Moor) that would be directly affected by the proposals. Fields are separated by mature hedges with mature trees, a high diversity of woody plants and a rich field layer. Four (minor) watercourses are present; the River Yeo, the Den Brook, and two smaller, unnamed streams.

Wherever possible, turbines and infrastructure were sited away from watercourses and field boundaries at the design stage, thus minimising potential effects on habitats and associated fauna.

Most infrastructure (including eight of the nine turbines) would be on agriculturally improved grassland; only one turbine and its associated infrastructure would be situated in an area of higher nature conservation value – within semi-improved wet pasture at Itton Moor Local Wildlife Site (the lowest tier of designation at County level).

Approximately five small (approximately 5m) breaches of hedges and hedge-banks would be required to accommodate the main access tracks. The main site access point from the A3072 will also require clearance, and several shorter sections of hedge may need to be removed or cut to accommodate turning radii visibility.

Mitigation for habitat loss (in particular at Itton Moor LWS) will comprise turbine micro-siting to avoid the most botanically species-rich swards; undertaking local ground works during drier conditions to minimise risk of permanent damage to wetland, and habitat translocation if appropriate. It is proposed to undertake planting and post construction habitat management for nature conservation *via* an agri-environment conservation plan. Overall, the significance of impacts on habitats will be low.

Bat activity levels were moderate to locally high, being mainly associated with hedges, woodland edge, streams and wet pasture. Seven species were confirmed as occurring (Common and Soprano pipistrelle, Noctule, Long-eared bat, Daubenton's, Natterer's and Brandt's/Whiskered), with the most frequently encountered being Common pipistrelle. No nationally scarce species (such as horseshoe bats) were confirmed.

Impact on bat foraging habitat will be minimal and temporary only; whilst some grassland (mainly field margins) would be lost, land take would be small and most habitat loss would be quickly reinstated. Compensation includes habitat management (see above) and provision of bat boxes and a purpose-built bat roost in the roof of the electricity sub-station.

Recent research from Europe and the US suggests that some bats (especially Pipistrelles and Noctule) may be at risk of collision when foraging close to moving turbine blades; most bats at Den Brook were observed flying well below the rotor zone (which is 40 m at its lowest point). There is no evidence of bat collisions occurring with wind farms in the UK and, whilst there may be some potential for bats to collide with blades under certain conditions, formulation of a definitive impact assessment for this site has not been possible. A detailed monitoring programme is thus proposed.

Dormouse was widespread and probably locally abundant in suitable habitat (woodland and hedges). Badger activity was widespread; details of activity patterns are subject of a separate confidential report which will be provided to the statutory agencies.

Impact on Dormouse would be minimised by working under licence from the Department of Environment, Food and Rural Affairs; mitigation would include incorporation of 'green bridges' at hedge severance points to facilitate movement of this arboreal species, and cutting of hedge sections in winter and removal of bases in late spring once animals have moved into adjacent habitat. In the long-term, new hedge planting will benefit this species. No significant impacts are expected

Badger setts within 30m of any construction area will require works to be undertaken under guidance of a licence from the Statutory Nature Conservation Organisation (SNCO). A detailed survey would be carried out prior to site works, to check for new Badger activity.

Some 87 bird species were recorded in the survey area. The breeding bird assemblage was typical for farmland in this area of Devon and there were no rarities present. The wintering bird assemblage was typical of the region and moderately diverse.

The proposed development is not situated close to any sensitive or important areas for breeding or wintering birds (e.g. SPAs) and there are no nationally or internationally important concentrations of wintering birds present in the immediate surrounding area. In view of the diversity and moderate levels of abundance, the site's location and its habitat quality, the site is considered to be of 'Low Sensitivity', overall.

Key species identified as at potential risk at Den Brook were Lapwing, common raptors (Sparrowhawk and Buzzard) and Golden plover. Such birds mostly occurred at low or very low density and some were highly local in their distribution, mainly inhabiting areas away from the core turbine zone. Lapwing and Golden plover were recorded in locally significant numbers during winter only, and not in regionally important numbers.

Both Lapwing and Golden plover are tolerant of low level disturbance and it is likely that local plant movements during construction or decommissioning would not deter them from using the wider site; temporary displacement at these times is not considered significant.

During the operational phase, principal impacts are primarily the potential collision and possible displacement of birds. In view of the modest numbers of potentially vulnerable species recorded on site, and given the absence of any nearby specially designated area for birds and location of the site away from any key migration routes, collision risk is predicted by comparison with known collision mortality rates at other British wind farms. This is a standard approach on such development sites.

The highest collision rate recorded at any long-term British study site (Blyth Harbour) is just over one bird / turbine per year, which equates to approximately 12 birds being killed per year *in total* at Den Brook. Based on these collision rates, and in view of the patterns of bird movement on and through Den Brook, impacts upon populations of key species is not considered to be significant.

The effect on birds of large new structures in a landscape may have potential to displace and therefore affect distribution and thus energy budgets of some species, in particular wildfowl and waders, such as Golden plover and Lapwing. The only feeding area recorded for these species within the turbine zone was a small field at the site's eastern end, comprising recently sown grass with exposed soil. It is not likely that plovers favour this area regularly, as the annual cropping regime is more likely to result in favoured foraging/roosting areas shifting within the local landscape; habitat availability is likely to be the principal factor influencing plover distribution. The impact of displacement on these species is not considered to be significant, as there appears to be substantial alternative foraging habitat elsewhere locally.

Wildfowl were scarce at Den Brook, displacement and barrier-related impacts are not likely to be significant for these taxa. At Den Brook, only Starling were recorded regularly commuting in large

numbers over the site (to and from a communal roost at Okehampton). This species is able to make slight adjustments to its flight path to avoid turbines, as has been observed at other extant wind farms in the UK. Impacts on this species are not considered to be significant.

CULTURAL HERITAGE ASSESSMENT

Cultural heritage features include both visible remains, such as standing buildings, earthwork monuments and industrial remains, as well as buried remains of human activity. The cultural heritage section of the ES was undertaken by Entec UK Ltd, consultants. In this, an assessment was made of the potential effects upon cultural heritage at the proposed Den Brook wind farm between North Tawton and Bow, West Devon. The assessment included the potential for direct effects (i.e. disturbance) on known features, as well as the potential for features which are not currently known to exist. The assessment also considered the potential for changes to the setting of important features such as Scheduled Monuments and listed buildings, which are known as indirect effects.

The only direct effect identified is the potential for any remains present on the route of a Roman Road, as a result of the construction of an access track. No remains of the Road are currently known to exist in this location, but in any case construction would disturb only a very small part of the known extent of the Roman Road. Careful archaeological monitoring during construction (commonly referred to as a 'watching brief') will provide the opportunity for any remains identified to be excavated and recorded.

The general potential for further unrecorded remains has been identified from cropmark features within the vicinity of the site, which have been identified from aerial photographs. These are thought to represent the remains of prehistoric archaeology. According to the current record, such remains are likely to be found outside the wind farm to the north, over better quality soils, although a watching brief on topsoil stripping will allow any remains uncovered during construction to be excavated and recorded, if it is not possible for construction to avoid them. Two cropmark features, which may represent the remains of burial mounds, lie close to the access track to the wind farm from the A3072 Road, although these will be avoided.

The assessment considered the indirect effects of the wind farm on important features up to 5 km beyond the wind farm site. There is likely to be an effect on the setting of some of these features in the vicinity of the site, owing to their close proximity and likely views of the wind farm. This is particularly the case for the Grade II listed Crooke Farmhouse and a complex of prehistoric monuments between the site and Bow. However, when taking into account the existing form and setting of features and factors of localised topography, screening and distance, the overall effect is not considered to be of major significance. Furthermore, the indirect effects of the wind farm development are reversible and temporary, subject to the eventual decommissioning of the wind farm.

HYDROLOGICAL ASSESSMENT

The proposed Den Brook wind farm site is located within the catchment of the River Yeo. A number of tributaries to the Yeo, including the Den Brook and the Shepherds Lake, run through the development area. The Environment Agency classifies the biological and chemical water quality in this area as good to very good. The southern half of the site overlies bedrock of the Carboniferous Crackington Formation and the northern half of the site is located over the Permian Bow Conglomerates. Both these rock types are classified by the British Geological Survey as 'Minor Aquifers'. Riverine Alluvium and River Terrace Deposits are present within the valleys on the site. With the exception of a section of access track the wind farm development will be located on the area of Crackington Formation.

Enquires with local landowners have indicated that there are a number of private water supplies within the proposed development area. Two wells and a spring are located close to the northern boundary of the site and derive water from the Bow Conglomerates. Two other wells are located on the Crackington Formation at Itton Farm. Mitigation measures are proposed to protect groundwater

and to prevent any significant effects to these wells and the spring from the proposed development. These measures include no construction works in close proximity to any groundwater source.

The principal effects of the construction and operation of the wind farm on the hydrology and hydrogeology of the site are associated with the generation of sediment laden run-off and the potential spillage of chemicals which could act as pollutants to surface water or groundwater. The removal of topsoil will result in damage to the soil's structure and changes to the hydrological regime of the site. Proposed mitigation measures include sediment traps for dewatering; a 20m buffer zone of non construction around watercourses (with the exception of crossing points); best practice handling of soils and restoration of excavation sites in accordance with appropriate DEFRA and British standard guidance. A site Pollution Prevention Plan will be developed in accordance with the Environment Agency.

These measures will act to reduce and offset the potential effects of the wind farm's construction, operation and decommissioning and ensure that the proposed development will have no significant effect, in terms of the EIA regulations, on the hydrology and hydrogeology of the site.

TRANSPORTATION AND ACCESS

The majority of suitable onshore sites for wind farms are of a rural or semi-rural nature. Road networks to such sites will often require some degree of upgrading to accommodate construction and turbine delivery traffic.

The site entrance options and the various on-site and off-site routes have been examined for suitability by a civil engineer from RES. In addition relevant Highways Authorities were consulted including West Devon Borough Council and Devon County Council and the Highways Agency.

The railway track that runs through the centre of the site is owned and operated by Dartmoor Railway (DR) Early consultation with DR indicated that delivery of the larger and longer components for the wind farm, plus aggregate from Meldon Quarry, was a feasible access option for the site. In addition a passing loop (if required) and upgraded signalling would be designed by DR in consultation with the HMRI/HSE. The improved signalling and passing loop would have long term benefits for the railway line, increasing its capacity and its ability to run more regular train services between Okehampton and Exeter.

From consultations with relevant Highways Authorities, site investigations and computer modelling the most suitable access route is from the A30 at Whiddon Down. Turbines would be delivered to a local port, which may be Plymouth or Teignmouth. From the A30 the proposed access route would exit at Whiddon Down and follow the A382 and the A3124 towards North Tawton. Continue along the A3124 to the crossroads with the A3072, turning right towards Bow. A suitable site entrance would be created along this road in consultation with Devon County Council Highways.

Devon County Council has in principle agreed that the proposed route is suitable. The Highways Agency does not envisage any problems for loads of this nature and that there are no specific weight restrictions on the proposed route along the major trunk roads.

Traffic management measures will be implemented prior to and during the construction phase in consultation with the relevant Highways Authorities and the police to minimise any disturbance to local residents and ensure the safety of other road users during construction. Increased traffic levels would be experienced during the 12 months of construction but these effects are temporary and any disturbance to local residents and other road users will be short term when considered over the life of the project.

NOISE ASSESSMENT

This assessment of the acoustic noise impact of the proposed Den Brook wind farm on nearby properties has been made based on the recommendations specified in the DTI publication 'The Assessment and Rating of Noise from Wind Farms'.

The proposed wind farm would comprise nine wind turbines. The exact type of turbine has not been finalised but is likely to be acoustically similar to the Vestas V90 2.0 MW wind turbine type, upon which the noise assessment has been based.

Noise levels have been predicted at twenty-eight of the most acoustically sensitive residential properties. The maximum predicted noise level, due to the operation of the proposed Den Brook wind farm, is 38.9 dB(A) for a wind speed of 7 ms^{-1} at 10 m height.

A background noise survey has been carried out at two nearby locations from 4th October 2004 to 3rd November 2004. The measured background noise data have been used to determine indicative noise limits, as specified by the DTI guidelines.

The DTI Guidelines recommend that the allowable wind farm noise limit should be based on the prevailing background noise level, except where the background noise level falls very low, in which case the limit should be fixed at an absolute level. A higher noise level is permissible during night-time hours than during day-time ones, as it is assumed that residents would be indoors.

The predicted noise levels at all houses are within both quiet waking hours and night-time noise limits at all considered wind speeds. The minimum margin of predicted noise levels below derived noise limits, for all considered wind speeds, during quiet waking hours, is 5.7 dB(A). Similarly the minimum margin during night time periods, for all wind speeds considered, is 7.6cB(A).

As the proposed wind farm complies with the relevant guidance on wind farm noise, it is to be expected that the effect of the wind farm on the amenity of local properties would therefore be minor.

ELECTROMAGNETIC INTERFERENCE

As with any large structure, wind turbines can potentially interfere with communication systems that use electromagnetic waves as the transmission medium (e.g. television, radio or microwave links). Any effect depends on the turbine design and location and the fact that wind turbine rotors are not stationary.

It is possible for wind turbines to cause interference to local TV reception either by obstruction or by reflection. Viewers situated forward of the wind farm (where the aerial is pointing through the turbines) may have their signals periodically obstructed by the rotating blades causing a 'scattering' of the signal. Viewers situated to the side may experience periodic reflections from the blades, giving rise to a delayed image or 'ghost'.

RES has gained considerable experience in this area and in practice problems are only experienced when the receiver already has a poor signal. Generally TV interference problems are predictable and normally there is a range of solutions available.

It is also possible for a wind farm to interfere with a TV rebroadcast (RBL) links or super high frequency (SHF) links that carry the TV signal between transmitters. However such interference is predictable and is screened by the network operators.

The BBC state that analogue reception within the area is provided from the transmitters at Huntshaw Cross, Stockland Hill and Carodan Hill. RES has performed a full technical assessment through prediction modeling and field studies of the scale and location of TV interference that might occur as a result of the wind farm. The results showed that only limited interference to a few locations in close

proximity to the wind farm may be experienced, but as this is a conservative assessment it is likely that no interference will be experienced at all.

As there is acceptable coverage in the area from more than one transmitter any isolated cases of interference have ready solutions and RES would be prepared to enter into a legally binding agreement to ensure that it identifies and rectifies speedily at its own cost any such occurrence. If the proposal gains planning permission, RES would use the results from a pre-construction signal survey to plan any necessary remedial measures.

The wind farm will not have an effect on microwave links as they have been avoided through the careful siting of turbines during the design of the wind farm.

Both the Civil Aviation Authority and the Ministry of Defence (MoD) have confirmed that they have no safeguarding objections to the proposed Den Brook wind farm site.

SOCIO-ECONOMIC ASSESSMENT

Onshore wind energy is now competing directly with conventional generation in terms of raw costs of production. However wind has a range of additional benefits that are strategic, environmental and long term in nature. These values are not yet all internalised into the economic value of wind-produced energy, but their existence should not be overlooked. Government support is an acknowledgement and reflection of these benefits.

The construction and operation of the proposed wind farm would have a positive effect on the local economy, in terms of local employment during the construction phase, and also in the longer term from landowner rentals, business rates, local services, and employment of maintenance staff.

On a national level the UK demand for wind turbines and wind farms will help establish, mainly via inward investment, a substantial new UK industry providing long term skilled jobs serving both the home and overseas markets. Manufacturing benefit is already being experienced.

RES is keen that the wind farm becomes a feature of the area, attracting interest from locals and visitors alike. Proposals for a community fund and work with Dartmoor Railway are intended to provide tangible benefits to the local community and to enable worthwhile initiatives throughout the wind farm's life.

Wind farms are subject to local business rates of 45.9p in the pound (2004/2005 rates), and attract a rateable value of £5,000 per MW of installed capacity, which means that the Den Brook wind farm would contribute approximately £45,900 per annum to the funding of local government services.

Wind farm developments are a new yet important form of rural diversification. Host farms derive rental income from the turbines, and the new income stream generally helps sustain the economic viability of the farm business. These new finances allow investment in the other aspects of the farm business, which in turn spins off into local economic benefit. Via this route, the effect of the wind farm on the local economy would be a positive benefit.

Modern wind turbines are remarkably safe given their size and relatively short evolution. Safety of the Den Brook wind farm will be ensured through adherence to relevant design standards, construction practices and operational procedures.

CONCLUSION

The likely effects of the Den Brook wind farm have been reviewed. It is considered that the proposed wind farm would have few significant adverse environmental effects on the local environment and of these most can be reduced or prevented through mitigation measures.

In addition the proposed wind farm has associated positive environmental effects related to displacement of fossil fuels and the contribution that the scheme will make to the government's renewable energy targets.