CHAPTER 4: PROJECT DESCRIPTION

THE APPLICATION

4.1 Ecotricity has submitted an application, under section 36 of the Electricity Act 1989 to install and operate a electricity generating station with a capacity of over 50MW. Following an Environmental Impact Assessment the development has been defined more specifically as:

> *A wind energy development comprising the erection of up to twenty two wind turbines, each with a maximum overall height of up to 125m together with access tracks, crane pad areas, electricity sub-station, temporary construction compound, amended vehicular access on agricultural land at Heckington Fen, near East Heckington.*

4.2 **Figure 4.1** shows the positioning of the turbines and ancillary works. **Figure 4.2** outlines the application site in red and the extent of the site boundary adjoining the application site in blue. **Figure 4.3** is an elevation drawing of a typical wind turbine which will be constructed at this site. As part of this EIA identical copies of **Figure 4.1** and **4.2** have been submitted to The Secretary of State at a scale of 1:2,500, and of **Figure 4.3** at a scale of 1:200.

4.3 **Figure 4.4** provides indicative details of the turbine foundations and **Figure 4.5** illustrates an indicative sub-station (actual sub-station dimensions will depend on the Distribution Network Operator's requirements at the time of connection).

4.4 The proposed turbines will be located at the grid co-ordinates listed in **Table 4.1**.

Table 4.1 Turbine grid references

Turbine	Easting	Northing
1	519572	346370
2	519586	346048
3	519600	345643
4	519920	345963
5	519933	345564
6	519983	345205
7	520210	346312
8	520237	345901
9	520257	345556
10	520260	345116
11	520622	346522
12	520609	346171
13	520631	345770
14	520597	345416
15	520596	345008
16	520981	346391
17	520979	346055
18	521052	345766
19	520933	345357
20	520902	344899
21	521420	345863
22	521297	345450
Site Centre	520462	345745

SITE DESCRIPTION AND CONTEXT

The Site

4.5 The proposed development site is located on agricultural land within a 604ha land holding which comprises of mainly arable crops with some limited grazing. The land holdings are bound to the south by the A17, to the east by Holland Dike, to the North by Head Dike and to the east Sidebar lane. The development area lies between 0m - 3m AOD.

4.6 The main access point will be provided from the A17, 340m west of East Heckington Village where a new access track will be constructed to facilitate onsite access, as shown in **Figure 11.1**. There is one public right of way within the site boundary. There will be no direct impact on this right of way.

4.7 The site does not lie within any Areas of Landscape Importance and there is no Site of Special Scientific Interest (SSSI) or other ecology designations within the development site boundary.

4.8 A duck decoy once existed within the site boundary. There is no physical evidence of this feature on the surface given that the land is very heavily farmed; however it can be discerned in some aerial photography. Further information can be found in **Chapter 6: Cultural Heritage.**

4.9 There are no listed buildings or Scheduled Ancient Monuments located within the site boundary but there are a number in the locality. See **Chapter 6: Cultural Heritage** for further details.

4.10 The site falls within an area designated by a 1 in 100 year flood zone as identified by the Environment Agency flood map.

The Surrounding Area

4.11 In general the area surrounding the site is flat, being generally between 0 - 5m AOD, and is comprised of agricultural land and drainage ditches, dikes, and scattered settlements.

4.12 The village of East Heckington is located 1kM south from the nearest proposed wind turbine while the town of Swineshead is 5kM to the south east, Heckington 5.2kM to the west and South Kyme 4kM to the north. 11/33kV overhead power line runs across the landholdings roughly following the southern boundary parallel to the A17 and another on the northern boundary running northeast / southwest. The closest residential properties are Mill Green Farm to the north, College Farm and Catlins farm to the east, Glebe Farm and properties along sidebar lane to the West and an

assortment of farms and residential properties to the south. The nearest property is Home Farm to the south at approximately 998m from the nearest turbine.

WIND SPEED

4.13 The predicted Annual Energy Production (AEP) of the site has been calculated using a number of data sources. The DTI Wind Speed data base (NOABL)[1] calculated the wind speed of the site at 6.2 m/s at 45m above the ground and is cross-referenced with available meteorological data.

THE WIND TURBINES

4.14 No candidate turbine has been chosen for this Environmental Impact Assessment. The EIA has instead been completed based upon maximum dimensions of 80m to hub height, 90m rotor diameter and 125m tip height. These dimensions encompass the characteristics of three turbines available within the industry that are described within **Table 4.2.**

Table 4.2: Turbine Options

Item	**Specification**		
Manufacturer	Enercon	Vestas	Nordex
Model	E-82	V90	N90LS
Rated Capacity	2.3MW	3.0MW	2.5MW
Hub Height (to centre)	79m	80m	80m
Rotor Diameter	82m	90m	90m
Overall Tip Height	120m	125m	125m

4.15 Noise evaluation has identified that in order to comply with the UKs government on expected noise levels any subsequent development would have to be limited to the number of turbines identified within Table 4.3. Further information can be found in **Chapter 10 – Noise**.

Table 4.3 Resultant Turbine Scenarios.

Item	**Specification**		
	Scenario 1	Scenario 2	Scenario 3
Manufacturer	Enercon	Vestas	Nordex
Model	E-82	V90	N90LS
Number of Turbines	22	18	21
Total Rated Capacity	50.6MW	54MW	52.5MW

4.16 All information contained within the EIA is based upon the maximum of each specification with up to 22 turbines with a maximum tip height of 125m, maximum rated capacity of 3.0MW and total rated capacity of 54MW. This has ensured that all chapters within the EIA encompass each turbine type and number of turbines. Further information can be viewed in corresponding chapters 5 to 12.

4.17 As an example of the type of turbine that is proposed, the specifications of a Vestas V90 turbine is shown a**t Table 4.4**. Full details are provided within the enclosed turbine technology brochure produced by the turbine manufacturer Vestas **(Appendix 4.1**).

Table 4.4: Turbine Specifications – Vestas V90

Item	**Specification**
Rated output	3.0MW
Hub Height (to centre)	80m
Rotor Diameter	90m
Rotor and Pitch Control	
Type	Upwind rotor and full pitch regulation
Direction of rotation	Clockwise
Number of blades	Three
Swept area	6,362 m^2
Blade material	Fibre glass reinforced epoxy and carbon fibres
Rated blade rotation speed	Variable 8.6 – 18.4 revolutions per minute (rpm)
Pitch Control	Full blade feathering with 3 pitch cylinders
Generator and Drive Train	
Hub	Rigid
Generator	4-pole doubly fed generator.
Brake systems	4-step planetary gear with motor brake and torque limiter
Yaw control	Active via adjustment gears, load-dependent damping
Tower	
Construction	Three sections (29m maximum)
Material	Steel
Base diameter	4.2m
Top diameter	2.3m
Base circumference	13.15 m
Base area	13.76 m^2
Wind Velocities	
Start-up	3.5 m/s (7.8 mph)
Rated	15.0 m/ (33.6 mph)
Shut-down	25 m/s (mean (55.9 mph)

[1] The Department of Trade and Industry wind speed database (NOABL) contains estimates of the annual mean wind speed throughout the UK for 1km squares. . It comprises a map of the UK, to a 1km2 resolution for which annual mean wind speed has been modeled using an air flow model that estimates the effect of topography on wind speed and contains estimates of the annual wind speed throughout the UK. This database is an industry recognised tool for calculating the annual average wind speed at a height of 45m at on-shore sites within the UK.

More information can be found on the British Wind Energy Association internet site: www.bwea.com

TECHNICAL DETAILS

4.18 Connections to the grid by generators (including wind turbines) can be at a range of voltages (depending on the location – i.e. 11kV, 33kV etc), though must be at a fixed frequency of approximately 50Hz. In order to maintain this frequency, wind turbines generally employ a gearbox to maintain a high speed rotation in the generator to match the frequency of the grid connection across a range of wind speeds. In comparison the Enercon E82 turbine has a three stage transformer (AC-DC-AC) which allows the output frequency to be stabilized at 50Hz through a range of wind speeds without a gearbox.

Variable speed

4.19 Variable speed means that the speed of rotation of the blades (and therefore the generator) will depend on the wind speed, rotating slowly at times of low wind speed and speeding up with increases in wind velocity. An on-board computer varies the pitch of the blades depending on the wind speed, to optimise the surface area of the blades exposed to the wind and therefore the rotation speed. This process is called optimising the tip speed ratio[2] which is where maximum energy yield is achieved.

Turbine Monitoring

4.20 The turbines will be monitored remotely throughout its life by a SCADA (Supervisory Control And Data Acquisition) system, a Global Satellite Monitoring (GSM) digital connection linked to the Ecotricity computer system.

4.21 If a fault develops in a turbine it is immediately reported to the computer system which sends the details of the fault (e.g. by mobile phone SMS or e-mail) to the appropriate member of the service team and also to Ecotricity. The decentralised system means that service engineers can be deployed rapidly to address the problem.

Turbine colour scheme

4.22 The turbine colouring has yet to be confirmed but the industry standard is a non-reflecting (semi matt) off white (RAL 9018), to blend into the skyline.

4.23 The Enercon E82 turbine has a varying colour scheme as detailed. The finish of blades and majority of the tower is in industry standard non-reflecting (semi-matt) off-white, to blend into the skyline. The base of the tower is painted with concentric green bands, solid green from ground level to a height of 16.5 metres, then mixed with the white and reducing in shade as described in **Table 4.5** and **4.6**.

Table 4.5: Turbine Colours

Colour	Number
Green	RAL 6010
Off-white	RAL 9018

[2] *Tip speed ratio is the ratio of wind speed to rotor tip speed. Optimal energy capture only occurs at a certain ratio.*

Table 4.6: Colours of concentric banding at the base of the turbine

Band Reference	Off-white %	Green %
Blades and Nacelle	100	0
EC-F	100	0
EC-E	80	20
EC-D	60	40
EC-C	40	60
EC-B	20	80
EC-A	0	100

Information Board

4.24 If deemed appropriate and in conjunction with the Local Authority, Ecotricity will erect a public information board at the entrance to the site. The display will include information on the development and wind energy in general. Although the turbines will be permanently remotely monitored, emergency contact numbers will also be provided. The display will be a free standing laminated information board mounted on vertical posts with a surface area of 1m x 0.6m. The display will not be illuminated. The display board will be similar to that constructed at the Mablethorpe Wind Park as shown in **Figure 4.6 Photo H.**

CONSTRUCTION

4.25 The construction process is based on a rolling timetable i.e. each turbine foundation is constructed in turn and turbine installation commences as soon as a foundation is prepared. This can be classified into four stages:

- Site enabling works and access
- Foundation construction
- Grid connection
- Turbine installation

4.26 It is anticipated that these construction stages may overlap, so there may be two or more phases in operation at any time.

Site enabling works and access

4.27 Enabling works at the site are required in order to facilitate delivery of the turbine components and cranes and to erect the turbines. As shown on **Figure 4.1** such works include a 20m x 40m crane pad area adjacent to each turbine position and a 5.5m wide access track linking the turbine positions with a total length of 10.665km, which will be allowed to grass over. **Figure 4.6 Photo A** shows a typical cross section of the access track and finished ground levels, depicting the water-permeable fibrous layer, while **Photo B** shows a photograph of an access track under construction. The access track and crane pads will be comprised of locally sourced crushed aggregate and gravel to an indicative depth of 30-40cm.

4.28 Access onto the site will be obtained via a new access point from the A17. This location is shown on **Figure 4.1**. Internal access tracks are required in order to reach the turbine locations from this

point but utilise existing farm tracks where possible. Delivery of the turbine components will be onto site via the A1 onto the A17 from the west. The tuning radii of the abnormal loads delivering the turbine components is illustrated in **Figures 11.2 – 11.5,** which show a 'Swept Path Analysis'. This is a computer run assessment which shows the path the tyres of the abnormal loads will take and the path any wide loads will take. The access point design is illustrated in **Figure 11.8**. Access requirements are addressed in more detail in **Chapter 11: Transport and Access**.

4.29 A temporary construction compound will also be required to house machinery and materials, the location of which is shown on **Figure 4.1**. If required, full details of all temporary facilities required will be submitted to the Council, prior to the commencement of development.

Foundation construction

4.30 Foundation design is subject to a site specific design. A typical foundation design for a turbine of 3MW in size is square and measures approximately 16.2m wide and a maximum depth of 2.3m as shown in **Figure 4.4.** The foundations may require piling given the reclaimed nature of the land but this would be subject to a detailed civil design which, along with an appropriate method statement can be submitted to the local planning authority prior to the commencement of the development.

4.31 The foundation holes will be excavated using a JCB and then reinforcing steel will be delivered and assembled in the foundation holes. This typically takes a week for each foundation. Once the steel is fixed, concrete will be poured over a period of approximately three days per foundation. Only a certain amount of pouring can occur on a single day to allow time for proper curing. The foundations will then be left for one month to allow the concrete to cure before the turbines are installed.

4.32 As shown on in **Figure 4.6 Photo D** typically only a 1m flange of concrete around the turbine base will be visible. Surface soil will be replaced on top of the concrete foundation to allow green cover to establish up to the edge of the concrete flange.

4.33 The excavation of the foundations is the only stage of the construction process which results in waste material being produced. Excess surface soil removed will be redistributed on existing farmland. Any sub-surface deposits that need to be removed will be transported to a licensed waste transfer operative in the local area, to be used as aggregate.

4.34 The majority of construction traffic will involve standard sized vehicles and HGV traffic and can access the site using existing public highways (see **Chapter 11: Transport and Access** for further details). The construction process is shown photographically in **Figure 4.6**.

Grid Connection

4.35 The transformer and associated electrical equipment will be contained within the tower structure.

4.36 Cabling associated with this development will be underground and will connect the turbines with a new onsite 33kV sub-station located adjacent to the new access track as illustrated in **Figure 4.1**. Locally sourced bricks will be used for the proposed sub-station, to stay in keeping with the character of the surrounding area, subject to the District Network Operators (DNO) requirements. The sub-station will be designed by electrical and civil engineers to comply with all relevant High Voltage electrical regulations. The underground cables will be trenched at the edge of the proposed access tracks. The cable trenches will measure approximately 0.6m x 1.2m deep.

4.37 The electricity produced will be exported via the new onsite sub-station to the existing electrical substation to the south at Bicker Fen and from then will export onto the national grid. The connection between the new proposed substation and the existing at Bicker Fen is likely to be overhead wooden poles and would run directly south from the wind Park. Consultation with the DNO (Central Networks) has taken place and initial outline grid connection feasibility and costing report has been received.

4.38 Any alterations to main services such as gas, water, electricity and telecommunications, which are necessary to complete the laying of the underground cables, will be undertaken in agreement with the statutory operators and with the minimum disruption to services.

Turbine Installation

4.39 Delivery of the turbine components and cranes involves access to the site by abnormal loads. As a result, a police escort will be required and an abnormal load certificate obtained for some parts of the delivery. As such, approval will be gained from the Police and Highways Authority for access purposes. The turbine parts will be delivered to the UK from factories in Europe via the nearest appropriate coastal port on routine roll-on roll-off freight transport ferries.

4.40 Erection of the turbines will be undertaken by two cranes; the largest will be the main crane and will lift the major turbine components into position. The smaller of the cranes will assist by assembling the larger crane, moving materials on site and tailing, which is where the crane will lift one end of a component as the larger crane lifts the other end, to avoid components dragging on the ground. Each turbine normally takes 2-3 days to assemble. The proposed timing of the construction and the resulting number of vehicle journeys is shown in **Table 11.4: Indicative Construction Schedule (Chapter 11)**, which outlines an indicative 52-week construction period.

DECOMMISSIONING

4.41 The turbines are designed to be operational for at least 25 years. Wind turbines can be decommissioned quickly and easily at the end of their operational life span (1-2 days per turbine is required) and landscape effects are entirely reversible. The site of a wind development can be restored to its pre-development land use. This 'effects reversibility' is a key characteristic of wind developments.

4.42 During decommissioning the turbines will be dismantled and removed from site. The foundations would be left underground and covered with topsoil enabling green cover to establish over the turbine site. Underground cables, disconnected from the local grid, could also remain in the ground.

4.43 The decommissioning work will be the responsibility of the developer. The majority of the turbine components are recyclable, as most of the components are steel with a significant amount of copper in the generator, although the remaining components would need to be disposed of via a local licensed waste operator.