Heckington Fen Wind Park Variation of Consent (Environmental Statement) 2018

Miscellaneous Assessment

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HECKINGTON FEN WIND PARK
VARIATION OF CONSENT
(ENVIRONMENTAL STATEMENT) 2018

MISCELLANEOUS ASSESSMENT

APPENDIX 8

10 May 2018

Our Ref: OXF11047

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QUALITY MANAGEMENT

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Date:	**10 May 2018**
Project Number/Document Reference:	**OXF11047**

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1 INTRODUCTION

1.1 An application to construct a wind park at Six Hundred Farm, East Heckington, Lincolnshire (known as Heckington Fen Wind Park) was submitted to the Department of Energy and Climate Change (DECC) (now the Department for Business, Energy and Industrial Strategy (BEIS)) in 2011. The project comprised 22 wind turbines generating up to 131 GWh per annum and was granted consent in February 2013. In 2015, an application was submitted to DECC to vary the consent (**the 2015 Application'**). The 2015 Application included the amendment of the onsite access tracks, relocation and increase in size of the onsite substation footprint, amendment of the construction and crane pad locations and amendment of the turbine rotor diameter to up to 103 metres. The 2015 Application has not yet been determined.

1.2 Due to the passage of time, an application is now being made to extend the time for implementation of the existing consent for the Heckington Fen Wind Park.

1.3 An Environmental Statement (ES) was submitted as part of the original 2011 application (hereafter referred to as the 2011 ES) under the Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2000, as amended. An addendum to the 2011 ES (referred to as the 2015 Application ES) was submitted as part of the 2015 variation of consent.

1.4 The current legislative framework for Environmental Impact Assessment is set by European Directive 2011/92/EU, as amended by Directive 2014/52/EU (collectively referred to as the Environmental Impact Assessment (EIA) Directive). Directive 2014/52/EU entered into force on 15 May 2014. The requirements of the EIA Directive have been transposed into UK legislation through the Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2017 (hereafter referred to as the 2017 EIA Regulations), which came into force in May 2017.

1.5 Schedule 4 of the 2017 EIA Regulations provides information on what should be included in an ES. The 2017 EIA Regulations differ from the 2000 EIA Regulations (as amended) in that they now require the EIA process to assess the likely significant effects on human health and climate, and the risks to the environment as a result of accidents or disasters.

1.6 This chapter forms part of the environmental information to support the application to extend the time for implementation of the consent for the Heckington Fen Wind Park. The application does not involve any changes to the proposed development but aims to provide updated information to satisfy the additional requirements of the 2017 EIA Regulations. This chapter provides information in relation to human health, climate and accidents and disasters, which were not required under the 2000 EIA Regulations (as amended). This chapter draws upon the (relevant) information presented within the 2011 ES and the 2015 Application ES as well as presenting new information.

2 CLIMATE CHANGE

2.1 This section considers potential impacts on and due to climate change. Climate change here is considered broadly in two domains: the impact of greenhouse gas emissions (GHGs) caused or avoided directly or indirectly by the proposed development, which contribute to global climate change; and the potential impact of changes in climate to the development, which could affect it directly or could modify its other environmental impacts.

Climate Change Risks and Adaptation

2.2 The main potential impact from climate change is change in flood risk due to change in surface watercourse flow, change in peak rainfall intensities and/or change in the probability of extreme rainfall events. This impact could affect flood risk on the development site or could modify the flood risk caused by the development to other receptors.

2.3 It is considered that global climate change is likely to change the risk of flooding within the UK. The 2011 Environmental Statement included a Flood Risk Assessment (FRA) (Appendix 9.1 of the 2011 ES), which identified the current and future risk of flooding to the site and surrounding areas. Due to the proposed development's location in the Lincolnshire Fens, there are a number of open drainage channels across the site. As a result, the majority of the site is located within Flood Zone 3a, which is identified by the Environment Agency (Environment Agency, 2018) as having a high probability of flooding (1 in 100 year). Small areas of the site are located within Flood Zones 1 and 2, which are identified as having a low to medium risk of flooding respectively.

2.4 North Kesteven District Council have undertaken a Strategic Flood Risk Assessment (SFRA) (North Kesteven District Council, 2009) encompassing the area of the proposed development. The SFRA identified levels of flood hazard taking into account flow velocities and depth. A comparison between the flood extents identified in the 2011 ES and the current Environment Agency Flood Map for Planning (Environment Agency, 2018) has been made in this 2018 ES. This comparison shows negligible differences in flood extents within the site boundary and therefore it can be assumed that the outputs from the 2009 model are still applicable to the site.

2.5 The Environment Agency provided hydraulic modelling data to inform the FRA in 2011, which included an allowance for the increase in flood levels as a result of climate change. The extrapolated data indicated that flood levels in Head Dyke-Skerth Drain, within the vicinity of the site, would be approximately 2.9 metres above Ordnance Datum (AOD) during a 1 in 100 year plus climate change event and 3.04 metres AOD during a 1 in 1000 year plus climate change event. This would result in a flood depth of up to 2.44 metres for the 1 in 1000 year plus climate change event. The functional operation of the proposed development is designed to withstand partial water inundation. Those parts of the development which aren't compatible with inundation, i.e. the substation, would be located outside the area at risk of flooding.

2.6 The FRA for the proposed development concluded that, including the allowance for climate change, the development is not likely to result in a significant reduction in flood plain storage and is not likely to result in an increase in flood risk on or off site.

2.7 As indicated in the updated assessment on flood risk (**Appendix 6**) the accepted percentage applied to flood levels to make an allowance for climate change has increased from 20% (as used in the 2011 ES) to 65%. The FRA presented in 2011 shows that the 20% allowance for climate change resulted in a very small increase in flood depth. As a precautionary approach to account for the change in percentage allowance the design of the proposed development has taken into account the flood levels of the 1 in 1000 year plus climate change (20%) event.

2.8 With regard to other impacts of climate change on the development itself, these are not considered to be significant over the proposed development's 25-year operational lifetime. The Met Office UK Climate Projections ('UKCP09') dataset (Met Office and Defra, 2018 and Sexton *et. al.,* 2010), which provides probabilistic projections of change in climatic variables in regions of the UK over time under several potential future global emissions scenarios, has been reviewed to consider the extent of likely changes under a high emissions scenario (a high emissions scenario was chosen in order to be conservative). Generally, increases in peak and average summer temperatures are predicted, there is a higher likelihood of extreme weather events with high wind speeds, and there may be an increase in humidity levels. However, wind turbine components are designed to work in a wide range of temperature and humidity conditions and include protection against wind speeds outside their design envelope for power generation.

2.9 Overall, it is anticipated that the design of the proposed development would be sufficiently robust to accommodate predicted changes in climate over the development's lifetime.

Greenhouse Gas Emissions

2.10 The main potential impact on climate change is from Green House Gas Emissions. Onshore wind turbines are recognised as a source of renewable electricity generation with very low emissions of GHGs compared to conventional fossil-fuelled generators. In operation, the proposed development would have no direct GHG emissions and minimal indirect emissions (the latter from small consumption of materials and energy required for control, monitoring and maintenance).

2.11 The main source of GHG emissions would be in the construction stage of the development's life cycle, indirectly from the 'embodied carbon' of manufactured components (the GHG emissions associated with material extraction, processing and manufacturing activities) and directly from fuel consumed by vehicles/plant transporting and installing the components on-site. Depending on methods used for waste management at the time, the decommissioning phase may be a source of GHG emissions, although the majority of the structural and electrical components of wind turbines are capable of being dismantled and recycled, which may reduce or avoid net GHG impacts at that time. Land use change would not lead to significant GHG emissions from loss of soil or vegetation carbon stocks, as the proposed development is not in an area of peat and would involve minimal loss of mainly arable land, as detailed in Chapter 13 of the 2011 ES.

2.12 GHG emissions due to the proposed development must be set against the emissions from other electricity generation sources that are displaced by it. In this respect, electricity generation from wind turbines offers very substantial reductions compared to the current average mix of electricity generators supplying the UK grid, which presently and in the near future will continue to include fossil-fuelled generators with much higher GHG emissions per kWh generated ('carbon intensity').

2.13 The net effect on climate change due to GHG emissions from the proposed development is therefore predicted to be beneficial (i.e. a reduction in emissions) compared to a business-as-usual baseline for electricity generation. This is demonstrated in principle in life-cycle analysis studies for Siemens and Vestas onshore wind turbine models of similar design and generation capacity to the options set out in Table 4.2 of Chapter 4 of the 2011 ES, which include the construction, operational and decommissioning stages. The Siemens study (Siemens, 2018) shows a carbon intensity of 5 gCO_2e/kWh and a payback period of under six months for the renewable energy it generates to exceed that consumed in all other lifecycle stages (a proxy for CO_2 emissions, showing the minimal cost of the construction lifecycle stage compared to benefits of operational renewable electricity generation). The Vestas studies (Razdan & Garrett, 2015 and Razdan & Garrett, 2017) show a carbon intensity of 7 gCO_2e/kWh and a payback period of around eight months. This may be compared with the average carbon intensity of electricity generation in the UK in 2017 of 361 gCO_2e/kWh (BEIS and Defra, 2017) (for operational emissions only - not counting construction of other generators, which would increase that figure slightly).

2.14 The specific GHG reductions achieved by displacing electricity generators with higher carbon intensity would depend on the amount of electricity exported to the grid and what other marginal sources are displaced. On a moment-to-moment basis this can be quite variable, depending on wind conditions, which other generators would have been operating (managed through a capacity market mechanism) and also considering the impacts of maintaining necessary back-up or peaking capacity to manage the intermittency of wind power. In the long run, however, over the proposed development's operating lifetime, the average generation capacity it would provide (taking into account load factor, discussed below) can be considered to displace the provision of equivalent capacity from a typical marginal source. The carbon intensity of marginal electricity generators therefore provides a guide to the GHG emissions reduced on average compared to a business-as-usual baseline.

2.15 BEIS publishes projections of the carbon intensity of long-run marginal electricity supply that would be affected by small (on a national scale) sustained changes in generation or demand (BEIS, 2018 and BEIS, 2017b). BEIS's projections over the proposed development's operating lifetime of at least 25 years (i.e. to around 2045) are based on an interpolation from 2010's assumed marginal generator (a Combined-Cycle Gas Turbine (CCGT) power station) to a modelled energy mix in 2030 consistent with energy and climate policy and predicted demand reduction scenarios by that point. A grid-average emissions factor is projected by BEIS for 2040 and the marginal factor is assumed to converge with it by that date, interpolated between 2030 and 2040; both factors are then interpolated from 2040 to a national goal for carbon intensity of electricity generation in 2050.

2.16 Table 3.6 of Chapter 3 of the 2011 ES indicates a total rated capacity of up to 54 MW for the proposed development. Actual electricity generation from wind turbines varies by wind speed, with no generation below a minimum threshold and full capacity reached at an optimal wind speed, beyond which no additional power is generated in higher winds. The 'load factor', i.e. how much electricity a wind turbine will generate over a given year compared to its theoretical maximum capacity, is therefore dependent on the wind turbine model and site-specific wind conditions. The 2011 ES indicated in Table 3.6 of Chapter 3 that the estimated annual power output would be up to 131 GWh per annum from an installed capacity of 54 MW, based on a load factor of 27.7%. As a general guide, records from operating onshore wind farms included in the Digest of UK Energy Statistics 2017 (BEIS, 2017a) indicate that the average load factor in 2012-2016 has been 26.6%, varying between 24% and 29% in that time (Table 6.5 for schemes with unchanged configuration, in that reference).

2.17 With 131 GWh generated annually over a lifetime of 25 years, assumed to be from around 2020 to 2045, the proposed development would save around 390 $ktCO_2e$ compared to the typical marginal generation sources it displaces. Although the carbon intensity of both grid-average and marginal generation is projected by BEIS to decline steeply over the proposed development's lifetime (necessarily so in order for the UK to meet its climate change commitments), the proposed development's carbon intensity, as given in the lifecycle studies referenced above, would be lower throughout this period.

3 POPULATION AND HEALTH

3.1 The 2014 amendment to the European Directive for EIA (2011/92/EU amended by 2014/52/EU) and the subsequent adoption of Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2017 reinforce the consideration of population and health through the regulatory planning process. This section comprises an assessment of the relevant health pathways associated with the construction, operation and decommissioning of the proposed development.

3.2 Occupational health will be regulated by the Health and Safety Executive. The facility operator will have a general duty of care to employees under the Health and Safety Act (1974) as amended and associated statutory instruments. On this basis, occupational health has been scoped out of the following appraisal.

3.3 Following a review of the 2011 ES, construction and operational activities have been broken down into individual health pathways (i.e. activities with the potential to influence health) to explore any potential change in hazard exposure that might influence local community health. Table 3.1 presents the health pathways associated with the construction and operational phases of the proposed development and provides an indication as to the type of influence (i.e. adverse, beneficial or neutral), timescale (temporary or long term), and geographical scope (local, regional or national).

Table 3.1: Health Pathways

Feature	Health Pathway	Potential Impact	Timescale	Geographic Scale
Construction and Decommissioning Phase	**Environmental**			
	Changes to local air quality (potential dust nuisance)	Adverse	Temporary	Local
	Changes in noise exposure from construction activities and construction traffic	Adverse	Temporary	Local
	Changes in local transport nature and flow rates	Adverse	Temporary	Local
	Economic			
	Direct, indirect and induced income and employment opportunities	Beneficial	Temporary	Regional
Operational Phase	**Environmental**			
	Changes in noise exposure from wind turbine emissions	Adverse	Long term	Local
	Reduction in the air quality effects associated with fossil fuel energy production by increasing the use of cleaner technologies	Beneficial	Long term	National
	Change in shadow flicker exposure	Adverse	Long term	Local
	Change in exposure to EMF	Adverse	Long term	Local
	Visual impacts	Adverse	Long term	Local

Feature	Health Pathway	Potential Impact	Timescale	Geographic Scale
	Economic			
	Diversification of farm activities to help sustain traditional working practices and provide greater income for the farm	Beneficial	Long term	Local
	Loss of farmland due to direct land take from turbine foundations and access roads.	Adverse	Long term	Local
	Indirect effects on tourism to the region	Neutral	Long term	Regional

3.4 Each of the health pathways outlined above are not unique to the sector, and are inherently addressed through planning to protect the environment and health.

3.5 The following section signposts to where each health pathway has been assessed and addressed within the previously submitted information and ES, and where appropriate, provides additional commentary to further set potential health concerns into context.

Noise and Health

3.6 The 2011 ES (Chapter 10) assessed the potential effects in relation to noise during both the construction and operational phases of the development. An update is provided in this 2018 variation ES These documents identified the modelled noise levels at 19 noise sensitive receptors in the vicinity of the site. Baseline noise surveys were undertaken at six locations, which were used to identify the background noise levels across the site and in surrounding areas. The assessment concluded that during construction of the development, noise levels are expected to be audible at various times but remain within the acceptable limits as identified in relevant guidance documents (BS 5228, 2008 – now amended by BS 5228, 2014). Construction activities would be limited to the hours of 08:00 to 18:00 Monday to Friday and 08:00 to 12:00 on Saturdays. This would limit the health effects of noise to a temporary annoyance. There are no schools or other facilities which depend on a quiet environment within close proximity to the proposed development site which would further reduce any health effect. Therefore, the impacts were considered to be negligible at the majority of properties during construction with the exception of one (Rectory Cottages), which is predicted to experience a temporary minor impact, which is not considered to be significant.

3.7 An assessment of the operational noise of the proposed development on local receptors has concluded that the daytime and night -time limits identified in relevant guidance documents (ETSU-R-97, 1997) would not be exceeded at all of the noise sensitive receptors and, as such, residual operational noise impacts upon health are not considered significant.

Air Quality and Health

3.8 Chapter 13 of the 2011 ES assessed the effects of the proposed development on air quality. The potential health effects associated with the construction of the development is related to emissions from construction traffic, in particular Heavy Goods Vehicles (HGVs), and the generation of dust during foundation excavations and ground clearance. Chapter 13 of the 2011 ES presents a number of measures to mitigate these effects such as using water to dampen down during any dust generating activities and the avoidance of undertaking these activities during windy conditions. The construction of the wind park would result in up to 11 HGV movements per day and up to 12 staff car movements per day. The 2011 ES concluded that there would be no significant effects in relation to construction activities, and adverse health effects are not considered likely taking into account the low level of HGV and car movements.

3.9 The 2011 ES assessment identified that the proposed development would not have any direct impacts in relation to air quality during operation. Beneficial indirect effects could occur through the reduction in the dependence on fossil fuel energy production methods as a result of the energy generated from the proposed development. This would contribute towards the regional and national targets for improvements in air quality as well as contributing to reduce the release of particulate matter which can cause breathing difficulties, asthma and lung cancer. The effect on climate change is discussed further in Section 2.

Transport and Health

3.10 An assessment on the traffic and transport associated with the proposed development is presented in Chapter 11 of the 2011 ES and updated in this 2018 variation ES. Construction traffic would consist primarily of staff movements and HGVs/abnormal loads for delivery of equipment and turbines. While this may result in a marginal short-term change to local transport movements, the magnitude and duration are not expected to be of a level to result in any material impact to health from changes in air quality, noise or risk of accident and injury.

3.11 Overall, the impact from construction traffic would be temporary, intermittent and is anticipated to be managed through a Construction Method Statement (CMS). The CMS would be presented to the local planning authority prior to construction to minimise potential disruption, congestion and to avoid sensitive areas and receptors.

3.12 Operational traffic is also expected to be minimal, consisting of occasional light vehicles for maintenance. There is not expected to be any health effects associated with these movements.

Shadow Flicker and Health

3.13 An assessment of shadow flicker has been undertaken in Chapter 13 of the 2011 ES. The assessment identified that there are no residential properties within the area that could potentially by affected by shadow flicker. The 2011 ES proposed measures to reduce the level of shadow flicker by committing to shut down particular turbines at certain times of the year should it become apparent that shadow flicker is occurring.

3.14 Based on this assessment it is not expected that there would be any adverse health effects as a result of shadow flicker.

Electric and Magnetic Fields

3.15 Following the DECC Voluntary Code of Practice (DECC, 2012) for assessing electric and magnetic fields (EMF) from electricity distribution infrastructure, overhead power lines or underground cables operating at ≤132kV are compliant by design with guideline public exposure levels set to protect public health, as are substations at or beyond their publicly accessible perimeter (EMFs. Info website, 2018). The proposed on-site grid connection infrastructure for the proposed development would comprise a substation and underground cables at ≤132kV and therefore comply with the guideline exposure limits.

Socio-economic and Agriculture

3.16 The long term agricultural land take associated with the proposed development would be 9.62 hectares. This long term loss of agricultural land would not materially change the use of the agricultural land and is offset by the diversification opportunities of the wind park. The number of jobs created as a result of the proposed development would not be considered to have any significant health effects. Therefore, no further assessment on the socio-economic effects of the proposed development is required.

Visual Impacts and Health

3.17 Visual impacts of the proposed development do not relate to any direct health effects. An assessment of visual effects in relation to views from PRoWs and highways has been undertaken in Chapter 5 of the 2011 ES which has been updated in Appendix 1 of this ES.

4 ACCIDENTS AND DISASTERS

Flooding

4.1 The 2011 ES included an assessment of the risk of flooding to the development but also the effects that the development would have on flooding elsewhere (Chapter 9). This assessment also takes into account the likely future changes to the risk of flooding as a result of climate change.

4.2 The turbines are designed to reduce the risk of malfunction as a result of flooding. The turbines would be of a type which would allow partial submersion by housing the transformer higher up the turbine tower. To minimise the risk of water ingress during a flood event the access hatches would be raised approximately 3 metres above the ground level. In addition, the substation would be located outside of the 1 in 1,000 year flood extent to further reduce the risk of flooding.

4.3 The site would generally be unmanned with occasional maintenance and testing visits approximately every six months. The risk of flooding to site personnel will be managed by controlling access during times of flood.

Abnormal Loads and Construction Traffic

4.4 The delivery of turbine components and construction apparatus would require the use of abnormal load vehicles as a result of their size. Chapter 11 of the 2011 ES describes the traffic management measures proposed to reduce the risk of accidents. All abnormal loads would require a police escort and permits/licences will be applied for prior to construction from the highways authority. To further reduce the risk of an accident the delivery of large components would be scheduled outside of peak hours and adequate warning signs/vehicles would be used to alert members of the public to their presence.

Public Safety

4.5 Chapter 13 of the 2011 ES assesses the effects of construction and operation of the proposed development on public safety. During construction, potential effects could occur as result of distraction of drivers using the A17 (1.1 kilometres south). The ES considered these effects to be minimal based on the intermittent views expected from this public highway. Users of Public Rights of Way (PRoW) are not likely to be affected during construction due to distance between the closest PRoW and the site (275 metres).

4.6 The layout of the turbines has been specifically designed to ensure they are located at least fall over distance from public highways and PRoWs. Additionally, no turbine would be within blade tip fall over distance +/-10% to any occupied buildings, roads, railways or power lines. A single 11 kV overhead line is located 200 metres from turbine 1, however discussions have been conducted with E.On Central Networks and it has been agreed that this line would be buried to accord with the safety guidelines.

4.7 All turbines would be properly maintained to ensure they operate safely. The turbines include a remote monitoring system so they can be monitored continuously from an off-site location.

Ice Throw

4.8 Under certain atmospheric conditions, ice can accumulate on the blades of the turbines which can then be dislodged causing harm to any nearby buildings, cars or people. The layout at Heckington Fen Wind Park has been specifically designed using the following minimum buffers (Chapter 3 of the 2011 ES):

- 650 metres from 3rd party properties;
- 175 metres from motorways and trunk roads; and
- 45 metres from PRoWs.

4.9 These buffers mean that only trained maintenance personnel would be within close proximity to the turbines during the operation of the wind park, reducing the risk of harm caused by dislodged ice. Turbines would be shut down remotely if sensors found an imbalance due to the accumulation of ice.

5 STATEMENT OF COMPETENCE

Natalie Brisland

5.1 Natalie is a senior consultant in the Oxford based EIA team and has 5 years' experience in Environmental Consultancy. Natalie has experience in project management, the production of Environmental Statements, Non-Technical Summaries, Screening and Scoping. She has specialist experience in the production of Hydrology, Geology and Hydrogeology Chapters for renewable energy projects.

Amy Robinson

5.2 Amy is a Technical Director with RPS, specialising in EIA. Amy has 17 years' experience in managing EIA projects of all sizes, from small scale projects through to Nationally Significant Infrastructure Projects. Amy is experienced in providing high quality robust Environmental Statements across a range of sectors, with particular experience in onshore and offshore renewable projects, energy from waste, residential, minerals, mixed use, leisure, nuclear, highway and airport projects.

Tom Dearing

5.3 Tom is a principal environmental consultant specialising in sustainability and climate change assessment, working in RPS. Tom has a technical background in carbon foot printing and has built on this during four years' experience undertaking climate change and sustainability assessments with RPS for clients in the major energy infrastructure, commercial and transport sectors. This has included writing expert witness testimony for several public inquiries. In addition to his work in sustainability and climate change, Tom also undertakes health and social impact assessment, as part of the integrated suite of environmental impact assessment services offered by RPS.

Andrew Buroni

5.4 Andrew Buroni is RPS' Health and Social Impact Assessment Practice Leader with over 13 years of project experience on leading international health and social impact assessment in the energy (including nuclear power), oil and gas, waste management, transport, civil aviation, spatial planning, regeneration and sustainable development sectors.

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