Oweninny Wind Farm

Oweninny Power Ltd.

Environmental Impact Statement

Chapter 6

Human Beings

June 2013

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6. HUMAN BEINGS

6. 1 INTRODUCTION

This chapter assesses the potential impact of the proposed project on human activity. It covers the potential impact on the population of the area, on socio-economic activity and on the land use and amenity value of the area.

6. 2 METHODOLOGY

The methodology for this chapter involved examination and compilation of relevant population and socio-economic data collected by the Central Statistics Office (CSO). Regard was also given to relevant planning and land use documents for the area.

An examination and compilation of the most recent Electromagnetic Field (EMF) research and studies was undertaken.

6. 3 RECEIVING ENVIRONMENT

6.3.1 Population, Employment and Socio-economics

6.3.1.1. State population

The total population of the country enumerated on Census night 10 April 2011 was 4,588,252 persons, compared with 4,239,848 persons in April 2006, representing an increase of 8.2% in five years[1].

Despite continued growth rate population densities are still low from a European perspective and the overall population still remains below that of the island in the early-19th century. The population of the area comprising the Republic of Ireland was over 6.5 million as measured by the 1841 Census of Population.

Population structure and change in Ireland is strongly influenced by migration and emigration rates, rather than birth and death rates. Over the last 10 - 15 years, population trends in Ireland have changed dramatically. Historically, these trends were largely determined by labour market conditions in Ireland and in the countries to which Irish people migrated. Population growth peaked at 81,000 per annum during the 2002-2006 period. The most recent inter-censal period (2006-2011) shows the highest natural increase at 45,000 persons per annum, with 73,000 births and 28,000 deaths.

While the natural increase of Ireland's population has in general been positive over the past 50 years, the large swings in net migration have had a strong effect on overall population growth. Net outward migration has varied considerably over the past 50 years.

[1] Central Statistics Office, Statistical Year Book www.cso.ie

Outward migration during the 950s led to a population low point of 2.8 million being recorded in the 1961 Census with net migration remaining negative throughout the 1960s.

Net inward migration was recorded briefly for the first time in the 1970s with an annual average of 14,000 between 1971 and 1979. This quickly reverted to net outward migration again throughout the 1980s with a record low point of 44,000 in 1989. The turnaround began in the 1991-1996 inter-censal period, with small positive inflows leading up to the peak net inward migration period of 2002-2006 when derived net inward migration measured 191,000 for the four year period (or 47,800 on annual average basis). It has now fallen back again for this inter-censal period to 118,650 or an annual average of 23,730.

The CSO population and emigration estimates April 2012 (with revisions from April 2007 to April 2011) indicates that

> *"Emigration from Ireland in the twelve months to April 2012 is estimated to have increased to 87,100 from 80,600 in the year to April 2011, while the number of immigrants is estimated to have fallen marginally to 52,700 from 53,300 over the same period. These combined changes resulted in an increase in the net outward migration from 27,400 in the year to April 2011 to 34,400 in the year to April 2012. Over the same period, the number of births was 74,000 while the number of deaths was 29,200, resulting in natural growth for the year to April 2012 of 44,900, a fall of 2,600 on the previous years figure of 47,500."*

The combined effect of natural increase and negative net migration resulted in an overall small increase in the population of 10,500 bringing the population estimate to 4.59 million in April 2012.

6.3.1.2. Mayo Population

The statistical year book, an annual publication by the Central Statistics Office, provides a comprehensive overview of the country in terms of population, labour market, education, agriculture , industry , the economy, housing and the environment. The statistical year book 2012 indicates that the population of Mayo stood at 130,638 persons in April 2011 an increase of 5.5% over the previous statistical year 2006. The population in County Mayo increased by 11.2% respectively during the periods 2002 to 2011, which is lower than the national average rate of increase for the same period. As would be expected, growth that was recorded was not uniform throughout the county. Substantial growth occurred in rural areas around the main towns, with decreasing numbers in other rural areas.

There has traditionally been a strong rural dimension to Co Mayo, which is still evident today, as the majority of the population live within rural areas. The principal towns are Castlebar, Ballina and Westport. Castlebar is the chief town in Co. Mayo.

Decreases in population in rural areas are generally attributed to the continuing decline in agricultural employment in rural areas.

Population decline is reflective of a number of processes at work, particularly in rural Ireland. These influences include the decrease in the number of farmers and the consequent increase in farm sizes, lack of locally based employment opportunities, lack of access to services and the movement of population, particularly the young, towards the larger urban centres.

6.3.1.3. Population in District Electoral Divisions at Oweninny site

The proposed development is located in a sparsely populated area of North Mayo. The proposed site boundary includes two electoral areas in County Mayo, namely Ballina and Bellmullet electoral areas. District Electoral Divisions (DEDs) intersecting the site include Kilfian South, Glenco/Sheskin, Derry, Kilfian West and Deel – see Figure 6-1. The most populous DED covering most of the site is Kilfian South. The populations of each DEDs from Census of Ireland data produced by the Central Statistics Office are shown in Table 6-1.

The population of the state and of County Mayo are included here also. With the exception of Kilfian South there has been a decline in the rural population in the district electoral divisions surrounding Bellacorick.

Table 6-1: Population Change 2002-2011

Area	Persons 2002	Persons 2006	Persons 2011	% Change 2002 - 2011
State	3,917,203	4,239,848	4,588,252	+17.1%
West Region	380,297	414,277	445,356	+17.1%
Mayo	117,446	123,839	130,638	+11.2%
Ballina Rural Area	15,041	15,545	16,416	+9.1%
Belmullet Rural Area	7,927	7,923	8,005	+1.0%
022 Kilfian South	250	246	259	+3.6%
058/065 Glenco/Sheskin	125	117	97	-22.4%
019 Derry	236	216	195	-17.4%
023 Kilfian West	151	133	134	-11.3%
018 Deel	551	511	532	-3.4%

6.3.2 Socio-economics

The occupation by industry for County Mayo is shown in Table 6.2. Similar to the national picture a significant drop in employment occurred in the construction and associated activities (quarrying and transportation) with a reduction in manufacturing industry also. The service industry, public administration and defence and education saw an overall increase during this period. The numbers unemployed more than doubled in the inter-censal period.

Table 6-2: Number of Persons in Employment by Industry - Co. Mayo

Occupation	2006	2011	% change
Agriculture, forestry and fishing	4,754	5,411	+13.8
Mining, quarrying and turf production	337	249	-26.1
Manufacturing industries	6,676	5,838	-12.6
Electricity, gas and water supply	309	373	+20.7
Construction	7,787	3,127	-59.8
Wholesale and retail trade	7,035	7,675	+9.1
Hotels and restaurants	3,410	3,481	+2.1
Transport, storage and communications	1,971	1,697	-13.9
Banking and financial services	1,040	1,018	-2.1
Real estate, renting and business activities	2,788	2,931	+5.1
Public administration and defence	2,531	3,203	+26.6
Education	3,465	4,190	+20.9
Health and social work	5,697	5,695	0.0
Other community, social and personal service activities	1,836	1,988	+8.3
Industry not stated	2,641	2,200	-16.7
Total at work	52,277	49,076	-6.1
Unemployed - looking for first regular job	774	893	+15.4
Unemployed - having lost or given up previous job	4,466	10,973	+145.7
Total in labour force	**57,517**	**60,942**	**+ 5.9**

6.3.2.1. Summary

In terms of population dynamics Mayo has seen an overall increase in population of 11.2% between 2006 and 2011, the last inter-censal period. This is largely associated with urban and near urban area growth. By contrast, with the exception of Kilfian South DED, there has been a marked decline in population numbers in the rural DEDs around the proposed development site. Mayo has also seen a 6% increase in the total available

labour force in the period, however some 11,866 people are stated as being unemployed (19.5% of the total labour force). Unemployment is largely associated with the construction industry and with the associated supply chain industries such as mining and quarrying and manufacturing.

The Oweninny wind farm project will provide meaningful direct employment in the construction industry during the construction phases of the project which could see employment opportunities over a 10 year period with additional spin off employment in quarrying and materials supply. Additionally, employment opportunities will arise during the operational period.

6.3.3 Public Attitudes

The report '*Attitudes towards Wind Farms and Wind Energy in Ireland*[2]', which provided the results from Ireland's first independent study of the Irish public's attitude towards the development of wind energy, highlighted the following:

- There is a high level of public support for developing more sources of renewable energy in Ireland.
- The overall attitude to wind farms is very positive. More than eight of ten people believe wind energy to be a good or fairly good thing.
- A large majority of the general public believes that wind farm developments do not impact on the scenic beauty of an area. This is the case irrespective of the type of landscape.

It was noted that a significant portion of those opposed to a local wind farm did not really have any reason they could articulate, other than that they simply didn't want it.

More recently Fáilte Ireland, in association with the Northern Ireland Tourist Board (NITB), commissioned a survey of both domestic and overseas holidaymakers to Ireland to determine their attitudes to wind farms[3]. Interviews indicated that most visitors are broadly positive towards the idea of building more wind farms on the island, although a sizeable minority (14%) exists who are negative towards wind farms in any context, see Chapter 16, Section 6.2.3).

At two public consultation meetings held in Crossmolina and Bangor in December 2012 the majority of the public were considered to be supportive of the proposed wind farm development mainly due to the employment opportunities that would arise during its construction and operation.

[2] Attitudes Towards the Development of Wind Farms in Ireland, Report by Sustainable Energy Ireland, 2003

[3] Fáilte Ireland, Visitor Attitudes on the Environment - Wind Farms, 2008/ No 3

6.3.4 Health and Safety

The basic technology to be employed in the project is well understood and there have been significant technical advances in the recent past that have further improved it in terms of health and safety. The development of the technology is reflected in its growing application in many successful projects both nationally and internationally.

6.3.5 Electromagnetic Fields

Electric and magnetic fields (electromagnetic fields (EMF)) around wind farms can originate from the grid connection lines, wind turbine generators, electrical transformers, and underground network cables. Both electric and magnetic fields also occur naturally. The Earth's magnetic field, which is due mainly to currents circulating in the outer layer of the Earth's core, varies between about 30μT (microtesla, 1000μT = 1mT, millitesla) at the Equator and about 60μT at the poles. This field may be distorted locally by ferrous minerals or by steelwork such as in buildings.

At the Earth's surface there is also a natural electric field, created by electric charges high up in the ionosphere, and varying between 100 and 150 Volts per metre (V/m) in fine weather. Below a storm cloud containing large quantities of electric charge for example, the field may reach intensities up to 20kV/m over flat surfaces, while above hillocks or other irregularities or near the tops of objects such as trees, the field strength can be considerably higher. In mountains, for instance, the presence of these fields produces electrical discharges and crackling noises on sharp ridges and on the ends of ice peaks.

6.3.6 Ice shedding

Similar to other structures there is some potential for ice to form on wind turbines under certain atmospheric conditions, typically with ambient temperatures near freezing (0°C) combined with high relative humidity, freezing rain, or sleet. Weather conditions, the force of gravity and turbine blade rotation may cause this ice to be shed, giving rise to safety concerns. Under certain conditions changing temperatures and climatic conditions may cause ice fragments to loosen and fall. Rotating turbine blades may also propel ice fragments up to several hundred metres from the turbine depending on conditions. The immediate risk area will be directly beneath the turbine blades and within several hundred metres from the wind turbine itself.

Two types of ice can form on the blades of wind turbines. Smooth glaze ice, which is transparent and highly adhesive, forming when moisture contacts surfaces colder than 0°C, (e.g., ice storms at low elevation). It normally falls straight down shortly after formation. Granular and opaque rime ice (formed from super-cooled droplets which trap air giving the ice a white appearance) can form at colder temperatures and is less adhesive. It is sometimes thrown from moving turbines, but often breaks into smaller pieces. Falling ice may cause damage to structures and vehicles, and injury to site personnel and the general public, unless adequate measures are put in place for protection. Ice shedding from stationary turbines could place service personnel within the wind farm at risk.

6.3.7 Shadow Flicker

Wind turbines, as with trees or any other tall structure, can cast long shadows when the sun is shining and is low in the sky. A phenomenon, known as shadow flicker, which could be considered a nuisance even though the effect would be very short-lived, could occur under certain conditions. This is where the blades of a wind turbine cast a shadow over a window in a nearby house. The rotation of the blades might cause a shadow to be

cast about once per second or two in the room whose window is affected. The potential for shadow flicker at distances greater than 10 rotor diameters (a maximum of 1,200m in the case of Oweninny) is very low. Where unacceptable impacts in terms of level of shadow flicker are predicted the relevant contributing turbines can be curtailed in operation for the brief critical periods. An assessment of the potential for shadow flicker from wind turbines within the Oweninny wind farm on houses within 10 rotor diameters to occur is provided in Chapter 8 of this EIS.

6.3.8 Noise

Noise may have various effects on human beings exposed to it ranging from discomfort and annoyance to various psychological and pathological conditions. The susceptibility of people to noise, and the level of annoyance they experience, varies widely; indeed the degree of annoyance is dependent on the quality of the sound and the recipient's attitude towards it. Measurable psychological and pathological effects have been shown to be attributable to noise. They include effects on health, sleep, communications, working efficiently, industrial accidents and mental stress. An increase in background noise will occur during the construction and operational phases of the development. Construction noise will be typical of that associated with any large construction site and will be temporary in nature. An increase in background noise will occur when the wind farm is operational and generating electricity. The levels of noise attributable to the proposed development are such that significant health effects outside the site boundary (such as occupational deafness, etc.) can be ruled out. Impacts such as annoyance must however be examined as part of this study. A full assessment of the construction and operational noise is provided in Chapter 7 of this EIS.

6. 4 POTENTIAL IMPACTS OF THE DEVELOPMENT CONSTRUCTION PHASE

6.4.1 Population, Employment and Socio-economics

6.4.1.1. Local Level

The proposed development contains no residential component and will have no significant direct impact on the composition of the population in the immediate area. There is no evidence from Ireland or elsewhere that the presence of a wind energy development in an area has an effect on population numbers.

During construction there may be some limited impacts on the residential amenity of the population living in the locality of the development. These would be short-term impacts relating primarily to construction noise and traffic. These impacts are quantified and described in detail elsewhere herein.

As in many capital intensive industries, renewable energy development tends to be characterised by substantial short-term employment creation during the construction phase and relatively modest long-term employment thereafter. As the Oweninny project will be developed over a number of phases its short term construction employment opportunities will extend over a more prolonged period than normal for a wind farm development. In the case of Oweninny short term employment opportunities during the construction phase will extend over a prolonged period as the wind farm is constructed in phases. At peak employment, it is estimated that more than 100 construction jobs will be created with an estimated 12 full time jobs associated with wind farm maintenance during the operational phase and a further 5 -10 jobs in the proposed Visitor Centre. For

example at Bord na Moná's Mount Lucas wind farm development up to 150 people have been employed in construction at peak periods.

Employment in the wind energy sector is closely related to the rated capacity planned, constructed and installed and, as such, jobs supported by the wind industry are located largely where generating capacity is installed. Therefore, for the industry as a whole the jobs created will be widely dispersed around the island of Ireland, including Co. Mayo. The installed capacity proposed for the site means that maintenance personnel are likely to be based there and essentially dedicated to the operation and maintenance of the wind farm.

During the construction phase, which will occur over three separate phases, with phase 1 and phase two lasting about 24 months each and phase 3 between 36 and 48 months, there will be significant expenditure on the provision of fill and aggregate materials and on site facilities including the construction of the civil and electrical infrastructure. These can benefit local companies, contractors and their employees. There will also be indirect employment in the manufacture of building materials and equipment used in construction.

A requirement for some temporary or medium-term accommodation may arise during project construction.

The wind farm will impact significantly on other employment in the area particularly local quarries that may be awarded contracts for the supply of fill material aggregates and concrete. The project will generate annual Local Authority Rates for Mayo County Council that will provide indirect long-term benefit for the broader community.

The anticipated total capital cost of the project is of the order of up to €600M. In addition to impacts on the national economy, this expenditure will result in economic benefit to the local economy. Up to approximately 25% of expenditure will be on the supply of construction material, non-turbine equipment and services.

There will be a significant benefit to Mayo County Council in terms of rate payments. Local Authorities receive annual rates from wind developers with an average of €6866 per MW. In 2013 local authorities will benefit to the tune of €11.9 million[4] demonstrating the wind industry's benefit to county councils.

6.4.1.2. National Level

Based on the estimates of the capacity to be installed to reach national targets for renewable energy generation, a report in 2009 by Deloitte[5] indicated that the construction and development of wind energy projects across Ireland to 2020 will involve c. €14.75 billion of investment, c €5.1 billion of which will be retained in the local Irish economy to 2020.

[4] The Irish wind Energy association, Economic Benefits of Wind Energy, 2013

[5] *Deloitte, IWEA* Jobs and Investment in Irish Wind Energy Powering Ireland's Economy,2009

Studies have shown that in 2007 with an installed capacity of just over 56,500 MW, the EU wind energy sector employed more than 150,000 people directly and indirectly in the sector.

The Deloitte report suggested that the wind energy sector to 2020 in Ireland is capable of supporting more than 10,760 jobs through direct and indirect involvement in the sector. Regarding potential employment in the renewables sector, construction jobs include civil engineering, electrical engineering, labouring, project management, health and safety, turbine transport and crane operation, and further environmental analysis required to satisfy planning conditions. Figure 6-2 shows the breakdown in Irish Wind jobs by category.

The above is a substantial contribution, particularly given the decline in traditional industries including agriculture and across a number of areas of manufacturing. In addition many of the jobs created in the renewables sector would be private sector employment, thereby contributing to the necessary balance between the enterprise and public sectors. The estimates take no account of turbine installation, as international suppliers tend to predominantly deploy in-house teams rather than sub-contracting all activities. Projected employment in the wind industry is shown in Figure 6-3.

The report also identifies other sectors where activity is expected to increase to facilitate wind energy development generating additional employment opportunities;

> *"Other opportunities in the Wind Energy Sector are becoming apparent, such as grid development upgrade works, pump storage, energy exports and electric transport and many others, and these initiatives will all contribute positively to the growing employment numbers in the wind energy sector and the investment in the sector. At this stage, the research is still ongoing in relation to these initiatives and as such employment numbers cannot be quantified accurately".*

The outcome of the analysis undertaken regarding employment is comparable with the results found in studies elsewhere.

6.4.2 Public Attitude to Wind Farms

Surveys of public attitudes both across Europe and in specific countries show consistent, strong support for renewable energy in general and for wind power in particular.

6.4.2.1. Ireland

The results from Ireland's first independent study of the Irish public's attitude towards the development of wind energy were reported by the Sustainable Energy Authority of Ireland[2].

Because wind turbines and wind farms are a relatively new feature on the landscape and have been largely confined to remote areas, the direct experience by the public of wind farms is limited. Thus, while the supportive attitude of the general public towards wind farm development is of obvious interest, the views of those living in close proximity to existing wind farms are of particular interest. For this reason the study collected views of people living in the vicinity of a wind farm.

The report noted that people in the immediate vicinity of an existing wind farm are positively disposed to the development, see Figure 6-4.

The study highlighted that wind farms are seen in a positive light compared to other utility-type structures that could be built on the landscape:

- *"The study indicates that the overall attitude to wind farms is almost entirely positive. More than eight out of ten believe wind energy to be a very or fairly good thing.*
- *The study highlights that wind farms are seen in a positive light compared to other utility-type structures that could be built on the landscape.*
- *Encouragingly, the study highlights that two-thirds of Irish adults are either very or fairly favourable to having a wind farm built in their locality, with little evidence of a 'Not In My Back Yard' effect*."

Of those who are positively disposed to a local wind farm, the overwhelmingly cited reason was that it produces clean energy. Where negative attitudes were voiced towards wind farms the visual impact of turbines on the landscape was the strongest influence. However, impact on the landscape was not a major concern for those living near an existing wind farm.

In a more recent Ipsos MRBI poll carried out on behalf of the IWEA in March 2013, 80% of those polled were in favour of wind energy with 53% sharply in favour and only 8% firmly opposed.

6.4.2.2. Britain & Northern Ireland

Various wind farm developers have carried out surveys to explore public attitudes to wind farm development. In all surveys, a majority of respondents have indicated a high level of satisfaction with wind farms. The surveys also show that local approval rises once a wind farm becomes operational. The British Wind Energy Association has noted that over 50 surveys have determined that wind farms have a high level of public support, with an average of 70 - 80% of respondents, including those residents living near wind farms, believing that wind energy is, in principle, a good thing. In 2003 a Scottish Executive poll of nearly 2,000 people living within 20 km of Scotland's ten largest wind farm found more than 80% are in favour of increasing the amount of electricity generated by the turbines. Only 2% said that it should be reduced. Around 20% thought that wind farms have a positive effect on their area, compared to 7% who disagreed. Almost 90% said the landscape had remained unspoiled by the development of wind-powered turbines.

These surveys are echoed in Northern Ireland by the study Attitudes and Knowledge of Renewable Energy[6], prepared on behalf of the Department of Enterprise, Trade and Employment (DETI) and others. It showed that 98% of the general public of Northern Ireland believes that renewable energy is a "very good idea" or "a fairly good idea." Of the respondents in this survey 87% stated that they would be happy to have a renewable energy development in their area. Of all types of renewable energy, on-shore wind ranked with solar-power as the most widely accepted technologies. Of the respondents 90% believed that wind development is a good idea and 70% approved of such a development locally.

[6] Attitudes and Knowledge of Renewable Energy amongst the General Public, Report of Findings August 2003

Market Research Northern Ireland carried out a survey of residents around Elliot's Hill Wind Farm in 2003, interviewing 400 householders within 4 km of the development. The results showed that 70% of residents expressed approval for the wind farm and 86% were of the opinion that the wind farm fits in with the surrounding countryside and landscape. Those residents close to and within sight of the wind farm were more likely to have a favourable opinion.

These results are further echoed by a Millward Brown Ulster[7] survey conducted in Northern Ireland in April 2005. This study determined that 87% of people in Northern Ireland believe that wind farms are necessary to meet current and future energy needs; that 66% of people in Northern Ireland and 73% of those in the western portion of the province would be happy to have a wind farm in their local area. This survey showed increases in positive attitudes towards wind farms by those in the southern and western regions of Northern Ireland.

6.4.3 Community Benefit

Community benefit schemes, which are over and above the local direct project investment, are a well-established component of wind energy developments in Ireland. The Irish Wind Energy Association (IWEA) recognises and stresses that increasing community acceptance of wind energy is central to the efficient deployment and expansion of wind energy in Ireland with the consequent positive economic development resulting in greater security of our energy supply, job creation, lower energy prices and a reduction of greenhouse gas emissions. IWEA have reinforced their commitment to local communities through publication of its community engagement and commitment guidelines[8], the principles of which will be followed by Oweninny Power Limited. The wind sector already delivers long lasting community benefits to communities across Ireland

Often seen as a goodwill contribution, community benefit schemes are a commitment by developers to ensure that a proportion of the benefits delivered by wind energy projects are realised within the communities that live near them. Community benefit is also recognition of local communities' accommodation of wind farms in their area.

Contributions made by the developer are used to support the local community, through funding of projects and services over and above those required to be provided by the local authority. These can include:

- the provision or improvement of amenity facilities
- the provision or improvement of recreational facilities
- the provision or improvement of educational facilities
- the provision or improvement of cultural or heritage facilities

[7] NI Omnibus Action Renewable 2005 Milltown Brown Ulster

[8] Irish Wind Energy Association , Good Neighbour, IWEA Best Practice Principles in Community Engagement and Community Commitment, 2013

- the protection or enhancement of the environment

The IWEA published protocol for community benefit sets out the key principles are as follows:

- *"These Best Practice principles apply to onshore wind energy projects of 5MW and above in the Republic of Ireland reaching commercial operation 6 months after publication of the principles*
- *Any method of community funding will be determined by the relevant developer with the project specific communities. The communities will be identified through a process of engagement involving all relevant stakeholders. The community to benefit from developer contributions could be determined by taking a number of factors into consideration such as population and population density. Local consultation and knowledge should be central to defining the local community.*
- *the protocol to be agreed by all participating onshore IWEA members and apply to all projects of 5MW and above in Ireland reaching commercial operation 6 months after adoption of the protocol.*
- *Support equivalent to a value of at least €1000/MW of installed capacity per annum, index-linked for the lifetime of the project to be provided.*
- *Payments and/or benefits in kind under a community benefit scheme to commence not later than twelve months from the date of completion of commissioning of the windfarm (unless otherwise agreed by the developer/operator and any proposed recipient to be paid at a later date).*
- *Payments and/or benefits in kind shall be provided for the duration of the commercial operation of the wind farm. Annual payments may be wholly or partially aggregated over the permitted operational life, as agreed through consultation between the project developer/operator and the community.*
- *All parties to this Best Practice will continue to commit to full, open and transparent dialogue with local communities around proposed windfarm projects."*

Oweninny Power Limited believes in the importance of community benefit and both Bord na Móna and ESB take a balanced and sensitive approach to local communities where its wind farms are located. In line with the IWEA protocol and the ESB Community Engagement Policy, Oweninny Power Limited will:

- Seek to be fair and equitable in its dealings with the local community
- Consult and engage with the local community where possible
- Try to remedy genuine concerns the local community may have about the project
- Put in place local community funding arrangements for the Oweninny wind farm community area. A support fund will be put in place for Owenniny wind farm with the funding directed towards areas such as the Visitor Centre development and operation, education and sustainable development and assisting vulnerable groups in the community.
- A regulated independent grant making body will be retained to administer and distribute the community support funds. This body will work within an agreed framework and will manage approval committees, prepare and evaluate applications

for funding, distribute funds to selected projects. A detailed control framework will be put in place and the grant making body will

- Promote and publicise the fund and the application process through local partnerships, community associations and local media
- Provide application forms and Web application for funding projects
- Assess all applications to the community support funds within a specified time frame
- Notify successful and unsuccessful applicants
- Provide Oweninny Power Limited with a project appraisal document outlining the projects for funding
- Recommend the Area of Benefit for the fund in conjunction with the local community
- Promote and assist Oweninny Power Limited in public relations events in the local community
- Support Oweninny Power Limited in setting up a local Community Liaison Committee if required
- Provide evidence of project completion and success and provide Oweninny Power Limited with a follow up report.
- Evaluate the impact of the support fund on the local community
- Provide Oweninny Power Limited with annual accounts for audit

6.4.4 Health & Safety

The Department of Environment, Heritage and Local Government (DoEHLG) Wind Farm Planning Guidelines note as follows regarding safety aspects:

> *"There are no specific safety considerations in relation to the operation of wind turbines".*

As with any structure, fires in wind turbines are not totally unknown. A wind turbine caught fire in hurricane-force winds at Ardrossan, North Ayrshire, Scotland, during severe weather in 2011. A wind turbine also collapsed in the Maas area of Ardara in Donegal in 2013. While such events are dramatic visually, they are nevertheless extremely rare in context of 165,000 working, productive wind turbines world wide.

6.4.4.1. Electromagnetic Radiation

All electrical equipment produces both electric and magnetic fields, collectively termed electromagnetic fields or EMF. In common with electrical equipment, the turbines and other equipment associated with a wind farm emit electromagnetic radiation. Such emissions for the type of machine under consideration would be very low in the immediate vicinity of the machine and almost non-existent at any distance from it. There is no evidence that such emissions, which are common at higher levels in all built-up areas, are injurious to human health.

Domestic electrical appliances and tools for example can generate much higher magnetic and electric fields in their close proximity than transmission lines at a nominal 50m

distance away. A comparison of typical magnetic and electric fields from 220kV transmission lines and the fields generated by domestic appliances is shown in Plate 6-1.

Power systems generally use alternating voltages and currents and hence the fields they produce are also alternating. Power lines in Ireland operate at 50 cycles per second (hertz or Hz); so voltage, current and fields each alternate at this frequency.

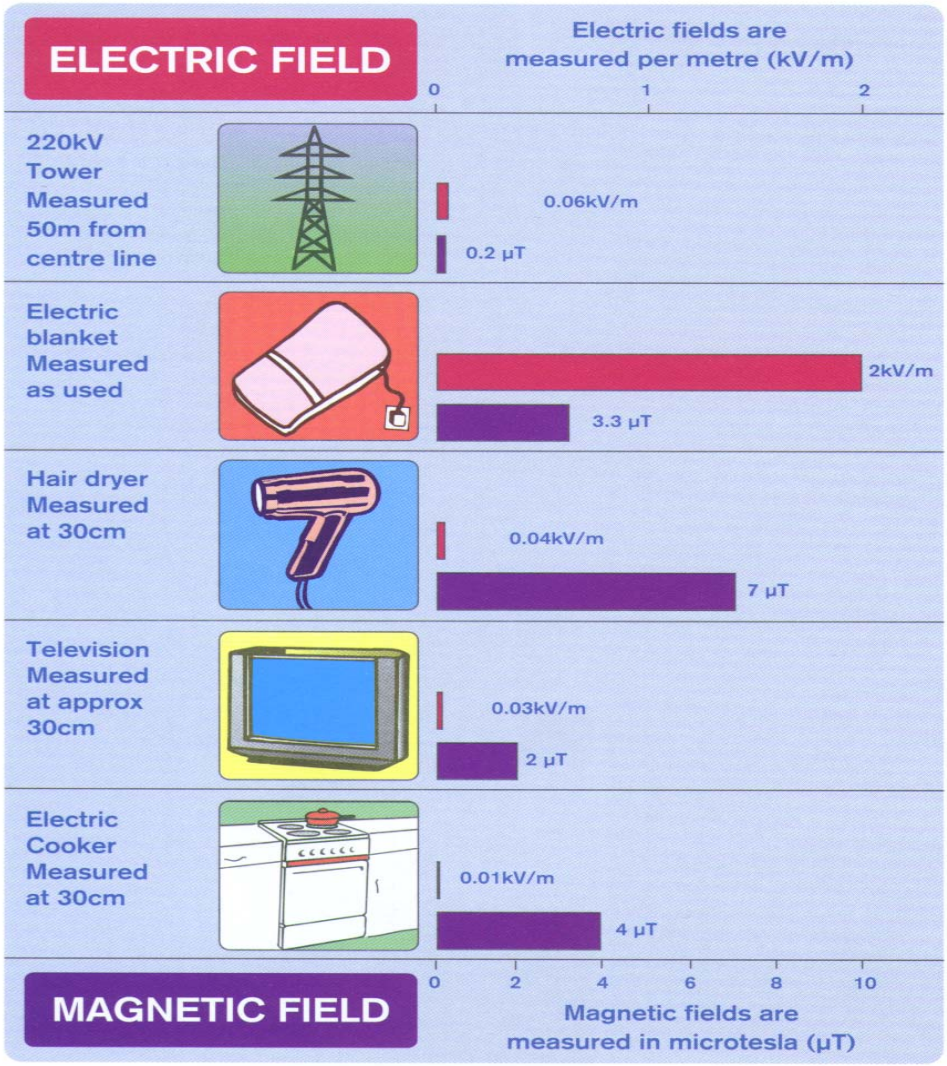

Plate 6-1: Electric and Magnetic Field comparisons

It is accepted internationally that wind turbine generators and underground electricity cables do not give rise to potential EMF impacts with human beings. Turbine generators are located inside the turbine's central housing, which will be situated up to 120 m above ground, and will result in little or no EMF at ground level. In addition all wind turbines are at least one kilometre from the nearest dwelling house. The underground cables that connect the turbines effectively generate no EMF at the surface because of the close placement of phase conductors, that is placing the cables with small separation distances, to minimise the EMF field generation and screening of the cables. Transformers located in substations are the main EMF generation focal points within the wind farm itself and there are also localised fields associated with the 110 kV overhead electricity lines. However, in the case of Oweninny the nearest dwellings are in excess of 400m from the

nearest proposed overhead line or substation and as such there will be no impact from EMF associated with these, see

Table *6-3*.

Table 6-3: Distance of neighbouring houses to OHL and substation locations

House Code	Distance to nearest OHL (km)	Distance to nearest substation (km)	House Code	Distance to nearest OHL (km)	Distance to nearest substation (km)
H1	2.6	2.5	H24	5.8	2.1
H2	2.5	2.4	H25	6.6	2.5
H3	2.5	2.4	H26	6.7	2.5
H4	2.5	2.5	H27	5.1	3.7
H5	2.5	2.8	H28	5.1	3.7
H6	2.4	2.7	H29	5.1	3.7
H7	1.6	2.7	H30	5.2	3.7
H8	1.1	2.6	H31	5.3	3.9
H9	1.2	2.9	H32	5.4	4.0
H10	1.3	3.0	H33	5.4	4.0
H11	1.3	3.0	H34	5.6	4.1
H12	6.1	2.3	H35	5.7	4.0
H13	0.4	1.8	H36	5.3	3.4
H14	0.4	1.5	H37	5.3	3.4
H15	1.2	1.2	H38	5.5	3.6
H16	1.4	1.3	H39	5.6	3.6
H17	4.6	3.6	H40	5.8	3.3
H18	4.8	3.5	H41	5.8	2.1
H19	4.8	3.5	H42	6.6	2.5
H20	4.9	3.5	H43	6.7	2.5
H21	4.9	3.5	H44	6.8	2.7
H22	5.3	3.5	H45	6.9	2.7

House Code	Distance to nearest OHL (km)	Distance to nearest substation (km)	House Code	Distance to nearest OHL (km)	Distance to nearest substation (km)
H23	5.7	3.2	H46	8.1	4.7

6.4.4.2. Structural Integrity of Turbines:

In the past, some poorly designed wind turbines have experienced blade failures during storms. This has applied particularly to two-bladed machines. In documented cases of wind turbine blade failure, the maximum reported throw distance is 150 m for an entire blade, and 500 m for a blade fragment.

The type of wind turbine proposed will be a three-bladed machine with High IEC Class Two Certification for Structural Integrity issued by Germanischer Lloyd. The machines will be designed to withstand gusts of up to 70 m/s (157 miles/hour), which is well above the wind speed applicable to the deign of conventional structures in this part of Ireland. The maximum gust recorded at Belmullet between 1981 and 2010 was 94 knotts (109 miles/hour).[9] The extreme conditions represented by the design wind speed are very rare and, if they did occur, would cause widespread destruction to dwellings and infrastructure. Because of the distance to the nearest dwellings, greater than 1000m, it is extremely unlikely that even under these conditions the wind turbines would cause additional damage or risk to persons.

The DoEHLG Planning Guidelines refer to the possibility of injury to people or animals from a damaged blade as being very remote. The Guidelines explain why this is the case, as follows:

> *"Most blades are composite structures with no bolts or separate components and the danger is minimised as a result."*

6.1.1.1. Hazard from Falling Ice

In cold climates or at high altitude ice can potentially build up on the blades or other parts of a wind turbine. Ice falling off could potentially injure persons below. This does not arise when a turbine is in operation but rather where it has been stopped, following a grid failure for example, and the ambient temperature is very low, allowing ice to build up. Any ice formation during operation would be likely to cause a dynamic imbalance on the rotating blades that would automatically result in a shut-down of the wind turbine.

Falling ice could cause damage to structures and vehicles, and injury to site personnel and the general public, unless adequate measures are put in place for protection.

[9] http/www.met.ie/climate-ireland/1981-2010/Belmullet.html

The DoEHLG Wind Farm Planning Guidelines refer to the possibility of injury to people or animals from flying fragments of ice. The Guidelines explain why this is the case, as follows:

> *"The build up of ice on turbine blades is unlikely to present problems. Most wind turbines are fitted with anti-vibration sensors, which will detect any imbalance caused by the icing of the blades. The sensors will cause the turbine to wait until the blades have been de-iced prior to beginning operation."*

Wind turbines installed in such environments may incorporate an automatic ice warning system and some components in the wind turbine require a certain time for preheating prior to turbine restart. This does not arise in Irish conditions and there is no single known recorded incidence of flying fragments of ice occurring at a wind farm in Ireland in almost 20 years of commercial operation.

6.4.4.3. Summary:

Ireland has had operational wind farms for a considerable period at this stage and to date there has been only one turbine failure incident at Maas near Ardara in County Donegal. There were no impacts on human beings associated with this turbine failure.

The minimum distance between wind turbines at Oweninny and occupied dwellings is over 1,000m, sufficient to provide protection of residential amenities and to meet safety requirements. Extensive operational experience has shown that the health and safety record of wind turbines is exceptionally high, being better in most instances than other forms of electricity production.

Some health or safety related topics are covered by separate and more specific legislation and so do not form part of this environmental assessment; examples include worker health and safety, and construction safety.

6.4.5 Other Issues

Other significant concerns for human beings are generally audibility, shadow flicker and visibility. These issues are dealt with in Chapters 7, 8 and 10, which deal with Noise, Shadow Flicker and Landscape respectively.

6. 5 MITIGATION

6.5.1 General

Mitigation of impacts on human beings has been considered in the context of mitigation of other aspects of this development in the relevant Sections of the EIS.

6.5.2 Health & Safety

Safety is a core value in both ESB and Bord na Móna and in their subsidiary companies. Its management and continual improvement are an integral part of each company's activities. This emphasis on safety will be applied to all aspects of the construction and operation of the Oweninny Wind Farm.

Access to electrical equipment will be restricted to authorised persons who will operate under specific safety rules.

Health and safety provisions will be in accordance with recognised best practice in the wind energy industry. General health and safety procedures will include but will not be limited to the following:

- Site access will be restricted to authorised construction personnel only.
- Clear signage will be provided indicating site restricted area
- All appropriate safety regulation signage will be displayed at the site entrance and elsewhere as appropriate.
- All construction works will be to codes of practice and certified standards set by the various construction trades, such as electricians, excavators, transportation, etc.

It is the developers' intention that the project will be built, operated and maintained to the highest standards of safety. All relevant legislation will be fully adhered to during all stages of development. Any risks that might be associated with this project will be minimised by the use of recognised best practice and technology.

Modern wind turbines incorporate sophisticated control systems that continually monitor the operational status and safe working of key components of each wind turbine and allow an operator to remotely manage the turbines. Under fault conditions, affected turbines shut down automatically and transmit an alarm to the control centre. For safety-critical faults, turbines do not restart until a maintenance engineer has diagnosed and rectified the problem.

Specific actions in relation to safety will include the following:

- The wind turbines will be equipped with lightning protection to effectively and safely discharge a lightning strike to earth.
- The 110 kV overhead lines will be equipped with lightning protection to effectively and safely discharge a lightning strike to earth.
- All electrical systems will comply with the relevant national and international standards.
- Access to electrical equipment will be restricted to authorised persons who will operate under specific safety rules.

6.5.3 Electromagnetic Radiation

The 110 kV overhead line routes and substations are located more than 400m from any dwelling and EMF effects on local residents will not arise from the development.

With respect to site staff Oweninny Power Limited regards the protection of the health, safety and welfare of its staff and the general public as a core company value. Its policy is to

- Fully comply with all legal requirements relating to EMF,
- Design and operate the wind farm infrastructure in compliance with legislation and with due regard to the most up to date recommendations and guidelines of the leading expert and independent international bodies.
- Closely monitor and support engineering and scientific research in the area.
- Provide advice and information to its workers and the general public on the issue.
- Comply fully with the 1998 ICNIRP Guidelines and the EU Council Recommendation adopted in June 1999. The exposure limits in the EU Recommendation are identical to those in the ICNIRP Guidelines.

6.5.4 Structural Integrity of Turbines:

Wind turbine structural failures are extremely rare but in the case of Oweninny a set back distances of at least 1000m has been provided. It should be noted that the Department of Environment, Heritage and Local Government Wind Energy Guidelines recommend a setback distance of 500m and this is exceeded in case of Oweninny. The set back distance provides an adequate safe distance from occupied dwellings should a total or partial structural failure of the wind farm occur.

In addition to ensuring safe distances from occupied buildings additional mitigation to protect site personnel and the public the following mitigation will also be implemented in the event of damage to a turbine and subsequent likely turbine failure

- Physical and Visual Warnings such as fences and warning signs will be erected as appropriate for the protection of site personnel and the public.
- The facility for remote turbine deactivation will be provided
- Access to turbines for site personnel will be restricted in storm events. Where access by site personnel is required safety precautions may include remotely shutting down the turbine, yawing to place the rotor on the opposite side of the tower door and parking vehicles at a distance of at least 100m from the tower. All personnel will be fitted with appropriate PPE.

6.5.5 Hazards from Falling Ice

To minimise the potential risk from falling ice the design of the wind farm has ensured that turbines are located a safe distance from occupied structure, road, or public use area. Wind Energy Production in Cold Climate[10] , recommended by Germanischer Lloyd as well as the Deutsches Windenergie- Institut (DEWI) for example, provides the following formula for calculating a safe distance:

1.5 * (hub height + rotor diameter)

In the case of Oweninny with a maximum hub height of 120m and a maximum rotor diameter of 120m this would equate to a safe distance of 360m. The Oweninny wind turbines are located a minimum distance of 1000m from any occupied dwelling and also the nearest turbine to the N59 is more than 400m distance well outside the calculated safe distance.

In addition to ensuring safe distances from occupied buildings additional mitigation to protect site personnel and the public the following mitigation will also be implemented in the event of ice formation on turbine blades

[10] Tammelin, Cavaliere, Holttinen, Hannele, Morgan, Seifert, and Säntti, *Wind Energy Production in Cold Climate,* 1997.

- Physical and Visual Warnings such as fences and warning signs will be erected as appropriate for the protection of site personnel and the public.
- The facility for remote turbine deactivation will be provided
- Access to turbines for site personnel will be restricted while ice remains on the turbine structure. Where turbine access by site personnel is required safety precautions may include remotely shutting down the turbine, yawing to place the rotor on the opposite side of the tower door, parking vehicles at a distance of at least 100 m from the tower, and restarting the turbine remotely when work is complete.
- All personnel will be fitted with appropriate PPE.

6.6 CONCLUSION

The project is located in a sparsely populated area of County Mayo and as it has no residential component it will not impact on population of the area although through employment opportunities it may help sustain the existing population level. The project will contribute significantly to the national, regional and local economy during the construction phases both through direct and indirect employment opportunities created locally. It is estimated that at peak construction up to 100 jobs will be created with up to a further 12 full time positions associated with the wind farm operation and a further 5 - 10 employment opportunities in the proposed Visitor Centre. During its operational phase the project will contribute significant economic benefit to Mayo County Council through rates paid on the development. A significant community Benefit contribution will also be generated during the lifetime of the wind farm.

It is anticipated that the proposed development will not result in any significant adverse long-term impacts on human beings. Set back distances of project components will ensure no significant impact from EMF, potential turbine failure or possible ice throw during winter weather conditions. Construction activities may cause some nuisance impacts in the form of dust, noise, air emissions and increased traffic. However, these impacts will be minor and of a temporary nature and will cease once construction has been completed.

During the construction phase, which will occur over three separate phases, with phase 1 and phase two lasting about 24 months each and phase 3 between 36 and 48 months, there will be significant expenditure on the provision of fill and aggregate materials and on site facilities including the construction of the civil and electrical infrastructure. These can benefit local companies, contractors and their employees. There will also be indirect employment in the manufacture of building materials and equipment used in construction.

Overall the benefits to human beings in the area will be positive, increasing economic activity and providing employment opportunities in an area traditionally deprived of such opportunities.

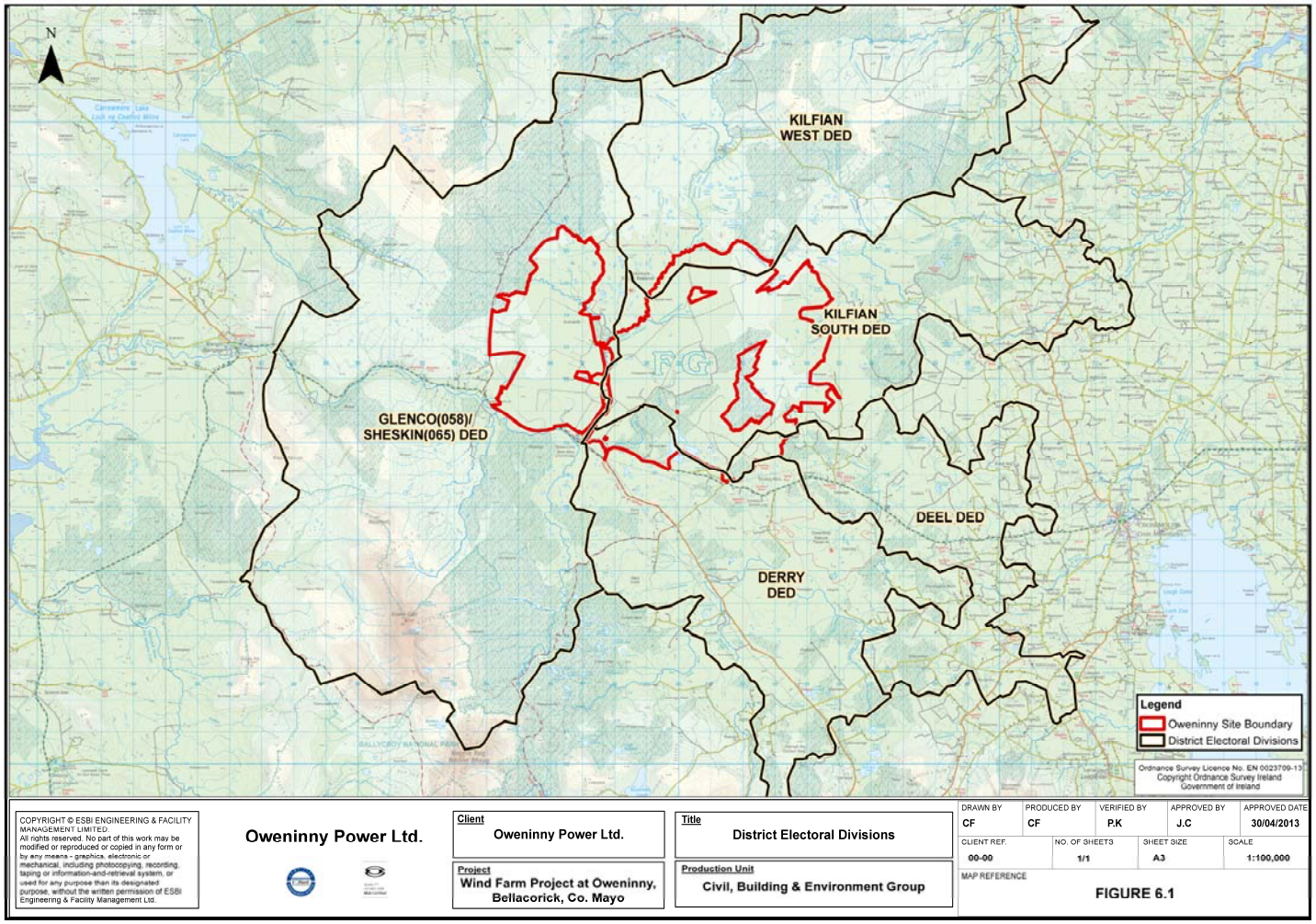

Figure 6-1: District Electoral Divisions at Oweninny

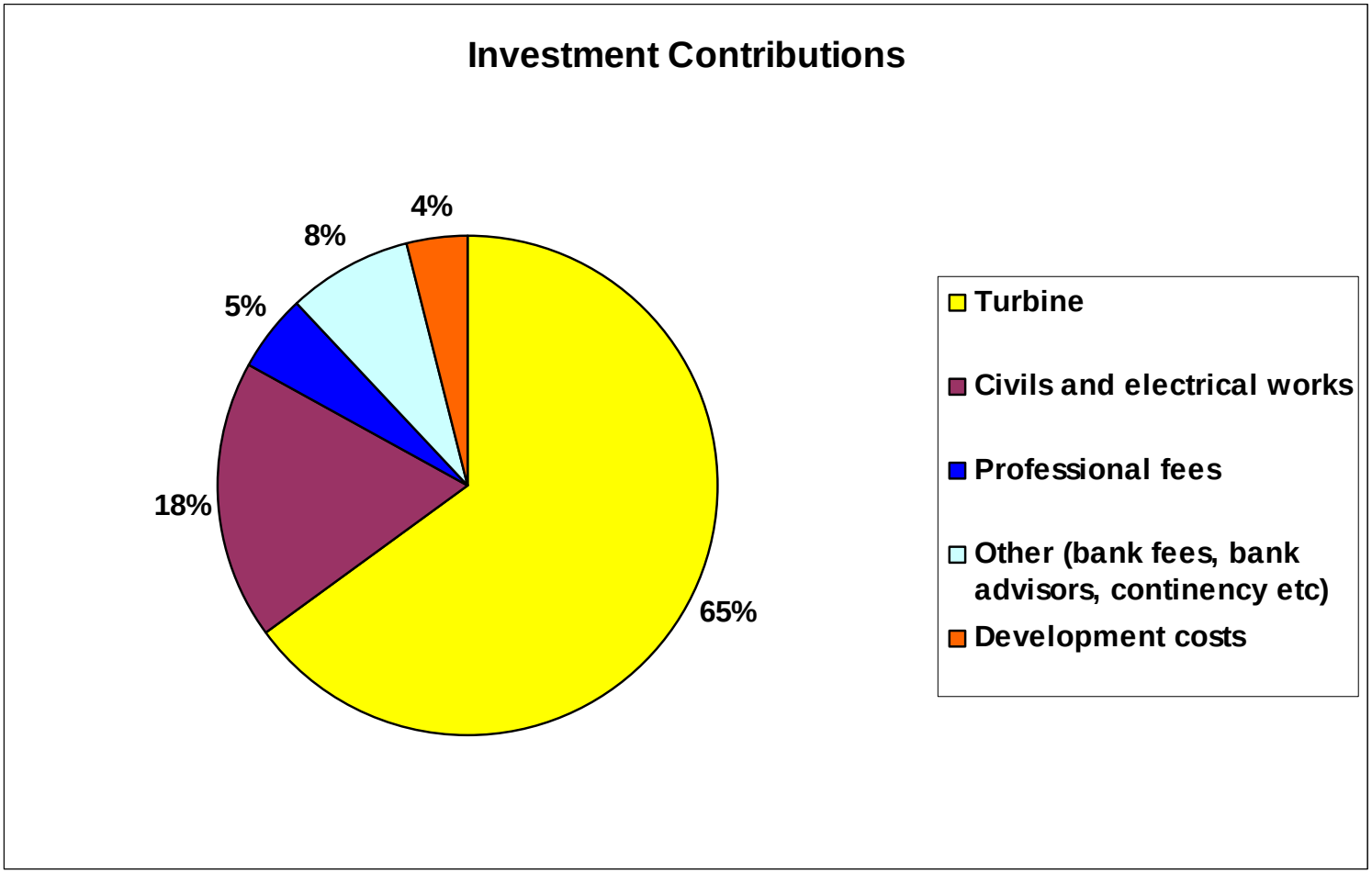

Figure 6-2: Investment Contributions

(Source: Deloitte, IWEA, Jobs and Investment in Irish Wind Energy, Powering Ireland's Economy, 2009)

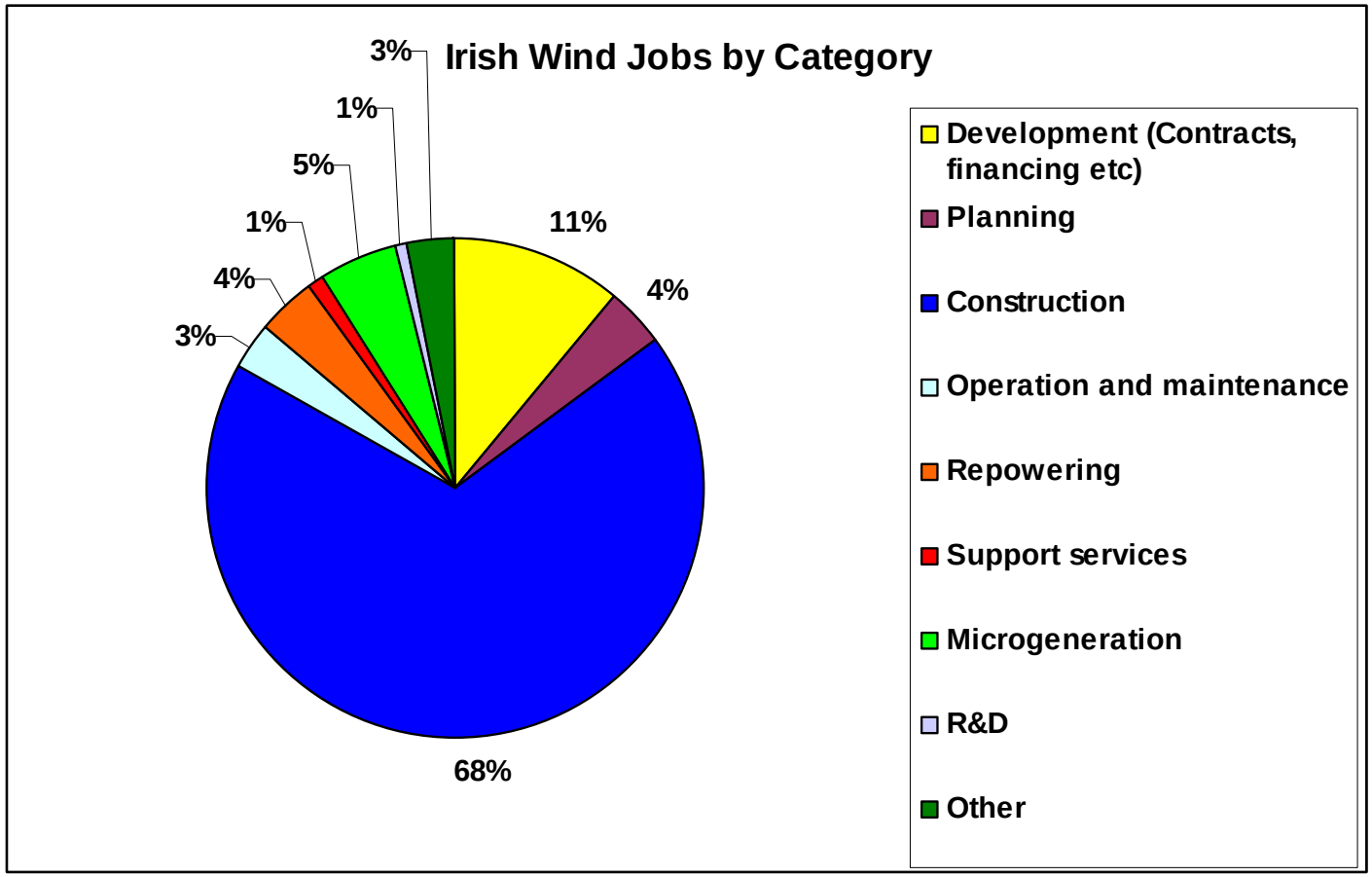

Figure 6-3: Irish Wind Jobs by Category

(Source: Deloitte, IWEA, Jobs and Investment in Irish Wind Energy, Powering Ireland's Economy, 2009)

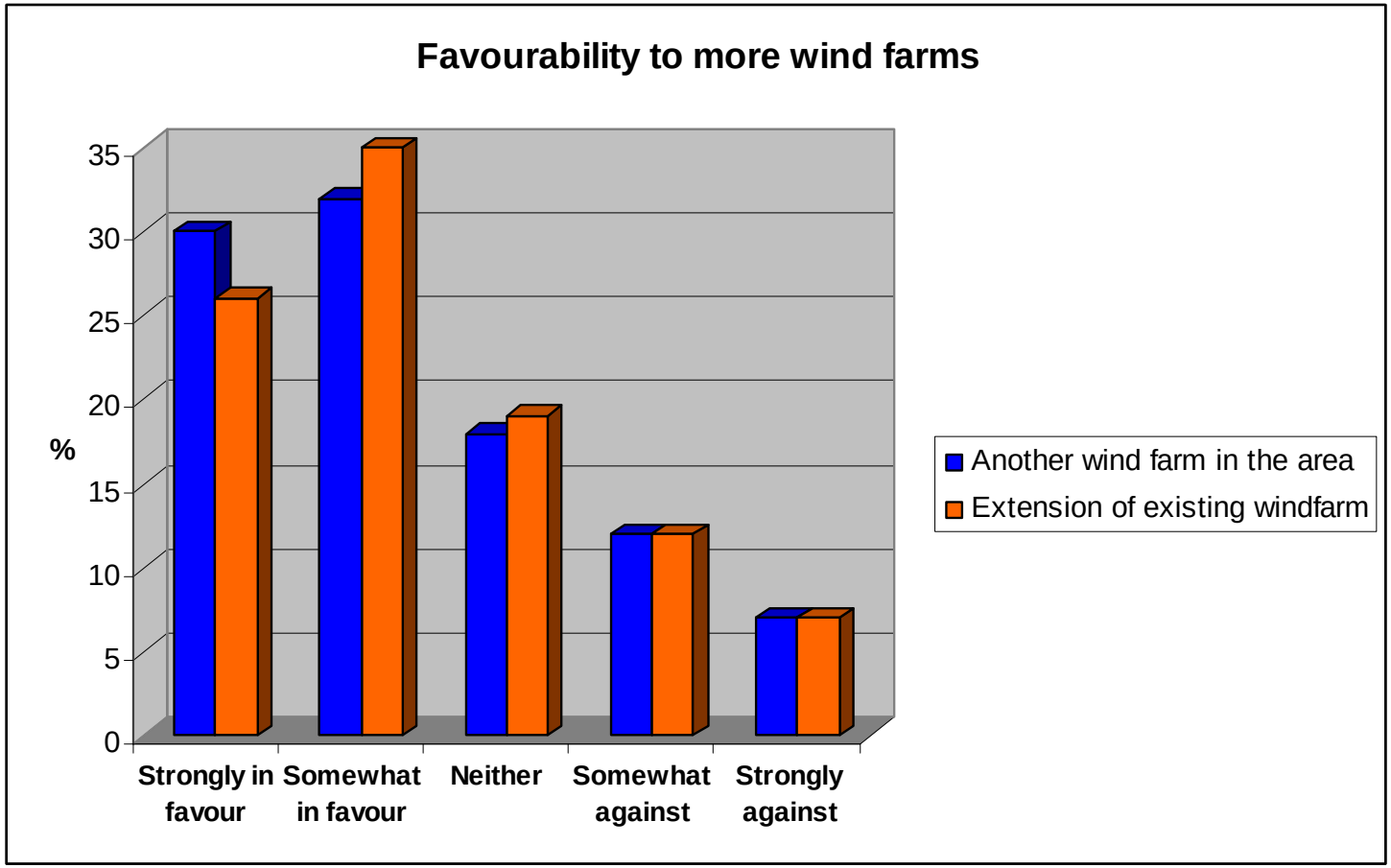

Figure 6-4: Favourability to More Wind Farms

(***Source: Attitudes and Knowledge of Renewable Energy amongst the General Public, Report of Findings August 2003***)