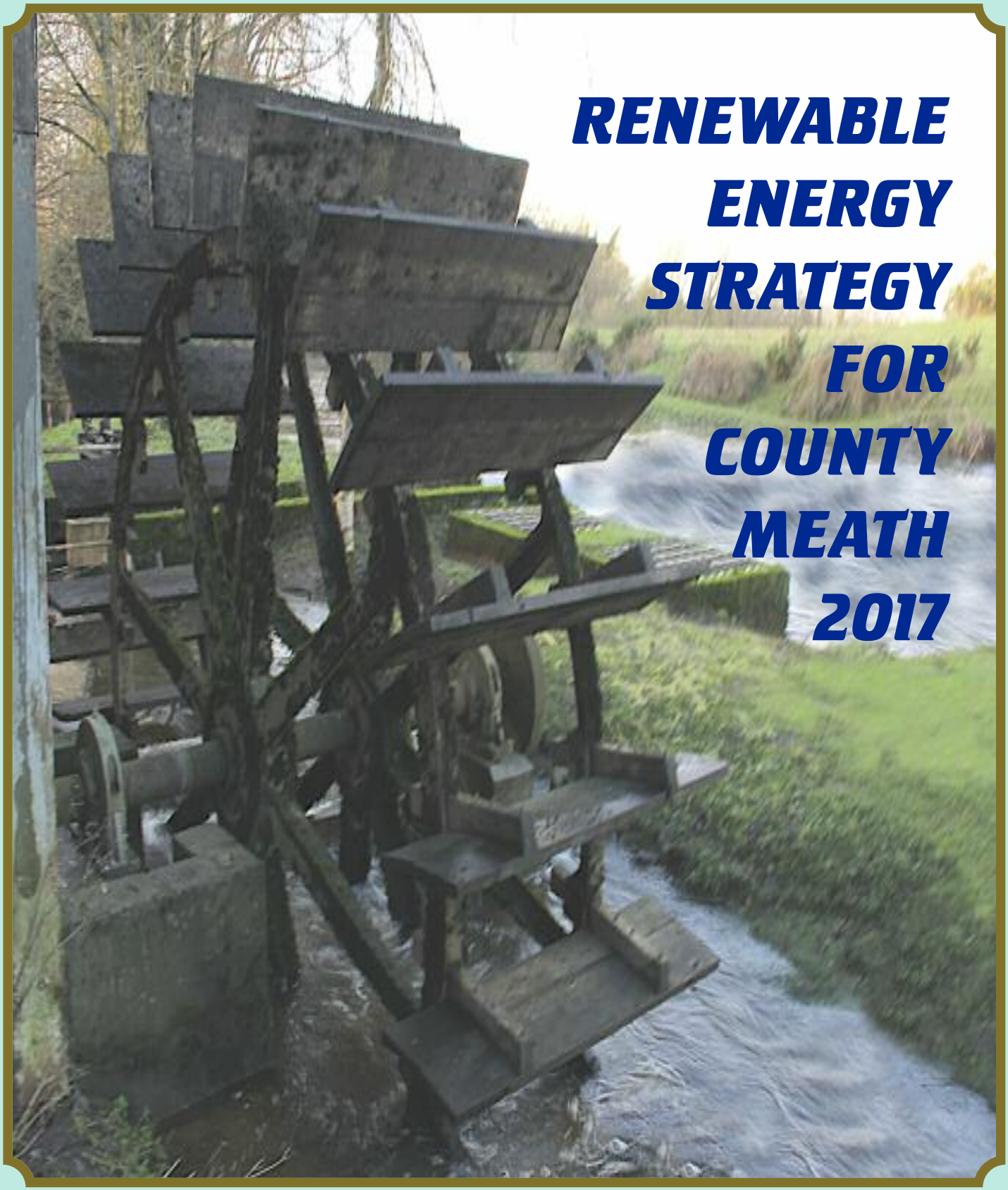


RENEWABLE ENERGY STRATEGY FOR COUNTY MEATH 2017

MEATH ENVIRONMENTAL NETWORK POLICY DOCUMENT

Meath Environmental Network, a consortium of diverse groups with a common interest in the natural environment, have worked together on the proposal to provide a Renewable Energy Strategy for County Meath

Newgrange and Dowth visable above the River Boyne

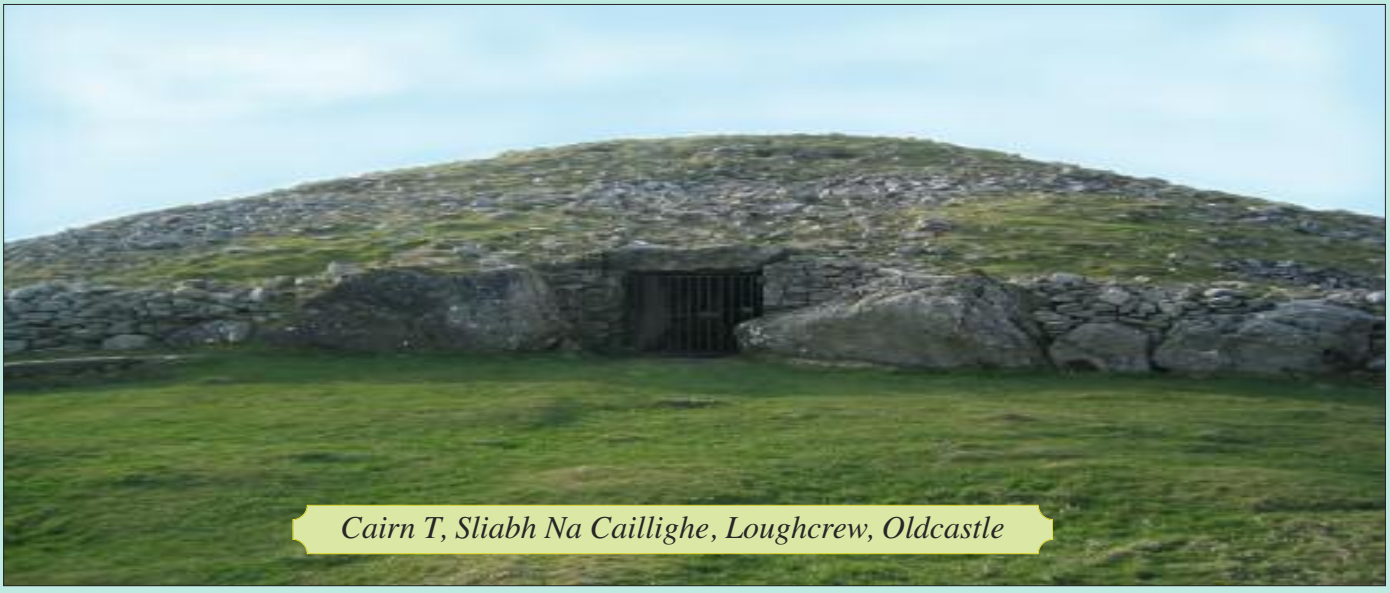
Meath

Kells Heritage Trail

Spire of Loyd

The tower, a mock lighthouse, was erected in 1791 by the First Earl of Bective in memory of his father Sir Thomas Taylor, The architect was Henry Baker who completed the design of the Kings Inn in Dublin after Gandon. The tower has an internal spiral stone staircase and was used in the 19th century to view the horseracing and the hunt.

A section of land adjoining the tower was given to the Kells Union Workhouse in 1851 to be used as a paupers' graveyard. A famine road existed between the paupers' graveyard and the workhouse which was situated to the west of the Fair Green.



Cairn T, Sliabh Na Caillighe, Loughcrew, Oldcastle

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RENEWABLE ENERGY STRATEGY for COUNTY MEATH 2017

MEATH ENVIRONMENTAL NETWORK POLICY DOCUMENT

ABSTRACT

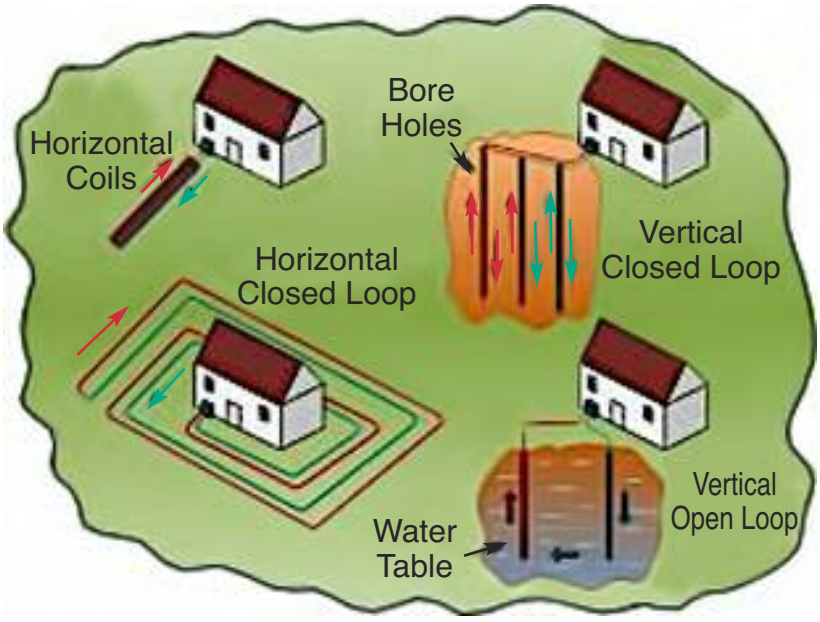
The key objectives of this policy for a Renewable Energy Strategy in County Meath are to develop a planning framework to support and underpin the core strategy policies and objectives of Climate Change Strategy and Energy Management Action Plan 2011-2012 including community to attain those targets whilst protecting our renewable resources so they may provide not just for this generation but those coming after us.

Its core aim is to ensure that the County continues to be a leader in addressing climate change through the facilitation of community inclusive, appropriately located renewable energy developments and through supporting energy efficiency in all sectors of the county usage electricity, transport, heating.

This Renewable Energy Strategy should be incorporated into the existing County Development Plan by way of a variation process and underpinned by an agreed vision as follows:

Vision

Meath County Council should support and facilitate the sustainable development of renewable energy production and use in County Meath, in line with the strategic goals set out by the Department of Communications, Energy and Natural Resources whilst balancing the need for community renewable energy development and the protection of the environmental, cultural and heritage assets of the county. This may be achieved by underpinning the use of renewable energy resources and in development areas by the local authority.



1.0 Background

Historically there has been renewable energy available from many sources: hydro, wind, burning of renewable fuel sources (wood). The largescale use of coal fueled the industrial revolution in the 18th and 19th centuries and oil/gas deposits have only been with us since the centralised use of electricity in the1900s with nuclear and natural gas use coming on stream in the 1970's.

As energy is neither created nor destroyed it is the energy transformation mechanism we choose to use, which has the potential to release geologically trapped carbon or not – simply that.

Excluding geologically trapped carbon sources for energy generation we have radiant heat (sun) thermal heat derived from the sun/earth (solar, geothermal), gravitational energy derived from the Earths gravitational pull (tidal, hydro) and nuclear.

What is driving change and why?

The need for change is driven by the recognition that global warming is occurring which has resulted in the various commitments we have made, as a race, to ameliorate anthropogenic climate change. These have been summarized in the Kyoto Protocol and the various reports from the Intergovernmental Panel on Climate Change (IPCC) leading to the Paris Declaration December, 2015 and Ireland's ratification in 2016. There are fundamental changes, required to take place if we are to provide the energy required for "business as usual", within the limits we must place upon ourselves to decarbonise our energy sources.

Energy contributes to three sectors: electricity, heating and transport. Ireland's National Renewable Energy (RE) Action Plan sets out the envisaged contribution from RE in each of the three sectors. The electricity sector plays the most significant role. Our overall RE target of 16% will be met from approximately 40% RE in electricity consumption, 12% in the heat sector and 10% in the transport sector.

Ireland by 2050:

A radical transformation of Ireland's energy system is required to meet our climate policy objectives. This transformation will result in a low carbon energy system by 2050. By this we mean that Greenhouse Gas Emissions (GHG emissions) from the energy sector will need to be reduced by between 80% and 95%, compared to 1990 levels. By 2100 our GHG emissions will have fallen to zero or below.

Progress towards 2020 Renewable Energy and Energy Efficiency Targets for Ireland

	Target 2020	2014 (Actual)	% Difference
Renewable Energy	16%	8.6%	7.4%
Ren* Elec (RES-E)	40%	22.7%	17.3%
Ren* Heat (RES-H)	12%	6.6%	5.4%
Ren* Transport (RES-T)	10%	5.2%	4.8%
Energy Efficiency	**20% saving**	**8-9% saving**	**11-12% saving**

** Renewable*

(Government White Paper, December 2015).

Current targets:

Ireland's current targets relating to GHG emissions are a 20% reduction in emissions from 2005 levels by 2020 and that we reach 20% of our energy consumed from renewables – under existing policies we will show an excess of 4-7Mt of non-Emissions Trading System (ETS) Emissions at a cost to the exchequer of an estimated 200m€/yr. (Paul Mulvaney, the Executive Director, Innovation at the ESB). Ireland's 2020 GHG emissions reduction target applies to the non-traded sector which encompasses elements of the economy outside the EU's ETS. The final determination of whether Ireland meets its 2020 emission target will be based on the cumulative performance as against the annual targets between 2013 and 2020.

Under the Climate Change Bill – Ireland is moving to a low carbon economy consistent with IPCC reductions for developed countries for 80-90% reduction in greenhouse gases by 2050 compared to 1990 based on aggregate reduction in CO^2 emissions of at least 80% across electricity generation, built environment and transport sectors with an in parallel approach to carbon neutrality in the agriculture and land use sector through CO^2 sinks and sequestration.

There is a requirement for a mix of renewable energy sources to provide for the level of non-GHG producing energy sources needed. In 2014 8.6% of Ireland's energy came from renewables of which 47% came from wind and 42% came from bioenergy with the remainder from hydro, geothermal and solar (Table 1, from SEAI, 2015)

We would like to see County Meath actively participate by producing a relevant Renewable Energy Strategy for County Meath in 2017.

1.1 Renewable Energy Strategy for County Meath

Directive 2009/28/EC on the promotion of the use of energy from renewable sources establishes the basis for achieving the EU's 20% renewable energy target by 2020. Ireland's National Renewable Energy Action Plan (NREAP) sets out how Ireland intends to achieve our individually binding national renewable energy (RE) target of 16% of energy demand by 2020: through 40% of electricity consumption, 10% of transport energy and 12% of heat energy being obtained from renewable sources. To achieve these agreed European targets, the delivery of RE infrastructure will have to undergo substantial transformation.

This policy document aims to facilitate consistency of approach in the preparation of a Local Area Renewable Energy Strategy (LARES) for County Meath, and to assist where possible our local authority in developing a robust, coordinated and sustainable strategy in accordance with national and European obligations.

Local authorities increasingly deliver wind-energy strategies in response to the statutory requirement to have regard to the Wind Energy Development Guidelines and the increased development of wind farms across the country. The Department of the Environment, Community and Local Government (DECLG) published the Wind Energy Development Guidelines in 2006 and we are awaiting new guidelines for the purpose of guiding local authorities in the delivery of these plans or strategies and to facilitate the delivery of a planned approach to the sensitive siting of these developments. In parallel to the development of these local authority wind energy development plans, there is a growing trend whereby some authorities are considering the development of RE strategies with a broader focus than solely wind energy. Thus, while there is no obligation to prepare a LARES, we feel it may be useful for County Meath Council to develop a LARES incorporating it into the County Development Plan (CDP) and in association with other renewable energy strategies.

The extent to which a strategic environmental assessment (SEA) or appropriate assessment (AA) is carried out, or required to be carried out, will be affected by the decision taken to include the LARES into the CDP.

1.2 Objectives

The key objectives of this Renewable Energy Strategy policy document for County Meath are to develop a planning framework to support and underpin the core strategy policies and objectives of Climate Change Strategy and Energy Management Action Plan 2011-2012 ensuring that the County continues to be a leader in addressing climate change through the facilitation of community inclusive, appropriately located renewable energy developments and through supporting energy efficiency in all sectors of the county usage electricity, transport, heating.

To facilitate this, this Renewable Energy Strategy

should be incorporated into the existing County Development Plan by way of a variation process and underpinned by an agreed vision as follows:

Meath County Council should support and facilitate the sustainable development of renewable energy production and use in County Meath, in line with the strategic goals set out by the Department of Communications, Energy and Natural Resources, whilst balancing the need for community renewable energy development and the protection of the environmental, cultural and heritage assets of the county.

1.3 Strategic Aims:-

A LOW CARBON FUTURE FOR COUNTY MEATH

The White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015-2030' sets out a national objective for a low carbon economy with reduced greenhouse gas (GHG) emissions and greater investment in renewable energy technologies. This Renewable Energy Strategy (RES) policy recognizes that Ireland (and County Meath) is a long way off meeting its own energy demands from renewable resources, and it is recognised that significant and immediate commitment to energy (and better energy efficiency) is now required. While it is recognised that greater efficiencies in energy usage and support for the same are needed continued patronage for investment in energy production in County Meath will confer economic advantages in the form of jobs and investment. In addition to meeting its own energy needs, County Meath will benefit through its contribution to national renewable targets, in a renewable energy framework that will also ensure the protection of local environmental assets.

It is the strategic aim of this Renewable Energy Strategy policy to facilitate a low-carbon future in County Meath, by supporting the sustainable development of the renewable energy sector in County Meath. Commitment to the Renewable Strategy should be reflected in the Council's Local Economic and Community Plan (LECP) with a key objective to improve the sustainability of the county's energy use to enable sustainable local economic development. This Renewable Energy Strategy policy document would support the objectives of the LECP as they relate to green economy and it is expected that the development of a sustainable energy base along with investment in efficiency would confer an economic advantage to the county in the form of sustainable jobs and investment.

There are two main policy responses to climate change: mitigation and adaptation. The County Meath RES should facilitate the mitigation of climate change by supporting renewable energy sources as an alternative to fossil fuels thereby reducing GHG emissions.

1.4 Strategic Planning Framework

Framework A planning and regulatory framework for renewable energy development in County Meath would be advised to provide certainty and clarity to both communities and development bodies alike and would ensure consistency in planning decisions. It would also ensure that all proposals and decisions are communicated to and promoted with all stakeholders, general public, industry participants and the wider interested parties.

Scope for future scientific developments will need to be taken into account when planning energy requirements and taking action which could fundamentally change the nature of Irish landscape. For example, in relation to conduction of electricity according to Professor Seamus Davis, Professor of Physics at Cornell University, Itacha, New York; "Room temperature superconductors would improve the power efficiency and stability of power networks worldwide. They would greatly improve the ability to send more power into built-up areas without digging up all the streets and would revolutionise IT, because laptops, tablets, iPads and so on would use little or no energy and furthermore would be 1,000 to 10,000 times faster than at present. Room temperature super conductors will also be very important for high energy physics, fundamental science, medicine and future forms of medicine.

1.5 Procedural Considerations

We ask that all stakeholders are consulted as part of a procedural review prior to commencement of work on an RES for the County and that screening is carried out to ensure compliance with all legislative requirements to ensure protection of the environment is to the forefront of the RES.

A non-exhaustive list of bodies suggested for procedural review is provided in Appendix 3

The consultees identified in Appendix 3, particularly the representative bodies, should be given notification that the strategy has been commissioned so they can disseminate this information to their members.

A. Strategic Environmental Assessment

The LARES is not a statutory requirement and thus a SEA is not automatically required. We would however promote screening for SEA be completed in relation to the LARES as a best-practice exercise.

The DECLG has published guidance on the SEA Directive which should be consulted.

The EPA ENVision atlas is also a useful tool when compiling a map of SEA constraints and should be considered in any LARES.

The SEA process allows for the identification of potential environmental impacts at an early stage of developing the LARES and can enable early mitigation of potential environmental impacts.

B. Habitats Directive and Appropriate Assessment

The Habitats Directive (Council Directive 92/43/EEC as amended) and the Birds Directive (Council Directive 79/409/EEC as amended) form the cornerstone of Europe's nature conservation policy.

Appropriate Assessment is a process that requires the competent authority — Meath County Council, to assess the possible nature conservation implications of any plan or project, alone and in combination with other plans or projects that might affect any Natura 2000 site (Article 6 (3) of the Habitats Directive). 'Plan' and 'project' are not defined in the Habitats Directive but European Court of Justice (ECJ) case law indicates that both should be given a very broad interpretation. 'Plans' include all statutory and non-statutory land use and framework and sectoral plans and strategies to the extent that they have the potential to have significant effects on a Natura 2000 site.

To assist planning authorities, the Department of the Environment, Community and Local Government (DECLG) published Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities (2009). The European Commission also provides guidance on this topic (Wind Energy Guidance and Natura 2000).

C. Flood Risk Assessment

Local authorities should incorporate into the strategy guidelines on flood-risk assessments for RE developments. RE projects must be carried out in accordance with flood-risk management guidelines.

Developments should avoid flood risk areas, but where exploitable resources are present in a high-risk flood zone, e.g. on a floodplain, mitigation measures and testing should be carried out according to the flood-risk guidelines to reduce flooding potential and influence and requirements relating to Areas for Further Assessment (AFAs) and the outputs and activities relating to Catchment Flood Risk Assessment and Management Studies (CFRAMS) should also be given due consideration during the production of the LARES.

2.0 OVERVIEW OF SOURCES OF RENEWABLE ENERGY

GENERAL COMMENTS **RENEWABLE ENERGY IS ENERGY THAT COMES FROM RESOURCES THAT ARE CONTINUOUSLY REPLENISHED THROUGH THE CYCLES OF NATURE. UNLIKE FOSSIL FUELS, THE SUPPLY OF ENERGY FROM THESE RESOURCES WILL NEVER BECOME EXHAUSTED.**

THERE ARE NUMEROUS POTENTIAL SOURCES OF RENEWABLE ENERGY WHOSE DEVELOPMENT WILL DEPEND ON INPUTS FROM OBJECTIVE RESEARCH PROJECTS AND WHOSE WIDESPREAD USE WILL DEPEND ON ECONOMIC FACTORS. THE ENVIRONMENTAL COST OF THE MATERIALS USED IN THE CONSTRUCTION OF RENEWABLE ENERGY GENERATORS IS LIKELY TO BECOME AN INCREASINGLY IMPORTANT CONSIDERATION IN THE FUTURE.

The storage of power from eratic energy production sources may be likely to become a limiting factor in their use however, developments in energy storage facilities, whether electrical or physical, should support their use

Production of carbon associated greenhouse gases may limit the potential of materials used for energy production by combustion or fermentation unless controls are developed to prevent the carbon associated gasses entering the athmosphere.

A brief description of examples of renewable energy resource types available in Ireland is provided below. The purpose of this overview is to assist the local authority in the identification of future and potential renewable energy (RE) resources within its administrative area.

Examples of current and potential sources of renewable energy are:

- Wind Energy
- Bioenergy
- Hydropower
- Solar Energy
- Ocean Energy
- Geothermal Energy
- Combined Heat and Power

2.1 Wind Energy

The process of capturing the power of air movement to turn it in to usable energy for such uses as transport on water, pumping or grinding has been used for centuries. The adaption of windmills to produce electricity has been used in rural Ireland for decades. Recently the development of large scale windmills or turbines has become common. There are various designs such as those having vertical or horizontal axes, differing number of blades etc. Energy is acquired from air movements which rotate blades, (which may be of various formats), that drive a generator. Movement of the rotor attached to the blades causes the rotation of magnets relative to a wire coil in the generator. This movement causes electromagnetic induction which produces electrical current. A wind farm is the term used for a cluster of turbines that are erected in close proximity.

Due to the variability of wind conditions, wind generation poses challenges to the operation of electricity grids. In Ireland, these challenges are being addressed by the electricity system operators under their DS3 programme [30].

Since Ireland's first commercial wind farm was established in 1992 wind energy has been heavily promoted in Ireland. However it has its disadvantages and limitations:

Not all the kinetic energy of the wind can be extracted since conservation of mass requires that as much mass of air exits the turbine as enters it. Betz's law gives the maximal achievable extraction of wind power by a wind turbine as 59% of the total kinetic energy of the air flowing through the turbine' [Harvesting the Wind: The Physics of Wind Turbines Kira Grogg – 2005]

The sporadic nature of wind power which causes challenges for management of a national or regional electricity grid.

The development of wind farms in Ireland is heavily dependant on Government subsidies and their promotion seems to be driven by commercial rather than environmental priorities.

The possible detrimental effect on bats and birdlife.

Studies have suggested that very high wind penetrations are not achievable in practice due to the increased need for power storage, the decrease in grid reliability, and the increased operating costs. Based on these constraints, a practical upper limit for wind penetration has been reported as 10%. (William Korchinski; 2013).

Dealing with the oversupply of energy from wind requires short and long term storage in different time-frames short term with a fast response time or on a longer term over many hours. Very high wind penetrations are not achievable in practice due to the increased need for power storage, the decrease in grid reliability, and the increased operating costs.

The ancillary environmental costs of the construction and siting of turbines should also be considered. The carbon footprint of the supporting concrete bases for turbines; the amount of aggregate used, the carbon footprint of the concrete itself, the lorry and possibly ship journeys needed to carry the concrete etc. are local costs. Rare earth metals are used in small amounts in the manufacture of many electronic devices but in larger quantities in the magnets used in wind turbines. Unfortunately, the mining processes used to extract such heavy metals is causing severe environmental degradation and associated extinction of communities in areas of the world remote from Ireland.

The impact of the very low frequency sounds and infrasound (below 20 Hz) generated by large wind turbines when the wind driving them is turbulent needs long term assessment.

Onshore wind energy

Numerous wind farms have been built in or are planned for areas of rural Ireland. Such issue as the appropriate siting of the farms and height of the turbines are a cause of concern in some areas.

Onshore wind farms currently represent the greatest contribution to the amount of RE generated in Ireland. As of September 2012, Ireland had 1,696 MW of wind connected to both the distribution and transmission systems. Appendix 4 deals with Wind Turbines as Planning Exempt Developments

Offshore wind energy

Developers and planners are increasingly considering the siting of wind farms offshore. The differential response to temperature changes of earth and water facilitate regular air movements in coastal environments it follows that the sea is a far more suitable location for such units subject to appropriate siting.

Typically, offshore wind farms are considerably larger than onshore wind farms in order to make them more financially viable as the cost of manufacture, construction and maintenance of offshore farms is currently much higher than for onshore wind farms.

Offshore wind farms typically require higher support scheme payments than onshore wind farms. There is currently no domestic support scheme available for offshore wind as Renewable Energy Feed in Tariff (REFIT) is available for onshore wind only. Permitting of offshore wind farms falls under the remit of the Department of Communications, Climate Action and the Environment for the foreshore area (out to 12 nautical miles, approx. 23km). Local authorities will be primarily concerned with onshore elements of offshore wind farms such as cable landfall and the onshore grid connection infrastructure to facilitate this type of project.

2.2 Bioenergy

Bioenergy may be defined as the energy derived from biomass. The bioenergy sector will play a key role in the delivery of our renewable heat and renewable transport targets. The RE Directive categorises bio-energy into three sub-groups: biomass, bioliquids and biofuels.

Bioenergy technologies may be broken down into three sub-groups:

- Combustion – both using biomass solely, and the co-firing of biomass with a fossil fuel (most commonly used for 'dry' resources).
- Biochemical processes – including anaerobic digestion of organic residues and also fermentation and esterification in the production of biofuels.
- Thermochemical processes still being developed: gasification and pyrolysis (these technologies are still maturing and may not contribute to reaching energy targets in the short term).

The Draft Bioenergy Plan provides a mechanism to inform and coordinate policy and implementation across the sector. It consists of two sections: section one sets out the broader context for the development of Ireland's bioenergy sector, and the current state of play with regard to the range of policy areas that must be coordinated in order to create the conditions necessary to support the development of this sector. There are a wide range of Government departments, agencies

and state bodies that are critical enablers for bioenergy development by virtue of their responsibility for areas such as forestry, agriculture, waste, research funding and business development. A key output from the Bioenergy Plan is the identification of ways to ensure the optimal coordination of all of these players. Peat is the most carbon-intensive fossil fuel of all, releasing twice as much CO2 (carbon dioxide) as natural gas, according to the Irish Peatland Conservation Council. In 2005, Bord na Móna secured a 15-year deal with the ESB to supply around 2m tonnes of peat to West Offaly and Lough Ree Power annually. Peat burning as an energy sources should cease as soon as possible.

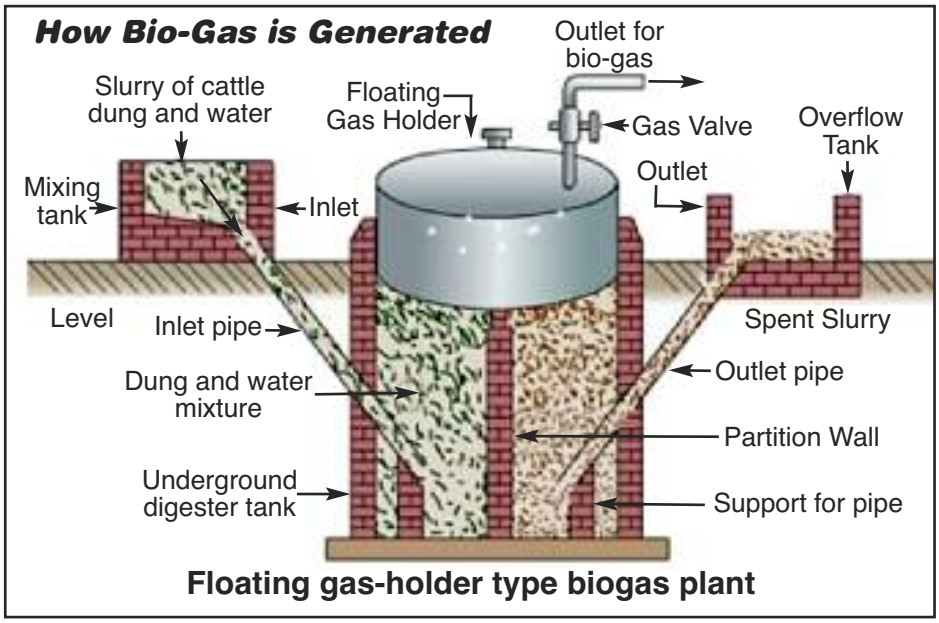
The existing peat fired Power Plants in Loughree, County Longford and West Offaly Power County Offaly were designed in Finland for biomass firing. Bord na Móna has operated the Edenderry plant at up to 80% of the rated output exclusively on biomass and have advised that its output could be raised to 100% of rated output with a capital expenditure of less than €20 million. (Source: Irish Academy of Engineering's Response to DCENR's Consultation Document on Ireland's Renewable Electricity Support Scheme 2015). Calculations by Sustainable Energy Ireland estimate that greater use of biomass at West Offaly, Lough Ree and Edenderry could result in carbon savings alone of €14m a year.

A. Biomass

Biomass is defined in the RE Directive as the biodegradable proportion of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, including fisheries and aquaculture, and the biodegradable fraction of industrial and municipal waste.

Energy from biomass, including organic waste, is referred to as bioenergy. When plant material

is burned for energy purposes, carbon dioxide – a "greenhouse gas" is released. However, arguments are made by proponents that because the plant material is replaced, new plant growth absorbs the amount of carbon dioxide released on combustion, bioenergy is considered to be 'carbon neutral'.



How Biogas is made from animal slurry

Projects involving the combustion of biomass can range in size from a domestic boiler to commercial and industrial installations. The main feedstocks are dry organic residues (e.g. wood chip and wood pellets), energy crops and the combustion of municipal solid waste in waste-to-energy facilities. The most efficient combustion processes use both the heat and electricity generated in a high-efficiency CHP (combined heat and power) process.

The anaerobic digestion of biomass can result in two end uses: the generation of heat and/or electricity, or the production of biomethane as a transport fuel or for grid injection. Multiple feedstock anaerobic digestion facilities vary from on-farm digesters to larger centralized digesters, using various agricultural and food wastes as feedstocks. Examples include: grass, slurry, food waste and the organic fraction of municipal solid wastes. Municipal sewage and landfill gas can also be used to produce heat and/or electricity. The Renewable Energy Feed in Tariff (REFIT) 3, for up to 310 MW, for biomass technologies was introduced in 2012 following state-aid clearance. This secures REFIT rates for specified biomass technologies of certain sizes, including high-efficiency anaerobic digestion CHP and biomass CHP.A Government-commissioned technical analysis considered biomass usage and concluded that Ireland's limited biomass resource would be more efficiently deployed in the heating sector. Future support for biomass will be decided in the context of the renewable electricity and renewable heat consultations that are currently underway.

B. Biofuels

Biofuels may be defined as liquid or gaseous fuels for transport produced from biomass. A number of conversion techniques are used to produce biodiesel, bioethanol and biomethane. Bioliquid sources include vegetable oils (rapeseed, soya and palm), animal fats and used cooking oils. The liquids may be used to produce heating, cooling and electrical energy. Bioethanol is made by fermenting plant materials and biodiesel is made from vegetable oils, animal fats or recycled grease.

Liquid biofuels can be incorporated as blends with petrol/ diesel fuels or used on their own as a replacement fuel. As set out in the NREAP, biofuels will be critical to the delivery of our renewable transport target. Under the RE Directive, every European member state must at a minimum have 10% of its transport-sector consumption from renewable sources by 2020.

The Biofuels Obligation Scheme was initiated in July 2010 under new legislation. Under this scheme, suppliers of petrol and diesel to the transport sector in Ireland must ensure that in any given year a set percentage of their supply is composed of biofuel that complies with the

sustainability criteria set out in Article 17 of the RE Directive. The percentage under the obligation is currently set at 6% by volume. This rate of obligation will remain in place for 2013 and 2014 but will subsequently be increased on a sustainable basis to 2020 (in a manner which takes due account of any revision to Directive 2009/28/EC, currently under negotiation in the European Union), to meet the Renewable energy in transport (REST) target of 10% in 2020 and with due regard to the requirements of the Fuel Quality Directive.

Biofuels that are produced and consumed in Ireland under Article 21(2) of the RE Directive (so called second-generation biofuels) include those derived from used cooking oil (UCO), category 1 tallow (to produce biodiesel) and whey (residue from dairy products production used for bioethanol production). Biodiesel production and use from UCO and tallow has increased significantly since 2009. In 2008 bio-fuels provided a mere 1.8% of the world's transport fuel.

C. Biogas

Biogas is generally produced by microorganisms when they cause decomposition of - plants, manure or slurry which is commonly termed anaerobic digestion. The primary gas produced is methane, which serves as a renewable and versatile raw material for generating electricity, heat and fuel, thus contributing to a safe and environmentally compatible energy supply.

Prior to injection into the natural gas grid or to use as vehicle fuel, biogas must undergo an upgrading process, where all contaminants as well as carbon dioxide are removed and the percentage of methane is increased from the usual 50-75% to more than 95%.

Biogas can be stored or can be fed into the natural gas grid and its use is therefore extremely flexible.

Biogas is also generated at wastewater treatment plants and waste disposal sites. For use as an energy source, biogas is generally converted into electrical and thermal energy in cogeneration plants (CHP units). The heat generated can be used to heat buildings, for example. Electrical and thermal energy produced by biogas plants is especially climate-friendly because the amount of carbon dioxide (CO2) produced during production of the gasses is more or less equal to the amount absorbed by the energy crops during growth or the amount which escapes as waste decays.

Thirty four per cent of all municipal waste produced in the European Union continues to be dumped at land fill sites. The high volumes of biodegradable (compostable) municipal waste are responsible for the formation of methane gas, which when allowed into the atmosphere is particularly harmful. However with the correct treatment bio-waste can be used to produce the versatile energy source that is biogas for electricity, heating, cooking, and powering vehicles as well as a high quality fertiliser. There is possibly potential for all landfill sites to be used as a source of bio-gas energy.

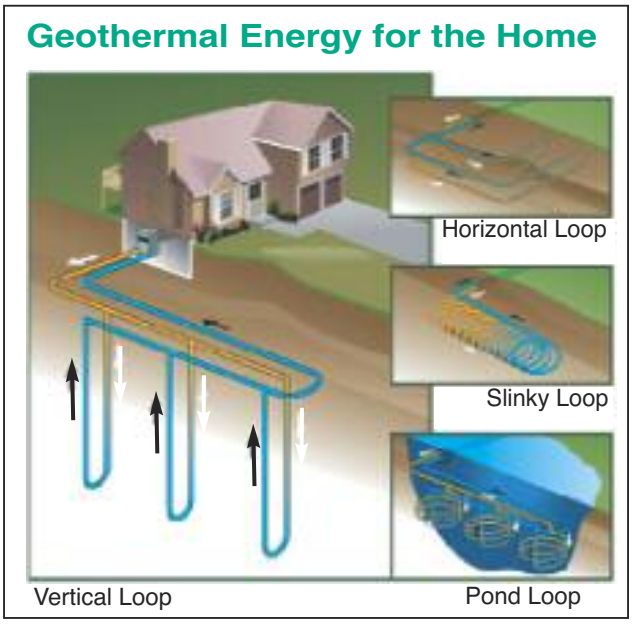
2.3 Geothermal Energy

Geothermal energy means energy stored in the form of heat beneath the surface of solid earth. The temperature of the earth's core is at least 4,200°C. It is generally classified as either 'deep' or 'shallow' depending on the depths involved. This energy may be extracted through heat being exchanged with a fluid and is used for electricity generation and space-heating. Several studies are being carried out at present to assess the resource potential of renewable energy, such as the Play Fairway Analysis of the Geothermal Potential of Ireland, which provides a ranked risk assessment of exploration of geothermal energy resources on a regional scale, based on assessing the presence of an energy source, a reservoir and insulator layers as prerequisites for a developing a successful geothermal system.

Another report conducted in 2004 by CSA Group for SEAI specifically refers to the potential of deep geothermal renewable heat for the Navan area and North Leinster.

A. Deep Geothermal Energy

Deep geothermal energy (typically classified as



being greater than 400m in depth, but generally installed on a 'kilometre depth' scale) may be used for both thermal and electricity generation. The centre of the earth has a temperature of around 4,200°C. Most of this heat arrives at the surface of the earth at too low a temperature to be used for heating or power generation activities, so drilling is required to harness this resource. Recent tests have indicated that depths of up to 4km might be required in Ireland to harness deep geothermal power. Sites on the geological "fault line" known as the Iapetus Suture which runs north east from approximately Limerick to Drogheda offers ideal potential sites for collection of deep geothermal energy.

This is far deeper than geothermal power harnessed in Iceland or the better sites on mainland Europe, and is likely to be expensive to access. The indicative depths required for development of deep geothermal electricity in Ireland would affect the viability of such projects, unless a substantial grant or much higher feed-in-tariff than is provided to other renewable technologies were made available, or unless the development were built beside a substantial heat demand that could make the project commercially viable, without substantial support schemes. Technology for electricity generation from lower temperatures is being researched; thus, although a depth of 4km is estimated as necessary for electricity generation in Ireland at present, this depth may reduce as technology evolves. (Ireland 3rd report on NEEAP 2014) There is a requirement for further study, which should be included as part of the current Energy Research Strategy, (ERS Group Report 2016).

The Geothermal Energy Bill is currently before the Dáil to permit deep drilling for Deep Geothermal Energy. However, there is currently no deep geothermal electricity generation in Ireland and REFIT is not currently available for geothermal power, a REFIT tariff should be encouraged.

The modelled electricity scenario in the NEEAP does not envisage electricity from deep geothermal sources contributing to our 2020 target, we would like this to be expedited at local and national level.

There are advantages of Deep Geothermal Energy:

- Consistent base-load electrical power provision (unlike e.g. wind).
- Reliable space-heating provision
- Sustainable
- Clean - pollution free Zero CO2 emissions for low-enthalpy (near zero for high-enthalpy)
- Small physical footprint required for energy plants
- Cost competitive space-heating and high-enthalpy electricity supply
- Has a consistent output regardless of the weather (unlike solar and wind)

This form of energy is already being utilised in Austria, America, France Germany, Iceland and other countries. While still a developing technology, based on the information available this is one of the more promising forms of alternative energy.

There are legal impediments to developing deep geothermal sources of energy in Ireland. Drilling to depths greater than 300m requires a mining license. To rectify this the 2016 Autumn legislative programme featured on its schedule the "Geothermal Energy Bill", which has not yet been heard. An SEAI study in 2004 conducted by SLR consultants identified the

potential for deep geothermal resources in Ireland. The report highlighted a number of geographical areas where higher than normal temperatures at depth were recorded. Navan was identified as one of these locations.

B. Shallow Geothermal Energy

Specifically, Ireland possesses 42 known warm-springs (water temperatures 13-24.7°C), mainly located in Dinantian limestones [e.g., 1, 12, 22] and concentrated in two groups: North Leinster (west Dublin/south County) (Area 6) and North Munster (north Cork/Mallow) (Area 10).

Hot springs, which often occur on fault lines could also be used commercially to generate electricity. (66% of energy is derived from geothermal sources in Iceland).

Naturally occurring geothermal systems are however limited, not so much by the heat source, but by the amount of fluid and the number and size of the fractures available for the fluid to circulate and absorb the heat. Research into the formation of enhanced geothermal is just beginning. Many projects in the U.S., Europe, and Australia have demonstrated that it is possible to create permeable fracture networks around injection wells through hydro fracturing and then drilling into these fracture systems to produce hot water. A 2010 MIT study, "The Future of Geothermal Energy" claims that once this technology is developed enhanced geothermal systems could produce 10 to 20% of the United States electricity. Like all geothermal systems, use of low temperature springs must be carefully managed. Shallow geothermal (also known as ground-source) energy can be harnessed by either 'closed' or 'open' loop systems and is most frequently used for providing heat. It can also be used for cooling purposes.

Closed-loop geothermal systems operate by circulating a heat transfer fluid around a sealed pipe network which is buried in the ground in either a vertical or horizontal configuration. Closed loops may be installed into purpose drilled boreholes, structural foundations, ponds or purpose dug trenches.

Open-loop geothermal systems typically operate by pumping water into and out of an aquifer. Geothermal energy is extracted through heat pumps, typically gaining between 2.5 and 4 times as much energy (in the form of heat) as is used (in the form of electricity).

Shallow geothermal energy can be found virtually anywhere and has been successfully harnessed by homes and commercial and recreational buildings in Ireland for heating purposes. There are now more than 8,500 ground-source energy systems in Ireland.

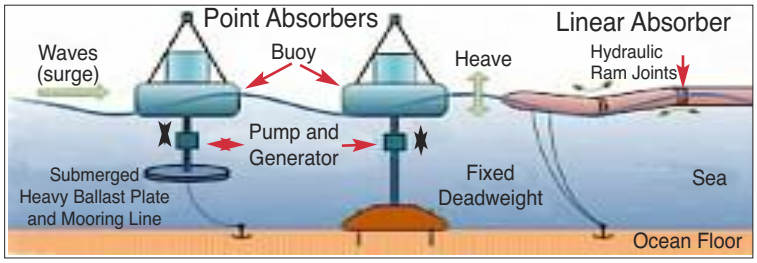
A project at the Geological Survey of Ireland (2012) partly involved the development of a national geothermal energy installations database. (http://www.gsi.ie/). Over 350 MW of installed capacity already exists and there is considerable potential for further development.

Geothermal energy may also be used for renewable heat in district heating systems.

C. Land based Geothermal Energy

Work on this form of energy generation is much more advanced that other alternatives. Energy capture ranges from installing a series of pipes in the upper layers of the earth's crust typically about a meter deep in domestic type situations. Water is pumped through the pipes where it

picks up the ambient temperature of the earth (averages 8 degrees throughout the year) then the water temperature is boosted using a heat pump before it circulated throughout the heating system (normally underfloor).

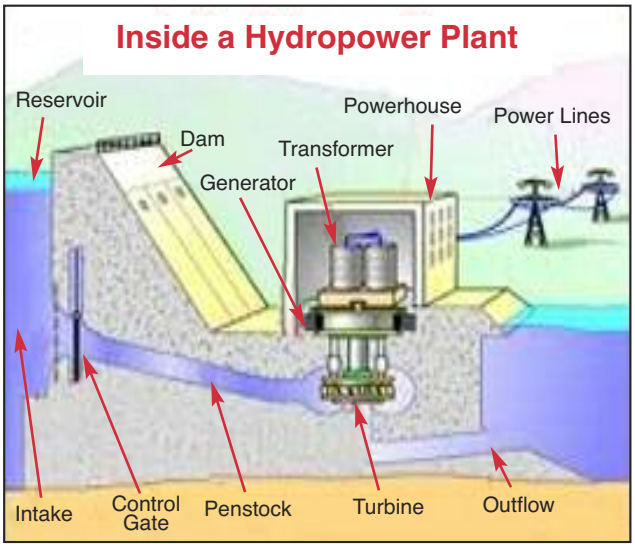


2.4 Hydropower

Hydroelectricity is electrical energy derived from flowing water, particularly falling water. On a global scale, hydroelectric power is the most widely utilized form of renewable energy. Approximately 20% of total global power production is from hydroelectricity, which is only 30% of the economically feasible global potential.

A hydro plant is built by installing a dam to create falling water if necessary, installing a turbine for the water to flow through and installing a generator to convert the energy to electricity

The Ardnacrusha hydroelectric station is the largest hydropower facility in Ireland. The NREAP report 2012 envisaged 234 MW of hydroelectricity contributing to our RE 2020 target, mostly from the existing large hydro plants. There are also many smaller hydroelectric plants in operation across the country. A 1985 report by the Department of Energy identified potential for further small hydroelectric developments. (Small-Scale Hydro-Electric Potential of Ireland; Department of Energy: www. seai.ie) (ESBI/ETSU (1997). A REFIT tariff is available for hydro plants of 5 MW or less, and a number of such plants have joined the original scheme.



There are also a number of ongoing initiatives to examine the possibility of 'pumped storage' schemes to provide reserve and responsive power when required. A Pumped Storage scheme has a remote powerhouse that pumps water from a low area of the land to a high area of the land to maintain the water flow. Pumped Storage schemes are the most reliable at energy generation due to the closed cycle of water flow, whereas the energy generation of Run of River and Diversion schemes may fluctuate in response to the weather, tide and other environmental factors. The pumped-storage scheme at Turlough Hill, Co Wicklow is an example of this type of project. However, under the RE Directive, pumped storage is not considered an RE technology and is not counted towards our national target.

2.5 Solar Energy

Energy derived from light may be converted into heat or electricity using specifically designed "panels".

Evacuated tube solar collectors are used to collect heat to produce hot water or for space heating. The collectors, often housed within glass tubes, are composed of differing layers – a heat insulating backing, a heat transport fluid eg antifreeze, a dark flat-plate absorber, and a transparent cover that reduces heat losses-. The absorber layer consists of a thin sheet, commonly of copper, to which a selective coating eg matte black is applied. In water heating panels, fluid is usually circulated through tubing to transfer heat from the absorber to an insulated water tank.

A solar thermal energy system can provide both water and space heating, although it is predominantly used for water heating at

present. Solar water heating is currently the most common application of active solar thermal in Europe.

'Passive' solar heating is the term used to describe a method of building design to maximise solar gains and minimise heat losses. 'Active' solar heating is one of the primary ways for buildings to use solar energy.

Solar devices may turn light into electricity using the photovoltaic effect. The general principle by which they function to produce electricity is that light enters the cell through a covering layer that minimizes the loss of light by reflection; the light then passes to the energy conversion layers below. The absorber layer which is the core of the device is sandwiched between two, what are called, junction layers. Electrical contact layers are also needed. When light falls on a solar cell, electrons in the absorber layer are excited and move from a low energy to a higher energy state which is eventually collected as an electrical current.

Photovoltaic cells can be arranged into small grouping called panels or large groupings called arrays. These arrays, composed of many thousands of individual cells, can function as central electric power stations, converting sunlight into electrical energy for distribution to industrial, commercial, and residential users. Also stand-alone systems may consist of solar panels and batteries that are directly wired to an application such as a water pump for farm animals or emote lighting systems.

Solar photovoltaic (PV) technology is rapidly becoming cost competitive for electricity generation, not only compared with other renewables, but also compared with conventional forms of generation. Solar also brings a number of benefits like relatively quick construction and a range of deployment options, Solar panels can be deployed in roof-mounted or ground-mounted installations. In this way, it can empower Irish citizens and communities to take control of the production and consumption of energy

The design and technologies around solar installations are evolving constantly and it is likely that over the lifetime of that over the lifetime of this Renewable Energy Strategy solar energy will be widely used.

As with wind turbines the sources of materials for their construction should be sustainable.

GROUND MOUNTED SOLAR ARRAYS

The following site selection criteria for ground mounted arrays apply:

- Typically suited to lowing-lands due to the need for level sites.
- Accessibility/proximity to electricity networks. Ability to achieve a network connection, typically via a 10kV or 20kV cable on the distribution system.
- Site area of at least 25 acres.
- South facing aspect with either flat terrain or sloping gently.
- Land free from obstacles that may cause shading.

Though solar farms are not specifically identified in the classes of Environmental Impact Assessment (EIA) development listed either in the EIA Directive or in Schedule 5 to the Planning and Development Regulations it would be advisable that all such large scale projects are subject to EIA.

ROOF MOUNTED SOLAR ARRAYS

Part L of the Irish Building Regulations state that a building shall be designed and constructed so as to limit the amount of energy required and the amount of carbon dioxide (CO^2) emissions for its operation insofar as is reasonably practicable.

Building regulations requirements for new dwellings also prescribe that a reasonable proportion of the energy consumption to meet the energy performance of a dwelling is provided by renewable energy sources. Solar technologies can be used to help meet this contribution and should be recommended in the LARES.

CURRENT TRENDS

Technology has advanced and there are many companies providing both thermal and PV systems to new and retrofit houses. No current grant aid currently applies to PV systems though they are now as efficient as thermal production systems and also provide electricity – this should be reviewed.

Bord na Móna intend to use state-owned land in the Midlands for a solar energy electricity producing farm. The development team has commenced a number of work streams including the deployment of a solar resource assessment station at Ballykean bog and will progress development work on a demonstration project during 2016. Another company Lightsource estimates that up to 40pc of the country's electricity could be generated by solar farms on 0.02pc of the country's land mass. In the UK, government subsidies are available for solar technologies.

At SEAI's Energy Show 2016 the Product of the Show accolade went to "Solar Electric Ireland" for their product SonnenBatterie - a high tech energy storage solution which also won them Best Innovative Product. The product combines a solar photovoltaic system and a battery, meaning homeowners can get about 75% of their yearly electricity requirement from clean energy generated on their roof. The system is already installed in thousands of homes in Europe.

Though solar farms are not specifically identified in the classes of Environmental Impact Assessment (EIA) development listed either in the EIA Directive or in Schedule 5 to the Planning and Development Regulations it would be advisable that all such large scale projects are subject to EIA.

The 2010 NREAP did not envisage solar power making a contribution to Ireland's 2020 renewable electricity targets, but this has been revised. Market trends suggest that there will be an increase in solar energy installations the period to 2020.

Solar energy is not a resource that is currently supported under the REFIT scheme. Electric Ireland's microgeneration tariff for the domestic sector has supported solar power for the last number of years, while previous grant schemes run by SEAI for the heating sector have to date supported thermal solar energy.

2.6 Ocean Energy

Wave Energy refers to the capture of energy from the motion of surface waves of the ocean while tidal energy capture is a means of converting tidal movements into energy. Tidal energy capture usually consists of the construction of a barrage dam type structure enclosing turbines which generate power from water flows associated with the tides.

Wave and tidal technologies are not yet commercially viable and are still at the research and development D stage worldwide. Ireland has operated an ocean energy research programme since 2008, through Universities and the Marine Institute.

The NREAP 2012 has factored 75 MW of ocean energy into the modelled scenario for 2020. This is in expectation that the technology will be commercially and technologically viable by that stage. Should the technology be developed to effectively harness wave and

tidal energy, Ireland has a strong natural advantage and could capitalise on these forms of energy. State-aid clearance has not yet been sought for a REFIT for wave and tidal energy.

A. Wave Energy

The kinetic energy contained in waves can be extracted and converted into electricity. The average wave height off the west coast of Ireland is 2.5 to 3 metres. The power generated is a function of the wave height, length, speed and water density. Many different prototype devices for the capture of wave energy have been developed by companies. The European Commission has included ESBI's Westwave project in the NER 300 scheme.

B. Tidal Energy

Tidal energy in an appropriate location can provide a reliable and predictable energy resource due to the predictability of tidal flows. The two main types of tidal energy extraction are tidal barrage systems and tidal stream-flow turbines. Barrages, usually located across a tidal inlet, capture the energy of the tidal movement by creating a barrier and channeling it through turbines. Tidal stream-flow turbines are located beneath the ocean surface and can be submerged so they are not seen or heard. They operate on the same principle as wind turbines but, as water is a great deal denser than air, tidal turbines generate more energy for a given rotor size. Similarly to wave devices, there is a broad and diverse range of technologies under development for harnessing tidal energy. A 1.2 MW tidal device has been successfully operating since 2008 in Strangford Lough in Northern Ireland.

C. Offshore Wind, Wave and Tidal Energy

The DCENR developed an Offshore Renewable Energy Development Plan, which describes the policy context for development of offshore wind, wave and tidal stream energy in Irish waters for the period to 2030. In accordance with EU Directive 2001/42/EC of the European Parliament and of the Council on the Assessment of the Effects of Certain Plans and Programmes on the Environment ('the SEA Directive'), a Strategic Environmental Assessment has been prepared to evaluate the likely environmental effects of implementing the plans to develop offshore renewable (offshore wind, wave and tidal) energy in Irish waters. A Natura Impact Assessment has also been prepared. These documents represent excellent reference material for further information on offshore RE development.

2.7 Combined Heat and Power

Combined heat and power (CHP) is a technology that uses the energy produced in the combustion of fuel to produce both useful heat energy and electricity. CHP can refer to gas-fired CHP or biomass CHP. Biomass CHP is a form of RE.

In many scenarios, CHP increases the total amount of useful energy that is produced from a fuel when it is burned. However, the ratio of production of heat and electricity from a CHP unit is often fixed – i.e. when you turn the unit up or down to get more of one type of energy, you automatically get more of the other. For this reason, it is important that, with CHP units, careful consideration is given to the 'demand' for energy that the unit is trying to satisfy in terms of both electricity and heat.

While the development of CHP units is often associated with industries and commercial entities that have constant or predictable heat and electricity demand, the application of CHP is now becoming more widespread across a broader range of uses, we would like to see it encouraged as part of all planning application made – where suitable.

REFIT tariffs for biomass technologies specifically reserve a set number of MW for biomass high-efficiency CHP. It would be positive to see an increase in the biomass

contribution in Meath taking advantage of additional high efficiency biomass CHP and the introduction of the REFIT scheme for biomass technologies.

2.8 Microgeneration and Autoproduction

Production of renewable energy may be generally categorized by the electrical energy output as follows:

AUTO-GENERATION

Auto-generation is the production of electricity for a consumer's own use on the premises/site where the energy is to be consumed. This arises where an electricity consumer has an on-site renewable energy generator to provide a portion of their electricity needs. This onsite generator is not operated as a backup generator at times of grid outage – rather it displaces imports from the grid on a day to day basis. There is no upper limit in energy output to the definition of an auto-producer.

MICRO-GENERATION

In Ireland, micro-generation is classified by ESB Networks as small scale, grid connected electricity generation where customers produce their own electricity and export the surplus onto the ESB Networks Low Voltage (LV) System. Such generators cannot be used to sell electricity to the electricity grid and a return is via a feed-in tariff only.

A range of small and micro-scale energy generation technologies – including wind, solar thermal, solar photovoltaic (PV), geothermal, air-source heat pumps and hydroelectric generators that can contribute to the sustainability and security of energy supply have emerged in recent years. Such generators can be suitable for directly serving the electricity and heat needs of consumers on scales ranging from individual residences to small business or industrial premises.

Electric Ireland, on a commercial basis, operates a limited domestic feed-in-tariff for microgeneration under specified conditions. No other electricity suppliers have opted to enter the microgeneration market to date and there is no other support scheme available at present. The DCENR and SEAI are currently examining policy options around the microgeneration sector and how it might be taken forward. Those wishing to connect microgeneration may do so by complying with the conditions for connecting micro-generation set out by ESB Networks on their website.

Depending on their cost effectiveness and user appeal, certain types of these technologies may see rapid market uptake in the coming years and contribute to energy and environmental policy objectives. SEAI implemented the Small and Micro-Scale Generation Programme and pilot field trials to assess the potential of some of these generators to contribute to energy supply, and to monitor their performance.

There is no universally agreed definition of microgeneration, but it is generally accepted to apply to very small scale electricity generators with an electrical output of less than 50kWe. The definition has also been extended to renewable heat energy-generating technologies; for example, in the UK, microgeneration is defined, in section 82 of the Energy Act 2004, as the small-scale production of heat and/or electricity from a low-carbon source. There are some provisions in legislation and standards adopted in Ireland, key among these being:

- The European CHP Directive (2004/8/EC), was brought into law in Ireland in S.I. 298 of 2009, which brought Section 6 of the Energy (Miscellaneous Provisions) Act 2006 into operation. It applies to micro-CHP plants with a maximum capacity of less than 50 kWe, and thus would cover domestic and small commercial and industrial applications.
- The CENELEC Standard EN50438 was adopted by the CER in a decision paper for microgeneration in Ireland. It applies to equipment rated up to 16A per phase for three-phase (11 kWe), or up to 25A for single-phase (6 kWe), which covers primarily domestic and very small commercial applications.

For electricity generation, a number of microgeneration technologies may be used; for example, a wind turbine, photovoltaic panels, micro-hydro (scaled-down version of hydro-electricity station), micro-CHP (fuelled by biofuels), or a combination of these.

In general, there are two key types of these microgenerators that produce electricity:

1. Stand-alone systems – designed to operate in conjunction with a battery bank and/or other back-up generation to supply on-site demand only
2. Grid-connected systems – where excess generation can be sent to the grid and in times of low generation electricity can be drawn from the grid

For heat generation, a range of technologies – including geothermal, solar thermal, small-scale biomass and air-source heat pumps – are in common use across the country. These are most often implemented on a building-scale basis, without reference to a larger heat distribution grid, although in certain cases a heat distribution system may be connected to renewable heat generation.

The microgeneration of RE does not necessarily fall under the same planning process as larger-scale projects, and the terms can vary between domestic, agricultural and industrial installations. Local authorities should be aware of the exemptions for microgeneration set out in S.I. 83 of 2007 and S.I. 235 of 2008, and the restrictions on these exemptions as per S.I. 600 of 2001. Projects that do not fall under the exemptions must seek planning permission.

A thorough description of micro and small-scale generation technologies is available, alongside a detailed review of relevant planning exemptions, is on the SEAI website: www.seai.ie/ Renewables/Microgeneration

Local authorities with a greater proportion of urban environment could facilitate the use of RE through promoting microgeneration in their area. Part L (Conservation of Fuel and Energy) of the Second Schedule to the Building Regulations includes requirements on sourcing a reasonable proportion of energy in new buildings from RE sources. There is some precedent in this regard where local authorities have requested that developments incorporate a defined level of energy and carbon intensity performance over and above the Building Regulations.

The triple E product register is a benchmark register of energy-efficient products. The register provides a greater resource for identification of products that meet a minimum set of stringent efficiency criteria and typically will be of a best-in-class efficiency standard.

S.I. 201 of 2012 provides, interalia, for the refund of VAT paid by farmers or qualifying equipment, purchased from the 1st January 2012, for the purposes of micro-generation of electricity for use in a farm business.

Generators with an installed capacity of 1MW or less are deemed to be automatically authorized and licensed by the energy regulator (CER) under the terms of S.I. 383 and 384 of 2008 and are subject to the conditions in these orders.

GENERAL SUMMARY OF COMMON ENERGY PRODUCTION SOURCES

In summary, wind (onshore and offshore), hydropower and solar photovoltaic are used to generate electricity, and wave and tidal have potential to do so in the future. Geothermal and biomass energy can be harnessed to contribute to both heat and electricity. Solar thermal energy is generally used for water and space-heating. Biomass is particularly useful for the heat sector (e.g. biomass-based district heating, wood chip boilers, etc.), but can also be used to generate electricity. Liquid biofuels currently contribute to the transport sector, while gaseous biofuel (in the form of biomethane) may contribute to the transport sector in the future.

As described above there is a necessity for a baseload supply of energy backed up by a variable supply such as wind. Baseload supply may be provided by Geothermal, Hydro,

Biomass co-firing, Biomass CHP and Landfill gas, with variable supply from Wind, Solar and Ocean Storage (Stored Wind Solar)

Some RE technologies are supported by government schemes and initiatives such as the Renewable Energy Feed-In Tariff (REFIT) administered by the Department of Communications, Energy and Natural Resources (DCENR) to support renewable electricity, however these do not stimulate community RE schemes to any great extent and require revision.

3.0 RENEWABLE ENERGY RESOURCES & THEIR POTENTIAL FOR COUNTY MEATH

3.1 Background

There are obvious long term benefits to achieving the 2020 Climate Change targets for everyone due to:-

- Reduced Greenhouse Gas (GHG) production, by avoiding 15m ton of CO2 emissions and so improving our environment
- Avoiding costly compliance fines associated with energy and emissions reductions targets
- Renewable electricity displacing €750m worth of imported energy per annum/annually
- Macro-economic benefits, as well as the creation of thousands of new jobs
- Large and small energy generation and conservation projects are essential to meet these targets. Generation could be undertaken by groups and individuals and funded by:
  - Real community ownership
  - Individuals
  - Nationally sponsored schemes run by State bodies such the Sustainable Energy Authority Ireland
  - Private developers

Meath Environmental Network and their members towards the introduction of Bye-Laws and incentives to increase the use of small scale renewable energy projects at local level, planning guidelines to improve suitable and sustainable use of renewable technologies on new builds and to pursue the Bill before the Dáil on Deep Geothermal for Navan, County Meath.

On the issue of transport, County Meath is a commuter belt and as such much of the energy consumed at a County level is on transport. However, although the energy cost associated with transportation in County Meath is likely to be significant, transport policy is made at a local and national level and by the transport motor industry itself, the local Transport Plan is provided by planning department of each Local Authority and as such we would expect it to be mentioned in the LARES and a policy on Biofuels use in locally subsidized transport be included as well as the use of electric vehicles under the provision of the local authority. It was noted at the time of the Third Progress Report on NREAP, that Dr. Eimer Cotter, Head of Low Carbon Technologies with Sustainable Energy Association of Ireland (SEAI) was quoted in a press release April 5th, 2016 as stating that "The use of biofuels added to traditional transport fuels needs to treble. And new electric vehicle registrations needs to grow from less than 1% of new car sales to 20% within the next five years."

This needs to be reflected at local level in County Meath.

Dr. Cotter also said: "The report highlights that while 40,000 homes and 550 businesses are already using some form of renewable heat technology, this level needs to increase sevenfold. We have made substantial progress to date but continued action across all of society is required if we are to move Ireland's energy system onto a low carbon pathway."

This document would like to see Meath County Council, take these requirements into account when approving future planning applications and as stated, incorporated into future transport plans for the county.

Renewables contributing - Nationally

	Renewable Contribution to Gross Energy (ktoe)							Shares %	
	1990	2000	2005	2010	2012	2013	2014	1990	2014
Hydro	60	73	54	52	69	52	61	35.7%	6%
Wind	0	21	96	242	345	391	442	0%	43.3%
Solid Biomas	105	113	180	211	240	267	304	62.9%	29.8%
Land II Gas	-	24	25	44	43	37	39	-	3.8%
Biogas	2	4	9	14	13	11	13	1.4%	1.3%
Biofuels	-	-	1	93	85	99	112	-	11%
Solar	-	-	-	7	10	11	12	-	1.2%
Geothermal	-	-	7	26	30	33	38	-	3.7%
TOTAL	168	235	373	688	835	901	1,021		100%
Share of GFC (Gross Final Consumption)	2.3%	1.9%	2.8%	5.7%	7.1%	7.6%	8.6%		

Source: SEAI, "Energy in Ireland - Key Statistics 2015; Biomass refers to wood, wood wastes and tallow.

The above Table provides a snapshot of where we are going with renewable energy nationally. It would be useful to have the similar data for County Meath as a baseline to work upon.

Fundamentally the Meath Environmental Network would like to see the LARES contain a detailed recommendation for the inclusion of Community Energy and facilitation in practice for its inclusion in the strategy.

3.2 How to achieve a stable renewable energy supply in Ireland and County Meath?

The challenge of an energy source plan is to balance the ever expanding needs of the human population against the detrimental effect that sourcing the energy may have on the natural environment and ultimately the quality of life experienced by many people. All sources of energy have cost - initial set-up, aesthetic impact on their location, transportation, emissions during utilisation and disposal of by-products after use e.g. ash from wood and coal. While Ireland's objective as a country is to significantly reduce carbon emissions it should also aim to be energy self-sufficient.

Renewables have a key role to play at National and Local level in attaining targets whilst providing independence and self-sufficiency with regard to energy requirements. Incentives and policy should encourage the use of all renewable alternatives to the carbon containing energy sources such as oil, coal, peat etc and should not support high carbon energy production in any way.

Local participation in local energy plans is also fundamental to ensuring 'energy citizens' are engaged in local energy issues. A fully participative consultation process should precede the adoption of any energy plans to allow communities, individuals and interest groups to engage with energy planning in their local areas and to help shape the solutions to achieve a sustainable energy future. It should be planned to develop the Meath Local Authority Renewable Energy Strategies (LARES) in consultation with the communities in the locality. A good example, is a plan which analyses the energy profile of the county and lists strategic aims for the county within each renewable energy technology.

What is Community Energy? Community energy is a broad term that describes active engagement by communities and local ownership and participation in energy efficiency procedures and any form of

renewable energy generation and distribution. This is the most desirable form of production and distribution of energy in the county.

There are a number of barriers to the development of Community Energy, however these could be removed by implementing the following measures:

- Facilitating access to the National Grid for communities, micro-generators and auto-generators.
- Mandate electricity companies to enter into Power Purchase Agreements (PPA's) with small generators, with a low cost/admin model so that small generators can received payments for the electricity they export to the grid.
- Fair and secure payments to support community energy and micro generation at a price that balances the long term socioeconomic costs of this generation with the total net metering price and ensures the Public Service Obligations levy is maintained at close to current levels.
- There should be feed-in tariffs for all renewably sourced electricity e.g. solar, deep geothermal. (The current RE Feed in Tariff (REFIT 3) schemes expires after 2017. The new scheme should also incentivise renewable heat installations, providing grant aid to citizens willing to invest in renewable technologies to upgrade businesses and domestic sites.
- Funding and Financial support for community groups in the initial stages of development, feasibility study, planning and construction - in particular to bridge the gap between feasibility and planning.
- Community Energy Co-ops should be encouraged – energy co-ops actively encourage educational programmes and help inform local people of the potential benefits of renewable energies and their importance in combatting climate change (Rundle-Thiele et al, Willis & Willis 2012). Facilitate the development of Community Micro grids through the smart grid programme.

3.3 Renewable Energy Sources, which could contribute locally

The advantages and disadvantages of local potential sources of renewable energy supply are now considered.

Currently there is no single source of renewable energy that has been proven to be capable of providing a consistent electricity supply to the national grid. The experiences of power outages in New South Wales, Australia in February 2017 associated with the suspicion of the overreliance on renewables (solar and wind) being associated with power outages (The Daily Telegraph, Sydney, February 9, 2017) indicates that a broad combination of renewables is needed if the current "base energy" supplies from carbon sources are to be replaced. Advances in energy and electricity storage facilities will make erratic sources of power eg wind more practical in the future.

Developments in the technology of power/electricity production will make systems available in the future that are conceptual at present. A LARES for Meath should ensure that future useful developments are facilitated.

3.4 WIND ENERGY

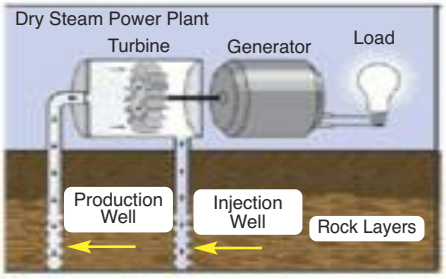
Onshore wind energy is currently a major source of renewable energy production in the country.

The disadvantages associated with the need for consistent airflow to power onshore turbines and the need for higher turbines to attempt to obtain such consistency, needs to be considered in relation to the environmental, heritage and social costs of such large structures in County Meath. Predicted changes in windflow patterns associated with potential global warming, more periods of calm and periods of severe storms, will limit the consistency of power from wind turbines even further.

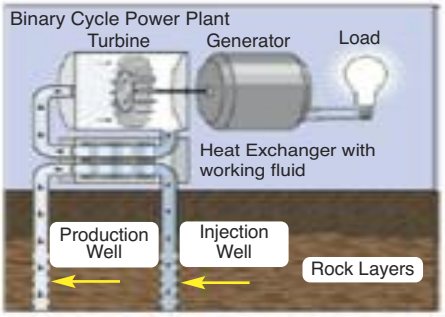
While wind energy is a part of the national overall

Electricity generation from geothermal waters – power plants

Dry Steam Power Plants
Steam plants use hydrothermal fluids that are primarily steam. The steam goes directly to a turbine, which drives a generator that produces electricity



Binary-Cycle Power Plants
Energy is extracted from moderate-temperature water fluids in binary-cycle power plants. Hot geothermal fluid and a secondary (hence, "binary") fluid with a much lower boiling point than water pass through a heat exchanger. Heat from the geothermal fluid causes the secondary fluid to flash to vapour, which then drives the turbines. Secondary fluids: e.g., pentane, butane, propane.



Source: U.S. DOE Geothermal Technologies Program
http://www1.eere.energy.gov/geothermal/powerplants.html

renewable energy portfolio there has been considerable opposition to some wind farm developments in County Meath and how this capacity is achieved should be with community involvement where community energy projects are encouraged and funded.

Offshore wind farms may have greater potential for consistency of supply however, the urbanisation and high environmental designation of much of the Meath coastline will limit landfall opportunites from such power generation.

3.5 DEEP GEOTHERMAL ENERGY

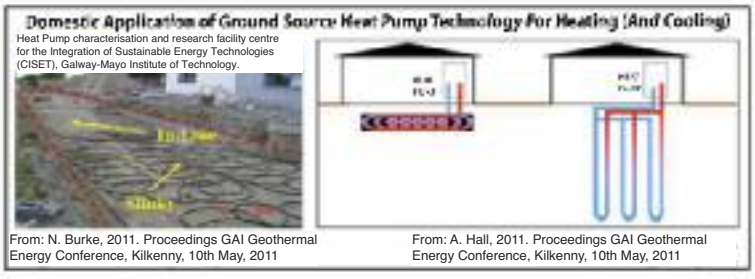
The high temperatures at the earth's core drops nearer the surface to between 180 and 200°C such as in the Kentstown rock at Tara Mines. Experiments within the mine have indicated that temperatures of 86°C and 160°C may be occur at depths of 2.5 and 4 km. The Kentstown type rock is closer to the surface near Navan than elsewhere.

Geothermal potential for Navan

The reason that Tara mines area was used for investigations was because of the data on temperatures, rock formations collected from the mines. The general technique would be that two pipes starting 7 meters apart would be drilled down to 4 km deep where they would be about 0.4 km apart at their greatest depth. Water would be pumped down one pipe, percolate through the Kentstown rock, be heated to 180 and 200 degrees centigrade and travel as superheated steam up to the surface through the other pipe. (The unit at the surface

What is Geothermal Energy? Ground Source Heat Pump Technology

Shallow extraction of heat using Ground Source Heat Pump (GSHP) technology perhaps the form of geothermal energy utilisation that people in Ireland are most familiar with.
All current utilisation of geothermal energy in the Irish Republic employs shallow low enthalpy GSHP technology that exploits ground or water temperatures in the range 8 – 15°C for the provision of space heating



From: N. Burke, 2011. Proceedings GAI Geothermal Energy Conference, Kilkenny, 10th May, 2011

From: A. Hall, 2011. Proceedings GAI Geothermal Energy Conference, Kilkenny, 10th May, 2011

would collect any extraneous material brought up through the second pipe i.e. a semi-enclosed system. A fully enclosed system may not be feasible due to the consistently high temperatures at lower depths). A heat exchanger would then run a turbine.

Navan would require a 5Mkw plant, which would potentially require an area of 0.75 acres with a water cooling system providing potential heat greenhouses for horticulture. Deep Geothermal energy is harnessed via heat exchange techniques. See above diagram for illustration. Water would be pumped down one pipe through the Kentstown rock, be heated to 180-200°C and travel as superheated steam up to the surface through the other pipe. A heat exchanger would then run a turbine.

Heat from the collected hot water is transferred from the heat exchanger to a district heating network and fresh water is used to deliver this heat to the customers connected to the network. The heat produced could be used for districted heating (pipe insulation technology has improved by reducing heat loss to 0.1°C per kilometer. The heat produced would cost less than half the cost of heat from natural gas.

IRETHERM and the Geological Survey of Ireland Shallow Geothermal Energy Project are other sources of information on geothermal energy that may be of use to Meath County Council. The programme generated new data on Ireland's deep geology and geothermal potential and made recommendations for areas where further work could prove useful, notably Hotwell House, Enfield, South Meath.

Another report conducted in 2004 by CSA Group for SEAI specifically refers to the potential of deep geothermal renewable heat for the Navan area and North Leinster.

Meath County Council should consider the potential for district heating systems from renewable sources (including biomass and geothermal) when considering new developments or retrofitting existing developments.

3.6 Shallow Geothermal Energy

Ireland possesses 42 known warm-springs (water temperatures 13-24.7°C), mainly located in Dinantian limestones [e.g., 1, 12, 22] and concentrated in two groups: North Leinster (west Dublin/south County) (Area 6) and North Munster (north Cork/Mallow) (Area 10).

Possible deeper, hotter circulation pattern occurrences are located at Enfield Co Meath (Hotwell House) (22.5°C waters) and Glanworth South (Johnstown), Cork (24.7°C). (Jones et al 2011).

There is potential for local exploitation of geothermal upwelling along the fault line through County Meath and enhanced geothermal as described should be considered in the LARES.

3.7 Land based Geothermal Energy

The encouragement of the installation of geothermal pumps in private housing and where appropriate in public utilities and housing in County Meath should be included in the LARES.

3.8 SOLAR POWER POTENTIAL FOR COUNTY MEATH

Solar technology is one of the technologies being considered in the context of the new support scheme for renewable electricity generation, we would like to encourage County Meath Council to bring this support scheme in as expeditiously as possible to enable communities and individuals to take active control of their own energy production. Solar also brings a number of benefits like relatively quick construction and a range of deployment options, Solar panels can be deployed in roof-mounted or ground-mounted installations. In this way, it can empower Irish citizens and communities to take control of the production and consumption of energy.

3.9 Biomass

Despite release of carbon being a short-term feature of energy production from biomass the Meath Environmental Network would like to have, included in the LARES for County Meath, a policy for the responsible use of biomass in co-firing stations. There is a perceived difficulty with the introduction of large scale biomass farms to fuel feedstock for burning stations – for Waste to Energy (WtE) or direct feedstock for cement production, as the use of agricultural land for biomass crops may best be managed to maximize agricultural food production potential.

The REFIT schemes, which support the generation of electricity and CHP technologies including waste-to-energy, anaerobic digestion and landfill gas, supports the use of waste as a renewable energy feed-stock (Biomass) – we would request that enforcement of the types of waste used in such areas is strictly monitored to prevent recyclable materials from entering this stream. We would request that the County Meath Council LARES consider maximizing the CHP potential from Indaver WtE plant and Lagan Cement works for the Duleek area and relevant planning applications as a matter of policy in the future. All Biomass co-firing plants should be encouraged to use the excess heat/energy generated to maximize the use of this energy source rather than losing it.

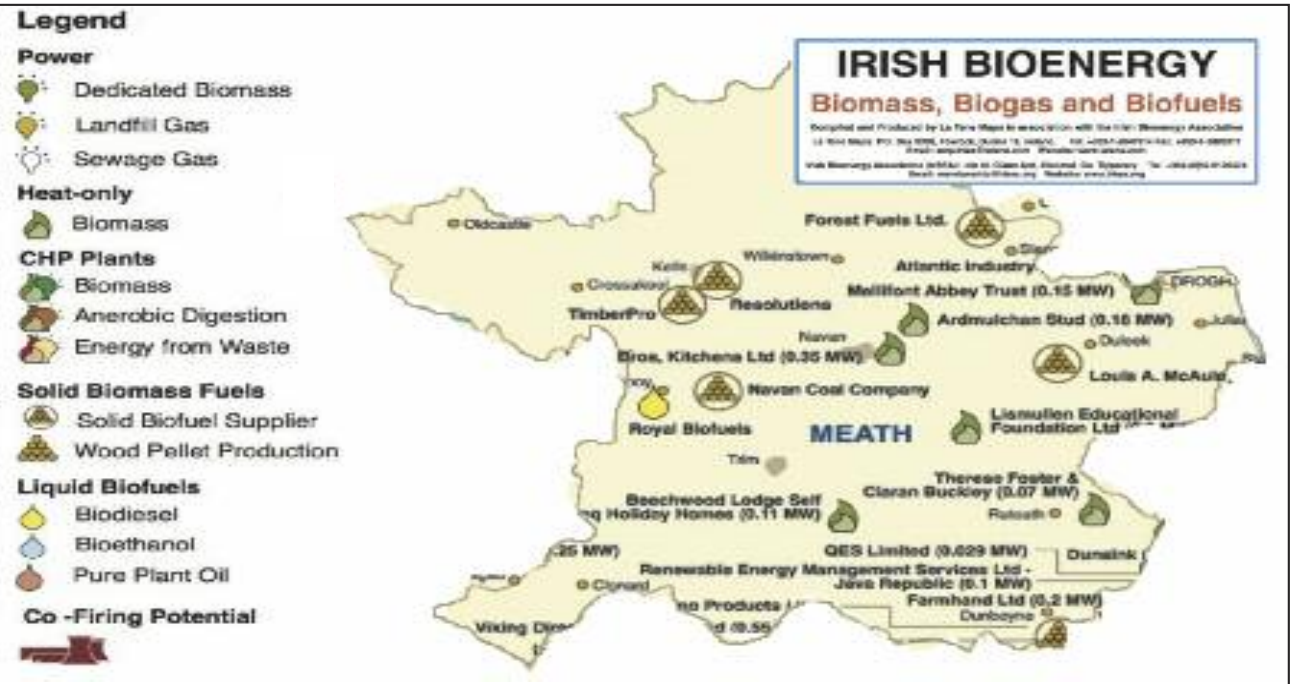
3.10 Biogas

All compostable material in County should be collected separately at source. The gas released during composting should be collected and the solid material used as fertiliser.

There are possibilities for County Meath for example, Germany is the largest biogas producer in Europe with over forty companies supporting its production. In 2014, the 7,944 biogas plants in Germany generated about 27.6 billion kWh of electricity, thereby providing about 7.9 million households with environmentally-friendly energy. The biogas plants provide for more than four per cent of Germany's electricity consumption. Other countries are also extremely active. The second largest market for biogas plants is Great Britain, which generates electricity predominantly from landfill gas. Italy is in third place. Compensation for electricity fed into the grid at a rate of 28 cents per kWh for electricity generated using agricultural raw materials created a real boom in Germany up until 2012 – we require incentives in this area.

Technologies are available for continuous processes to convert mixed organic waste material, ranging from food waste to animal slurry into Biogas, generate electricity, heat and fertiliser.

As a significant farming county, large amounts of waste from animals could be diverted to Biogas plants. Meath Environmental Network would like County Meath Council to promote the inclusion in the LARES of Biogas use from anaerobic digestion plants on farm, industrial Biogas production and the use of landfill gas to feed into the energy requirement at local level where possible. Potentially there are approximately 1,232,000 tonnes of slurry/animal waste available for biogas production in Meath per annum. The potential



Map of Biomass and Biogas Sites in Co. Meath

for this type of energy production will improve in the future.

Passive release of Biogas to the atmosphere should be actively prohibited as it is both an environmental contributor to GHG production and a lost source of renewable energy. REFIT tariffs should promote the local use of bio-waste to encourage farmers to invest in AD and the production of Biogas locally, which will feed into the grid providing renewable energy produced locally, rather than allowing bio-waste to be exported with increased CO^2 emissions related to transport.

3.11 Hydroelectric Power

County Meath with its many rivers and the possible refurbishment of old watermills is in a position to develop small scale hydroelectric power supplies that do not interfere with wildlife and this should be encouraged through the LEADER funding programme and supported through the provision of small scale suppliers accessing the Grid in the LARES.

However pumped hydroelectric stations are not considered as Renewable Energy under the Directive.

3.12 Other Potential Renewable Energy Sources For Co. Meath

Heat from Waste Water

Using waste heat from sewers to heat homes is a practical system that could be used in towns in County Meath.

An example is the Southeast False Creek Neighborhood Energy Utility of the City of Vancouver, British Columbia. When one washes dishes or takes a shower, the energy that goes into heating water is typically washed down the drain. The Southeast False Creek Neighborhood Energy Utility recycles this waste heat back into the community, which uses waste thermal energy captured from sewage to provide space heating and hot water to buildings in Southeast False Creek.

This recycled energy eliminates more than 60% of the greenhouse gas pollution associated with heating buildings. The utility is self-funded: it provides a return on investment to City taxpayers, while at the same time, provides affordable rates to customers.

The utility began operations in 2010 and since then has rapidly expanded to serve 395,000 m^2 (4,300,000 ft^2) of residential, commercial, and institutional space. Over time, the utility will be expanded to serve new developments in the neighborhood and Great Northern Way campus lands. This may be an example for consideration.

Biofuels

Bioethanol production relies on the cultivation of large amounts of plant material and may not be suitable in large amounts for County Meath as it would usurp land fit for agricultural purpose.

Wave and Tidal Power

As the coastline of County Meath has not been identified as a location in the eleven identified practical tidal current energy sites on the Irish coast, there is probably no need for inclusion of marine energy sources in the LARES at present although this may change if technological developments make such sources practical in the future.

4.0 CONCLUSION

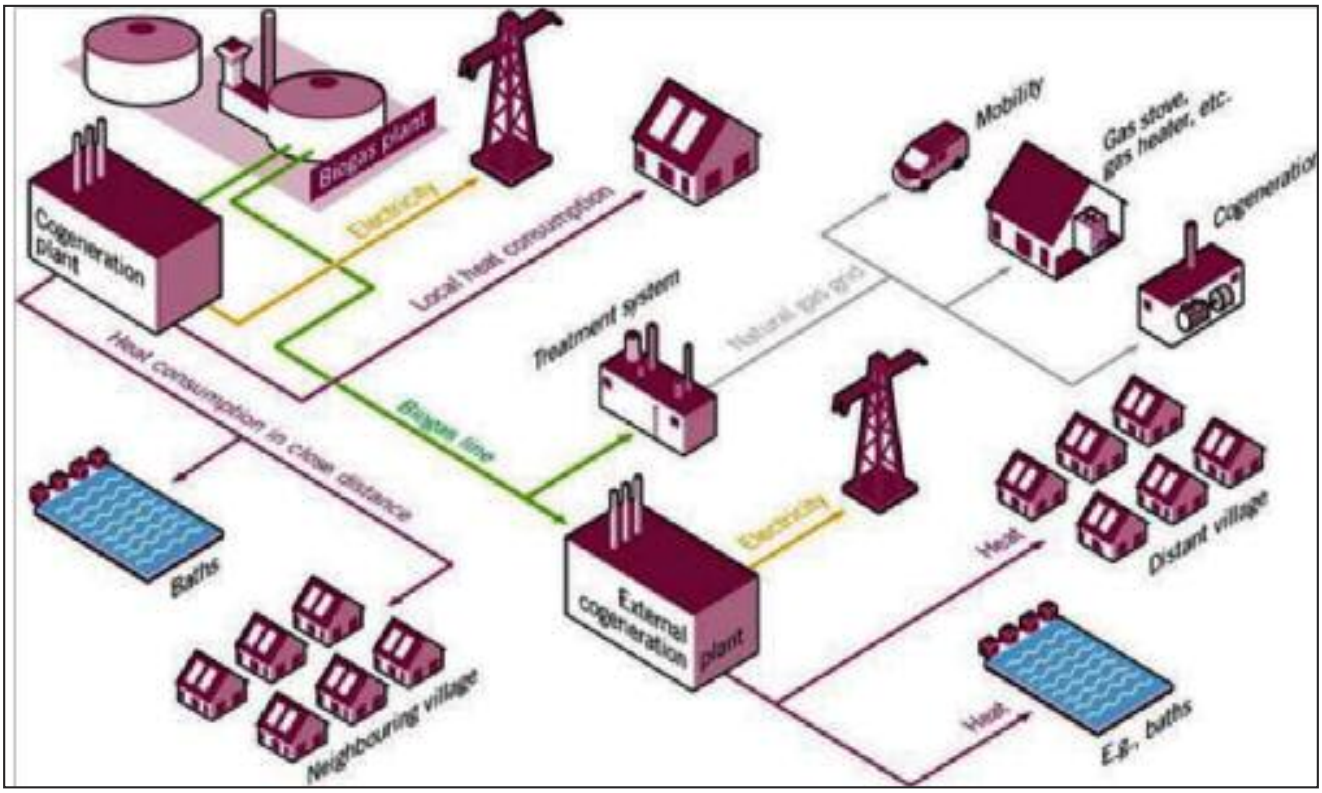
To significantly reduce CO2 emissions and meet Ireland's targets within the EU and the Paris 2016 agreement we need to reduce energy waste from insufficiently insulated buildings and inefficient heating systems, while also switching from fossil fuels to renewables.

With a temperate climate for solar & biomass options, waterways of sufficient capacity for hydro-electricity generation and its location on the natural occurrence of Kentstown granite substrata (geothermal) combined with naturally occurring warm springs, County Meath is in an ideal position to have a balanced portfolio of sustainable energy sources with a low to zero environmental impact.

We would recommend that Meath County Council take a strategic view in providing a LARES (Local Authority Renewable Energy Strategy) for County Meath working, not just towards energy conservation with the Energy Team, but also renewable energy generation at County level including the following:

Recommendations at a county level:

- Encourage energy and heat conservation for businesses and homes.
- To require all planning applications for new buildings to demonstrate how their designs have incorporated energy efficiency or passive measures, as a means of reducing future reliance on traditional fuel sources and to identify how the energy needs of the proposed development can be addressed with indigenous renewable energy resources and technologies, as an important element in establishing a low carbon County and assisting in meeting committed county, regional and national renewable energy targets.
- Planning applications should be assessed to ensure that commercial renewable energy proposals are not masquerading as community energy projects.
- To review the Deep Geothermal Project in Navan, Tara Mines, as a pilot project to see potential as a renewable energy source for Navan town (in 2011 it was estimated by GT Energy that it would only cost eight million euro for Navan town to become self-sufficient in space and water heating and electricity).
- Local geothermal and solar panel energy potential should be actively encouraged, given the potential for shallow geothermal along the fault Drogheda – Mallow, the Boyne and Blackwater rivers and tributaries and the current deficit of solar panel energy homes in Meath.
- To collaborate with EirGrid over the lifetime of the Strategy to ensure that County Meath has the grid infrastructure in place and where possible to have underground transmissions systems, to maximize its potential for renewable energy generation to meet its own energy needs and to enable export to the demand market.
- The grid system used to transmit energy produced by renewable/sustainable sources should promote local community input onto the grid.



- To maximize use in the County, of the available bioenergy resource to exceed national targets for renewable heat of 12% and 10% by 2020.

RECOMMENDATIONS

- Expressions of interest should be invited to develop biogas systems especially for household waste. Waste collection services should be obliged to inform householders that a compost bin will be provided upon request to provide the material necessary.
- To favourably consider the redevelopment of brown field sites in predominantly industrial / commercial areas for large solar PV projects subject to normal planning considerations such as impact on landscape, urban design, biodiversity, ecological impact, aviation, access to grid, security fencing, decommissioning issues and impact on residential amenity.
- The use of wind turbines for energy production, should be encouraged with a maximum height limit of 13 metres for Domestic use as per SI83 of 2007 and 20 metres for Agriculture/Commercial use as per SI235 of 2008 (please see Appendix 4).
- To review the maximization of the Combined Heat & Power (CHP) potential from the Indaver Waste to Energy plant and Lagan Cement and Biogas plant at Beauparc and other smaller heat producing business particularly public buildings such as Navan Hospital should be reviewed with a view to maximization of energy efficiency.
- Biomass burning use should be critically assessed – it is less environmentally preferential than other forms of heat generation. MSW (Municipal Solid Waste) biomass burning at co-fired/incinerator plants should be strictly screened to prevent recyclables or wet-waste being burned.
- To facilitate the development of small scale hydro power developments at suitable locations that do not interfere with wildlife to be identified on a case by case basis.
- To support and facilitate the emergence of a competitive supply chain economy that will sustain and assist in further developing a robust renewable energy sector in County. This would enable local communities to provide economically viable renewable energy solutions with long term sustainability.

Recommendations at national level to achieve local strategy:

- Legislation change is required to enable drilling below 300m to avail of deep geothermal sources of energy.
- Subsidies should be made available for local community geothermal, solar, biomass/gas, hydro and wind based energy sources. These subsidies should not favour one energy source over another.
- It should be mandatory that all electricity providers (including Bord Gáis Energy, Electric Ireland, Energia, Flogas Natural Gas, Panda Power, SSE Eirtricity) have a "Feed-in" tariff that encourage companies and individuals to export surplus energy to the national grid.
- The SEAI is the agency tasked with empowering communities with the aims of the White Paper 2015, whilst encouraging community inclusion, currently other than the Better Energy Communities Scheme, providing grants for energy efficiency predominantly, there are no definitive structures in place to provide communities with the autonomy required to take their own initiative in energy generation at local level, to provide autonomy comprising of micro-grid and a possible future independence from national grid, this requires urgent attention.
- Passive housing should be actively encouraged. Buildings should have insulation to a level which minimizes heat loss, space and water heating by solar panels and or air/water geothermal heat pumps, heat recovery ventilations systems etc.
- Undergrounding of power cables to make lines less susceptible to outages during the high winds, thunderstorms and heavy snow or ice storms we are likely to experience with climate change and to make power lines less visually intrusive.

Appendix 1

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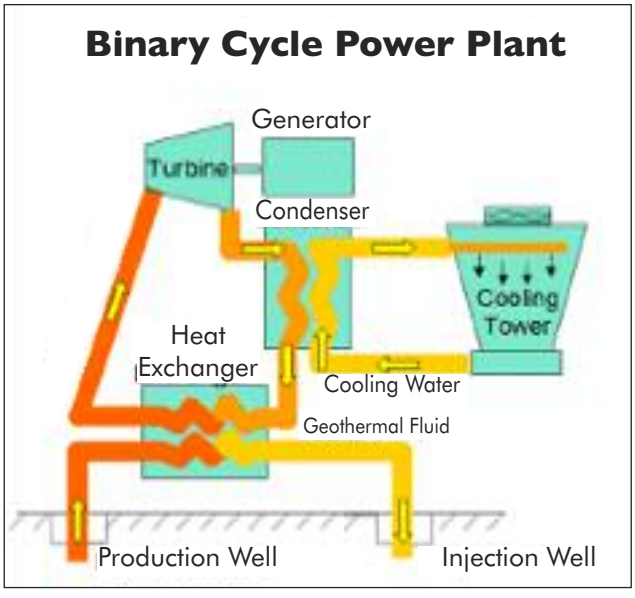

Appendix 2

Glossary of Terms

Anaerobic Digestion: The process whereby bacteria break down organic material in the absence of oxygen yielding a biogas containing methane.

AA: Appropriate Assessment

Bio-fuels: Fuels derived from biomass

Biomass: Biological material derived from living or recently living organisms which can be converted into fuel for electricity, heating or transport.

CFRAMS: Catchment Flood Risk Assessment and Management Studies

Combined Heat and Power (CHP): Combined heat and power is the simultaneous production of heat and electricity

District Heating (DH): District heating is a local heating network facilitated through underground pipes and a centralised heat source.

Electric Vehicle (EV): Battery operated electric vehicles and plug-in hybrid vehicles.

Fossil Fuels: Fuels that arise from organic matter over geological timescales.

Greenhouse Gases (GHG): The gases that are responsible for trapping the solar radiation in the Earth's atmosphere. The most significant impact comes from carbon dioxide and methane.

Grid Capacity: The technical/physical ability of the electricity transmission or distribution network to accommodate new electricity generation or usage.

Installed Capacity: The theoretical instantaneous output of electrical power if all generators are working at full capacity.

LARES: Local Area Renewable Energy Strategy

Large scale wind generation: Electricity generation installations with an installed nameplate rating in excess of 5Mw (source: S.I. No. 284/2008 - Electricity Regulation Act 1999 (Public Service Obligations) (Amendment) Order 2008)

Micro-generator: An installation which is primarily meant to generate electricity for the installation's own use and for which feeding to the national network is only a secondary motive. The maximum output of a micro-generation installation can be defined at approximately 11KW. (This is based on the Finnish standard EN50438).

NREAP: National Renewable Energy Action Plan

Pumped Hydroelectric Energy Storage (PHES): A facility designed to generate electricity during peak periods with a hydroelectric plant utilising water pumped into a storage reservoir during off-peak periods.

Public Service Obligations (PSO) levy: In the context of EU law, a PSO is an arrangement in which a governing body or other authority offers subsidies, thereby permitting the company to operate a specified service for a specified period of time for the given subsidy. The current legislation for the PSO for electricity generation is valid until 2027.

REFIT: Renewable Energy Feed In Tariff, current scheme expires after 2017.

Renewable Energy: Energy from renewable non-fossil sources.

Smart Grid: An evolution of the existing electricity grid with added monitoring, analysis, control and communication capability that maximizes the efficiency of the electricity system.

Total Final Consumption (TFC): The total energy used by the final end user. It excludes energy used in the energy sector such as electricity generation or heat production.

WtE: Waste to Energy

Appendix 3

Consultation Bodies for Meath LARES (Local Authority Renewable Energy Strategy)

The Meath Environmental Network

Member Groups of the Meath PPN

Meath IFA

Angling Groups In Meath

National Bodies:

Irish Environmental Network

Appendix 4

Turbines as Planning Exempted Developments

Domestic Exemption under SI 83 of 2007

The construction, erection or placing within the curtilage of a house of a wind turbine.

1. The turbine shall not be erected on or attached to the house or any building or other structure within its curtilage.
2. The total height of the turbine shall not exceed 13 metres.

3. The rotor diameter shall not exceed 6 metres.

4. The minimum clearance between the lower tip of the rotor and ground level shall not be less than 3 metres.

5. The supporting tower shall be a distance of not less than the total structure height (including the blade of the turbine at the highest point of its arc) plus one metre from any party boundary.

6. Noise levels must not exceed 43db(A) during normal operation, or in excess of 5db(A) above the background noise, whichever is greater, as measured from the nearest neighbouring inhabited dwelling.

7. No more than one turbine shall be erected within the curtilage of a house.

8. No such structure shall be constructed, erected or placed forward of the front wall of a house.

9. All turbine components shall have a matt, non-reflective finish and the blade shall be made of material that does not deflect telecommunication signals.

10. No sign, advertisement or object, not required for the functioning or safety of the turbine shall be attached to or exhibited on the wind turbine.

Agricultural/Commercial exemption under SI 235 of 2008

The construction, erection or placing within the curtilage of an industrial building or light indutrial building, or business premises of a wind turbine.

1. The turbine shall not be erected on or attached to the premises or building or any other structure within the curtilage of the building or premises.

2. The total height of the turbine shall not exceed 20 metres.

3. The rotor diameter shall not exceed 8 metres.

4. The minimum clearance between the lower tip of the rotor and ground level shall not be less than 3 metres.

5. The supporting tower shall be a distance of not less than the total structure height (including the blade of the turbine at the highest point of its arc) plus:

(a) 5 metres from any party boundary, (b) 5 metres from any non-electrical overhead cables,

(c) 20 metres from any 38kV electricity distribution line,

(d) 30 metres from the centreline of any electricity transmission line of 110kV or more.

6. The turbine shall not be located within 5 kilometres of the nearest airport or aerodrome, or any communication, navigation and surveillance facilities designated by the Irish Aviation Authority, save with the consent in writing of the Authority and compliance with any condition relating to the provision of aviation obstacle warning lighting.

7. Noise levels must not exceed 43db(A) during normal operation, as measured from the nearest party boundary.

8. Not more than one turbine shall be erected within the curtilage of the premises or building.

9. All turbine components shall have a matt, non-reflective finish and the blade shall be made of material that does not deflect telecommunication signals.

No sign, advertisement or object, not required for the functioning or safety of the turbine shall be attached to or exhibited on the wind turbine.

The turbine shall not be located within an Architectural Conservation Area.

Summary of all exemptions for small scale renewables:

http://www.seai.ie/Renewables/Microgeneration/Conditional_Planning_Exemptions/

<http://www.seai.ie/Renewables/Microgeneration/Conditional_Planning_Exemptions/>

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