

7 The Wind Farm Development Process

This section guides community groups through each of the stages involved in establishing a wind farm project, from initial site selection right through to the commissioning of the wind farm.

7.1 The Stages in the Wind Farm Development Process

The stages in the development of a wind farm are as follows:

Stage 0:	Formation of Community Group
Stage 1:	Site Selection
Stage 2:	Obtaining Planning Consent
Stage 3:	Getting a Contract from an Electricity Distributor for the Purchase of the Power
Stage 4:	Arranging Finance
Stage 5:	Construction
Stage 6:	Commissioning

For a summary of this process see the following files contained on the accompanying CD Rom

File 18: Operational Plan for a Community-owned Wind Farm

File 19: Wind Farm Project Cycle with Stages for Community Involvement Identified

File 20: Diagrammatical Description of Operational Plan for the Development of a Community-owned Wind Farm

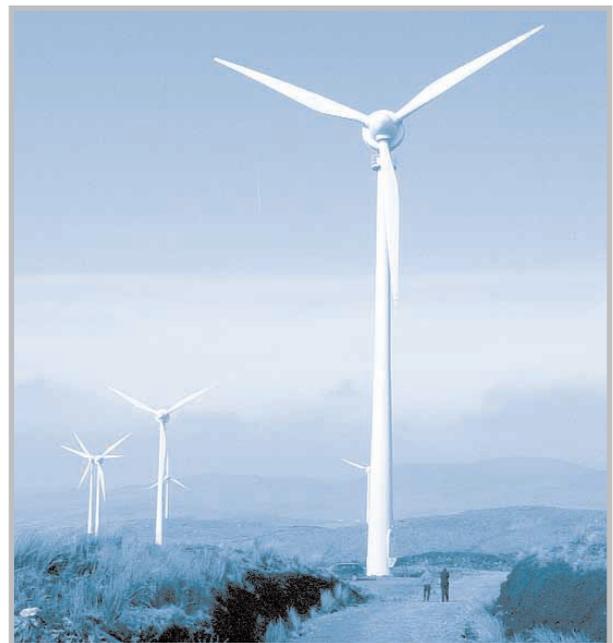
File 21: Operational Schedule for the Development of a Community-owned Wind Farm

We have already discussed Stage 0, namely the setting up of a Community Group. Stages 1-6 will be explored in detail in this section. Firstly, even if a local group only intends to buy into a commercial development, its members might wish to do so before the turbines are actually up and running, as that would enable them to be in a position to get the best possible terms in exchange for shouldering some of the extra risk. In such a situation, they would need to know what was involved in taking the project on from the point at which they make their investment.

Secondly, if improvements are made to the policy environment in Ireland, as discussed in Part I, a community wind investors' group may decide to investigate the possibility of developing a wind farm itself rather than buying into a commercial development. Such a course would require it to spend an appreciable amount of money with no guaranteed return – making a full appreciation of the complexities and risks involved in developing a wind farm project essential.

Angela Duignan of Energy4All writes:

"In the short to medium term Energy4All is promoting part community ownership of developer sites as the most practical method for sharing renewable project benefits. However, schemes independent of outside developers are possible and, especially for small projects, preferable. Community-led schemes bring projects to areas that developers would not consider due to scale, profitability or complexities but such projects are prone to take a long time to develop. Considerable effort is required to match local commitment with resources and renewable expertise but the key limiting factor at the moment is risk capital as it takes stg£100,000 to take a scheme up to the planning application stage and sometimes significantly more."



7 The Wind Farm Development Process

STAGE ONE: SITE SELECTION

The main factor which determines whether a wind farm is going to be profitable is obviously the wind. The higher the average speed over the year the better, particularly as the power a turbine can extract depends on the cube of the windspeed. This means that a site with an average speed of 7 metres per second can produce 59 per cent more power than one with 6 metres per second.

Sustainable Energy Ireland's Wind Atlas of Ireland is available on CD Rom format from the Renewable Energy Information Office. Using this format it is possible to home in on the areas of particular interest and the Atlas can be used to get a good preliminary indication of the wind speeds in the area.

As a rule of thumb, any upland area with a view is likely to have a good enough wind resource for a wind farm but this is likely to make the location sensitive from a tourism perspective. Consequently windspeed maps need to be compared with the **County Development Plan** (available from local county council offices) or, in the case of counties Cork and Kerry, with the zones that the county planners have established wind farms are likely to be permitted. In early 2004, Mayo, Clare, Galway and Sligo were well advanced with their zoning process but some other counties are not at this stage yet.

Once the location of the windiest acceptable areas have been established – and a conversation with a senior planner would be useful to confirm them – the next step should be to contact the grid operator or suitably qualified and experienced electrical engineering consultancy to identify areas where connections might be possible. This would involve a connection to the distribution side of the grid for wind farms under 10MW and to the transmission side of the grid for bigger wind farms.

After the grid operator's information has narrowed down the best area for the wind farm, the next step is to drive through the area looking for suitable sites and talking to landowners there. It is a good idea to locate three or four possibilities and then commission a consultant to visit them all to select the most promising one. After that, carry out the following three checks on the site selected by the consultant:

1. Examine the County Development Plan to see if the site has any archaeological remains or is within a Natural Heritage Area (NHA), Special Area of Conservation (SAC) or Special Protected Area (SPA). The Heritage Service (previously Dúchas) within the Department of Environment, Heritage and Local Government should be consulted to see if there are

any plans to designate NHA, SAC or SPA status in the area of the proposed site (www.duchas.ie)

Even if the enquiries show that there are unlikely to be any archaeological remains, get an archaeologist to walk the ground to ensure that there are no obvious relics that would make a wind farm undesirable. A check with a naturalist who knows the area would be a good idea too. Both professionals may be required to contribute to an Environmental Impact Assessment later on so the visits now are a good way of establishing a relationship. Having said that, do not overlook local knowledge. If there is a local archaeological or naturalist group it would make sense to involve them. A project about community ownership should not be afraid to engage with the community at all levels.

2. The visual and environmental impact of wind farms can often be mitigated by small changes in design. Go back to the county planners and confirm that they are happy about the site selected. Arrange a site meeting if possible. Issues that could be discussed include the sensitivity of the landscape around the site; the scale of the proposed farm; any cumulative effects due to other wind farms in the area; the impact on views and designated scenic landscapes as well as any local visual aspects; impacts on nature conservation, archaeology, and historical structures; local environmental impacts including noise and shadow flicker; potential impacts on fauna and flora, the visual and environmental impacts of associated access roads, plant and grid connections. **File 22: Guide to the Planning Process**



3. Double-check with the grid operator. Connection to the distribution grid is becoming increasingly difficult due to both competition and grid capacity constraints and potentially presents a major constraint to the project. The grid operator published a guide, *Guide to the Process for Connection to the Distribution System* (ESB, January 2002), which sets out the steps and requirements necessary to obtain a generation connection to the Distribution System (contact info@eirgrid.ie for a copy). Consider using the grid operator's fee-based Pre-Feasibility Study service designed to explore connection opportunities for specific sites and to estimate connection costs, which can be as high as 15 per cent of the capital cost of a wind farm. (The actual cost is very dependent on the site's location and whether a substation is necessary.) The grid operator service will cost around €750. A possible alternative to a grid connection is to supply electricity directly to a local industry or manufacturing plant, as done by the Burtonport Co-operative.

7 The Wind Farm Development Process

If the site passes these tests, the next steps are:

1. Secure a legally-binding option to erect wind turbines on the site from the landowner or owners

This will probably involve payment unless the owner(s) can be persuaded to take shares instead. The proposed Renewable Energy Advisory Group could supply specimen agreements and advise on terms. A local solicitor should be engaged to examine the legal ownership of the site and its access route and any third party issues such as grazing or turbarry rights. If the land is commonage, the written consent of all owners will be required, which may be hard to get. The cost of the lease is generally based on 2.5 per cent of gross annual turnover or approximately €3,500 for every 1MW wind turbine (2003 figures). There should be clear and transparent locational data regarding the turbines and their visual impacts before people living in the area consent. Otherwise it may lead to individuals pulling out at a later stage when they realise the impacts.

2. Erect a mast tall enough to mount an anemometer

This is used to measure, over a minimum period of one year, the wind resource at the intended hub height of the wind turbines selected for the wind farm. This should be as close to hub height as possible and readings should be taken from two heights on the mast for verification. (Preliminary readings at a minimum height of 10m are often taken first for a period of a few months to check if the site is as promising as thought before going to the expense of erecting the taller mast.) These wind speed readings are correlated against those from the nearest Met Éireann weather station with readings stretching back for at least 30 years. This enables a rough prediction of the annual energy production in kilowatt-hour per year (kWh/yr) for the site to be made.

Anemometers and masts can be rented from several companies in Ireland. The correlation and prediction analysis can either be carried out by consultants or by the turbine manufacturers if you have already decided on the equipment likely to be used. It is worth comparing the costs of getting the turbine manufacturer to carry out the measurements with contracting an independent expert to measure the wind resource. Also compare the cost of buying the equipment outright or leasing it and then supplying the data to a consultant to be interpreted. It is important to emphasise the importance of accurate measuring. The entire project finance relies very heavily on wind speed readings.

Community groups should be aware that steps can be taken to minimise the cost of this process. For example, due to the number of anemometers that are already in existence it is possible to get a reasonable estimate of windspeeds in many locations. It may be possible for an expert to make such an estimation for €500 to €600.

If a group decides to erect a test tower itself, this will cost €3,000 - €8,000 depending on its height, plus €3,000 for the instruments. For test towers above 30 metres it would be inadvisable for the community to carry out the work themselves. The community should purchase a new calibrated anemometer and new windvanes, however the rest could be second-hand. Data loggers are very reliable and as the larger developers are increasingly using expensive gsm-enabled models, guide models are available at good prices. These are quite adequate for community groups as members can read the loggers regularly at no cost, something not always possible for developers often working hundreds of miles away.

3. Define scope of Environmental Impact Assessment

If an Environmental Impact Assessment (EIA) is required to accompany the planning application, ask an environmental consultant to visit the site to define its scope. (Not all counties require an EIA for projects below 5MW – in those cases, an environmental report which can be drawn up by a planning consultant is all that will be required).

One of the main parts of an EIA is the Environmental Impact Statement (EIS) document, which is why you often see “EIA/EIS” written as one. The scoping of the EIA is important because its cost depends on the complexity and sensitivity of the site. For example, if a bird survey is required it could add another €10,000 if done professionally. A planning application with surveys and drawings and an EIA for an average site should cost around €50,000 but allow an extra €5,000 for survey work if the terrain is complex or the slopes are steep. The cost of the EIA component in that figure is €40,000 but the price could run to almost double that for upland bog sites or if a hydrological study is required.

During the visit, the consultant will get a feel for the farm’s likely effect on flora, fauna and birds, humans and the view. He or she will also look for possible impacts on water supply, turf cutting and walking routes and summarise the likely overall positive and negative environmental impacts of the wind farm. They can then estimate the cost of the EIA needed. If any wildlife surveys are going to be required, members of the community group with appropriate

7 The Wind Farm Development Process

skills might be able to carry them out over the course of the year while the wind tests are being completed. This would save the group the costs of the work. Guidelines on the information to be contained in Environmental Impact Assessments have been issued by the Environmental Protection Agency (contact: www.epa.ie). *File 23: Process from EIA to EIS*



STAGE 2: GOING FOR PLANNING CONSENT

After a year, when all the wind data is in, the turbine manufacturer or consultant will determine the likely energy yield from the site and work out how the turbines should be set out to exploit its potential most effectively. The energy yield is calculated by multiplying the theoretical power of the wind by an efficiency factor determined by the performance of the wind turbine type selected and the location of each turbine in relation to the others. Overly close spacing of turbines can greatly reduce production and shorten the life of the turbines by causing turbulence. For each possible layout, a picture of what the wind farm will look like against the backdrop of the actual landscape will be created to accompany the planning application. The resulting wind resource report is important for funding applications and loan requests.

The cost of the turbines can be calculated from the preliminary wind farm configuration and layout. To this are added the costs of the Environmental Impact Assessment (EIA), the site construction work, legal and financing charges and the cost of the grid connection to arrive at the total project cost. This figure plus details of the proposed financing arrangements, the likely price that will be obtained for the electricity and the cost of leasing the site can be inserted into the Financial Model on the CD Rom accompanying this guide (*File 2: The Financial Model for a Sample Wind Farm*) to produce a cash flow forecast and an estimated rate of return on the community's investment. This will indicate whether it is worth proceeding with the project or not.



If the financial report is favourable, and an EIA is required, ask the environmental consultant who visited the site earlier to go ahead as the job may take several weeks to complete as it can involve several experts doing baseline surveys of the topography, human habitation, flora and fauna, soils and geology, hydrology, air quality, landscape quality, material assets, cultural heritage and traffic. The energy consultants' report will already have addressed noise and shadow flicker and these will be added to the EIA, which will contain a description of the

development and its likely effects under a number of sub-headings such as potential impacts, remedial measures, predicted impact, monitoring and site reinstatement. The cost of the full report may be in excess of €50,000 as discussed in the last section.

Once that is complete, the planning application can go ahead. At the pre-planning meetings, the planning officer will have clarified the documents required with the application and the amount of detail needed. It is advisable to use an engineer to help with the application form. Planning permission can take from six months to a year to obtain, particularly if further information is requested by the planning authority. Following the granting or refusal of planning permission, an appeal may be submitted to An Bord Pleanála, either by third party objectors or by the promoters. Adjudication by the Bord can be a long, drawn-out process. The Government is currently investigating alternative mechanisms to expedite the planning process for major infrastructural projects deemed to be of benefit to the state, this may extend to some wind energy projects.

Obtaining planning permission for a wind farm can cost €100,000 - €150,000 including the EIA. Schedule 9 of the Planning and Development Regulations 2001 gives full details of fees for planning applications and is available from county council offices. *File 18: Operational Plan for a Community-owned Wind Farm* and *File 19: Wind Farm Project Cycle with Stages for Community Involvement Identified*



STAGE 3: GETTING A CONTRACT TO SUPPLY ELECTRICITY

If planning consent is granted there is still only a 50-50 chance that a wind farm will actually be built. This is due to the very high uncertainty relating to grid connection and Power Purchase Agreements in Ireland at present.

In countries with a feed-in law, there is no uncertainty about this stage as wind farm developers know that electricity distributors are legally obliged to accept their power and to pay them a guaranteed price. As a result, the promoters can use their estimates of the construction costs and the measurements they have taken of the wind resource on their sites to calculate almost exactly what the financial return from their project will be. This allows them to raise any further equity capital they require (in the case of a community project, by inviting extra people to come in) and then, if the project is to be geared,⁴⁶ to borrow the balance of the capital they need from a financial institution.

⁴⁶ Gearing is the term used when developers increase both the riskiness and the profit potential of their projects by augmenting their own capital with borrowed funds.

7 The Wind Farm Development Process

This is not yet possible in Ireland. A community group would need both a grid connection agreement with the grid operator and a Power Purchase Agreement from either an electricity distributor or from an organisation prepared to purchase the power for its own use, before it could confidently work out the financial return. It should therefore delay inviting more people to participate until both agreements have been secured.

As discussed in Part I, a replacement for the AER system is currently being considered by the Renewable Energy Development Group. Therefore the future context in which electricity supply contracts will be issued is currently uncertain.

The ESB's publication, *Guide to the Process for Connection to the Distribution System* (ESB, January 2002) sets out the steps and requirements currently necessary to obtain a generation connection to the distribution side of the national grid, the part most likely to be used by community wind farms. Connection charges depend on the specific technical details of the proposed facility. Once the application is acknowledged it will take at least 90 working days before a conditional grid connection offer is made to the community company. The community company must accept this connection offer within 60 working days or the connection offer expires. The grid operator then issues a **Formal Acceptance Notice**. This is a "bankable" document essential for any application for loans or investment funds.

Almost certainly, future Power Purchase Agreements are going to become more complex than they have been under the AER arrangements. Even if a European-style feed-in law with a fixed, guaranteed price is enacted in Ireland, issues like the ownership of the green credits that the wind farm will generate will have to be considered. (Green credits are a way of ensuring that all electricity distributors either sell, or pay the extra cost of, a minimum amount of green electricity.) Developers will also have to consider whether they should accept a price indexed to the general cost of living or if that would be a mistake since energy prices are likely to rise more rapidly than other costs. Most community projects will need specialist help in this area.

By law, wind farm developers must also obtain from the Commission for Energy Regulation (CER) an **Authorisation to Construct** under Section 16 of the Electricity Regulation Act, 1999. CER has the power to grant or refuse to grant a **Licence to Generate Electricity** under Section 14 (1) of the 1999 Act. CER can also issue a **Licence to Supply Electricity**. In January 2003, CER signalled its intention to modify the procedure for assessing small-scale (less than 5MW) licence applications in order to minimise the regulatory burden on smaller market participants. It proposes to

follow a simple financial assessment procedure and to carry out technical assessment in-house to reduce costs. Current fees for a wind farm of less than 5MW capacity are €35 each for an Authorisation to Construct and a Licence to Generate.

STAGE 4: ARRANGING FINANCE

Once a community wind farm's core group has obtained a contract with a customer to purchase its power and can be sure that it can get that power to the purchaser, it should develop a Business Plan as this will be required by potential investors, loan providers and investment institutions. A Business Plan is a detailed financial forecast that summarises the profit plan, cash forecast and balance sheet. It sets out:

- the management team and the wind farm product and services;
- the technology to be used and details of quality control and assurance;
- the intended electricity market size and potential for growth. A competitor analysis will also be included;
- details of all funding sources and whether or not funding has been secured;
- the socio-economic benefits of the project.

The **Profit Plan** represents a careful assessment of the profit the community group reasonably believes it can achieve in the wind farm project, setting natural caution against natural optimism. It is not an optimistic target, nor the minimum achievable if things go wrong. It must be a realistic assessment based on careful study.

The Profit Plan will show annual revenues generated from electricity sales against direct costs, overheads and capital expenditure to give a net profit or loss for each year. The Profit Plan will show if the project is profitable and at what stage the profit will be generated.

The **Monthly Cash Forecast** flows naturally from the assumptions made in the Profit Plan. For each item of income and expenditure itemised in the Profit Plan, a judgement is made as to which month the income will actually come into the bank account and in which month payment will have to be made. Having totalled revenue and costs for each month one ends up with either net cash in or net cash out for each month. The cash forecast tells the community group how much money they need and when they need it.

File 2: The Financial Model for a Sample Wind Farm

The **Balance Sheet** shows whether the business is strong or weak and how much capital is employed. It will show whether financial requirements are short or long-term. Balance sheets are prepared monthly by trading companies. A Monthly Balance Sheet Forecast is prepared for the wind farm project based on the cash forecast. Your accountant and bank manager will discuss



7 The Wind Farm Development Process

the implications of the completed balance sheet with respect to looking for finance for the project.

As a rule of thumb, a Business Plan will cost in the region of €3,000 - €3,500 to prepare, depending on its scope. It may range upwards from this to €5,000 if the community was to have 100 per cent ownership, which would require a more complex study. LEADER companies or a County Enterprise Board may grant-aid the preparation of the Business Plan. If the community group is seeking a stake in a commercial developer's wind farm, both the developer and the community company will require separate Business Plans.

Raising Loan Finance

If the wind farm project is sound and the community group can demonstrate that it knows what it is doing it will almost certainly be able to raise 80 per cent of the capital it requires as a bank loan – assuming it wants to take that higher-risk route. The bank will require:

1. Copy of planning permission and project plans.
2. Grid connection agreement.
3. Details of equity funding.
4. Profile of the management team and its advisers.
5. Wind resource report from reputable firm of experts.
6. Construction contracts with a credible contractor with firm costs.
7. Copy of the Power Purchase Agreement.
8. Project cash flows; construction cash flow schedule including VAT and letters of credit.
9. Copy of the operation and maintenance contract with warranty terms, costs and conditions; the CER permissions, Authorisation to Construct and Licence to Generate.
10. Land rights, leasehold/ freehold and any way-leaves.

Wind Farm financing of around 80 per cent of the project cost is the most common approach in Ireland today as debt is the cheapest form of funding for wind projects in the current low interest rate environment. The bank's only security is the project and its assets. Avoid providing a bank guarantee that includes a charge on the personal assets of anyone in the group. **File 24: Model Documentation Required by those Providing the Loan** 

The Western Investment Fund managed by the Western Development Commission has within its remit the scope to invest in community based wind farms.⁴⁷

⁴⁷ For further information on the WIF visit www.wdc.ie. Two main criteria for investment apply: the commercial viability of the project and its ability to provide the WIF with an appropriate financial return for the risk undertaken and the social benefits accruing to the areas served by the project as a result of the investment, including employment potential and quality of life. The WIF does not give grant aid.

STAGE 5: ENTERING INTO CONSTRUCTION CONTRACTS

Once finance has been secured, the community company will need to enter into a wide range of legal contracts with technical advisers, county councils, land owners, electrical contractors, the distribution network operator, the Commission for Energy Regulation, construction firms, wind turbine manufacturers and suppliers, lending institutions, operation and maintenance contractors, insurance firms and others. (**File 25: Understanding the Contracts Matrix**)  Expert advice will be crucial to ensure that the contracts are watertight, the allocation of risk is clear and that all the contracts are compatible. This advice would be available if a body such as the Renewable Energy Advisory Group, as proposed by the REP, is set up.

The terms of engagement of the consultant experts should have a clear scope of work and agreed fees. Both the banks and investors will look closely at the contracts and lenders may want some of them assigned to them as part security for their loans.

The organisation and administration of the construction process can be simplified if a turnkey contractor is appointed to carry out all the work associated with the construction and commissioning of the wind farm for a fixed fee. The fee is often high but the contractor carries most of the financial risks and undertakes to deliver a commissioned wind farm for a fixed price by a certain date. Lending institutions prefer turnkey development contracts but the premium price can render small projects uneconomic. A turnkey contract covers the scope of work, duration, guarantees, rights to sub contract, variations, performance standards, default/step-in, termination, force majeure, reports and records, insurance, indemnities and many other issues. The contract should contain robust warranties and penalty clauses to take account of possible delays in construction. The contract will have milestones with interim certificates and payments linked to interim deliverables.

STAGE 6: COMMISSIONING

The turnkey contractor will be responsible for commissioning the wind farm and will only receive the last part of the contract payment after the wind farm has supplied power and operated satisfactorily for whatever period was stipulated in the contract.

A summary of the above stages is provided in **File 18: Operational Plan for a Community-owned Wind Farm** 