Renewable Energy In Ireland : Law, Policy and Practice

Renewable Energy In Ireland:
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DECLARATION

This thesis has not been submitted to any other University or institution as part of another academic course.

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Introduction

The energy demands of modern society have increased exponentially since the onset of the industrial revolution. The very basics of everyday life such as heat, transport and food preparation alone consume vast amounts of energy in one form or another. In the industrial sector there are ever increasing demands placed on energy resources, which up until recent years were almost solely derived from fossil fuels. The rate of consumption of such fuels by the developed world has been exacerbated by the surge in the global economy which was experienced in the last ten to fifteen years.

This high rate of consumption of fossil fuels continued unabated despite growing calls by environmental groups for alternatives to be sought. It is surprising that man should have relied so heavily on resources of which there are only limited amounts available for exploitation throughout the planet. Even this threat of eventual expiration of fossil fuel resources was not enough of itself to force governments worldwide to rethink their energy policies and strategies. The final catalyst to action, albeit a very slow initial reaction, came in the form of a growing awareness of subtle changes in the climate of the earth. These changes were potentially brought about by natural elements but are definitely accelerated by the increase in concentrations of various damaging gases, termed greenhouse gasses, present in the earth's atmosphere largely as a result of industrialisation. Therefore, it was necessary for alternative methods of energy production to fossil fuel combustion to be found and, as a result, the science of renewable energy production was born.

The purpose of this study is to investigate the current status of renewable energy development in Ireland today through examination of the various influencing factors. The merits of renewable energy as a form of electricity production, among other potential uses, are not called into question. It is the opinion of the author that the importance of renewable sources of energy in the global battle against climate change is generally recognised. Therefore, in compiling this study, the author has taken for granted that the development of renewable energy technologies is highly desirable and a wider discussion on the possible energy alternatives, such as nuclear power for example, is not entered into.

The investigation is centred around the impact of national and supranational organisations on the local level of implementation of renewable energy projects in

Ireland. In order to ascertain more fully the Irish situation in relation to renewables an analysis of both International and European obligations is required. The majority of such obligations are found in the form of political objectives with very little actual substantive law presently in existence. The examination of such policies is nevertheless enlightening as policy documents are very often the forerunner of legislative actions. This fact is demonstrated throughout the present study on both European and National levels as both legislatures are on the cusp of implementing groundbreaking legislation. The initiatives and programmes employed by the EU and consecutive Irish Governments, within which there is a certain understandable degree of overlap, in order to implement their political, and to a lesser extent, legal objectives are outlined. All relevant measures adopted nationally and at EU level are examined in order to gain a fuller perspective of the multitude of influences which are being exerted on the local agenda, whether directly or indirectly.

Each of the potential renewable energy alternatives is also examined in order to achieve a deeper understanding of the possible strengths and weaknesses they possess inherently. In doing so the individual factors influencing implementation rates relating to each form of technology become apparent. The final chapter of the study highlights some particularly troublesome elements in the practical implementation of renewable energy production policy.

Chapter One

INTERNATIONAL OBLIGATIONS

The Irish Government's policy and legal obligations in the area of renewable sources of energy stem from both International Conventions and membership of the European Union. In fact many of the European requirements arise by virtue of the Union itself signing up to international commitments. However for the sake of ease of discussion each will be outlined separately.

The United Nations Environment Programme (UNEP) has been largely responsible for the emergence of a global policy on the environment in the last twenty years. The most significant early development came in the form of the United Nations Conference on Environment and Development which was held in Rio de Janeiro, Brazil, from June 1992. Environmental issues such as worldwide sustainable development were addressed by the delegates from over 150 governments including developed and developing countries. The majority of the negotiation process had already been carried out by the Intergovernmental Negotiating Committee which had previously been set up by the United Nations General Assembly [1] and without much delay the United Nations Framework Convention on Climate Change was adopted (Ireland being one of the signatories). The Convention took the form largely of statements of objectives and principles rather than setting specific targets for the individual signatories. The ultimate objective of the Convention, as outlined in Article 2 "is to achieve… the stabilisation of greenhouse gas concentration in the atmosphere at a level which would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change… and to enable economic development to proceed in a sustainable manner." [2] More particularly, Article 4 required all states to develop national inventories of 'anthropogenic emmissions by sources and removals by sinks' and formulate programmes to start to tackle the problem including measures to mitigate climate change. [3] Annex 1 contained

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[1] General Assembly Resolution 45/212 (1990)
[2] Information Unit on Climate Change; *United Nations Framework Convention on Climate Change* UNEP; Geneva;1993.
[3] French, Duncan, *1997 Kyoto Protocol to the 1992 UN Framework Convention on Climate Change* Journal of Environmental Law, Vol. 10, No. 2,1998.

supplemental obligations for developed countries namely that they were to aim to return to their 1990 level of emissions by the year 2000. It is important to note that these statements were more aspirational in nature rather than legally binding on the parties to the Convention. Article 7 of the Convention was also significant in that it allowed for The Conference of the Parties to be set up, having responsibility to "[k]eep under review the implementation of the convention and any related legal instruments…and [to] make, within its mandate, the decisions necessary to promote the implementation of the convention". More specifically Article 7 required that the Conference of the Parties should review the obligations contained in the convention with a view to determining whether they continue to be adequate in the light of developing scientific knowledge. [4]

Another positive outcome of the Conference, and more directly related to the topic of renewable energy sources, was the inception of Agenda 21 being the United Nations Action Plan to achieve sustainable development. This plan required the development of "new policies or programs, as appropriate, to increase the contribution of environmentally safe and sound and cost effective energy systems, particularly new and renewable ones, through less polluting and more efficient energy production, transmission, distribution and use." Particular emphasis is placed on the chain of command right down from International to local level with the suggestion that Local Authorities devise their own Local Agenda 21, citing as justification that "because so many of the problems and solutions being addressed by Agenda 21 have their roots in local activities, the participation and cooperation of local authorities will be a determining factor in fulfilling its objectives."

The third session of The Conference of the Parties, mentioned earlier, took place in Kyoto, Japan, in December 1997 where the new Protocol [5] to the 1992 Framework Convention on Climate Change was initialled. The Protocol, in contrast to the Convention, contained specific obligations to reduce greenhouse gases, which for the purposes of the Protocol were listed as carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Under the terms of the Protocol, which are binding on all the parties, developed countries are to reduce

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[4] Johnston, Stanley. P., *The Earth Summit*, (Introduction), 1993.
[5] FCCC/CP/1997/l 7/Add 1.

their emissions of the above offending greenhouse gases by 5.2%. Article 3(1) being the core obligation states that "[t]he Parties included in Annex 1 shall, ensure that their aggregate anthropogenic carbon dioxide emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this Article, with a view to reducing their overall emissions of such gases by at least 5% below 1990 levels in the commitment period 2008 to 2012." The global requirement of a 5.2% reduction translates to a European Union target of an 8% reduction. In turn Irelands individual obligation is set through the European mechanism of achieving the overall reduction by allowing the less developed countries within the Union to actually increase their emissions while simultaneously requiring the more industrialised nations to effect a reduction. Accordingly Irelands target was set at a 13% increase over 1990 levels which had already been exceeded by 2% as far back as 1998.

The global significance of The Kyoto Protocol was greatly reduced this year by the US Bush administration's refusal to ratify resulting ultimately in the USA pulling out of the agreement. The apparent justification for this move was that national economic interests would be better served outside the agreement. This action is all the more ironic when one notes that the United States with only 4% of the world's population is responsible for 25% of global greenhouse emissions. [6] However, despite this setback, the EU, Japan and all the other significant signatories appear to remain committed to the ratification of the Protocol which in the case of the EU is to be completed in 2002. It is, therefore, clear that the Irish national target level as outlined above remains in place.

[6] IEC_REIO Newsletter, Energy Update, *EU to press ahead with Kyoto*, Summer 2001.

EUROPEAN UNION POLICY AND LAW

The Commission's Green Paper, *Energy for the future: Renewable Sources of Energy* of 11 November 1996[7] is the most comprehensive statement on renewable energy by a Community institution to date. It contains the following summary ;

"The European Union's current energy situation calls for effective management of all available resources in order to attain Community objectives. A well balanced fuel mix, in which all appropriate energy resources play their proper role, is essential to support economic growth. Renewable sources of energy are currently unevenly and insufficiently exploited in the European Union. Although the potential is significant, renewable sources of energy make a disappointingly small contribution of less than 6% to the Union's gross inland energy consumption. European Union energy consumption is predicted to grow steadily in the future. Even a significant increase in the use of renewable energy resources, as pleaded for in this Green Paper, will not be enough to satisfy the expected demand. If, therefore, the Community does not succeed in attaining a significant higher share of renewable energy in its energy balance, it will become increasingly difficult to comply with the international commitments concerning environmental protection. Secondly, failure to increase the share of renewable energy resources will have negative effects on other important policy objectives, in particular security of supply, economic and social cohesion and – at least in the medium to long term – economic competitiveness.

The present Green Paper constitutes the first phase of a two-step approach to develop a strategy aimed at ensuring a greater use of renewable resources of energy. The establishment of a Strategy for Renewable Energy Resources was foreseen in the Commission's White Paper "An Energy Policy for the European Union" and specifically included in the indicative work programme attached to that document. The present Green Paper describes the current situation, the advantages of an increased use of renewables vis-à-vis Community objectives, and sets out the basic elements of a policy strategy to be implemented at both Community and Member State levels. The Green Paper reinforces the strategic aim of promoting renewable energy sources as an integral part of energy policy and a number of other policies and

[7] Commissions Green Paper, *Energy for the Future: Renewable sources of Energy*, COM (96), 11 November 1996.

sets the objective of doubling the contribution made by renewable energy sources to the European Union's energy balance by 2010.

The level of exploitation of renewable energy sources varies significantly between the Member States. These variations are due to different geographical and climatic conditions in the Community as well as differences in the policies which have been put in place in support of renewable sources of energy. Technological development in the field of renewables has, in recent years, been significant and many of the technologies either are, or are becoming, economically viable, in particular in certain regions of the Community and compared to the economies of other decentralised energy applications. Nevertheless, due to market failures and other obstacles, renewable energy technologies still have difficulties in "taking off" in marketing terms.

Renewable sources of energy should be actively promoted for a number of reasons. Development of renewables goes hand in hand with the objective of protecting the environment and reducing CO2 emissions from the energy sector. Renewable energy sources are indigenous sources of energy and can therefore contribute to reducing dependency [on] energy imports. Development of renewable energy sources can actively contribute to employment creation, and deployment of renewables is an important aspect of regional development with the objective of achieving greater social and economic cohesion between the regions of the Community. Moreover the expected growth in energy consumption in many third countries, in particular Asia and Africa, and which to a large extent can be satisfied using renewable energy, offers hugely interesting business opportunities for EU based industries which in many areas are world leaders as regards renewable energy technologies. Finally, the general public favours the development of renewables more [than] any other sources of energy mostly for environmental reasons.

Under the prevailing economic conditions, a serious obstacle for a greater use of certain renewables, has been the cost associated with their exploitation. Although the cost curve for most renewables is dropping rapidly, the use of renewables is in many cases hampered by higher capital cost[s] than those related to conventional fuel cycles. This is particularly the case due to the fact that fuel and energy prices do not

reflect the full cost, including the external cost implied for the society for the environmental damage caused by the use of conventional and fossil fuels. Secondly, a significant obstacle is that renewable energy technologies, as is the case for many other innovative technologies, suffer from lack of confidence from investors, governments and users, low levels of knowledge about their technical and economic potential and a general resistance to change and new ideas.

To counteract these obstacles, it is, in this Green Paper, proposed to implement a policy strategy consisting of four distinct elements.

Firstly a clear ambitious, and yet realistic, increase in the contributions of renewables to the Community energy balance should be aimed for at Community level. If we were to double the contribution by 2010 compared to the current level, this would mean achieving a contribution by renewables to the gross inland energy consumption close to 12%. An ambitious objective provides the necessary means for focusing the minds of decision makers at all levels and enables a continuous monitoring of progress with a view to rectifying or adjusting policies.

Secondly, it is proposed to strengthen Member State cooperation on renewables. To achieve the target, strong policies will have to be implemented at national level and it is necessary to have a mechanism for coordinating efforts at Community level. The Commission's recent proposal for energy policy cooperation around agreed policy objectives, one of which is effective promotion of renewables, is an important instrument in this respect.

Thirdly it is suggested that the Community reinforces its policies affecting development of renewable sources of energy. The provisions of The Treaties and the internal market requirements offer substantial opportunities for the promotion of renewable energy sources. Moreover, given the fact that cost currently constitutes the largest barrier to a more widespread use of renewables the policy instruments must address in particular this problem. Internalisation of external cost is a key concept in this respect, to which the Commission remains committed. Accompanying measures, including continued and strengthened policies and support for Community RD&D,

training actions, awareness building, pilot schemes etc must be continued and reinforced.

As policies in other areas than energy, including external affairs, agriculture, regional policy, fiscal policy etc., also have a major impact on the conditions under which renewables are developed, it is fundamental to the strategy that these policies facilitate the development of renewable energy sources. It is also important that the coordination between the decision makers in the various fields is improved.
The fourth element of the strategy is a proposal for strengthening assessment and monitoring of the progress towards achieving our objectives for the penetration of renewables.

The aim of this Green Paper, as the first step in a two-step approach, is to stimulate wide consultations and discussion with all interested parties and the Community Institutions. This document sets out a broad framework, but does not make detailed proposals. On the basis of the conclusions that the Community will draw from the wide debate, a more detailed Community Strategy with an Action Plan will be established by mid-1997."

The White Paper[8] of the same title soon followed which outlined the strategy under the headings:

- an ambitious objective for increasing the contribution made by renewables;
- strengthening the cooperation between Member States;
- reinforcing Community policies (renewable energy sources in the internal market framework; specific financial support for actions for the promotion of renewables; research, development and demonstration; regional policy; agriculture and forestry policy; actions in the field of external relations policy);
- assessment and monitoring.

The White Paper also stressed the importance of ensuring fair access for renewables into the energy market which was vital in the wake of the Commission's Proposal to set up a "common framework for the taxation of energy" in the form of a Proposal for

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[8] Commissions WhitePaper, *Energy for the Future: Renewable sources of Energy*, COM (96), 576 final, 20 November 1996.

a Council Directive on "Restructuring the Community Framework for the Taxation of Energy Products".[9] The White Paper restated the European Union target to double the contribution of renewable energy sources from 6% to 12% of total energy consumption by the year 2010. . It eventually led to a Proposal for a Directive on the promotion of electricity from renewable energy sources. [10] This proposal reinforces the status of renewable energies and outlines targets, objectives, general principles and procedures, but leaves it open to the Member States to choose and implement particular schemes.[11]

Following on from the White Paper the subject of renewables was again addressed at the Second Inter-parliamentary Meeting on Renewable Energy Sources in the European Union which was held in Madeira on 12-13 May 2000. The resulting 'Madeira Statement' calls upon various EU bodies to increase their level of support for renewables and emphatically welcomed the proposal for a directive, as mentioned above. Interestingly, the delegates endorsed the notion promoted in the proposed directive that each Member State should be assigned clear negotiated targets while allowing the individual Member States to chose their own means of implementing these targets. The Statement "urges the EU institutions and especially the European governments as part of the ongoing negotiations at the Intergovernmental Conference, to address the problem of the lack of a legal base in the current EU Treaties of the need to meet the EU'S climate policy commitments, at the very least with a Treaty commitment to the promotion of renewable energy resources." [12]

However in the light of the Irish failure to ratify the Treaty of Nice it remains to be seen whether or not this appeal to the Council of Ministers has had any great effect or not. Undoubtedly the inclusion of a Treaty base on renewable energy sources would facilitate the development of future binding EU legislation which would provide immense practical assistance in the development of the renewable energy industry at National level. This fact is evidenced by the continuing debate surrounding the proposed Directive with the Council issuing its formal common position on 23 March

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[9] COM(97) 30 final, 12.31997.
[10] Com(2000) 279 final 2000/o116 (COD), Proposal for a Directive of the European Parliament and of the Council on the Promotion of Electricity from Renewable Energy Sources in the Internal Electricity Market.
[11] *Ibid.* Preamble No.11.

this year which was in stark contrast to the previous amendments adopted by the European Parliament. The legal basis itself is one of the bones of contention as well as the main focus of the directive which the Council maintain should be centred on promoting the contribution of renewable energy sources to electricity production rather than on creating a common framework to that effect. [13] Definitions, objectives, views on support regimes and reporting requirements are among the other areas where the opinions of the Council and the Parliament's amendments of the Commissions proposal differ significantly. Nevertheless it is reasonable to assume that there will be some sort of resolution on the directive within the foreseeable future requiring implementation by the Member States. On a practical level however the effects of such a directive will not be seen fully for some years to come which is more time than most of the Member States can afford in terms of reaching their individual targets assigned by the EU under the Kyoto Protocol.

The European Court of Justice is also playing its part in terms of promoting awareness of the importance within the Community of the development of renewable energy sources. In a recent judgement handed down on 13 March [14] it held that German legislation imposing an obligation to purchase electricity produced from wind power in Northern Germany was not state aid within the meaning of the Treaty. In so ruling the Court clearly gave priority to the European Unions environmental policy objectives over the smooth running of the common market which, it was argued, was impinged by the particular piece of legislation involved.

These various European Institutional measures are supported, at least in the early stages, by the Commission's Campaign for Take-Off which aims to support the development of renewable sources of energy. It's specific targets are:

- one million PV (photovoltaic systems)
- 5 million square metres of solar connectors
- 10,000 MW of wind turbine generators
- 10,000 MW of CHP biomass installations
- one million dwellings heated by biomass

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[12] Renewable Energy Sources, Environmental Policy and Law, 30/4 (2000).
[13] Europe Environment, No 587 – 3 April 2001.
[14] Case c-379/98.

- 1,000 MW of biogas installations
- 5 million tonnes of liquid biofuels.

The campaign is only concerned with the more developed technologies such as solar , wind and biomass which are capable of achieving substantially increased market penetration if initial stimulus is applied. [15] The aim is to promote more private sector investment into renewable energy development through activities at both Community and National level.

[15] http://www.irish-energy.ie/services/mainic.html

EUROPEAN UNION PROGRAMMES AND INITIATIVES

The wide number of initiatives discussed earlier are more politically than practically based with some having legal implications. There is, however, a very large practical emphasis placed on the development of renewable energy sources by the EU in general as is evidenced by the various energy programmes in place. Some of these are specifically devoted to renewables alone while others are more indirectly relevant to the renewable energy debate but nonetheless worthy of mention.

The 5th Framework Programme for Research, Technological Development and Demonstration (1999-2002)

The 5th Framework Programme for Research, Technological Development and Demonstration (1999-2002) serves as the first example of one of these schemes. The European Commission's energy RTD activities in the form of research and development, technological demonstration, dissemination and other reinforcing measures are being continued through the new Energy Subprogramme (known as ENERGIE) within the Fifth Framework.

The programme, with a budget of 1,042 million Euro over the period 1999-2002, operates on a 'Calls for Proposals' basis which effectively invites proposals for projects which meet the requirements of its key actions. ENERGIE is organised around two key actions, Cleaner Energy Systems, including Renewable Energies and Economic and Efficient Energy for a Competitive Europe. Its targets are greatly influenced by the European requirements under the Kyoto Protocol. The focus of the most recent proposals, deadlines of which being 9 February 2001 and March 2001, was on:

- Fuel Cells, for stationary or mobile applications
- Sustainable Communities, engaging renewable energy systems, in islands, rural communities or urban communities
- Clean & Efficient Urban Transport
- Gas Power Generation
- Integration of renewables and decentralised energy production
- Bioenergy
- Energy storage

- Photovoltaics

The focus here is clearly on creating and applying new solutions to renewable energy source development. [16]

ATLAS

Another EU initiative worthy of mention is ATLAS which is largely an information service. It aims to provide decision makers in industry and government with up to date information on future energy technologies, which include a large number of technologies which would be classified as renewables. Over 50 relevant energy technologies have been examined taking particular account of:

- Current usage
- Potential future usage
- Market barriers to increased deployment
- Competitiveness in a worldwide context
- Environmental sustainability
- Technical developments required. [17]

Energy Framework Programme

Further to the above initiatives is the Energy Framework Programme. Its impact is more indirect in nature than the two initiatives already examined. "In January 1999 the Council of the European Union adopted the Decision on "a multi-annual framework programme for actions in the energy sector (1998-2002) and connected measures."

This framework programme brings together six areas of EU spending on energy research and promotional activity that were previously dealt with separately. This energy framework programme creates a more focussed and integrated Community energy policy which is to be implemented through six specific programmes:

ETAP	forecasting and analysis of energy markets and trends
SYNERGY	international cooperation in the field of energy
SAVE	encouragement of efficient use of energy sources
CARNOT	promotion of the use of clean coal technologies

[16] http://www.irish-energy.ie/services/main7g.html
[17] http://www.irish-energy.ie/services/main7b.html

SURE encouraging nuclear safety in countries in TACIS

ALTENER promotion of renewable energy sources

A budget of 170 million Euro has been allocated to the implementation of the programme, of which 68 million is for 1998 and 102 million for 2000 to 2002." [18] The benefits of such a programme include a more effective integration of differing energy programmes in order to ensure that Community resources are assigned appropriately.

ENER-IURE

Strictly speaking there is no current EU legislation operating directly in the field of renewable energy development even though such a directive is presently being fielded. As a result an initiative was required to further the cause of direct legislative harmonisation in the area of renewables. ENER-IURE is such an initiative. "The ENER-IURE framework is focussed on fulfilment of the targets established in the ALTENER Programme. These are mainly the stabilisation of contaminating emissions, fulfilment of the Green Paper on Renewable Energy Sources and the forthcoming strategy of the White Paper for a Community Strategy and Action Plan, doubling the target which calls for a 12% RES contribution to the European energy system by 2010.

The ultimate aim is the establishment of general legal principles and the specific legal instruments required to promote Renewable Energy Sources in the European Union, breaking down the existing barriers to their dissemination. There is no doubt that the implementation of a well-defined legal framework would contribute to strengthening the position of RES.

To achieve this goal the following tasks are carried out:

a. To synthesise existing regulations affecting RES in Europe
b. To structure them according to the various administrative levels on which the EU operates
c. To analyse and promote regulations benefiting RES

[18] http://www.irish-energy.ie/services/main7f.html

d. If relevant, to propose the formulation of guidelines and directives to help the different European administrations to produce appropriate RES legal administrative development

The fifteen European Union countries legislation will be analysed and the partners will provide experts to attend the working meetings and information to produce the brochures."[19]

European Energy Network (EnR)

The programmes previously discussed have all been initiated by the European Community institutions either directly or indirectly. However other programmes have come into existence which further the cause of renewable energy development and which are not attributable to the Community itself. "EnR is a voluntary association of European organisations having a responsibility for the planning, management or review of national research, development, demonstration or dissemination programmes in the fields of energy efficiency and renewable energy. It is flexible in character, able to accommodate a range of working relationships from unanimous concerted effort through optional participation by any number of members to bilateral collaboration.

EnR's vision is to be at the forefront of Europe's drive towards increased energy efficiency and use of renewable energy sources by enhancing the role of its members through communication, co-ordination and collaboration and by acting as a bridge between national activities and those of the European Community and other relevant international bodies."[20]

Its aims are to "act as an informal communication network, providing a first point of contact in Member countries; dedicate its efforts towards joint activities , where its unique character provides added value; provide a channel for pan-European technical support to European organisations, e.g. the Commission, on matters of energy policy, strategy and programmes.

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[19] http://www.irish-energy.ie/services/main7c.html
[20]http://www.irish-energy.ie/services/main7h.html

EnR has no budget and the administration of EnR is in the hands of a yearly rotating Presidency and Secretariat. EnR's activities rely primarily on national resources. However, specific projects within the working groups can receive financial contributions from outside sources, as can major tasks involving the member organisations such as dissemination activities.

The main function of EnR is to encourage and facilitate exchange of information and expertise amongst its member organisations. The cumulative experience and know-how of these organisations constitutes a unique and valuable European resource. EnR members are able to develop the most effective approaches to energy programme management to the benefit of both national and international customers." [21]

PSI

PSI (Priority Setting Initiative) was the continuation until the end of 1999 of the JOULIE 'SENSER' project which was completed in 1998. The main targets for these projects were:

1. The analysis of developments in National and EU energy RTD activities with respect to four principal issues:
   - activities, priorities, expenditures and results in energy RTD programmes;
   - market developments and trends, driving energy RTD;
   - energy system modelling results, interpretations and impact on energy RTD priorities;
   - energy RTD strategy development and priority setting: processes and actors.
2. The development and construction of a database to capitalise information on RTD activities, market developments, model outcomes and actors in the strategy development of energy RTD;
3. The development of recommendations on possibilities to improve the coordination and synergy between European and national energy RTD strategies.[22]

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[21] http://www.irish-energy.ie/services/main7h.html

[22] http://www.irish-energy.ie/services/main7h.html

OPET Network (Organisations for the Promotion of Energy Technologies)

"The OPET Network within the Fifth Framework Programme is to be implemented as an Accompanying Measure in conformity with the work programme of the ENERGIE subprogramme.

OPET is a network of organisations responsible for the dissemination and exploitation of new energy solutions into appropriate markets within the EU and beyond. This is achieved by information sharing on the performance, benefits and implementation of new and improved energy technologies emerging from the RTD process.

The Open Call for Proposals including the OPET Accompanying Measure was published on 20 March 1999 with a closing date of 15 June." [23]

SAVE II

Some of the programmes adopted by the EU are more generally conservationist in nature rather than aiming specifically at the issue of sustainable development through the use of renewables. An example of one of these types of programme is "SAVE II [which] is the European Union non-technological programme aimed at promoting the rational use of energy within the Union. The programme is the follow-up to the original SAVE programme which ran from 1 January 1991 until 31 December 1995. The SAVE II programme was adopted by the Council of Ministers on 16 December 1996 and will run until 31 December 2000.

The aim of SAVE II is to promote general energy efficiency throughout the European Union by providing assistance to national efficiency measures devised by the individual Member States. The programme is geared more towards generating awareness of energy efficiency rather than funding actual efficiency measures themselves.

Altener II

The most significant programme developed by the EU in terms of funding for research and development in the field of renewables is Altener. "The overall aim of

[23] http://www.irish-energy.ie/services/main7d.html

the Altener programme is to make an essential contribution to increasing use and market share of Renewable Energy Sources, which are environmentally sustainable and constitute a major component of the Community Strategy to Abate Greenhouse Gas Emissions.

Altener's specific objectives are:

- To implement and compliment EU measures designed to develop the renewable energy resource potential.
- To encourage harmonisation of products and equipment in rthe renewable energy market.
- To support pilot actions on infrastructures that will increase investor confidence, stimulate the take-up of renewable energy technologies and improve their competitiveness.
- To improve information dissemination and co-ordination at the international ,EU, national, regional and local level, thereby increasing investor confidence and market penetration.
- To support targeted actions designed to speed up investment in renewable energy technologies and to increase operational capacity for energy production from renewable energy sources.
- To implement the EU renewable energy strategy.

Altener, the only Community programme to focus exclusively on the promotion of renewable energy sources, ended its five year term at the end of 1997. It has now been succeeded by Altener II, an initiative that will extend activities in the renewable energies field and make a major contribution to the Community Strategy and Action Plan outlined in the White Paper 'Energy for the Future: Renewable Sources of Energy'.

The Altener programme is the main instrument to support and monitor the EU Strategy on RES and, consequently its Campaign for Take-Off. Support to the Campaign under Altener provides funding for the promotional actions. Proposals received under the 1998 call resulted in Community Support for more than 200 projects, many of them directly linked to the Campaign, including ;

- Advertising for the Campaign for Take-Off
- Developing project implementation plans
- Collecting data for AGORES, the virtual EU information centre for Renewables
- Developing specific marketing and promotional activities to support the CTO
- Targeted actions for large4 scale projects in the key sectors of the CTO" [24]

INTERREG II

Community Initiative Cross-Border Cooperation and Completion of Energy Networks
The very nature of the EU as a Union of Member States presupposes the existence of national borders which may inhibit the general development of a Community-wide energy industry. Therefore a programme was required to minimise any potential obstacles resulting. "In February 1994 the Commission decided to establish a Community initiative concerning cross-border cooperation and selected energy networks, Interreg II, to follow from the Interreg and Regen programmes. The first Interreg programme was introduced in 1990 to accelerate the integration of internal border areas into a single internal market and to reduce the isolation of external border areas. The Regen programme was also decided in 1990 to enable natural gas to be introduced in Objective 1 Regions, including the construction of main gas grids in Portugal and Greece, and was also aimed at improving their energy connections (gas link between Ireland and the United Kingdom and electricity link between Italy and Greece).

Interreg II is aimed at assisting both internal and external border areas of the European Union in overcoming the special problems which arise from their relative isolation within national economies and within the Union as a whole; to promote the creation and development of cross-border networks; and to assist the adjustment of external border areas to their new role as border areas of a single integrated market.

As regards energy-related activity in the area of cross-border cooperation, eligible measures include: the provision in border areas of local gas and electricity supplies; the development of renewable energy resources; programmes for the rational use of energy; and measures in the energy field to complement the development of Trans-

[24] http://www.irish-energy.ie/services/main7e.html

European Networks. Interreg II also aims to complete selected energy networks and to link them to wider European networks." [25]

[25] http://www.irish-energy.ie/services/main7i.html

Chapter Two

NATIONAL POLICY AND LAW

There is no current Irish legislation governing the area of renewable sources of energy. There has, however, been a marked increase in recent years in the emphasis placed by government agencies and authorities on the development of a national renewable energy industry. This emphasis is largely due to the influence of the various EU initiatives and programmes outlined earlier and in response to the commitments made when both the government and the EU signed up to the Kyoto Protocol. In order to meet these commitments Ireland is to produce a National Greenhouse Gas Abatement Strategy. Significantly for Ireland 95% of the production of the greenhouse gases listed under the protocol (at least from the man made perspective) can be attributed to the combustion of carbon based fuels in order to meet the country's energy needs. Therefore, there is immense potential to meet the Kyoto target through the development of renewables alone. In its efforts to reduce the emissions of greenhouse gases the government has stressed the importance of the principle of sustainable development as a major aspect of its environmental policy.

The Green Paper on Sustainable Energy

"The Green Paper on Sustainable Energy was published in September 1999 by the Department of the Environment. Among the major features of the Green Paper are the following:

- A substantial budget of £126 million allocated to energy-related CO2 abatement under the Plan as follows:

- Strengthened Irish Energy Centre	£29 million
- Research and Development	£40 million
- Renewables / Combined Heat & Power (CHP)	£37 million
- Energy Efficient Homes Public Sector Buildings	£20 million

- The role of economic instruments such as emissions trading and energy taxes for reducing energy consumption is discussed; however there is a recognition that such policies need the support of the social partners through discussions on the successor of Partnership 2000.
- The Irish Energy Centre is to be strengthened and established as a separate statutory body.

The Green Paper was to pave the way for publication of the Minister for the Environment and Local Government's Greenhouse Gas Abatement Strategy. Publication of that document will mean that other areas such as the use of carbon sinks and reductions of methane from agriculture can also be examined. Minister Jacobs stated that publication of the Green Paper, allied with the positive commitments that have been given by the government in terms of funding, would enable the National Strategy to be prepared in a more constructive way.

The Green Paper indicates how Ireland will progress towards meeting its energy requirements in an environmentally and economically sustainable way having regard to forecast economic growth and security of supply objectives. The Brundtland Commission defined sustainability as ensuring the needs of present generations can be met without compromising the ability of future generations to meet their needs.

It is stated in the Green Paper that a sustainable energy policy should:

- Ensure security of energy supply in order to support economic and social development while protecting the environment
- Maximise efficiency efficiency of generation and emphasise the use of renewable resources
- Promote a culture of energy conservation by all users
- Minimise emissions of greenhouse gases and other pollutants, both by clean generation and by sustainable consumption levels in all sectors; and
- Maintain local air quality, and limit and reduce the Irish contribution to regional and global environmental problems.

The Green Paper concentrates on one of the environmental issues that form part of energy's contribution to sustainable development, i.e. Ireland's policy for limiting energy related CO2 emissions…

An ambitious approach is to be adopted to increase the role of renewable sources of energy in the power generation sector. This includes:

- Establishment of a Renewable Energy Strategy Group which will include representatives of planning authorities, the ESB, the Irish Energy Centre / Renewable Energy Information Centre and relevant Government Departments, to

recommend measures to redress the many constraints in the deployment of renewable energy

- Increased targets for the generation of electricity from renewable energy sources to 500 Mwe in the period 2000-2005
- Modification of the AER scheme to take account of experience to date
- the application of the public service obligation provisions of the Electricity Regulation Act, 1999, for the purchase of electricity generated from renewable sources linked to AER or similar competitions
- the sale of electricity generated from renewable sources directly to final customers as provided for under the Electricity Regulation Act, 1999.
- Encouraging community based renewable energy development
- An examination, in consultation with interested parties, of the feasibility of introducing "net metering" of electricity as a means of encouraging small-scale renewable energy production at the local level
- A guarantee of access to the electricity network for projects successful under the EU Fifth Framework Programme
- Use of the existing tax relief measure and consideration of other fiscal measures for renewable energy in the context of green tax measures in future budgets
- A revitalised approach to the promotion of research into the development of renewable sources of energy; and a refocusing of the role of the Irish Energy Centre and its Renewable Energy Information Office to support these activities." [26]

Sustainable Energy Bill 2001

Largely as a result of the above Green Paper a Bill on sustainable energy has been tabled. The Sustainable Energy Bill 2001 [27], which has already been passed by the Seanad, provides, among other things, for the Irish Energy Centre to be legally established as a State body with a new title 'Sustainable Energy Authority of Ireland'. The Bill appears to follow the course set out comprehensively in the Green Paper and the National Climate Change Strategy. It has yet to be passed by the Dail and so a certain level of amendment is to be expected at that stage.

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[26] Irish Energy Centre (In consultation with the Department of Public Enterprise), *Development Plans and Renewable Energy*, December 2000.
[27] www.gov.ie/oireachtas/frame.html

National Development plan 2000 - 2006

The national significance of renewable energy sources is emphasised clearly in the National Development Plan 2000 - 2006 [28] which states:

- Section 2.22: in relation to sustainable development: "the main environmental challenges which must be addressed by the NDP and other policy measures include...meeting our Kyoto commitment to limit our production of greenhouse gas emissions."
- Section 4.65: "In the energy sector, a key priority in the National Development Plan will be to identify those areas of expenditure which will assist Ireland in complying with its obligations under the Kyoto Protocol to the UN Convention on Climate Change. The strategy will be to pursue least cost approaches to achieving more sustainable energy devices and systems. There will be a pronounced emphasis on economic instruments such as emissions trading to give incentives to CO2 emitters and energy users to reduce emissions cost effectively."
- Section 4.66: "Special efforts will also be necessary to expand the use of renewable energy and to promote the development of technology which contributes to CO2 abatement."
- Section 4.128: In relation to rural impact - "Investment in telecommunications and energy will be mainly concentrated in more peripheral areas where the market alone is unlikely to provide and this should be of direct benefit to the surrounding rural areas."
- Section 13.4: The EU Commission has identified regional competitiveness as one of the three strategic priorities for Community Policies; and in Section 13.5: Under Regional competitiveness, one of the priorities identified by the Commission for consideration for assistance is investment in energy (efficiency and renewable).
- Section 13.9: "In recognition of the potential that the development of alternative energies has to contribute to sustainable development and to achieving Kyoto limits and in line with Community Priorities, the Plan proposed Structural Funds expenditure to support investment in respect of this in the Economic and Social Infrastructure Operational Programme."

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[28] Government Publications, ISBN 0-7076-6285-0.

- Section 13.21: In relation to environmental impact and sustainable development in the context of compliance with EU and national policies: "Under the Treaty of Amsterdam, the Union's financial instruments are required to work, simultaneously and in the long term interest, towards…sustainable development…this means that environmental and nature protection legislation must be incorporated into the definition and implementation of measures supported by the Structural Funds and the Cohesion Fund. This will help the Union to comply with its international commitments such as those concerning climate change at Kyoto…Achieving [the Irish] target will prove extremely difficult in the context of rapid economic growth"
- Section13.22: "The establishment of a system of eco-audit of policies is a key environmental priority in the Government's 'An Action Programme for the Millennium.' In addition, 'Sustainable Development – a Strategy for Ireland,' undertook to develop within three years, a Strategic Environmental Assessment (SEA) system for major sectoral plans and programmes."
- Section 13.28: In relation to compliance with existing international obligations to reduce sulphur dioxide, nitrogen oxides and ammonia production – "meeting these targets will require significant action in the energy, industry, transport and agriculture sectors."

NATIONAL PROGRAMMES AND INITIATIVES

Irish Energy Centre

In conjunction with the statements of policy a number of practical initiatives and programmes have been developed by successive Irish Governments in order to further the cause of renewable energy source development. The most significant of these has been the establishment of the Irish Energy Centre in 1994 whose responsibility it is to help reduce emissions by promoting energy efficiency. The centre "has a mission to support, promote and advise on the development of energy efficiency and energy management in all sectors of the Irish economy. It is also charged with the task of co-ordinating and implementing the National Energy Conservation Programme. The ultimate objective of the centre…is to effect savings…from the nation's energy bill…The aims of the centre are to be achieved by promoting Irish participation in European Union energy programmes…and through,

- Best Practice Programme
- Energy technology Promotion
- Grant Schemes
- Education Programmes"[29]

Due to the wide ranging duties of the Irish Energy Centre generally a special sub-office was established within the centre to deal solely and specifically with the issues surrounding renewable energy. This office, the Renewable Energy Information Office (REIO), "aims to promote the use of renewable energy resources and provide independent advice and information on financial, social and technical issues relating to renewable energy development…In order to achieve its objectives, REIO:

- Operates a helpdesk, informed by a comprehensive library of relevant materials and publications
- Publishes a regular newsletter, Energy Update
- Publishes a range of information brochures
- Compiles contact lists of suppliers, consultants and developers operating in the renewable energy field

[29] McParland, P, Irish Energy a Study, Trinity College, 1998.,also generally Irish Energy Centre promotional literature.

- Maintains a database of relevant parties in Ireland who have a key role to play in the further growth of the renewable energy industry
- Organises conferences, workshops and information meetings on various relevant issues
- Provides a priority advice service for local authority planners and decision makers
- Chairs and facilitates working groups to address problems and remove obstacles to renewable energy development
- Assumes a transnational role through the exchange of information with organisations abroad and co-operation with and participation in international activities"[30]

Alternative Energy Requirement Competitions

Other Government initiatives[31] include a renewable Energy Feasibility Grants Scheme, the opening of a renewable energy park and information facility at Sonairte, the National Ecology Centre in Laytown, Co. Meath and the introduction in 1998 of tax relief for corporate equity investment in renewable energies. However, the most significant of all government initiatives have been the Alternative Energy Requirement Competitions. "In October 1993, the then Minister for Energy, Noel Treacy, T.D., announced the Alternative Energy Requirement (AER I) to achieve the Government target of 75 MW of installed electricity generating capacity by 1997 from Alternative Energy Sources (a term which comprised Renewables and Combined Heat and Power (CHP) from natural gas). It was expected that this would consist of 30 MW of wind power, 10 MW from hydro, 20 MW from CHP and 15 MW from waste and other sources, including biomass. Due to the level of interest shown, the Minister of State at the Department of Transport, Energy and Communications Emmet Stagg, T.D., decided that ESB Power Procurement should offer 34 Power Purchase Agreements in respect of 111 MW. The final breakdown was 75 MW from wind, 22 MW from CHP, 12 MW from waste (including landfill gas) and 4 MW from small-scale hydro.

A further initiative was announced in July 1995 to promote the production of electricity from biomass. The details of the competition, which focussed on securing

[30] http://www.irish-energy.ie/services/main1.html

one plant of between 10 and 30MW using biomass and/or waste as a fuel, were announced in December 1995. A successful project was selected. It has not been constructed.

Mr. Emmet Stagg, T.D., Minister of State at the Department of Transport, Energy and Communications launched a £100 million renewable energy initiative Renewable Energy: A Strategy for the Future, in April 1996 marking the culmination of a major review of renewable energy policy. This review process grew initially from the outcome of the first Alternative Energy Requirement competition (AER I) which involved not just the 34 proposals in respect of which contracts were offered, but also the;

- Sheer volume of interest demonstrated in that competition;
- level of expectation created in the market place;
- economic, environmental and enterprise potential innate to renewables;
- interface with innovative projects; and
- genuine feasibility of renewable energy.

This package, underpinned by European Regional Development Fund (ERDF) Support of £7.5m, was one of the most radical energy policy initiatives ever pursued at that time. In broad outline, the elements of the strategy were:

(a) commissioning, completion and publication of a study into the Total Renewable Energy Resource in Ireland

(b) establishment of a working group on grid connection issues

(c) establishment of a Renewable Energy Information Office

(d) securing, by the end of 1999, electricity supply from an additional 100MW of installed capacity using renewable energy sources, through competitions. This was to comprise, by 1999, 30MW per annum for wind energy, 1MW per annum for hydro and 7 MW from biomass. ERDF support of up to £6.5m from the Economic Infrastructure Operational Programme was to be provided

(e) drawing up, in consultation with the power Procurer and the ESB, a scheme to cater for the development of small scale renewable energy based electricity generating projects;

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[31] See generally ENFO information literature on sustainable energy, SD10.

(f) provision of ERDF grant support from the Economic Infrastructure Operational Programme of up to £1m for the building, by the end of 1999, of a pilot wave energy generating plant

(g) Allowing third party access to the electricity network for renewable generators who wish to sell green electricity directly to electricity consumers

(h) Guaranteeing electricity market for EU Thermie funded renewable energy projects

(i) Setting targets for the future generation of electricity from renewable energy for the 2000-2010 period, including 30MW per annum from wind energy and 1MW per annum from hydropower

(j) The pursuit of further fiscal measures to support renewable energy development in the context of the greening of the 1997 budget

Moving from the Strategy for the Future, the AER III competition was announced in 1997. Due to the high level of interest in the competition, the Minister awarded an increased number of contracts:

- 9 wind farms in the 5 MW category amounting to 100.82 Mwe, at a price range of 2.21 – 2.79 p/kWh
- 8 wind farms in the under 5 MW category, amounting to36.51 Mwe, at a price range of 2.75 – 3.2 p/kWh
- 2 waste to energy projects and one landfil gas project amounting to 14 Mwe and 2.92 Mwe respectively, at a price range of 2,5 – 3.94 p/kWh
- 10 small hydro schemes amounting to 4.42 kWh, at a price range of 3.48 – 3.9 p/kWh

The AER III competition saw bids for electricity generation at remarkably low prices, particularly for the wind categories. While many of these projects remain to be constructed, it is considered likely that the success rate will be as good as for AER I."[32] The AER IV competition was initiated in 1997 also and was aimed at securing 25 Mw of newly installed additional electricity generation capacity from high efficiency Combined Heat and Power (CHP) systems and up to 10 MW of electricity generating capacity from existing similar systems.

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[32] Irish Energy Centre (In consultation with the Department of Public Enterprise), *Development Plans and Renewable Energy*, December 2000.

In May 2001 the latest Alternative Energy Requirement (AER V) [33] was launched with the emphasis very solidly being placed on wind energy. Of the 255 MW of electricity being tendered under the scheme 200 MW is to be gained from large-scale wind energy with 40 MW from small-scale wind energy projects. The remainder is to be distributed between biomass, 10 MW, and small-scale hydropower, 5 MW. Further to the recommendations of the Strategy Group the upper size limit of 15 MW per wind farm which existed under the previous AER initiatives is to be discarded for large-scale wind developments. In contrast, there is to be a reduction in the capacity of small-scale wind developments to 3 MW in an attempt to encourage greater participation by community groups as opposed to companies.

[33] Energy Update, New initiative to support wind, bioenergy and hdropower, IEC_REIO_Newsletter, Summer 2001.

Chapter Three

WIND ENERGY

In order to gain a fuller understanding of the issues surrounding the whole area of renewable energy we must examine the actual individual technologies themselves. There are a large number of technologies some more radical than others and only some of which are regarded as viable technologies in the Irish context.

The harnessing of wind energy is not a new concept. As can be seen in the traditional landscape of many European countries, notably Holland, the energy contained in masses of moving air has been used through relative primitive windmills to grind grain and pump water among other things. However the wind turbines of todays technology are a far cry from those early windmills both in terms of output and design.

The machines currently used comprise of a single mast with a three bladeded rotor attached laterally. The size of both mast and blades can vary greatly and this level of variation in design reflects the amount of research and development undertaken within the industry particularly in recent years. As noted by the Commission in its 1999 report[34]the "cost of wind energy plant has fallen substantially during the last fifteen years, and this trend is continuing. Energy prices have fallen even faster, due to lower wind turbine prices, higher efficiency and availability, and lower operation and maintenance costs. Wind turbine prices fell by a factor of three from 1981 to 1991, and energy prices have halved in the last 9-10 years.

The price of modern turbines around the 45 m diameter mark is around 700 ECU/kW. It may be noted that the "most economic size" has changed over the years and is still moving upwards. The larger the machines, the fewer are required for a given capacity. This brings savings in site costs and in operation and maintenance costs. For example site costs can be reduced by around 25% by moving from machines of the 300 kW size range to 1 Mw size machines.

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[34] Wind Energy The Facts, A Plan for Action in Europe, ISBN 92-828-4571-0, 1999.

Overall, balance of plant costs adds between 15 and 40% to wind turbine costs depending on the number and size of machines in the wind farm, and the location. The windiest sites – on hilltop sites, often remote from a grid connection, or coastal locations where deep piling into silt is needed, tend to incur costs above average. Operational costs vary between countries and between wind farm sites; they range from around 25 ECU/kW/yr for 200 kW machines, falling to around 15 ECU/kW year for 500 kW machines."

The report also lists the upland regions of Ireland along with Britain and Greece as being the optimal areas within the EU for availing of the wind energy resource. Emphasis is also placed on the developing area of offshore wind farms "Offshore wind has the potential to deliver substantial quantities of energy – at a price which is cheaper than most of the other renewable energies. Wind speeds are generally higher offshore than on land, although the upland regions of the British Isles, Italy and Greece, do yield higher speeds…The development of offshore wind energy gives the industry further opportunities. As the technology matures, the cost reduces and the market expands, the industry is being recognised as an exciting and vibrant new entity, and the major players who have hitherto been reticent about identifying themselves with renewable energy, are now keen to join in"

The advantages of wind farms over other non renewable sources of energy are many. They do not produce any by products or emissions. Water resources are not required in their operation as indeed are any other form of natural resource except the wind itself which is readily harnessed. As stated in the above report "Wind energy is a clean renewable and sustainable means of electricity generation. It is one of the most cost-effective energy options for reducing global warming. Wind energy already avoids over 6,300.000 tons of CO2, 21,000 tons of SO2 and 17,500 tons of NOx emissions per year in the EU alone…Furthermore , wind energy does not create any dangerous waste products. It is indigenous, secure and freely available.

About 99% of the land area within a typical wind farm site is available for agricultural or other use. 80% of the people polled are in favour of wind energy

In 3 to 4 months a modern wind turbine on an average site will generate as much energy as that used to manufacture it. Wind farms can be decommissioned, and sites fully restored, very easily. The recyclable content of wind turbines is increasing and more energy can be recovered from, than is used in, scrapping machines."

Another advantage to the development of the wind energy industry which may not be readily apparent is the provision of employment. From the report "The wind energy industry is now a mature industry that employs many thousands of Europeans. One Megawatt of wind power installed capacity creates jobs for 15- 19 people under present European market conditions. In more labour intensive parts of the world this figure may double…the development of the wind energy sector has given birth to new major factories throughout the whole world and the new technological area stimulates production of components for the new wind turbine generator makers in factories which traditionally supplied the 'old technology' electricity producers"

This is not to say that wind energy is without its disadvantages. One of these, viewed by most as being of minor significance, is the possibility of particulates being picked up by turbulence from the turbines. The two main bones of contention with respect to wind energy are the noise and visual effect arguments enunciated by residents in the vicinity of wind farms. Other issues include the possibility of 'shadow flicker' and electromagnetic interference. All of these factors are a source of great discussion between environmentalists and residential groups. The noise factor as well as shadow flicker are generally accepted by the industry as being valid complaints but the extent of these elements as a source of disturbance largely depends on a number of factors such as wind speed and season which of themselves are a source of dispute between the various parties on either side of the debate.

In addition an "environmental problem that wind energy enthusiasts in the US experienced, but which may have less significance here is the issue of avian mortality at wind farms. Raptors and other birds have been flying into the turbine blades with negative consequences. The California Energy Commission has found that as many as 200 to 300 redtail hawks and 40 to 60 golden eagles, in addition to other species die each year at their Altamont Pass farm alone. In fact, wind farms have been documented to act as both bait and executioner; rodents taking shelter at the base of

turbines multiply because of protection from their predators, while in turn their greater numbers attract more raptors to the farm with unfortunate results." [35]

HHDROPOWER

Ireland is no stranger to the area of hydroelectric power. Indeed there is ample evidence throughout the countryside of the harnessing of rivers to produce energy to turn mill wheels in a similar vein to the windmills discussed earlier. The Ardnacrusha hydroelectric plant, built in the 1920's, was one of the most ambitious projects of its type undertaken in Europe at the time. It involved the construction of a lengthy canal to divert water from the Shannon and keep it at its height approximately forty miles from the mouth of the river so that the sudden drop could generate the power required to turn the massive turbines. At the time of its construction it was viewed by many critics as a certain white elephant in the hands of the fledgling State. This viewpoint was due largely to the comparatively high output of the station at the time which, it was felt, would never be necessitated. These fears were obviously never realised and even today the power station remains the country's largest renewable energy generating unit. Such large-scale hydroelectric projects are of less significance in the current drive towards hydropower development. The current focus lies in small-scale schemes of under 5 MW. There are more than 40 independent hydro power producers, representing each of the 26 counties, generating power for their own personal use or in some cases contributing to the national grid. However, a " recent report concluded that there is potential for a further 72 MW generating capacity from small-scale schemes (ESBI Report). This would provide enough energy for over 46,000 homes."[36]

The only real disadvantage attached to hydro power is the potential impact on the aquatic ecosystem upon which it is harnessed. However such disturbances can be minimised as outlined in the recent recommendations made by the Irish Energy

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[35] McParland, P, Irish Energy a Study, Trinity College, 1998
[36] http://www.irish-energy.ie/services/main1c.html

Centre in conjunction with The Department of Public Enterprise. [37] "Regarding hydro energy specifically the Council will seek to respond positively to applications in the context of a sustainable energy policy. In responding to applications, the Council will seek to ensure that the free passage of fish is provided for by incorporating a fish pass where necessary which should:

- be negotiable by the fish without undue effort
- not expose the fish to risk of injury
- be easily found by fish

The Council will further seek to ensure that where necessary the tail-race will be screened at the point of return, and that sufficient residual flow is left in the main river channel to allow migration of ascending fish. In order to ensure that descending fish are not drawn into the turbines of a hydroelectric scheme, or are delayed or injured at the water abstraction point, a head-race screen will be placed where necessary at the point of divergence from the main river."

SOLAR ENERGY

Energy from the suns' rays is clearly evident in both the heat and light produced. The harnessing of these rays to produce energy in another form is referred to a solar power and is much more widespread in the Mediterranean Member States of the EU than in Ireland. However, the fact that Ireland is definitely not a country renowned for its high levels of sunshine does not mean that solar power is an impossibility. Three distinct technologies have emerged in the area of solar power.

The least well known of these technologies is the known as Passive Solar Design. It is strictly speaking more closely aligned with the area of energy efficiency than with renewable energy production but is nevertheless relevant. "Passive solar architecture is a design approach rather than the active use of a specific technology or device. The fabric, orientation and layout of the building are manipulated to achieve maximum solar gains and minimise the need for artificial lighting, heating and ventilation.

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[37] Irish Energy Centre (In consultation with the Department of Public Enterprise), *Development Plans and Renewable Energy*, December 2000.

Passive solar design principles can be incorporated into new homes at no extra cost while bringing substantial benefits in energy savings and comfort." [38]

The more widely recognised element of solar energy is the area of active solar heating or Solar Thermal. "There are three well-developed solar thermal technologies that can transfer solar energy into turbine based electrical generation. Each is categorised by the type of mirror that it uses. The first, the parabolic trough system, concentrates sunlight onto a thin receiver pipe at the focal point of the trough shaped collector. The second, the parabolic dish system, uses tracking reflectors to concentrate sunlight onto a receiver system that acts as the "engine" or a heat "exchanger" and is located at the mirrors' focal points. The third technology is a central receiver system, and uses tracking mirrors to reflect solar energy into a heat exchanger on a central tower.

Solar thermal technologies need open, unblocked access to the sun. Land requirements for parabolic trough and central receiver technologies are significant, and can range from five to ten acres per Megawatt respectively. Additionally, solar thermal technologies require substantial levels of daytime sun in order to effectively produce electricity. Therefore, in addition to being tremendously expensive, the ultimate range of potential sites is highly limited to regions that experience both a comparatively large number of sunny days and a high level of annual solar radiation. These factors would almost certainly rule out solar thermal technology as part of the future of economically viable alternative energy in Ireland." [39]

This note of criticism refers largely to the potential of such systems on a large-scale or industrial basis whereas such systems have been successfully installed for domestic use. According to the ESBI report, mentioned earlier, such a unit can fulfil 60 % of a households yearly water heating requirements and as a result 2,500 square metres of solar thermal collectors have been installed in Ireland, which represents just 0.2% of the estimated practical solar heating resource available now. [40] Indeed the technological advances in the industry in recent years have served to reduce the disadvantageous effects that Irelands low level of sunshine has on potential solar

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[38] http://www.irish-energy.ie/services/main1c.html
[39] McParland, P, Irish Energy a Study, Trinity College, 1998
[40] http://www.irish-energy.ie/services/main1c.html

power development. This fact is evidenced by the recent installation of a vertical solar panel, known as the Friendly Solar Wall, in Donegal on the wall of Dunloe enterprise development company Forbairt na Rossann. "The system...operates by air trapped in the gap between the glass panel and the wall becoming heated by the sun. When the warmed air reaches a certain degree level, currently set at 30 degrees celsius, a regulator shuts down the conventional oil-based back-up heating system, and warm air from the panel cavity is driven through the building through the vent system.

The capital costs for the panel were IR£20,000, to which the Department of Public Enterprise provided 50% through the Interreg II Energy Challenge programme.

The Norwegian company, Solar Lab , supplied the system and its design, which is tailored for use in Scandinavian countries where the sun is low in the sky, is also said to be suitable for use in countries like Ireland, where winter sunshine levels are low."[41]

The final type of solar power remaining is photovoltaics (Pv). These are a highly advanced type of cell which use semiconductors to convert solar energy directly into electrical energy without the use of any other form of mechanics. These type of cells are those commonly found in solar powered watches and calculators and were originally thought to be so expensively priced as to be incapable of economic viability. However in recent years the cost has reduced significantly to the extent that the technology is proving more attractive for use in commercial and industrial buildings. At present the most prominent use of the technology in Ireland is its use in powering parking metres around Dublin City. It remains, however, at a cost which places it outside the competitive range of alternatives and so further research and development is required before it becomes an economically viable renewable energy product.

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[41] Energy Update, IEC_REIO_Newsletter, Summer 2001.

GEOTHERMAL ENERGY

Geothermal electricity generation involves the harnessing of energy in the form of heat, hot water and steam below the surface of the earth among other deeper sources such as hot dry rock, geo-pressure and magma with the latter group remaining to be exploited due to the lack of appropriate technology. These geothermal reserves can be used to produce heat directly or in the generation of electricity and the technology itself has been in existence since the early 1900's when it was developed in Lardello, Tuscany, Italy. This system has also been in use in Ireland for quite some time in Trinity College Dublin and has the advantage over other similar types of renewable energy production of being neither seasonal nor intermittent. It remains, however an underdeveloped source of renewable energy in Ireland.

BIOMASS

There are a number of differing theories as to exactly what biomass consists of but the situation is clarified, in Ireland at least, by the definition presented in the most recent renewables support initiative, AER V. Biomass is defined as "the biodegradable fraction of materials from agriculture and forestry, wood and cork waste, biodegradable products of the pulp and paper industry and the decomposition of the biodegradable fraction of separated municipal wastes and landfill gas…Proposals in the biomass category may include plants requiring the use of some fossil fuels source to prepare and/ or ignite and/or sustain combustion of non-fossil fuels. Such biomass plants may be considered eligible for this competition provided that they are designed and operated to the minimum of fossil fuel necessary for that purpose and provided that in any event less than 10% of the fuel input is from fossil fuel sources." [42]

For the purposes of discussion it is easier to separate the various types of biomass into the two categories of energy crops and forest residue, firstly, and secondly, wastes. "The three main sources of energy from biomass are forest residues, wood pulp industry residues and short rotation energy crops. Biomass is the oldest of the

[42] Energy Update, IEC_REIO_Newsletter, Summer 2001

renewable energy sources. In Ireland, its main use is as wood fuel for domestic and process heating, which amounts to just under 1% of total primary energy demand.

In the home highly efficient wood burning stoves and fireplace inserts now available are far more efficient and controllable than traditional units. Wood wastes and by-products are also used to provide energy in the wood processing industries. There is great potential to 'co-fire' wood and peat at our peat burning power stations, bringing substantial reductions in carbon dioxide emissions. It is expected that the large scale uses of biomass will increase. Short rotation forestry could be used in the future to cultivate wood fuel for heat production and electricity generation. There is an established market for 'conventional' industrial power or CHP generation using straightforward biomass. However further researcd and development and demonstration is needed for gasification technologies." [43]

With respect to the latter category the view from the Irish Energy Centre is as follows: "Because of their carbon content, waste streams from wood and certain industrial processes, municipal solid waste, agricultural waste and sewage sludge all have potential to be used as alternative energy sources. Energy from waste biomass encompasses the production of heat, fuels and/or electricity from agricultural an municipal wastes. Energy can be recovered from landfill gas, biogas produced through the anaerobic digestion of sewage, agricultural slurries and the organic component of industrial and municipal waste.

Landfill gas is harnessed to produce electricity at five municipal landfill sites in Ireland (four in Dublin and one in Cork). Technologies to produce electricity and heat from landfill sites are now well established and environmental legislation which requires the collection of methane at landfill sites is being widely introduced.

The technology of anaerobic digestion is well established for the treatment of agricultural (slurry) and other wastes. Between 40- 60% of the organic matter can be converted to biogas which can be burnt directly in a gas boiler or used to fuel an

[43] http://www.irish-energy.ie/services/main1c.html

internal combustion engine. Other organic material (straw, poultry litter and mushroom compost) can be converted to electricity or heat by thermochemical means.

Municipal solid waste contains a significant energy content that can be recovered through combustion techniques. Only the larger population centres would produce sufficient waste flow to sustain these facilities. Three waste to energy generation projects have been offered contracts under the AER II and AER III competitions. However, it is unlikely that any of these projects will proceed until the waste management strategy for the country as a whole is implemented." [44]

The advantages of biomass generally include low sulphur content and a relatively clean combustion by-product. "Newer biomass technologies offer an alternative to older industrial boilers and uncontrolled open-air combustion of agricultural and forestry residues. This open air burning emits organic substances and possibly carcinogens which is seen as a major problem in this country. In addition, energy uses for biomass may promote better forestry management, and the cultivation of certain HEC species may prove beneficial in preventing soil erosion." [45]

LIQUID BIOFUELS

"Liquid biofuels are transport fuels, primarily biodiesel and bioethanol, processed from agricultural crops and other renewable feedstock. At present most biodiesel in the EU is processed from oliseed rape and sunflower. Bioethanol is processed from wheat, sugar beet and sweet sorghum. As well as reducing emissions of greenhouse gases, liquid biofuels produce less harmful emissions during combustion than their fossil fuel equivalents.

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[44] http://www.irish-energy.ie/services/main1c.html
[45] McParland, P, Irish Energy a Study, Trinity College, 1998

The main cost element in biofuel production is the feedstock, however with more research cheaper feedstocks are predicted to reduce the costs of fuel production quite considerably.[46]"

OCEAN ENERGY SYSTEMS

These types of systems include both wave energy systems and tidal energy systems. In the case of the former, despite a large amount of research carried out both nationally and internationally, there are no systems which are considered commercially viable in existence at the present. This state of affairs persists in spite of the vast potential for harnessed energy which exists worldwide and particularly in Ireland due to its position on the Atlantic Shelf. Significantly, "under AER III, applications were invited to develop a wave energy to electricity plant. However, EU grant aid earmarked for this project was withdrawn on the basis that wave technology has not advanced sufficiently beyond the research stage to justify assistance under the European Infrastructure Operational Programme." [47]

The technology is more progressed in the case of tidal energy. Most standard systems involve the use of a dam or barrier combined with sluices and turbines. The turbines, which are located within the sluices, generate power as the water is pushed through them by the force of the tidal flow. The sluices operate by opening during rising tide, allowing the dammed area to fill with water, and are subsequently closed during high tide. The water is then trapped until low tide when it is released through the turbines. The technology itself is sufficiently advanced for the generation of energy to be technically feasible. The difficulty with implementation remains that the difference in load between high and low tide is not adequate to produce enough pressure for the system, as its present state of development stands, to be commercially viable.

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[46] http://www.irish-energy.ie/services/main1c.html
[47] http://www.irish-energy.ie/services/main1c.html

Chapter Four

EUROPEAN BARRIERS TO IMPLEMENTATION

The unfortunate fact of the matter remains that despite the various and wide-ranging initiatives devised by both the EU and National authorities the implementation rate of renewable energy systems is very low. The first of the AER competitions was the most successful in terms of subsequent implementation rate with a total of 17 projects, excluding CHP, becoming operational. However, the following yeas were to a large extent quite barren with only three more projects from AER II and AER III reaching production levels resulting in a total of 20 renewable energy systems implemented in the five years between 1994 and 1999. [48]

There are a number of factors which have contributed to this situation some of which relate to the individual technologies themselves, which have been outlined in chapter three, such as incomplete research and development. Other factors are of a more grass roots nature concerning the initial planning stages of development. There was also a certain amount of discussion in recent years as to the legality within EU Law itself of the various initiatives and programmes devised by EU authorities and Member State governments to entice development of renewable sources of energy. The central issue was whether the introduction and development of such schemes result in a competitive handicap for a national or EU electricity industry, and whether such schemes are compatible with EU competition law.

"Pursuant to Article 25(1) of Directive 96/92 EC, in 1997, the Commission decided to take the necessary steps to harmonise its policy on renewable energies basing it on energy taxation and environmental considerations. The Commission's proposal to set up "a common framework for the taxation of energy" was followed by the White Paper on renewable energies. It stressed the importance of ensuring fair access of renewables to the electricity market, and was endorsed by the Council and the European Parliament. The White Paper finally led to a proposal for a directive on the promotion of electricity from renewable energy sources. The proposal reinforces the status of renewable energies and outlines targets, objectives, general principles and procedures, but leaves it to the Member States to choose and implement the particular

[48] http://www.irish-energy.ie/services/main1c.html

schemes."[49] The above passage outlines the current, as well as future, legal basis of the renewable energy schemes and initiatives available in the individual Member States derived directly or indirectly from the EU.

Each of the different types of schemes offered through the above basis must be examined to determine if they could be contrary to the competition Articles in the Treaty and in particular to examine whether or not they would come under the State Aid derogations found in Article 87. The Article itself states that "Save as otherwise provided in this Treaty, any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, insofar as it affects trade between Member States, be incompatible with the common market." [50] Article 87 (3) (b) goes on to allow for a derogation for such State aids where the purpose of such aid is to "promote the execution of an important project of common European interest or to remedy a serious disturbance in the economy of a Member State".

There are two main types of schemes which are offered throughout the Member States in the promotion of renewable energy development. The first of these, support schemes, appear most notably in the form of obligations to purchase at a guaranteed price as evidenced in the German law on renewable energy, Erneuerbare Energien Gesetz (EEG). This piece of legislation "requires grid operators to purchase electricity from renewable sources at fixed prices. Technologies covered are wind, photovoltaics, geothermal, small hydro (below 5 MW), biomass, and certain forms of waste. The stated objective of the law is to double the share of renewable energy sources in total energy consumption by 2010." [51]Other variations within this category would include tax exemptions as well as support schemes for research and development and capital development.

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[49] Krieglstein, Felix B., *Renewable Energy Schemes and EC State Aids Provisions*, European Environmental Law Review, February, 2001.
[50] Article 87 (1)
[51] Krieglstein, Felix B., *Renewable Energy Schemes and EC State Aids Provisions*, European Environmental Law Review, February, 2001.

Finance schemes, the second category, encompass schemes such as "a "renewable" "green" or "non-fossil fuel" levy fixed by the Member State... imposed on all consumers of electricity within the Member State. The levy may be a fixed payment per kWh consumed, or a transparent and separate fee added to the normal tariff...An example is the Non-Fossil Fuel Obligation (NFFO) introduced in the United Kingdom."[52]Another form of finance scheme is the quota-based system to which the schemes currently in operation here in Ireland, as well as the Netherlands, belong.

It is clearly obvious from the description of these schemes that they are capable of distorting competition. Therefore, the next criteria, being whether or not they could be classified as State Aids, must be examined. The rulings of the Court of Justice demonstrate that it is the effects [53] of such individual schemes rather than their causes or aims which are of paramount importance. Both the Court and the Commission adopt an extremely wide interpretation of such effects so that both direct and indirect aid is covered. Therefore, such schemes will only escape illegality if they can fall within the derogation outlined above.

The entire area was clarified by the court in its landmark judgement handed down on 13 March this year in the PreussenElektra Case. [54] The case involved a German Law which "required public electricity supply undertakings to purchase electricity produced within their area of supply from renewable sources, including wind energy, at minimum prices which are higher than the real economic value of that type of energy."[55] The plaintiff company brought an action in the domestic court for the extra amount paid due to the obligation to purchase electricity produced from renewables. They argued that the legislation involved the application of a State Aid which had not been notified to the Commission and thus amounted to a State Aid contrary to EU Law. An Article 234 (ex 177) reference ensued with the domestic Court requiring clarification on two issues, the first being whether or not the system promulgated by the legislation in question constituted State Aid for the purposes of EU Law. The

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[52] Krieglstein, Felix B., *Renewable Energy Schemes and EC State Aids Provisions*, European Environmental Law Review, February, 2001.
[53] Case 173/73 Italy v Commission [1974] ECR 709, Case 78/76 Steinike and Weinlig v Germany [1977] ECR 595.
[54] Case C- 379/98.
[55] Europe Environment, Court of Justice issues important ruling in favour of renewable energy, no. 586, 20 March, 2001.

second question concerned whether the system could come under the term quantitative restrictions to trade prohibited by the Treaty.

In respect to the first issue the Court found that ""only aid granted directly or indirectly through State resources constitutes aid within the Treaty". The Court considered that neither the statutory obligation introduced by the German rules, nor the allocation of the financial burden between supply undertakings and private operators of upstream electricity networks "involved a direct or indirect transfer of State resources"...On the second issue, the Court of Justice went further than the Advocate General in ruling that the rules were "capable, at least potentially, of hindering intra-Community trade", but, "they are aimed in particular at protecting the environment by contributing to the reduction of emissions of greenhouse gases". Thus the objective of those rules appears amongst the priority objectives of the Community."[56]

This ruling represents an emphatic and unambiguous approval by the ECJ of the priority status attributed to the issue of renewable energy development by the other EU Institutions. The judgement clears the path for the further development of both EU and National initiatives and effectively gives them a 'get out of jail free' card with respect to State Aid designation. However the uncertainty surrounding the entire area until this judgement was issued serves to reinforce the need for EU harmonising legislation on the matter.

[56] Europe Environment, Court of Justice issues important ruling in favour of renewable energy, no. 586, 20 March, 2001.

NATIONAL BARRIERS TO IMPLEMENTATION

From a domestic perspective the most concerning stage of renewable energy development and implementation is the planning phase. In fact, this was identified by the Renewable Energy Strategy Group in its Strategy for Intensifying Wind Energy Deployment which resulted in the addition of new terms and conditions to the contracts offered under AER V. "Potential generators will be required to have full planning permission before applying to AER. The Strategy Group proposed this condition to avoid a repetition of the scenario in previous AER rounds wherein a number of projects with power purchase agreements (PPAs) were unable to proceed because they could not get planning permission, while at the same time, developers with planning permission were unable to gain access to the market because they had failed to secure an AER contract."[57]

In many cases potential developers are simply dissuaded from entering the market at all due to the perceived and actual difficulties in gaining planning permission for renewable energy projects particularly wind farms. There is immense potential throughout Ireland and particularly in western counties to tap into the wind energy resource. Unfortunately, however, it is these very same counties which rely heavily on tourism as their main source of revenue. As a result planning applications for wind turbines, which are viewed by many (other than the author) as being an eye-sore, are usually met with a plethora of objections founded on the aesthetics of the particular locality involved. Such applications rarely make it through the entire planning appeals process.

Other concerns of residents upon which planning objections are often based include devaluation of property as well as factors such as noise pollution and shadow flicker mentioned earlier. There is a large degree of misinformation circulating with respect to such developments with potential disadvantages exaggerated by action groups intent on prevention and, if not, stalling the installation of renewable energy production projects. All of these factors combined have made it extremely difficult for small-scale developers, in particular, to get such projects up and running. The

[57]Energy Update, New initiative to support wind, bioenergy and hydropower, IEC_REIO_Newsletter, Summer 2001.

recent announcement of the planned wind farm development in Moneypoint, Co. Clare, is a welcome break in the apparent impasse of the last few years. However, it is noteworthy that the developer, being the ESB, is one holding a certain amount of industrial muscle which may or may not have been flexed during the planning application process. It is unlikely that these circumstances are going to change enormously over the next few years within which time the government plans to increase its renewable energy output exponentially. Therefore, some review of the planning process in relation to renewable energy development is necessary. The entire issue needs to be viewed from a national, even global, perspective in order to ensure that the 'not on my back doorstep' philosophy does not prevail any further.

Conclusion

There are a number of conclusions to be drawn separately from the individual aspects of this study. These will be dealt with in sequence as they arise in the text with an overall conclusion drawn accordingly.

It is clearly evident from the terms of the International Conventions and Protocol discussed in chapter one that the issue of climate change generally has reached the point of world priority status. The very media hype surrounding the recent conferences is testament to this fact. In turn, the more specific economic and environmental issue of renewable energy development has been pushed to the forefront of energy production policy world-wide. This fact is evidenced by its prominence in the individual national strategies of the Kyoto signatories aimed at reaching their agreed targets.

The immense global value placed on the issues of climate change and renewable energy development is also demonstrated by the refusal of the hundred plus signatories to allow the Protocol to fall in the face of the controversial abstention by the USA, notably the worst offender of greenhouse gas emission. These factors are all contributing to an increase at national and local levels in acceptance of the relevance of environmental issues generally. It was a welcome surprise to the author to discover, when conducting her own mini rural empirical study, how many people at the end of the line were aware of Kyoto and what it signified.

In the context of the European Union, the political significance of the role played by the renewables industry in combating climate change is evident in the policy documents outlined. Its' high priority status is emphasised by the many and varied initiatives devised through the Community Institutions to further renewables development and implementation. The fact that European legislation is currently close to the stage of publication reflects the widely held view that harmonisation of the Law in relation to renewable energy development will further its cause as an industry in its own right. The proposal for the inclusion within the Treaty of a legal basis for renewables as well as the EU's continued commitment to its obligations under Kyoto will also serve the aforementioned cause. However, there is an urgent need for the directive, which is currently under discussion, to be implemented as soon as possible. With each month that goes by the energy consumption of Member States

increases while the percentage produced from renewables is not reaching levels sufficient to offset the increase in consumption as well as contribute to the reduction o f emissions required by 2010. The directive would provide the impetus for Member States to forge ahead with their respective legislation through being flexible yet having the force of European Law. The various programmes and initiatives which aim to cover every aspect of the renewables industry would also be aided by the directive by providing them with a more strict legal basis and thereby helping to produce results at grass-roots level.

The significance of renewable energy development from a National perspective is evidenced by the emphasis placed upon it in the political and legal initiatives outlined in the first section of chapter two. However, in a similar vein to the EU context, there is a need for a comprehensive piece of governing legislation to be implemented as soon as possible whether it be the current Bill or a derivation of it.

The Irish Energy Centre with its separate Renewable Energy Information Office is to be commended for its trojan efforts in the name of renewable energy, but would certainly benefit from its elevation to State Authority status proposed in the new Bill. The most significant practical measure at national level is the AER competitions. However even these are suffering due to a lack of communication and co-operation with the planning authorities. There are two main areas, it is concluded, where National measures are lacking. The first of these is in the information domain. Admittedly a lot of the groundwork has been carried out by the Irish Energy Centre but this is not enough. A government funded nationwide information campaign is required in order to dispel myths surrounding renewable energy development. The REIO would be an ideal body to implement and operate the campaign which would also serve to reinforce for the average Irish person the global and national importance of the development of renewables. It would also help in informing local resident groups on the merits of such renewable programmes with the ultimate aim of alleviating the 'object regardless' vein of thought, which unfortunately is quite prevalent, and helping them to appreciate the wider picture. Another national measure which could readily be implemented and which is indeed tabled in the proposed Bill is the elevation of the IEC to the level of State Authority. This

proposal, though undoubtedly contentious, would enable renewable energy development projects to proceed with a great deal less planning difficulties.

From chapter three we can conclude generally that only a certain number of listed technologies are presently commercially viable in Ireland. This fact is due to both difficulties presented in the area of research and development as well as in the area of climatic and seasonal conditions. The most suitable types of project from an Irish perspective lie in the fields of wind, hydro, biomass and even wave energy to a lesser extent. The suitability of these technologies in an Irish context is demonstrated by their repeated inclusion in the AER competitions.

There are implications to be drawn from the ruling in the PreussenElektra case discussed in chapter four. As is often the case with the judgements of the European Court of Justice, the final ruling appears to be plucked from the sky (in the furtherance of policy objectives) with the necessary legal argument supplemented subsequently. Nevertheless the ruling indirectly provides the renewable energy industry with a competitive advantage over traditional fossil fuel energy production. The apparently narrow approach adopted by the Court in relation to the definition of State Aids is in marked contrast to previous rulings [58] and so it remains to be seen if future cases will shed any light on this apparent indecision on the part of the Court. Notwithstanding these observations any judgement of the ECJ has the force of Law in the Member States and so the renewable energy undertakings will, for the moment at least, enjoy a certain degree of immunity from litigation. However this status would be further assisted by the inclusion in the Treaty of a legal basis for renewable energy development.

On the National front the conclusion to be drawn from the discussion in the latter half of chapter four is that the planning process requires an urgent overhaul. The development of a National Plan under the authority of the proposed 'Sustainable Energy Authority of Ireland' involving the identification of ideal sites for renewables development would be one way of combating the planning difficulties. The Authority

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[58] Case 173/73 Italy v Commission [1974] ECR 709, Case 78/76 Steinike and Weinlig v Germany [1977] ECR 595.

could be modelled along the lines of the Roads Authority with planning preference a given due to its status as a Statutory body. It can be argued that renewable development is even more deserving of such status than the Roads Authority. This move would allow for appropriate compensation to be administered to aggrieved parties while also allowing the present practice of tendering, under the AER competitions, to continue in a similar vein to the tendering of the West link toll road in Dublin. If there is not some measure introduced to alleviate the problems encountered by developers through the planning process then it is unlikely, taking the recent rate of implementation of AER projects into account, that Ireland will arrive anywhere near its target under Kyoto.

To end on a positive note, it must be said that there have been great advances in recent years in the entire area of renewable energy. However it is clear from this study that more work is needed at National, European and indeed Global levels in order that positive results be felt at the bottom of the pile, being in this case individual local Irish developments.

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