



**EXPERT EVALUATION NETWORK
DELIVERING POLICY ANALYSIS ON THE
PERFORMANCE OF COHESION POLICY 2007–2013
YEAR 1 – 2011**

**TASK 1: POLICY PAPER ON RENEWABLE ENERGY AND
ENERGY EFFICIENCY OF RESIDENTIAL HOUSING**

IRELAND

VERSION: FINAL

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Directorate–General Regional Policy**

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LIST OF ABBREVIATIONS

- BER – Low Income Housing Scheme and the Building Energy Rating
- BioEnergy CHP – BioEnergy Combined Heat and Power
- BMW – Border Midland and Western
- CBOs – Community Based Organisations
- CER – Commission for Energy Regulation
- DCENR – Department of Communications, Energy and Natural Resources
- EEN – Expert Evaluation Network
- ERDF – European Regional Development Fund
- ESB – Electricity Supply Board
- ESF – European Social Fund
- LFG – land fill gas
- Mt – Million tons
- NREAP – National Renewable Energy Action Plan
- OP – Operational Programme
- PV – photovoltaic
- PPO – Pure Plant Oil
- REFIT or FIT – Renewable Energy Feed-in Tariff
- RES – Renewable Energy Sources
- RES-E – RES used for electricity production
- RES-T – RES used for transport
- RES-H – RES used for thermal energy production
- SEAI – Sustainable Energy Authority of Ireland
- S&E Southern and Eastern

1. EXECUTIVE SUMMARY

As an island nation Ireland is especially vulnerable in relation to energy supply and price. The country has limited indigenous resources and capacity and is heavily dependent on the importation of oil, gas and coal. Renewable energy and the efficient use of energy in industry, transport and in residential and other buildings are therefore major concerns for the Irish government. A key government policy objective is to achieve a significant increase in the proportion of renewable energy and to ensure that energy is used efficiently in residential buildings. A range of national grants and other incentives are available to achieve this objective. Since 2007 Ireland has experienced a serious banking crisis, a deterioration in economic growth and escalating unemployment and debt. Expenditure on renewable energy has fallen during this period but expenditure on energy efficiency of housing has increased significantly.

European Union energy policy, as reflected in ERDF funding and in various Directives, supports and complements Irish energy policies. However, Ireland has not been eligible for support from the Cohesion Fund since 2003 and energy funding from ERDF is modest in comparison with national funding in the 2007–13 programme period. Support is also concentrated on energy efficiency and conservation in commercial and industrial undertakings rather than in residential housing. The poorer Border Midland and Western (BMW) region fares rather better than the Southern and Eastern (S&E) region in relation to ERDF funding but the level of allocation and expenditure is insufficient to have a significant regional impact.

The Irish government and European Commission share the view that government intervention is essential in relation to renewable energy and energy efficiency. There are a number of economic, social and environmental arguments for this. A stable and sufficient supply of renewal energy and widespread energy efficiency are unlikely to be achieved unless there is active involvement by the Commission and governments throughout Europe.

In Ireland renewables are supported by a range of grants and other incentives such as the Renewable Energy Feed-in Tariff (REFIT). This tariff gives greatest support to off-shore wind investment reflecting the higher capital costs for investors, as well as to biomass CHP and Anaerobic CHP. Ocean wave energy, while eligible for a high level of support is still at an experimental stage in Ireland. In view of Ireland's particular characteristics, there is a strong case for placing much more emphasis on microgeneration. If oil and gas prices continue to increase, renewables will become more cost competitive. Increased awareness of the external costs or negative externalities associated with fossil fuels is also likely to further increase public support for renewables.

2. NATIONAL POLICY

Ireland is heavily dependent on fossil fuels for energy production and consumption and in 2008 renewables comprised only 3.8% of total energy consumption compared with 10.3% for the EU 27¹. The current main sources of renewables are biomass, wind and hydro. The proportion of gross electricity consumption from renewables stands at 11.7% compared with 16.7% in EU 27, but it is planned that this will rise to 33% by 2020 (Government of Ireland, 2007; SEAI, 2010). Whether or not Ireland can meet its targets depends on a range of economic and technical factors relating to renewables, including the level of incentives, as well as wider market considerations such as the supply and price of fossil fuels.

Policy in relation to renewable energy and energy efficiency is especially important in Ireland due to a range of critical factors. These include:

- Ireland's peripheral location
- Its limited indigenous resources
- Unlikely further development of hydro or of nuclear power
- Small energy market
- Heavy dependence on gas, oil and coal
- Heavy reliance on UK for gas imports
- Low generation adequacy and performance of existing plant
- Currently no inter-connector with Britain
- Challenge of intermittent wind capacity and provision
- The critical need for a secure supply of reasonably-priced energy to facilitate economic and social development

In the light of this and as a member of the European Union there has been an increasing acceptance in Ireland of the need for policy initiatives in relation to energy use and efficiency and in particular in relation to the use renewable energy. This section sets out the proposals for energy generation and use, including renewable energy, as published in a number of key official documents since 2006. These include:

- A Green Paper entitled "*Towards a Sustainable Energy Future for Ireland*" (Government of Ireland, 2006)
- A White Paper entitled *Delivering a Sustainable Energy Future for Ireland* (Government of Ireland, 2007)
- *Ireland: National Climate Change Strategy 2007-2012* (Department of the Environment, Heritage and Local Government, 2007)
- Ireland: National Development Plan, 2007-2013, (Government of Ireland, 2007)

¹ Source: Eurostat.

- National Renewable Energy Action Plan: Ireland (Government of Ireland, 2009)

The White Paper, *Delivering a Sustainable Energy Future for Ireland*, pinpoints three strategic goals of Irish energy policy. These are (i) security of energy supply, (ii) sustainability of energy supply and use and (iii) competitiveness of energy supply. *The National Climate Change Strategy 2007–2012* covers similar ground and outlines measures by which Ireland proposes to meet its commitments from Kyoto between 2008 and 2012. The goal is to reduce Ireland's greenhouse gas emissions by over 17 million tonnes (Mt) of carbon dioxide equivalent over this period.

This Report will focus on (i) the goal of sustainability which emphasizes the importance of renewable energy and (ii) the energy efficiency of residential housing.

The policies proposed in the White Paper under the sustainability heading are as follows:

- Address climate change by reduction in greenhouse gas emissions
- Accelerate growth of renewable energy sources
- Promote sustainable use of energy in transport
- Encourage use of wind, ocean, solar and bioenergy resources
- Maximise energy efficiency in all areas of the economy
- Accelerate energy Research and Development and Innovation to support sustainable energy goals

The following targets were set out for renewable energy:

- A target of 15% of electricity consumption from renewable resources was set for 2010 and 33% of electricity consumption for 2020
- At least 400 MW from CHP by 2010 and 800 MW by 2020
- At least 500 MW of installed ocean energy capacity by 2020
- A minimum of 5% market penetration of renewables in the heat market by 2010 and 12% in 2020 in the domestic, community, commercial and industrial environments
- A target of 5.75% biofuels market penetration by 2010 and 10% by 2020
- A target of 30% biodiesel in new public transport buses
- Biomass to contribute up to 30% of energy input at peat stations by 2015
- Use of 100% pure plant oil (PPO) in fleets maintained by local authorities and public bodies

A range of schemes have been in place since 2007 to incentivise the development and deployment of renewable energy as well as promoting energy efficiency in commercial, industrial and residential buildings (See Annex 1 and 2). The *National Renewable Energy Action Plan* of Ireland sets out the steps envisaged for electricity (RES-E), transport (RES-T) and thermal energy (RES-H) in order to meet the EU 2020 targets.

Schemes are administered by a number of bodies including the key Government Department of Communications, Energy and Natural Resources (DCENR), the Sustainable Energy Authority of Ireland (SEAI), the Electricity Supply Board (ESB), the Commission on Energy Regulation (CER) and a range of voluntary Community Based Organisations (CBOs). The main Government expenditure in the form of subsidies or grants is carried out under the auspices of SEAI. A total of EUR 58 million was spent on SEAI schemes in 2008 and this rose to EUR 72.6 million in 2009, increasing further to EUR 105.2 million in 2010. Details are set out for expenditure on renewable energy and energy efficiency of housing in Table A.

Table A – Expenditure on SEAI Energy Schemes, 2008 and 2009 (EUR million)

<i>Renewable Energy</i>	<i>2008</i>	<i>2009</i>
Renewable Energy RD&D	2.3	2.4
Greener Homes	22.5	11.7
ReHeat Deployment	4.1	1.8
CHP Deployment	2.1	2.4
Ocean Energy	1.1	3.8
Micro Generation	–	0.6
<i>Total</i>	32.1	22.7
<i>Energy Efficiency of Housing</i>		
Low Income/Warmer Home Scheme	5.9	12.8
Home Energy Rating	2.4	3.8
House of Tomorrow	8.8	1.6
Home Energy Saving Pilot	1.4	0.2
Home Energy Saving	–	17.9
<i>Total</i>	18.4	36.2
<i>Energy Efficiency : Industry, Business, Public Sector</i>		
Industry and Business	4.3	5.3
Public Sector	0.9	5.2
<i>Total</i>	5.2	10.5
<i>Innovation and Integration</i>		
Renewable Energy Information Office	0.6	0.9
Sustainable Energy Zone	0.6	0.7
Smart Metering	0.7	0.6
Energy Policy Statistics Unit	0.5	1.1
Transport	–	0.0
<i>Total</i>	2.4	3.3
<i>Grand Total</i>	58.0	72.7

Source: Sustainable Energy Authority of Ireland

In relation to renewable energy the SEAI allocated almost EUR 32.1 million in 2008 and EUR 22.7 million in 2009. The Greener Homes and the ReHeat Deployment Schemes accounted

for most of the expenditure in this category. However, overall expenditure on renewable energy fell further to EUR 15.2 million in 2010.

As regards energy efficiency of housing, a total of EUR 54.6 million was spent over the two years in question. This increased to EUR 86.1 million in 2010. The Home Energy Saving scheme (piloted in 2008 and mainstreamed in 2009 with expenditure of almost EUR 18 million and increased to EUR 47.4 million in 2010) was by far the most important area of activity. This was followed by the Low Income/Warmer Homes Scheme which increased to EUR 30.3 million in 2010. A new Retrofit programme was also initiated in 2010 with expenditure of EUR 8.1 million (DCENR and SEAI, 2011).

In addition to the schemes outlined in Annex 1, a range of other schemes relating to renewable energy and energy efficiency of housing are given in Annex 2. Many of these are not grant-aided but are based on a Renewable Energy Feed-in Tariff (REFIT or FIT), tax incentives and regulatory measures rendering comparison between the different schemes difficult. Furthermore, while the broad financial totals in Table A are indicative of the importance attached to particular categories, it is difficult to compare the rate of support for the different renewable sources such as ocean or wind. Thus, ocean energy which is at an experimental stage, receives grant aid administered by SEAI as set out in Table A, as well as being eligible for REFIT, but in the case of wind energy, which is now operational, support is mainly based on REFIT.

On the basis of Table A it is clear that overall expenditure on renewable energy has fallen back by almost one third between 2008 and 2009 and fell further in 2010 largely due to a significant decrease in the Greener Homes and ReHeat Deployment categories. These two categories have now been closed to applications for 2011 due to non-availability of exchequer funding. The ocean energy category increased significantly between 2008 and 2009 (although from a low base) but fell back to EUR 2.8 million in 2010. While the research and CHP categories showed modest increases between 2008 and 2009, they both decreased in 2010 and the CHP Programme has also now been closed for 2011 due to lack of funding.

Overall expenditure on energy efficiency of residential housing almost doubled between 2008 and 2009 and more than doubled again in 2010. This was accounted for mainly by the Home Energy Saving scheme, the Low Income/Warmer Homes Scheme and the Building Energy Rating (BER) scheme which, in effect, support renewable energy. Therefore, while there is variation in expenditure on and support for different schemes, the overall budget for energy efficiency more than counteracted the apparent drop in support for renewables. Furthermore, as mentioned above, extra funding was allocated in 2010 in order to extend a Retrofit programme in residential housing. This programme is seen as a key element of much-needed job creation. Therefore while some schemes are being closed down due to the

economic downturn, overall expenditure has increased in order to tackle energy efficiency and at the same time boost job creation.

The Electricity Supply Board (ESB) is the state body with responsibility for the generation of electricity and has a range of power stations using fossil fuels and renewable sources such as hydro, thermal and wind. In line with government policy, the ESB aims to ensure that renewable energy will comprise 33% of generation by 2020. The Board, through ESB International, has made significant investments in wind generation in Ireland and in the UK and has an operational wind portfolio of 235 MW with a further 96 MW of wind capacity under construction. The Board also actively promotes energy efficiency in housing (ESB, 2008, 2009 and 2010).

As regards possible regional variation in relation to policy, the vast majority of energy schemes are national ones and the grant levels and tax incentives are the same for all regions. However, in the BMW region ERDF support is slightly greater than in the S&E region (see below). This reflects the long-standing locational and structural challenges facing the BMW region and in view of the matching national funding, it would be expected that resulting policy would be more active in this region. This is examined later in the Report. Some regional agencies in the BMW region are taking a particularly active role in developing renewable energy and energy efficiency options. For example, the Western Development Commission has examined the potential of the wood heat and wind energy sectors for the BMW region, including community ownership of wind farms (Western Development Commission, 2008 and 2009).

3. ERDF AND COHESION FUND SUPPORT AND CONTRIBUTION TO NATIONAL POLICY

ERDF and Directive 2009/28/EC

While the European Commission has emphasized the importance of renewable energy and energy efficiency for some years, the approach to renewable energy received a new impetus with Directive 2009/28/EC. This Directive lays down that:

- (i) Mandatory targets should be established to achieve a 20% share of energy consumption from renewable sources by 2020
- (ii) Each member state must submit a National Renewable Energy Action Plan (NREAP)
- (ii) A mandatory national target of 10% should be established as the share from renewable sources in transport in Community energy consumption by 2020.

Main ERDF Measures

The main measures in the ERDF programmes to promote renewable energy and energy efficiency as reflected in Operational Programmes and Annual Implementation Reports are as follows:

Renewable energy deployment measures: The primary focus is on addressing barriers to the large-scale deployment of wind, the emerging potential and deployment of small scale biomass and the integration of bio-fuels, together with R&D on ocean energy where a range of Irish Universities and Institutes of Technology are supported. A CHP and ReHeat programme have been established and an Ocean Energy Development Unit is now active.

Energy efficiency first measures: The focus is placed on action which will enable Ireland to reach and exceed the Government formal targets under the Energy Efficiency Action Plan required for the Energy Services Directive. The main funded initiative to date is the Energy for Business Programme.

Integration and innovation measures: Integrating sustainable energy practices and structures into public policies and the development of regional and national infrastructures is the core objective. Two sets of activities are envisaged: the integration of sustainable energy policy measures at a regional and city level and the smaller-scale piloting, demonstration, and evaluation of sustainable energy technology options, including those in the renewable energy, energy efficiency and urban transport areas. A Sustainable Energy Zone was established in Dundalk in the North East of Ireland on a pilot basis as a partner city in the EU Concerto programme. However, no funding is currently available to continue or extend this initiative.

It seems clear that ERDF renewable energy stated policies aim to encourage similar sources of renewable energy as national support in Ireland e.g. wind, ocean and bio-fuels. The measures on energy efficiency and integration and innovation also closely mirror the approach taken at national level as outlined above. However, as indicated below the scale of ERDF support is insufficient to have a significant impact.

Scale of Support

The allocation in the Operational Programmes to the two regions for energy efficiency and management (Code 43) was a total of EUR 25 million or 6.7% of the ERDF for the programme period. While no specific allocation was made to renewable energy (Code 42), there is an obvious inter-connection between the two categories See Annex Tables A and B.

It should be noted however that energy efficiency in residential housing is not included in ERDF funding for Ireland in the 2007–2013 period apart from measures specific to social housing. In May 2009, however, the European Parliament and the 27 Member States adopted Regulation (EC) 397/2009 which amended Regulation 1080/2006 on the European Regional

Development Fund. The new Regulation enables EU States and regions to use ERDF funding to invest in energy efficiency and renewable energy investments in housing. Up to 4% of the total ERDF allocation can be used for this purpose. In Ireland's case, this could amount to an additional EUR 15 million for energy efficiency in housing. This measure is designed to improve "social cohesion" and therefore social housing would tend to get priority, but private housing is not excluded. Whether this new source of ERDF funding has been sought or spent in Ireland is unclear at this stage.

There is a little variation in the scale of support for energy efficiency in general in the two Irish regions. In the 2007 Operational Programme the BMW region had been allocated a total of EUR 28 million. However, this was revised downwards to EUR 15 million or 4% of the total ERDF in October 2009 and the OP Monitoring Committee recommended a further downward revision in May 2011. The original allocation to the S&E region of EUR 10 million (2.6% of total ERDF) remains unchanged.

In response to the economic downturn the scale of total ERDF support was increased in all categories in the BMW region from a 40% to a 50% share. However, while ERDF support encourages national spending, the overall size of the reduced ERDF energy contribution in this programme period is insufficient to have even a modest impact or to encourage spending at a time of severe national retrenchment. Of the total EUR 25 million of ERDF allocated to energy in the two Irish regions, only EUR 7.5 million has been committed (See Annex Table B). The slowdown has been particularly evident in the BMW region where only EUR 3.8 million has been spent on energy over the entire period 2007–2010 (BMW Regional Assembly Draft AIR, 2010). There are two basic reasons for this: the significant slowdown in demand from both businesses and households and the inability of the government to finance the national contribution.

4. RATIONALE FOR PUBLIC INTERVENTION

The case for public intervention in relation to renewable energy and energy efficiency is spelled out in detail in the two Operational Programmes and in a variety of Directives, Regulations and Communications from the European Commission and the European Parliament. The case for intervention is also clearly set out in Irish official documents where information is provided on policy implementation instruments to be achieved with matched funding. According to these various sources, increasing renewable energy and improving energy efficiency of residential housing will :

- Make a major contribution to economic growth, exports and job creation
- Reduce the level of "external costs" or "negative externalities" associated with the use of fossil fuels

- Improve security of supply of energy
- Provide competition with fossil fuels where prices are volatile
- Provide increased local and regional opportunities
- Ensure savings to businesses and households from energy conservation and efficiency
- Satisfy the increased public demand for green goods and services
- Reduce greenhouse gases
- Make a contribution to counteracting adverse climate change

Irish official publications making the case for public intervention on the above grounds include the Green and White Papers given in Section 2 together with The *National Strategic Framework for Ireland* (Department of Finance, 2007), *Building Ireland Smart Economy : A Framework for Sustainable Economic Renewal* (Department of An Taoiseach, 2008), *Environmental Goods and Services on the Island of Ireland : Enterprise Opportunities and Policy Recommendations* (Forfas and InterTrade Ireland, 2008), *Science, Technology and Innovation : Delivering the Smart Economy* (Department of Enterprise and Employment, 2009), *Developing the Green Economy in Ireland : Report of a High Level Group* (Government of Ireland, 2009) and *Renewable Energy in Ireland* (SEAI, 2010).

These various publications make reference indirectly to profitability by arguing that savings in terms of both long-term economic and social costs will accrue to the economy, to companies and to individuals. Increased social and environmental returns are clearly linked to greater profitability.

As regards public intervention a distinction is made between the different renewable sources. Wave power is eligible for the highest level of support, but is currently at an experimental stage in Ireland. This is followed by Anaerobic Digestion, with CHP of less than 500 kW, offshore wind power and Biomass, with CHP of less than 1,500 kW. It should be noted that a “queue system” is operated by the Commission for Energy Regulation (CER) for all wind applications and not all applicants receive offers due to the danger of over-capacity. This could change in the future with better inter-connection. At present biomass is favoured and relatively well-incentivised in view of the extent of “set aside” of agricultural land and the small holding structure of much of Irish agriculture. A significant reduction in food production is therefore unlikely to occur if biomass expansion is encouraged. The different incentives for energy efficiency of housing were set out above in Table A but as from 2011 **increased** emphasis is being placed on a new Retrofit programme, managed by SEAI.

There is constant debate in Ireland regarding the rationale for and methods of supporting renewable energy sources and improving energy efficiency of residential buildings. This is largely due to the perceived volatility of supply and the escalation of oil and gas prices

which affect Ireland considerably. National newspapers also publish regular features on the case for renewables and energy efficiency and the Electricity Supply Board and several TV stations and magazines such as ConstructIreland carry positive images and messages on a regular basis. Therefore, considerable numbers of households and businesses have taken basic action to conserve energy by insulation and installation of **water heating** solar panels and more efficient heating systems with the assistance of available incentives.

5. RATE OF SUPPORT AND PROFITABILITY

One of the key supports for the production of renewable energy in Ireland is the Renewal Energy Feed-In Tariff (REFIT). This scheme provides a guaranteed price for electricity produced by new plants for a period of 15 years. The original scheme introduced in 2006 supported large-scale wind farms of more than 5 MW, small scale wind farms of less than 5MW, Hydro less than 5 MW, Biomass land fill gas (LFG) and other Biomass. The scheme was extended in June 2008 to include new Offshore Wind, Ocean Energy and BioEnergy Combined Heat and Power (BioEnergy CHP) plants. Support levels are linked to the Consumer Price Index. Support is based on the level of production (See Table B).

It is clear that there are significant variations in support for the different sources of renewables with Anaerobic CHP, Biomass CHP, Offshore wind and wave power eligible for much greater support than Hydro or Onshore wind. This reflects the difficulties in encouraging farmers to switch to Biomass from traditional crops and the significant capital costs for investors involved in offshore wind and wave development which are unlikely to be recovered quickly by prospective profits. While wave energy is eligible for a high level of support, this is not as yet operational and is unlikely to be for some time. However, ongoing research in this area is warranted (FitzGerald, 2011).

Table B – Support for renewables in electricity generation – Ireland (EUR/mWh)

Domestic	171.2
Industry	118.8
Biomass	FIT 83.81 (guaranteed for 15 years)
Biomass CHP	FIT 120 – 140
Biowaste	FIT 83.81 (guaranteed for 15 years)
Anaerobic CHP	FIT 130 – 150
Small hydro	FIT 83.81 (maximum 5 MW)
Wind onshore	FIT 66.35 – 68.68 (guaranteed for 15 years. Highest more than 5MW)
Wind offshore	FIT 140 (guaranteed for 15 years)
Wave	FIT 220
Microgeneration*	Small wind/PV FIT 90 (max 5kW) for energy exported to grid only

*Microgeneration: Currently a FIT of 190 is applied to the first 3MWh, thereafter reverting to 90. Source: Ecofys and Department of Communications, Energy and Natural Resources, 2011

While microgeneration e.g. photovoltaic (PV) and small-scale wind is becoming popular in some households, these renewables receives modest support in Ireland and a number of small producers, consumers and scientists argue that more official incentives are warranted. The tariff is currently not available for commercial firms and the domestic tariff is only for exports to the grid and is lower than in many other European countries. See also Section 6 below.

Support levels for renewables change over time and are linked to the Consumer Price Index but do not vary between regions. Significant increases in the cost of oil and gas in recent times are likely to make renewables more competitive and could lead to increased support for renewables and more emphasis on energy efficiency measures. With technological advance and increased scale and reduced unit costs in due course, it can be expected that the rate of required government support will be less. Whatever the arguments for renewables and energy efficiency, security of supply and price of the various alternatives are likely to be key determinants of government and public support in the years ahead.

6. COSTS, PUBLIC SUPPORT AND PRICES

This Section provides estimates of the cost of producing electricity from a selected number of energy sources. Before doing so, however, it is important to point out that this is not a simple exercise. One commonly used cost concept is “levelised cost” or “life cycle cost” which is the lifetime discounted cost of generation converted to a unit cost such as EUR/MWh or EUR/kWh. These are the “private costs” borne by producers and they can vary significantly depending on a whole range of factors including the size of capital, fixed and variable costs, and the exact technology and scale of production (McDonald, 2010). Furthermore, the usual estimates of “private costs” borne by the producer of an energy source rarely represent the full costs associated with producing electricity. This is especially so in the case of fossil fuels such as coal, oil and gas where significant “external costs” (also called “social costs” or “negative externalities”) are imposed on the wider society but are not borne by the producer. In the case of coal, for example, the EU Externe Network Project has estimated that the additional external costs of producing electricity can be as high as 10 cent per kWh across the European Union for coal, 11 cent for oil, 5 cent for peat and 4 cent for gas. In Ireland the external costs range between 6–8 cent for coal and 3–4 cent for peat (<http://www.externe.info/>). The existence of such external costs is one of the main arguments for intervention set out in Section 4. It is now widely accepted that the emission of significant levels of CO₂ from fossil fuels have major implications in terms of air and water pollution, deterioration of buildings and crops, global warming, climate change, rising sea levels, flooding and general environmental degradation as well as personal health.

These additional costs are of critical relevance and must be given due recognition when evaluating the total costs and benefits of the various energy sources.

The EU Externe Network Project Renewable clearly illustrates that renewable sources of energy such as wind, photovoltaic and hydro do not have the same adverse implications and impose far less “external costs”. Large onshore wind farms impose some external costs in terms of extra noise and visual intrusion on the landscape. It seems clear, however, that the negative implications of producing electricity from renewables are much less than in the case of fossils fuels.

Even comparisons between the costs of renewables can be problematic and complex. Key questions arise such as “what is the opportunity cost (or benefit foregone) of using this resource”. For example, it is normally necessary to set aside land used for food production in order to produce biomass. This is a benefit foregone. A further important consideration is the level of the “import content” of the raw materials for each energy source. In the case of large wind farms in Ireland and in the absence of a local manufacturing facility, the large turbines must currently be imported from other countries, thus contributing to a balance of payments problem.

It is also necessary to take into account the benefits of the various energy sources. One of the main benefits attributed to fossils fuels is that they can virtually guarantee “security of supply” at least in the short term, and this is a central objective of most governments. However, in view of Ireland’s high dependence on imports, there is no guarantee of this. Furthermore, with the current rate of depletion, long term security of supply may be in serious doubt. There is a case, therefore, for much more careful conservation and allocation of remaining stocks of fossil fuels.

In the light of the above private cost estimates must be treated with caution, especially for fossil fuels in view of the external costs involved. For renewables too the range of costs could be substantial. In the case of wind, for example, the capital cost of turbines, range from about EUR 1.1 m/MW to EUR 1.4 m/MW of generation capacity depending on size while connection costs range between EUR 150K and EUR 300K/MW (International Energy Agency, 2008). However, connection costs could be much higher if the grid needed strengthening, thus raising the overall cost per unit.

Bearing these points in mind estimates are provided for selected technologies in Table C.

Table C – Cost Estimates for Producing Electricity : Ireland (EUR/kWh)

	<i>Levelised Cost</i>
	EUR/kWh
AD CHP <500	0.15
AD CHP >500	0.13
Biomass CHP <1,500	0.13
Biomass >1,500	0.11
Biomass Combustion	0.08
Onshore Large wind	0.07
Onshore small wind	0.09
Offshore wind	0.14
Hydro	0.08
Microgeneration (PV/wind)	0.13
Coal	0.07
Gas	0.08
Oil	0.07
Peat	0.06

Source: SEAI and DCENR, Dublin and Wrixon, 2011 for microgeneration.

It is clear that the levelised cost estimates per kWh are least in the case of the fossil fuels (coal, gas, oil and peat). However, as mentioned earlier the external costs associated with coal would increase the overall levelised cost by up to 10 cent. Significant increases must also be taken into account for oil thus making its total costs similar to or greater than several renewables. Although gas and peat are judged to be cleaner sources, there are still external costs and accompanying concerns.

Onshore wind and hydro are the most cost effective renewables but, as mentioned earlier, onshore wind has additional associated external costs and is subject to various locational constraints while the potential for further hydro in Ireland is limited.

Microgeneration, PV/wind has not been developed as quickly in Ireland as it has in many other European countries despite its appropriateness and the dispersed settlement pattern. One reason for this is that the tariff level payable for microgeneration is one of the lowest in Europe at 9c/kWh. Producers, consumers and scientists consulted during this study have argued that photovoltaic has particular advantages in the southern regions of Ireland where there is a good solar regime and low ambient temperatures making energy generation more efficient. It is also virtually maintenance-free; yet it has considerable technological innovation, cost-cutting and employment potential (Government of Ireland, 2007; Micropower, 2011; Wrixon, 2011).

House Prices and Rents

It would be expected that house prices and rents in Ireland would include a premium for energy efficiency, especially since the Buildings Energy Rating system was introduced. However, there is little evidence of a premium to date. House prices and private rents in Ireland have fallen significantly over the last few years and are likely to decline further in view of excess supply and the economic downturn. When stability returns in due course, a research study should be carried out to assess the relationship between energy efficiency and house prices as well as rents.

7. CONCLUSIONS

In view of Ireland's heavy dependence on the importation of fossil fuels the Irish government and the European Commission have taken a particular interest in renewable energy and energy efficiency and have clear and similar stated policy objectives. The Irish government has a range of measures in place to achieve its objectives. Due to the economic downturn expenditure on renewable energy has been cut in recent years, although expenditure on energy efficiency has increased significantly. EU funding via ERDF complements the various Irish initiatives. However, the ERDF allocation for the 2007–13 programming period is modest and, although this support influences the direction of expenditure, it is currently too small to have a significant national or regional impact.

The economic, social and environmental arguments for European Commission and government intervention in relation to energy are clear and widely accepted. In particular, it is essential to recognise that significant "external costs" must be taken into account when assessing the cost of producing electricity from the different energy sources. This is especially important in relation to fossil fuels and strengthens the case for further support for renewables. Despite the current economic difficulties facing Ireland, Irish and European Union policies must continue to give serious attention to renewable energy and energy efficiency.

Among the other key issues deserving ongoing attention in Ireland are inter-connection with Britain, energy storage and an integrated approach to energy supply and generation.

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ANNEX

Annex 1. Main SEAI renewable energy schemes in Ireland

Renewable Energy RD&D

The aim of this scheme is to accelerate the deployment rate of renewable technology and thus improve implementation of renewable energy in the Irish market.

Greener Homes Scheme

This programme facilitates the wider deployment of renewable energy in the residential sector and underpins the development of a sustainable market, resulting in reduced dependence on fossil fuels and lower emissions.

BioHeat Deployment

The programme aims to increase the deployment of renewable energy heating technologies in the commercial and industrial sectors.

Combined Heat and Power Deployment

The CHP Deployment programme aims to increase the deployment of small-scale (less than 1 MWe) fossil-fired and biomass CHP systems in accordance with the requirements contained in the EU Directive on CHP.

Ocean Energy

An Ocean Energy Unit has been established to implement the government policy decision to accelerate the development and deployment of Ocean Energy technologies (wave and tidal) in Ireland. The aim is to increase the capacity for research and development in academic institutions and commercial firms involved in developing devices.

Micro Generation

The aim is to assess the technical, financial and regulatory challenges relevant to the deployment of small and micro-generation technologies.

SEAI Residential Energy Efficiency schemes in Ireland

Low Income Housing/Warmer Homes Scheme

This programme targets homes experiencing fuel poverty and where residents are unable to afford the capital investment necessary to improve energy performance.

Home Energy Rating

The Home Energy Rating Scheme (BER) was established under the EU Energy Performance of Buildings Regulations 2006. The SEAI is responsible for registering BER assessors, logging assessments and managing the scheme.

House of Tomorrow

This programme encourages the uptake of superior sustainable energy planning, design, specifications and practices in the construction of new homes and the refurbishment of old ones.

Home Energy Saving Pilot

This pilot scheme was established in 2008 to encourage home owners to retrofit energy saving features in older existing dwellings in the counties of Clare, Limerick, Tipperary in the west of the country and in Louth in the north east.

Home Energy Saving

This scheme mainstreamed the above scheme in 2009. Like the pilot it is designed to retrofit energy saving features in older existing homes.

Annex 2– Measures to promote the use of energy from renewable resources in Ireland

<i>Name and reference of the measure</i>	<i>Type of measure</i>	<i>Expected result</i>	<i>Targeted group and or activity</i>	<i>Existing or planned</i>	<i>Start and end dates of the measure</i>
1. Biofuels Mineral Oil Tax Relief (MOTR) Schemes	Fiscal Measure	Increased production and use of Biofuels on Irish transport fuels market	Biofuel Producers	Existing	2005 to end 2010
2. Biofuel Obligation	Regulatory	Increased production and use of Biofuels on Irish transport fuels market	Biofuel Producers	Existing	Jul-10
3. ReHeat	Financial	Increased deployment of renewable heating technologies in the commercial, industrial and public sectors. Provides financial assistance for boilers fuelled by wood chips and wood pellets, solar thermal collectors, and heat pumps.	Commercial, agricultural, industrial and service sectors, as well as energy supply companies.	Existing	2006 onwards
4. CHP Deployment grant scheme (30% on equipment purchase and 40% for feasibility studies)	Financial	Aims to increase the deployment of small scale (<1MWe) biomass CHP systems across Ireland in accordance with requirements of EU Directive on CHP.	Commercial, agricultural, industrial and service sectors as well as energy supply companies (ESCOs).	Existing	2006 onwards
5. Greener Homes Scheme	Financial	Facilitates the wider deployment of renewable-energy heating technologies in the residential sector and supports the development of a sustainable market, resulting in reduced dependence on fossil fuel and lower CO2 emissions.	Homeowners	Existing	2006 onwards
6. Bioenergy scheme for the production of nonfood crops	Financial	Grant support for the planting of perennial biomass crops (willow and miscanthus) – contributes to biomass needs of renewable energy sector	Agriculture sector	Existing	Since 2007
7. Electric Vehicles	Financial	Increased use of electric vehicles in Ireland.	General Public	Existing and Planned	Vehicle registration Scheme already in place to end December 2012 and grant scheme (subject to approval)

<i>Name and reference of the measure</i>	<i>Type of measure</i>	<i>Expected result</i>	<i>Targeted group and or activity</i>	<i>Existing or planned</i>	<i>Start and end dates of the measure</i>
					of minister for Finance) to commence January 2011 to December 2012.
8. Alternative Energy Requirement (AER) Programmes I- VI	Financial	Increase in RES-E following six separate calls for tender. There is 532MW of Renewable generation in AER.	Generators of electricity from renewable sources	Existing but closed for new applicants	There were 6 separate calls for tender beginning in the mid 1990s. The last call for tender was in 2003.
9. Renewable Energy Feed-in Tariff scheme (REFIT)	Financial	Increase in electricity from renewable energy sources via a feed in tariff mechanism. (initially up to 1450MW, but to be extended in 2010 (subject to state aid clearance) to cover 2020 target/Gate 3)	Generators and suppliers of electricity from renewable sources	Existing (However processing of any new applications is subject to state aid approval for an extension of REFIT.)	2007 onwards
10. Rollout and implementation of Gate 3 renewable generation grid connection offers	Soft	Under Gate 3, 3900MW of Renewable generation are receiving grid connection offers over 18 months from December 2009. The rollout and implementation of Gate 3 by the regulator, TSO and DSO will ensure that Ireland can reach its 40% RESE target.	Generators of RESE	Existing and planned. It is noted that constraint reports included in connection offers may need to be adjusted following a decision on the consultation on Principles of Dispatch and the Design of the market schedule in the Trading & Settlement Code.	December 2009 onwards
11. Rollout of Grid 25 strategy	Financial / Infrastructural	Grid 25 provides the framework to build a more cost effective and efficient system to cater for the integration of increasing amounts of renewable generation and will necessitate EUR 4 billion investment in the grid. An SEA will be carried out on the implementation programme for Grid25.	Generators of RESE	Existing and planned (Grid 25 is in the implementation and rollout phase.)	2008 onwards
12. All Island Grid	Technical	The study examines a range of Generation	TSO, regulator, policy	Existing	2009-2012

<i>Name and reference of the measure</i>	<i>Type of measure</i>	<i>Expected result</i>	<i>Targeted group and or activity</i>	<i>Existing or planned</i>	<i>Start and end dates of the measure</i>
Study		portfolios for Ireland, the ability of our power system to handle various amounts of electricity from renewable sources, the investment levels required, and the climate change and security of supply benefits that would accrue	makers, industry		
13. East West Interconnector	Financial / Infrastructural	A 500MW interconnector between Ireland and the UK due to be operational by 2012 which will allow for electricity exports from Ireland to the UK and facilitate integration of Renewable generation on the Irish electricity system. It is noted that a policy framework will have to be implemented around use of the interconnector.	Transmission System Operator, Generators of RESE	Existing	2009-2012
14. Small, Renewable, Low carbon generation connecting to the grid outside the 'Gate' process	Soft /infrastructural	A policy that facilitates renewables by providing for grid connections outside the gate process for certain small, renewable, low carbon generators	Small, renewable and low carbon generators such as small bio-energy, wave, tidal generators	Existing	July 2009 onwards
15. Revised Application procedures for authorisations to construct and licences to generate	Regulatory	SI 383 and 384 of 2008 simplify the granting of authorisations and licenses to generating stations with installed capacity of 10MW or less. CER/10/098 introduced a simplified procedure for generators with installed capacity up to 40MW.	Those constructing generating stations with installed capacity not exceeding 40MW and generating electricity	Existing	June 2010
16. Principles of Dispatch and the Design of the Market Schedule in the Trading & Settlement Code	Regulatory	The Single Electricity Market (SEM) Committee is currently undertaking a consultation in this field. The policy will have important implications for how renewable generation is to be treated in the SEM.	Those operating in the Single Electricity Market	Existing / Planned	2010 / 2011
17. Relief for investment in	Financial (Tax relief)	The relief for investment applies to corporate equity investments in solar,	Companies paying corporation tax,	Existing	1999-2011

<i>Name and reference of the measure</i>	<i>Type of measure</i>	<i>Expected result</i>	<i>Targeted group and or activity</i>	<i>Existing or planned</i>	<i>Start and end dates of the measure</i>
renewable energy generation – Section 486B, Tax Consolidation Act (TCA) 1997		wind, hydro or biomass technology generation projects. The relief is given in the form of a deduction from a company's profits for its direct investment in new ordinary shares in a qualifying renewable energy company.	Generators of solar, wind, hydro and biomass generation		
18. Small and Micro Scale Generation Pilot Programme (Grants).	Financial	The pilot is expected to inform on the technical, market and regulatory issues associated with the installation, network connection and operation of small and micro scale generation technologies.	Micro renewable Generators	Existing (closed for new applications)	Launched in February 2009. Initial results from the monitoring programme are expected within the 3rd quarter 2010, with monitoring continuing through 2011.
19. Part L of the Second Schedule of the Building Regulations 1997–2008	Regulatory	In relation to Dwellings, Part L 3(b) requires that “a reasonable proportion of the energy consumption to meet the energy performance of the dwellings is provided by renewable energy sources”. This provision is expected to increase use of renewable energy in dwellings	Domestic (dwellings)	Existing The Department of Environment is developing a strategic framework to achieve a carbon neutral standard for dwellings by 2013. Increased use of onsite renewables will be a key element of the framework. Building Regulations Part L Conservation of Fuel and Energy) for buildings other than dwellings are being reviewed in 2010.	2008
20. SI 666 of 2006 Part 2 Alternative Energy Systems	Regulatory	Shall ensure before work commences that consideration is given to the technical, environmental and economic feasibility of installing alternative energy systems: this measure should help increase renewables	Owners / Designers of Large new buildings (over 1000m ²)	Existing	2006 onwards

<i>Name and reference of the measure</i>	<i>Type of measure</i>	<i>Expected result</i>	<i>Targeted group and or activity</i>	<i>Existing or planned</i>	<i>Start and end dates of the measure</i>
		in large buildings			
21. Statutory Instrument (SI) 83 of 2007 and SI 235 of 2008	Regulatory	Conditional planning exemptions for renewable technologies that meet specified criteria – expected to encourage uptake of energy from renewable technologies	Domestic, business and agricultural sectors	Existing	2007 and 2008 onwards
22. Foreshore consent process for offshore energy projects	Regulatory	The Minister for Environment intends to streamline and modernise the consent process for certain developments in the offshore environment, including offshore renewable energy projects such as wave, wind and tidal technologies on a phased basis in order to ensure service continuity in relation to the processing of offshore applications and providing an improved timeline for making decisions on these projects.	Generators of RESE operating in the offshore environment	Existing/ Planned	2010 onwards
23. Planning and Development (Strategic Infrastructure) Act 2006 (No. 27 of 2006)	Legislative/Regulatory	The Act provides for, among other things, the establishment of a streamlined consent procedure for certain types of major infrastructure and a specialized division within the planning board to take decisions.	Transmission System Operator (for strategic projects)	Existing	2006 onwards
24. Planning & Development (Amendment) Bill 2009	Legislative/Regulatory	The Bill provides for changes to the planning system and proposed changes will have certain implications for the renewable energy sector.	Developers who have to go through the planning process	Planned	The bill has been moving through the legislative process since 2009
25. Accelerated Capital Allowances (ACA) for Energy Efficient Equipment (SI 393 of 2009)	Financial (Tax Relief)	Specifies certain technical standards to be met by renewable energy products to be eligible for the ACA tax relief. Technologies covered include wind turbines >5kw, solar PV and CHP.	Companies paying corporation tax	Existing with biomass boilers to be added in 2010	2009 onwards
26. Ocean Energy	Financial / Soft	Government target of 500MW installed by 2020. The Ocean Energy Prototype	Developers of wave and tidal devices Offshore	Existing	2008 onwards

<i>Name and reference of the measure</i>	<i>Type of measure</i>	<i>Expected result</i>	<i>Targeted group and or activity</i>	<i>Existing or planned</i>	<i>Start and end dates of the measure</i>
		Development Fund is aimed at stimulating the development and deployment of Ocean Energy (OE) devices and systems. The Ocean Energy Development Unit is working on a grid connected test facility for wave energy devices. A strategic environmental assessment (SEA) on offshore wind, wave & tidal development scenarios is underway	wind Industry		
27. Renewable Energy RD &D Programme	Financial Financial support is available in three categories: Category 1: Shared-cost Demonstration Category 2: Shared-cost R&D Category 3: Commissioned Public Good Activities	Programme primarily focused on stimulating the deployment of renewable energy technologies that are close to market, and on assessing the development of technologies that are close to market, and on assessing the development of technologies that have prospects for the future.	Developers of renewable energy technologies	Existing	July 2002 onwards
28. Operational and Technical Research	Soft / Technical	Studies expected to assist increasing renewable generation on the grid e.g. Facilitation of Renewable Studies; Offshore Network Research; Wind Security Assessment Tool	Transmission system operator, renewable generators	Existing	Ongoing
29. Renewable Energy Information Office (under the Sustainable Energy Authority of Ireland)	Soft	This is an information service on renewable energy that provides the public with a service whereby they can easily obtain practical information on renewable energy	General public, industry, business	Existing	Ongoing
30. Local energy Agencies	Soft	The network of local energy agencies collective goal is to support the	General public, industry, business	Existing	Ongoing

<i>Name and reference of the measure</i>	<i>Type of measure</i>	<i>Expected result</i>	<i>Targeted group and or activity</i>	<i>Existing or planned</i>	<i>Start and end dates of the measure</i>
		development and implementation of energy policy. Information, advice and skills provided through the local agencies can enhance knowledge on options for increased renewable energy at local level			
31. Tree Felling Policy for Wind Farm Development	Soft	The Department of Agriculture, Fisheries and Food recently introduced a tree felling policy for wind farm development. This is to align the two policy areas. Industry and DAFF are in discussion on the policy.	Wind Farm Developers / Forestry sector	Existing	2009 onwards
32. Smart metering pilot programme	Technical /Soft	The results of the smart metering pilot will inform an analysis of the feasibility of implementing smart meters throughout Ireland. Electricity and gas smart meter trials are underway.	Electricity and Gas consumers, policy makers	Existing	2007 onwards
33. Charles Parsons Energy Research Awards	Financial / Soft	The objective of the awards (overseen by Science Foundation Ireland) is to stimulate and develop energy research in Ireland by providing funding for research groups to undertake energy research particularly in priority areas. A specific aim is to increase significantly overall, research capacity and in particular attract more engineers into energy research.	Energy researchers, universities, industry, policy makers	Existing	2006
34. Draft Geothermal Legislation	Legislative / Regulatory	Bill being drafted to facilitate geothermal development	Industry, policy Makers	Planned	2010
35. Guidelines for Planning Authorities on Wind Energy Development (DEHLG)	Soft	Facilitate a consistency of approach by planning authorities, both in identifying areas suitable for wind energy development and having regard to potential impacts, inter alia on nature and diversity	Planning authorities	Existing	1996 onwards
36. Draft Guidelines on Wind Energy	Soft	Looks at how wind energy targets can be met in ways that minimise adverse	Responsible authorities in Member States	Existing in draft	Final draft March 2010

<i>Name and reference of the measure</i>	<i>Type of measure</i>	<i>Expected result</i>	<i>Targeted group and or activity</i>	<i>Existing or planned</i>	<i>Start and end dates of the measure</i>
Development and EU Nature Conservation (European Commission)		impacts on nature and biodiversity.			
37. Offshore licensing and leasing	Regulatory	Offshore renewable energy projects are governed by the Foreshore Acts 1933 to 2009. In the future the foreshore consent system will be much closer aligned to the existing land planning system in order to provide for a more streamlined consent process.	Offshore energy industry; planning authorities	Planned	Ongoing
38. BES (Business Expansion Scheme)	Financial	A tax relief incentive scheme that provides tax relief for investment in certain corporate trades. There is no tax advantage for the – company in receipt of the BES, but securing this funding may – enhance their ability to attract other external funding.	Renewable Energy Developments meeting the qualifying conditions	Existing	Ongoing

Source: Ireland: Renewable Energy National Action Plan, Dublin

TABLES

Annex Table A – Allocation and commitments of ERDF, ESF and Cohesion Fund (end 2009) in Ireland (EUR million)

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
01 R&TD activities in research centres	115.5	24.9	21.6	15.4	10.4
02 R&TD infrastructure (including physical plant, instrumentation and high-speed computer networks linking research centres) and centres of competence in a specific technology	22.0	64.7	29.4	2.9	27.0
03 Technology transfer and improvement of cooperation networks between small businesses (SMEs), between these and other businesses and universities, postsecondary education establishments of all kinds, regional authorities, research centres and scientific and technological poles (scientific and technological parks, technopoles, etc.)	0.0	0.0	0.0	0.0	0.0
04 Assistance to R&TD, particularly in SMEs (including access to R&TD services in research centres)	0.0	0.0	0.0	0.0	0.0
05 Advanced support services for firms and groups of firms	0.0	0.0	0.0	0.0	0.0
06 Assistance to SMEs for the promotion of environmentally-friendly products and production processes (introduction of effective environment managing system, adoption and use of pollution prevention technologies, integration of clean technologies into firm production)	0.0	0.0	0.0	0.0	0.0
07 Investment in firms directly linked to research and innovation (innovative technologies, establishment of new firms by universities, existing R&TD centres and firms, etc.)	0.0	0.0	0.0	0.0	0.0
08 Other investment in firms	40.0	17.5	43.8	5.3	7.3
09 Other measures to stimulate research and innovation and entrepreneurship in SMEs Information society	0.0	0.0	0.0	0.0	0.0

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
10 Telephone infrastructures (including broadband networks)	18.5	0.0	0.0	2.5	0.0
11 Information and communication technologies (access, security, interoperability, risk-prevention, research, innovation, e-content, etc.)	0.0	0.0	0.0	0.0	0.0
12 Information and communication technologies (TEN-ICT)	0.0	0.0	0.0	0.0	0.0
13 Services and applications for the citizen (e-health, e-government, e-learning, inclusion, etc.)	0.0	0.0	0.0	0.0	0.0
14 Services and applications for SMEs (e-commerce, education and training, networking, etc.)	0.0	0.0	0.0	0.0	0.0
15 Other measures for improving access to and efficient use of ICT by SMEs	16.0	8.0	50.0	2.1	3.3
16 Railways	28.5	0.0	0.0	3.8	0.0
17 Railways (TEN-T)	0.0	0.0	0.0	0.0	0.0
18 Mobile rail assets	0.0	0.0	0.0	0.0	0.0
19 Mobile rail assets (TEN-T)	0.0	0.0	0.0	0.0	0.0
20 Motorways	25.0	0.0	0.0	3.3	0.0
21 Motorways (TEN-T)	0.0	0.0	0.0	0.0	0.0
22 National roads	20.0	0.0	0.0	2.7	0.0
23 Regional/local roads	0.0	0.0	0.0	0.0	0.0
24 Cycle tracks	0.0	0.0	0.0	0.0	0.0
25 Urban transport	0.0	0.0	0.0	0.0	0.0
26 Multimodal transport	0.0	0.0	0.0	0.0	0.0

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
27 Multimodal transport (TEN-T)	0.0	0.0	0.0	0.0	0.0
28 Intelligent transport systems	0.0	0.0	0.0	0.0	0.0
29 Airports	0.0	0.0	0.0	0.0	0.0
30 Ports	0.0	0.0	0.0	0.0	0.0
31 Inland waterways (regional and local)	0.0	0.0	0.0	0.0	0.0
32 Inland waterways (TEN-T)	0.0	0.0	0.0	0.0	0.0
33 Electricity	0.0	0.0	0.0	0.0	0.0
34 Electricity (TEN-E)	0.0	0.0	0.0	0.0	0.0
35 Natural gas	0.0	0.0	0.0	0.0	0.0
36 Natural gas (TEN-E)	0.0	0.0	0.0	0.0	0.0
37 Petroleum products	0.0	0.0	0.0	0.0	0.0
38 Petroleum products (TEN-E)	0.0	0.0	0.0	0.0	0.0
39 Renewable energy: wind	0.0	0.0	0.0	0.0	0.0
40 Renewable energy: solar	0.0	0.0	0.0	0.0	0.0
41 Renewable energy: biomass	0.0	0.0	0.0	0.0	0.0
42 Renewable energy: hydroelectric, geothermal and other	0.0	0.0	0.0	0.0	0.0
43 Energy efficiency, co-generation, energy management	25.0	7.5	30.0	3.3	3.2
SUB-TOTAL – Renewable energy	25.0	7.5	30.0	3.3	3.2

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
44 Management of household and industrial waste	3.0	0.0	0.0	0.4	0.0
45 Management and distribution of water (drinking water)	8.0	0.0	0.0	1.1	0.0
46 Water treatment (waste water)	5.0	0.0	0.0	0.7	0.0
47 Air quality	0.0	0.0	0.0	0.0	0.0
48 Integrated prevention and pollution control	0.0	0.0	0.0	0.0	0.0
49 Mitigation and adaptation to climate change	0.0	0.0	0.0	0.0	0.0
50 Rehabilitation of industrial sites and contaminated land	0.0	0.0	0.0	0.0	0.0
51 Promotion of biodiversity and nature protection (including Natura 2000)	0.0	0.0	0.0	0.0	0.0
52 Promotion of clean urban transport	10.0	0.0	0.0	1.3	0.0
53 Risk prevention (including the drafting and implementation of plans and measures to prevent and manage natural and technological risks)	0.0	0.0	0.0	0.0	0.0
54 Other measures to preserve the environment and prevent risks	0.0	0.0	0.0	0.0	0.0
55 Promotion of natural assets	0.0	0.0	0.0	0.0	0.0
56 Protection and development of natural heritage	3.5	0.0	0.0	0.5	0.0
57 Other assistance to improve tourist services	0.0	0.0	0.0	0.0	0.0
58 Protection and preservation of the cultural heritage	3.0	0.0	0.0	0.4	0.0
59 Development of cultural infrastructure	0.0	0.0	0.0	0.0	0.0
60 Other assistance to improve cultural services	0.0	0.0	0.0	0.0	0.0

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
61 Integrated projects for urban and rural regeneration	25.5	1.3	5.1	3.4	0.5
62 Development of life-long learning systems and strategies in firms; training and services for employees to step up their adaptability to change; promoting entrepreneurship and innovation	0.0	0.0	0.0	0.0	0.0
63 Design and dissemination of innovative and more productive ways of organising work	0.0	0.0	0.0	0.0	0.0
64 Development of specific services for employment, training and support in connection with restructuring of sectors and firms, and development of systems for anticipating economic changes and future requirements in terms of jobs and skills	10.0	6.0	60.0	1.3	2.5
65 Modernisation and strengthening labour market institutions	0.0	0.0	0.0	0.0	0.0
66 Implementing active and preventive measures on the labour market	0.0	0.0	0.0	0.0	0.0
67 Measures encouraging active ageing and prolonging working lives	0.0	0.0	0.0	0.0	0.0
68 Support for self-employment and business start-up	0.0	0.0	0.0	0.0	0.0
69 Measures to improve access to employment and increase sustainable participation and progress of women in employment to reduce gender-based segregation in the labour market, and to reconcile work and private life, such as facilitating access to childcare and care for dependent persons	7.9	0.23	2.9	1.1	0.1
70 Specific action to increase migrants' participation in employment and thereby strengthen their social integration	4.4	0.23	5.2	0.6	0.1
71 Pathways to integration and re-entry into employment for disadvantaged people; combating discrimination in accessing and progressing in the labour market and promoting acceptance of diversity at the workplace	17.6	1.8	10.2	2.3	0.8
72 Design, introduction and implementation of reforms in education and training systems in	200.8	60.8	30.3	26.7	25.4

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
order to develop employability, improving the labour market relevance of initial and vocational education and training, updating skills of training personnel with a view to innovation and a knowledge based economy					
73 Measures to increase participation in education and training throughout the lifecycle, including through action to achieve a reduction in early school leaving, gender-based segregation of subjects and increased access to and quality of initial vocational and tertiary education and training	131.8	45.8	34.7	17.6	19.1
74 Developing human potential in the field of research and innovation, in particular through post-graduate studies and training of researchers, and networking activities between universities, research centres and businesses	0.0	0.0	0.0	0.0	0.0
75 Education infrastructure	0.0	0.0	0.0	0.0	0.0
76 Health infrastructure	0.0	0.0	0.0	0.0	0.0
77 Childcare infrastructure	0.0	0.0	0.0	0.0	0.0
78 Housing infrastructure	0.0	0.0	0.0	0.0	0.0
79 Other social infrastructure	0.0	0.0	0.0	0.0	0.0
80 Promoting partnerships, pacts and initiatives through the networking of relevant stakeholders	0.0	0.0	0.0	0.0	0.0
81 Mechanisms for improving good policy and programme design, monitoring and evaluation at national, regional and local level, capacity building in the delivery of policies and programmes.	0.0	0.0	0.0	0.0	0.0
82 Compensation of any additional costs due to accessibility deficit and territorial	0.0	0.0	0.0	0.0	0.0

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
fragmentation					
83 Specific action addressed to compensate additional costs due to size market factors	0.0	0.0	0.0	0.0	0.0
84 Support to compensate additional costs due to climate conditions and relief difficulties	0.0	0.0	0.0	0.0	0.0
85 Preparation, implementation, monitoring and inspection	7.5	0.53	7.1	1.0	0.2
86 Evaluation and studies, information and communication	2.4	0.02	0.8	0.3	0.008
	750.7	239.4	31.9	100	100*

Source: DG REGIO

*Percentages do not total exactly to 100% because of rounding of figures

**Annex Table B – Allocation and commitments of ERDF, ESF and Cohesion Fund to Ireland
(end 2009) in EUR million**

Renewable energy	allocation	commitments
Wind		
Solar		
Biomass Hydroelectric, geothermal and other		
Total	0	0
Energy efficiency in residential housing		
Energy efficiency, co-generation, energy management	25.0	7.6
Housing infrastructure		
Total (1)	25.0	7.6,
Total ERDF+ESF+Cohesion fund	750.7	239.4
Total ERDF+Cohesion fund	375.4	124.1

(1) Note: not all investment is for energy efficiency in residential housing

Source: DG REGIO