SUSTAINABLE ENERGY IRELAND

Energy Research, Development and Demonstration in Ireland

2007 AND 2008 INVENTORIES REPORT

"Developing and deploying low-carbon technologies will require an integrated policy framework. Many of the most promising technologies currently have higher costs than those they would replace and it is only through research, development, demonstration and deployment (RDD&D) that these costs can be lowered… and the technologies become economic…"

Mr. Nobuo Tanaka, Executive Director,
International Energy Agency (extracted from *Ensuring Green Growth in a Time of Economic Crisis: The Role of Energy Technology*, IEA, G8 Siracusa, April 2009)

"Finding the new driver of our economy is going to be critical. There is no better potential driver that pervades all aspects of our economy than a new energy economy…"

President Barack Obama, 2008

Energy Research, Development and Demonstration in Ireland

2007 AND 2008 INVENTORIES REPORT

December 2009

Report Prepared by:
Matthew Kennedy, Sustainable Energy Ireland
Brian McNamee, Consulteco

Table of Contents

Table of Figures

Table of Tables



Executive Summary

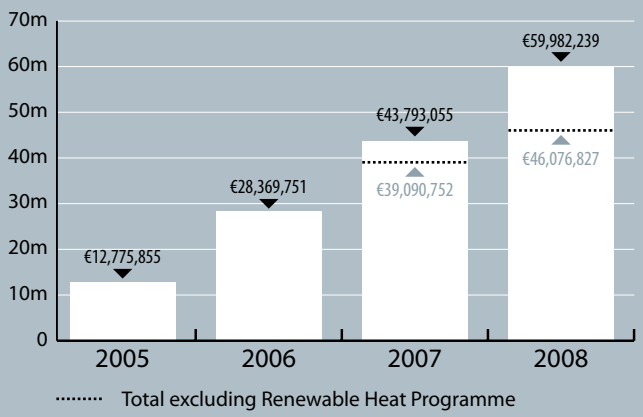
This publication, compiled by Sustainable Energy Ireland (SEI), presents the fifth and sixth national Inventories of energy research, development and demonstration (RD&D) in the Republic of Ireland for the years 2007 and 2008. It identifies the level of funding expended on energy projects by stakeholders involved in energy RD&D. The profile presented in the Inventories is placed in the policy context of enhancing our energy security in a more environmentally sustainable manner.

The report classifies energy RD&D projects according to the definitions employed by the International Energy Agency[1]. This publication includes some trends analysis and maps key findings from the 2007 and 2008 Inventories alongside findings from previous Inventories compiled by Sustainable Energy Ireland.

Relevant stakeholders in energy RD&D were asked to complete an online questionnaire on energy related projects that were undertaken in 2007 and 2008. Data was returned on a total of 345 projects in 2007 and 569 projects in 2008. This exercise was entirely voluntary, and complete coverage of energy RD&D activity is not claimed. Indeed it may be the case that some organisations, particularly in the private sector, have not submitted information, and no attempt has been made to estimate unreported expenditure.

The results show that a total of €43,793,055 was spent on energy RD&D in 2007 with €59,982,239 expended on energy RD&D in 2008. Figure 1 below presents the significant growth in energy research, development and demonstration (RD&D) in Ireland since 2005:

Figure 1 – Expenditure on RD&D, 2005 to 2008 (€)



For both 2007 and 2008 the main sources of funding were 'Own & Private funding', with values of €21,736,683 in 2007 and €33,818,158 in 2008. Irish Government funding sources accounted for €19,936,476 worth of expenditure in 2007 and €23,649,685 in 2008.

Expenditure on 'Demonstration' projects increased from €29,104,205 in 2007 to €47,208,737 in 2008, while expenditure on 'Research and development' projects decreased from €14,688,852 in 2007 to €12,773,505 in 2008. This may reflect the fact that a number of technologies have progressed from demonstration technologies through to maturity but requiring deployment support. This is particularly the case with renewable energy heating technologies. Educational establishments continue to deliver the bulk of activity in the energy R&D field, with a total of 85 projects in 2007 and 93 projects in 2008.

Overall the trend reflects an increased emphasis in Government policy on research and development in the science, technology and innovation arena and an increased interest in sustainable energy solutions brought about by global concerns about climate change and energy security. Energy RD&D has been prioritised in recent years by a number of national agencies as reflected in Appendix 3 of this report. Each agency approaches energy RD&D from a somewhat different perspective, from basic research funding, to policy research, to innovation and enterprise development. This prioritisation, along with increased funding from the private sector, has resulted in the trend for increased funding shown.

SEI is pleased to present the Inventories for 2007 and 2008.

[1] See Appendix 1 for details on the R&D project definitions employed by the International Energy Agency.

Foreword

I am pleased to introduce you to the fifth and sixth national Inventories of Irish Energy Research, Development and Demonstration (RD&D). This year we have delivered a joint publication, covering expenditure on energy RD&D in 2007 and 2008, that presents a comprehensive picture of our energy RD&D and reflects the significant investment that was recently made in both renewable energy and energy efficiency research within Ireland. It reflects the rapid acceleration of energy RD&D and technology innovation by Irish academic institutions, private sector industry and publicly funded organisations.

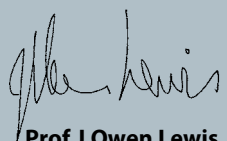
Given the extraordinary scale of the Irish renewable energy resource and finite nature of conventional oil and gas reserves, a policy priority must be the development of a range of indigenous and sustainable energy technologies. In recent years, the Irish Government's commitment to promoting sustainable energy research has been reflected in Ireland's *National Development Plan (NDP) 2007-2013*, the *Strategy for Science Technology and Innovation (SSTI) 2006-2013*, and within *Building Ireland's Smart Economy*[2]. These policies have created an imperative for enhanced energy research, enabling a strong foundation that will assist Ireland meet its ambitious energy targets and move towards a sustainable energy future.

Building Ireland's Smart Economy places significant focus on the opportunities arising from research in the renewable energy and environmental technologies areas, including the development and commercialisation of ocean energy. Investment in focused sustainable energy RD&D supports industrial competitiveness and innovation and contributes toward the knowledge economy as part of the wider sustainable development agenda. SEI's engagement in applied research involves the stimulation and acceleration of the generation, delivery and implementation of solutions that contribute to a low carbon society in Ireland. The early promotion and development of the sustainable energy sector in Ireland will position our economy at the leading edge of renewable energy and energy efficient technology deployment and support the development of key expertise and competences. This will lead to the establishment of indigenous businesses with the potential to export to Europe and beyond, and create an attractive place for foreign direct investment in the sector.

The Irish Energy Research Council (IERC)[3] recognised the need for a sustained commitment to strengthening Ireland's research capacity and the need to support innovation in energy related products and services. While SEI's role in RD&D stems from the Energy Research Sub Programme of the NDP 2007-2013, the IERC recommended that SEI be given responsibility for energy systems modelling and R&D programmes in sector specific fields. SEI, through applied energy research, continues to provide an evidence base for sound energy policy formulation by testing, demonstrating and piloting new sustainable energy technologies within the Irish market.

The results of previous research Inventories reflected historically low levels of investment (€12.8 million in 2005), coupled with fragmented research efforts on a wide range of topics. The more recent focus on development of the sustainable energy sector, and its link with economic stimulus, has resulted in significant accelerated investment on energy RD&D projects from €28 million in 2006 to just under €44 million in 2007 and to investments totalling over €60 million in 2008. The Irish Government's Energy White Paper[4], has a strategic goal of accelerating energy RD&D programmes in support of our sustainable energy policy targets. The upward trajectory of investment recorded in these Inventories demonstrates a growing contribution to building Ireland's research capacity and, in doing so, helps position Ireland to the forefront of sustainable energy innovation.

Finally, I would like to record my thanks and appreciation to all those who supplied information to this publication – your generous collaboration is warmly appreciated.



Prof J Owen Lewis,
Chief Executive,
Sustainable Energy Ireland.
December 2009

[2] *Building Ireland's Smart Economy: A Framework for Sustainable Economic Renewal* (2008), Department of the Taoiseach.
[3] *An Energy Research Strategy for Ireland (2008)*, Irish Energy Research Council.
[4] *Delivering a Sustainable Energy Future for Ireland (2007)*, Department of Communications, Energy and Natural Resources.

Introduction and Objective

Data and statistics are indispensable instruments for policy making in the area of energy generation, distribution and use, and the impact this may have on the environment. Accurate and reliable energy RD&D data facilitates the setting of priorities, the implementation of policies and the assessment of past actions. Indeed, energy RD&D has made an important contribution, as a policy tool, to address energy and related environmental challenges in Ireland. In this respect it is vitally important to gain an understanding of RD&D expenditures and trends. The Irish Government's *Strategy for Science, Technology and Innovation (2006-2013)* has committed to establishing an Inventory of energy research and researchers.

The level of activity on energy RD&D in Ireland is presented in these Inventories compiled by Sustainable Energy Ireland. All interested stakeholders in energy RD&D were asked to submit questionnaire returns on relevant projects that they were undertaking.

National, European and International Context

The National Context

The Department of Communications, Energy and Natural Resources (DCENR) is committed to delivering a sustainable energy future for Ireland and places significant focus on driving the energy RD&D agenda. In tandem with the Government policy on science and innovation, the energy RD&D agenda will contribute toward achieving ambitious energy efficiency and renewable energy deployment targets. The DCENR plays a crucial role in the co-ordination of energy RD&D, in building research capacity, and in leveraging of resources from the E.U. Framework Programme and other sources.

The Energy White Paper has identified a number of sustainable energy targets for renewable electricity, transport and heat, and energy efficiency. The underpinning strategic goals are:

- Addressing climate change by reducing energy related greenhouse-gas emissions
- Accelerating the growth of renewable energy sources
- Promoting the sustainable use of energy in transport
- Delivering an integrated approach to the sustainable development and use of bioenergy resources
- Maximising energy efficiency and energy savings across the economy
- Accelerating energy research development and innovation programmes in support of sustainable energy goals

The Strategy for Science, Technology and Innovation recommended the establishment of the Irish Energy Research Council (IERC), which subsequently delivered an energy research strategy for Ireland. This Strategy is an important development in the delivery of Ireland's commitment to strengthen national RD&D and support the long term objectives that were highlighted in the Energy White Paper. The Strategy describes the rationale and proposed strategic actions for each of the following prioritised areas of research activity:

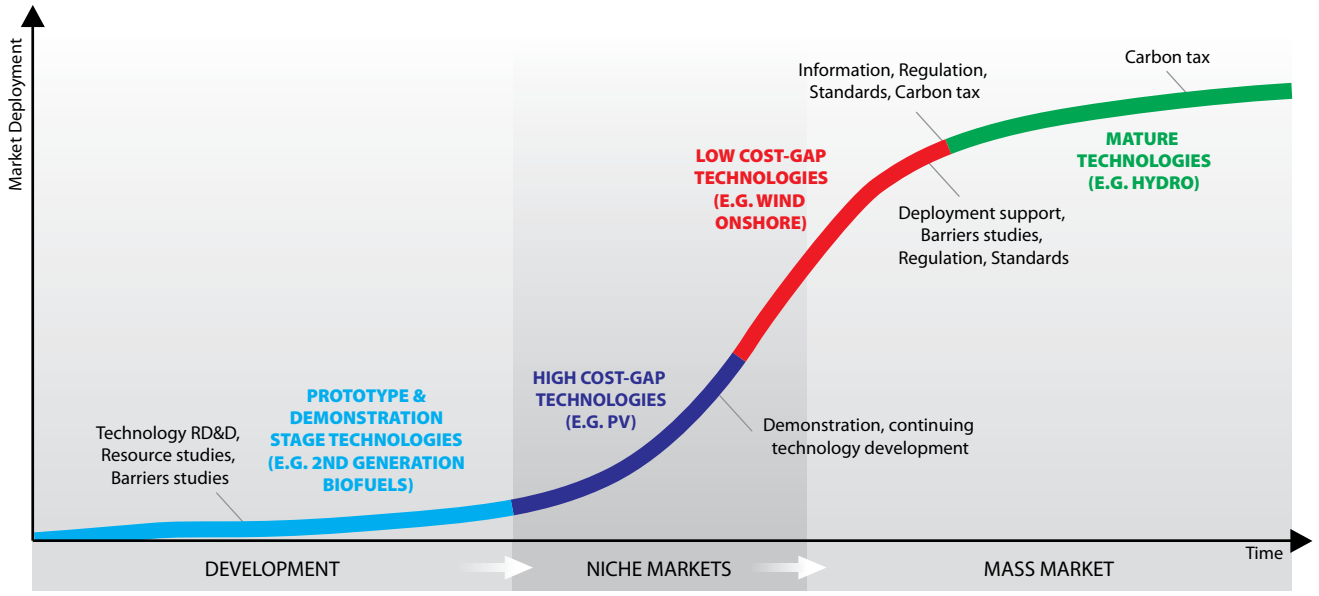
- Energy systems modelling and analysis
- Fundamental frontier and multi-disciplinary research
- Energy RD&D in a limited number of sector-specific fields (Ocean Energy, Grid / Infrastructure, Energy in Buildings, Energy in Transport and Sustainable Bioenergy)
- Identifying and mapping Ireland's energy resources
- A 'watching brief' for technologies of potential application in Ireland



The Strategy recommends that SEI be given responsibility in three of these priority areas; namely for energy systems modelling, R&D programmes in sector specific fields and a watching brief on developments. Science Foundation Ireland will be responsible for energy related fundamental and frontier research and the strategy recommends that the Department of Communications, Energy and Natural Resources be responsible for mapping Ireland's energy resources.

Research to inform energy policy is conducted by SEI, the Economic and Social Research Institute and third level institutions, while technical research is supported by agencies including SEI, the Environmental Protection Agency, Science Foundation Ireland (SFI), Enterprise Ireland, Teagasc, the Marine Institute and private sector institutions. A summary of the responsibilities for Energy Research & Development in Ireland is outlined in Appendix 3.

In May 2008, a third research pillar was added to SFI's remit that focuses on developing the research base that underpins sustainable energy technologies. SFI have funded one five year Strategic Research Cluster on Advanced Biomimetic Materials for Solar Energy Conversion and published a call for a further Strategic Research Cluster (SRC) in energy research in August 2009. The DCENR and the Department of Enterprise, Trade and Employment have delegated SEI a significant role in coordinating energy RD&D efforts in Ireland. SEI supports energy research and demonstration through programmes arising out of Ireland's National Development Plan 2007-2013, through the commissioning of both applied and public good research. SEI's research activities focus on near term policy objectives and, where directed at specific technologies, seek to move technologies through a spectrum of interventions based on the maturity of the technology: from Technology R&D, to Prototype & Demonstration, and finally to Deployment Support. This is presented in the illustration below.



Adapted from: *"Deploying Renewables: Principles for Effective Policies"*, International Energy Agency, (2008).



The European Context

The Second Strategic Energy Review[5] takes the first steps towards a European Energy Policy. The European Commission proposes to renew the Energy Policy for Europe in 2010 and chart a policy agenda for 2030, including an examination of objectives including the de-carbonising of EU electricity supply and the implementation of low energy buildings. The pursuit of such sustainable energy initiatives is a significant driver of the economic competitiveness of European industries within the European Economic Recovery Plan[6]. This Plan will establish three Public- Private Partnerships (PPPs)[7] under the European Union's Framework Programme for Research and Technological Development (FP7), the European Union's chief instrument for funding scientific research and technological development over the period 2007-2013. These PPPs will stimulate energy RD&D and support innovation in the manufacturing, construction and automotive sectors.

Ireland has the opportunity to contribute to European and global scientific and technological advancement through FP7. Research, development and demonstration activities under FP7 are expected to:

- Improve energy efficiency throughout the energy system taking into account the global environmental performance;
- Accelerate the penetration of renewable energy sources;
- Decarbonise power generation and, in the longer term, substantially decarbonise transport;
- Reduce greenhouse-gas emissions;
- Diversify Europe's energy mix; and
- Enhance the competitiveness of European industry.

The European Strategic Energy Technology Plan (SET-Plan)[8] was endorsed by the European Council and Parliament in 2007. It is expected that the 2010 work programme of FP7 will align with the priorities of the SET Plan including (1) European Industrial Initiatives: Wind, Grid, Solar, Bioenergy, CCS and (2) Energy Efficiency. Further priorities identified include research on promising renewable energy sources (such as environmental impact of ocean energy and microbial energy conversion) and the testing of concepts and approaches regarding breakthrough orientated research (i.e. future and emerging technologies).

Ireland participated in a number of Coordinated Actions (CAs) in 2007 and 2008 including the CA on the implementation of the Energy Performance of Buildings Directive and the CA on the Energy End Use Efficiency and Energy Services Directive.

The International Context

In fulfilling its commitment to international co-operation, Ireland provides national delegates to the International Energy Agency (IEA) Executive Committees of four Implementing Agreements: Bioenergy, Ocean, Wind and Renewable Energy Technology Deployment. SEI (on behalf of the DCENR) is responsible for providing national delegates to the Executive Committees of these four Implementing Agreements. Ireland is represented on the Governing Board of the IEA, the Standing Group on Long Term Coordination, the IEA Committee for Energy Research and Technology, and the Renewable Energy Working Party. In 2009 SEI joined the EU Energy Technologies Systems Analysis Programme (ETSAP) and attended the Implementing Agreement on Hybrid and Electric Vehicles.

International coordinated research activities under the IEA framework in which Ireland participated in 2007 and 2008 include:

- Design and operation of power systems with high penetration of wind
- Recommended practices in the design and testing of ocean energy technologies
- Integration of ocean energy converters in electrical grids
- Socioeconomic aspects of bioenergy systems
- Commercialising liquid biofuels
- Biorefineries

[5] EU Energy Security and Solidarity Action Plan: 2nd Strategic Energy Review [MEMO/08/703]. Communication "Second Strategic Energy Review - An EU Energy Security and Solidarity Action Plan" [COM/2008/0781]

[6] A European Economic Recovery Plan, Brussels, 26.11.2008 COM(2008) 800 final.

[7] Adopted by the EC on 26 Nov 2008 and endorsed by the EU Council on 11-12 Dec 2008.

[8] The European Union SET Plan will guide Member States and European level energy research priorities, objectives, targets and programmes up to 2050. Further information is available at: http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm

Data Collection

Definitions of energy RD&D

This report uses the same definitions of energy RD&D as those employed by the International Energy Agency in its compilation of statistics on energy RD&D. The actual categories of RD&D employed are given in Appendix 1. This classification divides energy RD&D into six major categories:

I: Conservation

II: Fossil fuels; oil, gas, coal

III: Renewable Energy Sources

IV: Nuclear Fission and Fusion

V: Power and Storage Technologies

VI: Cross-cutting Technologies and Research

These categories provide a comprehensive classification for identifying energy RD&D projects.

Data sources and collection

The data collection for energy RD&D projects in the Republic of Ireland was undertaken by Sustainable Energy Ireland by means of an online survey questionnaire on the Energy RD&D website at http://inventory.sei.ie (see Appendix 2).

Individuals and organisations who had provided returns in previous years and those assumed to be involved in energy RD&D projects were asked to complete the online questionnaire. Details of projects in progress during 2007 and 2008 and which received funding in those years are included in the Inventories.

For the 2007 and 2008 inventories a certain amount of aggregation was carried out on project data, with the result that detailed breakdown according to certain criteria such as 'project size' or 'organisation type' is not available as in previous years.

The projects in this publication only include those that were instigated because of their relevance to energy, and do not include RD&D projects that may have had 'spin-off' benefits for energy but were conceived for other non-energy purposes. Therefore 'energy RD&D' and 'RD&D that affects energy use' are not the same. To facilitate trends analysis and for the purposes of comparison we have included some of the programmes that commenced as energy demonstration initiatives but have now moved into deployment. These programmes will not be included in the subsequent Inventories. We have presented our renewable energy data in two specific categories; one category that describes renewable energy RD&D investment and another category that includes renewable energy heating technologies that have quickly moved from a demonstration phase to deployment phase.

Response rate limitations

Whilst the response rate was very positive, the survey managers do not claim to have obtained complete coverage of all projects on energy RD&D. The survey relied on the goodwill and co-operation of organisations carrying out energy RD&D and considerable efforts were made to obtain comprehensive data. Indeed it may be the case that some organisations, particularly in the private sector, have not submitted information, and no attempt has been made to estimate unreported expenditure.

Data received is published here in good faith and has not been verified with the source organisation. SEI can assume no responsibility for the accuracy or precision of project details.

Going forward

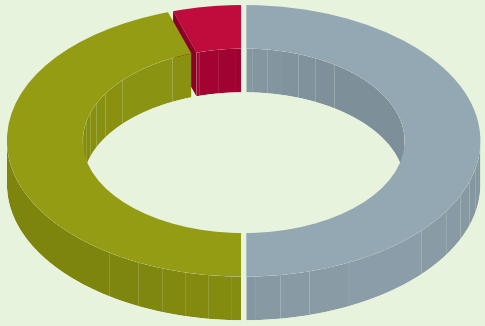
SEI initiated an energy R&D coordination activity during 2009 which will continue into 2010. This involves arranging information seminars in Ireland's third level education institutions, wherein the energy research projects underway are presented and networks between SEI staff and researchers in the universities and institutes of technology are strengthened.

Results

In 2007 a total of €43,793,055 was spent on energy research, development and demonstration in the Republic of Ireland, on a total of 345 projects. The level of expenditure increased to €59,982,239 in 2008 on a greater number of projects; 569 in total.

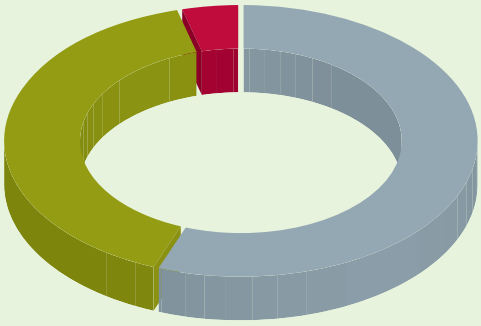
A breakdown of the sources of funding for 2007 and 2008 is shown in Figures 2 and 3. For both 2007 and 2008 the main sources of funding were 'Own & Private funding', €21,736,683 in 2007 and €33,818,158 in 2008 and Irish Government funding sources, €19,936,476 in 2007 and €23,649,685 in 2008.

Figure 2 – Sources of funding, 2007



Own & Private funding 50%
Irish Govt funding 45%
EU funding 5%

Figure 3 – Sources of funding, 2008

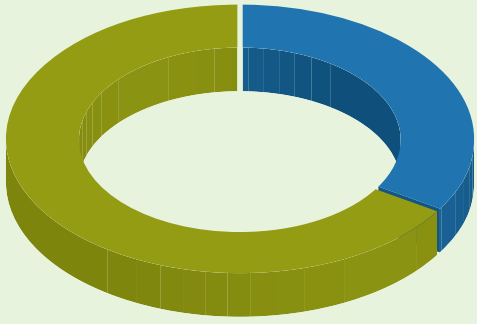


Own & Private funding 56%
Irish Govt funding 40%
EU funding 4%

Research and Development versus Demonstration Projects

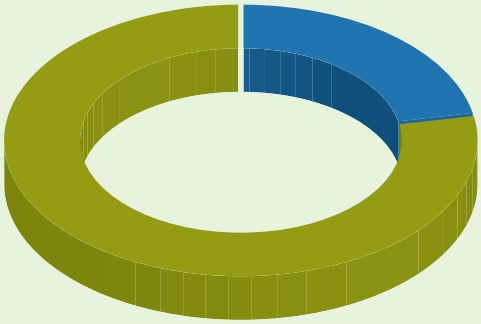
Of the funding spent in 2007 by organisations involved in energy RD&D, €14,688,852 was spent on Research and Development projects and €29,104,205 on Demonstration projects. The proportion of expenditure on Demonstration projects increased in 2008 due to a greater overall expenditure on this activity as compared with 2007. In 2008, €12,773,505 was spent on Research and Development projects and €47,208,737 on Demonstration projects. This increase in the proportion of funding spent on Demonstration in 2008 (Figure 5) is partly explained by the inclusion of programmes that commenced as demonstration programmes but have evolved into higher volume deployment programmes.

Figure 4 – Proportion of funding spent on 'Demonstration' and 'Research & Development' in 2007



Research and Development 34%
Demonstration 66%

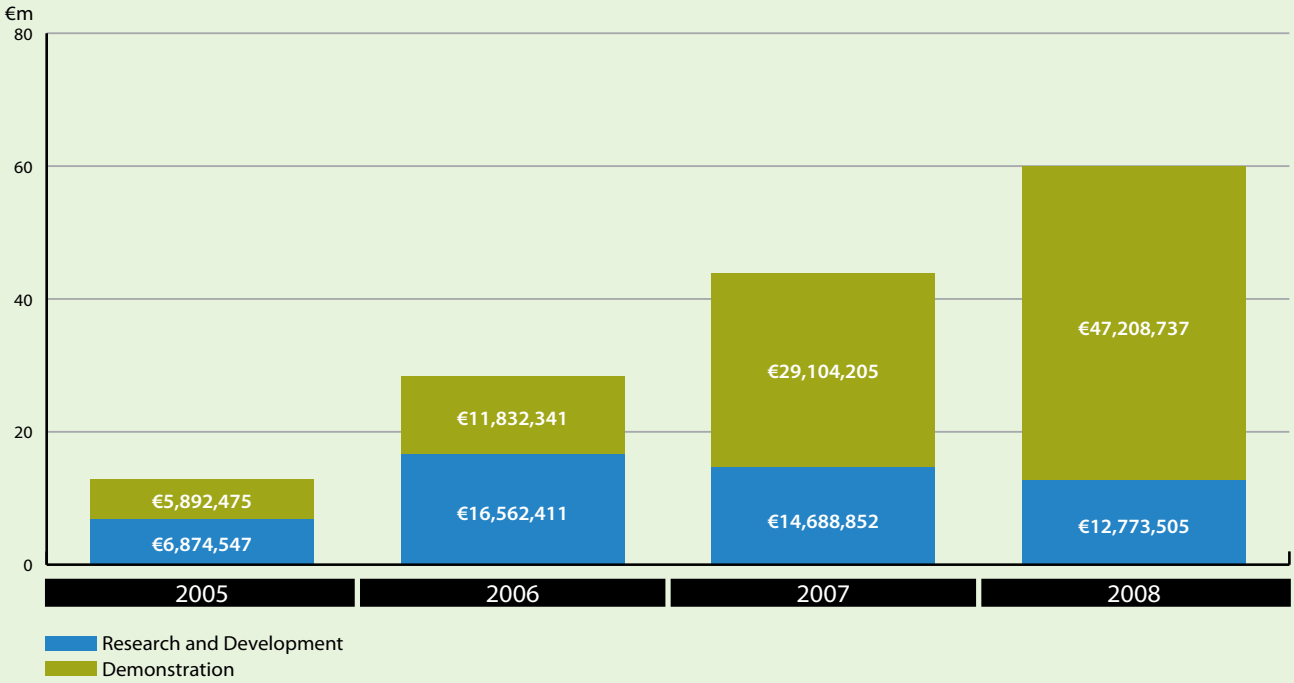
Figure 5 – Proportion of funding spent on 'Demonstration' and 'Research & Development' in 2008



Research and Development 22%
Demonstration 78%

The trend in the expenditure on Demonstration projects and Research & Development projects from 2005-2008 is shown in Figure 6.

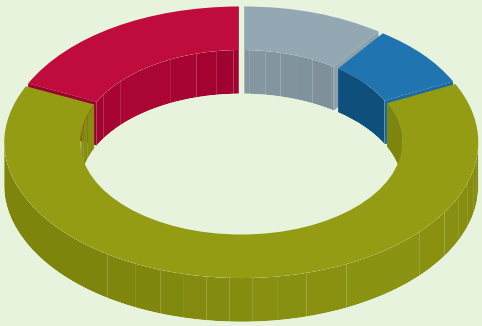
Figure 6 – 'Research & Development' and 'Demonstration' expenditure 2005 – 2008



This shows a steady increase in expenditure on Demonstration projects from 2005 to 2008, and a decrease in expenditure on R&D from 2006 to 2008. The R&D figures in 2006 included the first tranche of funding from the Parsons Awards, which resulted in a significant increase in R&D expenditure in that year in comparison with previous and subsequent years.

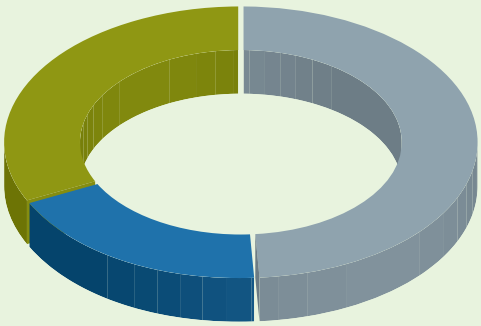
Figure 7 and Figure 8 show the source of funding for Research and Development and Demonstration projects in 2008. While the source of funding for RD&D projects as a whole was dominated by 'Own and private' funding sources, in 2008, this is likely to be due to the preponderance of 'Demonstration' projects in that year and the leveraging of private sector investment that resulted.

Figure 7 – Research & Development projects funding breakdown, 2008



Own funding..... 10%
Private funding.....8%
Irish Govt funding 64%
EU funding..... 18%

Figure 8 – Demonstration projects funding breakdown, 2008



Own funding..... 49%
Private funding..... 19%
Irish Govt funding 32%

The requirement to leverage Own or Private funding for demonstration projects resulted in 68% of overall funding coming from these sources on this type of project. On the other hand, Irish Government sources remain the dominant funders of R&D projects in 2008, at 64% of the total.

Projects by Funding Size

Due to the increased overall expenditure on Demonstration projects in 2008, a greater number of smaller projects were funded in that year. In 2007 a total of 158 projects received funding of €50,000 or less, the majority of which were demonstration projects. Average funding per project was €126,936. In 2008, the total number of projects that received funding of €50,000 or less was 313, the majority of which were demonstration projects. Average funding per project was €105,417, a decrease on 2007 figures.

Table 1 – Project size by funding received, 2007

Funding received (€)	*No. projects*	*Funding received (€)*	*No. projects*
1 - 50,000	158	700,001-750,000	0
50,001-100,000	74	750,001-800,000	2
100,101-150,000	39	800,001-850,000	0
150,001-200,000	28	850,001-900,000	1
200,001-250,000	11	900,001-950,000	0
250,001-300,000	5	950,001-1,000,000	0
300,001-350,000	3	1,000,001-1,050,000	0
350,001-400,000	8	1,050,001-1,100,000	0
400,001-450,000	2	1,100,001-1,150,000	1
450,001-500,000	5	1,150,001-1,200,000	0
500,001-550,000	3	1,200,001-1,250,000	0
550,001-600,000	1	1,250,001-1,300,000	0
600,001-650,000	3	1,300,001-1,350,000	1
650,001-700,000	0		

The amount of funding received by projects in 2007 and 2008 is categorised by project size in Tables 1 and 2.

Table 2 – Project size by funding received, 2008

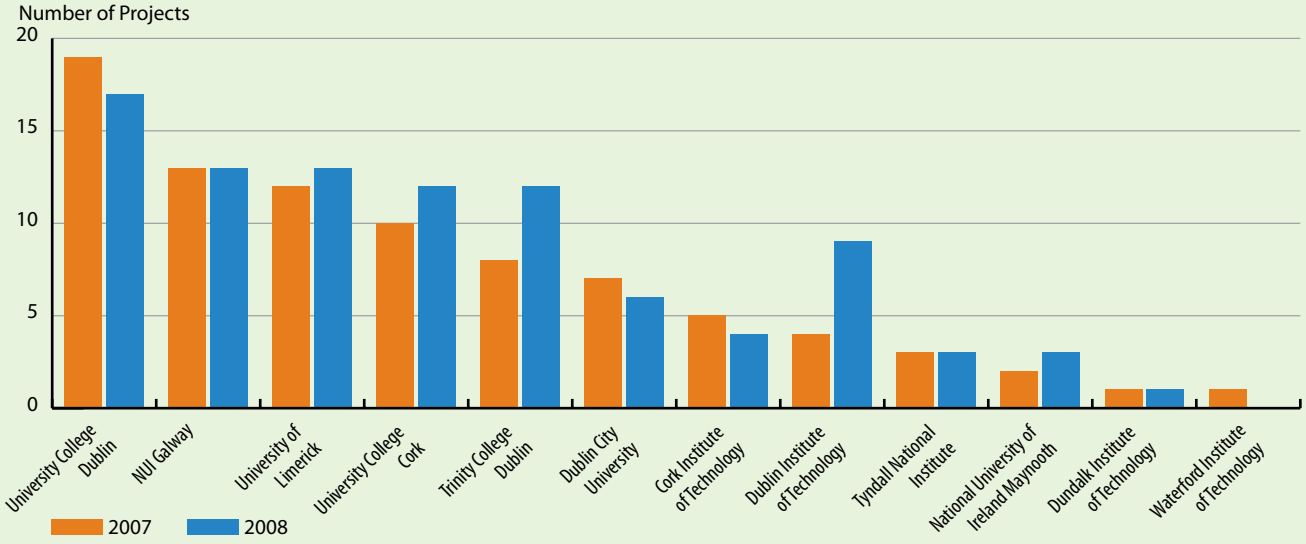
Funding received (€)	*No. projects*	*Funding received (€)*	*No. projects*
1 - 50,000	313	850,001-900,000	0
50,001-100,000	105	900,001-950,000	1
100,101-150,000	54	950,001-1,000,000	0
150,001-200,000	43	1,000,001-1,050,000	0
200,001-250,000	16	1,050,001-1,100,000	0
250,001-300,000	12	1,100,001-1,150,000	0
300,001-350,000	5	1,150,001-1,200,000	0
350,001-400,000	4	1,200,001-1,250,000	1
400,001-450,000	2	1,250,001-1,300,000	0
450,001-500,000	2	1,300,001-1,350,000	0
500,001-550,000	2	1,350,001-1,400,000	0
550,001-600,000	2	1,400,001-1,450,000	0
600,001-650,000	1	1,450,001-1,500,000	0
650,001-700,000	3	1,500,001-1,550,000	0
700,001-750,000	0	1,550,001-1,600,000	0
750,001-800,000	0	1,600,001-1,650,000	1
800,001-850,000	0		

R&D projects carried out by educational establishments

The number of R&D projects carried out by educational establishments in 2007 and 2008 is shown in Figure 9. A total of 85 energy R&D projects in 2007 and 93 projects in 2008, were carried out by educational establishments. University College Dublin received funding for the greatest number of projects in both years, 19 projects in 2007, to a value of € 2.5 million and 17 projects in 2008, to a value of € 2.3 million.

Although the dominant sector involved in R&D activities in Ireland continues to be the third level, other organisational types, such as those in commercial, public and community sectors, played a significant role in carrying out R&D activities.

Figure 9 – R&D projects carried out by educational establishments, 2007 and 2008



A total of 85 energy R&D projects in 2007 and 93 projects in 2008, were carried out by educational establishments.

University College Dublin received funding for the greatest number of projects in both years, 19 projects in 2007, to a value of €2.5 million and 17 projects in 2008, to a value of €2.3 million.

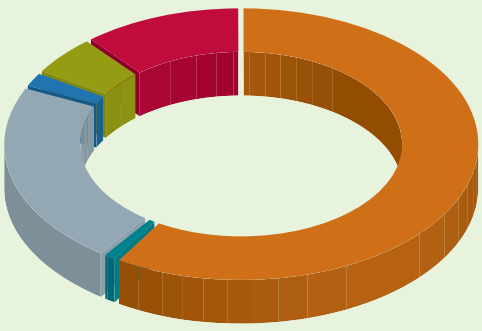
Energy RD&D by main technology area

The International Energy Agency classification system has been used to classify energy RD&D projects in this inventory. Appendix 1 provides a detailed list of the categories. The system classifies projects into six groups:

I: Conservation
II: Fossil fuels; oil, gas, coal
III: Renewable Energy Sources
IV: Nuclear Fission and Fusion
V: Power and Storage Technologies
VI: Cross-cutting Technologies and Research

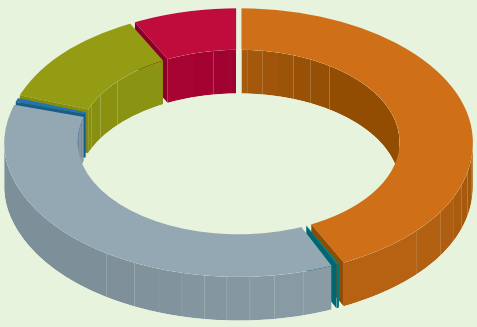
Figures 10 and 11 provide a breakdown of energy RD&D funding for 2007 and 2008 by technology area.

Figure 10 – RD&D funding by technology area, 2007



I: Conservation..... 59%
II: Fossil fuels: oil, gas, coal..... 1%
III: Renewable Energy Sources..... 22%
IV: Nuclear Fission and Fusion..... 2%
V: Power and Storage Technologies 5%
VI: Cross-cutting Technologies and Research..... 11%

Figure 11 – RD&D funding by technology area, 2008



I: Conservation..... 43%
II: Fossil fuels: oil, gas, coal..... 1%
III: Renewable Energy Sources..... 36%
IV: Nuclear Fission and Fusion..... 1%
V: Power and Storage Technologies 12%
VI: Cross-cutting Technologies and Research..... 7%

Conservation projects refer to RD&D projects that were funded in industry, residential & commercial, transportation and other conservation areas. These projects accounted for 59% of the funding expended on projects in 2007, and 43% in 2008. In monetary terms, expenditure on this group of technologies remained similar at €25,958,448 in 2007 and €25,668,238 in 2008.

Typical conservation initiatives include low carbon housing and building initiatives, energy management bureaux and public sector model solutions. Under the Conservation technology area, the funding levels allocated to Residential and commercial projects, such as heating, cooling, ventilation, lighting, insulation, building materials and low energy housing, accounted for 48% of the total funding expended on projects in 2007, and reduced to 39% in 2008, but with a greater amount of funding allocated as more funds were expended in public sector demonstration projects in 2008. SEI's House of Tomorrow Programme represents a majority of the projects funded in the conservation category.

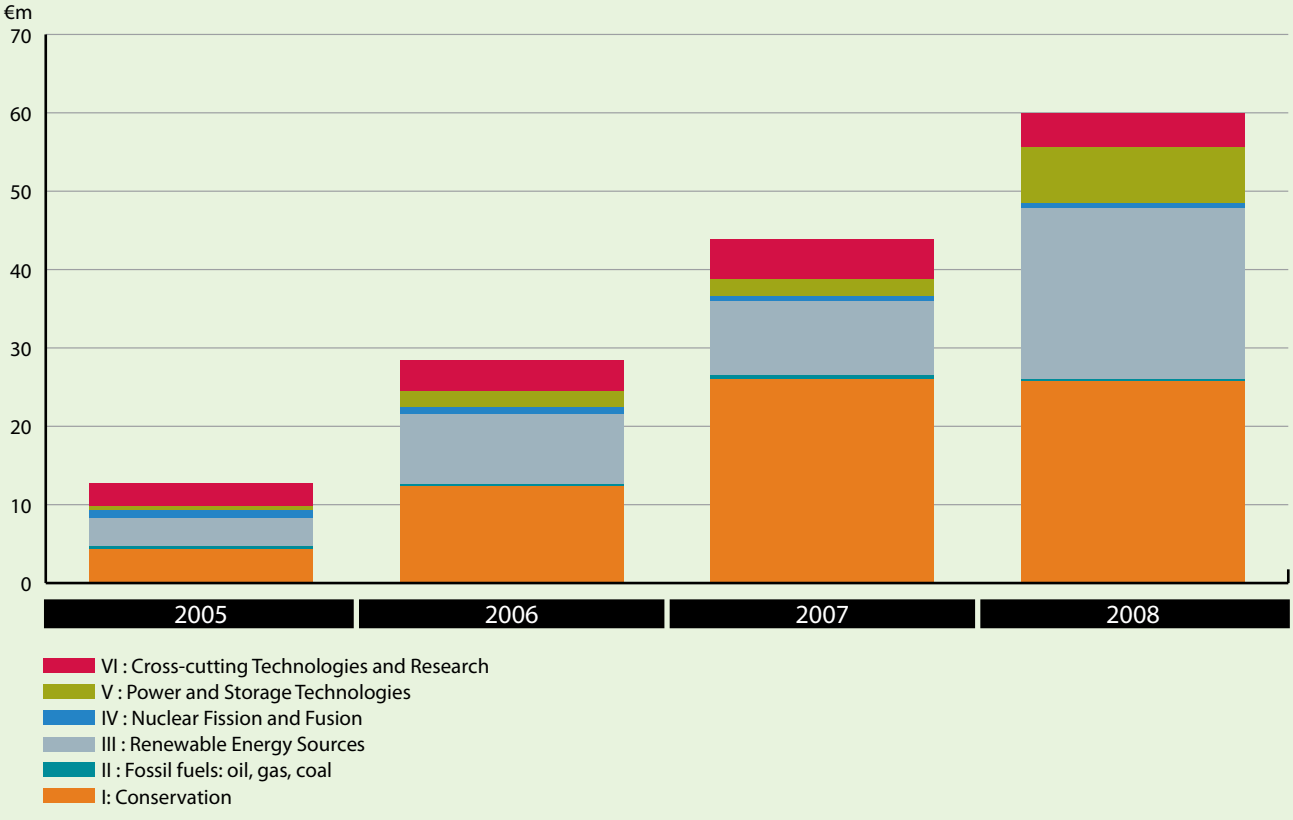
The proportion of expenditure on Renewable Energy Sources projects increased from 22% of the funding in 2007 to 36% in 2008. Expenditure on Renewable Energy projects, in monetary terms, increased from €9,394,997 in 2007 to €21,800,622 in 2008. Further explanation of the funds expended on projects from renewable energy sources is presented in Figures 15 and 16.

The increase in funding on Power and Storage Technologies from 2007 to 2008 was due to increased expenditure on CHP in 2008. Power and Storage Technologies accounted for 5% (€2,128,540) of the funding expended on projects in 2007 and 12% (€7,215,566) in 2008. The proportion of expenditure on Cross-cutting Technologies and Research' was 11% (€4,987,801) in 2007 and fell to 7% (€4,358,623) in 2008. Expenditure on Nuclear Fission and Fusion remained low at 1% - 2% over 2007 to 2008.

Expenditure Trends by IEA Classification

The trend in expenditure from 2005 to 2008, classified according to IEA technology groups is shown in Figure 12. This shows a general increase in renewables funding and funding on Conservation projects, with a levelling off of expenditure on this latter category in 2008. Expenditure on Cross-cutting Technologies and Research remained relatively steady over the four year period.

Figure 12 – Expenditure by IEA classification, 2005-2008



Funding on Projects from Renewable Energy Sources

We have presented our renewable energy data in two specific categories; one category that describes all renewable energy RD&D investment and another category that excludes renewable energy heating technologies that have quickly moved from a demonstration phase to deployment phase.

When we include renewable heating deployment projects in the Renewable Energy Sources category for 2007 and 2008 (see Figure 13 and 14 and Table 3), Biomass received the most funding at 81% (€7,617,950) in 2007 and 63% (€13,790,660) in 2008. Solar increased as a proportion of Renewable energy funding, from 7% (€631,211) in 2007 to 21% (€4,583,573) in 2008. Ocean remained steady at 7% of the funding in 2007 and 2008, whilst Geothermal increased from less than 1% of the funding in 2007 to 6% in 2008. Wind energy projects accounted for similar proportions of overall expenditure at 3% in 2007 and 2% in 2008. Small Hydro projects also remained low at 1 - 2% over both years.

Figure 13 – Funds expended on projects from renewable energy sources (including renewable heat deployment), 2007

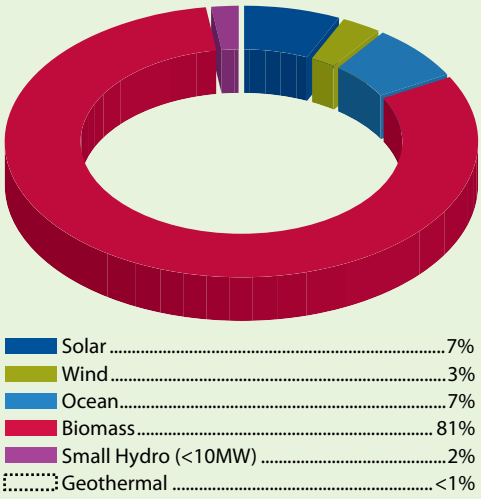
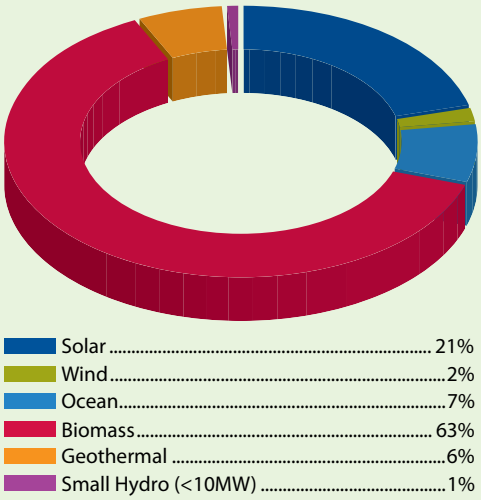


Figure 14 – Funds expended on projects from renewable energy sources (including renewable heat deployment), 2008



Figures 18 and 19 (page 15) reflect the impact when renewable heat is extracted from our findings.

Table 3 – Funds expended on projects from renewable energy sources, (including renewable heat deployment) 2007 and 2008

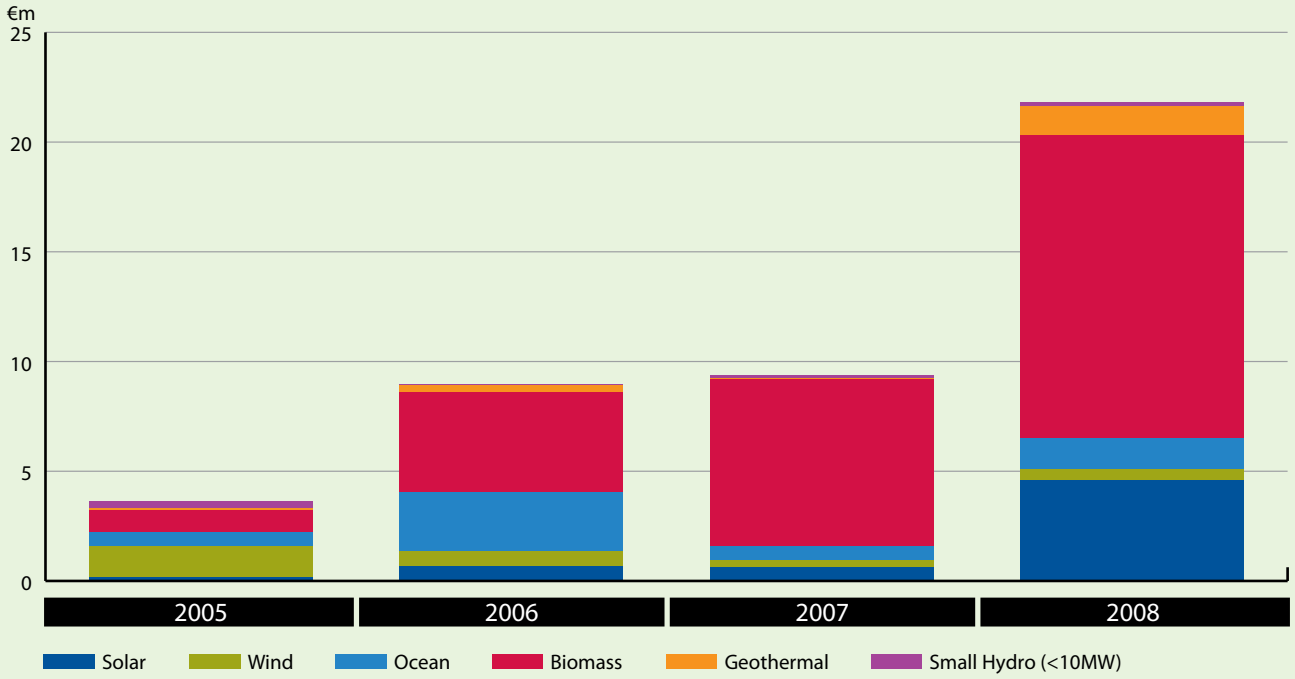
	Funding (€)	
Renewable Energy Source	***2007***	***2008***
Solar	631,211	4,583,573
Wind	309,528	522,740
Ocean	625,484	1,403,833
Biomass	7,617,950	13,790,660
Geothermal	53,123	1,339,838
Small Hydro (<10MW)	157,701	159,978
Total	**9,394,997**	**21,800,622**

Trends in Renewable Energy Projects by Source

The overall trend in funding from 2005-2008 on Renewables projects, (including renewable heat deployment) is shown in Figure 15.

Figure 15 displays a continuous increase in expenditure on Biomass projects from 2005 to 2008, and a significant increase in expenditure on Solar projects in 2008. This trend is largely influenced by the inclusion of deployment projects in the renewable heating applications of solar and biomass energy, but also reflects the fact that conversion technologies aside from heating for these resources remain less mature than technologies such as wind. As such, they attract a larger proportion of research funding.

Figure 15 – Expenditure on renewable energy sources, (including renewable heat deployment), 2005 to 2008



As indicated in Figure 16 and Figure 17 the majority of funding for renewable energy RD&D projects came from Own & Private sources. These figures and Table 3 include projects from renewable heat deployment (ReHeat).

Figure 16 – Renewable energy funding sources, 2007

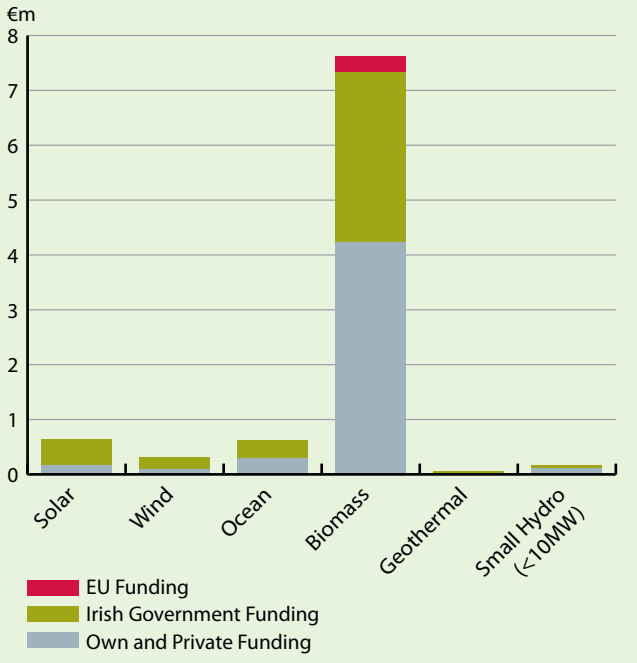


Figure 17 – Renewable energy funding sources, 2008

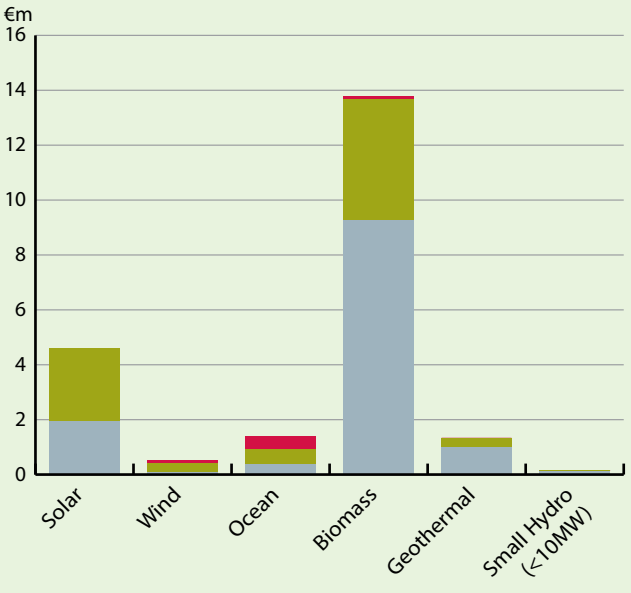


Table 4 – Renewable energy funding sources, 2007 and 2008 (including Renewable Heat Deployment)

	Own & Private funding		*Irish Govt funding*		*EU funding*	
	2007	***2008***	***2007***	***2008***	***2007***	***2008***
Solar	171,896	1,963,955	459,315	2,619,618	0	0
Wind	87,737	99,849	221,791	312,573	0	110,318
Ocean	297,743	389,874	327,741	513,959	0	500,000
Biomass	4,231,428	9,286,791	3,097,590	4,376,369	288,932	127,500
Geothermal	28,939	984,616	24,184	355,222	0	0
Small Hydro (<10MW)	118,276	122,020	39,425	37,958	0	0
Total	4,936,019	12,847,105	4,170,046	8,215,699	288,932	737,818

When we exclude renewable heat deployment projects in the Renewable Energy Sources category for 2007 and 2008 (see Figure 18 and Figure 19, and Table 5), Biomass received the most funding in 2007 at 63% of the funding (€ 2,962,594) and Solar in 2008 at 40% (€ 3,204,796).

Figure 18 – Funds expended on projects on renewable energy sources (excluding renewable heat deployment), 2007

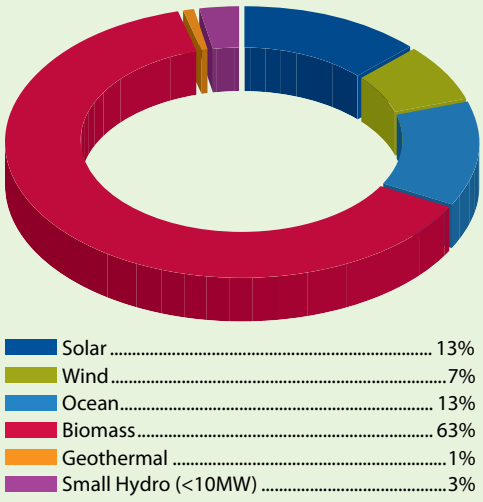


Figure 19 – Funds expended on projects on renewable energy sources (excluding renewable heat deployment), 2008

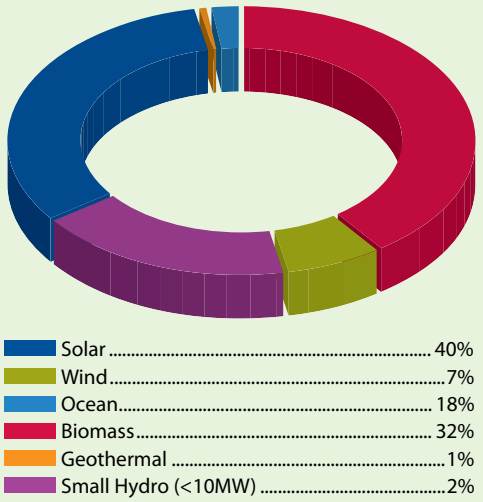


Table 5 – Funds expended on projects on renewable energy sources (excluding renewable heat deployment)

	Funding (€)	
Renewable Energy Source	***2007***	***2008***
Solar	584,264	3,204,796
Wind	309,528	522,740
Ocean	625,484	1,403,833
Biomass	2,962,594	2,526,217
Geothermal	53,123	77,646
Small Hydro (<10MW)	157,701	159,978
Total	**4,692,694**	**7,895,210**

Conclusion

While the new energy and environment policy agreed by the European Council (March 2007) established the political agenda to achieve the Community's core energy objectives, it is the Irish Government that holds the ultimate responsibility for the delivery of energy policy targets and objectives relating to the competitiveness, environmental impact and security of electricity and energy supply. National and European RD&D programmes are key instruments to support innovation and contribute to the delivery of these energy objectives. The trends identified in the RD&D Inventories for 2007 and 2008 indicate that the Irish Government is committed to leveraging RD&D to meet its energy policy objectives.

The year 2008 showed a marked increase in the amount of funding for demonstration projects. The findings show the importance of funding technologies through the phases of maturity. They highlight examples, such as, renewable heating and building energy efficiency technologies, where technology research, followed by demonstration, has successfully lead to the market deployment of technologies.

This publication has provided a breakdown of energy RD&D funding for 2007 and 2008 by International Energy Agency technology category. The 'Conservation' project category, primarily the demonstration of energy saving building practices and technologies, remained the dominant category in 2007 (59%) and 2008 (43%), followed closely by investment in 'Renewable energy sources' (22% and 36%).

Expenditure on 'Renewable energy sources' achieved a significant increase from €9,394,997 in 2007 to €21,800,622 in 2008. The findings and trends presented from 2005 do include some programmes that commenced as energy demonstration initiatives but have now moved into deployment. When these programmes (such as Renewable Heat Deployment) are extracted from the findings in 2007 and 2008 we see that Expenditure on 'Renewable energy sources' accounts for €4,692,694 in 2007 and €7,895,210 in 2008. Biomass and solar energy technologies have attracted the largest RD&D spending in both periods.

This report establishes a clear trend of increased commitment by the Irish Government and private funding sources to sustainable energy research. This is reflected in a greater than 200% increase in reported RD&D funding from 2006 to 2008. However, the trend is less indicative in research and development alone as funding appears to have decreased over the period after a significant increase in 2006. This trend is expected to reverse in coming years as the impact of the IERC Strategy and increased research funding through SFI, along with Ireland's Smart Economy strategy is reflected in the statistics.

Appendix 1

The IEA Energy Technology Groups

Group I: Conservation

1.1 Industry

1.2 Residential and commercial

1.3 Transportation

1.4 Other conservation

Group II: Fossil fuels; oil, gas, coal

2. Oil and Gas

2.1 Enhanced Oil and Gas

2.2 Refining, transportation and storage

2.3 Oil shale and tar sands

2.4 Others

3. Coal

3.1 Production, preparation and transport

3.2 Combustion

3.3 Conversion

3.4 Others

Group III: Renewable Energy Sources

4. Solar

4.1 Heating and cooling

4.2 Photo electric

4.3 Thermal electric

5. Wind

6. Ocean

7. Biomass

8. Geothermal

9. Hydro

9.1 Large (>10MW)

9.2 Small (<10MW)

Group IV: Nuclear Fission and Fusion

10. Nuclear Fission

11. Nuclear Fusion

Group V: Power and Storage Technologies

12.1 Electric Power Conversion

12.2 Electricity transmission and distribution

12.3 Energy Storage

Group VI: Cross-cutting Technologies and Research

13.1 Energy Systems Analysis

13.2 Others

Definitions

(Reproduced from the International Energy Agency categorisation)

Group I: Conservation

Industry

R&D related to: reduction of energy consumption in industrial processes including combustion, development of new techniques, new processes and new equipment in metallurgical, petro-chemical, chemical, glass, paper and pulp, textile, food industries.

Residential and Commercial

R&D related to: space heating and cooling, ventilation and lighting control systems other than solar technologies; low energy housing design and performance other than solar technologies; new insulation and building materials, thermal performance of buildings; domestic appliances.

Transportation

R&D related to: analysis and optimisation of energy consumption in the transportation sector, public transportation systems; engine-fuel optimisation; use of alternative fuel; fuel additives; diesel engines, Stirling motors, electric cars, hybrid cars.

Others Conservation

R&D related to: waste heat utilisation (heat maps, total energy systems, low temperature thermodynamical cycles); district heating; heat pump development; recycling and uses of urban and industrial wastes; use of wastes and low-temperature heat in the agricultural sector (drying, greenhouses).

Group II: Fossil Fuels Production

Enhanced Oil and Gas

R&D related to: secondary and tertiary recovery of oil and gas; hydro fracturing techniques

Refining, Transport and Storage of Oil and Gas

R&D related to: refining; gasification of naphtha and feedstocks; transport of liquid hydro-carbons; pipeline network system evaluation; submarine pipelines (shallow and deep sea); transport of gaseous hydrocarbons; safety aspects of LNG transport; pipeline network system evaluation; storage of liquid hydrocarbons (strategic storage); submarine large scale storage units; storage of gaseous hydrocarbons (strategic storage); submarine large scale storage units; safety aspects of LNG storage.

Oil Shale and Tar Sands

R&D related to: oil shale and tar sands.

Others Oil and Gas

R&D related to: development of advanced exploration methods (geophysical, geochemical, seismic, magnetic) for on-shore and off-shore prospection; on-shore and off-shore deep-drilling equipment and techniques; safety aspects of off-shore structures; alleviation of environmental impact of off-shore oil and gas.

Coal Production, Preparation and Transport
R&D related to: mining techniques (operations underground and control of operations, mine safety); mechanical preparation of coal; coal degasification and desulphurisation; coking, blending and briquetting of coal; coal transport techniques, including coal slurries.

Coal Combustion
R&D related to: conventional utility boilers; fluidised bed combustion; industrial applications; integrated gasified coal combined cycle (IGCC).

Coal Conversion (excluding IGCC)
R&D related to: coal gasification, including underground (in-situ) gasification, low Btu gasification, (except for IGCC) and high Btu gasification; coal liquefaction, including hydro generation, Fischer-Tropsch synthesis.

Other Coal
R&D related to: coal, lignite and peat geological survey techniques, deposit evaluation techniques; peat production and conversion; R&D on environmental, safety and health aspects of coal.

Group III: Renewable Energy Sources

Solar Heating and Cooling
Includes daylighting

Photo Electric
Renewable energy from photo electric

Thermal Electric
Renewable energy from thermal electric

Wind
Renewable energy from wind

Ocean
Renewable energy from the ocean

Biomass
Renewable energy from biomass

Geothermal Energy
Renewable energy from geothermal

Large Hydro
Plants with capacity of 10 MW and above.

Small Hydro
Plants with capacity of below 10 MW.

Group IV: Nuclear Fission And Fusion

Light Water Reactors (LWR)
Including safety, environmental etc. R&D specifically related to LWR.

Other Converter Reactors
e.g. (Heavy Water Reactors) HWR, (High Temperature Reactors) HTR, (Advanced Gas-cooled Reactors) AGR, (Steam Generating Heavy Water Reactors) SGHWR including safety, environmental etc. R&D specifically related to this item.

Fuel Cycle
R&D related to: ore, uranium and thorium extraction and conversion; enrichment; reprocessing; fissile material recycling; transport of radioactive materials; nuclear parks siting studies (regional nuclear fuel cycle centres); nuclear waste treatment, disposal and storage.

Nuclear Supporting Technologies
R&D related to: general nuclear safety; general nuclear environmental protection; radiation protection and decommissioning of power plants and related nuclear fuel cycle installations; fissile materials control. Note: nuclear ship R&D is excluded.

Nuclear Breeder
R&D related to: metal-cooled fast breeder; gas-cooled fast breeder; other breeders.

Nuclear Fusion
R&D related to: magnetic confinement; laser applications.

Group V: Power And Storage Technologies

Electric Power Conversion
R&D related to: turbo-engines, multi-fuel gas turbines, conventional and combined cycles; super-conducting generating machines; magnetohydrodynamic conversion; heat/electricity combined production; electricity generators and components; dry cooling towers; re-powering, retrofitting, life extensions and upgrading of fossil fuel power plants; thermal pollution from power plants; air pollution from power plants; boiler R&D.

Electricity Transmission and Distribution
R&D related to: electricity transmission and distribution (e.g. solid state power electronics, load management and control systems, network problems, superconducting cables, AC and DC high voltage cables, HVDC transmission); all high temperature superconducting research.

Energy Storage
R&D related to: all forms of energy storage, including superconducting magnetic, hot or cool, and kinetic energy storage technologies.

Group VI: Other Cross-Cutting Technologies or Research

Energy Systems Analysis
R&D related to: system analysis related to energy R&D; sociological, economical and environmental impact of energy which are not specifically related to one technology area listed in the sections above.

Others
R&D related to: hydroelectric; hydrogen; energy technology information dissemination; studies not related to a specific technology area listed above.

Appendix 2
Survey Questionnaire

General Information:

Project Title: *

Lead Organisation: Please Select *

Project Type: Please Select *

IEA Classification: Please Select *

EU Project Details:

EU Programme/Framework: Not an EU Project

EU Title (If different to main title above):

Project Stage: Please Select

EU Partner: Select EU Partner

Add Another EU Partner

Project Location:

Project Address:

Project Web Address:

Personnel Contact Details:

Primary Contact: Please Select

Secondary Contact: Please Select

Admin Contact: Please Select

Sub Contractors / Co Workers / Partners:

Project Timescales:

Start Date: Start Month: * Start Year: *

Project End Date: Start Month: * Start Year: *

(Please provide best estimate if no firm project end date is currently known)

Current Status: Project Status *

Project Description:

Objectives:

Summary:

Future Planned Activities:

Total Project Cost: €

Total lifetime cost of the project (€, excl. VAT)
(for European projects include only the total cost
apportioned to the Irish element of the project): *

Project Finance in the Year 2006

Total Funding Received in this Year:

Expenditure on project from **own resources** in 2006 only (€, excl. VAT):

External private funding / income received on project
in 2006 only (€, excl. VAT):

Funding body/organisation:	Funding Programme:
1.	1.
2.	2.
3.	3.

Irish Government funding received on project in 2006 only (€, excl. VAT):

Funding body/organisation:	Funding Programme:
1.	1.
2.	2.
3.	3.

EU funding received on project in 2006 only (€, excl. VAT)
– Include only funding received in 2006 by the Irish element:

Funding body/organisation:	Funding Programme:
1.	1.
2.	2.
3.	3.

Appendix 3

Current Energy Research Activities in Ireland

This section provides information on energy research and resources available in Ireland. The following agencies participate in energy research:

1. Sustainable Energy Ireland

SEI's role is to promote and assist the development of sustainable energy in Ireland. This includes research, development, demonstration and dissemination. SEI contributes to both policy and technical research and is responsible for coordinating the Energy theme of EU Framework Programmes. It supports energy research and demonstration through programmes arising out of Ireland's National Development Plan 2007-2013, through the commissioning of both applied and public good research.

SEI delivers the following research related programmes:

Renewable Energy Research, Development and Demonstration Programme (R.E. RD&D) – RD&D in renewable energy.

Ocean Energy Development Unit (OEDU) – SEI supports the introduction of ocean energy into the renewables portfolio in Ireland and helps develop the ocean energy sector.

Transport R&D – SEI conducts research into electric vehicles and battery electric vehicles.

Industry R&D – SEI develops energy management standards; Energy Efficient Design programmes; and technology and process optimisation.

Building R&D – SEI is responsible for implementing the EU Energy Performance of Buildings Directive.

Capacity building through IRCSET – SEI provides support to researchers and research facilities.

FP7 – SEI is the National Delegate and National Contact Point for Energy in the EU's Framework Programme 7.

Intelligent Energy Europe (IEE) – SEI is the National Contact Point for the IEE programme.

Research commissioning through the International Energy Agency (IEA) – SEI is the contracting party to four IEA Renewable Energy Implementing Agreements to which Ireland is a party, Bioenergy, Ocean, Wind and RE Technology Deployment.

2. Science Foundation Ireland (SFI)

SFI's role in energy research is to develop research units and capacities to address multi disciplinary issues and to identify high risk, speculative studies. It promotes EU and international co-operation in energy research.

The main energy related research programmes managed by SFI are:

Principal Investigator (PI) awards – supports science and engineering that underpins biotechnology (BIO), information and communications technology (ICT), and sustainable energy and energy-efficient technologies.

Research Frontiers Programme (RFP) – supports research in framework and/or integrative fields of science, engineering and mathematics.

Starting Investigator Research Grant (SIRG) – supports early-career-stage investigators to carry out research in science and engineering that underpins BIO, ICT, and sustainable energy and energy-efficient technologies.

President of Ireland Young Researcher Award (PIYRA) – recruits young researchers currently based around the world to carry out their research in third level institutions in Ireland.

Stokes Professorship and Lectureship – supports strategic planning for increasing the number of research-active faculty members in the short term.

Research Professorships – funds the most promising research talent within Ireland in the areas underpinning ICT and BIO, and assist Irish Research Bodies to attract outstanding scientists and engineers from outside the State.

Centres for Science, Engineering and Technology (CSETs) – links scientists and engineers in partnerships across academia and industry to further research, foster industrial development and expand educational and career opportunities in Ireland in science and engineering.

Strategic Research Clusters (SRCs) – facilitates the clustering of outstanding researchers to carry out joint research activities in areas of strategic importance to Ireland, and cultivates strong industry partnerships.

3. DCENR - Charles Parsons Energy Research Awards (now administered by SFI)

The aim of the Awards is to significantly develop Irish research capacity in priority areas of energy research. Research groups are located in Institutions on the Island of Ireland (32 counties) and have the capacity to conduct innovative research and to provide research training. A key objective is to stimulate an increase in research carried out by engineers.

Awards are made to research groups to fund:

Researchers – up to seven years funding for researchers who have obtained a PhD and have usually completed a post doctoral fellowship.

PhD Studentships – four-year awards to engineering graduates with allowance for the students to carry out part of their PhD training at International centres of excellence.

Summer student placements – designed to introduce undergraduate engineering students to the research activities of the groups.

Irish Energy Research Council

The Irish Energy Research Council is a non-statutory body with the following remit:

- advise on the development of policy for energy research and on priorities for Irish energy research up to 2013 and for the longer term;
- provide analysis and advice on the research capacity (human and infrastructure) required to address these priorities;
- coordinate existing energy RTDI activities in Ireland;
- facilitate positioning of energy research policy with overall energy policy as well as with policies for transport, environment, agriculture enterprise, science and education;
- play a key role in linkages with the EU and appropriate international bodies (including the International Energy Agency), and advise on coordinating the Irish engagement with the energy elements of programmes including the EU Framework Programmes;
- undertake (or commission) such underpinning analysis as required to inform policy development and strategic direction of relevant national energy RTDI programmes;
- support where appropriate major strategic research initiatives not encompassed by existing mechanisms;
- have regard to the all-island dimension in delivery of these remits.

4. Enterprise Ireland

Enterprise Ireland's role in energy research is to stimulate business activities including the commercial development of products and services.

High Potential Start-Up (HPSU) – provides financial assistance to HPSU companies to support the development of products, services or processes.

Competence centres – are resourced by highly-qualified researchers associated with research institutions, to undertake market focussed strategic R&D for the benefit of industry.

R&D Fund – small projects, stimulation grant, collaboration.

5. Forfás

Forfás provide the international context for measuring Ireland's standing in many business and social areas, including energy.

It delivers programmes and activities to:

- Build a world class research system for Ireland.
- Translate knowledge into jobs and growth.
- Undertake surveys on behalf of CSO, Eurostat and the OECD.
- Identify infrastructural challenges facing enterprise in Ireland.
- Benchmark Ireland's performance against other leading economies.
- Identify the opportunities for enterprise in the environmental/energy goods and services sector.
- Undertake greenhouse gas pricing models.
- Assess carbon taxation potential and develop related business case scenarios.

6. Environmental Protection Agency (EPA)

Among the research programmes that the EPA administers are:

Science, Technology, Research and Innovation for the Environment (STRIVE) – the purpose of the programme is to protect and improve the natural environment by addressing key environmental management issues through the provision of world-class scientific knowledge.

Cleaner Greener Production Programme (CGPP) – a grant scheme to encourage Irish organisations to implement 'cleaner greener' practices.

In addition, the EPA will undertake other functions including key national support in respect of the EU's 7th Framework Programme for research (FP7), specifically the theme Environment, including Climate Change as well as liaison and support in respect of other EU programmes and in the wider international context.

8. The Irish Research Council for Science, Engineering & Technology (IRCSET)

IRCSET forms a Board of senior academic and industrial figures. It operates multi-million euro research funding initiatives which support talented researchers in their early-career-stage formation across Masters, Doctoral and Postdoctoral levels in the sciences, engineering and technology.

The emphasis of the funding programmes is on exploratory research aimed at yielding new concepts, findings and innovations within Ireland. IRCSET's initiatives are funded by the National Development Plan of Ireland under the auspices of the Department of Education & Science.

Research disciplines covered by IRCSET programmes include Computer Science, Energy, Mathematics, Chemistry, Physics, Engineering, Biological Sciences and Earth Sciences. SEI collaborates with IRCSET under its Energy theme.

In addition to IRCSET's role in the Science and Society programme of the European Commission's Framework Programmes, the Council is involved in a number of activities at European level, including European Research Area Networks (ERA-NETs) and the European Science Foundation.

9. The Marine Institute

The Marine Institute delivers a marine energy related research programme.

Sea Change – A Marine Knowledge, Research & Innovation Strategy for Ireland 2007-2013 - this strategy aims to drive the development of marine resources in Ireland in a manner that contributes to the knowledge economy. The impacts which are targeted in the Sea Change Strategy include:

- Competiveness and sustainability;
- Economic stimulation and diversification;
- Research capacity increases;
- Regional development & North-South Co-operation;
- Public service improvements; and
- Improvements in environmental quality and management.

10. Economic and Social Research Institute

Current research on energy economics is focused on three broad areas:

- The operation of energy markets and their implications for competitiveness.
- Security of energy supply.
- The environmental implications of energy use (ISus).

New research on fuel poverty, funded through the Energy Policy Research Centre

Future ESRI research will focus on:

- How the new electricity markets perform in terms of delivering energy at a competitive price.
- How changes in household behaviour and in the structure of the business sector will impact on energy efficiency and on future energy demand.
- The implications for future energy use and supply of developments in transport and infrastructure.
- The effects of climate and energy security policies.
- The long-term role of energy in the economy.

Additional information and links

Energy RD&D online inventory

http://inventory.sei.ie/

Sustainable Energy Ireland

Energy Policy Statistical Support Unit (EPSSU)

http://www.sei.ie/Publications/Statistics_Publications/

International Energy Agency

R&D Statistics Home Page

http://www.iea.org/Textbase/stats/rd.asp

R&D Statistics Access Database

http://wds.iea.org/WDS/Common/Login/login.aspx

European Commission

Directorate-General for Research Information and Communication Unit

http://europa.eu.int/comm/research/rtdinfo/index_en.html

http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/introduction

"The energy sector faces the challenge of becoming more competitive, less reliant on imported energy carriers and environmentally sustainable. Innovative technologies are important in the sector's transition. R&D investment in the energy sector is therefore crucial."

A European Strategic Energy Technology Plan Capacities Map,
(Extracted from *A Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, 2008)*

Sustainable Energy Ireland
Wilton Park House
Wilton Place
Dublin 2
Ireland

T. +353 1 8082100 | info@sei.ie
F. +353 1 8082002 | www.sei.ie

Sustainable Energy Ireland is funded by the Irish Government under the National Development Plan 2007-2013 with programmes part financed by the European Union