ISMERI EUROPA

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

UNITED KINGDOM

VERSION: FINAL

PROFESSOR PETER TYLER

ST CATHARINE'S COLLEGE, CAMBRIDGE

AND CAMBRIDGE ECONOMIC ASSOCIATES

A report to the European Commission
Directorate-General Regional Policy

CONTENTS

LIST OF ABBREVIATIONS

- DECC-Department of Energy and Climate Control
- EEN – Expert Evaluation Network
- ERDF – European Regional Development Fund
- ESF – European Social Fund
- GD-Green Deal
- FIT-Feed-In Tariffs
- Ofgem-Office of the gas and electricity markets
- OP – Operational Programme
- RDA-Regional Development Agency
- ROC – Renewable Obligation Certificates
- RHI –Renewable Heat Incentive
- SAP-Standardised Assessment Procedure
- TSB-Technology Strategy Board

1. EXECUTIVE SUMMARY

At the present time there is much interest in the United Kingdom in increasing the exploitation of renewable energy sources. Compared to elsewhere in Europe the United Kingdom has made a relatively slow start. It is also recognised that more progress in improving energy efficiency in the housing is required. The rationale for intervention has been made on environmental grounds with a strong emphasis on the reduction of carbon emissions and meeting binding international targets. There are also seen to be important benefits to innovation, investment and growth. A substantial job payback has been identified.

In recognition of the need to increase investment in renewable energy sources and improve energy efficiency in the home HM Government has initiated a number of quite wide ranging national measures that include direct support for new capital investment and indirectly through fiscal, tariff and regulatory support as in the use of Renewable Obligation Certificates and Feed-in tariffs. Over the period 2000-2009 total funding committed to the overall development, demonstration and deployment of renewable energy technologies is estimated to have been £ 464million (EUR 525.5 million) (NAO, 2010). Because the cost of providing energy from renewable energy varies considerably by source there are corresponding variations in the rate of return from support. The cost information is used to gauge the level of support required to enable the providers of renewable energy and the national grid suppliers to maintain a rate of return commiserate with market convention. This modelling has helped to determine the banding of Renewable Obligation Certificates (ROCs) as well as levels of Feed-in tariffs.

Energy efficiency in housing

A recently introduced initiative to encourage energy efficiency in the home is the Green Deal. This policy enables Registered Social Landlords to recover the investment they make in insulation and energy efficient heat sources from the rent they charge tenants.

The future direction of policy will be influenced by a proposed reform of the electricity market in the United Kingdom. A consultation on Electricity Market Reform was launched in late 2010. There is interest in encouraging more certainty in Feed-in tariffs. The Renewables Obligation is the main platform being used to ensure stable and long-term support for renewables.

ERDF has been used alongside other national funding streams by the Regional Development Agencies and in Scotland, Wales and Northern Ireland by the Devolved Administrations. The emphasis given to renewable and energy efficiency has varied but in some regions it has been of considerable importance. Support has been given to encourage innovation, R&D and

business. Use of ERDF in relation to energy efficiency of residential housing has only occurred since 2009 following the amendment to Article 7 that enabled Member States to spend up to 4% of their total ERDF allocation on these measures with a focus on supporting social cohesion.

As with the overall take-up of ERDF allocation in the early phase of the programming period deployment of funding was slow with commitment at only 10% of allocation by the end of 2009. There were a number of reasons for this including issues around interpretation of eligibility criteria. Over the last eighteen months the position has begun to change significantly. The financial crisis in 2008 and the subsequent recession and austerity measures have made it more difficult for renewable energy projects to access finance.

The Report concludes by identifying some of the main challenges that are likely to constrain evaluation of the impact of policy and where more research is needed at the present time.

2. NATIONAL POLICY

Introduction

The United Kingdom has started from a relatively low base in its exploitation of renewable energy. Thus, in 2005 only 1.3% of total energy consumption was provided by renewable energy sources compared with an EU 27 average of 8.5%. In recent years there has been much attention to increase the contribution that the sector can make. There is a target under the EU Renewable Energy Directive 2009 to supply 15% of all the United Kingdom's energy needs (electricity, heat and transport) from renewable sources by 2020. The current UK renewable policy framework has three main components. These are to establish a financial framework that can 'provide long-term, comprehensive and targeted support for renewable technologies' (DECC, 2010), unlock barriers that are inhibiting the use of established renewable technologies (including things planning control, supply chains, ensuring connectivity to the electricity grid and the use of bio energy) and develop emerging technologies (with much attention currently being given to wind and marine energy sources).[1]

It has been estimated that energy use in the home is responsible for around a quarter of the United Kingdom's carbon dioxide emissions. Evidence has also pointed to the United Kingdom housing stock having poor energy efficiency in comparison with the rest of Europe (Parliamentary Office of Science and Technology, 2005). It is thus not surprising that the United Kingdom has been seeking to encourage more energy efficiency in residential housing.

There have been a number of elements to the policies adopted. One has been to make newly built houses consume less energy with an objective of all new homes in England being carbon neutral by 2016. The emphasis is on strengthening new-build standards through changes to Building Regulations. Much effort has gone into the Standard Assessment Procedure for Energy Rating of Dwellings (SAP). HM Government has also sought to encourage energy efficiency in homes by reducing the VAT rate on relevant building work (HM Revenue and Customs, 2008).

At the present time free loft insulation and cavity wall insulation grants are available to private households where anyone is aged 70 and above or anyone is in receipt of certain

1 The future direction of policy will be influenced by proposed reform of the electricity market in the United Kingdom. A consultation on Electricity Market Reform was launched in late 2010. There is interest in encouraging more certainty in Feed-in tariffs. HM Government Carbon Plan outlines a 'contract for difference' approach for low carbon generation whereby there is a guaranteed price for generators and contracting for the Government to meet the difference between this and the current market price. The merits of this approach are being compared with the alternative of a premium feed-in tariff where generators get a fixed payment on top of the market price (HMG, 2011).

benefits, tax credits or allowances. All other home owners and private tenants will still qualify for a partial grant. From 2012 HM Government is seeking to establish the Green Deal (DECC, 2011). The Green Deal is currently being piloted in Greater Manchester and it involves improvements in wall insulation and heating systems paid for by Registered Social Landlords who then recover these costs from their tenants. The tenants are expected to be able to cover these costs and also save from lower energy bills.

In March 2011 Government outlined the Renewable Heat Incentive (RHI) Policy that is designed to transform the way in which heat is generated and used in buildings and homes. The object is to provide long-term financial support to renewable heat installations that encourages them to use renewable heat through a tariff support scheme. The RHI tariff levels will be based on the relative costs of the technologies involved and provide a return on capital. Compensation as such is designed to provide only for the additional costs of the renewable technology over and above the comparable fossil fuel equivalent.

The scale of support for renewable energy

The Department of Energy and Climate Change (DECC) is responsible for the United Kingdom's overall renewable energy policy and targets. Its support framework provides finance for renewable energy technologies, innovation and deployment. There are two main types of policy support in relation to renewables. The first is *direct* support using public funds to encourage research, development, demonstration and the early deployment of renewable energy technology (NA0, 2010). The preferred form of intervention here has usually been grants, although there has also been some use made of loans and equity investments with an emphasis on using the intervention to secure other cross-cutting objectives of government policy that include technology, innovation and the promotion of economic competitiveness. It has been estimated that over the period 2000-2009 total funding committed to the development, demonstration and deployment of renewable energy technologies was £ 464 million (EUR 525 million). The Offshore Wind Capital Grants Scheme appears to have had one of the most significant impacts increasing renewal generating capacity by 14% in 2008 (NAO, 2010).

The second form of support is *indirect* through regulatory, fiscal and tariffs that reward renewable energy generation and penalise the use of carbon-intensive energy. A central element in this is the 'Renewables Obligation' (DECC, 2011). This requires licensed electricity suppliers to obtain an increasing amount of their supplies from renewable sources. Around £ 1 billion (EUR 1.1 billion) of financial support was provided through this in 2008-9 (NAO, 2010). In addition, electricity generated from renewable sources is eligible for tax relief. This is because the Climate Change Levy introduced in Finance Act 2000 only applies to electricity generated from traditional sources.

In addition, in April 2010 a Feed-in tariff system was introduced whereby a generation tariff is paid to small scale renewable energy producers for every KWh generated (whether or not such electricity is exported to the national grid) and an export tariff to them where such electricity is also exported to the national grid (Ofgem, 2010).

There is also a Renewable Fuels Transport Obligation adopted in 2008 that required transport fuel suppliers to provide a certain percentage of all road vehicle fuel from sustainable renewable sources by 2010.

Of the two forms of support the Renewables Obligation is the most significant. To provide a simple comparison, in 2008-9 direct support was of the order of £ 76 million (EUR 86 million), whilst indirect Renewables Obligation support was of the order of a £ 1 billion (EUR 1.1 billion). This is, in fact, treated as government expenditure, although it is ultimately financed through electricity charges levied on consumers.

Variation by energy source

Historically direct support for new and existing renewable technology has been through grants. Detailed analysis of how public funds have been used to assist renewable energy technologies is constrained because there is no systematic collection and assembly of the required data. Moreover, information provided by the Department of Energy and Climate does not include the activities, and thus funding, deployed by the Regional Development Agencies in England and the Devolved Administrations (Scotland, Wales and Northern Ireland), or for that matter, financial support from other government departments.

Over the period 2000 to 2009 it is possible to obtain some idea of the use of total *direct* funding support provided by the Department of Energy and Climate, the Carbon Trust and Technology Strategy Board. Some of this was in the form of loans and the amount paid back was £ 191.8 million (EUR 217.2 million). This excludes the financial support provided by the Regional Development Agencies.

Some indication of how this support was distributed by different energy sources is presented in Annex Table L. Annex Table L indicates that of the £ 113.5 million (EUR 128.5 million) spent by the Department of Energy and Climate some £ 37.7 (EUR 41 million) million was on offshore wind and marine, £ 18.5 million (EUR 21 million) on bio energy and £ 36.2 million (EUR 41 million) on photovoltaic. It is estimated that 70% of the *gross* expenditure on grant schemes for renewable technology throughout this period was on the installation of established renewable technologies like the capital costs of offshore wind farms or biomass generating plant. The remaining 30% went to the development of new technologies involving collaborative Research and Development funding with the Technology Strategy Board and the Carbon Trust in the United Kingdom.

Besides this total direct funding by central government there was also further funding for renewable technology by the Regional Development Agencies and Devolved Administrations. In 2008-2009 the Regional Development Agencies spent £ 43 million (EUR 48.7 million) (and this compares with the £ 31 million (EUR 35 million) spent by DECC in that year). Of the total RDA spend on renewable energy in 2008-9 the largest amount, around £ 14 million (EUR 15.9 million), was in the Northern region. The Northwest, South West, East Midlands and West Midlands committed around £ 4 million (EUR 4.5 million).

Indirect price support

The Renewables Obligation Order in England and Wales, Scotland and Northern Ireland placed an obligation on licensed electricity suppliers to source an increasing proportion of electricity from renewable sources. Suppliers can meet their obligations by presenting sufficient Renewable Obligation Certificates to cover their obligations. Where suppliers do not have sufficient ROCs to meet their obligation, they must pay an equivalent amount into a buyout fund. The funds are paid back on a pro-rata basis to those suppliers that have presented ROCs (Collins, 2010).

The amount of ROCs that suppliers receive varies by renewable energy source. In 2009 DECC introduced 'banding' to the Renewables Obligations so that key technologies like offshore wind would receive a higher subsidy. Annex Table I shows that it is lowest for landfill gas (0.25 ROCs/ MWh-implied subsidy on top of wholesale price of 1.2 p/kWh (EUR 1.4/KWh)) and highest for wave generation in Scotland (at 5 ROCs/MWh-implied subsidy on top of wholesale price of 24.0 p/kWh (EUR 27.2/KWh)). At the present time HM Government is undertaking a review of the banding regime and this will be published in 2013.

In relation to the Feed-in Tariff scheme the tariffs for new installations in the period 2010-2013 vary considerably by source (Annex Table A).

Impact of financial crisis and austerity

The financial crisis in 2008 and the subsequent recession and austerity measures have made it more difficult for renewable energy projects to access finance (HC, 2010). The Department of Energy and Climate Change has responded by seeking to help to secure investment from the European investment Bank and British banks and provided new venture capital funding through the Carbon Trust.

There is no precise indication of what is the impact of the current austerity measures on public financing for renewable and energy efficiency in the homes, partly because funding has historically come from a number of different departments that include the Department for Energy and Climate Change. The abolition of the Regional Development Agencies in England may mean fewer resources for investment in renewable technology and relevant

business support at the regional level. However, the Department of Energy and Climate Change has previously found it difficult to spend some of its funds suggesting an absorption problem. DECC has also argued that support for energy innovation does not need to continue at the £ 30 million to £ 58 million (EUR 34 million to EUR 65.7 million) that it did in England over 2008-10 presumably indicating some degree of maturity is occurring in the relevant technology platforms.

Variation by region

Indirect support through the use of regulatory and price/fiscal measures (i.e. Renewable Obligation and Feed-in Tariffs) varies by renewable energy source. Some direct support varies by region. Each Regional Development Agency in England and the Devolved Administrations undertakes its own review and assessment of funding needs and identifies the best way to secure its energy renewable goals. Support has tended to be higher where the region has a particular comparative advantage in certain renewables as a result of physical factors like the ability to site offshore wind turbines.

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

Introduction

The United Kingdom's National Strategic Reference Framework underpinning the deployment of ERDF over 2007 to 2013 emphasises the need to stimulate regional economic growth but a cross-cutting theme is environmental sustainability and respecting the principles of sustainable development. A core part of this is to reduce the UK's emissions of carbon dioxide by 60% by 2050. There is a particularly strong link between innovation and investment in renewable energy sources. HM Government has made a similar argument in relation to the Heat Transfer Initiative (DECC, 2011) and energy efficiency in residential housing (DCLG, 2011).

ERDF Contribution to national policy

Renewables

The use of ERDF funding to address the renewable and energy efficiency agenda of the United Kingdom has sought to ensure complementarily between national and regional objectives both with respect to the environment and the encouragement of economic development. National policy has set the agenda for the use of tariffs and regulation and with the exemption of Northern Ireland the same policy regime is operating across Scotland, England and Wales. Broadly the same tariff position for electricity pricing support is also operating across the United Kingdom for energy efficiency in the home.

The main sources of funding for renewable energy innovation across the United Kingdom has been DECC. This has been supplemented by support from other Government Departments and the Regional Development Agencies in England and the devolved administrations in Scotland, Wales and Northern Ireland. In England grant support from the Regional Development Agencies has exceeded that provided directly by the DECC. The support provided by the RDAs has drawn on their own central government funding (the Single Programme) and ERDF has tended to reflect similar projects to those supported by DECC funding and the same would generally be true in the Devolved Administrations.

Thus ERDF funding has been used alongside the funding available from other national sources. Regions have decided their own priorities as to which renewable energy types that they wish to support in line with relative comparative advantage and thus potential. Annex Tables D and E indicate how assistance has been divided by energy source. It is difficult to assess whether the variation in ERDF support across the regions is in line with support from national sources because of a lack of information, particularly relating to support from Government departments other than DECC. In England, however, the ERDF expenditure undertaken by the RDAs has been matched by national resources from the Single Programme and thus broadly reflects the same spatial variation. Where assistance for investment in renewable has been provided by grants from DECC this has been by specific initiative launched periodically and there will not thus be any direct match between national funding and the ERDF allocation.

A recent House of Commons Select Report (HC, 2010) has argued that the funding has tended to support technologies that are now seen to be relatively mature. ERDF funding and the general work of the RDAs will be transferring to the Technology Strategy Board in England once the RDAs close. The Devolved Administrations will continue to use ERDF in line with their national priorities as in the past.

United Kingdom structural Fund priorities in renewable and energy efficiency in the home

HM Government policy has been to align ERDF programme priorities with the Regional Economic Strategies of the Regional Development Agencies in England and the Devolved Administrations in Scotland, Wales and Northern Ireland. The ERDF strategy for the Competitiveness and Employment Objective in England has identified core objectives to be the encouragement of sustainable development, the use of low carbon energy sources and promoting greater efficiency in the use of energy.

In Scotland the renewable energy sector is seen to offer substantial economic benefits, as well as assisting in helping to protect the environment. The Scottish Executive wants 40% of electricity in Scotland to be generated from renewable sources by 2020. The Welsh Environment Strategy identifies a strong link between the economic development of the

Welsh economy and the promotion of sustainable development and in particular responding to climate change. A priority for ERDF expenditure is to create an attractive business environment around the development of clean and renewable energy and energy efficiency and exploit the economic potential of the region's substantial maritime and inland water assets. In Northern Ireland ERDF support has prioritised promoting cleaner and more efficient energy related technologies. An important rural and agriculture agenda is also identified.

Scale of ERDF support compared to other aims supported under the Operational Programme

Annex Table B shows how support for renewable has been reflected in the allocation of ERDF. There are no entries in the table on expenditure on energy efficiency in housing under type 78 Housing Infrastructure because the enabling legislation amending Article 7 was only enacted in 2009. Investment in the renewable energy sector has represented just over 3% of the total UK allocation. By way of comparison, integrated projects for urban and rural regeneration accounted for around 4% and implementing active and preventive measures on the labour market for nearly 11%. Assistance to R&TD, particularly in SMEs was about 3%.

Annex Table B shows that commitment as a proportion of allocation was only 10% by the end of 2009. The position was better for individual energy sources around 22% for wind and 32% for biomass. Commitment under the heading of energy efficiency, co-generation and energy management that had been particularly weak. Allocation by energy source was 0.4% for wind, 0.3% for solar, 0.4% biomass and 0.5% hydroelectric and geothermal. Actual commitment by the end of 2009 was greatest in biomass at 0.3% of total commitment.

By region

Annex Table C shows that the amount allocated to renewables has varied across the eligible regions of the United Kingdom. Some 59% of all UK expenditure allocated to renewables is in the competitiveness and employment regions with 41% in the convergence regions. The convergence regions have allocated around 3.6% of their total ERDF and the competitiveness and employment regions around 2.6%. There is considerable variation by region. In competitiveness and employment regions ERDF expenditure on renewable energy has been concentrated in the East of England, Yorkshire Humberside and Northern Ireland and to a lesser extent in the South West, North East and London. In the convergence regions the largest expenditure has been in West Wales and the Valleys and the rest in Cornwall.

Annex Tables F, G, and H show the regional breakdown for ERDF expenditure relating to energy efficiency in the home. The overall UK allocation to this activity is 2.8% of total ERDF. The proportion is higher at 3.0% in the competitiveness and employment regions. In this group the North West and London have featured heavily. The proportion in the convergence regions overall is 2.4% and most of the expenditure is in West Wales and the Valleys.

Have there been any changes in the scale or form of ERDF support since the programming period began?

ERDF investment in energy investment in the home has only been possible since 2009 so there has not been enough time for significant change in what is actually being implemented. Also there does not seem much evidence that support was intensified during the economic down-turn because as at the end of 2009 overall ERDF commitment in relation to allocation was so low.

4. RATIONALE FOR PUBLIC INTERVENTION

Renewable energy

There is a plethora of documents that argue the case for support for renewable energy in the United Kingdom. The rationale for public policy intervention has been discussed extensively. The more so since the United Kingdom has abundant renewable energy resources but is lagging behind many other countries in Europe. The case for intervention has been made extensively on environmental grounds with a strong emphasis on the reduction of carbon emissions and meeting binding international targets. At both the regional and national level support for the sector has also been made on economic grounds with important benefits in terms of stimulating innovation, investment and growth. A substantial job payback has been identified.

In deploying their ERDF the Regional Development Agencies in England and the Devolved Administrations in Scotland, Wales and Northern Ireland use ERDF alongside other funding sources. There has been a preference in the UK to support grants over other forms of support (i.e. loans etc). However, 'there would not appear to be an extensive body of research on the relative cost effectiveness of grants, equity funding, loans or other forms of financial support for renewable energy technologies' (NAO, 2010).

Energy efficiency of residential housing

The United Kingdom has been slow in reducing energy loss from residential homes and has a poor record in relation to much of Europe. The need to improve the situation has been set out persuasively in a number of documents. The use of ERDF to secure objectives under this heading is of relatively recent origin, and this explains why there is little evidence of allocated expenditure in this direction by the end of 2009. However, there has been buoyant demand for the ERDF funded initiatives in some regions since that time suggesting the presence of strong market failure. Interest in the expenditure of ERDF resource in this direction has also been strong because of the scope it offers to tackle social exclusion.

5. RATE OF SUPPORT AND PROFITABILITY

Renewable energy

There is extensive discussion in the literature as to how generation costs vary according by technology. Annex Table J provides an indication of how these costs vary for different generation technologies in pounds per megawatt hour in 2010. Tidal power, offshore wind and solar require particularly high up-front expenditure since they are very capital intensive. A further source on the extent of cost variation has been provided in a recent Mott MacDonald study undertaken for DECC. Annex Table K summarises this information and enables comparison with nuclear PWR since all information is presented in levelised cost terms.

This cost information has been used to model the level of support required to enable the providers of renewable energy and the national grid suppliers to maintain a rate of return commiserate with market convention. This modelling has thus helped in determining the banding of ROCs as well as levels of Feed-in tariffs.

Energy efficiency in housing

Both the Green Deal and the Renewable Heat Incentive require cost and pay-back calculations. In the case of the Renewable Heat Incentive scheme the approach requires the long-term financial support through tariff support to be assessed. The Green Deal requires Registered Social Landlords to recover the investment they make in insulation and energy efficient heat sources from rents. The payback period has to be assessed. In fact, the calculations also consider the social rate of return of the investment since the benefits continue to accrue to the tenants and society as a whole after the capital costs have been recovered.

The Renewable Heat Incentive Scheme provides a financial incentive to install renewable heating in the place of fossil fuels. The first phase involves long-term tariff support for the non-domestic sector to install renewable heat instead of fossil fuels. The mechanism is thus to reduce the relative cost of energy used to produce heat and this will enhance company profitability. As part of this first phase a Renewable Heat Premium Payment system will also be introduced for the domestic sector. Thus, a household that installs a renewable heat system will be assisted through the premium required to subsidise the cost of installing renewable heating systems. These payments to households will begin in July 2011. They will support a range of technologies across all regions of Great Britain and will be eligible to replace gas and coal fired systems.

A second phase of the Renewable Heat scheme will be introduced in 2012 and is designed to provide long term tariff support and will coincide with the Green Deal for Homes. The

tariff levels will bridge the financial gap between the cost of conventional and renewable heat systems with additional compensation for certain technologies for an element of non-financial cost. Payments will be made quarterly over a 20 year period and the RHI is funded from general government spending and not a levy.

6. COSTS, PUBLIC SUPPORT AND PRICES

In an earlier section of this Report evidence was presented that indicated that UK renewable had received £ 460 million (EUR 520 million) of public sector support of which 96% was in the form of grants. Annex Table L outlines how the level of funding has been divided by energy source. The main source of support is through fiscal and tariff support and this varies by technology but there are not any overarching estimates of what this means in terms of 'effective' public subsidy. However, Annex Table I shows renewable obligation levels of Renewal Obligation certificates supported by technology and the implied public subsidy on top of the wholesale price. The source for this is the Department of Energy and Climate Change National Renewable Energy Action Plan. Annex Table J provides estimates of how UK energy costs vary by renewable energy technology. Annex Table K provides levelised costs of the main technologies in £ (EUR) per MWh (Mott MacDonald, 2010). This source provides a breakdown of how levelised cost varies by capital, fixed operating, variable operating, fuel, carbon, decommissioning and CO_2 cost.

In relation to the market price of residential housing there is a relationship between the energy efficiency of the building and the house price, particularly in the light of recent moves to require the energy efficiency of the building to be assessed. However, compared to other factors that influence price, the premium is extremely small. The Green Deal is designed to ensure that the rent of social housing enables the up-front investment in energy saving measures to be captured.

7. CONCLUSIONS

In this section the emphasis is on identifying problems that are likely to affect the implementation and impact of policy relating to renewable energy and energy efficiency in the home.

An issue of serious concern, and which has been highlighted in the recent House of Commons Public Accounts Report (House of Commons, 2010), is that it has proved to be difficult to secure take-up of direct support for renewable energy. This usually takes the form of grants to support business development and R&D and where ERDF has played a part. Of £ 367 million (EUR 415.6 million) available (from national and regional initiatives) over 2000-2009, only £ 186 million (EUR 210.6 million) was actually spent. Given that the UK missed its 2010 renewables target the importance of ensuring better take-up of the

resources available from whatever source is clear. Moreover, the problems associated with a failure to take-up assistance in the sector are now being compounded by the effects of fiscal austerity which is likely to reduce, perhaps quite significantly, the volume of resources available, particularly across the English regions which have delivered ERDF. It has been announced that the Regional Development Agencies are to be abolished by end March 2012. Whilst the functions undertaken by the RDAs are being absorbed into other parts of Government including the Technology Strategy Board it is not clear what the implications of this will be on delivery at the regional level.

It is obviously very difficult to know what has been the impact thus far of national fiscal, tariff and regulatory initiatives designed to stimulate both the use of renewable and energy efficiency in the home. As this Report has emphasised, there is a very large amount of debate, investigation and review at the present time. Some potentially quite promising initiatives have only recently been announced and their likely impact remains uncertain. Establishing the impact of the overarching tariff regimes and fiscal subsidies on the profitability of providing energy from renewables, and thus the impact on activity and investment in the sector, will require some econometric modelling. Enquiries are currently being made as to whether this exists and whether it has been given any regional dimension. This is particularly the case given the very significant differences that exist in the underlying cost of provision from different renewable energy sources between different regions as highlighted in this Report.

ERDF support is working to encourage enhanced levels of business development, R&D and investment across the English regions, Scotland, Wales and Northern Ireland. The indications are that it is making an important contribution but it is essential that the achievements of both national orientated programmes and regional development programmes including those co-funded by ERDF are evaluated and value for money assessed. Related to this is the difficulty of obtaining up-date information and bringing together what is being spent by a number of different departments. In the future DECC have argued that it will monitor expenditure on innovation in the sector through its membership of the Carbon Innovation Group but it is not accountable for support from other departments and thus how the required monitoring will be coordinated.

REFERENCES

Aeon (2010), Assessment of Non-Cost Barriers to Renewable Energy Growth in EU Member States. Ecorys.

Aeon (2010), Non-cost Barriers to Renewables-Aeon Study. United Kingdom.

Collins, P (2010), Renewable Obligation Guidance for Licensed Electricity Suppliers. Ofgem.

Committee on climate change. (2010), Scotland's Path to a Low-Carbon Economy.

Committee on climate change (2010), The Renewable Energy Review.

DCLG. (2011), Code for Sustainable Homes and Energy Performance of Buildings: Cumulative and Quarterly data for England, Wales and Northern Ireland up to December 2010.

DCLG Grant Shapps (2011), Manchester to Kiskstart Green Homes Revolution. March 2011.

DECC (2011), The Energy Bill.

DECC (2011), Renewable Heat Incentive. URN 11d/0017.

DECC (2011), The Renewable Heat Incentive. Impact Assessment urn 11d/0018.

DECC (2010), UK National Renewable Energy Action Plan.

DECC (2009), the UK Renewable Strategy.

Department for Trade and Industry (2006), United Kingdom National Strategic Framework. 2007-2013. OCTOBER 2006.

Energy Saving Trust (2008), Energy Efficiency and the Code for Sustainable Homes. Level 3. CE290.

Energy Saving Trust. Building Regulations Covering Energy Efficiency. http://www.energysavingtrust.org.uk/business/business/housing

House Commons (2010).

HM Government. Carbon Plan (2010/11).

HM Government (2009), The UK Renewable Energy Strategy.

HM Revenue and Customs (2008), Building and Construction Work and VAT.

House of Commons Committee on Public Accounts (2010) Funding the Development of Renewable Energy Technologies. Seventh Report of Session 2010-11. hc538. (2010).

Mott MacDonald (2010), UK Electricity Generation Costs Update.

National Audit Office (2010), Government Funding for Developing Renewable Energy Technologies. National Audit Office. Report by the Comptroller and Auditor General. HC 35 session 2010-2011.

National Renewable Energy Action Plan for the United Kingdom. Article 4 of the Renewable Energy Directive 2009/28/ec.

Ofgem (2010), Renewables Obligation: Guidance for Licensed Electricity Suppliers (GB and NI).

Ofgem (2010), Introducing the Feed-In Tariff Scheme.

Parliamentary Office of Science and Technology (2005). Household Energy Efficiency. Number 249.

Renewable Heat Incentive (RHI) Scheme. http://www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy

The Renewables Obligation (Amendment) Order 2011 (DEC, 2011).

ACKNOWLEDGEMENTS

The author is most grateful for help and assistance from:

Stuart Brandrick, Advantage West Midlands.

Alasdair Brown, Energy and Waste Manager, South West Regional Development Agency.

Michelle Burdett, East England Development Agency.

Marina Ciaraldi, Development Manager, Economic Inclusion Directorate, Yorkshire Forward.

Marie Clayton, ERDF Development and Delivery Manager, North West Development Agency.

Stuart Creedy, Head of ERDF. East Midlands Development Agency.

Nuala Crossin, European Programmes, Department of Enterprise, Trade & Investment

Netherleigh.
Julie Farrow, Renewables - Department of Energy and Climate Change.

Kathryn Helliwell, Research, Monitoring and Evaluation - Welsh European Funding Office, Welsh Assembly Government.

Nigel Jarvis, Head of Transport, Environment and Community, ERDF Programme Management. Welsh Government.

Graham Kinshott, Department of Communities and Local Government.

Carol Sweetenham, Department of Communities and Local Government.

Anna Vinsen, Advantage West Midlands.

Ginny Walker, RDA Structural Funds Manager - England.

Tracy Welland, Project Development Manager, Transport, Environment and Community, ERDF Programme Management, Welsh Government.

TABLES

Annex Table A – Synthesis of measures to support renewables in electricity generation – UK

	Electricity prices (per kWh 000)		Measures:						
	Domestic	Industry	Biomass	Biowaste	Photovoltaics	Solar thermal	Small hydro	Wind onshore	Wind offshore
	137.0	*102.5*	FIT 99-126.5 (operational since 2010)	FIT 99-126.5 (operational since 2010)	FIT 322.3-454.3 (depending on capacity and connectedness)	QS with green certificates	FIT 195.8-218.9 (depending on capacity)	FIT 49.5-379.5 (depending on the size)	QS with green certificates
			QS with green certificates	0.25 ROCs/MWh for landfill gas, 0.5 ROCs/MWh sewage gas	QS with green certificates	TE: no levy (EUR 5.17 per MWh)	QS with green certificates	QS with green certificates	TE: no levy (EUR 5.17 per MWh)
			TE: no levy (EUR 5.17 per MWh)	TE: no levy (EUR 5.17 per MWh)	TE: no levy (EUR 5.17 per MWh)		TE: no levy (5.17 EUR per MWh)	TE: no levy (EUR 5.17 per MWh)	

Note: Data and measures relate to 2009.
Degression is the rate of reduction each year, usually a fixed % of the rate in the previous year Subsidies: FIT = Feed-in Tariffs Premium
QS = Quota System
IG = Investment Grants
TE = Tax exemption
FI = Fiscal Incentives Other
Acronyms: CHP = Combustion Heat and Power(cogeneration)

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

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
01 R&TD activities in research centres	176.7	97.6	55.3	1.8	2.3
02 R&TD infrastructure (including physical plant, instrumentation and high-speed computer networks linking research centres) and centres of competence in a specific technology	268.3	73.7	27.4	2.7	1.7
03 Technology transfer and improvement of cooperation networks between small businesses	293.5	79.2	27.0	3.0	1.8

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
(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.)					
04 Assistance to R&TD, particularly in SMEs (including access to R&TD services in research centres)	304.7	157.6	51.7	3.1	3.7
05 Advanced support services for firms and groups of firms	404.1	149.1	36.9	4.1	3.5
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)	272.5	113.2	41.5	2.8	2.6
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.)	280.9	43.9	15.6	2.8	1.0
08 Other investment in firms	434.1	304.4	70.1	4.4	7.1
09 Other measures to stimulate research and innovation and entrepreneurship in SMEs Information society	535.5	269.3	50.3	5.4	6.3
10 Telephone infrastructures (including broadband networks)	113.5	43.7	38.5	1.1	1.0
11 Information and communication technologies (access, security, interoperability, risk-prevention, research, innovation, e-content, etc.)	26.8	12.2	45.4	0.3	0.3
12 Information and communication technologies (TEN-ICT)	26.9	6.0	22.1	0.3	0.1
13 Services and applications for the citizen (e-health, e-government, e-learning, inclusion, etc.)	29.0	1.9	6.7	0.3	0.0
14 Services and applications for SMEs (e-commerce, education and training, networking, etc.)	110.8	49.1	44.3	1.1	1.1
15 Other measures for improving access to and efficient use of ICT by SMEs	68.5	9.3	13.6	0.7	0.2
16 Railways	84.9	16.2	19.0	0.9	0.4
17 Railways (TEN-T)	0.0	0.0	0.0	0.0	0.0
18 Mobile rail assets	2.0	0.0	0.0	0.0	0.0

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
19 Mobile rail assets (TEN-T)	0.0	0.0	0.0	0.0	0.0
20 Motorways	1.4	0.0	0.0	0.0	0.0
21 Motorways (TEN-T)	90.1	0.0	0.0	0.9	0.0
22 National roads	2.0	0.0	0.0	0.0	0.0
23 Regional/local roads	26.2	6.5	24.8	0.3	0.2
24 Cycle tracks	6.3	3.9	61.1	0.1	0.1
25 Urban transport	9.0	0.0	0.0	0.1	0.0
26 Multimodal transport	117.7	9.5	8.1	1.2	0.2
27 Multimodal transport (TEN-T)	0.0	0.0	0.0	0.0	0.0
28 Intelligent transport systems	3.0	0.0	0.0	0.0	0.0
29 Airports	23.0	0.0	0.0	0.2	0.0
30 Ports	15.3	0.6	3.9	0.2	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	2.3	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	39.0	8.4	21.6	0.4	0.2

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
40 Renewable energy: solar	26.6	0.7	2.6	0.3	0.0
41 Renewable energy: biomass	42.2	13.7	32.4	0.4	0.3
42 Renewable energy: hydroelectric, geothermal and other	52.3	4.4	8.4	0.5	0.1
43 Energy efficiency, co-generation, energy management	150.7	3.6	2.4	1.5	0.1
SUB-TOTAL - Renewable energy	**310.8**	**30.8**	**67.4**	**3.1**	**0.7**
44 Management of household and industrial waste	20.2	0.9	4.5	0.2	0.0
45 Management and distribution of water (drinking water)	0.0	0.0	0.0	0.0	0.0
46 Water treatment (waste water)	0.0	0.0	0.0	0.0	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	102.5	40.1	39.1	1.0	0.9
50 Rehabilitation of industrial sites and contaminated land	179.0	0.3	0.2	1.8	0.0
51 Promotion of biodiversity and nature protection (including Natura 2000)	1.6	0.0	0.0	0.0	0.0
52 Promotion of clean urban transport	85.1	4.1	4.8	0.9	0.1
53 Risk prevention (including the drafting and implementation of plans and measures to prevent and manage natural and technological risks)	0.1	0.0	0.0	0.0	0.0
54 Other measures to preserve the environment and prevent risks	18.4	0.1	0.4	0.2	0.0
55 Promotion of natural assets	29.0	26.8	92.4	0.3	0.6
56 Protection and development of natural heritage	60.0	7.2	12.1	0.6	0.2
57 Other assistance to improve tourist services	32.4	59.3	183.1	0.3	1.4
58 Protection and preservation of the cultural heritage	3.1	1.0	32.1	0.0	0.0
59 Development of cultural infrastructure	28.1	4.4	15.5	0.3	0.1

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
60 Other assistance to improve cultural services	2.1	5.2	249.3	0.0	0.1
61 Integrated projects for urban and rural regeneration	436.8	143.3	32.8	4.4	3.3
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	1261.0	661.6	52.5	12.7	15.4
63 Design and dissemination of innovative and more productive ways of organising work	11.0	0.0	0.0	0.1	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	108.8	113.9	104.7	1.1	2.6
65 Modernisation and strengthening labour market institutions	0.0	6.4	0.0	0.0	0.1
66 Implementing active and preventive measures on the labour market	1067.8	728.7	68.2	10.8	16.9
67 Measures encouraging active ageing and prolonging working lives	133.4	47.3	35.4	1.3	1.1
68 Support for self-employment and business start-up	87.8	29.5	33.6	0.9	0.7
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	247.4	137.3	55.5	2.5	3.2
70 Specific action to increase migrants' participation in employment and thereby strengthen their social integration	49.0	0.9	1.9	0.5	0.0
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	1108.2	530.4	47.9	11.2	12.3
72 Design, introduction and implementation of reforms in education and training systems in 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	156.5	49.7	31.8	1.6	1.2

	EUR million		Commitments as % of allocation	% of total	
	Allocation	Commitments		Allocation	Commitments
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	186.7	90.8	48.7	1.9	2.1
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	55.7	43.3	77.7	0.6	1.0
75 Education infrastructure	37.8	7.5	19.9	0.4	0.2
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	1.0	0.7	71.5	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.	34.0	0.0	0.0	0.3	0.0
82 Compensation of any additional costs due to accessibility deficit and territorial fragmentation	0.0	0.0	0.0	0.0	0.0
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	3.7	0.0	0.0	0.1
85 Preparation, implementation, monitoring and inspection	224.7	58.9	26.2	2.3	1.4
86 Evaluation and studies, information and communication	82.0	27.5	33.5	0.8	0.6
	9890.9	**4308.3**	**43.6**	**100**	**100**

Source: DG REGIO

Annex Table C – Total renewable energy

	Renewable energy: total (FOI 39-42)		Total ERDF + Cohesion		Total renewable energy as % of Total ERDF+Cohesion
	EUR million	%	EUR million	%	
Competitiveness	94.3	58.9	3,585.7	66.2	2.6
Convergence	65.9	41.1	1,830.3	33.8	3.6
UK	160.2	100.0	5,416.0	100.0	
UK (% of EU 27)		3.3		2.0	3.0

Annex Table D –Total renewable energy by group

	Renewable energy: total (FOI 39-42)		Total ERDF + Cohesion	
	EUR million	% within each group	EUR million	% within each group
Competitiveness	94.3	100.0	3,585.7	100.0
East Midlands England ERDF Regional Competitiveness and Employment programme	0.0	0.0	268.5	7.5
East of England ERDF Regional Competitiveness and Employment programme	16.1	17.1	111.0	3.1
East Wales ERDF Regional competitiveness and Employment programme	4.0	4.2	72.5	2.0
East Wales ESF Regional Competitiveness and Employment programme	0.0	0.0	0.0	
Gibraltar ERDF Regional Competitiveness and Employment programme	0.0	0.0	5.8	0.2
London England ERDF Regional Competitiveness and Employment Programme	12.4	13.1	181.9	5.1
Lowlands and Uplands of Scotland ERDF Regional Competitiveness and Employment programme	1.0	1.1	376.0	10.5
Lowlands and Uplands of Scotland ESF Regional Competitiveness and Employment programme	0.0	0.0	0.0	
North East England ERDF Regional Competitiveness and Employment programme	10.0	10.6	375.7	10.5
North West England ERDF Regional Competitiveness and Employment Operational Programme	0.0	0.0	755.8	21.1

	Renewable energy: total (FOI 39-42)		Total ERDF + Cohesion	
	EUR million	% within each group	EUR million	% within each group
Northern Ireland ERDF Regional Competitiveness and Employment programme	15.4	16.3	306.8	8.6
Northern Ireland ESF Regional Competitiveness and Employment programme	0.0	0.0	0.0	0.0
South East England ERDF Regional Competitiveness and Employment programme	0.0	0.0	23.7	0.7
South West England ERDF Regional Competitiveness and Employment programme	12.0	12.7	124.7	3.5
West Midlands England ERDF Regional Competitiveness and Employment programme	4.0	4.2	399.9	11.2
Yorkshire and Humberside England ERDF Regional Competitiveness and Employment programme	19.4	20.6	583.6	16.3
Convergence	65.9	100.0	1,830.3	100.0
Cornwall and the Isles of Scilly ERDF Convergence programme	28.0	42.5	458.1	25.0
Highlands and Islands of Scotland ERDF phasing out Convergence programme	1.1	1.7	121.9	6.7
Highlands and Islands of Scotland ESF phasing out Convergence programme	0.0	0.0	0.0	0.0
West Wales and the Valleys ERDF Convergence programme	36.8	55.8	1,250.4	68.3
West Wales and the Valleys ESF Convergence programme	0.0	0.0	0.0	0.0

Annex Table E – Total renewable energy – % within each group (Competiveness and Convergence)

	Renewable energy: wind	Renewable energy: solar	Renewable energy: biomass	Renewable energy: hydroelectric, geothermal and other	Renewable energy: total (FOI 39-42)
Competitiveness	**100**	**100**	**100**	**100**	**100**
East Midlands England ERDF Regional Competitiveness and Employment programme					
East of England ERDF Regional Competitiveness and Employment programme	42.1	15.3	8.3	8.5	17.1
East Wales ERDF Regional competitiveness and Employment programme	4.7	6.4	3.4	3.5	4.2
East Wales ESF Regional Competitiveness and Employment programme					
Gibraltar ERDF Regional Competitiveness and Employment programme					
London England ERDF Regional Competitiveness and Employment Programme	14.1	19.1	10.3	11.9	13.1
Lowlands and Uplands of Scotland ERDF Regional Competitiveness and Employment programme					1.1
Lowlands and Uplands of Scotland ESF Regional Competitiveness and Employment programme					
North East England ERDF Regional Competitiveness and Employment programme					10.6
North West England ERDF Regional Competitiveness and Employment Operational Programme					
Northern Ireland ERDF Regional Competitiveness and Employment programme	3.3	4.5	37.9	10.6	16.3
Northern Ireland ESF Regional Competitiveness and Employment programme					
South East England ERDF Regional Competitiveness and Employment programme					
South West England ERDF Regional Competitiveness and Employment programme	14.1	19.1	10.3	10.6	12.7
West Midlands England ERDF Regional Competitiveness and Employment programme					4.2

	Renewable energy: wind	Renewable energy: solar	Renewable energy: biomass	Renewable energy: hydroelectric, geothermal and other	Renewable energy: total (FOI 39-42)
Yorkshire and Humberside England ERDF Regional Competitiveness and Employment programme	21.6	29.3	15.9	19.8	20.6
Convergence	**100**	**100**	**100**	**100**	**100**
Cornwall and the Isles of Scilly ERDF Convergence programme	33.7	55.1	45.5	41.6	42.5
Highlands and Islands of Scotland ERDF phasing out Convergence programme	1.6	2.7	2.2	0.9	1.7
Highlands and Islands of Scotland ESF phasing out Convergence programme					
West Wales and the Valleys ERDF Convergence programme	64.6	42.2	52.3	57.4	55.8
West Wales and the Valleys ESF Convergence programme					

Annex Table F – Energy efficiency in residential housing

	Energy efficiency in residential housing (FOI 43+78)		Total ERDF + Cohesion		Total energy efficiency in residential housing (FOI 43+78) as % of Total ERDF+Cohesion
	EUR million	%	EUR million	%	
UK	150.7	2.8	5,416.0	2.0	2.8
Competitiveness	107.6	71.4	3,585.7	66.2	3.0
Convergence	43.1	28.6	1,830.3	33.8	2.4
EU 27	5,403.2		268,407.1		

Annex Table G – Energy efficiency in residential housing by group

	Energy efficiency in residential housing (FOI 43+78)		Total ERDF + Cohesion	
	EUR million	% within each group	EUR million	% within each group
Competitiveness	**107.6**	**100.0**	**3,585.7**	**100.0**
East Midlands England ERDF Regional Competitiveness and Employment programme	0.0	0.0	268.5	7.5
East of England ERDF Regional Competitiveness and Employment programme	12.8	11.9	111.0	3.1
East Wales ERDF Regional competitiveness and Employment programme	4.1	3.8	72.5	2.0
East Wales ESF Regional Competitiveness and Employment programme	0.0	0.0	0.0	0.0
Gibraltar ERDF Regional Competitiveness and Employment programme	0.0	0.0	5.8	0.0
London England ERDF Regional Competitiveness and Employment Programme	18.2	16.9	181.9	5.1
Lowlands and Uplands of Scotland ERDF Regional Competitiveness and Employment programme	5.9	5.4	376.0	10.5
Lowlands and Uplands of Scotland ESF Regional Competitiveness and Employment	0.0	0.0	0.0	0.0

	Energy efficiency in residential housing (FOI 43+78)		Total ERDF + Cohesion	
	EUR million	% within each group	EUR million	% within each group
programme				
North East England ERDF Regional Competitiveness and Employment programme	16.2	15.0	375.7	10.5
North West England ERDF Regional Competitiveness and Employment Operational Programme	21.8	20.3	755.8	21.1
Northern Ireland ERDF Regional Competitiveness and Employment programme	2.4	2.3	306.8	8.6
Northern Ireland ESF Regional Competitiveness and Employment programme	0.0	0.0	0.0	0.0
South East England ERDF Regional Competitiveness and Employment programme	1.1	1.1	23.7	0.7
South West England ERDF Regional Competitiveness and Employment programme	4.0	3.7	124.7	3.5
West Midlands England ERDF Regional Competitiveness and Employment programme	8.0	7.4	399.9	11.2
Yorkshire and Humberside England ERDF Regional Competitiveness and Employment programme	13.2	12.2	583.6	16.3
Convergence	**43.1**	**100.0**	**1,830.3**	**100.0**
Cornwall and the Isles of Scilly ERDF Convergence programme	4.0	9.3	458.1	25.0
Highlands and Islands of Scotland ERDF phasing out Convergence programme	0.0	0	121.9	6.7
Highlands and Islands of Scotland ESF phasing out Convergence programme	0.0	0.0	0.0	0.0
West Wales and the Valleys ERDF Convergence programme	39.1	90.7	1,250.4	68.3
West Wales and the Valleys ESF Convergence programme	0.0	0.0	0.0	0.0

Annex Table H – Energy efficiency in residential housing – % within each group (Competiveness and Convergence)

	Energy efficiency in residential housing (FOI 43+78)
Competitiveness	**100**
East Midlands England ERDF Regional Competitiveness and Employment programme	0.0
East of England ERDF Regional Competitiveness and Employment programme	11.9
East Wales ERDF Regional competitiveness and Employment programme	3.8
East Wales ESF Regional Competitiveness and Employment programme	
Gibraltar ERDF Regional Competitiveness and Employment programme	
London England ERDF Regional Competitiveness and Employment Programme	16.9
Lowlands and Uplands of Scotland ERDF Regional Competitiveness and Employment programme	5.4
Lowlands and Uplands of Scotland ESF Regional Competitiveness and Employment programme	
North East England ERDF Regional Competitiveness and Employment programme	15.0
North West England ERDF Regional Competitiveness and Employment Operational Programme	20.3
Northern Ireland ERDF Regional Competitiveness and Employment programme	2.3
Northern Ireland ESF Regional Competitiveness and Employment programme	
South East England ERDF Regional Competitiveness and Employment programme	1.1
South West England ERDF Regional Competitiveness and Employment programme	3.7
West Midlands England ERDF Regional Competitiveness and Employment programme	7.4
Yorkshire and Humberside England ERDF Regional Competitiveness and Employment programme	12.2
Convergence	**100**
Cornwall and the Isles of Scilly ERDF Convergence programme	9.3
Highlands and Islands of Scotland ERDF phasing out Convergence programme	
Highlands and Islands of Scotland ESF phasing out Convergence programme	
West Wales and the Valleys ERDF Convergence programme	90.7
West Wales and the Valleys ESF Convergence programme	

Annex Table I - Renewables obligation: levels of ROCs support by technology

Generation type	ROCs/MWh	Implied subsidy on top of wholesale price (p/kWh)
Landfill gas	0.25	1.2
Sewage gas, co-firing of biomass	0.5	2.4
Hydro, onshore wind, geopressure, energy from waste with CHP, pre-banded gasification, pre-banded pyrolysis, standard gasification, standard pyrolysis, co-firing of energy crops, co-firing of biomass with CHP	1	4.8
Offshore wind, co-firing of energy crop with CHP, dedicated biomass	1.5	7.2
Wave, tidal stream, tidal barrage, tidal lagoon, solar PV, geothermal, advanced gasification, advanced pyrolysis, anaerobic digestion, dedicated energy crops, dedicated biomass with CHP, dedicated energy crops with CHP	2	9.6
Tidal stream (Scotland)	3	14.4
Wave (Scotland)	5	24.0

Notes: Implied subsidy assuming ROC price of £ 48/MWh (4.8 p/kWh) (average price in 2010). Small-scale hydro below 1 MW receives increased support in Northern Ireland varying from 4 ROCs to 2 ROCs according to scale. Small-scale onshore wind 250 kW or below in Northern Ireland received 4 ROCs per MWh. Offshore wind receives 2 ROCs subject to meeting specific criteria from 1 April 2010. Small-scale PV 50 kW or below in Northern Ireland receives 4 ROCs per MWh.
Source: DECC (2010) UK National Renewable Energy Action Plan (NREAP); CCC calculations.

Annex Table J - UK energy costs for different generation technologies in pounds per megawatt hour (2010)

Technology	Cost range (£ /MWh)
New nuclear	80-105
Onshore wind	80-110
Biomass	60-120
Natural gas turbines with CO_2 capture	60-130
Coal with CO_2 capture	100-155
Solar farms	125-180
Offshore wind	150-210
Natural gas turbine, no CO_2 capture	55-110
Tidal power	155-390

(A further UK 2010 estimate is the Mott MacDonald study released by DECC in June 2010)

Annex Table K – Levelised costs of main technologies: £/MWh (EUR/MWh in brackets)

	Total levelised costs
Gas Cycle Gas Turbine	79.7 (90.3)
As above but with Carbon Capture and Storage (First of a Kind).	111.4 (129.6)
Advanced Super Critical Coal	102.2 (115.7)
As above with Carbon Capture Storage (First of a Kind).	136.2 (154.3)
Coal with Carbon Capture Storage (First of a Kind).	131.2 (148.6)
Coal Integrated Gasification Combined Cycle with Carbon Capture Storage (First of a Kind).	143.0 (162.0)
Onshore wind	87.8 (99.4)
Offshore wind (First of a Kind).	148.5 (168.2)
Offshore wind R3 version with First of a Kind)	177.4 (200.9)
Nuclear Pressurised Water Reactor (First of a Kind).	97.1 (110.0)

Levelised cost of generation is the discounted lifetime cost of owning and operating a power plant expressed on a per unit of output basis. The main point is that each of the different generating technologies shown in the table can be compared to each other. Source: Mott MacDonald (2010).

Annex Table L – Direct spending on renewable energy, 2000-2009. EUR million

	2002-3-2005-6	2006-7	2007-8	2008-9	Total Gross	Total Net
Department Energy and Climate Change. Of which:	88.1	59.7	29.8	33.5	211.1	128.5
Offshore Wind	43.2	36.7	14.4	2.7	97.0	40.8
Bioenergy Capital Grants scheme	8.8	12.3	6.8	16.1	44.0	17.7
Bioenergy infrastructure scheme	–	1.5	1.0	0.6	3.1	3.1
Marine Renewables Deployment Fund	–	1.0	0.8	0.1	1.9	1.9
Clear Skies	9.3	2.2	–	–	11.4	11.4
Major Photovoltaic Demonstration Programme	26.8	2.7	–	–	29.6	29.6
Low Carbon Building Programme	–	3.4	6.8	14.0	24.2	24,2
Carbon Trust schemes. Of which:	9.8	1.9	8.5	5.8	26.0	26.0
Applied research scheme (renewable energy only)	2.3	1.1	0.6	0.6	4.4	4.4
Biomass heat accelerator	–	0.3	0.9	0.9	2.1	2.1
Incubator (renewable energy only)	0.6	0.2	0.3	0.3	1.4	1.4
Investments (renewable energy only)	3.7	0.0	0.7	1.1	5.5	5.5
Marine Energy Accelerator	–	–	0.3	1.0	1.3	1.3
Marine Energy Challenger	3.3	0.1	–	–	3.4	3.4
Partnership for Renewables	–	–	5.7	1.7	7.4	7.4
PV Research Accelerator	–	–	0.1	0.2	0.3	0.3
Technology Strategy Collaborative R&D (renew bales). Of which:						
Energy Generation and Supply (historic portfolio	37.3	7.2	8.6	8.8	62.0	62.0
Materials for Energy call	–	–	–	0.3	0.3	0.3
Low Carbon Energy Technologies call	–	–	0.3	–	0.3	0.3
Total Direct Expenditure	**135.2**	**68.9**	**47.2**	**48.5**	**300.0**	**217.2**

Source: House of Commons (2010).

Annex Table M - Renewables spending in 2009-10 by DECC, Carbon Trust, Technology Strategy Board and Energy Technologies Institute

£ m	2009-10 spend
Offshore wind	2.3
Bioenergy Capital Grants scheme	7.6
Bioenergy Infrastructure scheme	4.6
Marine Renewables Deployment Fund	2.9
Clear Skies	N/A
Major Photovoltaic Demonstration Programme	N/A
Low Carbon Buildings Programme (Capital)	40.8
Advanced Biofuels	1.1
Anacrobic Digestion	6.4
Biogas	1.1
Deep geothermal	4.5
Marine Renewables Proving Fund	8.2
Renewable construction Demonstration Fund	7.6
Renewables elements of Central Government Low Carbon Technology Programme	2.4
DECC Sub-total	**89.5**
Applied research scheme (Re tech)	0.7
Biomass heat accelerator	0.9
Incubator (Re technologies)	0.6
Investment (Re projects only)	3.2
Marine Energy Accelerator	1.8
Marine Energy Challenge	N/A
Partnership for Renewables	3.1
PV Research Accelerator	0.9
Offshore wind	1.8
Insource Energy	1.1
Carbon Trust Sub-total	**14.1**
Energy Generation and Supply	2.5
Materials for Energy	1.9
Low Carbon Energy Technologies	5.7
TSB Sub-total	**10.1**
Offshore Wind	9.7
Marine	0.6
ETI Sub-total	**10.3**
Total	**124.0**

Notes: 1) This table shows expenditure on renewable technologies on an accruals basis. Expenditure from programmes funding a mixture of renewable and other non-nuclear technologies are included where the renewable spend could be separated out. 2) Rounding has affected the Carbon Trust and TSB sub-totals by £ 0.1 million each. 3) DECC's 2009-10 spend included activities funded from the additional funding for non-nuclear low carbon technologies in Budget 2009.

Annex Table N - Renewables spending in 2009-10 by Regional Development Agencies

RDA spend on renewable energy in 2009-10	
Technology	**£ m**
Offshore wind	13.8
Onshore wind	1.1
Wave and tidal	21.0.5
Biomass	11.2
Biofuels	1.6
Solar	2.5

RDA spend on renewable energy in 2009-10	
Technology	**£ m**
Fuel cells	0.3
Geothermal	0.3
Other*	14.4
Total	**66.2**

Notes: *Other spend includes: anacrobic digestion, community renewable energy schemes, hydro, microgeneration, onshore wind and renewable skills training. It excludes spending on: carbon capture and storage, hydrogen and fuel cells, insulation, non-renewable low carbon technologies and skills training. Includes spending by: Advantage West Midlands (AWM), East of England Development Agency (EEDA), East Midlands Development Agency (EMDA), North West Regional Development Agency (NWDA), One North East (ONE), South East England Development Agency (SEEDA), South West Development Agency (SWDA) and Yorkshire Forward (YF). There was nil return for the London Development Agency (LDA).