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

SPAIN

VERSION: FINAL

ANXO CALVO SILVOSA, J. ANDRES FAIÑA, J. LÓPEZ-RODRIGUEZ

JEAN MONNET CHAIR ON EUROPEAN INDUSTRIAL ECONOMICS & C+D RESEARCH GROUP.
SCHOOL OF ECONOMICS AND BUSINESS, UNIVERSITY OF A CORUÑA, SPAIN

A report to the European Commission
Directorate-General Regional Policy

CONTENTS

LIST OF ABBREVIATIONS

- CE – (Constitución Española), Spanish Constitution
- CNE – (Comisión Nacional de Energía), Spanish energy market regulator
- CTE- (Código Técnico de la Edificación) Code on Building Technical Requirements
- EEN – Expert Evaluation Network
- ERDF – European Regional Development Fund
- ESF – European Social Fund
- ESE – Energy Saving and Efficiency
- DSO – Distribution System Operator
- IDAE – Spanish Institute for Diversification and Energy Saving, autonomous body under the auspices of the Central Government (MITC)
- MITC – Ministry of Industry, Turism and Commerce
- MIBEL – Iberian (Spain-Portugal) integrated electricity market
- NREAP – Spain's National Renewable Energy Action Plan (2005-10) and (2011-2020)
- OP – Operational Programme
- PAE4+ – Energy Savings and Efficiency Action Plan (2008-2012 Action Plan)
- PV – Photovoltaic Energy
- PAE4- 2005-2007 Energy Saving and Efficiency Action Plan.
- PAE4+ – 2008-2012 Energy Saving and Efficiency Action Plan, Spanish ESE Plan.
- REP -205-2010 Spain's Renewable Energy Plan, Spanish RES Plan.
- RD – (Real Decreto) Royal Decree, Regulation issued by Spanish Central Government
- RES – Renewable Energy Sources
- TSO – Transmission System Operator

1. EXECUTIVE SUMMARY

Spain has succeeded in deploying renewable energies (RES). Overall, RES contributed 12.2% of gross energy consumed in Spain in 2009, while electricity from renewable sources accounted for around 25% of total generation.

Electricity production from renewable sources is mainly supported by the electricity market. Producers of electricity from renewable energies are granted adequate returns on investment (by means of a feed-in-tariff or a feed-in-premium choice). Premiums in the electricity market, amounting EUR 20,000 million in 2005-10, provided most of the initial impetus for RES in Spain.

The Spanish Plan for promoting RES (2005-2010 RES Plan) is expected to grant EUR 681 million in investment aids for projects in renewable energies (mainly solar and biomass) that are not included in the mainstream supply to the grid. ERDF co-funded measures for RES are complementary aids to those in the RES Plan. ERDF funding represents around 50 % of the public financial aids forecast in that Plan. Convergence objective and transitory regimes Regional Operation Programmes (ROPs) concentrate the bulk of ERDF support in this field. It focuses on solar energy (the largest one, about EUR 114 million) and on biomass (EUR 50.8 million), while ERDF aid to hydroelectric and geothermal energies is far less important and aid to wind power is almost irrelevant.

Energy Saving and Efficiency, ESE, policy in the field of building has two key instruments: 1) regulatory measures, to a large extent, linked to Directive 2002/91/EC, and 2) incentives to invest in these kinds of projects. A series of standards and codes were enacted in Spain (2006-2007) referring to technical features of building, energy efficiency certification and thermal installations in buildings. However, many of these actions have not fully met their expectations due to coordination problems (different levels of government) and the lack of effective flanking measures, like training of installers and awareness raising campaigns.

ESE projects in productive, commercial and public services sector are granted non-reimbursable financial aid. A large part of them concerns buildings (40%), mostly addressed to business facilities and, to a far lower extent, to residential housing.

Policy measures in the Spanish plan for ESE (PAE4+) are largely funded through charges on the tariffs and tolls paid by operators and consumers in the electricity and gas markets. Direct forms of aid to residential housing investments in ESE are not foreseen in the current Spanish ERDF programmes, but ESE actions addressed to productive, commercial and public services sectors are eligible in ERDF ROPs. ERDF aid in ESE projects (FOI 43) totals EUR 134.7 million. It is targeted primarily at the regions of convergence and transitory regime, but it is also important in the ROPs of some important regions in the competitiveness objective: Catalonia, Madrid, Navarre and the Basque Country. The overall scale of ERDF support in

relation to ESE Spanish plan (PAE4+ 2008-2012) is relatively low, approximately 4% of total public funding in the plan.

The rationale for RES and ESE policy measures in Spanish planning and programming documents is mainly based on general policy and environmental aims such us reducing dependence on foreign fuels, fighting against climate change, reducing emissions of CO_2 and other greenhouse gases, improving consumption patterns and productive methods and avoiding energy waste.

The premiums granted to electricity from renewable sources vary according to the costs associated with each technology, trying to guarantee an adequate return on investment. There are no regional differences in the intensity of support.

In the case of ESE in residential housing, the rate of support does not tend to vary over time depending on changes in the costs of electricity or heating. In spite of the recent rise in final electricity prices, no intensification of the rate of support has been observed.

2. NATIONAL POLICY

Support Policy for RES

Following the European model, production and marketing of electricity in Spain are both deregulated, while transportation and distribution are regulated activities with tolls and tariffs (Law 54/1997). A wholesale electricity market was created at the end of the 90s (currently the Spanish pole of the Iberian, Spain-Portugal, integrated electricity market, MIBEL), yet a high proportion of domestic consumption (less than 10 KW of power) continues to be supplied at regulated tariff (last resort rate). The regulated rate does not cover all production and distribution costs, leading to a deficit ('tariff deficit'), which is through credits backed by revenue from the electricity system.

The special regime grants the grid access priority and ensures higher remuneration to producers of renewable energies (by means of a feed-in-tariff or a feed-in-premium choice). The extra cost of the RES is passed on to the electricity system and to consumers through tolls and consumption rates.

At the early stage, Spanish policy promoted renewable energies successfully. Overall, RES contributed 12.2% of gross energy consumed in Spain in 2009, while electricity from renewable sources accounted for around 25% of total generation (NREAP, page 9).

Regarding the support provided to RES, Spain's Renewable Energies Plan 2005-2010 (REP) and the National Action Plan for Renewable Energies in Spain (NREAP) 2011-2020 are the key planning instruments. They set production targets in renewable energies and resort to three basic measures:

1. Premiums for the generation of electricity using renewable sources (higher remuneration under the special regime) are by far the most important support measure. Overall, the volume of premiums addressed to electricity production from renewable energies has risen from under EUR 1,000 million in 2005 to over EUR 7,092 million in 2010 (see Figure 2), currently reaching around EUR 20,000 million[1].
2. Tax incentives for biofuels (hydrocarbons tax exemption), estimated at EUR 2,855 million for 2005-10.
3. Aid to investment in renewable energies, mainly solar and biomass, EUR 681million in 2005-2010. These are partially co-funded with the ERDF and are dealt with in section 3.

[1] Source: CNE (2011)

Support varies among different types of RES sources according to the technologies used, but there are no regional variations in the intensity of support.

The premiums, which were channelled through the special regime, provided the initial impetus for renewable energies through the electricity market. This special regime allows electricity producers from renewable sources to choose between tariffs or premiums over the prices in the Spanish wholesale electricity market (RD 436/2004 and RD 661/2007).

The main policy changes observed since 2007 refer to RD 661/2007 and two new rules which have strengthened the central government's control over installed power and RES premiums. Long term policy was modulated by means of a regulatory reform. RD 661/2007 established formalized power targets for RES and new levels and limits to be applied to premiums regarding the fulfilment of capacity targets. This decree gave rise to an appeal effect which triggered a huge number of PV projects surpassing considerably the original planning targets. Royal Decree 1578/2008 defined a new economic regime and introduced pre-registration requirements for granting premiums under the special regime for the PV, while Royal Decree Law 6/2009 extended this pre-assignment system to other renewable energies.

According to the authors of this report, these mitigation measures were adopted by the Spanish Government to solve coordination problems with the regional governments, limiting deviations from planned targets, and simultaneously addressing the impact of RES premiums on the tariff deficit.

Measures on Energy Saving and Efficiency in Buildings

The action plans of the Energy Efficiency and Saving Strategy for the 2005-2007 (PAE4) and 2008-2012 (PAE4+) periods are key planning tools. Monitoring of plans shows that between 2005 and 2010 final energy intensity decreased by over 13% in Spain. It is difficult to accurately tell to what extent this is due to the real impact of the above mentioned plans.

Regarding energy efficiency and saving policy in buildings, two main kinds of measures are implemented: first, regulatory measures linked to Directive 2002/91/EC and second, financial aid to investment in projects which will be described in the next section.

A series of standards and codes were accordingly approved to fulfill European requirements by means of three RDs on the following issues: 1) The Technical Building Code, TBC, (RD 314/2006), 2) Basic procedures for energy efficiency certification of new buildings, ECNB, (RD 47/2007) and 3) the Regulation governing thermal installations in buildings, RTIB, (RD 1027/2007).

Spain was one of the first countries to introduce (2006) an obligation to use building integrated RES technologies in new buildings and in the restoration of old ones. However,

AEON study (2011) concludes that the unsatisfactory implementation of the law and the lack of effective flanking measures, like training of installers and awareness raising, have resulted in low rates of compliance and frequent quality deficits. As a further problem, simplified administrative procedures are not available for some small RES technologies, such as PV and geothermal applications. Many of these actions have not fully met their expectations due to coordination problems between the different levels of government. Instrumentation largely falls to the regional governments and only six of the seventeen regional governments (Andalusia, Galicia, Valencia, Balearic Isles, Basque Country and Navarre) have implemented the Spanish decrees relating to the TBC, ECNB and RTIB.

Finally, in general terms, policy on promoting ESE does not vary among regions but there are regional measures implemented according to the specific geophysical and climatic regional features.

Regarding both RES and ESE, support was not intensified in order to counter the effects of current economic downturn. Neither support has been reduced so far because of subsequent constraints on public financing.

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

The measures in the ERDF programmes to promote renewable energies and energy saving and efficiency are included in the Transport and Energy axis of the ROPs in convergence and transitory regime regions. In competitiveness regions -Catalonia, Madrid, Navarre and the Basque Country- they also provide support to energy efficiency actions and, to a lesser extent and more sporadically, to renewable energy projects (see Annex Table B). In convergence objective regions, especially those of pure convergence, there are other energy measures (33 Electricity, 35 Natural Gas), focused on improving distribution and transportation infrastructures, that are not directly related to the promotion of renewable energies. There are measures specifically addressed to RES in the fields of solar energy (foi 40), biomass (foi 41) and others (foi 42).

ERDF co-funded measures for RES are non-reimbursable grants aimed at partially offsetting the investment costs of this kind of projects. They are addressed to renewable energy projects that do not enter in the mainstream supply to the grid. Therefore, the ERDF support is essentially addressed to renewables not funded by the special regime of electricity production (fit, fip)[2]. Convergence objective and transitory regime ROPs concentrate the bulk of ERDF support on investments in renewable energy projects. Programmed support

[2] There are some forms of investment aid for small projects in PV connected to the electrical grid in order to compensate the costs of integrating them in the architecture of buildings or in the landscape.

amounts to EUR 180 million (Annex Table B). In essence, they focus on solar energy (the biggest, about EUR 114 million) and on biomass (EUR 50.8 million), while ERDF aid to hydroelectric and geothermal energies is far less important and wind power almost irrelevant.

The measures to support solar energy investments are mainly targeted to small solar thermal projects at low temperatures (mainly hot water) and isolated photovoltaic solar power. In the field of biomass, the eligible costs are related to production (thermal biomass boilers -household and industrial-) and the equipment and facilities for biomass treatment in biogas production.

The bulk of support for RES in Spain (mainly wind farms and PV plants) which are supported via premiums in the electricity market is excluded from ERDF funding. ERDF aids for RES are mainly non-reimbursable grants addressed to thermal solar energy and biomass facilities for heating and hot water supply. Photovoltaic solar energy and, to a lesser extent, thermoelectric solar power are other eligible concepts. They are complementary to those delivered by national policy. The Spanish Plan for promoting RES (REP 2005-2010) is expected to deliver EUR 681 million in aid for RES investment projects. Consequently, the scale of ERDF support for RES represents around 50% of total public financial aids for RES projects.

ESE policy measures are mainly designed by the Spanish Institute for Energy Diversification and Saving (IDAE) and are carried out in collaboration with the regional governments and energy institutes. These actions are largely funded through charges on the tariffs and tolls of the electricity and gas system. The Spanish ESE Plan (PAE4+ 2008-2012) includes funding for EUR 2,366.5 million of public aid, which mainly comes from electricity and gas tariffs and tolls (58.3% and 12.0%, respectively). Support to ESE actions in buildings is a very important part of the 2008-12 Spanish ESE Plan (E4.Action Plan). The key measures (adopted since 2007), with a repercussion on the building and residential sector are principally: a) Campaigns to raise public awareness and inform about ESE measures, b) Energy saving and renewal measures for electrical appliances, boilers, air-conditioning, windows, facades, roofs, lifts, etc., and c) specific funding facilities for Energy Service Companies (ESF), encouraging use of biomass for heating in buildings, as well as actions and criteria for rehabilitation and promotion of eco-friendly town planning.

The actions scheduled in the ESE Plan and E4 Strategy in terms of energy efficiency and saving are targeted to improving energy efficiency in buildings that already exist (rehabilitation of the thermal sheeting, heating installations, lighting installations), promoting buildings with a high energy rating (new and refurbishment of existing ones) and a review of energy demands in the building regulations.

These measures are funded with IDAE resources (EUR 350 million/year), which mainly comes from the surcharge in electricity rates and tolls (0.8%, EUR 275 million) and, to a lesser extent, from the gas tariff (EUR 57 million) and from central government budget (EUR 18-20 million). An amount of EUR 110-120 million (roughly one third) is used by the IDAE scheme for strategic ESE projects, while the rest is channelled toward regional ESE schemes.

Regional ESE schemes are jointly funded by IDEA contributions (which account for roughly 77%, approximately EUR 210-240 million/year) and regional funding (the remaining 23%). Regional ESE aids are usually addressed to small size projects involving energy audits and investments in ESE actions in productive sectors and public services. There are also specific actions for the residential sector aimed to encourage saving energy and renewal measures for electrical appliances, boilers, air-conditioning, windows, facades, roofs, lifts and the like.

The IDAE scheme for ESE strategic projects issues annual public calls (amounting to around EUR 120 million) to implement for larger (in size) energy efficiency projects in at least three regions. That is the reason why IDAE's ESE strategic projects do not overlap with those of the regional schemes. Approximately 40% of the IDAE strategic projects focus on buildings, although these are mainly in the commercial sector.

Regarding measures for buildings, important difficulties were encountered in addressing energy rehabilitation measures affecting a significant number of buildings. Up to 2009, annual rehabilitation was carried out on 0.2% of existing buildings, where the target was 3.3%. The crisis in the real estate sector makes it more difficult to achieve objectives in the building sector (NREAP, p, 31).

Direct aid to residential investment in ESE is not eligible in the current Spanish ERDF programmes. The main measures for the residential sector (improvements of thermal sheeting and heating and lighting installations) are explicitly excluded from ERDF funding in current Spanish OPs (MEH, 2008).

Nevertheless, other ESE actions have been included in the ERDF operating programmes[3]. ERDF support to energy efficiency projects (FOI 43) totals EUR 134.7 million. This is targeted primarily to the regions of convergence and transitory regime, but it is also important in the ROPs of some important regions in the competitiveness objective: Catalonia, Madrid, Navarre and the Basque Country. The bulk of activities are targeted to energy audits and studies, efficiency and saving projects and heat and power generation in the productive sectors and public services. The scale of ERDF support in relation to national support is relatively low for ESE measures. It represents around 4% of all public resources forecast in the PAE4+ 2008-2012.

[3] The source and sectorial application of public funds over the PAE4+ 2008-2012 are given in Annex Table C.

Regarding the changes in the former focus of ERDF support since the beginning of the current programmed period, it must be underlined that the actions in Spanish ROPs to be carried out by IDAE in collaboration with regional governments in order to further subsidise RES and ESE projects were given up. In the end they are being replaced by agreements with the EIB to set up a JESSICA project, where reimbursable aid will be granted through a revolving mechanism in proportion to the eligible expenditure. Beneficiaries cannot be public entities, although they do include Energy Service Companies (ESC).

It is also worth mentioning that the IDAE scheme for ESE strategic projects has been included in ERDF funding since 2011. This seems to be a good decision because the IDAE scheme for ESE strategic projects normally accomplishes its targets. The full budget is normally implemented through a system of guarantees that it is more difficult to apply to small regional projects, though many regional schemes also achieve high implementation levels.

The certification levels of expenditure and output indicators for 2009 were very low. Even now only an average proportion of 1.1% of overall aid has been certified. The energy efficiency measure reached a relatively higher level of 1.6%.

ERDF aid has not been used as a counter-cycle measure.

4. RATIONALE FOR PUBLIC INTERVENTION

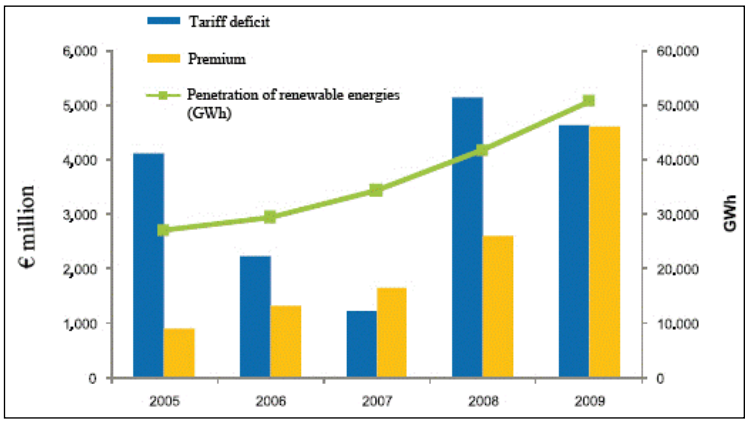
The rationale for public intervention in promoting renewable energies and energy efficiency and saving in official planning documents are (1) to reduce dependence on foreign fuels and (2) to improve patterns of consumption and productive methods. It is clear that this policy on buildings has favourable effects on: reducing dependence on imports of fossil fuels (25.6 Mtep in 2009, Appa (2009, p141)); the fight against climate change through reducing emissions of CO_2 and other greenhouse gases; strengthening of the grid infrastructure through joint efforts by RES promoters to connect their installations (over the 2002-2009 period, this effort totals EUR 1,363 million (Appa, 2009, p141)). The above justify government intervention in these areas. As a further positive aspect, advocates of renewable energies also argue that RES- related technologies significantly reduce the marginal price of wholesale electricity. This reduction was estimated in EUR 4,835 million in 2009 (Appa, 2009, p141).

Direct support to electricity production from renewable sources in Spain is granted through special regime premiums, which provides higher payments than the ordinary regime (wholesale market price). This is done through regulated rates and specific premiums which internalise environmental benefits, energy diversification and security of supply benefits.

There are differences in the intensity of aid to different renewable energy technologies based on the costs associated with each one, on the degree to which the special system participates in covering demand and on its impact on the technical and economic management of the system. However, in all circumstances, these differences are not related to territorial differences.

In the area of energy efficiency and saving, regional governments may introduce specific orientations and even different levels of intensity in the support delivered to their territorial jurisdiction. These actions are carried out in the framework of the general strategy designed by the Central Government. To a great extent, it makes sense that regional governments implement general measures according to their specific circumstances (temperatures, humidity, topography, sunshine, etc.). This represents an efficiency factor of policy in accordance with the territorial organisation of Spain.

Figure 1- Renewable energies: Premiums vs. Deployment



Source: Appa (2009)

Currently, a debate on funding support to renewable energies through regulated tariffs and production premiums) has been generated in Spain; the tariff deficit is at the root of this debate. This can be defined as the difference between the amount collected through regulated tariffs and access tolls (set by the government) and the real costs tied to wholesale prices and distribution costs. We must bear in mind that the aforementioned aid to renewables increases the amount consumers have to pay for the electricity they consume. There is a growing number of voices in favour of alternative methods of funding aid to renewables (for example, through the central government budget or by involving the regional governments in economic promotion and not only in the administrative processes of permits, passing on of costs to other energy sectors, etc.), or reducing aid (as renewable energies are considered expensive) to make electricity cheaper for users. Figure 1 shows the evolution of the premium received, the tariff deficit and the level of penetration of RES in the Spanish electricity system (Appa, 2009). A similar debate has arisen with regard to funding of measures for energy efficiency and saving concerning the part that affect the tariff or the electricity tolls.

5. RATE OF SUPPORT AND PROFITABILITY

Generally speaking, the regulation lays down that premiums obey the principle of a reasonable return on investment. From 2007 onwards, there has been a major reform of the regulation (RD 661/2007): 1) the energy planning targets were formalised and 2) a methodology set for reviewing (every four years) and updating premiums in accordance with technical and economic criteria: technological evolution, market behaviour, degree of meeting the renewable energy targets, participation in covering demand and impact on the technical and economic management of the system.

In the field of renewable energies, as a rule, the intensity of support varies in accordance with the technology used. However, as noted above, RD 661/2007 lays down that reviews of support to production will be carried out in accordance with:

- the costs associated to each of these technologies;
- the degree of involvement of the special regime in covering demand and its impact on the technical and economic management of the system, while ensuring reasonable rates of return with reference to the cost of money in capital markets.

It therefore appears that the evolution of total costs per unit of energy generated -expressed through the experience curve of each technology- will largely determine the intensity of support to production in the future and the profitability of the facilities. We must bear in mind that improvement of different technologies will lead to profitability through better efficiency (for instance, increase of the annual uptime hours) and reductions in operating costs. In short, the intensity of support will reflect the variations of costs associated to each technology. Regional governments have neither financial nor regulatory participation in setting the regulated tariffs or the premium within the special regime of electricity production; consequently there are no regional differences in the intensity of support.

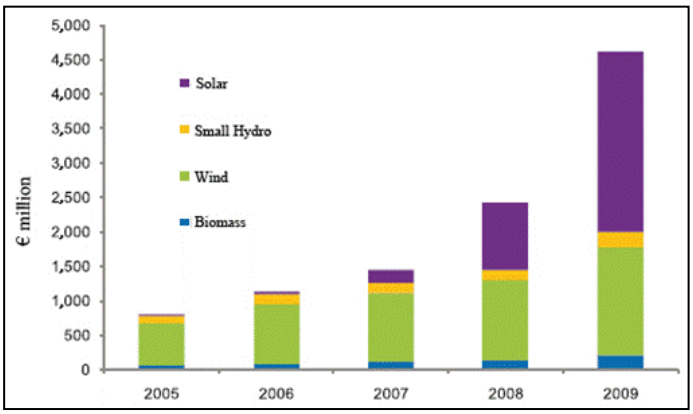
In determining the support scheme for renewable energies, the central government (Ministry of Industry) takes decisions based on the studies and technical reports from the independent regulator, CNE, which consider different price scenarios of fossil fuels and the cost of CO_2.

In the case of ESE in residential housing, the rate of support does not tend to vary over time depending on changes in the costs of electricity or heating. In spite of a recent rise in final electricity prices, no intensification of the rate of support has been observed.

The territorial structure of Spain makes it easier for different regional governments, depending on their level of self-governance, to develop different policies and set up incentives over actions to encourage energy efficiency and support to renewable energies.

6. COSTS, PUBLIC SUPPORT AND PRICES

Figure 2 – Renewable energies premium by sources



Source: Appa (2009)

Regarding the current amount of public support given to each type of renewable energy, Figure 2 shows the breakdown of premiums received by the different renewable energy technologies during the period 2005-2009.

The volume of support to electricity production from renewable energies has risen from under EUR 1,000 million in 2005 to over EUR 4,500 million in 2009[4]. It is worth mentioning that the rapid increase of PV premiums from 2007 onwards reached over half of total premium volume in 2009. Therefore, support to production depends on the technology used.

Regarding regional differences in support, neither Law 54/1997 nor RD 661/2007, which regulate the special regime, allow regional governments to introduce changes to the regime of current regulated premiums/tariffs. However, the regional governments can use their budgets to set up aid schemes for investments in renewable energy facilities. During the period of reference, there regional lines of support have been created mainly to encourage the purchase of thermal solar energy equipment for domestic use (hot water), photovoltaic installations without connection to the grid (and therefore not subject to support to production), geothermal facilities (normally to produce hot water for household use), etc.

The European Commission (2007) carried out an estimate of production costs for the different renewable technologies and a forecast for 2030. Annex Table D shows the results of these calculations. This shows the cost differences (EUR/MWh) between the different technologies: among the cheaper ones are those that use biomass as fuel (25-85), hydro-electrical facilities (25-95) and wind power (35-110); at the other end, we have the photovoltaic solar facilities (140-430). The Spanish system for providing support to electricity production from RES (the special regime) tries to guarantee a good enough internal rate of return of the project according to an estimation of costs and revenues. So the more mature technologies (v.g. wind farms) are those that have less support per MWh produced. The higher premium reductions are expected in the photovoltaic sector. Annex

[4] 7,000 million in 2010.

Table D includes additional information on investment costs and the O&M costs per technology. The Spanish Institute IDAE will shortly publish a report on production costs associated to the different renewable technologies in the Spanish case.

There are no significant cost differences between facilities located in different territories. However, there could be differences of returns depending on the different amounts and quality of renewable resources based on its spatial location. This is an issue that needs reflection: the context of a high volume of premiums -possibly excessive in some cases- has led to a proliferation of facilities whose economic-financial feasibility has relied almost exclusively on an extremely generous support scheme. In such cases, the availability of natural resources (annual hours of wind resource, hours of sunshine, etc.) failed to justify the set-up of specific facilities in some areas. A streamlining of the premium mechanism (really supporting those with a minimum availability resource) would help the system to become more efficient overall.

In the field of energy efficiency in buildings, the Strategy Action Plan E4 aims to increase the energy certification of buildings, by means of making it a mandatory requirement for granting occupants their certificate of occupancy, making this more visible for the public. This would encourage demand for buildings with low energy consumption (highly efficient, bioclimatic, sustainable, etc.). Therefore, in the medium to long term the market price of dwellings might also include a premium for energy efficiency. For the moment, there is no evidence that people looking for houses are prepared to pay a higher price to purchase more energy efficient houses. The fall in building prices as a consequence of the current crisis makes it difficult to assess the effect energy certification has on the market price. Similarly, no solid evidence has yet been found to support the hypothesis that income from rentals may include a premium for the energy efficiency of the building.

7. CONCLUSIONS

The Spanish system of promoting renewable energies achieved significant success in deploying renewable energy sources into the electricity system, positioning Spain among the European leaders in this field. Most of these achievements came from the incentives in the electricity markets (fip, fit). Now it is time to implement some measures to improve the regulation:

1. General reviewing the promotion mechanism. Now the system needs a more efficient way of reviewing the scheme of premiums and to introduce other mechanisms of promotion. It is essential to substantially enhance the role of the regulator (CNE) in issues such as implementing technical proposals and general monitoring of the system.

2. Streamlining the current system of premiums. The actual return from the facilities depends on technology costs and availability of resources in each region. It may be appropriate to streamline the system of premiums to encourage those facilities that have greater availability of renewable resources.
3. Administrative coordination. It would be extremely positive to continue to strengthen the coordination mechanisms between the different levels of government (central, regional and local). In this regard, the current pre-registration requirements for premiums (fit, fip), based only on order of arrival, should be reformed to include more efficient criteria such as availability and quality of the renewable resource (equivalent hours of wind, hours of sunshine, etc.).
4. Payments for capacity in conventional electricity technologies. The increasing weight of renewable energy production under the special regime leads to price reductions in the wholesale market in low demand periods. So this implies a long-term adverse signal to investors in other technologies. Consequently, it may be advisable to enhance payments for capacity.
5. New sources for funding premiums. The deployment of RES was mainly carried out using incentives (fit, fip) funded through the electricity system by means of charges on tolls and tariffs passed through final consumers. There are currently some voices that question the feasibility of this model because it raises the final price of electricity.

In terms of ESE in buildings, Spain swiftly implemented the 2002/91/EC, and was one of the first countries to make the use of RES in buildings compulsory.

1. Improving territorial implementation. The effectiveness of these measures should be improved by means of enhancing the territorial implementation measures to be enacted by regional governments. Regional governments should also be required to deploy all the accompanying measures (training of installers, awareness raising and the like) to implement European and Spanish rules efficiently.

2. Debate on ESE policy funding. Funding of ESE policy mainly stems from participation in electricity and gas tariffs and tolls. There is now a debate on the suitability of this system. However, its coherence in terms of signalling and incentives should be stressed because charges over electricity prices tend to reduce inefficient consumption and energy wasting.

3. Improving ERDF management. In general terms, the information and verification system of ERDF programmes should be streamlined to be more effective in order to raise the implementation levels of ERDF funded measures in RES and ESE

fields. Moreover it is advisable to introduce simplified procedures for licencing small RES projects.

4. Changes in ERDF measures. One of the joint initiatives between the Spanish Institute IDAE and regional governments to implement ESE measures in ROPs has not yet been carried out. A new Jessica project has recently been launched to solve this problem. All efforts to effectively implement the Jessica tool in the ESE field are really welcome. Similarly, it is highly advisable to include under ERDF funding the scheme for strategic ESE projects managed by the Spanish Institute for Energy Saving and Diversification (IDEA.
5. ERDF eligibility for ESE measures in residential housing. A large part of ESE activities concerns buildings, but most of them are addressed to business facilities and, to a far lower extent, to residential housing. As a general rule, residential housing projects are not eligible in the current Spanish ERDF programmes. It might be important to include such kind of projects under ERDF funding. A new scheme of grants encouraging ESE in residential housing and rehabilitation and refurbishing projects might be highly positive to face the current adjustment in the Spanish real estate sector.

REFERENCES

AEON study (2010), Non-cost barriers to renewables in Spain, a report for DG TREN, Berlin/Milan, April 2010

APPA (2009): Estudio del Impacto Macroeconómico de las Energías Renovables en España. Año 2009. http://www.appa.es/descargas/InformeAppa_web.pdf

Comisión Nacional de Energía (2011) http://www.cne.es/cne/Publicaciones?id_nodo=143&accion=1&soloUltimo=si&sIdCat=10&keyword=&auditoria=F

Comisión Nacional de Energía (2010): Informe a la propuesta de Real Decreto por el que se regulan y modifican determinados aspectos relativos al régimen especial, septiembre.

Comisión de las Comunidades Europeas (2007): Una política Energética para Europa, COM (2007) 1 final.

Ecofys (2011): Financing Renewable Energy in the European Energy Market

IDAE, Ministerio de Industria, Turismo y Comercio (2005): Plan de Energías Renovables de España (2005-2010)

IDAE, Ministerio de Industria, Turismo y Comercio (2010), Spain's National Renewable Energy Action Plan (NREAP) 2011 -2020 and Annex on Regulations in force in each of the Autonomous Communities, June 2010, Plan de Acción Nacional de Energías Renovables de España (NREAP) 2011-2020

http://ec.europa.eu/energy/renewables/transparency_platform/doc/national_renewable_energy_action_plan_spain_en.pdf,

IDAE, Ministerio de Industria, Turismo y Comercio (2007), Estrategia de ahorro y eficiencia energética en España 2004-2012. Plan de acción 2008 – 2012, Julio 2007 (2008-2012 Energy Savings and Efficiency Action Plan. 2008-2012 Action Plan) (PAE4+)

IDAE, Ministerio de Industria, Turismo y Comercio (2005), Plan de energías renovables en España 2005-2010 (2005-2010 (Spanish Renewable Energies Plan) (REP), Agosto 2005.

IDAE, Ministerio de Industria, Turismo y Comercio (2007), Estrategia de ahorro y eficiencia energética. Plan de Acción 2008-2012. (PAE4+)

IDAE, Ministerio de Industria, Turismo y Comercio (2004), Estrategia de ahorro y eficiencia energética. Plan de Acción 2005-208, PAE4

MEH (2008), Orden EHA/524/2008, de 26 de febrero, (BOE 1 de marzo de 2008) sobre "normas sobre los gastos subvencionables de los programas operativos del FEDER y el FC", Boletin Oficial del Estado, Madrid.

INTERVIEWS

Company/Institution	Name	Position	Type of Interview	Date
KPMG	Carlos Solé	Responsable de Regulación de Energía (área de Riesgos y Cumplimiento Normativo)	*	04/05/2011
Instituto de Diversificación y Ahorro Energético, IDAE	Juan Antonio Alonso González	Director de Ahorro y Eficiencia Energética	*	04/05/2011
Instituto Energetico de Galicia, INEGA	Emérito Freire	Director de Estudios	**	09/03/2011
Ministerio de Economía y Hacienda	Anatolio Alonso	Responsables de Fondos Comunitarios	**	12/05/2011
Ministerio de Economía y Hacienda	Jose Luis Kaiser	Responsables de Fondos Comunitarios	**	17/05/2011
Instituto Energetico de Galicia, INEGA	Emérito Freire	Director de Estudios	**	19/05/2011
Gobiernos Regionales	Responsables de los 17 gobiernos regionales	Responsables de los Gobiernos Regionales en el Foro de Economía de Vigo	*	06/06/2011
Ministerio de Economía y Hacienda	Anatolio Alonso	Responsables de Fondos Comunitarios	*	06/06/2011
Ministerio de Economía y Hacienda	Jose Luis Kaiser	Responsables de Fondos Comunitarios	*	06/06/2011
Code: * In situ interview, ** Telephonic Interview				

TABLES

Annex Table A

2010	Power generating facilities			Option a)	Option b) Premium market trades		
Group	Subgroup	Capacity	Years	Fixed Tariff cEUR/kWh	Prima reference cEUR/kWh	UpREP limit cEUR/kWh	Lower limit cEUR/kWh
b.1 (solar)	b.1.1 (PV)	P≤ 100 kW	first 25 years	465.897			
			thereafter	372.718			
		100 kW<P ≤ 10 MW	first 25 years	44.169			
			thereafter	353.352			
		10<P≤ 50 MW	first 25 years	243.077			
			thereafter	194.462			
	b.1.2 (Solar: thermal processes for electricity production)		first 25 years	284.983	268.717	363.906	268.757
			thereafter	227.984	214.973		

2010	Power generating facilities			Option a)	Option b) Premium market trades		
Group	Subgroup	Capacity	Years	Fixed Tariff cEUR/kWh	Prima reference cEUR/kWh	UpREP limit cEUR/kWh	Lower limit cEUR/kWh
b.2 (wind)	b.2.1 (terrestrial)		first 25 years	77.471	30.988	89.866	75.405
			thereafter	64.746			
	b.2.2* (marine)				89.184	173.502	
b.3 (geothermal, wave, tidal, hot dry rock, ocean–thermal and ocean currents)			first 25 years	72.892	40.672		
			thereafter	68.872	32.373		
b.4 (hydroelectric P≤10MW)			first 25 years	82.519	26.495	90.137	68.978
			thereafter	74.268	14.223		
b.5 (hydroelectric 10MW< P≤ 50MW)			first 25 years	**	22.263	84.635	64.746
			thereafter	***	14.223		
b.6 (biomass)	b.6.1 (energy crops)	P≤ 2MW	first 25 years	168.096	126.723	175.936	163.029
			thereafter	124.764			
		2MW< P	first 25 years	155.084	111.562	159.643	150.968
			thereafter	130.624			
	b.6.2 (gardening or agricultural waste)	P≤ 2MW	first 25 years	132.994	9.162	140.812	127.905
			thereafter	89.663			
		2MW< P	first 25 years	113.771	70.249	118.384	109.804
			thereafter	85.334			
	b.6.3 (forest residues)	P≤ 2MW	first 25 years	132.994	9.162	140.812	127.905
			thereafter	89.663			
		2MW< P	first 25 years	125.148	81.633	129.704	121.028
			thereafter	8,5334			
b.7 (manure, biofuels or biogas)	b.7.1 (landfill biogas)		first 25 years	84.551	44.721	94.792	78.711
			thereafter	68.872			
	b.7.2 (generated biogas digesters)	P≤ 500kW	first 25 years	138.262	108.104	162.182	130.656
			thereafter	68.872			

2010	Power generating facilities			Option a)	Option b) Premium market trades		
Group	Subgroup	Capacity	Years	Fixed Tariff cEUR/kWh	Prima reference cEUR/kWh	UpREP limit cEUR/kWh	Lower limit cEUR/kWh
		500kW< P	first 25 years	102.409	6.587	116.691	101.033
			thereafter	68.872			
	b.7.3 (dung)		first 25 years	56.706	3.738	88.126	53.955
			thereafter	56.706			
b.8 (biomass from industrial plants)	b.8.1 (agricultural biomass)	P≤ 2MW	first 25 years	132.994	9.162	140.812	127.905
			thereafter	89.663			
		2MW< P	first 25 years	113.771	70.249	118.384	109.804
			thereafter	85.334			
	b.8.2 (forest biomass)	P≤ 2MW	first 25 years	98.177	56.814	106.006	92.993
			thereafter	68.872			
		2MW< P	first 25 years	68.851	25.329	73.421	64.746
			thereafter	68.851			
	b.8.3 (black liquor biomass)	P≤ 2MW	first 25 years	98.177	59.439	106.006	92.993
			thereafter	68.872			
		2MW< P	first 25 years	84.635	38.813	95.215	79.346
			thereafter	68.851			

Source: nreap (2010), 117-118

Annex Table B – Support to energy measures by ERDF programmes

Programmed ERDF Aid (Miles EUR)		OTHERS				TOTAL OTHERS	% OTHER ON ENERGY	RENEWABLE ENERGY				TOTAL RENEW.	% RENEW. ON ENERGY	ENERGY EFFIC.	% EFFIC. ON ENERGY	TOTAL RENEW. + EFFIC.	% R+E ON ENERGY	TOTAL ENERGY	TOTAL ROP	% ENERGY ON TOTAL ROP
PO	BENEFICIARIO	FOI 33	FOI 35	FOI 36	FOI 37			FOI 39	FOI 40	FOI 41	FOI 42			FOI 43						
ANDALUSIA	IDAE					0	0%		23.538	10.090		33.628	59%	23.550	41%	57.178	100%	57.178		1%
	REE, S.A.	34.938				34.938	100%					0	0%		0%	0	0%	34.938		1%
	REGIONAL GOVERNMENT	5.635	5.635			11.270	21%		16.660	8.330		24.990	47%	16.660	31%	41.650	79%	52.920		1%
TOTAL ANDALUSIA		40.573	5.635	0	0	46.208	32%	0	40.198	18.420	0	58.618	40%	40.210	28%	98.828	68%	145.036	6.843.929	2%
CAST-MANCHA	IDAE					0	0%		4.524	1.941		6.465	59%	4.524	41%	10.989	100%	10.989		1%
	REGIONAL GOVERNMENT					0	0%		11.270	4.508		15.779	100%		0%	15.779	100%	15.779		1%
TOTAL CASTILLA - LA MANCHA		0	0	0	0	0	0%	0	15.795	6.449	0	22.244	83%	4.524	17%	26.768	100%	26.768	1.439.394	2%
EXTREMADURA	IDAE					0	0%		5.196	2.220		7.416	59%	5.185	41%	12.601	100%	12.601		1%
	REE, S.A.	11.721				11.721	100%					0	0%		0%	0	0%	11.721		1%
	REGIONAL GOVERNMENT	2.927	1.951			4.879	70%	122	513	244	122	1.001	14%	1.103	16%	2.104	30%	6.982		0%
TOTAL EXTREMADURA		14.648	1.951	0	0	16.600	53%	122	5.709	2.464	122	8.417	27%	6.287	20%	14.705	47%	31.304	1.580.188	2%
GALICIA	IDAE					0	0%		7.155	3.065		10.219	59%	7.143	41%	17.363	100%	17.363		1%
	REGIONAL GOVERNMENT	23.480	2.250		2.250	27.979	54%		7.710	9.390		17.100	33%	6.855	13%	23.955	46%	51.933		2%
TOTAL GALICIA		23.480	2.250	0	2.250	27.979	40%	0	14.865	12.454	0	27.319	39%	13.998	20%	41.317	60%	69.296	2.191.544	3%
TOTAL CEUTA	ONLY IDAE					0	0%		139	64		203	59%	139	41%	342	100%	342		1%
MURCIA	IDAE					0	0%		1.643	706		2.349	59%	1.643	41%	3.992	100%	3.992		1%
	REGIONAL GOVERNMENT					0	0%	185	927	556	185	1.854	77%	556	23%	2.410	100%	2.410		0%
TOTAL MURCIA		0	0	0	0	0	0%	185	2.570	1.262	185	4.203	66%	2.199	34%	6.403	100%	6.403	523.859	1%
CANARY ISLANDS	IDAE					0	0%		1.799	772		2.571	59%	1.799	41%	4.370	100%	4.370		0%
	GAS CANARIAS, S.A.			55.012		55.012	100%					0	0%		0%	0	0%	55.012		5%
	REGIONAL GOVERNMENT					0	0%	2.844	8.734	1.284	1.284	14.145	64%	7.860	36%	22.005	100%	22.005		2%
TOTAL CANARY ISLANDS		0	0	55.012	0	55.012	68%	2.844	10.533	2.056	1.284	16.716	21%	9.659	12%	26.375	32%	81.387	1.019.298	8%
CAST-LEON	IDAE					0	0%		2.412	1.035		3.447	59%	2.423	41%	5.870	100%	5.870		1%
	REGIONAL GOVERNMENT					0	0%		6.750	6.000		12.750	85%	2.250	15%	15.000	100%	15.000		2%
TOTAL CASTILLA – LEON		0	0	0	0	0	0%	0	9.162	7.035	0	16.197	78%	4.673	22%	20.870	100%	20.870	818.194	3%
C-VALENCIANA	REGIONAL GOVERNMENT					0	0%	285	7.689	949	570	9.493	51%	8.986	49%	18.479	100%	18.479		1%
	IDAE					0	0%		3.907	1.673		5.579	59%	3.907	41%	9.486	100%	9.486		1%
TOTAL C. VALENCIANA		0	0	0	0	0	0%	285	11.596	2.622	570	15.073	54%	12.893	46%	27.965	100%	27.965	1.326.341	2%
TOTAL BALEARIC ISLANDS (ONLY REGIONAL GOVERNMENT)		0	0	0	0	0	0%	0	3.500	0	0	3.500	100%	0	0%	3.500	100%	3.500	107.197	3%
TOTAL CATALONIA (ONLY REGIONAL GOVERNMENT)		0	0	0	0	0	0%	0	0	0	7.866	7.866	23%	25.668	77%	33.534	100%	33.534	679.074	5%
BASQUE COUNTRY	AYUNT. LOIU					0	0%					0	0%	238	100%	238	100%	238		0%
	DIP. GIPUZKOA					0	0%					0	0%	1.319	100%	1.319	100%	1.319		1%
	MANCOM. LEA IBARRA					0	0%					0	0%	235	100%	235	100%	235		0%
TOTAL BASQUE COUNTRY		0	0	0	0	0	0%	0	0	0	0	0	0%	1.792	100%	1.792	100%	1.792	240.582	1%
TOTAL MADRID (ONLY REGIONAL GOVERNMENT)		0	0	0	0	0	0%	0	0	0	0	0	0%	10.000	100%	10.000	100%	10.000	336.953	3%
TOTAL NAVARRA (ONLY REGIONAL GOVERNMENT)		0	0	0	0	0	0%	0	0	0	0	0	0%	2.694	100%	2.694	100%	2.694	47.109	6%
TOTAL		**78.701**	**9.836**	**55.012**	**2.250**	**145.799**	**32%**	**3.436**	**114.067**	**52.826**	**10.027**	**180.357**	**39%**	**134.736**	**29%**	**315.093**	**68%**	**460.892**	**17.198.935**	**3%**

ERDF Aids: Programmed ERDF Aid 2007-2013

FIELDS OF INTERVENTION (FOI)

33 – Electricity
35 - Natural Gas
36 - Natural Gas Network TEN
37 - Petroleum products
39 - Renewable Energy: Wind
40 - Renewable Energy: Solar
41 - Renewable Energy: Biomass
42 - Renewable Energy: Hydroelectric, Geothermal and Other
43 - Energy Efficiency, Cogeneration and Energy Management

Annex Table C

SOURCES OF PUBLIC FUNDING FOR THE 2008-2012 PLAN			
		RESOURCES 2008-2012 (EUR thousand)	MEDIA RESOURCES ANNUAL (EUR thousand)
PUBLIC FUNDS	Central government - IDAE	188.0	35.0
	Central government	54.0	10.0
	ERDF IDAE & CG (in ROPs)	64.0	12.8
	Regional Governments funding and ERDF	404.0	80.0
SHARES IN TARIFFs	GAS	285.0	57.0
	ELECTRICITY	1,379.5	275.9
TOTAL		2,366.5	473.3

PUBLIC RESOURCES AND SECTOR APPLICATION			
		PUBLIC RESOURCES 2008-2012 (EUR thousand)	MEDIA RESOURCES ANNUAL (EUR thousand)
FINAL USES BY SECTORS	INDUSTRY	370.0	74.0
	TRANSPORT	408.3	81.7
	BUILDINGS	803.7	160.7
	DOMESTIC AND OFFICE EQUIPMENT	532.5	106.5
	AGRICULTURE	93.8	18.8
	PUBLIC SERVICES	89.0	17.8
PROCESSING SECTOR	ENERGY TRANSFORMATION	29.3	5.9
	COMMUNICATION	40.0	8.0
TOTAL		2,366.5	473.3

Source: IDAE (2007), Action Plan E4+

Annex Table D

RES-E sub-category	Plant specification	Investment costs	O&M costs	Efficiency (electricity)	Efficiency (heat)	Lifetime (average)	Typical plant size
		[€/kW$_{el}$]	[€/(kW$_{el}$* year)]	[1]	[1]	[years]	[MW$_{el}$]
Biogas	Agricultural biogas plant	2550 - 4290	115 - 140	0.28 - 0.34	-	25	0.1 - 0.5
	Agricultural biogas plant - CHP	2765 - 4525	120 - 145	0.27 - 0.33	0.55 - 0.59	25	0.1 - 0.5
	Landfill gas plant	1350 - 1950	50 - 80	0.32 - 0.36	-	25	0.75 - 8
	Landfill gas plant - CHP	1500 - 2100	55 - 85	0.31 - 0.35	0.5 - 0.54	25	0.75 - 8
	Sewage gas plant	2300 - 3400	115 - 165	0.28 - 0.32	-	25	0.1 - 0.6
	Sewage gas plant - CHP	2400 - 3550	125 - 175	0.26 - 0.3	0.54 - 0.58	25	0.1 - 0.6
Biomass	Biomass plant	2225 - 2995	84 - 146	0.26 - 0.3	-	30	1 – 25
	Cofiring	450 - 650	65 - 95	0.37	-	30	-
	Biomass plant - CHP	2600 - 4375	86 - 176	0.22 - 0.27	0.63 - 0.66	30	1 – 25
	Cofiring – CHP	450 - 650	85 - 125	0.2	0.6	30	-
Biowaste	Waste incineration plant	5500 - 7125	145 - 249	0.18 - 0.22	-	30	2 – 50
	Waste incineration plant - CHP	5800 - 7425	172 - 258	0.14 - 0.16	0.64 - 0.66	30	2 – 50
Geothermal Eletricity	Geothermal power plant	2575 - 6750	113 - 185	0.11 - 0.14	-	30	5 – 50
Hydro large-scale	Large-scale unit	850 - 3650	35	-	-	50	250
	Medium-scale unit	1125 - 4875	35	-	-	50	75
	Small-scale unit	1450 - 5750	35	-	-	50	20
	Upgrading	800 - 3600	35	-	-	50	-
Hydro small-scale	Large-scale unit	975 - 1600	40	-	-	50	9.5
	Medium-scale unit	1275 - 5025	40	-	-	50	2
	Small-scale unit	1550 - 6050	40	-	-	50	0.25
	Upgrading	900 - 3700	40	-	-	50	-
Photovoltaics	PV plant	2950 - 4750	30 - 42	-	-	25	0.005 - 0.05
Solar thermal electricity	Concentrating solar power plant	3600 - 5025	150 - 200	0.33 - 0.38	-	30	2 – 50
Tidal stream energy	Tidal (stream) power plant - shoreline	5650	145	-	-	25	0.5
	Tidal (stream) power plant - nearshore	6825	150	-	-	25	1
	Tidal (stream) power plant - offshore	8000	160	-	-	25	2
Wave energy	Wave power plant - shoreline	4750	140	-	-	25	0.5
	Wave power plant - nearshore	6125	145	-	-	25	1
	Wave power plant - offshore	7500	155	-	-	25	2
Wind onshore	Wind power plant	1125 - 1525	35 - 45	-	-	25	2
Wind offshore	Wind power plant - nearshore	2450 - 2850	90	-	-	25	5
	Wind power plant - offshore: 5...30km	2750 - 3150	100	-	-	25	5
	Wind power plant - offshore: 30...50km	3100 - 3350	110	-	-	25	5
	Wind power plant - offshore: 50km...	3350 - 3500	120	-	-	25	5

Source: Financing Renewable Energy in the European Energy Market