Non-cost barriers to renewables – *AEON* study

Spain

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Berlin/Milan, April 2010

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Introduction

In the recent past, Spain has definitively emerged as one of the leading European RES markets, with a large wind and PV capacity in operation, and a consistent pipeline of high temperature concentrated solar power plants. Ironically, it was the boom of PV installations in 2008 that brought the national government to question and reassess the incentive-driven deployment of renewables. The result of this reassessment was expressed in two laws, Royal Decrees 1578/2008 and 6/2009, which represent an unequivocal attempt to strictly control the progressive market development of each RES technology in order to keep under control the costs for the Spanish national budget.

According to most of the renewables market players interviewed, these two partly unexpected laws have created a sense of "legal uncertainty" among the marker operators operating in Spain. This has further exacerbated in the last weeks, when looming and insistent rumours of a retroactive reduction of the PV feed-in tariffs have caused losses in the stock markets.

Also for technologies such as biomass, geothermal and upgraded biogas injected in the gas network, insufficient or unclear financial incentives are considered as an important market barrier. Finally, the financial guarantee requirements introduced by the two Royal Decrees mentioned above reportedly constitute a primary investment deterrent.

For these reasons, the "non-cost barriers" examined in the present study are currently not in the centre of attention in Spain, though their importance was and is widely acknowledged.

Each of the following paragraphs corresponds to one of the chapters in the present study.

The permitting processes in Spain are in general affected **by inefficient administrative procedures** resulting in excessive bureaucratic loads, especially for small and medium residential and commercial applications. The recent introduction of RD 6/2009 has set up a homogeneous administrative process for all RES-e technologies, however without alleviating the administrative burdens. The administrative framework is further affected by consistent regional differences in its implementation, while spatial planning and competing public interests issues, albeit in a minor key, complete the picture of a very complex environment faced by RES developers.

Technical specifications in Spain used to represent significant barriers to trade linked to the eligibility for support schemes. However, these problems are now overcome, as the acceptance of test results and certification from other European countries is usually explicitly mentioned in the legal basis for the support schemes.

Spain has been the first European country to introduce in 2006 an obligation to use **building integrated RES technologies** in new buildings and in those undergoing major renovations with the CTE, Código Técnico de la Edificación. However, 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.

The provisions on the **efficient use of renewable energy sources** foreseen by article 13 (6) of the Renewables Directive 2009/28/EC are currently not fulfilled in Spain:

Information and awareness raising campaigns on RES in Spain do not reach a sufficient level. Information on RES support measures at national level is deemed to be sufficiently available and clear. However, many financial incentives for the ordinary citizens are implemented at regional level, where information is not always up to date and easily accessible. The Spanish population, installers and other traditional energy sector operators, have in general still a poor perception of the benefits and of the working principles of building integrated RES systems, both for heat and electricity. It seems that the available funds for information and awareness raising campaigns are not used efficiently, and that a better coordination of the actors involved in the dissemination would be useful to reach the targets.

Qualification and certification for installers of renewable energy systems in Spain is carried out independently at regional level: some best practices, such as in Andalucía and in the city of Barcelona are alternated with less effective practice in other areas. Market players from the renewable heating sector consider the lack of training of installers a major problem. The lack of a single national body for the certification of installers and, consequently, the absence of specific guidelines and training requirements destined at RES professional installers enforced at national level might contribute to the problem.

Infrastructure development problems in Spain appear to be more concentrated at the level of the distribution network, operated by several DSOs and regulated by the CNE (Comisión Nacional de Energia), the Spanish energy market regulator. The current DSO regulation framework does not appear to be finely tuned, as it does not properly account for the impacts of distributed generation (including RES) on distribution network planning and costs. The regulator CNE, due to its relatively weak level of independence, is unable to tackle this insufficiency in an appropriate time frame. On the other hand, Red Electrica Española, the Spanish TSO, is considered a best practice example at global level in its efforts for integrating and efficiently operating a a large capacity of fluctuating renewables, both wind and PV, on its transport network.

Power grid issues are certainly considered a major barrier amongst the Spanish renewable electricity industry and project developer community. The connection to the grid of RES systems is mainly affected by delays in the authorisation phase and in the execution of connection works. These delays can sum up to over 2 years in the case of large RES installations such as wind and PV power parks. Amongst the causes of such delays, the competing interests of DSOs and independent power producers seem to

suggest that the electricity distribution activity may need to be more strongly regulated by CNE and perhaps further unbundled.

Currently in Spain there is only one application of injection of biogas in the **gas transport network**, a publicly founded pilot project. Our research, in fact, has shown in Spain the lack of a regulating and administrative framework, the low prices of natural gas and the greater profitability of utilising biogas locally to produce electric and/or thermal energy (incentivised by RD661/2007) are not favourable for the development of this particular sector under the present conditions.

Traditionally, **District heating** has never found fertile ground in Spain. The national potential for district heating is geographically limited to certain areas, as in several parts of Spain the winter heat loads are too low to justify such an infrastructure. However, there is a very interesting potential for district cooling in some areas. More recently, the sector has started to emerge thanks to the incentives for cogeneration introduced by RD 661/2007. Amongst the new systems being realised, urban waste and biomass are the most common fuels, showing a good penetration of RES in the DHC fuel mix. The barriers towards the development of DHC systems in Spain are common to all fuel technologies, and mostly relate to social resistance and urban planning deficiencies.

1 Issue 1 Administrative Procedures

1.1 Introduction

According to our research, administrative procedures required to develop RES applications in Spain are affected by the following problems:

Inefficient administrative procedures resulting in disproportionate bureaucratic loads, especially for small and medium residential and commercial applications. In particular, a system developer has always to deal with more than one authority (national, Regional and Local authorities all take part in many administrative processes) in obtaining the needed permits and other documentation.

The recent introduction of RD 6/2009 has set up a similar administrative process for all RES-electricity technologies, based on the pre-assignation of the feed-in tariff for all . However, this has not alleviated the administrative burdens faced by RES developers, as a considerable amount of permits are needed in order to apply to the mentioned pre-assignation registry. Indeed, the new decree has in some cases posed a sever market barrier, because it limits the yearly amount of installations. Thus, market players face uncertainty as for when their investments could be realised.

In the last years, the numerous different regulation and laws that have successively reshaped the framework for RES development in Spain created a feeling of **"legal uncertainty"** among market players that has effectively reduced the number of project developments. (Sacristán 2010).

Regional differences. The bureaucratic path necessary to develop a similar RES Installation may significantly vary across the different regions of Spain **(Comunidades Autónomas, CC.AA.)** often due to different interpretations of the national laws such as RD 661/2007, either because of the lack of clarity of these laws or due to different preferences towards one technology or the other at political level.

Spatial planning issues are affecting the development of certain RES technologies such as Biomass, Geothermal, Hydro and Wind energy.

Competing environmental public interests and, less often, NIMBY effects may have significant impact on RES project development activities.

1.2 Description of barriers & solutions

1.2.1 Detailed description of the Barriers and solutions

Barrier 1.1 – Inefficient general administrative procedures

Registro de preasignación de retribución: all RES technology installations producing electricity that take advantage of the feed-in tariff are subject to the Special Regime **(Regimen Especial)** managed by the Ministry of Industry, Tourism and Commerce (MITyC) as foreseen by Royal Decree (RD) 661/2007.

More recently, RD 6/2009 introduced for all RES subject to RD 661/07 the requirement to apply to the **retribution pre-assignation registry (**Registro de preasignación de retribución) in advance to their construction and operation.

This new administrative framework was introduced to give policy makers control over the annual volume of RES installations, and consequently on the costs caused by the feed-in tariff payments to RES system operators. This need became very urgent after the huge, unexpected boom of PV during 2008. 2,7 GWp of PV systems were installed in that year (against the 0,4 GWp forecast by the National Energy Plan for the whole period 2005-2010). This implies severe costs on the final consumers of electricity for the following 25 years.

The application for the pre-assignation registry requires that the system operator fulfil an extensive list of requirements, which most stakeholders consider excessive:

- Administrative authorisation (often but not always waived to systems smaller than 100 kW);
- Building permit;
- Financial deposit to the state bank;
- Confirmation of grid access and connection point;
- Financial deposit necessary for the grid connection;
- Proof of sufficient own funding or financing necessary to cover 50% of the investment;
- Purchase agreement for 50% of the necessary equipment;
- Others (depending on the chosen RES technology).

After the pre-assignation is secured, system developers have 36 months to build the installations. For complex applications like biomass and geothermal, this is not a sufficient period. (Sacristán 2010)

These complex requirements, together with the fact that the inscription in the pre-assignation registry is guaranteed only until the total capacity objectives set by RD 661/07 are met, are considered by most stakeholders we interviewed a major roadblock for the development of RES installations in Spain.

Possible Options: Most interviewed stakeholders argue that these administrative requirements should be softened (APPA REPAP 2010, ASIF – Collado 2010, AEE – Ceña, Simonot 2010, APPA – De Gregorio 2010) with the aim of reducing the initial risk of investors when applying for the pre-assignation registry. There also strong doubts that

a system based on pre-registration can effectively stimulate the market and allow for complying with the national targets, as it in fact happened in the past in other countries.

A further major recurring barrier is indicated in the vast **heterogeneity, complexity and slowness of the authorisation procedures,** often deriving from different interpretations of the same national laws, in the different levels of local administration - mostly at regional level in the different Spanish **Comunidades Autónomas.** In many cases, the available information on administrative procedures results excessively complicated to understand. (APPA - REPAP 2010).

Possible Options: In case of doubtful interpretations of the same national laws, the CC.AA. could ask the CNE (National Energy Commission) for a binding interpretation. (Sacristán 2010) See also what discussed below.

Finally, law should rigidly regulate **speculation arising from the resale of obtained licences** for the construction of RES systems in order to prevent repercussions on the administrative processes: in fact, speculative requests tend to overload administrations causing further delays in the authorisation processes (APPA - REPAP 2010).
Possible options: In order to solve a large part of the barriers outlined above, an Inter-Sector Conference for Renewable Energy could be established. The Conference should collect from all available instances, both public and private, information on difficulties in complying with the administrative requirements for developing a RES system. The collected information would serve as a basis in order to evaluate the effectiveness of these procedures and drive towards their simplification. The conference could also serve as a reference point ensuring coherence and uniformity between all local and central administrations involved in the authorisation, certification and granting processes. (APPA-Greenpeace (2009), art.19)

Biogas & Biomass

The Spanish Biomass and Biogas sectors have not developed as much as foreseen in the 2005-2010 National Energy Plan. According to APPA, as of March 2009 Biomass has only reached 32% of the objective (900 MW of Installations would still be due before the end of 2010 in order to reach the target) while Biogas has only reached 65% (87 MW of Installation due until 2010). Apart from economical considerations and other factors concerning the availability of fuels, delays and missed opportunities arise from the **absence of a single administrative body,** from which all the necessary authorisation and permits can be obtained. (APPA - REPAP 2010) (AEBIG 2010)

Possible Options: The creation of inter-ministerial commissions at national level and of equivalent bodies at regional level would allow identifying a single interface for Biogas (and other RES) developers. Administrative procedures should be rationalised with pre-determined timetables. (AEBIG 2010)

For biomass power plants, one of the pre-requisites established by RD 6/2009 is to provide a **contract for the supply of biomass.** However, this is very difficult to obtain 2 years before the biomass plant starts operating, due to the unwillingness of most biomass producers to commit themselves so long in advance.

Possible Options: A letter of intents signed by the biomass fuel suppliers could be a much more appropriate requirement that most biomass developers would be able to meet without difficulty. (APPA - de Gregorio 2010).

Wind

The **pre-assignation registry** established by RD 6/2009 is a severe barrier against market development, and may limit the wind market in 2010 by 60% compared to 2009 levels. This is due both to the excessive requirements, and to the near fulfilment of the total power objective (20.155 MW) stated by RD 661/07 (AEE 2010). In order to solve the **impasse** created in the Spanish with market and return confidence to the investors, it is necessary for the national authorities to clarify what are the total power objectives for wind installations in Spain from now to 2020.

Other major problems that affect wind energy project development in Spain are:

- **Slow and sometimes non-transparent authorisation procedures** as reported by many promoters: some projects were launched in 2001 and still do not have all the needed permits.
- **Lack of co-ordination between the different levels of government involved:** different regions publish tenders with different rules and different calendars.
- **Heterogeneity of the procedures** to be followed in the different regions: Environmental impact assessment requirements differ wildly, both for new wind farms and for repowering of existing ones.

All these factors often lead to competence conflicts among authorities, and therefore to delays.

Finally, for a single project development **up to 25 different permits** may be needed from regional and national authorities, and the permitting for small projects is as complicated as the one for large projects (Wind energy - the facts (2008)).

Possible Options: better coordination and implementation of a monitoring system of the administrative procedures across the country. (AEE – Ceña, Simonot 2010).

PV – Large scale ground installations

For large-scale PV energy installations, RD 1578/2008 has introduced the **pre-assignation remuneration registry (RPR)** that limits the volume of incentivised installations with quarterly market caps, The system developers together must provide with the application:

- a financial deposit;
- the connection point to the electric grid (administered by the relevant DSO);
- the administrative authorization (administered by the regional authority);

- the building permit (administered by the local municipality).

These requirements are seen as a severe barrier, as they involve costs (the building permit, for instance, requires a down payment of up to 4% of the value of the entire project) that may not be recovered for an undetermined period of time and therefore increase the risk for the investor. In fact, the inscription to the registry may be refused and postponed to a successive quarter due to several reasons, such as the reaching of the quarterly market cap, or insufficient or erroneous documentation. Currently, for large ground PV systems the queue for the feed-in tariff assignation is evaluated at 4 years. In this situation, investors are not willing to expose themselves as there is no security regarding when the installation can be realised and put into operation. (ASIF – Collado 2010, ASIF PV LEGAL 2010). The PV market has completely collapsed since 2009.

Possible Options: The desired control on market development could be obtained, without imposing such an excessive uncertainty and risk on PV project developers, for example introducing flexible tariff schemes that decrease the retribution to PV systems when the volume of installations exceeds a certain threshold. (ASIF PV LEGAL 2010) For the inscription in the RPR, the building permit could be replaced by a positive spatial planning approval released by the competent Municipality (ASIF - PR1 (2009).

Geothermal – High and medium enthalpy (electricity generation)

In order to understand the administrative barriers that affect the development of large Geothermal applications, it must be noted that this technology requires very long times for the development of a single project.

The preliminary phases necessary to determine the existence of an exploitable geothermal resource may last between 9 and 12 years. During this period, it is necessary to obtain from the competent regional authority (CC.AA.) initially a number of investigation permits, and successively a number of exploration permits. Taking into account the fact that Regional governments only stay in charge for 4 years, it is difficult to maintain **political support** during all the preliminary period leading to the construction of a “deep” geothermal plant and the actual exploitation of the natural resource. Therefore, the preliminary phases may show an intermittent profile of activity, often lasting more than a decade. (IGME – García 2010).

The **law regulating the investigation, exploration and exploitation of geothermal resources** is the **Ley de Minas** (law 22/1973 successively modified by law 54/1980) that includes these resources under section “D”, together with other mineral resources that can be exploited for energy purposes such as coal, radioactive minerals, etc. It is evident that this law (dating back to the dictatorship years, when the CC.AA. did not have the current administrative powers), it is not specific enough to deal with the needs of the geothermal sector. (IGME – García 2010) As with other technologies, the **Ley de Minas** is differently interpreted by each CC.AA., leading to a fragmented regional regulations (IGME – García 2010) (APPA – de Gregorio 2010).

As for other technologies, Geothermal energy is subject to the Pre-assignation registry established by RD 6/2009. Beyond what already discussed about the registry general, the geothermal FiT cannot be fully known in advance, due to the fact that RD 661/07 states

that a considerable variable part of the will be known only when the system enters operation. This creates difficulties for financing and seriously hinders the development of geothermal projects. (APPA – de Gregorio 2010).

Possible Options: In order to facilitate the development of geothermal projects, it is necessary to alleviate the risks in the initial phases of the projects, by allowing that the necessary permits for investigation and exploration of the geothermal resources are granted swiftly, and for all the time needed to complete these tasks. It is also necessary to remove the uncertainty on the project retribution introduced by the tariff components foreseen by RD 661/2007. . (APPA – de Gregorio 2010).

Small hydro

The **long administrative procedures** and the **lack of coordination between all the administrations involved** in the concession of licences are seriously hindering the development of small hydro. In fact, there are no real "fast track" procedures for smaller projects, as required by the RES-E Directive. The Royal Decree 916/1985, amended by the Royal Decree 242/1988, institutes a short procedure to obtain the hydrological licences (concessions and authorisations) for installing, refurbishing or upgrading small hydropower resources of nominal power inferior than 5.000 KVA. Nonetheless, the administrative process for these projects has not improved. As a result, in the case of mini-hydro power plants, the administrative process often lasts more than 5 years, while in some cases, hydroelectric concessions are pending since almost 20 years. (APPA - REPAP 2010, ESHA 2007, de Delás 2010)

Possible Options: Political will is required to solve this problem. While the energy administration wants to promote mini hydro, the hydrological administrations tend in practice to disfavour it. Authorisation procedures for installations localised in the areas allowed by the Hydrological plans could be simplified, by centralising in the same joint report all the procedures related to the different Hydrological Confederations (areas) involved in the authorisation of the project. During the lifetime of a project, it would be useful that an eventual modification of an existing installations could be autonomously approved by the same Authority that approved the original project, provided that the modified installation does not alter by over than 50% the power and that it still meets the requirements of the Hydrologic Planning. (APPA – REPAP 2010)

Barrier 1.2 – Competing public interests

The Environmental Impact Assessment Procedure, regulated by RDL 1/2008, is often the most delicate part of large RES project developments. The presence of NIMBY effects and the opposition of certain environmental organisations often affect this procedure, resulting in considerable delays or in the abort of the project development.

Biomass

The **lack of specific legislation** in order to control the environmental impact of agricultural, forestry and urban activities constitutes an obstacle to the increase on biomass valorisation energy installations. In fact, allowing biomass residuals to be wasted instead of exploiting their energy potential is an avoidable cost for the community, both economic and environmental. (APPA - Barreras 2010).

Possible Options: According to the proposals of APPA, a stable framework for biomass fuel cultivation and commercialisation should be established by actions like:

- amending the article of the Law 43/2003 **de Montes** that implies land qualification to change from agricultural to forestry as a consequence of merely planting fibre-rich cultivations;
- modifying forestry regulations by adapting time horizons compatible with those required by of biomass projects: 5 years is not a sufficient period to plan a biomass supply agreement. (APPA - Barreras 2010).

Wind

Local resistance and the opposition of environmental organisations often pose obstacles in the attainment of a positive Environmental Impact Assessment. Amongst the most common allegations against wind farms:

- Repercussions on bird population
- Visual impact of the installations, including impact due to lightning at night

Possible Options: Accurately monitoring the impact of existing projects, informing on their outcomes and putting in place appropriate compensation measures. (AEE - Ceña, Simonot 2010).

Geothermal – High and medium enthalpy (electricity generation)

The Environmental Impact Assessment process may last over a year and constitutes a serious risk in project development. (IGME - García 2010).

Possible Options: Environmental Impact requirements and procedures should be streamlined and harmonised at regional level.

Small hydro

According to a report of the small-hydropower association, **environmental requirements are sometimes exaggerated** and constitute a major barrier that hinders investment in small Hydro Power in the country.

In Spain water is in general a scarce resource, contended by different interests. The water flows needs of hydropower projects need to be balanced with others: **ecological flows**, agriculture flows and even recreational fishing flows. In some cases, there are some attempts to impose retroactively ecological flows to hydropower systems that were already authorised and installed. One example is the "**Sector plan for Environmental Flows in the Inland Basins of Catalonia**" approved in 2006 and currently being implemented with a progressive approach.

RD 1/2001 "Ley de Aguas", implementing the Water Framework EC Directive, states that **reserved flows** should be determined by the competent basin authorities, based on scientific studies for each segment of the rivers. (ESHA (2007)) However, most local and regional authorities often choose calculation methods that result in a reserved flow very close to the total river flow, making any exploitation virtually impossible.
Local opposition of the population may arise also against small hydro projects, but it is generally perceived as a minor issue.

Possible options: Also in this case, political will is fundamental in order to solve the problems. The environmental and other reserved flows requirements should be made proportionate and reasonable, because in most cases the hydropower installations are compatible with other human activities as provision by the Ley de Aguas.

Barrier 1.3 – Inexistent or insufficient spatial planning
There is a general insufficiency in spatial planning for RES installation addressed by APPA and Greenpeace in its proposal for a law on renewables in Spain (APPA-Greenpeace 2009) In general, RES are not taken sufficiently into account when regional and local authorities are planning the urban and extra-urban territory.

Possible Solution: All the provisions made by the CC.AA or the local authorities that affect the territory should contain an adequate consideration of the benefits that the development of RES can bring to the community. Therefore, these plans or dispositions should not contain general prohibitions or restrictions towards RES based exclusively on aesthetic considerations, but motivate the eventual restrictions based on other existing dispositions or facts that further motivate the preservation of the territory. On a different level, urban planning instruments should indicate the use of RES for heating, cooling and electricity generation purposes both at district and single building level, when these can be used efficiently in the planning, design, building or renovation of residential, commercial and industrial areas. (APPA-Greenpeace (2009), art. 18).

Wind
The Spanish ministry of environment was responsible for a study of the national offshore wind resources, but the study is delayed. As a consequence, a national regulation for the exploitation of offshore wind resource is still absent. (AEE - Ceña, Simonot 2010).

Geothermal – High and medium enthalpy (electricity generation)
At the present day, Spain does not have a detailed official study on the potential of the national geothermal resource. It is necessary that such a study is urgently realised to:

- quantify its potential;
- locate it on the territory;
- explain its characteristics;
- as it happens for other RES technologies. (APPA - Barreras 2010).

Mini-hydraulic
Every few years, the different Hydrological Confederations have to renew the **Hydrological Plans** that establish the exploitation limits for each activity in each river or canal. In the last few years, electricity production has seen its role progressively diminished, as in many cases the Hydrological Basin plans tend to rule out the construction of hydropower system in great portions of the rivers.

Possible options: Also on order to **streamline the authorisation procedures** for mini-hydro installations, it would be extremely useful that **the Hydrological Plans** explicitly indicate in which portions of rivers these installations can be built. The Plans should also indicate the requirements in terms on environmental impact and other exploitation

conditions, in order to relieve the project developers from spending time in individuating these conditions.
Subsequently, all authorisation procedures for installations localised in these pre-determined areas could be simplified. (APPA - REPAP 2010)

1.2.2 Best Practice Elements and Indicators

No.	Technology	Benchmark	Result
1.1	PV	Is one stop-shopping possible?	No
1.2	PV	Amount of money to be invested in the administrative process (including cost of work and costs like fees) (in €)	110.000€
1.3	PV	Time to be spent for the administrative process (duration to get all the main permits) (in months)	55
1.4	PV	Estimated number of permits required (#)	20

1.3 Literature

AEBIG (2010): El Futuro del Biogas en España, Spanish Biogas Industry Association (AEBIG), 2010. http://www.aebig.org/documentos/futuro_biogas.pdf

AEE (2010): Press release 02/2010, Spanish Wind Enterprise Association (AEE), 2010. http://www.aeeolica.es/userfiles/file/notas-de-prensa/2010/NP%20AEE%20_%20potencia%20instalada%20febrero%202010.pdf

AEE - Ceña, Simonot (2010): Interview with Alberto Ceña and Emilien Simonot, Spanish Wind Enterprise Association (AEE) - March 2010.

APPA - Barreras (2010): Barreras y Medidas Energías Termoeléctricas, Spanish Renewable Energy Association (APPA), March 2010.

de Gregorio (2010) : Interview with Margarita de Gregorio, Thermoelectric Energies Director, Spanish Renewable Energy Association (APPA) - March 5, 2010.

APPA - REPAP (2010) - Hoja de Ruta de Energias Renovables en España. Spanish Renewable Energy Association (APPA), not yet published, 2010.

APPA-Greenpeace (2009): Anteproyecto de Ley para el Foment de las Energías Renovables, Spanish Renewable Energy Association (APPA) and Greenpeace, 2009

ASIF - Collado (2010): Interview with Eduardo Collado - March 3, 2010.

ASIF - PR1 (2009): La Asamblea de ASIF pide al Gobierno el afianzamiento de la nueva regulación – Spanish PV Industry Association (ASIF), Press Release March 2009.

http://asif.org/files/ASIF_Asamblea_Mar09.pdf

ASIF - PV LEGAL (2010): PV LEGAL Research - 2010, not yet published.

ASIT - Polo & Cisneros (2010): Interview with Pascual Polo Amblar, General Secretary, and Elena Cisneros, Technical Responsible, Spanish Solar Thermal Industry association (ASIT) - March 2010

ESHA (2007) - Administrative Barriers for Small Hydropower Development in Europe. http://www.esha.be/fileadmin/esha_files/documents/publications/position_papers/ESHA_contribution_to_Administrative_barriers_workshop_IEEA_.pdf

GEOFAR (2009): Non-Technical Barriers and the Respective Situation of the Geothermal Energy Sector in Selected Countries. http://www.energia.gr/geofar/articlefiles/2nd_report.pdf

IGME - García (2010): Interview with Celestino García, Head of Technical Projects, Spanish Minerary and Geological Institute (IGME) - March 2009.

Labriet, M. et al. (2009) - The implementation of the EU renewable directive in Spain. Strategies and Challenges. Elsevier, 2009

Sacristán (2010) - Interview with Ana Sacristán Salvador, Lawyer, Roedl&Partner Madrid, March 5 2010.

Wind energy - the facts (2008) - Case study: Spain. http://www.wind-energy-the-facts.org/en/part-4-industry--markets/chapter-5-administrative-and-grid-access-barriers---an-analysis-of-existing-eu-studies-in-the-field/case-studies/spain.html

Sector plan for Environmental Flows in the Inland Basins of Catalonia: http://aca-web.gencat.cat:80/aca/documents/ca/planificacio/cabals/cabals_manteniment.pdf

2 Issue 2 Technical Specifications

2.1 Introduction

This chapter analyses if the provisions of the Renewables Directive 28/2009/EC concerning technical requirements are fulfilled in Spain.

Notably, following preamble:

> "National technical specifications and other requirements (...) in the field of technical standards and regulations (...) relating for example to levels of quality, testing methods or conditions of use, should not create barriers for trade in renewable energy equipment and systems. Therefore, support schemes for energy from renewable sources should not prescribe national technical specifications which deviate from existing Community standards or require the supported equipment or systems to be certified or tested in a specified location or by a specified entity."

and mainly Article 13 (2):

> "Member States shall clearly define any technical specifications which must be met by renewable energy equipment and systems in order to benefit from support schemes. Where European standards exist, including eco-labels, energy labels and other technical reference systems established by the European standardisation bodies, such technical specifications shall be expressed in terms of those standards. Such technical specifications shall not prescribe where the equipment and systems are to be certified and should not impede the operation of the internal market."

Until a few years ago, there used to be significant barriers to trade linked to the technical conditions for eligibility for support schemes. Solar thermal products had to be re-tested to be considered as eligible for the support schemes in the Spanish market. Non-eligible products were de facto out of the market. Together with difficulties in France, these problems in Spain were one of the main reasons for stakeholders to express complaints that finally led to the inclusion in the RES Directive of the provisions mentioned above.

However, these problems are now overcome. Technical specifications for support schemes are currently not a barrier in Spain. The acceptance of test results and certification from other European countries is often explicitly mentioned in the legal basis for the support schemes.

2.2 Description of barriers & solutions

The analysis has been performed on the basis of following sources:

- An overview of all financial support schemes at national and regional level (DENA 2010)
- A more detailed analysis of a sample of national and regional support schemes: national support scheme for biomass (Biomcasa 2009 and 2010), and of a sample of regional support schemes of the regions of Andalusia (AAE 2010a, AAE 2010b), Aragon, Murcia, Navarra (Navarra 2009) and Madrid (Madrid 2008).
- Technical Building Code (Código Técnico de la Edificación, CTE), promulgated by Royal Decree 314/2006, 17 March 2006
- On the RITE (Reglamento de Instalaciones Térmicas de los Edificios - Regulation on Indoor Heating/Air-conditioning Systems), laying down the conditions that must be met by systems intended to provide thermal comfort and hygiene by providing heating, air-conditioning, and hot water, so as to achieve a rational use of energy. The last version of the RITE was approved on 20 July 2007 by the Council of Ministers, and promulgated in the form of Royal Decree 1027/2007. A correction of errors was subsequently published.
- The Technical Building Code (CTE)
- Interview with representatives of importing companies (Schäfer 2010. Schneider 2010).

The national tax break scheme has not been considered; since it is due to expire in early 2011 anyway.

Barrier 2.1 – Weak definitions

An extensive online research showed that, in several Spanish regions, it is very time consuming to find clear information on the technical parameters that need to be fulfilled by renewable energy equipment in order to be eligible for support schemes or to comply with the renewable obligations for buildings. The online research was performed in early March 2010.

However, when the information is found, the technical specifications are usually clearly defined. Interviews with market players (Schäfer 2010, Schneider 2010, ASIF - Collado 2010) suggest that the lack of clear definition is not considered a relevant barrier.

Barrier 2.2 – no EU standards applied

Differently from what happened in the past, the Spanish support schemes now only refer to European standards when setting technical specifications. No specific national standard is required.

Barrier 2.3 – Specified locations

Until a few years ago, solar thermal manufacturers from other European countries strongly complained that products already tested and certified in the EU needed to be re-tested in Spain according to the same standards. However, this problem has been solved.

Currently, in order to sell solar collectors in Spain, it is necessary to obtain a homologation from the national ministry (MITYC 2010, MITYC 2007). To obtain it, it is sufficient to show a test certificate according to European standards issued by any accredited certification body, also from other European countries. For other renewable energy technologies, no such homologation procedures have been signalled as a problem. The homologation requires compliance with European standards, which can be certified also by foreign certification bodies and test institutes. Moreover, the manufacturer must hold an ISO 9001 certificate. Industry players welcome this additional requirement, as it protects the Spanish market from unreliable producer (Schneider 2010, Schäfer 2010). These industry sources report that the administrative procedure can be accomplished within a couple of weeks, without significant efforts.

As for biomass, the legal basis for the main support scheme explicitly refers to "quality marks, certifications of conformity with applicable rules and legislation and other voluntary quality marks legally obtainable in any Member State of the European Union or of the European Economic Area" (Biomcasa 2009). Also for PV and heat pumps, requirements of additional testing or certification to enter the Spanish market are not signaled.

Barrier 2.4 – Barriers to trade

As discussed in detail in the previous section 2.3, significant barriers related to the support schemes currently do not exist in Spain.

2.2.1 Best Practice Elements and Indicators

No.	Technology	Benchmark	Result
2.1		Are specifications expressed in terms of European standards (including eco-labels, energy labels and other technical reference systems), though such European references exist?	No

2.3 Literature

AAE (2010a): Programa de Incentivos para el desarrollo energético sostenible de Andalucía 2009-2014 http://www.juntadeandalucia.es/agenciadelaenergia/nav/com/contenido.jsp?pag=/contenidos/incentivos/incentivos_09&id=2

AAE (2010b): Agencia Andaluza de la Energía, email information of 4 March 2010

ASIF - Collado (2010): Interview with Eduardo Collado, Technical Director, Spanish PV Industry Association (ASIF) - March 3, 2010.

Biomcasa (2009): Resolución de 13 de marzo de 2009, de la Presidencia del Instituto para la Diversificación y Ahorro de la Energía, por la que se establece la convocatoria y

bases correspondientes a la habilitación de empresas colaboradoras en el Programa de Acuerdos Voluntarios con empresas del sector de la biomasa térmica en edificios. http://www.idae.es/index.php/mod.documentos/mem.descarga?file=/documentos_Bases_convocatoria_habilitacion_empresas_colaboradoras_Prog_AcVol_biomasa_%2820-03-2009%29_e6869e47.pdf

Biomcasa (2010): Programa de Acuerdos Voluntarios con empresas del sector de la biomasa térmica en edificios (Biomcasa), http://www.idae.es/index.php/mod.pags/mem.detalle/idpag.477/relcategoria.1160/relmenu.160 as of March 2010

CTE (Codigo Tecnico de Edificacion)- Royal Decree 314/2006 of 17 March 2006

DENA (2010): dena-Subsidy Overview EU-27 – REN Heat, http://www.dena.de/en/infos/publications/publikation/eu-27-renewable-heat, and dena-Subsidy Overview EU-27 – Photovoltaic, http://www.dena.de/en/infos/publications/publikation/eu-27-photovoltaic/

Madrid (2008): ORDEN de 16 de octubre de 2008, por la que se regula la concesión de ayudas por el Instituto Madrileño de Desarrollo para promoción de actuaciones de ahorro y eficiencia energética. http://www.madrid.org/cs/Satellite?c=CM_Orden_BOCM&cid=1142498732374&idBoletin=1142498599836&idSeccion=1142498599872&language=es&pagename=Boletin%2FComunes%2FPresentacion%2FBOCM_popUpOrden

MITYC (2007): ORDEN ITC/71/2007, de 22 de enero, por la que se modifica el anexo de la Orden de 28 de julio de 1980, por la que se aprueban las normas e instrucciones técnicas complementarias para la homologación de paneles solares http://www.estif.org/solarkeymark/Links/Internal_links/News/A03687-03689.pdf

MITYC (2010): Documentacion requerida para tramitar la certificacion de captadores solares termicos http://www.mityc.es/energia/es-ES/Paginas/Buscador.aspx?k=homologacion&s=

Navarra (2009): RESOLUCIÓN 1658/2009, de 17 de junio, de la Directora General de Empresa, por la que se aprueba la convocatoria de la subvención a instalaciones de aprovechamiento de energías renovables, http://www.navarra.es/home_es/Actualidad/BON/Boletines/2009/89/Anuncio-13/

RITE (2007): Reglamento de Instalaciones Térmicas de los Edificios - Regulation on Indoor Heating/Air-conditioning Systems introduced by Real Decree 1027/2007 of July 20th, 2007.

Schneider (2010): Private communications with Michael Schneider, TiSUN Spain, March 2010

Schäfer (2010): Private communications with Detta Schäfer, Sonnenkraft Spain, March 2010

3 Issue 3 Building integrated technologies

3.1 Introduction

Spain has been the first European country to introduce an **obligation to use renewable energy appliances in new buildings**, and in those undergoing major renovations. Such an obligation had been successfully implemented in Israel since the 1980s, but before the Spanish experience, there had been no experience in its application in the European context. The Spanish experience started at local level, with the solar ordinance approved by the City of Barcelona in the year 2000, leading to the adoption in 2006 of a solar obligation in the national building law **CTE, Código Técnico de la Edificación**, introduced by RD 314/2006 (ESTIF (2007).

This pioneering role, linked with the dramatic changes in the Spanish construction market during the economic crisis, led to some teething problems: unsatisfactory implementation, lack of effective flanking measures like training of installers and awareness raising have resulted in low rates of compliance, and frequent quality deficits. The latter can lead to a loss of reputation of those renewable technologies that were supposed to be promoted. Possible solutions are being discussed in Spain and are reported here.

Another important issue is that **simplified administrative procedures are not available** for some small RES technologies, such as PV and geothermal applications. leading to unnecessary paperwork and installation delays. One-stop shopping is not possible in those cases.

3.2 Description of barriers & solutions

In March 2006, the Spanish government adopted a new Technical Building Code called CTE (**Código Técnico de la Edificación** - RD 314/2006) that, among others, includes **obligations to cover 30-70% of the Domestic Hot Water (DHW) demand with solar thermal energy** and to install photovoltaic energy systems in definite categories of buildings that exceeds a certain surface. Because it is possible to fulfil the obligation also by other forms of renewable heating, instead of solar thermal, in the following we call it "renewable obligation".

The requirements of the CTE are legally binding all over Spain. However, local authorities may set more strict requirements than those foreseen in the CT. A number of municipalities make use of this, including the City of Barcelona (ESTIF 2007, Puig 2008,

Prosto 2010). For reasons of space, this text focuses on the national regulation CTE, which affects most the largest number of buildings in Spain and because improvements in the CTE would have a positive impact also on the local regulations.

Further RES installation requirements are defined in RITE (RD…), REBT (RD...) and in CALENER, the reference IT tool for the energy certification of buildings developed by IDAE in collaboration with the Ministry of Industry, Tourism and Commerce and the Ministry of Housing. CALENER was established in RD 47/2007, the national law implementing EC Directive 2002/91 on the Energy Performance of buildings.

3.2.1 Detailed description of the Barriers and solutions

Barrier 3.1 – Inefficient general administrative procedures

In general, small-size obligatory RES installations are not exempt from the same administrative process that is required in case of voluntary installations of the same technology. This represents a problem particularly for those technologies that, in order to be economically sustainable, need to access the Special Regime regulated by RD 661/2007 and RD 1578/2008, and therefore to the pre-assignation registry application described as a major hurdle in chapter 1. As an example, in order to take advantage of the feed-in tariff support measures, **small and medium rooftop PV systems** have to follow **the same administrative path of large ground installations** as required by RD 1578/2008. In some cases the administrative authorisation is required also for systems below 100 kW. (ASIF - PV LEGAL 2010).

Possible options: ASIF, the Spanish PV industry association, proposes to simplify the authorisation process for such installations, by requesting that a simple notification to the Local Authority shall be made sufficient. ASIF is currently working with the Spanish Government on the drafting of such simplified regulation. (ASIF – Collado 2010).

In general, small **ST installations** are not exempted from obtaining a **building permit prior to installations.** Further, all ST systems whose power is superior than 5 kWe need to **be registered to the regional registry** established by RITE. (ASIT - Polo & Cisneros 2010).

The registration of the installed ST systems as per the requirements of RITE is affected by **different implementations at regional level**. In some areas of the country (e.g. Andalucía and Valencia), the registration of installations is often not carried out by installers, due to the consistent paperwork required that appears to have a discouraging effect on most installers. This creates a problem, as the missing registration prevents control on the installations and quantification of the market. However, in those regions where the registration to the RITE registry is a condition to access the support measures for ST installations, it is then carried out in most cases in order not to lose the economic support. (eclareon – Cervantes 2010).

Possible Options: While the registration to the RITE does not appear to be unmotivated, the building permit (while not difficult to get) represents an unnecessary burden,

especially, but not only, when ST installations are mandatory as per CTE. A simple notification should suffice in this case. (ASIT - Polo & Cisneros 2010).

Barrier 3.2 – No/insufficient specific rules for building integrated/small scale RES installations

In the case of **photovoltaic energy,** the current building obligations do not incentivise the auto consumption of the energy produced, as this is normally fed into the grid and remunerated under the feed-in tariff (ASIF - Collado 2010).

Possible options: in a recent study prepared in collaboration with KPMG, ASIF has proposed that in the medium term the national government introduces a net-metering system in order to better incentivise local auto-consumption of PV electricity in the residential and commercial sectors. Net-metering systems have already been introduced in countries like Italy and Germany, where they represent a major stimulus for the installation of small and medium PV systems. (ASIF - PR2 (2009))

Barrier 3.3 – Competing public interests

Geothermal – Low enthalpy (heat pumps and other direct thermal applications)
In some regions, an environmental impact assessment (EIA) is required even for small residential geothermal applications, *de facto* hindering the utilisation of this technology. This happens for instance in Andalusia, where an EIA is required for all ground perforation, no matter the depth that needs to be reached. As a comparison, in the **Comunidad Autónoma de Madrid** the very same permit is not necessary for perforations up to 200 metres in depth. (IGME – García 2010).

Possible options: geothermal technology should be explicitly addressed in the future reviewed versions of CTE, RITE and CALENER and its national objectives set in the PER 2011-2020, currently being prepared by the Spanish Government. In this way, all regional authorities will have to recognise the importance of low enthalpy geothermal applications and remove unnecessary administrative burdens (see discussion on EIA in Chapter 1 above). (APPA - de Gregorio 2010).

PV – Small to medium scale rooftop installations

In order to install PV systems in residential buildings, a consensus amongst all neighbours is needed in order to proceed with the installation. This need may often block an installation, and may be overcome only improving the awareness of the population towards the benefits of PV and other RES applications in general (see Issue 5) (ASIF - Collado 2010).

Barrier 3.4 – Renewables obligations insufficient

So far, the implementation of the renewable obligations in the CTE led to less satisfactory results than expected (ASIT 2009, ASIT 2010, Schneider 2010, Schäfer 2010, Pérez 2010). One underlying reason has been the collapse of the Spanish construction market: The CTE entered in force during 2007, at the end of a long boom of the construction industry in Spain, which was then dramatically hit by the financial crisis.

However, also taking into account the reduced number of new constructions, the implementation of the CTE is not considered as satisfactory for the following reasons:

- High number of buildings in which no renewable heating systems are installed, making use of legal exceptions, or simply ignoring the obligation
- High number of buildings where the renewable heating systems installers have a poor quality level
- Non satisfactory level of learning effects among professional stakeholders (construction companies, architects, planers, installers) and among the final beneficiaries (building owners, building users).

All these factors, whose occurrence rates are currently being assessed by quantitative studies (Pérez 2010), reduce the positive impact of the renewable obligation in terms of renewable energy production. The quality problems are even more damaging, as they can jeopardize the reputation of the renewable technologies, thus also damaging the voluntary market.

Experts and stakeholders argue that the general legislative principle of the **CTE,** the renewable obligation itself, is certainly valid. The failures are linked to **the lack of appropriate flanking measures and to the weaknesses of the enforcement procedures** (ASIT 2009, ASIT 2010, Pérez 2010, Schneider 2010, Schäfer 2010) .

The **possible remedies** must be sought taking into account the framework conditions under which a solar obligation operates in Spain, which are of course different than in Germany or in Israel. Important aspects of these conditions are:

- **Extreme costs pressure:** in the context of the general crisis of the construction sector, construction companies compete mainly on costs. This creates a pressure towards cheapest solutions, low quality of materials and/or installation works, a drive towards a purely formal compliance with the renewable obligation, or even towards non compliance, given the lack of credible sanctions.
- **Lack of competence** of architects, planners and installers: the renewable obligation was introduced before the market had spontaneously generated widespread competences, as it is the case for instance in Austria and Germany. Unfortunately, no appropriate training campaign was enacted. As a consequence, and also pushed by the cost pressure, many professionals are learning by doing within the context of the legal obligation, resulting in technical problems;
- **Lack of information** among final users (building owners, and building users) who are often not able to recognize if the ST system is working properly, and to perform the minimum monitoring needed to determine if professional maintenance is required. (Peréz 2010).

A number of **flanking measures proposed by stakeholders** (Schäfer 2010, Schneider 2010, ESTIF 2007, Polo & Cisneros 2010, Peréz 2010) have not, or not sufficiently been implemented:

- Strong awareness raising campaigns to inform and motivate all stakeholders, including the building users and owners as well as the professionals in the construction sector: particularly in a country like Spain, a legal obligation will not

work if it is not fully supported by the public opinion and by the relevant stakeholders.

- A better combination of sticks and carrots: the financial incentive schemes for solar thermal, which are currently offered mainly by regional and national support schemes for any solar thermal system, could be focused only on those systems that exceed the legal obligation, in order to provide an incentive to invest on larger systems on a voluntary basis.
- The obligatory solar fraction could be reduced (Schäfer 2010). Linked with the previous point, such a measure would reduce the risk of frequent stagnation in summer, while keeping the incentive for motivated investors to install larger systems, where technically appropriated.
- Moreover, systems that reach a higher solar fraction on a voluntary basis could be incentivised by awarding them a higher energy efficiency class in the certification of buildings
- At least for larger systems, obligation to monitor and report real energy production data
- Obligation to have maintenance and service contracts for the systems
- Introduction of a national certification for installers, with an appropriate training standard (see Issue 6 below)
- Promotion of ESCOs and energy contracting.

As for the **enforcement procedures**, the current situation in practice does not even guarantee the physical realisation of the required RES installations, which is verified only on paper at the initial stage when the project is authorised. After construction, there is no check that the RES installation is realised according to the approved building project design. Later, the correct functioning of the installation is not verified at any other time point during its operation lifetime. (Polo & Cisneros 2010) It must be noted that the CTE is a national legislation, but the enforcement is delegated to the local authorities, which often are understaffed. It is understandable that, if the resources for enforcement controls are limited, the CTE requirements related to health & safety are given priority.

Possible options: Comparative analysis at international level (ESTIF 2007) and market players (Schäfer 2010) suggest that a system of detailed random checks in each geographical area could be a useful solution. Only a limited number of buildings would be checked, to avoid excessive costs for the public administration. However, these checks could be performed in-depth, with a visit on-site by independent experts, with the aim of identifying any important quality faults. The information found could be made public, with the effect of creating an incentive for construction companies, architects, planners and installers to work at a high quality level in the field of renewables in building.

ASIT also suggests that the competent regional authorities (i.e. the **Comunidades Autonomas**) do an effort in enforcing the inspections and maintenance interventions as originally required by RITE (articles 25 to 31) on all installed equipment, in order to verify correct functioning and respect of the building obligations. (Polo & Cisneros 2010)

Another issue is that **other RES technologies different from ST ad PV are not explicitly addressed by the CTE**. The requirements to use PV and ST can be waived under a series of circumstances, including the possibility to generate an equivalent

amount of energy utilising other renewable sources. In practice, though, the absence of explicit mentions of these alternative technologies has confused certain regional administrations, which in some cases do not allow other RES technologies to be used at all in order to meet the CTE requirements.

For instance, **low enthalpy geothermal applications** are not explicitly mentioned in CTE and CALENER. This issue leads at regional level to different interpretations or even restrictions in their utilisation in order to meet the energy requirements of new and refurbished buildings. (APPA - REPAP 2010).

Possible options: Geothermal and biomass energy need to be taken explicitly into account in the pending revision of CTE and CALENER, providing also the correct framework in order uniform the utilisation of this technology in each CC.AA. (APPA - de Gregorio 2010).

Barrier 3.6 – RES deployment hindered by spatial planning matters

In general, energy policy consideration did not play a role urban planning in Spain so far. Urban planning instruments should indicate the use of RES for heating, cooling and electricity generation purposes both at district and single building level, when these can be used efficiently in the planning, design, building or renovation of residential, commercial and industrial areas. (APPA-Greenpeace (2009), art. 18).

3.2.2 Best Practice Elements and Indicators

No.	Technology	Benchmark	Result
3.1	PV	Is this installation type in normal cases exempted from an authorization procedure (building permit)?	NO
3.2	PV	Are legal-administrative requirements adequate for this installation type?	NO
3.3	PV	Number of administrations that must be contacted (#)	3
3.1	ST	Is this installation type in normal cases exempted from an authorization procedure (building permit)?	NO
3.2	ST	Are legal-administrative requirements adequate for this installation type?	YES
3.3	ST	Number of administrations that must be contacted (#)	N/A
3.1	GT	Is this installation type in normal cases exempted from an authorization procedure (building permit)?	NO
3.2	GT	Are legal-administrative requirements adequate for this installation type?	NO
3.3	GT	Number of administrations that must be contacted (#)	N/A

3.3 Literature

APPA - Barreras (2010): Barreras y Medidas Energías Termoeléctricas, Spanish Renewable Energy Association (APPA), March 2010.

de Gregorio (2010) : Interview with Margarita de Gregorio, Thermoelectric Energies Director, Spanish Renewable Energy Association (APPA) - March 5, 2010.

APPA - REPAP (2010) - Hoja de Ruta de Energias Renovables en España. Spanish Renewable Energy Association (APPA), not yet published, 2010.

APPA-Greenpeace (2009): Anteproyecto de Ley para el Foment de las Energías Renovables, Spanish Renewable Energy Association (APPA) and Greenpeace, 2009

ASIF - Collado (2010): Interview with Eduardo Collado, Technical Director, Spanish PV Industry Association (ASIF) - March 3, 2010.

ASIF - PR1 (2009): La Asamblea de ASIF pide al Gobierno el afianzamiento de la nueva regulación – Spanish PV Industry Association (ASIF), Press Release March 2009. http://asif.org/files/ASIF_Asamblea_Mar09.pdf

ASIF - PR2 (2009): ASIF propone modificar la regulación para que los consumidores puedan producir y consumir su propia electricidad fotovoltaica - Spanish PV Industry Association (ASIF), Press release November 2009. http://asif.org/files/ASIF_propone_modificar_la_regulacion_para_que_los_consumidores_puedan_producir_y_consumir_su_propia_electricidad_fotovoltaica_Nov09.pdf

ASIF - PV LEGAL (2010): PV LEGAL Research - Spanish PV Industry Association (ASIF), not yet published.

ASIT - Polo & Cisneros (2010): Interview with Pascual Polo Amblar, General Secretary, and Elena Cisneros, Technical Responsible, Spanish Solar Thermal Industry association (ASIT) - March 2010

ASIT - Genera (2009): Impacto del CTE en el Sector de la Solar Termica: Previsiones, Realidades y Medidas Necesarias. Spanish Solar Thermal Industry association (ASIT), III Congreso de la EST en el CTE Genera 2009, 13 Mayo. http://www.asit-solar.com/presentaciones/ASIT-EREN,%2017%20marzo%202010.pdf

CTE (Codigo Tecnico de Edificacion)- Royal Decree 314/2006 of 17 March 2006

Peréz (2010): Interview with David Peréz, partner, eclareon. March 2010.

Cervantes (2010): Interview with Victor Cervantes, senior analyst, eclareon. April 2010.

ESTIF (2007): Best practice regulations for solar thermal, Project “Key issues for Renewable Heat in Europe” (K4RES-H),

http://www.estif.org/fileadmin/estif/content/policies/STAP/Best_practice_solar_regulations.pdf

GEOFAR (2009): Non-Technical Barriers and the Respective Situation of the Geothermal Energy Sector in Selected Countries.
http://www.energia.gr/geofar/articlefiles/2nd_report.pdf

IGME - García (2010): Interview with Celestino García, Head of Technical Projects, Spanish Minerary and Geological Institute (IGME) - March 2009.

Labriet, M. et al. (2009): The implementation of the EU renewable directive in Spain. Strategies and Challenges, Elsevier, 2009.

ProSTO (2010): Promoting solar thermal ordinances in Europe, project website,
http://www.solarordinances.eu/SolarOrdinances/tabid/36/Default.aspx

Josep Puig (2008): "The Barcelona Solar Thermal Ordinance: 10 years experience", presentation at ProSTO meeting.
http://www.solarordinances.eu/Portals/0/03_Puig.pdf

REBT (2002): Reglamento Electrotécnico de Baja Tensión – Regulation on Low Voltage appliances. Introduced by Royal Decree 842/2002 of 2 August 2002.

RITE (2007): Reglamento de Instalaciones Térmicas de los Edificios - Regulation on Indoor Heating/Air-conditioning Systems introduced by Real Decree 1027/2007 of July 20th, 2007.

Sacristán (2010): Interview with Ana Sacristán Salvador, Lawyer, Roedl&Partner Madrid - March 2010.

Schneider (2010): Private communications with Michael Schneider, TiSUN Spain, March 2010

Schäfer (2010): Private communications with Detta Schäfer, Sonnenkraft Spain, March 2010

4 Issue 4 Promotion of energy efficient renewable energy equipment

4.1 Introduction

Purpose of this chapter is to verify if following provisions of article 13 (6) of the Renewables Directive 2009/28/EC are fulfilled in Spain:

> "With respect to their building regulations and codes, Member States shall promote the use of renewable energy heating and cooling systems and equipment that achieve a significant reduction of energy consumption. Member States shall use energy or eco-labels or other appropriate certificates or standards developed at national or Community level, where these exist, as the basis for encouraging such systems and equipment.
>
> **In the case of biomass,** Member States shall promote conversion technologies that achieve a conversion efficiency of at least 85 % for residential and commercial applications and at least 70 % for industrial applications.
>
> **In the case of heat pumps,** Member States shall promote those that fulfil the minimum requirements of eco-labelling established in Commission Decision 2007/742/EC of 9 November 2007 establishing the ecological criteria for the award of the Community eco-label to electrically driven, gas driven or gas absorption heat pumps.
>
> **In the case of solar thermal energy,** Member States shall promote certified equipment and systems based on European standards where these exist, including eco-labels, energy labels and other technical reference systems established by the European standardisation bodies.
>
> In assessing the conversion efficiency and input/output ratio of systems and equipment for the purposes of this paragraph, Member States shall use Community or, in their absence, international procedures if such procedures exist."

Currently, these requirements are not yet fulfilled.

Biomass

One of the programs for the promotion of biomass is the "Programa de Acuerdos Voluntarios con empresas del sector de la biomasa térmica en edificios (Biomcasa)". The legal basis is very detailed, with 23 pages of legal provisions, but it does not contain any indication on the minimal efficiency of the biomass boilers. The official website presenting this program makes a reference to the "Technical guide for biomass systems in buildings" (IDAE 2009). This guide, at page 50, states that according to the RITE (RITE

2007), biomass burners used for production of heat must have an efficiency of at least 75%. This is clearly below the requirements of art.13(6) of the RES Directive.

Additionally some regional support schemes for biomass, for example in Asturias, set the minimum level of efficiency at only 75%.

Heat pumps

The regional support schemes covering also heat pumps usually do not require compliance with the Commission Decision 2007/742/EC of 9 November 2007, nor any other specific ecological and/or energy efficiency requirements for heat pumps. See for instance Asturias (2009) and Baleares (2009).

Solar Thermal

In this case, the requirements are fulfilled; see also the Chapter on Issue 2 above.

4.1.1 Best Practice Elements and Indicators

No.	Benchmark	Result
4.1	Are the requirements of Art 13 (6) of the Directive concerning the promotion of efficient bioheat and heat pumps fulfilled? (yes/no)	NO

4.2 Literature

Asturias (2009): Resolución de 15 de junio de 2009, de la Consejería de Industria y Empleo, por la que se aprueban las bases reguladoras de la concesión de subvenciones para uso de energías renovables, BOLETÍN OFICIAL DEL PRINCIPADO DE ASTURIAS núm. 148, http://faen.es/nueva/Intranet/documentos/1996_Resolucion%20subvenciones%20renovables%20Asturias%202009.pdf
7

Balears (2009): Govern de les Illes Balears, Subvencions installacions energies renovables, http://www.caib.es/govern/sac/visor_proc.do?codi=378625

Biomcasa (2010): Programa de Acuerdos Voluntarios con empresas del sector de la biomasa térmica en edificios (Biomcasa), http://www.idae.es/index.php/mod.pags/mem.detalle/idpag.477/relcategoria.1160/relmenu.160 as of April 2010. The legal basis is at: http://www.idae.es/index.php/mod.documentos/mem.descarga?file=/documentos_Bases_convocatoria_habilitacion_empresas_colaboradoras_Prog_AcVol_biomasa_%2820-03-2009%29_e6869e47.pdf

IDAE (2009): Guía técnica – Instalaciones de biomasa térmica en edificios http://www.mityc.es/energia/desarrollo/EficienciaEnergetica/RITE/propuestas/Documents/GuiaBiomasa.pdf

RITE (2007): Reglamento de Instalaciones Térmicas de los Edificios - Regulation on Indoor Heating/Air-conditioning Systems introduced by Real Decree 1027/2007 of July 20th, 2007.

5 Issue 5 Information/awareness raising

5.1 Introduction

Information on RES support measures at national level is deemed to be sufficiently available and clear, while information on the support measures at regional level are not always up to date and easy accessible. Renewable heating is supported mainly at regional level.

Five years ago, in the Plan de Energiás Renovables 2005-2010 (PER 2005), IDAE, the Spanish Institute for Energy Saving and Diversification, indeed identified the **lack of awareness and information** in the **general public**, the **municipal administrations** and the relevant **decision-makers (architects, promoters, etc.)** as one of the main barriers to be addressed in order to promote solar thermal and solar photovoltaics development. According to the plan, IDAE was responsible for implementing most of the measures addressing these issues, together with the sector's industry associations and the local authorities (Regional and Municipal).

Currently, the information offered on the website of IDAE represents a good initial source of initial information for both the general public, by means of simple general descriptions and FAQ documents, and for professionals (installers, architects) that can retrieve technical guides and other more specific documents. The IDAE website offers links to the relevant websites of each Regional Authorities, were more detailed information on regional incentives and programs can be found.

In the last years IDAE also realised a series of information campaigns such as:

- **Solarízate** (Go solar), a project to familiarise a wider audience with solar power, the outcome of two consecutive collaboration agreements signed by the IDAE and GREENPEACE. The aim of "Solarízate" is to set up solar photovoltaic systems at state schools in Spain. The project has its own website www.solarizate.org which includes teaching materials on solar power aimed at teachers and schoolchildren.
- **Enermanos**, a cartoon series in order to create in the young Spanish population awareness on RES and energy saving, In collaboration with TVE, the Spanish state television.

In the last years, the Spanish solar industry associations ASIT and ASIF participated in the organisation of the European Solar Days (Día Solar) that were joined by 16 countries in 2009. In 2009, Over 400 events were realised throughout Spain.

Nonetheless, the Spanish population, installers and other traditional energy sector operators, have in general still a **poor perception of the benefits and of the working principles of RES systems** with regards to electric and thermal energy generation in residential and commercial buildings.

5.2 Description of barriers & solutions

5.2.1 Detailed description of the Barriers and solutions

Barrier 5.1 – Insufficient availability of information on support measures

In general, **information on available support measures at national level has been found to be sufficient in quantity and clarity** (Peréz 2010, Anta 2010). Most necessary information is presented on the website of the Ministry of tourism, Industry and Commerce (MITyC 2010)

Problems instead do exist at regional level, especially with solar thermal and other technologies whose installation is partially financed with regional grants. The intermittent nature of these support measures results in unclear information on when and under which conditions these measures are available. (ASIT - Polo & Cisneros 2010). Researching such information on the regional websites often requires a considerable effort in finding the right information and understanding whether this is still valid or not.

Possible Options: Centralising the information in a homogenous format, collecting the available support measures from all regional authorities.

Barrier 5.2 – Insufficient funding for campaigns/programmes

None of the interviewed stakeholders suggested that lack of funding is the main reason behind the lack of information and awareness, though more funding may nonetheless help with solving the problems, provided these are used efficiently. (Anta 2010, Polo & Cisneros 2010, Peréz 2010, Pascual 2010)

Barrier 5.3 – Insufficient campaign-/programme-design

IDAE, the Spanish Institute for Energy savings and diversification, offers to the public and to installers a vast database of information on RES, and is responsible for running information campaigns in collaboration with regional and local administrations. However, the results do not appear to be optimal according to some of the stakeholders interviewed, especially with regards to the general public and installers/technicians.

According to ASIT, the Spanish PV industry association, less than 10% of the end users understand how **PV energy installations** work, but the recent boom of PV in Spain has created awareness in the population of the existence of this technology and of the support measures for it. (Anta 2010)

The advantages of **solar thermal** energy are not well known amongst the public. Even in case of obligatory installations (see chapter 3 above) the users may not even understand when or if the ST system is working. A similar lack of information and appreciation for

RES systems can be observed in many installers, due to the lack of sufficiently well designed information programs. (ASIT - Polo & Cisneros 2010)

With regards to the **biogas sector**, no sufficient information is disseminated to the sector's stakeholders in the rural world and in the technological sector. Rather than a matter of more funding, it is up to the various parties involve in the awareness raising and information campaigns (IDAE, the regional administrations and the regional energy entities) to better coordinate themselves in targeting and reaching the correct market actors with tailored information campaigns. (Pascual 2010)

Lack of information persists about **geothermal energy** and its possibilities in providing heating and cooling to residential and commercial buildings. (GEOFAR 2009)

Possible Options: the lack of awareness in the sector operators (installers) and the general public should be addressed by more dedicated campaigns and events (technical days, seminars and conferences) that should be organised at different levels in the territory. In order to address the general public, attention should be paid to how RES and traditional energy sources are presented on the mainstream media, ensuring fairness and balance in the information presented with regards to costs and benefits of each technology. Not only the economical aspect should be taken into consideration, but also the overall social and environmental impacts. (APPA - REPAP 2010)

5.2.2 Best Practice Elements and Indicators

No.	Benchmark	Result
5.1	Is sufficient information on support measures available?	Average

5.3 Literature

Anta (2010): Interview with Javier Anta, President of ASIF – Spanish PV Industry Association, April 2009

APPA - REPAP (2010) - Hoja de Ruta de Energias Renovables en España. Spanish Renewable Energy Association (APPA), not yet published, 2010.

ASIT - Polo & Cisneros (2010): Interviews with Pascual Polo and Elena Cisneros – March-April 2010.

GEOFAR (2009): Non-Technical Barriers and the Respective Situation of the Geothermal Energy Sector in Selected Countries.

MITyC 2010: Special Regime Electric Energy Production www.mityc.es/energia/ELECTRICIDAD/REGIMENESPECIAL/Paginas/Index.aspx

Pascual (2010): Interview with Andrés Pascual, Centro tecnológico AINIA - April 2010

Peréz (2010): Interview with David Peréz, Partner, eclareon Madrid. March 2010.

6 Issue 6 Certification of Installers

6.1 Introduction

Market players from the renewable heating sector consider the lack of qualification of installers a major problem

Most quality problems in the solar thermal sector are due to faults in the installation process (Polo & Cisneros 2010, Schäfer 2010, Schneider 2010). This weakness also jeopardises the effectiveness of advanced building regulations, as already discussed in chapter 3.

The lack of a single national body for the certification of installers and, consequently, the absence of specific guidelines and training requirements destined at RES professional installers enforced at national level may contribute to this problem.

6.2 Description of barriers & solutions

6.2.1 Detailed description of the Barriers and solutions

Barrier 6.1 - Lack of a Certification body

The requirements for thermal installations, including biomass heaters, solar thermal systems and geothermal heat pump installations in buildings are described in the RITE **(Reglamento de Instalaciones Térmicas en Edificios)** and the competence for such certification is delegated to the Regional authorities **(Comunidades Autónomas)** (APPA - REPAP 2010). Articles 34 to 42 of the RITE determine the requirements and the modalities for the inscription of installing and maintenance companies in the regional registry of authorised operators. The same articles also define the certification procedures for the professional workers employed by the same companies. In particular, all thermal installations >5KW need to be certified and registered by the competent regional authority. The authorisations and certifications released at regional level have national validity. (RD 1027/2007).

Similarly, the requirements for PV systems and electric heat pump installations are described in the REBT **(Reglamento Electrotécnico de Baja Tensión).** (APPA - REPAP 2010) Article 22 of the REBT also delegates to the Regional authorities the authorisation and certification of installers. (RD 842/2002).

Therefore, while the regulation framework is unified at national level, **there is not a single body competent at national level** for the certification of installers of RES systems, but the responsibility is spread over the 17 Spanish CC.AA. (ASIF - Collado 2010) (ASIT - Polo & Cisneros 2010).

The region of Andalusia has created an own certification scheme (Prosol) for solar thermal and other RES installers. Only systems installed by certified installers can benefit from the regional financial incentive. This scheme is considered as a good practice example by market players (Shäfer 2010, Schneider 2010). However, most other regions have no such schemes. In Catalonia, solar thermal installations made obligatory by the Barcelona Solar Ordinance (OST 2005), have to be realised according to the quality parameters specified by APERCA, the Catalonian association of renewable energy professionals (APERCA 2010).

Barrier 6.2 & 6.3 - Lack of guidelines and training

On a practical level, the certification guidelines and the training requirements specified by RITE do not include specific requirements of knowledge on renewable energy technologies. As a consequence, lack of specific training frequently leads to poor quality of the installations. Certain companies offering renewable energy systems to the final users invest significant own resources to train their own installers. However, given the nature of the market, they often take the risk of investing time and money in training people who will then work for other companies. Moreover, they face the competition of low quality installers who offer less qualified services, taking advantage of the information disadvantage of the final users, who are often not able to distinguish between a proper and a faulty installation. Under this context, a significant frequency of low quality installation may result in a **poor perception of RES systems** advantages among final users.

In order to provide for the lack of detailed information, IDAE, the Spanish Institute for Energy Diversification and Savings, has published a series of guidelines for photovoltaic and solar thermal installations and more recently in 2007 has published a commentary on the RITE providing guidance to installers in adapting installations to the new requirements. However, these guidelines are not binding at legal level and therefore are not enforced.

Possible options: it is necessary to increase the qualification of installers. A national certification should be based on a curriculum that effectively ensures that the installers working with renewable systems have the appropriate skills. The model of Andalusia, where the financial incentive is awarded only to systems installed by certified installers, could be extended to other regions. The requirements of RITE and REBT may need to be updated taking into account the particularities of each RES technology. In this direction, most Spanish RES industry associations are providing important references by developing their own installation and installer certification guidelines, and discussing them with the national policymakers.

Several RES industry stakeholders are investing in training installers:

- ASIF, the Spanish photovoltaic industry association is currently collaborating with the Ministry of Energy and Minerary Resources in order to define PV installation certification guidelines. (ASIF - Collado 2010)
- ASIT, the Spanish solar thermal industry association, has prepared installation and maintenance guidelines specific for solar thermal systems, available on their website (ASIT - Polo & Cisneros 2010).

- With regards to heat pumps, the EUCERT certification and qualification system, set up by the European Heat Pumps Association (EHPA) already complies with the requirements of article 14 of the RES directive EC/2009/28 and may be taken as a reference for Spain. (APPA - REPAP 2010).

6.2.2 Best Practice Elements and Indicators

No.	Benchmark	Result
6.1	Are certification schemes or equivalent qualification schemes available for installers?	only at regional level
6.2	Is sufficient training on RES provided during the standard education curriculum of installers?	No

6.3 Literature

APERCA (2010): Guia per la realització de projectes d'energia solar tèrmica – Solar thermal Installatios guide. APERCA, Cataloniana renewable energy specialists assiciation, 2010.
http://www.aperca.org/pagines_09/recursos_nou/disseny/Guia_elaboracio_projectes.pdf

APPA - REPAP (2010) - Hoja de Ruta de Energias Renovables en España. Spanish Renewable Energy Association (APPA), not yet published, 2010.

ASIF - Collado (2010) - Interview with Eduardo Collado - March 3, 2010.

ASIT - Polo & Cisneros (2010): Interview with Pascual Polo and Elena Cisneros - March 2010.

OST (2005): Ordenanza Solar Térmica (OST) de Barcelona, Agencia Local de Energía de Barcelona. http://www.barcelonaenergia.cat/cas/documentos/documentos3.htm

PROSOL (2009): RES Installation Certification Program, Agencia Andaluza de la energía.
http://www.agenciaandaluzadelaenergia.es/agenciadelaenergia/nav/com/contenido.jsp?pag=/contenidos/incentivos/Incentivos_09/Beneficiario/prosol

Schneider (2010): Private communications with Michael Schneider, TiSUN Spain, March 2010

Schäfer (2010): Private communications with Detta Schäfer, Sonnenkraft Spain, March 2010

7 Issue 7 Infrastructure Development

7.1 Introduction

In Spain, the large generating capacity of wind power farms is connected to the **Transport Network infrastructure** managed by Red Electrica Española (REE).

According to the interviewed stakeholders, the REE and the Ministry of Industry, Tourism and Trade (MITyC) work quite efficiently to develop the transmission network, based on an electricity network expansion planning report, which is periodically issued by the Ministry.
However, some transmission lines may suffer delays due to administrative or local opposition problems. During the last few years, REE has been able to integrate into its network one of the largest wind power capacities worldwide. This was achieved thanks to the Control Centre of Renewable Energies (Cecre), a world leading initiative that guarantees network expansion and stability, while ensuring priority for the connection of RES. (IIT - Frías/Cossent 2010, AEE - Ceña, Simonot 2010, IEA – Spain (2009)).

Except for wind, most RES installations are connected to **the distribution network**, where there appears to be more problems. The distribution network is operated by several DSOs and regulated by the **CNE** (**Comisión Nacional de Energia**), the Spanish energy market regulator. The current **DSO regulation framework does not appear to be finely tuned**, as it does not properly account for the impacts of Distributed Generation and RES on the distribution network planning and costs. CNE is aware of these problems but it is finding difficulties in implementing the required remedies in a convenient timeframe, due to its relative **lack of independence** in its regulatory role. (IIT - Frías/Cossent 2010, IEA – Spain (2009))

Thus, DSOs are not properly motivated to make efficient use of the RES installations in expanding and renovating their network, and in fact tend to see large scale RES penetrations as a potential source of risk.

The increase of **interconnection transmission** capacity between Spain and France is one of the main concerns of the Spanish TSO regarding adequacy evolution. Also the increase of transmission interconnection capacity with Portugal is important in the framework of the development the Iberian electricity market. Plans are underway to upgrade this interconnection capacity. (ENTSO-E 2010)

7.2 Description of barriers & solutions

7.2.1 Detailed description of the Barriers and solutions

Barrier 7.1 - Problems concerning connection to existing electricity networks

In Spain, the large generating capacity of wind power farms is connected to the Transport Network infrastructure directly managed by Red Electrica Española (REE), together with some of the recent CSP systems. Most other RES installations are instead connected to the distribution network operated by several DSOs and regulated by the CNE.

All power generation capacities, such as RES installations, connected to the distribution network are defined as Distributed Generation (DG). High penetration and concentration of RES in a distribution network is a cause of preoccupation amongst DSOs due to the **lack of predictability and controllability** of most RES electricity generation installations and due to the fact that DG has a repercussion on DSOs' costs. These costs may arise from different factors such as network reinforcement, energy losses or poor quality of service. (Frías et al. (2009)).

The current DSO regulation framework is established by RD 222/2008. RES operators wishing to connect to the DN in Spain have to pay for all the connection costs, including the eventual upstream network reinforcements ("deep" connection charges). On the other hand, network charges are not applied to them for the later utilisation of the distribution infrastructure. This means that RES operators have initially to pay a large amount of money – a first barrier - but that later they are not incentivised to make an efficient utilisation of the resource. (Cossent et al. (2009)). Spanish DSOs are subject to penalties for energy losses and low quality of service and, given the lack of predictability in the behaviour of intermittent RES DG such as PV, may therefore see a large penetration of these on their network as a **potential source of risk and economic loss** for their service. In the Spanish context this is especially true, as **DG is not incentivised to make an efficient use of the grid**. (Cossent et al. (2009)).

Possible Options: Reform the grid connection and DSO regulations**, reducing DG connection fees (**adopting "shallow" fees) (Cossent et al. (2009)), while introducing **network charges**, incentivising DSOs to make an efficient use of DG on their network **exploiting their potential for improving the distribution network service and infrastructure**. In this context, active network management is a fundamental prerequisite. Additionally, in order to achieve an effective regulation in the short term, it would be necessary for the **CNE to become more independent** from the National Government. In fact, the CNE has still mainly an advisory and consultative role and its regulatory decisions are subject to approval to the Ministry of Industry, Tourism and Commerce. (IEA – Spain (2009), (IIT - Frías/Cossent 2010).

Another (minor) problem reported in Spain is that DSOs tend to favour the connection of RES systems owned by companies that belong to the same industrial group, for instance by setting more convenient connection charges. (Cossent et al. (2009).

Possible Options: Proceed to full ownership unbundling of the electrical distribution sector, not allowing the groups to which DSOs belong to own DG power generation capacity. (Cossent et al. (2009)).

At TSO level, the scenario is more positive. The **Control Centre of Renewable Energies (Cecre)**, created by REE, is considered an excellent pioneering effort to increase the reliability and stability of the electricity system and giving priority to RES installations at the same time. (IEA – Spain (2009).

Barrier 7.2 - Problems concerning development of electricity network infrastructures according to a long-term strategy

The Spanish RES stakeholders complain that the electricity infrastructure does not grow as fast as the development in RES would require. (APPA - REPAP 2010). This is particularly true for the distribution network, for mostly the same reasons discussed in the previous barrier. The CNE's task is to set the allowed annual revenues of each DSO, taking into account the particular characteristics of their respective service areas. Hence, if the allowed revenues, due to the current regulatory framework, do not include the costs of expanding or reinforcing the network due to the connection of DG, then the DSOs will be reluctant to invest. In this task of stimulating investment, CNE has to deal with the strong DSOs and that does not have the necessary independence from the Government in order to take and enforce its decisions (IIT - Frías/Cossent 2010, IEA – Spain (2009)).

Possible options: Strengthen the independence of the CNE in driving and enforcing the network expansion plans, and incentivise the DSOs to expand their networks (IIT - Frías/Cossent 2010, IEA – Spain (2009)).

Barrier 7.3 - Problems concerning development of a Trans-European Electricity Network

The increase of **interconnection transmission** capacity between Spain and France is one of the main concerns of the Spanish TSO regarding adequacy evolution, as well as the increase of transmission interconnection capacity with Portugal in the framework of the development the Iberian electricity market. Simultaneous import capacity is expected be more than doubled from 3.2 GW in 2010 to 6.6 GW in 2015, thanks to the new Spain-France interconnection (expected in 2014) and also to the new interconnections with Portugal in 2011 and 2012. Export capacity will also reach values close to 7 GW. (ENTSO-E 2010)

According to stakeholders interviewed, the current interconnection capacity with Portugal may still be adequate, but the one with France is insufficient. Indeed, lots of environmental protection and NIMBY issues were faced during the initial phase of the project, so an underground solution for the interconnection with France has been sought and already approved. (IIT - Frías/Cossent 2010, IEA – Spain (2009)).

7.2.2 Best Practice Elements and Indicators

No.	Technology	Benchmark	Result
7.1	N/A	Presence of an efficient (in terms of capability of achieving its stated objectives) plan for the reinforcement of the interconnection capacity with neighbouring countries.	Average

7.2	N/A	Presence of an efficient plan for the reinforcement of the connection capacity within the country.	Average

7.3 Literature

APPA - REPAP (2010) - Hoja de Ruta de Energias Renovables en España. Spanish Renewable Energy Association (APPA), not yet published, 2010.

APPA-Greenpeace (2009): Anteproyecto de Ley para el Fomento de las Energías Renovables.

Cossent et al. (2009): Towards a future with large penetration of distributed generation: Is the current regulation of electricity distribution ready? Regulatory recommendations under a European perspective.

Frías et al. (2009): Improvements in current European network regulation to facilitate the integration of distributed generation.

IIT - Frías/Cossent (2010): Interview with Pablo Frías and Rafael Cossent, Instituto de Investigación Tecnológica, Universidad Pontificia Comillas, Madrid - 4 March 2010.

IEA – Spain (2009): Energy Policies of IEA Countries - Spain Review, 2009

AEE - Ceña, Simonot (2010): Interview with Alberto Ceña and Emilien Simonot, Spanish Wind Enterprise Association (AEE) - March 2010.

ENTSO-E (2010): ENTSO-E European network of transmission system operators for electricityReport System, Adequacy Forecast 2010 – 2025, 2010. http://www.entsoe.eu/fileadmin/user_upload/_library/publications/entsoe/outlookreports/SAF_2010-2025_final.pdf

8 Issue 8 Power Grid Issues

8.1 Introduction

In Spain, systems that generate electricity from RES are statutorily entitled **to priority access and connection** to the electrical grid. RES system operators may be contractually entitled to an expansion of the grid, of which they are to bear the costs, if the expansion is required for their system to be connected to the grid. The main applicable laws in this respect are the Royal Decree on the Regulation of the Distribution and Transmission of Electricity (RD 1955/2000) and Royal decree on the regulation of electricity production under the Special Regime (RD 661/2007) (RES LEGAL 2010).

The connection to the grid of RES systems is mainly affected by **delays in the authorisation phase** first, and in the **execution of connection works** later. These delays can sum up to over 2 years in the case of large RES installations such as wind and PV power parks. Amongst the causes of such delays, the **competing interests of DSOs and independent power producers** seem to suggest that the electricity distribution activity may need to be more strongly regulated by CNE and perhaps further unbundled.

The access to the network for RES systems is affected by the limitation imposing that the distribution network may only accommodate RES generation **up to 50% of its evacuation capacity**, therefore imposing higher costs and delays to the system operators willing to access the grid.

8.2 Description of the barriers & solutions

8.2.1 Detailed description of the Barriers and solutions

Barrier 8.1 - Problems concerning grid connection

System operators are granted the connection of RES systems to the grid. System operators and the grid operator have to agree the technical conditions for the connection by a contract, which shall comply with the model contract provided by the Ministry of Energy and Mining. Before such a contract may be concluded, the system operator in question shall submit to the grid operator the administrative authorisation for the installation of the power system and, if the operation requires special devices, of the connection devices between the systems and the connection point to the transmission and distribution grid (RES LEGAL 2010) (RD 661/2007, art.16-17).

The plant operator shall bear the costs of the connection and of the eventual necessary upgrade of the grid capacity up to the connection point. (RD 661/2007, Annex XI).

Furthermore, operators of plants whose capacity exceeds 10 MW must be connected to a control system and shall bear its costs of installation and maintenance, including those of the communication lines to the grid operator necessary for its operation. (RES LEGAL 2010) (RD 661/2007, art.18).

In order to describe the barriers that currently arise within this regulation framework, it is useful to distinguish between RES systems connected to the transport network managed by Red Electrica Española (REE), i.e. wind power systems in most cases, and all other RES installations which are normally connected to the distribution grids managed by several DSOs. (IIT - Frías/Cossent 2010).

Wind Power systems connected to the transport network

According to AEE **(Asociation Empresarial Eolica),** the Spanish wind energy industry association, **grid connection authorisation and realisation times are very long,** lasting up to 35 months for a 2MW wind farm. The reasons behind these delays are diverse. REE, which is in general seen as a very good interlocutor, is often overloaded with connection requests and has not enough staff to cope with the workload. **Planned expansions of the infrastructure capacity** may also delay the connection of wind farms. (AEE - Ceña, Simonot 2010). Administrative permitting and connecting line authorisations are often required to be carried out together, and delays in the latter may influence the first. Also, negotiations with the owners of land necessary to build a connecting line are often difficult. (Wind energy - the facts (2008)).

Possible options: AEE recommends that when grid connection is denied on the basis of insufficient network capacity, the same RES project is guaranteed a connection point within the following revision of the Renewable Energy Plan. Under no circumstances a point of connection may be denied if there is available network capacity and the planned installed capacity for the previous planned period had not been reached. (AEE Wind Power (2009)).

Similarly as found for administrative procedures, grid connection procedures may vary from region to region, leading to conflicts between different administrative levels. (AEE - Ceña, Simonot 2010) (Wind energy - the facts (2008)).

RES installations connected to the distribution network

With regards to the installation of PV systems to the distribution network, a research and survey carried out by ASIF within the PV LEGAL project determined that 6-8 weeks are generally needed in order to secure the grid connection permit for medium size PV installations. In the case of large installations of above 1 MWp in size, times are considerably longer: 12-20 weeks.

The main reasons behind these delays seem to lay in the lack of transparent information provided by the DSOs on the current grid connection capacity and in the technical requirements necessary for the connection itself. The dialogues with the DSOs result difficult, vague and affected by considerable delays.

Once the PV installations are realised, further 5-12 weeks are needed in order to physically connect them to the grid, and the reason behind this further delay are to be

found in the staff and schedule limitations of the DSOs themselves. (ASIF - PV LEGAL 2010).

Possible options: ASIF advocates for a simplification of the connection requirements and procedures necessary for small and medium PV and RES systems to the grid.

Barrier 8.2 - Problems concerning grid access

According to RD 661/2007, RES installations may be connected to a distribution network only if they use **up to 50% of the existing connection line and transformation capacity.** When this threshold is reached, the costs of the necessary upgrade have to be born by the RES system operator requesting the connection to the grid.

Possible options: according to ASIF this limitation is excessive, and it most cases it is the DSO that majorly benefits of the upgrade of the grid capacity financed by the connecting RES operator. The proposal of the Spanish PV industry association is to allow for connections for up to 100% of the grid capacity without requesting the payment of grid upgrades costs. (ASIF 2010 PV LEGAL).

RD661/07 in its Annex XI defines a number of RES technologies as "non dispatchable". In the text, RES technologies are generally said to be non dispatchable if:

- their primary energy source is not controllable or storable;
- the associated electricity generation systems do not allow for system operator managed production control without renouncing to the available primary energy source, i.e. wasting wind or solar resource.

As a matter of fact, **geothermal energy is wrongly included within these technologies,** and this constitutes both a mistake and a severe barrier against the development of this technology, as it creates in TSOs and DSOs a false perception of the possibility of geothermal electricity production. (APPA – de Gregorio 2010).

Possible options: RD 661/2007 should be amended in order to remedy the mistake, including geothermal energy as a dispatchable energy source.

Barrier 8.3 - Problems concerning TSOs and DSOs

There are several cases of **unjustified delays in the authorisation of the connection works** necessary to connect new RES installations to the grid, when these projects need to be verified and approved by the Spanish TSO and DSOs. The average duration of such administrative processes is estimated at 4 months, and these processes may become sensibly slower when the DSO is a small independent company. (APPA - REPAP 2010).

While it is not a critical aspect, it was reported already in chapter 7 that some DSOs tend to favour the connection of RES systems operated by companies that belong to the same industrial group. Furthermore, it must be noted that in Spain "small" DSOs with less than 100.000 customers are allowed to directly own RES generation capacity, and that there have been reports of difficulties in accessing the networks of some of these small operators. (Cossent et al. (2009)).

Possible option: in order to prevent these issues, and given also the large number of Small DSOs in Spain (over 300), it could be useful to proceed to **full ownership unbundling** for both large and small DSOs, following the example of the Netherlands that will implement this kind of regulation in early 2011. Other countries such as Denmark and UK are supportive of this solution.

As mentioned in the previous chapter, the **role of the CNE (Comisión Nacional de Energia)** in regulating the DSOs activity is still mainly of advisory and consultative nature, and it would be necessary to give it a more independent and decisive power, removing its need to receive the approval by the Ministry of Industry, Tourism and Commerce. (IEA – Spain (2009)).

8.2.2 Best Practice Elements and Indicators

No.	Technology	Benchmark	Result
8.1	WIND	Are the rules on cost sharing and bearing of grid connection objective, transparent and non-discriminatory?	Average
8.2	WIND	Is the denial of grid connection by TSOs and DSOs a common problem, constituting an important barrier for RES development?	No
8.3	WIND	Number of months for getting grid connection (considering also approval of grid connection)	35
8.4	WIND	Estimated connection costs in Euros (in case producer pays)	1.200.000€

8.3 Literature

AEE (2010): Press release 02/2010.

AEE - Ceña, Simonot (2010): Interview with Alberto Ceña and Emilien Simonot - March 5, 2010.

AEE Wind Power (2009): Wind Power 2009 - Spanish Wind Energy Association.

APPA – de Gregorio 2010: Interview with Margarita de Gregorio - March 5, 2010.

APPA - REPAP (2010) - Hoja de Ruta de Energias Renovables en España. Spanish Renewable Energy Association (APPA), not yet published, 2010.

APPA - Greenpeace (2009): Anteproyecto de Ley para el Fomento de las Energías Renovables.

ASIF - PV LEGAL (2010): PV LEGAL Research - not yet published.

ASIF - PR1 (2009): La Asamblea de ASIF pide al Gobierno el afianzamiento de la nueva regulación – Press Release March 2009.

Cossent et al. (2009): Towards a future with large penetration of distributed generation: Is the current regulation of electricity distribution ready? Regulatory recommendations under a European perspective.

Frías et al. (2009): Improvements in current European network regulation to facilitate the integration of distributed generation.

IIT - Frías/Cossent (2010): Interview with Pablo Frías and Rafael Cossent, Instituto de Investigación Tecnológica, Universidad Pontificia Comillas, Madrid - 4 March 2010.

IEA – Spain (2009): Energy Policies of IEA Countries - Spain Review, 2009

RES LEGAL (2010): Legal Sources on Renewable energy http://www.res-legal.eu

9 Issue 9 Gas Network Issues

9.1 Introduction

In the recent past, generation of biogas in Spain has been predominantly obtained from the degassing of landfills, although since the publication of Royal Decree 661/2007 the interest in biogas generation from agribusiness waste digesters has noticeably increased. The latter applications produce a biogas whose characteristics, due to the absence of polluting agents, make it more adapt to be injected into the gas networks. (Pascual 2010) According to the roadmap for renewables being prepared by APPA, the injection of biogas in distribution networks would only make sense if the price of natural gas was higher (and therefore justified the cost of biogas upgrading) and if the technical barrier represented by the high pressure at which the gas needs to be injected could be overcome. (APPA REPAP 2020)

Our research, in fact, has shown that in Spain at the moment there are virtually no practical applications of biogas production injected on the gas network. According to the stakeholders interviewed, the reasons behind this fact can be summarised as:

- **Lack of a regulating and administrative framework**
- The current low price of natural gas compared to biogas upgrading costs
- The **greater profitability of utilising biogas locally** to produce electric and/or thermal energy (incentivised by RD661/2007) compared to the high costs involved in the upgrading of Biogas in order to inject it in the network.

  (Pascual 2010, Ramos 2010, APPA - REPAP 2010)

The only case of injection of Biogas in the gas distribution network is represented by the Valdemingòmez complex in the Comunidad de Madrid, which however is a heavily publicly funded project and can therefore overlook the economical barriers described above. (Pascual 2010)

9.2 Description of barriers & solutions

9.2.1 Detailed description of the Barriers and solutions

Barrier 9.1 – Problems related to the upgrading process

At present, there are no clear provisions on the technical requirements for the injection of biogas in the gas transport network. (Pascual 2010) Further, the requirement of injecting the gas at high pressure constitutes a technical and economical barrier. (APPA REPAP 2020)

Barrier 9.3 – Inefficient authorisation procedures

At present there is absence of regulation on how to authorise the connection of a biogas production unit to the gas distribution network (Pascual 2010, Biogas Regions 2008)

Possible Options: It is desirable that the Spanish national administration recognises that the utilisation of upgraded biogas injected in the gas distribution network has a greater potential in terms of energy efficiency and therefore provides a stable framework for the upgrading and injection process of biogas in the gas distribution network (Pascual 2010, AEBIG 2010)

9.2.2 Best Practice Elements and Indicators

No.	Benchmark	Result
9.1	If green certificates and/or subsidies for biogas are in place, do they de facto make unattractive to feed green gas into the grid due to the high level of subsidy for biogas used for electricity generation?	YES
9.2	Are the costs of grid connection for producers of gas from renewable energy sources objective, transparent and non-discriminatory?	N/A
9.3	Do transmission and distribution tariffs discriminate against gas from renewable energy sources?	N/A
9.4	Average time needed for grid connection approval (from application for grid connection to formal approval) in months (#).	N/A

Note: green gas is upgraded biogas to natural gas quality for grid injection.

9.3 Literature

APPA - REPAP (2010) - Hoja de Ruta de Energias Renovables en España. Spanish Renewable Energy Association (APPA), not yet published, 2010.

Biogas Regions (2008): Promotion of biogas and its market development through local and regional partnerships

Ramos (2010): Interview with Jesus Ramos, AVEBIOM – Spanish association for the energetic valorisation of Biomass, April 2010

EC Report (2009): Report pursuant to article 3 of directive 2001/77 /EC of 27 September 2001 regarding promotion of electricity from renewable energy sources in the internal electricity market

Pascual (2010): Interview with Andrés Pascual, Centro tecnológico AINIA - April 2010

AEBIG (2010): El Futuro del Biogas en España, Spanish Biogas Industry Association (AEBIG), 2010. http://www.aebig.org/documentos/futuro_biogas.pdf

10 Issue 10 District Heating

10.1 Introduction

Traditionally, in Spain there has always been scarce existing district heating & cooling (DHC) infrastructure. More recently, the sector has started to emerge thanks to the incentives for cogeneration introduced by RD 661/2007. In 2007, 13 DH systems were in place and, by 2010, 2 more have already been realised and 9 are currently either under construction or in planning phase. Therefore, the number of DH systems will have doubled in a few years. Amongst the new systems being realised, urban waste and biomass are the most common fuels, showing a good penetration of RES in the DHC fuel mix.

The national potential for district heating is geographically limited to certain areas, as in several parts of Spain the winter heat loads are too low to justify such an infrastructure. However, there is a very interesting potential for district cooling in many areas.

The barriers towards the development of DHC systems in Spain are common to all fuel technologies, and mostly relate to **social resistance** and **urban planning deficiencies**. (EcoHeat4eu)

As a matter of fact, most of the DH heating applications realised in Spain in the last years were part of urban renovation plans, for instance in the city of Barcelona, Catalonia. The Barcelona-SUD plant is already operating, one more DHC plant is in construction and a third is planned. (Valle 2010)

10.2 Description of barriers & solutions

10.2.1 Detailed description of the Barriers and solutions

Barrier 10.1 – Lack of positive conditions for the increase of the share of renewables in existing DHC systems

Due to the very small number of existing DHC systems, this is not a relevant issue for Spain.

Barrier 10.2 –Lack of positive conditions for the initiation and expansion of DH systems largely based on renewables

As discussed in the introduction, for climatic reasons the demand for heating during the cold season is limited to a few areas of Spain, so DH would not be suitable for large parts of the country. However, there is a very significant potential for district cooling applications in many urban areas, particularly along the coasts, where see water can be used as a cooling source.

The main challenges faced by District Heating relate to **social resistance**: people tend to oppose changing a heating system that works for a new one. The **lack of proper information and awareness** induces diffidence towards the new centralised technology in favour of the old autonomous one, which end users may believe to allow them more independence. Additionally, the **construction works** involved in fitting an existing area with DHC and the necessary **construction of a nearby heat generation** (or cogeneration) unit also play a part in making a DH/DHC solution unpopular, as it happened with the Barcelona-SUD plant realisation (EcoHeat4eu)

Urban planning is a second factor that does not favour the development of DHC systems. The planning activities carried out by municipalities may be affected by the social factors described above and by the high investments involved, but certainly a part is played by the indifference shown by urban planners and architects towards the use of District Heating and Cooling solutions. (EcoHeat4eu, Valle 2010)

Possible Options: in order to develop the DHC sector in Spain, the lack of specific legislations should be addressed, while appropriate targets should be included in the new Energy Plan for 2011-2020. The main changes in legislation should regard introducing obligations for minimum installation of DH/DHC in urban planning of residential and commercial areas, together with the incentives for existing buildings to make use of the available DHC networks. (EcoHeat4eu)

The social resistance in both end users and decision makers can be addressed by appropriate information and dissemination measures, highlighting the benefits and success stories of DH/DHC in Spain and other countries. (EcoHeat4eu)

10.2.2 Best Practice Elements and Indicators

No.	Benchmark	Result
10.1	Are there policies to promote the increase of the RES share in existing DH networks?	Yes
10.2	Are there policies to promote the initiation / expansion of DH networks?	Yes
10.3	Percentage present renewable share (see ECOHEATTOOL)	N/A
10.4	Percentage CHP share (idem)	N/A

10.3 Literature and Sources

EcoHeat4eu: Online database of the EcoHeat4eu Intelligent Energy for Europe project. http://ecoheat4.eu/en/Country-by-country-db/Spain/Needs-Challenges-Barriers-Oppurtunities/

Valle 2010: Interview with Maria Valle, Aiguasol, Madrid, April 2010