PV LEGAL

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FINAL REPORT

REDUCTION OF BUREAUCRATIC BARRIERS FOR SUCCESSFUL PV DEPLOYMENT IN EUROPE

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CONTENTS

FOREWORDS

Dr. Edmund Stoiber
Former Minister-President and Chairman
of the EU High Level Group
on Administrative Burdens

The EU Commission wants to reduce bureaucracy-related costs of the existing legislation by 25 percent by the end of 2012. According to its calculations, with corresponding efforts by the Member States, this would trigger a 1.5 percent boost in growth in Europe and could add 150 billion Euros to the EU's GDP per year. In autumn 2009, as Chairman of the EU High Level Group on Administrative Burdens, I was able to give EU Commission President Barroso over 260 very concrete cutback suggestions. Since then, there are already well over 300 suggestions. The savings volume of these suggestions sums up to around 41 billion Euros. This is an economic recovery plan free of charge, since, in contrast with spending programmes or tax cuts, counterfinancing with reductions in tax breaks and/or personal allowances is not required.

A very fundamental point of our mandate and the main focus of our work in 2011 is a report on good governance practices in the Member States for the least burdensome implementation of EU legislation, which the Group will present by the end of 2011. This report should make a contribution to reducing administrative costs caused by inefficient governance practices. Around one-third of bureaucratic costs for businesses deriving from EU legislation originate from inefficient administrative procedures or from an implementation of EU legislation which goes beyond the required measure ("gold plating"). A good example of this is the European Public Procurement Law, whose implementation in the Member States differs in a striking manner. The European Commission has detected that typical procedures for public tenders take between 77 days in Lithuania and 241 days in Malta, and that the costs for businesses and public authorities amount to between 22 work days in Luxembourg and 93 work days in Bulgaria.

Independent of our report, but definitely in the context of our work, the "PV LEGAL" project aims for the reduction of legal-administrative obstacles when planning and installing photovoltaic systems. Especially with this future-oriented technology, which plays an important role for the EU's climate objectives, administrative burdens should be limited to only necessary ones. I find it very impressive that 12 countries have participated in this project to determine the varying legal frameworks and the implementation of the EU Guidelines, as well as to work on very concrete possibilities for improvement. A cross-border exchange of experiences like the one the PV LEGAL project enables makes a crucial contribution to building best practices, and has also proven to be the key for implementing EU Guidelines in the least burdensome manner possible.

I wish great success to further works with regards to PV LEGAL and potential follow-ups for the quickest possible implementation of the results.

Günther Oettinger
European Commissioner for Energy

Three challenging goals the European Union is striving for are directly intertwined with renewable energy: To proceed on the path towards a low-carbon economy, to ensure our energy supply in times of depleting fossil resources and to create jobs in future-oriented industries.

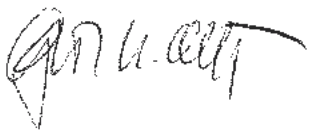
To these ends, the EU adopted in 2009 the Renewable Energy Directive, introducing legally binding national targets adding up to a minimum share of 20% of renewables in the Union's energy consumption by 2020. As a provision to reach this ambitious goal, the Member States agreed in the Directive to ensure lean administrative and permitting procedures in the deployment of renewable energy, providing a favourable environment for investors.

In their National Renewable Energy Action Plans, Member States projected that electricity from photovoltaics will contribute with 83.4 TWh to the EU electricity consumption in 2020. This will be an impressive development when compared to only 1.5 TWh in 2005 and 35 TWh in 2010.

Since PV will play an important role in the EU renewable energy share in 2020, it is important to make sure that the development of this technology is not hindered by administrative barriers. The PV LEGAL Project, financed by the Intelligent Energy Europe programme, looks into these issues: it identifies still existing barriers to the development of photovoltaic systems in twelve Member States – covering the largest photovoltaic markets in the EU. The analysis shows that administrative requirements can represent a considerable share of the development costs of a project. It also issues recommendations on solutions to overcome these hurdles: Streamlined administrative procedures – having in mind the decentralised nature of photovoltaics – and efficient grid connection processes are key to lowering the costs and increase the competitiveness of PV. These results can help national public authorities and network operators to improve the regulatory framework for renewable energy sources.

The current troubled economic environment renders streamlined administrative procedures as proposed by the PV LEGAL Project even more important. Considerable investment is needed to achieve the EU's renewable energy target. Lowering administrative costs will improve the cost-effectiveness of investments in photovoltaic systems, thus stimulate higher investment volumes and give leverage to the national authorities to reduce financial support.

This report is another step forward on the way towards realising the European Union's renewable energy targets, towards less carbon emissions, towards a more diversified energy supply and towards maintaining the Union's leadership in clean energy technology. Building on what we have reached already and with continuous effort, I am confident that we will be able to meet these goals.



1

EXECUTIVE SUMMARY

1.1. Permitting and grid connection barriers for PV system installations

The European project PV LEGAL (started in July 2009 and ending in February 2012) is aimed at first identifying and then reducing those legal-administrative barriers that currently affect the planning and deployment of photovoltaic (PV) systems across Europe.

Assessment and categorisation of barriers

The PV LEGAL consortium, after analysing the barriers to the development of PV in each of the 12 participating European countries and confronting their results, has identified four main areas in which the barriers hampering PV installations in Europe can be classified:

- Barriers in permitting procedures
- Barriers related to grid connection rules and technical standards
- Barriers in grid connection procedures
- Barriers related to grid capacity issues

Barriers in permitting procedures include all administrative processes needed to authorise the construction of a PV system and are often the most severe obstacles to be tackled by a PV system developer. Examples of these processes are obtaining a building permit, an electricity production licence or an environmental impact assessment. These procedures become a problem when they are non-transparent, complicated, costly and result in excessive lead times. Additionally, these procedures create inappropriate burdens for small PV systems built in residential housing. Another common problem occurs when spatial planning provisions neglect the installation of PV systems across entire urban or rural areas without identifying areas where these can be developed.

Barriers related to grid connection rules and technical standards are those that excessively complicate the requirements for a PV system to be accepted on the electrical grid. PV systems, in order to be allowed to connect to the electricity distribution or transmission grid, need to meet certain criteria defined by grid operators and electricity market regulators. Often these criteria do not take into account the characteristics of PV systems and may then represent a barrier to their penetration. These barriers are characterised by lack of clarity, transparency and uniformity in rules and standards and by the insufficient participation of PV industry in their definition process.

Barriers in grid connection processes are those involved with both the initial grid connection permit and the final grid connection phases - often the last but decisive step in the development of a PV system. These procedures represent a problem when they are lengthy, when they differ from region to region and when they involve an exaggerated number of different authorities. Another problem may be the high cost of these procedures, which in some countries reduces the profitability of a PV system when inappropriate regulation of the electricity sector transfers the costs of grid upgrades to the PV developer.

Barriers related to grid capacity issues arise when the number of grid access requests exceeds the available capacity of the grid in a certain region or across an entire country, also leading to problems linked to economic speculation on the already conceded grid access points. Very often, this issue occurs when the development of the grid infrastructure is not properly planned in order to keep the pace of PV and other renewable energy sources (RES) development.

PV LEGAL industry survey

In order to quantify the effect of these barriers on actual PV project development duration and costs, the PV LEGAL consortium has periodically surveyed PV industry stakeholders in each of the participating countries. With a series of interviews, PV LEGAL project partners carefully assessed the costs, labour, duration and waiting times involved with each main phase of the development of a PV system.

The most recent results of the PV industry survey are summarised in the following charts, and further discussed in each relevant section of chapters 3 and 4. These charts allow us to compare the sometimes strikingly different durations and efforts involved in realising a similar PV system in each for each of the participating countries. The figures are shown for all the three main market segments utilised for the analysis:

- Residential rooftops (a standard 3 kW PV system)
- Commercial rooftops (a standard 50 kW PV system)
- Industrial ground-mounted (a standard 2500 kW PV system)

The share of legal-administrative costs over total PV project development costs can give an idea of the economic burden that permitting and grid connection procedures represent for a PV developer, a burden that is generally reflected on PV system prices on the national market.

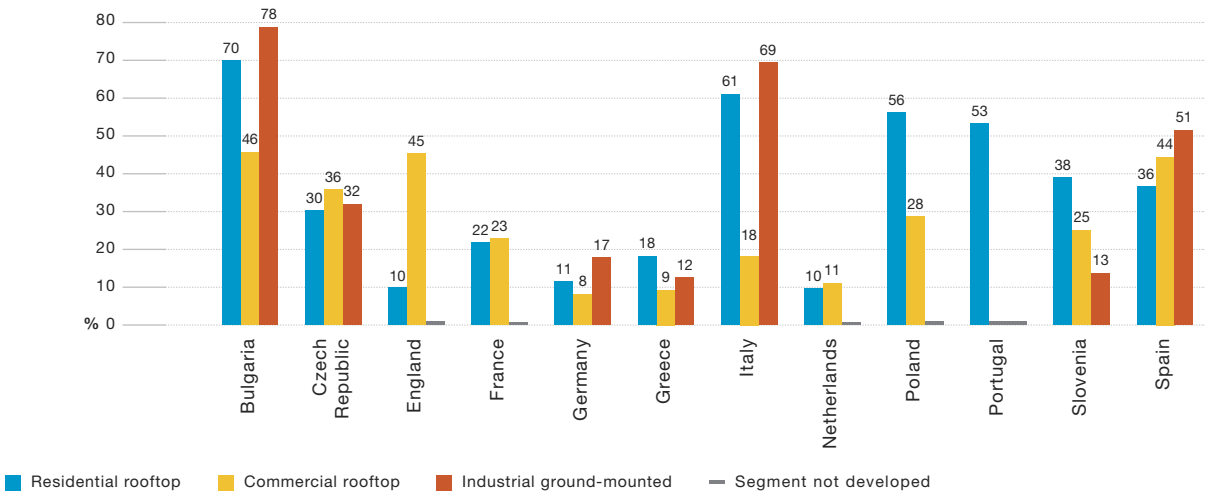


Figure 1 - Overall % share of legal-administrative costs over total project development costs (excluding PV equipment)

The total labour required to complete the legal-administrative permitting and grid connection processes may instead give an idea of the complexity and lack of transparency of the procedures involved.

The total duration of a PV project development process is another measure of the economic risk involved in a project: the longer the duration, the longer a PV developer is financially exposed before it can start earning revenues.

The total waiting time spent by a PV developer expecting an answer from an authority or a grid operator also shows the inefficiency with which such authorities deal with the processes they are supposed to administer.

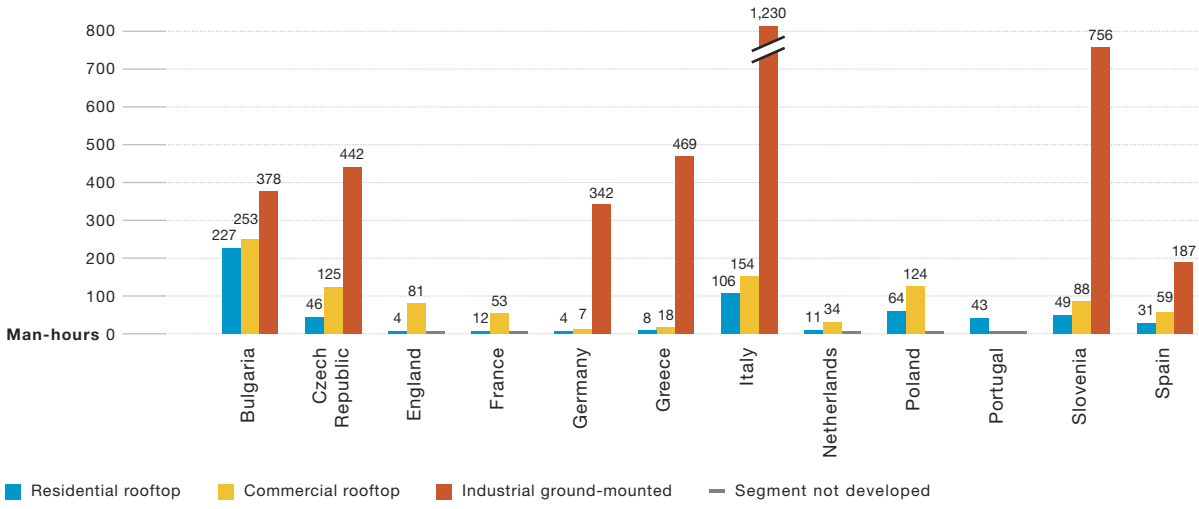


Figure 2 - Compliance with legal-administrative requirements: total labour (man-hours)

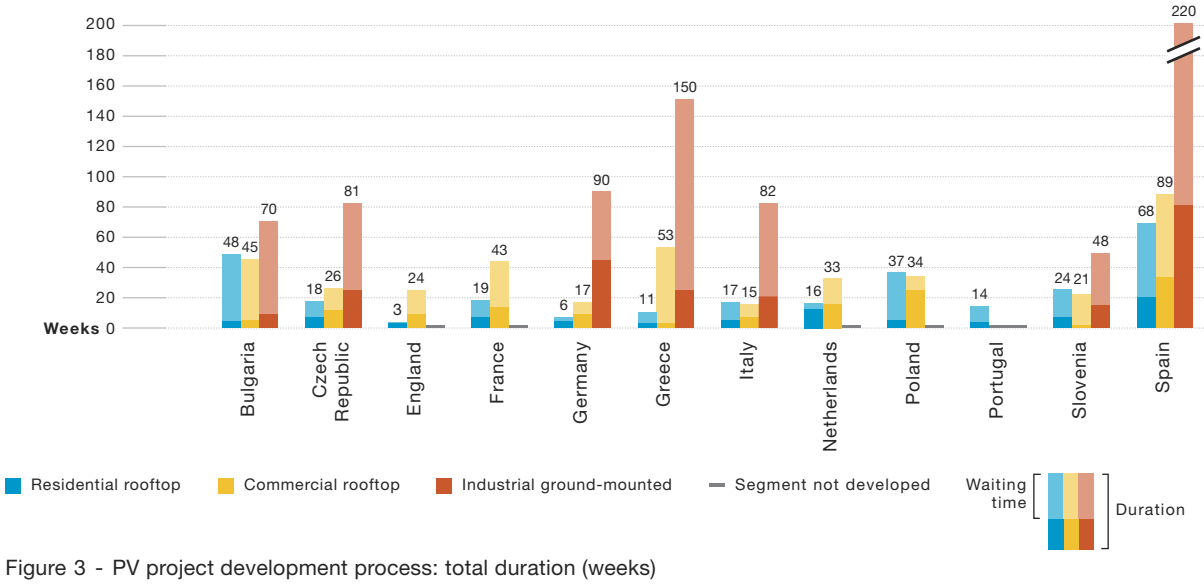


Figure 3 - PV project development process: total duration (weeks)

1.2. Summary of PV LEGAL recommendations

The table below summarises the general PV LEGAL recommendations, formulated by condensing the work of all PV LEGAL partners in identifying barriers, analysing their background and advocating for their removal from national frameworks. Each recommendation and its background analysis is thoroughly described in chapter 3. These recommendations may be applied to all European countries, even those that did not directly participate in the project.

An important motivation behind these recommendations is their adoption that will result in reduced costs for PV developers. This reduces the overall cost for PV technology deployment and is in the interest of the community. This, in turn, means that the economic support needed by PV will also be reduced, leading to a decreased overall cost for the community.

	Recommendations
Permitting procedures	• Enforce lean and appropriate permitting procedures • Define a one-stop shop for all permitting procedures • Set clear deadlines for permitting procedures • Provide guidance for planning authorities • Waive building permits for rooftop PV systems • Ensure that spatial planning accommodates for PV installations • Guarantee transparent and proportionate permitting fees
Grid connection rules & technical standards	• Involve the PV industry in the definition of standards and grid connection rules • Define clear technical standards and grid connection rules at national level • Ensure that national standards and grid connection rules are binding and exclusive • Set up and independent mediation office to resolve conflicts
Grid connection procedures	• Guarantee priority access to the grid for PV installations • Streamline grid connection procedures • Set clear deadlines for the assignment of a grid connection point • Enforce penalties for missed deadlines • Provide for proportionate and transparent grid connection costs • Ensure that trained and certified installers may connect small PV systems to the grid
Grid capacity issues	• Provide for periodical grid analysis and set-up regional grid development concepts • Ensure public availability of grid data • Set legal provisions for grid reinforcement and recovery of costs • Set clear deadlines and incentives for grid extension • Prevent speculation on grid connection permits • Avoid establishing generic limits for PV installations

Table 1 - PV LEGAL general recommendations

2

INTRODUCTION

Administrative barriers hampering the development of PV in Europe

Several European countries have already recognised the potential of solar energy and are implementing strategies to develop the market. Nevertheless, bureaucratic hurdles have made it difficult to maximise the exploitation of the sun as a source of electric energy. Permitting processes and grid connection procedures still require significant improvement in many European countries. As a result, planning, constructing and connecting a solar photovoltaic (PV) system to the grid can still take several years in Europe.

The RES Directive

On 23 April 2009, a new Directive for the promotion of Renewable Energies (Directive 2009/28/EC) was adopted. It sets binding renewable energy targets by 2020 for each Member State and includes stronger provisions for the reduction and simplification of administrative barriers and access to the grid for renewable energy systems.

The Directive clearly states that Member States:

- Shall "ensure that any national rules concerning the authorisation, certification and licensing procedures that are applied to plants and associated transmission and distribution network infrastructures for the production of electricity (…) from renewable energy sources (...) are proportionate and necessary" (Article 13 (1)).
- Shall "take appropriate steps to accelerate authorisation procedures" (Article 16 (1)).
- Shall provide for "priority access or guaranteed access to the grid-system of electricity produced from RES" (Article 16 (2(b))).
- Shall ensure that transmission system operators (TSOs) "shall give priority to generating installations using renewable energy sources in so far as the secure operation of the national electricity system permits and based on transparent and non-discriminatory criteria" (Article 16 (2(c))).
- Shall "minimise the curtailment of electricity produced from renewable energy sources" (Article 16 (2(c))).
- "May require TSOs and distribution system operators (DSOs) to bear, in full or in part, the costs of technical adaptations, such as grid connections and grid reinforcements, improved operation of the grid and rules on the non-discriminatory implementation of the grid codes" (Article 16 (4)).
- Ensure that cost sharing is "enforced by a mechanism based on objective, transparent and non-discriminatory criteria" (Article 16 (6)).

Objectives of PV LEGAL

The European project PV LEGAL (July 2009 - February 2012) aimed at first identifying and then reducing those legal-administrative hurdles that, against the demands of the RES Directive, affect the planning and installation of PV systems across Europe.

The project considered legal-administrative barriers to be those determined by regulations and provisions originating from government bodies or grid operators that disproportionately delay the deployment of PV in Europe. Similar delays may also be created by internal working and reporting processes within authorities or grid operators that may willingly or unwillingly delay PV projects.

Some of these barriers may in fact be intended to prevent the development of PV in order save costs for the community, since support for PV is generally borne by consumers in the form of slightly increased electricity costs. But more efficient permitting and grid connection procedures will lead to less expensive processes for PV developers and eventually the community.

PV LEGAL is co-financed by the European Commission within the “Intelligent Energy Europe” programme. Thirteen national PV industry associations, the European Photovoltaic Industry Association EPIA and the consultancy eclareon GmbH are involved in this project, coordinated by the German Solar Industry Association, BSW-Solar.

3

ANALYSIS OF ADMINISTRATIVE BARRIERS AND RECOMMENDATIONS

3.1. Barriers in permitting procedures

3.1.1. Description of processes

Administrative permitting procedures are often the first concrete step a PV developer takes in realising a PV system. Depending on the type of PV system and the country where it is being developed, these procedures may involve completing one or more administrative processes leading to the attainment of the required authorisations such as:

- Building permits
- Environmental Impact assessment
- Electricity production licence
- PV system registration
- Spatial planning licence

A **Building permit** is required in most jurisdictions for new constructions, additions to pre-existing structures and, in some cases, for major renovations. In the case of a PV system, a detailed project must be elaborated and submitted to the competent municipal or regional authority for approval. Generally, the new construction must be inspected during and after completion to ensure compliance with national, regional, and local building codes.

An **environmental impact assessment** is an evaluation of all the possible positive or negative natural, social and economic impacts that a PV project could have on the environment. The purpose of the assessment is to ensure that decision makers consider the ensuing environmental impacts when deciding whether to proceed with a project.

An **electricity production licence** is a certification needed for independent power producers that wish to sell the electricity they produce on the free market. The rationale behind such a licence is that, in a traditional centralised power generation regime, there should be a control by competent authorities on the electricity generators present on the grid infrastructure. Among the criteria examined are the capability of investors to realise the project and the technical integrity of the project. In general, a building permit and an environmental impact assessment are needed in order to submit a request for an electricity production licence.

PV system registration is generally required in those countries, such as Spain or Italy, that have imposed limits on the annual capacity of PV systems that may access the economic support measures provided by the state. Since the support measures for PV are generally funded from consumer electricity tariffs, a government desire to control this cost may lead to the decision to set up such a register. Only PV systems admitted to the register are eligible for a Feed-in Tariff. In general, the registration is allowed only to PV systems that have preventively obtained all the other required administrative authorisations and a grid connection permit.

A **Spatial planning licence** is a permit needed in order to build a PV system in areas where this would be normally prohibited by existing spatial planning provisions. In those areas covered by an urban or land development plan, an investor may only pursue investments that are contemplated in the plan. This means that production investments such as a PV system may not be allowed in areas designated for residential or commercial buildings, and a special licence is needed to overcome this regulation.

In the **residential rooftops segment**, the administrative process is in most cases simple and normally requires only a building permit or a simple notification to the municipality stating that the PV system will be installed. In some cases, it is even sufficient to notify the municipality when the system has been completed. However, in countries where the PV market is less mature, a developer of a small residential rooftop system may have to face an environmental impact assessment or a spatial planning licence application.

In the **commercial rooftops segment**, the administrative process can become more challenging. Planning permissions and environmental impact assessments are more frequent, while in some countries an electricity production licence may also be necessary

In the **industrial ground-mounted segment**, the administrative procedure is usually complex and time-consuming. Given the relevant space occupation of large ground PV projects, it is necessary that these are developed in harmony with local land or urban development plans. Furthermore it is commonly necessary to undergo an environmental impact assessment and to verify the acceptance of the local communities. The administrative lead times are normally in the range of a year or more.

The pre-registration for PV systems in Spain

The pre-registration for PV systems was introduced in Spain in 2008 with Real Decreto 1578/2008, in order to give policy makers control over the annual volume of PV installations, and consequently over the costs determined by the Feed-in Tariff payments to system operators. This need became urgent after the huge, unexpected boom of PV during 2008, when 2.7 GW of PV systems were installed (against the 0.4 GW forecast by the National Energy Plan for the whole period 2005-2010).

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

- Administrative authorisations
- Building permit
- Financial deposit to the state bank
- Confirmation of grid connection point
- Financial deposit for the grid connection
- Proof of sufficient funding to cover 50% of the investment;
- Purchase agreement for 50% of the equipment

After the pre-assignation is secured, system developers have 36 months to build the installations.

The results of the PV LEGAL research show that the amount of labour required to complete the administrative requirements of the permitting processes (Figure 4) is in general higher in the industrial ground-mounted segment, with **Italy** and **Greece** presenting the most resource-hungry processes. A particular case is found in **Bulgaria**, where the same administrative process is applied to all three market segments. As a consequence, even for residential rooftop applications a consistent amount of labour is necessary to complete the administrative procedures.

Figure 5 shows that, as expected, also the cumulative duration of the administrative processes is higher in the industrial ground-mounted segment, and in general in those countries where administrative lead times are affected by high waiting times: **Czech Republic**, **Greece** and **Spain**.

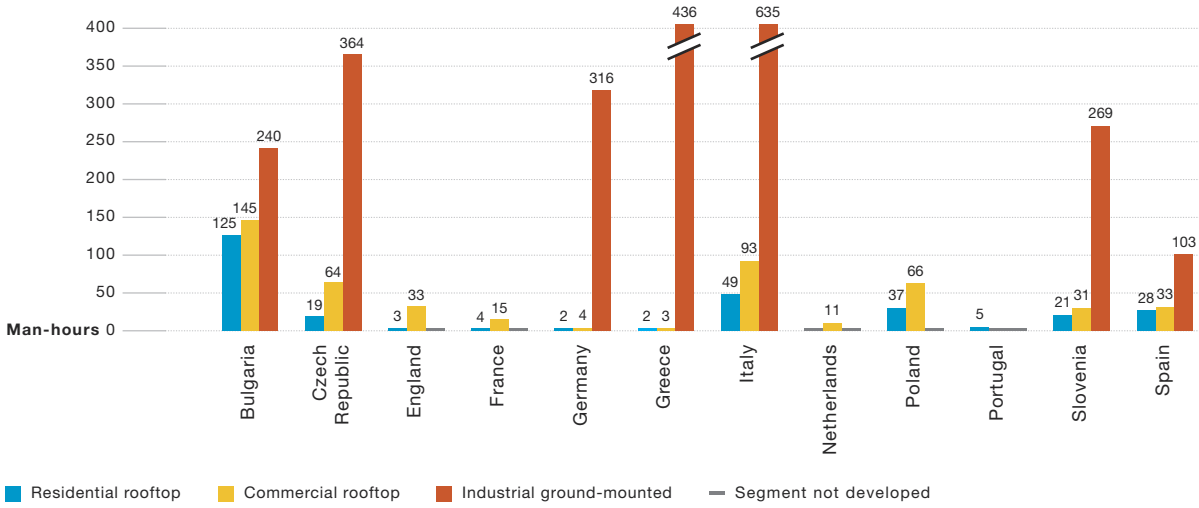


Figure 4 - Total average legal-administrative labour requirements for administrative permitting processes (man-hours)

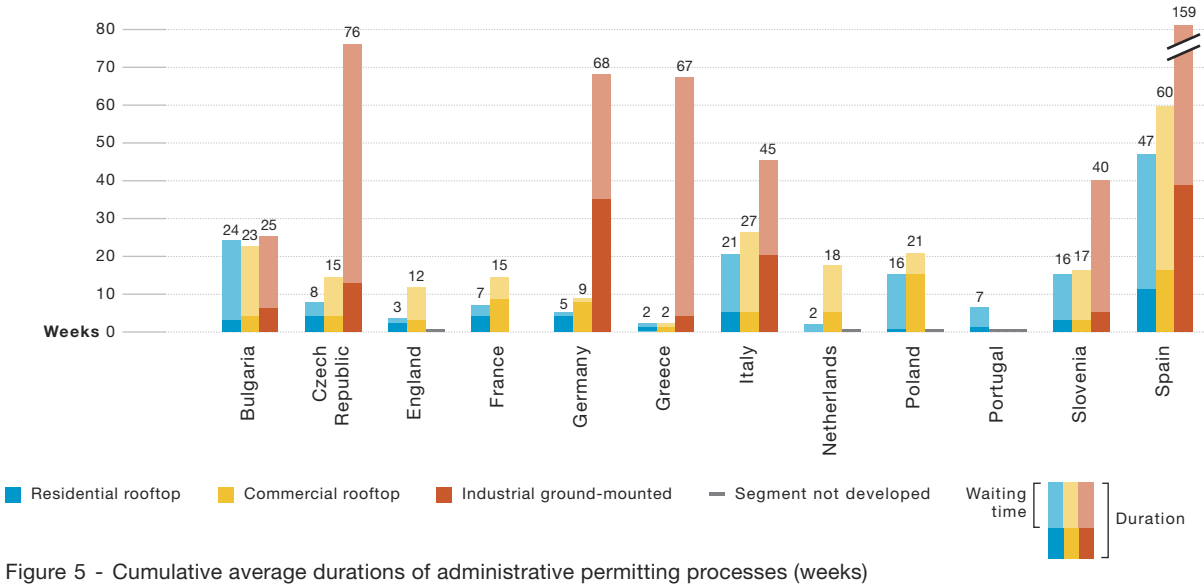


Figure 5 - Cumulative average durations of administrative permitting processes (weeks)

3.1.2. Common barriers in Europe

Administrative permitting procedures are often the most severe obstacle to be tackled by a PV developer. These procedures may involve obtaining building permits, grid connection licences, environmental impact assessments and electricity production licences. The following sections examine the most common barriers.

Non-transparent, complicated and lengthy permitting procedures

In most of the countries researched, permitting procedures were found to be an excessive burden for PV system development, requiring significant amounts of time and money to overcome, whether due to unsatisfactory regulation or insufficient preparation of public administrations at national, regional and local levels.

Complication and lack of transparency often arises from the lack of harmonisation at national level and the insufficient preparation of civil servants and public authorities. In these circumstances, administrative processes are often characterised by long waiting times, unproductive periods during which the PV system developer is awaiting an answer from the administrative authority and the latter is not carrying the process forward.

This is a harsh problem especially when it affects the development of small PV systems for residential applications. In **Bulgaria**, complicated administrative procedures affect the development of rooftop PV systems of all sizes. The same procedure needs to be followed for all applications, resulting in an inappropriate 40 to 60 weeks lead-time needed to authorise even a small residential PV rooftop system. In **Spain**, the same administrative procedure, possibly the heaviest in Europe, is required for small residential PV systems and large multi-MW ground installations alike.

Even in **Germany**, the exemption from requiring a building permit is not clearly defined by the law, and as a consequence some PV rooftop systems do require a building permission. This barrier is in the process of being partly removed, as the national building code model is being reviewed and some regional (State) building codes are also currently being amended. In **England**, local authorities show different interpretations of building regulations, lack of knowledge and understanding amongst staff and, in some cases, financial opportunism. In **Spain**, the procedures for obtaining municipal permits are complicated and not harmonised across the country. In **Italy**, the national guidelines for the *Autorizzazione Unica* permit were announced in 2003 but only saw the light in late 2010. Their implementation is currently under way.

Similar problems also tend to appear when the number of administrations and public bodies involved in an authorisation process is excessive. This often results in an exaggerated quantity of documentation that needs to be produced and in long lead times with lack of respect towards the deadlines. This is happening in several countries, including **France, Greece, Poland** and **Italy**.

Finally, in those cases where the administrative permitting process is very challenging, its difficulty may contribute to the creation of a speculative market for completed authorisations. As experienced in the past in both Spain and Italy, these speculative markets are detrimental towards the stability and maturity of the PV sector.

The German "bound decisions" principle

A good practice example in this field is the introduction of so-called "bound decisions" principle in Germany. This means that in the authorisation process, the administration has no discretionary power. If the requirements for the permission defined by law are fulfilled, the permit authority has no choice but to grant the permission.

In case of rejection, the German judicial system provides for a broad range of legal remedies and independent courts.

Excessive administrative fees

Administrative fees may in some cases represent a relevant part of the cost of a PV investment. In **Spain**, for instance, building permit fees currently range at 4% of the total PV system costs including PV modules and other equipment. In other countries, while fees may not be excessive, they can still vary greatly in different regions or municipalities and thus constitute an additional planning barrier for a PV system developer.

Spatial planning hindering the construction of PV systems

Spatial planning provisions often constitute an unexpected but challenging barrier for PV deployment. In some countries, spatial planning was made at a time when PV was not considered an ordinary technology to be installed on building rooftops or on open land. Moreover, insufficient preparation of civil servants and complicated planning

provisions can contribute to exacerbating the delays suffered by PV developers.

In **Germany**, for instance, there is no clear legal definition of how large a PV project must be for it to be considered spatially important. Each case needs to be reviewed individually by the responsible authorities, and each state applies different criteria. For PV projects of spatial importance, some states require a complex procedure. In **Poland** and **Slovenia**, countries where spatial planning originates from outdated laws, PV systems cannot be built in any of the areas interested by planning.

Spatial planning confusion in England

A West Midlands citizen wishing to install a PV system on his property approached his local Building Control department as he had been informed by the PV installer that the installation qualified as 'Permitted Development'. Usually this would mean that no planning permission was required.

However, the person was informed by Building Control that he would have to pay for an in-depth inspection of his property by a Council surveyor due to the office's interpretation of the relevant clauses of Building Regulations. When questioned more closely by the customer, the Council agreed to reduce the fee but still insisted the inspection take place, despite the property technically qualifying under Permitted Development.

Whilst citizens in other regions also often experience this issue, many others in other parts of the UK have been able to install their domestic solar PV without any problem. This illustrates the fact that complying with the requirements of the Building Control departments of different local authorities can be something of a lottery in terms of which procedures are required and how much is charged to the customer. Furthermore, upon further investigation, when telephoning a variety of different local Council Building Control departments, it was found that often different people within the same department would give different answers to the same question, indicating that this is more likely a problem related to insufficient staff training.

PV systems registration

In some countries, in order to access the Feed-in Tariff or be allowed to sell the electricity produced by a PV system, it is necessary either to obtain admission to a special register or a licence for electricity production.

The purpose of the systems registry - such as those that currently exist in **Spain, Netherlands** and **Italy** - is normally to control the amount of yearly installations of PV capacity: Only the systems admitted in the registry may receive the Feed-in Tariff. However, experience shows that these registries are usually burdensome and tend to create uncertainties in the market for investors. An extreme situation is the one currently experienced in **Spain**, where the PV systems registry has determined a long queue of feed-in tariff requests that, both in economical and temporal terms, heavily discourages further PV system planning in the country.

Electricity production licence

An electricity production licence is a certification that was originally set up to regulate the activity of the few existing traditional power producers in a country. As a consequence, it is normally cumbersome and inappropriate for small independent PV electricity producers. An example of its unsuitability comes from **Poland**, where all PV systems require a licence. In **Greece**, a similar obligation was recently waived for PV systems below 1 MW.

Environmental impact assessments and landscape permits delaying the development of PV systems

Environmental impact assessments and landscape permits are often very difficult and time-consuming processes involving several authorities. In **Italy**, both these processes show differences at regional level and lack of clarity as to when and in which cases they are required. In **Bulgaria**, they are characterised by long waiting times.

Prohibition against building rooftop PV systems in areas subject to monument protection or on listed buildings

Further, specific provisions for guaranteeing the conservation of monuments and other historically significant buildings may get in the way of the installation of PV system even in surrounding buildings or areas. This happened for instance in **France**, where ABF (*Architectes des Bâtiments de France*) appears to have an excessive power in essentially imposing a ban on PV in entire towns.

Building permits for rooftop plants waived in Slovenia

Until the end of September 2010, the various interpretations of the laws regarding building permits created a lot of uncertainty in the Slovenian PV market. Investors who were already in the process of installing the PV systems did not know whether they would need to obtain a building permit. To obtain building permits generally takes a lot of time and the procedure represents an additional financial burden.

The matter was resolved only after the amended Ordinance establishing the conditions for the installation of PV systems and their connection to the electricity grid was published in the Official Journal of Slovenia on 24 September 2010.

PV systems up to 1 MW have been classified as simple devices for producing electricity, whose installation is considered as an investment and maintenance work for which there is no need of a building permit. As a condition for the installation without a building permit, there are specific requirements regarding how the investor must look after the PV system.

The final provisions of the Ordinance also require that PV power plants installed without a building permit before the enactment of the amended Ordinance be classified as simple devices for generating electricity and shall not be removed as long as they comply with the current regulatory requirements.

3.1.3 Recommendations

The recommendations below are the culmination of work carried out by PV LEGAL project partners in the 12 countries participating in the project. In formulating them, the authors of this report have tried to identify general solutions that can be applied in countries beyond those that participated in the project.

Taken as a whole, these recommendations aim to streamline and harmonise the PV permitting procedures in the spirit of article 13 of the European RES directive.

Enforce lean and appropriate permitting procedures

Permitting procedures should reflect the decentralised nature of PV. As such, streamlined and lean procedures should be sought in order to reduce the burden on planners and administrations. Permitting procedures applicable to large conventional power plants are not suitable for PV. They do not reflect the simple decentralised nature of PV technology and should therefore be altered. In addition, permitting authorities should not be allowed too much discretionary authority in the administrative process; otherwise procedures may become less clear and their outcome less predictable.

Define a one-stop-shop for all permitting procedures

It is advisable to reduce to a minimum the number of public departments and staff involved in PV permitting. With a one-stop-shop approach, such as the one implemented in Greece for residential PV, administrative burdens can be removed from the project planner as well as from the administration. In Portugal, all permitting procedures for the residential rooftops segment are handled online and taken care of by one authority.

Set clear deadlines for permitting procedures

Deadlines should be defined for authorities to deal with permitting requests. Whenever deadlines are not met, a legal entitlement for PV system operators should be enforced that allows for the reimbursement of potential damage suffered due to the delay. The penalties should be more than symbolic; they should be strong enough to compensate, for instance, for a missed FiT degression step and the consequent decrease of investment returns.

Residential PV systems in Greece – Getting rid of red tape

Until 2009, installing a residential PV system in Greece was practically impossible. Even small PV systems had to go through the whole authorisation procedure of large systems, while the owner of the system had to be registered as a business entity with tax authorities. Not surprisingly, there was no market for residential PV systems.

In 2009, there were regulations and incentives for residential PV systems with a capacity of up to 10 kW. At that point, two authorisation steps were needed: a permit for small works by the local Urban Planning Authority, and a connection offer by the grid operator (Public Power Corporation - PPC). A Power Purchase Agreement (PPA) needed also to be signed with PPC. In 2010, following the advice of PV LEGAL and adopting Directive 2009/28/EC, the Greek legislation for residential PV systems changed and there is currently a one-shop-stop procedure for installing a residential PV system with a capacity of up to 10 kW. Other barriers were lifted allowing the installation of small PV systems all over the country, as previously there were certain regional restrictions.

Provide guidance for planning authorities

Clear and consistent guidance for planning officers should be made available with the goal of enforcing a uniform approach to permitting. Planning authorities should clearly and uniformly define the permits needed. Trainings and workshops should be organised for local authorities and support should be granted for municipal agents in charge of permitting.

Waive building permits for rooftop PV systems

Rooftop PV systems, at the least, should be exempted from building permissions, to allow for a burden-free development of this market segment. The exemption should be defined by the law and should cover all types of rooftop PV systems. A simple notification of the system to the planning authority (as required by the RES Directive) should be sufficient. For example, in Germany even this requirement is waived; only a notification to the Federal Network Agency for statistical purposes is asked.

Ensure that spatial planning accommodates for PV installations

In some countries spatial planning provisions can prevent PV systems from being built. Spatial planning provisions should therefore not discriminate explicitly against PV but rather prioritise RES over conventional energy sources.

Guarantee transparent and proportionate permitting fees

Administrative authorities should not charge fees for permitting procedures since these procedures can instead be tailored to the needs of PV and, consequently, administrative efforts by the authorities can be significantly reduced. However, if fees need to be collected (e.g. for larger projects), they must be transparent and proportionate. Regional differences should be avoided to allow for more planning certainty, and the fee structure should be published and easily accessible on the Internet.

Breakthrough of PV LEGAL in the Netherlands

In early October 2011 Holland Solar, the Dutch PV LEGAL partner, announced the “Green Deal”, an agreement with the Dutch Government for the simplification of authorisation processes and permits necessary to install a PV system in the Netherlands. Thanks to these adjustments it will be easier to invest in solar energy both for private citizens and commercial organisations.

The procedures for the implementation of solar energy by citizens and businesses will be simplified. Especially private customers currently find the procedures for delivering solar power to the grid unclear. Holland Solar will work with the grid operators in making information more accessible, and on the process of offsetting generated energy against own energy consumption. Also part of the “Green Deal” between the Minister and Holland Solar is removing of bottlenecks in the authorisation procedure applicable to the realisation of solar energy systems on listed buildings and for city areas with a protected view. Today’s procedure often causes incertitude for the applicants on a municipal level. The state government will work on a uniform directive for municipalities.

3.2. Barriers related to grid connection rules and technical standards

3.2.1. Description of issue

PV systems, in order to be allowed to connect to the electricity distribution or transmission grid, must follow certain rules and meet certain technical criteria, usually defined by grid operators and electricity market regulators. Often these provisions, which must be satisfied by a PV project either at the time of requesting access to the grid or during the test and commissioning phase, do not take into account the characteristics of PV systems and may consequently represent a barrier to their market penetration.

3.2.2. Common barriers in Europe

Lack of involvement of the PV industry in the definition of technical standards

Often the technical standards for connecting a PV system to the grid are inherited from those of traditional power generation systems or other renewable energy sources as wind. But PV is a different technology whose requirements should be defined only by a careful examination and discussion of its specific characteristics. Unfortunately, experience shows that the PV industry does not have enough say in the regulatory bodies that establish these standards.

In **Germany**, the body responsible for the definition of technical standards for grid safety as well as the connection and operation of energy-generating installations is, for historical reasons, constituted mostly by grid operators, where the renewable energy industry (RES industry) is under-represented.

In **Spain** and **Portugal**, the capacity of PV systems that can be connected to the grid is limited respectively by 50% and 25% of the upstream transformer capacity: a measure that appears extremely precautionary, not to say discriminating. The PV industry was not sufficiently involved in setting up these rules. In **England**, the current Engineering Recommendation G59/2 inefficiently regulates the connection to the grid of a wide range of PV system sizes (from as small as 3.6 kW to as much as 5 MW) with very different operating characteristics. Also, the recent uptake of PV has highlighted insufficient technical requirements for inverters, resulting in poor operation of PV systems. In both cases, improved collaboration of the PV industry with the responsible standardisation bodies may improve the situation.

The difficulties in advocating solar industry technical proposals in Germany

Until 2011, the technical guidelines for grid operators in Germany (as well as in many other European countries) required that in the case of an over-frequency event caused by a network disruption, power plants were required to shut down within 200 milliseconds when a frequency of 50.2Hz was reached in the grid. During periods of high sunshine this meant that up to 12 GW of PV power generating capacity or more could have been forced off the grid within a short period in Germany. This could have lead to emergency situations with considerable supply shortages in Germany and in Europe.

The PV industry, represented by BSW-Solar, recognised this problem and quickly proposed a solution to the FNN, the German body responsible for the definition of technical standards for grid safety. A voluntary commitment of inverter manufacturers could have ensured a more variable reaction for PV systems, so that they do not simply go off the grid when the frequency exceeds 50.2 Hz, but rather perform a gradual shutdown. It would be possible to quickly implement the necessary technical modifications on newly supplied inverters and thus avoid a simultaneous shutdown of newly installed PV systems during a grid overload.

However, when it came to voting on the voluntary self-commitment in the FNN, the representatives of the distribution networks voted against the solar industry's proposal. Instead, they decided to undertake a thorough examination of the proposal made by the solar industry. In their view, the shutdown issue might not be as serious at the distribution network level. This move delayed necessary steps, which were later implemented, significantly. If the solar industry had been represented in the committee, the technical background of the proposal and its significance - including its significance for the stabilisation of the distribution networks - could have been explained quickly and emphatically, and the committee might have been persuaded of its merit.

Lack of clarity and transparency of technical standards and grid connection rules

In many cases, technical standards and connection rules are not defined rigorously at national level, and this results in very different interpretations of regional or local administrative authorities, electrical companies and distribution system operators.

In **France**, the grid connection process is not fully linked to a single law or provision. As a consequence, the electricity distribution operators are free to set their own standards and to change them arbitrarily. Similarly, in **Spain**, there are as many different grid connection request forms as there are electricity distribution operators. The same is true in **Germany**, where grid operator associations and other bodies compile minimum standards for grid connections of PV systems. Unfortunately, these are only partially adopted by individual grid operators and indeed are supplemented by tougher demands so that, in practice, different requirements apply for PV system developers. This leads to discussions between developers, installers and distribution system operators and can only partially be resolved by legal recourses.

The experience of Portugal

When the first technical standards for grid connection of small-scale PV systems were developed, a simple and effective grid connection was required. It was sufficient that the production meter was installed beside the existing consumption meter and simply connected to it. However, this scheme was changed upon pressure from EDP (the incumbent Portuguese electricity producer and distributor) resulting in the requirement for the production meter to be connected directly to the grid downstream from the consumption meter.

This change resulted in a significant increase of costs for PV system installations, as in this case also the existing meter has to be updated to the new technical standards and relocated outside the private property in order to be easily accessible from the DSO staff. As a consequence, PV installers need to update the equipment associated with the general electricity supply of the final client, including the extra costs in the PV system price. As the PV industry was not involved in the development of these technical guidelines, it was not possible to contrast this decision.

The mediation role of the EEG Clearingstelle in Germany

The German *Clearingstelle* is an independent mediation office whose mission is to help "to settle any disputes and issues of application arising under the EEG (Renewable Energy Sources Act)". In practice, the *Clearingstelle* offers alternative dispute resolution options that may prove more efficient and cost-effective than resorting to legal action. Such options include mediation, joint dispute resolution and arbitration. Thereby, opposing parties can avoid costly litigation and tedious, lengthy court actions, but yet achieve a feasible and mutually acceptable solution. Furthermore, the *Clearingstelle* provides general advice on how to apply the provisions of the EEG.

As an example, on 25 June 25 2010 the *Clearingstelle* has published a clarification on the conditions for the commissioning of a PV system. This clarification is in line with what BSW-Solar suggested. According to the decision, the commissioning of a PV system depends neither upon the connection of an inverter nor "the prior application for grid connection, implementation of a connection study or the laying of the grid connection or of connecting lines". To commission the installation it is merely necessary that, alongside the technical operational readiness, the generation of power is guaranteed. Even though decisions of the *Clearingstelle* EEG are not legally binding, most of the German distribution grid operators have informed that they are implementing the decision.

3.2.3 Recommendations

The following recommendations are the result of work carried out by PV LEGAL partners in the 12 countries participating to the project. In formulating them, the authors of this report have tried to identify general solutions that may also be applied to countries beyond those that participated in the project. The applicability of these recommendations should be evaluated in the national context of a given country.

In particular these recommendations, stemming from the analysis of the barriers linked to technical standards and grid connection rules, aim at decisively involving the PV sector in the discussion of technical standards and at efficiently harmonising rules at national levels.

Involve the PV industry in the definition of standards and grid connection rules

As PV technology becomes a significant factor in the energy supply system, it will be crucial to involve the PV industry in defining technical standards. Industry know-how is needed when revising grid codes or setting up grid connection rules to accommodate for the needs of distributed energy generation technologies. This input will ensure the safe operation of the grid and should be required by national energy law.

Define clear technical standards and grid connection rules at national level

Technical standards and grid connection rules should reflect the features and requirements of PV technology. Standards and rules should be clear, specific and uniform and ideally be developed on a national level to avoid regional peculiarities that hinder broad PV penetration. DSOs should be involved as well as all energy generation stakeholders.

Further, all steps needed for the connection of a PV system to the grid should clearly be described. Ideally, there should be a legal entitlement of PV system planners to a connection study and to all relevant information needed to plan for connecting the PV system to the grid.

Ensure that national standards and grid connection rules are binding and exclusive

To ensure transparency, good access to the grid and a reduced cost of PV system installations, grid connection rules defined at national level should be binding and not subject to stricter definition by individual DSOs. Guidelines for DSOs on how to harmonise procedures – such as the ones used in **Slovenia** – should be set up. A uniform template for the grid connection application form should be used by all DSOs, following the example set up in **England**.

Set up an independent mediation office to efficiently resolve conflicts between parties

An independent mediation office (based on the example of the *Clearingstelle* EEG in **Germany**) can be helpful to resolve conflicts between parties without incurring in bureaucratic delays. The independence of such a body must be ensured, by allowing equal contribution by all stakeholders and by enrolling neutral technical and legal experts.

3.3. Barriers in grid connection procedures

3.3.1. Description of processes

Connection to the grid is often the last and decisive step in the development of a PV system, but it remains important early in the process of developing a PV system. That is because one of the first tasks a PV developer must undertake is to verify if a grid connection is available in the premises where he has chosen to develop a PV system.

In general, the grid connection process consists in an initial grid connection permit phase, during which a request for a connection point is sent either to the competent distribution grid operator or, in case of large PV power parks impacting the high voltage network, to the transmission system operator. After internal consultations and the opportune technical verifications, the interrogated grid operator will in most cases reply to the system developer confirming the access point and presenting an offer for the realisation of the connection works. In case the grid operator refuses the access point request, it is normally required to provide an alternative access point and connection works offer. Once the PV system developer accepts a connection offer, a provisional connection contract is signed between the two parties, a deposit is paid to the operator and usually the works for installing the PV systems can be started.

Once the PV system construction and installation has been finally completed, the PV developer will contact the grid operator and request that the connection works are executed. Finally, the PV system will be connected to the grid and will begin feeding electricity into it, after a brief test and commissioning phase. At this point, the PV system owner and the grid operator generally conclude the process signing a connection contract.

While this is a general flow for the grid connection process, in practice variations appear in some of the European countries considered by PV LEGAL. In **England**, the process for small residential PV systems is very simplified: the connection may be directly executed by a certified installer that only needs to notify the DSO after the grid connection is completed.

The total duration of the grid connection process, described in Figure 6, comprehends the initial grid connection permit phase, when a connection point is requested and obtained from the grid operator, and the final phase when the PV system is physically connected to the grid after its construction in order for it to start operation. The PV LEGAL research shows that durations are spread quite homogeneously across countries, with peaks in **Bulgaria**, **Italy, Slovenia** and **Spain**. A case apart is represented by **Greece**, where durations are indeed extremely high due to the current bottleneck caused by the thousands of grid permit applications received by grid operators.

Note how the duration of the grid connection process in the residential segment is minimised in **England**, where certified installers are allowed to directly connect a completed PV system to the grid, saving time and avoiding the involvement of the local DSO staff.

The results of the PV LEGAL research also highlight that total legal-administrative labour requirements for the grid connection process, shown in Figure 7, are excessive in countries such as **Italy, Bulgaria, Slovenia** and **Spain**, especially when it comes to developing an industrial ground-mounted PV system.

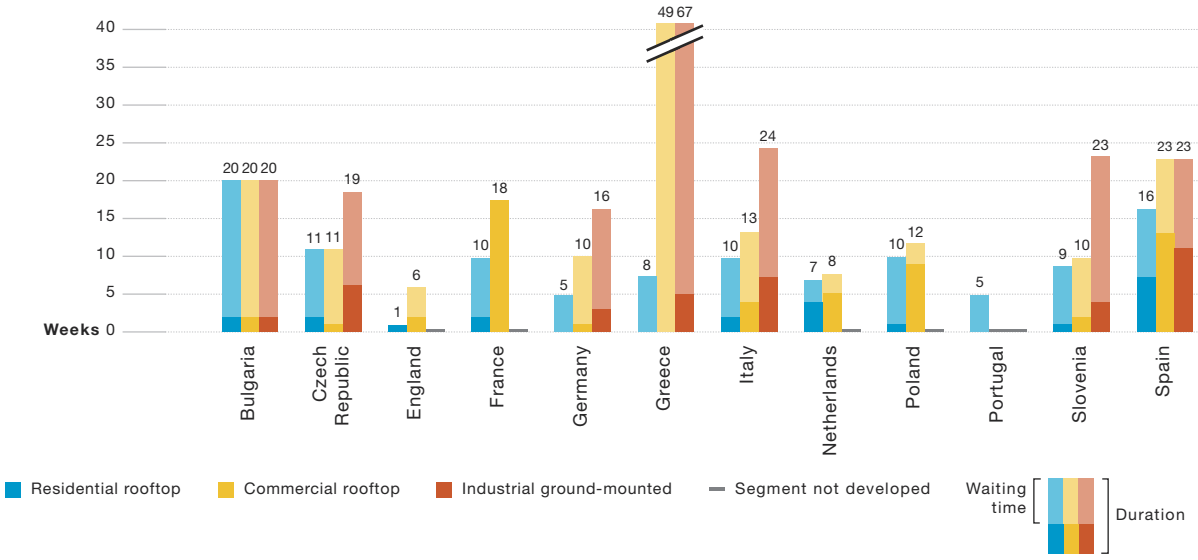


Figure 6 - Cumulative average duration of the grid connection process (weeks)

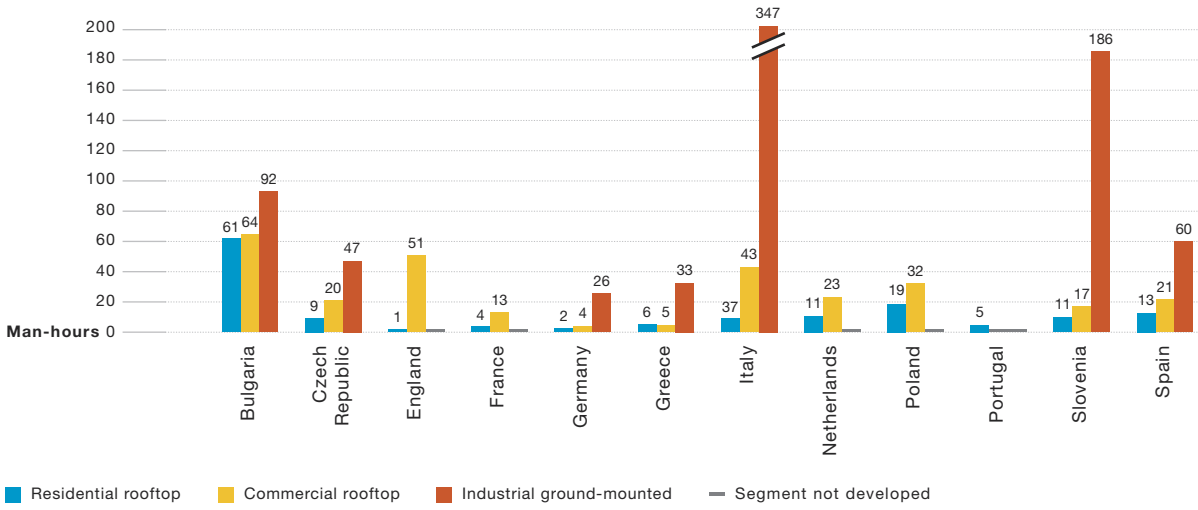


Figure 7 - Total legal-administrative labour requirements for the grid connection process (man-hours)

3.3.2. Common barriers in Europe

While some Member States do not yet even recognise priority grid access for PV and other RES systems, in most countries the grid connection processes are often afflicted by complicated procedures and severe delays that have a significant impact on project development lead-times and consequently on the economic returns of PV systems.

Lengthy and complicated grid connection procedures

PV LEGAL research has revealed that in most of the 12 countries covered by the project, grid connection procedures are considered too complicated and result in excessive lead times. Two main causes have been identified for this: often too many authorities (beyond the grid operator) are involved in the processes; and deadlines are usually not respected, even for small residential PV installations.

Too many authorities involved in the process have been reported in **France, Spain, Greece, Italy** and the **Netherlands**. It is often the case that, when several authorities have to be contacted, decision-making power is not clearly assigned to any of them, creating ambiguity in the process and resulting in long lead times.

Long waiting times and lack of respect of deadlines have been reported from **Slovenia, France, Greece** and **Italy**, while **Germany** and **Slovenia** have also reported that grid connection procedures are in general too long. As in the case of permitting procedures, the failures in respecting the deadlines are often caused by insufficient staffing of grid operators and other authorities involved, or by insufficient training of the same staff. The staffing problem can generally emerge when a PV market suddenly picks up and grid operators are caught unprepared for the workload increase.

Insufficient clarity and standardisation of grid connection procedures

Regarding this barrier, the RES Integration report makes a distinction between it and the previously described one related to complicated procedures. The issue of complicated procedures, in fact, mainly relates to processes that could be improved, whereas the issue of unclear and non-homogeneous procedures refers to situations in which the actual process is not defined (totally or in part) or in which the processes differ from grid operator to grid operator. The latter is clearly a worse situation for a PV developer. Such occurrences have been reported in **Italy, Poland, Portugal** and **Slovenia**.

In **Germany**, the lack of an obligation for the grid operator to perform a preliminary grid connection study may result in lack of clarity for the PV system developer as to whether the most appropriate connection point has been assigned. Moreover, another consequence of the lack of these studies is an uneven distribution of costs for the reinforcement of the grid.

Excessive grid connection costs

As evidenced in the RES Integration report, this barrier principally arises from the approach used for sharing the costs of grid connection among producers and grid operators. Two main cost sharing approaches are possible: deep costs and shallow costs. In a deep cost approach, a PV developer requesting grid connection has to bear several grid infrastructure related costs (grid connection, reinforcement and extension). In a shallow cost approach, instead, the PV developer bears only the grid connection cost, but not the costs of reinforcement and extension.

In general, a deep cost approach creates higher costs and risks for a PV system developer. Additionally, due to the complexity of the power grids and to the need to take into account scenarios on future demand and generation, it is often not possible to objectively define which grid reinforcements are necessary by the addition of one specific plant. Therefore, the deep cost approach tends to give the grid operator discretionary power, which can lead to controversial situations and possibly abuses.

Amongst the countries participating in PV LEGAL a non-shallow cost sharing approach is currently defined by the electric sector regulations of **Spain, Czech Republic, Poland** and **England**. In **Poland**, even though PV systems are very few, grid operators often attempt to transfer to the PV developer most grid connection costs, even if the Energy law states only 50% of the actual costs should be covered by the RES system developer.

No guaranteed grid access for PV systems

In some cases, even when national law guarantees access of RES to the electricity distribution and transmission infrastructure, it is still possible that PV installations are permanently or temporarily denied connection to the grid. In Bulgaria, although pursuant to the Renewable and Alternative Energy Sources and Bio-fuels Act (RAESBA) the connection of RES projects to the distribution and transmission grids is mandatory and a priority, there have been refusals to connect already constructed PV and RES projects and of setting limits on the generated electric power

that they can feed into the grid (in this particular case for wind plants). This scenario is applicable also to PV projects and was reconfirmed by a December 2010 statement of the national TSO (NEC). In it, it was declared that NEC intended to suspend connection of new RES capacity (including PV) until the final adoption of the new Renewable Energy Sources Act that took place only in summer 2011. France and the Czech Republic have recently been formally requested by the European Commission to bring its national legislation on renewable energy in line with common agreed EU rules. The Commission established, that both Member States have not yet put in place transparent and clear administrative procedures to guarantee access of renewable energy to the grid.

Confusion on grid connection procedures in Slovenia

In Slovenia, about 8 process steps are necessary to connect with the electricity grid:

- Creation of a project application
- Creation of a building permit application and a construction project application
- Application for approval to connect the system
- Review of the application to connect
- Issuing of the approval to connect
- Application for a contract regarding the connection
- Issuing of approval to connect to the electricity grid
- Issuing of a contract regarding the delivery and transmission of electrical energy

These steps may seem clear at first glance, but individual distribution companies each have their own rules and procedures regarding connecting to their network. From the first step, there may be great differences in costs associated with reinforcing the network and great differences in the costs of connecting. Cost determinations are due to unclear rule definitions within the domain of each individual distribution company. There are also variations in waiting times for obtaining necessary documentation. Certain electricity distribution companies issue approvals, contracts and certificates only after the maximum allowable period, while others have much shorter waiting periods.

3.3.3. Recommendations

The recommendations below condense the work carried out by PV LEGAL project partners in the 12 countries participating in the project. In formulating them, the authors of this report have tried to identify general solutions that may also be applied to countries beyond those that participated in the project. However, the applicability of these recommendations should be evaluated in the national context of a given country.

Eventually, these recommendations aim at enhancing the transparency and the efficiency of grid connection procedures in the spirit of article 16 of the European RES Directive.

Guarantee priority access to the grid for PV installations

In the spirit of the European RES Directive, it is crucial to ensure that PV and other RES systems are connected to the grid as a priority. Even in the cases when this is guaranteed by national legislation, in practice the right to a connection can sometimes be denied, as has been seen in the cases of Bulgaria and the Czech Republic. National Governments should make sure that these violations do not take place.

Streamline grid connection procedures

Lengthy and complicated grid connection procedures can significantly slow down or even prevent the installation of PV systems. The following recommendations should be adopted:

- **Limit paperwork and communication exchanges** so that the requirements by the DSO on the PV system operator are proportionate. In some of the researched countries up to eight communication steps with the DSO may be needed in order to connect a PV system.
- **Implement simpler dedicated procedures for small systems** to allow for swift and non-bureaucratic installations in the residential rooftop segment. For instance, the electricity supply connection point of a house should also serve as the default connection point for a PV system, should this be installed.
- **Introduce one-stop-shop procedures** that reduce number of authorities involved in the grid connection process and allow the PV system developer to liaise with a single interlocutor during the whole process. Concretely, the single interlocutor could be either the DSO or a central body set-up by the national government.

- **Introduce online portals and tools** for the submission of requests and the notification of their outcome. In countries such as Portugal, online tools have proven to be effective and allow for rapid processes when dealing with the DSO or other authorities in charge.

Set clear deadlines for the assignment of a grid connection point

The allocation of a grid connection point and the connection of a completed PV system should be undertaken by the DSO "without culpable delay" or "promptly", therefore introducing in the legal framework a qualitative criterion as the one recently introduced in the German EEG law.

Additionally, a quantitative deadline should be anyway set in order to avoid ambiguities: PV LEGAL partners, after considering the contexts of all 12 countries involved, agree that an action should be required from the DSO no later than six weeks after a grid access or a grid connection request has been made.

Enforce penalties for not respecting deadlines

In cases where time limits for the allocation of a connection point are not respected, a legal entitlement for PV system operators should be enforced, allowing for the reimbursement of the potential damage suffered due to the delay. The penalties should not only be of symbolic nature, but also rather be appropriate to compensate for missed FIT revenues.

Provide for proportionate and transparent grid connection costs

Grid connection costs charged to the PV system operator must be proportionate, transparent, standardised and regulated. In general, a shallow grid connection costs approach is preferable, as it reduces the initial economic risk for the PV developer. Accordingly, grid operators should be allowed to recover grid reinforcement and expansion costs to allow for this regime to function. Information about grid connection costs should be made publicly available and be monitored by an independent body such as the national electricity market regulator.

Online grid connection requests in Portugal

In Portugal, for residential PV systems it is sufficient to register a grid connection request on the website of DGEG (Ministry of Energy and Geology). After registration, the request is forwarded to the national grid operator (EDG) that proceeds with the verification of available grid capacity and other technical requirements. In this way, the PV developer has only one interface to deal with, and the rest is taken care of by the DGEG. In general, an answer is received within 10 to 14 days.

Advocating for procedural uniformity in Italy

In Italy, although legislation on grid connection is defined on the national level, the territorial distribution of grid operators implies that the grid connection procedures for PV plants as well as the exchange of information and notifications between the DSO and the PV system developer are subject to 'local' differences in terms of efficiency and speed at which formalities are fulfilled. These differences involve the whole process, from the request of the connection offer to the actual test and connection of the PV system.

The definition of the procedural steps and of the waiting times implied during the connection phase is contained in the TICA (Integrated Text for the Active Connections) and by the grid connection guidelines set by *Enel Distribuzione*, the main Italian DSO holding 80% of the market. However, between all the steps mentioned above, or even after the final test phase it is possible that the exchange of information and documentation happen in a less well defined framework subject to relevant fluctuations in terms of waiting times and efficiency and, to a certain extent, related to the discretion of the officers involved.

PV LEGAL workshops held during summer 2011 by Assosolare with *Enel Distribuzione*, recommended improvements in the standardisation and uniformity of operating procedures, particularly concerning some recurring patterns that are not yet regulated by the TICA but have been reported by the operators as critical (i.e. information and documentation exchange, reply time, support and means of communication).

Ensure that trained and certified installers may connect small PV systems to the grid

The European RES Directive foresees the implementation by Member States of training schemes for renewable energy installers. Such training schemes should include training on PV grid connection procedures and requirements. Installers trained in these national schemes could then be allowed to connect PV systems autonomously without the help of staff from the grid operator, therefore reducing its resource requirements. This recommendation should especially be observed for residential rooftop PV systems whose connection on the distribution grid does not normally pose severe technical challenges.

Deadlines and penalties for grid connection delays in France

The law "*Grenelle 2*" has also defined a deadline for the grid connection of small installations in its article 88. This deadline is defined as follows: except in specific cases that need grid extension or reinforcement, the grid connection delay for a RES electricity production, less than 3 kW, cannot exceed 2 months from the grid connection proposal acceptance.

This grid connection proposal has to be sent by the DSO to the producer within one month from the grid connection request reception. If those deadlines are not honoured, penalties – to be defined by a separate decree – will apply. However, since the law publication on 12 July 2010, the penalties decree has not yet been published.

New grid connection rules in Slovenia

On 30 May 2011 the guidelines for the connection and operation of PV power plants of installed electrical capacity up to 10 MW were published in the Official Journal of the Republic of Slovenia. The guidelines are a part of the System Operating Instructions for the Electricity Grid (SOIEG) that should have originally been issued in June 2011, but suffered a certain delay due to the underlying discussion between electrical companies and other industry stakeholders.

The guidelines, while not reducing the number of administrative steps required to connect PV systems to the electric grid, still do provide updated technical conditions for grid connection and clearly define the steps leading to the connection of a PV system to the grid. ZSFI, the Slovenian PV LEGAL partner, contributed to the preparation of the guidelines with a series of recommendations discussed during the Forum held in Celje on November 10th 2010.

3.4. Barriers related to grid capacity issues

3.4.1. Description of issue

The consistent growth of PV and other RES installations in several European countries in recent years clearly represents a technical and regulatory challenge to the European transmission and distribution grid infrastructure. Unfortunately, in some cases this challenge is not tackled properly and therefore significantly limits or totally blocks the installation of further capacity.

3.4.2. Common barriers in Europe

Virtual saturation of the grid and PV moratorium

Virtual saturation of the grid is a problem that may arise at a time when all the available grid capacity, either in a region or across a whole country, is reserved by projects under development that have requested and secured a grid access point. In such a situation, the competent grid operator may not accept further requests in order not to compromise the security of the grid infrastructure. Virtual saturation of the grid has been reported in **Bulgaria, Greece** and **Italy** (especially in the sunnier southern regions of the country).

A negative phenomenon that is often associated with virtual grid saturation is the emergence of a secondary speculative market for authorised grid access points, land plots in vicinity of a grid interconnection node and other administrative permits. The detrimental effects of this speculative phenomenon are well known: increased costs for PV development and a flood of merely tentative grid connection requests that further feeds the virtual saturation of the grid in a mutual, self-feeding cause-effect pattern.

In such circumstances, national governments, often acting in collaboration with transmission system operators, may take drastic measures, for example introduce a PV moratorium. A PV moratorium is a legal provision completely blocking the development of PV technology for a limited or unlimited period of time, such as the one in introduced in February 2010 in the **Czech Republic**, which is currently still blocking the development of PV installations across the country. A similar provision was also imposed in **France** during the beginning of 2011 in order to allow the national government to redesign the support framework for PV.

The PV moratorium in the Czech Republic

The PV moratorium was introduced in February 2010 by the CSRES association. CSRES is an organisation formed by the transmission grid operator (CEPS, whose majority is owned by the Czech Government) and several distribution grid operators (CEZ Distribuce, E.ON Distribuce and PRE Distribuce). CEPS asked the association to suspend providing grid connection permits for further RES electricity generating systems.

The official reason for the moratorium was an extremely high number of agreed grid connection permits (cumulatively reaching more than 6 GW) and the consequent uncertainties for grid stability should al that RES capacity be installed.

Subsequently, CEPS has commissioned a grid study whose outcome, though controversial, has been used as a basis for the moratorium and further legislative steps. The study sets out the maximum installable RES capacity at 1650 MW for the 2010-2012 period and at 2000 MW for the 2012- 2015 period.

The aforementioned grid study has been challenged by several RES stakeholders, including the Czech RE Agency, which has put forward recommendations for the suppression of the moratorium in the National PV LEGAL position paper.

Insufficient development of the transmission and distribution grid capacity

As also highlighted in the RES integration report, this barrier is related to the difficulties in obtaining access and connection to the grid due to infrastructural limitations not allowing addition of new PV plants. In general, this is a transitory problem. In these cases, the growth rate of PV and other RES Installations is higher than the rate of development of the electrical grid.

The main causes behind these problems can be insufficient planning or inefficient procedures involved in the network development process. An insufficient adjustment of the grid planning process to the growth of RES is also a strong indicator that the regulatory framework has not been adapted to the transition of the energy sector from centralised to distributed electricity generation. This fact may in the future lead to considerable problems with the integration of RES to the grid and today already represents in part a barrier to the further deployment of PV.

In some parts of **Germany**, existing capacity is no longer sufficient to feed in all RES electricity at all times. Such grid bottlenecks may further occur in certain regions as renewable energy continues to develop. The PV industry provides technical solutions to contribute to ensuring grid stability (e.g. inverters providing reactive power; adapted automatic frequency disconnection settings) and will continue to do so. However, in many cases grid capacity needs to be sufficiently expanded and increased. According to the German Energy Industry Act (EnWG) and EEG, grid operators have a general obligation to extend their grids, which they do not, however, fulfil sufficiently in view of the increased extension of renewable energy.

Insufficient development of grid capacity has been highlighted by PV LEGAL research also in **Italy**, where infrastructural limitations are worsened by the cumbersome administrative process for grid expansion, and **France**, where the transmission infrastructure requires planning and reinforcement (also characterised by long lead-times) in order to accommodate the addition of significant PV capacity.

3.4.3. Recommendations

The recommendations below condense the work carried out by PV LEGAL project partners in the 12 countries participating in the project. In formulating them, the authors of this report have tried to identify general solutions that may also apply to countries beyond those that participated in the project. However, the applicability of these recommendations should be evaluated in the national context of a given country.

These recommendations aim at reasonably addressing the issues deriving from increased penetration of PV and other RES generators on the grid infrastructure, in the spirit of article 16 of the European RES Directive.

Provide for periodical grid analysis and set up regional grid development concepts

An independent body (e.g. the electricity market regulator) should evaluate the grid infrastructure status especially in case grid operators refuse to connect further PV and RES capacity, citing grid saturation issues. This is the only way to allow for an unbiased and objective assessment of the state of the grid. Such a study should evaluate costs, benefits and the potential for grid extension and improvements.

At the same time, building on ambitious regional RES targets, DSOs, also in collaboration with the RES sector, should elaborate strategic grid concepts taking into account the future load curves and other regional specifics.

The French *"Grenelle 2"* law

In France, the *"Grenelle 2"* law (Loi n°2010-788 du 12 juillet 2010 portant engagement national pour l'environnement) foresees, in its article 68, a regional development of RES. Each region has to define its own RES plan in accordance with the EU Directive and objectives. These regional schemes for climate, air and energy (SRCAE) have to be jointly elaborated between Regions and Prefectures. Targets will have to be consistent with national, and de facto European, objectives for 2020 and 2050.

The SRCAE goals will focus on:

- Reduction and adaptation to climate change and energy management
- Air quality
- Qualitative and quantitative RES production targets consistent with European objectives

These schemes can include a territorial plan for climate & energy applying to Regions, Departments, town and community of cities (above 50,000 inhabitants). They have to be adopted before 31th December 2012, and updated every 5 years. They may also include a dedicated RES grid connection planning devised by the transmission system operator.

Ensure public availability of grid data

The websites of grid operators, or an equivalent, centralised platform should offer detailed information at regional level on grid status, available grid capacity, generation capacity, PV and other RES installations connected to the grid and grid permits granted. The availability of such information would constitute an adequate starting point for the planning of PV and RES developers, who could thus direct their efforts toward the most suitable locations of the grid infrastructure.

Set legal provisions for grid reinforcement and recovery of costs

In order to avoid PV system grid connection denials, the national energy law should clearly define under which conditions grid operators must reinforce the grid to accommodate more RES generation capacity. At the same time, the law should specify who must bear the grid extension costs. One way would be to require that the grid is reinforced if it is reasonable from a macroeconomic perspective. The costs for the development of the grid could be collected by the DSOs via grid charges and be passed on to the electricity consumers.

Set clear deadlines and incentives for grid extension

Once the regional grid concepts discussed above are in place, clear deadlines for the grid extension process should be set, so that it is known when the network infrastructure will be able to accommodate larger amounts of PV and RES generation capacity. At the same time, grid operators should be provided with valid incentives that reward and compensate them in case of proper reinforcement of the grid infrastructure. On the other hand, grid operators should be penalised for insufficient development of the grid. For instance, should grid curtailment of RES generators occur because of unaddressed structural limitations of the network, grid operators should compensate the RES producers. Consider section 12 of the German EEG law: *"The grid system operator shall, in particular, bear responsibility if he did not exhaust all the options for optimising, boosting and expanding the grid system."*

Prevent speculation on grid connection permits

In order to avoid speculation on PV connection licences, sufficient grid capacity to connect PV systems should be ensured so that licenses are not a scarce commodity traded for profit on a secondary market.

In countries with regulatory frameworks that provide for the reservation of grid capacities when developing PV systems, those reservations should be valid only for the specific project they were applied for. This limitation would discourage resale of licenses to be used for other projects. Further, clear milestones should be established according to which a continuous development process can be tracked, and grid capacity reservations should be granted for a limited time, sufficient to realise the PV system but not overly long. France, for example, has recently set up a mechanism that requires the PV developer to prove the seriousness of its intentions.

Infrastructural limitations of the grid in southern Italy

The Italian PV LEGAL Advisory Paper addresses the infrastructural issues in the Italian grid, highlighting the need for a prioritisation of the interventions according to a distributed generation development model.

Recently, a convention between ENEL and the Ministry of Economic Development has been signed to adapt the distribution grid to the use of electricity produced by PV systems (up to 1 MW) and develop smart grid solutions in the southern regions of Campania, Puglia, Calabria and Sicily. The interventions will be funded with European structural funds).

Similarly, the Italian Electricity and Gas Regulatory Authority (AEEG) have planned actions in this area through the financing of smart-grid pilot projects and the development of production-forecast systems for non-programmable energy sources.

Avoid establishing generic limits for PV installations

In all cases, fixed and generic limits on the connection of PV capacity in a certain area or to a grid connection node should be avoided. Instead, local capacity issues should be evaluated on a case-by-case basis, considering the capacity of the grid and the capabilities of a PV installation to interact with it and sometimes improve its performance.

4

COUNTRY FACTSHEETS

Introduction to the country factsheets

The country factsheets give an overview of the PV market situation for each of the participating countries. Each factsheet is divided into two pages.

On the first page, the **National data** section summarises the current national situation and is completed by a description of the three PV installations segments: residential rooftops (segment A), commercial rooftops (segment B) and the industrial ground-mounted (segment C).

The **PV industry survey results** section displays quantitative results of PV LEGAL research for each of the 3 segments.

Figure x.1: The average share of administrative costs in the total project development costs excluding PV equipment.

Figure x.2: The average labour requirement for each main process involved in the development of a PV project, expressed in man-hours.

Figure x.3: The overall average project development duration and the average waiting time experienced by project developers. The duration and waiting time are expressed in weeks.

Figure x.4: The average duration and waiting time for each main process involved in the development of a PV project, expressed in weeks. The processes are: site selection, the administrative process, grid connection permit, PV system construction and grid connection.

On the second page, barriers and recommendations are presented, concluding with a review of progresses and expected future developments in the national PV sector.

Barriers and recommendations: as described in the previous chapters of this report, PV system development is confronted with four different barrier types. The permitting procedure contains the legal-administrative obstacles and specific barriers for environmental areas and historical buildings. The table also describes the barriers linked to the grid connection process, its rules and technical standard and its capacity issues. For each of the barrier types, recommendations are given to improve the current situation.

Results and future developments: In this last part, the national profile presents an overview of progresses in the country since the beginning of the PV LEGAL project and of future developments to be expected for the national PV industry.

Bulgaria

National data

Total PV capacity installed end 2010	18 MW	2010 market Type of market	11 MW Emerging

PV industry survey results

For several years, Bulgaria has been a focus of interest for many investors in the PV sector since it has been promising favourable conditions for developing PV systems. Nevertheless, the market has been growing at a very slow pace in recent years. Disproportionate administrative constraints are certainly the main reasons for such a slow take-off.

Summary of market segments

Until today most of the market development has been in the ground-mounted segment; disproportionate requirements for smaller segments have prevented these from growing.

The permitting application process for solar systems is particularly complex and time-consuming for small- and medium-sized systems involving different authorities as it does not distinguish from the procedure applying to larger systems.

In addition, the mandatory environmental impact assessment even if successfully admitted is often delayed and very time consuming.

The preliminary statement and contract to grid connection also depends on the different requirements of the DSOs.

Temporary governmental restrictions on RES systems add to the uncertainties of investors in the photovoltaic segment.

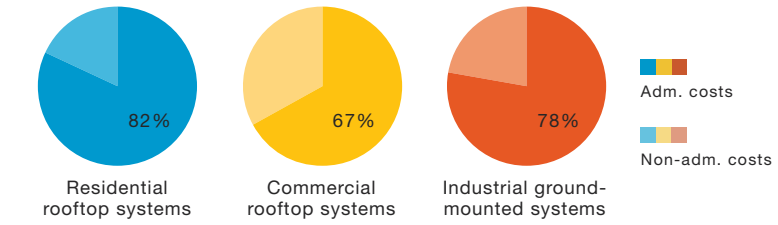


Figure A.1 - Share of administrative costs in total project development costs (excluding PV equipment)

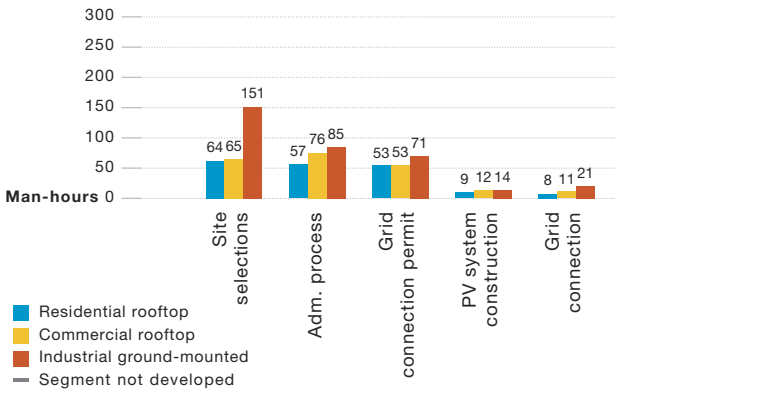


Figure A.2 - Breakdown of process administrative labour requirements (man-hours)

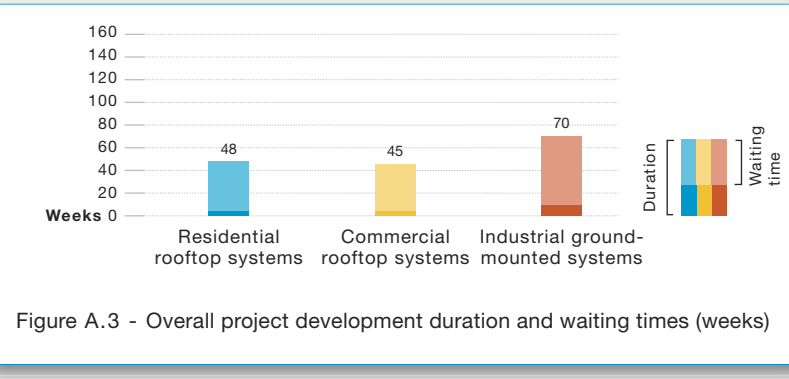


Figure A.3 - Overall project development duration and waiting times (weeks)

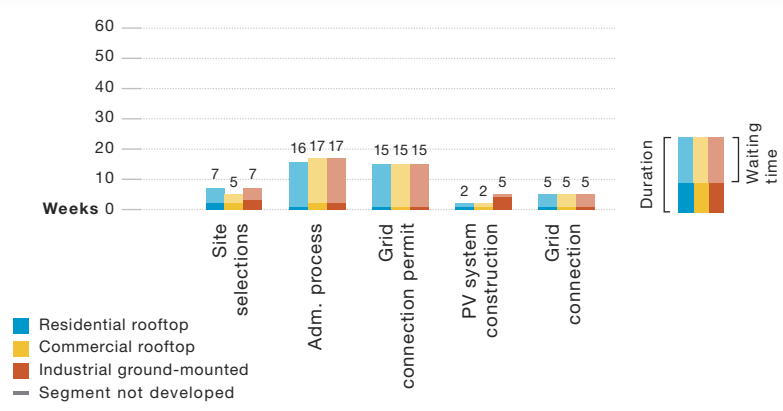


Figure A.4 - Breakdown of process duration and waiting times (weeks)

	Barriers	Recommendations
Permitting procedures	• Non-transparent, complicated and lengthy permitting procedures, especially for rooftop systems.	• Shorten waiting time and cut the cost of the development of rooftop PV projects; introduce a simple notification procedure for rooftop systems.
	• Specific procedures: environmental impact assessment delays the development of PV systems.	• Existing regulation should not be obligatory for all PV installations, only for those in the protected areas.
Grid connection rules & technical standards	• No barriers identified.	
Grid connection procedures	• Priority access or guaranteed access for PV to the grid is not always provided by the DSOs. • Unclear terms in grid connection contract (grid connection point). • Unclear grid connection costs.	• Unify application form for grid connection.
Grid capacity issues	• Virtual saturation of the grid/PV moratorium.	• Prevent speculation by introducing more deadlines and milestones into the grid connection process; financially binding commitments for investors. • Grid operator should not refuse the issue of preliminary grid contract just because there is a lack of grid capacity, capacity issues should be evaluated on a case-by-case basis.

Results and future developments

Since the beginning of the PV LEGAL project, very little progress has been observed in Bulgaria; in some cases the situation has worsened.

In May 2011 a new RES Act (RESA) was adopted. Through this act some of the legal procedures for rooftop PV were simplified and shortened, but almost all of the old barriers are still in place. Moreover, some **new barriers have been created**:

- Concerning the grid connection of new projects, a **maximum yearly grid capacity has now been introduced**, which means that only certain projects can qualify for grid access.
- Grid connection provisions in RESA come into force as of 01.07.2012 and no transitional legal-administrative procedure is in place until then. In the meantime, **new PV projects will not have access to the electricity grid.**

Additionally, another major new barrier has been introduced by the amendment in May 2011 of the act for Protection of Agricultural Lands (PALA) where **a ban for the use of certain agricultural lands for PV has been introduced**. The affected territories amount to approximately 40% of the total agricultural land stock.

There are still several subordinate Acts to be adopted by the national authorities according to RESA and PALA. They have to clarify – or indeed, to introduce - many of the legal-administrative procedures regarding legalization, building and grid connection of PV.

The PV sector is clearly concerned about current developments in Bulgaria which largely contradict the provisions of the RES Directive as regards to administrative simplification and grid integration.

Czech Republic

National data

Total PV capacity installed end 2010	1.9 GW	2010 market Type of market	1.4 GW Developed

A moratorium was introduced in February 2010 and caps PV and wind energy at 1,560 MW for the period between 2010 and 2012. Between 2012 and 2015 the cap will be 2 GW. No more projects can be connected due to alleged grid hosting capacity limits.

Summary of market segments

Residential rooftop systems: The rooftop segment is the largest segment, accounting for three-quarters of all licences. The application process for the building permission process depends on the different regional legislations. The grid connection moratorium let (speculative) investors sell their capacity reservations, leading to an additional uncertainty on the market.

Commercial rooftop systems: In addition to the building permission procedure in this segment that is similar to the residential sector, commercial systems require an ability study as part of the application for grid connection.

Ground-mounted systems: The future development of ground-mounted systems is uncertain and expected to be hindered. In addition to financing restrictions, the permitting process for agricultural land (and sometimes installation for industrial installation) is very lengthy.

Different legal regulations for building permits exist.

PV industry survey results

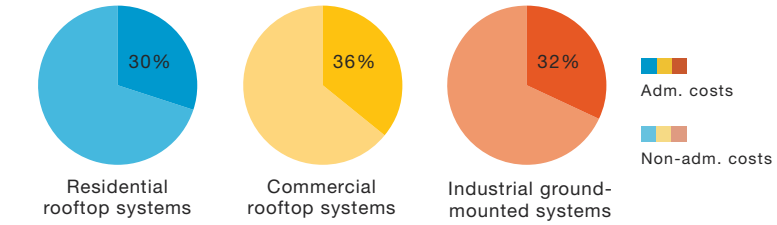


Figure B.1 - Share of administrative costs in total project development costs (excluding PV equipment)

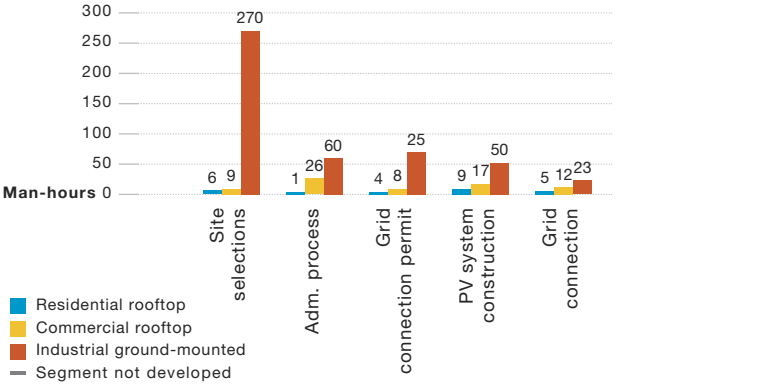


Figure B.2 - Breakdown of process administrative labour requirements (man-hours)

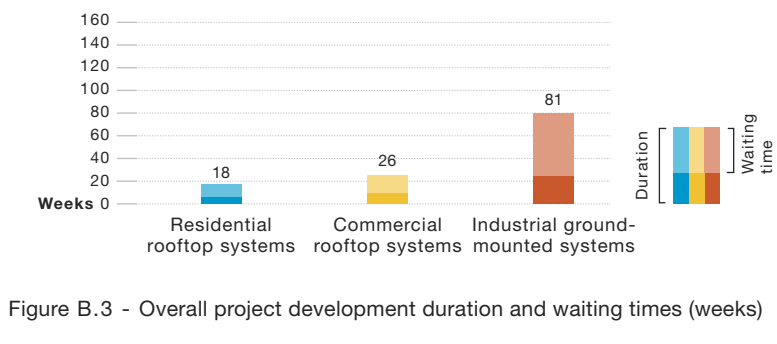


Figure B.3 - Overall project development duration and waiting times (weeks)

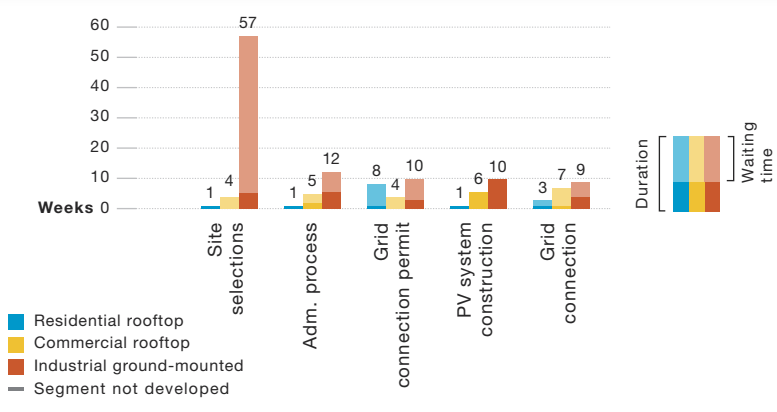


Figure B.4 - Breakdown of process duration and waiting times (weeks)

	Barriers	Recommendations
Permitting procedures	• Inconsistent building permission process. • Limitation of land use plans excluding PV installation on residential buildings. • Monument protection preventing PV installations.	• The barriers mentioned were identified before the PV moratorium was adopted. To support a better deployment of PV the moratorium should be removed as well as the legal-administrative obstacles.
Grid connection rules & technical standards	• No barriers identified.	
Grid connection procedures	• High costs and lengthy process for grid connection.	• Provide proportionate and transparent grid connection costs and streamline the grid connection procedures.
	• Non-standardised procedures depending on DSO.	• Set precise and standardised definitions by law and uniform instructions for all grid operators.
Grid capacity issues	• Virtual saturation of the grid/PV moratorium.	• Perform periodical grid analysis and set up regional grid development concepts. • Set legal provisions for grid reinforcement and recovery of costs, clear deadlines and incentives for grid extension. • Prevent speculation on grid connection permits. • Waive the moratorium at least for PV systems up to 30 kW.

Results and future developments

After having observed a spectacular growth in demand for PV systems in 2009 and 2010, some **severe roadblocks to a further development of the PV market** have appeared in Czech Republic. The first was the introduction for a minimum efficiency of PV panels, which would discriminate against some products. Since no systems are being developed anymore this requirement is not effective. Another issue, which does not constitute an administrative barrier per se but which is clearly damaging the PV sector in Czech Republic, was the **adoption of a 26% retroactive pre-emptive tax** on the revenues of PV systems of more than 30 kW that were installed in 2009 and 2010. This measure is leading many PV plant owners to deficit or even bankruptcy due to incapacity to reimburse the bank loans they have contracted to set up the PV plants.

Finally, due to an alleged saturation of the grid based on a controversial study, a **moratorium has been adopted preventing any further connection of PV systems to the grid.** The National Renewable Energy Action Plan has also been used to substantially limit the deployment of PV until 2020.

Since the beginning of the project little progress has been made, although even that has been obscured by the moratorium:

- In November 2009 a methodical instruction tool on building permissions was published by the Ministry for Regional Development and the Landscape Development Office. This document should provide **clarity with regards to building law applications for PV systems.**
- In April 2010 an amendment to the connectivity regulation has been adopted. It should **limit speculative reservations** (introduction of deposit payments and introduction of land planning permissions for larger installations)

Until a decision is taken to re-start a PV market in Czech Republic, there is little chance that the progress made on administrative or grid connection processes will be of any use. It is urgent that the current potential of the Czech grid is studied to allow a development of PV systems, in particular for the residential and commercial segments.

France

National data

Total PV capacity installed end 2010	1 GW	2010 market	719 MW
		Type of market	Growing

PV industry survey results

In recent years the number of installations has increased rapidly with the cumulative installed and connected capacity reaching over 1 GW by the end of 2010. Requests for connections at that time were much higher due to a favourable support scheme. The rapid growth observed since 2009 has allowed a large development of the PV sector while leading to some speculative activities on the market.

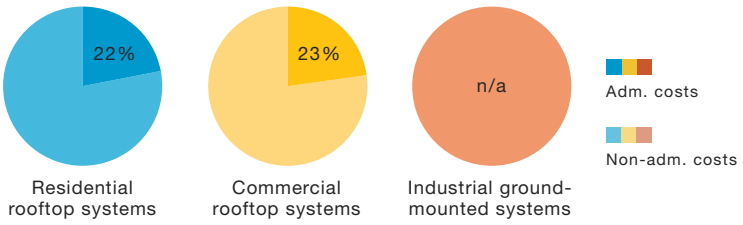


Figure C.1 - Share of administrative costs in total project development costs (excluding PV equipment)

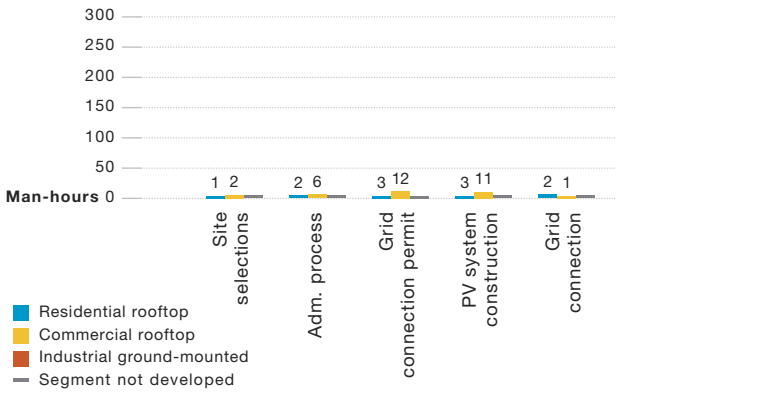


Figure C.2 - Breakdown of process administrative labour requirements (man-hours)

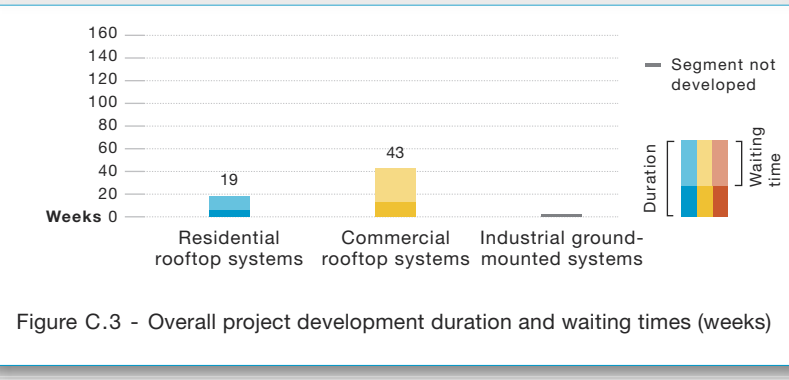


Figure C.3 - Overall project development duration and waiting times (weeks)

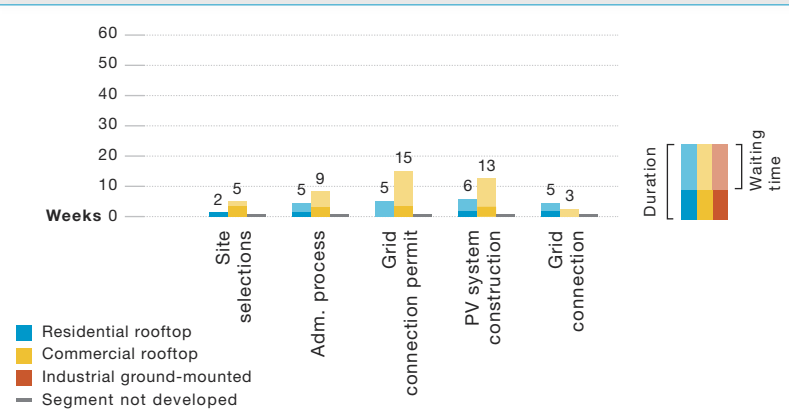


Figure C.4 - Breakdown of process duration and waiting times (weeks)

Summary of market segments

Residential rooftop systems: Even though high administrative barriers are related to permitting procedures the residential segment has the prospect of a very dynamic growth in upcoming years.

Commercial rooftop systems: The main obstacle in the commercial segment is still the lengthy connection procedure and lack of clarity about technical regulation requirements for the grid connection process.

Ground-mounted systems: In the ground-mounted segment major modifications in the administration procedures occurred in 2009. Within this segment installations are classified by power. Depending on the size of the system the administration requirements are getting more complex and hindering the development of the segment.

For all PV installations, town planning constraints are another obstacle to the development of PV projects. However, since the end of 2010, due to a moratorium and then a new FiT scheme, projects above 100 kW are subject to call for tender. This decision has frozen this market segment.

	Barriers	Recommendations
Permitting procedures	• Non-transparent, complicated and lengthy permitting procedures.	• A single administration should be in charge of permission process for renewable energy systems.
	• Specific procedure for rooftop PV systems in monument protection areas.	• Develop exchange initiatives with architecture association and PV representatives.
Grid connection rules & technical standards	• Lack of clarity and transparency of technical standards and grid connection rules.	• Include PV sector in the development of new voltage networks. • Harmonise the requirements of the electric grid for PV installations. • Make information on grid connection procedures and the waiting list more transparent and publicly available.
Grid connection procedures	• Lengthy and complicated grid connection procedures.	• Encourage DSO to allow PV installers to do grid connection. • Set deadline for installations above 3kW and implement penalties when they are not respected.
Grid capacity issues	• Missing extension of the distribution network capacities.	• Create discussion groups with industry and grid operators on the network development.

Results and future developments

France has seen an explosion of demand for the installation of PV systems through the end of 2010. The level of connections has not followed as quickly since the process is very long and can require months or even years in some cases. Nevertheless since the beginning of the PV LEGAL project significant progress has been observed:

- In April 2009, the French DSO (ERDF) has set up a website on which projects under 36 kVa can **apply for grid connection online**. This website also includes status reports on the grid connection process, allowing for a more transparent, even if not quicker, process.
- **Since 2009, installers certified by the DSO can carry out the connection work**, reducing the waiting time for connecting small PV systems.
- Since November 2009 an environmental impact assessment and a building permit are required for every PV system above 250 kW. These new administrative procedures should allow for a better regulated development of ground-mounted PV in the country.
- Since March 2010 a certification from the energy users safety committee (CONSUEL) is required for PV installations below 250 kW, further **improving the quality and the security of PV installations** in France.
- With the new FiT decree introduced in March 2011, DSOs have the obligation to communicate to the government the detailed list of new projects entering the waiting list during each quarter, **allowing a better knowledge on the actual state of connection requests**, and allowing adjustments in the decrease of FiT levels.
- In July 2010, the Law Grenelle 2 defined a **clear time limit for the connection of small installations** (< 3 kW) to the grid, reducing the uncertainty for investors; however no penalties have been defined yet.
- This law also foresees a regional development of RES. Each region has to define its own RES plan, in accordance with the EU directive and objectives. This disposition allows for a **better capacity for developers to plan for new projects**.

The soaring market development observed until the end of 2010 in France was stopped with the introduction of a restrictive support framework in March 2011. It limits the support via FiT to projects up to 100 kW. For systems above 100 kW, calls for tender are used, postponing the development of larger projects. Therefore, even if the annual connected power will be 1.4 GW in 2011, it will be due to the 2010 market. New projects in 2011 will barely reach 500 MW, which means a small grid connected market next year. In addition, a very high number of barriers that need to be removed to ease the development of projects still exist.

Germany

National data

Total PV capacity installed end 2010	17.2 GW	2010 market Type of market	7.4 GW Developed

PV industry survey results

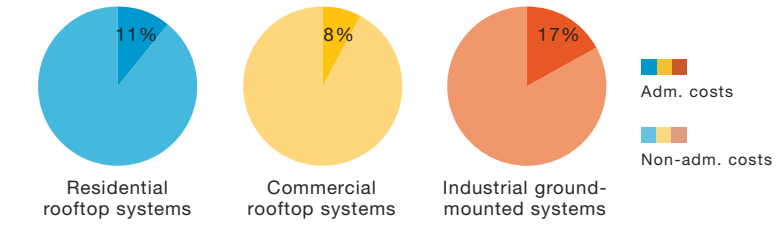


Figure D.1 - Share of administrative costs in total project development costs (excluding PV equipment)

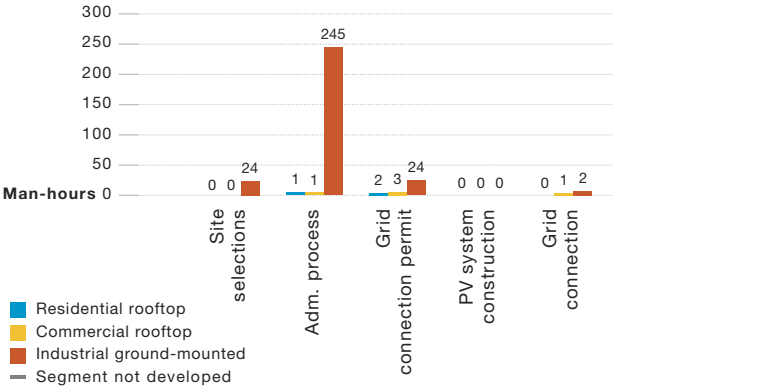


Figure D.2 - Breakdown of process administrative labour requirements (man-hours)

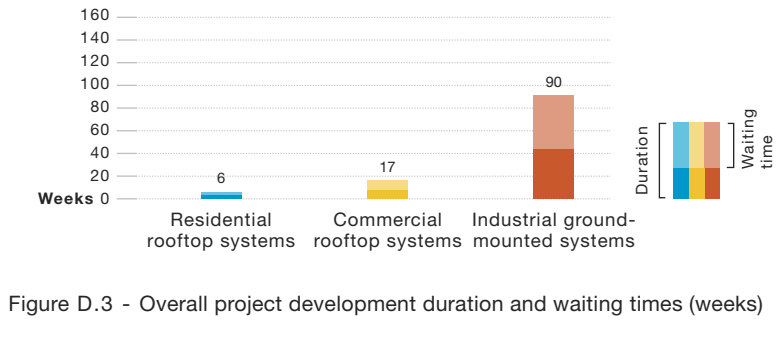


Figure D.3 - Overall project development duration and waiting times (weeks)

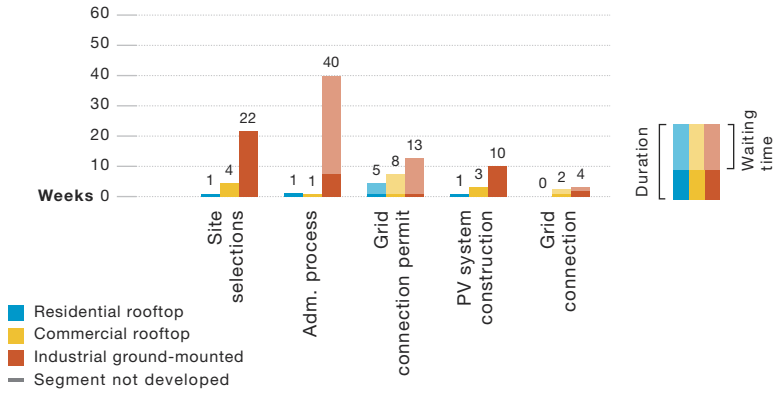


Figure D.4 - Breakdown of process duration and waiting times (weeks)

Germany is the most developed market in Europe throughout all market segments. Its experience in developing PV systems allows a clear analysis of the situation regarding legal-administrative barriers and the formulation of some synthetic recommendations.

Summary of market segments

Residential rooftop systems: Whether a rooftop system requires a planning permission is not always clearly defined by law. Therefore contacting the building authority is recommended. The application for grid connection is often quick and problem-free. However, longer waiting periods and inappropriate connection fees are foreseen in an increasing number of cases.

Commercial rooftop systems: The commercial segment is the largest segment in Germany. The main obstacle here is the grid connection process. Long waiting times and unreasonable connection fees are important concerns for project developers. In addition it is not always clearly defined by law whether a PV system requires a planning permission. Installing a PV system in monument protection areas can be difficult (also for residential rooftop systems).

Ground-mounted systems: Permitting procedures are often onerous and expensive. The eligibility for Feed-in Tariff payments is limited to ecologically less valuable areas, meaning that the development of this market sector is limited and finding suitable areas may turn out to be difficult. The application to grid connection is often very difficult and lengthy.

	Barriers	Recommendations
Permitting procedures	• Spatial planning and building laws often hinder the construction of PV systems.	• Waive building permits for all rooftop PV systems.
Grid connection rules & technical standards	• PV industry is not involved in the definition of technical standards.	• Participation of the renewables sector in defining technical standards.
	• Technical standards are not adapted to PV.	• Define clear grid connection rules and technical standards and create a clearing point for technical questions.
Grid connection procedures	• Grid connection delays and difficulties.	• Define a legal entitlement of PV systems operators to the conduction of a connection study by the grid operator. • Clearly define steps leading to the attribution of connection point.
Grid capacity issues	• Missing extension of the distribution network capacities.	• Evaluate grid extension costs by regulator. • Develop regional grid concepts by grid operators. • Name a catalogue of criteria for the determination of the economic reasonableness of the grid extension. • Publish information on the availability of grid capacity.

Results and future developments

Throughout the duration of the project, **significant improvements** have been observed in Germany, which already benefits from one of the leanest processes in Europe in terms of administrative-legal requirements for the development of PV systems.

Improvements in the definition of areas eligible for Feed-in-Tariffs, or on the conditions for commissioning of PV systems, have been clarified by the German **"Clearingstelle"** (clearing point for legal questions on the implementation of the German Renewable Energy Act) in 2010. These clarifications, even if not legally binding, are respected by most involved parties.

At the beginning of 2011, additional improvements have been made. In March 2011, through the implementation of the **European RES Directive**, a precise timeframe for processing grid connection requests has been set, and grid operators have to provide a detailed cost estimate for the connection.

Concerning the issue of overfrequency protection, in April 2011, the **"Forum Grid Technology/Grid Operation" (FNN)** has adopted a solution taking into account the recommendations from the PV industry. For years the industry had asked for certain recommendations to be put forward. The increased involvement of the solar industry in the activities of the FNN is one of the recommendations formulated by BSW-Solar and the PV LEGAL consortium in order to reduce legal-administrative barriers to the grid integration of PV in Germany and other European countries. In August 2011, a solar-friendly revision of building law regulations was adopted at Federal level by the German government, easing building law requirements for solar energy in outside areas. At State level, several States are waiving building permits for all types of rooftop PV systems.

Although the complexity of planning processes is relatively low in Germany, compared to other European countries, there are still some hurdles for the development of larger projects. With over 800 network operators, the grid connection process is by no means uniform throughout Germany and the experience developed will help standardise the process.

Greece

National data

Total PV capacity installed end 2010	206 MW	2010 market	150 MW
		Type of market	Growing

PV industry survey results

Despite its favourable conditions, Greece being one of the sunniest countries in Europe, the Greek market has so far failed to achieve its actual potential. The reasons for this slow take-off lie mainly in bureaucracy and a difficult financing environment, nevertheless the situation could rapidly evolve positively.

Summary of market segments

Residential rooftop systems: The new legislation in place since mid-2010 has removed most of the barriers and the authorization process has been simplified. Though the residential segment is still relatively small, it is expected to grow dynamically as banks are now offering up to 100% financing for this sector.

Commercial rooftop systems: The market development of the commercial segment, which is still small, is expected to gain importance as most of the barriers have been lifted. Before the changes the authorisation process was very time consuming, but has improved considerably with the exception of waiting time for the connection to the grid.

Ground-mounted systems: The same advantageous uplifting of barriers occurred for ground mounted segment. Simplified procedures, removal of requirements for special permission and production licences for systems up to 1 MW will further help to develop this segment, although waiting times for getting an offer for connection to the grid should decrease considerably.

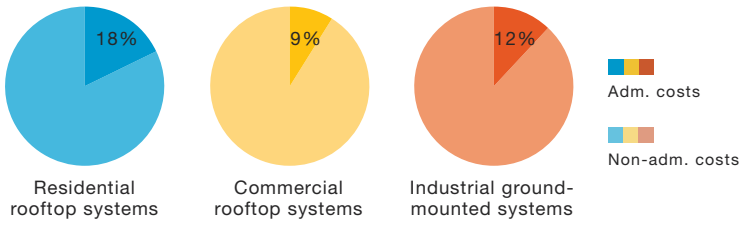


Figure E.1 - Share of administrative costs in total project development costs (excluding PV equipment)

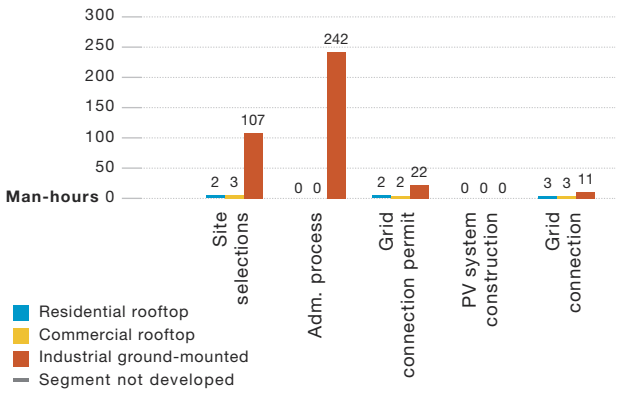


Figure E.2 - Breakdown of process administrative labour requirements (man-hours)

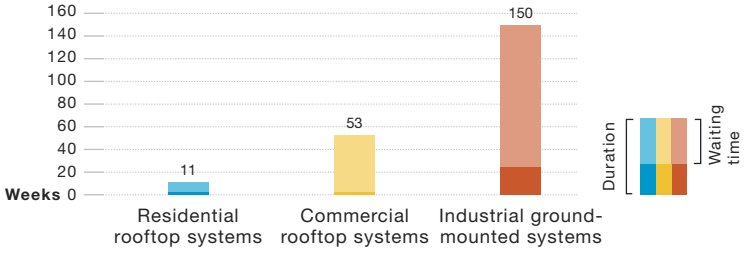


Figure E.3 - Overall project development duration and waiting times (weeks)

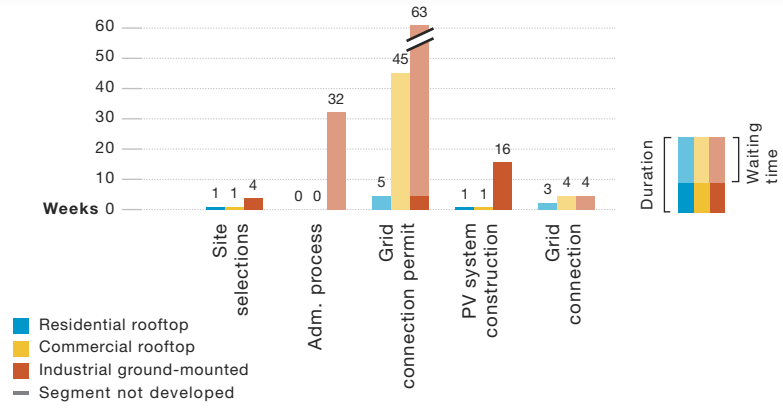


Figure E.4 - Breakdown of process duration and waiting times (weeks)

	Barriers	Recommendations
Permitting procedures	• Non-transparent, complicated and lengthy permitting procedures.	• Grant authorisation if time limits are not respected. • Get rid of unnecessary permits and involve more staff in the permitting procedures.
	• Specific permitting procedures/ environmental impact assessment delays the development of PV systems.	• One-stop-shop service for these permissions and reduce the waiting time for them.
	• Production licence and register are requested.	• Abolish the procedure for the production licence.
Grid connection rules & technical standards	• Lack of clarity and transparency of technical standards and grid connection rules.	• Include PV sector in the development of new voltage networks. • Harmonise the electric grid regulation for PV installations. • Inform on grid connection procedures and make the waiting list more transparent and publicly available.
Grid connection procedures	• Lengthy and complicated grid connection procedures.	• Define clear guidelines and timeframes for grid connection offers and extend grid appropriately.
Grid capacity issues	• Virtual saturation of the grid.	• Perform periodical grid analysis and set-up regional grid development concepts. • Ensure public availability of grid data. • Set legal provisions for grid reinforcement and recovery of costs, clear deadlines and incentives for grid extension. • Prevent speculation on grid connection permits.

Results and future developments

Since the beginning of the PV LEGAL project, significant progress has been observed in Greece - in particular regarding the residential rooftop segment and larger systems up to a certain extent. In autumn 2010 a series of Ministerial Decisions helped simplify the authorisation process. More specifically the progress includes:

- New applications for large PV systems are no longer frozen; they can now be filed to the Regulatory Authority for Energy.
- **Production licences are no longer needed** for systems smaller than 1 MW.
- Rooftop systems of any size no longer require environmental permitting, while procedures have become easier for ground-mounted systems.
- **Residential systems can now be installed in all regions** (previous regulations excluded the autonomous island grids).
- Applications previously excluded (such as **facades, louvers, warehouses, carports, etc.) are now feasible** in the residential sector.
- Installation of PV systems on prime agricultural land is now allowed with certain limitations.
- A 150 €/kW bank guarantee is needed for ground-mounted systems up to 1 MW before the signing of a grid connection contract.

In April 2011 a new ministerial decision was adopted which further simplifies authorisation procedures for PV systems. It clarifies issues related to permits needed by Urban Planning authorities. This new decision however has re-introduced further barriers for systems installed on historic buildings and heritage areas thus blocking installation of small rooftop systems in those cases. Since the end of 2010, following the positive changes introduced, there has been a new wave of applications, creating a grid-connection bottleneck. Getting an offer for grid-connection is now the major barrier for investors. In addition the difficult access to capital due to the financial crisis is currently constraining the development of PV. Although the situation has largely improved some barriers in the administrative and grid integration process remain to be lifted.

Italy

National data

Total PV capacity installed end 2010	3.5 GW	2010 market	2.3 GW
		Type of market	Developed

PV industry survey results

Italy has experienced an important development in recent years since the adoption of a favourable support framework. However the level of Feed-in Tariffs often indirectly finances the cost of complex and long administrative procedures. A real simplification and streamlining of procedures would allow the FiTs to finance the actual cost of the system.

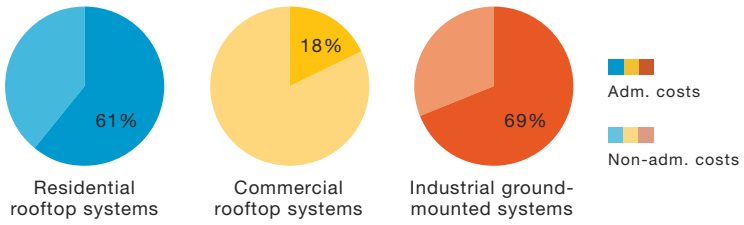


Figure F.1 - Share of administrative costs in total project development costs (excluding PV equipment)

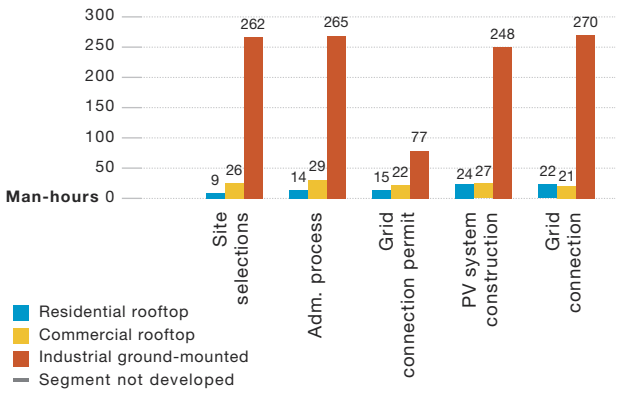


Figure F.2 - Breakdown of process administrative labour requirements (man-hours)

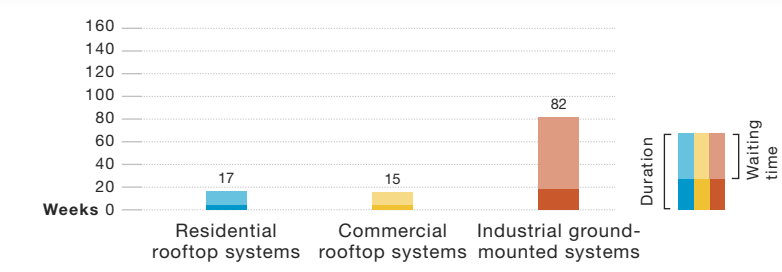


Figure F.3 - Overall project development duration and waiting times (weeks)

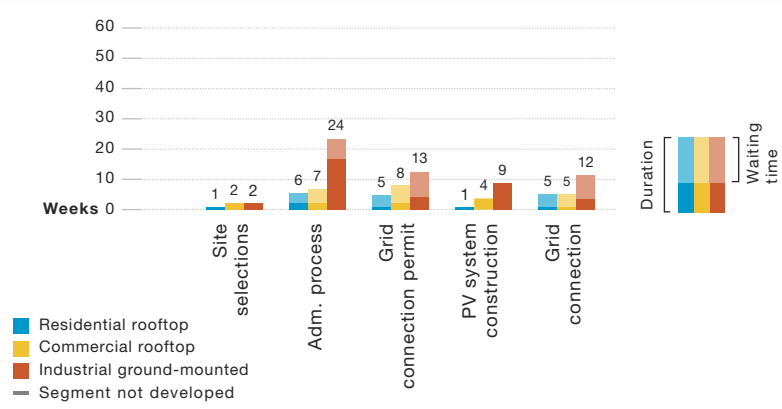


Figure F.4 - Breakdown of process duration and waiting times (weeks)

Summary of market segments

Residential rooftop systems: For the residential sector, the authorisation process is relatively simple, requiring the filling out of a Simplified Administrative Procedure (PAS) or, in some cases, a simple communication addressed to the Municipality.

Commercial rooftop systems: The IVth Conto Energia provides important simplifications for the segment, allowing the installation of systems up to 1 MW with a PAS. Regional differences still represent potential barriers at legal-administrative level. On the other hand, the instability of the legal framework has negatively influenced the whole PV market sector, investors are more diffident while credit is more difficult to get.

Ground-mounted systems: The IVth Conto Energia introduced strong limitations for ground-mounted systems and set up a registry procedure with monetary hard cap to limit the installed power and the related expense. A significant reduction of this segment is foreseen in coming years.

	Barriers	Recommendations
Permitting procedures	• Non-transparent, complicated and lengthy permitting procedures/ Speculative market for authorisation.	• Implementation of national guidelines at regional level and simplification of the authorisation process. • Special training on PV systems for administration staff.
	• The registry for "big systems" is a critical procedure that damages and delays development of the sector.	• Abolish the registry for "big systems".
	• Certification of Municipality for operator declaring valid entitlement of plant construction.	• Unnecessary step: declaration should be abolished.
	• Specific permitting procedures delay PV development.	• Landscape evaluation should be streamlined and simplified. Exemptions should be extended.
Grid connection procedures	• Insufficient standardisation of procedures.	• Actions needed to reduce the non uniformity of grid connection procedures. Standardise communication procedures between the DSO and the person/company responsible for the system.
	• Lengthy and complicated grid connection procedures/Speculation on grid connection points.	• Introduce economic compensation for PV project developer when time limits are not respected by DSOs and authorities. • Simplify grid connection procedures.
Grid capacity issues	• Virtual lack of grid capacity/PV moratorium.	• Limit speculative grid connection applications. • Grid development should go hand-in-hand with permitting of new systems.
	• Missing expansion of the distribution grid capacity.	• Foster more investment on grid infrastructure and smart grid solutions. • Incentives for PV systems with a predictable output profile should be brought back in the agenda and implemented.

Results and future developments

Since the beginning of the PV LEGAL project some significant progress has been observed in Italy regarding administrative processes and connection of systems to the grid. In 2010, **National Guidelines for Unique Authorisation** ("Autorizzazione Unica": the centralised procedure for the authorisation of PV Systems) were published. In 2011, two decrees changed once more the reference framework introducing new norms that also affect the Guidelines, particularly concerning ground-mounted systems. In addition the Gestore dei Servizi Energitici (GSE) is, since 2010, responsible for setting up an **online process** for Feed-in Tariff requests, which is today operational. Some problems have been reported, particularly with regard to the online application for the registration of "big systems".

As regards grid connection permitting, several improvements have been observed:

A revised Unified Text for Active Connections (TICA) was also published in 2010, aiming at introducing **swifter connection procedures.** It provides for more transparency in the communications between the grid operators and project developers and introduces provisions concerning reduction of speculative connection requests. However it has created another concern over the payment of guarantees for systems falling into "critical areas" or "critical lines". This point and the relevant articles of the TICA are suspended and new solutions are being proposed by the Authority (AEEG).

Italy is currently experiencing significant market growth rates. There is a risk that new hurdles will slow PV's development; financial support should be adapted to regulate the overflow of new projects. The definition of a National Energy Strategy and of a National Energy Plan are urgent and necessary to define new targets for RES on the longer term. The stabilisation of the photovoltaic legal-administrative framework is fundamental for any future development.

The Netherlands

National data

Total PV capacity installed end 2010	96.9 MW	2010 market Type of market	29 MW Emerging

PV industry survey results

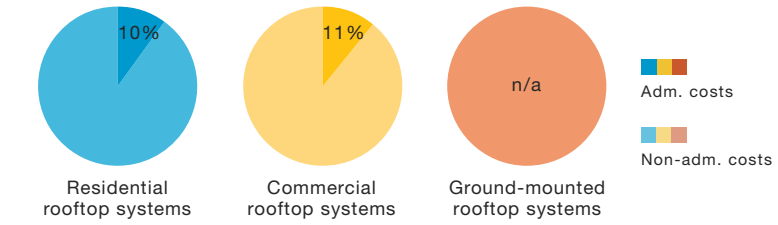


Figure G.1 - Share of administrative costs in total project development costs (excluding PV equipment)

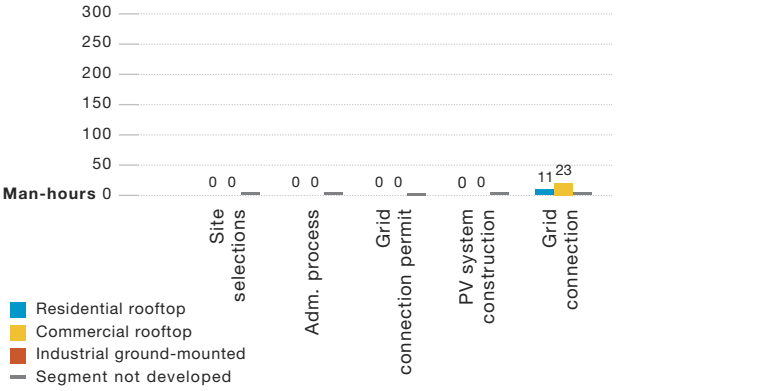


Figure G.2 - Breakdown of process administrative labour requirements (man-hours)

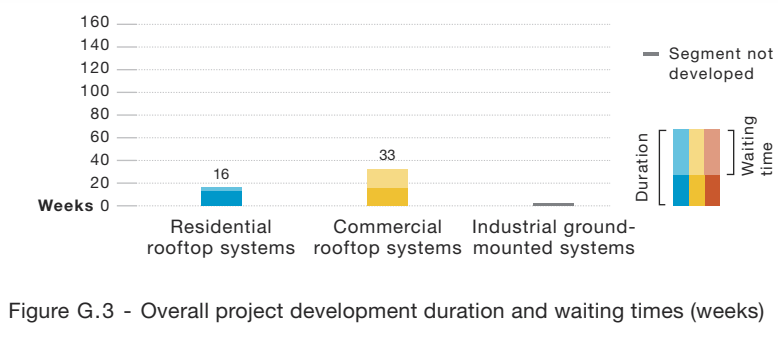


Figure G.3 - Overall project development duration and waiting times (weeks)

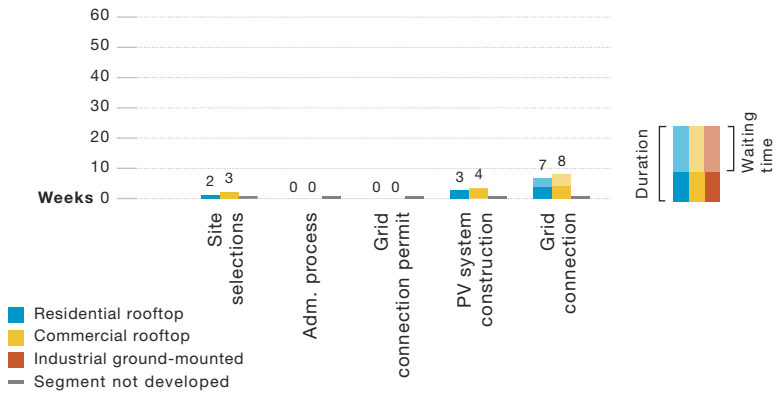


Figure G.4 - Breakdown of process duration and waiting times (weeks)

Until today, the Dutch market has been developing moderately. The Feed-in Tariff scheme was cancelled for PV systems up to 15 kW at the end of 2010. Today, these small size PV systems are being developed thanks to the net-metering scheme in place. A FiT still exists for systems larger than 15 kW. In the Netherlands so far only two segments have been present: residential rooftop systems and medium-sized PV systems on commercial and industrial buildings. Ground-mounted systems are expected to develop as from 2012.

Summary of market segments

Residential rooftop systems: This is the most common application: the building permission procedure is relatively simple and often requires no permit. An exception is made for listed buildings in areas with protected city views, where a building permit is still required. No national quality system exists for PV systems, hindering further development of the market.

Commercial rooftop systems: Connection to the grid requires a series of procedural steps with different authorities. This results in unnecessary cost and extra waiting time.

Ground-mounted systems: The uncertainties regarding financial feasibility for ground-mounted projects, high legal and administrative barriers, in particular for building and grid connection procedures, make the development of the segment very difficult.

	Barriers	Recommendations
Permitting procedures	• Non-transparent, complicated and lengthy permitting procedures.	• Simplify connection procedures with a one-stop-shop system and online procedure.
	• Specific permitting procedures for buildings in areas subject to monumental protection.	• Define criteria for PV systems to be allowed in monumental protection areas and introduce faster and less expensive application process.
Grid connection rules & technical standards	• No barriers identified.	
Grid connection procedures	• Lengthy and complicated grid connection procedures.	• Implement a one-stop-shop system and online procedure for grid connection process. • Facilitate the technical testing procedure.
Grid capacity issues	• No barriers identified.	

Results and future developments

Since the beginning of the PV LEGAL project there have been several changes in the Netherlands. The existing Feed-in tariff was changed in 2011 by the new government. The previous scheme was capped by an annual budget and caused serious legal/administrative barriers. The new scheme facilitates the development of large-scale systems (larger than 15 kW) and ground-mounted applications. Thanks to a net-metering scheme small-scale (up to 15 kW) systems can develop in the residential rooftop segment. In 2011, about 15 MW should be installed thanks to this new scheme, potentially increasing quickly in the years thereafter.

Regarding grid connection procedures, in 2010 some improvements regarding the technical specifications for grid connection across the country were achieved. The **specifications are now the same for all regions.** This progress has resulted in an improvement for PV investors and thus reduced costs and grid connection time.

At the end of 2011 more progress was made with regard to the certification of installers. A national quality assurance program for PV systems and installers is being set up for the beginning of 2012, made up of representatives from the government, the standardisation body, the association of installers, and the national association for the solar energy industry.

A "Green Deal" was signed beginning of October 2011 between the solar sector and the Dutch government aiming at the **introduction of quality certification and better streamlining of the practical application of PV systems.**

This agreement foresees simplifying procedures for the implementation of solar energy by citizens and businesses. Through this agreement Holland Solar will work with the grid operators on:

- **Making information more accessible.**
- Working out the process of offsetting generated energy against own energy consumption (**net-metering**).

Part of the green deal also foresees the removal of bottlenecks in the authorisation procedure for **systems installed on listed buildings** and for city areas with a protected view. Today's procedure often causes complications for the applicants on a municipal level. The state government will work on a uniform directive for municipalities.

This open, closer collaboration between the sector association and the government should help to find adequate solutions fulfilling interests for both parties. These recent improvements are providing some hope for a future long-term development of PV in the Netherlands.

Poland

National data

Total PV capacity installed end 2010	1.75 MW	2010 market	0.37 MW
		Type of market	Emerging

Currently there is no PV market in Poland apart from a few installations for demonstration purposes. The reason is that the support scheme through the green certificate system is still too low to attract PV investors.

Summary of market segments

The market for PV in Poland is relatively new. Therefore, only a few PV systems are installed on residential and commercial buildings. The ground-mounted segment is still emerging.

In general the legal-administrative procedures in the three market segments are very similar thus often inappropriate to the system size. The connection procedure is very complex and non-transparent as the owner must deal with non-standardised requirements from DSOs. Another obstacle is the burdensome administrative process for the licence for renewable electricity production.

Additionally, the installation of PV systems is linked to very rigorous construction law. The production activities such as generating electricity are prohibited on residential buildings standing on areas of the local development plan and may hinder PV development further.

PV industry survey results

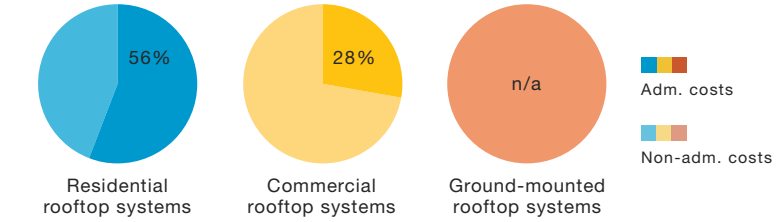


Figure H.1 - Share of administrative costs in total project development costs (excluding PV equipment)

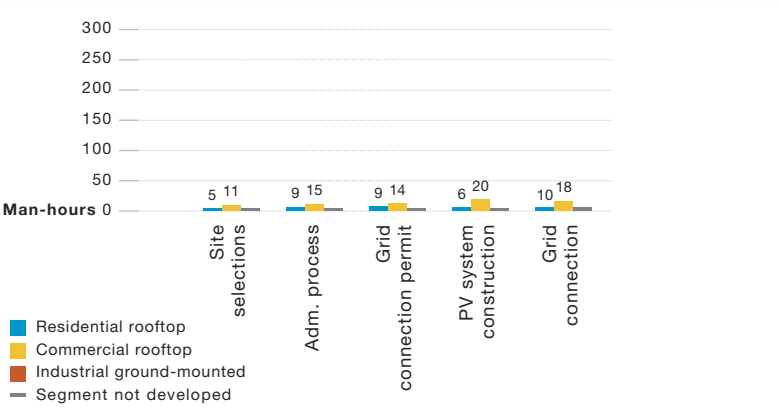


Figure H.2 - Breakdown of process administrative labour requirements (man-hours)

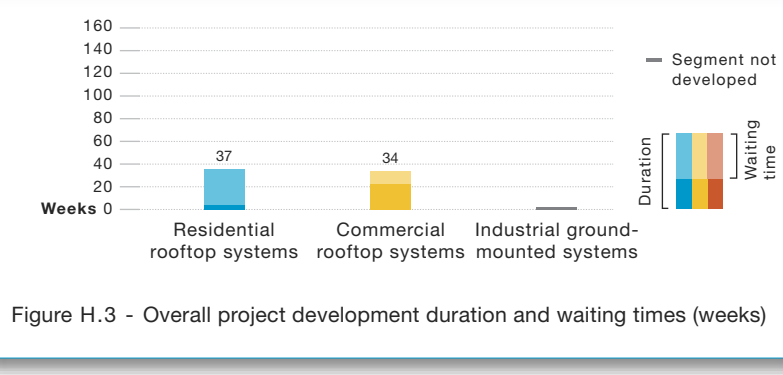


Figure H.3 - Overall project development duration and waiting times (weeks)

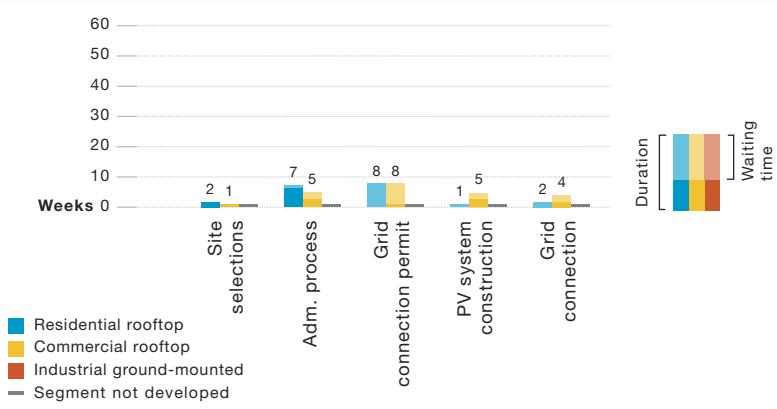


Figure H.4 - Breakdown of process duration and waiting times (weeks)

	Barriers	Recommendations
Permitting procedures	• Long administrative procedure to obtain certificates of origin. • Specific procedures: lengthy production licence process and registration.	• Replace certificates by FiTs, or simplify procedure to obtain certificates. • Abolish the requirement for an electricity production licence for systems up to 30kW.
Grid connection rules & technical standards	• No barriers identified.	
Grid connection procedures	• Non-standardised requirements depending on DSO.	• Set precise and standardised definitions by law and uniform instructions for all grid operators.
	• Lengthy and complicated grid connection procedures.	• Streamline procedures especially for small systems. • Define grid connection procedure by law. • Organise trainings for grid operator.
	• High connection fee.	• Require grid connection cost for systems up to 5 MW to be borne by the DSO.
Grid capacity issues	• No barriers identified.	

Results and future developments

The Polish market has not emerged yet. Nevertheless the potential is there. It is expected that with the adoption of the new RES act, support for PV could increase and **a growing interest for PV on buildings and rooftops is starting to appear among policy makers.**

In terms of legal administrative barriers, some improvements have been observed since the beginning of the project.

A very **clear description of the application process** for obtaining a licence for the production of electricity from renewable energy system has been available since 2010 on the website of the Energy Regulation Office (URE). This information increases the transparency in the legal-administrative process. Lead times are expected to be reduced accordingly. A differentiated approach among large and smaller systems seems to be considered now by the URE.

Since December 2010 **significant progress has been made regarding grid connection procedures:**

- **Deposit payments for the connection of RES systems** to the grid have been introduced. A maximum amount for this deposit which can be requested by the grid operator has been defined (up to 30,000 PLN per MW). Such regulation should secure the investor from excessive level of advance and accelerate the process of grid connection. On the other hand, the necessity to obtain financial resources for the advance may constitute a great difficulty for the investor to accomplish the project.
- **A copy of the Local Land Development Plan must be submitted** to the grid operator together with the grid connection request. In case no such plan exists, the grid operator must be provided with a "decision for area development conditions" by the local authority for the site where the PV system is to be installed (if such a decision is required on the basis of the law on spatial planning).
- **Grid operators must publish the information** on connected projects and available grid connection capacity on their website.

The latest discussions on a potential improvement of the market support to PV offers hope that a PV market in Poland can develop in the future. This support should be in all cases accompanied by streamlined administrative and grid connection processes if the market is to develop.

Portugal

National data

Total PV capacity installed end 2010	130 MW	2010 market Type of market	20 MW Emerging

PV industry survey results

Despite favourable conditions, Portugal being one of the sunniest countries in Europe, the market has not reached its actual potential. This is largely due to overly burdensome administrative processes, as well as a legislative environment that promotes mainly very small PV systems.

Summary of market segments

Residential rooftop systems: The residential rooftop segment is the most important one in Portugal. Changes in the legislative procedure have facilitated the administrative process. A quota of 25 MW is in place making development on top of this cap not probable. The cap for 2012 was further reduced to 10 MW.

The main barrier is still the complicated application of technical regulations which creates high cost and delays due to the changes of grid connection requirements. Other obstacles such as the installations inspection process and grid connection procedures, also delay the development of systems.

Commercial rooftop systems: In this segment the licensing process is working smoothly and with the necessary transparency. Due to the complicated access to the grid (self-consumption of 50% of the produced energy, limitation of capacity) the target of 50 MW in 2011 will not be achieved; for 2012 the cap was reduced to 30 MW.

Ground-mounted systems: In the ground-mounted segment no regular legislation exists or is planned but this did not keep the government at the end of 2010 from distributing in an one single auction licences for a total capacity of 150 MW.

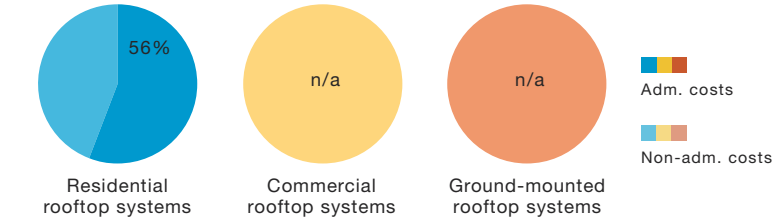


Figure I.1 - Share of administrative costs in total project development costs (excluding PV equipment)

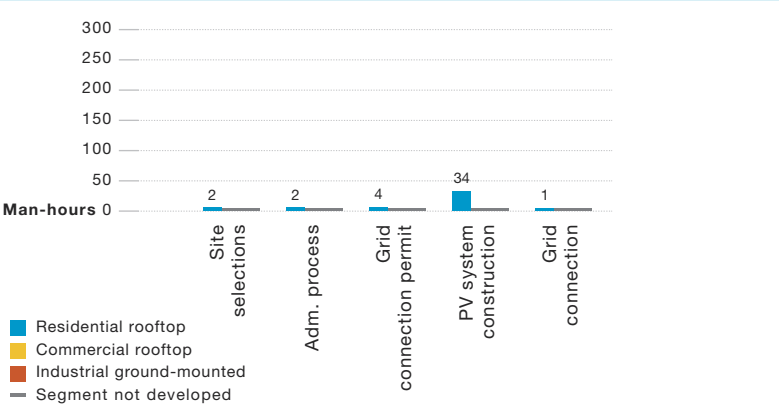


Figure I.2 - Breakdown of process administrative labour requirements (man-hours)

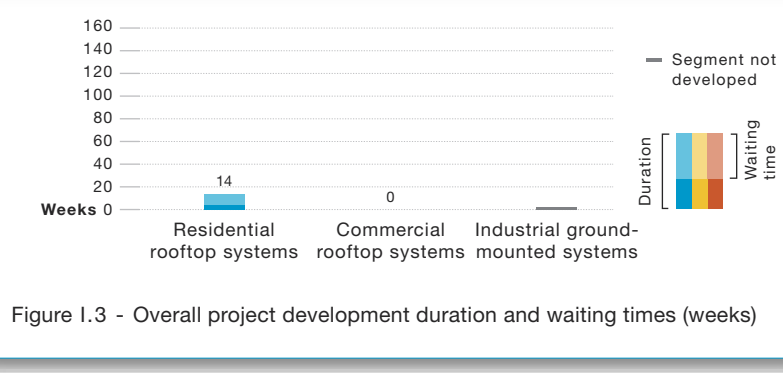


Figure I.3 - Overall project development duration and waiting times (weeks)

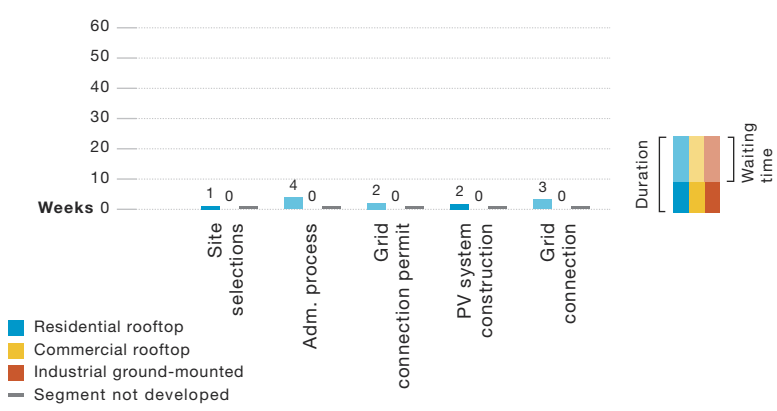


Figure I.4 - Breakdown of process duration and waiting times (weeks)

	Barriers	Recommendations
Permitting procedures	• No barriers identified.	
Grid connection rules & technical standards	• Lack of clarity and transparency of technical standards and grid connection rules.	• Ensure that the technical commission defines clear technical requirements.
Grid connection procedures	• Low standardisation of procedures.	• Introduce specific guidelines and technical rules for the PV sector.
Grid capacity issues	• No barriers identified.	

Results and future developments

Since the beginning of the project, Portugal has shown some progress mainly regarding very small PV systems. Progress in the development of larger systems, in particular in the commercial segment, is still awaited.

In late 2010 new legislation for residential systems allowed for a **significant improvement and led to a transparent and fast licensing process.** The online registration system is now open anytime and a number is automatically attributed for each request. Thus anyone can know where it is situated in the waiting list, bringing transparency to the process. The PV LEGAL project has helped provide all the details on the process and shown where the blockages were located.

In early 2011 the legislation for commercial rooftop systems was published where the Feed-in Tariff for systems up to 20 kW or up to 250 kW was detailed. Yet the same transparency as in the residential segment is not in place. An online licensing system allows for full transparency and avoids what happened in the past for small scale PV systems: the online system collapsed each time the register was opened for new requests. But as the conditions are complicated and systems over 20 kW have to get the licence in an auction, the demand is very low and did not reach the quota.

Slovenia

National data

Total PV capacity installed end 2010	36 MW	2010 market	27 MW
		Type of market	Growing

Slovenia is a small country but there is definitely potential for developing a PV market contributing to the 2020 targets for renewable energies. Nevertheless since photovoltaic is a completely new field there are still significant obstacles in place.

Summary of market segments

Residential rooftop systems: The residential sector is not yet very developed and remains hindered by complicated and time-consuming grid connection procedures. In addition the criteria for the application process are unclear and different for each DSO.

Commercial rooftop systems: The most developed segment is for small- and medium-sized PV systems. The main problem is the broad range of regulations faced during grid connection procedure and the lengthy period for obtaining subsidies after the grid connection has been made.

Ground-mounted systems: The main obstacle in this segment is the application process for building permits, which can take several months. There is a 5 MW yearly limit cap for ground-mounted PV systems. The same barriers exist as for the residential and commercial rooftop segments and hinder future development.

PV industry survey results

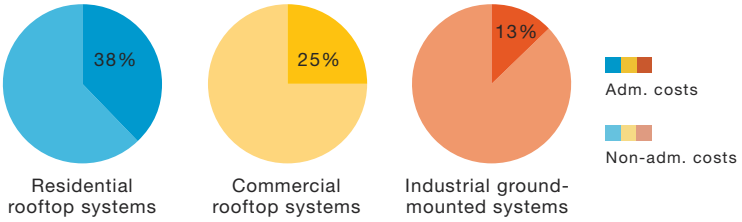


Figure J.1 - Share of administrative costs in total project development costs (excluding PV equipment)

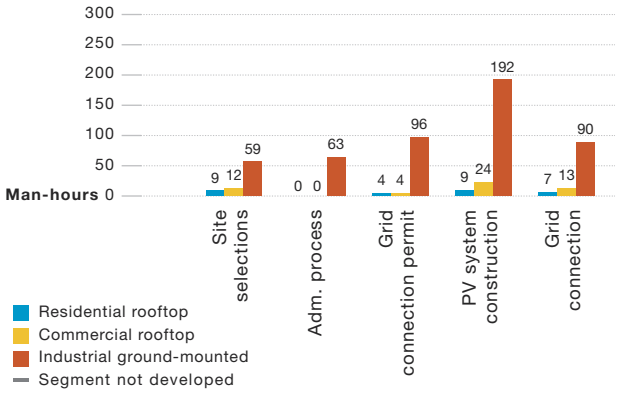


Figure J.2 - Breakdown of process administrative labour requirements (man-hours)

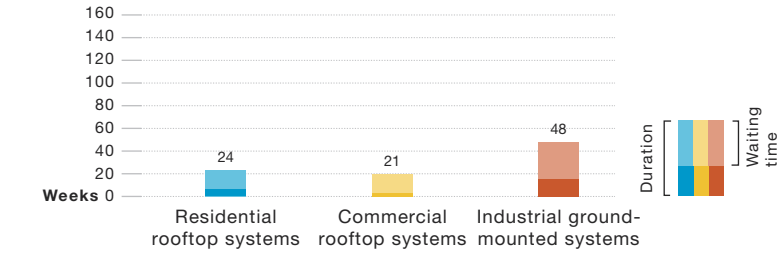


Figure J.3 - Overall project development duration and waiting times (weeks)

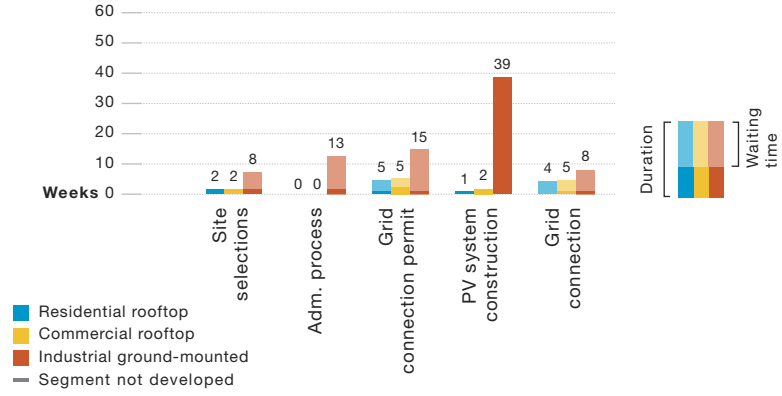


Figure J.4 - Breakdown of process duration and waiting times (weeks)

	Barriers	Recommendations
Permitting procedures	• Spatial planning often hinders the constriction of PV systems.	• Allow spatial plans for the construction of renewable energy systems.
Grid connection rules & technical standards	• No barriers identified.	
Grid connection procedures	• Non-uniform rules for connection procedure.	• Prepare clear and transparent system operation instructions for the electricity grid.
	• Lengthy and complicated grid connection procedures.	• Publish guidelines for the system operation. • Define steps for the grid connection ` of PV systems.
Grid capacity issues	• No barriers identified.	

Results and future developments

Since the beginning of the project, some improvements have been observed in Slovenia, reflecting a willingness to let the market develop.

In the past, only legal entities or private entrepreneurs could participate in the Feed-in Tariff support scheme. This was a problem for individuals, who did not want to formally start a business for the purposes of installing a PV system on their rooftop. To change this situation, an amendment to the Energy Act was adopted and published in the Official Journal of Slovenia on the 8th of March 2010. This improvement has clearly helped to **facilitate the development of PV systems in the residential sector.**

Some progress has also been made regarding building permits. In the past investors who were already in the process of installing PV systems did not know whether they would need to obtain a building permit. The matter was resolved in September 2010 with the publication of an ordinance that establishes the conditions for the installation of PV systems and their connection to the electricity grid. PV systems up to 1 MW have been classified as simple devices for producing electricity, whose installation is considered as an investment and maintenance work for which there is no need of a building permit anymore. As a condition for the installation without a building permit, there are specific requirements regarding how the investor must look after the PV system. The final provisions of the Ordinance also foresee that PV power plants installed without a building permit before the enactment of the amended Ordinance are also to be classified as simple devices for generating electricity and shall not be removed as long as they comply with the current regulatory requirements.

In May 2011 the **instructions for connecting and operation of power plants** of installed electrical capacity up to 10 MW as a part of the System Operating Instructions for the Electricity Grid (SOIEG) were published. These instructions do not actually reduce the number of steps to connect PV systems to the grid but provide technical conditions about grid connection and clearly define steps leading to the connection.

The progress made in recent years mainly concerns small- to medium-size PV systems. Some more improvements still need to be done in particular with regard to grid connection procedures or administrative aspects which should reduce the overall duration of these processes and facilitate the deployment of PV systems in Slovenia.

Spain

National data

Total PV capacity installed end 2010	3.98 GW	2010 market	439 MW
		Type of market	Growing

PV industry survey results

Spain's market since 2009 has been particularly constrained. After an exceptional growth in 2008, severe barriers have been introduced to limit the growth of PV in Spain, having a detrimental effect on the Spanish PV industry and the image of PV in the mind of Spanish citizens. The market level in Spain today is far below its actual potential, especially considering its exceptional irradiation levels. During 2010 and 2011 the Spanish PV market has reached more than 400 MW.

Summary of market segments

In addition to lengthy administrative procedures the most important impact for the market is the pre-allocation registration — a very long and bureaucratic process on which the eligibility of every PV project depends.

Another barrier is the grid connection process often linked to restrictive technical standards and non-transparent economical cost.

The project procedure is almost identical for the residential, commercial rooftop and ground-mounted systems. Thus compared to larger systems developers of small systems are confronted with disproportionate administrative requirements and very high cost of installations hindering the deployment of photovoltaics.

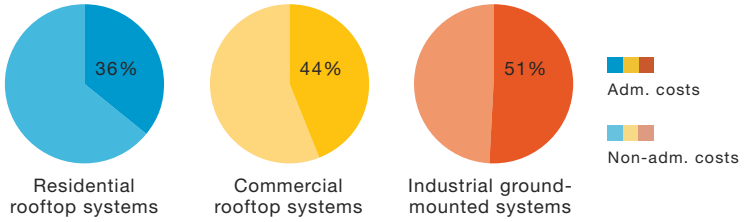


Figure K.1 - Share of administrative costs in total project development costs (excluding PV equipment)

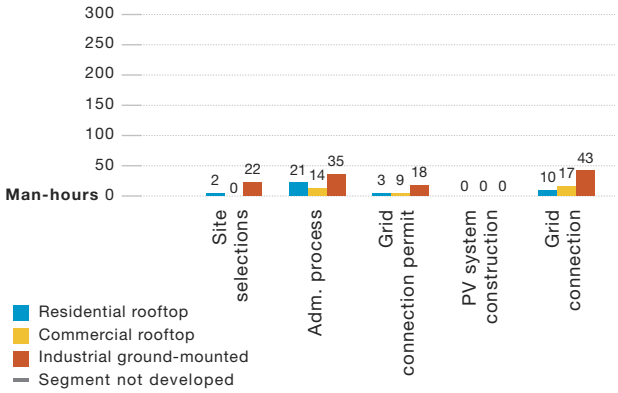


Figure K.2 - Breakdown of process administrative labour requirements (man-hours)

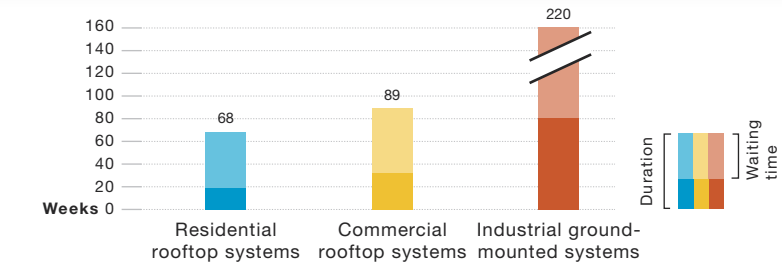


Figure K.3 - Overall project development duration and waiting times (weeks)

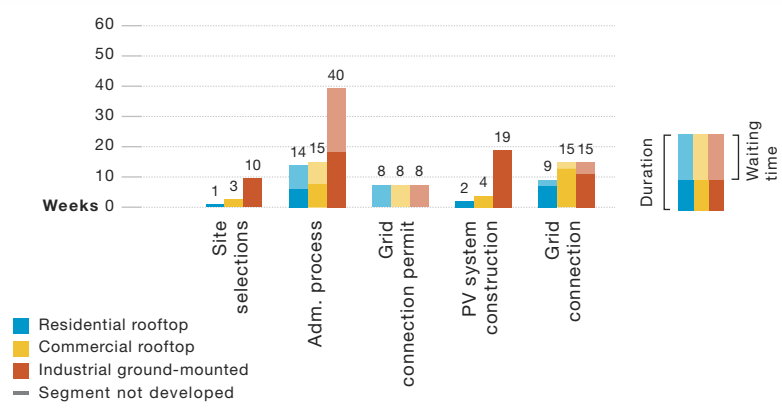


Figure K.4 - Breakdown of process duration and waiting times (weeks)

	Barriers	Recommendations
Permitting procedures	• Non-transparent, complicated and lengthy permitting procedures.	• Simplify procedures for small systems below 10kW and exempt them from getting permission.
	• High fees for building permission.	• Lower the fees and taxes for PV systems.
	• Very long and bureaucratic procedure to enter pre-allocation register.	• Abolish pre-registration process or simplify the procedure.
Grid connection rules & technical standards	• PV installations connected to high voltage must adapt to the new technical requirements of voltage dips, telemetry and control centres.	• Extend the expiration date set by the government to comply with the requirements of voltage dips.
Grid connection procedures	• High grid connection fees.	• Reduce connection costs for small installations. • Grid operator should justify grid connection cost.
Grid capacity issues	• Missing extension of the distribution network capacities.	• Create discussion groups with industry and grid operators on network development.

Results and future developments

The current focus of the Spanish Government is on economic issues related to PV and not on improving legal-administrative procedures. Therefore, it is currently very difficult to convince the government to implement the PV LEGAL proposals, such as removing the existing market cap, as the government may consider this suggested action incompatible with the desired tight economic control.

The Royal Decree of December 2010 limited the equivalent hours of PV installations of producing electricity and receiving the Feed-in Tariff. It also limited, **retroactively**, the compensation for the installations applicable under the legal regime of the RD 661/2007. This constraint is valid until December 2013, however these installations will receive the feed in tariff for 30 years.

Nevertheless, since 2010 Spanish market actors have been expecting the publication of a **new Royal Decree which should considerably simplify the administrative requirements** for the development of PV systems. Amongst other things, this decree should:

- Remove the need to obtain an administrative permit for all PV installations of up to 100 kW connected to the low voltage grid.
- Introduce a major simplification of the grid connection process of PV installations of up to 20 kW, provided the PV installation is associated to an electrical consumption of equivalent or higher power at the same connection point.
- Reduce bureaucracy for connecting PV installations of up to 10 kW as these will be permitted to connect to the internal low voltage electricity network, instead of connecting to the medium voltage grid.
- Allow for users to connect to the low voltage grid of the PV owner, when this same owner, as a consumer, connects to the grid in medium voltage.

Additional legal-administrative improvements for PV installations of up to 10 kW will also be introduced through the adoption of a net-metering scheme. This new scheme could avoid having to go through the pre-allocation register which considerably slowdowns the development of PV systems. The Royal decree has not yet been adopted and has been under discussion since 2010; the longer it takes to enter into force, the longer it will take for the market to start developing again.

United Kingdom

National data

Total PV capacity installed end 2010	66 MW	2010 market	45 MW
		Type of market	Growing

PV industry survey results

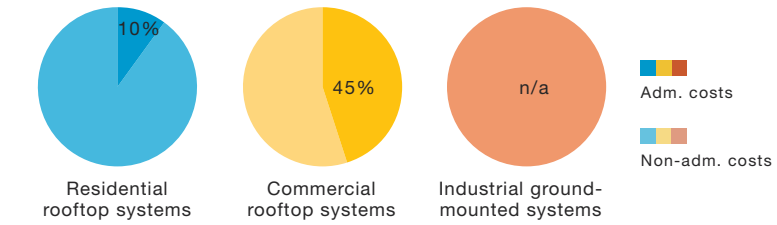


Figure L.1 - Share of administrative costs in total project development costs (excluding PV equipment)

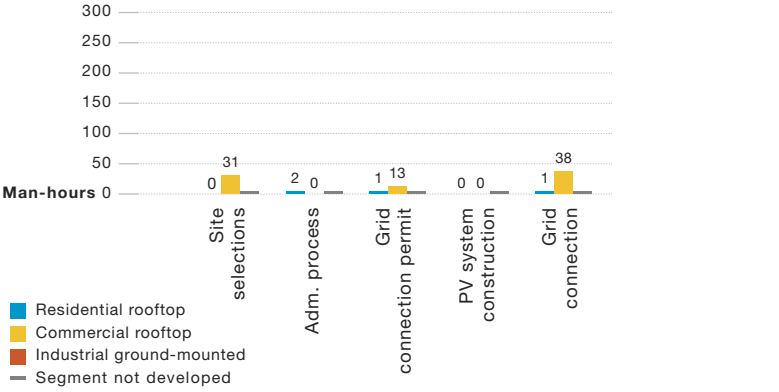


Figure L.2 - Breakdown of process administrative labour requirements (man-hours)

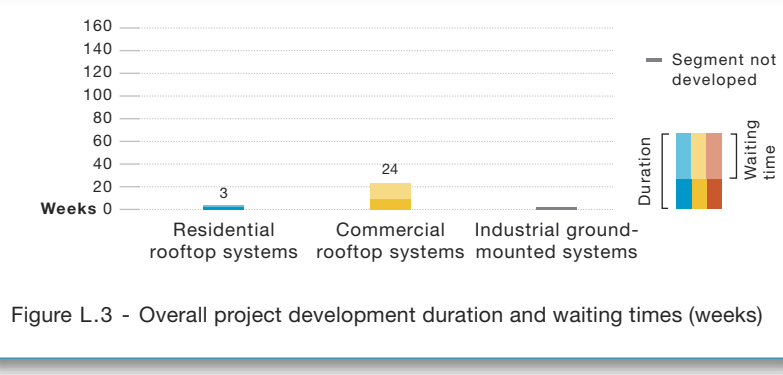


Figure L.3 - Overall project development duration and waiting times (weeks)

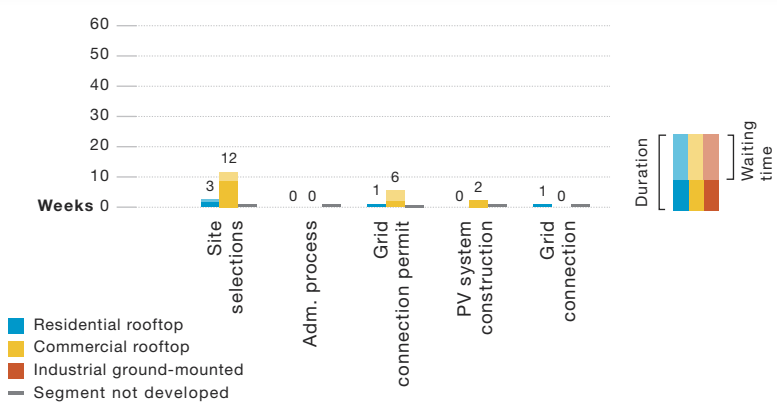


Figure L.4 - Breakdown of process duration and waiting times (weeks)

The PV market has been growing at an extremely rapid pace in UK since the introduction of the FiT scheme in April 2010. However since mid 2011, the support to large PV systems (over 50 kW) has been considerably reduced, prohibiting the development of systems above this size. Thus the PV LEGAL project concentrates only on the residential and commercial segments in England.

Summary of market segments

Residential rooftop systems: The segment is divided into two sub-segments (single and multiple installations) resulting in different planning, grid access and grid connection procedures. Compared to larger scale systems there are few legal and administrative barriers for single domestic PV installations as, in theory, planning and grid connection permission is not required.

Commercial rooftop systems: The less common segment in England for medium and large scale commercial installations requires planning and grid connection permits making the process more costly and lengthy. Grid expansion requirements (and its waiting time) to cope with installations result in additional costs for PV system developers. This unknown cost escalation factor restricts the viability of projects and is a reason why the market for this segment is smaller than the residential one.

	Barriers	Recommendations
Permitting procedures	• Unclear, complicated and lengthy permitting procedures.	• Strengthen communication between industry, communities and local department publishing technical notes to clarify (building) regulations changes. • Increase training provision about changes in planning law for local authority which also should be consistent nationally and be followed throughout the country.
Grid connection rules & technical standards	• No barriers identified	
Grid connection procedures	• Connection procedure covers a wide range of connection sizes – from small to large PV systems.	• Develop "type-certified" recommendation with DSO and the PV sector.
Grid capacity issues	• Required expansion of the distribution grid capacity.	• Require DSOs to create a detailed map of their area showing where in the UK grid is strong or weak, showing investors where risk is likely to be higher. • Provide public funding for grid expansion costs. • Set limits to the fees DSOs can charge based on the power capacity of installations.

Results and future developments

The introduction of the Feed-in Tariff has led to rapid growth in the UK PV market over the past year. Cuts to support for PV systems above 50 kW have not stopped the development of smaller applications and indeed this is where growth has been concentrated just recently.

In terms of the legal and administrative barriers identified, some progress has been made since the start of the project. There are two key points to note so far:

- Local Authority Building Control has issued a **guidance note on solar PV installation.** It should reduce confusion amongst Building Control departments around the country regarding the eligibility/capability of companies and individuals to install solar PV panels on domestic buildings. It will thus reduce costs given that additional surveys and checks were imposed on householders.
- A **review of the connection standard for small scale generators** is being conducted. This standard enables the generator to simply 'connect PV systems up to a certain level and inform' the DSO. It is hoped that public consultation on the revised standard can begin in either mid December 2011 or early January 2012.

The Government is now consulting on additional tariff cuts for smaller systems of up to 250 kW. If the cut is as strong as announced (over 50% on current FiT level) these changes will place a significant dampener on investor confidence and UK solar PV market growth in the near future. The reduction in financial support for solar PV in the UK further increases the need to remove as many legal and administrative costs from the process of solar PV installation as possible.

APPENDIX I:
PV LEGAL PROJECT METHODOLOGY

The European project PV LEGAL, co-financed by the European Commission within the "Intelligent Energy Europe" programme, was carried out by 13 national PV industry associations, the European Photovoltaic Industry Association EPIA and the consultancy eclareon GmbH, coordinated by the German Solar Industry Association, BSW-Solar.

Over the 30 months of its duration starting in July 2009, The PV LEGAL project workflow was articulated in three main phases:

- **Phase 1:** Initial research and analysis on legal-administrative processes and barriers for the development of PV systems in the 12 countries participating in the project. This first phase resulted in the creation of the PV LEGAL database.
- **Phase 2:** Formulation of recommendations for the removal of the identified barriers. This culminated in the preparation of the advisory papers and their discussion at the national and regional forums organised in each country.
- **Phase 3:** Final presentation and advocacy of the conclusions of the advisory papers to national and regional decision makers invited to participate in several, dedicated review workshops.

Figure 8 - PV LEGAL project workflow

Assessing barriers: PV LEGAL research and database

The scope of the initial phase of the PV LEGAL project was to research and gather detailed information about the development of PV projects and the legal-administrative barriers associated with such projects in several European countries: Bulgaria, Czech Republic, France, Germany, Greece, Italy, Netherlands, Poland, Portugal, Slovenia, Spain and England.

The PV LEGAL research covered 3 distinct PV market segments:

- Residential rooftops: small scale installations on residential buildings (Segment A)
- Commercial rooftops: small to medium scale installations on commercial buildings (Segment B)
- Industrial ground-mounted: medium- to large- scale ground-mounted installations on open lands (Segment C)

In some cases, when different legal-administrative requirements apply to PV systems within the same market segment, these systems were gathered into different sub-segments.

Focus of the research: legal-administrative barriers

The focus of the PV LEGAL research was to identify and analyse all legal-administrative barriers that investors and project developers face when setting up a PV project. PV LEGAL considers legal-administrative barriers to be those involved in the administrative processes that are set-up by regulations stemming from government bodies or grid operators and which disproportionately delay the deployment of PV in Europe.

These barriers are constituted by requests from authorities or grid-operators for information and data, such as application forms, registrations, licences, reports and others. Such regulations can result in a considerable load of paperwork required to fulfil the obligations. Delays may also be constituted by internal working and reporting processes within authorities or grid operators that may willingly or unwillingly delay PV projects. This may be due to inefficient authorities or simply to a lack of experience with regard to the handling PV projects. Both intentional (e.g. rules for environmental protection) and unintentional (e.g. grid connection regulations which do not fit to small residential buildings) barriers have been the focus of our research.

PV Industry survey

In order to corroborate the results of the initial desktop based research, the project consortium researched quantitative data (such as duration, costs and waiting times) involved with the processes and barriers identified, drawing from the hands-on experience of the national PV industry stakeholders. Depending on the size of their PV market, the PV LEGAL project partners conducted enough interviews to get a significant sample of PV companies operating in each segment.

The methodology used for the interviews was based on the internationally accepted Standard Cost Model (SCM). The SCM Network is a collaborative international working group sharing experiences and knowledge to reduce administrative burdens by addressing unnecessary bureaucracy and red tape.[1] The network has developed a methodology that is currently used by most EU countries and the European Commission to quantify administrative burdens. Since the methodology developed by the SCM network aims at quantifying administrative burdens for national administrations, the PV LEGAL consortium adequately adapted its methodology in order to address the administrative burdens for PV industry stakeholders.

The PV LEGAL database

The results of the research were initially published in May 2010 in the form of a database publicly accessible on the PV LEGAL website. The database provides users with detailed information about the PV project development process in the different segments and sub-segments of the national PV markets, making extensive use of flowcharts and overview tables. The database content has been updated twice over the duration of the project, the first time in December 2010 and the second time in December 2011.

In order to represent the practical information on the PV project development process in a standardised fashion, the database represents all the procedures required to authorise, install and finally connect a PV system to the grid as a graphical interactive flowchart defined PV project lifecycle. Such interactive flowchart is defined as a sequential succession of navigable processes (such as site selection, grid connection permit, etc.), each of them containing a sequence of process steps, either of administrative or non-administrative nature.

1 See http://www.administrative-burdens.com

The flowchart below shows how the development process of a project is graphically shown in the PV LEGAL database.

The PV LEGAL database can be freely accessed online at: http://www.pvlegal.eu/database.html

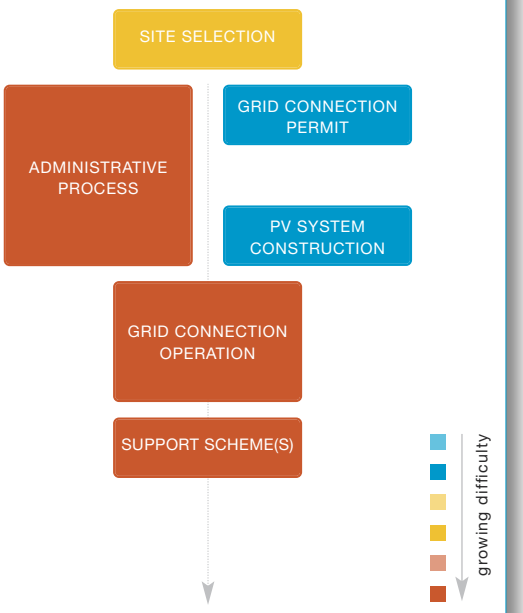


Figure 9 - Example of project lifecycle flowchart from the PV LEGAL database

Formulating recommendations: PV LEGAL advisory papers and forums

Based on the results of the PV LEGAL research, each national partner further deepened the analysis of barriers, investigating their causes, their intentionality and their necessity to eventually protect other interests in direct competition with those of the PV industry, such as environmental protection or public safety.

A deepened review of what is behind each barrier was necessary to formulate robust and practically applicable recommendations towards the removal of each barrier. The analysis and recommendations formulation were discussed together on several occasions by the PV LEGAL project consortium, organised in thematic working groups. By evaluating how a similar barrier was previously overcome in another country or by observing the occurrence of the same barrier in several countries at the same time, partners could join forces in recommending the best possible solutions.

The recommendations were then thoroughly discussed with PV stakeholders in each country, in order to build consensus and to further refine their scope. The recommendations were condensed in a preliminary advisory paper, either on a national or regional level, and presented to a wide audience of stakeholders gathered in the PV LEGAL national forums organised from September to December 2010 in all countries.

The national forums in most cases turned out to be productive and inspiring. The advisory papers were well received by the audience and the discussions that sprung from the national forums helped consolidate the advisory papers in their final format.

Advocating for change: the PV LEGAL review workshops

In early spring 2011, once the advisory papers were finalised, national and regional decision makers where approached to discuss and promote the adoption of the recommendations. The format initially chosen for this task was to organise a review workshop, either at national or regional level, for each advisory paper. The idea was to bring to the same table national or regional government officers, grid operators and other electricity sector stakeholders, to present them the recommendations contained in the advisory papers and to convince them that their adoption could not represent a loss for any of the other interests involved.

In those countries where this original format could be implemented, such as in Germany or in Spain, it turned out to be extremely successful.

However, in many countries the responsible national PV association deemed it not practically possible to bring such diverse and contrasting stakeholders to discuss openly at the same table. Therefore, in those cases it was preferred to meet each of the targeted decision makers bilaterally; this solution also proved to be successful.

Country	Residential rooftop systems Small-scale installations on residential buildings		Commercial rooftop systems Small to medium-scale installations on commercial buildings		Ground-mounted systems Medium to large-scale ground-mounted installations on open lands	
	Standard PV system size (kW)	Legal-administrative costs as a share of overallproject development costs (excluding PV equipment)	Standard PV system size (kW)	Legal-administrative costs as a share of overallproject development costs (excluding PV equipment)	Standard PV system size (kW)	Legal-administrative costs as a share of overallproject development costs (excluding PV equipment)
Bulgaria	3	82%	50	67%	2,500	78%
Czech Republic	3	30%	50	36%	2,500	32%
England	3	10%	50	45%	2,500	n/a
France	3	22%	50	23%	2,500	n/a
Germany	3	11%	50	8%	2,500	17%
Greece	3	18%	50	9%	2,500	12%
Italy	3	61%	50	18%	2,500	69%
The Netherlands	3	10%	50	11%	2,500	n/a
Poland	10	56%	50	28%	2,500	n/a
Portugal	3	53%	50	n/a	2,500	n/a
Slovenia	3	38%	50	25%	2,500	13%
Spain	20	36%	50	44%	2,500	51%

Table 2 - PV Industry survey results for legal-administrative share of costs involved in PV system development

Country		Residential rooftop systems Small-scale installations on residential buildings				Commercial rooftop systems Small to medium-scale installations on commercial buildings				Ground-mounted systems Medium to large-scale ground-mounted installations on open lands			
		Standard PV system size (kW)	Overall Labour (hours)	Overall Duration (weeks)	Waiting time (weeks)	Standard PV system size (kW)	Overall Labour (hours)	Overall Duration (weeks)	Waiting time (weeks)	Standard PV system size (kW)	Overall Labour (hours)	Overall Duration (weeks)	Waiting time (weeks)
Bulgaria	Min		215	43	38		253	45	40		374	65	56
	Avg	**3**	**227**	**48**	**44**	**50**	**253**	**45**	**40**	**2,500**	**378**	**70**	**61**
	Max		239	53	50		253	45	40		382	75	65
Czech Republic	Min		35	16	10		82	25	12		196	70	52
	Avg	**3**	**46**	**18**	**11**	**50**	**125**	**26**	**14**	**2,500**	**442**	**81**	**56**
	Max		54	20	12		130	26	16		606	90	60
England	Min		2	2	1		28	15	9				
	Avg	**3**	**4**	**3**	**1**	**50**	**81**	24	**14**	**2,500**		**n/a**	
	Max		12	5	1		201	36	22				
France	Min		10	16	8		22	26	18				
	Avg	**3**	**12**	**19**	**12**	**50**	**53**	**43**	**29**	**2,500**		**n/a**	
	Max		16	21	17		93	77	50				
Germany	Min		3	4	0		5	13	6		158	70	23
	Avg	**3**	**4**	**6**	**2**	**50**	**7**	**17**	**8**	**2,500**	**342**	**90**	**46**
	Max		6	8	5		11	24	11		510	120	67
Greece	Min		7	9	7		14	33	31		428	124	108
	Avg	**3**	**8**	**11**	**9**	**50**	**18**	**53**	**51**	**2,500**	**469**	**150**	**125**
	Max		9	13	11		21	68	66		496	172	141
Italy	Min		70	8	4		87	8	4		792	52	40
	Avg	**3**	**106**	**17**	**12**	**50**	**154**	**15**	**8**	**2,500**	**1,230**	**82**	**61**
	Max		124	24	20		209	24	13		1,639	116	104
The Netherlands	Min		8	13	3		22	31	15				
	Avg	**3**	**11**	**16**	**4**	**50**	**34**	**33**	**16**	**2,500**		**n/a**	
	Max		15	19	4		55	36	18				
Poland	Min		30	22	20		91	17	5				
	Avg	**10**	**64**	**37**	**32**	**50**	**124**	**34**	**10**	**2,500**		**n/a**	
	Max		121	55	48		152	50	14				
Portugal	Min		29	11	7								
	Avg	**3**	**43**	**14**	**10**	**50**		**n/a**		**2,500**		**n/a**	
	Max		52	18	14								
Slovenia	Min		44	20	15		77	18	17		582	47	30
	Avg	**3**	**49**	**24**	**18**	**50**	**88**	**21**	**20**	**2,500**	**756**	**48**	**32**
	Max		56	26	20		99	24	23		959	50	33
Spain	Min		27	62	40		35	73	48		166	203	115
	Avg	**20**	**31**	**68**	**48**	**50**	**59**	**89**	**55**	**2,500**	**187**	**220**	**139**
	Max		44	79	63		74	106	65		224	236	165

Table 3 - PV Industry survey results for legal-administrative labour requirements, project duration and waiting times involved in PV system development

APPENDIX II: PROJECT PARTNERS

Coordinator

BSW-Solar
www.solarwirtschaft.de

Work-package leaders

ASIF
www.asif.org

Eclareon GmbH
www.eclareon.com

European Photovoltaic Industry Association – EPIA
www.epia.org

PTPV
www.pv-poland.pl

Partners

Assosolare
www.assosolare.org

Enerplan
www.enerplan.asso.fr

Helapco
www.helapco.gr

Micro Power Council
www.micropower.co.uk

SER-SOLER
www.enr.fr

ZSFI
www.zsfi.si

Subcontractors

APESF
www.apesf.pt

BPVA
www.bpva.org

CZREA
www.czrea.org

Holland Solar
www.hollandsolar.nl

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- RES Integration study, eclareon GmbH, www.eclareon.eu/en/res-integration
- RES LEGAL research, German Ministry for the Environment, Nature Conservation and Nuclear Safety, www.res-legal.de/
- Directive for the promotion of Renewable Energies (Directive 2009/28/EC)
- European Commission infringement procedure launched on 24 November 2011 against Czech Republic and France: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/11/1446&format=HTML&aged=0&language=EN&guiLanguage=en

APPENDIX IV: GLOSSARY

DISTRIBUTION SYSTEM OPERATOR (DSO)	Distribution grid operators operate medium-voltage and low-voltage grids and co-ordinate their grids with other electricity grids within a designated area (region)
GRID CONNECTION	The connection of the PV system to the electrical grid
GRID CONNECTION FEE	The fee to be paid for the connection of the PV system to the grid
GRID OPERATOR	Operator of transmission or distribution grid that transmits or distributes electricity within a designated area and co-ordinates its services with other grids
GRID USAGE FEE	The fee to be paid for the use of the grid (for example transport of generated electricity into and through the grid)
GROUND-MOUNTED SYSTEM	This term covers all PV systems, generally of large size, that are installed on the ground
INSTALLED CAPACITY	The sum of the PV modules' rated power of a PV system. The rated power is either calculated as sum of the nameplate capacity of the modules or the sum of the flashed power of the PV modules
INVERTER	A device that converts direct current (DC) to alternating current (AC)
LAND DEVELOPMENT PLAN	Higher level in land use planning. Used for planning on town level
LAND USE PLANNING	Branch of public policy that encompasses various disciplines that seek to order and regulate the use of land in an efficient and ethical way
LEGAL-ADMINISTRATIVE BARRIERS	Legal-administrative barriers are barriers that are caused by regulations stemming from government bodies or grid operators and which delay the authorisation or the installation of PV systems. This definition comprises bureaucratic barriers but it also covers barriers that stem directly from the law, not only from the application of the law by the administration

LEGAL-ADMINISTRATIVE LABOUR REQUIREMENTS	Total amount of time in hours invested for complying with legal-administrative requirements during PV project development process
LISTED BUILDING	A building that has been placed on a list of edifices of special architectural or historic interest. Usually, a listed building may not be demolished, extended or altered without special permission from the local planning authority
MAXIMUM CAPACITY	The highest possible output of a PV system under normal conditions
NON LEGAL-ADMINISTRATIVE LABOUR REQUIREMENTS	Amount of time in man-hours that need to be invested for this process, excluding the time to be spent for complying with legal-administrative requirements
OVERALL DURATION	Total amount of time needed for project development until PV plant starts operating
OVERALL LABOUR	Total amount of time in hours invested for complying with legal-administrative requirements during PV project development process
PERMISSION	A license to carry out an act that without such licence would be unlawful
PROCESS	A Process is one of the necessary functional procedures necessary to develop a PV system, such as site selection, grid connection, PV system construction etc. A Process is described by a sequence of Process Steps (which may be either of administrative or non-administrative nature)
PROCESS DURATION	The overall time needed to complete a specific process of the PV project lifecycle
PROCESS STEPS	A step is one of a sequential succession of actions that need to be executed in order to satisfy the legal-administrative and the other requirements of a process
PROJECT DEVELOPER	A person or company that is in charge for the planning and development of the PV project
PV PROJECT LIFECYCLE	All the procedures required authorising, installing and finally connecting a PV system. In our representation, the Project Lifecycle is defined as a sequential succession of Processes (such as site selection, grid connection, etc.), each of them described by a sequence of Process Steps (either administrative or non-administrative)
PV SYSTEM	A PV system uses a semi-conducting material to convert light into electricity
PV SYSTEM OPERATOR	A person or company that (owns and) operates a PV system
RENEWABLE ENERGY SYSTEM (RES)	An appliance that can produce energy, usually in the form of electricity or heat, utilising renewable sources
ROOFTOP SYSTEM	This term covers all PV systems installed on or in the roof of buildings
SEGMENT	A segment is a part of the national PV market. Three market segments have been identified within PV LEGAL: • Segment A: small-scale installations on residential buildings (Residential rooftops) • Segment B: small to medium-scale installations on commercial buildings (Commercial rooftops) • Segment C: medium- to large-scale ground-mounted installations on open lands (Industrial ground-mounted)
STEP	A step is one of a sequential succession of actions that need to be executed in order to satisfy the legal-administrative and the other requirements of a process

SUB-SEGMENT

A sub-segment is a subset of a national market segment, defined by different legal-administrative requirements based on a particular characteristic of the PV systems: size, Installation location, etc.

TRANSMISSION GRID OPERATOR

Transmission grid operators operate supra-regional high-voltage grids and co-ordinate their grids with those of the distribution grid operators. In many European countries there is only one transmission grid operator. However in some countries, such as Germany, Austria and Great Britain, 3 to 4 companies provide transmission services

URBAN DEVELOPMENT PLAN

The lowest level in land use planning. Used for planning on local level and on parts of a town

WAITING TIME

Overall waiting time for authorities/administrations or grid operators who have to take an action, thereby delaying the PV project. The waiting time has been measured for each process (for example site selection or grid connection permit) and for the overall PV Project Lifecycle that consists of all these processes. The measurement of the waiting time for the overall PV project Lifecycle takes into account the possibility that project developers work on one particular process while waiting for the other. For this reason, the waiting time for the overall PV project Lifecycle is usually shorter than the sum of waiting time used for the single processes. The waiting time, which takes into account the possibility of working on another process A while waiting for process B, is defined as “net waiting time”. The waiting time that is the sum of all processes is defined as “gross waiting time”

PV LEGAL

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