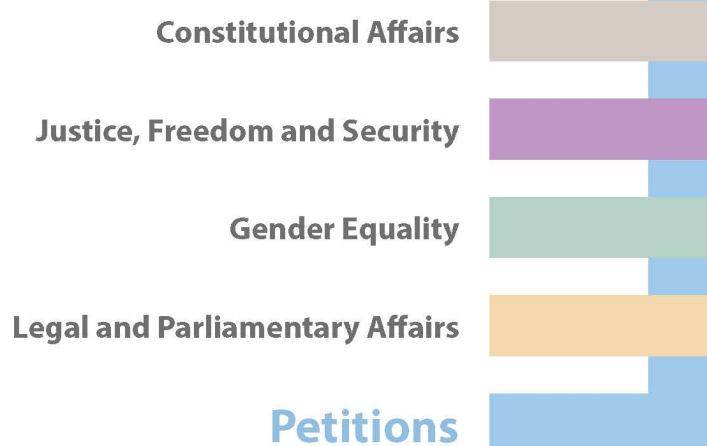


DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT
CITIZENS' RIGHTS AND CONSTITUTIONAL AFFAIRS



**Solar energy policy in the EU
and the Member States,
from the perspective of
the petitions received**

STUDY FOR THE PETI COMMITTEE



DIRECTORATE GENERAL FOR INTERNAL POLICIES

**POLICY DEPARTMENT C: CITIZENS' RIGHTS AND
CONSTITUTIONAL AFFAIRS**

PETITIONS

Solar energy policy in the EU and the Member States, from the perspective of the petitions received

STUDY

Abstract

Upon request by the PETI Committee, the Policy Department on Citizens' Rights and Constitutional Affairs commissioned the present study in order to assess a series of petitions received in relation to solar energy policies in Member States and their compatibility with EU laws and policies. The petitions examined raise three main concerns, i.e. policy risk in support systems, self-consumption and industrial policy in EU Member States, notably Spain, Belgium, Germany and Italy. The analysis concludes that renewables' support policies should be stable and avoid frequent or retro-active changes; that the regulated extension of self-consumption is accompanied by measures to ensure that "prosumers" contribute to financing grid costs and other costs; and that industrial policy for renewables is stable and predictable.

ABOUT THE PUBLICATION

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LIST OF ACRONYMS

€	Euro
€c	Eurocent
CHP	Combined heat and power
CWaPE	Commission Wallone pour l'Energie
DIA-	Policy Dialogue on the assessment and convergence of RES policy in
CORE	EU Member States
EDAF	Electricity deficit amortisation fund
EGF	European globalisation adjustment fund
EU	European Union
GDP	Gross domestic product
GSI	Global Subsidies Initiative
GW	Gigawatt
IEA	International Energy Agency
iisd	International Institute for Sustainable Development
ISI	Fraunhofer Institute for Systems and Innovation Research (ISI)
kWh	Kilowatt hour
kWp	Kilowatt peak
m²	Square meter
MACGR	Monthly average compound growth rate
MANC	Monthly average new capacity
MW	Megawatt
MWh	Megawatt hour
NREAP	National Renewable Energy Action Plan

OECD Organisation for Economic Co-operation and Development

PETI Committee on petitions

PV Photovoltaics

RD Royal Decree

RDL Royal Decree Law

USD US Dollar

W Watt

EXECUTIVE SUMMARY

At the request of the PETI Committee, Policy Department on Citizens' Rights and Constitutional Affairs commissioned the present study to Fraunhofer ISI in order to assess the petitions received on solar energy. **Petitions were examined and categorized in relation to the type of issue raised and three broad topics were identified: policy risk in support systems, self-consumption and industrial policy.** For each topic, general background information as well as an assessment of the policies of those countries from which petitions were received, was given. A comparatively larger number of petitions received expressed concerns related to the changes in the Spanish policy on solar energy, which is consequently addressed in this study more in depth.

1. **Policy risk in support systems¹ is higher in countries implementing frequent and especially retro-active changes to their support systems.** While such changes can reduce immediate support costs, they imply higher future support costs and endanger reaching renewable extension targets due to increasing policy risks. While political continuity is a best practice for supporting renewable energy, retro-active and retrospective changes have occurred in a number of European countries after the solar boom in the late 2000s. In **Spain** for example, many **retro-active changes** were implemented since 2007 leading to an almost complete halt to renewable investments and severe job losses in the sector. Also in **Wallonia**, frequent changes to the support scheme have reduced the growth rate of photovoltaics (PV) in the region. In both countries, national courts and international arbitration courts are dealing with the topic. However, on a **European level**, both countries are on track regarding their 2020 targets (even though there are doubts regarding their success in this regard when the target year 2020 approaches) and **Member States enjoy wide freedom regarding the choice of support scheme under the Renewables Directive (2009/28/EC)**. This might be taken into consideration by the EU Court of Justice shall legal action be brought to it.
2. **Self-consumption can be a means of enabling financing for renewables' extension** and increase acceptance for new energies. However, system-wide benefits of increasing self-consumption shares are limited. As grid costs² do not decrease with higher self-consumption rates but fees are put onto less demand, **increasing self-consumption leads to higher costs for electricity consumers without own power plants.** Developments in **Spain, Wallonia** and **Germany** show that policy-makers are increasingly aware of the challenge to **steer a rational extension of self-consumption by not completely exempting self-generated electricity from all fees.** However, there are differences between the countries. While the **Spanish** regulation makes self-consumption completely unattractive, this is not the case for **German** or **Wallonian** law. Also, there seem to be differences regarding legislation in the countries, as the **Wallonian** legislation was declared illegal by Courts while the **German** one was not. In the case of Spain the law is too new for a final legal assessment. In general, as stated in Section 3.1, legislation

¹ "Policy risk in support systems" can be defined as the risk connected with a possible future change in the support policies put in place by administrations to incentivise energy production from renewables and compensate for their higher production costs.

² The electricity grid needs to be built in such a way that all loads can be served and at least most of the generated electricity can be fed into the grid. When a household consumes its self-generated electricity from a PV plant it usually still needs electricity from the grid at other times. At least in countries where electricity consumption is highest in the evening, the self-generated electricity does not reduce the need for grid extension and maintenance.

implying retro-active changes as in **Spain** and **Wallonia** is always more problematic. Regarding self-consumption we recommend Parliament to **call for clear rules and for the avoidance of retro-active changes** in any system. However, we also emphasize the need for a **regulated extension of self-consumption** given that solar electricity has achieved grid parity in many EU countries and costs of decentralized storage are also decreasing. From our point of view, it is useful that **“prosumers” contribute to financing grid costs and other costs**. Concerning **plug-and-play** solar systems we think that the Parliament's efforts for European standards are very useful and should be continued.

3. **Industrial policy in the PV sector seemed to be a success story in Europe** for a long time with increasing employment levels in many countries. However, during the last years, a number of factors led to a **consolidation of the global manufacturing sector** for PV modules and cells. In addition, **Chinese dumping** prices further increased the pressure on European manufacturers. These are however **impeded since December 2013 by measures on European level**. As a stable domestic market is one of the important drivers for the development of a new industry, **job losses** in the PV sector (for example those mentioned in one petition from Italy) are another reason for the Parliament to call for **stable and predictable renewable support policies and extension pathways**. Other than that, the effects of globalization on the European economy are not restricted to the energy sector and responses are subject to political debate and decision. We are therefore not in a good position to give specific advice on this topic.

INTRODUCTION

Over the last years, the European Parliament received a number of petitions concerning solar energy policies and regulation in a number of EU countries. While the majority of complaints relates to policy changes in Spain, petitions also include countries like Italy, Belgium and Germany.

The Fraunhofer Institute for Systems and Innovation Studies (ISI) was contracted to examine the petitions and provide background information in order for the PETI committee to react adequately to these and the EU Commission's responses.

To fulfill this objective, Section 1 gives a short introduction to support policies for electricity from renewable in EU member states. A categorization of petitions by country and topic can be found in Section 2. In Section 3, the topics relevant for the petitions are explained and petitions assessed regarding their relevance to the topic. Section 4 contains a table summarizing petitions and recommendations.

1. POLICIES TO SUPPORT ELECTRICITY FROM RENEWABLES IN EU MEMBER STATES

Since 2009, support for electricity for renewables in EU member states is governed by **Directive 2009/28/EC**, commonly referred to as the "RES Directive"³. The Directive defines **binding targets** for member states' shares of renewable energies in final energy consumption. However, Member States have full **freedom** regarding the contribution of different sectors (i.e. electricity, heat and transport) and the support instruments used to reach the targets. Member States also have the possibility to make use of **flexibility** mechanisms if they must or wish to generate parts of the necessary renewable energy in other EU countries. The process of target achievement is closely **monitored**. In 2010, Member States had to formulate **National Renewable Energy Action Plans** (NREAPs) including **extension trajectories** for each sector and technology and measures and instruments **to promote renewables**. Furthermore, biannual interim targets were defined as milestones towards each national 2020 target. Member states need to report biannually the differences between their current situation and their plan (Steinhilber 2016).

As a result of the freedom regarding support instruments to foster renewables, a **variety of support schemes for renewables** in general and **solar energy** in particular **exists across EU Member States**.

Quota schemes

Three countries (Belgium, Romania and Sweden) currently use a quota scheme to support renewables. In this scheme, the electricity supply chain is obliged by Government to source a certain quota of electricity from renewable sources. Renewable plant operators receive one or several **certificates** for every unit of electricity they produce. They sell the generated electricity at the regular electricity market where they receive the regular electricity price. In addition, they sell the certificate at the certificates markets where demand is created based on the obligatory quota. In theory, the quota system leads to low support costs due to competition. In reality however, support costs were higher in most cases when compared to feed-in tariffs (described below) as plant operators face the double price risk at

³ Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, see <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009L0028>

electricity and certificate markets which leads to comparatively high risk premiums and capital costs (Butler and Neuhoﬀ 2008).

Feed-in schemes: feed-in tariffs; feed-in premiums (fixed, floating, floating with a cap-and-floor); auctions

The remaining countries all apply a feed-in scheme to support renewables. Feed-in schemes either use feed-in tariffs or feed-in premiums whose level is either administratively set or determined in a competitive auction.

Traditionally, **feed-in tariffs** were designed as **administratively set** feed-in tariff. Such system implies a very low risk for plant operators as they receive a fixed amount of money for each unit of electricity generated regardless of the demand situation. While this system led to comparatively low support costs per unit of electricity due to low capital costs it also implies some problems. The most important one is that adaptations of support levels in the past were sometimes too slow to respond to sinking technology costs, especially in the case of PV. Together with the fact that under feed-in tariffs typically no limits to annual installed capacities apply, the excessive level of feed-in tariffs in some years led to extreme extension rates of renewables implying high overall support costs. In addition, at higher renewable shares, the fact that renewable plant operators are not incentivised to react to the demand situation, becomes problematic. As a consequence of these challenges, **many EU member states have changed and are changing their support schemes from administratively set feed-in tariffs to auction-based feed-in premium schemes**. This move is also supported by the EU Commission's "Guidelines on State aid for environmental protection and energy 2014-2020" published in late 2014⁴.

In **feed-in premium schemes**, renewable plant operators sell the electricity generated at the regular electricity market. On top of the regular electricity price, they receive a premium. This **premium can either be fixed or floating**. If the premium is **fixed** the revenue of the plant operator per unit of electricity fluctuates to the same level as the electricity price. The advantage of a fixed premium is the predictability of yearly support expenditures. However, a fixed premium implies a high risk of too high or too low revenues as setting an adequate premium requires a long term electricity price forecast. The uncertainty about the overall income also poses a risk to plant operators and thus increases capital costs. In schemes with a **floating premium**, plant operators also receive a premium on top of the regular electricity market price. However, this premium adapts to the level of the market price such that the overall revenue of a plant operator for each unit of electricity generated remains stable, i.e. if the market price sinks the premium increases and vice versa. As usually not the individual hourly market price but for example the average monthly market price is used for the premium calculation, generating electricity in hours with high prices is still slightly more profitable than in hours with low electricity prices. As a consequence, a sliding premium preserves the main advantages of a feed-in tariff but still incentivizes generation that follows demand patterns. A third option, the **premium with cap-and-floor** is like a sliding premium but the revenue of the plant operator is not fixed at one value but corresponds to a range between the minimum and the maximum.

Auctions for determining the support level have two advantages. First, like a simple cap for yearly new installations, they avoid very high and unintended renewables extension as happened in the past with solar PV. Usually, in auctions, a certain amount of installed capacity is tendered which means that at a maximum this auctioned capacity can receive support in a given period. Second, the competitive determination of the support level can reduce lobby influence and thus decrease support costs. However, this can only be achieved if competition in the market is sufficient which is not always easy to determine in advance. Also, auctions imply additional risks for plant operators as they have to invest already before the auction but cannot be certain that the project will be successful in the auction process. This additional

⁴ see [http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014XC0628\(01\)](http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014XC0628(01))

risk implies additional capital costs. As a consequence, for auctions to reduce support costs, the savings due to competition must outweigh the additional costs due to increased risks. Another uncertainty with auctions is the effectiveness of this support instrument. In the past, some auctions resulted in very low support levels but in the end plants were not built and renewable extension targets could not be reached. In general, designing an adequate auction leading to low costs and target achievement can be complicated and the design must always be carefully adapted to market conditions. The recent renewable auctions in European countries have also shown that. As the scheme is still rather new it is however not yet possible to finally evaluate its success.

In October 2014, the European Council has agreed on targets for the period after 2020. The new targets include a **renewable energy target of at least 27%** (European Council, 2014). However, contrary to the 2020 target, there will be no binding targets on member state level. Therefore, **it is currently uncertain what policies to support renewables will look like in the EU after 2020.**

2. OVERVIEW AND CLASSIFICATION OF PETITIONS

Table 1 shows an overview of petitions regarding solar electricity. The petitions are summarized and categorized by country and topic.

As can be noted from Table 1, most petitions are related to Spain. These petitions focus on retroactive changes to the support system which modified substantially the income of investors in solar PV under the former support regime. The one petition concerning Belgium also complains about frequent (if not retroactive) changes of the support system which inhibit rational investment decisions.

Another relevant topic for petitioners from Spain is the introduction of a tax on solar energy which allegedly renders self-consumption of electricity generation from PV financially unattractive. The one petition from Germany also concerns the field of self production and consumption although dealing with a very special subtopic plug-and-play systems.

The Italian petition deals with a third topic, competition and job losses in the PV sector in Italy. Possible reasons are seen in Chinese dumping or globalization more generally.

In the following the three broad topics of petitions – retroactive changes, self-consumption, and industrial policy and job losses – are explained in more detail. An introduction to each topic is followed by a discussion of the country-specific problems mentioned in the petitions.

Table 1: Overview of petition countries and topics

	Retroactive and frequent changes of support systems	Self production and consumption of electricity	Industrial policy – Competition and jobs
Belgium	1 petition complains about the frequent changes in the Wallonian renewable support system which inhibit informed business decisions.	1 petition complains about a tax for electricity prosumers to finance grid use.	
Germany		1 petition complains about technical rules that inhibit the use of plug and play solar systems for German households.	
Italy			1 petition is about job losses due to the closing of a PV production plant. Suspected reasons are Chinese dumping prices or more generally lower production costs in other countries.
Spain	9 petitions complain about changes in the remuneration of electricity from PV. Plants were built expecting a fixed tariff for 25 years. In order to reduce the deficit of the Spanish electricity sector, support was reduced substantially.	6 petitions complain about the changed conditions for self-consumption of electricity generated from PV after the introduction of a tax on solar electricity generation.	

3. BACKGROUND INFORMATION BY TOPIC

3.1. Policy risk - retroactive and frequent policy changes

3.1.1. Effects of retroactive changes

Electricity generated from most renewable sources is still more expensive than electricity from conventional plants. Therefore, in most countries, renewable electricity still **relies on publicly administered and financed support systems**. For investors in renewable projects this fact implies a **policy risk**⁵ i.e. the risk of changing support conditions or support frameworks. Policy risks are more relevant for capital intensive investments with long pay-back periods as is the case for renewable electricity generation plants.

While in general policy risk is hard to quantify, investment in European countries is mostly considered to have low policy risks. Nevertheless, in the renewable sector a number of countries especially in recent years have implemented **retroactive**⁶ **policy changes**. Such changes have **effects on both past and future investments in renewables** in a country: owners of renewable plants already built are faced by lower than expected revenues and profits and in severe cases go bankrupt. Future investments are also threatened, as perceived policy risk increases and thus future investors either restrain from realizing investments altogether or need to be compensated for higher risks by higher support levels as expected returns on equity increase. Therefore, given obligatory renewable extension targets such as in the European Union until 2020, **retroactive policy changes can increase support costs for renewable in the medium to long term even if short term costs are reduced.**

A report by the project "Re-Shaping" states that **policy stability** is the single most important factor regarding the influence of policies on capital costs of renewables (Rathmann et al. 2011). The International Feed-in Cooperation also sees a **stable and transparent policy framework** as crucial for a successful and efficient exploitation of renewables (Klein et al., 2010). Recent analysis within the DIA-CORE project confirms these results (Noothout et al. 2016).

To summarize, **retroactive or frequent policy changes in renewable support schemes substantially increase perceived policy risks for future investments in renewables.** As a consequence, **renewable extension might stop even at adequate support levels, or lead to an increase in support levels, due to higher risk premiums.**

3.1.2. EU regulation and retroactive changes on national level

The **Renewable Energy Directive** foresees that EU member states reach a certain percentage of renewable energy by 2020. However, member states are free regarding the choice of support instruments for reaching these targets. As a consequence, **retroactive or frequent changes in renewable support policies do not directly infer with EU law.** This might be less clear though in situations where countries realize retroactive policy changes that might inhibit their reaching of the 2020 targets.

National legislation is therefore the main assessment criterion for answering the question whether retroactive changes are illegal in a certain country or for a specific technology. In

⁵ "Policy risk" or "political risk" is defined as the risk that an investment's returns could suffer as a result of political changes or instability in a country' and 'becomes more of a factor as the time horizon of an investment gets longer' (Investopedia, n.d.).

⁶ Or retrospective – for a more detailed definition of both terms see (European Renewable Energies Foundation (EREF) 2013; Fouquet and Nysten 2015)

general, retroactive (or retrospective) changes in legislation are generally possible but need to be justified. The assessment of the legal feasibility of a specific retroactive policy change is thus complicated and not possible within this report. In countries where retroactive changes occurred (such as Spain or Wallonia) many **law suits at national courts and international arbitration courts were started and many of those are still pending**.

3.1.3. Country-specific information

3.1.3.1. Spain

As the majority of complaints regarding retroactive changes to the renewable support system come from Spanish petitioners, the changes as well as the reasoning behind the changes will be explained in more detail in the following.

Due to the impressive growth of Spanish renewable capacities as well as the innovative design of the Spanish support system and measures for system integration, **Spain has always been in the forefront of countries supporting renewables. This situation however changed dramatically after 2007.**

In 2007 (as in the years before), the support for electricity generation from renewables was based on a system where plant operators **could chose between a feed-in tariff or a feed-in premium** on top of the regular wholesale electricity price under which the total revenue per MWh was limited by an upper and lower bound (**premium with cap and floor**). For geothermal energy and solar photovoltaics, only the fixed tariff option was available.

As in other EU countries, the **support level for PV was comparatively high** in Spain in 2007 and 2008. Royal Decree 661/2007 set the following tariff levels:

- 44.0381 €c for the first 25 years and 35.2305 €c/kWh thereafter for plants with a capacity below or equal to 100 kW
- Lower tariffs for plants with a capacity between 100 kW and 10 MW (41.75 and 33.4 €c/kWh) and for plants with a capacity above 10 MW (22.9764 €c/kWh and 18.3811 €c/kWh)⁷.

Two additional factors led to the **boom of installed PV capacities** in Spain in 2007/2008 shown in

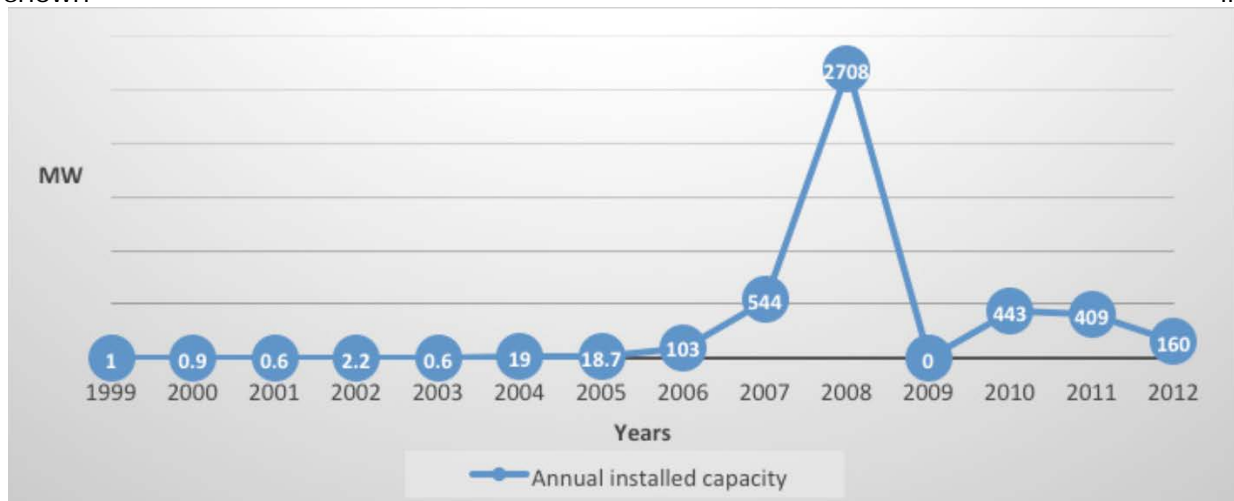


Figure 1: Spain's annual installed solar PV capacity (MW, 1999-2012)

⁷ To compare, German tariffs at the time were even a bit higher with values between 37,96 €c/kWh and 49,21 €c/kWh (but only paid for 20 years and given a lower solar radiation).

(del Río and Mir-Artigues 2012; de la Hoz et al. 2012):

- Due to a **loophole in the support laws**, large ground-mounted PV systems could split their capacity and be supported as several systems with a capacity below 100 kW ("**huertos solares**") so that the high tariffs meant for rooftop systems were applicable to cheaper ground-mounted systems.
- Royal Decree 661/2007 contained a regulation that after reaching 85% of the target power from 2010, additional plants would be supported either by a new support regime (to be defined) or receive the hourly electricity wholesale price. However, a twelve-month transition period was also included in the law. The end of the transition period was announced on September 29, 2007 and supposed to end on September 28, 2008. Obviously, investors reacted to the uncertainty of future remuneration by investing as fast as possible to receive the original tariffs. The degree of **uncertainty** was intensified as the first proposal for a new support framework included retroactive changes by suggesting that plants built after reaching the 85% capacity limit were to receive the electricity wholesale price only. The delay of a second proposal further increased uncertainties as new tariff levels were only known about three months before coming into force (Royal Decree 1578/2008).
- **Construction companies** were looking for investment opportunities as the previous housing boom came to an end.
- **Access to credit** for smaller PV plants was relatively easy and interest rates low.
- **Municipalities** granted permits without delays to profit from benefits of renewables in their community.
- The **USD/€ exchange rate decreased** making imported solar panels cheaper.

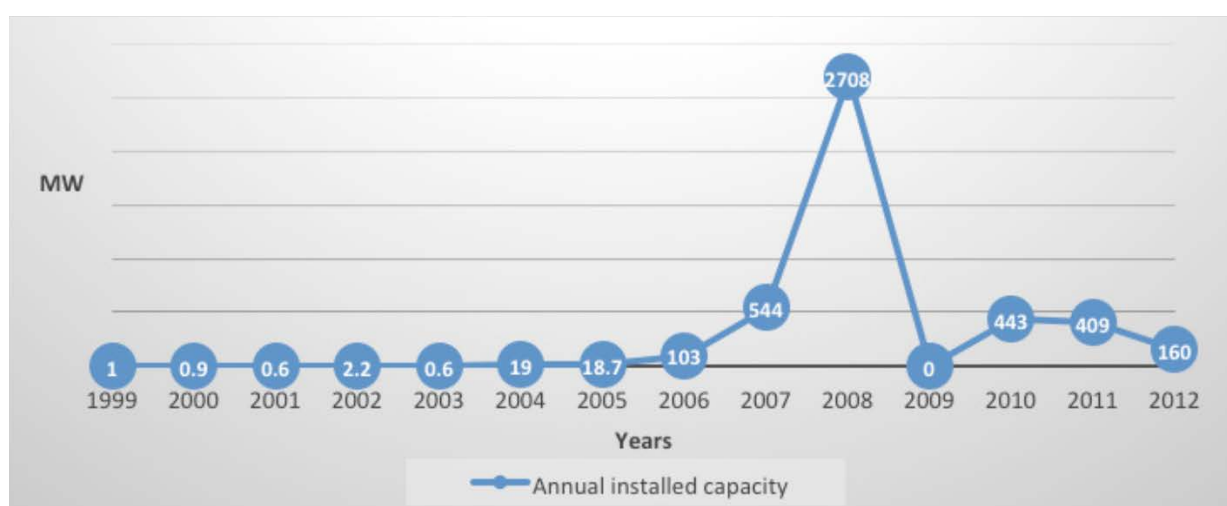


Figure 1: Spain's annual installed solar PV capacity (MW, 1999-2012)

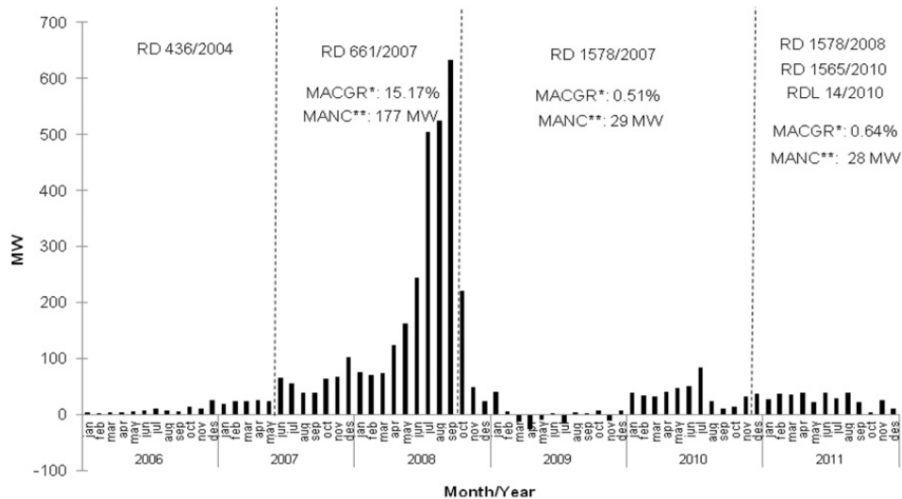


Figure 2: Monthly installed PV capacity in Spain (2006 to 2011)

Source: GSD and IISD 2014, *Monthly Average Compound Growth Rate, ** Monthly Average New Capacity, Negative values stem from data base corrections.

As a consequence of the PV boom combined with relatively high tariffs as well as other factors (such as capacity payments for conventional plants), the **deficit in the Spanish electricity sector increased substantially**. The **main reason** for the deficit however is the **regulated electricity retail tariffs** (see Box 1 for more details on the Spanish electricity sector deficit).

Box 1: Reasons for and effects of the deficit in the Spanish electricity sector:

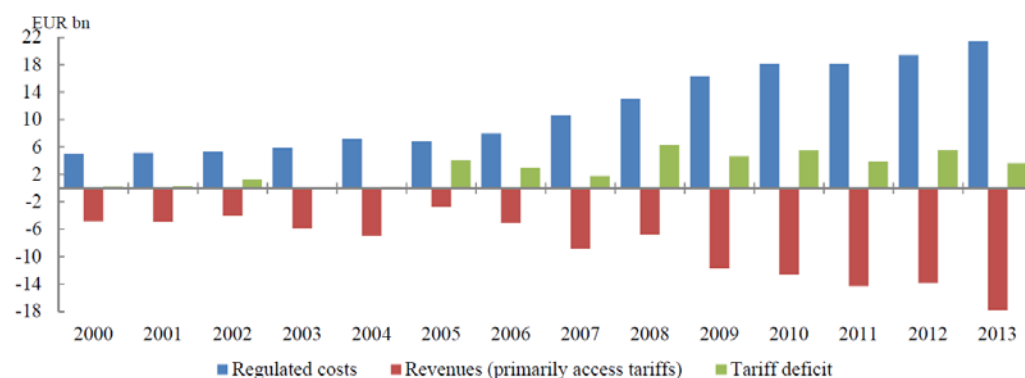
The increasing **deficit** of the Spanish electricity sector at a time of economic crisis is seen as the main reason and also the official justification for the cuts in the Spanish support system for renewable electricity.

But why is there a deficit in the sector? In Germany, for example, support costs for renewables also increased substantially due to the high cost solar boom in 2008 and 2009 but costs were simply translated into higher consumer tariffs. In Spain however, this is not possible due to **regulated tariffs for end users**.

The **deficit in the Spanish electricity sector** started to develop in 2001 but increased substantially since 2005. Between 2005 and 2013, costs of the electricity system increased by 221%, revenues only by 100 %. By 2013, the accumulated debt was about 30 billion € (3% of GDP). In 2014, Spain had a country-specific recommendation from the EU to limit this deficit.

The costs of the Spanish electricity system include remuneration for transmission and distribution grids but also a number of subsidies, e.g. for renewables, for combined heat and power plants (CHP), for domestic coal and for conventional back-up capacity plus annuities to pay back earlier debt. In 2005, the different cost elements started to grow while regulated tariffs stayed at the same level. The situation got more severe with the economic crisis as this led to a shrinking demand and therefore revenue decrease while system costs were still rising. Regulated tariffs were not increased to cover costs for political and social reasons according to Linden et al. (2014).

Graph 3.7: Evolution of electricity tariff deficit in Spain, 2000-2013



Source: Commission Services based on CNE data

Figure 3: Evolution of electricity tariff deficit in Spain (2000 – 2013),

Source: (Linden et al. 2014)

Initially, the deficit was paid for by five utilities which were expected to be paid back with future revenues. However, given the deficit growth, from 2003 the utilities were allowed to sell the debt to third parties. As financing became more difficult due to the economic crisis, since 2009 the Electricity Deficit Amortisation Fund (EDAF) which is 100% guaranteed by the State was founded to manage and sell the deficit.

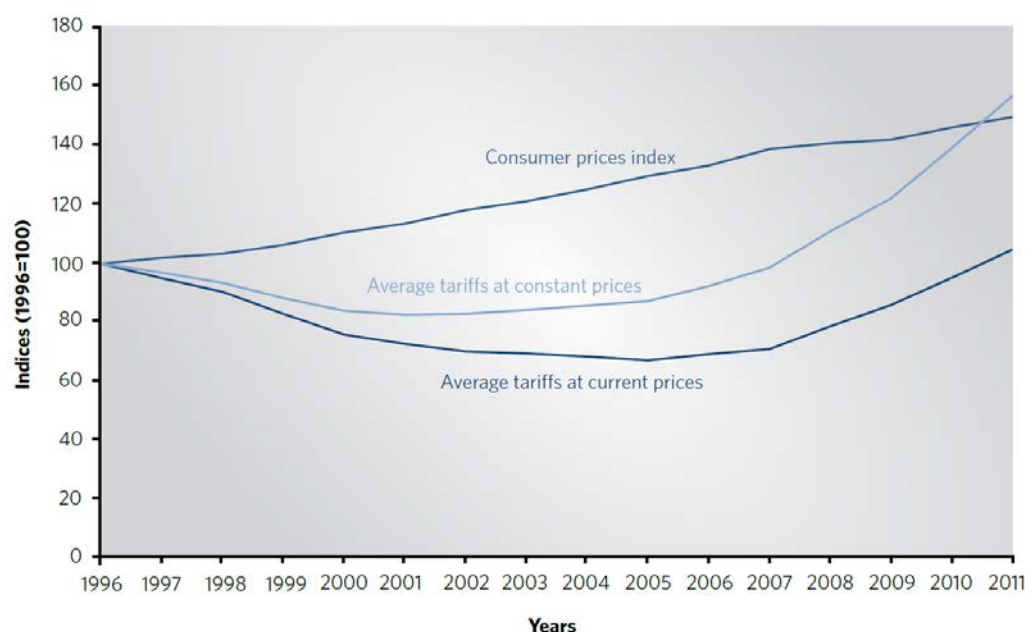


Figure 4: Development of electricity tariffs in Spain (1996 – 2011)

Source: GSI and iisd (2014)

In 2012 and 2013, some Royal Decrees (some of these are listed below) were published cutting renewable support, increasing regulated tariffs, reducing remuneration for transmission and distribution and introducing a tax of 7% for electricity generation (22% for hydro). In 2013, further laws were implemented changing again the support system for renewables, but also reducing capacity payments, remuneration for transmission and distribution, mothballing overcapacities and reducing incentives for interruptible demand contracts. As a consequence of all reforms, the electricity sector deficit has been reduced substantially.

Sources: Linden et al. 2014; Donat et al. 2014; OECD and IEA 2015; GSI and iisd 2014

In order to decrease the costs for supporting renewable and especially PV, a number of measures were implemented in the years after 2007. From 2010 onwards measures also included changes to the support for existing plants (GSI and iisd 2014; del Río and Mir-Artigues 2012; De Boeck et al. 2016):

- Royal Decree 1578/2008:
 - Reduction of tariff levels and distinction between ground-mounted and rooftop PV systems for new plants
 - Reduction of support period for new plants to 25 years
 - Annual and quarterly capacity quotas. If more than 75% of the quarterly quota were installed, the tariff for the next period would be reduced with a maximum reduction of 2.7% equaling a reduction of 10.8% per year.
- Royal Decree 1565/2010:
 - Further tariff decrease using correction factors for new plants (0.95 for small rooftop systems, 0.75 for bigger rooftop systems and 0.55 for ground-mounted systems), resulting in an overall decrease in tariffs of 19%, 31% and 61% in three years respectively.
 - Reduction of support period to 25 years for existing plants. Changed to 28 years by Royal Decree 14/2010.
 - Cap on annual supported full load hours for existing plants with the numbers depending on date of installation (less hours for plants installed under RD 661/2007), plant type and location.
- **Royal Decree Law 1/2012:**
 - Moratorium: **abolishment of all support for new plants.**
- **Royal Decree Law 2/2012:**
 - Introduction of a **7% tax on electricity generation** (22% for hydro plants) **for all plants.** Renewable generators cannot pass on the tax to the market as they do not sell electricity to the market.
 - At the same time the **feed-in premium option is abolished.**
- Royal Decree Law 2/2013:
 - Core inflation rate instead of consumer price index inflation rate used for yearly tariff adaption for existing plants. As the core inflation rate is typically lower than the consumer price index inflation rate, this means a decrease of tariffs (in real terms) in future years.
- Royal Decree Law 413/2014 (and Ministerial Order IET 1045/2014):
 - Change of support system for existing plants
 - Capacity payments and generation-based support for plants with generation costs above market prices
 - Calculated for different plant types and allowing for “reasonable profitability” (pre-tax return of 7.39%). Payments already received are considered in the calculation.
 - As a consequence, the income of many existing plants will decrease substantially compared to past expectations. Among others, wind plants built before 2005 will not receive any more payments.
 - The remuneration scheme was in place since July 2013 (RDL 9/2013) but particular installations were only linked to remuneration standards in June 2014. (EU Commission, 2015)

As stated in the list of legal changes above, Spain introduced a number of retroactive measures in their support system after 2009 which led to **severe loss of revenues for owners of existing plants. In combination with the moratorium for supporting new plants, the changes led to an almost complete halt of investments in PV in the country as well as to job losses in the industry** (see GSI and iisd 2014 and Figure 1).

A large number of lawsuits are ongoing regarding the retroactive changes for electricity from renewables in Spain. These include **international lawsuits** where international companies sue the Spanish Government as well as **national lawsuits** before the Supreme Court. While there are already some rulings regarding the changes introduced in 2010 that confirm their legality (reduction of paid full load hours) both from international and national courts, lawsuits against the more recent changes are still ongoing. In December 2015, the Spanish Supreme Court has questioned the constitutionality of recent changes of the support system which means that the issue might have to be decided by the Constitutional Tribunal. However, the Constitutional Tribunal also in December 2015 published a ruling regarding an appeal of the Province of Murcia against the changes introduced in 2013 where it approved the changes as constitutional. To conclude, **the legality of the recent changes is still unclear and will remain so until a new ruling by the Constitutional Tribunal with an average ruling time of 2 years** according to online magazines⁸.

On a European level, Spain already received a Reasoned Opinion from the European Commission regarding the implementation of the Renewable Energy Directive in March 2015. However, the main reason for this was the failure to implement the required sustainability standards for biomass. In terms of support schemes for electricity generation, there is currently no official reason to intervene into Spanish policies as on the one hand, Member States enjoy complete freedom regarding the choice of support instruments and on the other hand, Spain is still on track regarding the official RES interim targets (eufores et al. 2015). However, Spain failed to comply with the more ambitious RES-E interim trajectory from the National Renewable Energy Action Plan (NREAP) and recent assessments are doubtful whether Spain will reach its 2020 targets (Keep on track 2015). Furthermore, the new electricity sector laws include a passage limiting priority access and dispatch for renewable to "equality of economic conditions in the market". This might be a breach of the Renewables Directive (2009/28/CE, Article 16⁹) (Keep on track 2015). Thus, **while the European Renewables Directive gives wide freedom to the Member States regarding the choice of support instruments, the European Union might be in a position to intervene in relation to Spain shall it be unable to reach its targets.**

3.1.3.2. Belgium

The Belgium support system for renewables is relatively complex as energy policy competencies are split between the federal government and the three regions Brussels-Capital, Flanders and Wallonia. Among others, the federal government is responsible for guaranteeing security of supply and supporting offshore wind, while **support for other renewable technologies is organized on a regional level.**

The main support instrument for renewables in all three regions is a **quota system** where electricity **suppliers are obliged to source a certain share of their electricity from renewables.** To this end, they need to **either produce renewable electricity or buy green certificates from renewable electricity generators.** The income from selling green certificates in addition to selling the electricity produced serves as a **subsidy** for

⁸ Web sources:

<http://www.theolivepress.es/spain-news/2016/01/11/spanish-government-cuts-to-renewable-energy-could-be-unconstitutional-court-says/>

<http://www.powerengineeringint.com/articles/2016/01/spanish-supreme-court-to-rule-on-government-renewables-decision.html>

http://www.pv-magazine.com/news/details/beitrag/spains-supreme-tribunal-rules-against-pv-system-owners_100022919/#axzz3zZpffOGd

http://www.pv-magazine.com/news/details/beitrag/spains-supreme-court-will-consider-a-challenge-to-the-sun-tax_100022753/#axzz3zZpffOGd

⁹ Text of Directive 2009/28/EC and of its Article 16: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02009L0028-20151005>.

renewable energy producers. In general, under quota schemes **renewable energy generators face relatively high revenue risks** as they have to bear the double price risk of the regular electricity market (where they sell the electricity produced) and the certificate market (where they sell their green certificates). This increases capital costs due to risk premiums and thus increases support costs compared to systems with more stable support schemes. However, risk premiums can be reduced for example by setting cap and floor prices for the certificates. In addition, while quota schemes are usually technology neutral, **technology-specific support can be introduced by using banding**¹⁰. The **Belgium regions use both, banding factors and cap and floor prices**, in their quota schemes.

While the overall scheme is the same across the regions, the **concrete implementation differs substantially** between them. The most important divergences concern the required renewable shares, the guaranteed minimum prices for green certificates, the penalties for non-fulfillment of renewable quotas (acting as a price cap for the certificates) and the technology-specific banding factors.

As the petition from Belgium (2633/2013) concerns the support policy in the region of **Wallonia**, the following description and analysis of the support system and changes in this system over the last years focuses on Wallonia. The petition complains about frequent policy changes prohibiting an informed investment decision.

In Wallonia, the **green certificate system** has been in place since 2002. In 2008, a banding factor for PV was introduced in the quota system. Until November 2011, PV plants were entitled to receive 7 green certificates per MWh of electricity from the first 5 kWp¹¹, 5 green certificates per MWh from the second 5 kWp (between 5 and 10 kWp) and 1 or 4 green certificates per MWh of electricity for the next 240 kWp (between 10 and 250 kWp). To receive 4 green certificates per MWh, the plants had to fulfill a number of criteria including energy efficiency standards for the building and more than 50% self-consumption of the electricity generated. The certificates were originally valid for 15 years.

¹⁰ In a technology-neutral quota scheme every renewable plant operator (regardless of the technology they use) receives one certificate per MWh of electricity generated. With banding, more expensive technologies such as solar PV or offshore wind receive not only one but several certificates per MWh of electricity generated. As a consequence, they can sell more certificates at the certificate market and have higher revenue per MWh when compared to cheaper technologies such as onshore wind. However, the achievement of the quota in such a scheme does not necessarily mean that the acquired renewables share is reached.

¹¹ The p in kWp stands for peak. It corresponds to the maximum generated energy in one unit of time under standard conditions. These conditions include a light intensity of 1000 W/m², with a spectrum similar to [sunlight](#) hitting the earth's surface at latitude 35°N in the summer ([airmass](#) 1.5) and a cells' temperature of the cells being 25 °C

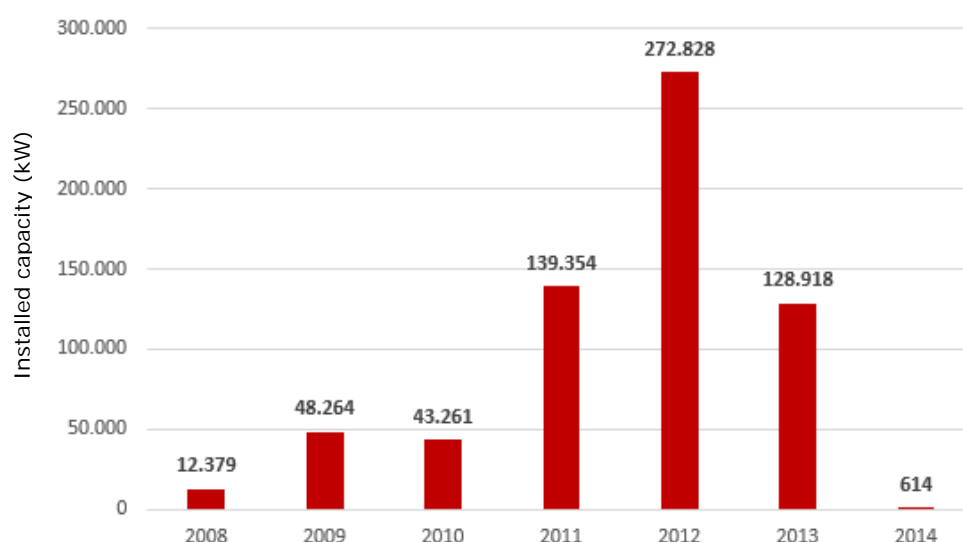


Figure 5: Annual installed PV capacity in Wallonia (2008 – 2014)

Source: Energie Facteur 4 2015

The minimum price of certificates in Wallonia is 65 €/certificate. Thus, 7 certificates per MWh correspond to a premium payment of 455 €/MWh on top of the regular electricity price. This generous support especially for small PV systems¹² in combination with the decreasing prices for solar modules led to **high growth rates of PV installations in 2011 and 2012** (see Figure 6). As a consequence of the high growth in small PV capacities and the corresponding increase of green certificates issued, an **oversupply** of certificates in the certificate market was created leading to **low certificate prices** and an increasing share of certificates sold at the minimum price to the grid operator ELIA. The price drop **endangers the profitability of existing plants** and could block future development in some subsectors (i.e. biomass) (Najdawi et al. 2013).

From 2011, the support system for PV plants with a capacity ≤ 10 kWp was changed several times in order to reduce overall support costs and **reestablish an equilibrium between demand and supply** on the certificates market. Figure 5 shows the resulting development of plant registrations in 2011 and 2012.

¹² The support scheme "Solwatt" for PV plants with a capacity below 10 kWp includes access to the banded quota system as well as a net-metering regulation (see 3.2.2.2).

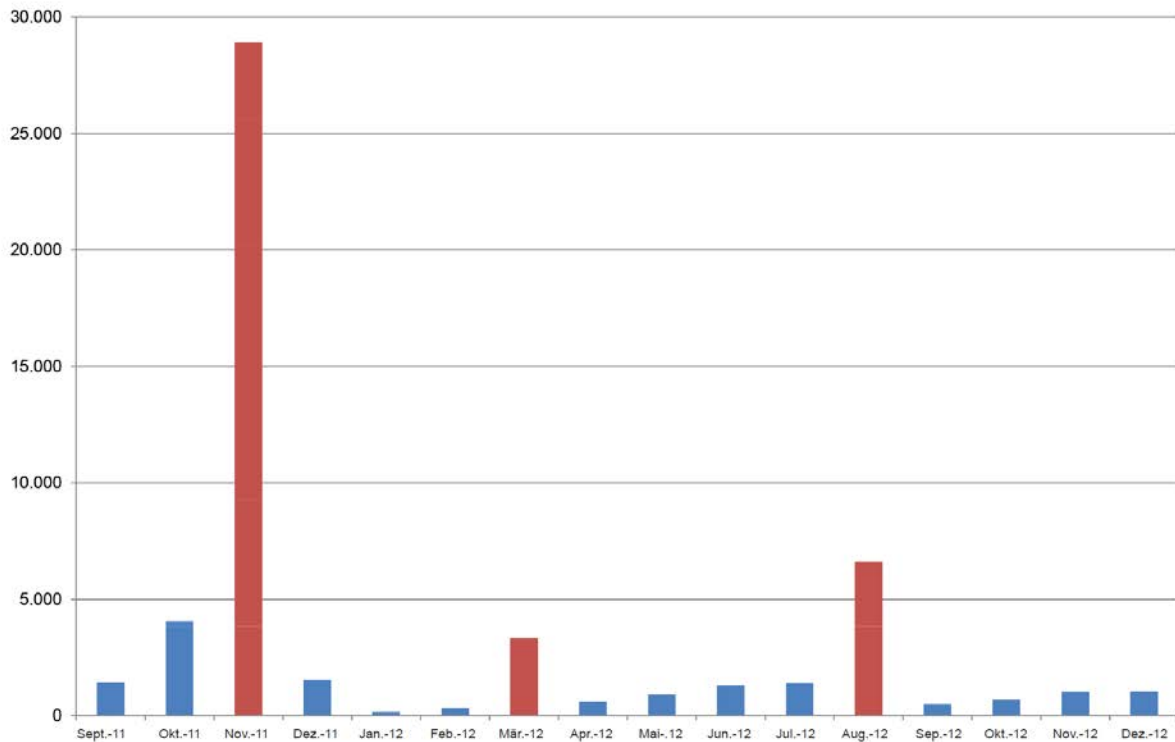


Figure 6: Development of registrations for new PV plants in 2011 and 2012

Source: Energie Facteur 4 2015

From December 2011¹³, the duration of support was reduced from 15 to 10 years. From April 2012 (installation until September 2012), the number of certificates received for 1 MWh changes over time resulting in a slight reduction of average certificates per MWh to 6. From September 2012 (installation until February 2013), the amount of average certificates per MWh was further reduced to 5 (CWaPE 2013). A further reduction to 1.25 to 1.5 certificates /MWh was valid from April 2013 (installation until August 2013). Plants registered after April 2013, receive 1 certificate per MWh of electricity produced.

From March 2014 the new support system “Qualiwatt” for PV plants with a capacity up to 10 kWp was introduced. It provides an annual premium for the maximum number of 12000 installations per year. The amount of the subsidy is calculated based on the costs of a 3 kWp system allowing for an internal rate of return of 5%¹⁴. PV installations with an installed capacity of more than 3 kWp receive the same amount of support as 3 kWp installations but in addition can participate in net-metering¹⁵ (compare Section 3.2.2.2). In 2014, the subsidy was between € 321.51 and € 342.33 per kWp (corresponding roughly to between 357€/MWh and 380 €/MWh assuming 900 full load hours per year), in 2015 between € 259.85 and € 287.12 per kWp (corresponding roughly to between 289 €/MWh and 319 €/MWh assuming 900 full load hours per year). The subsidy remains in principle stable for each individual plant over the five-year subsidy period. However, if the electricity price differs by more than 10% between the years, a correction factor is applied (Najdawi 2014). The subsidy corresponds thus to a fixed premium payment with a small variable element to reduce the risk of over or undercompensation.

¹³ The support scheme was changed for plants registered from December 2011. These plants could however be built and go into operation until May 2012 which explains the high capacity additions in 2012.

¹⁴ For natural persons with low income a bonus applies allowing for an internal rate of return of 6.5%.

¹⁵ Net metering means that for every unit of electricity fed into the grid, the plant operator or household can consume one unit of electricity from the grid at any time for free. A more detailed description of net metering and similar schemes can be found in Section 3.2.2.2)

As can be seen from the number of PV installations in Wallonia, the **frequent support scheme changes and the drop of the support level during the last years led to a massive reduction of PV growth rates in the region.**

3.1.4. Recommendations

In general, **retroactive changes to a support system are never advisable from an economic and political point of view because of the long term costs and loss in effectiveness and economic efficiency they cause. The same holds true for rapid changes in support systems.** Therefore, from our point of view **the European Parliament should call for the support systems to be politically stable and for countries to respect best practices for renewable support systems.**

However, whether the EU can directly intervene in a country or take legal measures against the country is a juridical question. The Renewables Directive gives complete freedom to Member States regarding the choice of support system. At the time of drafting the Directive, this was due to the unresolved debate regarding the best support instrument and seen as a success especially for those countries and politicians opposing a harmonized European quota system. However, this freedom of choosing the right support scheme also includes changing and adapting schemes over time. The EU only has a right to interfere if more concrete measures (such as the sustainability requirements for biofuels) are not implemented by a country. If countries fail to reach interim targets, there is a requirement to adapt the NREAP and define measures to get back on track. Coming closer to 2020 however, there might be a possibility for infringement procedures if it is very probable that a country will not reach its 2020 targets based on the "Renewables Directive" (Fouquet and Nysten 2015). But even if this were the case, it is not clear whether that would change the situation quickly as infringement procedures tend to last very long.

As a consequence, **from our point of view and at the current point in time, it is not possible to legally proceed against changes in the Spanish and Belgium support schemes at the European level. The European Parliament should therefore concentrate on requesting for implementing best practice support schemes as described in the European Commission's "European Commission guidance for the design of renewables support schemes"**¹⁶.

3.2. Self-consumption

3.2.1. Effects of self-consumption

Self-consumption is the on-site consumption of locally produced energy. Among the renewable energies, it is mostly the self-consumption of electricity **generated from roof-top PV plants.** However, a low number of industry sites also install wind turbines or biomass generation plants for self-consumption.

For individuals, **self-consumption is profitable if the costs of electricity generation from the roof-top plant are lower than buying electricity from the grid.** This is potentially the case if renewable electricity has achieved "grid parity" i.e. generation costs equal the respective electricity price. The electricity price of course differs between customers, with private households usually paying the highest prices.

¹⁶ see https://ec.europa.eu/energy/sites/ener/files/com_2013_public_intervention_swd04_en.pdf

In addition, in order for self-consumption to be profitable, the **timing of electricity generation and electricity consumption is essential**. If the PV plant generates electricity at midday and electricity is mainly consumed in the evening, **without an additional storage device**, the plant operator (such as the individual that has installed a roof-top PV) cannot make use of the cheap electricity. Therefore, under current conditions in most countries, self-consumption without any support (such as net-metering or a low feed-in tariff for excess electricity) is only profitable if high rates of self-consumption are reached. This can be reached if demand pattern can be shifted to better match the supply pattern of PV generation.

However, end user electricity prices are not only determined by electricity wholesale prices. They also include to a large part **grid fees as well as taxes and other fees**, e.g. a fee financing the country's renewable energy support system. Thus, if self-generated electricity is cheaper than electricity bought from the grid, this does not necessarily imply that self-generation is an economically efficient type of electricity generation as generation costs might still be (and in many cases are) above electricity wholesale prices.

The extent to which self-consumption is profitable for individuals depends on the difference between the costs of self-generation and the costs of buying electricity from the grid, as well as the share of electricity generated that is consumed onsite and the regulations for feeding spare electricity to the grid.

Several different regulations exist for the remuneration of spare energy fed into the grid: on the one end of the spectrum, the electricity fed into the grid is not remunerated at all (see Section 3.2.2.1 for details on the Spanish regulation). On the other end of the spectrum, a net-metering scheme is in place, which means that all self-generated electricity is remunerated with the electricity retail price as long as total onsite electricity generation is below onsite electricity consumption. Between the two extremes, the electricity fed into the grid can either receive support from the renewable support scheme, the electricity retail price or any other amount between these two¹⁷.

While self-consumption can be profitable from an individual's viewpoint under certain conditions this does not necessarily mean that self-consumption is also beneficial for the electricity system as a whole. Indeed, **the assessment of self-consumption on a system level is ambiguous**.

The European Commission stated that self-consumption has a series of advantages, notably it can facilitate consumer empowerment, contribute to financing renewable extension, reduce system losses and **potentially reduce system costs** (European Commission 2015).

The last point is however highly **dubious**. In general, bigger electricity systems are always cheaper due to balancing effects – for example, peak capacity is lower in a big system than in a smaller system and in the case of renewables, generation patterns are more stable across larger geographic areas. As a consequence, generation capacity needs to be higher in smaller systems, which generally leads to higher costs. Economies of scale also reduce costs in bigger systems as larger generation systems are in general less expensive when compared to smaller systems (e.g. small rooftop PV plants have higher levelized costs if electricity generation than large ground-mounted PV systems).

Furthermore, self-consumption also has important allocation effects. While self-consumers profit from self-generation and direct support costs for renewables decrease with rising shares of self-generation, self-generators are exempt from paying grid fees, taxes and other fees for the consumption of their self-generated electricity. As a consequence, **other**

¹⁷ This is the case if net-billing is in place: under this scheme, the amount of electricity fed into the grid is measured and translated into a reduction of the electricity bill for electricity bought from the grid. While under net metering, the exported electricity is valued at the retail electricity price, under net billing a lower value is assumed.

electricity consumers (without self-generation units) will need to pay more and face increasing electricity prices.

The fee most discussed when assessing self-consumption is the **grid fee**. In theory, self-consumption could reduce the need for grid extension on a local level, at least in situations where a good overlap is achieved between onsite electricity generation and consumption, as in the case of PV generation and air condition (AC) use during midday. However, in many cases, this overlap is not achieved, or at least not achieved every day. As a consequence, distribution grids are still laid out as if there was no self-consumption. Therefore, **grid costs do not decrease to a large extent if self-consumption increases.**

The **European Commission has published best practices regarding the support of self-consumption** (European Commission 2015). While these are generally in favor of enabling self-consumption, they also mention the problems such as rising grid fees for other electricity consumers. **Also from our point of view, self-consumption is beneficial provided that system cost development and distributional effects are carefully considered when designing self-consumption policies.**

3.2.2. Country-specific information

3.2.2.1. Spain

In Spain, a **new law on self-consumption was introduced in 2015**. Contrary to a previous draft version, this law contains **very adverse regulations for self-consumption, as excess electricity fed into the grid is not remunerated at all**. In addition, while self-consumed energy is not charged grid fees, other fees apply. Furthermore, a **specific fee** is introduced for self-consumed energy to cover for additional system costs (Royal Decree 900/2015, §1-§18). This specific fee, the *peaje de respaldo* was referred to as the “**solar tax**”. **From our point of view, an extra payment applying only to self-generated electricity does not seem to be adequate¹⁸. Furthermore, all changes introduced by the Royal Decree also apply to existing plants i.e. the change is retro-active.**

As a consequence of the fees applied, self-consumption of solar electricity is not financially viable unless self-consumption rates are very high (Dufo-López and Bernal-Agustín 2015; De Boeck et al. 2016). As the overall support scheme for PV is not very convenient (compare Section 3.1.3.1), **the law on self-consumption further deteriorates the investment climate for renewables in Spain**. Also the legislative process increased investor uncertainty as it took very long to develop the law and changes from the first draft were substantial¹⁹. However, the legislation on self-consumption was implemented under the previous (now caretaker) Government, while opposition parties have pledged to change the law within 100 days shall they be in government after elections. Having regards of the fact that no agreement was found on the formation of a government following the recent elections, and that new elections will soon take place, the future situation remains uncertain in the short time (Planelles 2016).

¹⁸ Self-generated electricity does not reduce grid costs in most cases. Thus, grid fees should also apply to self-consumed electricity in order to reach a fair distribution of costs between those who cause the costs. In most cases however, grid costs do not either increase if self-consumption increases. Therefore, an additional fee violates the principle of a fair distribution of costs. In the Spanish case, conditions for self-consumption are already unattractive even without the additional fee.

¹⁹ The unattractive conditions for self-consumption in Spain also imply that decentralized battery storage are not an economic option in Spanish households. However, as batteries are still expensive (even the Tesla Powerwall) this is also the case in many other countries with more favorable conditions for decentralized PV and self-consumption. As from a system point of view additional storage is probably needed only at very high renewable shares, this is not necessarily problematic.

3.2.2.2. Belgium

In Belgium, a **net metering scheme is in place to support self-consumption**. Net-metering is open for plants with a capacity ≤ 10 kW in Flanders and Wallonia and with a capacity below 5 kW in Brussels. As the petition regarding Belgium concerns the Wallonian support scheme, the following paragraph focuses on developments in Wallonia. Similar regulations were however introduced in Flanders as well.

In Wallonia, in July 2015 an **additional grid utilization fee was to be introduced²⁰ for “prosumers”** i.e. operators of small power plants (mostly PV plants) making use of the net-metering scheme. Net-metering in Wallonia is implemented using one meter running backwards when the plant exports electricity to the grid. Thus, “prosumers” do not pay the grid fee for all electricity they import from the grid but only for the difference between the electricity generated and consumed. The grid fee was supposed to be between 64.3 €/kW/year and 87.87 €/kW/year depending on the distribution grid operator (EANDIS 2015).

However, such grid utilization fee was **annulled by the Court of Appeal of Liège before its entry into force on the basis of an appeal of the association “Touche pas à mes certificats verts”** who is also the author of the petition regarding Belgium (2633/2013). Therefore, the part of the petition regarding self-consumption is probably not relevant anymore at the current point in time.

3.2.2.3. Germany

In Germany, self-consumption is in principle supported. Plants with a share of self-consumption are still entitled to receive the regular feed-in tariff for the excess electricity they export to the grid. In addition, self-consumed electricity is free from almost all taxes and fees. As electricity retail prices are more than twice as high in comparison to the feed-in tariff for solar plants, self-consumption can be profitable at least if the self-consumed share of electricity is high enough.

Since 2014 however, owners of newly installed power plants with a capacity of more than 10 kW are obliged to **pay a certain percentage of the “EEG-Umlage” (levy to finance renewable support)**. Plant owners, not importing any electricity from the grid and opting to not receive the feed-in tariff for exported electricity, are exempt from this payment. The reason behind the regulation is the argument that grid expenses remain stable even if consumers partly use self-generated electricity as peak load does not change.

The decision to introduce this fee was criticized widely. However, protests were not successful. Nevertheless, the new regulation can be seen as a wide-ranging change regarding the assessment of self-consumption as under previous laws (until 2012) self-consumption was even supported by an extra-tariff. Of course the situation at the time was different as grid parity had not been reached yet.

²⁰ enacted in December 2014

Box 2: Plug-and-play solar systems (electricity microgeneration)

The **petition** regarding Germany is however not complaining about the conditions for self-consumption in general but about the **impossibility to install a plug-and-play solar system**. According to official sources these small installations are not outruled under German renewables law (Clearingstelle EEG 2015). However, in comparison to the Netherlands, **safety regulation** seems to be much stricter in Germany so that simply plugging in the installation is not allowed. Furthermore, as soon as the small installation generates excess electricity, the general rules of the German renewable law apply: in this case, the installation needs to be prepared for curtailment by the grid operator, the installation has to be realized by a certified person and the plant must be registered. As a consequence, **the installation of a plug-and-play module needs to meet a number of criteria and is not as simple as expected**.

The European Parliament has already acted on this problem in 2013 by proposing standardized EU-wide regulation and access to support systems for these small installations (European Parliament 2013).

3.2.3. Recommendations

As stated above, self-consumption can be a means of enabling financing for renewables' extension and increase acceptance for new energies. However, system-wide benefits of increasing self-consumption shares are limited. As grid costs do not decrease with higher self-consumption rates but fees are put onto less demand, **increasing self-consumption leads to higher costs for electricity consumers without own power plants**.

Developments in Spain, Wallonia and Germany show that policy increasingly is aware of the challenge to steer a rational extension of self-consumption by not completely exempting self-generated electricity from all fees. However, there are differences between the countries. While the Spanish regulation makes self-consumption completely unattractive, this is not the case for German or Wallonian law. Also, there seem to be differences regarding legislation in the countries, as the Wallonian legislation was declared illegal while the German one was not. In the case of Spain, the law is too new for a final legal assessment. In general, as stated in Section 3.1, legislation implying **retro-active changes** as in Spain and Wallonia is always more problematic.

Regarding self-consumption **we recommend for the Parliament to call for clear rules and for the avoidance of retro-active changes in any system**. However, we also emphasize the **need for a regulated extension of self-consumption** given that solar electricity has achieved **grid parity** in many EU countries and **costs of decentralized storage are also decreasing**. From our point of view, it is **useful that "prosumers" contribute to financing grid costs and other system related costs**.

Concerning plug-and-play solar systems we think that the Parliament's efforts for European standards are very useful and should be continued.

3.3. Industrial policy**3.3.1. Development of PV industry in Europe**

Employment creation is often stated as one of the benefits of supporting renewable energies. Indeed, jobs in the renewable sector were increasing across Europe and elsewhere due to the market growth induced by support policies (compare among others Duscha et al. 2014).

Economic theory tells us that industrial policy (i.e. support to specific sectors in the economy using either technology-push or demand-pull measures) can help create dynamic comparative advantages and thus enable new industries to become competitive on a global scale. However, economists are not in agreement regarding the benefits of industrial policies: the main controversial issue is the question whether the state is able to pick the right winners, i.e. to identify sectors that will be competitive in the long run (compare among others Carbaugh and St. Brown 2012).

Even though Europe is still the world leader in electricity generation from PV, the main growth centers of PV capacity have moved to Asia over the last years. The same is true for **cell and module production which has shifted to Asian countries in recent years.** While in the period from 1997 – 2008, 20-30% of global PV panels were produced in Europe, this share has fallen to 5% or less in the period between 2011 and 2013 (see Figure 7).

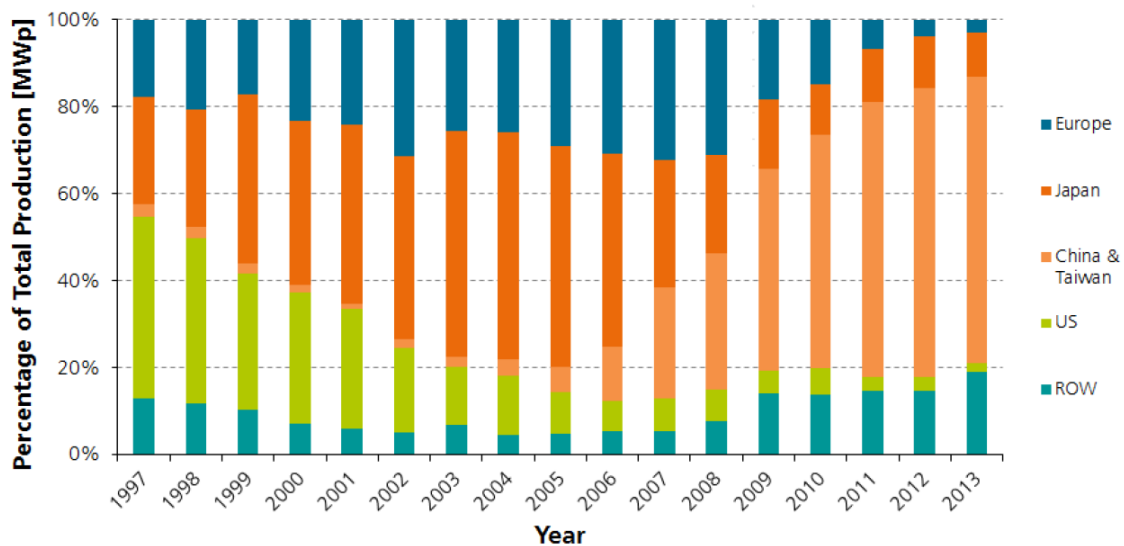


Figure 7: Global PV module production by world region

Absolute figures of cell/module production²¹ by EU countries have decreased as well since 2010. Currently the EU share in PV module production is estimated to be around 2GW (a number of smaller producers with <100 MW production and focusing on niche products) but also large PV manufacturers remain in Europe (e.g. Solar World AG, >1 GW production with a 500 MW facility in Freiberg, Saxony; Jabil Circuit from US but with production of 1GW in Poland; and potentially Recom AG in Athens, Greece is to build a 500 MW facility in Italy, so far producing in Malaysia).

Due to global overcapacities in module manufacturing, the PV industry went through serious financial difficulties, with most PV manufacturers losing money in 2012 due to low module prices Figure 8. This trend continued in 2013 and 2014.

²¹ PV panels consist of photovoltaic cells which are assembled into modules.

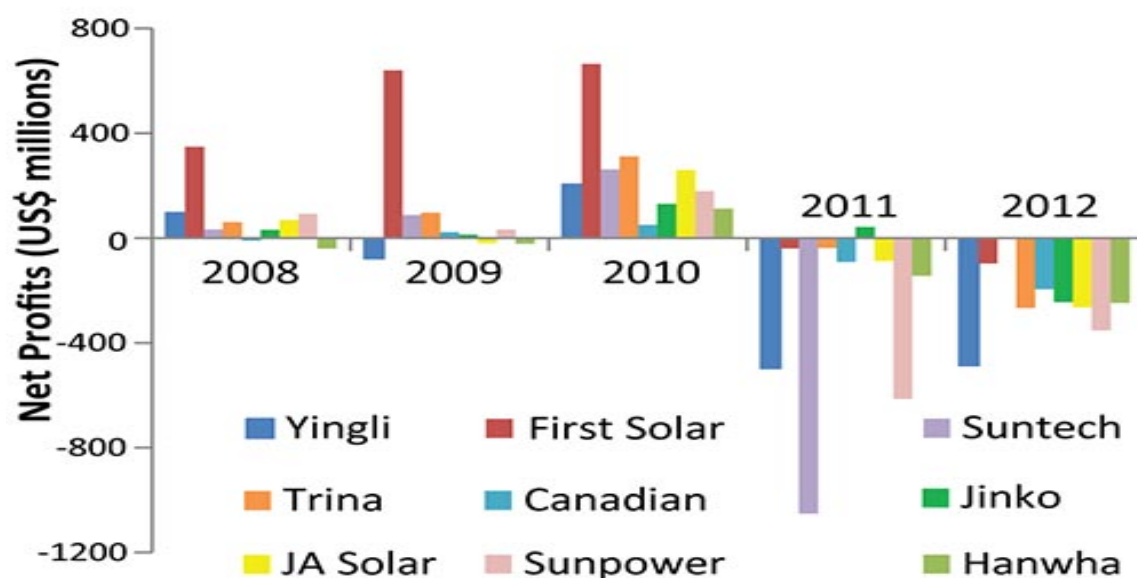


Figure 8: Net profits (losses) of 9 major US-listed PV manufacturers during 2008–2012

Source: Zheng and Kammen (2014)

As can be observed from Figure 9, **crystalline modules from China were sold substantially cheaper than modules from Europe and Japan**. There are several reasons for the **higher competitiveness of Chinese manufacturers**. Among them are larger capacities of manufacturing plants, technological advantages, lower labour costs but also allegations on state aid given by the Chinese government²².

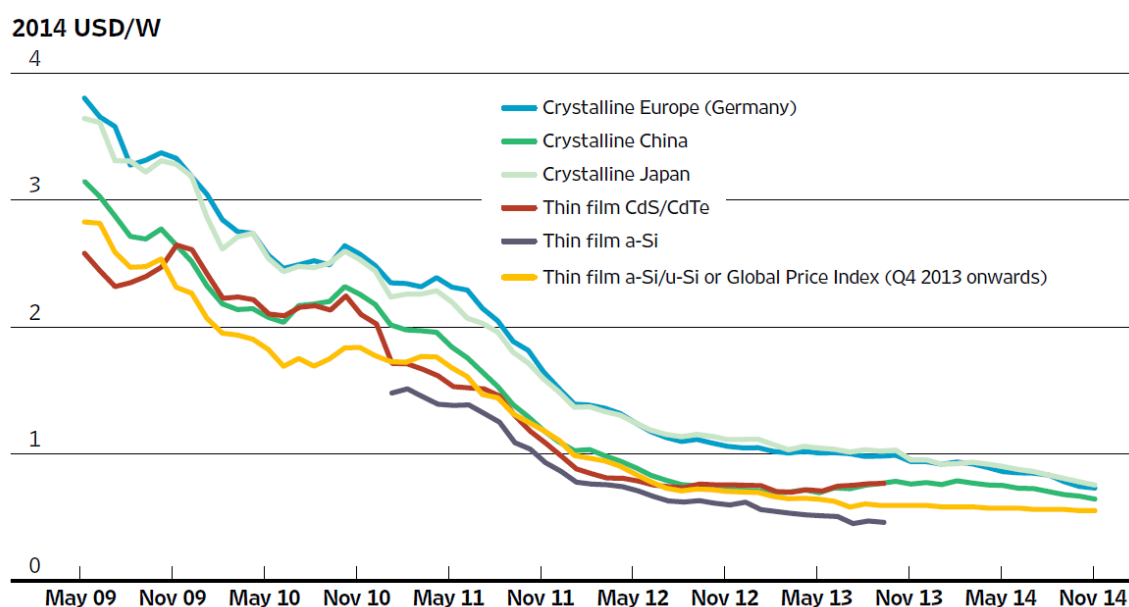


Figure 9: Average monthly solar PV module prices by technology and manufacturing country sold in Europe, 2009 to 2014

Source: IRENA (2015)

²² See for example <http://uk.reuters.com/article/2013/08/27/uk-eu-china-solar-idUKBRE97Q0PU20130827>

To conclude, European renewable support policy seemed to be very successful regarding industrial policy goals for a long time (compare among others Fishedick and Bechberger 2009). However, as stated above, **in recent years competitiveness and market shares have decreased. Many production facilities went bankrupt, were closed or had to cut back jobs. This development on a global level was probably also the reason for the company Solarday in Italy to lay off worker and close** (see petition 1331/2012)²³.

Three factors are likely to **change this picture in the future**: first, **the PV market is likely to grow substantially** from meeting demand of about 50 GW p.a. in 2014 to 135 GW in 2020²⁴. Secondly, a **substantial consolidation of the market** took place during the last three years. Third, the **European Union has implemented measures to prevent pressure on European manufacturers due to Chinese dumping and subsidies** (see Box 2). Therefore, **the perspectives for the remaining PV cell and module manufacturers are likely to improve in the near future**.

Box 3: EU measures against dumped and subsidized imports of solar panels from China (European Commission 2015)

The EU has implemented **measures against dumped and subsidized imports of solar panels from China in December 2013 for a period of two years**. These measures include duties as well as an undertaking under which certain Chinese companies are allowed to export cells and panels to EU countries if they charge a price above a defined minimum price. If the companies do not commit to the rules of the undertaking, the dumping and subsidy duties apply.

Currently, expiry reviews are conducted which usually take between 12 and a maximum of 15 months. During this period, the measures remain in place. An expiry review can only lead to a time extension of the measures or result in their abolishment. Therefore, a partial interim review is conducted in order to assess whether the measures in force should be adapted. Furthermore, the level of the minimum price is reviewed in order to reflect market developments.

3.3.2. Recommendations

A stable domestic market is one of the important drivers for the development of a new industry. Thus, **job losses in the PV sector are another reason for the Parliament to call for stable and predictable renewable support policies and extension pathways**.

Other than that, the effects of globalization on the European economy are not restricted to the energy sector. We are therefore not in a good position to give specific advice on this topic. Regarding the petition from Italy (1331/2012) we think that **the Commission's answers are well suited to cover the topic**. For the specific plant closure it would possibly have been **advisable for Italy to access the EGF** but at this point in time, this is most certainly too late.

²³ The solar park to be set up in Serbia mentioned by the petition as one reason for the company to close its production site in Italy was cancelled in the meantime (see Bayar 2013).

²⁴ Based on GTM Research

4. SUMMARY OF PETITIONS AND RECOMMENDATIONS

Table 2 Summary of petitions and recommendations

Petition number	Country	Petition topic	Summary of Commission answer	Recommendations
0693/2010	Spain	Retroactive changes to Spanish renewable support scheme inducing income cuts of 30% - 40% for solar PV plants		Requesting for stable and fair policy frameworks; legal measures are maybe possible if interim renewable extension targets are not achieved (which is currently not the case for Spain)
0773/2010	Spain			
0100/2011	Spain		Retro-active changes are to be avoided following the Commission's Communication on renewable energy of January 2011 (COM(2011)31). However, due to the freedom of MS regarding the choice of support instrument, there seem to be no legal grounds to take action against the Spanish government. The Commission hopes that the strong public reaction and response of the Commission to the Spanish case likely discourage such developments in the future.	
0203/2011	Spain			
0331/2011	Spain			
0395/2015	Spain			
0430/2013	Spain	General complaint about changes in Spanish renewable support scheme	MS enjoy wide freedom regarding the choice of support schemes as long as they reach the indicative trajectory set out in Part B of Annex I of the Directive. This condition is presently met by Spain. The question whether changes to national renewable energy support schemes comply with EU General Principles of Law, needs to be assessed on the basis of relevant domestic legal frameworks and thus by national Courts.	
0172/2013	Spain			
0709/2013	Spain			
1481/2013	Spain			
0384/2015	Spain	Self-consumption: Bureaucracy and tax regulations for small scale PV plants		Requesting for clear rules and avoidance of retro-active changes regarding self-consumption; prosumers should however bear a fair share of the system costs (grid costs are in most cases not substantially reduced by self-consumption)
1264/2013	Spain	Self-consumption: peaje de respaldo ("solar tax") and new tax on electricity generation in general	The commission sees self-consumption as an important means to reach the 2020 targets. Therefore, self-consumption should be regulated in such a way that cost savings are adequately reflected. Regarding the changes in support for existing renewable the Commission has publicly expressed its concerns. However, MS enjoy wide freedom regarding the design of their support instruments as long as they reach the indicative	
2378/2013	Spain			
1552/2013	Spain			

Petition number	Country	Petition topic	Summary of Commission answer	Recommendations
			<p>trajectory set out in Part B of Annex I of the Directive. This condition is presently met by Spain.</p> <p>Furthermore, the Commission is still assessing the legal compatibility of the electricity sector reform (Act 24/2013) with EU legislation and will consider if EU action is appropriate and necessary once the assessment is complete. The Commission policy is not to comment on drafts. The Commission would like to refer to its Guidance on best practices on renewable energy self-consumption schemes in order to help guide Member States policies in this area.</p>	
2617/2013	Spain			
1887/2014	Spain			
2633/2013	Belgium	Complaints about fast-changing policy framework in Wallonia and grid fee for self-consumption	MS enjoy wide freedom regarding the choice and design of support instruments as long as the indicative renewable extension trajectories are reached (currently the case for Belgium). The question whether changes to national renewable energy support schemes comply with EU General Principles of Law, needs to be assessed on the basis of relevant domestic legal frameworks and thus by national Courts. Further information would be needed for assessing the lawfulness of the new grid fees.	Calling for stable and fair policy frameworks; legal measures are maybe possible if interim renewable extension targets are not achieved (which is currently not the case for Belgium); grid fee annulled by Belgium court
0986/2014	Germany	Complaint about strict rules regarding plug-and-play PV systems	In the EU no harmonised codes for the connection of small photovoltaic systems to the grid exist. With regard to Germany, the conditions for connecting PV systems to the grid are well defined and overall favourable, although some restrictions apply. The Commission does not have any evidence that Germany applies clearly disproportionate or discriminatory rules.	Continuing efforts to standardize regulation across EU
1331/2012	Italy	Job losses due to closure of PV production plant; general effects of globalization on European employment	The industrial policy of the Commission tries to reinforce the EU industrial base. The Commission also guarantees through its trade policy that the enforcement of fair international trade practices is a key priority and is implementing measures to	No specific action on EU level possible; market consolidation in PV production due to overcapacities relevant not only for EU companies; dumping and subsidy

Petition number	Country	Petition topic	Summary of Commission answer	Recommendations
			<p>effectively protect the EU industry from such practices as well as to help EU enterprises to successfully seize opportunities in global markets.</p> <p>The Commission cannot intervene directly in specific cases of business closures. However, it can provide support for workers at risk of unemployment using various instruments, and in particular the European Globalisation Adjustment Fund (EGF), which is mentioned in the letter of the Committee on Petitions. At the request of a Member State, the EGF provides redundant workers with assistance in the form of training, job-search assistance, support for entrepreneurship, etc. to help them find other jobs as quickly as possible. The EGF can only be mobilised once several criteria are met and at the request of the Member State concerned.</p>	<p>duties for Chinese cells and modules already in place</p>

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ANNEX

Petition summaries:

Spain:

- The petitioner objects to plans by the Spanish Government to reduce by 40% revenue from solar energy plants, indicating that the owners had invested in solar farms under the terms of Royal Decree 661/2007, which guaranteed a KWh price for a period of 25 years. The 40% reduction now being considered by the Government would, however, have a highly adverse effect on the renewable energy sector and the petitioner accordingly calls for the price established under the Royal Decree-Law to be maintained (0693/2010).
- The petitioner expresses concern at plans by the Spanish Government to cut by 40% revenue from solar energy plant, indicating that owners have invested in solar farms in the light of Royal Decree 661/2007 which guaranteed a KWh price for a period of 25 years. The 40% reduction now being considered by the Government would, however, have a highly adverse effect on the renewables sector and the petitioner accordingly calls for the price established under the Royal Decree law to be maintained (0773/2010).
- The petitioners, owners of solar photovoltaic installations in Spain, protest at the entry into force of Royal Decree-Law 14/2010, which reduces the remuneration of photovoltaic energy producers by 30%. It means that owners of solar farms cannot afford to repay the bank loans contracted to pay for their installation and will go bankrupt. The petitioners call for the defence of renewable forms of energy such as solar power, and maintain that the Royal Decree-Law in question infringes the principle of legal security enshrined in the legal order. (0100/2011)
- The petitioner protests against the Spanish Government's intention to cut the allowance paid to solar energy plants by 40%. Owners of these plants invested in solar farms based on Royal Decree No 661/2007, which guaranteed a price per kWh for 25 years. However, the Spanish Government is considering whether to cut the payment for this electricity by 40%, which would have a very adverse impact on this renewable energy sector. The petitioner requests that the price set in the Royal Decree be maintained. (0203/2011)
- The petitioner complains at the decision of the Spanish authorities to reduce the premiums for the production of photovoltaic energy. The petitioner, who installed a solar heating system in 2007 on the basis of the premium and guarantee system then in force, considers that the competent authorities, by not maintaining the conditions they promised investors at that time, are guilty of unlawful breach of a contractual obligation, and that vast numbers of investors risk financial ruin. The petitioner therefore calls on the European Parliament to intervene. (0331/2011)
- The petitioner complains about the bureaucracy and tax regulations which small-scale generators of solar power using photovoltaic panels have to deal with. He states that this bureaucracy is counterproductive, and disincentivises environmental conservation. He asks that red tape be reduced and solar power generation encouraged (0384/2015).
- The petitioner invested, through a German company, in a Spanish solar energy investment fund, which manufactured and operated photovoltaic installations in Spain. The price/kWh was fixed and guaranteed by law. He complains that the price/kWh was dramatically reduced by legal stature and therefore his investment no longer generates profit. He is aware of the risks related to investment funds but he did not expect such a shift by Spain and he is currently disappointed (0395/2015).

- This petition refers to Royal Decree 14/2010 which dramatically reduced the price per kilowatt hour produced and to Royal Decree 9/2013, which repealed the provision of subsidy to energy production by renewable sources. In reply to petition No 0331/2011, the European Commission held that this reduction does not infringe EU law and recommended lodging an appeal with the Spanish courts. Appeals on this issue are already pending before the Spanish courts. Moreover, Spain had received a letter of formal notice by the European Commission on its untimely compliance with the requirements of the Directive on Renewable Energy (Directive 2009/28/EC).
- The petitioner draws the attention to the tax imposed on those who decide to generate their own electricity through photovoltaic or wind energy. The tax (so called "backup toll") would be so high that it would indeed be cheaper to have a contract with a large electricity supplier company. The petitioner is alleging the corruption of politicians as a reason for this. He claims that many of those who lose their political seat end up working for electricity or a gas company. Thus, the Spanish government is still more eager to help coal industry and remove the support to the renewable energies. The petitioner claims that at the time of writing there have been around 30.000 signatures supporting this petition on www.Change.org. He is asking for the EP's support, too (1264/2013).
- The petitioner, a British resident in Spain, states that, in Spain, people have started to remove their solar panels because a proposed new taxation of solar power has been introduced which will further undermine the ability of Spain to respect the EU renewable energy targets and which, according to him, will amount to taxing the sun even though in the past the same public authorities encouraged and sometimes subsidised households wishing to produce their own solar energy. The petitioner considers that such proposals could amount to a breach of EU rules and objectives on sustainable energy and reducing the carbon footprint of Member States (2378/2013).
- The petitioner warns that energy companies and the Spanish Government are hindering the development of renewable energies in Spain. He asks the European Union to ensure that Spanish Royal Decree 1699/2011 is finally implemented. (0172/2013).
- Petitioners denounce that the government of Spain has in recent years enacted legislation which infringes Directive 2009/28/EC on the promotion of the use of energy from renewable sources. Specifically, petitioners point to Royal Decree 1565/2010, Royal Decree Law 14/2010, Royal Decree Law 1/2012, Law 15/2012 and Royal Decree Law 2/2013, which they allege do not legitimately pursue the reduction of Spain's public deficit. Petitioners denounce that the overall framework does not promote renewable energy, does not guarantee legal security, and that it discriminates amongst technologies and investors in the electricity sector (0430/2013).
 - A 30-50 % reduction in the number of years during which a regulated tariff is applied to photovoltaic energy (royal decree 1565/2010);
 - A drastic limitation on the maximum annual number of hours to which regulated tariffs apply for photovoltaic technology (RDL 14/2010);
 - A moratorium on renewable energies, which effectively abolishes the distinction between the special system and the ordinary one (RDL 1/2012); the tax on regulated tariffs (Law 15/2012);
 - An end to the use of the real consumer price index (CPI) to update regulated tariffs for renewables (RDL 2/2013).
- Petitioners denounce that the government of Spain has in recent years enacted legislation which infringes Directive 2009/28/EC on the promotion of the use of energy from renewable sources. Specifically, petitioners point to Royal Decree 1565/2010, Royal Decree Law 14/2010, Royal Decree Law 1/2012, Law 15/2012 and Royal Decree Law 2/2013, which they allege do not legitimately pursue the reduction of Spain's

public deficit. Petitioners denounce that the overall framework does not promote renewable energy, does not guarantee legal security, and that it discriminates amongst technologies and investors in the electricity sector (0709/2013).

- In the petitioner's opinion certain measures taken by the Spanish government in the last years threatens the development of sources of renewable energy and are contrary to the principles of legal certainty and legitimate expectations. Therefore the steps taken by the Spanish government, damaging the legal security of investments in renewable energy and contrary to promotion of this kind of energy sources put at risk achieving by Spain the environmental objectives established by the Directive 2009/28/EC (1481/2013).
- The petitioner refers to a law in Spain which requires users of electricity from their own solar panels to use far more expensive electricity generated by the conventional central method. According to the petitioner, this law is contrary to the EU's policy of reducing the use of fossil fuels and encouraging the use of renewables. The law also penalises people who seek to generate and use energy in a responsible manner. Moreover, the petitioner considers that he has the right to decide what energy source to use (1552/2013).
- The petitioner demands that the costs he has invested in the solar power equipment which result in losses be returned to him. He claims that a law has been introduced in Spain retroactively which undermines self-generated electricity from solar panels to be used as an alternative source of energy to the State provided one. He feels he is being discriminated against for generating his own electricity. He has invested in this system in good faith and now he feels being punished (2617/2013).
- The petitioner explains that her local government imposed a tax on people acquiring solar energy. She is outraged that she has to pay whereas she uses her own energy, from an inexhaustible source that is a common good, all the more as it respects the environment. According to her, this tax favours the electricity companies, which have agreements with the Spanish government (1887-14).

Italy

- The petitioner states the following: in April 2012, the Italian photovoltaic company MX Group, put its subsidiary Solarday into liquidation, closed its photovoltaic plant in Brianza (Italy) and the company created in New Jersey (USA), and made its employees redundant (over 200 in Italy and 120 in the US), stating that its problems were due to dumping on the part of the Chinese Government. Moreover, according to a statement by the Serbian Government on 8 May 2012, the company is planning to move its production to Serbia as a condition of holding the contract for the construction in Serbia of the largest solar park in the world, the so-called 'Onegiga' project. That exacerbates the unemployment and social problems in the province of Monza and Brianza. In this situation, the European Union must take full responsibility for dealing with this social crisis in Brianza and other similar crises in Europe caused by the negative effects of financial and market globalisation. The European Parliament is hereby called on to: 1. urge the European Commission to work with the national and regional authorities in Italy to promote in Brianza a European pilot project/flagship project to revive the photovoltaic sector in that region, which can be applied in other countries where the photovoltaic industry is going through the same crisis; 2. urge the European Anti-Fraud Office (OLAF) to conduct an in-depth investigation into how Solarday ended up in insolvency; 3. call on the Republic of Serbia to ensure that the planned 'Onegiga' project creates new jobs without taking jobs away from Italy in the

district of Brianza; 4. urge the European Commission, which has started proceedings against Chinese dumping in the photovoltaic sector, to consider the respect of human rights, workers and the environment; 5. urge the European Commission to conduct an analysis (such as a Green Paper) in respect of dealing with globalisation, with a particular focus on the problem of relocation of production (1331/2012).

Belgium:

- The petitioner, a Belgian association (Asbl) called "Touche Pas A Mes Certificats Verts" denounces a lack of consistency, and on-going modifications, of the "Green Certificates" scheme in Belgium and especially in Belgium's southern region of Wallonia (e.g: the Royal Decree of 16 July 2002 on the Introduction of Mechanisms Promoting Renewable Energy Generation). A so-called "Green Certificate" is a tradable commodity proving that certain electricity is generated using renewable energy sources. Typically one certificate represents generation of 1 Megawatthour of electricity. In its claim, extremely detailed and articulated, the Belgian association argues that the ever-changing schemes have not allowed for a fair and entirely aware business-decision to take place, hence breaching the spirit of Directive 2009/28/CE on the "promotion of the use of energy from renewable sources" and relevant Court of Justice of the European Union's relevant jurisprudence (e.g: CJUE Affaire C-369/09 P). What is defined as "renewable" varies from certificate trading scheme to trading scheme (2633/2013).

Germany:

- The petitioner reports that his energy supplier prevents him from installing an officially certified "plug and play" photovoltaic system, in case he does it as planned without taking the subsidies foreseen under the German law for the promotion of renewable energy. He believes that the only reason for the provider to refuse this is to avoid selling less energy to him. He asks why such installations are possible in other countries but not Germany (0986/2014).

DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT CITIZENS' RIGHTS AND CONSTITUTIONAL AFFAIRS C

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