



PowerUp MyHouse

# Legal Face of PVT

Output O2 deliverable report

Final version

*PowerUP MyHouse*

*Development of innovative learning and practice modules to increase the usage of renewable energies for sustainable buildings*

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## **Abstract**

Within the scope of the PowerUp MyHouse project, and following Output O1, this document (Output O2 report) addresses the most relevant aspects of legal face of PVT technology in several countries. Partners from Portugal, Turkey, Sweden, Lithuania and Denmark cooperated in this task.

The use of renewable energy sources (RES) is an important issue supported all over the world, especially in Europe. States provide cash and in-kind incentives for the use of RES, using their own resources and/or international resources. These incentive systems vary from country to country, region to region, and even from technology to technology used.

Increasing incentives or supports is very important for solar energy, especially for PVT. In order to use a technology, no matter how successful it is, it is essential to have legal infrastructures that support it, at least not prevent it. It is possible that there are technologies that cannot be put into practice quickly simply because their value is not easy to understand. All of these show that it is essential to answer the questions: “what is the situation of legal and bureaucratic regulations in countries where renewable energy resources are used at an advanced level?”, “how are they structured?” and “can they be transferred to less developed countries?”.

The PVT technology is still very recent in commercial terms, so the existing legislation is not adequate or does not explicitly contemplate at all this type of system.

Given the scarce information on the legal framework for PVT systems, this document addresses this issue at the level of RES systems for the production of both electricity and heating, which are widely disseminated. The existing support and incentives, both for RES-E and for RES-H, in the different countries are significantly different both in terms of amounts and in terms of the diversity of financial mechanisms.

In the countries of the European Union, the next developments and opportunities in the renewable energy sector depend mainly on the objective of reducing greenhouse gas emissions and the fulfillment of the commitments assumed under the Paris Agreement.

For PVT technology to grow significantly, it is necessary to go forward. In this context, it is important that the companies in the PVT systems field of work provide the holders (country governments) credible plans. It is also essential to increase the knowledge of architects, planners and installers on the advantages of PVT solutions.

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## 1. Introduction

This output (O2) aims to look at to the legal face of PVT. The use of renewable energy sources (RES) is an important issue supported all over the world, especially in Europe. States provide cash and in-kind incentives for the use of RES, using their own resources and/or international resources. These incentive systems vary from country to country, region to region, and even from technology to technology used. PVT is a developing and changing technology. For example, although there are incentives for PV and thermal in Turkey, there is no incentive for PVT technology. The legal structures cannot follow these systems which are constantly evolving and changing. Increasing incentives or supports is very important for solar energy, especially for PVT. In order to use a technology, no matter how successful it is, it is essential to have legal infrastructures that support it, or at least not prevent it. It is possible that there are technologies that cannot be put into practice quickly simply because their value is not easy to understand.. All of this show that there are some essential the questions: “what is the situation of legal and bureaucratic regulations in countries where renewable energy resources are used at an advanced level?” or “how are they structured?” and “can they be transferred to less developed countries?”.

As this project focuses on PVT from all angles, it is important to share the results with the public, especially with decision makers. Thus, this O2 output report focuses on:

- National incentive policies on PVT (e.g. Who is it for?; What kind of conditions are sought?; What do they include (vat exceptions; customs tax exceptions, vat discount, social security support, credit and interest support, etc.)? );
- PVT support and preventive factors applied at the local level (What are these?);
- Legal permit processes and sanctions on PVT (Opportunities and obstacles ...);
- International incentive policies on PVT (If it exists, how to use it?);
- Financial institutions support;
- Cost-benefit rate from the investor's perspective;
- The legislation affects the application of PVT technology separately as PV and T;
- Transfer possibility in supports and incentives (What kind of necessities do they require, if possible?).

The workload of this output is shared by the responsible partners:

- IPT manages the O2 output, researches on legal face of PVT in Portugal and non-partner countries and prepares the report final version;
- ATU researches on legal face of PVT in Turkey;
- HiG researches on legal face of PVT in Sweden;
- PANKO researches on legal face of PVT in Lithuania;

- DTU researches on legal face of PVT in Denmark;
- MG researches on legal face of PVT in several countries (best examples).

PVT systems are used in several applications: single-family and multi-family houses, hotels, campuses, public services, hospitals, agricultural and industrial processes, and even district heating. Payback time as low as 4 years have been observed in hotel cases in Spanish conditions [1.1].

According to Spanish manufacturer Abora, a hybrid system costs less than a thermal system plus a separate photovoltaic system. The PVT system costs a little more than a thermal system (since it includes photovoltaic), but the economic savings achieved by additional photovoltaic production means that most facilities (where a thermal plant would be installed) choose for PVT when they know its advantages. Also according to this manufacturer, it is important to bear in mind that the installation of PVT systems is not economically viable in every type of installation. Viability is ensured in buildings with a need for hot water, as it surely also consumes electricity. In these places, PVT is clearly more profitable than other solar technologies, with paybacks between 4 and 6 years being common. The key to getting good paybacks depends on three issues: radiation, energy price and energy consumption. If these three factors are met, paybacks are very attractive to the customer. So, since the system is profitable, it is also bankable. For example, Abora states that, having a warehouse in Portugal, allows for immediate delivery and more competitive prices in this country: Pack's with bank financing approval with an interest rate of around 2%.

The trade-off between the higher cost of a PVT collector and that of separate PV or T collectors must be balanced by the value of the heat or electricity produced on the same occupied area for the system owner. The heat produced can be delivered to a heating network, used onsite or stored in heat storage devices. The electricity produced can be delivered to a grid, used onsite or stored as either electricity or converted to heat. If the electricity is self-consumed, the savings can deeply enhance the Return on Investment (ROI) depending on the local electricity price. This is especially true when replacing alternative heat sources by for the combination of heat pump technology: the trade-off costs/savings have to be taken into account since boreholes or air heat exchangers are replaced [1.1].

Currently, one of the main problems is to balance the high and growing demand for energy with the sustainable use of resources and the reduction of greenhouse gases (GHG) emission, in order to reduce the consequences resulting from energy production. The most effective way to resolve this issue is to promote energy production using renewable sources. This objective is so important at the European level that the European Parliament and the European Council issued a joint directive (Directive 2009/28/EC of 3 April 2009) which establishes the conditions for increasing the share of energy through the use of renewable energy sources establishing an average share for the European Union of 20%, without prejudice to more or less

ambitious targets for each Member State (MS). The central objective is “to reduce the Community's GHG emissions and its dependence on energy imports”, together with “increasing energy efficiency”. The Directive “sets mandatory national targets for the global share of energy from renewable sources” [1.2].

Directive 2009/28/EC establishes the existence of a National Action Plan for Renewable Energies (NAPRE). Each MS had to deliver the NAPRE to the European Commission, by 30 July 2010, in which national targets are defined for the shares of energy from renewable sources in 2020, as well as how the sectoral measures are going to be implemented to meet the objectives that were described.

The improvement of energy efficiency is a key objective of the Community. Buildings have an impact on the environment, leading to an increasingly global concern to try to mitigate the effects as effectively as possible. The environmental impacts arising from buildings are mainly due to: the use of materials extracted from nature, their transformation and demolition at the end of their life, and also the energy needed to maintain thermal comfort conditions and air quality inside buildings. The extraction, construction and demolition phases involve an energy expenditure that is generally classified as embodied energy.

The European Union is concerned to promote, as much as possible, the reduction of these impacts on the environment, imposing on all MS legal rules that increasingly reduce the use of fossil energy in the air conditioning of buildings, through:

- Reduction of the energy needs of buildings;
- Primary use of renewable energy sources in buildings;
- Promotion of greater flexibility in energy use by citizen communities.

In this sense, there were community guidelines that were published and the MS transposed into national legislation. Regarding Energy Requirements and Performance of Buildings, it is important to highlight the Energy Performance of Buildings Directive (EPBD); directive 2010/31/EU of May 19, 2010 and constant amendments to directive (EU) 2018/844 of May 30, 2018.

All this legislation highlights the concern of the European Union to:

- All new buildings have almost zero energy performance (nZEB - near Zero Energy Building in the Article 9 of the EPBD);
- A Long Term Strategy for the Renovation of Buildings should be prepared in order to promote the renovation of the housing stock (Article 2a of the amended EPBD directive (EU) 2018/844) so that all buildings are transformed into buildings nZEB until the year 2050.

The increased investment in energy production using renewable sources faces two major problems [1.2]: i) the high cost of technologies that allow the production of renewable energy; and ii) the unique characteristics of regions and countries that have



to be taken into account when choosing the type of source or sources to be used. Regulators from different countries and regions have at their disposal a significant set of regulatory instruments, all of them with different application and with advantages and disadvantages. The main objective of these instruments is the replacement of energy production from non-renewable sources by energy production from renewable sources. Two objectives derive from this main objective: i) the promotion of technological development; and ii) the reduction of transaction and administration costs, in order to keep consumers receptive to renewable technologies. However, it is important to mention that the specific characteristics of each region and country require a careful analysis in order to implement the most appropriate instrument or combination of instruments.

These regulatory instruments can be divided into three major areas [1.2]: incentives based on production, incentives based on investment and incentives based on the legal framework. Production-based incentives are those based on the amount of energy produced. The main instruments are the minimum Feed-in tariff, production tax credits and the quota system. These instruments come bundled with a set of parameters that complement the main systems. On the other hand, investment-based incentives are intended to remunerate investors for their initial investment and can be, for example, tax incentives, tax exemptions, bank guarantees or accelerated depreciation. Finally, the third area encompasses the legal framework regarding non-monetary incentives, such as the type of regulator or the way projects are approved.

Tax incentives have been applied in several MS of the European Union as a specific set of regulatory policy to encourage the production of renewable energy, which has been used to increase the production of renewable energy and, thus, reduce the effect of greenhouse gases (CO<sub>2</sub>) [1.2]. In any case, the application of this regulatory instrument is only fully effective when the regulatory framework allows it, in order to introduce market stability and protect investments.

Direct tax incentive systems are those that make it possible to reduce investment costs in renewable energy production, through exemption from taxes on individuals or taxes on companies. There are three types of taxes in the category of direct tax incentives [1.2]: personal income taxes, corporate taxes and property taxes:

- Private income tax, this type of incentive is used in some MS: Czech Republic, Belgium, France and Luxembourg (being applied depending on their characteristics);
- Corporate tax, this type of incentive is used in Belgium and Greece, and has also been used in Spain. In Belgium and Greece there is an exemption from part of the expenditure on renewable energy production systems;
- Property Taxes. In Spain and Italy there is a local property tax. The underlying tax incentive is to reduce the tax paid by property owners who install renewable energy production systems in their properties. However, there are limits to these deductions. For example, in Italy the reduction only applies to properties that are

the first residence of a family and that do not fall into the luxury property category.

Indirect tax incentive systems are those that focus not on investments, but on energy production. Indirect tax incentives include [1.2]:

- Value Added Tax (VAT), being a common tax within the European Union, the incentive based on this instrument is related to the reduction of VAT on transactions involving the production of renewable energy. It is used in Portugal, France and Italy, being, in all cases, supported by the State. For example, in Portugal, the purchase of domestic renewable energy production systems is subject to an intermediate VAT rate. The application of this incentive requires authorization from the European Commission under the competition rules;
- Exemption from excise taxes: this incentive is used in the promotion of renewable electricity through the special tax exemption since the use of this type of energy does not harm the environment. This type of incentive is used in Germany, Denmark, Romania, Slovakia, Sweden and Poland.

With the COVID-19 (and post-COVID) manufacturing changes, the GHG emission has become one of the most vital social economics issues. The clean energy and climate change associations have spent decades tackling a crisis that has been unfolding in motion [1.3]. For example, the Paris Agreement puts forward to reinforce the worldwide response to the threat of climate change by limiting the mean global temperature growth at a maximum of 2°C in comparison with pre-industrial levels. The EU's nationally determined contribution under the Paris Agreement aims to decrease the GHG emission by at least 40% by 2030 in comparison with 1990 levels. Meanwhile, the World Green Building Council (WGBC) has issued a new vision to reduce 40% GHG emissions by 2030 and achieve 100% net zero emission buildings by 2050. Solar energy is one of the most promising renewable resources, which can solve the challenges associated with the climate change and environmental contamination. In terms of current solar energy technologies, photovoltaic-thermal (PVT) system is one of the most efficient owing to its stability, non-polluting, security and good visibility features.

In addition to the research carried out by all the partners involved in this matter, the IPT group made contacts, by email, with several entities (public and private) from different countries. The contents of the email sent to the different entities (which are also referenced) are available in Annex.

Finally, besides this introduction, this report has another seventeen chapters. Chapters 2 to 17 address the issues highlighted in this O2 output for several countries, while the last chapter is the conclusion.

## 2. Portugal

In Portugal there is no legislation that specifically addresses the PVT hybrid solar technology. Existing legislation on RES, which could cover PVT systems, is separated into two different diplomas. One of them concerns the production of electrical energy (RES-E) and the other to the heating of water (RES-H) at the microgeneration level. As such, this section highlights the most relevant aspects of these subjects.

In Portugal, according to article 10 of DL 154/2014, the competent authority that manages the energy affairs is the *Direção-Geral da Energia e Geologia*, DGEG (General Directorate for Energy and Geology). For the attribution of benefits for the RES-E (renewable for electricity generation), the DGEG performs the administration of the small production (UPP - *unidade de pequena produção* in portuguese) and self-consumption (UPAC - *unidade de produção para autoconsumo* in portuguese) units through an electronic registration system named SERUP (*Sistema Eletrónico de Registo de Unidades de Produção*). Thus, for UPPs and UPACs to connect to the distribution grid, they must register with SERUP in order to access the remuneration scheme. The attribution of the benefit must respect legal limitations in terms of the amount, defined cap (i.e., benefit attribution limit) and the limit periods for the attribution of benefits. The period for granting the benefit is defined in parallel with cap. This means that the benefit is granted until one of the limits is reached: the cap or the limit period. For installations that use solar energy, the limit is 15 years for thermodynamic solar and 20 years for photovoltaic solar [1.2].

### 2.1. RES-Electricity

#### Support schemes

Electricity from renewable sources has a unique remuneration regime for electricity produced from small production and self-consumption units (UPPs and UPACs), came into force in January 2015 in Portugal. That remuneration is based on a bidding model in which producers offer discounts to a reference tariff [2.1]. UPPs and UPACs have common regulations and certain particularities.

#### Technologies

In general, all technologies used in renewable electricity generation are eligible for support.

#### Statutory provisions

DL 225/2007 (*Decreto-Lei n.º 225/2007 de 31 de Maio* - Decree-Law No. 225/2007 of 31 May), which sets measures related to renewable energies as provided in the National Energy Strategy.

Ordinance 14/2015 (*Portaria n.º 14/2015 de 23 de Janeiro* - Ordinance No. 14/2015 of 23 January), which sets the legal regime applicable to small production (UPP) and self-consumption (UPAC) units.

Ordinance 15/2015 (*Portaria n.º 15/2015 de 23 de Janeiro* - Ordinance No. 15/2015 of 23 January) sets the reference tariff for small production (UPP) and self-consumption (UPAC) units, foreseen in DL 153/2014, as amended.

Ordinance 20/2017 (*Portaria n.º 20/2017 de 11 de Janeiro* - Ordinance No. 20/2017 of 11 January) sets the reference tariff for small production units (UPP) for the year 2017, amended by Ordinance 32/2018 (*Portaria n.º 32/2018 de 23 de Janeiro* - Ordinance No. 32/2018 of 23 January), which sets the same tariff for the year 2018.

## **2.2. RES-Heating**

### Support schemes

There is no direct support mechanism, or fiscal benefits for RES-H (renewable for heating and cooling) in place as of February 2019); only indirect support. The Energy Efficiency Fund (FEE – *fundo de eficiência energética*) provided a subsidy to investments in solar thermal installations for heating water through "Efficient Buildings 2016" that opened for new applications on 8 July 2016 and ran until 8 November 2016.

Under Efficient Buildings 2016, the FEE provided a subsidy for investments in energy efficiency measures leading to improvements in the energy performance of existing buildings, including solar thermal heating (AQS – *produção de água quente sanitária*), in both residential and service sectors. The applications for Efficient Buildings 2016 opened in July 2016 and closed in November 2016 [2.1].

### Technologies

Solar thermal heating and other energy efficient equipment

### Statutory provisions

Ordinance 26/2011 (*Portaria n.º 26/2011 de 10 de Janeiro* – Ordinance No. 26/2011 of 10 January) on the regulation for the management of the FEE.

FEE Rules 02/2017 (*Regulamento de Submissão de Candidaturas do Fundo de Eficiência Energética*, Versão 2 de Fevereiro 2017) on the rules on the submission of applications of the FEE.

## **2.3. Statutory provisions for both RES-E and RES-H**

DL 118/2013 (*Decreto-Lei n.º 118/2013 de 20 de Agosto* – Decree-Law No. 118/2013 of 20 August), which transposes Directive 2010/31/EU into a national law.

Ordinance 32276-A/2008 (*Despacho n.º 32276-A/2008 de 17 de Dezembro* - Ordinance No. 32276-A/2008 of 17 December) on the Fund to Support Innovation (FAI – *fundo de apoio à inovação*).

Ordinance 394/2004 (*Portaria n.º 394/2004 de 19 de Abril* - Ordinance No. 394/2004 of 19 April) on the rules for the implementation of the MAPE (Measure to Support the Harnessing of Energy Potential and Rationalisation of Consumption).

Ordinance 944/2005 (*Portaria n.º 944/2005 de 28 de Setembro* - Ordinance No. 944/2005 of 28 September) on the professional course of technician of renewable energy.

Ordinance 13415/2010 (*Despacho n.º 13415/2010 de 19 de Agosto* - Ordinance No. 13415/2010 of 19 August) on energy efficiency programmes under the Fund to Support Innovation (FAI).

Ordinance 5727/2013 (*Despacho n.º 5727/2013 de 2 de maio* - Ordinance No. 5727/2013 of 2 May), which suspends the evaluation of renewable projects to be applied for the Fund to Support Innovation (FAI).

Ordinance 3156/2016 (*Despacho n.º 3156/2016 de 1 de marco* - Ordinance No. 3156/2016 of 1 March) on the replacement of the programme that calculates the amount of energy produced by solar thermal systems and solar photovoltaic panels, under the Energy Certification System for Buildings (SCE), as amended by Ordinance No. 10346/2018.

DL 78/2016 (*Decreto-Lei n.º 78/2006*), which approves the Energy Certification and Indoor Air Quality National System.

DL 95/2019 (*Decreto-Lei n.º 95/2019*) which is the 6th revision of DL 118/2013, maintains the adoption of solar thermal systems or, alternatively, systems based on renewable energy for the production of AQS in new construction or significant renovations.

#### Summary of policies [2.1]

Training programs for installers - Many institutions offer professional training for installers of solar thermal installations. Additionally, within the scope of the National Qualification System, there is the professional course of technician for renewable energy which focus on the installation of solar thermal and photovoltaic installations (as well as wind energy and bioenergy plants).

Certification of RES installations - Where solar thermal installations are used, the performance and durability of the installation and its components must be certified by an accredited entity.

Exemplary role of Public Authorities - New buildings owned or used by public authorities shall be "nearly zero-energy buildings" when certified after 31 December 2018, which means that the building shall have a high energy performance and energy needs are largely provided by renewable sources, mainly produced on site or nearby.

RD&D policies - There are incentives for research and projects on innovation and technological development in the field of renewable energy. Campaign to disseminate information on RES covers solar, photovoltaic, wind, biomass, geothermal, and wave.

RES-H building obligations - There is the obligation to use solar thermal systems or, alternatively, systems based on renewable energy for heating water in new buildings and buildings undergoing major interventions. Other forms of RES can be used as an alternative to solar thermal collectors, as well as for other purposes if they are more efficient or convenient: photovoltaic, wind, biomass, geothermal, wave.

#### Subsidy FEE

The FEE promotes energy efficiency in buildings sector (energy efficiency improvements in the existing buildings) (Ordinance 26/2011). Between 2017 and 2018, the FEE launched one call for funding for projects targeting energy efficiency improvements in buildings.

The call for funding from the FEE aimed to promote energy efficiency actions in the existing buildings was open until 13 November 2018 (<http://www.pnaee.pt/avisos-fee/aviso-25>). The eligible technologies are solar thermal energy, aerothermal energy, hydrothermal energy, biogas, biomass and geothermal energy.

In the most recent call for funding (launched in 2017, a total of € 1,550,000 was available for natural persons owning a single house or owning an apartment in a multi-family house and the same amount for legal persons owning a building for services purposes (<http://www.pnaee.pt/avisos-fee/aviso-25>).

#### **2.4. "More Sustainable Buildings" Program - Phase II**

This section presents the most recent information (relating to 23 July 2021) on the essentials of the matters discussed here. This information concerns the 2nd phase of "More Sustainable Buildings" Program [2.2].

The 1<sup>st</sup> phase of the Support Program for More Sustainable Buildings was covered by a huge demand that led to the exhaustion of all the funds allocated to the Program before the end of 2020 and its estimated reinforcement of around €5 million, totaling 9.5 M€. With this initiative, it was possible to leverage around 21 million euros of investment that contributed to promoting the economic dynamization of employment, through the launch of small works, of rapid execution and spread throughout the territory, which could absorb some of the impact of the economic crisis caused by the COVID-19 pandemic, among other initiatives. Thus, the Economic and Social Stabilization Program (PEES – *programa de estabilização económica e social*), approved by Council of Ministers Resolution 41/2020, of 6 June, under which this Program was inserted, was fully complied with.

#### Framework

In compliance with the commitment assumed when the 1st phase of the Support Program for More Sustainable Buildings was interrupted, due to exhaustion of funds, the 2nd phase of the Program aims to continue the program, assuming identical characteristics and incorporating some improvements compared to the 1st phase.

This 2nd phase is part of the Recovery and Resilience Plan (PRR – *plano de recuperação e resiliência*) which identifies the commitment to energy efficiency in buildings as a priority for economic recovery in line with the climate transition, in accordance with the objectives of the European Ecological Pact.

This Program is part of the European initiative “Renovation Vacency”, especially dedicated to the renovation of buildings and which aims to address the current low renovation rates across the EU.

At national level, this initiative is also part of the National Plan for Energy and Climate 2030 (PNEC 2030), approved by Council of Ministers Resolution no. 53/2020, of 10 July and in the Long Term Strategy for the Renovation of Buildings (ELPRE – *estratégia de longo prazo para a renovação de edifícios*), approved by Resolution of the Council of Ministers No. 8-A/2021, of 3 February, being fully aligned with the national goals in terms of energy and climate with a view to achieving carbon neutrality in 2050, as well as for the fulfillment of other strategic objectives, namely the fight against energy poverty.

The operationalization of this initiative will be carried out through the Environmental Fund (FA – *fundo ambiental*), with the support of the Energy Agency (ADENE – *Agência para a Energia / Agência Nacional de Energia*) and the National Laboratory for Energy and Geology (LNEG – *Laboratório Nacional de Energia e Geologia*).

### Goals

This program aims to finance measures that promote rehabilitation, decarbonisation, energy efficiency, water efficiency and the circular economy, contributing to the improvement of the energy and environmental performance of buildings. Specifically, it is intended that the measures to be supported can lead, on average, to at least 30% reduction in the consumption of primary energy in the intervention buildings.

In this context, actions to be developed in existing residential buildings that contribute to the goals defined in the National Energy and Climate Plan 2021-2030 (PNEC 2030) and in the Long-Term Strategy for the Renovation of Buildings are eligible for financing through this program (ELPRE), as well as for other environmental purposes.

### Allocation

The global allocation for the 2<sup>nd</sup> Phase of the Support Program for More Sustainable Buildings is €30,000,000.

### Scope

The Incentive Program covers:

- Existing single-family housing buildings, as well as multifamily buildings or their autonomous fractions, built and licensed for housing until December 31, 2006, inclusive, throughout the national territory.
- Existing single-family housing buildings, as well as multifamily buildings or their autonomous fractions, built and licensed until July 1, 2021, only for interventions that fall under some specific typologies.
- Real estate owned by legal persons are excluded from the provisions of the previous numbers.

### Beneficiaries

Individuals who can prove the status of holder of any right to carry out interventions in the candidate properties are eligible, including their owners and co-owners or the head of a couple with undivided inheritance.

Proof of the status of holder of the rights referred to in the previous point may be made through any suitable document for this purpose, namely Urban Land Registry, Certificate or Deed.

### Types of projects to be supported, limits and fees of participation

Each candidate is limited to a maximum total incentive of:

- €7,500 per single-family building or autonomous fraction
- €15,000 in the particular case of a multi-family building (building) in total ownership.

If interventions in the 1st phase of the program had already been supported, these amounts are deducted from the amounts supported since 7 September 2020.

The regulation aims to support applications that focus on the types of projects, including the co-payment and the maximum limit of eligible expenses supported by the Environmental Fund (FA) for each type. The table below presents that information for RES-H and RES-E:

Table 2.1 - Support applications focusing on RES-H and RES-E project types.

Typology No.	Project typology (*)	Sharing rate	Limit
<b>3</b>	<b>Heating and/or cooling systems and/or domestic hot water (DHW), which use renewable energy, energy class "A+" or higher, namely:</b>		
3.1	- Heat pumps	85%	€2,500



<b>3.2</b>	<b>- Solar thermal systems</b>	<b>85%</b>	<b>€2,500</b>
3.3	- Boilers and biomass stoves with high efficiency	85%	€1,500
<b>4</b>	<b>Installation of photovoltaic panels and other renewable energy production equipment for self-consumption with or without storage</b>	<b>85%</b>	<b>€2,500</b>

(\*) The efficiency specifications of each type of project are included in Annex I to the regulation.

### General eligibility conditions

The candidate may submit more than one application at different times until the deadline for submitting applications for this program, provided that they aim at:

- The same type of project, as long as it does not exceed the limits established by candidate and by type of intervention;
- Different project typologies in the same building or autonomous fraction;
- The same type of project in different buildings or autonomous fractions.

Each application must include only one type of project, referring to only one building or autonomous fraction.

Owners of existing, single-family buildings, as well as multi-family buildings or their autonomous fractions, built and licensed for housing from December 31, 2006 until July 1, 2021, can only submit projects referring to typologies 3, 4, 5 and 6 referred to in point 6.3. of the Regulation.

The installers and, where applicable, the manufacturers of the solutions supported by the regulation, whether they are companies or individual technicians, must have a permit, certificate, declaration or other applicable document enabling them to carry out the intervention in question and be registered with the existing platforms for the project typologies. In addition, the technical monitoring and energy certification of the intervention property must be carried out by a qualified expert from the Energy Certification System for Buildings (SCE).

### Deadline

The deadline for submitting candidacies for the incentive runs from June 22<sup>nd</sup> to 23.59h on November 30<sup>th</sup>, 2021 or until the date on which it is foreseeable that the estimated allocation will be exhausted.

### **3. Spain**

In Spain, buildings should satisfy a minimal solar contribution for warm sanitary water. There is also a financial support for large thermal plants in buildings that are supplied from RES. A new RD&D plan (2017 – 2020) aimed at directing support to RES-E, RES-H has been published [3.1]. Policies for training and certification of solar panel installers are in place.

#### **3.1. RES-Electricity**

##### Support schemes

In 2015 Real Decreto 900/2015 was approved, establishing charges on existing and new self-consumption RES plants, both on capacity and generation levels. According to RD 900/2015 these are not taxes or compensation for utility losses, but contributions to overall system costs. Self-consumption installations under 10 kW and plants located not on the Spanish mainland will be spared the generation charge but will still be subject to a fixed charge per kW of capacity. Yet, on October 2018 Royal Decree 15/2018 eliminated these charges on existing and new self-consumption RES plants, while it additionally simplified the procedure to apply to the self-consumption scheme for RES plants until 100 kW.

##### Technologies

In general, all technologies are eligible. Each round tender addresses specific technologies. In the last round tender, PV and wind energy were eligible.

##### Statutory provisions

Royal Decree 413/2014 of 6 June, regulating the activity of electricity production from renewable energy, CHP and waste.

Royal Decree 900/2015 of 9 October, regulating the administrative, technical and economic conditions for the supply and production of electricity under self-consumption.

Royal Decree 15/2018 of 5 October, announcing urgent measures for the energy transition and the protection of self-consumers.

#### **3.2. RES-Heating**

##### Support schemes

No support scheme for RES-H was in place in Spain in the years closer to 2019.

##### Policies

Spain has a national training system for installers and an obligatory certification for solar thermal panels. In addition, there are two wider frameworks, the R&D plan and the building code that include RES as an area of interest.

### Summary of policies

Training programmes for installers - The national system of qualification and professional formation (NSQPF) provides a structured framework for the provision of vocational training also for energy.

Certification Programmes for RES installations - As regards certification, an obligation to be certified is in place for solar thermal panels to comply with international standards.

RD&D Policies - A State Plan of Scientific and Technical Research and Innovation 2017 – 2020 establishing goals and priorities of the national research policy in the mid-term in the RES-E, RES-H sectors was approved at the end of 2017. One of its strategic actions is “Energy and Climate Change”.

Building obligations - With respect to buildings and RES, it is stated in the technical building code that all new buildings or buildings undergoing major renovation in which there is demand for warm sanitary water / air conditioning of a covered swimming pool must satisfy some of this demand through solar thermal installations. There is also a programme aimed at providing financial support for large RES thermal plants (GIT) to supply warm water and air conditioning to buildings.

### Technologies

All policies apply to solar thermal. The NSQPF also applies to PV installations and wind power plants and the GIT programme applies to biomass and geothermal too. The national plans of R&D do not specify technologies, but only types of projects. It is possible that technologies are specified in the single calls under the R&D plan.

### Statutory provisions

Law 5/2002 of June 19 of qualifications and professional formation.

Order of 28 July 1980 that approves rules and technical instructions for homologation of PV installations.

National plan of scientific research, development and technological innovation 2013 – 2016.

CTE (*Código Técnico de la Edificación*), which is the National building code.

*Programa GIT (Grandes Instalaciones Térmicas)*, meaning Programme for Large Thermal Plants.

### 3.3. Support for RES-E and RES-H co-financed with European Union Funds

The *Ministerio para la Transición Ecológica y Reto Demográfico* (Ministry for the Ecological Transition and Demographic Challenge), through the *Instituto para la Diversificación y Ahorro de la Energía* IDAE (Institute for Energy Diversification and Saving), allocated 316 million euros to this line of aid for the 2014-2020 period. The objective was to promote renewable installations for the production of energy, both thermal and electrical, throughout the National territory [3.2].

The grants, financed by the European Regional Development Fund (ERDF), are executed through calls made by the IDAE in each autonomous community, with island specificity, and distribution of resources and conditions agreed with the different territories, according to criteria and typologies included in the regulatory bases.

The grants are non-refundable and are governed by the principle of competitive competition with the aim of optimizing their application as much as possible. The main characteristics of the Lines of Aid for Investment in Thermal and Electric Renewables are summarized in Table 3.1:

Table 3.1 - Main lines of aid for investment in thermal and electrical renewables [3.2].

Concept	Requirements
Aid scheme	The aid is granted by means of competition. This means that the calls establish a maximum level of aid to request (in €/kW) and the potential beneficiaries request aid less than or equal to those values. Lower supports increases the chances of success.
Scoring criteria	In addition to the above economic criteria, applicants can receive points for three other criteria: <u>Location</u> - If they are located in a Just Transition area. <u>Administrative viability</u> - The projects with greater progress in the previous administrative procedures will be valued more. <u>Positive externalities</u> divided into four sub-criteria: <ul style="list-style-type: none"><li>- Economic Technician - According to the type of application and the degree of innovation of the projects.</li><li>- Organizational - If it is carried out by a renewable energy community or another type of citizen participation.</li><li>- Social-environmental - Includes systems to fight energy poverty, promotion of strategic industrial sectors, etc.</li><li>- Industrial and business - Focused on industries or other specific economic activities in each region.</li></ul>
Typologies of subsidized actions	The types of action are divided into two groups, each with its own particularities: <ul style="list-style-type: none"><li>a) Typologies of electricity generation with renewable sources which include, for example, photovoltaic, wind, biomass or renewable gas projects, highlighting the innovation and development of renewable power linked to the storage or production of hydrogen and applications in self-consumption.</li></ul>

	b) Typologies of thermal energy production from renewable sources, which promotes projects with technologies such as geothermal energy, solar thermal energy, aerothermal energy linked to photovoltaic installations or biomass, mainly focused on the development of innovative applications in industry and the service sector to achieve a significant reduction in its emissions and a high level of self-consumption.
Beneficiaries	Individuals or legal entities, public or private, who are going to carry out a project in accordance with the specifications, may present themselves to the calls. Communities of property, communities of owners, groups of communities of owners and other groups that can carry out the action of the aid may also request subsidies.
Financing of the calls	The program will be co-financed by European Regional Development Fund (ERDF) and may be reinforced with other European instruments aimed at promoting economic recovery. In total, 316 million euros of public support are available to finance renewable technology projects. These calls for the production of electrical energy and thermal energy from RES are included in the ERDF program for the promotion of Renewable Energies throughout the national territory.

### 3.4. Recovery, Transformation and Resilience Plan (2021-2030)

El Plan de Recuperación, Transformación y Resiliencia tiene en cuenta las siguientes líneas principales de apoyo a las energías renovables son las componentes 2 y 7:

The Recovery, Transformation and Resilience Plan (*Plan de Recuperación, Transformación y Resiliencia*) takes into account the following main lines of support for RES are components 2 and 7. The essential aspects of these two components are presented in the following tables [3.3] [3.4]:

Table 3.2 - Component 2: Housing rehabilitation and urban regeneration plan [3.3].

Concept	Requirements
Challenges and objectives	<p>The main objectives of this component are to promote the rehabilitation of the building stock in Spain, in line with the European Renovation Wave, as well as the increase in the stock of social rental housing in energy efficient buildings, contributing to the activation of this sector and to the generation of employment and activity in the short term.</p> <p>As a specific objective, it seeks to achieve energy rehabilitation rates significantly higher than the current ones that allow to advance the fulfillment of the rehabilitation objectives contemplated in the National Integrated Energy and Climate Plan (PNIEC - <i>Plan Nacional Integrado de Energía y Clima</i>) and in the long-term Strategy for energy rehabilitation in the building sector in Spain (ERESEE - <i>Estrategia a largo plazo para la rehabilitación energética en el sector de la edificación en España</i>).</p> <p>In particular, it will promote the activity of urban rehabilitation and regeneration as a key element in the reactivation of the construction and real estate sector and in the fulfillment of European and national</p>

	commitments on energy and climate, and digitization.
Total investment	6,820 million euros
Reforms	<p>C2.R2: Implementation of the ERESEE and its action plan that defines a framework to support the renovation of the national park of residential and non-residential buildings, both public and private, highly energy efficient and decarbonized by 2050.</p> <p>C2.R3: Housing Law, which constitutes the response by the State to the obligation that, within the framework of its constitutional powers, is incumbent upon it to protect the right to have access to decent and adequate housing and to enjoy it and contributes to the key principle of affordability of efficient housing included in the Renovation Wave.</p>
Investments	<p>C2.I2: Program for the construction of social rental housing in energy efficient buildings that aims to support the development of a set of measures developed by the different public administrations.</p> <p>C2.I3: Building energy renovation program (PREE - <i>Programa de rehabilitación energética de edificios</i>) promotes the energy renovation of existing residential buildings and other uses, through energy saving and efficiency actions and the incorporation of renewable energies.</p> <p>C2.I4: Regeneration program and demographic challenge, aimed at public and private projects in municipalities and centers of less than 5,000 inhabitants for the energy efficiency of buildings, the generation and consumption of renewable energies and ensuring the deployment of electric mobility.</p> <p>C2.I5: Program to promote the rehabilitation of public buildings (PIREP - <i>Programa de impulso a la rehabilitación de edificios públicos</i>), which seeks the sustainable rehabilitation of institutional public parks, Autonomous Communities and local entities for all types of publicly owned buildings for public use. One of the main objectives is energy saving.</p>

Table 3.3 - Componente 7: Despliegue e integración de energías renovables [3.4].

Concept	Requirements
Challenges and objectives	<p>The PNIEC (2021-2030) foresees a significant growth in the penetration of renewable energies in Spain, reaching 74% in the electrical field in 2030 and 42% on final use. In this context, the main objective pursued is to increase the use of renewable energy over final energy consumption and take advantage of this deployment, through:</p> <ul style="list-style-type: none"> <li>a) The development of a clear and predictable regulatory framework that promotes private investment in renewables, reinforces social participation in this area and maximizes the adequate environmental and social integration of renewables;</li> <li>b) The establishment and consolidation of the industrial value chain in the field of renewables,</li> <li>c) Support for development and innovation in renewable generation technologies or the integration of said generation in end uses,</li> <li>d) The development of skills and knowledge that contribute to the use of job opportunities in the development of renewables.</li> </ul> <p>In addition, it includes a vision of the insular specificity in the energy transition and the promotion of renewable energies in the islands, the</p>

	improvement of the operation of their energy systems through storage and the implementation of “Smart Islands” projects, as well as citizen participation through renewable energy communities.
Total investment	3,165 million euros
Reforms	<p>C7.R1: Regulatory framework for the promotion of renewable generation that generates certainty and allows increasing the presence of renewable energies in national energy consumption by promoting private investment, eliminating barriers to the deployment of renewables and improving the integration of renewable generation in the environment.</p> <p>C7.R2: National Self-consumption Strategy, to promote this type of generation, establish objectives in this matter for the period 2021-2030 and identify and develop mitigation measures for the main barriers to its deployment.</p> <p>C7.R3: Development of energy communities to promote citizen participation in the energy transition and, specifically, of renewable energy communities and citizen energy communities. Both participatory, training and community constitution processes will be supported, as well as the promotion of specific projects.</p> <p>C7.R4: Framework for innovation and technological development of renewable energies, given that there are cases of renewable sources where a strategic and facilitating framework is necessary that allows their continued technological development, issues clear signals for an orderly and coherent deployment, measures that allow the maximum use of industrial, social, environmental and economic opportunities, and ultimately contribute to moving towards 100% renewable energy demand.</p>
Investments	<p>C7.I1: Development of innovative renewable energies, integrated into buildings and production processes. Use of different lines of investment aid in actions such as the deployment of integrated renewables in buildings, companies and industry; renewable integration projects in the environment; integration of renewables in industrial processes or development of innovative renewables; as well as direct public investment in pilot projects or innovative initiatives.</p> <p>C7.I2: Sustainable energy in the islands through the promotion of an Agenda for the Energy Transition in the Islands, supporting projects for the penetration and integration of renewable energies in island and non-peninsular systems.</p>

#### 4. France

There are various policies aiming at promoting the development, installation and use of RES installations in France, including training programmes, certification schemes or RD&D programmes.

In general, the French support measures apply to all renewable energy generation technologies. However, some incentives are limited to certain technologies (february 2019) [4.1].

In France the generation of heat through renewable energy plants is promoted through two systems of energy subsidies, two tax regulation mechanisms as well as through the granting of a zero percent-interest loan.

In France, public distribution of heat is a competence of the local or regional authorities. To promote the use of renewable energies, territorial collectivities are entitled to classify heating networks located in their area, provided they are supplied with at least 50% of heat from RES. New and renovated buildings located within a classified area are obliged to be connected to the heating network.

#### **4.1. Main statutory provisions applied to RES**

Hybrid PVT systems face competition from other hybrid technologies, such as PV modules combined with a heat pump which have some significant advantages on PVT systems [4.2].

To legislate on this matter, the French government used as background the following directives:

- 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 amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (Text with EEA relevance);
- Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency (Text with EEA relevance) - PE/4/2018/REV/1

Which gave rise, more recently, to the Decree n.° 2020-26 of January 14, 2020 relating to the energy transition bonus. Last data update for this text: April 26, 2021, NOR: LOGL1935489D, JORF n ° 0012 of January 15, 2020 [4.3].

The main statutory provisions for supporting RES-Electricity and RES-Heating in France are:

- *CCH (Code de la construction et de l'habitation)* - Construction and Housing Code.
- *BOI-TVA-LIQ-30-20-95-20140225 (TVA - Prestations imposables au taux réduit - Travaux d'amélioration de la qualité énergétique - Tax regulation)* – Eligibility of refurbishment works improving energy quality to the reduced VAT rate.
- *Arrêté du 26 octobre 2010 (Arrêté du 26 octobre 2010 relatif aux caractéristiques thermiques et aux exigences de performance énergétique des bâtiments nouveaux et des parties nouvelles de bâtiments)* - Decree of 26 October 2010 regarding the thermal characteristics and energetic performance requirements.
- *Décret du 21 décembre 2016 (Décret n° 2016-1821 du 21 décembre 2016 relatif aux constructions à énergie positive et à haute performance environnementale)*



*sous maîtrise d'ouvrage de l'Etat, de ses établissements publics ou des collectivités territoriales)* - Decree of 21 December 2016 regarding the positive-energy and high environmental performance standards of new buildings commissioned by public authorities.

- *Loi n° 2015-992 (Loi n° 2015-992 du 17 août 2015 relative à la transition énergétique pour la croissance verte)* – Act on the energy transition for green growth.
- *Arrêté du 9 mai 2017 soleil (Arrêté du 9 mai 2017 fixant les conditions d'achat de l'électricité produite par les installations implantées sur bâtiment utilisant l'énergie solaire photovoltaïque)* – Order on the eligibility requirements for solar energy systems fixed on buildings.
- *BOI-TVA-LIQ-30-20-90-20-20140929 (Bulletin Officiel des Finances Publiques - TVA - Taux réduits - Travaux (autres que de construction ou de reconstruction) portant sur des locaux à usage d'habitation achevés depuis plus de deux ans)* – Official Tax Bulletin, provisions on the reduced VAT rate for works carried out in residential buildings.
- *BOI-IR-RICI-280-10-20-20120912 (Bulletin Officiel des Finances Publiques – Crédit d'impôt afférent aux dépenses en faveur du développement durable - Logements ouvrant droit au crédit d'impôt - Official Tax Bulletin)* – Instruction on the residential buildings eligible to the Tax Credit for Energy Transition.
- *Arrêté du 30 décembre 2015 (Arrêté du 30 décembre 2015 pris pour l'application de l'article 200 quater du code général des impôts relatif au crédit d'impôt sur le revenu pour la transition énergétique)* – Decree of 30 December 2015 setting out the specifications of the income tax credit for energy transition.
- *Décret n° 2015-1911 (Décret n° 2015-1911 du 30 décembre 2015 relatif au règlement des aides du fonds d'aide à la rénovation thermique des logements privés - FART)* - Decree of 30 December 2015 regarding the regulation of the fund for the support of the thermal renovation of private housings.
- *Arrêté du 3 mai 2007 (Arrêté du 3 mai 2007 relatif aux caractéristiques thermiques et à la performance énergétique des bâtiments existants)* - Order of 3 May 2007 regarding the thermal characteristics and the energetic performance of existing buildings.
- *Arrêté du 30 mars 2009 (Arrêté du 30 mars 2009 relatif aux conditions d'application de dispositions concernant les avances remboursables sans intérêt destinées au financement de travaux de rénovation afin d'améliorer la performance énergétique des logements anciens)* - Order of 30 March 2009 regarding the granting conditions of the zero percent-interest loan for the support of housing renovation aiming at improving the energetic performance of existing buildings

- BOI-IR-RICI-280-20180706 (*Bulletin Officiel des Finances Publiques - Crédit d'impôt pour la transition énergétique - Official Tax Bulletin – Instruction on the application of the Tax Credit for Energy Transition*) )BOI-IR-RICI-280-40-20150812 (*Bulletin Officiel des Finances Publiques - Crédit d'impôt pour la transition énergétique - Modalités d'application*) - Official Tax Bulletin about instruction on the application conditions of the Tax Credit for Energy Transition.

There is no definition, in the regulation law, of a PVT system. There are no directly implemented subvention or subsidy regarding only the PVT solar collectors in France. However, to encourage solar installation projects, the French state is offering a series of grants and subsidies to install solar panels in 2021.

*MaPrimeRenov'*, Self-consumption premium, reduced VAT, EcoPTZ, Energy Savings Certificates or regional aid allows to better finance the solar panel installations. The good news is that most of the 2020 state aid extends into 2021 for solar panels [4.4].

Table 4.1 shows the main subsidies for solar panels and their amounts in 2021 [4.5]:

Table 4.1 – Main subsidies for solar panels and their amounts in 2021 [4.5].

Name (in French)	Panel Type	Amount of aid	Obtaining conditions
<i>Prime à l'autoconsommation</i> (Self-consumption premium)	Photovoltaic	Depends on the power of the installation  Can reach 8,000 €	No income condition  Call on a qualified RGE professional  Install photovoltaic panels with resale of the surplus electricity produced
<i>MaPrimeRénov' solaire</i>	Thermal (for heating or hot water) or hybrid	Depends on the installation and income of the applicant  Can reach 10,000 €	All incomes, except those referring to decimal positions 9 and 10 (pink profile)  Call a qualified RGE professional  To comply with the technical requirements defined in the decree of November 17, 2020
<i>Prime CEE solaire</i>	Thermal (for heating or hot water) or hybrid	Depending on the climatic zone of the accommodation  No maximum amount	No income condition  Call a qualified professional  Respect the technical requirements defined in the standard operation sheets
<i>TVA réduite</i>	Photovoltaic, thermal or hybrid	10% rate for photovoltaic panels  A rate of 5.5% for thermal or hybrid panels	No income condition  Call a qualified RGE professional  Power of the photovoltaic panel ≤ 3 kWp
<i>Éco-PTZ</i>	Thermal or hybrid	Loan up to € 15,000 without interest  Up to € 30,000 if several works are planned	No income condition  Call a qualified RGE professional

#### 4.2. MaPrimeRénov' solaire (MaPrimeRénov' solar)

In January 2020, the entire sector of energy renovation experienced a small revolution concerning the financing of works. In order to simplify this complex and dissuasive universe for many households - especially the most modest ones - the Anah (national housing agency) has created *MaPrimeRénov'*. A kind of help easier to understand and quicker to obtain than its predecessors: the tax credit for the energy transition (CITE) and the Living Better Agility program [4.5].

In 2021, the novelty is that this solar thermal energy investment aid system becomes open to everyone: owner-occupiers, lessors or co-owners, regardless of the income level. It replaces the CITE (Energy Transition Tax Credit) that was removed in January 1, 2021.

This premium is dedicated to energy renovation work. Premium levels depend on the income profiles according to the following approach [4.4]:

- Blue – very modest;
- Yellow – modest;
- Purple – intermediates;
- Pink – senior.

The request to obtain *MaPrimeRénov'* is made online at [www.maprimerenov.gouv.fr](http://www.maprimerenov.gouv.fr).

Many operations are now eligible for this flat-rate premium, including the installation of solar panels. Unlike the self-consumption premium, *MaPrimeRénov'* does not concern 100% photovoltaic panels, nevertheless it concerns three types of modules.

The amounts of *MaPrimeRénov' solaire* are presented in Table 4.2 [4.5]:

Table 4.2 – Amounts of *MaPrimeRénov' solaire* [4.5].

Energy transition bonus			
	Very modest households (blue)	Modest households (yellow)	Intermediate households (purple)
Heating production equipment powered by solar thermal energy (or heat pump)	€ 10,000	€ 8,000	€ 4,000
Domestic hot water supply equipment powered by solar thermal energy (or individual solar water heaters)	€ 4,000	€ 3,000	€ 2,000
Heating or domestic hot water supply equipment operating with hybrid thermal and electric solar collectors (PV-T) with liquid circulation	€ 2,500	€ 2,000	€ 1,000

The scheme aims all owner-occupants or lessors with very modest, modest or intermediate incomes. For example, a single person must have a reference tax income (RFR):

- Less than or equal to € 29,148 outside Île-de-France

- Less than or equal to € 38,184 in Île-de-France

Only households with so-called “superior” resources cannot benefit from it to install solar equipment.

#### **4.3. La Prime Autoconsommation (The Self-consumption Premium)**

Together with the purchase price, this is one of the last subsidies for photovoltaics in 2021.

Self-consumption makes it possible to consume the energy produced by its own solar installation. Therefore this concerns photovoltaic and hybrid installations. Following there are some indications on photovoltaic aid for self-consumption in 2021 [4.4]:

- For photovoltaic or hybrid installations with photovoltaic self-consumption  $\leq 3$  kWp: there is a premium of € 380 including tax per kWp installed + € 0.10 per kWh of surplus sold.
- In the range of 3 to 9 kWp : a photovoltaic self-consumption premium of € 280 including tax per kWp installed. The surplus electricity can be sold back to the grid for a purchase price of € 0.10 per kWh.
- For the range of 9 to 36 kWp : a photovoltaic self-consumption premium of 160 € incl. Tax per installed kWp. The surplus electricity can be sold back to the grid for a purchase price of € 0.06 per kWh.
- With installations from 36 to 100 kWp: a photovoltaic self-consumption premium of € 80 including tax per kWp installed. The surplus electricity can be sold back to the grid for a purchase price of € 0.06 per kWh as well.

Consult the last tariff decree of May 9, 2017 setting the conditions for the purchase of electricity produced by photovoltaic installations [4.6].

#### **4.4. Le Certificat d'Économies d'Énergie (CEE) – Prime CEE (The Energy Savings Certificate)**

The CEE is another eco-energy premium for renewable energies applicable to solar panels [4.4].

With this bonus, energy savings can be converted into Energy Saving Certificates (CEE). To be able to benefit from it, high-performance thermal equipment needs to be installed in the house. In other words, projects that improve the performance of their buildings and equipment or give relevance to renewable energies must be developed. CEE premiums are distributed by sellers of fuel oil, gas, gasoline or even electricity.

Thus, there are several aids for solar panels for residential use, for example [4.5]:

- Individual solar water heater;

- Thermodynamic water heater;
- Combined solar system (only in metropolitan France);
- Energy system comprising solar photovoltaic and thermal collectors with water circulation (only in mainland France);

Since October 2018, hybrid solar panels have been eligible for CEE. The publication of the CEE BAR-TH-162 sheet refers to the "energy system comprising solar photovoltaic and thermal collectors with water circulation" (pages 28-30).

The fact that CEE now include water-based PVT demonstrates its importance in the single-family home market. However, they are not available, yet, for collective housing in metropolitan France. Nevertheless, they are already available in the French overseas departments and overseas regions.

The amount of the premium is determined according to the energy savings generated (kWh cumac - Cumac is the abbreviation of «*cumulé*» et «*actualisé*» used to assign energy saving certificates) as well as the climate zone (H1, H2 or H3) of the house [4.5].

#### **4.5. TVA réduite pour les installations solaires (Reduced VAT for solar installations)**

This aid concerns renovation projects. It applies to photovoltaic equipment: photovoltaic solar panels, inverters, cables, connection box. By this it should be understood that the house must be completed for at least 2 years. This state aid applies to solar photovoltaic installations of less than 3kWp only [4.4].

The calculation of VAT will depend on several factors:

- The age of the house (construction completed more or less than two years ago);
- The type of application (domestic hot water or swimming pool heating);
- The power of the installation (threshold of 3kWp);
- Finally, a distinction is made between VAT on thermal equipment and labor and VAT on photovoltaic equipment.

For many years now, professionals that perform renovations have been able to apply several reduced VAT rates [4.5]:

- 10% (intermediate rate) covering "improvement, transformation, development or maintenance work" (Service-Public.fr). The installation of photovoltaic panels is one of the things that is covered, since the PV installation has a power that is less than or equal to 3 kWp. If not, the value of the tax added is 20%;
- 5.5% (minimum rate) covering "renovation or energy improvement work". It concerns, among other things, the installation of thermal or hybrid panels, intended for heating.

On a quotation of several thousand euros excluding VAT, that ranges from a tax of 20% to 10% or even 5.5% it is far from being negligible.

As always, the use of an RGE (Recognized Guarantor of the Environment) professional is required. It is necessary to keep the mandatory VAT certificate, filled in with the company before invoicing.

#### **4.6. Eco-prêt à taux zéro (éco-PTZ) (Eco-loan at zero rate)**

Despite all the aid for installing solar panels, the remainder is rarely zero after deduction [4.5].

In order to facilitate this payment, the state created the zero-interest eco-loan. This involves borrowing up to € 30,000, without interest, to undertake an energy renovation project. Repayment is spread over a maximum of 15 years.

Eco-PTZ applies to eco-renovation projects. An example is the installation of heating using renewable energies or the installation of domestic hot water production using renewable energies. As such, thermal, hybrid and photovoltaic solar panels are eligible. However, 100% photovoltaic equipment is not entitled to it.

This loan is valid for a main residence built before January 1, 1990. The work must be carried out by a qualified RGE company [4.4].

#### **4.7. DualSun company information**

In the context of contacts established in June 2021 with the company Dualsun on the legal framework for PVT systems in France, the essentials on this subject are transcribed here:

“The question you raise are legit, indeed there is no specific legislation for hybrid product as our DualSun SPRING.

We are respecting specific legislation from photovoltaic on one side and solar thermal in the other. As so we have both certification for Europe IEC, and SolarKeymark which you can find on our website.

SPRING panels can be included in energy assessment for new building, the biggest advantage is that for a same collector area of a standard, project you will improve the performance of your building.

By extension PVT technology enjoy the same incentive condition than PV and solar thermal, as it can accumulate condition of both technology.”

Finally, it is important to highlight the content of the this information: Although the legislation does not specifically indicate the PVT technology, these (PVT systems) enjoy the same support as the PV and thermal systems together.

## **5. Belgium**

Belgium has made clear progress in increasing competition in electricity and natural gas markets. It has reduced the use of fossil fuels and increased the share of renewable energy.

Belgium's National Energy and Climate Plan sets a 2030 target to reduce greenhouse gas emissions from the energy sector by 35% from 2005 levels, to reach 17.5% renewables in gross final energy consumption, and significantly reduce energy demand. Belgium has made progress on these goals. Coal-fired generation was phased out in 2016 and Belgium is a global leader in offshore wind, with 2.23 GW in 2020 and plans for 4.5 GW by 2030 [5.1].

Belgium remains reliant on fossil fuels and is facing energy security challenges. Nuclear energy covers over half of electricity demand, while the government plans to phase out nuclear between 2022 and 2025.

In recent years, the share of energy obtained from renewable sources has increased significantly and it contributes to security of supply and benefits the climate. In addition, green energies are increasingly seen as a tremendous opportunity to reorient economic activity towards future and sustainable sectors.

In Belgium, the promotion of renewable energies is essentially a regional competence. Since the state reform, the federal authority has been competent for renewable energies in the marine areas over which Belgium exercises its jurisdiction in accordance with international maritime law [5.1].

As part of the transposition of the directive 2009/28/EC, Belgium has published its national renewable energy action plan, as well as its progress report [5.2].

Belgium, like many countries, require a clearer and more favorable legislative framework for the renewable energy sector. Indeed, some markets are completely artificial and regulated by aid mechanisms. The lack of clarity and coherence in policies are real obstacles to investment [5.3].

In Belgium, if a person install its own panels on a building, no planning permission is required. Conversely, if someone wants to place panels on the ground, the advice of a delegated official and the intervention of an architect is necessary.

This might be interpreted that to install PVT collectors they should not change the property.



There are no directly implemented subvention or subsidy regarding PVT solar collectors in Belgium. However, as they also generate electricity, they can benefit the advantages and subventions for having PV panels, described below.

In most of the Belgian territory there is a VAT reduction for the installation of photovoltaic panels. Regarding photovoltaic legislation, VAT is 21% but in some cases 6%, if the house was built more than 10 years ago. Owners of large installations using a network can be reimbursed for VAT and others can deduct it for tax purposes.

### 5.1. Premiums and subsidies for solar panels in Belgium

Premiums are an important element to take into account in the financing and profitability of photovoltaic solar panels. Follow the subsidies, Region by Region.

When someone decides to install photovoltaic panels, he can benefit from grants and subsidies. Things have changed a bit in recent months and years in this area in the various regions of the Belgium. Here is what it gives in Wallonia, Brussels and Flanders as summarized in Table 5.1 [5.4] [5.5].

Table 5.1 - Summary of regional aids, bonuses and costs [5.5].

	Bruxelles	Wallonie	Flandre
<b>Initial investment (purchase and installation)</b>	Energy bonus municipal possible	x	Up to € 1,500 from January 1, 2021. Maximum of 40% of the total price of the installation.
<b>Consumption</b>	Partial compensation system (savings of +/- 500 €/year) + green certificates (+/- 950 €/year during 10 years).	Counter is running Upside down	End of the clock that turns upside down on 12/31/2020. New pricing system on 01/01/2021
<b>Network use</b>	Network costs based on actual consumption.	Prosumer price since October 2020 (cost of +/- 250 €/year)	End of the prosumer rate on 01/01/2021

### 5.2. Premiums and aid in the Walloon Region

Thanks to solar panels, the user only pays the net balance of what he consumes on the electricity network. If the net balance is negative or equal to zero, then the user do not pay anything!

Since October 1, 2020, a Walloon “prosumer” rate has officially entered into force. Concretely, it is for the residential prosumers to pay compensation for the use of the

distribution network. According to the network operator (GRD), the prosumer tariff will be between € 234 and € 346 / year for a 3.5 kW<sub>e</sub> installation.

The Walloon government has however voted a decree to finance it 100% between 2020 and 2021, then at 54.27% in 2022 and 2023 [5.5].

### **5.3. Premiums and aid in Brussels**

Today, any small producer (<5kW<sub>p</sub>) that injects unused electricity benefits from the principle of partial compensation. As a prosumer, a person pays its network costs on the basis of its actual withdrawal from the distribution network. For the other elements of its bill, such as electricity, he pays on the basis of the net electricity consumed, that is to say the difference between the electricity withdrawn and that injected into the network. In the future, the compensation on the "electricity" part may be replaced by a separate injection charge.

On the other hand, the person receives green certificates for ten years, which represents ± 950 € per year for an average installation. The number is determined by a green meter separate from its electricity meter. The investment therefore always remains very profitable. The number of green certificates granted to prosumers was revised downwards (-20%) on January 1, 2021 for new installations [5.5].

In addition, several Brussels municipalities grant additional premiums for photovoltaic installations.

### **5.4. Premiums and aid in Flanders**

There had been no support mechanism for the installation of photovoltaic panels for several years. Flanders considered solar energy to be a profitable investment in its own right. However, she changed her mind and granted a new bonus as of January 1, 2021. Indeed, from this date, the pricing system was change in Flanders and the principle of the counter running backwards no longer applies for new photovoltaic installations and all those which reach the age of 15 years old, from 01/01/2021. Instead, each person can upgrade (resell) the injection of electricity that he generates but have not consumed. However, 1kWh injected will “bring” less than what anyone pay to withdraw 1 kWh (0.03 €/kWh against +/- 0.27 €/kWh). This new pricing will therefore delay the profitability of solar panels. By introducing the new premium, the Flemish Region maintains the return on investment of solar panels around 9 years [5.5].

The benefit of this new Flemish photovoltaic premium will be from 300 €/kW<sub>p</sub> up to 4 kW<sub>p</sub>. If the power of the installation is higher, the amount is then decreasing: 150 € / additional kW<sub>p</sub> up to 6 kW<sub>p</sub>, 0 € more beyond 6 kW<sub>p</sub>. Always with a maximum of 1500 €. However, the premium can only cover a maximum of 40% of the total price of the installation [5.5].

Only owners who are connected to the Fluvius electricity distribution can benefit from this new premium. The amount of the premium will be reviewed annually until 2024.

The Flanders region no longer issues green certificates.

## **6. Italy**

As PVT systems are still emerging, in Italy there is still no specific legislation for this type of systems, nor does the existing legislation directly contemplate this technology. Therefore, this section will focus mainly on existing legislation for RES-Electricity and RES-Heating systems.

The research carried out essentially points to the Legislative Decree 28/2011, 3 March 2011 (DL 28/11), postponed for several years, but which is currently in force. DL 28/11 regulates the use of renewable energy in order to comply with directive 2009/28 of the European Union. This document requires that at least 50% of the energy consumed in a building be produced in it from renewable sources. This obligation does not only apply to new buildings, but also to buildings that are undergoing renovations. It is also in this decree that all the rules for installation and certification are found. Chapter 2 of the decree presents the conditions under which the various incentives for the use of an energy source using renewable energy are granted, as well as the rules that must be respected in their allocation. In Chapter 3 of the same document, reference is made to the same elements but to the thermal energy obtained from renewable sources.

Thus, regarding state incentives for these systems, the following stand out:

- Incentives are awarded using guarantee funds and revolving funds;
- Incentives based on the investment made correspond to:
  - 40% of the installation cost for a power of up to 200kW;
  - 30%, if the installed power is greater than 200kW and less than 1MW;
  - 20%, if the installed power is greater than 1MW and less than 10MW.

For public buildings or entities that provide public service, this incentive can reach 60% of the investment.

In addition to DL 28/11, there may be some incentives to install RES equipment in Italy's Growth and Stability programs in recent years.

In Italy, support schemes for RES-E are managed by *Gestore dei Servizi Energetici* (GSE – Manager of Electricity Services). Electricity generated from RES is promoted through VAT, and real estate tax deductions. The electricity from RES fed into the grid can be sold on the free market or to the GSE on a guaranteed minimum price (“ritiro dedicato”). Alternatively, renewable energy producers can opt for net-metering (“scambio sul posto”) which provides economical compensation to PV-producers for the electricity fed into the grid. In 2018 the Ministry for Economic Development

approved the Renewable Energy Ministerial Decree (“Decreto FER 2018-2020”) governing support schemes for renewable energies [6.1].

A price-based mechanism to support the development of RES-H installations is available. A tax regulation mechanism is also in place for the promotion of RES-H. District heating and cooling networks are managed at local level.

All new or refurbished buildings must integrate RES, with an additional 10% to the obligation level for public buildings. A guarantee fund is in place for supporting district heating network development.

### **6.1. RES-Electricity**

#### Main support schemes

Tax regulation mechanisms - Photovoltaic and wind energy plants are eligible for a reduced VAT of 10%. This tax benefit applies to enterprises, professionals and private individuals. Furthermore, it is possible to receive a real estate tax reduction for buildings equipped with renewable energy installation from the municipality. The Budget Act of 2008 gives municipalities the opportunity to grant a reduction in real estate tax (*imposta municipale propria* - IMU) to buildings equipped with renewable energy installations.

Italy provides for a series of regional renewable energy programmes. The “Osservatorio Politiche Energetico-Ambientali Regionali e Locali” and “Federazione Italiana per l'uso Razionale dell'Energia - FIRE” give an overview of announcements for regional support schemes such as the regional renewable energy programmes.

The main novelties of the inter-ministerial decree DM FER 2018-2020 to support the development of electricity production from renewable sources include the return of photovoltaics, bonuses for replacing asbestos with PV systems and postponement of tenders to 2019. DM FER 2018-2020 promotes the construction of photovoltaic systems whose modules are installed on buildings with asbestos roofing (the so-called asbestos premium), providing additional advantages in terms of health and environmental benefits. This new Renewables Decree, therefore, readmits photovoltaics to incentives, but with some specifics and limitations. In order to participate in auctions and registers, photovoltaic systems must:

- Be of new construction;
- Have a power greater than 20 kW (therefore excluded from tax deductions for redevelopment interventions);
- Comply with the provisions regarding the prohibition of access to state incentives for plants located in agricultural areas.

In particular, photovoltaic systems built to replace asbestos roofing will be entitled, in addition to incentives for electricity, a premium of 12 €/MWh. However, this incentive

cannot be combined with other bonuses for the removal of asbestos (the asbestos must be disposed of in the manner prescribed by the GSE).

### Technologies

In general, all technologies used in renewable electricity generation are promoted; however, they are eligible for different incentives.

## **6.2. RES-Heating**

### Main support schemes

A price-based scheme (*Conto Termico*) is in place in Italy for small RES-H sources. Heat pumps (aerothermal, geothermal, hydrothermal), biomass and solar thermal are eligible technologies, and the incentive is granted for a period varying between 2 and 5 years. Furthermore, a tax regulation system is currently in place for the promotion of RES-H. Conto Termico and Tax deductions are not combinable.

### More about support schemes

Price-based scheme. This scheme provides an incentive for small RES-H sources. The eligibility depends on the source and the type of installation.

Tax regulation scheme. This scheme allows for a 50-75% tax deduction ("detrazione") for expenses related to refurbishment of existing buildings and/or energetic requalification of buildings and/or installation of RES-H technologies

## **6.3. General statutory provisions**

DPR 380/01 (*Decreto del Presidente della Repubblica 6 giugno 2001, n. 380. Testo unico delle disposizioni legislative e regolamentari in materia edilizia*) - Decree of the President of the Republic of 6 June 2001, n. 380. Single text of legislative and regulatory dispositions in construction issues.

DL 387/03 (*Decreto Legislativo 29 dicembre 2003, n. 387. Attuazione della direttiva 2001/77/CE relativa alla promozione dell'energia elettrica prodotta da fonti energetiche rinnovabili nel mercato interno dell'elettricità*) – Decree for the Promotion of Renewable Energy.

DM 37/08 (*Decreto 22 gennaio 2008, n. 37 del Ministero dello Sviluppo Economico. Regolamento concernente l'attuazione dell'articolo 11-quaterdecies, comma 13, lettera a) della legge n. 248 del 2 dicembre 2005, recante riordino delle disposizioni in materia di attività di installazione degli impianti all'interno degli edifici*) - Decree of 22 January 2008, n. 37 of the Ministry of Economic Development. Regulation related to the enactment of Art. 11-quaterdecies, c. 13, l. a of law 248 of 2 December 2005, restructuring the dispositions related to activities of plant installation within buildings.

DL 28/11 (*Decreto Legislativo 3 marzo 2011, n. 28. Attuazione della direttiva 2009/28/CE sulla promozione dell'uso dell'energia da fonti rinnovabili recante modifica e successiva abrogazione delle direttive 2001/77/CE e 2003/30/CE*) - Legislative Decree 3 March 2011, no. 28. Implementation of Directive 2009/28/CE on Promotion of Use of Energy from RES modifying and Repealing Directives 2001/77/CE and 2003/30/CE.

570/2012/R/efr (*Deliberazione 570 2012. Testo integrato delle modalità e delle condizioni tecnico-economiche per lo scambio sul posto - TISP*) – Conditions for Net Metering.

343/2012/R/efr (*Definizione delle modalità per il ritiro, da parte del Gestore dei Servizi Energetici S.p.A. - GSE, dell'energia elettrica immessa in rete dagli impianti che accedono all'incentivazione tramite le tariffe fisse onnicomprensive. Definizione delle modalità di copertura delle risorse necessarie per l'erogazione degli incentivi previsti dai medesimi decreti interministeriali*) - Definition of modalities for the intake, on the side of GSE, of electricity fed in the grid by plants incentivised by means of the "tariffa onnicomprensiva". Definition of the modalities for cost coverage of the incentives.

DM 24/12/2014 (*Approvazione delle tariffe per la copertura dei costi sostenuti dal Gestore servizi energetici GSE S.p.A. per le attività di gestione, verifica e controllo, inerenti i meccanismi di incentivazione e di sostegno delle fonti rinnovabili e dell'efficienza energetica, ai sensi dell'articolo 25 del decreto-legge 24 giugno 2014, n. 91, convertito, con modificazioni, dalla legge 11 agosto 2014, n. 116*) - Approval of tariffs to cover costs incurred by the Manager Energy Services GSE for the activities of management, audit and control, related to the incentive and support mechanisms for renewable sources and energy efficiency, according to Article 25 of Decree Law 24 June 2014, n. 91, modified with amendments by Law 11 August 2014, n. 116.

DM FER 2018-2020 (*Approvato il ritorno al fotovoltaico con un premio per la sostituzione dei tetti in amianto, dei ministeri dello sviluppo economico e Minambiente*) - The return to photovoltaics has been approved with a premium for the replacement of asbestos roofs by ministries of economic development and the environment.

#### **6.4. General policies**

In Italy training programmes for installers are regulated at central level but set up and managed at regional level.

Certificates of installed plants is obligatory. Each installer, after having installed a plant on any building, is required by law to release a certificate of compliance with a set of standards outlined in DM 37/08.

All new buildings and all buildings undergoing major refurbishment are obliged to integrate RES-E and RES-H. There are different obligations depending on the building type and size, and for public buildings the obligations are increased by 10%.

A guarantee fund supporting the development of district heating networks is in place within the “Cassa congruaglio” for the electricity sector. An additional fee of 0.05 €/Sm<sup>3</sup> (Sm<sup>3</sup> is a quantity measurement unit at specified pressure and temperature levels) is applied to the consumption of natural gas.

### Technologies

The certificates obligation applies to electricity production units and heating, cooling, and air conditioning plants.

The training programmes apply to boilers, fireplaces and biomass heaters, building-mounted PV and solar thermal installations, low enthalpy biomass plants and heat pumps.

The obligation to integrate RES-H and RES-E in buildings does not specify technologies but only the criteria that have to be respected.

## **7. Greece**

In accordance with European legislation, Greece has adopted a number of provisions, which mainly address energy efficiency in buildings. Apart from that, there are a number of national programmes whose primary aim is to promote energy efficiency through the use of RES in public or private buildings but which also provide funding for RD&D activities [7.1].

Greece has several policies aimed at promoting the development, installation and use of RES installations. However, there is no evidence of the inclusion of PVT technology in these policies, as seen in the following sections.

### **7.1. RES-Electricity**

From 2017, support schemes for electricity from renewable sources in Greece are promoted through a feed-in premium (FiP) granted by participation in “technology specific” tenders. Apart from that, RES is eligible for a net metering scheme, mainly for PV and small wind power plants. In addition, a tax regulation mechanism and a subsidy scheme are available under the new Development Law.

For this purpose the main means of support are:

- Feed-in tariff (Feed-In premium exemptions);
- Feed-in tariff for rooftop PV;
- Net-Metering;
- Premium tariff (Feed-in Premium);
- Subsidies;

- Tax regulation mechanism;
- Tenders.

The support scheme for the production of electricity from RES and CHP plants (under Law 4414/2016), aims to integrate and progressive participation of these generating units in the electricity market. Under this RES support scheme, the remuneration levels for photovoltaic projects consist of:

- Installations above 500 kW, are defined within the scope of tenders;
- Installations with a capacity of less than 10 kW that fall under the Special Roof Photovoltaic Program will continue to be remunerated in accordance with the provisions of this program;
- Other photovoltaic installations with a capacity of less than 500 kW will be remunerated in accordance with the provisions of Law 3734/2009, as applicable, with the exception of installations that participate (voluntarily) in competitions.

#### Summary of support schemes

**Premium tariff** - From 2016, RES and combined heat and power (CHP) plants connected to the transmission system participate in the electricity market and are awarded a sliding feed-in premium (FiP), called “Operating support based on a differential compensation price”. Apart from that, feed-in premium is awarded through tenders since 1 January 2017 (see “Tender”). Hence, Operating Support Contracts for RES plants  $\geq 1\text{MW}$  and wind plants  $\geq 6\text{MW}$  will not be signed until a tender is announced. Exemptions apply to smaller Installations.

**Tender** - From 2017, RES and CHP plants are awarded with a sliding FiP through tenders. Tenders are expected to be “technology specific”. The Ministry of Environment and Energy shall issue a decision concerning the capacities available for each technology for each subsequent tender. In December 2016, a pilot tender for PV already took place. The tender included two categories of PV installations, followed a two-stage process with specific price and volume caps. In 2018, two tenders for PV and wind energy took place.

**Feed-in tariff (feed-in premium exemptions)** - From 2016, RES and CHP plants to be connected to the transmission system participate in the electricity market and are awarded a sliding feed-in premium (called “Operating support based on a differential compensation price”) and from 2017, feed-in premium is granted through tenders (see “Tender”). However, exemptions apply to smaller installations, i.e. wind energy plants  $\leq 3\text{ MW}$  and other RES installations  $\leq 500\text{ kW}$ , which are eligible for a feed-in tariff.

**Tax regulation mechanism** - The Development Law that came into force in July 2016, foresees support for CHP plants, small-scale hydro-power plants, and self-production using other RES in a form of an income tax relief and stabilisation of income tax



coefficient. They can be substituted with other support mechanisms under Development Law, i.e. Subsidies.

**Subsidies** - The 2016 Development Law foresees support for CHP plants, small-scale hydro-power plants, and self-production using other RES in a form of subsidies, leasing subsidies, and subsidies for the creation of new jobs. They can be substituted with other support mechanisms, i.e. Tax regulation mechanism.

**Net metering** - The amendment of Law No. 3468/2006 introduces net metering for all RES for autonomous producers, while “virtual net metering” is applicable to PV and small wind power plants only in certain cases. The net metering process is stipulated in FEK B’ 3583/2014. Furthermore, a similar PV (virtual) net metering scheme was introduced in 2017.

### Technologies

In general, all renewable electricity generation technologies are eligible for support in Greece.

## **7.2. RES-Heating**

In Greece, support schemes for RES in heating and cooling sector (RES-H&C) are supported by two tax relief mechanisms and subsidies.

### More about support schemes

The new Development Law that came into force in July 2016 foresees support for CHP plants and RES H&C plants (for self-consumption, but not only):

- Tax relief. The 2016 Development Law foresees support for CHP and RES H&C plants in a form of an income tax relief and a stabilisation of income tax coefficient. They can be substituted with other support mechanisms, i.e. subsidies, under the Development Law.
- Subsidy I. The 2016 Development Law foresees support for CHP and RES H&C plants in a form of subsidies, leasing subsidies, and subsidies for the creation of new jobs. They can be substituted with other support mechanisms under the Development Law, i.e. tax relief.
- Income tax relief. Law No. 2238/1994 provides an income tax relief for natural and legal persons who have performed an energy upgrading of their building either at their own expense or through participation in national programmes (e.g. *Exoikonomo*).
- Subsidy II (combined with loan- “Energy Saving at Home II”): The Programme “Energy Saving at Home II” aims at improving the energy performance of residential buildings through the provision of interest-free loans and subsidies for the installation of RES plants and energy-saving measures. The total budget of

the programme is € 292.43 million. The programme will be open until the funds are exhausted.

### Technologies

All technologies used to generate heat from RES are eligible (e.g. solar thermal, geothermal, CHP).

## **7.3. General legal bases**

### Policies

A database of PV installers and RES professionals (including RES installers) was developed and updated by the Centre for Renewable Energy Sources (CRES). The introduction of new energy efficiency standards promotes, or even imposes the installation of RES in new buildings and in public buildings. Apart from that, incentives are offered for the installation of RES in existing buildings. In addition, Greece is supporting RD&D activities.

### Main statutory provisions

Law No. 3175/2003 (Development of Geothermal Energy, District Heating and Miscellaneous Provisions).

Min Res/F1/oik. 17149 (Procedure for the Issue of Planning and Operation Permissions for Renewable Energy Plants).

Law No. 3468/2006 (Generation of Electricity Using RES and High-Efficiency Cogeneration of Electricity and Heat and Miscellaneous Provisions).

Law No. 3661/2008 (Measures to Reduce Energy Consumption in Buildings).

KENAK (Energy Performance of Buildings Regulation).

Law 4122/2013 (Energy Performance of Buildings- Transposition of Directive 2010/31/EU).

FEK B' 3583/2014 (Ministerial Decree "Installation of RES plants by autonomous producers under a net-metering scheme as it is foreseen by Law No. 3468/2006, art. 14a").

Law No. 4342/2015 (Pension arrangements, transposition of EU Directive 2012/27/EU of the European Communities Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, as it was amended by Council Directive 2013/12/EU of 13 May 2013 "adapting Directive 2012/27/EU of the European Parliament and of the Council on energy efficiency, by reason of the accession of the Republic of Croatia" and other provisions).

Min Res./F10 oik.175067 (Ministerial Decree “Installation of RES plants by autonomous producers under a (virtual) net metering scheme as it is foreseen by Law No. 3468/2006, art. 14a”).

Law No. 4399/2016 (Institutional framework for the establishment of Private Investment support scheme for environmental regional and economic development of the country – Establishment of the Development Council and other provisions).

Law No. 4414/2016. (New Support Scheme of Renewable Energy and CHP Plants - Provisions concerning the Legal and Administrative Unbundling of Natural Gas Supply and Distribution and Miscellaneous Provisions).

Law No. 4447/2016 (Spatial planning and Sustainable development and other provisions – Article 28: Arrangements for the conclusion Procurement Operational Support RES and CHP Licensing issues plants Production RES stations and CHP).

RAE Decision 417/2016 (Conducting the Pilot competitive bidding process for photovoltaic installations in accordance with the provisions of Article 7 paragraph 8 of N.4414/2016).

Law No. 4153/2018 (Energy Communities and other provisions).

NSRF 2014-2020 (Implementation Guide for the "Energy Saving at Home II" programme).

## **8. Netherlands**

In the Netherlands, the main support instrument for renewable energy is the SDE+ premium feed-in scheme (SDE - *Stimulerend Duurzame Energie*). This support scheme promotes RES used for electricity, renewable gas and heating purposes. It encompasses a system of phased admission with escalating base tariffs, which favours low-cost RES options. Besides the premium scheme, investments in renewable energy technologies are supported via loans and various tax benefits. Moreover, the ISDE premium feed-in scheme and net-metering applies to small installations (ISDE - *Investerend Stimulerend Duurzame Energie*). Heat from renewable sources is promoted through a premium tariff (bonuses on top of the wholesale price) as well as tax benefits [8.1].

### **8.1. RES-Electricity**

#### **Support schemes**

In the Netherlands, electricity from RES is promoted mainly through a premium tariff (premiums on top of the wholesale price). Furthermore, RES-E is promoted through investment subsidy for PV installations, net-metering and tax benefits.

Summary of support schemes:

- Premium tariff (premiums on top of the wholesale price) aims to promote the generation of electricity from RES;
- Tax regulation mechanisms. Generators of electricity from RES that use the electricity they consume (own consumption clause) may be exempt from the tax levied on electricity consumption (Energy tax). Moreover, enterprises are eligible for a tax credit (EIA - Energy Investment Allowance) for investments in renewable energy plants.
- Loans. Investors in RES-E projects (excluding biomass and biogas) are eligible for a reduction of the interest rate on the basis of a green project declaration.
- Net-metering of electricity produced and fed-in to the grid through a small-scale connection ( $\leq 3 \times 80A$ ).

### Technologies

In the Netherlands, all technologies are eligible for at least one support scheme. However, each support scheme has a different focus.

## **8.2. RES-Heating**

### Support schemes

In the Netherlands, heat from renewable sources is promoted mainly through a premium tariff (bonuses on top of the wholesale price). In addition, tax benefits apply.

Summary of support schemes:

- Premium tariff. The Netherlands have introduced a premium tariff (bonuses on top of the wholesale price) to promote the generation of heat from renewable sources.
- Tax regulation mechanisms. Enterprises are eligible for a tax credit (EIA) for investments in specific types of renewable heating systems.
- Loans. Investors in RES H&C projects (excluding biomass and biogas) are eligible for a reduction of the interest rate on the basis of a green project declaration.

### Technologies

In the Netherlands, all technologies are eligible for at least one support scheme. However, each support scheme has a different focus.

## **8.3. General statutory provisions and policies**

### Statutory provisions

Elektriciteitswet 1998 (Electricity Act) – General Law on Electricity.

Wet IB 2001 (*Wet van 11 mei 2000 tot vaststelling van de Wet inkomstenbelasting 2001*) – is the Income Tax Act.

WBM (*Wet Belastingen op Milieugrondslag*) – Act on the Environmental Protection Tax.

GGOEHE (*Regeling garanties van oorsprong voor energie uit hernieuwbare energiebronnen en HR-WKK-elektriciteit*) – Regulation for guarantees for the Origin of RES and HR-CHP-electricity.

SDE+ (*Besluit stimulering duurzame energieproductie*) –Renewable Energy Production Incentive Scheme

RGP 2016 (*Regeling Groenprojecten 2016*) - Regulation Green Projects 2016.

Energielijst 2018 (Energy List 2018).

RAC 2018 (Regeling aanwijzing categorieën duurzame energieproductie 2018) – Regulation designating sustainable energy production categories.

*Algemene uitvoeringsregeling stimulering duurzame energieproductie* – is the regulation implementing sustainable energy production (RISEP).

### Policies

Regarding policies, the Netherlands Enterprise Agency facilitates market parties and specific organisations to establish training and certification facilities for RES installers and installations. Innovation in energy is supported through innovation contracts between private companies, universities, and R&D institutes. In the framework of the *Energieinvesteringsaftrek* (EIA – Energy Investment Allowance), tax credits are available for RES-H infrastructure.

## **9. Germany**

In Germany, electricity from renewable sources is mainly supported through a market premium scheme. However, small power plants up to 100 kW are still supported by a feed-in tariff. The criteria for eligibility and the tariff levels are set out in the Renewable Energy Sources Act (EEG 2017). In 2017 the tenant electricity surcharge has been added to the EEG, which supports electricity produced and consumed in the same residential building. Moreover, low interest loans for investments in new plants are provided for by different KfW-Programmes and there is an additional subsidy to promote the installation of flexible biogas capacities.

In Germany, the Guidelines for the support of RES-H set out the Market Incentive Programme (MAP), stipulating support schemes for the promotion of heat produced from renewable energy. BAFA (*Bundesamt für Wirtschaft und Ausfuhrkontrolle* = Federal Office for Economic Affairs and Export Control) is providing investment

support for individual heat installations as well as district heating systems, while KfW offers low-interest loans [9.1].

### **9.1. RES-Electricity**

#### **Support schemes**

In Germany, electricity from renewable sources is mainly supported through a market premium scheme. For most installations, the award and the level of the market premium is determined through a tendering scheme. Plants with a capacity of up to 100 kW and other plants in exceptional cases can benefit from a feed-in tariff. The criteria for eligibility and the tariff levels are set out in the Renewable Energy Sources Act (EEG 2017). In 2017 the tenant electricity surcharge has been added to the EEG, which supports electricity produced and consumed in the same residential building. The EEG also introduced support schemes to promote flexible biogas plants. Moreover, low interest loans for investments in new plants are provided for by different KfW-Programmes (Renewable Energy Programme –Standard, Programme offshore wind energy, BMU Innovation Programme, Renewable Energy Programme Premium).

Summary of the main support schemes:

- The KfW Renewable Energy Programme–Standard provides low-interest loans with a fixed interest period of 10 years including a repayment-free start-up period for investments in installations for electricity production.
- The BMU Innovation Programme provides low interest loans and subsidies for innovative pilot projects for RES.
- Market premium. Plant operators of RES plants exceeding an installed capacity of 100 kW which are not obliged to take part in the tendering procedures are supported by a market premium for electricity they sell directly. The amount of the market premium shall be calculated each month.
- Tenant electricity surcharge. PV-plants up to 100 kW on residential buildings are supported through the Tenant electricity surcharge, if the electricity is supplied and consumed within the building itself without using the grid. Electricity exported to the grid is supported by the Feed-in tariff.
- Market premium. Plant operators of RES plants exceeding an installed capacity of 100 kW which are not obliged to take part in the tendering procedures are supported by a market premium for electricity they sell directly. The amount of the market premium shall be calculated each month.
- Feed-in tariff. For power plants up 100 kW the support system is based on a feed-in tariff, which the grid operator pays to the plant operators. The amount of tariff is set by law and is usually paid over a period of 20 years. The plant operators can also opt for the market premium. Plants with a capacity higher than 100 kW can be supported through the feed-in tariff in exceptional cases.

## Technologies

In general, the EEG promotes all technologies used to generate electricity from renewable energy. However, capacity, location or materials used may give reason for excluding certain types of plants from the support system.

### **9.2. RES-Heating**

#### Support schemes

In Germany, the Guidelines for the support of RES-H set out the Market Incentive Programme (MAP), stipulating support schemes for the promotion of heat produced from renewable energy. BAFA is providing investment support and KfW offers low-interest loans (Renewable Energy Programme–Premium).

Summary of support schemes:

- Subsidy: BAFA investment support is given for heat produced in existing buildings. Installations in new buildings are only eligible if process heat is used;
- Loan: KfW provides low-interest loans with grant payback support for the development and expansion of heat installations/plants.

The covered technologies are biogas, biomass, geothermal energy, solar thermal.

### **9.3. General statutory provisions and policies**

#### Main statutory provisions for RES-E and RES-H

EWärmeG (*Erneuerbare-Energien- Wärmegesetz*) – Renewable Energies Heat Act.

HwO (*Handwerksordnung*) - Crafts Code.

Installateur HeizungsbauerMstrV (*Installateur- und Heizungsbauer-Handwerk*) - Installer and Heating Fitter Craft.

KWKG (*Kraft-Wärme-Kopplungsgesetz*) - Combined Heat and Power Act.

*Richtlinie zur Förderung von Maßnahmen zur Nutzung erneuerbarer Energien im Wärmemarkt* - Directive to Promote Measures for the usage of renewable energy in the heat market, i.e. Guidelines for the support of RES-H.

*Merkblatt KfW-Programm Erneuerbare Energien Premium* – KfW Renewable Energy Programme Premium.

*Merkblatt KfW-Programm Erneuerbare Energien* - KfW Renewable Energy Programme Standard.

EEG 2017 (*Erneuerbare-Energien-Gesetz*) - Renewable Energy Sources Act.

EEV (*Erneuerbare-Energien-Verordnung*)– Renewable Energy Ordinance.

## Policies

Germany provides policies for the promotion of RES covering training, certification and research programmes, a self-commitment of public authorities, the support of district heating networks and the introduction of building obligations regarding the use of heat produced from renewable energy.

Summary of policies:

- Training programmes for Installers. Installers are trained to install renewable energy technologies in the framework of the craftsman training.
- Certification Programmes for RES installations. Plants have to comply with the technical requirements (certificates) depending on the particular technology in order to be connected to the grid.
- Exemplary role of public authorities. Public authorities shall take an exemplary role in the promotion of renewable energy.

## **10. United Kingdom**

In the United Kingdom RES-E are supported through a feed-in tariff, Contracts for Difference scheme and tax regulation mechanism. Furthermore, in Great Britain commercial and industrial users of traditional energy sources are subject to a tax on fossil fuels used for electricity generation. Electricity from renewable sources is exempt from this tax.

As for RES-H price-based mechanisms are available for supporting RES-H installations. The Renewable Heat Incentive (RHI) is the main instrument for funding RES-H sources in the United Kingdom by supporting RES-H installations with a fixed amount per kWh produced. The scheme consists of two parts: The Non-Domestic RHI (UK) and the Domestic RHI (UK and Northern Ireland until 2016). While the Non-Domestic RHI provides payments to industry, businesses and public sector organisations, the Domestic RHI is open to homeowners, private landlords, social landlords and self-builders.

Generally speaking, all technologies used in the generation of electricity and for heat generation from RES are eligible [10.1].

### Statutory provisions

RHISR 2011 (The Renewable Heat Incentive Scheme Regulations 2011, No. 2860)

Domestic RHISR 2014 (The Domestic Renewable Heat Incentive Scheme Regulations 2014, No. 928)

EnA 2011 (The Energy Act 2011, c. 16)

## Policies



In the UK a certification scheme for solar thermal installations and an R&D policy are currently available. A plan for vocational training of installers is being developed.

The Microgeneration Certification Scheme (MCS) is aimed at providing an assessment and an approval that a RES installation complies with specific standards. Depending on the technology, requirements may vary, but are nevertheless usually linked to an internationally recognized standard (e.g. EN 12975-1: 2006 for solar thermal installations).

### **10.1. Renewable Heat Incentive scheme**

Under the UK Government's domestic Renewable Heat Incentive (RHI) scheme, it is possible to receive quarterly cash payments over seven years by installing an eligible renewable heating technology [10.2].

The RHI scheme aims to encourage uptake of renewable heat technologies amongst householders, communities and businesses through financial incentives, and contribute towards the ambition of 12% of heating coming from renewable sources.

The UK Government's Department for Business, Energy and Industrial Strategy (BEIS) makes key policy decisions and energy regulator Ofgem E-Serve administers the scheme.

There are two versions of RHI: domestic, and non-domestic. This section provides information only on the domestic RHI [10.3].

#### **10.1.1. Domestic RHI scheme**

The domestic RHI launched on 9 April 2014 and provides financial support to the owner of the renewable heating system for seven years. The scheme covers England, Wales and Scotland.

##### **Eligibility**

Anyone who generates domestic heat through a renewable source may qualify to apply. Some of the main eligibility criteria are listed below (based on the requirements and rules of the scheme available on Ofgem's website).

Thus, those who are eligible to apply for support are:

- Owner-occupiers, self-builders, private landlords and registered providers of Social Housing who have installed an eligible technology can apply for RHI support (provided they meet eligibility criteria);
- Single domestic dwellings are covered.

RHI support is not usually available to new build properties (other than self-build projects).

### Assignment of Rights (AoR)

The introduction of 'assignment of rights' (AoR) is an option to help householders and landlords access finance to overcome the barrier of the upfront cost of a renewable heating system.

Assignment of rights allows an 'investor' to help fund the purchase, installation and maintenance, of a household or landlord's renewable heating system. Households and landlords are then able to assign their RHI payments to the investor, who is referred to in the RHI Regulations as the 'nominated' investor. This came into effect on 27 June 2018.

### Limits on the amount of space heating

There are limits on the amount of space heating a house can receive payments for. The heat demand limits are set at 20,000kWh for ASHPs, 25,000kWh for biomass boilers and stoves and 30,000kWh for GSHPs.

For heat pumps, if the deemed demand is more than the capped limit then you will be paid the unit tariff multiplied by the amount of renewable heat that contributes to the capped demand.

There is no limit for solar water heating systems.

### Tariffs

The table below summarises the latest tariffs available for each technology:

Table 10.1 - Available tariffs for each technology (April 2021) [10.3].

	<b>Air source heat pump</b>	<b>Biomass</b>	<b>Ground source heat pump</b>	<b>Solar thermal</b>
Tariff (p/kWh renewable heat) (Applications submitted between 01 April 2020 and 30 June 2021 inclusive)	10.92	7.01	21.29	21.49

These tariffs are set by the UK Government at a level designed to compensate for the difference between costs of installing and operating renewable heating systems and fossil fuel systems, including non-financial costs such as disruption, based on 20 years of heat produced. Fossil fuel costs used are those for off-gas households.

Ofgem will make payments on a quarterly basis for seven years. Normally the heat required to heat the property is deemed (estimated) and payments based on this amount by technology:

- Biomass will be based on an estimated heat demand from an EPC;

- Heat pumps will be based on an estimate of the heat demand from an EPC combined with an estimate of the heat pump's efficiency;
- Solar thermal systems will be based on the estimate of system performance completed as part of a MCS installation.

#### Covered technologies

To be eligible for RHI payments all renewable technologies must be:

- Listed as a MCS certified product;
- Issued with a MCS certificate.

Technologies included are:

- Biomass (wood fuelled) boilers;
- Biomass pellet stoves with integrated boilers providing space heating;
- Ground to water heat pumps;
- Air to water heat pumps;
- Solar thermal panels (flat plate or evacuated tube only) providing hot water for your home;
- Water source heat pumps can potentially be eligible for the domestic RHI – they are included in the definition of a ground source heat pump;

Applications for the domestic RHI scheme must be made within one year of the system's commissioning date.

#### Non-compliant technologies

The domestic RHI does not support air to air heat pumps, log stoves, pellet stoves without back boilers and **hybrid photovoltaic thermal hybrid solar collectors (PVT)**.

## **11. Switzerland**

Regarding Switzerland, the surveys carried out resulted in very little information. Furthermore, the information concerns only RES-Electricity.

In Switzerland, the generation of electricity generated by the use of renewable energy sources is promoted through a feed-in tariff. Access of renewable energy plants to the grid is subject to the general legislation on energy. Electricity from renewable energy sources is not given priority connection [11.1].

## **12. Denmark**

In Denmark there are unfortunately no special incitements or directly implemented subsidy schemes related to PVT systems.

However, homeowners can be based on an invoice on a PVT system installation from an installer company achieve tax reduction by means of the so-called Håndværkerfradrag programme [12.1]. The salary part of the invoice can be deducted from the income of the homeowner, and in that way the taxation of the homeowner can be reduced. The maximum amount which can be deducted is 25,000 DKK. The economical support will in this way be influenced by tax conditions of the homeowner.

Further, also for solar heating systems there are no special incitements or subsidy schemes.

Homeowners can receive economical support to establish PV systems from a special national subsidy scheme on PV systems [12.2]. The subsidy for the homeowner is 0.60 DKK/kWh for the electricity delivered to the grid during the first 5 years of operation plus 2,000 - 6,000 DKK if a lithium battery is part of the system plus 2,000 - 6,000 DKK if black design PV panels, that is monocrystalline PV panels with black frames, are used. This subsidy scheme is based on the first come, first served principle, and the subsidies for 2021 have already been granted.

Finally, manufacturers and research institutes can apply for funding on research, development and demonstration of PVT systems within the national Energy Technology Development and Demonstration Program EUDP, which is supporting development and demonstration of energy technologies [12.3].

## **13. Sweden**

In Sweden, if you want to construct a building, add some part, expand or renovate a building or demolish a building you need to get a planning permission or development approval from the local municipality, which is called building or construction permit [13.1]. Solar panels or solar collectors that are mounted on the outside of a building's facade cladding or roofing material are in some cases exempt from building permits, even if they result in the building's external appearance being significantly affected. The exemption from the building permit requirement applies to all types of buildings. The following criteria must be met for such solar collectors and solar panels to be exempt from a building permit [13.2]:

- They must be mounted on the outside of a building's facade cladding or roofing material;
- They must follow the shape of the building;
- They may not be installed on buildings or in built-up areas that are particularly valuable;

- They may not be mounted within or adjacent to areas that are of national interest to the total defense forces of the country;
- That the solar energy plant does not require a building permit according to the detailed plan that applies to the district.

In order to determine whether the installation of such a solar energy plant requires a building permit, an assessment must be made in each individual case as to whether the plant installation means that the building's external appearance is significantly affected. It depends on the design of the facility but also on the type, size, appearance, character and material of the building in question. Aspects that can be considered in the assessment are, for example, the size, color, location and slope of the facility. However, there is a lack of guiding case law on the issue when solar energy systems mean that the building's exterior is significantly affected.

This might be interpreted that to install PVT collectors they should not be too thick and should not change the appearance of the property, but as there are not direct praxis, the authors believe that installation of PVTs most probably will be granted building permit (in case if it is needed).

There are no directly implemented subvention or subsidy regarding PVT solar collectors in Sweden. However, as they also generate electricity, they can benefit the advantages and subventions for having PV panels. For that, the new regulations include a so-called green technique tax reduction of 15% for total cost of installation of solar PV cells (connected to electricity grid) and 50% for storage batteries (with maximum limit of 50000 Swedish kr per year). That is for private persons, and if one invests on solar cells and storage batteries for his/her apartment or house, he/she will get 15% and 50% deduction on the costs, respectively, (within the mentioned limits per year) directly on the receipt [13.5].

In order to be eligible to receive the 15% Green technique reduction, if the system produces both solar electricity and solar heat, like in case of PVT solar collectors, at least 20% of the system's total production should provide electricity to be eligible to get the green technique subventions [13.5]. This means that the production of heat is allowed to be at most four times larger than the production of electricity. This rule is independent of the temperature of the heat and the collector temperature is not defined. This is a clear but strange requirement. The law is appropriate for a PVT-system that delivers domestic hot water. It delivers 3-4 times more heat than electricity. A PVT-collector which produce 30 °C water for pool heating will not get the tax reduction, since it delivers too much heat.

According to a previous governmental decision, companies and municipalities can get be granted with 10 % of eligible costs for solar cell installations from 15 January 2021 [13.4]. However, the allocated budget is limited, i.e. there might not be any grants left for some later applicants.

Besides, there is an income tax reduction of 0.60 Swedish kr per kWh of the sold excess generated electricity to the grid and up to amount of purchased electricity per year, which is valid for both private and legal persons. The tax reduction for the so-called micro-production of renewable electricity, covers up to 30000 kWh per year (18000 kr per year) [13.3] [13.6]. This is to compensate the difference between the purchased and sold electricity. The exact compensation for the excess electricity production of the solar cells (sold to the grid) includes the spot price for electricity + compensation for "grid benefit" (0.08 Swedish kr/kWh) + tax reduction (0.60 Swedish kr/kWh). The spot price varies and depends on the season and the total electricity production at the market.

### **13.1. Suggestion for improvements**

There is no definition in the regulation law of a PVT system. For instance if 6 m<sup>2</sup> of thermal collectors (delivering 2000 kWh<sub>heat</sub>/year) and 6 m<sup>2</sup> of PV-modules (1 kW<sub>p</sub>) (delivering 900 kWh<sub>el</sub>/year) are installed at the same time and integrated in a roof together, the owner will receive the 15 % green technique investment support only for the electrical part. However, if instead 12 m<sup>2</sup> of PVT panels with the same output is installed, then the 15 % green technique investment support is received even for the thermal part (in the PVT system). The separate PV and thermal system, such as the mentioned example, might be also cheaper to be installed than a 12 m<sup>2</sup> PVT-system.

The Swedish legislation could be improved by motivating people to use renewable energies in a larger extent. There are distinct areas, where private people and building stack holders are interested to invest on solar energies, but due to the limitations in the regulations, subventions and taxation, there are less economical motivations. For instance, if the PV-system produce more electric energy than the building electricity use during a year, it is called net producer, the grid company have the right to charge an input fee, and this makes it much less profitable for the net producers (Dn.se, 2021). Besides, there should be more investments for power plants to be used during the wintertime, when the use of solar collectors and panels are very limited.

Here there are some suggestions:

- 1) Decreasing or eliminating the so-called input charge for selling the annual over production of electricity to the net.
- 2) Widening the subventions even to private companies and housing cooperative or housing co-ops so that they will be more motivated to install solar collectors.
- 3) Updating the building permit regulations and making it easier to install PVT solar collectors.
- 4) Having a more holistic system perspective advising and implementing regulations, i.e. regulations and subventions should be more specific and dynamic depending on for example if a building is located in a region without

district heating network or if it is in a city center having the possibility to be connected to the district heating network. In the first case, installation of hybrid PVT system is more rewarding and should be motivated more in the regulations.

#### **14. Lithuania**

The use of PVT systems is not legally regulated in Lithuania and purchases of PVT systems are not directly subsidized. However, the Ministry of Environment of the Republic of Lithuania has established an Environmental Project Management Agency, which initiates the collection of applications for the introduction of renewable energy sources from natural and legal persons, as well as a partial reimbursement of costs incurred in setting up these systems. By Resolution No O5E-284, the State Energy Regulatory Authority has approved a fixed EUR 246/kW excluding VAT for the purchase or installation of a 1 kW installed power solar power plant [14.1]. Anyone who has completed an application for the installation of a solar power plant has a significant possibility of receiving support, thus compensating for 35-40% of the total cost of the installation of the project. The Ministry of Energy plans to contribute EUR 16 million to the financing of renewable sources for the period 2019-2022 and the amount may be increased [14.2].

Compensation for the exclusive use of solar cells in heating systems is neither foreseen nor planned. The purpose of this support shall be based on Lithuania's geographical location.

The consumer can choose 3 different options for the purchase of solar electrical equipment which are compensated [14.3]:

1. With the ability to store energy in batteries without selling energy (for own use);
2. The possibility of supplying excess (unused) electricity for storage (for a maximum period of 1 year);
3. Buy out a part of the power plant in a solar power plant park.

The Research Council of Lithuania regularly publishes calls for proposals to finance research, development and demonstration of renewable sources [14.4]. Lithuania has an innovative solar module plant which also provides installation services and is actively involved in green energy promotion programmes [14.5].

#### **15. Turkey**

Turkey has significant solar energy potential. Thus; there is a tremendous environment for solar energy applications in Turkey. There are no incentive mechanisms and administrative regulations for direct PVT applications in Turkey. However, different incentives are offered for applications for solar assisted electricity generation and

applications for solar assisted hot water production. In this section, incentives for solar electricity production and incentives for solar hot water production in Turkey were examined and compiled separately by scanning the literature and legislation. This content also provides recommendations for PVT applications. The work of Hasan et al. was used in the preparation of this report. [15.1] [15.2].

The supervision and regulation of energy applications in Turkey is carried out by the Energy Market Regulatory Board. The duties of the relevant board are to regulate and supervise the energy for Turkey in order to present it to the consumer in an adequate, high quality, continuous, economical and environmentally compatible manner. The Board includes the Electricity Market Renewable Energy Resources Support Mechanism (YEKDEM/EMRERSM). Within the scope of the relevant mechanism, incentive practices are organized in Turkey for the generation of energy from RES [15.3].

Within the scope of Turkey's "Electricity Energy Market and Supply Security Strategy Document", targets for 2023 on renewable energy resources have been determined. Within the scope of the related target, it is aimed to increase the share of RES in electricity generation to 30%.

#### **15.1. Incentives Offered for Solar Collector Applications**

The solar energy market in the world and the situation of Turkey were evaluated based on the solar collectors report published by the International Energy Agency [15.4]. Many countries have different incentive policies for solar energy to reduce dependence on fossil fuels and increase domestic energy production [15.5]-[15.8]. The solar collector market in the world has been extending each year, through improvements. In the world, the biggest capacity of plate and vacuum tube solar collectors which we call glazed solar collector is in China [15.4].

Turkey is an important country in the world solar energy collector market. Turkey in terms of both production and usage capacity in the field of solar collectors. According to the International Energy Agency, Turkey is among the top 10 countries in terms of total solar collector installation. Among the solar collector applications in Turkey, flat plate solar collectors are mostly preferred for hot water production.

Turkey has a large market in terms of both solar collector production and magnitude of collector users for the purposes of hot water utilization. Due to this, there are some firms differing in size in various cities of Turkey, with miscellaneous dimensions producing solar collectors. There are a few firms producing vacuum tube solar collectors. The types of collectors mainly produced in Turkey are flat plate collectors; the type following the predominance of this kind of production is vacuum tube collector. On the other hand, in Turkey, the production of unglazed water collectors is non-existing. One of the reasons why there is more production of flat plate collectors - among other reasons - stems from the fact that the production of this type is, technologically, easier than the production of the vacuum tube collectors. In Table



15.1, the amount of solar energy that houses in Turkey's regions have is seen. In Turkey, Mediterranean, Aegean, Southeast and Central Anatolia Regions are the areas which use the solar water heating systems most. Eastern Anatolia, Black Sea and Marmara Regions are the areas where the collectors are used least.

Table 15.1 - Ratios of solar water heating systems for the houses in Turkey's regions [15.9].

Regions	Usage rates %
Mediterranean region	70
Aegean region	45
Southeastern Anatolia Region	40
Central Anatolia Region	25
Eastern Anatolia Region	15
Marmara region	5
Black Sea region	5

As seen in Table 15.1, the rate of solar collector users is low in the Marmara and Black Sea regions. In addition, the solar energy potential in the Marmara and Black Sea regions is lower than in other regions. The low solar energy potential of the Marmara and Black Sea Regions is reflected by the low number of solar collector users in the regions. However, the solar energy potentials of the Marmara and Black Sea regions are sufficient to provide hot water through solar collectors. For example, although Germany's solar energy potential is lower than the Marmara and Black Sea regions; Germany is in a very good position in the world solar collector market.

Government policies are an important factor in the development of solar energy markets. In order for both developed and developing countries to impose more conditions on solar energy; Incentive policies (State policies) are followed by policy makers. Until now, a clear incentive policy has not been implemented in Turkey for the dissemination of solar collector applications. There is only one project commissioned by the Directorate of Forestry and Village Relations since 2004 for the production of water heating in forest villages [15.10]. The aim of this project is to meet the hot water needs of the people living in the villages by using solar collectors. With this project, it is to prevent the cutting of forest trees. This project has been implemented very effectively since 2004 and has good results. With the project, the villagers meet their hot water needs in their homes through solar collectors.

18% VAT is applied on solar collectors in Turkey. This is a great rate for both world conditions and Turkey. On the other hand, there are subsidies and obligations dictated by the state in developed solar collector markets in the world, such as the Spanish and Israeli markets [15.2]. For example, the Spanish Government has made it necessary to meet the domestic hot water need with solar collectors in order to develop the solar

energy collector sector in the country [15.11]-[15.13]. In addition, the Israeli Government does not license houses without a solar collector system for the development of the solar collector sector in the country [15.14]. As can be seen, when new buildings are built in these markets, it is checked whether solar collector systems are installed in the newly built structures. However, there is no such control mechanism in Turkey.

In addition, for the widespread use of solar collectors by the public in Turkey; Subsidy support for low-income groups needs to be activated through the implementation of an awareness campaign and grant financing.

The Ministry of Energy and Natural Resources of the Republic of Turkey has prepared a strategic action plan regarding energy. In the said action plan, targets such as ensuring energy supply security, continuously increasing the use of renewable energy by focusing on the diversification of energy diversity and continuously increasing the use of renewable resources for heating purposes were determined. In this context, hot water production with solar collectors is a concept that supports the policies of the Ministry [15.15]. For this reason, the ministry's offering of incentives for the dissemination of solar collector applications will help the ministry achieve its goals in the field of energy.

## **15.2. Incentives Offered for PV Applications**

Many writers have stated that the production of electricity from solar energy depends on government policies of countries [15.16]-[15.21]. Therefore, it is essential for Turkey to implement the optimum incentive policies in order for the jump of the sector related to the production of electricity from solar energy. The aim of this section is to remark Turkey's incentive policies of electricity production with solar energy.

The most common incentive policies applied worldwide is feed-in-tariff application. Fixed price/Tariff Guarantee, Premium Payment (Feed In Tariff - FIT) Method: In this method, which is called fixed price or tariff guarantee, a purchase guarantee is provided at a fixed/variable price determined by the state and this purchase continues for the first 10-20 years of operation, generally from the date of operation of the production facility [15.22].

Well prepared feed-in-tariff incentive mechanism is based on consistent and comprehensive characterisation of the projects on RES and careful categorization of RES and technologies [15.23]. Feed-in-tariff is so common in European countries. The country which should be taken as an example for feed-in-tariff is doubtlessly Germany. Wages are fixed in feed-in-tariff applied in Germany. In addition to this, in Germany, the fixed tariff guarantee is applied according to the installed power.

Fixed tariff guarantee has been applied for a long time in Turkey. The duration of the relevant fixed tariff is defined as 10 years. While it used to be applied as an average of 13.3 US Dollar cents/kWh for solar eclectic generation, it has started to be applied as

32 Turkish Lira cents/kWh as of July 1, 2021. However, according to the increase in the locality rates in the establishment of solar energy facilities for electricity generation, an additional 8 Turkish Lira cents/kWh and an additional support period of 5 years are given.

### **15.3. Recommendations to Decision Makers for PVT Applications**

It is obligatory to implement incentive policies by government bodies within the scope of Turkey's PVT practices. The following suggestions must be included in the incentive policies to be introduced. These recommendations are:

- Nationwide public awareness should be raised for more widespread use of PVT applications;
- R&D activities related to the production of PVT panels should be increased;
- 18% VAT rate applied to solar panels should be reduced;
- Making it mandatory to equip new buildings with PVT panels;
- Providing financial support to small sub-income groups through grants and loans in order to increase the use of PVT panels.

The use of PVT will become widespread in Turkey when the activities suggested above are implemented. Thus, the economic market of existing solar energy applications will grow even more and this will contribute to employment. This event will have serious benefits for the Turkish economy.

## **16. Best examples of the legal face of PVT**

In the legislation relating to RES, existing in different countries, there is a clear absence of reference to PVT systems. Thus, the aim of this section is to provide information on current legislations and available subsidies for PVT technology in comparison with common solar technologies such as photovoltaics (PV) and solar thermal systems (ST) among the selected EU countries (Italy, Austria, Germany, France, UK, Switzerland and Netherlands). In addition, this review is limited to available information on national level of each country and information in regional and municipalities level are not included in the current study.

### **Italy**

In Italy, four ST subsidy schemes are available and two of them are completely relevant to PVT systems. First ST subsidy scheme is related to private individuals, industrial applications and public administration for domestic hot water (DHW), space heating (SH), solar heat in industrial processes (SHIP) and pool heating (PH) in compliance with EN12975 or EN12976. The income tax deduction in this scheme is 65% of investment costs with maximum value of 60.000 €. In this scheme, eligibility of PVT for funding is

not clear and currently not available therefore further investigation necessary [16.1]. Second ST subsidy scheme is related to private individuals, industrial applications and public administration for DHW, SHIP, SH, solar cooling (SC), concentrated solar thermal system (CSTS) and on-greenhouse solar thermal system (OGHT) in compliance with Solar Keymark. In this scheme, annual incentives are 0.08 - 0.43 €/kWhth. However, eligibility of PVT for funding is not clear [16.2].

Third ST subsidy scheme is related to private individuals for DHW, SC and SH in compliance with building renovation. PVT systems are fully eligible for funding in this scheme by income tax deduction of 50% with maximum investment costs of 96.000 € [16.3]. Fourth ST subsidy scheme is related to public administration for DHW, SC, SH, transformation of existing buildings in nearly zero energy buildings (TEB-nZEB) in compliance with nearly zero energy buildings (nZEB). In this scheme annual incentives to be calculated individually and PVT systems are fully eligible for funding [16.2].

In Italy, two PV subsidy schemes are available and both are completely relevant to PVT systems. First PV subsidy scheme is related private individuals in compliance building renovation. The income tax deduction in this scheme is 50% of investment costs with maximum value of 96.000 €. Second PV subsidy scheme is related to the public administration for building-applied PV system (BAPV) and TEB-nZEB. In this scheme annual incentives to be calculated individually [16.3]. Finally, in Italy no additional funding scheme dedicated to PVT is available.

### **Austria**

In Austria, seven ST subsidy schemes are available and two of them include PVT systems as well. First ST subsidy scheme is related to private individuals for DHW and SH in building with permit before 2006 and gross area of more than 4 m<sup>2</sup>. However, eligibility of PVT for funding is not clear in this case [16.4]. Second ST subsidy scheme is related to industrial applications for DHW, SH and SHIP with gross area of less 100 m<sup>2</sup>. In this scheme, the subsidy is 150 €/m<sup>2</sup> for flat plate collector, 195 €/m<sup>2</sup> for evacuated tube collector and 125 €/m<sup>2</sup> for air-driven collector. PVT is excluded from funding scheme [16.5]. Third ST subsidy scheme is related to industrial applications for DHW, SH and SHIP with gross area of more than 100 m<sup>2</sup>. In this scheme the subsidy is 20% of investment costs for every collector area for SC and PVT is excluded from funding scheme [16.6]. Fourth ST subsidy scheme is related to industrial applications for DHW, SH, SC, solar district heating (SDH) with gross area between 100 m<sup>2</sup> and 10000 m<sup>2</sup>. In this scheme PVT systems are fully eligible for funding and related subsidy is up to 50% of investment costs. Fifth ST subsidy scheme is related to municipalities for DHW, SH, SC, SDH with gross area between 100 m<sup>2</sup> and 10000 m<sup>2</sup>. In this scheme PVT systems are fully eligible for funding and related subsidy is up to 40% of investment costs [16.7]. Sixth and seventh ST subsidy schemes are related to municipalities for DHW, SH and SHIP with gross area of less 100 m<sup>2</sup> and above 100 m<sup>2</sup>, respectively. For above 100 m<sup>2</sup>, the subsidy is 12% of investment costs [16.8], [16.9].

In Austria, PVT systems is not clearly mentioned in one available subsidy scheme for PV. This subsidy scheme is related to Private individuals, industrial applications and municipalities and it is limited to grid connected systems. The subsidy funding is for maximum value of 5 kWp. For BAPV the subsidy is 250 €/kWp and for building-integrated PV system is 350 €/kWp [16.10]. In summary, PVT collectors can benefit only from subsidy schemes supporting innovative projects and similar to Italy no additional funding scheme dedicated to PVT is available.

### **Germany**

In Germany, covered PVT collectors mentioned in only available ST subsidy scheme, which is related to all applicants for DHW, SH, SC, SDC and SDH in compliance with Solar Keymark and unglazed water collector is not eligible for this scheme. The minimum yield is 525 kWh/m<sup>2</sup>a and minimum gross areas for flat plate collector (FPC) and air-driven collector (ADC) are 9 and 7 m<sup>2</sup>, respectively. In this scheme, stronger is required for new buildings and minimum buffer storage for FPC and evacuated tube collector (ETC) are 40 and 50 l/m<sup>2</sup>, respectively. The subsidy is 30% of overall costs [16.11].

In Germany, one PV subsidy scheme also includes PVT systems for all applications and limited to the grid connected systems only. In this scheme, feed-in tariff is 114.7 €/MWh [16.12]. For all applications such as source for HP (and self-consumption of electrical energy) or as ST system only one specific PVT subsidy scheme is available in Germany in compliance with Solar Keymark. In this specific PVT subsidy scheme, the subsidy is 30% of overall costs (in case of using as ST) and 35% in combination with more renewables [16.13].

### **France**

In France, three ST subsidy schemes are available but none of them include PVT without any inequalities since those higher one-time payments are granted to ST system than to PVT systems at the same boundary conditions. First ST subsidy scheme is related to private individuals for DHW and SH in compliance with Solar Keymark or CSTBat for building renovation projects (building older than 2 years). In this scheme, subsidy for applicants with modest incomes is 6500 to 8000 € for SHS, 750 to 4000 € for DHW and 2000 to 2500 € for PVT-systems limited to water driven. The subsidy for applicants with intermediary incomes is 3000 € for SH, 350 to 2000 € for DHW and 0 to 1000 € for PVT-systems limited to water driven [16.14] [16.15]. Second ST subsidy scheme is related to collective housing, tertiary, industry and agriculture with gross area of more 25 m<sup>2</sup> and includes renovation and new buildings in compliance with Solar Keymark. In this scheme, subsidy depends on region (For example in the North is 55 €/MWh annual yield over 20 years) and PVT is excluded from funding scheme. Third ST subsidy scheme is related collective housing, tertiary, industry and agriculture with gross area of above 500 m<sup>2</sup> or annual yield of above 200 MWh for renovation and new buildings in compliance with Solar Keymark or CSTBat. In this scheme monitoring

required and data must be shared, the subsidy is defined individually for each project. In this scheme the eligibility of PVT for funding not clear [16.16].

In France, three PV subsidy schemes are available and all of them accept PVT collectors equally. First PV subsidy scheme is related to grid connected systems for building-integrated PV system (BIPV) and BAPV for below 100 kWp. The subsidy in this scheme for below 3 kWp is 390 €/kWp + 10 c/kWh, for below 9 kWp is 290 €/kWp + 10 c/kWh, for below 36 kWp is 180 €/kWp + 6 c/kWh and for below 100 kWp is 90 €/kWp + 6 c/kWh [16.17]. Second PV subsidy scheme is related to grid connected systems for BIPV and BAPV for below 100 kWp. The subsidy in this scheme for below 3 kWp is 18.53 c/kWh, for below 9 kWp is 15.75 c/kWh, for below 36 kWp is 12.07 c/kWh and for below 100 kWp is 10.51 c/kWh [16.17]. Last PV subsidy scheme is related to industry and agriculture for grid connected systems for ground installation, BAPV and BIPV from 100 kWp to 10 MWp. In this scheme feed-in tariff changes by tender from 59.5 €/MWh up to 117.8 €/MWh [16.18]–[16.20].

In France, for innovative projects related to the collective housing and innovative projects of collective space heating with ST + HP and PVT one specific PVT subsidy scheme is available. In this scheme, 1 or 2 installations can be granted and the subsidy depends on the specific project [16.21].

### **United Kingdom**

In UK, two ST subsidy schemes are available and none of them are applicable for PVT since the funding depends on the thermal output. PVT systems excluded from funding since that subsidy guideline is outdated and based on PVT systems with low thermal output. No information about PV or PVT subsidy schemes available. First ST subsidy scheme is related to private individuals and limited only to DHW only with FPC or ETC. In this scheme the quarterly payments over 7 years for 21.09 p/kWh (annual estimated yield) [16.22]. Second ST subsidy scheme is related to industrial, commercial, public sector for DHW, SH and SHIP with FPC or ETC only. In this scheme, PVT is eligible in case that the thermal output is metered separately and subsidy based on measured thermal contribution is 10.98 p/kWh [16.23].

### **Switzerland**

In Switzerland, one ST subsidy scheme is available. However, ST subsidy compatibility to PVT collectors depend on the specific collector used. In addition, two PV subsidy schemes are available and include PVT collectors as well. However, no additional separate funding scheme dedicated to PVT is available [16.24].

### **Netherlands**

In Netherlands, two ST subsidy schemes are available and none of them is fully applicable to PVT. Some unfavourable criteria for PVT included in ST subsidy schemes and none of them explicitly exclude PVT from funding. The electrical and thermal part of the PVT collector are funded separately by the corresponding ST scheme and uncovered collectors are subsidized at lower rates than covered collectors. First ST

subsidy scheme is related to Sustainable energy transition subsidy scheme (SDE++) for gross area of above 200 m<sup>2</sup> with annual subsidy of 15 years for 3.5 to 6 ct/kWh and limited to covered collectors only (included PVT). Second ST subsidy scheme is related to Investeringssubsidie duurzame energie en energiebesparing (ISDE) for gross area of below 200 m<sup>2</sup> and the subsidy is one-time payment based on annual energy yield of 0.68 €/kWh for below 10 m<sup>2</sup> and 0.30 €/kWh for 10 m<sup>2</sup> to 200 m<sup>2</sup> [16.25].

In Netherland, first PV subsidy scheme is related to SDE++ for above 15 kWp and below 1 MWp and feed-in tariff for 15 years from 0.1 to 3.5 ct/kWh. Second PV subsidy scheme is related one-time fixed amount by VAT refund (21%) and electrical part of PVT can be subsidized with 1/3 of VAT. Final PV subsidy scheme is related small consumers as net metering [16.26].

### 16.1. Summary & Overview

Table 16.1 indicates the numbers of available subsidy schemes for ST, PV and dedicated subsidy schemes for PVT, for each country selected in this document. This document showed that, ST subsidy schemes are not accepting PVT systems with high rate and only three cases can provide subsidy scheme for PVT with equal support as for ST. However, PV subsidy schemes include PVT systems looks promising with a rate of 100% in five of six countries. In addition, by 2021 specific dedicated PVT subsidy scheme is only provided in Germany.

Table 16.1 - Available subsidy schemes for ST, PV and PVT and related applicable rate for PVT.

	ST subsidy scheme			PV subsidy scheme			Number of subsidy schemes dedicated to PVT
	Total Number	PVT fully included	Rate	Total Number	PVT fully included	Rate	
Italy	4	2	50%	2	2	100%	0
Austria	7	2	29%	1	0	0%	0
Germany	1	0	0%	1	1	100%	1
France	3	0	0%	3	3	0%	0
UK	2	1	50%	0	0	0%	0
Switzerland	1	0	0%	2	2	100%	0
Netherland	2	0	0%	3	3	100%	0

Since that economic and social premises are different in various European countries and various levels of funding such as regional, municipal and national have to be considered. Therefore, the subsidy situation is not easy to compare by numbers. Furthermore, additional clarification is necessary since that many subsidy guidelines do not clearly point out PVT systems and only Germany provides a specific PVT subsidy scheme by 2021. In most cases ST subsidy schemes are not suitable for PVT since that some ST subsidy schemes are based on the conventional application of hot water generation which is not in the optimum range of PVT collectors. Furthermore, some ST subsidy schemes exclude air-driven and uncovered (ST and PVT) collectors from

funding. Another complexity of subsidy situation in PVT raises from various types of PVT collectors (water-driven, air-driven, uncovered and covered) and separate funding of the electrical and thermal part. Therefore, simplification of the PVT subsidy situation is essential.

## **17. Conclusion**

The PVT technology is still very recent in commercial terms, so the existing legislation does not suitable or does not explicitly contemplate at all this type of system. Furthermore, there are not many references about legislation applicable to PVT technology. Thus, given the scarce information on the legal framework for PVT systems, this document addresses this issue at the level of RES systems for the production of both electricity and heating, which are widely disseminated.

The existing support and incentives, both for RES-E and for RES-H, in the different countries, addressed in this document, are significantly different both in terms of amounts and in terms of the diversity of financial mechanisms. On the other hand, in some cases there is the possibility that PVT systems are covered by the same supports as one or even both RES-E and RES-H systems.

In the countries of the European Union, the next developments and opportunities in the renewable energy sector depend heavily on renewable energy development plans linked to the objective of reducing greenhouse gas emissions and the fulfillment of the commitments assumed under the Paris Agreement [17.1]. These renewable energy development plans are governed by two main regulations:

- The EU Winter Package, i.e. "Clean energy for all Europeans" which is the Europe-wide mechanism for driving the transition towards clean energy. It sets out the EU's goals for 2030 in relation to the reduction of greenhouse gas emissions, as well as energy efficiency and renewable energy incorporation objectives. The binding goals set for the EU (directly) associated with RES are:
  - To cut greenhouse gas emissions by 40% in relation to 1990 levels;
  - 32% of final energy consumption to come from renewable sources;
  - An increase in energy efficiency of 32.5%.
- The Integrated National Energy and Climate Change Plan. Following the guidelines defined in the Governance Regulation, each European country government included specific objectives in its respective document. It appears that in some of them they seem significantly more ambitious than those defined by the EU.

In this sense, the main opportunities facing the PVT industrial sector are [1.1]:

- Policy setting opportunities presented with the New Green Deal in the EU. The PVT sector needs to be prepared to ensure the case for PVT is heard and



facilitated and not inadvertently excluded from (as it is unfortunately the 2020 situation in Australia where renewable heat is not supported by policy);

- The European Commission on the 14th October 2020 published its Renovation Wave Strategy to improve the energy performance of buildings. Deep renovations can improve energy performance by 60%. Again, an emerging opportunity to place PVT front and center of this initiative by being engaged as a body in this process [17.2];
- There are some exciting emerging opportunities in the development of the 4GDH (4th Generation District Heating) program where lower temperature less than 100°C are being trialed and promoted as the future choice for expanding the decarbonization of heating and cooling. This significantly enables PVT coupled with heat pumps to play a role in distributed and centralized solutions [17.3];
- Seasonal storage opportunities will provide PVT systems the ability to monetize more of the heat generated that may otherwise be lost due to curtailed production. For example, when the customers summer PVT production exceeds thermal demand;
- Solar cooling is emerging as another area of great interest. PVT can contribute to these low carbon solutions with its diurnal features of heating during the day and cooling during the night.

Decisively, the Recovery and Resilience Facility (nicknamed the 'European bazooka') to support reforms and investments undertaken by Member States. The aim is to mitigate the economic and social impact of the coronavirus pandemic and make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions. Howsoever, for the PVT technology to grow significantly outside its market niche, among other necessary actions, it is recommended to take the following measures [17.4]:

- Players must develop clever and fair support schemes for PVT collectors and systems, present them to governments around the world, and request their implementation. After all, the PVT sector does not receive nearly as much support as the PV or solar thermal industry.
- Enlarging the knowledge of architects, planners and installers about PVT solutions. This should be helped by the fact that PVT is more efficient than just PV and is an attractive alternative to air and ground heat pumps.

Finally, more information on support schemes and policies (as well some other more contents) for the European countries and energy sectors can be found at <http://www.res-legal.eu/compare-support-schemes/> and <http://www.res-legal.eu/compare-policies/>.

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## Annex

This annex consists of two parts: 1- Contacted entities and 2- Body of the email sent to contacted entities.

### 1- Contacted entities:

Entity	Country	Email	Reply <sup>1</sup>
ERTEC (private company)	Portugal	<a href="mailto:ertec@ertec.pt">ertec@ertec.pt</a>	No
ADENE (National Energy Agency)	Portugal	<a href="mailto:geral@adene.pt">geral@adene.pt</a>	No
APREN (Portuguese Renewable Energy Association)	Portugal	<a href="mailto:apren@apren.pt">apren@apren.pt</a>	No
CEDER (Renewable Energy Development Center)	Spain	<a href="mailto:ceder@ciemat.es">ceder@ciemat.es</a>	No
APPA (Association of Renewable Energy Companies)	Spain	<a href="mailto:appa@appa.es">appa@appa.es</a>	No
Origen Solar (private company)	Spain	<a href="mailto:hola@origensolar.es">hola@origensolar.es</a>	No
EiDF SOLAR (private company)	Spain	<a href="mailto:info@edfsolar.es">info@edfsolar.es</a>	No
Abora (private company)	Spain	<a href="mailto:info@abora-solar.com">info@abora-solar.com</a>	No
Endef (private company)	Spain	<a href="mailto:info@endef.com">info@endef.com</a>	No
DualSun (private company)	France	<a href="mailto:contact@dualsun.com">contact@dualsun.com</a>	Yes
APER (Renewable Energy Producers Association)	Italy	<a href="mailto:gollesi@aper.it">gollesi@aper.it</a>	No
ENEA (Department for Energy Efficiency Unit)	Italy	<a href="mailto:segreteria.terin@enea.it">segreteria.terin@enea.it</a> ; <a href="mailto:roberto.morabito@enea.it">roberto.morabito@enea.it</a> ; <a href="mailto:segreteria.duee@enea.it">segreteria.duee@enea.it</a> ; <a href="mailto:efficienzaenergetica@enea.it">efficienzaenergetica@enea.it</a>	No
CRES (Center For Renewable Energy Sources)	Greece	<a href="mailto:cres@cres.gr">cres@cres.gr</a>	No
HELAPCO (Hellenic Association of Photovoltaic Companies)	Greece	<a href="mailto:info@helapco.gr">info@helapco.gr</a>	No
EBHE (Federation of Solar Energy Industries Federation)	Greece	<a href="mailto:info@ebhe.gr">info@ebhe.gr</a>	No
dena (Agency for the Applied Energy Transition)	Germany	<a href="mailto:info@dena.de">info@dena.de</a>	No
BEE (German Renewable Energy Federation)	Germany	<a href="mailto:info@bee-ev.de">info@bee-ev.de</a>	No
FVEE (German Renewable Energy Research Association)	Germany	<a href="mailto:fvee@helmholtz-berlin.de">fvee@helmholtz-berlin.de</a> ;	No
ISFH (Institute for Solar Energy Research in Hamelin)	Germany	<a href="mailto:f.giovannetti@isfh.de">f.giovannetti@isfh.de</a> ; <a href="mailto:c.lampe@isfh.de">c.lampe@isfh.de</a> ; <a href="mailto:k.bothe@isfh.de">k.bothe@isfh.de</a> ; <a href="mailto:dullweber@isfh.de">dullweber@isfh.de</a>	No
Solarus (private company)	Netherlands	<a href="mailto:info@solarus.com">info@solarus.com</a>	No
Solator (private company)	Austria	<a href="mailto:office@solator.cc">office@solator.cc</a>	No

<sup>1</sup> Entities that responded to the email requesting the required information.



2- Email body sent to the contacted entities:

**Subject: Legal framework for hybrid solar technology (PVT) in \_\_\_\_\_(Country)**

Dear Sirs, I hope you are all in good health,

As part of a European Project on PVT systems (electricity and heat production through solar hybrid technology – i.e., solar collector integrating photovoltaic and thermal modules in the same panel), I ask for your support to clarify some questions.

There is specific legislation in \_\_\_\_\_(Country) on the use of renewable energy which focuses separately on electricity production, on the one hand, and heat production (e.g., water heating) on the other. These two legal frameworks indicate the technologies that can be applied, and in the case of solar energy, one of them refers to photovoltaic systems (PV) to produce electricity and the other refers to thermal solar collectors for water heating.

In the absence of any reference to hybrid solar technology (PVT) in these legal frameworks, my question is whether:

- By using PVT technology instead of PV technology, are we complying with legislation on the production of electricity from renewable energies?
- By using PVT technology instead of solar thermal collectors, are we complying with legislation on heat production from renewable energies?
- When using PVT technology, are we respecting the legislation of the two previous situations at the same time?

There is also the issue of energy certification for buildings and respective legislation. Can PVT systems be included in this building energy assessment?

Finally, does PVT technology enjoy the same incentive conditions as PV technology and/or solar thermal collectors?

Thank you in advance for your attention and I look forward to your help.