Exploitation of the results and business models

D5.2: Analysis of regulatory framework and standardization needs

WP5, T5.2 Regulatory framework and standardization needs

Author: Matteo Del Buono, Laura Maturi (Eurac Research)

October 2018

www.energymatching.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°768766

Table of contents

List of tables

Executive summary

The use of energy in buildings accounts for a large share of the total end use of energy. This includes energy used for controlling the climate in buildings and for the buildings themselves, but also energy used for appliances, lighting and other installed equipment.

Buildings are typically constructed to be used for many decades and the capital lifetime for efficiency improvement will be, at most, a few decades. Improvement of buildings' efficiency at planning stage is relatively simple while improvements after their initial construction are much more difficult. Some measures to improve efficiency are possible only during construction or by major refurbishment, likely to happen only after several decades. Energy efficiency requirements in building regulations or energy standards for new and renovated buildings are therefore, among of the most important single measures for buildings' energy efficiency.

The aim of this deliverable is to describe the main regulations on energy efficiency in building valid in the three countries were Demo cases are located – Italy, France and Sweden. Based on this overview analysis the document enumerates the specific building codes for the solutions adopted by the Energy Matching technical partners.

1. Regulatory framework

1.1 Italy

The National Energy Strategy 2017[1] was adopted on November 10th 2017 with a Ministerial Decree of the Minister for Economic Development and the Minister for the Environment and Protection of Land and Sea. The NES 2017 is the ten-year policy document, which lays down the measures to be carried out in the energy sector up to 2030, in line with the European Roadmap 2050. The target set for 2030, with regard to energy efficiency, is a saving of 10 Mtoe with a reduction of final consumption of on average 118 to 108 Mtoe. The planned public and private investment in energy efficiency and renewable sources amounts to 110 billion euro out of a total of 175. Measures taken in the residential, industrial, transport and tertiary sectors will contribute directly to the increase in the environmental sustainability of the energy system.

Policies for Energy Efficiency

The 2017 Budget Law[2] extended the 65% tax relief for one year, up to December 31st 2017, in the case of measures relating to single dwelling units and for five years, up to December 31st 2021, for measurement relating to communal areas of multi-apartment buildings or which may affect all the building units in a multi-apartment building. Furthermore, for these new measures, the beneficiaries can opt to transfer the corresponding credit to the suppliers who have carried out the measures or to other private individuals. According to the implementation methods recently defined by the Order of the Director of the Italian Revenue Agency of August 28th 2017 (which replaces the previous Order of June 8th 2017) and which provides the possibility that subjects re-entering the no tax area may also transfer the corresponding tax relief credit to banks and financial institutions. The 2018 Budget Law confirmed the tax relief mechanism for incentivizing measures to upgrade the energy efficiency of buildings. Other important innovations are related to carrying out random checks on all the measures and significant changes to how the credit is transferred. The relief rate was reduced from 65% to 50% for the expenses incurred in 2018 for measures relating to:

- windows including fixtures
- solar shading systems
- replacing winter heating systems with systems with condensing boilers with an efficiency at least equal to the class A product;
- heat generators fuelled with combustible biomass

The new measures introduced by the 2018 Budget Law concern to micro-cogeneration to replace existing systems, and seismic risk reduction measures carried out at the same time as the measures on the communal areas of multi-apartment buildings.

Policies for Energy production

Support policies for RES-E are promoted by the Ministry for Economic Development) and managed by the *Gestore dei Servizi Energetici* (Manager of Electricity Services). Electricity production is mainly promoted through a combination of premium tariffs, feed-in tariffs and tender schemes, valid for the different renewable source like solar, wind, biomass, etc. The mechanism of tax regulation are also in place for

[1] Italian Energy Efficiency Action Plan, June 2017.
[2] Law No 205 of 27 December 2017.

investment in residential or industry sized RES-E plants. Grid operators are obliged to give priority dispatch to electricity from renewable sources. Plant operators can request the grid operator to expand the grid if the connection of a plant requires this expansion. A price-based mechanism to support the development of thermal renewable sources installations is available and managed by Gestore Servizi elettrici as well. Furthermore, a tax regulation mechanism is in place for the promotion of RES-H.

Thermal energy

The "Conto Termico"[3] is a price-based scheme for small RES-H sources, granting incentives to heat pumps (aerothermal, geothermal, hydrothermal), biomass and solar thermal technologies. The incentive is valid for a period varying between 2 and 5 years. For the building solar thermal the eligible sources are:

- Substitution of existing heating systems with heat pumps combined with sanitary hot water production, along with the installation of heat metering systems in the case of plants with a thermal output higher than 200 kW;
- Substitution of existing heating systems with biomass installations, along with the installation of heat metering systems in the case of plants with a thermal output higher than 200 kW;
- Substitution of existing boilers with heat pump-based boilers;
- Installation of solar thermal systems combined with solar cooling systems, for the generation of thermal energy for production purposes or for district heating networks.

Incentives are paid by the above-mentioned GSE in the form of annual rates for a period of 2 or 5 years, or in a single amount, in case the incentive does not exceed EUR 5,000. The incentive level varies depending on the type of the plant, source, capacity and location of the installation and it is calculated by the formulas given below[4].

Besides the price based scheme, Italy support the installation of RES-H tax regulation mechanism, which allows for a 65% tax deduction for expenses related to energy efficiency measures including installation of RES-H technologies. In the case of private individuals, this disposition is valid for works undertaken up to December 31st 2017 and in the case of common buildings, the disposition is valid up to December 31st 2021. For energetic requalification works aimed at improving the winter and summer energy performance of common buildings, the tax deduction will amount to 75% and works can be undertaken between January 1st 2017 and December 31st 2021[5].

Electricity

In Italy plant owners can use the net-metering mechanism, so called *scambio sul posto*[6]*,* if their plant's total power is between 3 kW to 500 kW. This possibility could be choose instead of the *tariffa onnicomprensiva,* or the sale of electricity into the free market, or in the market governed by *Ritiro Dedicato*. The principle of the mechanism is based on the balance of the energy fed in and consumed through the same connection point to the gird. The plant owner pays the usual energy supplier for the electricity consumed, while GSE gives credit for the electricity fed into the grid. More specifically, the plant's owner receives a yearly compensation equal to the difference between the value of electricity exported to the grid (e.g. for PV installations the energy fed in during daytime) and the value of the electricity consumed in a different period. If more energy is fed in the, owner is entitled to have an economic compensation. If he feeds in less than he consumes, the difference is subject to a payment. *Scambio sul posto* can be combined with tax concession.

[3] Decree 16th of February 2016.
[4] https://www.gse.it/servizi-per-te/efficienza-energetica/conto-termico.
[5] Act No. 296 of 27 December 2006. Provisions on the formation of the annual budget. Budget Act of 2007.
[6] https://www.gse.it/servizi-per-te/fotovoltaico/scambio-sul-posto.

All plants generating up to 500 kW are eligible, regardless of the technology used. Plants commissioned before December 31st 2007 were only eligible if they generation capacity was up to 20 kW, while plants commissioned before December 31st 2014 could be eligible if they generation capacity did not exceed 200 kW.

1.2 France

In France, the energy production from RES-E is promoted by different schemes such feed-in tariff, a premium tariff as well as through tenders for the definition of the premium tariff level. Additionally, tax benefits are also available. The generation of thermal energy is promoted by several energy subsidies schemes like tax regulation mechanisms as well as by a zero-percent-interest loan for the investors. The use of the grid for the transmission of electricity from renewable sources is subject to the general legislation on energy. There is no priority to dispatch electricity from renewable sources. As far as heating and cooling is concerned, the public distribution of heat in France is a competence of the local or regional authorities. Because the construction of a production plant must occur simultaneously with the construction of a new or development of an existing district heating, the procedure to connect the plant to the thermal grid is at the same time as that for the grid development.

Policies for Energy Efficiency

There are various policies aiming to promote the development, installation and use of RES-E in France, including training programs, certification schemes or R&D programmes. Regarding RES-E in the building, the RT 2012 thermal regulations[7] is to mention. The RT2012 have strengthened the requirements on thermal performance of new buildings for which a building permit was requested for after January 1st 2013. These buildings must have a primary energy consumption below a threshold of 50 kWhep/m2/year on average for the 5 regulatory uses (heating, domestic hot water, lighting, cooling and auxiliary systems). Moreover, the50kWhep/m²/year requirement is adjusted based on geographical location, altitude, building use, average surface area of the dwellings. Buildings using wood-energy and low CO_2emission district heating networks also benefit from an adjustment of the primary energy consumption threshold, limited to a maximum of 30%.

Furthermore, new buildings must be subjected to a feasibility study of the various energy supply solutions, and in particular, the possible use of renewable energies and more high-performance systems. In particular, the low-energy building (LEB) label has enabled the preparation for the introduction of the 2012 Thermal Regulations.

Policies for Energy Production

For the collective housing, tertiary, agricultural and industrial sectors, the main national system for financially supporting the development of renewable heat is represented by heat funds, implemented by article 19 of Decree No2009-967 of August 3rd 2009 of the programme relative to the implementation of the *Grenelle Environmental Roundtable* and with an annual envelope of around EUR 220 million. Run by the ADEME (*Agence de l'Environnement et la Maitrise de l'Ènergie*)[8], it offers support through investment aid for the

[7] Decree n. 2010-1269 of the 26th of October.

[8] https://www.ademe.fr/expertises/batiment/elements-contexte/politiques-vigueur/lois-grenelle-transition-energetique-croissance-verte.

development of the use of biomass, geothermal energy, solar power, recovered energy, as well as for the development of heat networks using these forms of energy.

Thermal energy

The thermal generation by renewable energy plants is manly supported through two systems of energy subsidies: the tax regulation mechanisms and the granting of a zero-percent-interest loan for the investment. The zero-percent-interest loan for housing renovation has been introduced within the frame of the *Environment Grenelle*. It allows the financing of work aiming at improving the energy performance of the housing without paying a cash advance and without paying interests. One of the conditions in order to benefit from the loan is to carry out a series of works, consisting of at least two actions including the installation of a heating plant or of a sanitary hot water system using renewable energies. Only one loan can be granted per housing unit. Moreover, the housing unit shall be a main residence built before 1990.

Solar installations for the heat production are eligible if they meet several requirements[9], in particular into the *Environment Grenelle* article 7 and 8 specify the technical eligibility criteria of heating plants and sanitary hot water systems using renewable energies:

- The installation shall be certified CSTBât or Solar Keymark or equivalent;
- The seasonal energy efficiency of the installation shall correspond to at least 90%.

Sanitary hot water installations are also eligible, as long as they meet the following requirements:

- The installation shall be certified CSTBât or Solar Keymark or equivalent;
- The energy efficiency of the water heating system shall correspond to at least 65% to 85%, depending on the installation size.

Moreover, the company undertaking the installation of the sanitary hot water system shall hold a quality label delivered by an accredited certification body. This condition applies for expenses in renewable energy devices made from January 1st 2015.

Natural persons may detract from the income tax a certain percentage of investments in renewable energy plants. The tax credit (*crédit d'impôt*) for renewable energy plants applied until the end of 2012. However, it is extended until the end of 2017 for installations carried out in buildings completed for more than two years[10]. Expenditures in hybrid installations using solar panels for the production of electricity and heat are eligible for the tax credit, if they meet the following conditions:

- According to the European regulation (UE) n° 813/2013, the installation shall reach an energy performance of at least 90%;
- The solar collectors shall hold the certification CSTBat or Solar Keymark.

[9] Arrêté du 30 mars 2009.
[10] Loi n° 2016-1917 du 29 décembre 2016 de finances pour 2017.

Expenditures in solar thermal installations for the production of sanitary hot water and/or heat are eligible for the tax credit, if they meet the following conditions:

- According to the European regulation (UE) n° 813/2013, the installation shall reach an energy performance of at least 65% to 85%, depending on the size of the installation;
- The solar collectors shall hold the certification CSTBat or Solar Keymark.

Electricity

The French Act on Energy Transition for Green Growth[11] from August 17th 2015 introduced a reshaping of the existing support schemes for renewable energies, mainly the feed-in tariffs. This mechanism shall progressively be replaced with the so-called "compensation mechanism", which consists in a premium tariff for the energy produced by renewable sources. The premium tariff shall cover the costs of their installations and ensure their profitability. Depending on the technology and size of the installation, a premium tariff is allocated through direct guaranteed contracts (*guichet ouvert*) or through a tender procedure. Only photovoltaic plants installed on buildings whose installed capacity does not exceed 100 kW are eligible[12].

Private persons may deduct from income tax a certain percentage of investments in renewable energy plants. The tax credit (*crédit d'impôt*) for renewable energy plants, which was supposed to apply until the end of 2012 has been extended until the end of 2017 for installations carried out in buildings completed since more than two years[13]. Expenditures in hybrid installations using solar panels for the production of electricity and heat are eligible to the tax credit, provided they meet the following conditions:

- According to the European regulation (UE) n° 811/2013, the installation shall reach an energy performance of at least 90%;
- The solar collectors shall hold the certification CSTBât or Solar Keymark.

[11] 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.
[12] Décret n° 2016-691 du 28 mai 2016.
[13] Loi de finances 2017; Art. 200 quater, Code Général des Impôts.

1.3 Sweden

The Kingdom of Sweden promotes renewable electricity through a quota system, tax regulation mechanisms and a subsidy scheme, while for thermal energy the main incentives is the tax reduction. Swedish grid operator are obliged to connect electricity generation systems to the grid, transmit electricity and expand the grid. Nevertheless, there is no priority to dispatch energy production into the grid, quite the opposite for the while the district heating operators, which are in fact obliged to negotiate terms to connect a heating plant. Concerning policies promoting the development, installation and use of RES-installations, there is a grant for research and development in the field of wind energy.

Policies for Energy Efficiency

The Swedish National Board of Housing, Building and Planning building regulations contains requirements for buildings in terms of residential design, accessibility and usability, load capacity, fire protection, hygiene, health, environment, water and waste management, noise protection, safety of use and energy conservation[14]. The regulation contains requirements for energy conservation that specify maximum permitted limits for energy consumption in buildings. Act No. 2009:194[15] establishes rules for the income tax deduction of installation works in apartments and single-family houses. Eligible measures are the installation of renewable energy devices and the replacement of conventional heating sources with renewable ones. The installation of or the replacement of conventional heating installations with solar panels in single-family houses is eligible for the tax allowance.

Policies for Energy Production

As described above, the main incentives scheme promoting RES-E is a quota system, based on a certificate trading system. Furthermore, tax regulation mechanisms and a subsidy scheme have been introduced. A short description of these schemes is shown below:

- **Quota system: t**he Electricity Certificates Act obliges energy suppliers to prove that a certain amount of energy production is generated by renewable sources. Energy suppliers shall provide this evidence by presenting tradable certificates allocated to the producers of energy by RES-E;
- **Tax regulation mechanisms:** energy produced by generators with a power lower than 50 kW is not taxable. In case of energy from wind, wave and solar, this power limit is higher as authorized by the Energy Tax Act. Since 2015, a tax reduction for the micro production of renewable electricity is in place[16];
- **Subsidy.** Sweden grants subsidies for photovoltaic installations.

[14] Sweden's Fourth National Energy Efficiency Action Plan 2017.
[15] Lag (2009:194) om förfarandet vid skattereduktion för hushållsarbete, Tax-Deduction Process for Installation Works in Households.
[16] https://www.regeringen.se/sveriges-regering/miljo--och-energidepartementet.

Thermal energy

The tax mechanism is the main incentives to support RES-H. The Act Regulation[17] establishes rules for the income tax deduction of installation works in apartments and single-family houses. Eligible measures are the installation of renewable energy devices and the replacement of conventional heating sources with renewable ones. Only the labour costs are deductible, while are not eligible the costs of materials, administrative costs and other expenses related to the installation. The person commissioning eligible installation works may deduct the eligible costs from his/her income tax at the beginning of the following year or he/she can apply for a provisional tax credit that the tax authority pays before the costs have to be covered. The amount of the tax reduction can cover 30% of the labour costs but shall not exceed SEK 50 000 per year (approx. € 5,360).

Electricity

The Government regulation No. 2009:689[18] authorizes grants for the installation of on-grid photovoltaic installations, which have been began from July 1st 2009 or later and be completed by December 31st 2019. The incentive cannot be combined with other public grants, including those of the European Union or tax reduction for labour costs. Eligible are PV-installations connected to either internal (on the given property) or external grid. Installations generating both electricity and heat from solar energy (hybrid installations) are eligible only if the electricity generated amounts to at least 20 % of an installation's total annual production. Only one PV installation per building will be funded.

A tax reduction is provided for the excess electricity fed from micro-producers of electricity generated from renewable energy sources into the grid at the basis of the kWh of renewable electricity fed into the grid at the connection point during a calendar year. The tax reduction applies to private individuals and companies that produce and feed in and take out the renewable electricity at one and the same connection point and that have a maximum fuse of 100 amps at the connection point and notified the grid operator about the production and feeding in of renewable electricity[19].

[17] Act (2009:194) on the Tax-Deduction Process for Installation Works in Households (Lag (2009:194) om förfarandet vid skattereduktion för hushållsarbete).

[18] Förordning (2009:689) om statligt stöd till solceller.

[19] Inkomstskattelag (1999:1229), Income Tax Act.

2. Standardisation needs

The 2010 Energy Performance of Buildings Directive (EPBD)[20] and the 2012 Energy Efficiency Directive (EED)[21] are the EU's main legislative instruments promoting the improvement of the energy performance of buildings within the EU, providing a stable environment for investment decisions to be taken and allowing the consumers to make informed choices that will help them save energy and money. On November 30th 2016, the European Commission (EC) proposed an update to the EPBD[22] in order to promote the use of smart technology in buildings, to streamline existing rules and accelerate building renovation. Later on June 19th 2018 the Directive (2018/844/EU) a revision of the EPBD was published. This document introduces targeted to accelerate the cost-effective renovation of existing buildings, with the vision of a decarbonized building stock by 2050 and the mobilization of investments. For a holistic approach, not only energy performance of the building has to be taken into consideration. While the Energy Performance of Buildings Directive promotes the improvement of the energy performance of buildings, an energy-related regulation on the single building component is necessary.

The Construction Products Regulation (EU) 305/2011[23], which came into force July 1st, 2013, replaces permanently the CPD Directive 89/106 / EEC. The Regulation aims to discipline the placing on the European market of construction products. The Regulation covers all construction products (materials, products, systems, kit, etc.) which are produced and placed on the market for incorporation in a permanent manner in construction works (buildings and civil engineering works); products should ensure compliance with at least one of the following requirements, the first six already provided by the previous Directive CPD 89/106:

- mechanical resistance and stability;
- safety in case of fire;
- hygiene, health and environment;
- safety and accessibility in use;
- protection against noise;
- energy economy and heat retention;
- sustainable use of natural resources

The manufacturer has to ensure traceability to allow any withdrawal of the product from the market, if the manufacturer believes that the product placed on the market fails to meet compliance with the CE Marking.

The key concept of the new Regulation 305/11, compared to the CPD Directive 89/106 / EEC, is the Declaration of Performance (DoP) which replaces the previous Conformity of Construction Products Declaration. If the latter certifies the compliance of a product with the requirements of a technical rule (Art. 13 CPD), the declaration of performance:

- shall be issued for all products covered by a harmonized standard;
- shall contain information about the use

[20] https://eur-lex.europa.eu/legal-content/EN/ALL/;ELX_SESSIONID=FZMjThLLzfxmmMCQGp2Y1s2d3TjwtD8QS3pqdkhXZbwqGwlgY9KN%212064651424?uri=CELEX:32010L0031;

21 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027;

[22] https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition

[23] http://ec.europa.eu/growth/sectors/construction/product-regulation_en

- shall contain the essential characteristics relevant for the use;
- shall include the performance of at least one essential characteristic;
- give the responsibility of the declared performance to the manufacturer.

Besides the CPR regulations, the ISO 52000-1:2017 Energy performance of buildings -- Part 1: General framework and procedures establishes a systematic, comprehensive and modular structure for assessing the energy performance of new and existing buildings (EPB) in a holistic way. It is applicable to the assessment of overall energy use of a building, by measurement or calculation, and the calculation of energy performance in terms of primary energy or other energy-related metrics. It takes into account the specific possibilities and limitations for the different applications, such as building design, new buildings 'as built', and existing buildings in the use phase as well as renovation.

2.1 Regulation for active skin solutions

The primary function of window and blinds solution is to allow the transmission of natural light into a building, known as daylight transmission, controlling the thermal gain addressed to the internal room and spaces of the building itself. Windows generally have a poorer insulating performance than the wall they are set in and as such significantly affect the energy performance of that building. This impact of windows is estimated to exceed the impacts of framing production by one order of magnitude.[24] The climate of Europe varies considerably, and correspondingly the building requirements. Preventing heat loss from a building is the primary consideration for country located in northern Europe, while in southern climates the conservation of cool internal temperatures is the main focus. Both thermal considerations can be achieved using the well-constructed windows with appropriate glazing, in order to achieve the most advantageous thermal situation for the occupants. The type of window and blinds system included in a building envelope will have a considerable effect on the amount of heating and/or cooling required, so will influence the amount of energy consumed by the building. For example, in Sweden 7% of total energy consumption is lost through windows.[25]

The connection between internal environment and outside through glazed surfaces calls for three specific requirements:

- Control of heat flow through components with a low thermal inertia;
- Regulation of solar radiation access;
- Provision of adequate visual connection to outdoors and satisfactory level of natural light,
- Avoiding visual comfort detriments (such as glare, etc.).

Moreover, windows, transparent facades and shading devices have to guarantee specific performances regarding safety, mechanical resistance, aesthetics and protection against noise, wind and rain. Since the amount of heat transferred both in winter and summer through glazed surfaces represents a relevant portion of building energy balance for space heating and cooling, building energy retrofit by means of windows replacement and shading devices installation has a huge potential for energy saving and, if promoted by tax incentives is favourably cost-effective.

If the only parameter taken into account when designing active skin solutions was heat loss, the solution to make buildings warmer and more sustainable would be to use smaller windows. This has obvious drawbacks: the primary function of windows is to provide good quality natural light for the occupants. Reduced window

[24] EMPA, Materials Research and Technology, http://www.empa.ch/plugin/template/empa/*/32776/---/l=2
[25] R.E. Collins, G.M. Turner, A.C. Fischer-Cripps, J.-Z. Tang, T.M. Simko, C.J. Dey, D.A. Clugston, Q.-C. Zhang, J.D. Garrison, Vacuum
.

size will proportionally reduce this light delivery. Indeed, poor light transmission can create gloomy interiors that are less pleasant to spend time in and have been proven to affect both the mood of the occupant and their ability to perform quality work. In addition, the solar heat gain that windows can provide to a building can improve the overall energy efficiency of that building by contributing to the heating of the internal space.

BIPV - Building Integrated Photovoltaic

Building integrated photovoltaic systems have to deal with two different standardization and regulation schemes: one derived from the building side, often regulated in local building codes and international ISO standards; the other one from the electrical side, with international IEC standards and mandatory, not fully harmonized local regulations.

The first EN standard on BIPV was published in 2016, the "Photovoltaics in Buildings" EN 50583. It is the first standard specifically on BIPV subject, and it lists all other standards that should be applied for different BIPV applications. The standard is divided into two parts: EN 50583 -1 Photovoltaics in buildings, part 1: - panels and EN 50583 -1 Photovoltaics in buildings, part 2: - systems. It is based on the following three levels of differentiations:

- Level 1: General requirements for all BIPV resulting from requirements of the Low voltage directive and the Construction Products Directive of the European Union
- Level 2: Requirements resulting from panel material (e.g. glass)
- Level 3: Requirements resulting from panel mounting location within the building (5 mounting categories are differentiated)

The standard points out which building codes need to be considered in addition to the electrical standards that apply for both BIPV panels as well as PV panels. Nevertheless, after its approval, it is currently under discussion at the international level (e.g. within IEA PVPS Task 15 experts group) since it could be further improved. Eurac researchers, together with other EnergyMatching partners, are involved in these discussions within IEA PVPS Task 15. This might be a channel to push forward the standardisation needs related to projects technologies.

In parallel, different new work item proposals have been launched at international level; the pr ISO 18178 (Laminated Solar PV glass) from ISO TC160 (Glass in building). Within the IEC technical committee TC82 (Photovoltaics), 82/1055/NP (PV roof applications, 2015) draft IEC 63092 and 82/888/NP (PV curtain wall applications, 2014), IEC 62980 was not successful, or had very low progress over several years. Therefore, in 2017, a new attempt within the IEC TC82 (82/1339/DC) was made to establish a project team including experts from ISO, IEC, and the IEA PVPS Task 15, the PT 63092 "Building Integrated Photovoltaics (BIPV)". This project team comprises 40 members from 15 different countries.

The intended international BIPV standard will be based on the structure and contents of EN 50583, formally consolidating the former IEC 63092 (PV on Roof) and IEC 62980 (Curtain Walls).IEC 63092 will be the resulting standard. This project plans to issue a committee draft (CD) in 2018, and IS in 2019, with necessary revisions or additions based on EN 50583 and in harmony with ISO/TS 18178 (Approved as TS in May. 2018).

Shown below the main European directive about windows and shadowing solutions for the Energy matching project:

Windows and glass in building

Window block ventilation unit: Commission Delegated Regulation (EU) No 1254/2014 of 11 July 2014 supplementing Directive 2010/30/EU of the European Parliament and of the European Council regarding energy labelling of residential ventilation units.

UNI EN 14351-1 Windows and doors-product standard, performance characteristics-part 1: Windows and external pedestrian doors without resistance to fire and/or smoke seals.

UNI EN ISO 10077-1 thermal performance of Windows, doors and shutters-calculation of thermal transmittance-part 1: General. UNI EN ISO 10077-2 thermal performance of Windows, doors and shutters-calculation of thermal transmittance-numerical method for frames.

EN 410:2011 glass in building--determination of light and solar features.

UNI 11173 Windows, doors and curtain walls-selection criteria based on the air permeability, water tightness, wind resistance, thermal insulation and sound insulation.

UNI 10818 Windows, doors and screens-general guidelines for installation.

UNI EN 673:2011 glass in building-determination of thermal transmittance (U value)-method of calculation.

Blind control and shadowing

EN 14500 Blinds and shutters – thermal and visual comfort – test and calculation methods, European Standard, May 2008.

EN 14501 Blinds and shutters – thermal and visual comfort – performance characteristics and classification. European Standard, 2005.

EN 13363, 2007. Solar protection devices combined with glazing – calculation of total solar energy transmittance and light transmittance. Part 1 with simplified calculation method, Part 2 with detailed calculation method. DIN EN 13363-2:2005-06, DIN EN 13363-1:2007-09.

EN 13561 External blinds and awnings – performance requirements including safety, European Standard, 2015.

EN 13659, 2015 Shutters and external Venetian blinds – performance requirements including safety, European Standard, 2015.

EN 15251 Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting, and acoustics, December 2007.

Some countries are pushing forward the use of control and automation systems through specific regulations. In Italy for example, the *Decreto dei minimi* states that for non-residential buildings it is compulsory to use a “class B” regulation control system according to UNI EN 15232 (Table 1).

The “blind control” class B mentioned in Table 1 includes *Motorized operation with automatic control*, which EnergyMatching is developing within the window block technology.

			Definition of classes							
			Residential				Non residential			
			D	C	B	A	D	C	B	A
5	LIGHTING CONTROL									
5.1	Occupancy control									
	0	Manual on/off switch								
	1	Manual on/off switch + additional sweeping extinction signal								
	2	Automatic detection								
5.2	Daylight control									
	0	Manual								
	1	Automatic								
6	BLIND CONTROL									
	0	Manual operation								
	1	Motorized operation with manual control								
	2	Motorized operation with automatic control								
	3	Combined light/blind/HVAC control								
7	TECHNICAL HOME AND BUILDING MANAGEMENT									
7.1	Detecting faults of home and building systems and providing support to the diagnosis of these faults									
	0	No								
	1	Yes								
7.2	Reporting information regarding energy consumption, indoor conditions and possibilities for improvement									
	0	No								
	1	Yes								

Table 1 from UNI EN 15232

2.2 Regulation for heating and cooling solutions

Heating and cooling of buildings consume half of the EU's energy (546 Mtoe [26]) which makes developing an ambitious strategy for the efficiency and sustainability of heating and cooling systems essential to reach the goals set in the climate agreement COP21[27].

Therefore, the European Commission adopted a strategy in 2016 as part of the wider Energy Union Package, so called "Winter package"[28]. This strategy provides a framework of efficiency measures including improvements to the building envelope insulation, air tightness and ventilation in both new buildings and renovation of the existing stock, decarbonisation measures included the use of renewable energy as well as the decarbonisation of the electricity and district heating schemes. Within Europe, the legislative or normative measures in the regulatory frameworks have been identified as the most frequently used and most effective measures to reduce energy, followed by financial support and information activities in the residential sector.

The most widely used renewable energy for heating today is bioenergy (mostly in solid form), representing some 90% of all low carbon heating. Modern on-site bioenergy technologies include efficient wood burning stoves, municipal solid waste incineration and pellet boilers. In Europe, Sweden is the largest consumer of

[26] Overview of support activities and projects of the European Union on energy efficiency and renewable energy in the heating & cooling sector, Horizon 2020, Framework Programme 7 and Intelligent Energy Europe programmes of the European Union

[27] https://www.un.org/sustainabledevelopment/cop21/

[28] https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition

wood and wood waste for district heating, followed by Finland [29]. Use of liquid and gaseous biofuels used for heating is marginal. Next to bioenergy, heat pumps, which provide highly efficient means of cooling, space and water heating, are being used more and more in the European countries

The building sector remains, therefore, the main challenge in the decarbonisation of the H&C sector. The Energy Performance of Buildings Directive (EPBD) requires that from the year 2020 onwards all new buildings will have to be 'nearly zero energy buildings' (NZEB), which means reducing the energy demand to the cost-optimal level of 2020, while the very low amount of remaining energy demand in a NZEB should be covered to a 'very significant extent' by energy from renewable sources, including energy from renewable sources produced on-site or nearby. For public buildings, these standards need to be met by the end of 2018.

Cutting the energy consumed by heating and cooling in buildings can be achieved through scaling up the use of advanced construction and design techniques and high-performance insulation materials when renovating buildings. Energy use can also be cut by providing better information and control of energy use with intelligent thermostats. They can turn heating off when the set temperature is reached, or even switch off when there is nobody in the building, in particular office buildings. Energy can also be saved by upgrading heating and cooling equipment such as boilers to the latest, most efficient technologies. A variety of clean and energy-efficient electro technologies, such as heat pumps, can play a key role. In an electric heat pump, heat is taken from outside (e.g., air, ground, water) and moved inside the building. While electric heat pumps are mostly deployed at house and building level scales, they are also available in larger scales to supply new generation district heating networks. Other solutions that are becoming widespread include solar thermal energy and geothermal energy, particularly to produce hot water.

Shown below the main European directive about solar collector and heat pumps solutions for the Energy matching project:

Heat pumps

UNI EN ISO 13612-1:2014 Heating and cooling systems in buildings — Method for calculation of the system performance and system design for heat pump systems — Part 1: Design and dimensioning; Part 2: Energy calculation.

UNI EN ISO 5149-2, Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Definitions, classification and selection criteria — Part 2: Design, construction, testing, marking and documentation Part 2: Design, construction, testing, marking and documentation

EN 14511 – 1 to -4: 2013 - Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling.

EN 14825: 2012 - Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling - Testing and rating at part load conditions and calculation of seasonal performance.

UNI EN 255-1, Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors — Heating mode — Part 1: Terms, definitions and designations

[29] Policies for renewable heat, An integrated approach, IEA Insights Series 2012

Thermal Solar system and collector

There are European Standards for three different solar thermal technologies: solar thermal collectors (EN 12975 series), factory made systems (EN 12976 series) and custom-built systems (EN 12977 series). Part 1 of the standard always lists the general requirements for the product and the other parts

EN 12975-1 Thermal solar systems and components-collectors-Part 1: General Requirements.

EN ISO 9806 Thermal solar systems and components-collectors-Part 2: Test Methods.

EN 12976-1 Factory made systems – Part 1: General requirements - Part 2: Test methods.

EN 12977-1 Thermal solar systems and components. Custom built systems – Part 1: General requirements for solar water heaters and combi-systems.

EN 12977-2 Thermal solar systems and components. Custom built systems – Part 2: Test methods for solar water heaters and combi-systems.

EN 12977-3 Thermal solar systems and components. Custom built systems – Part 3: Performance characterization of stores for solar heating systems.

EN 12977-4 Thermal solar systems and components. Custom built systems – Part 4: Performance test methods for solar combi-stores.

EN 12977-5 Thermal solar systems and components. Custom built systems – Part 5: Performance test methods for control equipment.

2.3 Energy hub specific regulation

Under the EnergyMatching equipment, a special mention is for the Powershare™ Technology. The system manages the distribution of the electric production and the coverage of the common loads among different buildings in a small-scale electric grid. Most European countries have strict regulation for the access to the public grid. The DSO (Distribution System Operator) does not allow the installation of smart micro grid to share electricity. Nevertheless, there are multiple exceptions from the DSO monopolies for so-called “internal grids”; for example, university and campus areas, industrial zones, airports, farms, schools, hospitals, renewable energy sites, within apartment buildings and also depending on if cables are crossing a facility border or a public road. Moreover, as mentioned before in this document, the European Commission published its so-called ‘Winter Package’ to facilitate the transition to a ‘clean energy economy’ and to reform the design and operation of the European Union’s electricity market. Under this framework, the traditional monopoly roles of DSOs are being increasingly contested with the emergence of private and micro-grids. Local energy communities (LECs)[30] can be an efficient way of managing energy at a local community level – with or without a connection to distribution systems. Technologies like PowerShare™ could have significant benefits for many applications but today the technology cannot be installed unconditionally due to the lack of specific regulations.

[30] Article 2 (6) of the Winter Package.

2.4 Market driven or voluntary certification

Solar Keymark Certificate: The Solar Keymark is a voluntary third-party certification mark for solar thermal products, demonstrating to end-users that a product conforms to the relevant European standards and fulfils additional requirements. The Solar Keymark aims at reducing trade barriers and promote the use of high quality solar thermal products in the European market and beyond. It is used in Europe and increasingly recognized worldwide. The Solar Keymark is a CEN/CENELEC European mark scheme, dedicated to:

- Solar thermal collectors,
- Solar thermal systems, storages and controllers.

The Solar Keymark has been developed by the European Solar Thermal Industry Federation (ESTIF) and CEN (European Committee for Standardisation) in close co-operation with leading European test labs and with the support of the European Commission. It is the main quality label for solar thermal products and is widely spread across the European market and beyond.

Ecodesign label[31]: the European Directive 2009/125/EC (also known as Ecodesign directive) established a framework for the setting of eco-design requirements of Energy-Related-Products (or ErP) sold in the EU countries. Its scope covers a multitude of product groups such as boilers, televisions, light bulbs and circulators. The European Directive was implemented with a number of EU Regulations, of which EU Regulation n. 1253 specifically addresses ventilation unit. According to such document, ventilation units are divided into different categories according to their use (for residential or non-residential applications) and features. A number of energy indicators such as the SEC (Specific Energy Consumption indicator) is considered to assess the energy efficiency class of products and to define whether they are compliant with the minimum requirements. Moreover, in the document, it is clarified which types of information the manufacturers must publish on their website and customer. A few exceptions are considered, as for example ventilation unit with a total power absorption lower than 30 W/fan.

[31] https://ec.europa.eu/jrc/en/energy-efficiency/products/ecodesign

3. Conclusions

The Clean Energy for All Europeans legislative proposals [32]covers energy efficiency, renewable energy, the design of the electricity market, security of electricity supply and governance rules for the Energy Union. In addition, the Commission proposed a new way forward for Ecodesign as well as a strategy for connected and automated mobility. The package also includes actions to accelerate clean energy innovation and to renovate Europe's buildings. It provides measures to encourage public and private investment, promote EU industrial competitiveness and mitigate the societal impact of the clean energy transition.

Within these European policies, this project represents a challenge to increase the technical expertise of the partner and to enhance the knowledge and comprehension of the regulations for the solutions selected. Particularly this deliverable offers an overview of the current regulatory framework and a cause of reflection for synergies between building and components standards.

Some of the EnergyMatching technologies (i.e. blind control and shadowing) belong to a mature regulated sector, while other (i.e. the Energy Hub) have to be developed in a lack of existing standards. This lack implies possible market penetration obstacles for some countries.

Standard related to some EnergyMatching technologies (i.e. BIPV) have recently been developed, but they are still under discussion for further improvement in several European expert groups. EnergyMatching project will keep contacts with these expert groups to bring forward EnergyMatching technologies standardisation needs.

[32] https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition

Technical references

Project Acronym	**EnergyMatching**
Project Title	Adaptable and adaptive RES envelope solutions to maximise energy harvesting and optimize EU building and district load matching
Project Coordinator	David Moser and Laura Maturi EURAC david.moser@eurac.edu laura.maturi@eurac.edu
Project Duration	October 2017 – March 2022 (54 months)

Deliverable No.	D5.2
Dissemination level*	PU
Work Package	WP 5 – Exploitation of the results and business model
Task	T5.2 - Regulatory framework and standardization needs
Lead beneficiary	Eurac
Contributing beneficiary/ies	P13 R2M
Due date of deliverable	30 September 2018
Actual submission date	09 November 2018

PU = Public

PP = Restricted to other programme participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

CO = Confidential, only for members of the consortium (including the Commission Services)

v	Date	Beneficiary	Author
1.0	01/08/2018	EURAC	Matteo Del Buono
1.1	23/10/2018	EURAC	Matteo Del Buono