

Summary Report – Renewable energy and construction market

For ETEROB Project

Document control page

	Information
Country	Poland
Document Owner/Partner	BSW
Issue Date	25-07-2014
Last Saved Date	29-07-2014
File Name	ETEROB – Summary Report – Energy in construction industry.pdf

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Czech Republic

At the beginning of this study we will try to describe the structure of construction market, specify the environment of building market in the Czech Republic and describe supporting programmes for development of renovations of buildings by the state and the EU.

General structure of construction market is defined in accordance with the below described indicators

- investors
- purchasers
- contractors
- producers and sellers of construction materials
- producers and sellers of construction machines and equipment
- design and consulting offices
- engineering offices
- property salesman
- state administration bodies

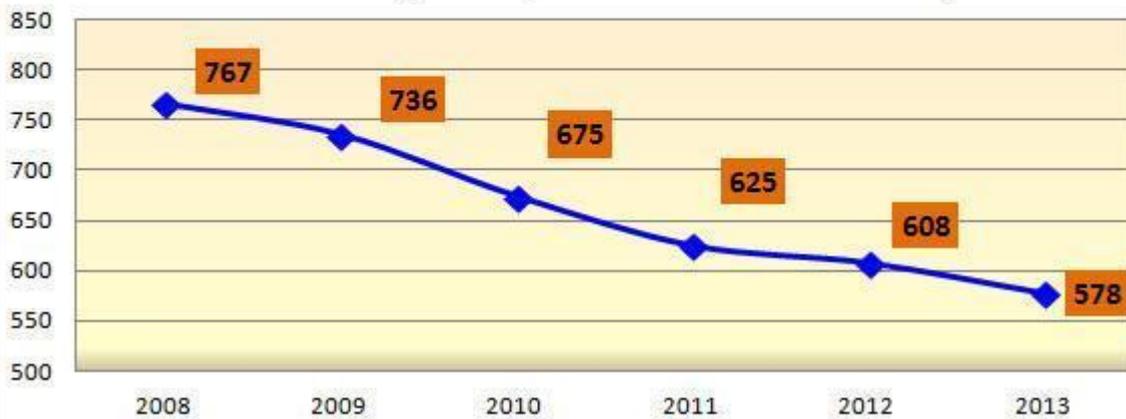
Construction market can be divided according to its purpose and function to:

- buildings and halls of civil construction
- buildings for living
- buildings and halls for industry
- transport buildings
- water management buildings
- underground buildings
- other engineering buildings
- other buildings

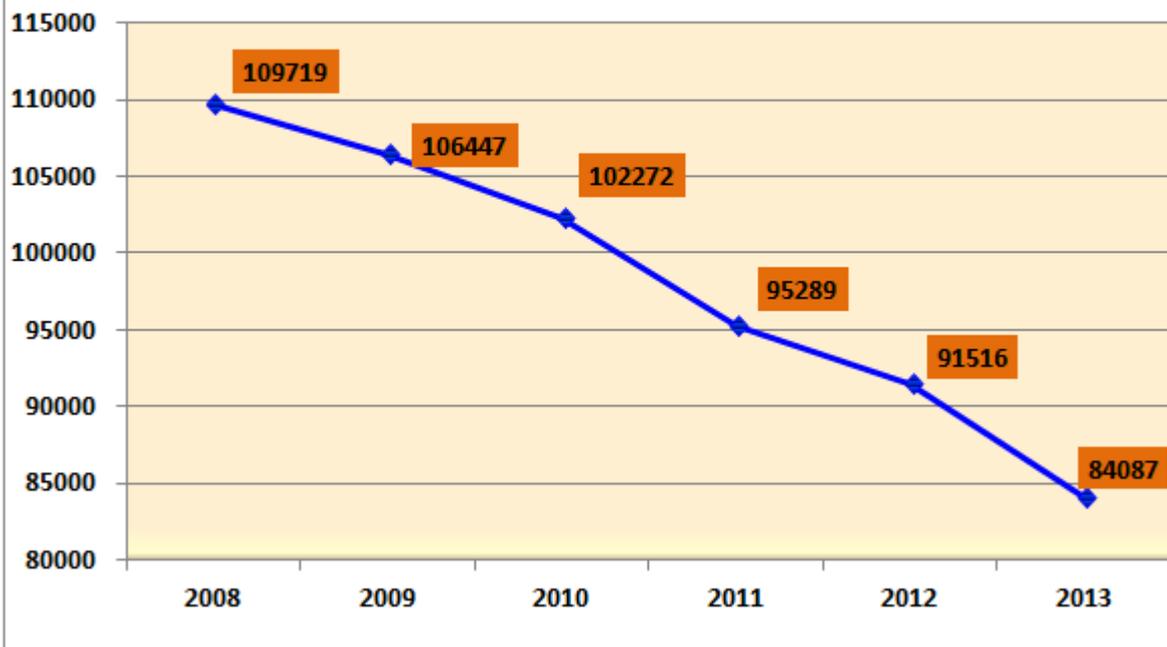
Description of construction market in the Czech Republic until the end of year 2013

On the construction market there are more than 300 thousand of legal and natural persons with main construction activity. Information in tables are based on companies with 50 and more employees

Počet podniků v letech 2008-2013 (podniky s 50-ti a více zaměstnanci)



Počet pracovníků v letech 2008 - 2013 (podniky s 50-ti a více zaměstnanci)



Important information about construction market in the Czech Republic is the overview of contracts.

Data related to contracts of construction companies inform about the development of construction market from the point of view of investors, focus of demands on construction activities in the structure of construction directions. Data related to contracts also allow analysing the “work reserve” of construction companies.

Data related to contracts are elaborated for companies with 50 and more employees. Status of contracts represents the amount of received, still not started contracts and reg. the unfinished contracts the amount left to implementation in following periods.

The data are in billions of CZK.

Contracts to the end of the year

Year	2010	2011	2012	2013
Contracts in bill. CZK, normal prices				
Total	149,3	143,1	140,4	132,4
- inland	130,3	131,6	125,4	109,0
- abroad	19,0	11,4	15,0	23,4
Contracts in total = 100,0				
- inland	87,3	92,0	89,3	82,3
- abroad	12,7	8,0	10,7	17,7

Construction production companies and companies producing construction materials – according to sales

Podniky stavební výroby a výroby stavebních hmot - dle objemu tržeb

poř. č.	IČO	podnik	TRŽBY (v tis. Kč)	rentabilita tržeb %
1	SV 00014915	Metrostav a.s.*	25,719,468	3.4
2	SV 45274924	EUROVIA CS, a.s.*	25,270,900	5.4
3	SV 60838744	STRABAG a.s.	15,070,970	2.8
4	SV 46342796	OHL ŽS, a.s.*	8,994,664	3.1
5	SV 25337220	PSJ, a.s.*	7,539,813	1.3
6	SV 45309612	Subterra a.s.	4,319,827	3.5
7	SV 48035599	SWIETELSKY stavební s.r.o.	4,184,682	1.0
8	SV 48292516	SYNER, s.r.o.	3,579,520	3.1
9	SV 13694341	PSG-International a.s.	3,447,334	2.6
10	SV 27195147	SMP CZ, a.s.	3,237,377	6.6
11	SV 13642464	GEMO OLOMOUC, spol. s r.o.	2,931,722	1.9
12	SV 26177005	COLAS CZ, a.s.	2,418,584	1.0
13	SV 25671464	GEOSAN GROUP a.s.	2,387,145	1.7
14	PSV 25137026	ZAPA beton a.s.	2,374,901	5.2
15	SV 26746573	VCES a.s.	1,948,866	1.3
16	PSV 25029673	Saint-Gobain Construction Products CZ a.s.**	1,840,106	14.7
17	SV 40614948	Dálniční stavby Praha, a.s.	1,829,885	8.8
18	SV 47115921	Elektrizace železnic Praha a. s.*	1,685,406	11.1

The largest construction companies are the following companies – all companies construct energy efficient buildings as well as buildings in passive standards.

Metrostav a.s. Praha – all-purpose company, the major activities are construction of subway in Prague, underground constructions, tunnels, roads and highways and public construction

Eurovia a.s. (previously Vinci) Praha – this company mainly focuses on construction of roads, highways and railway corridors

Skanska a.s. Praha – all-purpose company mainly focusing on road and housing construction

OHL ŽS a.s. Brno – company focusing on construction and repair of railways

For construction of energy saving buildings is provided the system of grants and supports in the Czech Republic. Similar systems are used to renovation of old buildings.

Reasons for the state support are:

- Motivation to reduction of energy demands
- Support of scientific and technical progress
- Support of renewable sources
- Support of development of infrastructure
- Support of selected groups of population
- Improvement of Cash-flow of generally beneficial projects

Below follows a short description of most important supporting measures provided by the state and the EU funds

1) State fund of housing development : Panel 2013+, this programme is exploitable for:

- Repairs of faults of houses
- Reduction of energy demands of houses
- Refurbishment of sanitary facilities in flats
- Repairs of common areas

2) State fund of housing development : JESSICA programme

- JESSICA programme – innovation for reconstructions and refurbishments of apartment blocks since January 2014
- „JESSICA - (Joint European Support for Sustainable Investment in City Areas)“
- Parallel to Panel programme, covered by EU funds

3) EFEKT programme focused on:

- Support of energy savings
- Exploitation of renewable sources of energy
- Information and public enlightenment in the field of energy savings
- Support of energy consulting centres EKIS
- Organisation of conferences and educational seminars

- Issue of publications focused on energy savings and exploitation of renewable energy sources
- Smaller investment activities in the field of production and energy savings and power producing management

4) State fund of environment of the Czech Republic : Programme New green to savings Fields:

- Energy savings on heating
- Construction in passive energy standard
- Exploitation of renewable energy sources for heating and preparation of hot water
- Combined production of electrical energy and heat
Installation of cogeneration equipment burning biogas, landfill and sludge gas, biogas stations.
Installation of cogeneration equipment using hard biomass.
Combined production of electricity and heat from geothermal energy..
- Implementation of energy savings
Reduction of energy consumption by improving the heat-technical qualities of peripheral constructions of buildings.
- Utilisation of waste heat
Application of technologies for usage of waste heat.

5) Ministry of Industry and Trade : Programme Eco-energies. This programme is implementing the Priority axis 3 „Effective energies“ Operational programme Business and innovations 2007 – 2013 and 2014 - 2020. The target is:

- to reduce the energy demands to a unit of production while keeping the long term stability and availability of energy for business sphere,
- to reduce dependence of Czech economy on the import of energy commodities,
- reduce consumption of fossil primary energy sources,
- increase usage of renewable energy sources (RES),
- utilize significant potential of energy savings and use of RES in large companies too,
- utilize available potential of secondary energy sources

Italy

The construction sector is fundamental for the Italian economy. However, because of current uncertainty surrounding both the Italian and global economies, investments trends in the sector have been negative for the past four years, although less so for the residential maintenance/renovations segment which is receiving a boost from incentives aimed at energy saving. This, along with other factors that will be outlined in this report, explains why the trend towards green building in Italy remains positive.

Research reveals that, over the past four years, a few key drivers (legislation, certification, active role of trade associations and green building clusters) have increased the interest and demand for green building products and services in Italy. Currently, best prospects for the Italian green building market include:

- Photovoltaic panels (for domestic use);
- Solar thermal panels for building heating and hot water production;
- Insulation products and energy saving systems for residential and industrial applications;
- Wood construction;
- Geothermal energy for building heating applications.

Recently, some Italian trade show organizers have been trying to highlight the “green building” component among the categories of products they feature at their events. A major challenge for green builders in Italy is compliance with the Italian legislation that regulates green building, which started to be implemented in a uniform manner at the national level during the last four years.

Construction in general is fundamental for the Italian economy, both in terms of investments and number of employees. In 2011, the sector accounted for 11.1% of Italy’s GDP and 8.4% of the Italian work force. During the ten years from 1999 to 2009, investments in construction in Italy grew by 29.4%, twice as much as the country’s overall GDP. However, the growth trend stopped during the second semester of 2009, mainly because of uncertainty surrounding both the Italian and global economies and because of cyclical factors. New residential construction projects and public works (a segment that had been suffering already for a few years) were particularly hard hit, while the trend for residential maintenance (renovation) and non residential private construction projects remained positive.

Fortunately, some of the major infrastructural works planned by the Italian Government have been started during the last two years. Also, the plan named “Piano Casa” launched in 2009, which was agreed upon by the Government and the Regions and aims at revitalizing the construction sector, put many of the small contractors, distributors, architects, and building materials manufacturers, back to work.

It is worth noting that one of the objectives of the “Piano Casa” is to improve the energy efficiency of buildings. In addition to “Piano Casa”, other tax incentives (including those towards the use of energy efficient and renewable sources) are also sustaining residential renovation activities. This, along with other factors explains why the trend towards green building in Italy remains positive.

By way of background, in Italy, discussion of green building issues evolved not in academic and political circles, but rather among architects concerned about the sustainability of an environment whose health is increasingly affected by the choice of building materials. In turn, the architects are trying to promote green building among policymakers. In any case, the debate around green building in Italy only started in the early 1990s, well after the concept had gained a foothold in other European countries, especially the Northern ones. As a consequence, the building sector in Italy lags behind that of other countries for what concerns the awareness of green building issues among sector professionals, the number of green building structures actually erected and the availability of green building materials.

An important step towards the promotion of green building issues in Italy was the publishing in 2004 of a “White Paper on Energy, the Environment and Buildings” jointly by FINCO, the Italian Federation of Building Products and Services Manufacturers (www.fincoweb.org)

and ENEA, the Italian Agency for New Technologies, Energy and The Environment (www.enea.it). The publication was sponsored by the Italian Ministry for the Environment. The purpose of the White Paper was to demonstrate the benefit of regulating the energy consumption of buildings. The Paper proved that the combined construction, renovation and management of buildings make up 45% of Italy's primary energy needs (and it is worth noting that Italy imports 84% of the energy it consumes). The Paper also highlighted how "building envelopes" (i.e. the foundations, roofs, walls, doors and windows of buildings) in Italy generally are usually not energy efficient because of the lack of adequate thermal insulation, especially for those buildings constructed before a 1976 law that set heating guidelines. Therefore, the Paper advocated a number of measures for increasing the energy efficiency of buildings and the use of freely available and renewable energies, including:

- Large scale renewal of the "envelopes" of buildings, both new and existing;
- Regulation of summer air conditioning;
- Promotion of the use of renewable energies on a larger scale;
- Increase in the use of building automation systems.

Poland

The last major change in thermo-modernization of existing buildings took place in 2002 and further ones are being prepared. Owners of residential buildings commissioned before 2002 enhance their thermal performance at their own expense or using government programs. From 4 667 271 buildings completed by 2002 (which constitutes 89% of the buildings existing in 2010), maximum 30% (i.e. 1 400 000) were thermo-modernized to a different degree; including approx. 20 000 residential buildings, that were modernized thoroughly thanks to an energy-efficiency loan with a bonus for their owners.

The number of buildings that can technically be thermo-modernized by 2020 is estimated at approx. 3 330 000. These buildings will have to meet the requirements of the currently updated regulations on „Building technical requirements and building localization”, which considerably tighten the regulations from 2002. It should create a higher demand for construction works that are high standard and guarantee meeting statutory requirements.

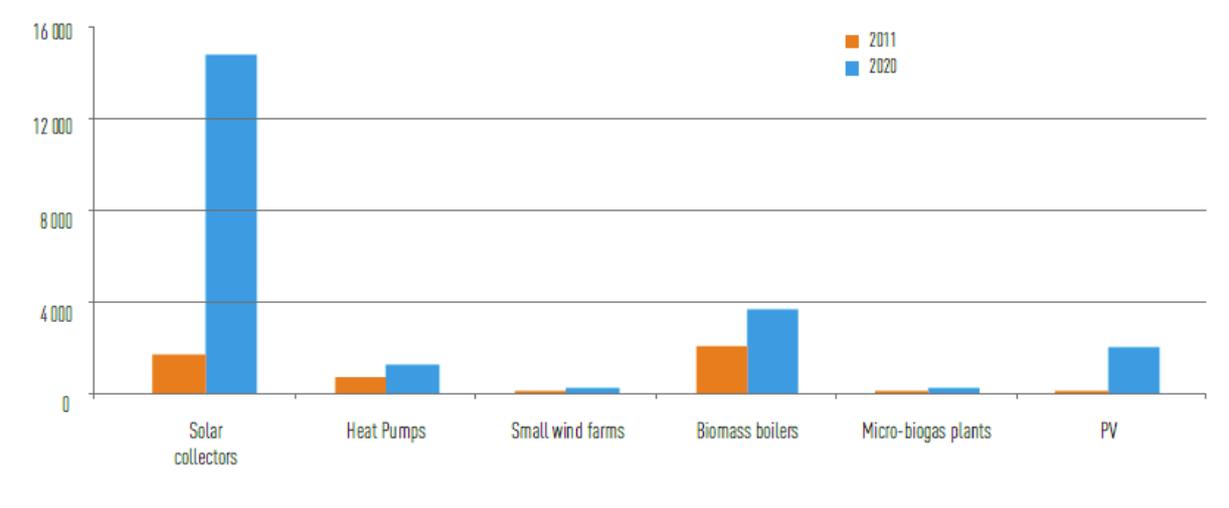
The analysis of accessible statistical data from the Central Statistical Office of Poland shows that from the total amount of construction sector employees, which amounted to 904 700 people at the end of 2010, 40%, i.e. approx. 360 000 people work in the building construction and modernization sector. It is assessed that in 2011 the total amount of RES systems engineers (including thermal solar energy, photovoltaic PV systems, small biomass boilers, agricultural biogas, heat pumps and small wind farms) in Poland was above. 4 000, and most people were employed in the solar collector system, less in the biomass boiler and heat pump sector and the least in the PV sector.

The estimated demand for qualified personnel in the sector of energy efficiency in the construction industry in the years 2014-2018 will amount to about 20 000 employees annually. The number of graduates of schools sufficient for the needs of the energy-efficient construction industry and RES is 16 000 persons annually. The total number of employees in the installation engineering sector in 2020 will be up to about 21.7 thousand. Most vacancies can be created in the thermal solar installations sector – over 14.9 thousand, and over 3.4

thousand in the biomass boiler sector (see Figure 1 below). The estimated demand for qualified energy-efficient construction industry personnel is 99 000 in the years 2012-2020 and the system of trainings taking into account the said recommendations should be launched in autumn 2014, so that in years 2019-2020 there is personnel that covers 100% of the market's needs.

Regarding RES qualifications, it is important to note that a new occupation has been created in the occupations classification: Renewable energy equipment and system installer. This occupation includes qualifications in equipment fitting and maintenance, and the following education areas can be distinguished within these qualifications (including skills and knowledge) – biomass boilers setup-maintenance, solar collectors setup/maintenance, heat pumps setup-maintenance, small wind farms setup-maintenance.

Figure 1. Employment in the sector of micro- and small-scale RES installation systems in the years 2011-2020.



Spain

The rehabilitation and regeneration and urban renewal have an important role to play in the economic recovery, contributing to the restructuring of other sectors, including mainly the tourist. Tourism is key to our country's economy and accounts for more than 10.2% of GDP, contributing 11.39% of employment. Many ancient tourist destinations face a systemic problem, the physical deterioration of their endowments and for which the application of rehabilitation strategies, regeneration and urban renewal could generate positive impacts.

No doubt seems to admit the fact that the Spanish built park needs rehabilitation interventions. Approximately 55% (13,759,266) of buildings is prior to 1980 and almost 21% have more than 50 years.

We must add the big distance that separates our building stock of European requirements relating to energy efficiency of buildings. Nearly 58% of our buildings were built before the first legislation introduced in Spain minimum energy efficiency criteria: the basic rule of the NBE-CT-79 building on thermal conditions in buildings.

The European Union has set a number of objectives in Package 20-20-20 'Energy and Climate Change', which provides for the 27 member countries, two mandatory targets: 20% reduction in emissions of greenhouse gases and raising the contribution of renewable energy to 20% of consumption, with an indicative target of improving energy efficiency by 20%.

2012/27/UE Directive on energy efficiency recognizes that buildings account for 40% of final energy consumption in the European Union. It is therefore necessary to develop a strategy for energy saving in the member states. Through this strategy of comprehensive and cost-effective renovations that reduce energy consumption of buildings, significant percentages with respect to the levels prior to the renovation, will create further opportunities for growth and employment in the construction sector.

Even with all the percentage represented by the rehabilitation in Spain in relation to the total construction is also one of the lowest in the euro area, reaching thirteen points below the European average, which reaches an environment of 41.7% of the construction industry.

This activity, broadly understood, is not only capable of meeting the objectives of energy efficiency and expressed as economic recovery, but also to actively contribute to environmental sustainability, social cohesion and improving the quality of life of all citizens both in homes and buildings, and urban spaces.

The main actors of this process of rehabilitation are, at the institutional level, the Spanish State and the Autonomous Communities, and enterprise level companies in different sectors and professional associations of rehabilitation. They act according to basic rules defined in Law 8/2013 of rehabilitation, regeneration and urban renewal.

The objectives of this Law are:

- Enhance rehabilitation and regeneration and urban renewal, removing existing barriers.
- Promote quality, sustainability and competitiveness, developing a regulatory framework accord to the European framework, especially in relation to the objectives of efficiency, saving energy and fighting to energy poverty.
- Provide an appropriate regulatory framework to enable the conversion and recovery of the construction sector, finding new areas of activity related to rehabilitation and regeneration and urban renewal.

The following data provide information on the structure of the construction industry, in 2012

Workers	Number of firms	Turnover (€ million)
1 to 9	139747	37668
10 to 19	12547	15940
20 to 49	6154	21805
50 to 99	1096	11136
100 to 249	499	13775
250 to 499	98	6070
500 to 999	45	7545
1000 and more	35	20968
Total	160221	134908

Rehabilitation Works: Number of buildings by type of work surface

LICENCIAS. Información histórica NACIONAL

AÑO: 2012

9. Obras de rehabilitación: N.º de edificios y superficie según tipo de obra

MES: DICIEMBRE

PERIODO	TOTAL		OBRAS DE AMPLIACIÓN		VACIADO		CIMENTACIÓN DE EDIFICIOS	CUBIERTAS DE EDIFICIOS	FACHADAS DE EDIFICIOS	N.º DE LOCALES REFORM. O ACONDICIONADOS
	N.º DE EDIFICIOS	SUPERFICIE (miles m²)	N.º DE EDIFICIOS	SUPERFICIE (miles m²)	N.º DE EDIFICIOS	SUPERFICIE (miles m²)				
2008	34.807	3.582	11.423	2.887	2.345	696	4.858	11.223	11.650	7.371
2009	33.267	2.495	9.217	2.013	1.825	480	4.457	12.645	11.282	6.242
2010	31.910	2.761	8.826	2.203	1.936	557	5.111	12.460	10.982	6.043
2011	30.237	1.740	7.316	1.172	2.208	570	5.228	11.977	10.106	6.374
2012	29.154	1.522	7.358	1.059	1.834	462	4.499	10.285	9.543	5.739
2011 ENERO	2.153	92	517	69	103	23	460	718	762	414
FEBRERO	2.297	155	642	133	100	22	400	856	815	539
MARZO	2.849	226	680	142	170	84	422	1.222	965	585
ABRIL	2.077	217	586	177	93	40	339	874	685	502
MAYO	2.856	138	804	97	187	42	561	1.124	941	540
JUNIO	2.853	113	621	74	219	39	597	1.258	1.010	627
JULIO	2.509	104	568	69	174	35	391	1.071	787	555
AGOSTO	2.057	103	449	66	141	37	264	890	676	378
SEPTIEMBRE	2.530	112	534	72	168	40	576	1.162	865	636
OCTUBRE	2.819	150	560	71	382	79	385	1.032	1.038	565
NOVIEMBRE	2.726	163	751	130	273	33	405	849	763	492
DICIEMBRE	2.511	167	604	72	198	96	428	921	799	541
2012 ENERO	2.224	156	617	129	157	27	294	802	741	454
FEBRERO	2.072	92	467	73	72	19	278	760	652	486
MARZO	2.587	116	773	81	166	35	468	919	689	565
ABRIL	2.093	89	475	59	155	29	346	821	647	377
MAYO	2.314	173	605	109	213	64	297	787	845	593
JUNIO	2.497	105	484	77	117	28	402	909	778	488
JULIO	2.639	93	607	83	65	10	354	1.120	1.038	557
AGOSTO	2.314	87	580	57	159	29	377	834	731	344
SEPTIEMBRE	2.929	177	667	93	263	84	396	801	817	478
OCTUBRE	2.784	156	633	126	141	30	627	1.209	1.078	528
NOVIEMBRE	2.671	139	908	118	100	21	437	773	870	443
DICIEMBRE	2.030	139	542	54	226	86	223	550	657	426
2011 ENERO-DICIEMBRE	30.237	1.740	7.316	1.172	2.208	570	5.228	11.977	10.106	6.374
2012 ENERO-DICIEMBRE	29.154	1.522	7.358	1.059	1.834	462	4.499	10.285	9.543	5.739
Var. de Acumulado %	-3,6	-12,5	0,6	-9,6	-16,9	-18,9	-13,9	-14,1	-5,6	-10,0
2011 ENE.-2011 Dic	30.237	1.740	7.316	1.172	2.208	570	5.228	11.977	10.106	6.374
2012 ENE.-2012 Dic	29.154	1.522	7.358	1.059	1.834	462	4.499	10.285	9.543	5.739
Var. Interanual %	-3,6	-12,5	0,6	-9,6	-16,9	-18,9	-13,9	-14,1	-5,6	-10,0

Legislative background

Czech Republic

The level of EU – legislative and standards

- The most important “covering” documents to EE in buildings :
Energy Performance of Buildings Directives
 - 2002/91/EC (EPBD I) and following amendments
 - 2010/31/EU (EPBD II)

This EU legislation does not define Energy audits but only Energy demands of buildings (ie. EDB cards)

Energy audits are defined at the national level.

Almost all EU countries have their own system of audits.

Energy Performance of Buildings Directive 2010/31/EU (EPBD II) – main reasons for development and enlargement of this Directive in comparison to EPBD I are:

- Clarification and simplification of existing definitions;
- Enlarge the force of Directive;
- Increase of Directive requirements to increase its effect;
- States the term “buildings with almost zero energy consumption;
- Defines requirements on a so called “cost optimal level”;
- Requires the public sphere to be an example in reduction of EDB

National level – the Czech Republic

- Fundamental “covering” document Act No. 406/2000 Coll., on energy management
- 14 significant amendments in 14 years of existence
- Relation to buildings:
 - Definition of Energy audit (not defined on the level of EU)
 - Card of energy demands of buildings (EDB),
 - Inspections of boilers and air-conditioners,
- Further definitions and requirements to Ekodesign,
- Definitions of Energy experts, regulations, responsibilities, duties and sanctions.
- Relation to EU legislation: main principles and rules embraced from EPBD II
 - Definition of requirements and relevant deadlines for EDB,
 - Definition of a duty to have EDB and who is allowed to issue it,
 - Adopted definition of building with almost zero consumption (nearly Zero Energy Building = nZEB)
 - Adopted definition for determination of legislative requirements on cost optimum level
- Regulation No. 480/2012 Coll. , on energy audit
 - Defines, who must have an energy audit

- Specifies mandatory parts of report on energy audit (mainly in tables)
- Defines the system of proposal of energy effective measures and their combinations
- Requires calculation and evaluation of economic and environmental suitability of proposed measures and recommendation of sufficient combination by the auditor
- Regulation No. 78/2013 Coll., on energy demand of buildings (executive regulation to Act No. 406/2000 Coll.)
 - Specifies content and design of EDB,
 - Specifies calculation methodology for EDB,
 - Defines, what buildings should be evaluated in accordance with the given calculation methodology

All three documents were amended in 2012 (resp. in 2013) in cooperation with the Ministry of Industry and Trade, Chamber of Commerce, Universities, independent experts and others.

- Besides the so far mentioned regulations, the Building Act No. 183/2006 Coll., deals with the duty to fulfil requirements to EDB during construction
 - The law combines the duty of fulfilment of requirements to energy demand of buildings with the process of construction procedure, ie. announcement during construction of new buildings
 - All other duties to EDB are solved with the previous Act on energy management

Energy audit	Card of energy demand of building
In accordance with national legislation	In accordance with EU Directive (EPBDII)
At national level solved by Act No. 406/2000 Coll., on energy management	
Regulation No. 480/2012 Coll., on energy audit	Regulation No. 78/2013 Coll., on energy demand of buildings
Since the year 2000, the Act amended 14x	Since the year 2007, amended in 2013
Performed for any type of buildings , with regard to higher labour-intensity and price it is not performed to smaller buildings such as family houses. Mandatory for public buildings with annual consumption of energy over 1500 GJ and for privately owned buildings with annual consumption of energy above 35000 GJ. Also for some of the grant programmes.	Performed for any type of buildings with exceptions (EPBDII takes out agriculture, industry, some of the ecclesiastical buildings and buildings under 50 m ²) Mandatory for all new and reconstructed buildings, in case of sale and lease, for public buildings and progressively for all employed buildings.

History of energy audits in the Czech Republic

- First methodology presented in nineties in cooperation with US AID
- First audits without compulsory defined structure were done before the year 2000 already
- In the year 2000 there was created the first version of the Act on energy management (Act No. 406/2000 Coll.), in year 2001 an appropriate executive Regulation on energy audit was created
- In years 2000 – 2005 the state supported provision of energy audits for public and private sector by grants
- In year 2005 about 12 000 of energy audits were done
- Due to the grant programmes it is possible to assume that an overwhelming majority of public buildings have an energy audit

Italy

Until recently, Italy lacked countrywide legislation and incentives to steer building activities towards sustainability. The only laws at the national level regulating the energy efficiency of buildings were:

- Law 373, from 1976, which regulated the heating process of buildings;
- Law 10, from 1991, which regulated the rational use of energy in general, predating the guidelines of a subsequent EU Directive. Unfortunately the law was never fully implemented.

At the same time, certain local (Regional, provincial and town) authorities were autonomously drafting green building legislation and including green building techniques in their regulatory plans. For instance, a 2004 Decree from the Province of Bolzano set the maximum values for the yearly heating consumption needs of new buildings and categorized buildings according to their heating consumption. The neighbouring Province of Trento was also an early proponent of green building norms. Almost all of the other Regional incentives for green building and energy saving have only been adopted during the past 5 years, sometimes transposing EU Directives into local legislation before this was done at the national level. Other Regions and Provinces that have been active in drafting local legislation promoting green building are: Calabria, Emilia Romagna, Friuli Venezia Giulia, Molise, Tuscany, Veneto and, most recently, Lazio, Marche and Puglia. As for the types of measures adopted, they range from allowing increases in the volume of buildings, provided that such increases meet energy saving criteria, to granting incentives for the production of energy through renewable sources or solar panels.

The good news is that in recent times the Government of Italy has finally taken more steps to promote energy efficiency and the use of renewable sources in construction at a countrywide level, as follows:

Legislation on energy efficiency in construction: EU Directive 91/2002, which mandated that starting on January 2006 EU member countries certify the energy consumption of

buildings through rules defined at the national level, was transposed into Italian Law by Law Decree 192/05, which also established the criteria, conditions and means for improving the energy performances of buildings. The Law Decree became effective on 10/8/2005 and established that within a year from that date all new buildings and all existing buildings with surfaces exceeding 1,000 square meters (approx. 10,764 square feet), for which an integral renovation of the elements of the “building envelope” is planned, must possess energy certification. Law Decree 311/06 broadened the scope of Law Decree 192/05 and, among other things, mandated that for new buildings or in case of installation of new heating systems or of renovation of existing heating systems, the systems must be able to generate at least 50% of the yearly requirements for sanitary hot water through renewable sources; the Decree also mandated the energy certification for existing buildings with surfaces inferior to 1,000 square meters. It should be noted that the Italian Government recently eliminated a requirement within Law Decree 192/05 to attach an energy certificate to the contract when selling or renting whole buildings or single housing units (one theory is that the Government wanted to make sure it could sell or rent more easily its own real estate properties, most of which do not meet the energy performance guidelines established by the Decree). Sector experts are still debating whether this recent decision impacts such regulations implemented by the individual Italian Regions. In any case, it is still mandatory to issue an energy certificate for every building to be sold (with very few exceptions), effective July 1st, 2009. Although the above Law Decrees have not yet been fully executed, noticeable progress has been made recently through a series of Implementing Decrees issued by the Italian Government:

- The first Implementing Decree was issued on April 02, 2009 by the Government and sets the general criteria, the calculation methods and the base requisites for the energy performance of buildings and heating systems and for the systems for hot water production for sanitary uses.
- The second decree was issued on 06/26/2009 and consists of the procedures for the application of energy certification of buildings and includes the “Italian Guidelines for Energy Certification of Buildings”. These became effective on 07/25/2009 and mandate the use of a “green report card” that calls for detailed analyses of the energy performance of a building in the Winter and Summer. The green report card is mandatory in the following cases: sale of a home, building of a new home, total renovation of a home, request of the 55% tax deduction for energy efficient renovation, signing of an energy supply contract on behalf of a condominium.
- A third decree is still missing. That decree is expected to set the criteria for approval of the individuals and organizations that will be allowed to perform energy certification.

On April 1st 2009 the Italian Government and the Italian Regions (which have the ultimate jurisdiction over urban planning) agreed on a stimulus plan, labelled as “Piano Casa” (“House Plan”), aimed at revitalizing the construction sector. Some of the main issues on which the Government and the Regions found an agreement were:

- Possibility to enlarge certain buildings by up to 20%;
- Possibility to demolish, rebuild and enlarge certain buildings by up to 30%.

It is worth noting that one of the objectives of the House Plan is to improve the energy effi-

ciency of buildings. Again, the means to achieve this latter goal differ among Regions, ranging from very strict measures (e.g. the Region of Piedmont mandates that the enlargement of buildings be accompanied by a 40% reduction in the primary energy consumption needs of a building) to very liberal ones (e.g. in the Region of Veneto the enlargement of buildings is not subject to any energy need reduction requirements).

Poland

The strategic document relating to national energy development is the Energy Policy in Poland until 2030 that has been approved in 2009. Suggested actions concerning RES regarding the construction sector and increasing renewable energy utilization include developing a path to achieve a 15% share of RES in final energy consumption. On 5 December 2010 the Polish government approved a Renewable Energy National Action Plan (RENAP), which summarizes the current knowledge regarding RES development in Poland (data from mid-2010). This document also defines the national goals regarding the share of energy from RES used in the transport sector, electric energy sector and thermal energy sector until 2020. So far, the renewable energy sector in Poland has been developing within the framework of a support system defined in the Energy law (art. 9a) and was an attempt to implement the previous directive 77/2001/WE on the promotion of electricity produced from renewable energy sources.

As a consequence, the sector's development was based on large-scale investments in installations for the co-combustion of biomass and coal in thermal power plants, and was not connected with the residential construction sector (e.g. there was no support for prosumer installations. Directive 2009/28/WE, which set a goal regarding the share of RES in Poland in 2020 (minimum 15% energy from RES in the final energy consumption), has shown the need to support distributed generation from prosumer installations integrated with buildings. These elements, together with the „path” of executing the goal for 2020, were mentioned in the RENAP. Standards for minimum RES share in the balance of energy consumption in new and renovated buildings is shown in Table 1.

Directive 2012/27/UE on energy efficiency obliges member states to annually renovate 3% of the total heating or cooling surfaces of buildings owned or occupied by state institutions. The 3% coefficient is calculated basing on the total area of rooms in buildings of a total floor space of over 500 m² (and as of 9 July 2015 – over 250 m²). However, member states will be able to employ different measures, including thorough renovations and measures influencing changes in user's behavior, which will allow achieving comparable energy conservation. It is essential to increase the building renovation indicator due to the fact that existing building stock is a sector that has the highest potential regarding energy efficiency.

	2010	2015	2020
Residential buildings	11%	14%	16%
Public buildings	10%	13%	15%
Buildings for industry and commerce	9%	12%	14%

Table 1. Estimate share of renewable energy in the construction sector on the basis of RENAP.

Article 4 of Directive 2012/27/UE obliges member states to prepare a long-term strategy for supporting investment in renovating national building stock – residential and commercial, public and private. This strategy should include:

- reviewing national building stock, based on statistical samples where appropriate;
- finding cost-effective ways of renovation, appropriate for the building type and climatic zone;
- policies and measures stimulating thorough, cost-effective building renovations, including stage-based thorough renovations;
- adopting a future-oriented approach regarding making investment decisions by single entities, the construction sector and financial institutions;
- fact-based estimates of the expected energy conservation and other benefits.

Directive 2012/27/UE on energy efficiency introduces a general obligation of metering buildings and residential and commercial units in multi-use buildings, as well as of shifting the settlement of costs of energy for the purpose of heating and water heating to the end-users – unit users, in accordance with the indications of meters. The deadline for introducing this requirement was set for 31 December 2016. The Directive in question introduces the obligation to use on-premises heat meters and water meters, and where employing such a solution is technically impossible or too costly – using heating cost divisors mounted on radiators. Bypassing this obligation requires the member state to prove that this type of metering is not viable economically. Meeting the abovementioned obligations by Poland will require appropriate personnel from the construction industry, which will undoubtedly influence an amendment of legal provisions in this matter. One of the priorities of the „Energy Policy of Poland until 2030” is ensuring reaching an at least 15% share of energy from RES in the gross final energy consumption in Poland in 2020. Poland is obliged to achieve intermediary goals, which are as follows: 8.76% until 2012, 9.54% until 2014, 10.71% until 2016 and 12.27% until 2018.

Spain

The first legal reference is the Law 38/1999 on Building Management, which established that the buildings should be projected so that the environment is not damaged and using rationally the necessary energy, by saving energy and thermal insulating. After this law was approved the Royal Decree 314/2006, known as Technical Building Code (CTE) which provided the legal framework for the requirements basic quality of buildings and facilities, and it includes the energy saving criteria. This standard has been transposed into Spanish law requirements relating to the requirements for energy efficiency in buildings, and the Directives 2002/91/EC and 2009/28/EC of the European Parliament and Council. Subsequently, the Directive 2010/31/EU on the energy performance of buildings has been transposed into Spanish law through Ministerial Order FOM/1635/2013 by the DB-HE "Energy saving" Basic Document, Technical Building Code, approved by Royal Decree 314/2006. The requirements for energy certification of buildings (labeling) in Directive is

updated by the Directive 2002/91/EC, and it was transposed by Royal Decree 47/2007. This last norm designs the procedure for energy performance certification of new construction buildings approved. Subsequently, the incorporation of the basic procedure for certification of energy efficiency of existing buildings was established by the Royal Decree 235/2013.

Standards for energy efficient buildings

Czech Republic

In the Czech Republic there are used international and national standards for energy saving building. The most common are the 3 below described methods.

LEED System – Method developed in the USA, used most frequently in the world

LEED System (Leadership in Energy and Environmental Design) for evaluation of saving buildings is LEED a globally recognized certification scheme with the fastest growing number of certifications. It evaluates the building in time of its construction or during its following operation from the point of view of impacts on the surrounding, water and energy consumption, used materials, quality of inside environment and user qualities necessary for effective work.

It focuses on particular parts of building and gives the building certain points for fulfilment of determined criteria for ecological construction. The building is evaluated within the following six main ecological categories, sustainable location, drinking water management, energy and atmosphere, materials and sources, quality of internal environment and innovations. In accordance with the overall reached amount of points within these categories the project may receive the final level: certified (40-49 points), silver (50-59 points), gold (60-79 points) and platinum for 80 and more points. It is possible to apply the LEED System to all types of buildings, including newly build buildings, interiors of buildings, existing buildings, retails of construction of residential district, schools and retail buildings.

BREEAM System – Method developed and used in Great Britain

BREEAM System evaluates nine categories which influence on the final evaluation is based on their relative impact on the environment:

- Energy (19 %), eg. energy efficiency
- Health and contentment of environment (15 %), eg. daily light the possibility of natural ventilation
- Materials (12,5 %), eg. use of materials with low impact of life cycle to the environment
- Management (12 %), eg. environmental impacts of constructions
- Contaminating agents (10 %), eg. use of sufficient cooling agent and emission by combining NOx
- Use of soil and ecology (10 %), eg. reduction of impact on environment
- Transport (8 %), eg. availability by public transport and support of ecological means of transport (bicycle, electrical car)
- Waste (7,5 %), eg. construction waste and usage of recycling

- Water (6 %), eg. economical appliance and measures for detection of water leak. During evaluation process there is found out the summary scope which is transferred to overall evaluation; for example > 85% = excellent, > 70% = great, > 55% = very good > 45% = good.

Systems developed in the Czech Republic

In the Czech republic there was under cooperation of FSv ČVUT and Česká společnost pro udržitelnou výstavbu budov - iisBE Czech developed a *SBToolCZ* methodology. It is based on the international SBTool methodology that was fully integrated into Czech conditions and it is ready to be used.

Currently there exist many certification tools in the world and almost in each and every country there is used a different evaluation methodology, in some of the countries they even use more certification methodologies which are competitors to each other or they complement each other. In general, it possible to state that in many countries there are used local evaluation methodologies and in some of the countries also methodologies also methodologies of supranational organisations either unified for all the states or with localisations for given specific conditions of certain country.

To the most important companies in the Czech Republic which promote the system of building evaluation belong companies Ekowatt and SEVEN.

Italy

In the past five years some key drivers have increased the interest and demand for green building products and services in Italy, as follows:

a) Incentives towards the use of energy efficient and renewable sources. The following are available:

- For photovoltaic systems: a measure called “Conto Energia” rewards electricity produced by homeowners and businesses through photovoltaic panels with a special rate guaranteed for 20 years. In addition to that, users can either sell the excess energy they produce to third parties or cede it to the grid and then withdraw it from the grid when they need it. For all PV systems that started functioning on or after January 01, 2010, incentive rates are reduced by 2% (i.e. the Government pays users less for the energy their PV systems produce).
- For solar thermal panels: there is a tax deduction of up to 55% of the expenses incurred in the installation of solar thermal panels, including the expenses incurred for installation-related engineering and masonry works.
- For wind power and all other renewable sources: a special, fixed all-inclusive rate is available for wind power up to 200kW and other renewable energies up to 1MW (excluding photovoltaic).
- For energy efficient renovation: it is possible to deduct 55% of the expenses incurred for the energy efficient renovation of existing buildings, both in their entirety and in their single components. This includes works on the “building envelope” and the substitution of heating systems. There are very precise guidelines for doing this. For

energy “re-qualification” for instance, it is necessary to meet certain objectives for the energy performance for the winter heating of buildings, in order to avoid exceeding specific values indicated in Attachment A of a 03/11/08 Decree by the Ministry of Economic Development. Also, for works on the “building envelope” it is necessary to meet the values of thermal transmittance indicated in Attachment B of the above mentioned Decree. Also, for the substitution of heaters for winter time, those heater shave to meet certain energy efficiency parameters indicated in a 02/19/07 Decree, which was later modified by a 10/26/2007 Decree and coordinated with a 04/07/2008 Decree. Also, Law Decree 115/08 allows increases in the volume of buildings, provided that such increases are for energy saving purposes.

- For home appliances: the 2008 budget law allows for incentives for the substitution of home appliances with energy saving models in the amount of 20% of the expenses incurred. Except for what concerns refrigerator upgrades to class A+ and above, the incentives are limited to homeowners who are already performing renovation works and only until 12/31/2009.
- In addition to the above national incentives, certain Regions have also been providing local incentives for energy efficient construction by using EU funds that are destined towards regional development plans (FESR). Such incentives differ in size, scope and time span and they are usually accessible only to companies or individuals based in those Regions.

b) Certification.

Demand is increasing for the following types of mandatory and voluntary certification that, in turn, reward and foster the building of energy saving residential and commercial units:

1) Certification of Building Products (mandatory): In order to be marketed in Italy, building products must possess the CE mark. This is in accordance with EU Directive 89/106, which was transposed into Italian national law by Presidential Decree 246/93 and other subsequent decrees. It applies to hundreds of building products and calls for a Declaration of Conformity from the manufacturer, placement of the CE Mark on the product and granting of a CE Certificate of Conformity from a notified body.

2) Certification of the Energy Efficiency of Buildings (mandatory): In the Summer of 2009 the Italian Parliament approved the “Italian Guidelines for Energy Certification of Buildings”. These became effective on 07/25/2009 and mandate the use of a “green report card” that calls for detailed analyses of the energy performance of a building in the Winter and Summer. The green report card is mandatory in the following cases: sale of a home, building of a new home, total renovation of a home, request of the 55% tax deduction for energy efficient renovation, signing of an energy supply contract on behalf of a condominium. The average cost of the “green report card” for an average size apartment (100 square meters, i.e. approx 1,076 square feet) is estimated to be 300 Euros, which is not too different from other European countries. As noted previously, the Italian Government recently eliminated a requirement within Law Decree 192/05 to attach an energy certificate to the contract when selling or renting whole buildings or single housing units. Sector and legal professionals are debating whether this recent measure is also valid in those Regions that had already regulated this issue: in the case of Lombardy for instance it has been established that the requirement to attach the energy certificate to the sales contract is still in force and that violators will be fined. In any case, it is still mandatory to draft an energy certificate for

every building to be sold (with very few exceptions), effective July 1st, 2009. Also as noted previously, there are still no national criteria for approval of the individuals and organizations that will be allowed to perform energy certification, therefore at the moment there are still noticeable differences among regions in terms of which categories of professionals are allowed to perform energy certification in each region, It is hoped that these inconsistencies will be resolved soon.

3) Other types of certification (voluntary):

- LEED: LEED certification is available all over Italy and is granted by the US Green Building Council, which has a chapter in Italy.
- Casa Clima: the local government of the Province of Bolzano, located in North Eastern Italy, and the administrators of the towns located in that Province, have created an agency named “Casa Clima”, whose aim is to encourage the construction of low energy consuming homes through consulting, design and certification services. Since the objective of the agency is to combine environmental best practices and cost saving measures, the project has become very popular among builders and homeowners in the area and has noticeably driven the local demand for homes whose heating consumption needs are below 3 liters of gasoil per square meters per year. “Casa Clima” buildings are now being erected in other parts of Italy as well.
- “SB100”: ANAB, the Italian Association of Architects promoting green building awareness has developed a voluntary certification system based on sustainability parameters that meet the following objectives:
 - Limiting the waste of natural resources;
 - Paying attention to the quality of the environment and to the health of those who spend most of their time inside buildings;
 - Considering the social implications of buildings and how they impact the growth of the community.

The above referenced certification system is called SB100 (which stands for “sustainable buildings with 100 actions). The system includes a list of objectives grouped by themes (bioenvironmental, social, economic, etc.) and lists 100 possible actions to be accomplished in order to reach those objectives. SB100 also allows for certification of the energy performance of the building in accordance with EU Directive 2002/91/CE.

- “Marchio Bioarchitettura di Qualità Energetico Ambientale”: INBAR, another non-profit association of professionals, technicians and other experts, grants its own “Marchio Bioarchitettura di Qualità Energetico Ambientale”, which verifies the achievement of certain energetic and environmental performance levels in the construction of new residential buildings. The aim is to evaluate the impact of a building during its whole life cycle.
- “Sistema Edificio”: ICMQ SpA, a well known certification body that operates mainly in the building sector, offers a comprehensive certification framework for buildings that includes mandatory energy efficiency certification but also other forms of voluntary certification for light, water, acoustic and thermal parameters that contribute to the value of a building.

In Poland, the basic regulations for the construction industry are scattered many laws and regulations. The most important act is the Law Building on September 19, 2007 (Journal Laws no. 191, item. 1373), together with subsequent amendments. (Last OJ of 2010 No. 243, item. 1623). Building Act regulates construction process. Details of this process are determined by the Decree of the Minister responsible for the construction industry. From the viewpoint of efficiency and the use of renewable energy in building important are the following Regulations:

- Regulation of the Minister of Infrastructure of 6 November 2008 on the methodology for calculating the energy performance of the building and a residential unit or part of a building constituting an independent technical-utilitarian part and the way of preparation and certification templates of their energy performance (Journal of Laws No. 201, item. 1240),
- Regulation of the Minister of Infrastructure of 6 November 2008 on the technical requirements to be met by buildings and their location (WT 2008).

The requirements in WT 2008 does not provide the maximum linear heat loss coefficient Ψ [W / mK] for thermal bridges. They serve only required the critical factor temperature for the building envelope and structural nodes on the premises heated to a temperature of at least 20 ° C in residential buildings. This value should be determined according to the method of calculating the temperature on the inner surface necessary to avoid critical surface humidity and interstitial condensation. at WT 2008 which allow the adoption of the required value of this coefficient equal to 0.72, which means in practice admission occurrence of significant thermal bridges values Ψ_e maximum ≈ 0.70 W / mK.

The basis for granting the premium for thermo-modernization is energy audit results. The scope and form of the energy audit are described in the Regulation of the Minister of Infrastructure of 17 March 2009. Regulation sets out the following minimum requirements for thermal resistance of walls after thermo-modernization:

- For external walls thermal resistance should be greater than 4.0 m² * K / W,
- For flat roof thermal resistance should be greater than 4.5 m² * K / W,
- For ceiling above unheated basements thermal resistance should be greater than 2.0 m² * K / W.

Passivhaus

PEP acronym for Platform Building Passivhaus. The Passivhaus standard is a demanding standard of energy efficiency. It combines a high interior comfort with a very low power consumption and an affordable price, in winter and summer. It was applied from 1991, when the first homes were built with this system in Central Europe. Today there are over 15,000 examples built, of all types and function, spread across the world. This standard not presupposes types of products or materials, nor any architectural style. The little extra energy they need their buildings can be covered easily from renewable energies, being in that case such construction with zero energy cost of heating and cooling for the Earth.

Efficiency Valuation Organization (EVO)

Efficiency Valuation Organization (EVO) is an international non-profit organization that offers products and services that helps to do measurement and verification of energy savings and water efficiency in energy projects. It's an interesting way to control the financial risk in management and operating energy contracts, saving and quantifying emission reductions carbon, developing efficiency projects, promoting sustainable construction or improvement of the efficiency of existing facilities. It is doing through accurate and effective methodology for identifying energy and water savings. In early 90s, the standardization of the measurement and verification of energy efficiency was developed to assist developers, owners and financiers of projects. Today, the International Performance Measurement & Verification Protocol (IPMVP), Pat EVO, is a lider in international saving energy standards. The IPMVP has been translated into 10 languages (including Spanish) and it is used in over 40 countries. Currently he is quoted regularly in regional and state testing protocols and uses.

LEED®: Líder en Eficiencia Energética y Diseño sostenible

LEED is an internationally recognized certification system for sustainable buildings, providing verification by a third party that a building or community was designed and built using strategies according to all most important energy indicators: energy savings, water efficiency, reduced CO2 emissions, improved indoor environmental quality, management of resources and sensitivity to their impacts.

AENOR. Asociación Española de Normalización y Certificación

There are specific certifications within the AENOR standard for the energy sector. The most important are:

- Regulatory Verification of Greenhouse Gas Emissions (GEI)
- Validation of Clean Protocols for Projects Development
- Determination of Joint Venture Projects
- Implementation of Environmental Management Systems · ISO 14001
- Certification · Energy Management System ISO 50001. This standard establishes requirements that must have a Energy Management System, in order to make continuous and systematic improvement of the energy performance of organizations with a triple cost savings. energy, environmental and economic
- In 2007, AENOR published the standard UNE 216301:2007 Energy Management System and in early 2010 the European standard EN 16001:2010 was published whose requirements and principles are the same in the UNE.
- Verification Energy Audit

- Certification Energy response of wind turbines during voltage dips

Key suppliers of renewable energy systems

Czech Republic

In this chapter it is very difficult to describe the amount of companies that work on the Czech supplier market with renewable energy sources for energy saving buildings. We are selecting just randomly important suppliers

Companies

- IBC SOLAR, a specialist in photovoltaics since 1982, provides all products for photovoltaic systems. Provides supplies of solar panels, converters, assembly and monitoring equipment and modern technologies for energy storage
- Nelumbo s.r.o. Supplies solar systems for heating of non-potable water, heating of houses, pools and photovoltaic power stations since the year 2001. As a new thing it offers small wind power stations for homes and companies. Within the products there can be also find solar garden lamps, solar fountains etc.
- Sany s.r.o. Producer of solar collectors SANYSTAR - sun energy, heat pumps. It also provides free designs, planning, trainings. It has a large net of sellers (retail, wholesale) and assembly companies all over the Czech Republic which provide consultations as well.
- Fronius Česká republika s.r.o. Company Fronius changes the energy and it is the number one company in three branches. High quality solar electronics. Development and production of photovoltaic changers for networked supply by electrical current. Accumulator systems
- ETL ECOTHERM s.r.o. Producer and supplier of technological equipment for boiler houses and transmission stations. Represented by ALFA LAVAL and SPIRAX SARCO. Producer of heat pumps. Producer and supplier of photovoltaic systems. Turnkey photovoltaic power stations.
- Schüco International s.r.o. Company Schüco International KG develops photovoltaic technologies, thermic systems and heat pumps. An innovation is an intelligent management of production, consumption and storage of electricity produced from PV equipment.
- Soleg s.r.o. Specialised warehouse with components for photovoltaic power stations, supplier of heat pumps. Represents following trademarks: Canadian Solar, REC, Avancis, Hanwha, Kostal, Fronius, Power One, Schletter. It also offers Panasonic heat pumps.
- Honeywell a.s. Regulation of heating and water installations – equitherm, zone and thermostatic regulation, balancing, blending, zone valves, safety valves, venting, water filters, reduction valves, pipe separators, water treatment, industry fittings.
- Hennlich s.r.o. Systems of heating and cooling with heat pumps Waterkotte – heat pumps water/water, ground/water and air/water. Applicable to family houses as well as to professional solution of large outputs in industry buildings, admin buildings and hotels.

Italy

In Italy there are both associations of professionals that are very active in promoting green building topics among the Italian public, as well as a few visible examples of technology districts that group firms involved in green building and of model “zero emissions” residential communities.

- The first Italian association of architects promoting green building awareness, which goes by the name of ANAB (acronym for Associazione Nazionale Architettura Bio-ecologica), was founded in 1989. ANAB has been particularly active in trying to develop green building guidelines aimed at the public sector (www.anab.it).
- INBAR (which stands for Istituto Nazionale di Bioarchitettura) is another non-profit association of professionals, technicians and other experts, which for the past decade has been promoting the awareness, information, and education of future generations of professionals on green building issues. INBAR together with the Italian Federation of Construction Cooperatives has launched a network of construction cooperatives named “La Casa Ecologica”, whose aim is specifically to promote sustainable building (www.bioarchitettura.org).
- The Green Building Council now has a chapter in Italy as well (GBCI). It aims to promote sustainable construction in Italy, mainly by granting certification according to U.S. LEED standards. Its 150+ members include several businesses, local administrations, professionals and foundations. GBCI is headquartered within the Habitech “Energy-Environment Cluster”, near Trento, in Northern Italy (www.gbctalia.org).

As for technology districts that group firms involved in green building and renewable energies and model “zero emissions” residential communities:

- As noted, Habitech, the “Energy-Environment Cluster”, is located near Trento, in Northern Italy. It owes its existence to an initiative of the local provincial government and is recognized by the Ministry of University and Research. It is based on collaboration between the University of Trento, research laboratories, private companies, and local authorities aimed at creating joint ventures specialized in the following sectors: sustainable construction, production of energy from renewable sources, and intelligent rural and urban planning technologies. The district also houses the headquarters for the Green Building Council in Italy.
- The whole town of Angeli di Rosora in the Marche Region in Central Italy, is the first Italian zero emissions community, with a school, a research center and electric vehicles added to what can be considered the first zero emissions house in Italy. The house was inaugurated in Angeli in June 2008. The building is three stories high, houses six apartments and was built by Loccioni, an engineering company that is now focusing on energy and environmental issues. The building is known as the “Leaf House” (an acronym for “Life energy and future”) and produces the whole amount of energy that it consumes. Common green building practices were used, such as wall and casing insulation, photovoltaic panels, heat pumps, diaphragm cell electrolysis (to extract hydrogen from water and turn it into electricity for night time and overcast days), and collection of rainwater. (The first zero emission non-residential building in Italy instead was completed in July of 2008 in the town of Bol-

zano. It is built entirely from renewable materials and according to the latest insulation techniques and entirely meets its own energy needs from locally available resources through geothermal and photovoltaic systems).

Poland

Key suppliers are listed in Table below:

Company name	Products offered	Type of business
Valliant Saunier Duval Sp. z o.o.	solar thermal systems solar storage tanks solar regulators solar systems accessories solar collectors-flat and tubular	distributor
Virtus Sun Sp. z o.o.	vacuum tubular collectors heat pump photovoltaic panels	distributor
Ensol Sp. z o.o.	photovoltaic modules inverters solar thermal collectors	manufacturer – supplier
SUNEX S.A.	solar collectors hybrid systems	manufacturer – supplier
Geres Asco Sp. z o.o.	solar collectors solar systems	manufacturer – supplier
Watt S.A.	solar systems solar collectors photovoltaic modules air-heat pumps	manufacturer – distributor
Hewalex Sp. z o.o.	solar collectors solar systems heat pumps	manufacturer – supplier
Caldoris Polska Sp. z o.o.	solar collectors solar systems photovoltaic panels	manufacturer - distributor
Solar-Energy S.A.	photovoltaic panels	manufacturer
Vetro Polska Sp. z o.o.	photovoltaic panels	manufacturer
Hymon Energy Polska	photovoltaic panels	manufacturer
NTS-Energy Sp. z o.o.	heat pumps	manufacturer
Nateo Sp. z o.o.	heat pumps	manufacturer
Solis Sp. z o.o.	heat pumps	manufacturer
Tedimex Sp. z o.o.	heat pumps	distributor
Faco S.A.	boilers for biomass	manufacturer
Eurobiomass Polska Sp. z o.o.	boilers for biomass	manufacturer
Kostrzewa Sp. z o.o.	boilers for pellets	manufacturer
Enecom Sp. z o.o.	boilers for pellets	distributor

Ecologica Sp. z o.o.	boilers for biomass and pellets	distributor
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Spain

The IDAE, Institute for Diversification and Saving of Energy, is under the Ministry of Industry, Energy and Tourism, which provides us with the following information agency.

Business Directory of Renewable Energy. It is a database in which renewable energy companies are represented. There are approximately 2600 registered companies.

Directory of Energy Service Companies. It is a database in which the companies related to the efficiency and energy are represented. There are approximately 1000 registered companies. This database contains contact information, services and geographical scope of market activity. As shown in this latest catalog we refer to partners in three of the most representative associations:

AMI. Association of Facility Management and Services Energéticos

ANESE. National Association of Energy Service Companies

ANFMA. National Association of Manufacturers of insulating materials (in the next box there are certain associated companies)

Key suppliers of energy efficient materials

Czech Republic

KNAUF INSULATION a.s.- heat, sound and fireproof insulations. The company produces and supplies insulations with wide range of use, all fulfilling requirements for energy efficiency, sound and fire resistance at new and reconstructed houses, commercial buildings.

ROCKWOOL s.r.o. – leading worldwide producer of insulations of stone wool. Heat, sound and fireproof insulations from stone wool. ROCKWOOL products propose for thermal insulation of roofs, frontages, partitions, floors, piping and boilers. Its thermo insulation is perfect, it does not burn.

Company URSA CZ s.r.o. is one of the main suppliers of heat, acoustic and fireproof mineral insulations on the Czech market. Product Mineral insulation PureOne by URSA is dedicated for insulations of roofs, frontages and floors.

Saint Gobain Construction Products s.r.o. Largest offer of heat, sound and fireproof insulations of glass wool, basalt wool, extruded polystyrene XPS and newly also expanded polystyrene EPS under one trademark - Isover.

Promat s.r.o. offers products and solutions for fire safety of buildings, it produces high temperature construction and insulation materials, fireproof additional sealing of insulation transmission. Material overview: PROMINA[®] - multipurpose large format boards.

Henkel ČR s.r.o. Ceretherm insulation systems, complex solution for new buildings and also reconstructions of frontages with ETICS. Dedicated for residential and industrial buildings. Product line of Ceretherm insulation system: Ceresit Ceretherm Express.

AGC Glass Europe a.s. Producer of window glass. NEWS at AGC Glass Europe : Toughenable painted glass Lacobel T, Glassiled with LED diodes, Stopray Ultravision 50, Stopray with value $U_g = 1.0 \text{ W}/(\text{m}^2\cdot\text{K})$, AntiBacterial glass (available as Planibel and painted Lacobel).

Deceunick s.r.o. Company Inoutic / Deceuninck is the leading producer of PVC systems for windows and doors and also construction materials – aprons, facing and terrace from a unique composite material - Twinson.

Sulko s.r.o. Specialist for plastic windows – production of plastic and aluminium windows and doors. Company SULKO is a purely Czech company that represents a guarantee of stability, security and flexibility for hundred thousands of clients in the Czech Republic and middle Europe.

Window Holding a.s. - producer of windows covering three major trade marks Vekra, Otherm, TWW. VEKRA is a an important company on the Czech market with vent filling – plastic, wooden and aluminium windows and doors OTHERM – respected trade mark for plastic and aluminium windows.

REMAK, a.s. Producer and seller of ventilation equipment and air-conditioners, roof, radial and axial fans, air heaters, air coolers, door and gate screens.

A- INVENT s.r.o. Decentralized - pipeless – system of controlled ventilation with recuperation – return gain of heat – on the basis of HIGHT-TECH ceramic exchanger. A-INVENT s.r.o. is an exclusive importer of inVENTer for the Czech Republic and Slovakia, it also imports the heat pumps air/water ClimaCubus.

Viessman s.r.o. The comprehensive Viessman programme proposes: heating systems with low level of pollutants for oil and gas, solar systems, heating systems for solid fuels and heating pumps. Provides – sales, consulting, assembly and service of products.

Italy

In recent years there has been in Italy an increased interest in the provision of energy efficient materials and elements to achieve energy and environmental goals. In particular some new companies providing energy services and efficient materials to final energy users, including the supply and installations of energy efficient equipment, and/or the building refurbishment, have started to operate on the Italian market.

What characterises these companies from the traditional energy consultants or equipment suppliers is the fact that they can also finance or arrange financing for the operation and their remuneration is directly tied to the energy savings achieved.

Suppliers of energy services and efficient materials and elements provide a wide range of activities, such as:

- Energy analysis and audits;
- Energy management;
- Project design and implementation;
- Maintenance and operation;
- Monitoring and evaluation of savings;
- Property/facility management;
- Energy and/or equipment supply;
- Provision of service (space heating, insulation materials, lighting, etc.).

Another category of suppliers that offer energy services to final energy users, including the supply and installation of energy-efficient equipment and materials, the supply of energy, and/or building refurbishment, maintenance and operation, facility management, and the supply of energy (including heat), are Energy Service Provider Companies. They may be consultants specialised in efficiency improvements, equipment manufacturers, materials or utilities.

The typical energy efficient project planned by a company/supplier of energy services and efficient materials and equipments includes the following elements:

- Site survey and preliminary evaluation;
- Investment grade energy audit;
- Identification of possible energy saving and efficiency improving actions;
- Financial presentation and client decision;
- Guarantee of the results by proper contract clauses;
- Project financing;
- Comprehensive engineering and project design and specifications;
- Procurement and installation of equipment; final design and construction;
- Project management, commissioning and acceptance;
- Facility and equipment operation & maintenance for the contract period;
- Purchase of fuel & electricity (to provide heat, comfort, light, etc.);
- Measurement and verifications of the savings results;
- Operation and maintenance.

The Italian market of suppliers of energy services and efficient materials and equipments is a well developed one, with a relatively large number of companies. However, there is no national registry of companies offering energy services and efficient materials and elements, and the exact number of the currently operating real energy services and efficient materials suppliers is unknown, however a rough estimate based on the information from Green Building and Energy Associations and other registries suggests the existence of thousands of companies/suppliers of energy services and efficient materials and equipments. There are two major national Associations: AGESI (incorporating around 50 large companies) and ASSOESCO (an association of 35 small and medium sized enterprises operating in the production of materials, building refurbishment, cogeneration and energy distribution in industrial and tertiary sectors). In addition, FEDERESCO is an assembly of around 40 local organizations dealing with various activities in the field of energy efficiency interventions. Considering the market of Tuscany region only, where most of project activities will be carried out, it is estimated that 60% of the energy services and efficient materials and ele-

ments suppliers market value is represented by around 180 small sized companies, 30% of the market is made up of around 120 medium sized companies, and the market is dominated by about 20 large companies. Of all companies, 70% have been active for less than ten years. The major companies are typically subsidiaries of large multinational groups (most of them with French or German origin) and energy service provision is their core business. Lately some of these companies have been evolving towards the facility management services. The smaller companies are mainly manufacturers of equipment and materials.

Poland

Key players on the Polish market are listed below:

Company name	Products offered	Type of business
Technicol Polska Sp. z o.o.	insulation materials and systems	distributor
Atlas S.A.	insulation systems	manufacturer – supplier
Baumit Sp. z o.o.	insulation materials	distributor
Kreisel Sp. z o.o.	insulation materials	distributor
Saint-Gobain Construction Products Polska Sp. z o.o.	insulation materials	distributor
Fakro Sp. z o.o.	windows	manufacturer – supplier
PP Oknoplast Sp. z o.o.	windows	manufacturer – supplier
Thermoplast Sp. z o.o.	windows	manufacturer
Termo Organika Sp. z o.o.	insulation materials	manufacturer – supplier
Fabryka Styropianu Sp. z o.o.	insulation materials	manufacturer
PPH Styropol Sp. z o.o.	insulation materials	manufacturer – supplier
Magbud Sp. z o.o.	insulation materials	manufacturer
Saint-Gobain Polska Sp. z o.o.	insulation materials and systems	distributor

Spain

ANFMA. National Association of Manufacturers of insulating materials

- **IPUR - Asociación de la Industria del Poliuretano Rígido**

Manufacturers of raw materials and Polyurethane Systems

- BASF
- POLIURETANOS IBERIA, S.A.
- BaySystems Iberia - BAYER MATERIALS SCIENCE, S.L. -
- DOW CHEMICAL IBÉRICA, S.L. -
- HUNTSMAN -
- SYNTHESIA INTERNACIONAL, S.L. -

Manufacturers of auxiliary raw materials for polyurethane systems

- ARKEMA -
- HONEYWELL -
- SOLVAY FLUOR -
- EVONIK -

Manufacturers of Polyurethane Sheets

- POLIURETANOS -

Polyurethane Association applicators projected

- ATEPA -

Expanded Polystyrene (EPS)

- ANAPE - Asociación Nacional del Poliestireno Expandido -
- BASF ESPAÑOLA -

Extruded Polystyrene (XPS)

- AIPEX – Asociación Ibérica del Poliestireno Extruído
- BASF CONSTRUCTION CHEMICALS ESPAÑA -
- KNAUF INSULATION -
- TOPOX -
- URSA -

Flexible foams

- ARMACELL IBERIA -
- KAIMANN IBERIA -
- L'ISOLANTE K-FLEX ESPAÑA -
- O.K. COMPANY, S.A. / OVERSEAS KONSTELLATION COMPANY -

SATE (external composite thermal insulation systems)

- ANFAPA (Asociación Nacional de Fabricantes de Morteros Industriales) -
- BAUMIT, S.L. -
- CAPAROL ESPAÑA -
- IVAS SPA a través de su concesionaria exclusiva SUCESORES MAXIM'S, S.L.U -

- MATERIS PAINTS España, S.L. -
- STO SDF IBÉRICA, S.L. -

WINDOWS and other products

- KNAUF GmbH Sucursal en España -
PROFINE IBERIA, S.A.U. –
- KÖMMERLING-
- SAINT-GOBAIN GLASS -
SAINT-GOBAIN WEBER CEMARKSA, S.A.-
- SEFAVE Asociación Española de Fabricantes de Fachadas Ligeras y Ventanas.
- ASOVEN PVC Asociación de fabricantes de PVC de España está formada por: LOS EXTRUSORES DE PERFILES DE PVC: DECEUNINCK, PROFINE KÖMMERLING/KBE, REHAU, VEKA IBERICA y SCHÜCO. Los demás asociados son FABRICANTES y DISTRIBUIDORES ventanas de PVC y EMPRESAS RELACIONADAS con nuestro sector industrial.
- AESFAVEAL Asociación Española de Fabricantes de Ventanas de Aluminio
- ASOMA -Asociación Española de Fabricantes de Ventanas de Madera y Mixta.