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2030

BUILDing
the FUTURE

THE NATIONAL PLANS FOR ENERGY EFFICIENCY

IO2

REPORT



Erasmus+

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The national plans for Energy Efficiency

In this document we present the conclusion of the national plan regarding the Energy Efficiency in the countries Germany, Poland, Spain and Italy. This report is the result of one output from the project "Home 2030" - New Ways in Vocational Training on the "Intelligent Use of Energy in Residential Buildings" which belongs to the Program Erasmus+.

The partners of this project analysed the national strategies for renewable energies. This was the basis to identify some similarities and / or differences. With this we were able to discuss the strategies to find some starting points for the development of the training activity in this project. The main objective is to create a new course with modern methods of education in the field renewable energies.

In the following first of all you will find the descriptions of the national plans of Germany, Poland, Spain and Italy. At the end of the report you will find a conclusion.

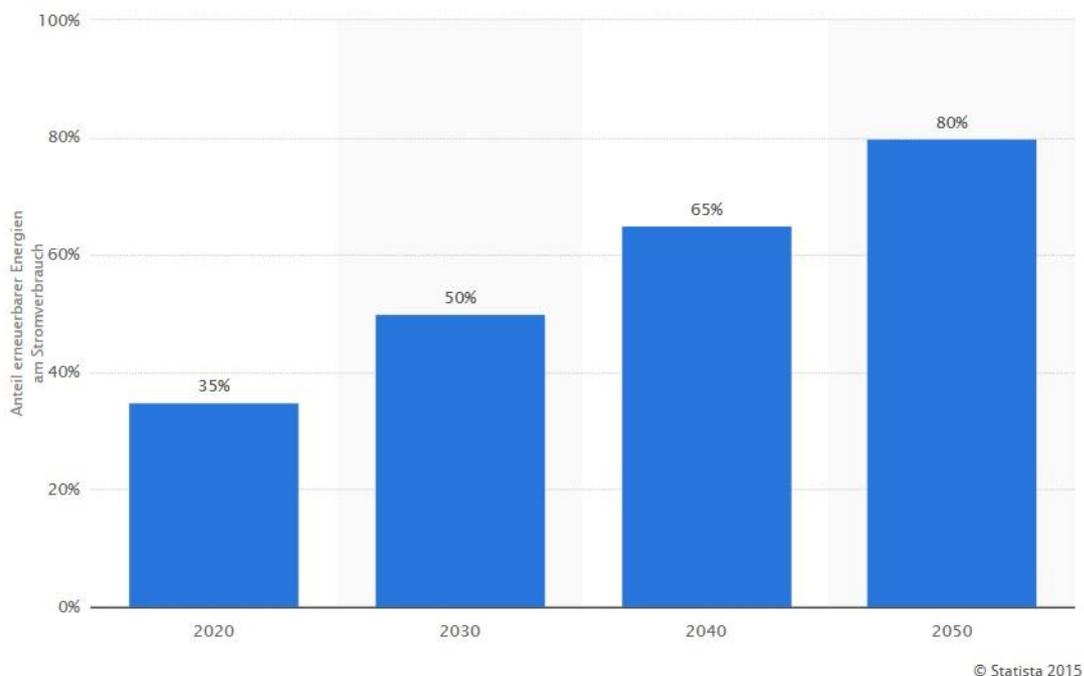
Germany

The „energy turnaround“ in Germany

The term „energy turnaround“ represents the emergence into the era of renewable energy and energy efficiency. The German Government has decided that the power supply in Germany should predominantly be ensured through renewable energies until the year 2050. This demand implies a fundamental modification of the systems of power supply which bears an economical and technological challenge for Germany.

Currently the power supply is mainly based on fossil energy sources. In 2011 the share of renewable energies was at 20 percent. The combustion of fossil energy sources releases climate-damaging gases. About 80 percent of greenhouse gas emissions arise from the actual structure of power supply. Therefore, the fundamental modification of the structure of power supply plays a central key role for the goal achievement of climate protection.

Here you can see the target for the following years:



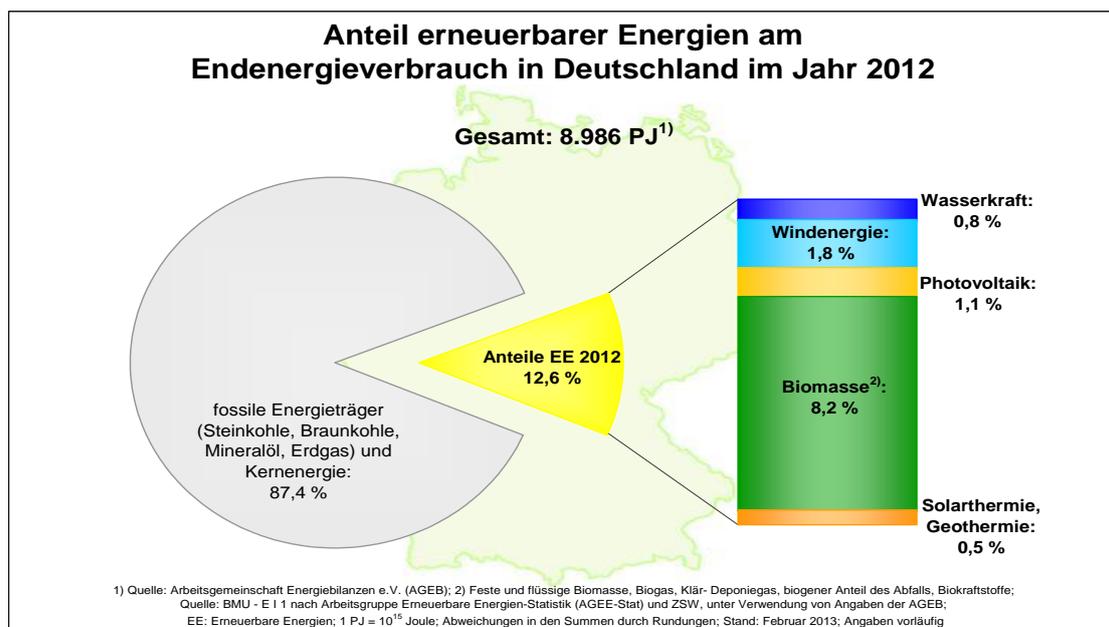
How to reach this goal?

What are the most important fields of action for the realization of “energy turnaround”?

The following fields of action which are defined in the energy concept provide the basis for the energy policy of the German Government:

- renewable energies as a mainstay for future power supply
- key issue of energy efficiency
- efficient network infrastructure for electricity and the integration of renewable energies
- energy-saving measures of buildings and energy-efficient construction
- challenge of mobility
- acceptance and transparency

(Indication of source: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.)



Graphic 1: Share of renewable energies in relation to the energy consumption in 2012 in Germany.

Indication of source: workgroup renewable energy – statistic (AGEE-Stat), February 2013.

What is the status of the “energy turnaround” in 2015?

Renewable energies have a percentage of 27,8 % of the whole energy consumption.

148 million tons of greenhouse gas are evaded.

The acts relating to the renewable energies control the cost of energy and integrate the renewable energies. Everybody in Germany has to take a part in the “energy turnaround”.

Energy efficiency has to be part of the national strategies.

For the use of renewable energies it is necessary to build new power supply systems. The reason is that the energy is produced in the north of Germany and the consumption is in the south of Germany.

One of the greatest challenges is the energy storage. Therefore, the German Government has developed many projects of the universities and vocational training centres to develop this technology.

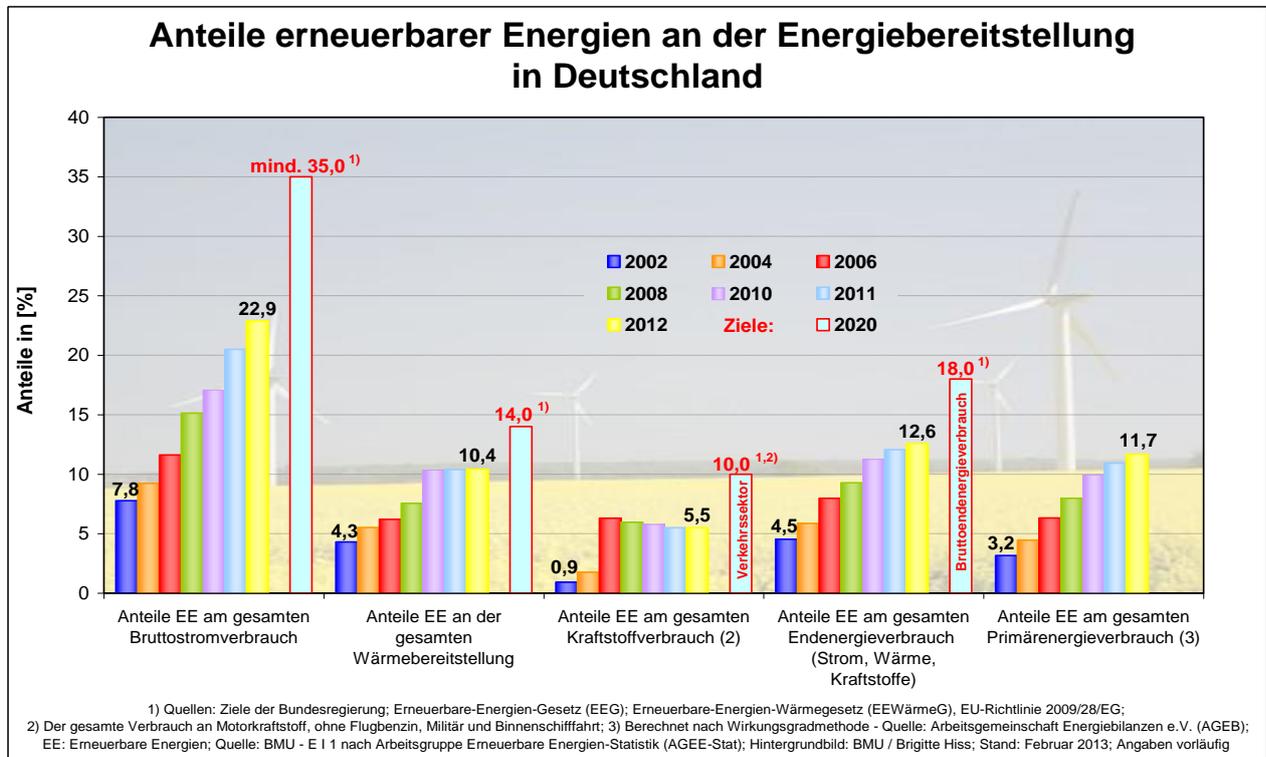
The traffic sector – public and individual transport – has to change the resources of energy. The main target is that in the year 2020 1 million vehicles use electricity.

Chosen instruments of „energy turnaround“

Aim of the German Government is that renewable energies constitute the largest part of power supply.

The following aims have a legal basis: By the year 2020 the share of renewable energies from the overall energy consumption should be increased by as much as 35 percent. By the year 2050 this share should amount to 80 percent. Concerning the whole of heat supply the share of renewable energies should be 14 percent in 2020 (see graphic 2).

(Indication of source: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.)



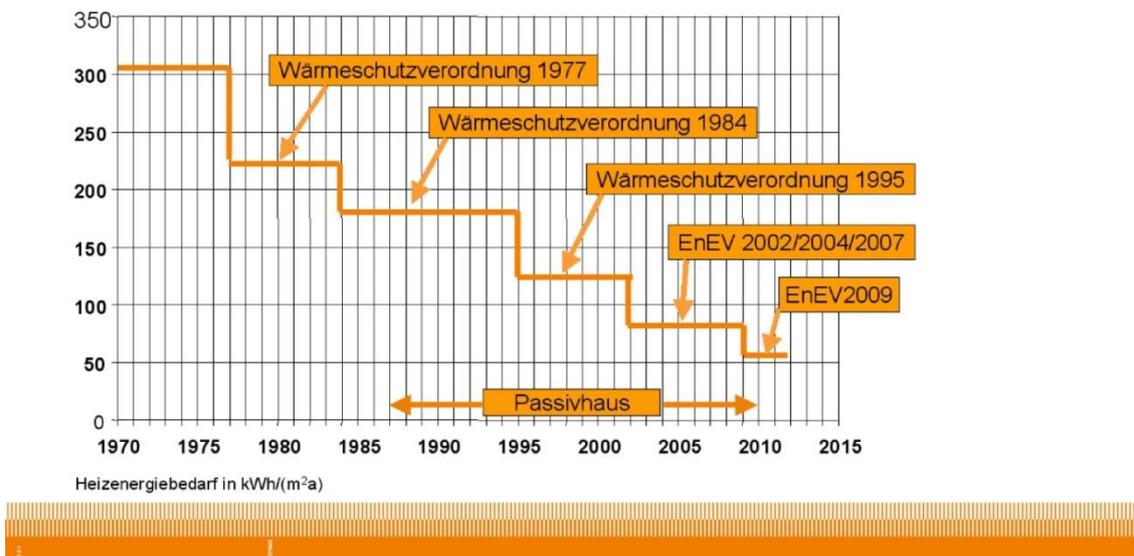
Graphic 2: Share of renewable energies regarding the energy supply in Germany.

Indication of source: workgroup renewable energy – statistic (AGEE-Stat), February 2013.

The German Government has been developing different instruments to accomplish these objectives. There are defined maximum limits of energy consumption and furthermore there are usage-dependent duties of renewable energies in sector electricity and thermal energy.

Among other things the energy conservation regulations (EnEV), the Renewable Energies Act (EEG) and the (German) Renewable Energy / Energies Hat Act (REHA) belong to these. In all of these instruments there are numerous connecting factors for day-to-day work in craft enterprises (see graphic 3).

Entwicklung der rechtlichen Anforderungen im Neubau

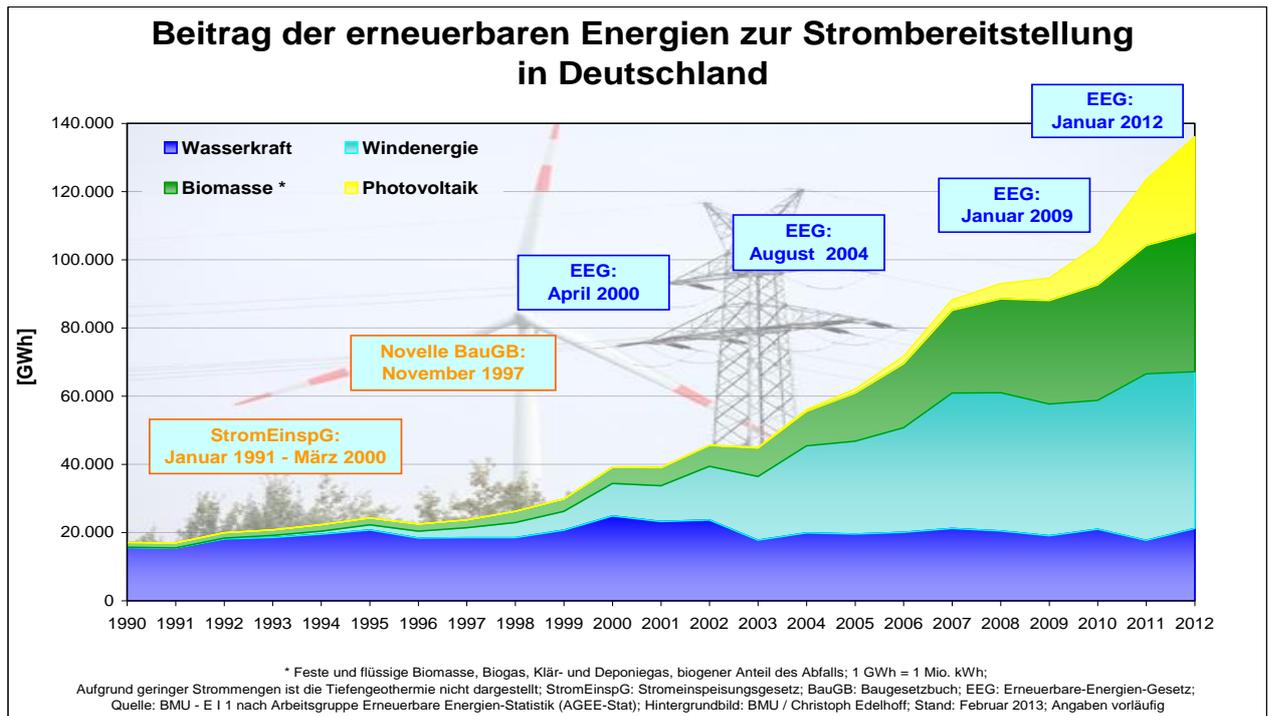


Graphic 3: Development of the legal requirements in the sector new buildings.

Indication of source: Energy Agency NRW.

The graphic shows the levels of requirements of energy consumption of dwelling houses. It illustrates the constant reduction of maximum limits in the section energy demand of heating. The attainment of a passive house standard is once more a possibility but isn't established by law (see graphic 3).

In the year 2000 the Renewable Energies Act (EEG) was established to promote the expansion of renewable energies. It obligates network operator priority to take electricity off renewable energies and to pay fixed prices. These instruments were highly efficient. Since their implementation registers a strikingly increased electricity generation (see graphic 4).



Graphic 4: Contribution of renewable energies for provision of electricity in Germany.

Indication of source: workgroup renewable energy – statistic (AGEE-Stat), February 2013.

In January 2009 the (German) Renewable Energy / Energies Hat Act (REHA) became applicable with the objective to advance the heat production out of renewable resources. It prescribes the partial usage of renewable energies for the producing of heat and/or cold in sector new building of (non) dwelling houses. This obligation also applies to existing public buildings if they will be restored in a vast size.

Poland

1. Energy turnaround in Poland

The development of the renewable energy sector is one of the priorities for the Polish Government - according to Directive 2009/28/EC, all EU Member States should gradually increase the share of energy from renewable sources in total energy consumption and the transportation sector.

The specific objectives of the Polish energy policy are as follows: to increase the proportion of energy from renewable sources in final energy consumption up to 15.5% in 2020 (19.3% for electricity, 17% for heating and cooling, 10.2% for transportation fuels). Achieving these objectives requires investments in new generation capacities. Wind energy and the use of biomass for energy purposes are currently the most dynamically developing renewables.

In 2001 renewable energy constituted only 2.4%, 2002 – 2.5%, in 2003 – 2.65% and in 2010 – 7.7%. In 2010 Poland prepared and submitted its National Renewable Energy Action Plan (NREAP) to the European Commission fulfilling its obligations deriving from art. 4(1) of Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources.

The main goal of the NREAP is to outline a path of Poland to achieve its renewable energy target by 2020 set by the EU. By 2020 Poland is obliged to increase its share of renewable energy of the total annual energy consumption to 15.5% (as set forth above).

The document includes national policies, support schemes, financial and non-financial incentives for green energy producers. It states that in regard to the Polish energy resources it is essential, that the most important components of the Polish renewable energy mix would be biomass and wind. Hydro energy development, in particular small hydro power facilities will continue to be a significant part of this energy mix. It is assumed that the geothermal resources and solar energy for heating will be used to a much greater extent.

The sectoral targets for 2020 include:

- RES-heating and cooling (district and non-district systems): 17,05%
- RES-electricity: 19,13%

- RES-transport: 10,14%

The national objective for 2020 provides a plan of the use of energy produced from renewable sources in heat engineering, refrigeration, power engineering and transport (Table 1).

Table 1. Plan of the use of RES in different sectors.

Specification	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
RE - heat engineering, refrigeration [%]	12.29	12.54	12.78	13.05	13.29	13.71	14.39	15.02	15.68	16.50	17.05
RE – power engineering [%]	7.53	8.85	10.19	11.13	12.19	13.00	13.85	14.68	15.64	16.78	19.13
RE - transport [%]	5.84	6.30	6.76	7.21	7.48	7.73	7.99	8.49	9.05	9.59	10.14
Total share of renewable energy [%]	9.58%	10.09	10.60	11.05	11.45	11.90	12.49	13.11	13.79	14.58	15.50

Source: National Renewable Energy Action Plan

The following table presents the number and efficiency of the systems producing energy from renewable sources in Poland (Table 2).

Table 2. Number and efficiency of the RES systems in Poland.

	Numer of power plants	Total power in 2010 [MW]	Energy produced in 2007 [GWh]	Energy produced in 2008 [GWh]	Energy produced in 2008 [GWh]
Biogas power plants	136	79.478	195.2	251.6	319.2
PV solar power plants	2	0.012	NDA	NDA	NDA
Water power plants	737	948.363	2 352.1	2 152.2	2 375.1
Biomass power plants	16	259.490	2 34.2	236.5	243.5
Wind power plants	378	1095.587	521.6	836.8	1 077.3
Power plants realizing co-incineration	41	N/A	2 126.2	2 963.3	4 663.8
Polish power engineering system	-	35 850	154 170	154 891	148 718

Source:

http://zielonytelefon.eco.pl/index.php?option=com_content&view=article&id=101&Itemid=97

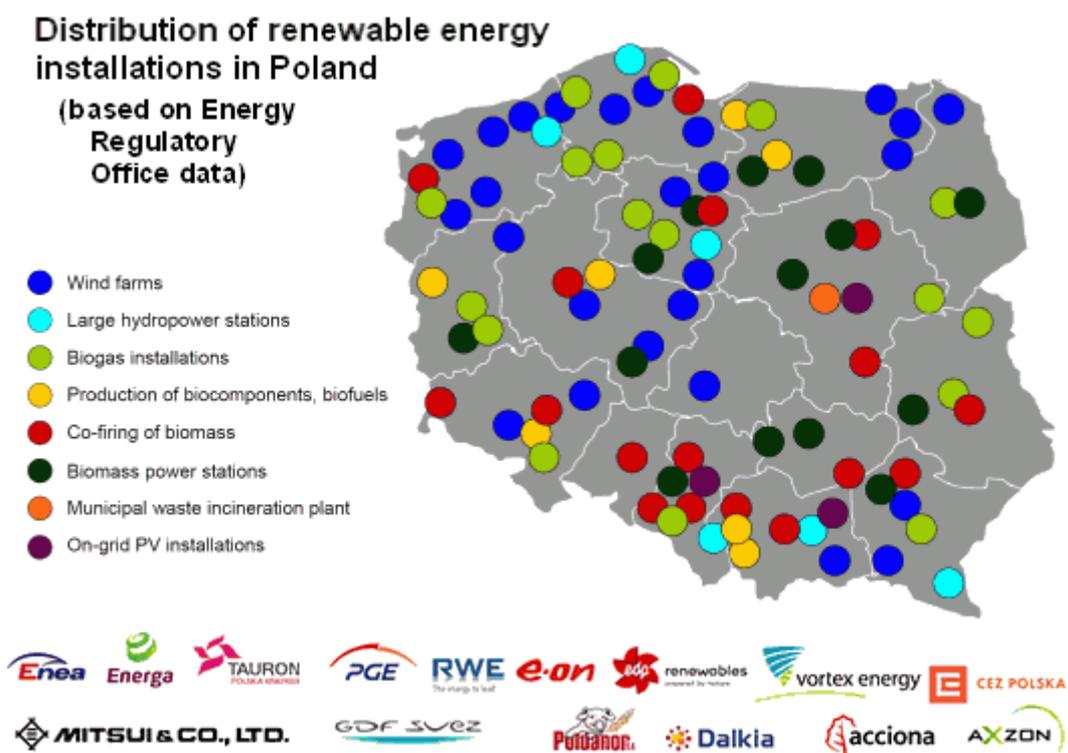
It is worth mentioning that according to EurObserv'ER Poland is ranked 5th in the EU in terms of production of primary energy from solid biomass. Poland is also a leader among the new EU member states in terms of total installed capacity of wind farms. The number of individual types of installations as well as their distribution in the country are presented in Table 3 and Map 1.

Table 3. Renewable energy installations (electricity).

Type of installation	Quantity	Power (MW)
biogas power stations	207	136.319
biomass power stations	29	876.108
photovoltaic power stations	9	1.289
wind power stations	743	2644.898
hydroelectric power stations	771	966.236
co-fired technology	41	n/a

Source: Energy Regulatory Office (as of 31.03.2013).

Map 1. Distribution of renewable energy installations in Poland.



The potential of renewable energy gained from different sources is presented in Table 4.

Table 4. Potential of renewable energy in Poland.

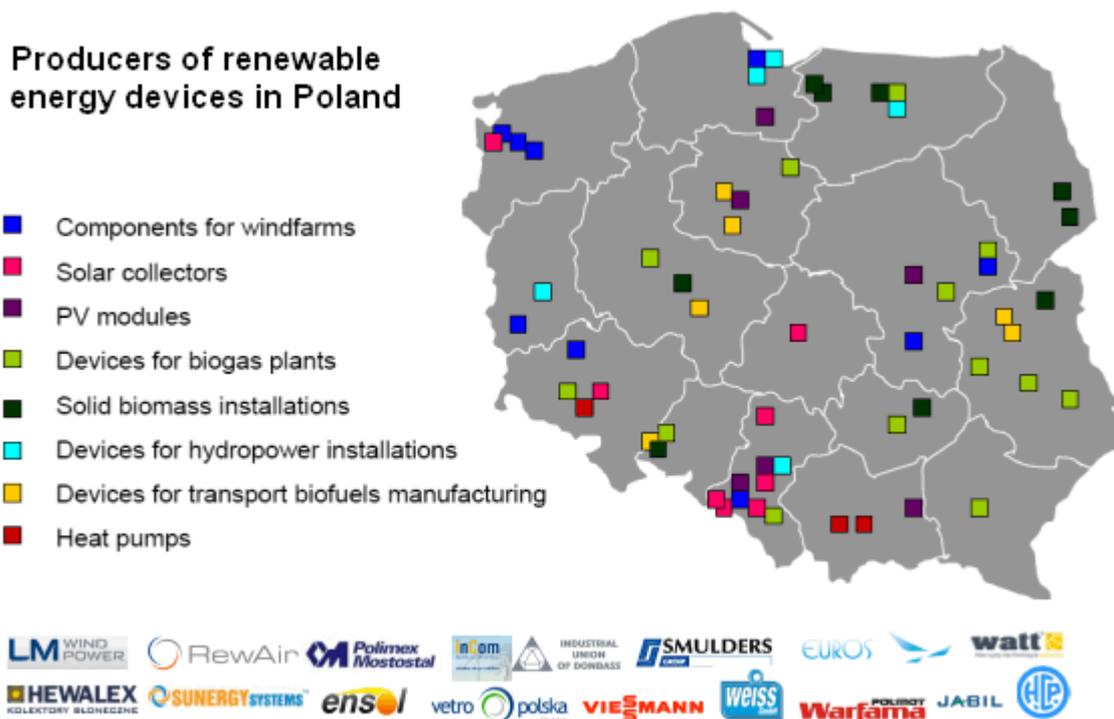
Type of renewable energy source	Real economic potential - final energy	Utilization of economic potential in 2020 (real market potential)	
	[TJ]	[TJ]	[%]
Biomass:	600.167,8	533.117,5	88.8
solid dry waste	165.930,8	149.337,7	90.0
biogas (liquid waste)	123.066,3	72.609,1	59.0
wood (forests)	24.451,8	24.451,8	100.0
Energy crops	286.718,9	286.718,9	100.0
Wind energy	444.647,6	119.913,3	27.0
Solar energy:	83.312,2	19.422,2	23.3
thermal	83.152,9	19.262,9	23.2
photovoltaic	159.3	159,3	100.0
Hydropower	17.9744	11.144,2	62.0

Source: Possibilities of using RES in Poland until 2020, Institute of Renewable Energy.

The most active foreign investors are Vortex, EDP, RWE, E.ON, CEZ, GDF Suez, Mitsui & J.Power, Acciona (wind farms), Dalkia (biomass combustion), Poldanor, AXZON Group (biogas plants). The Polish players are also investing in renewables e.g. Enea, Energa, Tauron, PGE.

Poland is gradually becoming an attractive destination for investments in manufacturing of devices used in energy generation. There are estimated to be more than 200 production companies working for the renewable energy sector (Institute for Renewable Energy data).

Map 2. Producers of renewable energy devices in Poland.



The key drivers of renewable energy sector development in Poland include:

- dynamic economic growth in recent years, growing number of business entities and domestic market of 38 million consumers,
- demand for green energy will grow due to the energy policy objectives: increase of the proportion of energy from renewable sources in final energy consumption up to 15.5% in 2020 (19.3% for electricity, 17% for heating and cooling, 10.2% for transport fuels),
- the need to reduce the amount of municipal biodegradable waste that may be landfilled to 35% by 2020, and the construction of thermal waste treatment plants,
- plans to build agricultural biogas plants in each Polish municipality by 2020,
- Favourable natural wind conditions, a large potential for obtaining biomass and biogas,
- investment incentives for renewable energy producers.

2. National energy politics

Table 5. Production of electric power by carriers.

Specification	2010		2011		2012	
	GWh	%	GWh	%	GWh	%
Black coal	87 941	55.8	87 326	53.4	80 596	49.7
Brown coal	48 651	30.9	52 529	32.1	54 054	33.3
Natural gas ¹	4 797	3.0	5 821	3.6	6259	3.9
Other fuels ²	4 812	3.0	4305	2.6	3923	2.4
Pumped water	568	0.4	430	0.3	428	0.3
Renewable energy	10889	6.9	13137	8.0	16879	10.4
including:						
- biomass and biogas	6 305	4.0	7601	4.6	10094	6.2
- hydropower	2 920	1.8	2331	1.4	2037	1.3
- wind power	1 664	1.1	3205	2.0	4747	2.9
- photovoltaic cells	-	-	-	-	1	0.0
TOTAL	157 658	100.0	163 548	100.0	162 139	100.0
¹) methane-rich and nitrogenated natural gas, gas produced during demethanization of mines, associated petroleum gas ²) heating and diesel oil, industrial gas, non-organic industrial and municipal waste						

Source: Agency of Energy Market's yearbook "Statistics of Polish power engineering".

Improvement of energetic efficiency, increase in the safety of delivery and development of competitive markets of fuels and energy, introduction of nuclear power, greater use of renewable energy sources and limitation of the influence of power engineering on the environment constitute priorities of *Energy Policy of Poland*

Until 2030 elaborated by the Ministry of Economy. The document was adopted by the Council of Ministers on 10 November 2009. It describes mechanisms that are supposed to encourage the development of renewable energy sources, e.g.:

- Exempting electric energy produced from renewable energy sources from excise;
- Energy origin certificates and other mechanisms supporting enterprises generating energy from renewable energy sources;
- Tax mechanisms;
- Supporting projects connected with renewable energy sources from EU resources and funds for environmental protection.

In order to achieve the main objectives of *Energy Policy*, it is important to take the development of renewable energy engineering into account. Energy generation from renewable resources ensures positive ecological effects and will contribute to the development of less economically developed regions. The document set the following goals: increasing the use of renewable energy sources in the final energy use to at least 15% in 2020 and 20% in 2030; Increasing the share of biofuels in the market of transport fuels to 10% by 2020, and increasing the use of second generation biofuels.

The main activities will be directed at reducing CO₂, SO₂ and NO_x emission in line with the commitments assumed by Poland. The main goal here will be to reduce CO₂ emission by the amount possible without jeopardizing energetic safety.

On 11 March 2015 President Bronislaw Komorowski signed the act on renewable energy sources in the version passed by *the Sejm* (chamber of Polish parliament) on 20 February 2015. The act was adopted after nearly five years of work and will come into force following 30 days from the day of publishing, whereas the provisions concerning the system of power exchange and feed-in-tariffs will come into force starting from 1 January 2016.

The objective of the act is to guarantee long-lasting development of the economy with simultaneous increase in the energetic safety and environmental protection. A considerable part of the act's provisions concerns new forms of supporting feed-in-tariffs which ensure prosumers sales of electric energy produced in small home renewable energy sources systems at prices guaranteed for 15 years. The second

key change in relation to the currently binding provisions supporting renewable energy sources is a change of the system of energy origin certificates to the system of power exchange. Furthermore, the act introduces a so-called renewable energy sources fee. In compliance with the act, the cost of extra charges for production of green energy will be borne by final recipients and will be included in the bills for electricity.

The Polish government supports energy production from renewable sources in different ways:

- Investment incentives for renewable energy manufacturers (system of color certificates),
- Energy-related enterprises engaged in trading and sales of electric energy are obliged by the law to purchase energy produced from renewable sources,
- Manufacturers of renewable energy have a priority access to transmission grids,
- Electric energy produced from renewable sources is exempted from excise,
- The fee for a connection to the network for small systems (<5 MW) is reduced by 50%. This type of system is exempted from the license fee and annual fee paid by license holders,
- Investments in clean energy may be part-financed by the Fund for Environmental Protection and Water Management.

Currently, the requirements for thermal protection of newly designed residential buildings are specified in the Regulations of the Minister of Infrastructure as of 12 April 2002 on the technical conditions that shall be met by building and their location (Dz. U. Nr 75, item 690, as amended).

At the beginning of 2014, amended technical conditions for building became binding. The amendment of the provisions is aimed at gradual (apportioned for a few years) decreasing of the demand of building for heat and increasing the use of energy produced from renewable sources. It is extremely important that now buildings need to meet the requirements concerning the permissible value of PE

(annual demand for non-renewable primary energy) and the minimum thermal insulation capacity of external building envelopes (walls, floors, roofs, ceilings, windows and doors) and wires (central heating and hot water tanks systems). Hitherto, it was necessary to meet one of these two requirements. It is a great challenge for designers, because the value of PE rate for a house is determined by numerous factors, such as: thermal insulation, ventilation methods, the kind of fuel used for heating and even its location.

3. Energy efficiency and „Smart Home“ (heating/ventilation/air condition, electrics, e-mobility)

Energy efficiency in Poland

During the last 10 years, great progress in scope of energy efficiency has been observed. Energy consumption of GDP has decreased by almost 1/3. Polish achievements mainly include: thermal modernization undertakings carried out under the act on supporting thermal modernization undertakings, modernization of street lighting and optimization of industrial processes.

However, energy efficiency of the Polish economy is by 3 times lower than in the most developed European countries and approx. twice lower than the average for EU member states. Furthermore, consumption of primary energy in Poland referred to the number of population is almost by 40% lower than in the countries of EU-15.

a) Act on energy efficiency

Main objectives include:

- Fulfilling the national objective in scope of economical energy management equaling 9% of final energy savings until 2016;

Table 6. Overview of objectives in scope of energy saving and gained savings (in the sectors of final energy use).

	Objective in scope of final energy saving		Gained and assessed final energy savings (2016)	
	Absolute value (GWh)	Share – in relations to average consumption in 2001-2005 (%))	Absolute value (GWh)	Share – in relations to average consumption in 2001-2005 (%))
2010	11 878	2	41 972	7
2016	53 452	9	67 211	11

- Since 1 January 2013, there is a supporting mechanism – a system of white certificates guaranteeing financial benefits for undertakings contributing to improvement of energy efficiency

Entities subject to these regulations:

- Final recipients, ie. in compliance with Directive 2006/32/EC: natural persons or corporate bodies purchasing energy for their own use;
- Enterprises providing means of improvement of energy efficiency;
- Enterprises engaged in the sales of electric energy, heat or natural gas to final recipients who have an access to the grid in the territory of the Republic of Poland.

One of the tools of supporting development of renewable energy and energy saving is National Smart Specializations listed by the Ministry of Economy. The following issues will be financed: sustainable energy production (renewable energy, prosumer, energy generated from waste, alternative fuels and environment protection, energy systems in buildings), natural resources and waste management (including innovative technologies of recovery and energy recycling).

Smart Home Products

Functionalities commonly used in residential buildings include: lighting control systems, arranging lighting scenes, automatic control of blinds and curtains; heating, ventilation and air conditioning control – thermal comfort; access control with different degrees of advancement; monitoring of parameters of device performance; monitoring and registration of events; cooperation with systems of security systems alarming about burglary or assault; fire sensors, etc. In larger buildings, these functionalities are integrated and constitute a unified building management system (BMS).

Italy

Energy turnaround in Italy

The national and international scenario in the current period is difficult and uncertain. The economic crisis has affected all western economies, and Italy is one of the hardest hit. A priority for the Country is to resume sustainable growth – sustainable from both the economic and the environmental perspectives.

The energy sector has a fundamental role to play in the growth of the economy and of Italy, both as a facilitating factor (having energy at competitive costs, with a limited environmental impact and a high quality is a prerequisite for the development of our businesses and for families), and as a growth factor in itself (just think of the potential of the green economy). Achieving a more competitive and sustainable energy is therefore one of the most significant challenges for Italy's future.

Renewables are a core element in achieving the goals of the Energy Strategy.

The basic decisions are to:

- Exceed the European 20-20-20 targets for renewables output, striking a better balance between different energy sources (with a greater focus on renewables for heating and cooling).
- Achieve economically sustainable development in the sector, with incentive costs aligned to European levels and support for a gradual move to grid party.
- Give preference to technologies with greater spin-offs for the sector and for the Italian economy as a whole.
- Gradually integrate renewable electricity with the electricity market and the grid.

In terms of quantitative targets, the intention is for renewables to account for 19-20% of gross final Consumption (compared to the European objective of 17%), equal to an annual 23-24 MTOE of final energy. This will enable a reduction in emissions of up to 50 million tons of CO₂.

More specifically, as regards the electricity sector:

The goal is to develop renewables so that they account for 34-38% (and potentially more) of final consumption, which equals to about 120-130 TWh/year or 10-11 MTOE. This would make production from renewables the leading component in the electricity generating mix in Italy, at par with, or exceeding, gas.

In terms of the technology mix, it's envisaged to follow the dynamics of development planned in the National Action Plan (NAP), except for solar technology, which has had, and will continue to have, a much more rapid development.

In doing this, it's essential and possible to keep the incremental burden in consumers' bills down by accompanying the increase of renewable energy volumes with progressively decreasing incentives proportionate with (decreasing) technology cost and in line with other lead countries in Europe. Overall, to achieve the 2020 targets, up to about € 11.5 -12.5 billion are being made available each year (at the end of 2012 ~10.5 billion were already committed), over a 20-year period. The remaining resources will be allocated on the basis of priority criteria that favour efficiency, technological innovation, lower environmental impact and the national supply chain.

As regards the heating and cooling sector:

The goal here is to bring renewables production up to 20% of final consumption by 2020 (compared to the 20-20-20 target of 17%). This would amount to about 11 MTOE/year.

Achieving the goal is related to the replacement of a part of existing plants fuelled by conventional fuels, to new installations and to the evolution of the integration obligations of renewable energy in buildings. The suggested dimension of the interventions also implies, provided it is cost-effective, the development or expansion

of network infrastructure for the deployment of renewable heat - through the activation of a guarantee Fund - and the establishment of a statistical system, with the spread of systems for measurement and metering of heat. In the coming years, the activity will therefore be aimed at a broad development of technologies such as biomass boilers, heat pumps, solar thermal, etc. (the most recent market surveys suggest an increase in production from biomass heating with respect to the National Action Plan's initial estimates).

To rationalize and provide continuity to the support mechanisms, a Heating Account has been introduced to incentivize small-scale projects, with up to approximately €900 million/year being made available. The planned instruments to support district heating networks will also be activated.

Turning to the transport sector:

Italy has confirmed the 2020 European consumption target of 10% for biofuels, which amounts to about 2.5 MTOE/year. We will push as strongly as possible for the adoption of second generation biofuels while preserving however the investments already made on the production of first generation biofuels. In terms of system costs, in view of the price differential for biofuels the impact by 2020 could amount to around €1 billion/year.

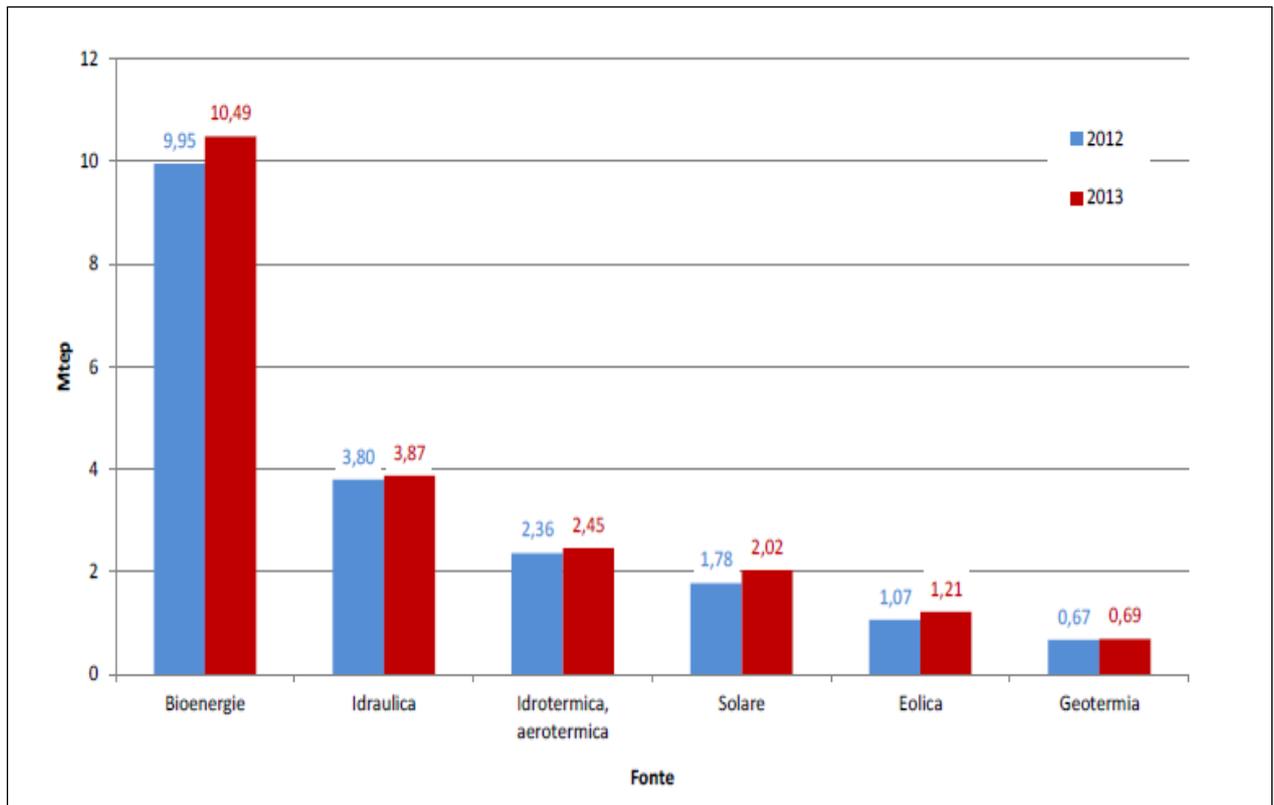


Figure 1 - Contribution of individual sources to the total consumption of energy from renewable sources

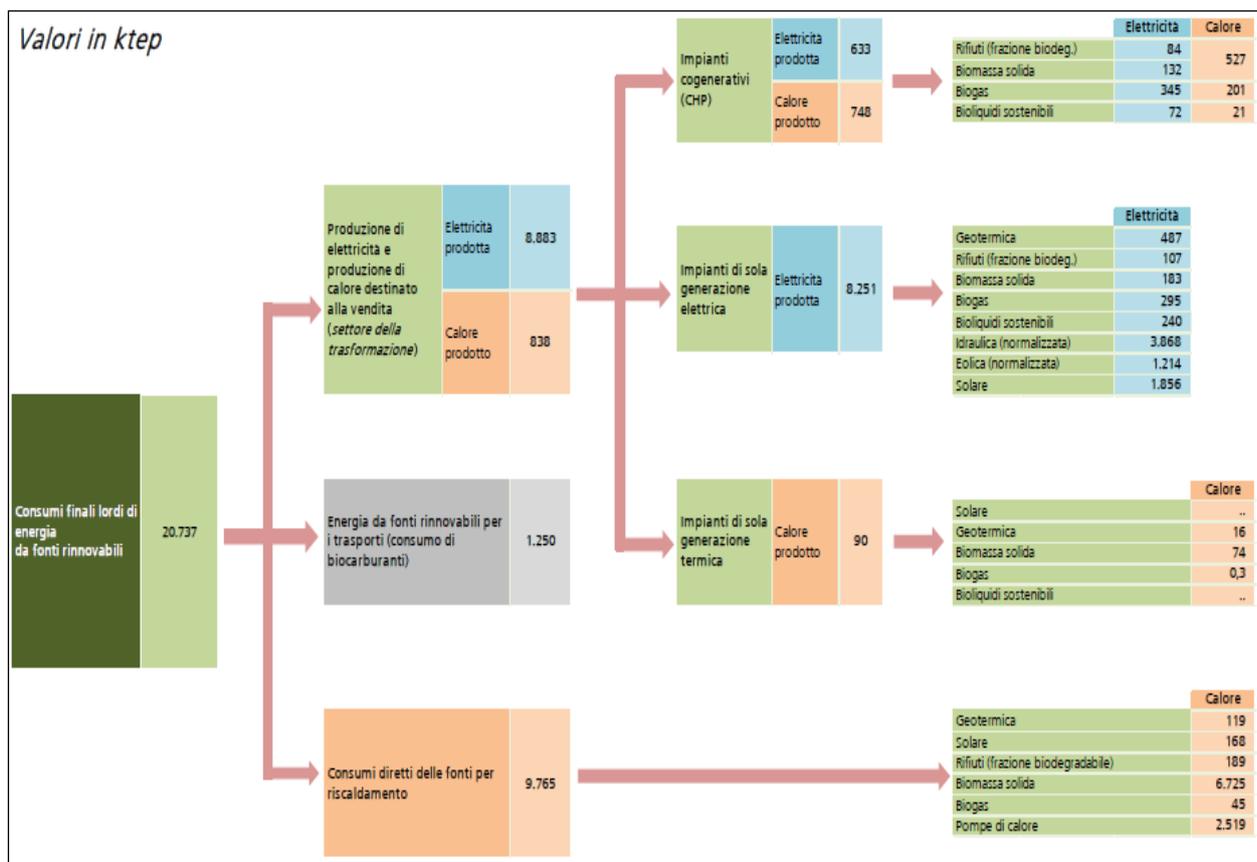


Figure 2 - Composition of the final consumption of energy from renewable sources in 2013

National energy policies and energy efficiency in the building sector in Italy

The building sector will be key to achievement of the targets set by Italy to 2020. The National Energy Strategy (NES) intends to reach its ambitious energy saving targets by strengthening existing instruments and possibly introducing new measures. In particular, the following actions are planned:

- strengthening of the minimum energy standards for constructing new buildings and renovating existing ones, in order to progressively increase the number of nearly zero energy buildings, in line with the provisions of Directive 2010/31/EU (EPBD recast);
- consolidation of tax deductions, especially in the sector of residential-services sector renovations, which must be updated to boost their effectiveness and cost/benefit ratio;

- strengthening of incentives for the renovation of government buildings, which should set the example for the whole sector of energy efficiency in buildings;
- strengthening of the targets of the White Certificates scheme, which is mainly designed for the industrial sector but can play a major role in raising the economic operators' awareness of energy efficiency issues.

This paragraph sets out the national framework of actions to implement the energy efficiency targets in buildings laid down in the NES and in Directives 2010/31/EU and 2012/27/EU.

Legislative framework for improving the energy performance of buildings

Over the past decade, energy policies have evolved significantly: new legislation and methodologies have introduced technical-regulatory measures to promote the rational use of energy and assess the effectiveness of policies. Directive 2002/91/EC, also known as the EPBD (Energy Performance of Buildings Directive), was issued to improve energy performance in the civil sector, which for many years has been the greatest consumer of end-use energy and the largest source of greenhouse gases in Europe and Italy. The Directive was implemented in Italy by Legislative Decree No 192/2005 as amended and supplemented.

Directive 2010/31/EU, also known as "EPBD recast", updated the principles relating to the improvement of energy performance of buildings. The Directive was transposed in Italy by Decree Law No 63/2013, converted by Law No 90/2013. Among other novelties, the EPBD recast has introduced a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings. Under the Directive, Member States must establish minimum energy performance requirements for buildings or building elements, with a view to achieving optimal cost/benefit ratios.

The national legislative framework for increasing the energy efficiency of buildings is quite varied. The decrees implementing Legislative Decree No 192/2005 and Decree-Law No 63/2013, converted into Law by Decree No 90/2013, are key acts which updated the regulatory framework and established criteria and procedures for nearly zero-energy buildings (NZEB). Other relevance measures are Legislative

Decree No 115/08 on energy services and Legislative Decree No 28/2011 on renewable energy sources. Details are provided below on the key Decrees for the energy efficiency of buildings issued in 2013 and on Legislative Decree No 28/2011 which transposed Directive 2009/28/EC on the promotion of the use of energy from renewable sources.

Decree Law No 63/2013

On 3 August 2013, Law No 90 was issued, amending and converting Decree Law No 63 of 4 June 2013 "Urgent provisions to implement Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010, on the energy performance of buildings". The first 13 articles of the Law introduce several amendments to Legislative Decree No 192/2005 to align it with Directive 2010/31/EU. Below is a summary of the main novelties introduced by the Law, which will be followed by technical implementing decrees.

1. New concepts

The Law introduces the concepts of nearly zero-energy buildings, system boundary, energy produced on site (energy produced or collected within the boundaries of the system) and cost optimal level.

2. Methodology for calculating the energy performance of buildings

The energy performance calculation method is updated on the basis of Standard UNI TS 11300, part 1, 2, 3 and 4 and Recommendation 14 of the CTI (Italian Thermo technical Committee).

3. Minimum energy performance requirements

The requirements will be defined on the basis of the technical and economic assessments deriving from application of the comparative method laid down in Regulation EU No 244/2012 and will be updated every five years on the basis of the following criteria:

- The minimum requirements comply with technical and economic cost-effectiveness assessments, based on the cost/benefit analysis of the economy lifecycle of the buildings;

- For new buildings and major renovations, the requirements are established by using the reference building, on the basis of the type of building and climate zones;
- To assess compliance with energy performance requirements, specific building parameters are established (thermal performance and transmittance indices) as well as overall parameters (overall energy performance indices, expressed both in total primary energy and in non-renewable primary energy).

4. Energy Performance Certificate (EPC)

The Law introduces the requirement when selling or letting a property to enclose the EPC with the sales or letting agreement. The EPC must include a set of information and indicators including:

- Overall energy performance of the building in terms of total primary energy and non-renewable primary energy using the respective indices;
- Energy rating calculated by means of the building's overall energy performance index expressed in non-renewable primary energy;
- Minimum energy efficiency requirements under the law;
- CO2 emissions;
- Exported energy;
- Recommendations for improving the building's energy efficiency with proposals for the most effective and cost-effective actions;
- Information such as energy audits and financial incentives.

5. Nearly zero-energy buildings (NZEB)

Starting from 1 January 2019 new buildings owned or occupied by public authorities must be NZEB. All the other new buildings must be NZEB from 1 January 2021.

6. Other eligibility factors

The Decree updates the system of penalties and extends the deadline for the 50% tax deduction on renovations, extending the deduction to furnishings and raising the deduction rate for energy upgrading from 55% to 65%.

Presidential Decree No 74/2013

Presidential Decree No 74 of 16 April 2013 established the new rules concerning the operation, management, control, maintenance and inspection of heating, cooling and hot water systems in buildings. The Decree lays down a set of obligations and criteria applicable to public and private buildings. They include in particular:

- New ambient temperature limit values for cooling and heating in all buildings;
- Changes in the periods and duration of operation of winter heating systems;
- Revised general criteria, requirements and responsible parties for the operation, management, control and maintenance of heating and cooling systems;
- The procedures and criteria for performing checks and maintenance on the installations, which can only be done by authorized firms in accordance with Ministerial Decree No 37/08;
- The competent Regional authorities in cooperation with the local authorities shall be responsible for performing energy efficiency checks, verifications and inspections on heating/cooling systems, and for establishing the criteria to be used for those checks;
- The Regions in cooperation with local authorities shall set up their registers of technical systems. They will also establish Regional registers of energy performance certificates, favouring their connection with the other Regions' registers;
- Programmes will be implemented for the professional qualification and updating of heating/cooling system inspectors, as well as programmes for the annual conformity check of inspection reports;
- Organization of information and awareness-raising campaigns aimed at the general public.

Presidential Decree No 75 of 16 April 2013 lays down the professional requirements and accreditation criteria to ensure the qualification and independence of the experts and bodies to be tasked with the energy certification of buildings. The Decree identifies the following approved certifying parties:

- Approved technicians holding the appropriate educational qualification (for details see Article 2 of the Decree) as well as the professional qualification;
- Public entities and bodies governed by public law operating in the energy and building sectors, which run the certification service via one or more qualified in-house technicians;
- Public and private bodies duly authorized to perform inspections the following sector: building, general civil engineering works and associated technical systems, approved by the Italian National Accreditation Body (ACCREDIA) or other equivalent European body (provided they operate with qualified technicians);
- The energy services companies (ESCOs) operating in accordance with the provisions implementing Directive 2006/32/EU on energy end-use efficiency and energy services, which deliver this service via qualified technicians.

The Decree provides for training courses for the issue of professional qualification to be held at national level by universities, research bodies and agencies and professional bodies and councils authorized by the Ministry of Economic Development and at regional level by the Regions and Autonomous Provinces, or by other regional-level authorized bodies. The Decree also sets out the minimum contents of the courses. The criteria for checking the quality of service are also established. They include document checks on the Energy Performance Certificates, and assessment of the correspondence of projects data or energy audits with the findings of on-the-spot building inspections. Lastly, simplification measures are introduced for updating the EPCs when the renovation works concern only the technical systems.

Legislative Decree No 28/2011

Legislative Decree No 28/2011 transposes Directive 2009/28/EC on the promotion of the use of energy from renewable sources. The Decree contains the following provisions on the energy efficiency of buildings:

- It establishes the obligation to include renewable energy sources in new buildings and buildings undergoing major renovations;
- It requires property sales or letting agreements to include a clause confirming that the purchaser or lessee received the information and documents on the building's energy certification;
- It requires all sales advertisements from 1 January 2012 to state the energy performance index contained in the building's energy performance certificate;
- It provides that new building construction and major renovation projects must include the use of renewable energy sources to cover heat, electricity and cooling requirements in compliance with the minimum integration principles and start dates set out in Annex 3. Failure to comply with the obligation shall lead to denial of the building licence.

Furthermore, the Decree sets out the installer qualification rules for the installation and extraordinary maintenance of renewable power generation systems.

RES sectors	Support schemes	Other measures
RES - E	<ul style="list-style-type: none"> • Green Certificates (phasing out) • Feed in tariff • Feed in premium • Net metering • ETS (indirect) 	<ul style="list-style-type: none"> • Priority dispatch and access to the grid • Services for market access • Simplified administrative procedures • Certification, training, information
RES - H	<ul style="list-style-type: none"> • Grants: "Heating Account" • White Certificates • Fiscal Incentives • ETS (indirect) 	<ul style="list-style-type: none"> • Obligations for new or refurbished buildings • Simplified administrative procedures • Certification, training, information
RES - T	<ul style="list-style-type: none"> • Blending obligation of sustainable biofuel (including biomethane) 	<ul style="list-style-type: none"> • Technical Regulation • Simplified administrative procedures • Research and development

Figure 3 - RES Italian instruments (Electricity – Heat – Transport)

Spain

1. Energy turnaround in Spain

Spain made a very important economic and technical effort during the first phase of promoting renewable energies and now requires the implementation of innovation and technology development mechanisms consistent with the European automation levels. It is necessary to keep in mind that Spain is currently experiencing an economic crisis that affects all sectors and renewable energy policies. Currently, renewable energy in our country is in a situation of uncertainty and cutbacks as a result of improvised policies. For example, renewable energy companies have had to invest without knowing what final price they would be paid until 2014, when the Law of compensation parameters with retroactivity to July 2013 was published. The Spanish State chooses austerity policies and giving back to the industry, with cuts that have been quantified with a value of up to 2.261 million Euros.

However, renewable energies are still struggling to having its share, showing everything positive that they involve: A macroeconomic study carried out by the Association of Renewable Energies estimates that renewable energy contributed to the GDP up to 9.496 million Euros (0.93% of the GDP) in 2013, with a final net contribution of 1,163 million, which helped to improve the trade balance in 3,073 millions. 148 million were invested in R+D+i. The sector generated savings in the electricity market worth 5.871 millions and prevented imports, i.e. cost savings with of 7,309 millions. It also saved 252 million in allowances and employed 93,415 people.

Looking back at these years of work within the sector, we have raw materials, technology and infrastructure and because of the levels of each of these, Spain could be playing a leadership role. Instead, the technological superiority is truncated by a current legislation that only promotes tax collection and/or cuts with dramatic consequences for the sector. For example, the reduction from 6.5% to 4.1% of the overall mandatory targets for biofuels has resulted on a last push for closing biodiesel plants.

The European Environment Agency has stated that Spain will not meet the objectives of renewable quotas 2020.

Spain suffers an energy dependence on fossil fuels amounting to 120 million euros, which is well above the European average when the country could start an emancipation process, as wind power was the main source of electricity generation in 2013. Seeing the government priorities it seems it will be difficult to fight this dependency.

Renewable energies represent the third largest source of primary energy consumption in 2013. The increase results in a higher power generation from renewable sources. 64.5% of the total renewable capacity is installed in the regions of Castilla León, Castilla La Mancha, Galicia and Andalusia.

Due to all this, a better regulation of the sector as well as a decided boost to research and technological development is being demanded, along with the creation of a specific agency to monitor and support the sector. Spain needs a technical discussion about alternatives, mapping of the alternatives by sector and the develop programs to facilitate the development of energies with systematized and specific technologies, with the possibility of turning each of the renewable energy in their own businesses cycles.

2. National energy politics

In 2013 Spain produced 78,874 GWh of electricity from renewable sources in the Special Regime, which allowed the covering of 30% of the domestic demand (261,023 GWh), representing as final energy up to 15.9%, obtaining point and a half above the level achieved in 2012.

Renewable sources have resulted in 43.2% of our national electricity balance.

Analyzing each of the renewable energies, in 2013 the power generation increased from 7.3% to 9.7%, while thermal technologies dropped from 7.1% to 6.2%. Wind power has been the primary source of electricity generation followed by the minorities, for example, photovoltaic (3.1%), mini hydraulic (1.9%), solar thermal power (1.7%) and biomass (1, 9%).

- Objectives and national instruments (e.g. laws, energy conservation regulations):

Spain has had to design an energy scenario, partly due to European requirements and as an inevitable necessity because of the energy behaviour of our society. It was necessary to cover the renewable energies sector.

For years Spain has been doing planning in energy efficiency and renewable energies through the Action Plans. These plans aim at achieving a rational and coordinated development of renewable energies across the country but also at the regional level, estimating the areas that are considered as suitable for the development of renewable energies.

The State Plan has the following specific objectives:

1. To strengthen the training and employment of human resources in R+D+i activities in both the public and the private sectors. The plan defines the actions to be funded and promoted.
2. To improve the quality of scientific and technical research in order to achieve the highest level of excellence and impact and thus contributing to scientific and technological leadership.
3. To facilitate the access to scientific and technological infrastructures, promoting scientific and technical facilities.
4. To strengthen the capacities relating to R+D+i of enterprises and the incorporation of SMEs in the innovation process.

We also have an extensive and dense legislation on energy:

- 1) The Law 54/1997 on the electricity sector which integrated the special regime regulated in RD 661/2007.
- 2) Royal Decree Law 6/2009 that establishes the registration of pre-allocation payments for installations of the special regime.
- 3) Royal Decree 1955/2000, which establishes the authorization procedures.
- 4) Royal Decree 842/2002 amending the Electronic Regulation for low voltage with their complementary technical instructions.
- 5) RD 314/2006 approving the Technical Building Code.
- 6) Law 22/1973 of Mines in what has to do with geothermal energy.
- 7) In water issues, the legislative RD 1/2001.
- 8) Law 9/2006 and Royal Decree 1/2008 regarding environmental regulation.

- 9) Order ITC/2877/2008 that establishes the mechanism for promoting the use of biofuels and other renewable fuels for transportation.
- 10) RD 1565/2010 that regulates and modifies certain issues relating to the activities of the production of electrical energy in the special regime.
- 11) Royal Decree 1578/2008 concerning the remuneration of the photovoltaic technology production of electricity by.
- 12) Royal Decree 164/2010, by which regulates and modifies certain aspects relating to production of electricity activities.
- 13) Royal Decree 14/2010 that establishes the urgent measures for the correction of the tariff deficit in the electricity sector.

There are several reasons for this numerous regulations, incentives or programs not working:

- The main lines of support and the regulations are still relatively not well known by the potential users, technology suppliers and installers.
- There is insufficient coordination between units and jurisdictional changes between different ministerial departments.
- The processes of asking for aids and incentives are sometimes complicated. Funding is fragmented.
- There is some dispersion of the information regarding the implementation of public policies in each area and in relation to the practical aspects of project management.

- Objectives in the energy consumption in residential buildings:

Spain is the 5th most populous country in the European Union and just like Germany, France, UK and Italy, has 65% of the soil built. The average consumption of a Spanish household is 10,521 kWh per year (0,038TJ), thus being one of the countries with the lowest consumption because of the Spanish weather. This consumption is based on two thirds of fuels, mainly petroleum products, natural gas and renewable energies.

Our real estate is mostly private and in the new landscape Spain has had to regulate (RD 233/2013 of April 5) a plan to stimulate rental, rehabilitation and renovation of houses.

The instrument used to test and track the energy performance is the Energy Certificate of Buildings, which evaluates from A (the most energetic) to G (the least). Since June 2013 is a compulsory label in any sale or rental of property. It is also an instrument of individual and collective awareness.

A new methodology for the energy certification during the different phases of the building is being implemented:

- Project and design phase: Using systems and equipment that maximize energy efficiency.
- Implementation phase: suitability of materials. In Spain there is an added difficulty as there is a shortage of materials with green label.
- Finished building phase, with its a correct usage.
- In buildings that are already built: potentiation of their rehabilitation. The *Plan Renove* with four main dimensions: energy rehabilitation of the thermal envelope of buildings; improving energy efficiency of heating and lighting systems; and finally, the renewal of appliances.

Another tool available to the public is the energy audit service, which provides a model of the building's consumption and analyses the factors of that consumption. This model defines specific improvements directed at the reduction of the consumption and the improvement of the comfort level.

More recent is the promotion in our country of buildings with almost zero energy consumption (EECN) regulated by the European Directive 31/2010/EU on energy efficiency. From 13 buildings in 2013 there were up to 103 in 2014, mostly detached houses but new public buildings such as schools, conference hall, library or protected housing facilities are being promoted. The three main areas promoting EECN are the Basque Country, Catalonia and Madrid.

All these efforts in saving and energy efficiency have resulted in a decrease greater than 13% in the final energy intensity over the past five years.

3. Energy efficiency and “Smart Home“ (heating/ventilation/air condition, electrics, e-mobility)

Spain is starting to move in this field with well-studied steps that are being awarded both, in Spain and internationally. There are places that are betting for this type of construction in real estate. But the majority of them are actually individual gestures.

The deepest rooted systems in our homes are safety related, those related to the welfare and involving considerable energy savings are relatively new ones, not to mention all those relating to the control of lights, shutters, windows, curtains and plugs, automatic air conditioning, heating and cooling.

These are projects that stand out, such as ECOPROYECTA, individual homes built in the Murcia area, designed with bioclimatic strategies, integrating renewable energy and water purification systems so that these homes can sustain themselves. Another project is the construction of a housing complex with natural building materials and renewable energies technologies. In Valladolid, the REMOURBAN project is highlighted, where 400 homes have been remodelled for biomass fuel use with the addition of a photovoltaic solar collection system.

There are projects that have been rewarded for Europe such as the Fab Lab House and the Andalusia Team. Young engineers from the universities of Seville, Granada, Jaen and Malaga are responsible for “Patio 2.12”, a prefabricated, sustainable and self-sufficient based on renewables energies houses, based on the Mediterranean tradition and known for their Andalusian patios.

Spain already has companies trading devices that can be automatically and continuously programmed. Even companies like Cactus Smart Home carry devices that learn the habits of the residents of a home.

In conclusion, Spain is at a phase of empowering projects that are related to automation, having many but most of them without a stable support. They should be enhanced by the different administrations so they become entrenched in our present.

Conclusion

In this report you can see, that the European strategy 2020 were transferred in national strategies or laws. All countries have a target quote for the percentage of the renewable energies of the overall energy production or energy consumption. The implementation of the national strategies has already begun. But you can also observe that the target achievement varies from country to country.

It is very important to note that the mix of energy sources differs from country to country. The reason for this is that every country has specific basic conditions. For example it is possible to use a high percentage of wind power in Germany. However, it is better to use solar power of heating systems in the southern part of Europe for example Spain.

For our project it was important to know more about the national plans to identify some points which are central for our training activity. Through the intensive discussion between the partners of this project we have learned a lot about the other national plans. So that all members of this project have received new information and input to think about the whole European strategy.