POWER HOUSE NEARLY ZERO ENERGY CHALLENGE

Co-funded by the Intelligent Energy Europe Programme of the European Union

NEARLY ZERO ENERGY HOUSING FOR WARM/MEDITERRANEAN CLIMATE ZONES

The nearly-Zero Energy Challenge in Warm and Mediterranean Climates

Operating Costs including Quality Assurance of nZEB in Warm / Mediterranean Climates

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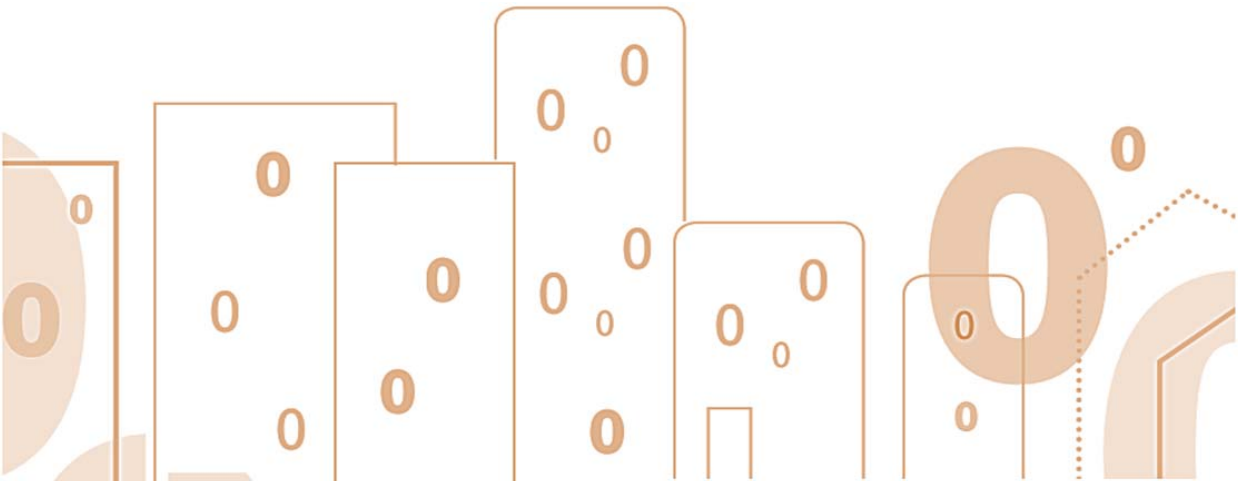

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1 Introduction

The objective of the MED Platform is to provide findings and recommendations to the nearly Zero Energy buildings definition and its implementation in the **Southern Europe countries** and promote the exchange of expertise among building stakeholders, through study visits and on-line courses.

For this, the MED Platform has carried out a detailed monitoring of operating costs, LEH usability and cost effectiveness analysis based on costs monitoring in new and retrofitted buildings in the MED area, by analysing a set of existing test cases.
It's important to note that the MED area has significant specificities - climatic, socioeconomic and cultural characteristics - that require the development of tailored tools and approaches, as highlighted on the carried out *Needs analysis*:

- The housing market of the southern countries has always been the most backward and reluctant to absorb innovations, both technological and process. Moreover, the traditional building technologies were originally adapted to the territorial characteristics (use of local materials, measures to take advantage of the mass of masonry as thermal inertia and devices to facilitate natural and night ventilation). This know-how has been lost in the last half-century which saw the globalization of technologies and building types, often with disputable results.
- The opportunities offered by a greater efficiency and cost effectiveness of RES such as solar thermal and photovoltaic are still under-exploited;
- Delay on the implementation of the EPBD directive due to the lack of sufficient regulatory laws and implementation of supporting tools (software tools, etc.);
- Lack of interest, resilience and reluctance from end – users to embrace the EPBD implementation due to a considerable cost for the energy efficiency certificate and the further implementation of the energy efficiency measures along with the lack of information and awareness about the benefits from EPBD implementation;
- Lack of available and accessible funding mechanisms tailored to end–users needs. In most cases, the private - public financing synergies doesn't seem to be enough for all the end – users, and the scheme of tax incentives given to end – users for energy efficiency investment can't be not followed by the majority of users;
- Lack of adequate funding mechanisms: for the refurbishment of the existing building stock. The main problem in MED area is the long investment return due to climate

conditions: The winter period is short and the temperatures not so cold, so the heating cost is in most cases not so high and the financial resources saved by improving energy efficiency is not enough to justify and repay the investment.

The main problem is the hot summer period, but it's very difficult in residential sector to evaluate the saving potential, due to the diffusion of individual electrical conditioners.

- Lack of innovative financial mechanisms such as Third Party Financing with the intervention of ESCOs, Voluntary Agreements, soft loans etc. These mechanisms might represent an interesting alternative, and must be considered on the revision of the revised energy policy of each Med Country;
- Lack of information and awareness by the end-users about the necessity and the environmental and economic benefits of the energy efficiency into households;
- For private owners: lack of knowledge about efficient buildings, high initial costs, long payback time, too much bureaucracy to obtain incentives, difficult to obtain economic funding from the banks, overestimation of initial costs;
- In addition, there are two other common key problems: the professional inertia of building professionals (engineers, architects, etc.) towards innovative technologies: Innovation is still considered as an unknown field that can cause further complication. Moreover, the building managers of multifamily housing do not want to assume more responsibilities and engage over that they "have to do".

Notes related to ITALY

The collection of test cases in Italy was longer and more difficult than expected since the construction sector crisis has affected the start of any real estate initiative, especially in the Southern regions (i.e. in Spain and in the south of Italy, the real estate activities have been stopped) .

For example, the selected pilot building in Pisa (IT) was planned to start the monitoring campaign on the beginning of 2014 but this has not been possible due to the bankruptcy of the builder just before the final completion. Due to this unexpected situation, it has been selected another test case, with lower energy performance expectations, but completed and full occupied by 2012.

Due to the above mentioned real estate crisis, almost all of the case studies identified were completed recently and then historical consumption data are not or partially available, which don't allow to report significant data in the present report.

Another important statement is that building retrofitting is not considered yet as a common and mandatory process on the housing sector in Italy. Compounding this aforementioned situation is the fact that the use of centralized systems for heating or hot water production are scarcely implemented and the use of individual boilers in each-dwelling make difficult the collection of energy data consumption because users are reluctant to deliver their own energy bills.

Notes related to SPAIN

As experienced in Italy, the collection of case studies was a long process and difficult process..

Firstly, in Spain, there is still no official definition of NZEB, so it was decided to look for buildings that have obtained the highest energy rating, which is an A, for new construction, and a D, for retrofitting, assuming that this design could correspond to the NZEB definition.

On the other hand, the majority of "A" buildings are new and correspond to business offices and are administered by private entities. With regards to the real estate development in Spain, only n° 3 "A" social housing buildings have been built and these ones have been selected as case studies but it is a very small sample and may not be representative. Furthermore, site works have recently been completed, so that most dwellings are not 100% occupied (in some cases the occupancy rate has reached just the 30%), so the collected consumption data are not reflecting the whole building status. One option was to extrapolate the whole building consumption from the partial consumption data, but as such buildings have centralized system for heating and hot water production, this approach is not viable and can biased any analysis. At this moment, with the current occupancy rate, the heating systems appeared oversized.

Important to note that for the retrofitting of social housing buildings, no examples have been found with energy label A. An unique retrofitting project was found in Bilbao, but it has not been executed yet. The selected two buildings in the Spanish buildings collection proposed an important retrofitting action in the building envelope, which include an improvement of wall and roof insulation, and the installation of double windows and exteriormounted shading devices. One of the case studies also foresee the installation of solar panels and a cogeneration system for DHW and even so, the building does not reach a "C".

Finally, in Spain, particularly in areas with warmest climates, it is really difficult to achieve an energy letter A, because although it raises an efficient design of the thermal envelope of the building, reducing significantly the energy demand, the maximum label that can be achieved is a C, unless the building uses a biomass system, that is, that a completely passive design could be implemented, but the A or B letter will never be reached. This contrasts with the reality on the energy consumed in Spain, especially in the Mediterranean coast, where many people have no need for cooling or heating, and however, the formal procedures require them to achieve an A.

Having said that the MED task force made an important effort to collect a sufficient number of test cases. It's important to note that it has been decided to aggregate the test cases from France.

Finally, the MED task force has gathered a total number of 10 pilot buildings in which it has been carried out the planned monitoring, plus 4 from France.

2 Overview on test cases

Nearly- Zero energy housing initiatives in warm/Mediterranean climates

N°	Country	Location	Number of dwellings	Year of construction completion	Type of building	Main characteristics
1	Spain	Barcelona, Calle Corsega	32	2011	Apartment in a block of six to ten stories	new building Public social rental
2	Spain	Valencia, Avenida Pio XII	28	2013	Apartment in a block of six to ten stories	in progress. Energy retrofitting private rental; private ownership by individual households
3	Spain	Barcelona, Carrer de Roc Boronat	95	2012	Apartment in a block of six to ten stories	new building Public social rental
4	Spain	Vitoria-Gasteiz, Bulevar de Salburua	242	2011	Apartment in a block of more than ten stories	new building Public social rental
5	Spain	Malaga, Avenida Jacinto Benavente (Los Limoneros Project)	140	2014	Apartment in a block of six to ten stories	Energy retrofitting Public social rental
6	Italy	Montaione	10	2013	Apartment in a block of five or less stories	new building Public social rental
7	Italy	Montelupo Fiorentino – Empoli	8	2013	Apartment in a block of five or less stories	new building Public social rental
8	Italy	Cisterna di Latina, Viale Adriatico	48	2013	Apartment in a block of six to ten stories	new building Public social rental

N°	Country	Location	Number of dwellings	Year of construction completion	Type of building	Main characteristics
9	Italy	Senigallia, Via Raffaello Sanzio	82	2012	Urban regeneration, several different buildings. Apartments in blocks of five or less stories.	Energy retrofitting Public social rental
10	Italy	Castelfranco	12	2012	Apartment in a block of five or less stories	new building Public social rental
11	France	Vitrolles	125	2013	Apartment in a block of six to ten stories	Energy retrofitting Public social rental
12	France	La Brede	10	2010	group of terraced houses	new building Public social rental
13	France	Muret	40 + 221	2015	Apartment in a block of six to ten stories	Energy retrofitting + new building Public social rental
14	France	Nantes	194	2012	Apartment in a block of five or less stories	Energy retrofitting Public social rental

Figure 1- List and general description of study cases for MED task force

Link to POWER HOUSE website with detailed description of test cases available at: http://www.powerhouseeurope.eu/nearly_zero_taskforces/nzeb_in_warmmediterranean_climates/case_studies/

For these above mentioned buildings, information on consumption has been collected and reported into the HIVE database (see project website NZEC PHE). Moreover, surveys on maintenance costs and problems encountered both from the point of view of the management and the relationship with the end users have been conducted.

In two buildings, further studies have been carried related to the application of the method "cost-optimal" methodology by proposing different alternative scenarios and comparing them with the situation of the building already built.

Regarding the case studies collected in Spain, we want to pay special attention to two of them because both samples are new buildings, with a representative size and a large socio-economic impact in the quarters where have been built. Furthermore, they have an added value because they are located in two different geographical areas (Catalonia and Basque Country) with distinct Mediterranean climates.

The above-mentioned case studies deeply analysed, are the following:

• Roc Boronat (Catalonia)

• Bulevar Salburua (Basque Country)

General information and data from those multifamily buildings are shown in annex.

3 Operating costs and quality assurance

General remarks

For Italy and Spain

For the Italian study cases, it has not been possible to collect the current operation/ maintenance costs, given the short operation period that has elapsed since the end of the building works.

However, with regards to maintenance costs, some data are available and issued from maintenance contracts with external contractors hired for maintenance works.

Results operating costs

Operating costs consist of the following elements; not all of them necessarily are to be covered by our inspection/data gathering, since they not all are related to energy aspects.

▪ **Cleaning**	<u>included in data collection</u>
o maintenance cleaning	NO
o glass cleaning	NO
o facade cleaning	NO
▪ **Energy and consumption**	
o water consumption	NO
▪ hot water *	consumption and costs
▪ heating *	consumption and costs
o cooling	consumption and costs
o ventilation	consumption and costs
o lighting	for common parts of buildings (if possible)
o work equipment	only if related to energy
o others	only if related to energy

For maintenance, it is adopted wherever possible the same definitions given in the IEE project “AFTER”, which carried out a systematization of many Energy Saving Measures (ESM).

- **Technical building operation**

Data gathering only if related to energy

- o operational management : It concern two different aspects:

- **Contractual relations with heating providers and facility management companies**. i.e. the contract with heating systems maintenance companies specifying a profit sharing scheme if contractual energy savings objectives are met.
- **Developing relationships with the end-users** (the tenants or inhabitants) and promoting the energy awareness that is required to secure contractual relations. Contractual relations with tenants are changing especially when tenants are asked to finance partly the investment for energy improvement of their dwellings.. Among these measures we find: campaigns, energy monitoring, exhibitions and events, face-to-face advice…

  The measures considered in this section are:

  - Energy monitoring
  - Individual billing/heat costs allocation
  - Submission of bills
  - Energy manager (incidence of the cost of the energy manager required by law in Italy)
  - Legal inspections (mandatory by law)
  - Resident participation
  - contract review
  - software
  - staff training

- **Running maintenance** : usually concern low cost measures such as the balance and regulation of heating systems, insulation and cleaning of the hot water pipes, and maintenance of boilers and sub-stations.

  The measures considered are:

  - periodical maintenance of boilers (mandatory by law)
  - replacement of burners, valves regulation or replacement replace/clean filters, regulation/replacement of circulation pumps
  - hydraulic balancing of the heating system
  - maintenance of thermal insulation of heating pipes
  - maintenance of photovoltaic
  - maintenance of solar heating
  - Control of artificial lighting in common spaces
  - kits for water saving

- Energy saving lamps
- Disposal of ashes, filters etc..

The breakdown of operating costs is in EURO/m².year

Cost elements included:

- Heating
- Hot water (if not included in heating)
- Ventilation system (if any)
- RES: solar thermal system, PV, geothermal pumps,
- Others

For Italy

For Italian test cases, we have provided the following data:

SIX-MONTHLY ENERGY CONSUMPTION DATA							
	Heating	Hot water	Heating + Hot water	Cooling	Ventilation	gains solar energy	Gains geothermal heat pumps
In kWh/ sqm usable floor area							
6- Montaione			X	Not present	Not present	X	
7 -Montelupo			X	Not present	Not present	X	X
8 -Senigallia	NA	NA	NA	Not present	Not present	NA	
9 -Cisterna			X	Not present	Not present	X	
10 - Castelfranco			X	X	Not present	X	
(1) gains from solar energy and geothermal pumps added to consumptions							

Euro/sqm usable floor area							
	Heating	Hot water	heating + Hot water	Cooling	Ventilation	gains solar energy	Gains geothermal heat pumps
6 Montaione			X	Not present	Not present	X	
7 Montelupo			X	Not present	Not present	X	X
8 Senigallia	NA	NA	NA	Not present	Not present	NA	
9 Cisterna	-	-	X	Not present	Not present	X	
10 Castelfranco			X	X	Not present	X	

Other collected data: Maintenance/Service/Repair costs					
	Heating	Hot Water	Solar	Disposals	Geothermal pumps
	Euro per m2 usable floor space/year				

6 Montaione	X	X	1,10 (1)	
7 Montelupo	X	X	2,50 (1)	X
8 Senigallia	2,91 (1)			
9 Cisterna	X	X		
10 Pisa	X	X		

(1) Estimated by contracted maintenance companies

The collected data are available on HIVE web page.

For Spain

For Spanish test cases, the following data have been collected

SIX-MONTHLY ENERGY CONSUMPTION DATA								
Pilot sites	Heating	Hot water	heating + Hot water	Cooling	Ventilation	TOTAL	Gains solar energy	Gains geothermal heat pumps
In kWh/ sqm usable floor area								
Boronat			Yes			Yes		
Alexandra	Yes	Yes	Yes	Yes		Yes	Yes	
Salburua	Yes	Yes	Yes			Yes		
PIOXII	Yes	Yes	Yes	Yes		Yes		

Energy costs year 2013-2014								
Pilot sites	Heating	Hot water	heating + Hot water	Cooling	Ventilation	TOTAL	gains solar energy	Gains geothermal heat pumps
Euro /sqm usable floor space								
Boronat			Yes			Yes		
Alexandra	Yes	Yes	Yes	Yes		Yes	Yes	
Salburua	Yes	Yes	Yes			Yes		
PIOXII	Yes	Yes	Yes	Yes		Yes		

Other collected data: Maintenance/Service/Repair costs						
Pilot sites	Maintenance/Service/Repair					TOTAL
	Heating	Hot Water	Solar	Disposals	Geotherma l pumps	
Euro per m2 usable floor space/year						
Boronat	Yes					Yes
Alexandra						Yes
Salburua	Yes					Yes
PIOXII	No					No

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Based on the monitoring of the above-mentioned buildings, the following data on the energy consumption/ year have been collected.

Boronat

			Year					
	Fuel/ Energy	**Unit**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Space heating	District heating	kWh				75800	281241	361636
Water heating	District heating	kWh						
Space cooling	Electricity	kWh				0	0	0
Electricity aux. Services and ventilation	electricity	kWh				16036	28228	27328
Solar thermal (production)	thermal energy	kWh				--	--	--
Solar photovoltaic (production)	electricity	kWh				--	--	--
Solar photovoltaic (released into the grid)	electricity	kWh				--	--	--

Alexandra

			Year				
	Fuel/ Energy	**Unit**	**2009**	**2010**	**2011**	**2012**	**2013**
Space heating + Water heating	Electricity	kWh			207610	248457	255607
	Electricity	kWh					
Space cooling + Water heating	Electricity	kWh			124923	172435	158249
Electricity aux. Services and ventilation	electricity	kWh			627151	620759	629856
Solar thermal (production)	thermal energy	kWh					
Solar photovoltaic (production)	electricity	kWh			32877	33375	31393
Solar photovoltaic (released into the grid)	electricity	kWh			32877	33375	31393

Salburua

			Year				
	Fuel/ Energy	**Unit**	**2009**	**2010**	**2011**	**2012**	**2013**
Space + DHW+CHP (electricity production)	Natural gas	Sm3	--	--	--	46930	135119
Water heating (included in the previous)	Natural gas	Sm3	--	--	--	--	--
Space cooling	Electricity	kWh	--	--	--	0	0
Electricity aux. Services and ventilation (Only boilers room)	electricity	kWh	--	--	--	61275	71908
Solar thermal (production)	thermal energy	kWh	--	--	--	0	0
Cogeneration-CHP (production)	electricity	kWh	--	--	--	112159	367680
Cogeneration-CHP (released into the grid)	electricity	kWh	--	--	--	104402	352300

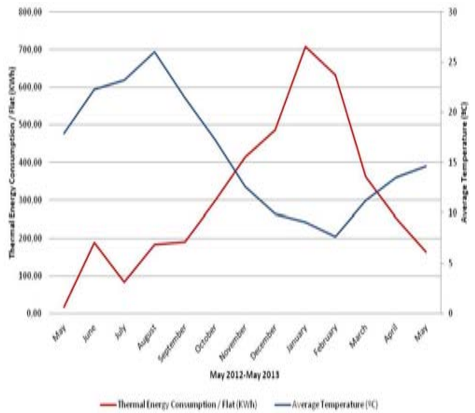
Pio XII

			Year				
	Fuel/ Energy	**Unit**	**2009**	**2010**	**2011**	**2012**	**2013**
Space heating	Electricity	kWh	81200	82100	79500	79650	79600
Water heating	Natural gas	Sm3	no data collected				
Space cooling	Electricity	kWh	7662	8428	7962	8220	7270
Electricity aux. Services and ventilation	electricity	kWh	no data collected				
Solar thermal (production)	thermal energy	kWh	no solar				
Solar photovoltaic (production)	electricity	kWh	no photov.				
Solar photovoltaic (released into the grid)	electricity	kWh	no photov.				

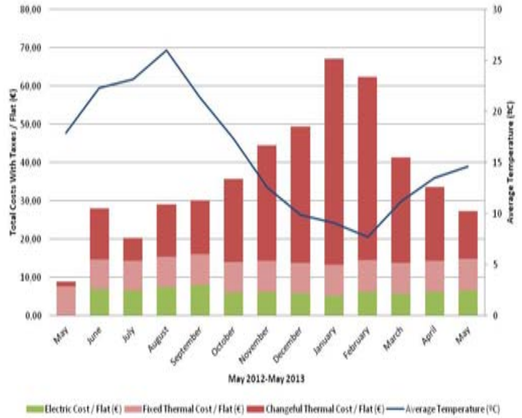
In addition, the monthly data gathered from the monitoring of "Roc-Boronat" and "Bulevar Salburua" sites have been included.

MONTH	OCCUPANCY RATE %	NUMBER OF HOUSINGS	AVERAGE MONTHLY TEMPERAURE ºC	TOTAL ENERGY SUPPLY MWh	NET AREA HOUSINGS	ENERGY USE/ HOUSING UNIT (kwh)	ENERGY USE/M2 (Kwh)	PRICE WITH TAX SERVICES €	AVERAGE PRICE FOR HOUSING €	TOTAL COST WITH TAX SERVICES €	TOTAL COST WITH TAX SERVICES €	TOTAL PRICE / HOUSING UNIT €	TOTAL COST/M2 €
may-12	24,2	23	17,9	0,4	1454,26	17,39	0,14	761,57	8,96		761,69	8,96	0,14
june-12	26,3	25	22,3	4,7	1586,57	188,00	0,33	1067,89	21,11	661,49	1.729,58	28,07	0,44
july-12	31,5	30	23,2	2,5	1938,10	83,33	0,22	913,32	13,72	632,59	1.545,91	20,38	0,32
august-12	31,5	30	26,0	5,5	1938,10	183,33	0,34	1158,33	21,47	715,58	1.873,91	29,00	0,45
september-12	32,6	31	21,4	5,9	2005,39	190,32	0,34	1187,91	21,98	768,91	1.956,82	30,08	0,47
october-12	37,8	36	17,3	10,7	2344,05	297,22	0,46	1534,75	29,66	573,66	2.108,41	35,70	0,56
november-12	44,2	42	12,6	17,4	2763,25	414,29	0,59	2025,06	38,23	601,94	2.627,00	44,57	0,69
desember-12	62,1	59	9,9	28,7	3940,45	486,44	0,66	2852,01	43,51	564,10	3.416,11	49,45	0,75
january-13	62,1	59	9,1	41,8	3940,45	708,47	0,93	3946,34	61,92	491,50	4.437,84	67,09	1,02
february-13	62,1	59	7,7	37,3	3940,45	632,20	0,85	3604,78	56,13	601,84	4.206,62	62,46	0,95
march-13	62,1	59	11,2	21,3	3940,45	361,02	0,54	2390,33	35,50	543,98	2.934,31	41,27	0,63
april-13	62,1	59	13,5	15,0	3940,45	254,24	0,42	1908,51	27,38	591,13	591,13	33,60	0,52
may-13	62,1	59	14,6	9,7	3940,45	164,41	0,32	1507,50	20,58	635,30	635,30	27,27	0,42
june-13	75,8	72	19,5		4707,02	0,00		0,00					
AVERAGE	48,32	40,79	16,16	15,45	2897,88	306,21	0,47	1775,59	30,78	615,17	2217,28	36,76	0,57

Table 1: Brief of Roc Boronat monitoring



Graph 1: Thermal Energy consumption (Heat & ACS) and average temperature in Barcelona



Graph 2: Overall cost with Taxex/ Dweling (Heat & ACS) and average temperature in Barcelona

Año	Mes	Ocupación (%)	Número de viviendas	Electricidad tomada de la red de suministro (de la sala de calderas) (kWhe)	Electricidad exportada (toda la que genera el equipo) (kWhe)	Consumo de Gas Natural Calderas (kWh PCS, para pasar a útil kWh PCI, multiplicar por 0,9) (kWh PCS)	Consumo Gas Natural Cogeneracion (kWh PCS, para pasar a útil kWh PCI, multiplicar por 0,9) (kWh PCS)	Consumo Calefacción (kWht)	Consumo ACS (kWht)
2012	Enero	0%	0	0	0	0	0	0	0
	Febrero	0%	0	0	0	0	0	0	0
	Marzo	0%	0	0	0	0	0	0	0
	Abril	18%	44	4818	0	17853	0	0	0
	Mayo	19%	47	6734	8093	67160	0	0	0
	Junio	24%	57	6131	11214	2793	58261	16945	3509
	Julio	26%	64	9208	4203	863	31254	0	3126
	Agosto	28%	67	7126	0	16077	0	0	3318
	Septiembre	28%	67	6425	2709	5972	14630	0	4530
	Octubre	28%	67	8637	16250	9946	26285	0	6954
	Noviembre	29%	69	6669	12956	15120	47969	48602	6763
	Diciembre	31%	74	5527	48977	24880	214120	48718	6252
2013	Enero	31%	74	4442	33188		38842	59067	6271
	Febrero	31%	74	6860	44571		234440	60648	5742
	Marzo	31%	74	6790	41374	200067	104104	44702	10498
	Abril	31%	76	6673	34149			28975	7503
	Mayo	32%	78	6100	42574			24224	7633
	Junio	33%	79	4444	16273			0	4228
	Julio	33%	79	5144	11126			0	0
	Agosto	33%	80	4097	13412			0	8679
	Septiembre	34%	83	4001	13239	34778	496469	0	7860
	Octubre	36%	86	6546	23930		117666	0	8164
	Noviembre	36%	86	6792	34837		198124	43090	9151
	Diciembre	37%	89	10019	43900	13289	141223	52498	6322

Table 2: Brief of Salburua' site monitoring

Results quality assurance

It's important to note that no quality assurance methods for the selected NZEBs are available, such as:

- Certification of building components;
- Certification of NZEBs;
- Certification of qualified tradespeople and/or designers.

Below the certification systems used in the three countries of the MED Task Force are described

For Italy

Nearly Zero Energy Buildings Certification

The new legislation is still under discussion, but it should be available soon.

The new legislation, includes the definition of "nearly zero energy building', and establishes that, by 31st of December 2020, all the new buildings must be NZEB. The deadline for the buildings property of the Public Administrations is brought forward to December 31st 2018.

For new buildings and those undergoing a major renovation, the compliance with the minimum requirements will be assessed by comparing the building with a reference sample (identical geometry, orientation, location, purpose of use).

For buildings affected by simple energy retrofitting related to the building envelope and HVAC systems, minimum requirements are indicated.

The new minimum requirements will come into force on 1st July 2015, and will become more stringent by 1st January 2019 for public buildings, and from 1st January 2021 for the other buildings in order to achieve the nearly zero energy buildings.

It is estimated that the first phase of implementation of the Decree as stated in the report, will result in an improvement of energy performance equal to a 45% in the warmest areas, and to a 35% in the coldest. In the second phase, it is estimated to reach a 55% in all areas.

So far, only few experiences have adopted the reference the following two energy classes: A (<30 kW /Sqm /year) and A + (<20 kWh/Sqm /year) as defined by the present regulation.

Certification CasaClima - KlimaHaus

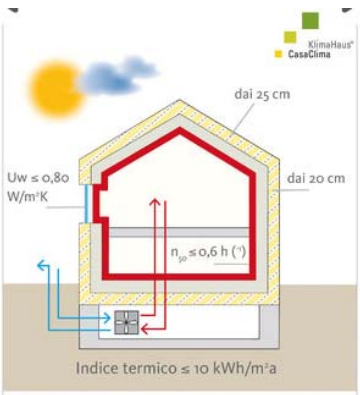
The *KlimaHaus* Certification is the first system of voluntary certification of quality energy-environment established in Italy. It is issued by the Agency CasaClima of Bolzano, a public institution (managed and coordinated by the Autonomous Province of Bolzano).

The goal of KlimaHaus is to combine saving, healthy living and sustainability. The categories KlimaHaus allow to identify the degree of energy consumption of a building. There three KlimaHaus certifications: CasaClima Oro, CasaClima A and B.

The lower energy consumption is guaranteed by a KlimaHaus Gold, which requires 10 kWh/Sqm /year for ehating, which can ensure, in practice, even in the absence of a heating system active. The CasaClima Oro is also called *"one liter home"* because for each square meter needs a liter of diesel or a m³ of gas per year.

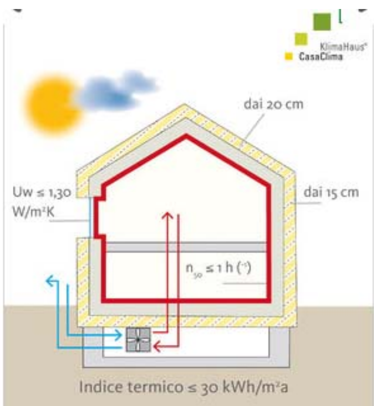
The homes with a heating consumption of less than 30 kWh/Sqm /year are classified as CasaClima A, the so-called "3-liter house", because it requires 3 liters of diesel or 3 m³ of gas per square meter per year .

CasaClima B is instead the homes that needs than 50 m³. In this case one speaks of "house 5 liter", since the energy consumption involves the use of 5 liters of diesel or 5 m³ of gas per square meter per year.



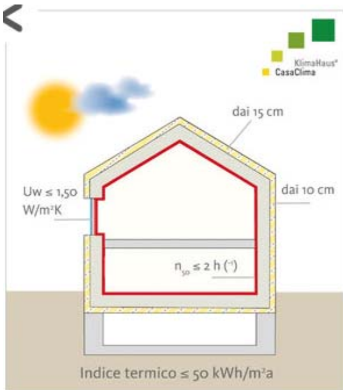
CASACLIMA ORO Casa da 1 litro di gasolio o 1 m³ di gas

I valori di trasmittanza termica e gli spessori di isolamento sono indicativi e si riferiscono ad un edificio mono o bifamiliare in zone climatiche E o F."



CASACLIMA A Casa da 3 litri di gasolio o 3 m³ di gas

I valori di trasmittanza termica e gli spessori di isolamento sono indicativi e si riferiscono ad un edificio mono o bifamiliare in zone climatiche E o F."



CASACLIMA B Casa da 5 litri di gasolio o 5 m³ di gas

I valori di trasmittanza termica e gli spessori di isolamento sono indicativi e si riferiscono ad un edificio mono o bifamiliare in zone climatiche E o F."

CasaClima Oro Fabbisogno energetico inferiore a 10 kWh/m²a / Casa da 1 litro	CasaClima A Fabbisogno energetico inferiore a 30 kWh/m²a / Casa da 3 litri	CasaClima B Fabbisogno energetico inferiore a 50 kWh/m²a/ Casa da 5 litri

Sustainability Certification

Some Regions have adopted systems of sustainability certification voluntarily, in addition to the EPC. Many of these implemented sustainability certifications are based on the so called *Protocol ITACA* written by ITACA Association and the Conference of Italian Regions.

The Protocol ITACA takes into account not only the aspects related to energy consumption but also other thematic areas such site selection, project planning and urban development; Environmental Loadings; Indoor Environment Quality; Service Quality and Socioeconomic aspects. The ITACA Protocol is applicable to different building life-cycle phases, serving different assessment purposes: Pre-design / Design / As-built / Operation. It is based on the international assessment tool “SBTool” created as part of the research process of Green Building Challenge. Along with the national version eventually, different versions have been developed in different Italian regions, integrating specific regional policies. There is also available a software which develops a scoring system through which the sustainability is assessed.

Link: http://www.itaca.org/valutazione_sostenibilita.asp


PRASSI DI RIFERIMENTO UNI/PdR 13.1:2015

Sostenibilità ambientale nelle costruzioni - Strumenti operativi per la valutazione della sostenibilità
Edifici residenziali

Environmental sustainability of construction works - Operational tools for sustainability assessment
Residential buildings

Il documento specifica i criteri sui quali si fonda il sistema di analisi multicriteria per la valutazione della sostenibilità ambientale degli edifici residenziali, ai fini della loro classificazione attraverso l'attribuzione di un punteggio di prestazione. Oggetto della valutazione è un singolo edificio e la sua area esterna di pertinenza.

Il documento si applica ai fini del calcolo del punteggio di prestazione di edifici residenziali, di nuova costruzione o oggetto di ristrutturazione.

Pubblicata il 30 gennaio 2015 ICS 91.040.01

ITACA Istituto per l'innovazione e trasparenza degli appalti e la compatibilità ambientale

UNI ENTE ITALIANO DI NORMAZIONE

Image 1 : the Itaca Protocol and Guidelines

Training to Energy Certifiers

The national reference is the Presidential Decree 04/16/13, n. 75, which was subsequently updated by the Act of 02/21/14, 9. The Decree makes possible to have the capacity to perform certification activities of energy for some graduates excluded by the RPD75, at the same time, increased the minimum duration of the courses from 64 to 80 hours. The Decree 75 defines the characteristics of skilled subjects according to two categories:

- Technicians possessing the qualifications specified in the Decree. (in possession of specified requirements)
- Technicians expressly graduated by the Decree, possessing a certificate of attendance with a final exam successfully passed in a specific training course.

All regions / autonomous provinces refer directly to the DPR 75 excepting:- Bolzano (an autonomous province), the duration of the course is 120 hours authorized by the Agency CasaClima;

- Bolzano (an autonomous province), the duration of the course is 120 hours authorized by the Agency CasaClima;
- Lombardy, over 72 hours (24 hours for those organized mode FAD) provided for all professionals (more details are available in the "Guidelines for the organization of Cened courses," on the website Cened);
- Valle d'Aosta, the course (54 hours for all courses) started after the approval of the DGR 1448 of 28/05/10. The courses with a final exam are alternatives to the attainment of professional experience proved by at least, five years of being a member of a professional organization / association. In the autonomous provinces of Trento and Bolzano and in the Lombardy region, in order to carry out the activity of certification it is compulsory attend a qualifying course.

A technician, if enabled, can carry out the energy assessment and then draw up the APE for any type of building, regardless of energy class, size, and type.

For Spain

Nearly Zero Energy Buildings Certification

Since in Spain, currently the requirements of what would be an NZE Building, are not yet set, its definition is based on obtaining an "Energy rating A" according to the Certification procedure.

Roc Boronat

Roc Boronat is the leading multifamily building in Barcelona, which got an energy rating "A."

The building achieved this high rating by reducing the demand and using high-efficiency systems to meet the demand. It's connected to the network District-Clima to supply heat for domestic hot water and heating. It was the first residential building connected to the network.

These features allow to reach a 20% of savings in electricity consumption and 50% reduction of CO_2 emissions, based on the use of residual steam from the energy recycling of urban waste.

The building has an annual energy consumption of 93.758,40 kWh and 24.090,70 kg CO_2 emissions, according to the data obtained by the PVY program “Calener” for standard conditions and normal occupation.

The rating "A" obtained is valid for 10 years.

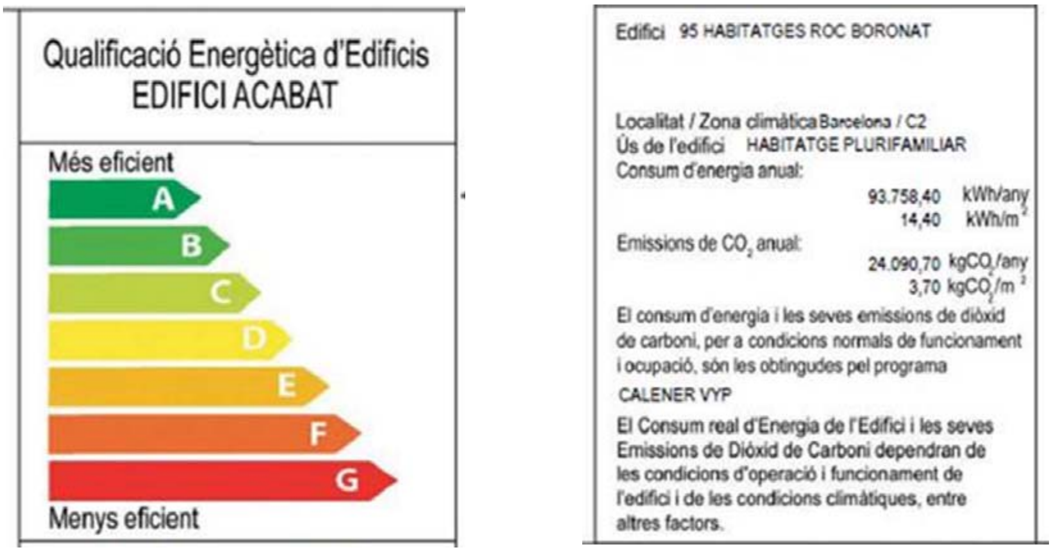


Image 2: - Roc Boronat

Salburua

The "Boulevard Salburua" is the first multifamily building completed in Vitoria, which obtained an “A“ energy rating. This high rating was achieved by reducing energy demand and using high-efficiency systems to meet the demand.

These features allow to reach savings in consumption and reduced CO2 emissions based.

The building has an annual final energy consumption of 892,753.50 kWh, primary energy consumption of 902,573.80 kWh and CO2 emission of 181,670.80 kg, according to data obtained from the “Calener“ program for normal operating conditions and occupation.

The rating A obtained is valid for a period of 10 years.

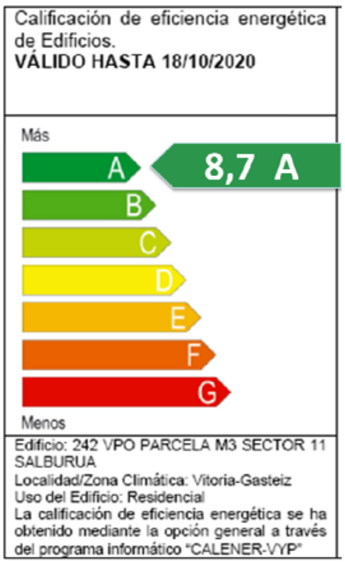


Image 3:- Salburua

For France

France has a long tradition of voluntary quality labels, ie Qualitel system. So also for energy certification and environmental quality labels are developed to support the design and implementation of interventions.

below only the Batiments Durables Méditerranéens certification, as specific to Mediterranean climates is described.

The “Démarche BDM”

In France, various schemes for energy and environmental certifications have been developed over the last 10 years. . One of these have been selected because of interest in the Task Force MED: this scheme called Démarche BDM, was developed specifically for Mediterranean climates. The initiative is part of the Association Envirobat Batiments Durables Méditerranéens (web: www.polebdm.eu) based in Marseille, which has developed this pedagogical tool for monitoring and evaluation of the environmental, social and economic performance of the building.

Flexible and interactive, this tool allows to:

• Optimizing choices, from programming to the operation of the building, for example in terms of bioclimatic, energy efficiency, cost, global and social impact.

• Driving the design defining the specifications and objectives for the project management and implementation of activities and ask the right questions.

• Adapt the building to the Mediterranean climate

The tool "My BDM home " suggests solutions to ensure thermal summer comfort, take advantage of the sunshine, treat natural lighting, and exploit local materials to create outdoor Mediterranean spaces or manage water properly.

About 200 projects have been certified by BDM.

Observatory for Energy Performance of social housing

Union Sociale pour l’Habitat (USH) has implemented a multi-year sustainable development action plan aimed to support housing providers in the transition proposed by the Grenelle de l’Environnement. One of the actions launched in 2011 was the creation of a national observatory for energy performance of social housing.

This observatory, financed from 2011 to 2013 in the framework of the «Règles de l’Art Grenelle Environnement 2012 » programme and supported by PROMOTELEC and GrDF, aimed to assess the impacts – in terms of energy performance, costs, comfort and operational practices- of the implementation of new and retrofitted energy-efficient housing projects.

In the framework of the Observatory activities, the USH and its affiliated social housing organisations have carried out several evaluation studies, as well as an energy monitoring programme.

A first survey was completed in 2011 and aimed to analyse the outcomes of ten energy retrofitting projects carried out thanks the use of a specific interest-free loan scheme. .A second survey was carried out in 2012 analysing over twenty retrofitting projects, aimed to achieve the *BBC*[1] *renovation* level. In parallel, in 2012, another survey was carried out to analyse ten new construction projects, aimed to achieve the BBC level.

The objectives of these three surveys were:

- to evaluate these real-life projects and the conditions of reproducibility;
- to analyse practice's changes of social housing providers and other building stakeholders generated by the BBC level implementation;
- To collect possible dysfunctions and pathologies generated by the BBC level implementation;
- To identify actions carried out by social housing providers to continually improve energy performance of their building stock.

Considering that insighful information generated by the Observatory represents an source of knowledge, we have decided to integrate it in our Taskforce conclusions.

Energy and environmental quality Survey and database in PACA region

Conducted by the cellule "*Economique Régionale de la Construction Provence Alpes Cotes d'Azur*" (Marseille) for the *Association Régionale PACA HLM et Corse*, the survey aims to measure the evolution of the share of housing with high environmental quality in the construction of social housing, through quantitative investigation. Envirobat BDM supported the analysis grid of the projects.

The survey was compared with a previous analysis in the context of the construction of the Regional Observatory, who took place in 2011. It covered construction permits to be issued in 2012 and 2013 (130 interventions of new construction). A response rate of 86% has enabled to obtain a good representative picture of the situation.

[1] BBC: Batiment à basse consommation

On 93 projects analyzed (3211 dwellings) 45 have obtained the level "bâtiment de basse consommation (BBC)" that is a consumption of less than 50 kW/h/sqm, 45% of the projects have an approach to environmental quality (Qualitel-Habitat & Environnement - http://www.qualite-logement.org). In the investigation of 2014 began to establish the eco-BDM (see above), but in general it reduces reliance on voluntary marks.

In conclusion is proved the pedagogical value of voluntary marks, which have helped to create a culture of sustainability, while the gradual raising of the services required by the certification mandatory energy made unnecessary additional level of verification.

In fact, the current role of volunteers' certification labels is of two types:

- Marketing (and therefore not very useful in social housing for purposes of marketing the product, but if anything useful to say the environmental responsibility of the promoters)
- Access to specific loans, when required by the financing company.

4 Integration and Summary of Results – Conclusions

For Italy

It is not yet possible to draw conclusions on energy consumption, whereas the acquisition of basic data of the Italian case studies took place, for two out of five cases, during the month of September and that there are no available historical consumption data.

It's also important to note that it is not still difficult to collect hot water consumption data related to solar thermal panels production: so, this data will be detected indirectly in terms of lower DHW consumption.

Moreover, as highlighted previously, the maintenance costs data are partially available on the basis of maintenance contracts already signed by the housing managers.

It's also important to note that these collected estimated costs are very inhomogeneous: for example, for the disposal of filters and ashes, for the two study cases managed by Publicasa SpA, the maintenance costs varies between 1.10 €./smq. (building 6) and 2.50 €./smq (building 7), while for the whole maintenance plant, the ATER Latina has contracted it at a cost of 2.91 €./smq (building 8).

Even if these differences could be explained by the different size/complexity of the buildings, these preliminary evidences demonstrate that the market for maintenance of RES still has not defined the pricing parameters.

For Spain

In the retrofitting projects, only data from current consumption have been collected. It is expected that by the end of the year, the selected projects are completed and it will be possible to collect the necessary data

Regarding maintenance costs, we would like to indicate that the building managers have just contracted it for heating and DHW systems, but the building elements are not included in these contracts. It is observed that the maintenance of efficient systems as cogeneration or district -heating, represent a high percentage of the maintenance costs. The durability of such systems is very dependent of the corresponding technical inspections; in Spain there are examples of how the absence of such maintenance has made obsolete some of these facilities, especially solar panels. However, we believe that the building need to be understood as an economic asset, it would lose much of its value if preventive maintenance actions are not done, in our opinion the constructive elements as roofs or facades need to be included on maintenance contracts. It seems that the only maintenance is purely corrective, i.e. it is only done when a lesion is detected.

This makes the evaluation of general maintenance costs very difficult.

For France

Some actions conducted by the PACA et Corse Region have are below reported because there are transferable in other countries of southern Europe.

In particular, the following initiatives should be highlighted:

- The creation of specific label for buildings in to the Mediterranean climate (BDM).
- The development of a database and a specific survey for the census and analysis of the environmental quality of buildings in the region.

5 Recommendations

For Italy

The analysis of the operating costs will be useful to define the parameters of the cost of maintenance of innovative plants.

To this end, it will be important to establish contact with maintenance companies and define with them the basic price lists at the regional level and maintain, where possible, comparisons at the national level. All these data will be critical in defining the input parameters to be considered in the calculation of the cost optimal, especially in case of maintenance.

For this reason, it is suggested to set up a "Regional Observatories of the NZE buildings" to collect data according to the criteria established in our project and to create the basis for the definition of the standardized costs to be used in the calculation of the reference building.

For Spain

With regards to renovated buildings, a quality control system of the building works on site is recommended, especially when innovative solutions are planned (insulating injection in chambers, insulating dry placing on the roof....) by hiring an accredited laboratory to ensure proper execution. This is a necessary step since the installers are often not the manufacturers and they do not have the experience necessary for their implementation, which could lead to subsequent installation failures. Similarly, it is also necessary to develop training courses for construction workers to acquire knowledge and skills regarding innovative solutions in the field of energy retrofitting.

With regards to maintenance, it is important to notify that there is a market for companies involved in the maintenance of systems that have detailed operation and maintenance procedures and related costs more or less established, especially in the field of tertiary buildings. However, in the residential sector, particularly in social housing, it is necessary to develop specific maintenance programs for NZEB, with some guides to help technicians to draft them and covering on the one hand basement maintenance operations with periodicities and on the other hand preventive maintenance prices.

For France

Thanks to the analysis of numerous case studies, the above mentioned Observatory of Energy Performance have issued some "Lesson learned" that represent important insights for the MED task force

- **First lesson**: Buildings equipped with complex or very sensitive equipment to install and to operate can generate significant additional costs in terms of initial investment and maintenance, that exceed the energy savings: Moreover, due the lack of clear guidance for installation, operation and maintenance, numerous abnormal consumption and malfunctions have been reported.

  Second lesson: The actors of the building sector (builders, building managers, industrials, ...) are too often focused on energy performance, neglecting overall economic performance, in particular costs for maintenance and operation. For the social housing environment, this energy performance-oriented approach is quite difficult to implement because tenants are still reluctant to pay additional costs for operating and maintaining advanced technological systems and are not convinced that these additional costs can be covered by the achieved savings.
- **Third lesson**: Most innovative technological systems or products are still in the *maturation* phase and do not always achieve the expected results (higher maintenance and/or installation costs than expected).
- **Fourth lesson**: Even if Energy efficiency is more and more stringent issue, Building process is still a fragmented process in which all the different actors are not working in integrated and systemic way. However, the overall performance of a building is not equal to the sum of the performance of equipment. Insufficient coordination of the different actors and diluting the chain of responsibility should lead to a paradigm shift.
- **Fifth lesson**: Although many buildings are designed as low energy buildings, a very significant difference between the theoretical calculated and measured consumption (ranging from single to double) can be registered. Similarly, additional costs charged on tenants are much higher than those announced. These buildings, often called "successful examples" do not yet appear as synonyms of buildings with low rental charges[2].

[2] Observatoire de la Performance Energétique du logement social, Premiers enseignements du Programme d'instrumentation de bâtiments thermiquement performants, Septembre 2014

For further information, please visit www.powerhouseeurope.eu

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