

Proyecto:ECOCITY-TUDELA

DELIVERABLE 4.2.1.3

Monitoring report- OCT-2011

BIOCLIMATIC ARCHITECTURE DEPARTMENT

Informe:

DELIVERABLE 4.2.1.3

Monitoring report- OCT-2011

MONITORING REPORT- OCT 2011

As part of the deliverable 4.1.2.3 relative to monitoring reports of the buildings inscribed inside the field of the Concerto program, the second data obtained are explained as follows. (Oct-2010, Oct-2011)

1. MONITORED FACILITIES

1.1. DWELLINGS IN THE LOURDES NEIGHBOURHOOD

As it was mentioned in the previous report, 12 temperature and humidity dataloggers were installed before the retrofitting.

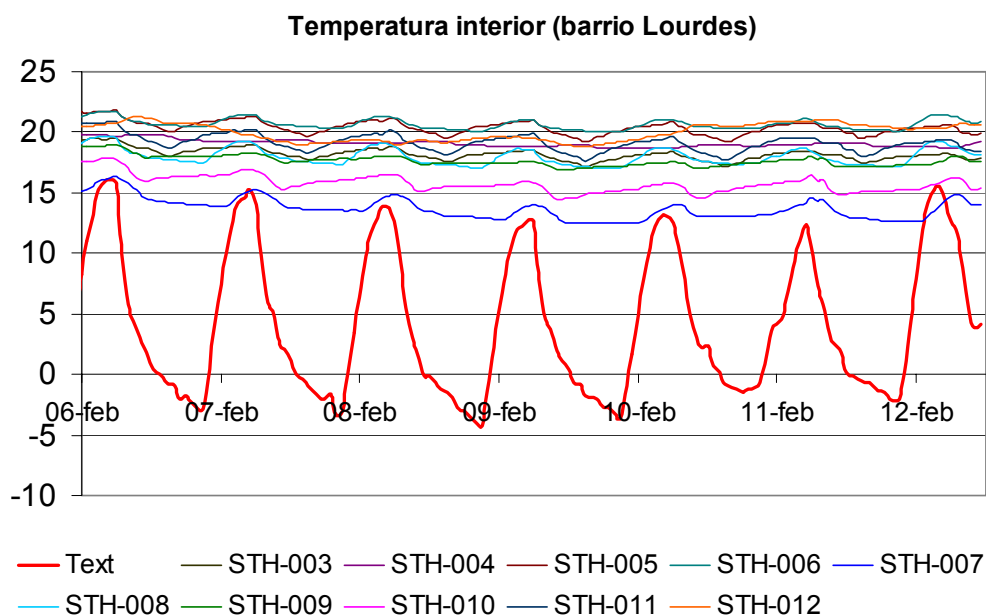
The data from the dwellings, where these equipments have been installed, are shown in this chart:

Datalogger number	TIPOLOGY	Portal	Floor	Site	Propierty	Heating systems
LOU-THR-001	Blocks from the 1950s	4	2° D	Living room	Owner	Neither. They don't use the dwelling in winter
LOU-THR-002	The towers	10	3° B	Living room	Owner	District heating + individual convector
LOU-THR-003	Blocks from the 1960s	12	4° C	Living room	Owner	District heating
LOU-THR-004	Blocks from the 1960s	3	1° D	Bedroom	Owner	
LOU-THR-005	Blocks from the 1960s	9	4° A	Living room	Tenant	District heating
LOU-THR-006	Blocks from the 1960s	2	1° B	Living room	Owner	District heating
LOU-THR-007	The "100 apartments"	13	2° D	Bedroom	Owner	Individual heating
LOU-THR-008	The towers	8	6° B	Living room	Owner	District heating + individual convector
LOU-THR-009	Blocks from the 1960s	11	4° C	Bedroom	Owner	District heating
LOU-THR-010	The "100 apartments"	6	1° C	Living room	Owner	Individual heating
LOU-THR-011	The towers	4	7° C	Bedroom	Owner	District heating + individual convector
LOU-THR-012	Blocks from the 1960s	3	4° C	Living room	Owner	District heating

Este año tenemos una serie completa de datos de calefacción, y los resultados recogidos se muestran a continuación:

1.1.1. Data

Temperature data have been obtained on an hourly basis. See below the temperature¹ profiles from the coldest week under analysis (from 06-02-2011 to 13-02-2011)

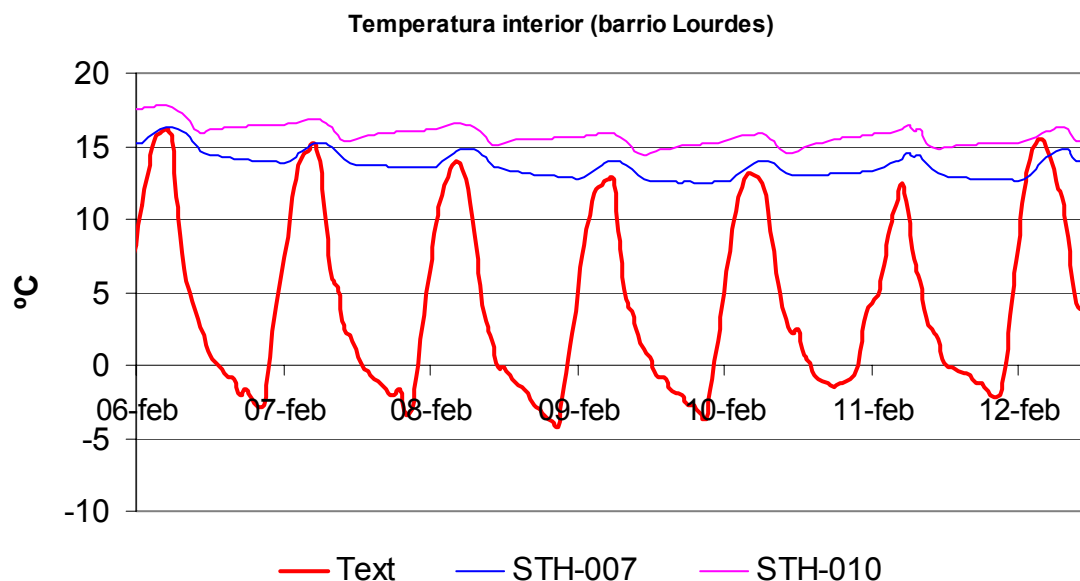


In general, except in dwellings 007 and 010, where indoor temperatures are very low (individual heating; families with little resources), temperatures inside the dwellings are slightly lower than those recommended to obtain appropriate comfort levels.

Next, we are seeing what will happen if we analyse the typologies of the dwellings. Below, temperatures from dwellings belonging to the “The 100 apartments”, where there is no central heating, are observed:

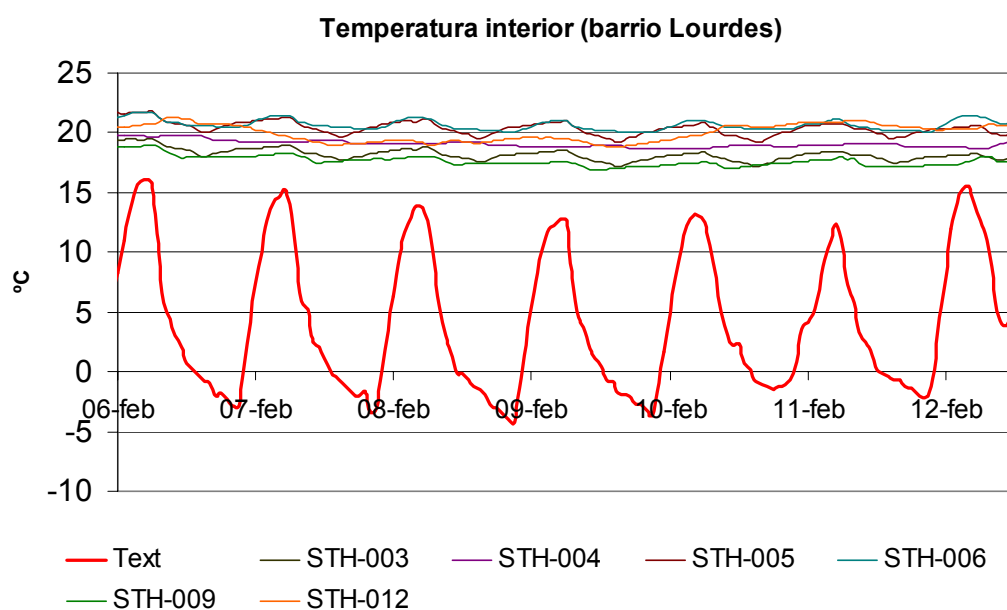
¹Datalogger STH 00-1 has been discarded because the dwelling was not used in winter.

We could not retrieve the datalogger STH 002.



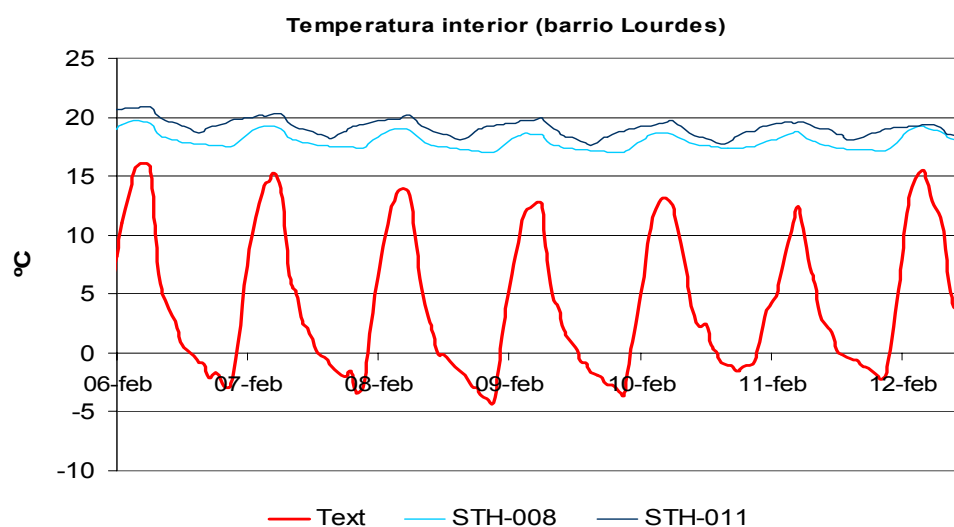
It can be observed that comfort temperatures are kept deeply below the reasonable level, so we may that either heating is not turned on or it is turned on at a very low level due to economic precariousness.

The following leads us to observe what is going on in “The dwellings from the 1960´s” where there are no extra heating systems, apart from the district heating system they are connected to.



All of these dwellings show similar temperatures, slightly lower than comfort temperatures in some cases. This is due to the fact that the dwellings do not have any control system and the district heating system either. The difference of temperatures in the dwellings can be related to the higher or closer closeness from the dwelling to the heating generation centre. The only existing “control system” is limited to the opening of the windows, when the inside temperature is too high. In all these dwellings there is not any extra heating device.

Let’s take a look to the dwellings from “The Towers”, which are also connected to the same community heating system:



In this case, the dwellings of “The Towers” do not reach the temperatures of the dwellings of the “Blocks from the 1960s”, in spite of needing a support system for the district heating. This is caused by the fact of the district heating system not being able to provide enough energy to the dwellings located inside the towers due to the distance to the production centre or to the lack of pressure in the pipes.

1.1.2. Conclusions

Considering the results, we can conclude that, in every case, comfort temperatures inside the dwellings do not reach the comfort temperatures when outside temperatures are low. On the other hand, when outside temperatures are high, inside temperatures are even higher than comfort temperatures. This is due firstly and mainly to the poor envelope of the buildings and, secondly, to the dreadful condition of the district heating, which is incapable of supplying the necessary heat to the dwellings provided with this heating system.

1.2. MANCOMUNIDAD BUILDING

While awaiting the installation of a monitoring system which integrates the data acquisition referring to the consumption of the different aspects of the building, total consumptions of this building ² have been analysed using the bills issued by the supplying electric company.

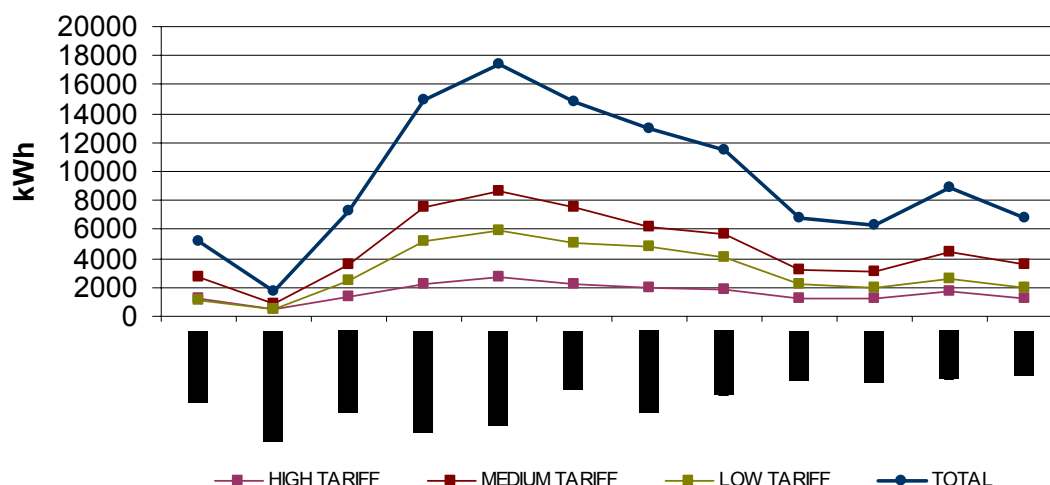
Consumptions are itemised in different tariffs, helping us to identify the source of these consumptions. The timetables from the different tariffs can be found on the following chart:

TIMETABLE TARIFF (2010)		
SUMMER 28/3 - 31/10	HIGH TARIFF	11:00-15:00
	MEDIUM TARIFF	8:00-11:00 AND 15:00-24:00
	LOW TARIFF	0:00-8:00
WINTER	HIGH TARIFF	11:00-15:00
	MEDIUM TARIFF	8:00-11:00 AND 15:00-24:00
	LOW TARIFF	0:00-8:00

Data referring to electric bills can be found on the following chart:

ELECTRICAL CONSUMPTION DATA (HEATING-COOLING-LIGHTING) kWh												
	AGOSTO	SEPTIEMBRE	OCTUBRE	NOVIEMBRE	DICIEMBRE	ENERO	FEBRERO	MARZO	ABRIL	MAYO	JUNIO	JULIO
HIGH TARIFF	1262	433	1326	2271	2754	2282	1969	1796	1290	1239	1778	1277
MEDIUM TARIFF	2719	821	3557	7484	8674	7492	6225	5707	3236	3122	4494	3519
LOW TARIFF	1150	484	2451	5131	5971	5068	4779	4020	2217	1935	2586	2035
TOTAL	5131	1738	7334	14886	17399	14842	12973	11523	6743	6296	8858	6831

ENERGY CONSUMPTION OF THE MANCOMUNIDAD BUILDING



² We must consider that all the building consumptions (heating, cooling and lighting) are electrical, and so they can be checked by means of the electric bills.

On the following chart we can find the percentages which consumptions for each tariff per month, represented on the total consumptions:

ELECTRICAL CONSUMPTION DATA (proportion of the diferents tarriffs)												
	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY
HIGH TARIFF	24.6%	24.9%	18.1%	15.3%	15.8%	15.4%	15.2%	15.6%	19.1%	19.7%	20.1%	18.7%
MEDIUM TARIFF	53.0%	47.2%	48.5%	50.3%	49.9%	50.5%	48.0%	49.5%	48.0%	49.6%	50.7%	51.5%
LOW TARIFF	22.4%	27.8%	33.4%	34.5%	34.3%	34.1%	36.8%	34.9%	32.9%	30.7%	29.2%	29.8%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

As it can be deduced from the consumption chart, expenses in the colder months are high, because the heating system is on and so consumption is higher than in the warmer months, where the cooling system is on.

On the tariff proportion chart, it is really noticeable the high consumption proportion and even the absolute values, which correspond to the low tariff, considering that this tariff, no matter the time of the year, refers to the hours going from 0:00 to 8:00, at a time when there is not any user at the office. This may be a sign of a deficient air conditioning system regulation, which makes the system remain turned on during the night in order to keep specific temperature instructions. Nevertheless, this point should be deeply analysed.

On the other hand, consumption during these first 12 months of building operation has been **114.554 kWh**, equal to **84.48kWh/m²** gross area heated³.

This quantity seems to be reasonable considering the building regulation still needs to be adjusted and that these consumptions include heating, cooling and lighting, and it is lower than **87.6 kWh/m²** included in the BEST table"

³ This building has 1,130 m² of heated usable area, corresponding to 1, 356 m² of gross area heated approximately.

2. FACILITIES TO BE MONITORED

2.1. DWELLINGS IN THE LOURDES NEIGHBOURHOOD

The monitoring systems described in this document are to be installed and functioning before December 31, 2011.

2.1.1. "100 Apartments"

In the building belonging to "100 apartments" type, 20 dwellings will be monitored. For this purpose, two types of meters will be installed:

- **Kamstrup 162JB – Single phasing device with direct connection** electric meters with data storage features and data download via optical port. See the figure below.

Kamstrup 162



- **Kromschroeder**-type gas meters with communication via radio, jointly with other repeaters and a GPRS connector. We will be capable of consulting data via an IP address in a WEB server.



2.1.1.1. Photovoltaic field

At the 100 apartments, 40 kWp of PV panels will be installed. They will be divided in 2 independent installations, which will be monitored as appropriate in order to assess their production.

2.1.2. 60's and 70's Dwellings

In the buildings belonging to the "60's and 70's" type, 20 dwellings will be monitored. For this purpose, two types of meters will be installed:

- **"Kamstrup 162JB – Single phasing device with direct connection"** electric meters with data storage features and data download via optical port.
- **"Kamstrup multical 402"** type calory meters with MOD-BUS communication.

MULTICAL 402



2.1.3. 50's Dwellings

In the buildings belonging to the "50's" type, 2 dwellings will be monitored. For this purpose, only electric meters will be installed, since both the heating and DHW systems are electric. The meters which will be installed are **"Kamstrup 162JB – Single phasing device with direct connection"** electric meters with data storage features and data download via optical port.

2.2. DWELLINGS IN THE QUEILES NEIGHBOURHOOD

The monitoring systems described in this section are to be installed and functioning before December 31, 2011.

2.2.1. Development Valle Ulzama

In this development all the dwellings are to be monitored using calory meters and inside temperature sensors in the interior of the dwellings.

The boiler room will be also monitored in order to obtain the consumption, losses and efficiency of the biomass boilers, both for heating and DHW.

All data will be retrieved by a WEB server. Cener will be capable of downloading and analyzing these data.

2.2.2. Development Marfer

The monitoring system of this development will be similar to that of Valle Ulzama.

2.2.3. Development IAS Gestión

The monitoring system of this development will be similar to that of Valle Ulzama.

This development is counts with a 22 kWp PV panel installation which will be monitored as appropriate.

2.2.4. Mancomunidad Building

The monitoring system of the mancomunidad is made up by two metering systems:

- **“Kamstrup 382 – Three-phase device with direct connection”** with data storage features and data download via optical port. These meters will provide individual consumption data of the air condition systems, lighting and equipment systems and DHW support electric resistance.
- **“Kamstrup multical 402”** type calory meters with data storage features and data download via optical port to account the consumption provided by the thermal solar capturers.

Both meters are already installed and functioning.

2.3. S. JUAN BAUTISTA DISTRICT HEATING

The district heating of S. Juan Bautista, which supplies heat to 486 dwellings, has been completely renewed, from the boiler room to the heat distribution of every dwellings, and including the general distribution collectors.

After this renewal, monitoring has been focused on:


- Installing the calory meters in all the 486 dwellings (both in the retrofitted and non-retrofitted ones).
- Complete monitoring of the boiler room with the possibility of accounting the energy intake, both net and gross, of each boiler (biomass and gas boilers), losses in distribution circuits and in the boiler room, etc.

All these data will be collected by a web server which is specific for this project, where instant production and consumption data may be consulted and downloaded to perform a subsequent analysis.

This system is already completely installed and will be functioning soon.

3. APENDIX

3.1. MANCOMUNIDAD BUILDING

MONITORING REPORT OCT-2010		 <small>centro nacional de energías renovables</small>				
BUILDING	Mancomunidad building					
ADRESS	C/. Paseo de los Grillos, 17					
DESCRIPTION OF CLIMATE SYSTEMS	HEATING AND COOLING MEANS BY ELECTRICAL HEAT PUMP					
		DHW CONSUMPTION (kWh)	SOLAR SUPPLY (kWh)	HEATING CONSUMPTION (kWh)	COOLING CONSUMPTION (kWh)	ELECTRICITY CONSUMPTION (kWh)
AUGUST	2009					
SEPTEMBER	2009					
OCTOBER	2009					
NOVEMBER	2009					8393
DECEMBER	2010					14865
JANUARY	2010					9651
FEBRUARY	2010					11296
MARCH	2010					9990
APRIL	2010					5551
MAY	2010					5362
JUNE	2010					2131
JULY	2010					5389
AVERAGE (kWh)	2010					8069.8
TOTAL (kWh)	2010					72628
TOTAL (kWh/m2)	2010					64.3
AUGUST	2010					5131
SEPTEMBER	2010					1738
OCTOBER	2010					7334
NOVEMBER	2010					14886
DECEMBER	2011					17399
JANUARY	2011					14842
FEBRUARY	2011					12973
MARCH	2011					11523
APRIL	2011					6743
MAY	2011					6296
JUNE	2011					8858
JULY	2011					6831
AVERAGE (kWh)	2011					9546.2
TOTAL (kWh)	2011					114554
TOTAL (kWh/m2)	2011					84.48

