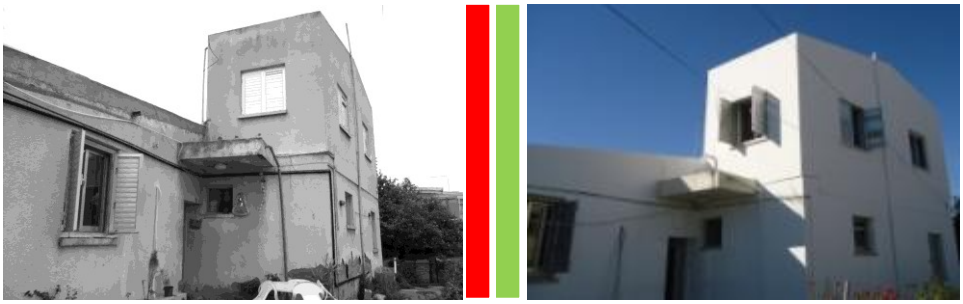
5.6.1-1

Evaluation of the pilot projects results and impacts on public policies

Work package n° 5 - phase 6



«PILOT EXPERIMENTATION OF ENERGY REFURBISHMENTS TO 25 INDIVIDUAL LOW INCOME HOUSEHOLDS IN CYPRUS »

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ΚΥΠΡΙΑΚΗ ΔΗΜΟΚΡΑΤΙΑ

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Acronyms

EPC: Energy Performance Certificate
CEA: Cyprus Energy Agency
RES: Renewable Energy Sources
LIH: Low Income Households
PP: Pilot Project

Symbols

 Semi detached house

 Apartment

 Detached house

 Country side

 Urban area

 Coastal area

 Mountainous area

 Family with women

 Family with man

 Family with kid

 Thermal insulation of roof

 Water insulation of roof

 Air conditioning (split units for heating and cooling)

 Photovoltaic system

 Solar thermal system for hot water

 Energy efficient lighting

 Wall thermal insulation (plaster)

 Energy efficient fire place

 Energy efficient windows

 Hot water storage tank

 External shading

1. EXECUTIVE SUMMARY

The project ELIHMED was a pioneer work for Cyprus and a real challenge for the Cyprus Energy Agency. The aim of the project was the experimentation of cost effective and innovative energy solutions for buildings, focusing on Low Income Households, dealing with energy poverty and motivating politicians, stakeholders and competent authorities towards energy efficiency.

In total 25 dwellings were selected for the pilot experimentation distributed in coastal, urban, mountainous and semi mountainous areas. In total 17 single houses, 4 semi detached houses and 4 apartments were selected. All the pilot dwellings selected met the minimum requirements and the criteria set during the public call for their selection. The majority of the pilot dwellings were suffering from high energy expenses, poor indoor air quality and humidity problems, inefficient lighting and moisture problems. The absence of any thermal insulation to the dwellings was created a great potential for important improvement of the energy efficiency of the dwellings.

After the completion of the selection process, a detailed Energy analysis was carried out for all the 25 dwellings and the list with the required workings was compiled. The architectural drawings of the buildings were collected and the owners answered questionnaires regarding their energy consumption. The energy consumption history and climate data were collected for all the dwellings from the 2010 to 2012. The energy class of the existing buildings was calculated (Energy performance certificate) according the National methodology for the energy certification of existing buildings.

The electricity consumptions for the 25 dwellings collected directly through the Electricity Utility Company (Electricity Authority of Cyprus) who agreed to provide support to the project and also to install smart meter devices to the households. The rest of the energy consumptions data were collected along with the questionnaires during the energy audits at the households.

The energy efficiency targets set were:

- The improvement of energy performance by 2 Energy Classes according to the national methodology for the energy certification of existing buildings.
- The improvement of energy performance by at least 30% according to the national methodology for the energy certification of existing buildings.
- The reduction of annual energy costs for the households by at least 30%.

The energy interventions that were chosen for the energy upgrade of the pilot dwellings were thermal Insulation, direct sun protection with exterior shading, efficient heating and cooling systems, efficient Lighting, water heating with solar panels.

At the same time, efforts were made by the Cyprus Energy Agency to pursuit private photovoltaic installers to involved in pilot experimentation and grant the beneficiaries with additional installations of photovoltaic (PV) systems. In total 11 pilot dwellings of those selected, benefited from the use of PV according to the suitability of their roof. The installations started in December 2012 and since June 2014 all the systems successfully completed and connected with the net metering system. It is worth mentioning that the 11 dwellings were the first pilots in Cyprus for PV net metering.

The costs for the refurbishments rise at around €250,000 (including sponsored photovoltaic systems) for the energy upgrading, for an overall of 4923m^2 covered heated space which results to 50€/ m^2 for a heated space or 10,000€/ pilot project. It is also important to mention that the savings after the implementation of the energy upgrades rises to €28,000 per annum or 6€/ m^2 of the heated space. Parallel to the interventions some other important issues were resolved including the waterproofness, the improvement of the indoor conditions quality along with the thermal comfort and the aesthetic view of both the inside and the outside of the dwellings.

For the supervision of the impact of the energy interventions to the 25 dwellings and in order to evaluate the final results, technical equipment, tools and questionnaires have been used. For the evaluation of the energy renovations two different methodologies were approached; (a) Energy Modeling based on an energy simulation of the buildings before and after and (b) Energy Analysis based on actual energy consumptions before and after.

The most important results for all the 25 pilot projects can be summarized as follows:

- Total Actual annual net electricity consumption reduced from 143 MWh to 81 MWh which reflects to 57% savings
- Total Actual annual electricity produced from photovoltaic systems equals to 37 MWh
- Total Actual annual fuel consumption reduced from 125 MWh to 72 MWh which reflects to 30% savings
- Total annual final energy consumption based on EPC methodology reduced from 886 MWh to 483 MWh which reflects to 45% savings
- Total annual primary energy consumption based on EPC methodology reduced from 2147 MWh to 993 MWh which reflects to 54% savings
- Total annual energy produced from RES based on EPC methodology increased from 13 MWh to 146 MWh which reflects to 1020% increase.
- Total annual CO_2 emissions based on EPC methodology reduced from 615 tons to 279 tons which reflects to 55% reduction
- Total Actual annual energy expenses for electricity consumptions reduced from 30886 € to 17240 € which equals to 44% savings
- The total average Energy Class improvement on EPC equals to 2.7 energy classes
- Thermal comfort in the houses for all pilot projects was improved significantly. It is also noticeable that the indoor temperature in the houses during the summer was reduced by 3.2^{o}C as an average whereas during the winter the indoor temperature was increased 3^{o}C.

The families that took part into this programme as beneficiaries for these pilot renovations, presented a few understanding differences regarding their dwellings and the importance of energy renovations. The majority of them were enthusiastic and cooperative but also there were exceptions with families felt unsatisfied with the delivered works.

It is very important that many of them were very satisfied with the reduction of their energy bills as a result of the refurbishments carried out.

2. INTRODUCTION

The project ELIHMED was a pioneer work for Cyprus and a real challenge for the Cyprus Energy Agency. The aim of the project was the experimentation of cost effective and innovative energy solutions for buildings, focusing on Low Income Households, dealing with energy poverty and motivating politicians, stakeholders and competent authorities towards energy efficiency. The individual objectives set were:

- To involve the key national actors related to the energy efficiency of buildings and social welfare.
- To actively involve local authorities by linking the objectives of ELIHMED project with the existing local Sustainable Energy Action Plans elaborated in the framework of Covenant of Mayors and the Pact of Islands.
- To promote the project objectives and outputs National wide by reaching at the same time policy makers, stakeholders, governmental organizations, local authorities, financing institutions, research centers, households and general public.
- To identify, select and provide cost effective energy solutions to 25 individual Low Income Households.
- To build a temporary and transparent structure for the selection of the 25 beneficiaries through evaluation process.
- To create a team of experts to carry out the energy audits to the 25 dwellings.
- To improve thermal comfort and fight energy poverty in 25 dwellings.
- To achieve energy savings and energy costs in 25 dwellings greater than 30%.
- To identify and evaluate the energy behaviour of the owners of the dwellings.
- To change the energy behaviour of the owners through awareness campaign and living lab process.
- To promote and establish future supporting schemes and funding instruments for energy renovations of buildings, especially those considered as Low Income Households.
- To achieve an important geographical coverage of the pilot experimentations in Cyprus taking to account also the climatic context.

For the selection of the beneficiaries the Low Income Households defined as follows:

Table 1 Definition of Low Income Households in Cyprus

Category of household	Gross Annual Salary
Single	€13,000
Single with serious health problem	€21,500
One parent and one child (*For every additional child)	€20,000 (*+€2,000)
Family without children(*For every additional child)	€22,000 (*+€2,000)
Family without children	€22,000
Family with disabled person	€33,000

Also the following criteria set to comply with the objectives of the project:

Table 2 Selection criteria for the pilot projects

Criteria	Description
Low income Household	Comply with LIH definition
Location	14 Municipalities with local energy policies and interest to support the project
House size	Apartments < 100 m2 Single houses < 150 m2
Year of built	1970-1995
Ownership	Private

3. PILOT PROJECTS

In total 25 dwellings were selected for the pilot experimentation distributed in coastal, urban, mountainous and semi mountainous areas. In total 17 single houses, 4 semi detached houses and 4 apartments were selected.

3.1 BEFORE REFURBISHMENT

The pilot projects before refurbishments are described below and justification is given regarding the selection of these pilot projects.

All the pilot dwellings selected met the minimum requirements and the criteria set during the public call for their selection. Interviews with the owners were carried out before the final award of the retrofitting to their buildings. The owners were also invited to sign a written declaration of acceptance and cooperation during the pilot project activities.

During the interviews, the following observations were made to the majority of the houses:

- High energy expenses
- Inefficient heating/cooling devices and equipment
- Poor indoor air quality and humidity problems
- Inefficient lighting
- Broken solar water heater
- Moisture problems to the building materials
- Water insulation problems
- Absence of thermal insulation

3.1.1 Description of the pilot projects

The table below provides an overview of the characteristics and the situation to the 25 dwellings before the refurbishments.

Table 3 Description of pilot project before energy renovations

PP	Location	Type	Area	Type of family	Annual income (€)	Size (m2)	Age of building	Annual energy cost (€)	Observations
1	Dali				16352	150	1985	1900	Split units, Fireplace (not in use), Solar Water heater, Ceiling Fan, Instant electric water heater, Single glazing, water insulation problems, no thermal insulation
2	Dali				8842	108	1985	3840	Split units, LPG stoves, Solar water heater, single and double glazing, no thermal insulation
3	Latsia				16591	180	1994	1800	A/C, Central heating, Solar water heater, single and double glazing, external blinds, no thermal insulation

PP	Location	Type	Area	Type of family	Annual income (€)	Size (m2)	Age of building	Annual energy cost (€)	Observations
4	Larnaca				30840	150	1994	3300	No thermal insulation, single glazing, split units, humidity problems, external blinds
5	Poils Chrysochous				8793	120	1975	1350	A/C, LNG stove, Solar water heater, no thermal insulation, Single glazing, external blinds
6	Yeri				14229	100	1979	2440	A/C, Central heating, LNG Stove, Solar water heater, double glazing, no thermal insulation, external blinds
7	Lefkara				23920	150	1992	1800	Single and double glazing, Tall Building, fireplace (1200 kg), LPG stove (120 kg), no thermal insulation, humidity problems
8	Lefkara				34729	170	1988	1700	Central Heating(800€), fireplace (3200 kg year), single glazing, Ceiling fans, wooden frames, Solar water heater, no thermal insulation
9	Ayios Athanasios				11690	51	1979	800	A/C, Solar water heater, external blinds, single glazing, no thermal insulation, concrete structure
10	Ayios Athanasios				25038	140	1991	2700	Fireplace, A/C, LNG stove, Solar water heater, no thermal insulation, single and double glazing, ext. blinds, water insulation problems
11	Aradippou				28275	128	1992	2800	Split units, fireplace (800 kg wood), Solar & LPG water heater, water insulation problems , ceiling fans
12	Aradippou				12484	105	1981	2070	Roof thermal insulation, double glazing, Ceiling fan, LPG heater

PP	Location	Type	Area	Type of family	Annual income (€)	Size (m2)	Age of building	Annual energy cost (€)	Observations
13	Engomi				13235	110	1979	1700	Electric heater, A/C, Oil stove, Single glazing, no insulation, external blinds, Humidity problems
14	Strovolos				13559	127	1984	1300	Electric heaters, A/C, Single glazing, no insulation, solar water heater
15	Strovolos				9972	80	1978	1000	Electric heaters, A/C, Solar water heater, single glazing, no thermal insulation, concrete structure
16	Strovolos				30000	150	1981	2260	Single and double glazing, central heating, electric heater, A/C, Solar water heater, no thermal insulation
17	Paralimni				20056	170	1995	1900	Fireplace place available (not in use), ext.blinds, 50%double glazing, 4 A/C, Solar water heater, installed previsions for central heating, humidity problems, fan
18	Paralimni				5136	110	1979	2200	Single glazing 100%, Ext. Blinds 40%, no thermal insulation, no A/C, Solar water heater, Central heating, humidity problems, fan
19	Lakatamia				2963	140	1993	1700	Electric heaters, fan, single glazing, no thermal insulation, solar water heater
20	Lakatamia				25828	125	1970	1640	Solar water heater, a/c, LPG Stove, Oil stove, single glazing, humidity problems, poor indoor and outdoor conditions
21	Lakatamia				27634	150	1988	2030	A/C, Central heating, Solar water heater, single glazing, no thermal insulation, LPG stove, instant electric water heater
22	Ergates				23874	145	1981	4435	Central heating, single and double glazing, fireplace, solar water heater, no thermal insulation

PP	Location	Type	Area	Type of family	Annual income (€)	Size (m2)	Age of building	Annual energy cost (€)	Observations
23	Psimolofou				27427	130	1985	2000	2 broken a/c, 1 LPG stove, 2 Oil stove, humidity problems, double glazing, solar water heater, no thermal insulation, structural problems
24	Ayios Athanasios				19312	94	2005	2800	Double glazing, a/c, fan, LPG stove, Solar water heater, no thermal insulation
25	Strovolos				28141	140	1993	3000	Central heating, Solar water heater, a/c, double glazing, external blinds, no thermal insulation

3.1.2 Energy audit

After the completion of the selection process, a detailed Energy analysis was carried out for all the 25 dwellings and the list with the required workings was finalized. The architectural drawings of the buildings were collected and the owners answered questionnaires regarding their energy consumption. The energy consumption history and climate data were collected for all the dwellings from the 2010 to 2012. The energy class of the existing buildings was calculated (Energy performance certificate) according the National methodology for the energy certification of existing buildings.

The expected final energy performance and the energy savings expected after the completion of the energy renovations in the pilot projects were calculated and evaluated. The final list of measures was compiled according cost optimum criteria but also taking into consideration the special needs of each household.

At the same time, efforts were made by the Cyprus Energy Agency to pursuit private photovoltaic installers to involved in pilot experimentation and grant the beneficiaries with additional installations of photovoltaic (PV) systems. In total 11 pilot dwellings of those selected, benefited from the use of PV according to the suitability of their roof. The installations started in December 2012 and since June 2014 all the systems successfully completed and connected with the net metering system. It is worth mentioning that the 11 dwellings were the first pilots in Cyprus for PV net metering.

The electricity consumptions for the 25 dwellings collected directly through the Electricity Utility Company (Electricity Authority of Cyprus) who agreed to provide support to the project and also to install smart meter devices to the households. The rest of the energy consumptions data were collected along with the questionnaires during the energy audits at the households.

The table below presents the energy data collected for three complete years (2010-2012) for electricity and for 2012 the other energy consumptions as provided by the owners. Also, the last two columns of the table shows the Energy classification of the building based on the methodology for the energy rating of buildings in Cyprus.

Table 4 Actual energy consumptions of the pilot projects before the energy renovations

PP	Elect.cons. 2010		Elect.cons. 2011		Elect.cons. 2012		Oil cons. 2012		LPG cons. 2012		Wood cons. 2012		EPC	EPC
	kWh	€	kWh	€	kWh	€	kWh	€	KWh	€	kWh	€	Class	$kWh_{pr}/m^2.year$
1	8165	1326	7447	1379	6577	1690	-	-	-	-	-	-	G	746
2	9672	1925	9378	2119	8220	2353	-	-	4640	360	-	-	G	713
3	4974	776	4623	842	4446	1209	12445	1000	-	-	-	-	G	1069
4	4551	709	4767	841	3960	926	-	-	-	-	-	-	G	778
5	2038	394	1856	418	1976	561	-	-	1740	135	-	-	G	647
6	3781	742	3861	879	3877	1110	6222	500	3093	240	-	-	G	914
7	7146	1072	6788	1203	9742	2278	-	-	-	-	3625	225	E	330
8	4383	670	4619	828	4945	1168	9955	800	-	-	10000	600	D	334
9	2661	508	2120	457	2398	672	-	-	-	-	-	-	G	871
10	10027	1632	8385	1572	6996	1919	-	-	1544	120	-	-	G	611
11	9899	1623	8699	1654	8725	2123	-	-	-	-	2500	150	E	439
12	7190	1434	5676	1298	6685	1906			6187	480			G	841
13	3588	706	3530	785	2764	794	3991	320	-	-	-	-	F	506
14	3683	722	3414	763	4123	1186	-	-	-	-	-	-	G	747
15	2428	465	2669	582	3147	889	-	-	232	180	-	-	G	1175
16	5889	1170	4604	1040	4346	1261	12444	1000	-	-	-	-	F	598
17	6721	1074	6027	1126	6051	1450	-	-	-	-	-	-	G	626
18	6830	1335	5546	1248	5628	1623	4978	400	-	-	-	-	C	306
19	5881	1131	5776	1243	5720	1626	-	-	-	-	-	-	F	555
20	7536	1180	7651	1392	7328	1769	-	-	-	-	-	-	G	852
21	3960	603	4113	731	3787	1043	12444	1000	1547	120	-	-	G	771
22	6237	1208	5915	1313	6352	1801	22400	1800	-	-	-	-	D	347
23	9789	1563	9368	1705	7613	1876	-	-	1547	120	-	-	G	950
24	11180	1808	10346	1915	11344	2860	-	-	773	60	-	-	G	651
25	5027	783	5201	948	5131	1230	2240	1800	773	60	-	-	G	649

3.1.3 Energy efficiency target(s)

The energy efficiency targets set are:

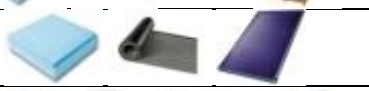
- The improvement of energy performance by 2 Energy Classes according to the national methodology for the energy certification of existing buildings.
- The improvement of energy performance by at least 30% according to the national methodology for the energy certification of existing buildings.
- The reduction of annual energy costs for the households by at least 30%.

3.1.4 Action plan(s)

Following the results of the completed energy analysis of the pilot dwellings, the 25 owners were informed with letters on 28th of December 2012 about the detailed workings and the measures selected for their dwellings. Minor Adjustments have been made according to the comments received by the owners.

The list of measures with the estimated cost as well as the energy performance before and after appears at the following table.

Table 5 Energy audits and action plan to the pilot projects

PP	Measures	PV	Estimated Cost	EPC Before		EPC After		Save	Class raise	Share of RES
		kW	€	Class	$kWh_{pr}/m^2.year$	Class	$kWh_{pr}/m^2.year$	%	n.	%
1		1.2	9300	G	746	C	241.12	68%	4	16
2			7635	G	713	D	438	39%	3	1
3		1.5	7494	G	1069	F	517	52%	1	8
4		3	11250	G	778	D	389	50%	3	25
5		1	6910	G	647	C	207	68%	4	19%
6		1	6230	G	914	E	491	46%	2	9%
7		3	8447	E	330	A	137	59%	4	32%
8		3	7500	D	334	B	79	76%	2	55%
9		1	7730	G	871	D	428	51%	3	19%
10		3	9955	G	611	B	99	84%	5	48%
11			8069	E	439	C	280	36%	2	2%
12			7950	G	841	C	284	66%	4	2%
13			10780	F	506	D	288	43%	1	2%
14			8603	G	747	E	373	50%	2	2%
15			9000	G	1175	D	395	66%	3	1%
16			8585	F	598	D	351	41%	2	2%
17			8136	G	626	D	306	51%	3	2%
18		3	7880	C	306	A	12	96%	2	92%
19			8575	F	555	D	405	27%	2	1%

PP	Measures	PV	Estimated Cost	EPC Before		EPC After		Save	Class raise	Share of RES
		kW	€	Class	$kWh_{pr}/m^2.year$	Class	$kWh_{pr}/m^2.year$	%	n.	%
20		1.4	7870	G	852	D	341	60%	3	14%
21			8476	G	771	E	499	35%	2	1%
22		3.6	9437	D	347	A	83	76%	3	61%
23		1.9	9325	G	950	C	247	74%	4	21%
24			7100	G	651	E	338	48%	2	1%
25			7000	G	649	F	590.64	9%	1	1%
							Total savings	54%		

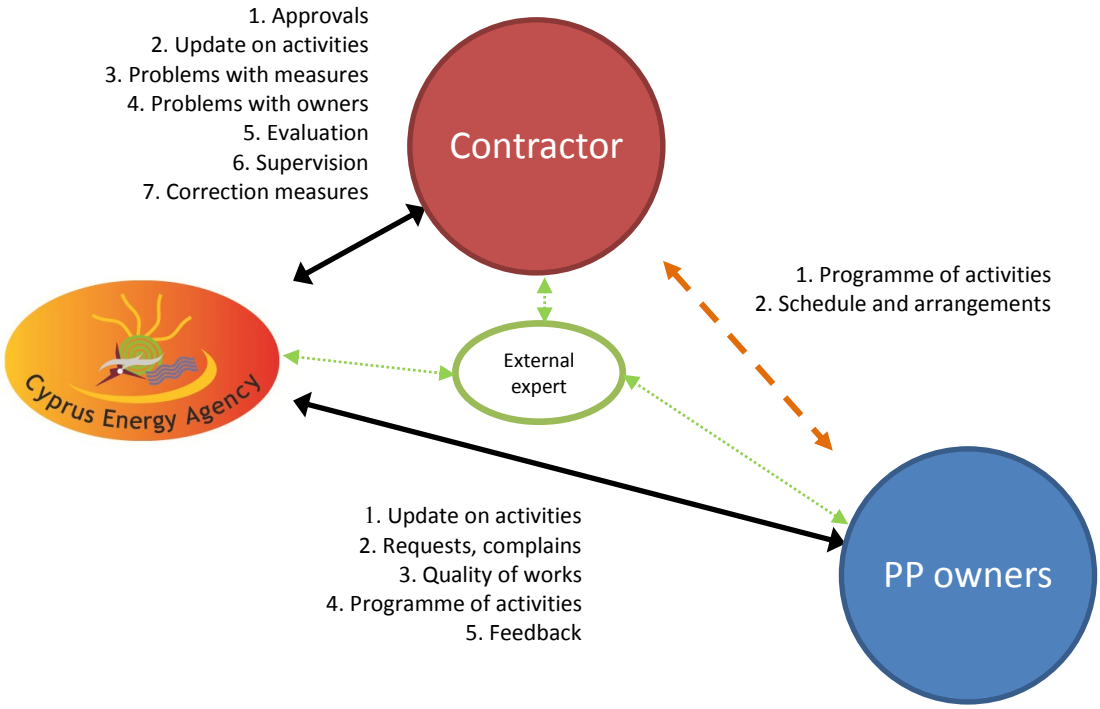
3.1.5 Call for tender

The tender documents for the selection of the contractor for the refurbishments were prepared by Cyprus Energy Agency with the assistance of an external expert and submitted to the National Competent Authority for Public Procurements. National Rules and Procedures for Public Contracts were respected and a Certificate of Conformity issued. The Competent Authority approved the tender documents on the 27th of May 2013 and CEA launched the open call in the same date through the e-procurement (which is an electronic instrument for public procurement). Five offers were received, and following the tender evaluation, the contract was signed with "STELIOS YIATROS AND SON LTD" on the 13th September 2013 for the amount of € 187,195. The Cyprus Competent Authority (Treasury of the Republic) approved the contract award. The contract duration was 6 months. All the workings were completed and approved by the end of March 2014, however the final delivery of the completed works was accomplished in June2014 when the quality control was realised and the contractual obligations were double checked.

3.2 DURING AND AFTER REFURBISHMENT

After the assignment of the convention to the contractor, some preliminary visits were carried out to all the residences under the supervision of the Cyprus Energy Agency in order to identify any construction difficulties and to give clarification instructions. Following the completion of the visits a meeting was carried out between the Energy Agency and the contractor in order for all the arrangements, the instructions or any small amendments to be part of the agreement between the two parties. Subsequently the agenda for the workings was asked which was necessary for the workings to proceed on the buildings in order to assure the availability of the owners, the correct order of execution and the supervision. The convention came in action as soon as the constructor submitted the agenda and the Cyprus Energy Agency approved it.

The communication model that was used during the whole of the completion time of the convention was the following:



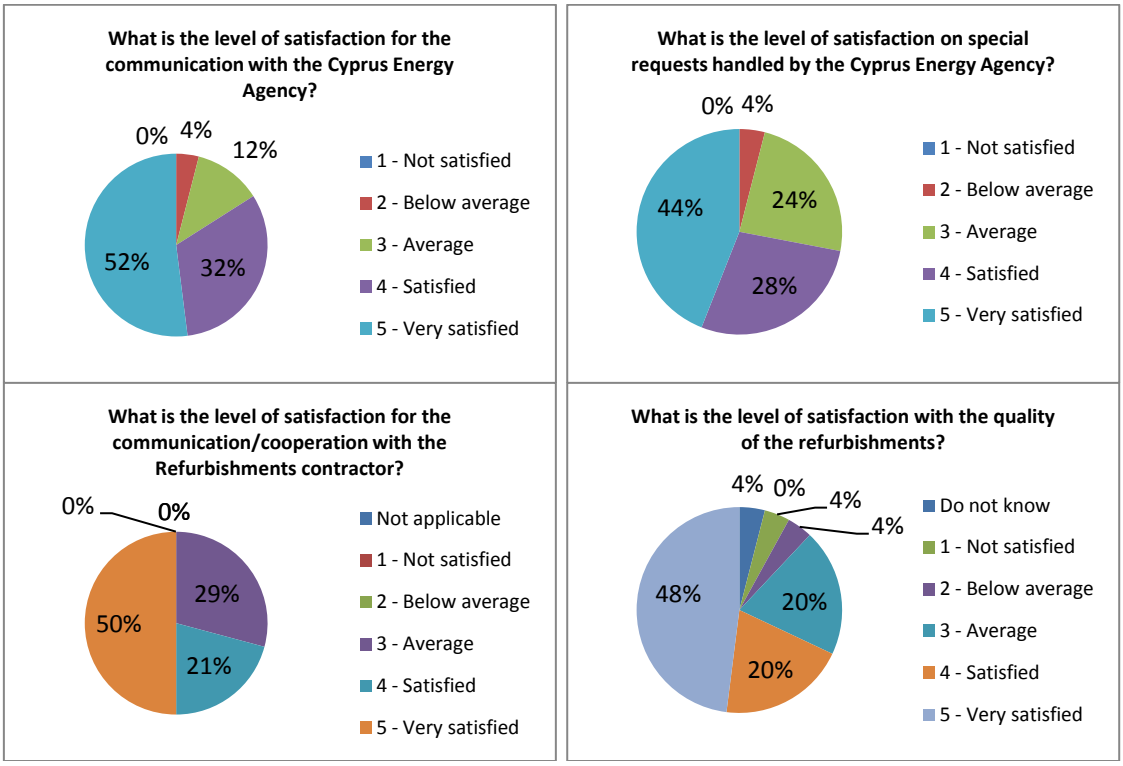
The coordination and supervision team on behalf of the Cyprus Energy Agency consisted the following experts and managers:

Table 6 Team of experts

Name	Position	Duties
Anthi Charalambous	Cyprus Energy Agency Director	Project Supervisor
Savvas Vlachos	Cyprus Energy Agency RES and EE expert	Project Manager
Gregoris Panayiotou	External expert	Energy Expert
Salomi Violary	External expert	Civil Engineer

During the proceedings a few problems occurred as well as some disagreements either with the owners or with the contractor. In order to resolve those issues or disagreements meetings were organised between the Cyprus Energy Agency, the contractor and the external partners where arrangements were made in order to resolve the issues that were raised. During those meetings an agenda was held which was accepted by both parties and the resulting actions to be taken were set in written instructions by the Cyprus Energy Agency.

The following results were recorded according to the answers by the owners of the pilot dwellings in a survey that was conveyed after the completion of the work:



3.2.1 Description of works

The energy interventions that were chosen for the energy upgrade of the pilot dwellings can be sorted as below:

Table 7 List of energy interventions

Category	Energy Intervention	Target	Special requirements
Thermal Insulation	Roof thermal Insulation (interior and or exterior)	Limitation of thermal losses from the building structure in order to reduce energy consumption in heating and cooling	Assurance of waterproof and static adequacy of the roof. Access to the roof during the carrying of loads
	Thermal insulation of the walls using thermal plaster		Removal of deteriorated plaster, smoothening of the surfaces and installation of the new plaster. Assurance of access
	Double glazed windows with thermally insulated frames.		Removal of old frames. Actions for configuration of the installation points(e.g mounting) ensuring the best fitting
Direct sun protection	External adjustable shading	Limitation of unwanted penetration of sun rays during summer time and reduction of energy consumption from air conditioning	Actions for configuration of the installation points (e.g mounting) ensuring the best fitting
Heating and Cooling Systems	Autonomous heating and cooling units	Rise in the energy efficiency of heating and cooling in order to limit the consumption	Removal of old heating and cooling systems or configuration of new positions for both external (split units) and internal (compressors)

Category	Energy Intervention	Target	Special requirements
	Energy wood fireplaces (air)	Improvement of energy efficiency on heating and limitation of consumption.	Removal of old fireplace or configuration of a new location. Actions for ensuring the suitability of the smokestack and access for electricity in order for the support fans to be installed
	Energy wood fireplace (boiler)	Improvement of energy efficiency on heating and limitation of energy consumption for heating and hot water by creating a combined system using diesel and wood.	Removal of old fireplace or configuration of a new location. Actions for ensuring the suitability of the smokestack and access for electricity in order for the support fans to be installed. Installation of pumps and configuration of connection and control along with the present heating system
Lighting	Energy efficient lighting	Energy saving for lighting by using more efficient lighting	Removal of old lamps and installation of new ones.
Hot water	Water heating solar panel.	Energy saving by covering the hot water needs.	Removal of old timeworn solar panels along with any support mechanism (pipes, storage tank etc) and installation of a new system

The procedures that took place per pilot dwelling along with their approval date are presented on the table below:

Table 8 List of energy interventions realized to the pilot projects

PP	Measures	Measure description (Contract obligations)	Date of approval
1	I	Roof thermal insulation with 5cm insulation material	**16/12/2013**
	II	Waterproof insulation	**04/11/2013**
	III	Replacement of air conditioning units with new energy efficient ones	**04/11/2013**
2	I	Roof thermal insulation with 5cm insulation material	**16/12/2013**
	II	Waterproof insulation	**04/11/2013**
	III	Replacement of Solar Water Heating system	**04/11/2013**
3	I	Roof thermal insulation with 5cm insulation material	**12/3/2014**
	II	Replacement of inefficient lighting with new more efficient	**12/3/2014**
	+	Waterproof insulation	**12/3/2014**
4	I	Roof thermal insulation with 5cm insulation material	**16/12/2013**
	II	Waterproof insulation	**22/10/2013**
	III	Replacement of inefficient lighting with new more efficient	**16/12/2013**
	IV	Replacement of Solar Water Heating system	**22/10/2013**
5	I	Installation of new plaster with thermal insulation characteristics and thickness 2,5 cm (walls and beams external)	**12/3/2014**
	II	Replacement of inefficient lighting with new more efficient	**12/3/2014**
	III	Roof thermal insulation with 5cm insulation material	**12/3/2014**
6	I	Roof thermal insulation with 5cm insulation material	**12/3/2014**
	II	Waterproof insulation	**12/3/2014**
	III	Replacement of Solar Water Heating system	**28/3/2014**
7	I	Installation of new internal ceiling with thermal insulation (thickness 5cm)	**04/11/2013**
	II	Installation of new efficient fire place (air module)	**16/12/2013**

PP	Measures	Measure description (Contract obligations)	Date of approval
	III	Replacement of inefficient lighting with new more efficient	**16/12/2013**
8	I	New efficient fire place and integration with the existing oil boiler for the central heating system of the house	**16/12/2013**
	II	Installation of internal thermal insulation (thickness 5cm) above the internal wooden ceiling of the building	**04/11/2013**
9	I	Roof thermal insulation with 5cm insulation material	**12/3/2014**
	II	Waterproof insulation	**12/3/2014**
	III	Installation of new plaster with thermal insulation characteristics and thickness 2,5 cm (walls and beams external)	**12/3/2014**
	IV	Replacement of single glazing with double glazing with thermally insulated frame	**12/3/2014**
10	I	Roof thermal insulation with 5cm insulation material	**12/3/2014**
	II	Replacement of existing (old) hot water tank with new one	**12/3/2014**
	III	Replacement of inefficient lighting with new more efficient	**12/3/2014**
	IV	Replacement of air conditioning units with new energy efficient	**12/3/2014**
11	I	Roof thermal insulation with 5cm insulation material	**16/12/2013**
	II	Waterproof insulation	**22/10/2013**
	III	Replacement of Solar Water Heating system	**22/10/2013**
12	I	Roof thermal insulation with 5cm insulation material	**16/12/2013**
	II	Replacement of Solar Water Heating system	**16/12/2013**
	III	Replacement of inefficient lighting with new more efficient	**16/12/2013**
	IV	Replacement of air conditioning units with new energy efficient	**04/11/2013**
13	I	Installation of new internal ceiling with thermal insulation (thickness 5cm)	**22/10/2013**
	II	Installation of new plaster with thermal insulation characteristics and thickness 2,5 cm (walls and beams external)	**22/10/2013**
	III	Roof repairs	**22/10/2013**
14	I	Replacement of Solar Water Heating system	**28/3/2014**
	II	Replacement of inefficient lighting with new more efficient	**12/3/2014**
	III	Replacement of air conditioning units with new energy efficient	**12/3/2014**
	IV	Replacement of single glazing with double glazing with thermally insulated frame	**28/3/2014**
15	I	Installation of new internal ceiling with thermal insulation (thickness 5cm)	**04/11/2013**
	II	Replacement of inefficient lighting with new more efficient	**04/11/2013**
	III	Replacement of air conditioning units with new energy efficient	**04/11/2013**
	IV	Installation of new plaster with thermal insulation characteristics and thickness 2,5 cm (walls and beams external)	**04/11/2013**
16	I	Installation of internal thermal insulation (thickness 5cm) above the internal wooden ceiling of the building	**22/10/2013**
	II	Replacement of inefficient lighting with new more efficient	**12/3/2014**
	III	Replacement of Solar Water Heating system	**28/3/2014**
	IV	Replacement of air conditioning units with new energy efficient (some of them)	**12/3/2014**
	V	Replacement of single glazing with double glazing with thermally insulated frame (some of them)	**28/3/2014**
17	I	Roof thermal insulation with 5cm insulation material	**12/3/2014**
	II	Replacement of single glazing with double glazing with thermally insulated frame (some of them)	**12/3/2014**
	III	Replacement of inefficient lighting with new more efficient	**12/3/2014**
18	I	Roof thermal insulation with 5cm insulation material	**12/3/2014**
	II	Installation of new plaster with thermal insulation characteristics and thickness 2,5 cm (walls and beams external)	**12/3/2014**
	III	Replacement of inefficient lighting with new more efficient	**12/3/2014**

PP	Measures	Measure description (Contract obligations)	Date of approval
19	I	Roof thermal insulation with 5cm insulation material	**12/3/2014**
	II Modified	Waterproof insulation	**12/3/2014**
	III	Replacement of inefficient lighting with new more efficient	**12/3/2014**
	IV	Replacement of existing (old) hot water tank with new one	**12/3/2014**
20	I	Roof thermal insulation with 5cm insulation material	**16/12/2013**
	II	Waterproof insulation	**16/12/2013**
	III	Replacement of inefficient lighting with new more efficient	**16/12/2013**
21	I	Installation of internal thermal insulation (thickness 5cm) above the internal wooden ceiling of the building	**12/3/2014**
	II	Replacement of inefficient lighting with new more efficient	**12/3/2014**
	III	Replacement of single glazing with double glazing with thermally insulated frame (some of them)	**28/3/2014**
22	I	Roof thermal insulation with 5cm insulation material	**12/3/2014**
	II	Waterproof insulation	**12/3/2014**
	III	Replacement of inefficient lighting with new more efficient	**12/3/2014**
23	I	Installation of new internal ceiling with thermal insulation (thickness 5cm)	**12/3/2014**
	II	Waterproof insulation	**12/3/2014**
	III	Replacement of air conditioning units with new energy efficient	**12/3/2014**
	IV	Replacement of inefficient lighting with new more efficient	**12/3/2014**
24	I	Installation of new efficient fire place (air module)	**12/3/2014**
	II	Replacement of inefficient lighting with new more efficient	**12/3/2014**
	III	Installation of external blinds	**12/3/2014**
25	I	Replacement of existing (old) hot water tank with new one	**16/12/2013**
	II	Installation of new plaster with thermal insulation characteristics and thickness 2,5 cm (walls and beams external)	**04/11/2013**

3.2.2 Costs

Based on the results of the energy audits that took action on the 25 dwellings, the costs for all the actions have been calculated keeping the budget to a maximum of €215, 00.

The ERDF contribution amounts 85% of the eligible budget, rising to €180.625 and the remaining 15% should be the national/local and/or own contribution of the Cyprus Energy Agency to the project implementation. The Cyprus Energy Agency, aiming to involve other public and private funding during the project implementation, has prepared the following financial plan:

- Invited Local Authorities that signed the CoM and/or Pact of Islands and have undertaken voluntary commitments of CO2 emissions reductions by 2020, to contribute for the refurbishment workings in the pilot dwellings that have been selected in their territories. The Local Authorities agreed and contributed financially with €1,500 per dwelling for their district.
- Invited the Cyprus Land Development Organization to contribute for the refurbishment workings for the pilot dwellings selected from their customers (private Low Income Households).
- Invited the Electricity Authority of Cyprus to contribute by providing and installing on pilot basis smart/net meters in the 25 pilot dwellings. This is the first project implemented in Cyprus that involved the installation of smart meters by the EAC. It is expected that the results will be rolled out soon.
- Invited the members of the Cyprus Association of Renewable Energy Sources Enterprises to contribute by providing and installing small PV systems for electricity production to the pilot dwellings. It is worth mentioning that the PV systems

installed at the dwellings have been the first pilots in Cyprus where the net metering has been performed.

The signed convection with the constructor on the 13/9/2013 was for €188,782 (vat included). During the implementation of the convection some extra activities needed to take place due to the problems that aroused leading to an increased final cost of €201,892. The table below demonstrates the most important expenses in the completion of the energy interventions:

Table 9 Energy renovations expenses breakdown

Activity	Costs	Funding source
Interventions for energy upgrading	201,892 €	European Regional Development Fund 85%
		Local Authorities and Cyprus Land Development Company
Photovoltaic systems	≈50,000 €	Cyprus Association of Renewable Energy Enterprises
External Experts	14,135 €	European Regional Development Fund 85%
Energy Audits	≈20,000 €	European Regional Development Fund 85%
Administration costs (public procurement, management, communication)	≈10,000 €	European Regional Development Fund 85%
TOTAL	**≈296,027 €**	

*The costs for the purchase and installation of smart meters as well as the monitoring and the evaluation of pilot projects results are not included

The overall costs rise at around €296,000 for the energy upgrading, for an overall of 4923m^2 covered heated space which results to 60€/ m^2 for a heated space or 11,841€/ pilot project. It is also important to mention that the estimate savings after the implementation of the energy upgrades rises to €28,000 per annum or 7-8€/ m^2 of the heated space. Parallel to the interventions some other important issues were resolved including the waterproofness, the improvement of the indoor conditions quality along with the thermal comfort and the aesthetic view of both the inside and the outside of the dwellings.

It is also important to mention that through this project some private and public sectors contributed in the funding of the actions rising to €86,000 without taking into account the funding received from the Electricity Authority of Cyprus for providing the smart meters.

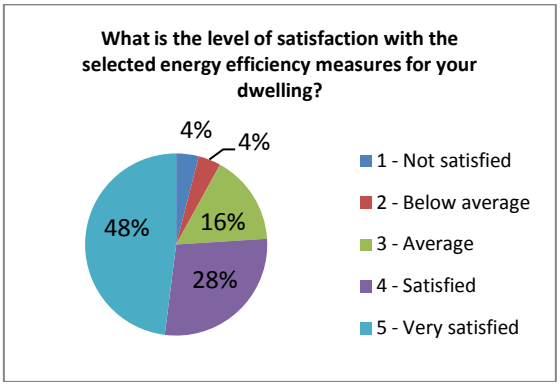
3.2.3 User involvement and feedback

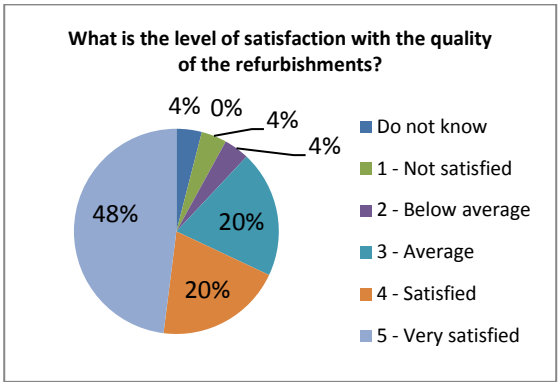
The families that took part into this programme as beneficiaries for these pilot renovations, presented a few understanding differences regarding their dwellings and the importance of energy renovations as well as the level of cooperation needed with both the Cyprus Energy Agency and the contractor. The following profiles of the families can be briefly described based on their contribution and attitude towards the project:

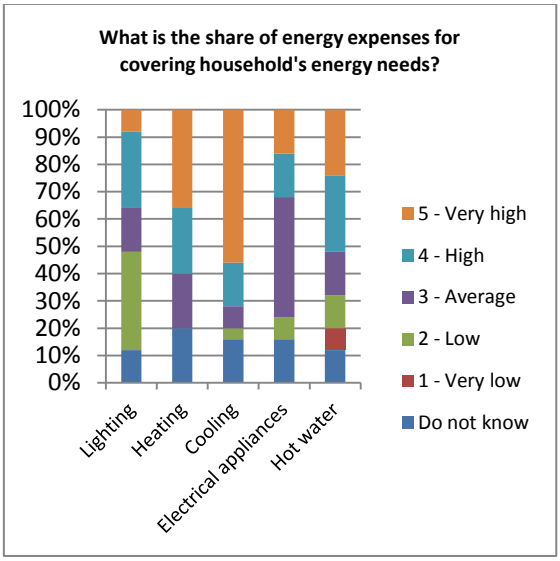
Table 10 Households profiles

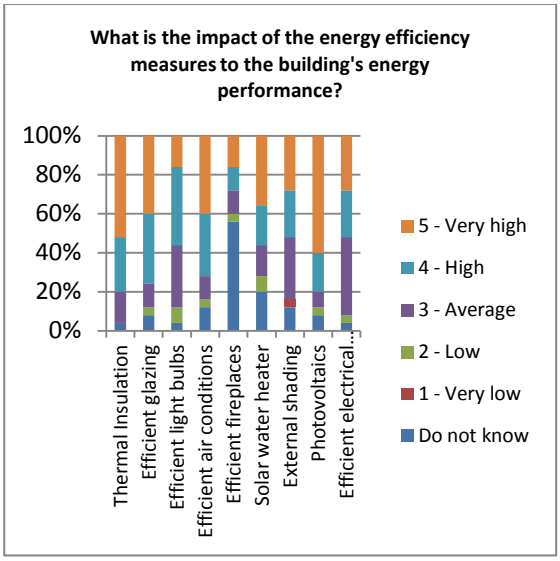
Household profile	Characteristics
Enthusiastic	Enthusiastic and happy with their selection as a pilot dwelling. Understand basic energy-related matters and are interested to learn more
Cooperative	Are satisfied with their selection as pilot dwelling. Accept the suggested energy interventions without necessarily understanding the meaning or the priorities.
Neutral	Even if they were satisfied with their selection as pilot dwelling they don't express their satisfaction and keep a neutral stance regarding the processes of the project. In general they don't understand the importance or the priority of the energy renovation.
Unsatisfied	Like to take part without having a good understanding the series of energy renovations. They tend to be strict and hard to satisfy. They express often their dissatisfaction.
Greedy	Are never satisfied. They tend to stay suspicious and want to ensure always something more for themselves. They are never cooperative and express intensively their complaints in order to get the most out of it. They like to think themselves as experts in all matters but tend to lack in basic knowledge with regards to energy renovations.

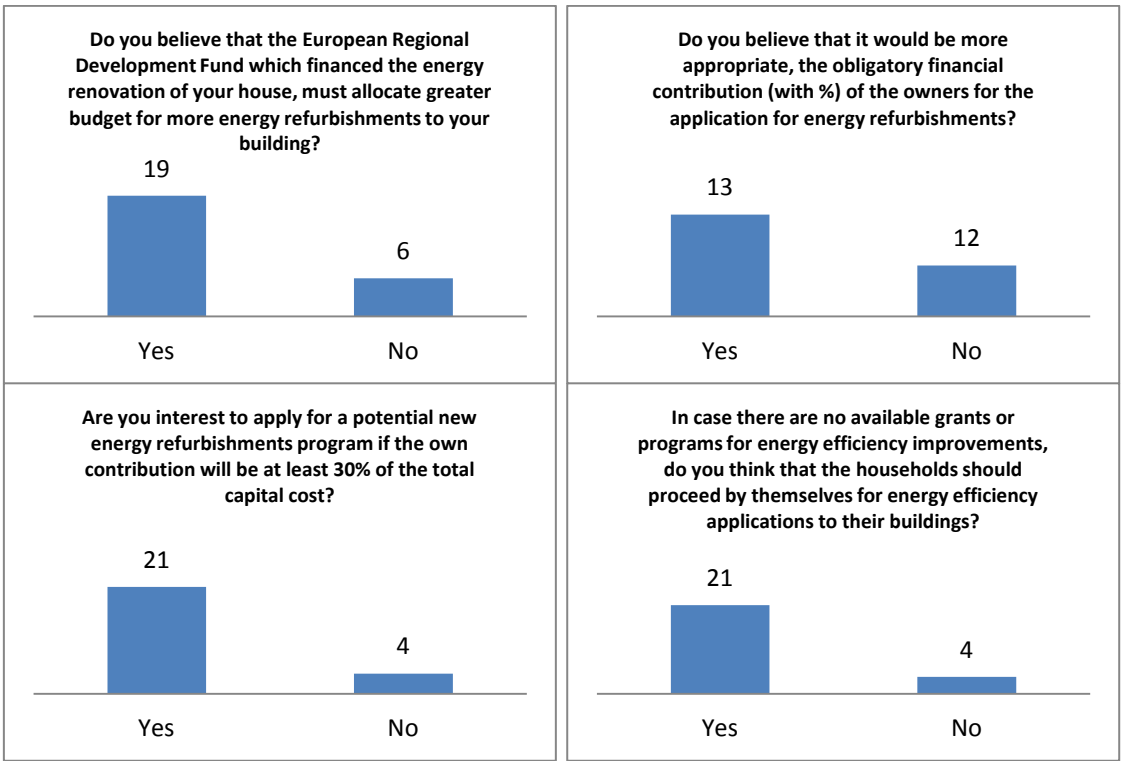
A survey was conducted after the completion of the project where the owners of the pilot dwellings were questioned regarding their satisfaction with the energy renovations:











3.2.4 Pictures from the pilot projects

PP1 – Waterproof insulation and new heat pumps

PP1 – Thermal Insulation and Photovoltaics

PP2 - Waterproof insulation

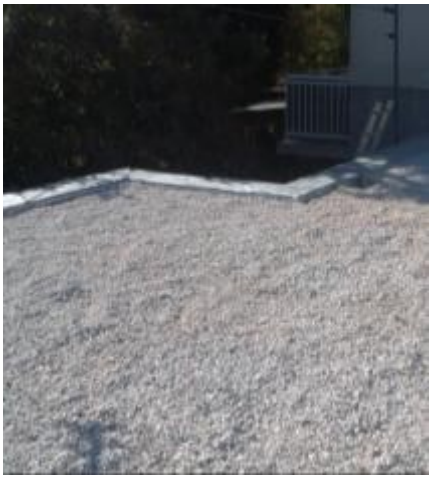
PP2 – Thermal insulation and new solar thermal water heater

PP3 – Roof insulation and PVs

PP3-smart/net metering

PP4 – Thermal Insulation of the roof

PP4 – Waterproof Insulation and new solar thermal water heater



PP5- Roof thermal insulation

PP5 – Wall finishing works

PP6 – Roof insulation

PP6 – Roof insulation

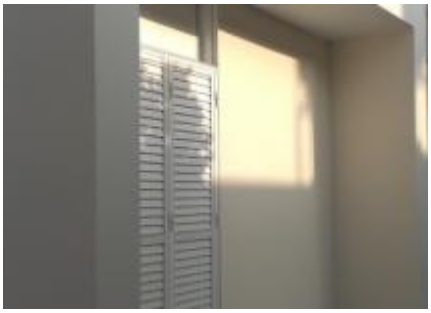
PP7- Efficient lighting and new ceiling with thermal insulation

PP7- New efficient fireplace (air module)

PP8 – Efficient fireplace (with boiler) installation

PP8 – Piping workings for the installation of the fireplace

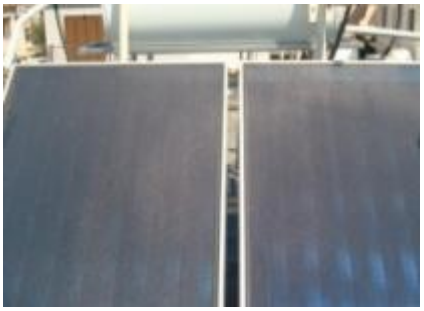
PP9 – Roof thermal insulation and photovoltaics



PP9 – Completed works of the walls with thermal plaster

PP10 – Roof insulation and PVs

PP10 – Roof repairing



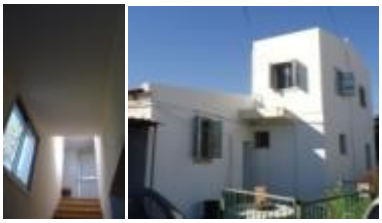
PP11 - New solar thermal water heater

PP11 – Waterproof Insulation

PP12 – Thermal Insulation of the roof

PP12 – New efficient air conditioning compressor

PP13 – Indoor and outdoor before



PP13 – Indoor and outdoor after

PP14 – Installation of Solar water heater

PP15 – Outdoor after

PP15 – Ceiling with thermal insulation

PP16 – Thermal Insulation of the roof

PP16 - Thermal Insulation of the roof

PP17 – Thermal Insulation of the roof

PP17 – Thermal Insulation of the roof

PP18-Wall thermal insulation

PP18 – Roof insulation and PVs

PP19– Roof thermal insulation

PP19– Roof thermal insulation

PP20 – Roof before insulation

PP20 – Roof with thermal insulation

PP23 – PVs and insulation

PP23 – Interior thermal insulation

PP24 – Energy efficient wood stove

PP24 – Energy efficient wood stove

PP25 – Before works

PP25 – After thermal plaster

4. MONITORING

In order to create the reference year the electricity consumption data was collected for years 2010 up to 2013 along with the data for fuel consumption for years 2012 and 2013. For the supervision of the impact of the energy interventions to the 25 dwellings and in order to evaluate the final results the following tools and equipment have been used.

Table 11 Monitoring equipment and tools

Tool	Purpose	Picture	Data Accuracy
Smart meter	Verification of the energy profile of the household with regards to the energy consumption before and after the interventions (in 23 dwellings)		Very High
Indoor smart meters	Verification of the detailed energy profile of the household with regards to electricity consumption before and after the interventions (2 households)		Very High
Data loggers	Recording of the temperature and relative air humidity for 2 dwellings		High
Infrared camera	For the recording of the thermal losses before and after the interventions		High
Temperature and humidity measuring device	For the overview of specific internal conditions for Temperature and Relative Humidity		High
Material moisture measuring device	For the specific overview of moisture in the various structures before and after the energy upgrade		High

Tool	Purpose	Picture	Data Accuracy
Electric Energy Analyser	For overviewing specific cases of electric loads in the dwellings.		Very High
Lux meter	Verification of containing the level of lighting after the replacement of the lights		Very High
Questionnaire for energy consumptions	For recording the consumption of fuel energy from firewood, gas and diesel		Average
Questionnaire for thermal comfort	For validation of the improvement in thermal comfort in the dwellings		Good

5. PERFORMANCE ASSESSMENT

In this paragraph, the assessment of pilot projects from an energy and environmental point is presented. For the evaluation of the energy renovations the following methodologies were used:

a. **Energy modeling** of each pilot project before and after the renovations with the commissioned calculation methodology for Cyprus for the energy performance certificate of buildings. The approach to the calculation methodology Cyprus embodied in a tool comprises of a calculation engine called "the Simplified Building Energy Model (SBEM-CY) operating with a user interface called iSBEM- CY. This methodology requires inputs
   i. on different forms of constructions and glazing types,
   ii. zoning of the building based on the drawings,
   iii. definition of the HVAC (heating, ventilation and air conditioning) systems, the HWSs (Hot Water Systems), and any SES (solar energy systems), PVS (Photovoltaic systems), wind generators or CHP (Combined heat and power)used in the buildings.
   iv. definition of lighting systems.

b. **Energy analysis** of energy consumptions data collected before and after the energy renovations. Energy bills were collected as well as electricity data from smart meters installed. Further information was provided by the householders through frequent surveys.

5.1 PERFORMANCE INDICATORS

According to the evaluation methodology was used; performance indicators were calculated for the 25 pilot projects in Cyprus. The table below provides an overview of the indicators calculated in order to compare the energy efficiency of the dwellings before and after and evaluate the performance of the refurbishments.

Table 12 Performance indicators

Indicator	Definition	Unit	Methodology
Ind 1a	Actual annual amount of electricity delivered to the pilot project	kWh_{el}/m^2.year kWh_{el}/m^2.inh.	Energy Analysis before and after energy renovations
Ind 1b.1	Annual amount of electricity delivered to the pilot project	kWh_{el}/m^2.year	Energy Modeling before and after energy renovations
Ind 1b.2	Annual amount of electricity for auxiliary delivered to the pilot project	kWh_{el}/m^2.year	Energy Modeling before and after energy renovations
Ind 1b.3	Annual amount of electricity for lighting delivered to the pilot project	kWh_{el}/m^2.year	Energy Modeling before and after energy renovations
Ind 1b.4	Annual amount of energy for hot water delivered to the pilot project	kWh_{el}/m^2.year	Energy Modeling before and after energy renovations
Ind 2a	Actual annual amount of thermal energy delivered to the pilot project	kWh_{th}/m^2.year	Energy Analysis before and after energy renovations
Ind 2b.1	Annual amount of thermal energy delivered to the pilot project	kWh_{th}/m^2.year	Energy Modeling before and after energy renovations
Ind 2b.2	Annual amount of energy delivered for heating to the pilot project	kWh_{th}/m^2.year	Energy Modeling before and after energy renovations

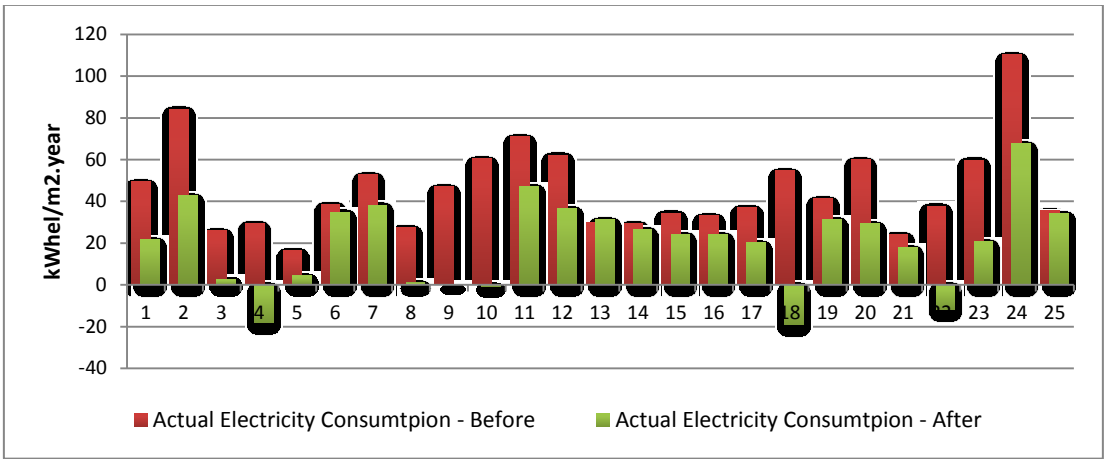
Indicator	Definition	Unit	Methodology
Ind 2b.3	Annual amount of energy delivered for cooling to the pilot project	kWh_{th}/m^2.year	Energy Modeling before and after energy renovations
Ind 3a	Annual total amount of final energy delivered to the pilot project	kWh_{fe}/m^2.year	Energy Analysis before and after energy renovations
Ind 3b.1	Annual total amount of final energy delivered to the pilot project	kWh_{fe}/m^2.year	Energy Modeling before and after energy renovations
Ind 3b.2	Annual total amount of primary energy delivered to the pilot project	kWh_{pr}/m^2.year	Energy Modeling before and after energy renovations
Ind 4a.1	Annual total amount of energy produced by RES by the pilot project	kWh_{pe}/m^2.year	Energy Analysis before and after energy renovations
Ind 4a.2	Annual share of RES to the pilot project	%	Energy Analysis before and after energy renovations
Ind 4b.1	Annual total amount of energy produced by RES by the pilot project	kWh_{pe}/m^2.year	Energy Modeling before and after energy renovations
Ind 4b.2	Annual share of RES to the pilot project	%	Energy Modeling before and after energy renovations
Ind 5a.1	Actual energy savings of ECMs	kWh_{fe}/m^2.year kWh_{el}/m^2.inh. kWh_{el}/year kWh_{th}/m^2.year kWh_{th}/m^2.inh.	Based on Energy Analysis before and after energy renovations
Ind 5a.2	Actual energy savings of ECMs	%	Based on Energy Analysis before and after energy renovations
Ind 5a.3	Actual energy savings of ECMs	€	Based on Energy Analysis before and after energy renovations
Ind 5b.1	Final Energy savings of ECMs	%	Based on Energy Modeling before and after energy renovations
Ind 5b.2	Primary Energy Savings of ECMs	%	Based on Energy Modeling before and after energy renovations
Ind 6b.1	Energy effectiveness of ECMs (Primary Energy Savings)	%	Based on Energy Modeling before and after energy renovations
Ind 6b.2	Energy effectiveness of ECMs (Final Energy Savings)	%	Based on Energy Modeling before and after energy renovations
Ind 6b.3	Energy effectiveness of ECMs (Energy Performance Certificate)	Energy Class Raise	Based on Energy Modeling before and after energy renovations
Ind 7b.1	Annual carbon dioxide emissions by the pilot project	kg CO_2/m^2.year	Based on Energy Modeling before and after energy renovations
Ind 7b.2	Annual carbon dioxide emissions by the pilot project	%	Based on Energy Modeling before and after energy renovations

The most important results for all the 25 pilot projects can be summarized as follows:

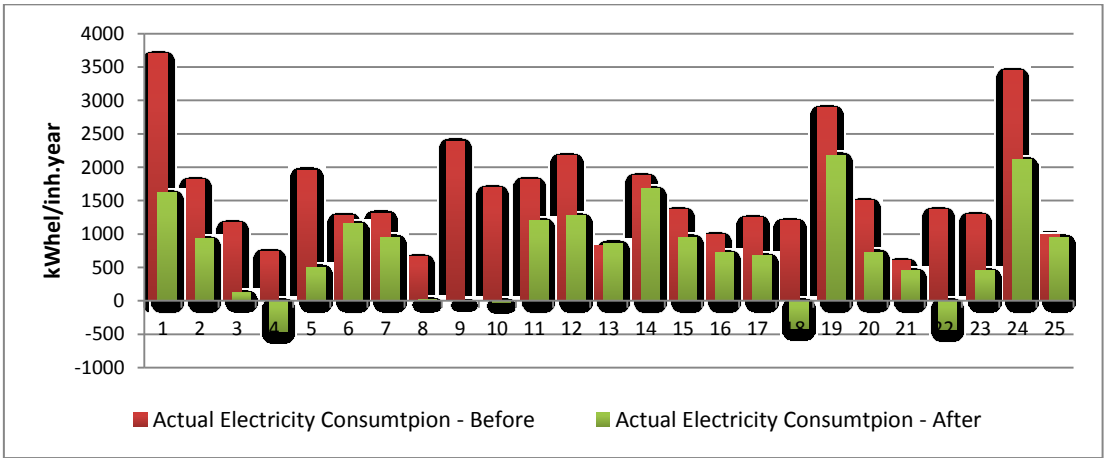
- Total Actual annual net electricity consumption reduced from 143 MWh to 81 MWh which reflects to 57% savings
- Total Actual annual electricity produced from photovoltaic systems equals to 37 MWh
- Total Actual annual fuel consumption reduced from 125 MWh to 72 MWh which reflects to 30% savings
- Total annual final energy consumption based on EPC methodology reduced from 886 MWh to 483 MWh which reflects to 45% savings

- Total annual primary energy consumption based on EPC methodology reduced from 2147 MWh to 993 MWh which reflects to 54% savings
- Total annual energy produced from RES based on EPC methodology increased from 13 MWh to 146 MWh which reflects to 1020% increase.
- Total annual CO_2 emissions based on EPC methodology reduced from 615 tons to 279 tons which reflects to 55% reduction
- Total Actual annual energy expenses for electricity consumptions reduced from 30886 € to 17240 € which equals to 44% savings
- The total average Energy Class improvement on EPC equals to 2.7 energy classes

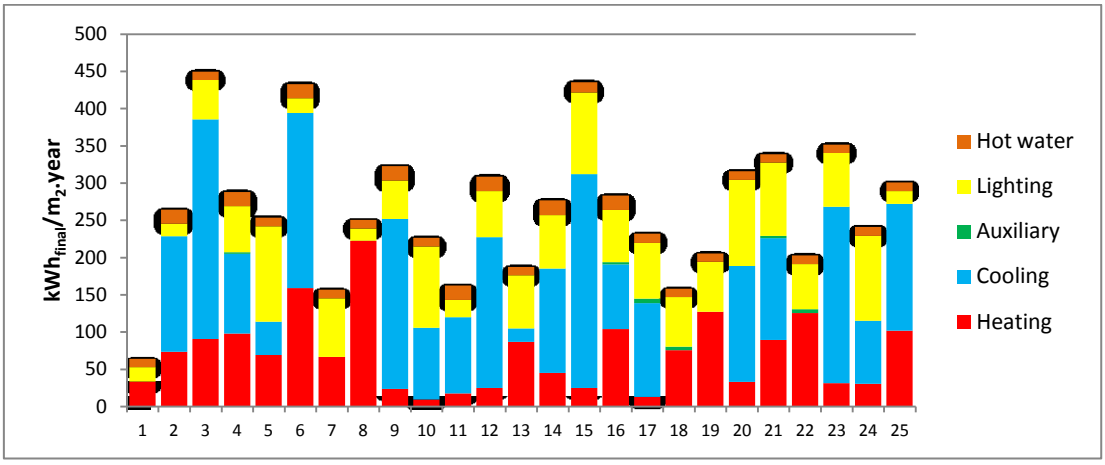
The following graphs and tables provide detailed results for each individual pilot project.



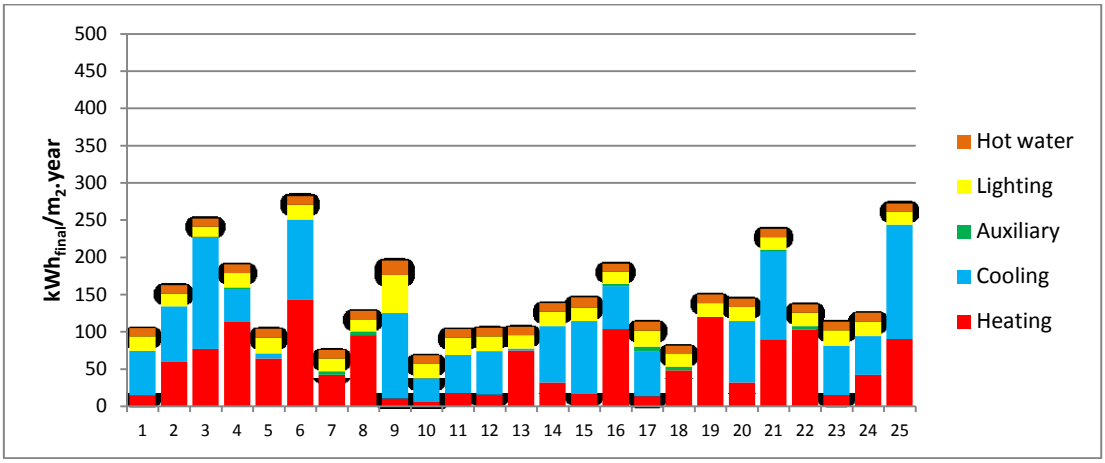
Graph 1 Comparison of actual annual electricity consumption per square meter to the pilot projects before and after the refurbishments



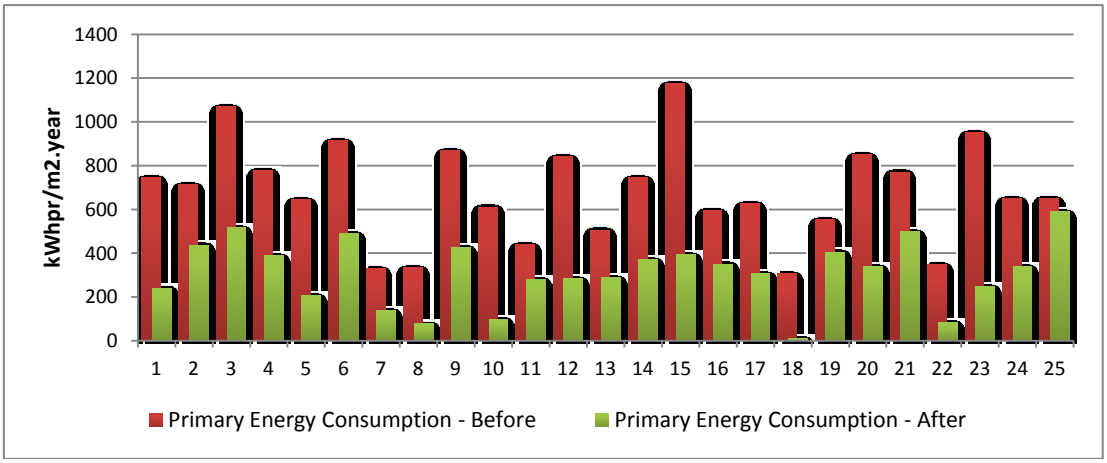
Graph 2 Comparison of actual annual electricity consumption per inhabitant to the pilot projects before and after the refurbishments



Graph 3 Annual final energy consumption per square meter per energy use to the pilot projects before the refurbishments (Based on EPC methodology)



Graph 4 Annual final energy consumption per square meter per energy use to the pilot projects after the refurbishments (Based on EPC methodology)



Graph 5 Comparison of annual primary energy consumption per square meter to the pilot projects before and after the refurbishments (Based on EPC methodology)

Table 13 Pilot projects electricity consumptions and productions

			Before			After					Savings			
			Electricity Consumption			Elect. Cons.	PV gen.	Net cons.	Net cons.	Net cons.				
	Area	Inh.	Average 2010-2012	Average 2010-2012	Average 2010-2012	2014	2014	2014	2014	2014				
	m^2	N.	kWh_{el}/ year	kWh_{el}/ m^2.year	kWh_{el}/ inh.year	kWh_{el}/ year	kWh_{el}/ year	kWh_{el}/ year	kWh_{el}/ m^2.year	kWh_{el}/ inh.year	kWh_{el}/ year	%	kWh_{el}/ m^2.year	kWh_{el}/ inh.year
PP			Ind 1.a	Ind 1.a	Ind 1.a	Ind 1.a	Ind 4a.1	Ind 1.a	Ind 1.a	Ind 1.a	Ind 5a.1	Ind 5a.2	Ind 5a.1	Ind 5a.1
1	150	2	7396	49	3698	5058	1815	3243	22	1622	4153	56	28	2077
2	108	5	9090	84	1818	4633		4633	43	927	4457	49	41	891
3	180	4	4681	26	1170	2690	2206	484	3	121	4197	90	23	1049
4	150	6	4426	30	738	2043	4788	-2745	-18	-458	7171	162	48	1195
5	120	1	1957	16	1957	1372	866	506	4	506	1451	74	12	1451
6	100	3	3840	38	1280	4309	832	3477	35	1159	363	9	4	121
7	150	6	7892	53	1315	7317	1588	5279	38	955	2163	27	14	361
8	170	7	4649	27	664	3557	3401	156	1	22	4493	97	26	642
9	51	1	2393	47	2393	1678	1676	2	0	2	2391	100	47	2391
10	140	5	8469	60	1694	4819	4909	-90	-1	-18	8559	101	61	1712
11	128	5	9108	71	1822	6013		6013	47	1203	3095	34	24	619
12	105	3	6517	62	2172	3850		3850	37	1283	2667	41	25	889
13	110	4	3294	30	824	3459		3459	31	865	-165	-5	-2	-41
14	127	2	3740	29	1870	3357		3357	26	1679	383	10	3	192
15	80	2	2748	34	1374	1911		1911	24	956	837	30	10	419
16	150	5	4946	33	989	3603		3603	24	721	1343	27	9	269
17	170	5	6266	37	1253	3414		3414	20	683	2852	46	17	570
18	110	5	6001	55	1200	2692	4794	-2102	-19	-420	8103	135	74	1621
19	140	2	5792	41	2896	4363		4363	31	2182	1429	25	10	715
20	125	5	7505	60	1501	5977	2324	3653	29	731	3852	51	31	770
21	150	6	3617	24	603	2685		2685	18	448	932	26	6	155
22	145	4	5466	38	1367	3766	5498	-1732	-12	-433	7198	132	50	1800
23	130	6	7768	60	1295	4986	2294	2692	21	449	5076	65	39	846
24	94	3	10365	110	3455	6353		6353	68	2118	4012	39	43	1337
25	140	5	4997	36	999	4774		4774	34	955	223	4	2	45
		Total	**142923**		**Total**	**98679**	**36991**	**61688**		**Total**	**81235**	**57%**		

Table 14 Pilot projects fuel consumptions

PP	Area	Inhabitants	Before Refurbishments					After Refurbishments					Savings		
			Fuel Consumption					Fuel Consumption							
			2012 Oil	2012 LPG	2012 Wood	TOTAL		2014 Oil	2014 LPG	2014 Wood	TOTAL				
	m^2	N.	kWh_{th}/ year	kWh_{th}/ year	kWh_{th}/ year	kWh_{th}/ m^2.year	kWh_{th}/ inh.year	kWh_{th}/ year	kWh_{th}/ year	kWh_{th}/ year	kWh_{th}/ m^2.year	kWh_{th}/ inh.year	%	kWh_{th}/ m^2.year	kWh_{th}/ inh.year
						Ind 2a	Ind 2a				Ind 2a	Ind 2a	Ind 5a.2	Ind 5a.1	Ind 5a.1
1	150	2				0	0				0	0	0%	0	0
2	108	5		4640		43	928		4640		43	928	0%	0	0
3	180	4	12445			69	3111	9956			55	2489	20%	14	622
4	150	6				0	0				0	0	0%	0	0
5	120	1		1740		15	1740		348		3	348	80%	12	1392
6	100	3	6222	3093		93	3105	4355.4	1855.8		62	2070	33%	31	1035
7	150	6			3625	24	604			2175	15	363	40%		
8	170	7	9955		10000	117	2851	0		10000	59	1429	50%	59	1422
9	51	1													
10	140	5		1544		11	309		308.8		2	62	80%	9	247
11	128	5			2500	20	500			1250	10	250	50%	10	250
12	105	3		6187		59	2062		3093.5		29	1031	50%		
13	110	4	3991			36	998				0	0	100%	36	998
14	127	2													
15	80	2		232		3	116		116		1	58	50%	1	58
16	150	5	12444			83	2489				0	0	100%	83	2489
17	170	5				0	0				0	0	0%	0	0
18	110	5	4978			45	996	3484.6			32	697	30%	14	299
19	140	2				0	0				0	0	0%	0	0
20	125	5				0	0				0	0	0%	0	0
21	150	6	12444	1547		93	2332	8710.8	1547		68	1710	27%	25	622
22	145	4	22400			154	5600	17920			124	4480	20%	31	1120
23	130	6		1547		12	258		154.7		1	26	90%	11	232
24	94	3		773		8	258				0	0	100%	8	258
25	140	5	2240	773		22	603	1344	773		15	423	30%	6	179
		Total	87119	22076	16125		Total	45770	12836.8	13425					

Table 15 Energy Performance Before Refurbishments

PP	Area	Energy Performance Before Refurbishments													
			Heating	Cooling	Auxiliary	Lighting	Hot water	Total final energy consumption	Total final energy consumption	RES production	RES production	Total Primary Energy Consumption	Total Primary Energy Consumption	CO_2 emissions	CO_2 emissions
	m^2	Energy Class	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/year$	$kWh_{pr}/m^2.year$	$kWh_{pr}/year$	$kWh_{pr}/m^2.year$	$kWh_{pr}/year$	$Kg\ CO_2/m^2.year$	$Kg\ CO_2/year$
		Ind 6b.3	Ind 2b.2	Ind 2b.3	Ind 1b.2	Ind 1b.3	Ind 1b.4	Ind 3b.1	Ind 3b.1	Ind 4b.1	Ind 4b.1	Ind 3b.2	Ind 3b.2	Ind 7b.1	Ind 7b.1
1	150	G	33	212,21	0	19	11	276	41424	6	900	746	111900	219	32891
2	108	G	73	155	0	17	19	264	28540	0	0	713	77004	210	22661
3	180	G	91	295	0	53	11	450	80912	5	900	1069	192420	309	55634
4	150	G	98	107	2	62	19	288	43200	0	0	778	116642	229	34302
5	120	G	69	45	0	128	12	254	30456	5	600	647	77640	188	22618
6	100	G	159	235	0	20	19	433	43288	0	0	914	91400	260	25978
7	150	E	67	0	0	79	12	162	24288	5	750	330	49557	77	11585
8	170	D	223	0	0	16	12	255	43421	6	1020	334	56780	32	5382
9	51	G	24	228	0	51	19	323	16451	1	51	871	44418	256	13062
10	140	G	9	96	0	109	12	226	31690	6	840	611	85564	180	25162
11	128	E	18	102	0	23	20	162	20799	0	0	439	56157	126	16131
12	105	G	25	203	0	62	19	312	32723	0	0	841	88353	247	25982
13	110	F	87	18	0	72	11	188	20626	6	660	506	55690	149	16377
14	127	G	45	140	0	72	20	277	35154	0	0	747	94913	220	27912
15	80	G	25	287	0	110	14	435	34826	4	320	1175	94000	346	27651
16	150	F	104	87	3	70	19	283	42477	0	0	598	89684	170	25476
17	170	G	13	126	6	75	12	232	39425	6	1020	626	106420	184	31304
18	110	C	76	0	5	66	11	158	17401	5	550	306	33660	86	9425
19	140	F	127	0	0	67	11	205	28755	6	840	555	77700	163	22831
20	125	G	33	156	0	116	11	316	39464	6	750	852	106500	251	31335
21	150	G	89	137	3	98	11	339	50783	6	900	771	115650	222	33254
22	145	D	125	0	5	61	11	203	29410	6	870	347	50315	95	13747
23	130	G	31	237	0	72	11	352	45724	6	780	950	123500	279	36305
24	94	G	31	85	0	114	12	241	22674	5	470	651	61194	192	18003
25	140	G	102	170	0	17	11	301	42098	6	840	649	90821	211	29536
								Total	**886,007**	**Total**	**13,061**	**Total**	**2,147,881**	**Total**	**614,542**

Table 16 Energy Performance After Refurbishments

PP	Energy Performance Certificate After Refurbishments													
		Heating	Cooling	Auxiliary	Lighting	Hot water	Total final energy consumption	Total final energy consumption	RES production	RES production	Total Primary Energy Consumption	Total Primary Energy Consumption	CO_2 emissions	CO_2 emissions
	Energy Class	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/m^2.year$	$kWh_{final}/year$	$kWh_{pr}/m^2.year$	$kWh_{pr}/year$	$kWh_{pr}/m^2.year$	$kWh_{pr}/year$	$Kg\ CO_2/m^2.year$	$Kg\ CO_2/year$
	Ind 6b.3	Ind 2b.2	Ind 2b.3	Ind 1b.2	Ind 1b.3	Ind 1b.4	Ind 3b.1	Ind 3b.1	Ind 4b.1	Ind 4b.1	Ind 3b.2	Ind 3b.2	Ind 7b.1	Ind 7b.1
1	C	14.33	59.89	0	19.38	11.08	104.68	15702	47	7050	241.12	36168	70.91	10637
2	D	60.2	73.89	0	16.91	11.29	162.29	17527	5	540	438	47304	128.86	13917
3	F	77.07	150.33	0	13.55	10.99	251.94	45349	46	8280	517	93060	147.56	26561
4	D	112.94	44.21	2.29	19.42	11.37	190.23	28535	130	19500	389	58350	114.37	17156
5	C	63.92	7.17	0	21.02	11.76	103.87	12464	50	6000	207	24840	59.59	7151
6	E	142.65	108.06	0	19.76	11.56	282.03	28203	47	4700	491	49100	136.32	13632
7	A	41.97	0	5.05	16.94	11.54	75.5	11325	63	9450	137	20550	10.73	1610
8	B	95.28	0	4.99	16.26	11.61	128.14	21784	95	16150	79	13430	2.19	372
9	D	10.24	114.87	0	51.24	19.33	195.68	9980	101	5151	428	21828	125.73	6412
10	B	5.48	31.86	0	19.48	11.55	68.37	9572	92	12880	99	13860	28.97	4056
11	C	17.58	51.32	0	22.9	11.77	103.57	13257	5	640	280	35840	82.23	10525
12	C	15.47	58.37	0	19.62	11.63	105.09	11034	5	525	284	29820	83.45	8762
13	D	74.76	2.41	0	18.22	11.25	106.64	11730	6	660	288	31680	84.67	9314
14	E	31.78	75.75	0	19.13	11.62	138.28	17562	6	762	373	47371	109.79	13943
15	D	16.3	98.1	0	17.99	13.75	146.14	11691	4	320	395	31600	116.03	9282
16	D	103.44	57.73	3.03	16.13	11.12	191.44	28716	6	900	351	52650	97.39	14609
17	D	13.11	60.77	6.17	21.23	12.13	113.41	19280	6	1020	306	52020	90.05	15309
18	A	48.13	0	4.85	17	11.31	81.29	8942	135	14850	12	1320	0.8	88
19	D	120.08	0	0	18.45	11.34	149.87	20982	6	840	405	56700	118.99	16659
20	D	31.91	82.38	0	19	11.24	144.53	18066	55	6875	341	42625	100.14	12518
21	E	90	117.06	3.02	16.77	11.13	237.98	35697	6	900	499	74850	141.44	21216
22	A	102.56	0	4.99	17.78	11.41	148.15	21482	128	18560	83	12035	18.44	2674
23	C	14.76	66.58	0	20.54	11.42	113.3	14729	65	8450	247	32110	72.53	9429
24	E	42.3	51.65	0	19.38	12	125.33	11781	5	470	338	31772	99.5	9353
25	F	90.25	153.29	0	17.41	11.29	272.24	38114	6	840	590.64	82690	168.51	23591
							Total	**483,503**	**Total**	**146,313**	**Total**	**993,573**	**Total**	**278,774**

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Table 17 Energy Performance After Refurbishments

PP	Area	Energy Performace Improvement				
		Total final energy consumption savings	Increase of RES production	Total Primary Energy Consumption savings	CO_2 emissions savings	SHARE OF RES
	m^2	%	$kWh_{pr}/m^2.year$	%	%	%
		Ind 5b.1	Ind 4b.1	Ind 5b.2	Ind 7b.2	Ind 4b.2
1	150	62%	41	68%	68%	16%
2	108	39%	5	39%	39%	1%
3	180	44%	41	52%	52%	8%
4	150	34%	130	50%	50%	25%
5	120	59%	45	68%	68%	19%
6	100	35%	47	46%	48%	9%
7	150	53%	58	59%	86%	32%
8	170	50%	89	76%	93%	55%
9	51	39%	100	51%	51%	19%
10	140	70%	86	84%	84%	48%
11	128	36%	5	36%	35%	2%
12	105	66%	5	66%	66%	2%
13	110	43%	0	43%	43%	2%
14	127	50%	6	50%	50%	2%
15	80	66%	0	66%	66%	1%
16	150	32%	6	41%	43%	2%
17	170	51%	0	51%	51%	2%
18	110	49%	130	96%	99%	92%
19	140	27%	0	27%	27%	1%
20	125	54%	49	60%	60%	14%
21	150	30%	0	35%	36%	1%
22	145	27%	122	76%	81%	61%
23	130	68%	59	74%	74%	21%
24	94	48%	0	48%	48%	1%
25	140	9%	0	9%	20%	1%
		45%	**1020%**	**54%**	**55%**	**13%**

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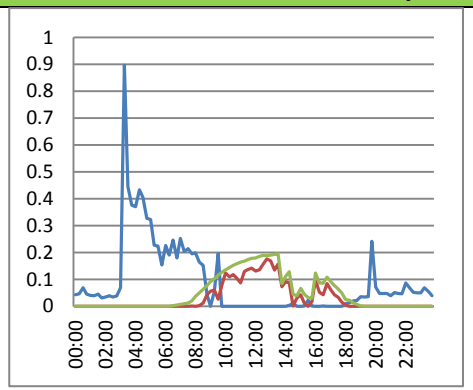
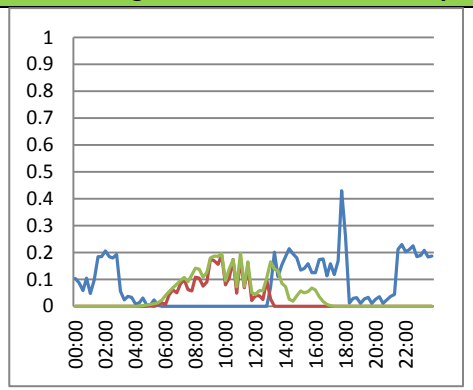
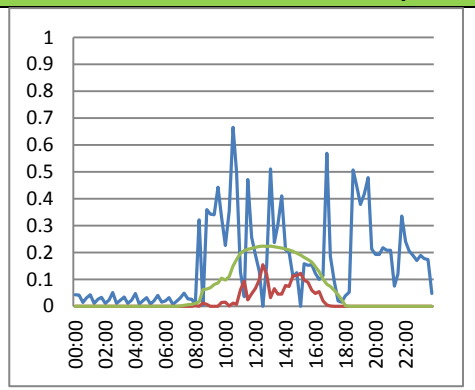
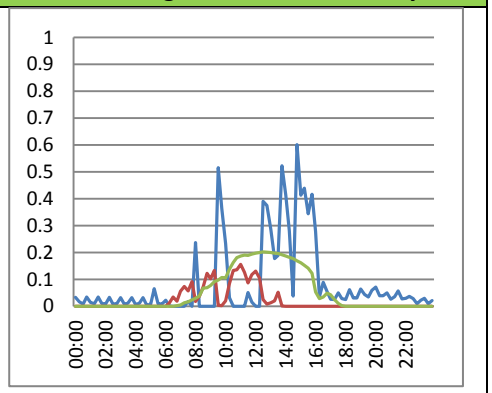
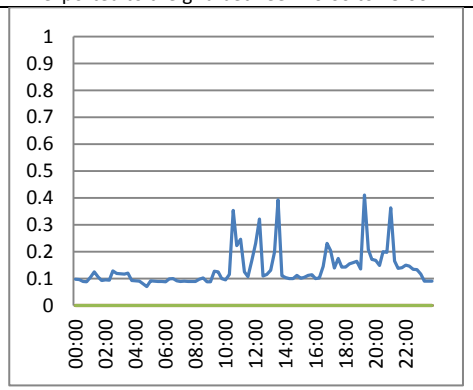
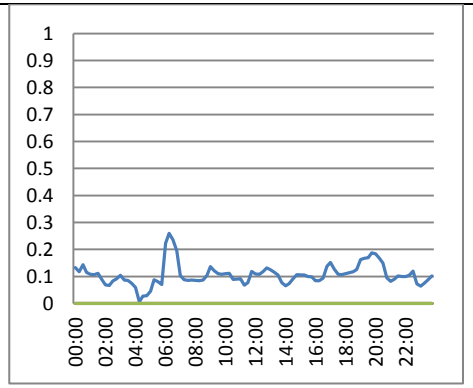
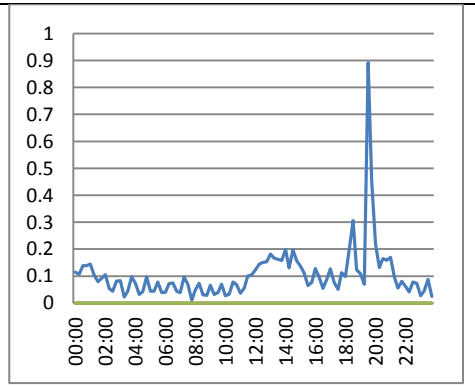
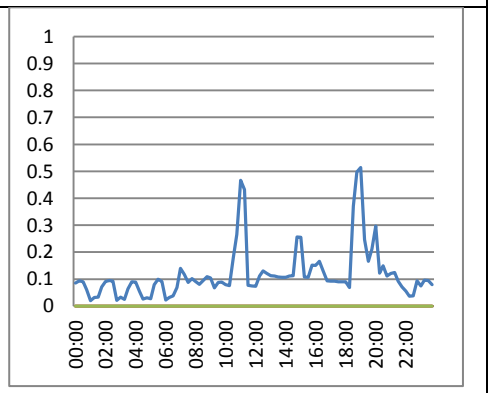
Table 18 Monitoring of pilot project with smart meters – Comparison of summer and autumn days before and after the refurbishments

Units in kWh

Blue line - Imported electricity Red line - exported electricity Green line – electricity produced by PV

PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
1	 Comment: PV installed prior energy refurbishment. Significant amount of electricity produced by PV, exported to the grid between 10:00 to 13:00	 Comment: After the energy refurbishment a significant decrease of energy consumptions and peak demands are observed		 Comment: The peak demand is decreased as a result of the energy refurbishments.
2		 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments		 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments

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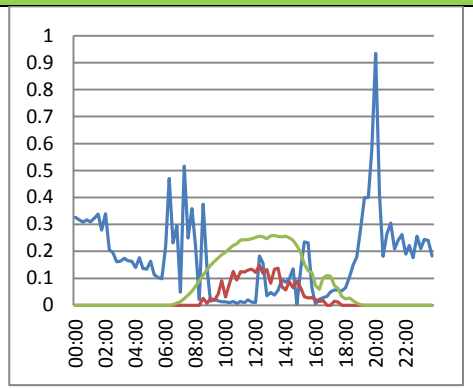
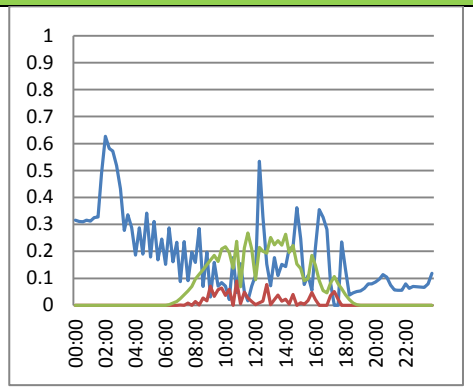
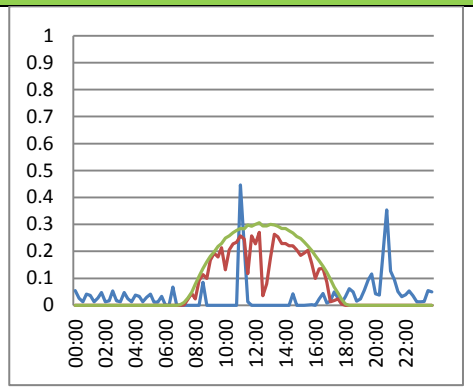
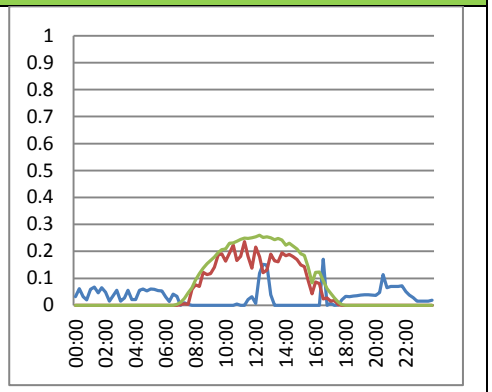
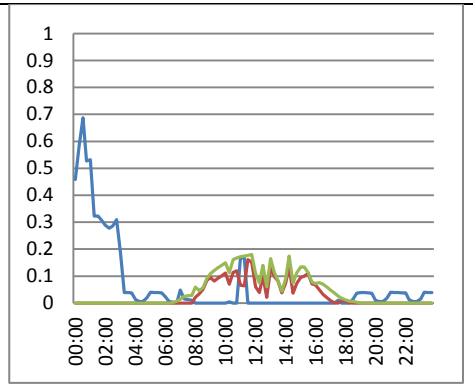
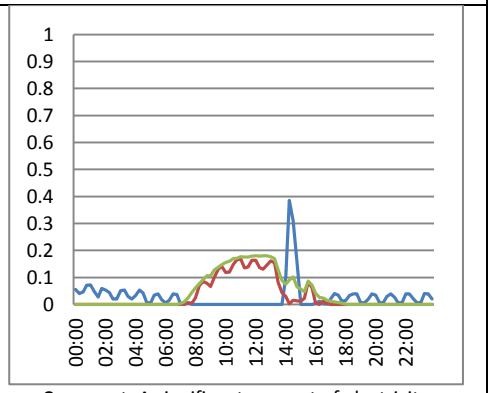
PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
3	 Comment: PV installed before energy refurbishments. A significant amount of electricity produced by PV was own consumed	 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments	 Comment: A significant amount of electricity produced by PV was own consumed. The remained energy exported to the grid	 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments
4	-	-	-	-
5	-	 Comment: A significant amount of electricity produced by PV was own consumed. The remained energy exported to the grid	-	 Comment: A significant amount of electricity produced by PV was own consumed. The remained energy exported to the grid

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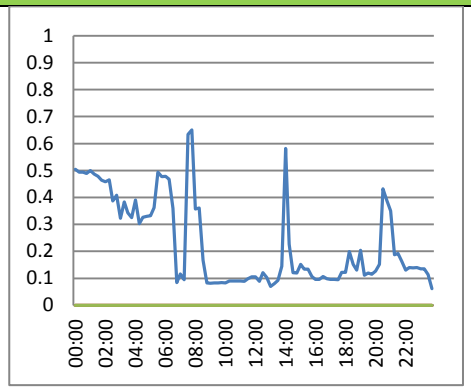
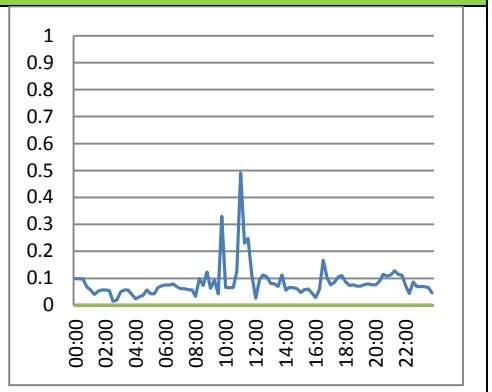
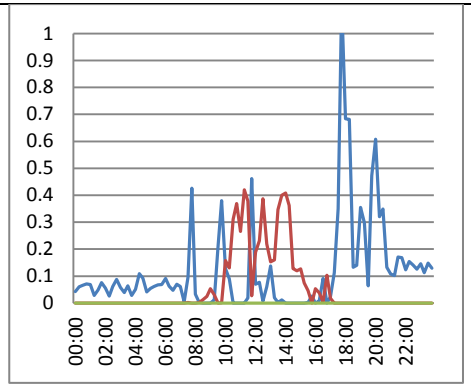
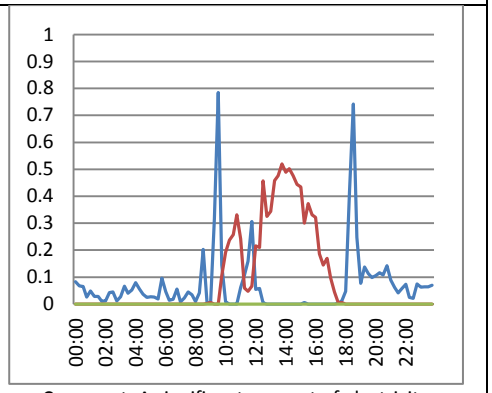
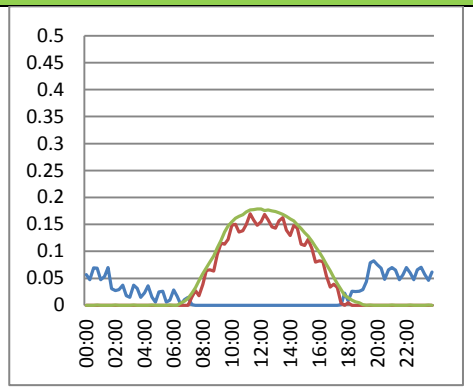
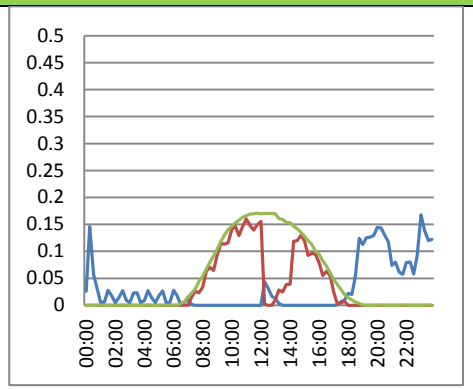
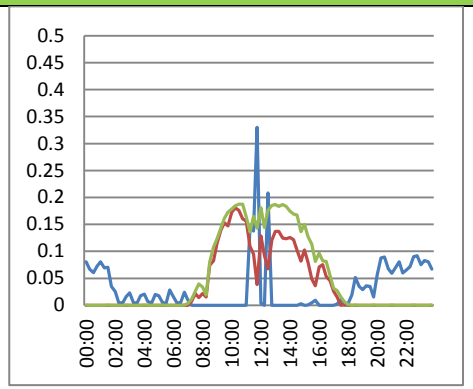
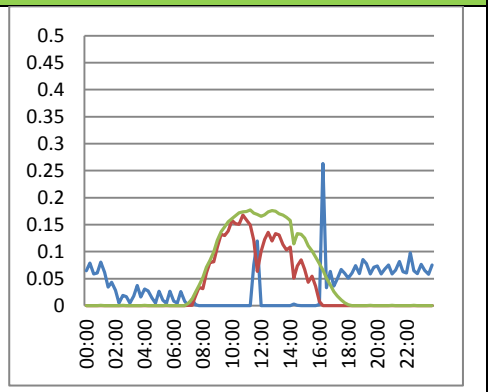
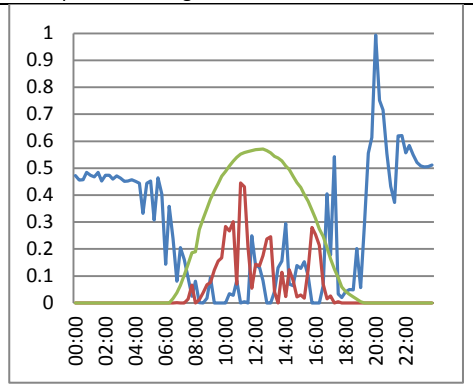
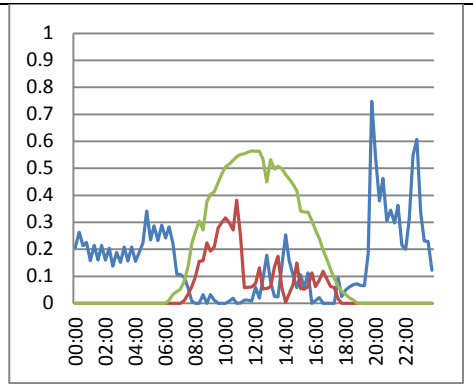
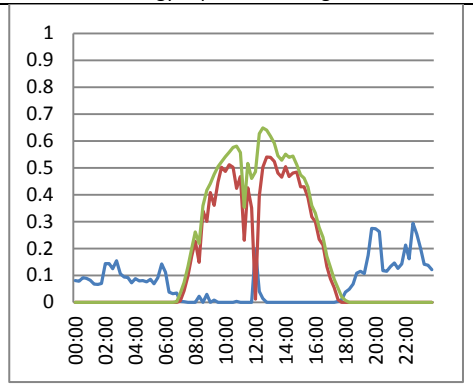
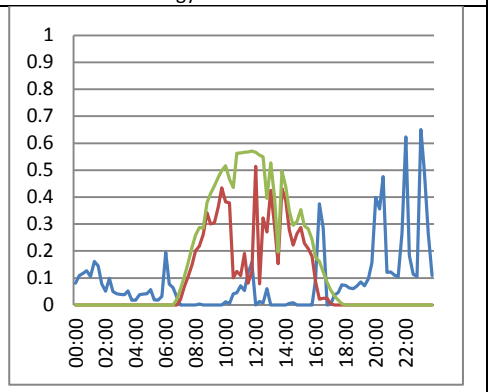
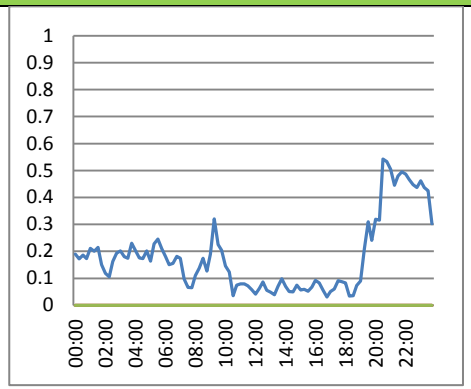
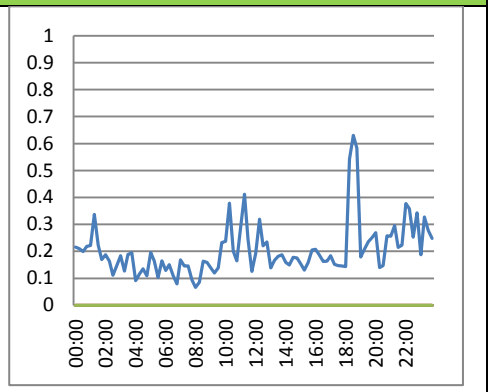
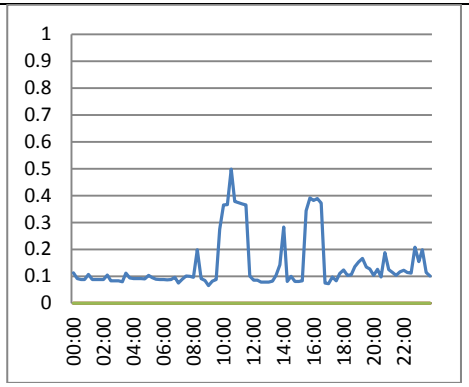
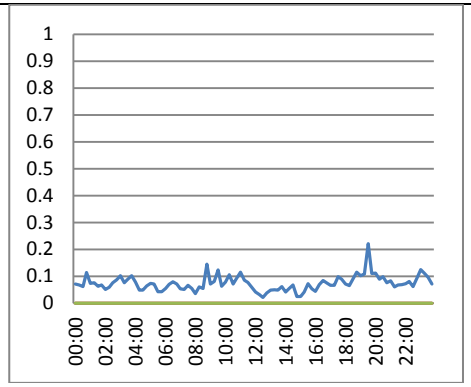
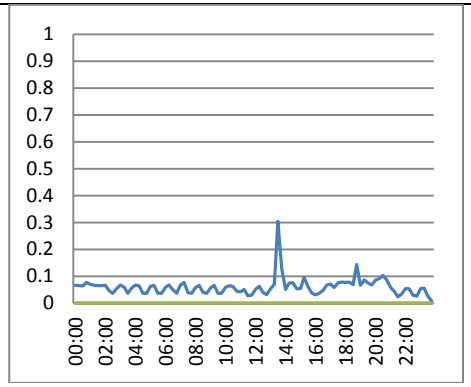
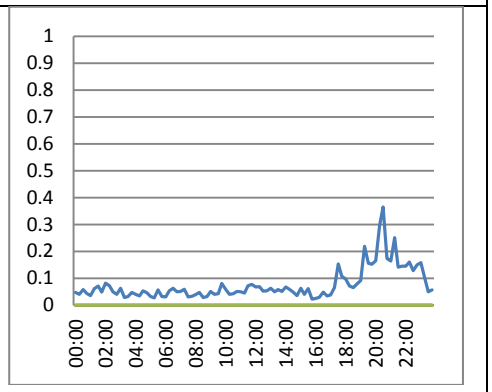
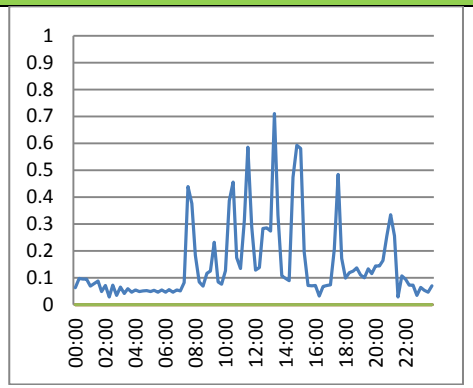
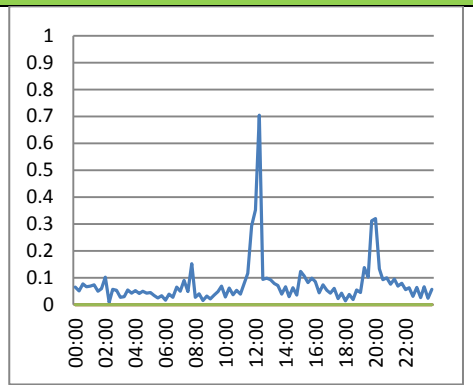
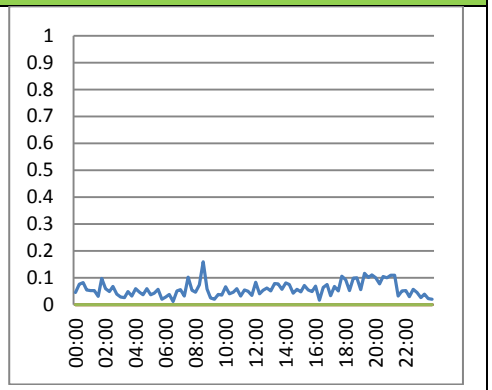
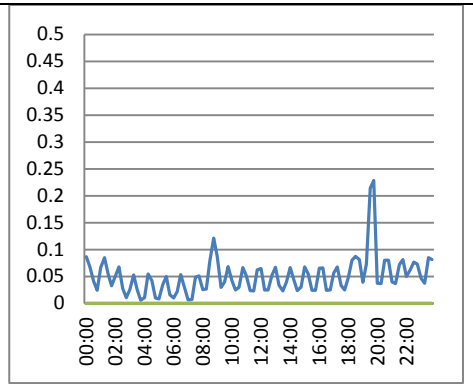
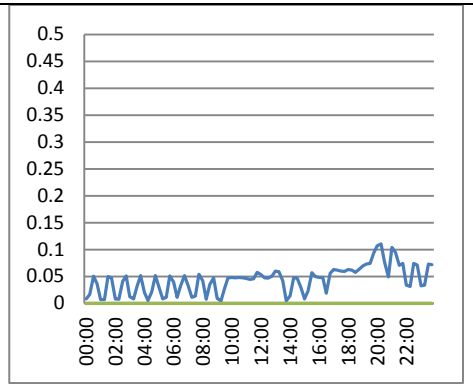
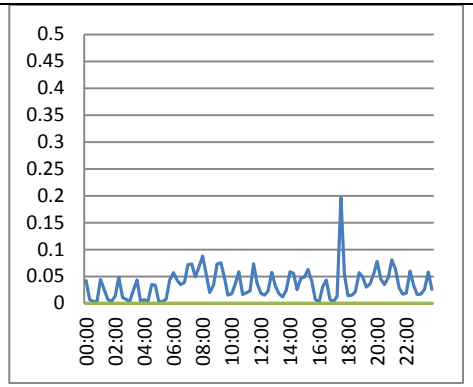
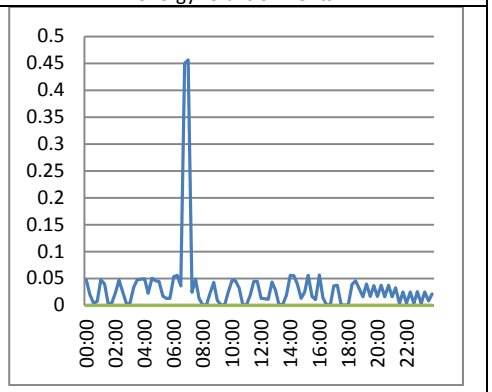
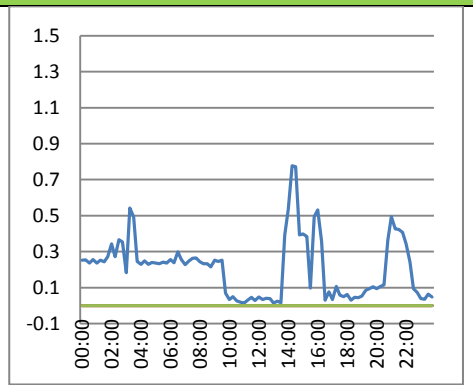
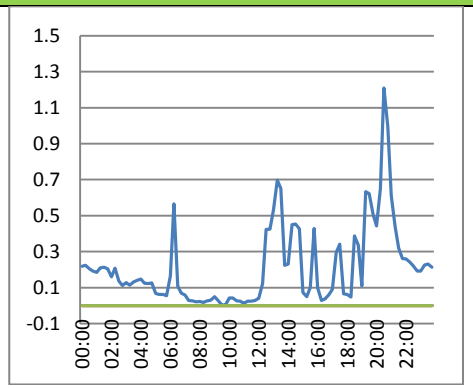
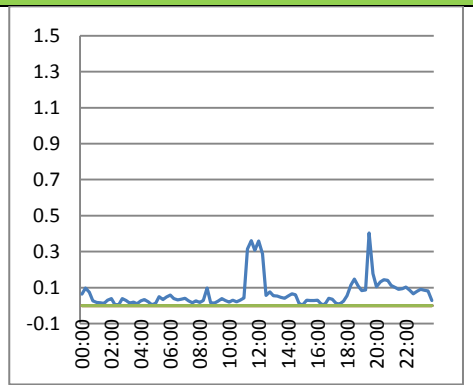
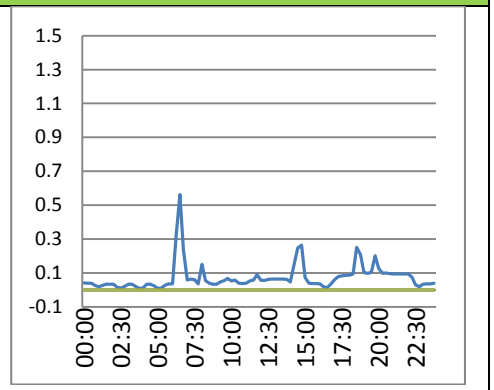
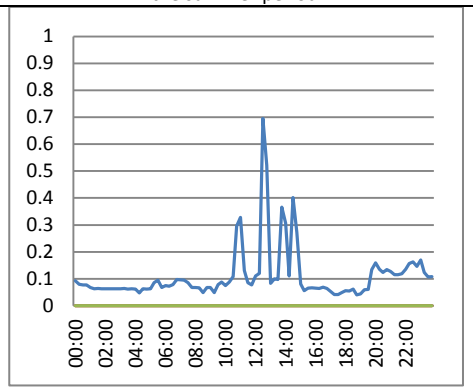
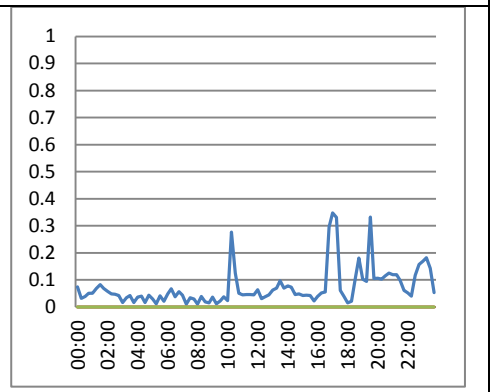
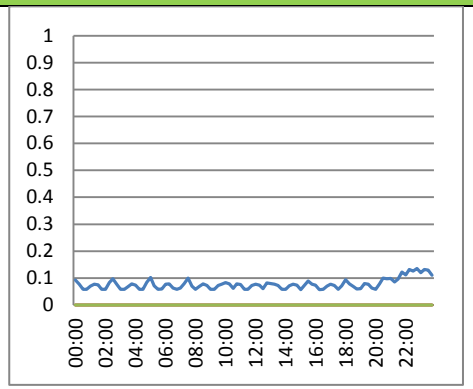
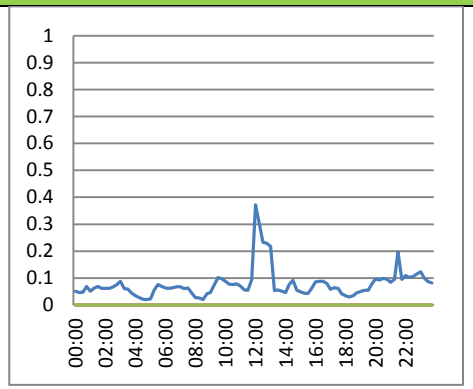
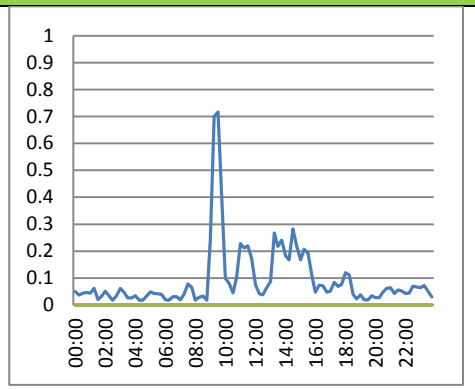
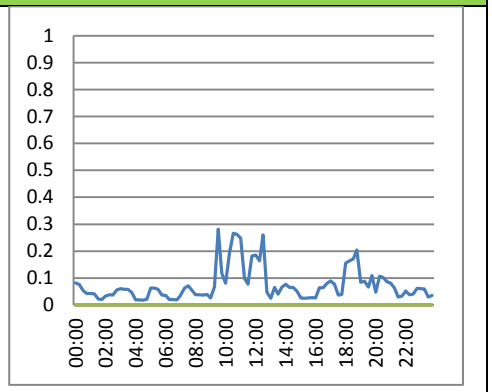
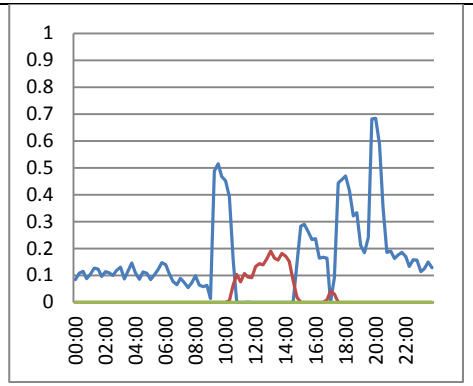
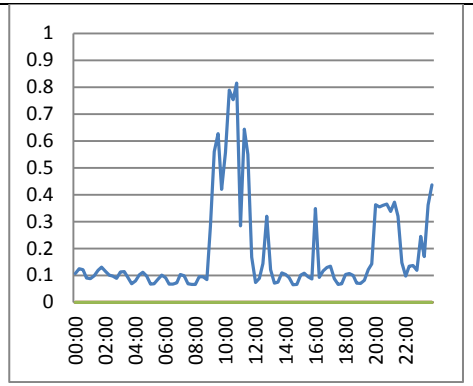
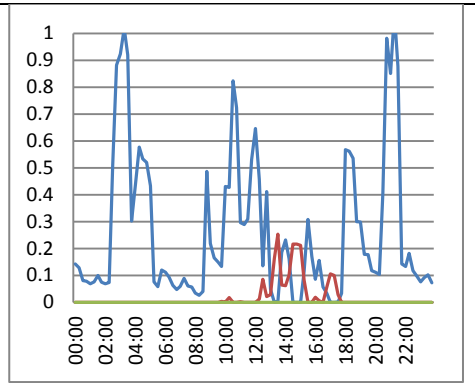
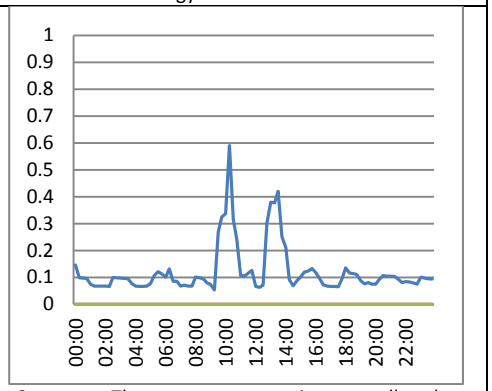
PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
6	-	 Comment: The peak demands reflects to the electricity consumptions for air conditioning during the summer time	-	
7	-	-	-	-
8	-	 Comment: A significant amount of electricity produced by PV was own consumed. The remained energy exported to the grid	-	 Comment: A significant amount of electricity produced by PV was own consumed. The remained energy exported to the grid

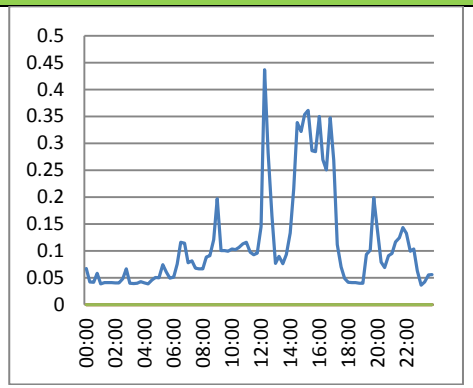
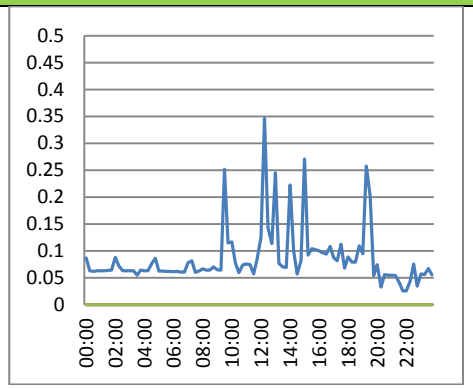
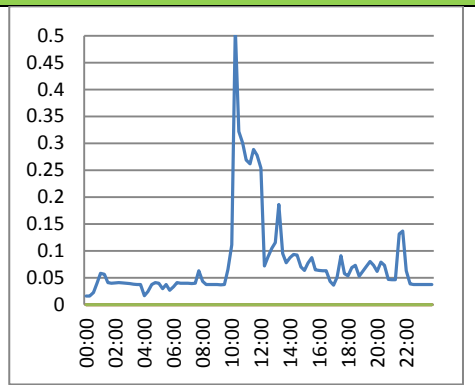
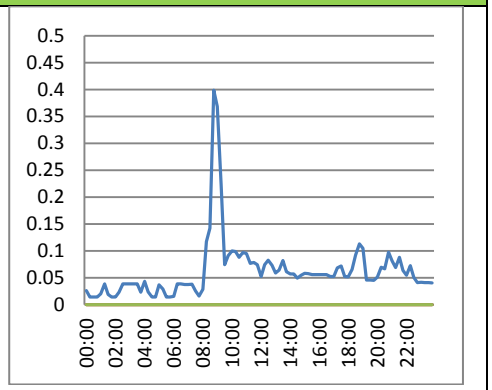
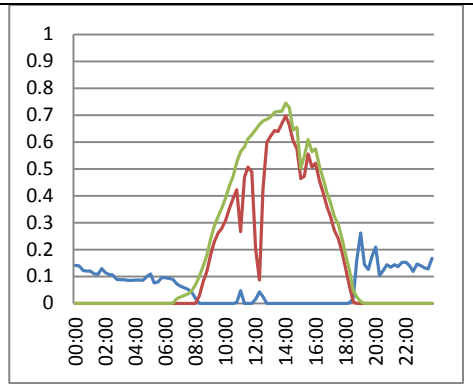
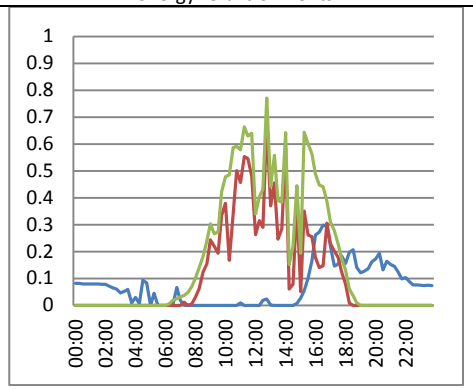
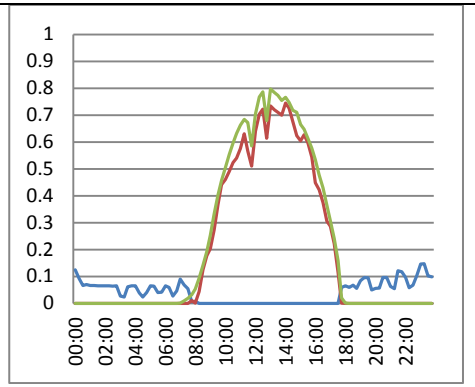
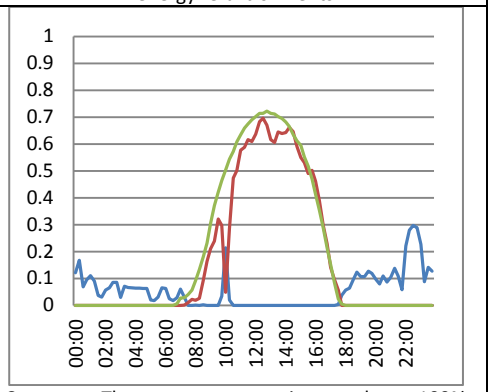
PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
9	 Comment: PV installed prior energy refurbishment. Significant amount of electricity produced by PV, exported to the grid between 10:00 to 13:00	 Comment: The energy consumption are almost 100% covered by the photovoltaic system	 Comment: A significant amount of electricity produced by PV was own consumed. The remained energy exported to the grid	 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments
10	 Comment: PV installed prior energy refurbishment. Significant amount of electricity produced by PV, was own consumed to the building	 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments	 Comment: Significant amount of electricity produced by PV, exported to the grid between 10:00 to 13:00	

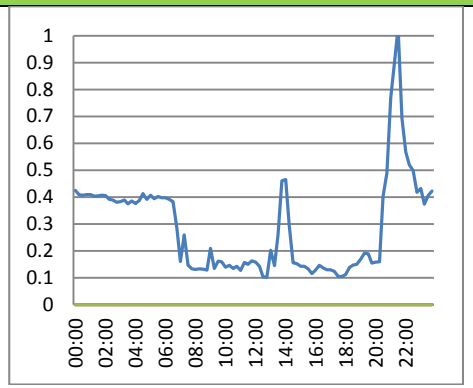
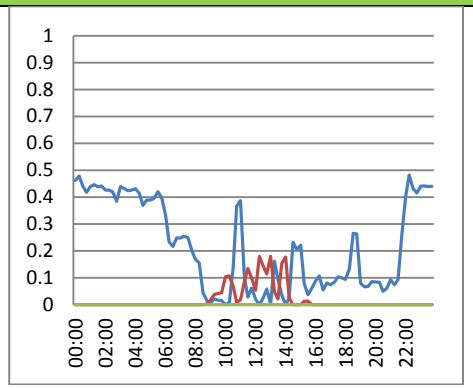
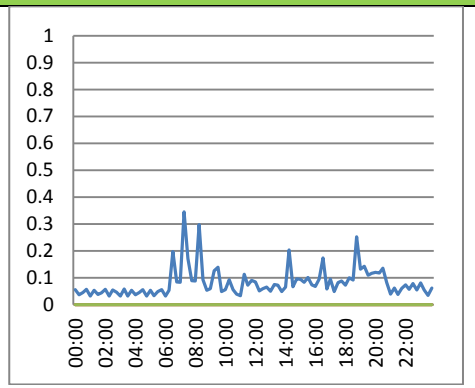
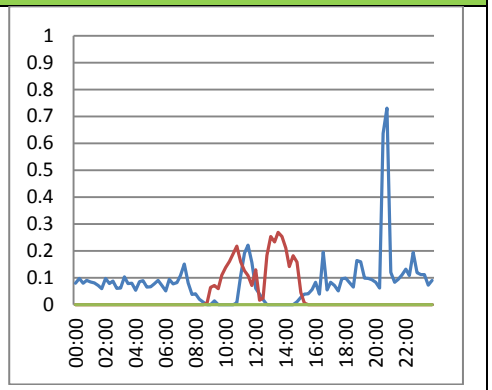
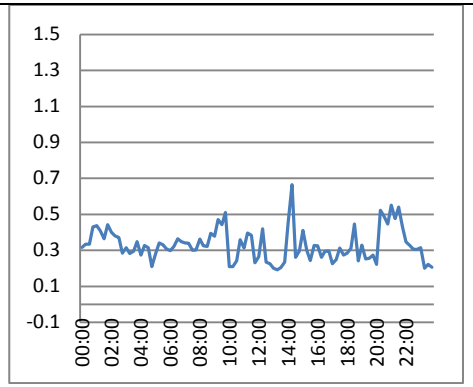
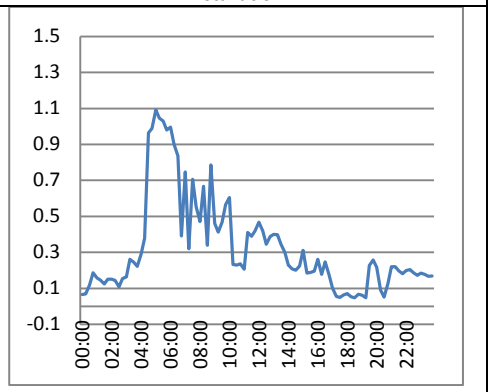
PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
11	-		-	
12	-	-	-	-
13		 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments		

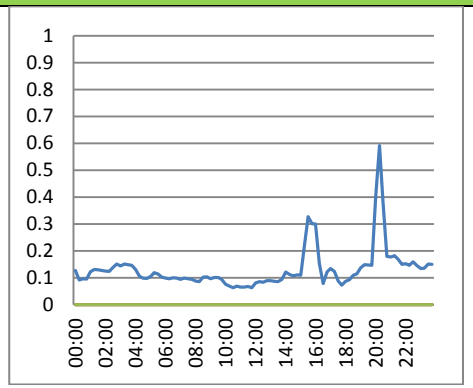
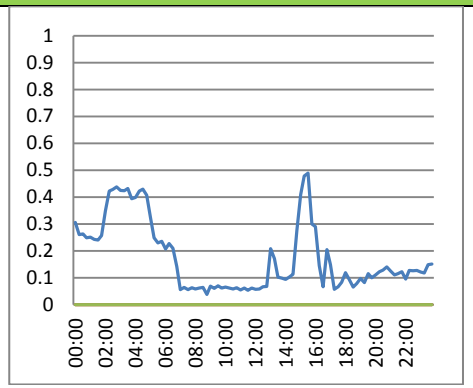
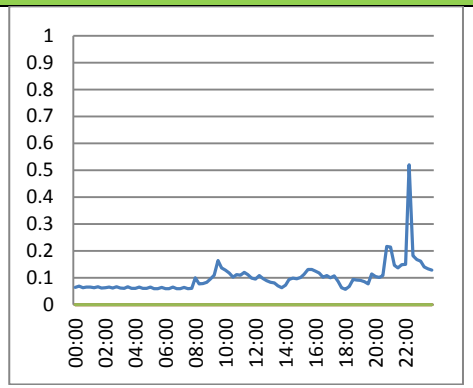
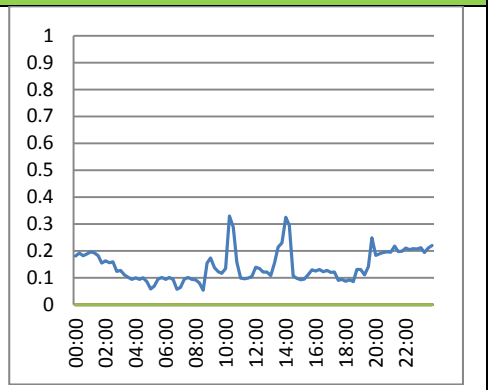
PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
14	-			 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments
15				

PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
16		 Comment: The peak demands reflects to the electricity consumptions for air conditioning during the summer period		 Comment: The electricity consumptions during winter are much lower in comparison with summer period
17	-		-	
18	-	-	-	-

PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
19				 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments
20		 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments. Failure observed with the PV installation.		 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments. Failure observed with the PV installation.

PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
21		 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments		 Comment: The energy consumptions as well as the peak demand were decreased as a result of the energy refurbishments
22	 Comment: PV installed prior energy refurbishment. Significant amount of electricity produced by PV, exported to the grid between 10:00 to 13:00	 Comment: The energy consumption are almost 100% covered by the photovoltaic system	 Comment: The energy consumption are almost 100% covered by the photovoltaic system	 Comment: The energy consumption are almost 100% covered by the photovoltaic system

PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
23		 Comment: The energy consumption was decreased as a result of the energy refurbishments and the PV installation		 Comment: The energy consumption was decreased as a result of the energy refurbishments and the PV installation
24	-		-	

PP	Baseline - 20/08/2013 – Tuesday	Monitoring - 20/08/2014 – Wednesday	Baseline - 06/10/2013 – Sunday	Monitoring - 5/10/2014 – Sunday
25				

5.2 THERMAL COMFORT

The Cyprus Energy Agency conducted a survey regarding the improvement of thermal comfort conditions as a result of the implementation of the action plans for all pilot projects. The main aim of this survey was to quantify the change in terms of the thermal comfort perception before and after refurbishment. In order to evaluate the thermal comfort conditions two questionnaires were carried out on May 2014 and December 2014.The results from the questionnaires are presented in the table below. The questions were answered based on scale 1 to 5 where 1 refers to strongly dissatisfied and 5 to strongly satisfied.

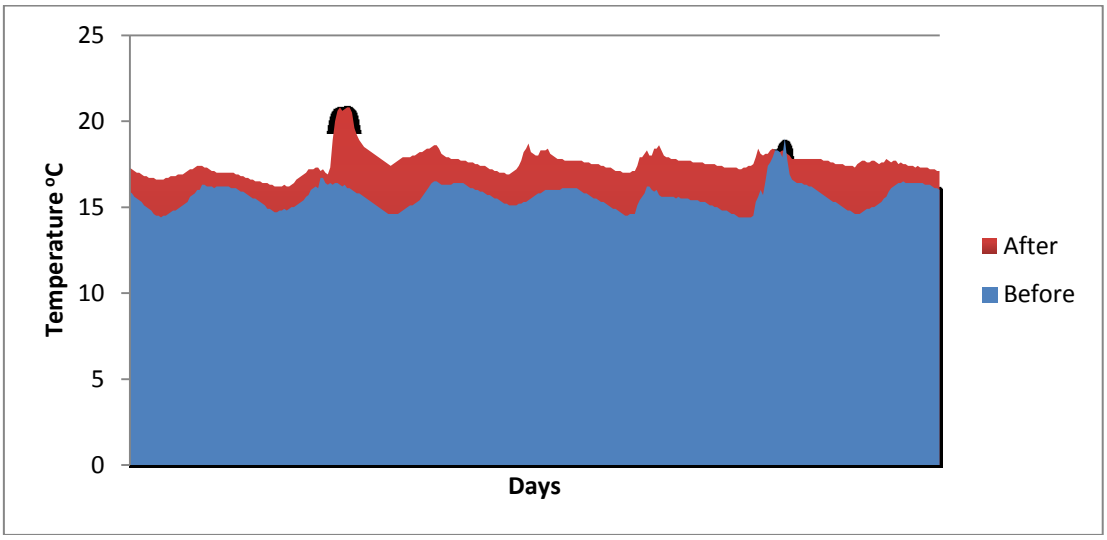
Table 19 Results of surveys on thermal comfort

PP	What is the level of improvement of thermal comfort in the house?	What is the level of improvement of indoor temperatures in the house during the Summer?		What is the level of improvement of indoor temperatures in the house during the Winter?		What is the level of satisfaction with the reduction of energy bills as a result of the refurbishments?	What is the level of satisfcation with the energy renovation of your house?
		Satisfaction	Temp. difference °C	Satisfaction	Temp. difference °C		
1	5						
2	Do not know	3	2°C	3	2°C	3	3
3	4	4	3°C	3	2°C	2	4
4	5						
5	Do not know	4	3°C	4	4°C	4	5
6	3	4	6°C	4	3°C	5	5
7	5	5	3°C	5	5°C	5	5
8	5	5	2°C	4	2°C	5	5
9	Do not know	3	2°C	5	2°C	5	4
10	3	5	4°C	4	3°C	5	3
11	4	5	5°C	5	3°C	5	3
12	4	5	3°C	5	3°C	5	5
13	3						
14	3	5	3°C	5	3°C	5	5
15	5	4	2°C	4	2°C	4	5
16	Do not know	4	3°C	4	3°C	5	5
17	Do not know	5	5°C	5	5°C	5	5
18	5	5	3°C	5	3°C	5	5
19	4						
20	3	3	3°C	5	5°C	5	5
21	3	4	3°C	4	3°C	4	5
22	4	3	2°C	4	3°C	5	4
23	5	5	5°C	5	3°C	5	5
24	5						
25	2	2	1°C	3	2°C	1	4

As can be seen the thermal comfort in the houses for all pilot projects was improved significantly. It is also noticeable that the indoor temperature in the houses during the summer was reduced between 2-6°C whereas during the winter the indoor temperature was increased up to 5°C. It is very important that the tenants were very satisfied with the reduction of their energy bills as a result of the refurbishments carried out. Finally, it can be

observed that the tenants were greatly satisfied from the overall energy renovation of their houses.
In addition, the Cyprus Energy Agency has placed thermometers as well as air relative humidity data lockers in two houses before the refurbishments so that to monitor and report the results of the temperature and the air humidity after the completion of the action plans.

The following graph compares the indoor temperature levels for 1 week before and 1 week after the energy refurbishments during the heating season (February 2014). The mean temperature increase as a result of the thermal insulation of the roof was 1.9 degrees Celsius.



Graph 6 Indoor temperature levels to the pilot project 3 for 7 days before and after the energy refurbishments of the building

6. LESSONS LEARNT

The first lesson learnt during the large scale pilot experimentation in Cyprus is related with the selection procedures of the beneficiaries. The procedure followed by the Cyprus Energy Agency could summarized as follows:(a)selection of the beneficiaries, (b) energy audit, (c) select the energy efficient measures, (d) apply energy efficient measures to the buildings without own contribution by the beneficiaries and (e) efforts by the Cyprus Energy Agency for additional financing for photovoltaic system installations.
During this experience, the lesson learnt, is that a more active involvement of the beneficiaries should have been requested in terms of financing as own contribution or obligation for additional energy efficiency measures without extra funding. This could have resulted into greater energy efficiency improvements with the same budget but also to motivate the beneficiaries to actually get involved in the process.

Also, an important lesson is that with an energy renovation of about 10,000 € it is possible to reduce the energy consumption of a household to more than 40%. This could be achieved with a simple payback of 6-7 years which creates a potential for "green" bank loans or other incentives for the promotion of energy efficiency of buildings.

Furthermore, from the analysis of the energy profile of the 25 households, it was identified that their energy expenses are significantly high compared to their annual income. In many cases the energy expenses were more than 15% of their annual income. A great potential for energy savings by changing the energy behavior of the tenants was observed. The guidebook published and disseminated to the families with title "householders, be your own energy manager" emphasized on the energy awareness of the tenants with significantly positive results.

The role of the Cyprus Energy Agency, acting as competent authority for applications, facilitator, energy consultant, coordinator and supervisor of the pilot experimentation was crucial for the successful implementation of the most cost optimum energy solutions to the 25 households.

In addition, during the pilot experimentation it was proved that the energy efficiency of the existing building, especially those of low income households, attracts the interest of politicians, energy stakeholders, universities, financing institutions, local authorities and general public. This conclusion shows where should be driven the future policies and incentives in Cyprus and the MED countries in general.

Finally, the results of the pilot experimentation on photovoltaic installations with net metering proved to be a great success and are very promising for Cyprus and other southern countries of Europe. This could be replicated to all the Mediterranean Countries as an additional measure to eliminate electricity bills along with the energy efficiency measures applied in advance.

7. CONCLUSIONS

The successful completion of the ELIHMED project has proven to be a big challenge for the Cyprus Energy Agency which was the bearer for the implementation of the project in Cyprus. The individual targets that were set for the project were very ambitious and the active contribution of National Authorities and organisations was needed in order to successfully confront all the problems and difficulties that arose. On the other hand it was a great opportunity for Cyprus and the Cyprus Energy Agency to implement innovative techniques that were applied for the first time in Cyprus.
The efforts for securing the use of the results of the project in Cyprus have been concentrated on the active involvement of the politicians, governmental authorities, local authorities, funding organisations, private companies and other agencies involved. From now on, the energy renovation of households consists of (a) measures of Local Action plans for Sustainable Energy of local authorities of Cyprus, (b) priority for funding through National funding schemes for energy renovations, (c) area of action for banking institutions for the granting of green loans and (d) political keystone through the use of photovoltaic systems with net metering on households.

Some of the most important indicators for the successful implementation of the ELIHMED project were:

- The active involvement of 14 local authorities and the Cyprus Land Development Organisation
- The active involvement of 10 private companies that are active on the photovoltaic systems
- The active involvement of the Electricity Authority of Cyprus
- The support of the project by the Cyprus Energy Regulatory Authority and the Energy Service which is a part of the Ministry of Energy, Commerce, Industry and Tourism
- The energy upgrading of 25 dwellings with low income with a cost of 60 €/m^2
- The real reduction in energy consumption by 57% and the reduction in the use of heating fuel by 30% which equals to savings from energy costs at 6 €/m^2
- The installation of 25 smart meters
- The pilot installation of 13 photovoltaic systems with the method of net metering with total installed capacity of 27.6kW. The expansion of net metering by the Cyprus Energy Regulatory Authority for further 11,000 households.
- The issuing of Energy Performance Certificate for 25 dwellings
- The preparation of a proposal for the creation of a revolving fund to finance energy upgrades in households in Cyprus