4.16 Annex 16 – Baseline Report

Municipality: Plovdiv
Building code:
Building: Medical University, Plovdiv
Clinics of Anatomy, Histology, Embryology
Address: Bld."Vasil Aprilov" 15A, Plovdiv
Total floor area, m^2: 5 462

Expected results	Value
Energy saved, MWh/year	647.76
Energy saved, €/year	25 749
CO_2 emissions saved, tco_2/year	140.26
CAPEX, €	250 918
Simple payback period [1], year	9.74

[1] Simple payback including cost price of materials, labor, mechanization, profit and not including cost of finance.

4.16.1. Current status of the building

Infrastructure	Description
Commissioned	1876 year
Building structure	Solid reinforced concrete structure with three overground floors. On the first floor are situated meeting, seminar, computer and dissecting rooms; on the second are offices, library, laboratories and classrooms; the third floor is temporaly uninhabitable. To the main building are few additional outbuildings.
Facade walls	Basement - stonework, inside plastered, without heat insulation. Overground walls of the main building - masonry with solid brick, both sides plastered, without heat insulation.Wall of the outbuildings - hollow bricks, plastered, without heat insulation.
Roof structures	Main building - wooden structure with a roof of a wooden edging, covered with roof tiles, without insulation. Additional buildings - wooden structure, covered with corrugated steel, without insulation
Floor structures	Floor on the ground
Joinery	Old double glazed PVC joinery with U<= 2.20 W/m2K (100%) Only one door of metal joinery with single glazing
Heating	Individual substation for heating, connected to power station of water vapour. Bad condition of the pipe-line system - insulaton partially torn, leakage. Two-pipe system line and forsed circulation. Radiators of aluminium, fully functioning. There is no heat armature for regulation.
Domestic hot water	DHW feeding by electrical boilers. The tanks are situated in the WC rooms.
Electric appliances and lighting	Appliances, affecting and non-affecting the heating; Lighting with luminescent lamps and incandescent lamps.
Air conditioning and ventilation	There is no ventilating system. Few rooms conditioned by individual air-coditioners, split system.
Operational hours	Residents: 12 hours a day, 5 days a week, excluding holidays Heating: 24 hours a day, 7 days a week, including holidays

4.16.2. Current energy consumption

Energy	Heating			Electricity		DHW		Total	
Year	Gcal/year	MWh/year	€/year	MWh/year	€/year	MWh/year	€/year	MWh/year	€/year
2012[1]	455.72	530.00	31 444	113.51	7 047	12.49	775	656.00	39 267
2013	227.00	264.00	12 389	122.51	11 832	12.49	1 206	399.00	25 427
2014	258.81	301.00	13 842	109.51	9 868	12.49	1 125	423.00	24 834
Average	313.84	365.00	19 225	115.18	9 582	12.49	1 036	492.67	29 843

[1] Reference year

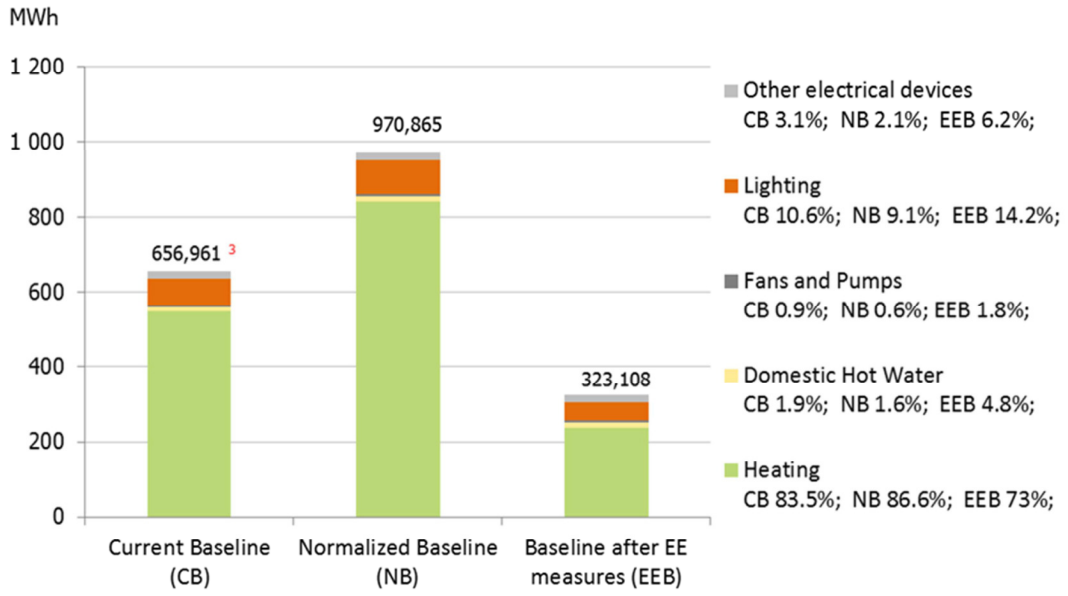
Actual prices of energy sources				
№	Energy source	Measure	Value	Consider since
1	Electricity	€/MWh	77.22	1/11/2015
2	Natural gas	€/MWh	36.29	1/1/2016
3	Central Heating Energy	€/MWh	35.20	1/10/2015

4.16.3. Analysis of the estimated energy savings

Energy saving measures		Energy saved [2]			Capex	Pay-back
№	Discription	MWh/year	€/year	t co_2/year	€	year
1	Insulation of external walls	228.76	8 395	47.62	72 140	8.59
2	Roof insulation	186.43	6 842	38.81	43 042	6.29
3	Switching the heating from local to DHS supply					
	- heating system renovation	190.06	6 975	19.02	107 622	14.89
	- change of energy source	-	254			
4	Lighting measure	42.51	3 282	34.81	28 114	8.57
	Total	647.76	25 749	140.26	250 918	9.74

[2] The amount of the energy savings is calculated according to the normalized value of the base consumption.

4.16.4. Energy consummation share



Parameter			Baseline	
№	Discription	Measure	Current	Normalized [4]
1	Internal temperature	°C	13.5	21.0
2	DHW consumption	l/m^2	65.0	81.0
3	Lighting functioning	%	70.0	100.0

[3] The difference between the numbers arising from the invoices and the software comes by technological deviation in the degree-days, used in modelling. According the methodology approved by the norm.

[4] Values come from the norm according to type and functioning of the building, number of persons inside, etc.

4.16.5. Energy saving measures – description

Energy saving measures	Activities	Measure	Price [1] (€)	Quantity	Sum (€)
1. Insulation of external walls	Preliminary preparation of external walls	m^2	2.12	3 142	6 661
	Thermal insulation mineral wool 10 cm,covered with plasterboard	m^2	10.97	3 142	34 468
	Flipping, plastering and painting the adjacent areas	m^2	8.55	3 142	26 864
	Collection, transport and disposal of construction waste to landfill up to 20 kilometers.	m^2	1.32	3 142	4 147
	Total ESM 1:				**72 140**
2. Roof insulation	Mineral wool insulation 14 cm., covered with plaster	m^2	11.44	2 226	25 465
	Collection, transport and disposal of construction waste to landfill up to 20 kilometers.	m^2	1.47	2 226	3 272
	Preliminary preparation of roof	m^2	0.72	418	301
	Thermal insulation EPS 12 cm	m^2	19.28	418	8 059
	Casting of stucco 4 cm., reinforced with welded mesh ϕ3 over 20 cm.	m^2	4.25	418	1 777
	Double-layer insulation, the second layer - with powder	m^2	8.67	418	3 624
	Collection, transport and disposal of construction waste to landfill up to 20 kilometers.	m^2	1.30	418	543
	Total ESM 2:				**43 042**
3. Switching the heating from local to DHS supply	Design of a new HVAC project for reconstruction - stage: technical level	m^2	0.80	5 363	4 290
	Dismantling of pipelines and radiators, collection, transport and disposal of waste to landfill up to 20 kilometers	m^2	1.00	5 363	5 363
	Supply and mounting of a new pipeline system thermo-isolated for the heating system	m^2	15.80	5 363	84 735
	Supply and mounting of plasterboard decorations, mineral wadding isolated	m^2	0.40	5 363	2 145
	Supply and installation of a an automated system for the HVAC monitoring	m^2	2.05	5 363	10 994
	Charge new accession to the central heating	psc	93.82	1	94
	Total ESM 3:				**107 622**
4. Lighting measure	dismantling of luminaire, removing transformers and chokes	psc	2.81	746	2 096
	removing fluorescent cigars, supply and mounting of LED cigars	psc	10.74	2 240	24 058
	installation of luminaire back	psc	2.30	746	1 716
	dismantling of incandescent lamp, supply and installation of energy saving lamp	psc	3.58	51	183
	Collection, transport and disposal of lighting waste to landfill up to 20 kilometers.	m^3	30.68	2	61
	Total ESM 4:				**28 114**
	Total:				**250 918**

[1] Cost assumptions are based on analize of normal practice of local contractors and usage of the guide prices in construction - the last published edition (01.2016). Usage of trade marks is not permitted by the regulator. All the materials has to be chosen by their basic charachteristics. All costs are considered at average level - neigther conservative, nor optimistic.

4.16.6. Information about investments and savings according to the measures applying

Energy efficient measures

Type of Measures	Investments (BGN)	Savings (kW/h)		Savings (BGN)	
		Electrical Energy	Heat energy	Electrical Energy	Heat energy
Insulation of external walls	141 094	2 288	226 474	346	16 074
Roof insulation	84 182	1 864	184 569	282	13 100
Switching the heating from local to DHS supply	210 490	1 901	188 155	287	13 355
Lighting measure	54 985	42506		6420	
Total:	**490 751**	**48 559**	**599 198**	**7 334**	**42 529**
CO2 Savings		**39.77**	**121.04**		

Additional activities

Type of Measures	Investments (BGN)
Related to external walls ESM	14 109
Related to roof ESM	8 418
Related to switching the heating from local to DHS supply	21 049
Related to Lighting ESM	5 499
Total:	**49 075**

Energy consumption

Items	Object
Type of object	university
Gross floor area (sq.m.)	5 462
Type of heat energy before the project	Natural gas
Type of heat energy after the project	Central Heating Energy
Class of the building before the project	E
Class of the building after the project	B

Energy Prices (BGN/kWh)	Before the project (historical)	After the project
Electical energy	0.19	0.15
Heat Energy (type of fuel)	0.11	0.07
Example: Diesel		
Example: Gas		

Object 1	Pre-project Consumption		Normalized consumption		Consumption after the project	
	kWh	BGN	kWh	BGN	kWh	BGN
Total consumption	**656 961**	**82 195**	**970 865**	**119 156**	**323 108**	**30 117**
Electrical energy	113 870	21 509	138 298	26 123	89 739	13 553
Heat Energy	543 091	60 686	832 567	93 033	233 369	16 564