

4.15 Annex 15 - Baseline Report

Municipality: Plovdiv
 Building code:
 Building: Medical University, Plovdiv
 Vivarium
 Address: Bld. "Vasil Aprilov" 15A, Plovdiv
 Total floor area, m²: 450



Expected results	Value
Energy saved, MWh/year	105.90
Energy saved, €/year	4 405
CO ₂ emissions saved, tco ₂ /year	43.25
CAPEX, €	33 647
Simple payback period ¹ , year	7.64

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

4.15.1. Current status of the building

Infrastructure	Description
Commissioned	1962 year
Building structure	Solid reinforced concrete structure with two overground floors. On the first floor are situated premises for storage rooms and bathrooms. On the second floor are situated administration and premises for animals.
Facade walls	Foundations underground - concrete, inside plastered. Facade walls - masonry with solid brick, both sides plastered. The visible condition of all facade walls is good, few areas with compromised plaster, without heat insulation.
Roof structures	Solid reinforced concrete, covered with waterproofing. The visible condition is good, there are no signs of leakage, but without heat insulation.
Basement structures	Floor on the ground.
Joinery	Double glazed PVC joinery (~ 90%), but with float glass ($\lambda \leq 2.20$ W/m ² K) Metal joinery with single glazing (~ 6%) and metal solid doors (~ 4%)
Heating	Individual substation for heating, connected to power station of water vapour. Bad condition of the pipe-line system - insulation partially torn, leakage. Radiators of cast iron, not fully functioning. There is no heat armature for regulation.
Domestic hot water	DHW feeding by one electrical boiler situated inside the building.
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-conditioners, split system.
Operational hours	Residents: 24 hours a day, 7 days a week, including holidays Heating: the same as residents

4.15.2. Current energy consumption

Energy	Heating			Electricity		DHW		Total	
	Gcal/year	MWh/year	€/year	MWh/year	€/year	MWh/year	€/year	MWh/year	€/year
2012	29.48	34.28	2 045	2.80	194	1.72	119	38.80	2 358
2013 ¹	25.18	29.28	1 666	28.58	2 773	1.72	167	59.58	4 606
2014	24.94	29.00	1 662	17.28	1 590	1.72	158	48.00	3 410
Average	26.53	30.85	1 791	16.22	1 519	1.72	148	48.79	3 458

¹ Reference year

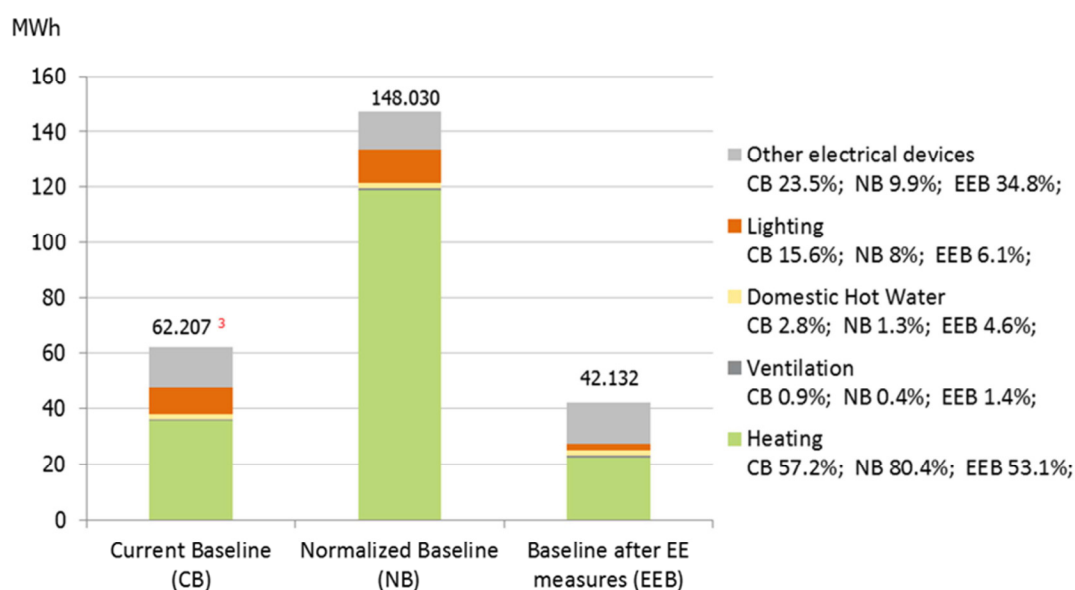
Actual prices of energy sources				
Nº	Energy source	Measure	Value	Consider since
1	Electricity	€/MWh	77.22	1/11/2015
2	Natural gas	€/MWh	36.29	1/1/2016
3	Central Heating Energy	€/MWh	35.20	1/10/2015

4.15.3. Analysis of the estimated energy savings

Energy saving measures		Energy saved ²			Capex	Pay-back
Nº	Description	MWh/year	€/year	t co ₂ /year	€	year
1	Insulation of external walls	23.38	887	5.30	10 008	11.29
2	Roof insulation	41.81	1 586	15.22	8 521	5.37
3	ESM on basement	7.01	266	9.58	1 604	6.03
4	Switching the heating from local to DHS supply					
	- heating system renovation	24.40	925	5.53	11 636	12.26
	- change of energy source	-	23			
5	Lighting measure	9.30	718	7.62	1 879	2.61
Total		105.90	4 405	43.25	33 647	7.64

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

4.15.4. Energy consumption share



Parameter			Baseline	
Nº	Description	Measure	Current	Normalized ⁴
1	Internal temperature	°C	10.0	21.0
2	DHW consumption	l/m ²	107.0	120.0
3	Lighting functioning	%	75.0	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.

4.15.5. 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	4.62	287	1 326
	Thermal insulation EPS 10 cm, flipping edges with safety profiles; plugging 8 pcs. / m ²	m ²	21.37	287	6 133
	Plastering two layers of "scratched" mineral plaster	m ²	6.29	287	1 805
	Collection, transport and disposal of construction waste to landfill up to 20 kilometers.	m ²	2.59	287	743
	Total ESM 1:				10 008
2. ESM on basem	Preliminary preparation of roof	m ²	0.72	249	179
	Thermal insulation EPS 10 cm on roof, covered with plaster	m ²	19.28	249	4 801
	Stucco 4 cm., reinforced with welded mesh	m ²	4.25	249	1 058
	Two layed waterproof, second layer with powder	m ²	8.67	249	2 159
	Collection, transport and disposal of construction waste to landfill up to 20 kilometers.	m ³	1.30	249	324
Total ESM 2:				8 521	
3. Roof insulation	Preliminary preparation of external walls	m ²	4.62	46	213
	Thermal insulation EPS 10 cm, flipping edges with safety profiles; plugging 8 pcs. / m ²	m ²	21.37	46	983
	Plastering two layers of "scratched" mineral plaster	m ²	6.29	46	289
	Collection, transport and disposal of construction waste to landfill up to 20 kilometers.	m ²	2.59	46	119
Total ESM 3:				1 604	
4. Switching the heating from local to DHS supply	Design of a new HVAC project for reconstruction - stage: technical level	m ²	0.75	450	338
	Dismantling of pipelines and radiators, iollection, transport and disposal of waste to landfill up to 20 kilometers	m ²	0.90	450	405
	Supply and installation of fan coils (Q heat / cool = 4,2 / 1,5kW) equipped with three-way valve for two-pipeline system	m ²	3.80	450	1 710
	Supply and mounting of a new pipeline system thermo-isolated for the heating system	m ²	16.70	450	7 515
	Supply and installation of pipelines for the condensate and connect the fan coil units to the internal electro grid	m ²	1.00	450	450
	Supply and installation of water collector and distributor with fittings and thermo isolation	m ²	1.00	450	450
	Supply and mounting of plasterboard decorations, mineral wadding isolated	m ²	0.40	450	180
	Supply and installation of a an automated system for the HVAC monitoring	m ²	1.10	450	495
	Charge new accession to the central heating	psc	93.82	1	94
Total ESM 4:				11 636	

5. Lighting measure	Dismantling of luminaires (whole units)	psc	2.81	34	96
	Supply and installation of new luminaires	psc	23.26	34	791
	Supply and mounting of LED cigars	psc	10.74	84	902
	Dismantling of incandescent lamps, supply and installation of energy saving lamps	psc	3.58	8	29
	Collection, transport and disposal of lighting waste to landfill up to 20 kilometers	m ³	30.68	2	61
Total ESM 5:					1 879
Total:					33 647

¹ Cost assumptions are based on analyze 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 characteristics. All costs are considered at average level - neither conservative, nor optimistic.

4.15.6. 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	19 573	935	22 442	141	1 593
Roof insulation	16 665	1 672	40 134	253	2 849
ESM on basement	3 137	280	6 731	42	478
Switching the heating from local to DHS supply	22 759	976	23425	147	1662.63
Lighting measure	3 674	9303		1405	
Total:	65 808	13 166	92 732	1 989	6 582
CO2 Savings		10.78	18.74		

Additional activities

Type of Measures	Investments (BGN)
Related to external walls ESM	1 957
Related to roof ESM	1 667
Related to basement ESM	314
Related to switching the heating from local to DHS supply	2 276
Related to Lighting ESM	367
Total:	6 581

Energy consumption

Items	Object
Type of object	hospital
Gross floor area (sq.m.)	450
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	62 207	9 117	148 030	19 150	42 132	4 644
Electrical energy	28 069	5 302	33 820	6 388	20 653	3 119
Heat Energy	34 138	3 815	114 210	12 762	21 479	1 525