

<i>Title of the measure:</i>	<b>BG22: KIDSF Projects:</b> <b>“Energy Efficiency Improvements in Public Buildings in the municipalities of Kozlodui and Novi han” (Lot 1)</b> <b>“Energy Efficiency Improvements in Public Buildings (EEIPB Project)” (Lot 2)</b>
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### *General description*

The Ministry of Energy (ME) organized and managed two separate projects, which were implemented simultaneously:

- “Energy Efficiency Improvements in Public Buildings in the municipalities of Kozloduy and Novi han” (Lot 1) with 13 buildings involved
- “Energy Efficiency Improvements in Public Buildings (EEIPB Project)” (Lot 2) with 25 buildings involved.

The Projects were funded with the third and fourth tranches of the Kozlodui International Decommissioning Support Fund (KIDSF) administered by the EBRD.

The purpose of the Project was to further improve energy efficiency of selected public buildings through modernization and refurbishment of their energy consumption systems. As part of the implementation of the projects, MEE launched a call for applications from municipalities for implementation of energy efficiency improvements in public buildings.

The project was carried out during the period of September 2011 – December 2012 and contained the following energy efficiency measure:

- Thermal insulation of façade walls;
- Thermal insulation of roofs and floors under/above non-heated premises;
- Replacement of windows;
- Rehabilitation and modernization of the heating systems;
- Installation of solar systems for DHW – implemented only in Lot 2.

The above measures were tailored to the type of buildings, listed in table 1 below:

Table 1 Type and number of buildings

Building type	Lot 1	Lot 2	Total
	Buildings	Buildings	Buildings
Halls	3	3	6
Kindergarten	3	5	8
schools	3	10	13
Community house	2	3	5
Sports hall	1	1	2
Health Service	1		1
Social Patronage		1	1
Hospitals		2	2
<b>Total buildings</b>	<b>13</b>	<b>25</b>	<b>38</b>

Number of municipalities	2	10	12
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### ***Impact evaluation***

As a base for the impact evaluation the following has been applied:

- For energy parameters – energy consumption according to the regulations and the difference between the computing heat losses of the “old” and the “new” components of the building envelop,
- For the economic parameters – real values (investments) of the implemented measures and the real prices of fuels and energy.
- For the physical parameters – heating volume of the buildings and areas of the façade walls, windows and roofs.

For the heating systems the preliminary assessment of the effect from the implemented measures is based on calculation of the reduced fuel/ energy consumption compared to the regulatory consumption.

The assessment algorithm is presented in chapter 9, where Fig. 1 and Fig. 2 show schemes of the algorithm for assessment of the energy and fuel savings.

The algorithm is established separately for

- Losses and savings of heat energy in the building envelope,
- Annual savings of heat energy in the heating installations and
- Annual savings of electricity in the solar installations for hot water.

The reduction of heat losses in building envelope is determined by calculating the annual heat consumption for the building before the implementation of the energy-efficiency measures, defined by using the A/V method for estimation of the maximum heat losses in the buildings.

Annual savings of fuel and of the primary energy resource are calculated with formulas for annual consumption of fuel before and after implementation of the energy efficiency measures. Efficiency coefficients are applied respectively for sub-stations, heat-supply network, boiler station and the system for automatic regulation with their values corresponding to the condition of the sub-projects before and after the implementation of energy efficiency measures;

Annual electricity savings are calculated as a result of the installed solar installations for domestic hot water and the new energy-saving lightings.

The monthly electricity saving is based on monthly energy consumption required for heating of the hot water, which will be provided by the new solar hot water installations.

The integrated assessment considers the mutual influence of all measures in one building.

The results from the Project are presented in table 2.

For the project “Energy Efficiency Improvements in Public Buildings in the municipalities of Kozloduy and Novi han” (Lot 1) calculated annual reduction will be:

- for energy and fuel consumption will be 2666,727 MWh in total,
- to which corresponds annual reduction of CO<sub>2</sub> emissions of 618,45 tonnes.

For the project “Energy Efficiency Improvements in Public Buildings (EEIPB Project)” (Lot 2), calculated annual reduction will be:

- for energy and fuel consumption 6858,443 MWh in total,
- to which corresponds annual reduction of CO<sub>2</sub> emissions of 1 119,18 tonnes.

For the two Projects in total the expected (calculated) annual result will be:

- savings of energy and fuel consumption 9 525,170 MWh/a in total,
- annual reduction of CO<sub>2</sub> emissions of 1 737,64 tonnes.

Table 2 Summary of calculated energy and emission savings

LOT	Investments	Annual energy consumption	Annual savings Energy	Annual savings Energy	Reduction of CO <sub>2</sub>
	BGN	GWh	GWh	%	t/a.
1	2 290 692	6,855	2,667	38,90	618,45
2	5 260 041	16,741	6,858	40,97	1 119,18
Total	7 550 733	23,596	9,525	40,37	1 737,64

In May 2013 were signed 16 agreements for the rehabilitation of 31 public buildings financed by the Fund. The value of the projects is estimated at 8.5 million Euros, with them rehabilitation of 15 hospitals, six schools, four office buildings, two gymnasiums and four other buildings was funded. The project implementation provides annual energy savings in the amount of 28,8 GWh and reducing carbon dioxide emissions by 9.63 tons.

For the period 2010-2013 has been agreed additional grant in the amount of 300 million Euros, of which about 40% are intended to be used for projects in the "non-nuclear" energy. At present, 34 grant agreements were signed which worth 334.8 million Euros. 126 buildings are already rehabilitated, another 75 in the large municipalities are in the process of selection of contractors for renovation, and to be contracted for another 150 buildings where contractors have already been selected. Again with the funds was replaced the street lighting in 20 municipalities, and in another 14 the process is not yet finished.

Evaluation of the results so far amounts to:

- energy savings - 2,0 GWh /yr.
- CO<sub>2</sub> emissions saved - 1,5 kt/ year.

In 2014 were implemented projects to improve energy efficiency in 75 public buildings totaling 10.89 million Euro co-financed by the International Fund "Kozloduy" (IFC) within the so called "Non-nuclear" window. Clients are municipalities and the expected effect is estimated at 22 084 MWh/year energy savings and 7952 t CO<sub>2</sub> eq./yr. reduced greenhouse gas emissions.

In 2015 were implemented 2 projects to improve energy efficiency in public buildings totaling 30,4 million Euro co-financed by the International Fund "Kozloduy" (IFK) within the so called "Non-nuclear" window. The projects details are:

*- Project "Energy efficiency in public buildings - tranche V"*

The project is worth 28,4 mln. Euros and includes the implementation of energy efficiency measures in 172 public buildings:

- 50 health establishments;
- 46 schools;
- 51 kindergartens;
- 20 administrative buildings;
- 5 others (community centers, houses of culture).

Implemented energy efficiency measures in these buildings include: replacement of windows, insulation of exterior walls, roof, reconstruction of boiler and heating system, rehabilitation of lighting.

The results of this project are:

- 79 110 MWh/a energy savings
- 35 731 t CO<sub>2</sub>eq./a reduced greenhouse gas emissions.

*- Project "Energy Efficiency in 8 Public Buildings"*

The project is worth 2 mln. Euros and includes the implementation of energy efficiency measures in 3 administrative public buildings and 5 buildings of educational institutions.

Energy efficiency measures include: replacement of windows; heat insulation of walls, floors and ceilings; replacement/modernization of heating system; energy efficient optimization of the electrical installation.

The expected results of the project are:

- 4 550 MWh / a energy savings;
- 2 050 t CO<sub>2</sub>eq./a reduced greenhouse gas emissions.

In 2015 was implemented "Reconstruction of municipal street lighting" Project

The project is worth 10.655 million Euros and is 100% funded by IFK.

The results of this project are:

- 19 900 MWh/a energy savings
- 12,4 t CO<sub>2</sub>eq./a reduced greenhouse gas emissions.

The results of the implementation of the Energy Efficiency - tranche V project in 2016 are shown in the table below. Within the four project lots, energy saving measures were implemented in a total of 171 buildings. Currently the project "Energy Efficiency of Municipal Street Lighting" is under implementation and data on the actual savings will be available in early 2018.

Table: Results of the implementation of the Energy Efficiency - tranche V project in 2016 by lots

Lot	Investments Thousands	Energy savings	Financial savings	CO <sub>2</sub> emissions savings
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	<i>BGN</i>	<i>MWh</i>	<i>Thousands BGN</i>	<i>tones</i>
<b>Lot 1</b>	9 432,3	7 568,9	856,1	2 344
<b>Lot 2</b>	15 664,7	12 542,6	925,2	3 785
<b>Lot 3</b>	18 622,6	8 842,4	1 891,6	3 001
<b>Lot 4</b>	13 564,4	6 048,2	691,9	1 588,6
<b>Total</b>	<b>57 284</b>	<b>35 002</b>	<b>4 364,8</b>	<b>10 718,4</b>

Table: Summarized evaluation of the implementation of measures funded under the Kozloduy International Fund for the period 2014-2016

<b>Number of buildings with implemented EE measures</b>	<b>Energy savings GWh/ann.</b>	<b>CO<sub>2</sub> emissions savings kt</b>
<b>287</b>	<b>81,6*</b>	<b>21,4*</b>

\* The evaluation includes the expected effect of the implementation of the project "Reconstruction of Municipal Street Lighting", reported in 2015.

### *Interaction of measures*

The interaction of the applied measures is evaluated based on integrated assessment of the mutual influence of all energy efficiency measures in the certain building.

### *Historical data*

### *References*

<https://www.me.government.bg/bg/themes/mejdunaroden-fond-kozlodui-mfk-905-348.html>

[http://seea.government.bg/documents/NEEAP\\_Annual%20Report\\_March\\_2016.pdf](http://seea.government.bg/documents/NEEAP_Annual%20Report_March_2016.pdf)