



Energy Efficient Modernization of Municipal Lighting System of Yerevan city

The overarching aim of the “Green Urban Lighting” UNDP-GEF project is to save energy and to reduce greenhouse gas emissions by increasing energy efficiency of municipal lighting systems in the cities of Armenia and to demonstrate advantages of new light emitting diodes (LED) technologies via implementation of municipal investment programs and national policies.

1st Phase: Isakov Avenue, 2015

The demonstration project is implemented in the frames of Statement of Intent signed between UNDP in Armenia and Yerevan municipality in August 2014.

Pilot streets: Isakov Avenue, Tairov Street from Victory Bridge to intersection of Zvartnots Airport

Length of Streets: 9 km

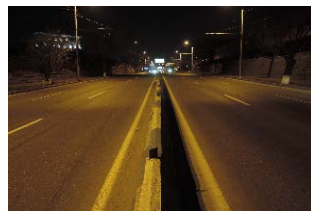
Funding: UNDP-GEF Project - 80%, Yerevan Municipality - 20%

Indicators of lighting system of the demonstration project in Isakov Avenue	Before:	After:	Benefits
	High Pressure Sodium fixtures	LED fixtures	
Quantity of fixtures	756	482	Decreased: 274
Average luminance level, lx (norm: 20)	16	26	Increase: 10
Total installed capacity, kW	216	79	Decreased: 137
Annual electricity consumption, MWh	781	290	Energy saving: 491
Annual GHG emissions, tCO ₂	347	129	Reduction: 218
Annual operation and maintenance costs, USD	63 200	21 500	Savings: 41 700

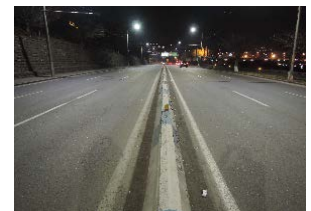
Main benefits of pilot project implementation

- ✓ Installed capacity and energy consumption decreased by 63% in the street lighting system.
- ✓ Annual greenhouse gas emissions were reduced by about 218 tCO₂.
- ✓ **Establishment of a special revolving fund** for energy efficiency related projects at Yerevan Municipal Illumination CJSC of Yerevan municipality.

Before



After



2nd Phase: Mashtots Avenue, 2016

As a result of the Pilot Project's 1st phase the savings, accumulated in the municipal special revolving fund for energy efficiency related projects were used for the 2nd phase of the demonstration projects.

Pilot Streets: Victory Bridge, Mashtots Avenue

Length of streets: 2.64 km

Funding: UNDP-GEF Project - 50%, Yerevan municipality - 50%

Indicators of lighting system of the demonstration project in Mashtots Avenue	Before: High Pressure Sodium fixtures	After: LED fixtures	Benefits
Quantity of fixtures	516	334	Decreased: 182
Average luminance level, lx (norm: 20)	16	26	Increased: 10
Total installed capacity, kW	119	30	Decreased: 89
Annual electricity consumption, MWh	384	103	Energy saving: 281
Annual GHG emissions, tCO ₂	171	46	Reduction: 125
Annual operation and maintenance costs, USD	37 850	9 370	Savings: 28 480

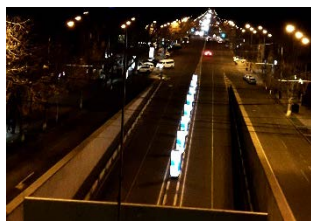
Main benefits of pilot project implementation

- ✓ Installed capacity and energy consumption decreased by 73% in the street lighting system;
- ✓ Annual greenhouse gas emissions were reduced by about 125 tCO₂.

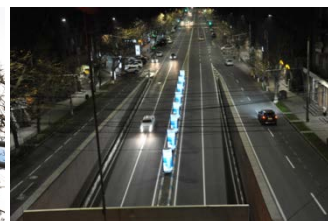
Long-term objectives

- ✓ The accumulation of the cost savings in the energy efficiency revolving fund of the Yerevan municipality enables municipality to invest in improvement of energy performance of the lighting systems on continuous basis.

Before



After



3rd Phase: Atenk Street, Brazil Square and Tsitsernakaberd Road, 2017

As a result of the Pilot Project's 1st and 2nd phases, the savings accumulated in the municipal special revolving fund for energy efficiency related projects were used for the 3rd phase demonstration projects.

Pilot Streets: Atenk Street, Brazil Square and Tsitsernakaberd Road

Length of streets: 3.5 km

Funding: Yerevan municipality: 100%

Indicators of lighting system of the demonstration project in Atenk Street, Brazil Square and Tsitsernakaberd Road	Before: High Pressure Sodium fixtures	After: LED fixtures	Benefits
Quantity of fixtures	308	192	Decreased: 116
Average luminance level, lx (norm: 20)	16	26	Increased: 10
Total installed capacity, kW	87.78	24.24	Decreased: 63.54
Annual electricity consumption, MWh	297.6	82.2	Energy saving: 215.5
Annual GHG emissions, tCO ₂	132.1	36.5	Reduction: 95.6
Annual operation and maintenance costs, USD	26 388	7 287	Savings: 19 100

Main benefits of pilot project implementation

- ✓ Installed capacity and energy consumption decreased by 72% in the street lighting system;
- ✓ Annual greenhouse gas emissions were reduced by about 95.6 tCO₂.

Results of the three projects implemented in Yerevan city

- ✓ Due to modernization of the lighting system, annual savings on power bill and maintenance charges reach about **89 300 USD**;
- ✓ Annual reduction of greenhouse gas emissions make **438.6 tCO₂**;
- ✓ Street lighting system was improved along about **15.14 km** of road.

Other advantages

- ✓ Level and uniformity of illumination were brought into compliance with the effective norms thus ensuring higher road safety;
- ✓ Transparent system of monitoring of higher energy savings and illumination, and lower greenhouse gas emissions;
- ✓ Rationale of a proper incorporation of energy savings in the lighting system into the town's energy action plan of 2016;
- ✓ The accumulation of the cost savings in the energy efficiency revolving fund of the Yerevan municipality enables municipality to invest in improvement of energy performance of the lighting systems on continuous basis.