

**UNITED STATES AGENCY FOR INTERNATIONAL
DEVELOPMENT**

Enterprise Energy Efficiency (3E) Project

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***TREBINJE STREET LIGHTING
PILOT PROJECT PROPOSAL No. B4-2***

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Implemented by:
Advanced Engineering Associates International, Inc. (AEAI)



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Enterprise Energy Efficiency - 3E

PILOT PROJECT PROPOSAL No. B4-2
TREBINJE STREET LIGHTING

SITE VISIT REPORT AND PILOT PROJECT PROPOSAL EVALUATION

Zoran Morvaj
Chief of Party

Sarajevo, April 18, 2012

CONTENTS

1. PILOT PROJECT PROPOSAL SCREENING REPORT
2. PROJECT EVALUATION SUMMARY
3. PROJECT TECHNICAL DESCRIPTION AND ANALYSIS

ATTACHMENT

- A. LETTER FROM THE MAYOR OF THE TREBINJE MUNICIPALITY

1. Pilot Project Proposal Screening Report

| | |
|---------------------------|--|
| I Partners: | |
| The Trebinje Municipality | |

| | |
|---|------------------|
| II Proposed EE measures after USAID 3E analysis: | |
| 1. Changing of street light fixtures | \$100,000 |
| Total cost of proposed EE measures | \$100,000 |

| | |
|---|-----------------|
| III Co-funding contributions: | |
| 1. Direct co-funding from partner's own funds; | |
| Trebinje Municipality | \$23,000 |
| 2. Partner co-financing from borrowed funds; | 0 |
| 3. Other donors` co-funding: | |
| UNDP | \$38,500 |
| 4. Provision of works and services (e.g., decommissioning of old equipment, installation of new equipment, design and supervision services, monitoring and verification (M&V)); | 0 |
| 5. Provision of materials and equipment (e.g., piping, wiring, insulation material, control equipment); and | 0 |
| 6. Partnership with a private sector partner that might contribute any of above. | 0 |
| Total confirmed co-funding by partner/donors: | \$61,500 |

| | |
|--|-----------------|
| IV Co-funding by USAID 3E: | |
| Total 3E Project co-funding based on best estimate: | \$38,500 |

| | | |
|--|-------------|------------|
| V Compliance with criteria for selection: | | |
| 1. Replicability potential and relative ease of implementation; | 0 - 12 | 12 |
| 2. Readiness and ability to put in place clear M&V procedures for reporting on post-implementation energy savings; | 0 - 12 | 12 |
| 3. Appropriate geographic location, building type and types of technologies so that the total portfolio of 10 pilot projects when implemented demonstrates various EE measures, technologies and practices applied to different building types or EE practices and are located across the country; | 0 - 24 | 24 |
| 4. Amount of co-financing for the pilot project that the partner is willing to or able to secure, or the amount of assistance the pilot project can obtain from other donors or private sector; | 0 - 24 | 18 |
| 5. For the public sector - willingness to introduce energy management practices into other public buildings that are responsibility of the partner; | 0 - 12 | 10 |
| 6. For municipalities - readiness to sign the EU Covenant of Mayors on EE; | 0 - 4 | 4 |
| 7. For all – a willingness to support the raising of EE awareness of building users and citizens at large. | 0 - 12 | 12 |
| Total: | 100% | 92% |

| | |
|---|-----|
| VI Environmental Compliance: | |
| Confirm that the pilot project implementation does not cause any environmental concerns or adverse environmental effects. | Yes |

2. Project evaluation summary

2.1 Basic data about the project:

- Project is to reduce electric energy consumption of the street lighting in Trebinje
- Number of power supply and metering locations = 4
- Number of lights = 91 (74 lights – 400W, 17 lights – 250W)
- Total installed capacity = 33,850W
- Average operating hours per day = 11 h
- Number of operating hours per year = $11 \times 365 = 4015\text{h}$
- Total electric energy consumption per year = 136 MWh
- Electrical energy cost = 0.1508 KM/kWh (0.116 \$/kWh)
- Total electrical energy cost per year = 20,500 KM (\$15,700)

2.2 Recommended measure:

1. Replacement of existing street lighting with LED street lights.

2.3 Rationale:

1. Mercury vapor lamps, which are a majority of the installed lights, are an obsolete technology for street lighting, and they are not energy efficient.
2. These measures can be replicated across Bosnia and Herzegovina, since most of the street lighting systems across the country are outdated.

2.4 Benefits:

- Large energy savings.
- Better road visibility.
- Stimulation of local economy; local firms will be hired to do the works.
- Increased awareness of the local government.
- Practical demonstration of benefits of new energy efficient lighting technologies.
- Demonstration of energy savings through LED lighting technology.
- Increase of public awareness of benefits of energy efficiency measures, and that energy costs should not be regarded as a fixed cost.
- Motivation of local governments to financially support such projects.
- Reduction of CO₂ emissions.
- Improvement of public health.

3. Project Technical Description and Analysis

3.1 Introduction

The Trebinje Municipality is interested in reducing energy consumption and to that end has signed the Covenant of Mayors. In achieving the targeted reduction in overall energy consumption, reduction in street lighting consumption plays an important role. Representatives of the Trebinje Municipality contacted 3E and proposed the public street lighting as a 3E pilot project. 3E received an official proposal signed by the Municipality Mayor.

The proposed pilot project represents improvement of the energy efficiency of the public lighting on four power supply and metering locations in the downtown area. The proposal is to replace existing lamps (Figure 1 and 2) with Light Emitting Diode (LED) lamps. Through this project 3E can demonstrate energy efficiency measures for public lighting for towns that use old and/or obsolete technology, which is very common in Bosnia and Herzegovina.

The 3E team visited the proposed facility and performed a walk-thru audit and collected relevant information:

3.2 Site visit report

Valid legal regulations provide that general utility consumption is under the jurisdiction of the municipal administration. Municipal utility consumption includes the costs of electricity and maintenance of the public light system, cost of water in public fountains and hydrants, and the maintenance cost of public green area and parks.

Costs of the public light system maintenance and electricity for the public light system have significantly increased; in 2010, these costs were about 4% of the budget of Trebinje municipality.



Figure 1. – Street lights in Trebinje



Figure 2. – Street lights in Trebinje

3.3 Technical and financial analysis

The main problem of the public light system in Trebinje municipality is the high cost of the outdated, high consumption and inefficient technology currently used in the public lighting system in the Trebinje Municipality. The majority of the lights are mercury light bulbs with a few halogen and sodium bulbs. Because of these inefficient technologies, 95% electricity in the public lighting system is lost in the form of heat energy. The only way to decrease the mentioned costs is to increase the efficiency of the lights used in the public light system by changing the technology used.

Another problem with the technology currently used is the frequent burn-out of the light bulbs due to their technical characteristics and age.

Trebinje Municipality allocates significant funds for payment of maintenance and electricity costs for the public lighting system, which in total is 630,628 KM per year for 2,513 lights in 157 measurement locations in 2010.

The estimated before and after measures electricity consumption and cost per year is shown in table 1. The large energy saving of more than 65% is because the LED street light technology is much more efficient and also because the existing system was oversized.

Table 1. Electrical energy consumption

| Energy carrier | Unit | Present | After measures | Savings |
|----------------|------|---------|----------------|---------|
| Electricity | MWh | 136 | 42 | 94 |
| | \$ | 15,800 | 4,900 | 10,900 |

The reduction of CO2 emissions achieved by implementation of the measures is 30 tons per year.

The cost for the measures and the payback period is shown in table 2. It is assumed that the price per kWh remains the same. Apart from the large energy savings a significant saving in maintenance costs is also important. The LED street lights have up to 5 times longer lifetime and do not suffer from significant lumen depreciation, while mercury vapor lights produce approximately 50% less light every five years used. The rated lifetime of LED lights is 50,000h (more than 12 years), while mercury vapor lights are rated to 10,000h, based on this a saving of approximately \$20,000 in maintenance costs will be achieved for the 91 lights evaluated. In the course of the LED lights lifetime of 12 years, approximately \$1,600 will be saved in maintenance costs per year.

Table 2. Preliminary cost and benefit analysis for recommended measures

| Measures | Investment [\$] | Annual Energy and Maintenance Savings Est [\$] | Simple payback period [year] |
|----------------------------------|-----------------|--|------------------------------|
| Changing of street light modules | 100,000 | 12,500 | 8 |

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LETTER FROM THE MAYOR OF THE TREBINJE MUNICIPALITY