**UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT**

**Enterprise Energy Efficiency - 3E**

# *PILOT PROJECT PROPOSAL No. B3-3*
# *SOS CHILDREN'S VILLAGE IN GRACANICA*

## SITE VISIT REPORT AND PILOT PROJECT PROPOSAL EVALUATION

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A. PROPOSAL FROM THE DIRECTOR OF SOS CHILDREN'S VILLAGE IN GRACANICA

# 1. Pilot Project Proposal Screening Report

| ***I Partners:*** |
|---|
| SOS Children's Village |

| ***II Proposed EE measures after USAID 3E analysis:*** | |
|---|---|
| 1. Repair of windows of 2 houses | $4,000 |
| 2. Installation of 2 solar water heating systems | $18,000 |
| 5. Monitoring and Verification System for 2 houses | $12,000 |
| **Total cost of proposed EE measures** | **$**34,000 |

| ***III Co-funding contributions:*** | |
|---|---|
| 1. Direct co-funding from partner's own funds; | **$**10,000 |
| 2. Partner co-financing from borrowed funds; | 0 |
| 3. Other donors` co-funding: | |
| | |
| 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:** | **$10,000** |

| ***IV Co-funding by USAID 3E:*** | |
|---|---|
| **Total 3E Project co-funding based on best estimate:** | **24,000 $** |

| ***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 | 22 |
| 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 | 15 |
| 5. For the public sector - willingness to introduce energy management practices into other public buildings that are responsibility of the partner; | 0 - 12 | N/A |
| 6. For municipalities - readiness to sign the EU Covenant of Mayors on EE; | 0 - 4 | N/A |
| 7. For all – a willingness to support the raising of EE awareness of building users and citizens at large. | 0 - 12 | 12 |
| **Total:** | **100%** | **87%** |

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

**<u>Note: Inapplicable criteria is not used in the calculation of the score (in this case 87%=73/84)</u>**

# 2. Project evaluation summary

### 2.1 Basic data about the project:

- Project is to reduce thermal losses in the building and use solar energy for water heating
- The year of construction = 1998
- The buildings are not thermally insulated
- Number of floors = 2 + basement
- Heated area
  - Building type 1 = 225 $m^2$
  - Building type 2 = 193 $m^2$
- Heated volume
  - Building type 1 = 585 $m^3$
  - Building type 2 = 502 $m^3$
- Outside wall area
  - Building type 1 = 184 $m^2$
  - Building type 2 = 148 $m^2$
- Window area
  - Building type 1 = 38 $m^2$
  - Building type 2 = 48 $m^2$
- Number of students and staff = 90
- Number of operating days = Official heating season= 185 days
- Heating supplied by a 35 kW oil boiler
- Annual heat energy consumption
  - Building type 1 = 3964 liters of light fuel oil (44 MWh)
  - Building type 2 = 3279 liters of light fuel oil (36 MWh)
- Annual heating cost for the building
  - Building type 1 = 8,000 KM ($6,000)
  - Building type 2 = 6,500 KM ($5,000)

### 2.2 Recommended measures:

1. Repair of windows of 2 houses
2. Installation of 2 solar water heating systems
3. Installation of a Monitoring and Verification System for 2 houses

### 2.3 Rationale:

1. The windows are as old as the building (13 years old), relatively new. However, they have been built from low quality and insufficiently dried wood. As a result, the windows do not seal properly and allow outside air and dust to infiltrate the building and also are a poor barrier to outside noise. Replacing them is not financially feasible since they can be adequately repaired at a much lower cost.

2. To reduce electricity costs for domestic hot water, solar collectors should be installed. Not only is it expensive to use electricity to heat water it is also technically not justified. A local heat source should be used whenever possible, such as hot water from the heating system or available solar energy. Solar thermal collectors are selected to demonstrate usage of a renewable energy source for water heating in a house with larger hot water

consumption. The hot water tank will have electric heaters as a backup heat source. A hot water distribution system to all necessary locations in the house will be built.

3. One of the goals of the project is to introduce the practice of energy management. In order to manage energy consumption, it must monitored first. A monitoring and verification system serves to monitor energy consumption and to verify projected (calculated) energy savings are being accomplished. Fuel oil consumption, indoor and outdoor temperatures will be monitored and recorded on an hourly basis and sent to a database which enables easy overview and analysis of data. Continuous monitoring will identify cases of excessive energy consumption and allow timely investigation and removal of its causes.

### 2.4 Benefits:

- Reduce usage of fuel oil – the most expensive energy source – for heating and reduction of usage of electricity for water heating.
- Children under the age of 18 live in the houses and will be exposed to the practice of energy saving, energy consumption monitoring and solar thermal energy usage. This will influence their behavior and attitude towards energy, which they will pass on to their friends, family and fellow students.
- Demonstrate practical energy savings and improved thermal comfort through new windows and a solar water heating system.
- Motivate other local governments to financially support such projects by disseminating information about this project. There are a large number of public buildings in Bosnia and Herzegovina that use fuel oil for heating, and potential financial savings resulting from reduced fuel oil consumption are significant.
- Stimulate local economy – if more publicly and privately owned buildings followed this example, local companies would install the solar water heating system and repair windows.
- Reduce of usage of imported fossil fuel.
- Reduce of CO2 emissions.
- Improve public health.

# 3. Project Technical Description and Analysis

### 3.1 Introduction

The management of the SOS Children's village is interested in reducing energy consumption and associated costs, and promoting usage of renewable energy sources. The Village is located on a hill overlooking Gracanica, and its layout consists of two rows of 6 houses running east-west. In each row there are only one of the two types of houses (Figure 1).

The houses are heated by individual boilers using fuel oil, which at the time of construction was not prohibitively expensive, yet provided the comfort of minimal manual labor necessary for the system operation. Gracanica has a district heating network, but the Village too far away to be connected to it.

Electricity is used for water heating. Since electricity and fuel oil are already expensive and their prices are expected to increase, reduction in their consumption has significant financial benefits. Since half of the electricity in BiH is produced from coal, reduction in electricity consumption also has environmental benefits.

### 3.2 Site visit report

The houses and the Village property are well maintained, clean and comfortable. The windows are double-paned, but do not seal properly and cause high heat loss and cold air infiltration. They can be repaired and need not be replaced.

Since six children live in each house, the consumption of hot water is high; and installing solar thermal panels for heating hot water is an appropriate energy efficiency measure.

Each house has its own boiler room in the basement with a single 35 kW oil boiler and a light fuel oil storage tank (Figure 1). The boiler is regularly maintained and the tank oil level is monitored and added amounts recorded. One Type 1 house and one Type 2 house with the largest fuel oil consumptions are selected for implementation of energy efficiency measures.

**Figure 1. House type 1 (left) and house type 2 (right)**

**Figure 2. Boiler and fuel oil tank**

### 3.3 Technical and financial analysis

The estimated energy consumptions, before and after measures, **for both houses**, are shown in the following table:

**Table 1. Energy consumption**

| Energy carrier | Unit | Present | After measures | Savings |
|---|---|---|---|---|
| Light fuel oil | MWh | 80 | 64 | 16 |
| Electricity | MWh | 23 | 13 | 10 |

The reduction of CO2 emissions achieved through reduction of electricity consumption is calculated based on the fact that half of the electricity in BiH is produced in coal fired thermal power plants[1].

The reduction of CO2 emissions achieved by implementation of the measures is 10-12 tons per year.

The cost for the measures and the payback period is shown in the following table. It is assumed that the price per kWh remains the same.

**Table 2. Preliminary cost and benefit analysis for recommended measures**

| Measures | Investment [$] | Annual Savings Estimate [$] | Simple payback period [year] |
|---|---|---|---|
| Repair of windows<br>Installation of a solar water heating system<br>Installation of a Monitoring and Verification System | 34,000 | 3,500 | 9.7 |

[1] 2010 Annual report of the State Electricity Regulatory Commission – SERC

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