ENERGY EFFICIENCY PROJECT
ZENICA CANTONAL HOSPITAL
Financier: EBRD
Client: Government of Zenica-Doboj Canton
Consultant: CMS, CETEOR and GreenMax

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Romano Pehar, EBRD
Leonida Hadzimuratovic, CETEOR
Sustainable Energy Initiative (SEI)

The EBRD has been engaged in sustainable energy finance since its establishment in 1991. In 2006, the EBRD launched the SEI to address the twin challenges of energy efficiency and climate change.

Strong partnerships with the major international initiatives for climate change (Global Environment Facility, the Climate Investment Fund and the Green Climate Fund.

<table>
<thead>
<tr>
<th>Year</th>
<th>Initiative</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 2006 | Sustainable Energy Initiative (SEI) | • Energy efficiency  
                                   |                                                                              |
| 2013 | Sustainable Resources Initiative (SRI) | • Renewable energy  
                                   | • Water efficiency  
                                   | • Material efficiency  
                                   | • Adaptation to climate change |
| 2015 | Green Economy Transition (GET) | • Environmental protection  
                                   | • Technology transfer |
Sustainable Energy Initiative (SEI)

**Projects across Sustainable Energy sectors**

- **Corporate Energy Efficiency**
  - Energy efficiency investments in energy-intensive industrial processes, retail and transport.

- **Sustainable Energy Financing Facilities**
  - Financing facilities through local financial institutions to support energy efficiency in SMEs, small-scale renewable energy, and residential buildings.

- **Power Sector Energy Efficiency**
  - Improving energy efficiency of transmission networks and thermal power stations.

- **Municipal Infrastructure Energy Efficiency**
  - Upgrading neglected municipal infrastructure to provide efficient district heating, public transport networks, and water supply systems.

- **Renewable Energy**
  - Supporting the development of renewable energy sources by providing project finance and technical assistance for renewable energy investments.

- **Climate Change Adaptation**
  - Developing approaches to integrate climate risk management and adaptation into project appraisal and development with a particular focus on the private sector.

**Technical assistance**
- Market analysis, energy audits, training, grant co-financing

**Projects and Investments**

- **Policy Dialogue**
  - Working with governments to support development of a strong institutional and regulatory framework that incentivises sustainable energy

- **Technical Assistance**

**Projects**

- Sustainable Energy Initiative (SEI)
- Energy Efficiency Project
- Zenica Cantonal Hospital

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**Infographic**

- European Bank for Reconstruction and Development (EBRD)
- Zenica Cantonal Hospital
- Technical assistance: market analysis, energy audits, training, grant co-financing
- Projects across Sustainable Energy sectors

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**Sustainable Energy Initiative (SEI)**

- Corporate Energy Efficiency
- Sustainable Energy Financing Facilities
- Power Sector Energy Efficiency
- Municipal Infrastructure Energy Efficiency
- Renewable Energy
- Climate Change Adaptation

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**Projects and Investments**

- Policy Dialogue
- Technical Assistance

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**Technical assistance**
- Market analysis, energy audits, training, grant co-financing
Green Economic Transition

€22.2bn

EBRD Annual Green Investment

- Green financing in industry, commerce and agribusiness
- Green Economy Financing Facilities
- Energy and natural resources sector
- % of GET in EBRD annual business volume

Central Asia
Central Europe and Baltics
Eastern Europe and Caucasus
Russian Federation
South-Eastern Europe (incl. Cyprus and Greece)
Southern and Eastern Mediterranean
Turkey
Regional

Energy Efficiency Project
Zenica Cantonal Hospital
**REEP (Regional Energy Efficiency Programme)**

**Project Preparation**

**Bosnia Herzegovina**
- 1 hospital EE project
- 3 district heating ESCO projects
- 1 street lighting ESCO project

**Serbia**
- 17 street lighting ESCO projects
- 9 building and 1 district heating projects

**Croatia**
- Street lighting ESCO projects with EUR 10m capex prepared
**ACHIEVEMENTS**

<table>
<thead>
<tr>
<th>Countries</th>
<th>Bosnia &amp; Herzegovina, Croatia, FYR Macedonia and Serbia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local partner banks</td>
<td>9 (2 BiH, 3 Croatia, 2 Serbia, 2 FYR Macedonia)</td>
</tr>
<tr>
<td>Total Financing available</td>
<td>EUR 92 mln</td>
</tr>
<tr>
<td>Total signed sub-loan amount to date</td>
<td>EUR 73.6 mln</td>
</tr>
<tr>
<td>Total no. of sub-projects to date</td>
<td>287</td>
</tr>
<tr>
<td>Total CO₂ savings</td>
<td>114,000 t/year</td>
</tr>
<tr>
<td>Total equivalent primary energy savings (MWh/y): -(Renewable energy capacity added)</td>
<td>486,000 MWh/year</td>
</tr>
<tr>
<td></td>
<td>54 (MW)</td>
</tr>
</tbody>
</table>

**WebSEFF II**

### Green Business Development Tools

- Resource and Energy Efficiency Audits
- Green Economy Financing Facilities
- Technology Transfer and Innovation Support
- Green City Initiative
- Blending Multilateral Climate Funds
- Policy Dialogue

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**REEP (Regional Energy Efficiency Programme)**

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**Energy Efficiency Project**

**Zenica Cantonal Hospital**

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**Public** 10%

**Private** 90%
About project

Energy Efficiency Project Zenica Cantonal Hospital is a part of the broader initiative by EBRD to promote the financing of the public projects according to energy efficiency (EE) principles, based on the effects of energy savings achieved through the implementation of the identified measures of increasing the energy efficiency in such facilities.

The Government of Zenica-Doboj Canton has expressed great interest for the realization EE Project Zenica Cantonal Hospital and approached the EBRD with request for financing subject project in standard form of sovereign financing on-lent to the Zenica-Doboj Canton, in amount of EUR 10 M.

Recognizing the Energy Efficiency Project Zenica Cantonal Hospital as the Green Investment, the financier has decided to support this project with a grant in amount of EUR 1 M.
Project implementation stages

1. Feasibility Study
2. Environmental and Social Study
3. Procurement preparation documents *(ongoing)*
4. Tender procedure
5. Selection of Contractor/Supervisor
6. Implementation of proposed measures
Zenica Cantonal Hospital

Consultant:
- CMS Sarajevo
- CETEOR, Sarajevo
- GREEN Max, Varšava
Zenica Cantonal Hospital

- Administration building
- Internal medicine department
- Infectious diseases department
- Laundry
- Workshop/pathology-laboratory
- Garage
- Central warehouse
- Boiler room
- Main building

Total number of beds: 912
Total number of patients/year: 30,800
Total number of employees: 1,626
Total number of facilities: nine (9)
Total heated area: 32,250 m²
Period of construction: 1953 - 2012
Current state
of buildings and technical systems
Current state of buildings and technical systems

- Structures of buildings are stable but in poor condition due to long post-construction period and lack of maintenance
- External walls with damaged thermal insulation or without it
- Joinery in very poor condition
- Damaged roof coverings and gutters
- Roofs of the Hospital facilities are covered with asbestos-cement sheets (*material that is harmful to health*)
- Technically inadequate constructed system of drainage of waste and storm waters which causes periodic flooding of the basement and semi-basement premises of the Hospital
- Steam boiler on coal in very bad condition (*dates from 1959*)
- Inefficient system of heat energy distribution
- Radiators are 50 years and without thermostatic valves
Overview of the energy balance for the current state of the Hospital

3.859 t/year
19.655 MWh
Primary energy (coal)

13.169 MWh
boiler (efficiency 67%)

11.852 MWh
distribution (losses 10%)

Heating
8,905 MWh
Technology
2,300 MWh
DHW
647 MWh

Efficiency level of the entire energy production and distribution system is 60.3%
Hospital requirements

- Improving thermal performances of the building envelope of the existing buildings
- Installation of a new boiler house (*primary fuel natural gas*)
- Removing asbestos sheets from the roofs of the Hospital buildings
- Solving the problem of periodic flooding of the Hospital basement premises
- Upgrade of one floor (*total area of 1.835 m²*)
- Extension i.e. construction of ground floor and two (2) floors of the new building (*total area of 960 m²*)
Proposed measures (EE and non-EE)

- Construction 2,800 m² of the new area (upgrade and extension)
- Improving thermal performances of the building envelope of the existing buildings (joinery, roofs and facades)
- Removing asbestos sheets from the roofs of hospital buildings
- Reconstruction the waste and storm water drainage system
- Installation of a new boiler house with total power of 8 MW (primary fuel natural gas and extra light fuel oil as alternative fuel)
- Installation of a steam boiler for kitchen and sterilizers
- Construction and reconstruction of the heat distribution system (hot water pipeline - substations - indoor installation)
- Installation of modern ventilation and cooling system in all hospital departments (air conditioning chamber will have recuperation of the heat of the exhaust air and compression cooling devices of total cooling power about 900 kW)
- Installation a new equipment in the laundry room
- Infrastructure construction for connection to the natural gas network
„Best in class“ measures

- High class building standards for upgrade/extension comparing to standard building construction in BiH
- Thermal insulation of external walls with rock mineral wool

<table>
<thead>
<tr>
<th>Building envelope elements</th>
<th>Standard new building (“U” W/m²K)</th>
<th>Upgrade/extension of the Main building (“U” W/m²K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joinery</td>
<td>Alu. 1.8, PVC 1.4</td>
<td>Alu. 1.6, PVC 1.2</td>
</tr>
<tr>
<td>External walls</td>
<td>0.25-0.30</td>
<td>0.20</td>
</tr>
<tr>
<td>Roofs / ceilings</td>
<td>0.20-0.25</td>
<td>0.18</td>
</tr>
</tbody>
</table>
Overview of the Hospital energy balance before and after implementation measures

<table>
<thead>
<tr>
<th>Description</th>
<th>Heat demand (MWh/year)</th>
<th>Energy in fuel for heat generation (MWh/year)</th>
<th>Electricity consumption (MWh/year)</th>
<th>Total energy for heat + electricity (MWh/year)</th>
<th>Savings in comparison to energy consumption after the project completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>10.422</td>
<td>17.283</td>
<td>951</td>
<td>18.234</td>
<td>9.593</td>
</tr>
<tr>
<td>Calculated baseline</td>
<td>11.852</td>
<td>19.655</td>
<td>1.775</td>
<td>21.430</td>
<td>12.789</td>
</tr>
<tr>
<td>Calculated baseline including upgrade/extension area</td>
<td>12.422</td>
<td>20.600</td>
<td>1.873</td>
<td>22.473</td>
<td>13.831</td>
</tr>
<tr>
<td>After the project completion</td>
<td>6.970</td>
<td>6.998</td>
<td>1.643</td>
<td>8.641</td>
<td>/</td>
</tr>
</tbody>
</table>

**Remark**  
Consumption of electricity was considered only for consumers that are the subject of the project
Overview of operative energy related costs before and after implementation measures

<table>
<thead>
<tr>
<th>Description</th>
<th>Operative energy related costs (KM/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual costs</td>
<td>995.262</td>
</tr>
<tr>
<td>Calculated baseline</td>
<td>1,210,462</td>
</tr>
<tr>
<td>Calculated baseline including upgrade/extension area</td>
<td>1,250,369</td>
</tr>
<tr>
<td>After the project completion – primary fuel natural gas</td>
<td><strong>934,256</strong></td>
</tr>
</tbody>
</table>

**Remark**
After implementation measures, operative energy related costs will be reduced for 25 % comparing to Calculated baseline including upgrade/extension.
<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area of the existing buildings (gross)</td>
<td>m²</td>
<td>36.650</td>
</tr>
<tr>
<td>Total area of upgrade/extension (gross)</td>
<td>m²</td>
<td>2.800</td>
</tr>
<tr>
<td>Total investment</td>
<td>KM</td>
<td>21.500.000</td>
</tr>
<tr>
<td>Share of EE measures in total investment</td>
<td>%</td>
<td>85%</td>
</tr>
<tr>
<td>Share of non EE measures in total investment</td>
<td>%</td>
<td>15%</td>
</tr>
<tr>
<td>Economic Discount rate</td>
<td>%</td>
<td>3%</td>
</tr>
<tr>
<td>Economic Net Present Value (ENPV)</td>
<td>KM</td>
<td>11.913</td>
</tr>
<tr>
<td>Economic Profitability Rate (EIRR)</td>
<td>%</td>
<td>10,21</td>
</tr>
<tr>
<td>Economic Return on Investment (EROI)</td>
<td>%</td>
<td>55%</td>
</tr>
<tr>
<td>Discounted return period</td>
<td>year</td>
<td>9 years and 1 month</td>
</tr>
<tr>
<td>Energy savings compared to comfort level baseline</td>
<td>MWh/year</td>
<td>13.831</td>
</tr>
<tr>
<td>Energy savings</td>
<td>%</td>
<td>62%</td>
</tr>
<tr>
<td>Reduction of emissions</td>
<td>t/year</td>
<td></td>
</tr>
<tr>
<td>CO₂</td>
<td></td>
<td>5.818</td>
</tr>
<tr>
<td>CO</td>
<td></td>
<td>17,1</td>
</tr>
<tr>
<td>NOₓ</td>
<td></td>
<td>21,9</td>
</tr>
<tr>
<td>SO₂</td>
<td></td>
<td>256,1</td>
</tr>
<tr>
<td>Solid particles</td>
<td></td>
<td>1,4</td>
</tr>
</tbody>
</table>
Benefits of the Project Zenica Cantonal Hospital

- Achieve optimum thermal comfort
- Reducing heat demand
- Free additional space due to the removal of storage of coal and ash
- Extending the lifespan of buildings and improving the esthetic appearance of the buildings
- Prevention of the possibility of harmful effects on the health of patients and employees by removing asbestos from roofs
- Improving air quality
- Reduction of greenhouse gas emissions
- Avoiding the cost for space rental outside of the Hospital for specialist outpatient clinics
- Avoiding treatment costs outside the Canton due to increased quality of medical services at the Hospital
- Shortened period of stay of patients
- Avoiding the cost for flooding rehabilitation and use the basement premises for specialist outpatient clinics
- Quality working conditions for employees and high level of attractiveness of the Hospital for medical staff
- Reduction of operating costs of the Hospital
THANK YOU FOR YOUR ATTENTION!

Romano Pehar, EE Expert, EBRD
rpehar@ebrd.com

Leonida Hadzimuratovic, Project Manager, CETEOR
lhadzimuratovic@ceteor.ba