Energy Efficiency Projects

ENVIRONMENTAL MANAGEMENT FRAMEWORK
- EMF -

Authors: Gordana Lučić M.Sc.M.E.
        Zoran Stanić M.Sc.E.E.

Zagreb, October 2002
CONTENTS

CROATIA: ENERGY EFFICIENCY PROJECTS

1. Background

2. General Considerations
   2.1 Regulatory Framework
   2.2 Institutional Arrangements - Permits and Approvals
   2.3 Institutional Arrangements – Monitoring
   2.4 Schedule
   2.5 Institutional Strengthening
   2.6 Consultation

3. Sample Environmental Management Plans
   3.1 Street Lighting
   3.2 District Heating
   3.3 Building Retrofits

4. Conclusions
CROATIA: ENERGY EFFICIENCY PROJECTS

1. Background
The development and implementation of energy efficiency projects (EE projects) in Hrvatska Elektroprivreda (HEP), is being prepared in cooperation with the World Bank and Global Environmental Facility (GEF). The activities started in 1999, when HEP, through the World Bank, received a Japanese Grant for District Heating and Energy Efficiency Project totaling US$187,994. The grant was earmarked for the development of energy efficiency projects and the establishment of Energy Service Company (ESCO) for the implementation of such projects in Croatia. In May 2001, the Council of the GEF has approved the Croatia – Energy Efficiency for inclusion in its work program. This means that grant funding from the GEF amounting to US$7,084 million has been committed for the project and that the World Bank can proceed with further preparation of the project. GEF funds can be used in parallel with the World Bank loan facility amounting to US$5 million, to be extended to Hrvatska Elektroprivreda for the implementation of energy efficiency projects.

In April 2002, HEP ESCO Ltd. was established as a separate company for the development, implementation and financing of EE projects. The company is fully owned by Hrvatska Elektroprivreda.

The environmental aspects of EE projects represent a constituent part of the documentation to be prepared for the World Bank loan and GEF grant. Those aspects are focused on the assessment of the project environmental issues and the definition of the scope of the Environmental Management Framework (EMF).

The environmental aspect has been elaborated in the EMF in four major sections, namely:

- General Regulatory Framework
- Institutional Arrangements
- Institutional Strengthening
- Typical Mitigation and Monitoring Plans
  - Modernization of Street Lighting,
  - District Heating
  - Building Retrofit

2. General Considerations
2.1 Regulatory Framework
The implementation of energy efficiency projects basically means the modernization of facilities and plants, including the disposal, reconstruction and replacement of the existing equipment and the construction and installation of new plants. Three main laws governing the execution of the aforementioned work are the Environmental Protection Act (Zakon o zaštiti okoliša, Official Gazette 82/94, 128/99), the Physical Planning Act (Zakon o prostornom uređenju, Official Gazette 30/94, 61/00) and the Construction Act (Zakon o gradnji, Official Gazette 52/99, 75/99).

Figure 1 gives a comprehensive presentation of basic activities required for the construction and reconstruction of facilities, with appertaining laws and documents, and on the whole embodies
everything required for investment projects, even the largest ones. The range of required
documentation and consents depends on the type, scope and purpose of the project. The links that
are shown originate from the aforementioned basic laws that will be applied and used, in their
entirety or relevant parts, during the implementation of EE projects. The activities have been
divided according to the responsibilities of individual participants in project execution. These are:
state administration bodies, project engineers, investors and contractors. Below is a list of activities
shown in Figure 1 given in numerical order.

List of activities shown in Figure 1.
1. Environmental Protection Act
2. Physical Planning Act
3. Construction Act
4. By-law on Environmental Impact Assessment
5. Water Act/Nature Protection Act
6. Commission for Environmental Impact Assessment
7. Public debate
8. Physical Plan
9. Siting Permit
10. General Permit
11. Building Permit
12. Operating License
13. General Consents
14. Investigation work
15. Blueprints and other, as required for Siting Permit
16. Excerpt from Conceptual Design
17. Consents, certificates, opinions on Final Design
18. Conceptual solution
19. Conceptual Design
20. Supplementing Conceptual Design pursuant to Siting Permits
21. Tender
22. Final Design
23. Detailed Design
24. As-built Document
25. Investigation Work Program
26. Feasibility
27. Investigation Work Program
28. Decision to undertake the project
29. Application for Siting Permit
30. Review of Conceptual Design
31. Decision to proceed with the preparation for construction
32. Application for General Permit
33. Final decision on construction
34. Application for Building Permit
35. Technical examination
36. Investigation work
37. Investigation work
38. Land acquisition
39. Construction
40. The commissioning of facility

Three main documents to be issued by state administration bodies (at national or local level, depending on the significance and scope of the investment project) are the Siting Permit (9), the General Permit (10) and (11) the Building Permit.

Three main design and investment documents required for obtaining general consents and permits and the development of the investment project are the Conceptual Design (19), the Feasibility (26) and the Final Design (22).

The commissioning of the facility (40) is the main prerequisite for obtaining the Operating License (12).

According to the information furnished by the Ministry of Environmental Protection and Physical Planning, several amendments to the existing law are being prepared along with a rule-book, with an aim of simplifying the permit issuing procedure and the procedure related to the elaboration of required documentation for investment projects and the promotion and encouragement of the use of sustainable development concept in such projects. These are:

- Amendment to the Construction Act – the Siting Permit will no longer represent a prerequisite for the issuance of the Building Permit,
- Amendment to the Construction Act – in case when modernization and reconstruction work has no significant impact on the environment, the Building Permit will not be required,
- Elaboration of the rule-book on the privileges granted for sustainable construction.

Regarding planning actions, the above documentation will be completed till the end of 2002 and adopted as law.

Below is an overview of preliminary activities connected with legislation for selected typical EE projects, i.e. modernization and reconstruction of the Street Lighting, District Heating and Buildings Retrofit projects.

Based on the carried out market analysis for EE projects in Croatia and in line with core activities of HEP, it has been assessed that typical EE projects to be implemented by HEP ESCO will be related to the modernization and reconstruction of:

- Street Lighting
- District Heating (DH)
- Buildings

Mitigation and Monitoring plans for such projects have been prepared accordingly. The description of possible adverse environmental impacts during the construction of EE projects has also been given, with the presentation of impact measurement and control method and plan.

Three EE pilot projects are in the preparation phase. These are:
- Modernization of a part of the street lighting in Zagreb (Street Lighting)
- Modernization of the Dubrava District Heating System (DH)
- Reconstruction of the School Končar (Building Retrofit)

A part of the prepared documentation for the above projects has proved very useful in the preparation of Mitigation and Monitoring Plans.

2.2 Institutional Arrangements - Permits and Approvals
Draft Operational Procedure Concerning the Implementation for typical HEP ESCO EE projects is described below. It consists of three main activities for each project type depending on the scope of work and mode of contracting between HEP ESCO d.o.o. and the owner of e.g. street lighting, DH equipment and schools/universities. Basic activities are as follows:

A. Obtaining approvals and permits for the implementation of EE projects,
B. Implementation of EE projects in accordance with project documentation and obtained approvals and permits,
C. Reporting to competent institutions.

A. In accordance with the described Legislative Framework Applying to EE Projects – General and specific legislation for Street Lighting Projects, DH projects and Building Retrofit projects (part 3.), the appropriate project documentation should be prepared (List of activities show in Figure 1.), and relevant approvals and permits for project implementation obtained. Generally, this procedure is investor’s obligation, i.e. the obligation of the owner of e.g. street lighting, schools and DH equipment (the Construction Act). All the conditions relative to environmental protection should be a constituent part of project documentation, including approvals and permits. In the development of bidding documents and contracts for the supply of equipment and performance of work the conditions of environmental protection should be included along with all other relevant conditions.

B. The selected equipment suppliers and contractors are responsible for the compliance of equipment and work with the Contract. As regards environmental protection, this means that noise levels should be kept within stipulated limits during the execution of work, that the waste should be disposed to a determined waste disposal site, etc. The supervision of work is carried out by the investor (depending on the contract, this can be performed by HEP ESCO, too).

B. The reporting to competent institutions consists of regular periodical reports and intermittent reports as requested by such institutions (e.g. inspection services and Ministry of Environmental Protection and Physical Planning). Periodical reports shall be made in a standard form and shall consist of the following parts:

- Description of place and time of implementation
- General description of undertaking
- Undertaken operations to perform the tasks,
- Equipment, installed and dismantled facilities
- Produced waste.

2.3 Institutional Arrangements - Monitoring
According to the requirements of the Environmental Protection Act, all the participants in the process, namely the investor, the designer and the contractor, are obliged to meet the requirements of environmental protection during each phase of the process to provide an effective protection against harmful influence to people’s health. On the other hand, the Construction Act imposes an obligation on the participants in the construction process, namely the investor, the designer, the project supervising engineer, the construction supervising engineer, the Site of Works Manager, to design, construct, maintain and use the construction object in a way to save energy and protect the environment and human health. The Environmental Protection Act and related Air Quality Protection Act and the Waste Act impose an obligation in connection with authorization and doing business to measure, keep records and inform state and local authorities of the following:

- Emissions of dusts and gases into the atmosphere
- Generating, storage and utilizing waste
- Noise levels

AIR

With regard to air protection, tests of flue gas emissions are outsourced to specialized companies which have appropriate measuring and control apparatuses. According to the By-law on Limit Values of Pollutant Emissions from Stationary Sources into the Air, the first measurement of pollutants shall be carried out during the test run of a stationary source before being granted the license and after having reached the undisturbed operation of the stationary source in question, but not later than six months after putting the same into operation. Unless otherwise stated in this Decree, the frequency of measurements taken on a specific stationary source shall be determined in accordance with the results of the first measurements. For stationary sources with predominantly invariable operating conditions at least three individual measurements shall be carried out in situations of undisturbed, continuous operation at the maximum emission level and at least one measurement under regularly repeated operating conditions at the variable emission level (for example, during the start-up and shut-down phases, fuel replacement and the cleaning and regeneration process). For stationary sources with predominantly variable operating conditions at least six individual measurements shall be carried out under the operating conditions which, as known from experience, may cause the highest emission levels. The duration of each individual measurement shall not exceed half an hour and the results of individual measurements shall always be expressed as a half-hourly average. For each continuous emission measurement the half-hourly average of the data measured shall be determined for each successive half-hour. Half-hourly averages shall be stored as a frequency distribution. The frequency distribution shall be determined upon expiry of each calendar year. The values of half-hourly averages shall be used to determine the daily average with regard to the daily operating time.

The results are analyzed and submitted to the Environmental Department of the Municipality/City of Zagreb and to the Ministry of Environmental Protection and Physical Planning. In case that permissible values of emissions have been exceeded, the operating staff correct the combustion process and new tests are conducted.

HEP ESCO will have support from HEP’s Environmental Department and will contract specialized companies for measurements and control of environmental impacts.
HEP ESCO will enter into contracts with a certified company to perform air emissions measurements. This partner company has the following equipment:

A) For the measurement of dust concentration in flue gases

1. "GOETHE" apparatus for isokinetic suction of flue gases that measures temperature and differential pressure in the point of suction, with suction possibility of 6 m³/h.

B) For the analysis of flue gases

1. "AMETEK" analyzer of oxygen content in flue gases with zirconium oxide cells, with the measurement range 0 to 21%.

2. "IMR" 3000 P analyzer with the measurement of temperature and flue gas composition, with electrochemical measuring cells for O₂, SO₂, CO and NOₓ.

3. "IMR" flue gas dryer with heated probe and hose.

4. "Madur" GA-40T plus, with the measurement of temperature and flue gas composition, electrochemical measuring cells for O₂, SO₂, CO and NOₓ and heated hose and other equipment.

5. "DRÄGER" test probes with chemical reagent for different gases and different concentrations.

6. "BACHARACH" for determining the degree of flue gas blackening according to the Bacharach scale.

WASTE

There are wastes resulting from investment and overhaul work. The waste generated during work carried out by own force are brought to the temporary storage site (for example- Jakuševac-Zagreb’s disposal side) and later on taken away by companies selected on a competitive basis which possess a license for the utilization of waste (as to be specified in the bid documentation). According to the Waste Act, all wastes generated during the investment process carried out by companies contracted by HEP ESCO are utilized by such companies. The contractor is obliged to observe and fulfil the obligations under the Waste Act. The standards and requirements would be specified in the bid documents.

NOISE

As regards noise, the measurements are outsourced to specialized companies which have appropriate measuring and control apparatuses manufactured by Brüel and Kjaer:

- Sound meter type 2231,
- Terza-octave filter type 1625,
- Sound analyzer type 1625,
- Noise level calibrator type 4230
The equipment complies with the Art. 4 of the Regulations on Conditions to be met by Companies for Measurement and Forecast of Noise in Living Environment (Official Gazette No. 37/90).

The measurements and analyses of the sound volume will be performed during the construction and operation at the locations in the vicinity of residential buildings. The measurements will be carried out during daytime as well as during nighttime, as need be.

The measurements will be carried out on the basis of effective standards:
- Law on Noise (Official Gazette No. 17/90),
- Regulations on Maximum Allowed Noise Level in Living Environment (Official Gazette No. 37/90),
- Regulations on Conditions to be met by Companies for Measurement and Forecast of Noise in Living Environment (Official Gazette No. 37/90)
- ISO 1996 Acoustics – Description and Measurement of Environmental Noise

The results will be compared to the limit values and in case of non-compliance the responsible person (contractor as to be specified in the bid documents) takes necessary measures to effectively decrease noise emission at least to the level allowed by the standard, to be confirmed by the measurements.

2.4 Schedule

Commencement Dates and Ending Dates for:
- Mitigation Activities – three times during the contract
- Monitoring-construction
  at the beginning of construction works
  during the construction works
  at the commissioning

Measurements are to be made by contracted specialized companies with appropriate equipment. The measurements are to be supervised by HEP ESCO and HEP’s Environmental Department.

<table>
<thead>
<tr>
<th>Who is responsible for measurements</th>
<th>Type of measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning of the construction works</td>
<td>Specialized company under supervision of HEP ESCO and HEP Environment</td>
</tr>
<tr>
<td>Realization of construction works</td>
<td>Specialized company under supervision of HEP ESCO and HEP Environment</td>
</tr>
<tr>
<td>Completion of construction works</td>
<td>Specialized company under supervision of HEP ESCO and HEP Environment</td>
</tr>
</tbody>
</table>

- Monitoring-operation: twice a year (every six months) or three times (every four months) during the realization of contracts or in case of environmental danger

2.5 Institutional Strengthening

According to current HEP's organizational scheme, environmental issues are dealt with by its Development Department, through pro-active involvement of experts from HEP's core businesses
and process units where numerous environmental issues are frequently encountered. Motivated by numerous studies and practical activities focusing on the environmental issues conducted within HEP's business, HEP's Management set up the Environmental Procedures Coordination and Standardization Team in 2001. The Team is lead by the Development Department, and it involves all core business units (generation, transmission distribution, economic affairs, business IT department). The Team's primary task is to monitor, guide and coordinate environment-related activities relevant for HEP's business system, cross-connect and inform HEP's Management and the process units in which the environmental issues arise and directly affect their operation. According to its structure and tasks, the Team is expected to become a core of HEP's Environmental Department in the near future. This would be the first step in the integration and organizational adjustment of environmental protection activities to the changes facing HEP at the point when this company undergoes its business restructuring and the process of the Croatian energy sector reform.

At the time when HEP's Environmental Policy was adopted (1996.), its basic principles were the first step towards the incorporation of systematic environmental protection into HEP's business policy. By the adoption of the 2000-2003 Management Business Program, and with an aim to realize the tasks set up therein, HEP's Environmental Plan became the key document for the introduction of the Environmental Management System (EMS) pursuant to ISO 14001 standard. The Plan, drafting of which started in 2000, has a task to set the initial steps to be taken at the top level of corporate management, other management levels, and core business functions of HEP, aiming at gradual and systematic integration of environmental issues into company's business operations on the principles of their continual improvement. The aforementioned basic environmental policy principles will be reviewed and revised in the Plan and adjusted to the requirements of a general environmental policy document on one hand, and to objectives and targets of an environmental management system on the other.

Along with the mentioned HEP's Environmental Plan, another related project was initiated - Development of HEP's Environmental Accounting System as the project dealing with one of the important aspects of HEP's business that has not been given particular attention so far. Once these projects are fully implemented and integrated with the existing HEP's management structure, the scheme according to ISO 14001, and particularly after the environmental accounting has been established, more reliable information on the needs, activities, current costs and investments into environmental protection for the entire business system will be available. This will create a sound basis to inform HEP's Management business decision-making on this business segment, and more efficient communication, both internal -within HEP, and external -with the international financing institutions and other partners regularly demanding information of this kind.

The equipment needs (type, number, cost-foreign and local), training (who, where, what to be trained in, for how long and costs) or any specialized consultants/studies (if needed, include: justification, TORs and costs) will be specified in preparation phase of the energy efficiency projects. This will be applied on the following:
- environmental monitoring (air emissions and quality of ambient air, water and noise emissions) and modeling,
- waste management,
- environmental policy and management (EMS).

2.6 Consultation with project-affected groups and local NGOs (Cooperation with public and professional environment in energy efficiency projects relating to electricity and heat)
The consultations with project-affected groups and local NGOs provided information, the exchange of opinions, gathering of suggestions and proposals from public and professional environment on electricity and heat efficiency improvement projects. From April 12, to July 16, 2002, nine round tables (RT) were organized regarding the optimization of city district heating systems in Zagreb and Osijek (3 RT), electricity and heat efficiency program (5 RT) and resume of points raised and suggestions given on all RT for the Ministry of Environmental Protection and Ministry of Economy (1 RT). Two RTs, as a part of Electricity and Heat Efficiency Program, were organized specially for the planned Pilot Projects – Street Lighting and Schools, and one RT was also organized for financial institutions and banks.

The total number of participants to the RTs made up 250 people.

Typical EE projects to be implemented by HEP ESCO will be connected with the modernization and reconstruction of street lighting, district heating (DH) and buildings. During the round table discussions on the implementation of energy efficiency measures at electricity and heat end-users in general, and on particular projects of this type, special attention was paid to the environmental impact of project preparation and implementation. The information and suggestions given by NGOs and project affected groups were used as one of the bases for the preparation of this EMP and especially for the development of the Mitigation and Monitoring Plan.

Below is an excerpt from consultations and conclusions reached at the meetings and round tables relative to the particular projects mentioned above.

3. Sample Environmental Management Plans for Typical EE Projects

3.1. Street Lighting Projects

Street lighting modernization projects are aimed at achieving better and safer illumination of city streets and reduction in electricity costs for city government (owners of city street lighting). In project development and execution of work on the modernization of street lighting, detailed work plan must be elaborated, taking into account all the specific features such as: densely populated city streets, intensive traffic throughout the day and problems related to the delivery of new and disposal of old equipment and other wastes.

The Street Lighting Project for a part of Zagreb is under preparation. In cooperation with the consultants Schiller Associates (2000)/Nexant (2002), Colorado USA and a domestic consultant IPZ Spelprojekt the studies were prepared for the reconstruction of the street lighting in a part of the City of Zagreb based on the Walk Through Audit and Investment Grade Audit. The Project Implementation Phase for the city street lighting shall be divided into several smaller-scale projects to be implemented successively one after another. This would be a series of small-size profitable projects that shall be realized in sequence and shall deliver independent savings in energy and financial costs upon completion. In this way a more dynamic implementation of the Project shall be instituted as well as faster return on investments. The first project will be one small Pilot Project consisting of a part of one street located in the city's center (Green Wave) and one street located in a new city’s part (Avenija Dubrovnik). The start of the contracting, for these Pilot Projects with city’s Government (HEP's Letter of Intent was accepted by city authorities in 2001) is planned for Autumn 2002.
It is not only the phase of modernization that is important for EE projects, but also the subsequent phase of modernized equipment operation till the end of the payback period. The supervision over the operation of such equipment in that particular period is important for HEP ESCO primarily for the purpose of strict implementation of the Measurement and Verification Plan and for the achievement of planned savings and returns on investment.

Table 1 shows the Mitigation Plan for Modernization and Street Lighting Operation. The modernization has been broken down per implementation phase, I - VI. Possible adverse environmental impacts and impact measurement methods have been identified for each phase of modernization and operation. All street lighting projects will be implemented under supply and install contracts. The contractors will be responsible for cleaning and for new equipment insulation and for safe disposal of old equipment. ESCO will be responsible for the supervision of work.

Table 1A shows the Monitoring Plan for identified possible adverse environmental impacts during street lighting modernization and its subsequent operation, with clear vision what, how and when will be monitored and who is in charge for the monitoring itself.

For both plans – the Mitigation Plan and the Monitoring Plan – the estimate of funds required for the procurement of equipment and its successful operation is given.
TABLE 1: MITIGATION PLAN: STREET LIGHTING PROJECTS

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure*</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>STREET LIGHTING PROJECTS *</td>
<td>Modernization of street lighting in cities</td>
<td>(a) Noise (II,III,IV)</td>
<td>Small</td>
</tr>
<tr>
<td></td>
<td>Activities:</td>
<td>(b) Dust (II,III,IV)</td>
<td>Small</td>
</tr>
<tr>
<td></td>
<td>(I) Engineering design</td>
<td>(c) Traffic disruption (II,III,IV,V)</td>
<td>Small</td>
</tr>
<tr>
<td></td>
<td>(II) Civil work including site preparation</td>
<td>(d) Disposal of old lighting equipment (III,IV,V)</td>
<td>In the project</td>
</tr>
<tr>
<td></td>
<td>(III) Installation of new poles for new connection or replacement of old poles</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>(IV) Underground cabling for new connection or replacement of old connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(V) Installation of lighting equipment including fixtures, lamps etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(VI) Installation of automatic and control equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operation</td>
<td>Disposal of the old lighting equipment</td>
<td>Use permitted/licensed operators. Recycle/Dispose at official gov't approved sites (all wastes)</td>
</tr>
<tr>
<td></td>
<td>Maintenance of the street lighting in cities</td>
<td></td>
<td>In maintenance cost</td>
</tr>
</tbody>
</table>

- All street lighting projects will be implemented under supply and install contracts. The contractors will be responsible for clearing away, installation of new equipment and safe disposal of old equipment. The actions will be specified in the contractor's bid document.
### TABLE 1A: MONITORING PLAN: STREET LIGHTING PROJECTS

<table>
<thead>
<tr>
<th>PHASE</th>
<th>What parameter is to be monitored?</th>
<th>WHERE</th>
<th>HOW</th>
<th>WHEN</th>
<th>Cost</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Is the parameter to be monitored?</td>
<td>is the parameter to be monitored/ type of monitoring equipment?</td>
<td>is the parameter to be monitored- frequency of measurement or continuous?</td>
<td>Install</td>
<td>Operate</td>
</tr>
<tr>
<td>I.</td>
<td>Construct</td>
<td>Noise</td>
<td>Decibel meter (noise)</td>
<td>Weekly, or when complaints are registered by local groups</td>
<td>Small</td>
<td>Small</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dust</td>
<td>Visual (dust)</td>
<td>In dry and windy conditions</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Traffic flow</td>
<td>Visual (traffic)</td>
<td>Weekly</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Disposal of the old lighting equipment</td>
<td>Visual (control)</td>
<td>In the project</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>II.</td>
<td>Operate</td>
<td>During O&amp;M Disposal of the old lighting equipment</td>
<td>Disposal site(s)*</td>
<td>Monthly</td>
<td>NA</td>
<td>In maintenance cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visual (control)</td>
<td></td>
<td></td>
<td></td>
<td>M&amp;O companies</td>
</tr>
</tbody>
</table>

*Disposal of old lighting equipment will be contractor's obligation and the actions will be specified in the contractor's bid document, according to standards.*
Street Lighting – regulatory framework, required documents and responsible institutions

The implementation stages of city street lighting modernization projects (Table 1) are the following:

(I) Engineering design  
(II) Civil work including site preparation  
(III) Installation of new poles for new connection or replacement of old poles  
(IV) Underground cabling for new connection or replacement of old connection  
(V) Installation of lighting equipment including fixtures, lamps etc.  
(VI) Installation of automatic and control equipment

For the first five stages (I) to (V) all the documents from Figure 1/1 through 40/, can be required. The differences may arise depending on the scope and characteristics of projects. For example:

- The scope of work (lighting in one street or city district or city area) conditions the range of required design and technical documentation and consents (activities 14 to 27),
- In case of street lighting reconstruction on the existing routes, no Siting Permits (9) are required, nor the documentation for obtaining such permits (Rule-book on the Identification of Projects not Requiring Siting Permit, *Official Gazette 98/99*).
- It depends on the type and scope of the project and the location at which the project will be implemented whether the consents (13) and (17) with appertaining documentation will be required or not; e.g. for the reconstruction of street lighting in the Zagreb City center, the consent of the City Institute for the Protection of Cultural Monuments and Nature Conservation will be required.
- Technical control (40) and the issuance of the Operating License (12) are based on a number of test certificates (24). This also applies to the installation of automatic and control equipment (VI); e.g. for street lighting, test certificates are required for the illumination level, grounding, insulation etc.

The presentation of the legislative framework applying to city street lighting modernization projects per implementation stage (I – VI) is given in Table 1B.
TABLE 1B: THE LEGISLATIVE FRAMEWORK APPLYING TO CITY STREET LIGHTING MODERNIZATION PROJECTS

<table>
<thead>
<tr>
<th>Implementation stages:</th>
<th>Applicable law</th>
<th>ENVIRONMENTAL PROTECTION ACT (1)</th>
<th>PHYSICAL PLANNING ACT (2)</th>
<th>CONSTRUCTION ACT (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>III</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>V</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>VI</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
On 23 April 2002 and 18 June 2002, the consultations were held in Hrvatska Elektroprivreda regarding *Electricity and Heat Efficiency Improvements and Electricity Efficiency Improvements in Street Lighting.*

The invitations to participate in the round table discussions were sent to the representatives of:

- local population and customers,
- city governments,
- environmental organizations,
- Ministry of Environmental Protection and Physical Planning,
- Ministry of Economy
- The Press, radio and TV.

Below are the names, relevant organizations, addresses and phone numbers of round table participants:

- **POTROŠAČ – Society for the Protection of Croatian Consumers,**
  Mr. Boris Rišner,
  Mr. Zdravko Lipić,
  Mr. Petar Dudar
  Zagreb, Ilica 48/III, +385 (1) 48 35 888

- **ASTRONOMICAL SOCIETY "INFINITUM"**
  Mr. Boris Stromar, President of Astronomical Society BESKRAJ
  Mr. Indramani Sharma, Member of Astronomical Society BESKRAJ
  10 000 ZAGREB, Jabukovac 6, Mobile: 091/519 6120
  Mr. Korado Korlević, Honorable Member of Astronomical Society BESKRAJ
  Observatory VIŠNJAN, Telephone: +385 (052) 449 212

- **ASTRONOMICAL OBSERVATORY ZAGREB and AAD ZAGREB** – Astronomical
  Astronautical Society of Zagreb
  Mr. Damir Hržina,
  Mrs. Morana Dulić

- **SEH – Croatian Union of Energy Sector Experts and UEZ** – Zagreb Association of Energy Sector Experts
  Mr. Dragutin Šilobot, President
  Mr. Dragan Cindrić, President
  10 000 ZAGREB, Illica 34, Telephone: +385 (1) 4833 746

- **Institute for Urban Planning and Construction**
  Mr. Zlatko Galić
  31 000 Osijek Šetalište kardinala F. Šepera 12, Telephone: +385 (031) 225 244
- City of Rijeka, Street Lighting Service
  Mr. Dušan Lončar
  Mr. Marko Križanec,
  51 000 Rijeka

- City of Zagreb, City’s Economy Office,
  Mr. István Gaal, Economy System Section Head,
  Mr. Mijenko Kovačević
  10 000, Trga Stjepana Radića 1, Telephone: +385 (1) 6101 111

- City of Zagreb, Mayor’s Office,
  Mr. Marijan Maras, Advisor to the Mayor
  10 000, Trga Stjepana Radića 1, Telephone: +385 (1) 6101 302, 6101 510

- GREEN ACTION,
  Mr. Toni Vidan
  10 000 Zagreb, Frankopanska 1, pp 952, +385 (1) 4813 096

- REC – Regional Center for Environmental Protection in Central and East Europe
  Ms. Irena Brnarda,
  10 000 Zagreb, Đordićeva 8a, Telephone: +385 (1) 4810 774

- Society for the Advancement and Promotion of Quality Living MAKRONOVA
  Mr. Zlatko Pejić, President
  10 000 Zagreb, Ilica 72, Telephone: +385 (1) 4847 119

- Ministry of Environmental Protection and Physical Planning,
  Ms. Višnja Grasović,
  10 000 Zagreb Ulica grada Vukovara 78, Telephone: +385 (1) 6106 557

- Ministry of Economy
  Mr. Igor Raguzin
  10 000 Zagreb Ulica grada Vukovara 78, Telephone: +385 (1) 6106 713, 6106 113

- Journalists of the following papers: Jutarnji list, Vjesnik Novi list, V, HINA
  Radio channels: Hrvatki radio, Obiteljski radio, Radio 101, Radio Osijek,
  TV channels: HRT and daily news of CCN.

The meeting /round table programs/ schedules were as follows:

A. Electricity and Heat Efficiency Improvements
- Introduction - Introducing the main goals of the round table and explaining why does HEP promote energy efficiency measures at end users of electricity and heat
- Environmental protection and efficient use of electricity and heat
- Preparation of energy efficiency projects
- Financing energy efficiency projects
Conclusions

B. Electricity Efficiency Improvements in Street Lighting

- Introduction - Introducing the main goals of the round table and explaining how the energy efficiency program was launched in HEP

- Environmental protection and efficient use of electricity and heat
- Application of energy efficiency measures in street lighting

- How to realize savings
- Energy efficiency financing
- Conclusions

Some presentations at the above two round tables (in boxes) dealt with environmental issues in general as far as energy efficiency projects are concerned, and in particular with typical projects that HEP ESCO d.o.o. plans to implement, such as street lighting projects. The presentations included the description of project preparation procedures for such projects by the elaboration of detailed implementation plans. A constituent part of such plans is this EMP, especially its Mitigation and Monitoring Plan.

Since the round table discussions were attended by broad public, which fact can be documented by the list of participants, the Street Lighting Project was discussed from the point of view of the consumer/city resident, city government/the owner of street lighting and professional associations and organizations.

As regards the preparation of street lighting projects, it has been assessed that city governments and contractors (HEP’s experts or private companies – depending on the city) have extensive experience in the implementation of street lighting projects, e.g. in the organization of work and the procedures related to the approvals and permits. This also relates to noise and dust prevention and monitoring during project implementation. All the work connected with the street lighting in the cities is suspended during winter months. The procedure of organizing temporary traffic regulation during project implementation (if necessary) is also well known and established. Old lighting fixtures represent waste which is being deposed off on regular waste disposal sites in the cities (e.g. in Zagreb this is the waste disposal site Jakuševac). However, the possibility of establishing a separate procedure for such waste and regulating its disposal by an appropriate ordinance is being considered.

As for the selection of engineering solutions and equipment and the implementation of street lighting project, a very interesting discussion was incited by the representatives of the Astronomical Observatory regarding the issue of so called lighting pollution. They proposed that the Law on Lighting Pollution be passed in Croatia (night turns into daylight, thus disturbing the living rhythm of e.g. birds) following the example of other European countries.

The main suggestions given by the parties and final conclusions reached with regard to the street lighting project, were the following:

- Inform, write and publish papers and articles about the phases in the preparation and implementation of the street lighting project in local newspapers, on radio and TV.
• During the elaboration of engineering solutions and the selection of equipment for street lighting one should observe the comments on the lighting pollution and include astronomical and other associations that pointed out to this problem in the activities.
• During the replacement of lighting fixtures start the activities of waste classification and find a solution to special disposal sites for such waste.

3.2. District Heating Projects (DH projects)

EE projects in district heating industry are aimed at improving the operation of district heating systems in buildings, heating stations (which can be located in buildings or can be separate facilities) and in the district heating network (heat pipelines) and at lowering heat consumption.

As regards a group of DH projects, the following project is under preparation: Project Modernization of the Dubrava District Heating System. The district heating system of Zagreb is organized in 5 zones, each covering a specific area of the town, such as Dubrava. The consultants Schiller Associates, Colorado USA, 2000, prepared a Study based on a Walk Through Audit for this Project. The planned work is encompassing the following:
• Replacing some boiler burners in order to improve efficiency
• Closing 4 boiler plants
• Installing one new boiler in the main boiler plant of the district (M. Gavazzija 3)
• Interconnecting the distribution system and 5 boiler plants
• Installing variable frequency drives on main distribution pumps, and
• Installing new digital control system interconnecting operating control of all remaining boiler plants.

Some results of the study mentioned above were useful for the elaboration of Mitigation and Monitoring plans.

The modernization of the DH system applies to the replacement and elimination of old equipment and the installation of new equipment. Depending on the scope and type of work, possible identified adverse environmental impacts differ. Therefore, Mitigation and Monitoring plans for such projects have been prepared for groups and/or components that can be modernized.

Table 2 shows the Mitigation Plan, and Table 2.A the Monitoring Plan for DH projects.
<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure*</th>
<th>Cost</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><em><em>DH PROJECTS</em> Construction</em>*</td>
<td>Modernization of the DH system (replacement and elimination of old equipment and installation of new equipment)</td>
<td>(a) Operate during normal daytime hours (b) Wet surfaces when dry, hot, windy (c) Advance notice of construction work and working signals (d) The same as under (c) (e) No CFC/HCFC use (f) Use permitted/licensed operators. Dispose at official gov’t approved sites (all wastes)</td>
<td>Install: Small</td>
<td>ESCO’s supervisor and contractors</td>
</tr>
<tr>
<td><strong>Components</strong></td>
<td></td>
<td></td>
<td>Operate: Small</td>
<td></td>
</tr>
<tr>
<td>(I) Boilers</td>
<td>(a) Noise (I,II,III) (b) Dust (I,II,III) (c) Traffic disruption (I,II) (d) Inconvenient to building users (III) (e) Insulated and replacement pipe is ozone friendly (II) (f) Disposal of the old equipment and scrap (I,II,III,IV) - Non-hazardous - Asbestos</td>
<td></td>
<td>Institutional Responsibility: NA</td>
<td></td>
</tr>
<tr>
<td>(II) Network – pipelines</td>
<td></td>
<td></td>
<td>In the project</td>
<td>NA</td>
</tr>
<tr>
<td>(III) Substation’s buildings</td>
<td></td>
<td></td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>(IV) Automatic and control equipment</td>
<td></td>
<td></td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Boilers emissions</td>
<td></td>
<td>Boilers’ owners/operators with ESCO guidelines on fuel quality</td>
<td></td>
</tr>
<tr>
<td><strong>Boilers</strong></td>
<td>Boilers emissions</td>
<td></td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

* All DH project will be implement under supply and install contracts. The contractors will be responsible for clearing away, installation of new equipment and disposal of old equipment. The actions and emission standards will be specified in the contractor’s bid document.
**TABLE 2A: MONITORING PLAN: DH PROJECTS**

<table>
<thead>
<tr>
<th>PHASE</th>
<th>What parameter is to be monitored?</th>
<th>WHERE</th>
<th>HOW</th>
<th>WHEN is the parameter to be monitored?</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct</td>
<td>Noise</td>
<td>At construction sites and nearest residences</td>
<td>Decibel meter (noise)</td>
<td>Weekly, or when complaints are registered by local groups</td>
<td>Small</td>
</tr>
<tr>
<td></td>
<td>Dust</td>
<td>At point of shipment receipt</td>
<td>Visual (dust)</td>
<td>Before start of work</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Traffic disruption</td>
<td></td>
<td>Work schedule</td>
<td>Once, upon arrival</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Inconvenient to building users</td>
<td></td>
<td></td>
<td></td>
<td>Contractors</td>
</tr>
<tr>
<td></td>
<td>Pipe insulation characteristics</td>
<td></td>
<td>Examine shipment documents</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Disposal of old equipment and scrap - Non-hazardous - Asbestos</td>
<td>Disposal site(s)</td>
<td>Visual</td>
<td>Weekly</td>
<td>NA</td>
</tr>
<tr>
<td>Operate</td>
<td>Boiler emissions (SO₂, NOₓ)</td>
<td>In stack</td>
<td>extractive (electrochemical measuring cells) or in-situ (NDUV) method according to HRN ISO standards (e.g. HRN ISO 7934, HRN ISO 7935, ISO 10849) and legislation*</td>
<td>Initially, than once/year or continuously</td>
<td>NA</td>
</tr>
</tbody>
</table>

* The measuring method and standards will be specified in the contractor’s bid documentation
The modernization of the DH system (replacement and disposal of old equipment and installation of new equipment) has been considered per individual component, as follows:

(I) Boilers
(II) Network – pipelines
(III) Substation’s buildings
(IV) Automatic and control equipment

The range of required design and technical documentation, required permits and consents again (as in case of street lighting) depends on the type and scope of projects. If the modernization of boilers (I) and heating stations (building and equipment) and district heating network (III) is being performed on the existing equipment/building or at the location where the equipment/building has once been installed/constructed, no Siting Permit is required and consequently, it is necessary to obtain less documentation and consents (Rule-book on the Identification of Projects not Requiring Siting Permit, *Official Gazette* 98/99).

The greatest number of consents (13 and 17) for obtaining the General Permit (10) and the Building Permit (11) is required for the modernization of the district heating network in case this is a new route of a hot water pipeline (the aforesaid consents are also required in case of new cable route for street lighting); e.g. in Zagreb, it is necessary to obtain consents from the following organizations: water supply and drainage utility; HEP’s Street Lighting Department (for street lighting projects the consent should be issued by HEP-District Heating), city gasworks, Hrvatski Telekom (Croatian Telecommunications), Zagrebačke Ceste (the Zagreb City Roads), Zagrebački Električni Tramvaj (the Zagreb City Electrical Tram) City’s Physical Planning Office, City’s Office for the Protection of Monuments, the Zrinjevac company (park landscaping), Hrvatske Željeznice (Croatian Railways), etc.

Among test certificates (24) required for the Operating License (12), plant’s noise-level certificate relating to the operation of modernized equipment is of special importance.

The presentation of the legislative framework applying to DH projects per individual component (I–IV) is given below:
### The Legislative Framework Applying to DH Projects

<table>
<thead>
<tr>
<th>Applicable Law</th>
<th>Environmental Protection Act (1)</th>
<th>Physical Planning Act (2)</th>
<th>Construction Act (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual components</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>II</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Consultation Regarding District Heating (DH) Projects

Three round table discussions were held on DH projects:

**Optimization of the Zagreb City District Heating System**, held in Zagreb on 12 April 2002 and **Optimization of the Osijek City District Heating System**, held in Osijek on 18 April 2002. and **Electricity and Heat Efficiency Improvements**, held in Zagreb on 23 April 2002, All round tables were held on the premises of Hrvatska Elektroprivreda.

The parties invited to these round tables were more or less the same parties that were invited to round tables on street lighting projects, i.e. the representatives of:

- local population and customers,
- city governments,
- environmental organizations,
- Ministry of Environmental Protection and Physical Planning,
- Ministry of Economy
- the Press, radio and TV.

The structure of participants resembled to a certain degree the structure of participants to the street lighting round tables, however the number of participants from particular institutions increased depending on the specifics of the topic (DH) and the place where the round table was held.

For example, at the round table "Optimization of the Zagreb City District Heating System" the number of representatives from the Zagreb City Government and Zagreb City Office rose. The participants were the following:

**CITY OF ZAGREB, City’s Economy Office**
10 000 Zagreb, Trg Stjepana Radića 1, Telephone : +385 (1) 6101 111
  
  Mr. Ante Muštra, Assistant to the Head of Office
  Ms. Nela Juric, Deputy Head of Office
  Mr. Istvan Gaal, Section Head
  Mr. Miljenko Kovačević

**City Office for Urban Development, Construction, Housing and Municipal Services and Traffic**
10 000 Zagreb, Trg Stjepana Radića 1, Telephone : +385 (1) 6101 185
  
  Mr. Igor Žigić

**City Institute for Development Planning and Environmental Protection**
10 000 Zagreb, Ul. Republike Austrije 18, Telephone : +385 (1) 6101 850
  
  Ms. Željka Pavlović
  Ms. Rajna Štark Valentak

Along with the already mentioned participants, the following participants were also present at the round table "Optimization of the Osijek City District Heating System":

**CITY OF OSIJEK, Economy Department**
Other participants and the participants to the third round table “Electricity and Heat Efficiency Improvements” are enumerated in the section relating to the street lighting projects (4.1.)

The meeting /round table programs/ schedules for both round tables, i.e. that in Zagreb and Osijek, were the same:

- Introduction - Introducing the main goals of the round table and describing HEP’s experience related to district heating.
- Optimization of Zagreb’s and Osijek’s district heating system and comments on the new law on district heating
- Promotion of environmental measures
- Promotion of energy efficiency measures applicable to DH
- Conclusions

A part of the presentation (in boxes) put an emphasis on environmental protection during the preparation, implementation and exploitation of DH facilities and plants.

Similar to the round table on street lighting, it has been emphasized during the discussion that city governments of Zagreb and Osijek, as well as HEP Toplinarstvo d.o.o. that provides heat to these two cities, have extensive experience in the preparation and implementation of DH projects. This includes the gathering of approvals and permits (which has been described in Part 3 to this Plan), and project preparation and organization of its implementation with the lowest environmental impact (noise, dust, traffic regulation and waste disposal). The consumers of heat that were present at the meeting had no objection on the past practices exercised during the implementation of DH projects. The only suggestion was that public/consumer information on the plans related to the reconstruction and construction of district heating systems should be improved. Furthermore, the representatives of heat consumers (“POTROŠAC” – Society for consumer protection of Croatia and Citizens’ Association of the City of Osijek) expressed special interest in the adjustment of district heating system expansion plans and physical plans of the cities of Zagreb and Osijek. For example, a part of the city of Osijek has heat supply but has no hot sanitary water supply. It has also
been emphasized that the implementation of energy efficiency measures in district heating systems should include better heat insulation in buildings, too.

Citizen representatives of Zagreb and Osijek are of the opinion that the introduction of centralized district heating systems in those two cities shall significantly reduce air pollution. The problem of coal fired boiler house located within the Medical Faculty on the Šalata (a district of Zagreb) was emphasized as a very negative example. The boiler house has been in operation since 1918, its consumption accounts for almost 90 percent of Zagreb’s coal consumption and this plant represents a direct threat to peoples’ health.

The main suggestions given by the parties and final conclusions reached regarding DH projects, were the following:

- Inform, write and publish papers and articles about the phases in the preparation and implementation of the DH project in local newspapers, on radio and TV (the same as for the street lighting projects).
- The development of district heating systems in the cities should be adjusted to city physical plans as much as possible, regarding simultaneous heat and hot sanitary water supply and the demarcation of city districts in which gas network expansion has been envisaged.
- In addition to energy efficiency measures applicable to DH systems, heat insulation of building envelope and roofs should be improved/reconstructed.
3.3 Buildings Retrofit Projects

One of significant markets for EE projects are so called buildings retrofit projects relating to improved energy efficiency in buildings. This primarily applies to the equipment and devices in buildings that consume energy – heat, electricity, fuel (gas, oil, coal) etc. Building envelope is very important for energy efficient consumption of heat, i.e. walls, façades, windows and doors. Such projects include offices, hospitals, universities, hotels, large retails, schools and apartments.

We hope that one of the first pilot projects regarding Buildings Retrofit will be the school Končar (secondary school). In May 2002, Nexant, Colorado USA has prepared a Study only for school’s heating system (based on a Walk Through Audit). HEP has submitted a Letter of Intent for Buildings Retrofit of this school to the city of Zagreb’s Government (the City owns all primary and secondary schools in Zagreb). When and if HEP’s Letter of Intent is accepted, HEP plans to prepare an additional Study for all other energy consumers in the school – electricity, fuel and building envelope (walls, façades, windows and doors).

Table 3 shows the Mitigation plan for Buildings Retrofit Projects, and gives a survey of possible adverse environmental impacts during the modernization of buildings per component of potential work (I-V) and during the maintenance of retrofitted buildings.

The components of potential work (I-V) are:

(I) Heating installation
(II) Lighting installation
(III) Gas/oil installation
(IV) Building envelope, including windows and roofs (insulation and/or double glazing of windows, etc.)
(V) Other electrical equipment (ventilation, air-condition, etc.)

Table 3A shows the Monitoring Plan of possible adverse environmental impacts.
**TABLE 3: MITIGATION PLAN: BUILDING RETROFITS**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Mitigating Measure</th>
<th>Install</th>
<th>Operate</th>
<th>Institutional Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BUILDING RETROFIT</strong>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(offices, hospitals, universities, hotels, large retails, schools, apartments)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modernization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Components</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(I) Heating installation</td>
<td>a) Noise (I-V)</td>
<td>(a) Operate during normal daytime hours</td>
<td>Small</td>
<td>NA</td>
<td>ESCO's supervisor and contractors</td>
</tr>
<tr>
<td>(II) Lighting installation</td>
<td>(b) Dust (I-V)</td>
<td>(b) Wet surfaces when dry, hot, windy</td>
<td>Small</td>
<td>Small</td>
<td></td>
</tr>
<tr>
<td>(III) Gas/oil installation</td>
<td>(c) Inconvenience to building users</td>
<td>(c) Advance notice of construction work and working signals</td>
<td>Small</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>(IV) Building envelope including windows and roofs (The nature of the projects is the better Insulation of the building)</td>
<td>(d) Disposal of all wastes</td>
<td>(d) Use permitted/licensed operators. Dispose at official gov’t approved sites (all wastes)</td>
<td>In project cost</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>(V) Other electrical equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance of buildings</td>
<td>Water, waste</td>
<td>Disposal of old material and equipment, and adequate water drainage using relevant standards</td>
<td>In the maintenance cost</td>
<td>NA</td>
<td>Owner and ESCO's supervisor</td>
</tr>
</tbody>
</table>

* All building projects will be implemented under supply and install contracts. The contractors will be responsible for clearing away, installation of new equipment and safe disposal of old equipment. The actions will be specified in the contractor's bid document.
# TABLE 3A: MONITORING PLAN: BUILDING RETROFITS

(office, hospitals, universities, hotels, large retails, schools, apartments)

<table>
<thead>
<tr>
<th>PHASE</th>
<th>What parameter is to be monitored?</th>
<th>WHERE</th>
<th>HOW</th>
<th>WHEN</th>
<th>Install</th>
<th>Operate</th>
<th>Install Operate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Noise</td>
<td>At construction sites and nearest residences?</td>
<td>Decibel meter (noise) Visual (dust) Visual</td>
<td>Weekly, or when complaints are registered by local groups Weekly</td>
<td>Small NA</td>
<td>Small NA Contractors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dust</td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste disposal</td>
<td>Disposal site(s)</td>
<td></td>
<td></td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Operate</td>
<td>Water, waste</td>
<td>Disposal site(s) (for example- Jakuševac-Zagreb's disposal side)</td>
<td>Visual</td>
<td>Monthly</td>
<td>NA</td>
<td>In maintenance cost M&amp;O companies</td>
<td></td>
</tr>
</tbody>
</table>
Energy efficiency projects in buildings relate to the retrofits in offices, hospitals, universities, hotels, large retail stores, schools, apartments. The scope of work can be divided into the following components (Table 3):

(I) Heating installation
(II) Lighting installation
(III) Gas/oil installation
(IV) Building envelope including windows and roofs
(V) Other electrical equipment

A smaller range of documentation, consents and permits is required for buildings retrofit projects than for the other mentioned energy efficiency projects. The major part of work is being performed inside the building and for such work no consents and permits are required. If the building envelope including windows and roofs (V) is being only modernized (installation of new materials and insulation), without major changes and with no building annexes, the issuance of Building Permits has been simplified and requires no Siting Permit ((Rule-book on the Identification of Project not Requiring Siting Permit, Official Gazette 98/99).

In regard to the modernization of the systems inside buildings (I to IV), the projects should be implemented pursuant to relevant technical regulations applicable to the installation of heating, lighting and gas or oil systems, and the equipment should be certified adequately.

The presentation of the legislative framework applying to building retrofits per component (I – V) is given below:
THE LEGISLATIVE FRAMEWORK APPLYING TO BUILDING RETROFIT PROJECTS

<table>
<thead>
<tr>
<th>Applicable law</th>
<th>ENVIRONMENTAL PROTECTION ACT (1)</th>
<th>PHYSICAL PLANNING ACT (2)</th>
<th>CONSTRUCTION ACT (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The components:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>V</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
Consultation Regarding Buildings Retrofit Projects

The preparation and implementation of buildings retrofit projects were discussed at two round tables titled “Electricity and Heat Efficiency Improvements”, held in Zagreb on 23 April 2002 and “Electricity and Heat Efficiency Improvements in Schools and Universities” held also in Zagreb, in Hrvatska Elektroprivreda on 16 May 2002. As already stated, at the round table “Electricity and Heat Efficiency Improvements” all the three typical projects that HEP ESCO d.o.o. plans to implement were discussed, i.e. Street Lighting Projects, DH Projects and Buildings Retrofit Projects. A separate round table was dedicated to the Pilot Project which is HEP ESCO d.o.o. preparing for the electrotechnical school “Končar” and which represents a typical comprehensive Building Retrofit Project (building envelope with roof and windows + heating and electrical and gas/oil systems).

The structure of invited parties was in part the same as the structure of parties present at other round tables on street lighting and DH projects, however a part of participants were the parties interested specifically in the possibility of application of energy efficiency measures in schools and universities. Thus, the following parties were present at the round table “Electricity and Heat Efficiency Improvements in Schools and Universities”, aside from a part of already mentioned invited participants:

**ELECTROTEHNICAL SCHOOL “KONČAR”**
10 000 ZAGREB, Konavoska 2, Telephone/Fax: +385 (1) 3666 114, Mobile: 091 3666 114
Mr. Ivo Klarić, professor, School Headmaster

**TEHNCICAL COLLEGE IN ZAGREB**
10 000 ZAGREB, Konavoska 2, Telephone: +385 (1) 3666 114
Mr. Branko Kunovac, Vice-Dean
Ms. Dunja Furčić

**MINISTRY OF EDUCATION AND SPORTS**
10 000 Zagreb, Jurišićeva 3, Telephone: +385 (1) 4813 545, 4813 536, 4813 538
Fax: +385 (1) 4813 539
Mr. Zdravko Pandžić (responsible for investment projects)

**KONČAR ENERGETIKA I USLUGE**
10 000 Zagreb, Fallerovo šetalište 22, Telephone: +385 (1) 3655 560
Mr. Marijan Mrak (responsible for heat supply for the School Končar)

**ERICSSON, NIKA TESLA**
10 000 Zagreb, Krapinska 45, Telephone: +385 (1) 3653 707
Ms. Dubravka Bračun, environmental advisor (she was leader of Green Actions before Mr. Toni Vidan)

Other participants, and the participants to the third round table “Electricity and Heat Efficiency Improvements” are enumerated in the section relating to the street lighting projects (4.1.)
The meeting /round table program/ schedule was the following:

- Introduction - Introducing the main goals of the round table and describing the possibilities for the application of energy efficiency measures in schools and universities.
- Promotion of energy efficiency measures
- Preparation of energy efficiency projects in schools and universities
- Possibilities for the application of energy efficiency measures in the Končar school
- Financing energy efficiency projects
- Practical experience in the promotion of environmental protection measures in schools and universities
- Conclusions

A part of presentation (in boxes) put an emphasis on environmental protection during preparation, implementation and exploitation of Electricity and heat efficiency improvements in schools and universities - Buildings Retrofit Projects

It has been emphasized in the discussion that EE projects should be carefully prepared and implemented in schools and institutes. This is because school children and students stay all day long in schools and universities. Therefore the work can be performed only during winter or summer vacations. In case that schools and universities are located in densely populated city areas special attention should be paid to possible environmental impacts e.g. dust, noise and waste.

The discussion following Ms Dubravka Baćun’s presentation “Practical experience in the promotion of the environmental protection in schools and universities” was especially interesting. The presentation was based on lecturer’s long experience in environmental protection from educational point of view. The problem of insufficient knowledge of environmental protection principles by all age groups of school children and students was emphasized. It has been proposed that teachers, pupils and students take an active part in the preparation and implementation of energy efficiency projects. Thus, they will be informed and will implement the principles of energy efficiency measures, environmental protection and sustainable development through concrete activities.

The main suggestions given by the parties and final conclusions for Building Retrofit Projects, were the following:

- Inform, write and publish papers and articles about possible application of energy efficiency measures in schools and universities in local newspapers, on radio and TV.
- When preparing EE projects for a particular school or university, involve teachers, pupils and students in such projects with an aim of informing them and educating them on the importance of such projects for the reduction of fuel costs and for environmental protection.
- The preparation and implementation of projects should be adjusted to the schedule of classes in schools and universities and should provide for the protection of surrounding residential or business settlements against noise, dust and waste.
4. CONCLUSIONS

The promotion and encouragement of energy efficiency measures is a very important objective of national energy policy (quotation from the Energy Act, part IV, Article 12 runs as follows: "Efficient energy use is of interest for the Republic of Croatia"). This fact, along with the energy component (reduced need for energy generation and imports), has significant impact on the encouragement of the application of environmental protection measures aimed at greenhouse gas emission lowering (lower generation in power plants).

HEP ESCO d.o.o., the company fully owned by the HEP Group, has the obligation to protect national public interests and, consequently, create conditions for the expansion of the market for EE projects in the Republic of Croatia. (HEP Group is 100 percent owned by the state, and shall remain at least 51 percent owned by the state until Croatia’s accession to the European Union, i.e. for the period of next 6 years, as a minimum).

In general, the implementation of EE projects is almost identical to the implementation of any other investment project. The legislative framework is the same, and the scope of its application depends on the type and character of EE projects.

The Environmental Protection Plan has been developed for three typical types of EE projects that are dominant in HEP ESCO d.o.o. plans. These are: the modernization of street lighting in the cities, projects connected with heating systems, and energy retrofits in buildings with respective energy consumers.

With regard to the development and implementation of EE projects, consultations were held with different profiles of interested groups representing electricity and heat consumers in households and industry, with government institutions, local communities and municipalities, non-governmental organizations, contractors and equipment suppliers, and other potential participants in such projects. The results obtained show that there is a broad interest and need for the development of EE market, but also a number of barriers, the most significant ones being the lack of finances and insufficient knowledge of the nature of such projects. HEP ESCO d.o.o. has conceived its work program so as to try to remove at least some of the mentioned barriers and expand the EE market in the Republic of Croatia and counts on the support from the World Bank and GEF institutions.
BASIC ACTIVITIES REQUIRED FOR THE CONSTRUCTION RECONSTRUCTION OF FACILITIES, WITH APPERTAINING LAWS AND DOCUMENTS

STATE AND LOCAL ADMINISTRATION

FUNDAMENTAL LAWS

ENVIRONMENTAL PROTECTION LAW (1)
By-law on Environmental Impact Assessment (4)

PHYSICAL PLANNING ACT (2)
Water Act / Nature Protection Act (5)

STATE AND LOCAL ADMINISTRATION

BUILDING ACT (3)

PSUO - Preliminary environmental impact assessment
SUO - Final environmental impact assessment

PP - if necessary?

PROJECT ENGINEERING AND OTHER DOCUMENTATION

Invest. Work program (25)
Invest. Work program (26)
Invest. Work program (27)

Investigation work (36)

DECISION (28)
Application (29)
Review (30)
Decision to proceed (31)
Application (32)
Final decision (33)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)

APPLICATION (34)
Commissioning (40)