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## Appendix A

Final report from The Center for Energy Efficiency – EnEffect



Municipal Energy Efficiency Services for Bulgaria -- Final Report  
Contract No. DHR-C-00-97-00064-00  
August 01, 1999

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**CENTER FOR ENERGY EFFICIENCY ENEffect**

# **FINAL REPORT**

**FOR THE PARTICIPATION OF ENEffect  
IN THE PROJECT "MUNICIPAL ENERGY EFFICIENCY INITIATIVE"**

**Consulting Agreement No.: C-5022-ENE-0000**

**By and Between  
Electrotek Concepts, Inc.  
and  
The Center for Energy Efficiency ENeffect**

**UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT  
BUREAU FOR EUROPE AND THE NEWLY INDEPENDENT STATES**

**Prime Contract Number: DHR-0030-C-00-5064-00**

**June, 1999**

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## ***Introduction***

*The project has been implemented in the course of the period 1997 – 1999 in fulfillment of Contract No. DHT-0030-C-00-5064-00, signed between EnEffect and Electrotek Concepts Inc. and the supplements to it. All tasks enlisted in Appendix A – Statement of Work - and the follow-up updates have been implemented. Only approved officials of EnEffect, listed in Appendix C to the Contract, have participated in project implementation. The specific contractual requirements about Limitation of Funds, Invoicing, Confidentiality, Contact with A.I.D. and Indemnification have been fully met.*

*This report provides information about the implementation of the different tasks under the Contract in which EnEffect was involved (Items 2 through 5 of the Programme). Additional information about some of the tasks is provided in the annexes to this report. In addition to data about the implementation of the individual project components, this report illustrates also the method of utilization of the available funds as provided under the contract.*

## 2. DEVELOPMENT OF PRIVATE SECTOR ENERGY SERVICES AND FINANCING CAPABILITIES

### 2.1. Demonstration Project Implementation

#### 2.1.1. Meetings in the Regional Hospital in Gabrovo and the National Centre of Public Health (Ministry of Health) to discuss project and collect baseline data

In fulfillment of this task five meetings were held with representatives of the Municipality, the hospital and the National Centre of Public Health. The objectives of the project and the efforts for its implementation were clarified. Detailed information was collected about: the energy consumption of the hospital, the construction of the buildings, the state of repair of the technical infrastructure, the organization of work and duty cycles of operation of the hospital and the budgets (balance sheets and reports on revenue and expenditures) of the hospital and the municipality. On the basis of the collected information a baseline database has been elaborated about the demand to be met during the next phases of the project.

#### 2.1.2. Organization of solicitation for energy audit – advertisements, printing, Request for proposal, consultation of bidders, opening of proposals, evaluation, etc.

A competition was organized for selection of the sub-contractor for energy audit of the hospital in Gabrovo. Following consultations made with five teams to precise project requirements, three proposals have been received from: the Association of Energy Engineers /AEE/ - Sofia Chapter, the company Databuild Ltd. – Sofia and the Centre for Accelerated Implementation “PROGRES” – Sofia. The proposals were reviewed and evaluated by a commission, nominated for that task. The selection of the energy audit sub-contractor (The Association of Energy Engineers /AEE/ - Sofia Chapter) was made by the principal executing agency, Electrotek Concepts, Inc., at the proposal of the commission (Annex 3).

#### 2.1.3. Provide logistical support for shipping energy efficiency equipment to Gabrovo.

Logistical support has been provided to the principal executing agency. The necessary documents for duty-free and V.A.T.-exempted import of the equipment have been provided. In this respect assistance has been obtained from the Agency for International Aid, USAID, the Chief Customs Office with the Ministry of Finance, the Municipality of Gabrovo and “Dr. Tota Venkova” Regional Hospital in Gabrovo. Tenders for implementation of the principal building and assembly works were organized. The necessary project design and specialized consultations were provided. EnEffect performed the overall co-ordination and author’s (designer’s) supervision of the project implementation and commissioning into regular operation of the completed assignments. The technical and economic results of the project have been finalized and summarized. Invited to attend the installation of the major equipment were representatives of the media and the local public for the purposes of broad popularization of the event (Annex 4).

On the basis of the results from the project for the hospital in Gabrovo a similar demonstration project has been developed for the Regional Hospital in Stara Zagora. The conditions of project financing of the latter, however, differed in terms of the extent of contribution of the USAID and the municipality/hospital. The municipality financed the major portion of the demonstration project in Stara Zagora. A preliminary condition was that financing of design and study activities as well as other types of technical assistance will be provided by the municipality/hospital. USAID provided funding for the purchase and delivery of the equipment for the air conditioning system. EnEffect conducted the preparatory work for and organization of the tenders for subcontractors for the construction and assembly works, and provided the necessary project design and consultations. EnEffect was also responsible for the overall coordination of project implementation activities and author's (designer's) supervision and approval of completed assignments. The attained technical and economic results have been assessed and summarized

#### 2.1.4. Collect hospital financial data from the National Centre for Public Health

With the collaboration of the National Centre for Public Health data has been collected about the fulfillment of the annual budgets of Regional hospitals in Gabrovo and other municipalities, surveyed under another project funded by the US Agency for International Development. Summary data was also collected about energy consumption and the method of calculation of bed/day costs in hospitals depending on the typical diseases for the respective region (hospital). The data has been then completed and fixed precisely with the help of the financial and accounting departments of the hospitals.

#### 2.1.5. Evaluation of project impact on municipal/ hospital budget on the basis of the energy audit

The analysis of project results has been conducted on the basis of data for a five-year period (1994-1998). The energy audit and the conducted monitoring on site operation upon application of the energy efficiency measures revealed the existence of a considerable potential for energy and money savings. The total monetary savings per year have been estimated at USD 46,690. These savings account for about 20% reduction of hospital's general fuel and energy costs.

The methodology used for evaluation of energy savings and the distribution of saved costs is the subject of a specific bilateral agreement signed between the Municipality of Gabrovo and the "Dr. Tota Venkova" Regional Hospital. The employed approach to engage an independent third party as arbitrator in the determination of the actual quantity of consumed energy and energy savings is useful and applicable to other projects of this type. EnEffect was a third party in all agreements concerning the project and served as a catalyst to the whole process. The distribution of the financial result of the savings is as follows: 70 % from the money saved go to the budget of the hospital and 30 % remain in the municipal budget, whereby the municipality has committed itself to use its share for funding of other energy conservation projects. The agreement for sharing of the savings is one of the possible solutions for re-distribution of the funds generated by budgetary organizations. This approach may be applied also in ESCo contracts to implement projects financed with municipal funds. Detailed information about the specific amounts of savings in material and monetary expression has been

quoted in the final report about the demonstration project for the hospital in Gabrovo Annex 4).

## **2.2. Private ESCo Development**

### **2.2.1. Support in the selection of 10 ESCos. Advertisement, evaluation of proposals**

The capacity of 12 Bulgarian companies (state-owned and private) to perform energy services on the basis of performance contracting have been investigated. To this end this form of contracting has been adequately presented to and discussed with the management of the companies. Upon analysis of the results from the meetings and the studies of the selected companies the following conclusions were made:

- the large companies, that possess the staff and above all the financial potential to realize performance contracting, are mainly state-owned companies, feature a cumbersome management and complicated decision-making procedure, all in all making them less interested and unsuitable for introduction of such a form of services in their practice; some of these companies, although they operate in the same sphere, show no interest in the more specific activities related to energy efficiency;
- private companies, that are interested in the opportunities offered by performance contracting, are considerably smaller, they possess above all the required staff, however lack free capital for implementation of such contracts;
- almost all companies feel insecure with respect to the real economic environment and financial institutions, including the potential customers;
- for both groups of companies a low level of familiarity with the practice of performance contracting has been identified, that aggravates further the lack of security for the companies.

As a result of the studies a summary conclusion has been made that by the time of the investigation the majority of Bulgarian companies are not ready to resort to broad application of performance contracting in the energy efficiency field.

### **2.2.3. Assistance in setting and attending meetings with government officials, bankers and lawyers to discuss ESCo contract terms**

Well-prepared in advance meetings were held with top officials of Bulgarian banks whose headquarters are in Sofia (Balkanbank, Credit Bank, Union Bank, United Bulgarian Bank, Bank for Agricultural Credit, etc.) and with representatives of local and international funds and financial organizations. The major principles of performance contracting were presented and the possibilities for participation of Bulgarian banks in its application were amply discussed. As a result of the study the following conclusion was made:

- the Bulgarian banks, that were visited, show no preparedness to credit whatever activities, including energy conservation measures; the credit granting terms applied by the banks are extremely hard and unattractive for credit recipients;

- the staff of the banks is not familiar with the specific characteristics of the energy efficiency projects and demonstrates no will to undertake in this kind of activities;
- Bulgarian banks as a whole are not prepared to get involved in energy efficiency projects and in particular in the application of performance contracting;

The meetings and studies on the existing legislative framework led to the following conclusion:

- Although there is no specific regulatory framework for this type of contracting, it may in broad terms be applied under the provisions of the legislation currently in force.

### 2.2.3. Assistance in assessing the impediments to ESCo activities in Bulgaria

As a result of the studies made on the state of the companies and banks in Bulgaria, as well as of the review of the legislation currently in force, the following final conclusions have been made:

- the general economic environment in the country during the time of the study was extremely unfavorable for experimentation of financial mechanisms that are new for the local practice, particularly in the case when they are based on some form of bank credits and bank guarantees;
- the companies and banks in Bulgaria during the same period were not prepared to get involved in projects based on performance contracting.

As a result of these conclusions it has been decided that this project component should be suspended and postponed for more favorable period in the country's economic development. The years after showed that this decision has been correct – most of the banks studied went bankrupt or were radically restructured. Most of the companies studied also underwent considerable changes – some were closed down and others were restructured. In the mean time changes were introduced to the existing legislation that give rise to some hopes that they may contribute to the introduction of performance contracting in Bulgaria.

## 2.3. **Information dissemination: shifted to 3.2.1. and 3.2.2.**

### 2.3.1. EnEffect participate in conference as a speaker

Officials of EnEffect attended a number of national and international events locally and abroad, at which issues related to the activities of the Municipal Energy Efficiency Network were discussed. In addition to the participation in the general discussions, special reports were delivered at the business meetings held in (a) Blagoevgrad) and (b) Lovetch, organized by the Black Sea Regional Energy Centre, in the (c) international regional conference held in the framework of the European Campaign “Sustainable Cities” (“Towards Local Sustainability in Central and Eastern Europe”), (d) the round table discussion on “Sustainable Development of Human Settlements in Bulgaria”, etc. The activities and experience of the Municipal Energy Efficiency Network have been shared with the participants of numerous international for a, organized by the European Commission, USAID, the UN Economic Commission for Europe etc.

### 2.3.2. Organize the conference

The First Annual Conference of the Municipal Energy Efficiency Network “EcoEnergy” under the title “Energy Efficiency in Municipalities” was held in Sofia on December 9 and 10, 1998. The principal objective of the conference was to summarize and evaluate the activities of the association for the period under review and to define the directions of its future development. The experience of cities and associations of cities abroad that apply an energy efficiency policy and have realized concrete projects in this field was presented. The program included also two accompanying events:

- **Workshop** to discuss the opportunities open to municipalities through their association in energy efficiency networks; and
- **Round table** discussion on the energy conservation potential in Bulgarian hospitals and the efficient use of the building stock of hospital complexes.

The conference was organized and prepared by the Centre for Energy Efficiency. The principal participants were representatives of the Network member-municipalities, municipal energy efficiency officers, representatives of the state administration, financial institutions, coordinators of national and international programs, NGOs.

The forum enjoyed broad international attendance: representatives from the United Nations, U.S.A., France, The Netherlands, Germany, Switzerland, Japan, Denmark, Russia, Romania – countries with rich experience in the field of energy efficiency and setting up of municipal environmental networks.

## 3. **DEVELOPMENT AND IMPLEMENTATION OF MUNICIPAL NETWORK**

### 3.1. **Evaluation of Mechanism for Municipal Energy Networking**

#### 3.1.1. Evaluate existing networking infrastructures in Bulgaria

In connection with the founding of the National Association of Municipalities in the Republic of Bulgaria, the team working on that task made a study of associations of municipalities in Bulgaria. These studies were made available to EnEffect and were used in the process of elaboration of the concepts and the intermediary rules of procedure for MEEN activities. Additionally, studies have been made on other associations of municipalities in Bulgaria. Contacts were made with the Association of Danube Municipalities, the Association of Black Sea Municipalities and the Regional Association of Thracian Municipalities. Contacts were established also with the following programs/ organizations, initiated by USAID in Bulgaria: LGI (Local Government Initiative), FLAG Consortium (Firm Level Assistance Group), PLEDGE (Partners in Local Economic Development and Government Effectiveness), Foundation for Reform in Local Self-Government, ICLEI (The International Council for Local Environmental Initiatives). Studies were made of their subject field and concrete initiatives and agreement was reached for joint participation in events sponsored by these organizations.

### Evaluate US networking approaches. Travel to US for meetings

With the assistance of U.S. consultants a study was made of the practice of different types of associations in the field of energy efficiency in the U.S.A., with an emphasis on those in which local authorities and municipalities are involved. The scope of the study covered also the activity of the International Council for Local Environmental Initiatives (ICLEI), and more specifically its initiative "Cities to Prevent Climate Change". Two visits to the U.S.A. were conducted with the objective to study the experience of associations active in the energy efficiency field and the state of US hospitals from the point of view of their energy efficiency.

#### 3.1.3. Assessment of "Energie Cites" approach

The activities of the European Network "Energie cites", with headquarters in the city of Bezanson, France, was studied. Because of the good organization of this network and the efficiency of its work, its fundamental principles have been selected as a basis of the concept for setting up of a Bulgarian Energy Efficiency Network. A study was made of the regulatory framework for establishment and operation of the "Energie cites" Network in Poland. The experience of this network is of exclusive benefit because of the similarity in local conditions in both countries.

Another study focused on the experience of The Netherlands, where for more than 5 years concerted efforts are made to work with municipalities under a specific program for local level energy efficiency, particularly by Novem, the Dutch Agency for Energy and the Environment. Contacts have been established with the Dutch project for Bulgaria, GREENEnergy, in which five Bulgarian municipalities are involved. The principal objective was development of municipal energy efficiency policy.

A study, although somewhat limited in scope because of lack of sufficient information, was made on the "Energie cites" Network in Romania as well. Information has been collected further on the energy efficiency programs and initiatives of local communities in Denmark, Switzerland and other countries.

#### 3.1.4. Assess relative cost/benefit of various approaches and recommend mechanism

As a result of the study of the experience of energy efficiency networks in Europe, as well as that of similar organizations in the USA, conclusions were made that shaped the foundations of the strategy and program of the Bulgarian Energy Efficiency Network "EcoEnergy". It has been found that under Bulgarian circumstances it will be feasible to combine certain approaches used in other countries. Maintaining close contacts between the Bulgarian network and its counterparts abroad is an important prerequisite for continuous peer exchange and enrichment of the activities and approaches of "EcoEnergy". It is scheduled to launch preparatory work for association of the Bulgarian network as a collective member in the European Network "Energie cites".

## **3.2. Implementation of Municipal Energy Networking**

### **3.2.1. Develop rules/procedures for municipal energy networking**

The first draft of the concept was developed by EnEffect and submitted to the U.S. Agency for International Development for funding of the starting activities to set up the network. The concept was submitted to the founding-member municipalities as well. The principal postulates of the concept are as follows:

Major objective: To create an institutional structure that shall unite municipal activities to improve energy efficiency through specific actions and projects in order to attain economic, environmental and social benefits.

MEEN “EcoEnergy” has been created as a voluntary, non-formal association of Bulgarian municipalities that wish to contribute to the sustainable development of municipalities through energy efficiency improvement.

The concept lays down three strategic objectives:

- Awareness of the energy problem as a national problem of primary importance for Bulgaria
- Creation of conditions for diminishing of budgetary energy expenditure in municipalities and for utilization of the money thus saved to fund other priority activities on their area
- Diminishing of the energy costs of end-consumers in municipalities (households and business entities)

### **3.2.2. Establish formal linkages**

Preliminary contacts were established with municipalities from all regions in Bulgaria. Information materials were sent out about the subject field and objectives of the Network. Meetings were held with potential Network members. The objectives of the Network were made known to the National Agency for Energy Efficiency, the Ministry of the Environment and Waters and the National Association of Municipalities in the Republic of Bulgaria.

The creation of MEEN was in preparation at the time when the National Association of Municipalities in the Republic of Bulgaria was set up. The two teams established relations of close collaboration to mutual benefit. This collaboration continues at present with tendencies for expansion. In addition, contacts were established further with other organizations and institutions active in the field of energy efficiency. Co-operation with the National Agency for Energy Efficiency with the Council of Ministers has been of utmost benefit. MEEN enjoys encouraging support on the part of the Agency that demonstrates favorable trends for further expansion. Relations of successful collaboration have been established with the Black Sea Regional Energy Centre under the FEMOPET Programme, offering opportunities for dissemination of information among municipalities about successful projects implemented in Bulgaria, as well as about European projects and initiatives.

MEEN’s policy is to broaden its contacts with other organizations and to seek for opportunities to implement joint activities and projects. This activity is planned as a current task and is still on. The so far collected and processed information as a result of

studies conducted by EnEffect about similar organizations abroad has been presented at some of the workshops held. Printed materials on this subject have been distributed among the municipalities. Information about similar organizations is also published in the "EcoEnergy" newsletter.

### 3.2.3. Advertise network through existing Associations of Municipalities / Mayors

MEEN was popularized by way of briefing the mayors of Network member-municipalities about the initiatives of the Network. This process is interlinked, because a large number of mayors sit for their municipality in both organizations. Advertising is effected also via the publications of the Association that are circulated among the municipalities. The main channels are the National Association of Municipalities in Bulgaria, as well as the local associations of municipalities – the associations of Danube municipalities, of Black Sea municipalities, of Thracian municipalities, etc.

### 3.2.4. Implement formal municipal energy efficiency network at ten municipalities

The creation of the Municipal Energy Efficiency Network was realized in several phases by way of a series of public events. The most significant ones (in chronological order and in the sense of the Programme of Work) were as follows:

- Meeting with municipalities

#### *Initiation meeting*

On 7 February 1997 in Gabrovo a business meeting was held of representatives of 23 municipalities and EnEffect. The draft-concept for founding of a municipal network for energy efficiency and environmental protection and the work program for its activities during the initial period was presented. Mr. John Tenant, Permanent Representative of the U.S. Agency for International Development (USAID), who participated in the meeting, declared the Agency's support for this initiative. The Mayor of Gabrovo and the Chairman of the Municipal Council of Gabrovo made active propaganda for the idea. The representatives of all municipalities that participated in the meeting declared their will to become its founders by signing a special protocol. The protocol was signed by representatives of the municipalities of Belene, Blagoevgrad, Bourgas, Dobrich, Gabrovo, Gorna Oryahovitsa, Haskovo, Karlovo, Kazanlik, Kotel, Montana, Omurtag, Pazardjik, Pleven, Razgrad, Rousse, Sliven, Slivnitsa, Varna, Vidin and Yambol. The protocol laid down the necessary follow-up actions to create conditions for MEEN's operations.

#### *Registration of the municipalities wishing to become members of the Network and nomination of the municipal energy efficiency officers*

A registration form for membership in the Network has been approved, in which the mayor of the municipality or some other official representative declares the wish or the municipality to become member and communicates the name of the nominated municipal officer-in-charge. By 30 March 1998 all founding municipalities have registered for membership in the Network and have nominated their officers-in-charge.

### ***Organization of a Network Secretariat to co-ordinate its activities***

EnEffect performs the function of MEEN's Secretariat. In order to be able to perform this function EnEffect has reorganized its structure and nominated experts who will be responsible for the implementation of the various aspects of this function.

The project "Energy Efficiency Strategy to Mitigate GHG Emissions. Energy Efficiency Demonstration Zone in the City of Gabrovo, Republic of Bulgaria", funded by the Global Environment Facility (GEF) through UNDP, and started in May 1998, provided the necessary conditions for further filling up staff vacancies in the Secretariat and delivery of equipment required for implementation of the planned activities. The Centre for Energy Efficiency EnEffect is acting as the Executing Agency of this above project.

### ***Development of Rules of Procedure for the organization and activities of the Municipal Network and a Programme of Work of the Network***

Drafts of the initial basic documents of the association – the Intermediate Rules of Procedure and Programme of Activities for the period 1997-2002, have been elaborated by the Secretariat in collaboration with some Mayors of member-municipalities. The Intermediate Rules of Procedure define the status of the Municipal Network, its strategic objectives and tasks, the forms of action, conditions for membership etc. The form and structure of the Network's representative bodies have been defined and the modes of co-ordination of its activity. The Intermediate Rules of Procedure allow participation of municipalities in the activities of the Network as members or observes, depending on the degree of their involvement in its activities. Any municipality may apply by a letter signed by the Mayor of the Municipality and addressed to the Network Secretariat. The application should communicate also the name of the nominated municipal officer-in-charge of energy efficiency and the mode of participation in the Network activities.

### ***Organizational business meeting of municipal officers-in-charge of energy efficiency***

The first business meeting of the municipal officers-in-charge of energy efficiency was held in Sofia on 12 March 1997. The motifs for creation of MEEN and the concept for its activities were presented. Discussion was held on certain problems related to the practical operation of the Network and the role of municipal officers-in-charge.

### ***Founding assembly of the founders; approval of the Rules of Procedure and Programme of Work; election of co-ordination bodies***

The second organizational meeting of the Municipal Energy Efficiency Network was held in Stara Zagora on 19 November 1997. Representatives of MEEN member-municipalities attended the meeting: mayors, deputy mayors and municipal officers-in-charge of energy efficiency, representatives of the Centre for Energy Efficiency EnEffect. Among the official guests of the meeting one should note Mr. John Tenant (Permanent Representative of the U.S. Agency for International Development, Mr. Ira Birnbaum (Senior Advisor on Energy and Infrastructure at USAID, Washington), Ms. Lada Stoyanova (Programme Expert at USAID), Mr. Robert Russo (Electrotek Concepts, Inc., Washington), Ms. Ginka Chavdarova (Executive Director of the National Association of Municipalities in the Republic of Bulgaria), Mr. Georgi Stoilov (President of the National Energy Efficiency Agency), Mr. Andrew Popelka (Tyssak Engineering, Inc., USA).

The main objective of the meeting was to approve the Rules of Procedure and the Plan of Activities of the Network and to elect its representative bodies. EnEffect presented

the elaborated drafts of the documents that have been disseminated in advance among the municipalities for remarks and comments. Following the in-depth debate and proposals for amendments the participants in the meeting approved the Intermediate Rules of Procedure and Programme of Work of the Municipal Energy Efficiency Network for the period 1997-2002. Proposals were made concerning the title of the Network, however this issue has been postponed for further consideration. The immediate tasks of the municipal network were specified and incorporated in the short-term program for the period 1997-1998.

The elected members of the Board of Directors of the Municipal Energy Efficiency Network were as follows:

President:                   the Mayor of the Municipality of Gabrovo  
Vice-President:           the mayor of the Municipality of Stara Zagora  
Members:                   the mayors of the municipalities of Gorna Oryahovitsa  
                                  and Karlovo

In compliance with the Intermediary Rules of Procedure the Head of the Centre for Energy Efficiency EnEffect, that has been assigned the role of Secretariat of the Network, is *ex-officio* member of the Board of Directors.

Representatives of all member-municipalities, except for Blagoevgrad, Kotel, Omurtag and Haskovo attended the meeting in Stara Zagora.

#### ***Sessions of MEEN's Board of Directors***

Upon the election of the Board of Directors of MEEN, its members held two business meetings as follows: on 7 April 1998 in Belene and on 16 September 1998 in Gabrovo.

The meeting in ***Belene*** discussed the following major issues: (a) position on the draft-law on energy efficiency; (b) fundamental principles of elaboration of the business plan for MEEN operations; (c) provisional criteria for rendering support to municipalities for implementation of energy efficiency activities under the limited budget for on-going projects; (d) data base on energy consumption in the municipalities; (e) opportunities for establishment of electronic communication between the member-municipalities and the Secretariat; (f) The need of providing computer training for the municipal officers-in-charge of energy efficiency; (g) approval of a new Network member – the Municipality of Botevgrad; (h) setting up of an Editorial Board of MEEN's newsletter and discussion of the contents and format of the newsletter

The agenda of the meeting in ***Gabrovo*** comprised discussion of the draft business plan of the Network, discussion of the preparations for the annual conference of the Network and other issues. It was decided that the title of the Network would be "EcoEnergy". It was further decided that at the annual conference of the Network a proposal would be made that the current Board of Directors should remain in office for one more year and afterwards the principle of rotation will be applied, and also to admit a new member of the Network. In connection with the debate on the criteria for membership in the Network it has been proposed to use the number of inhabitants of the municipal center as a criterion, because the smaller municipalities and human settlements feature a smaller energy conservation potential.

## *Elaboration of a strategy for the development of the Municipal Energy Efficiency Network of Bulgaria*

See Item 3.2.5.

- Develop agenda for 5 workshops
- Organize 5 workshops in different Bulgarian cities

The organizational meetings of the municipalities were combined with workshops and other events in order to minimize the trips of the participants and make utmost use of the events.

### *First workshop, Sofia, EnEffect, March 12, 1997*

In the course of the first organizational meeting of the municipal officers-in-charge a discussion was held on the future tasks of the organization, the role of municipal officers-in-charge and the most urgent first steps in the activities of the Network. A debate was held further on the officers-in-charge' demand of information and specialized knowledge in connections with their functions in the framework of the Network. On this basis a program of the forthcoming workshops was set up.

### *Second workshop, Stara Zagora, November 19, 1997*

The participants approved MEEN's Intermediate Rules of Procedure and Programme of Work for the period 1997-1998 and elected its representative bodies.

In addition to the organizational matters a specific focus was laid on certain fundamental issues of business planning and the elaboration of proposals for project financing. The major characteristics of the energy efficiency projects implemented in Gabrovo and Radomir and the energy efficient rehabilitation of the hospital in Stara Zagora were reviewed. Reports were delivered by: Architect Zdravko Genchev, Executive Director of EnEffect, on the opportunities for association of municipalities in an energy efficiency network; Mr. Robert Russo, from Electrotek Concepts, Inc., Washington, on the experience of energy efficiency associations in the U.S.A.; Mrs. Ginka Chavdarova, Executive Director of the National Association of Municipalities in the Republic of Bulgaria (NAMRB), who launched several proposals for joint activities of NAMRB and MEEN. Among the official guests invited to the workshop were Mr. John Tenant (Official Representative of USAID in Bulgaria), Mr. Ira Birnbaum (Senior Advisor on Energy and Infrastructure at USAID, Washington), Ms. Lada Stoyanova (Program Expert at USAID), Mr. Georgi Stoilov (President of the National Agency for Energy Efficiency), Mr. Andrew Popelka (Tyssak Engineering, Inc., U.S.A.), etc.

### *Third workshop, Sofia, University of Architecture, Construction and Geodesy, February 12, 1998*

The workshop "Municipal Energy Planning and Management" was held for the municipal officers-in-charge of energy efficiency. The objective of the workshop was to provide the participants with information on the fundamentals and possible approaches to the development of municipal energy efficiency programs. The principal reports were delivered by experts of EnEffect: (a) Fundamentals of municipal energy efficiency planning and management – the European experience and opportunities for its application in Bulgaria; (b) Practical approaches to the development of a local level energy policy: five stages of the development of an energy plan; (c) Planning of energy efficiency projects in buildings, energy audits; (d) Data base on energy consumption in municipal sites: five steps of municipal energy management

Mrs. Carol Mulholland of the US Consultancy Company "International Resource Group" and Mr. Robert Russo from the US Company "Electrotek Concepts, Inc." were invited as guests. They presented information about opportunities for obtaining funding for energy efficiency projects in municipalities using examples from the USA.

The participants were introduced to two energy efficiency pilot projects in the framework of the PHARE Programme, accomplished or still on-going in the cities of Plovdiv and Radomir. 34 representatives of 15 MEEN member-municipalities attended the workshop.

Fourth workshop, Belene, April 7, 1998

The a workshop on "Financing of energy efficiency projects" was organized jointly by the Centre for Energy Efficiency EnEffect and the Municipality of Belene in collaboration with the Black Sea Regional Energy Centre and the Association of Danube Municipalities. In addition to the subject of funding for energy efficiency projects, the agenda of the meeting was additionally enriched and included five sessions on the following major subjects: (a) Draft Law on Energy Efficiency; (b) EU organization to promote energy technologies (OPET and FEMOPET); (c) Energy efficiency and environmental protection – global and local effects; (d) Funding of municipal energy efficiency projects; (e) Energy efficiency programs.

Mr. Georgia Stoilov, President of the National Energy Efficiency Agency with the Council of Ministers, presented the motifs for and the draft of the Energy Efficiency Law. The National Energy Efficiency program by the Year 2020, developed under the Agency' aegis, was presented. The draft-law has been beforehand disseminated among the member- municipalities by the Secretariat. A discussion was held on the draft texts with the active participation of the representatives from the municipalities

Mr. Pedro Palesteros, representative of Directorate XVII of the European Commission in Brussels, presented the JULE-THERMIE Programme and the creation of a network of members and associated members of the Organization for Promotion of Energy Technologies (OPET and FEMOPET). The FEMOPET Centre in Bulgaria and the FEMOPET Black Sea Region were also presented.

The international and national policies to prevent and mitigate climate change after the Third Conference of the States-Parties of the UN Framework Convention on Climate Change, held in Kyoto, Japan, from 1 till 10 December 1997, were presented by Mr. Teodor Ivanov, chief expert with the Ministry of the Environment and Water. Senior research fellow, Dr. Eng. Hristo Hristov, head of the team that has elaborated the National Communication on FCCC, presented forecasts about GHG emissions in Bulgaria and actions taken to reduce them.

The opportunities for funding of energy efficiency projects from the National Environmental Trust Fund were presented by Dr. Valentin Bossevski, President of the Management Board of the National Environmental Trust Fund. The prospective opportunities for funding from the National Energy Efficiency Fund were also presented.

Fifth workshop, NPC, 10 December, 1998. Round-table discussion on "Efficiency in Bulgarian Hospital in the light of the reform in the health care system"

A round table discussion on the subject of the efficient use of the land plots, building stock and technical facilities of hospital complexes was organized on December 10, 1998 in Sofia in the framework of the annual conference of the Municipal Energy

Efficiency Network. The Ministry of Health supported the initiative launched by EnEffect to seek for correct solution of the problems in compliance with the basic concept for health reform in Bulgaria. Senior officials and experts from the ministries of health, the environment, labor and social welfare and regional development and public works, as well as mayors and specialists from the municipalities, managers of health centers, directors of state-owned, municipal and university hospitals, representatives of national and international programs, funds and financial institutions, designers and public figures were invited to participate in the discussion. The delivered brief summaries introduced the basic parameters of the health reform, the current state-of-repair of the hospital building stock and the regulatory framework in force in the health care system, as well as some observations on the method of formation of the value of hospital treatment. There is a considerable energy conservation potential in Bulgarian hospitals, that has been demonstrated through the already implemented pilot projects for energy efficient rehabilitation of the hospitals in Gabrovo, Stara Zagora and Plovdiv.

The participants made the conclusion that the efficiency of land plots, buildings and technical facilities of hospital complexes may be enhanced solely on the basis of a clear concept about the future of the health care system in Bulgaria. The subject of efficiency has been evaluated as being very topical and requiring the joint efforts of a variety of institutions and organizations at all management levels.

#### 3.2.5. Develop Business Plan for network activities

A draft strategy for the development of MEEN for the period up to the year 2010 has been elaborated. The strategy contains a forecast for Network activities, their evolution in the time and provisional financial back up from a variety of sources. Special attention has been paid to the process of transition from entire financing of the Network's activities from funding provided in the framework of international programs to overwhelming self-financing of the activities after the year 2003. Other specific issues have been comprehensively dealt with as well, such as forecasts for the membership size, qualification requirements for membership, organization's management and formation of equity revenue. The draft business plan of MEEN has been worked out on the basis of the Strategy for Development of the Network. The objective of elaboration of the business plan is to pave the way for a smooth and trouble-free transition to self-financing of MEEN's activities. A business plan of the network has been elaborated also about its activities during the period 1999-2010. The business plan details the mission, objectives and tasks of the network, its status and property and the activities to be launched, the market for these, the strategy for attainment of the objectives, the modes of financing of the network during the whole period of the business plan, the management bodies and structure of the network. The full text of the business plan is given in Annex 5.

#### 3.2.6. Development of an information database on energy efficiency

##### *Network member database*

Upon agreement of the municipalities, "brief prospects" of all Network member-municipalities were developed in order to provide reference information input – general, geographic, economic and cultural data – about the Network member-municipalities, as well as certain specific data, related to energy efficiency.

### *Energy management database*

Initial efforts have been made to create an information system about energy consumption in MEEN member-municipalities. The structure of the database to be introduced in the municipalities has been developed. It is realized in MS Excel and MS Access software. A questionnaire to be filled in by the municipalities and their subsidiaries in the municipal sector has been worked out. The system covers information about the actual fuel and energy consumption by functions and groups of municipal activities in material expression – initially for the year 1997 as a total and further on by quarters. The collected data has been used for analysis of energy consumption in the municipal sector in MEEN member-municipalities – for each municipality separately and total for all member-municipalities. Five pilot municipalities have been selected (Belene, Gabrovo, Gorna Oryahovitsa, Karlovo and Stara Zagora) in which the system will be tried with a view to its upgrading. This task was financed jointly by this project and the project “Energy Efficiency Strategy to Mitigate GHG Emissions. Energy Efficiency Demonstration Zone in Gabrovo” (GEF/UNDP).

### *Energy efficiency projects database for the Network member-municipalities*

According to the network strategy this database will be developed later with financing from the project “Energy Efficiency Strategy to Mitigate GHG Emissions. Energy Efficiency Demonstration Zone in Gabrovo” (GEF/UNDP).

### *Information sources on energy efficiency database*

A structure and appropriate software were developed. The database contains information about publications in the field of energy efficiency, available at EnEffect. A total of 3,000 documents have been processed and about 2,000 inputs have been made. The database is designed and realized using the software product Microsoft Access. The information is structured in five subject groups: energy policy, capacity building, demonstration projects, technological problems of energy efficiency and environmental aspects of energy efficiency. The main subjects are specified further in 26 subject areas. A system user guide has been developed. The system is maintained and updated by EnEffect. This information system will be available not only to EnEffect’s experts in the process of their work but also accessible to municipalities through the Secretariat. The mode of access for external users will be specified in the process of operation.

#### 3.2.7. Establish a formal peer exchange program for members

- Identify opportunities for peer exchange

Mutual assistance and collaboration among member-municipalities are strongly promoted in the framework of the activities conducted by the Network. The involvement of specialists from the Municipality of Gabrovo in the assembly of the air-conditioning system in Stara Zagora may serve as a good practical example for such collaboration. A large portion of this kind of activities takes place as an informal exchange between the municipalities proper and no record is kept about them by the Network Secretariat.

- Support of development of a peer exchange guide

The US project consultant Ms. Carol Mulholland has presented initial information about the elaboration of a guide on peer exchange among Network member-municipalities.

## **4. DEVELOPMENT OF ASSOCIATION OF ENERGY ENGINEERS CAPABILITIES**

### **4.1. Training on ASEAM**

On 10 to 12 June in Sofia “Electrotek Concepts, Inc.” and EnEffect organized a training course for experts on how to work with the ASEAM 3.0 simulation program (simplified methodology for energy audit, Version 3.0). The course was attended by representatives of the Association of Energy Engineers in Bulgaria (AEE), the Technical University of Sofia and EnEffect. The US expert Mr. Andrew Popelka, M.Sc. (Eng.) from the consultancy company “Tyssak Engineering Co.” (USA), was the lecturer and conducted also the demonstrations. The capacity of the latest version of the ASEAM 5.0 software package was demonstrated. EnEffect rendered assistance in the organization of the training course.

### **4.2. Use of ASEAM software to model Gabrovo hospital**

By means of the ASEAM 3.0 members of AEE-Bulgaria constructed a model for the “Dr. Tota Venkova” Regional Hospital in Gabrovo, the results of which were then used for technical and economic classification of the most profitable energy conservation measures and the opportunities they offer.

## **CONCLUSION**

### **Impact of the Network on the national energy efficiency policy**

*The major outputs* of this project were:

- Creation of the Municipal Energy Efficiency Network “EcoEnergy” and starting push of its operations;
- Preparatory work for and implementation of the energy efficiency demonstration project in the Regional Hospital in Gabrovo;
- Preparatory work for and implementation of the energy efficiency demonstration project in the Regional Hospital in Stara Zagora.

Following the creation and the two-years operational period of the Municipal Energy Efficiency Network ‘EcoEnergy’ one may now report the following major results:

- Real assistance has been rendered to the member-municipalities on how to identify the energy efficiency problems on their area and to formulate the urgent tasks for their resolution;
- Energy efficiency officers/experts were nominated in member-municipalities; in certain municipalities energy efficiency offices (within the municipal administration) were set up;

- Assistance has been rendered to member-municipalities on how to elaborate bankable proposals for funding of specific energy efficiency projects, some of which are currently undergoing a procedure for allocation of funding from international organizations (the European Union, USAID);
- Initial training has been organized for local specialists in municipal planning of energy consumption and elaboration of project proposals and business plans for energy efficiency projects, as a result of which ever more member-municipalities may independently prepare and submit energy conservation projects;
- The beginning was laid of development of an information database on the energy sector in member-municipalities as a pre-condition for the introduction of municipal energy planning and demand-side energy management (DSM);
- A certain contribution was made to upgrading of legislation in respect to local self-government and the energy sector (For instance: A Law on the Energy Sector and Energy Efficiency);
- Concrete demonstration projects were implemented, featuring real technical and economic results in the municipalities of Gabrovo and Stara Zagora;

The results scored so far by the activities of the Network provide grounds to make the following major conclusions:

- The creation of the Network has been a useful initiative whose positive results will multiply in the future;
- The Municipal Network has established itself as an effective collective body of municipalities in Bulgaria for collaboration with and influencing of the central authorities in the development and upgrading of the legislative framework of local self-government and the energy sector;
- The implemented demonstration projects in two Regional hospitals and the dissemination of information of the results attained there have promoted the Network's image and spurred broad public interest towards expansion of this activity to other municipalities and sites;
- The Network is gaining in prestige locally and abroad that serves as a basis for its further recognition and for expansion of its activities in the future.

The following major outcomes may be reported as a result of the creation and two-year operations of the Municipal Energy Efficiency Network "EcoEnergy":

- The most accessible and cost-effective energy efficiency measures in hospital buildings and complexes have been identified;
- Available forms of partnerships between different stakeholders from the public, private and NGO sectors in the implementation of energy conservation projects have been demonstrated;
- The results from the demonstration projects became a basis for significant policy initiatives in the health care sector at the national and local levels.
- The example of the demonstration projects in Gabrovo and Stara Zagora has helped other Network member-municipalities, as well as non-member municipalities, to initiate similar project proposals, some of which have been elaborated with support from EnEffect or addressed to it.

Американската агенция за международно развитие (USAID) изпълнява демонстрационен проект за енергийна ефективност в Габрово в рамките на голяма демонстрационна програма за енергийна ефективност на ООН. Ще се извърши детайлно енергийно обследване на Районната обединена болница "Д-р Тота Венкова" в Габрово. Въз основа на резултатите от него ще се определят мерки за повишаване на енергийната ефективност, които ще се осъществят практически през есента на тази година. Фирмата Electrotek Concepts, Inc. от САЩ, отговаряща за изпълнението на проекта,

### ТЪРСИ ПРЕДЛОЖЕНИЯ

от квалифицирани организации за извършване на енергийното обследване и за оказване на съдействие при осъществяването на избраните мерки. Подробно описание и инструкция за изготвяне на предложението на английски език могат да се получат в Българската фондация за енергийна ефективност ЕнЕфект след 15 май.

Предложенията да се представят в ЕнЕфект до 3 юни. Начало на обследването - 17 юни. Окончателен доклад - 5 юли 1996 г.

Българска фондация за енергийна ефективност ЕнЕфект  
София 1000, ул. "Струмица" 1-Б, IV ет.; тел. 981 4134, факс 981 5340  
Всеки работен ден от 14.00 до 17.00 ч.

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Американската агенция за международно развитие (USAID) изпълнява демонстрационен проект за енергийна ефективност в Габрово в рамките на голяма демонстрационна програма за енергийна ефективност на ООН. Ще се извърши детайлно енергийно обследване на Районната обединена болница "Д-р Тота Венкова" в Габрово. Въз основа на резултатите от него ще се определят мерки за повишаване на енергийната ефективност, които ще се осъществят практически през есента на тази година. Фирмата Electrotek Concepts, Inc. от САЩ, отговаряща за изпълнението на проекта,

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The same  
in "TRUD" paper

Изпубликувана във вестник "Свободна България" 4. Юли 1996

## REQUEST FOR PROPOSALS

for

## ENERGY AUDIT OF THE REGIONAL HOSPITAL IN GABROVO

**Requested by:** Electrotek Concepts, Inc. and EnEffect, The Bulgarian Foundation  
for Energy Efficiency

**Project Name:** Energy Audit of the Dr. T. Venkova Regional Hospital Gabrovo

**Project Number:** 5022-3220

**Type of Contract:** Fixed Price Contract

**Address:** 1000, Sofia  
I-B Strumitza Str.  
Mailing address:  
1606 Sofia, P.O. Box 85

**Contact Person:** Zdravko Genchev, PhD

Telephone: (359 2) 981 4134  
Fax: (359 2) 981 5340

**Deadline for Submission:** June 3, 1996, 16:00

**Type of Bid:** Sealed, to be opened after 17:00 on June 3, 1996

# 1. INTRODUCTION

Electrotek Concepts, Inc. with assistance from EnEffect, the Bulgarian Foundation for Energy Efficiency, is managing a project for the US Agency for International Development (US AID) to implement an energy efficiency demonstration project in the Dr. T. Venkova Regional Hospital, in the city of Gabrovo, Bulgaria. The objective of this effort is to assist the hospital in utilizing its energy resources more efficiently, and thus reduce both the energy costs and the pollution. Also, it is intended to serve as a model for energy efficiency and pollution control projects for similar facilities throughout the region. The exchange of technical know-how in the energy efficiency field is an important part of this activity.

An important first step in the project is a complete energy audit of the facility. The thermal energy utilization audit will include the hospital buildings' envelope, ventilation, heating system, boiler room equipment, hot water/steam heat exchangers, distribution pipes, and the Domestic Hot Water (DHW) heating. The audit of electricity consumption will be concerned with lighting, boiler house equipment, and all major electric energy loads within the facility.

Based on the energy audit results, a list of all applicable Energy Conservation Measures (ECM) will be generated and evaluated, based on their economic parameters. A group of the most effective energy conservation measures will be considered for implementation in the next stage of the demonstration project.

Electrotek Concept, Inc. is inviting Fixed Cost proposals from Bulgarian businesses and individuals interested in participating in this project. The bidder must possess the requisite knowledge and the necessary equipment, and must be able to comply with the project schedule. Selected contractor(s) will work closely, as a team, with EnEffect, and with US contractor(s). The US contractor(s) will be responsible for providing adequate guidance during specific tasks. Although knowledge of the English language is not a requisite of proposal acceptance, the Proposal and the Audit Report must be written in the English language.

Proposing organizations/companies are encouraged to become familiar with the Gabrovo hospital facility prior to submitting their proposal. Later claims of insufficient bids related to lack of knowledge of the project size cannot, and will not, be accepted. Bidders shall contact EnEffect in order to arrange a visit to the hospital. Bidders shall also contact EnEffect regarding any questions related to the preparation of this proposal.

Proposals shall be submitted by June 3, 1996, 16:00. Late proposals may not be accepted. Proposals shall be submitted in triplicate, either mailed in a sealed envelope or delivered in person. Bids will be open on June 3, 1996, after 17:00. All bidders will be notified about the selection results no later than June 14, 1996.

The proposing entities shall prepare their proposals at their own cost. Electrotek Concepts, Inc., or EnEffect, are not responsible for expenses incurred by the proposing organization(s)/individual(s) as a result of the preparation of the invited proposal. Electrotek and EnEffect reserve the right to accept or refuse any or all submitted proposals.

Note: involvement in implementation of Energy Conservation Measures is not part of this project activity, but the contractor's involvement in such an activity may be negotiated at a later stage of the project.

The energy audit includes both thermal energy consumption and electricity consumption. Depending on the quantities, the purpose, and the pattern of electricity consumption, the heat generated by electric equipment and lighting could have an impact on building zone temperatures (this is especially important for facilities with cooling equipment), electricity could be used inefficiently, or the consumption could be unnecessary.

The energy audit will provide baseline information for the evaluation of Energy Conservation Measures (ECM) applicable to the facility. Each ECM will be evaluated based on its energy saving potential, installation cost, and its economic parameters. The energy saving potential will be determined by modeling of the impact of each individual ECM on energy consumption. It is suggested (but not essential) that the modeling of the energy saving potential be performed with the help of software based on generally acceptable calculation algorithms, such as software s ASEAM3 (A Simplified Energy Analysis Model, version 3). This model calculates loads based on weather data in simplified bin form and its accuracy is sufficient for this project's purposes. The use of other calculating methods is also acceptable. The ECM's which, when installed at the same time, influence the energy saving potential of each other (called mutually non-exclusive) must be evaluated in conjunction with one another.

The most widely used economic parameters for determining the economic value of the ECM's are Net Present Value, Simple Pay-back, or Levelized Cost, depending on the character and the expected life of the ECM. The evaluation parameters for ECM's in this project will be selected by the bidder with respect to the current economic environment in Bulgaria and the selection must be stated in the proposal.

The project work will culminate in the recommendation of the best available ECM's for demonstration in the Regional Hospital facilities in Gabrovo. The calculated energy savings of the ECM's recommended for the demonstration will be provided to allow a comparison with actual measurements. Since the modeling will be performed with weather data for the 1994-95 heating season, the measured savings must be calibrated with last year's weather data before the comparison of calculated and measured savings. The data calibration is not part of this effort.

An area of interest during the energy audit work includes (but is not limited to):

Building shell: walls, top floor ceiling, bottom floor- thermal properties, insulation inspection, window glass, gaps, openings for ventilation, condition of seals, potential for improvements, doors (usage, gaps, glass properties, condition of weather-strips, insulation

Building ventilation: forced ventilation, patterns, the possibility for heat recovery, infiltration, random ventilation (window opening), air quality

Building space heating system: the sufficiency of heating capacity within the building zones, balancing requirements, the need for repairs, the need for pipes and radiator cleaning, regulating valves, thermostatic valves

Domestic water consumption: Consumption in faucets and their parameters (maximum flow, etc ), showers, the kitchen and laundry, leaky faucets, wasteful use of water within the facility, stand-by losses, sanitary use of hot water, technical parameters (flows), DHW usage pattern

Distribution system: Insulation of pipes, conditions of valves, leaks, limestone deposits

understand how and where the energy is currently being produced, transported, and utilized, and information on energy utilization effectiveness in space heating, domestic water heating (including kitchen, laundry and sterilization facilities), and electricity consumption. The energy audit results will then serve as a basis for the assessment of energy conservation opportunities.

### **6.1.1 Building Energy Audit**

In this task, the contractor shall perform the energy audit of the three main hospital buildings, including an evaluation of the building shell (walls, ceilings, windows, and doors), the building's heating system loops and their components, local/central ventilation, domestic hot water consumption, and electricity consumption. The audit shall produce a database of information related to physical parameters (such as heated floor space, number and physical condition of windows and doors, total fenestration area, number of doors and total door area, physical and thermal characteristics of walls, ceilings, windows, and doors, etc.), the occupation schedule, the total electrical load of lighting, the lighting schedule, measurement (or at least reasonable assessment) of infiltration, location and estimated/calculated quantities of domestic hot water consumption detailed by categories of use (e.g. laundry), and information on major electrical equipment within the building.

### **6.1.2 Distribution System Audit**

The contractor shall perform an audit of all steam and hot water distribution piping for space and water heating (with respect to the current state of insulation), leaks, and unnecessary heat losses to heated and unheated spaces.

### **6.1.3 Heat Supply System Audit**

The contractor shall perform an audit of the heat supply system, including the performance of boilers, heat exchangers, boiler house control systems, the operational control of steam/hot water equipment (steam valves, temperature control equipment, etc.), space heating circulation pumps, fuel delivery system pumps, and other parasitic energy consuming equipment. An assessment of the current sequences of operation shall also be performed.

### **6.1.4 Electricity Consumption Audit**

The contractor shall measure the quantities and utilization effectiveness of electricity consumption. This effort shall include quantification of energy used for facility lighting fixtures, major electric equipment within the hospital buildings, boiler house equipment, and major loads in the service facilities (maintenance, laundry, garages, etc.). Information on existing equipment such as nominal input, efficiency, availability factors, and utilization schedule shall be documented.

## **6.2 Task 2. Analysis of Energy Conservation Measures**

### **6.2.1 Selection of Energy Conservation Measures**

Based on the information collected during the energy audit, the contractor shall produce a list of Energy Conservation Measures applicable to all parts of the hospital facility energy system (boiler house, distribution system, buildings). The ECM's shall be selected with respect to their energy saving potential, availability, installed cost reasonableness, the practicality of their application, and - if available- general knowledge of previous experiences with such measures. The list could, for example, include building shell weatherization techniques (such as insulation, weather-stripping, window and door upgrading or replacement, roof improvements, etc.), utilization of heat recovery

## 7. DELIVERABLES

Complete Energy Audit Report in the English language, containing:

Description of used approaches, methods of measurement, and instrumentation used to obtain the energy audit data.

A detailed summary of results of all performed measurements, statistics, and analysis, as outlined in the Statement of Work.

Description of the energy saving modeling and the economic evaluation methods used for the selected Energy Conservation Measures.

Descending list of all evaluated Energy Conservation Measures, including their installation cost, assumed life, expected annual energy savings (GJ/year), value of savings (BL/year), and Simple Payback Period (SPP). Other economic parameters, such as Net Present Values (NPV) or Value Index may be provided, but are not required. If available, a list of local suppliers for each ECM shall be included.

Recommendation of Energy Conservation Measures for demonstration implementation based on the economic evaluation results as outlined in Task 3, including a description of practical aspects, availability, and general repeatability in other facilities and buildings throughout the country.

Organized measurement data and an analysis summary in electronic form in XLX, WK4 or an equivalent format.

## 8. PERFORMANCE SCHEDULE

- Energy audit effort starts on June 17, 1996
- Energy audit report submitted to EnEffect by July 15, 1996

End

# Electrotek Concepts, Inc.

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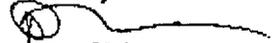
June 7, 1996

Georgy Rampov  
Association of Energy Engineers  
1527 Sofia  
Vasil Levski Blvd.

Dear Mr Rampov:

Your proposal has been selected for award. Electrotek intends to enter into a fixed price subcontract with you in the amount of \$11,240 for the services detailed in your proposal. We will be prepared to sign a contract with you during my upcoming trip to Sofia. Please contact Zdravko Geuchev at EnEffect to arrange a meeting the afternoon of June 18.

Sincerely,

  
Robert V. Russo  
Senior Project Manager  
International and Renewable Programs

cc: JC Smith, Electrotek  
Zdravko Genchev, EnEffect  
File 5007-532

# **REPORT**

## **Demonstration project for energy efficiency retrofit of the 'D-r T. Venkova' Regional Hospital in Gabrovo – implementation, monitoring and results**

### **ASSIGNING PARTY, FUNDING, EXECUTIVE AGENCY**

The demonstration project for energy efficient rehabilitation of the 'D-r T. Venkova' Regional Hospital in the city of Gabrovo has been implemented thanks to the financial grant and the support of the U.S. Agency for International Development (USAID) in the framework of the project "Municipal Energy Efficiency Initiative".

The project was initiated and implemented by the Chief Executing Agency 'Electrotek Concepts, Inc.' and EnEffect, jointly with the Municipality of Gabrovo, the 'D-r T. Venkova' Regional Hospital in Gabrovo, with the assistance of the Association of Energy Engineers (AEE), Sofia Branch. It has been incorporated in the demonstration and information component of the project "Energy Efficiency Strategy for Mitigation of GHG Emissions. Energy Efficiency Demonstration Zone in Gabrovo, Republic of Bulgaria."

The project has won the Association of Energy Engineers' 1998 International Energy Project of the Year Award - one of the most prestigious awards for design and implementation of an energy efficiency project.

This project is a good example of the USAID practice to render assistance when it is necessary to demonstrate that energy conservation and reduction of hazardous emissions in a cost-effective manner is possible and may be successfully multiplied.

### **PROJECT OBJECTIVES, TASKS AND SCOPE**

#### **Objectives**

- To reduce the energy component of hospital expenditure;
- To demonstrate the complete process of elaboration of energy efficiency projects - from drafting through implementation;
- To demonstrate the financial mechanism, through which assets generated from energy savings may be used to boost the allocated hospital budget and improve the quality of medical services

#### **Tasks**

- To identify the actual energy conservation potential, optional cost-effective energy conservation measures and proceed to implementation of selected measures;
- To demonstrate conventional and advanced energy conservation technologies;
- In the course of implementation of the energy efficiency project to simulate operation under market conditions - signing of a contract with an energy services company (ESCO), funding, sharing of savings, overcoming of barriers;

## IMPLEMENTATION METHODOLOGY AND PHASES

A general methodology may be applied for the majority of energy efficiency retrofit projects. This methodology is applicable also for the elaboration and implementation of market-oriented projects, ESCo contracts, third party financing and performance contracting. This project has been implemented under a scheme that may be divided into a series of conventionally differentiated, however indispensable phases.

### Preliminary study and energy audit of the hospital

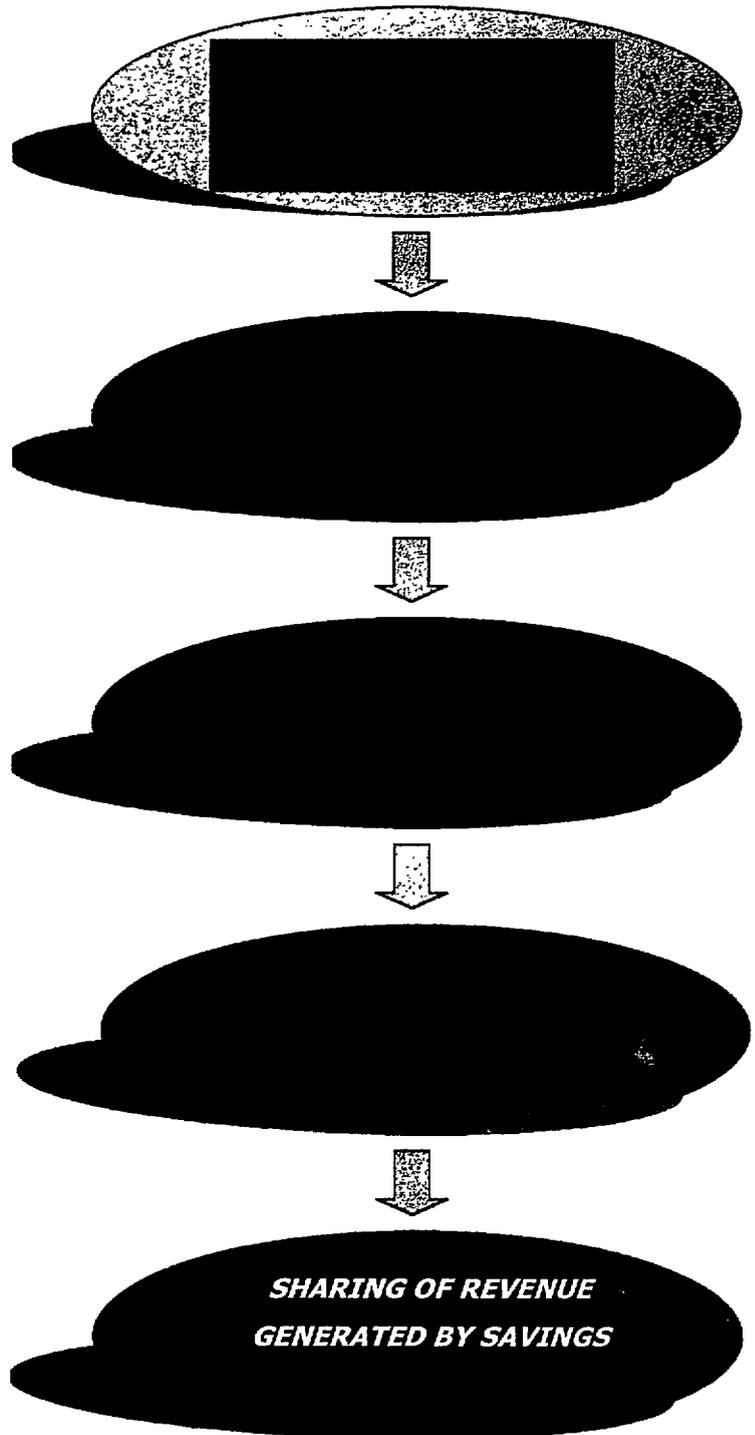
Following the preliminary study and the formal approval of the task on the grounds of its future-oriented feasibility, an energy audit has been carried out in order to determine the energy flows and the principal energy consumers in the hospital, to evaluate the energy conservation potential and to submit a package of recommended energy conservation measures to the management of the hospital.

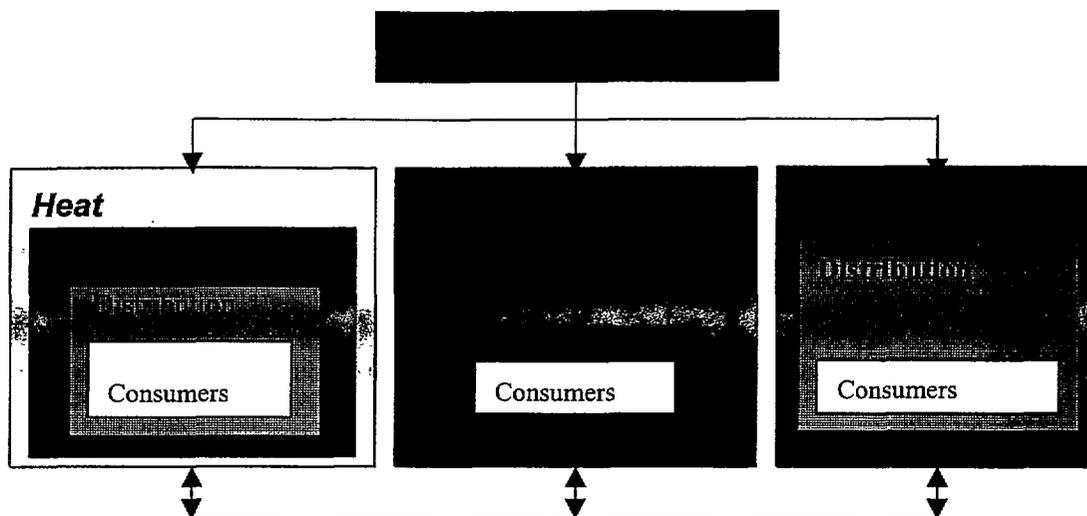
The energy audit and the technical and economic analysis have been conducted by a team of the Association of Energy Engineers, Sofia Branch, with the help of the US consultant and experts from EnEffect.

The assignment of that portion of the project has been effected as a result of a tender, organized and conducted by EnEffect. The selected specialists were professionals with rich experience, possessing modern technical equipment as required for the specific nature of the studies, and abilities for detailed analysis of the results by means of computer modelling and simulations.

The on-site audit and the measuring of the technical and operational parameters and analysis have been carried out during the winter and summer of 1996 and covered the following principal activities:

- collection of data and creation of a data base about the energy costs for the period from January 1, 1994 till June 1, 1996; measurements by sub-systems; and active series of 24-hours experiments.





In the analysis of the energy flows due account was taken of water consumption as well, because of the following reasons: water to meet the domestic hot water demand is a factor of significant importance for the operation of the hospital; the price of water shows an upward trend; water makes its 'contribution' to the growth of hospital expenditures.

- modeling of the energy flows of the site, using ASEAM 3.0 Software (the hospital complex has been treated as an integrated dynamic system), establishment of a baseline for energy consumption, simulation of the application of different energy conservation measures, determination of the energy conservation potential.
- technical and economic analysis and selection of energy conservation measures for demonstration.

As a result of the energy audit, the team recommended the so called 'long list' of 33 possible energy saving measures, that have been evaluated by different criteria: application costs, estimated savings in terms of energy, payback period, net present value, interdependence, multiplication opportunities.

**Technical and economic justification of feasibility. Selection of a 'Short list' of energy conservation measures to be applied.**

After classification of the various measures, the so called 'short list' of cost-effective energy conservation measures (ECM) has been drafted.

ECM	Savings				Payback period years
	Dimension	Quantity	%	US\$	
Window repair and weather-stripping	MJ/year	4,600,719	35.7	17,898	2.9
Replacement of the air conditioning system in the surgery ward	kWh	72,000	87	4392	8.4
Fitting of low-flow shower heads	MJ/year	576,070		2239	0.5
Replacement of burner nozzles	tons/year	20	1.2	2560	0.2
Fitting of main steam reduction valve	tons/year	28		3673	0.7

the parties and guaranteed correct use of the funds received from donations and the hospital's own financial contribution.

The tripartite contract for joint operation, signed between the Municipality of Gabrovo, the 'D-r T. Venkova' Regional Hospital and EnEffect, who represented the main Executing Agency, 'Electrotek Concepts, Inc.', guaranteed the viability of the project and defined the manner of organization of work and the responsibilities of the parties; co-ordination officers were nominated, who had to bear the direct responsibility for all organizational and technical operations, as well as for the activities related to co-ordination, design, deliveries, installation and commissioning into regular operation.

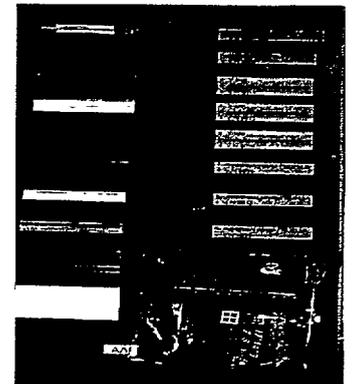
### **Installation works**

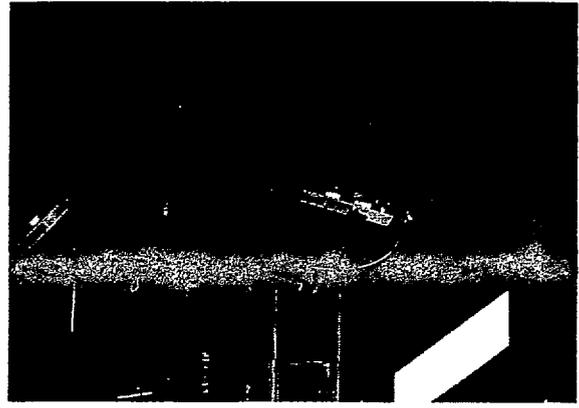
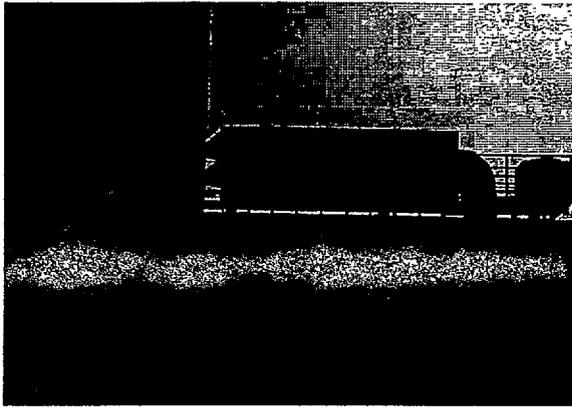
All activities related to the delivery and installation of the energy conservation measures have been carried out in a very short time - only 4 months. The successful implementation of the project was made possible through the co-ordinated efforts of more than 30 companies, organizations and individuals, including the Agency for Foreign Assistance (AFA), the Customs Office etc.

The activities for application of energy conservation measures in the framework of the approved budget of the project were as follows:

#### **Improvements to the building envelope (energy conservation measures of doors and windows)**

EnEffect and the municipality launched a tender for recruitment of Gabrovo-based sub-contractors for implementation of the repair works. The winning tactics of diminishing and distribution of the risk and fixed-price contracting was applied by assigning the work on the windows to three different companies simultaneously. It is worth noting an interesting fact: the best work performance has been ensured by a private company, a representative of the local small business. The materials were supplied from three different sources: directly by the donor USAID through the AFA, materials of Bulgarian make, delivered to the hospital warehouse and distributed in phases to the subcontractors, and materials procured by the subcontractors themselves. All windows and terrace doors of the three buildings (above 1500 units) were repaired and weatherstripped. More than 28,000 m of V-shaped vinyl and EPDM-rubber strips were fitted. The adjacent cracks and openings were treated with silicon and plastic mass. The double glazing was restored at the locations where it was missing – more than 2500 m<sup>2</sup> of glass has been fitted.





All installation works were carried out by local companies jointly with employees from the hospital and the municipality, that helped for their rapid familiarization with the system and guarantee its trouble-free regular operation. The setting up and commissioning of the 'SEMCO' air conditioning system and the system for automated operation and control were carried out by 'TYSAK Engineering Company, Inc.' (USA), licensed by the manufacturer.

#### **Installation of a 3-tariff master electric meter**

The new electric meter, a 'Landys' product, was installed by a local private company. This allowed the attainment of a mean monthly saving of US\$1330 thanks to the application of consumption reading on three tariff zones. In this way the investment made was paid back in less than a month.

#### **Staff training**

In addition to the mandatory briefing on how to operate and maintain the new equipment, the implementation of such a project should involve staff training as an obligatory component. Conscientious staff involvement - from the management through to the operators - in the process of rational energy use should begin as early as during the energy audit phase and continue through the period of project implementation. Training is a key factor to attain the formulated objectives and a guarantee for maintaining energy consumption at the achieved level in the time after.

#### **Regular operation. Monitoring and control on savings. Evaluation of impact**

##### **Monitoring and on-the-spot audit**

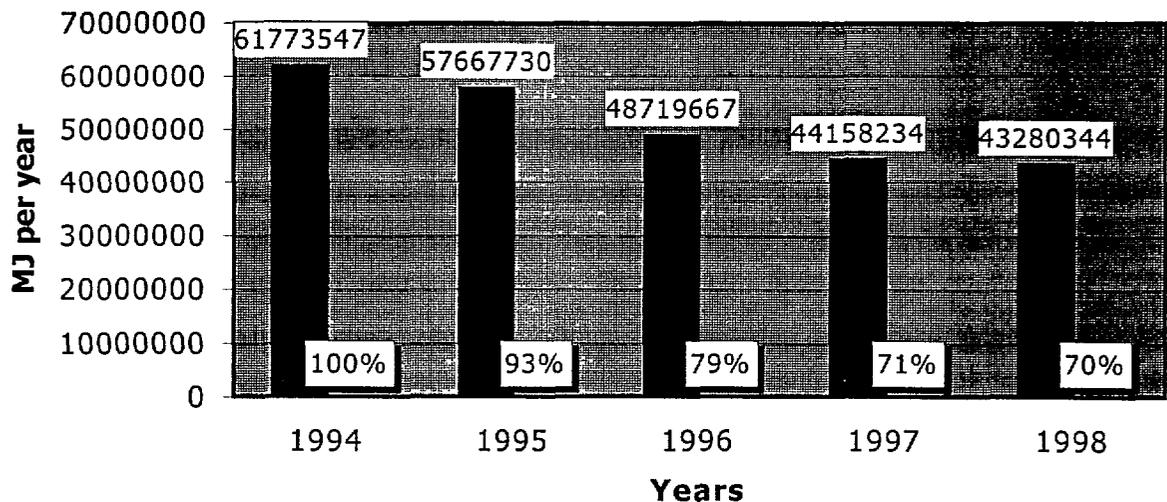
In the process of application of the energy conservation measures and their commissioning into regular operation the normal rhythm of work of the hospital was almost undisturbed thanks to the good co-ordination between the individual working groups. After a series of random measurements and a series of 24-hour winter tests for final determination of the level of savings (a team of the AEE), the thermal characteristics of the site before and after the application of energy conservation measures have been defined.

The thermal balance of the building prior to the application of energy conservation measures was assumed as a baseline. The results of the computerized model and the analysis of the energy flows show reduced energy consumption by 21%. Re-calculated by means of the fuel component it makes 18.94% respectively. The monetary value of the savings as a result of the introduced 3-tariff reading of electricity consumption is about US\$50/day. The graphic expression of the util-

**Long-term monitoring by primary data**

The long-term monitoring of the energy performance of the site is underway for 60 months now. The analysis of the data for the whole period corroborates the data of the on-the-spot monitoring (energy analysis of measurements and modelling of energy flows).

**Real fuel consumption in the Regional Hospital in Gabrovo\***



\* Note: The data for December 1998 are forecast values.

It may be noted from the chart above that the differences between fuel consumption prior to and after application of energy conservation measures exceed 30%. It is important to note further that no calibration with the actual climatic characteristics and duty cycle has been made on the data presented above. Since the beginning of 1997, i.e. after completion of the process of application of energy conservation measures, one may recognize a retention of a steady low fuel consumption for the following 24 months, while 1996 is an intermediate year, with energy conservation measures applied only at the end of the period.

There is a relative increase of the annual electricity consumption. The main reason is the increased installed capacity of the kitchen sector, which accounts for about 30% of the annual consumption.

The installation of a new air conditioning system did not lead to the estimated higher electricity consumption because of the discontinuation of the previous practice to switch on additional electric boosting heater in the surgery hall, that is anyway inadmissible from the point of view of hygiene.

The results of the monitoring by months and years for the whole period are shown in the figure below.

**Energy savings**

After calibration of the data as a function of the climate parameters and the operational duty cycle, the real fuel savings are 18.7% or respectively 219.4 t of heavy oil and 11.1 t of diesel oil per year. In monetary expression the savings produced by the 3-tariff reading of electricity consumption for a period of 22 months amount to cost reduction by some US\$ 30,081 compared to the results with 1-tariff reading, or an average of US\$ 16,408 per year respectively.

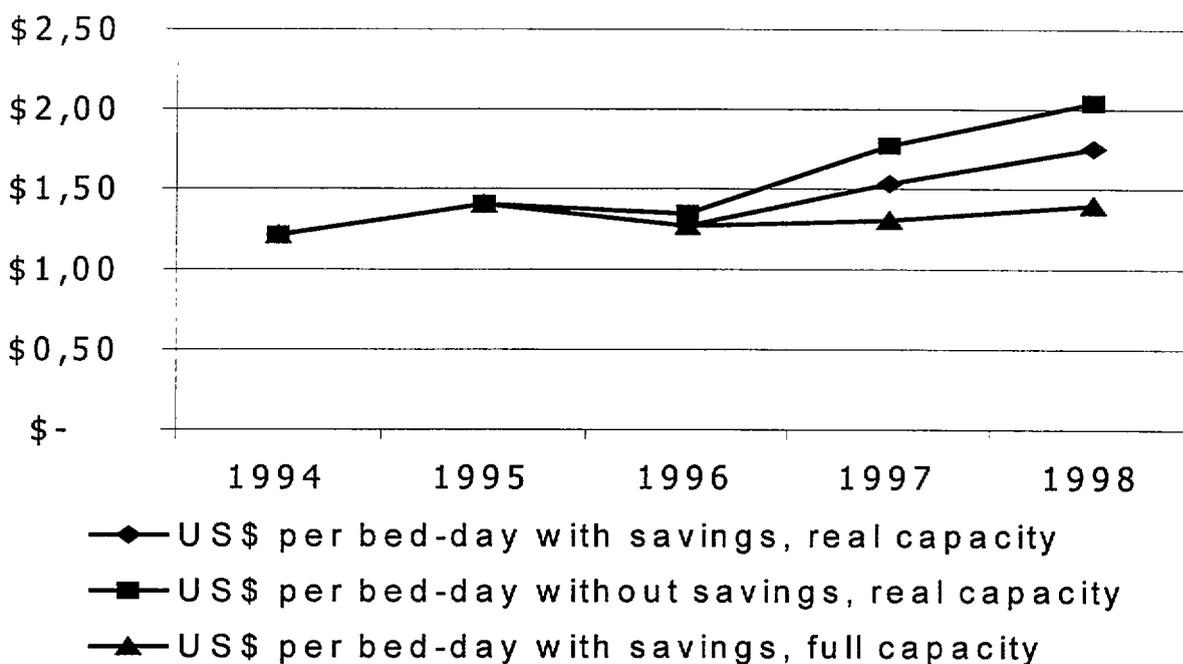


A physical expression of the good financial results from the project is the fact that the hospital has managed to finance from internal funds the repair of the gutters and the retrofitting of the surgery halls, including replacement of the doors and windows.

The formation of a conventional index 'price of energy per bed-day' (covering the cost of fuels, electricity and water related to the annual sum of real bed-days) allows us to make the conclusion that the energy efficiency measures are as important as the measures for correct organisation and more effective operation of the hospital. Energy efficiency alone, or organizational measures alone, may not stop the growth of the price of energy per bed-day.

The figure below shows a smooth increase of this price, despite the application of organizational/regulatory measures and ECM. The reasons for that are as follows:

1. The increase of the prices of energy carriers and water, that is an objective process and will continue until these prices reach their international levels;
2. The relatively higher installed capacities in the hospital - mainly electrical (new systems, equipment, air conditioning) - is connected, of course, with improved quality of the medical services and the comfort of occupants and visitors;
3. The stabilization of the rate of exchange;
4. There is still a certain amount of not fully utilized energy efficiency potential in both technical and organisational terms.



The diagram shown above has been designed using real data of 'D-r T. Venkova' Regional Hospital during the years of monitoring of hospital expenditures. It does not pretend to be universal or accurate, however it offers a good overview to help identify the trends and formulate the directions of necessary future intervention.

*Annex 5*

## Protocol

From the second meeting of MEEN, 18-19, November 1997, Stara Zagora

The **main goal** of the meeting was to be approved rules for the future activities of network.

### **Official guests:**

John Tenant, Ira Birbaum, Lada Stojanova, Rob Russo, Andrew Popelka, representatives of National Energy Efficiency Agency, foundation "TIME", Local Government Initiatives.

### **Final results:**

1. Interim rules about activities and work program of MEEN were accepted.
2. The nearer task were worked out.

## **ПРОТОКОЛ**

### **от втората организационна среща на Общинската мрежа за енергийна ефективност, проведена на 18-19 ноември 1997 г. в Стара Загора**

На 19 ноември 1997 г. в зала 1 на Община Стара Загора се проведе втората организационна среща на Общинската мрежа за енергийна ефективност. В срещата участваха представители на общините-членки на мрежата - кметове, зам.-кметове и общински отговорници за енергийна ефективност, представители на Българската фондация за енергийна ефективност ЕнЕфект, официални гости (Списък на участниците е даден в приложение). Срещата бе организирана от Българската фондация за енергийна ефективност с активното съдействие на община Стара Загора и с подкрепата на Американската агенция за международно развитие. Основната цел на срещата бе да се приемат правила за дейността на мрежата, план за дейността ѝ и органи за координация.

Като официални гости на срещата присъстваха Джон Тенант (Постоянен представител на Американската агенция за международно развитие), Айра Бирмбаум (старши съветник по енергия и инфраструктура в ААМР, Вашингтон), Лада Стоянова (програмен специалист в ААМР), Робърт Русо (Електротек Концептс, Вашингтон), Гинка Чавдарова (Изпълнителен директор на Националното сдружение на общините в Република България), Георги Стоилов (Председател на Националната агенция за енергийна ефективност), Ендрю Попелка (Тисак Енджиниъринг, САЩ). Като гости на срещата присъстваха също: Фурнаджиев (фондация "Тайм"), Мариана Стоилова (Българско общество за образование и култура), Йордан Аврамов (Група за местни инициативи).

Срещата протече в две сесии. Първата сесия се председателстваше от д-р Яблански, кмет на Стара Загора, който откри срещата с встъпително слово като домакин и активен поддръжник на идеята за развитие на общинска мрежа за енергийна ефективност. Приветствие към участниците в срещата изказа г-н Джон Тенант. Той подчерта категоричната необходимост от действия както на национално, така и на местно, общинско ниво, за намаляване на енергийната интензивност в България. С желанието да се подпомогнат общините в тази дейност той обоснова помощта, която Американската агенция за международно развитие предоставя за стартирането на общинската мрежа и за осъществяването на демонстрационни проекти за енергийна ефективност в общински болници.

В приветствие към участниците Георги Стоилов, Председател на Националната агенция за енергийна ефективност, оцени срещата като изключително важно събитие за националната политика за енергийна ефективност. Той даде висока оценка и на работата на Българската фондация за енергийна ефективност, като пример как една неправителствена организация може да

Втората сесия на срещата протече под председателството на д-р арх. Здравко Генчев. Кратко въстъпление направи Айра Бирнбаум, старши съветник по енергия и инфраструктура в ААМР, Вашингтон. Той подчерта, че създаването на Общинската мрежа за енергийна ефективност е най-важното нещо, направено в рамките на проектите на ААМР в енергийната сфера и може да служи като ефикасен механизъм за разпространението на опит и информация. Г-н Бирнбаум изрази задоволство от свършената работа в Габрово и очаквания за много добри резултати от прилагането на проектите в болниците в Стара Загора, Варна и Пловдив.

Втората сесия бе посветена на основната цел на срещата - приемане на правила за дейността на мрежата, дългосрочен и краткосрочен план за дейността ѝ и органи за координация. В своя доклад "Принципи на организация и програма за действие на общинската мрежа за енергийна ефективност" Валя Пеева, експерт в ЕНЕфект, представи разработените проекти на документите, акцентира върху някои моменти в тях и обоснова направените предложения.

Проектите на Временни правила за дейността, Програма за дейността 1997-2002 и Краткосрочна програма февруари 1997-март 1998 бяха предварително предоставени на участниците в срещата и това даде възможност за конкретност на дискусиата.

Георги Стоилов предложи задачите на общинската мрежа, изброени в член 3 на Временните правила, да се допълнят с нова точка, която да включва обединяване на усилията на общините като представители на потребителите за въздействие върху държавната енергийна политика по въпросите на цените на енергията и тарифите за тяхното формиране. В тази връзка г-н Стоилов предложи мрежата да стане член на държавно-обществената комисия за цените на енергията. Като обосновка на това свое предложение, г-н Стоилов посочи, че е необходимо да има равнопоставеност на енергоснабдяването и енергопотреблението. В момента съществува дисбаланс между огромната организация на енергоснабдяването и липсата на организираност на потребителите.

Николай Енчев, кмет на Карлово, изрази съгласие с проекта на Временните правила. За да се атакува един от най-важните проблеми на общините - липсата на свежи пари за реализация на проекти, той предложи да се допълнят задачите на мрежата с конкретната задача за въздействие върху държавната политика за създаване на реални възможности за финансиране на общински проекти за енергоспестяване от специализирания национален фонд за енергийна ефективност.

Иван Ненов, председател на общинския съвет на Габрово, изказа свои съображения срещу субсидирането на цените на топлинната енергия, което облагодетелства някои общини за сметка на другите. Той представи и виждането си, че самофинансирането е най-добрият начин за финансиране, който трябва да залегне в дългосрочната програма за действие на мрежата.

Роб Русо предложи като механизъм за действие да се създадат работни групи от кметове по най-важните проблеми на общините, свързани с реализирането на мерки за енергийна ефективност, напр. работна група по финансови механизми, работна група по закона за енергетиката, работна група по тарифите за улично осветление и др.

Петър Дулев, кмет на община Белене, подкрепи проектите на документите на общинската мрежа, предложи да се отразят направените допълнения и предложи една от следващите срещи да се организира в Белене.

## Decisions

From the First annual conference of MEEN

The Common Assembly:

1. Accepts the report about the period 1997-1998.
2. Accepts the plan for 1999.
3. Accepts the Strategy for development of MEEN.
4. According to suggestions for financing an energy saving activities the Secretariat have to prepare proposals addressed to governmental authorities for:
  - approval of National energy efficiency fund
  - to ensure the necessary legal conditions savings of the municipalities from energy efficiency activities or from RES to remain to municipalities
  - grants for energy efficiency projects or for RES to be V.A.T. free
5. Assigns the Secretariat to:
  - organize work shop on financing a municipal energy efficiency projects
  - to survey the criteria for establishment of new EE demo zones
  - to support the municipalities in participation of SAVE project for establishing of local and regional energy agencies
  - to prepare proposal about municipal activities in execution the country's obligations according to Kyoto protocol
  - to survey the possibilities for collective participation of municipalities in the European network "Energie Cites"

*Общото събрание на Общинската мрежа за енергийна ефективност ЕкоЕнергия, упълномощи секретариата на сдружението - Центърът ЕНЕфект, да обобщи дискусиите и да представи в окончателен вид направените предложения за решения на конференцията. Те бяха изпратени до всички общини-членове на мрежата и вече се работи по тяхното изпълнение.*

## **РЕШЕНИЯ**

на първата годишна конференция на Общинската мрежа за енергийна ефективност **ЕкоЕнергия**

1. Приема отчета за дейността на ОМЕЕ през периода 1997–98г., разработен и представен от Секретариата на мрежата.

2. Приема плана за дейността на ОМЕЕ през 1999 година, разработен на основата на дългосрочния план до 2003 г, като се ангажира с неговото изпълнение.

3. Приема по принцип проекта за Стратегия за развитие на ОМЕЕ и възлага на Секретариата да продължи работата по нея и я представи на Председателството за процедиране. Отчита необходимостта стратегията, като рамков документ на дейността на мрежата, да се поддържа актуална в съответствие с променящите се икономически, институционални и други условия в страната.

4. По направените предложения във връзка с финансирането на дейности за икономия на енергия Общото събрание на мрежата възлага на Председателството и Секретариата да изготвят предложения до съответните компетентни правителствени органи за:

(а) утвърждаване на Националния фонд за енергийна ефективност като важен финансов механизъм за стимулиране и подпомагане на общините за повишаване на енергийната ефективност.

(б) осигуряване на необходимите нормативни условия икономииите, реализирани от общините чрез дейности за енергийна ефективност или от прилагането на възобновяеми енергийни източници, да се оставят на разположение на общините с цел да се мотивират да осъществяват нови спестявания;

(в) освобождаване от ДДС на дарения за осъществяване на икономии на енергия или за използване на възобновяеми енергийни източници.

5. Възлага на Председателството и Секретариата:

(а) да организират работен семинар по финансирането на общински проекти за енергийна ефективност;

(б) да проучат критериите за обособяване на нови демонстрационни зони за енергийна ефективност по примера на Габрово и на основата на изявената готовност на няколко общини-членки да направят необходимите постъпки пред съответните международни организации и финансови институции;

(в) да установят активно сътрудничество с народните представители от съответните общини за по-бързо преодоляване на съществуващите нормативни пречки пред проектите за енергийна ефективност на местно и регионално ниво;

(г) да окажат помощ на желаещи общини-членки на мрежата да участват в проекта от програмата SAVE за създаване на местни и регионални енергийни агенции;

(д) да изготвят предложение до правителството да заяви по-активно участие на България в проекти на ЕС за повишаване на енергийната ефективност на местно ниво, както и в други чуждестранни проекти и програми, като програмата SCORE на Кралство Холандия;

(е) да изготвят предложение за действия на общините в изпълнение на задълженията на страната по протокола от Киото за предотвратяване на нежелани промени в климата на планетата;

(ж) да проучат възможността за въвеждане на колективно членство на общини в мрежата чрез техни сдружения, асоциации или други организации.

(з) за проучат възможностите и условията за колективно членство в Европейската мрежа "Енергийни градове".

6. Приема да бъде продължен мандатът на Председателството на мрежата в състава, избран на Общо събрание на 19 ноември 1997 г. в Стара Загора, до следващата годишна конференция, както следва: Председател: Община Габрово, Заместник-председател: Община Стара Загора, Членове:

Община Горна Оряховица, Община Карлово, Център за енергийна ефективност ЕнЕфект.

Координацията на дейността на мрежата ще се извършва от Центъра за енергийна ефективност ЕнЕфект с адрес: 1421 София, бул. Христо Смирненски 1, III ет., който осъществява функциите на секретариат, с постоянен координатор.

7. Общото събрание дава висока оценка за работата на Секретариата на Общинска мрежа за енергийна ефективност *ЕкоЕнергия*.

40