Report on Activities in Poland

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1. INTRODUCTION

Effective use of energy is a key requirement for economic development in Poland. Excessive use of energy means industries are not competitive, local governments' budgets are reduced, and citizens have less disposable income. For the utility industry to be able to supply energy reliably and cleanly, prices for energy must cover production and investment costs. But as prices rise, the consequences of wasting energy are exacerbated, and there is opposition to rationalization of prices and cost-based tariffs. Poorly constructed buildings and high energy costs lead to cold homes, schools, hospitals, and offices. Inefficient industries are non-competitive, leading to loss of jobs and a weak economy. Eastern Europe's levels of pollution are infamous, and inefficient and unecologic utilization of energy is a major contributor.

The ultimate goals of this USAID assistance were 1) to foster indigenous initiatives to improve the efficiency and cleanliness of energy use, 2) to accomplish this in a way that was self-sustaining through market economics (i.e., not remaining dependent on foreign assistance or subsidies), and 3) to make such initiatives compatible with a well-run, profitable and reliable energy utility sector.

1.1 Strategic Objectives

The activities described in this report were carried out within the context of USAID's Strategic Objectives for Poland, specifically:

- SO 1.3: Private Sector development is stimulated at the firm level
    - IR 2.3: Improved long-term provision of energy services supports market economy.
    - IR 2.1.3: Sustainable Business Support Organizations (BSO) providing assistance to small and medium enterprises (SME).
    - IR 2.2.1: Enterprises that use business plans, new management techniques, marketing and production methods.
- SO 2.3: Local government is effective, responsive, and accountable.
    - IR 3: Increased capacity to efficiently deliver services and manage local resources.
    - IR 3.1.2: Gminas with improved capacity to plan, finance and manage infrastructure projects.

Targets for the project were:

- 5 utilities will adopt modern planning methods (including Integrated Resource Planning) to set prices and design tariffs which cover costs and required investments and profits
- 8 BSOs provide assistance to SMEs in the area of improving energy efficiency
- 10 SMEs implement modern commercially-oriented business management concepts, practices and systems
- 10 gminas improve their capacity to plan, finance and manage infrastructure projects

All targets were achieved or exceeded by the end of the project, December 1999.

1.2 Major Activities

Activities were designed to assist utilities, local governments, private businesses, NGOs and universities. The remainder of this report describes what was done, the results, and what follow-on activities are expected in the next year or two. While specific initiatives are "classified" according to the sector of primary focus (e.g., local government, SMEs), in fact the most significant results occurred when institutions from several sectors worked together for their mutual benefit.

<u>Utilities</u>

Develop modern planning and IRP capability at power distribution utilities.

> *Polish partners*: Gornoslaski Zaklad Elektroenergetyczny S.A. (GZE) and Zaklad Energetyczny Torun S.A. (ZET).
>
> *Project team*: Electrotek, Central Maine Power (CNEX), Systematic Solutions, Inc. (SSI), Nashville Electric Service (NES), Energy and Environmental Economics, Inc. (E3)

Work with a power distribution utility to initiate customer energy services activities and implement demand side management projects.

> *Polish partners*: Gornoslaski Zaklad Elektroenergetyczny S.A. (GZE) and subsidiaries; several industrial customers and municipalities (Zabrze, Gieraltowice, Rudziniec) served by GZE.
>
> *Project team*: Electrotek, Lakeland Utility Conservation Inc./George Reeves Associates, Negawat Sp. z o.o.

Help heat companies modernize their tariff design and cost allocation procedures and prepare acceptable tariff submissions for URE.

> *Polish partners*: Zaklad Energetyki Cieplnej "KOSPEC" Sp. z o.o. in Koscierzyna (KOSPEC), Przedsiebiorstwo Energetyki Cieplnej w Malborku Sp. z o.o. in Malbork (MPEC), Przedsiebiorstwo Energetyki Cieplnej Sp. z o.o. in Bytow (BPEC), Rada Energetyki Cieplnej Okregu Polnocnego (RECOP).
>
> *Project team*: Electrotek, Narodowa Agencja Poszanowania Energii S.A. (NAPE), CNEX, Cherubin consultant

<u>SMEs, BSOs, Universities</u>

Courses to train and certify energy auditors of SMEs or update the technical knowledge of personnel who had already been certified as energy auditors. Provide a source of information and a "help" facility where energy service companies can ask questions about Polish laws, regulations, and funding sources as well as clarify technical or performance contracting issues. Publish relevant books and newsletters to help disseminate this information.

Polish partners: Krajowa Agencja Poszanowania Energii S.A. (KAPE), numerous private Polish enterprises and energy service companies.

Project team: Electrotek, NAPE

Seminars on "Financing Energy Efficiency Projects" for local governments, banks, and SMEs. Work with Polish ESCos and local governments to design, finance and implement energy efficiency projects.

Polish partners: Polish Network "Energie Cites" (PNEC); ProEsco, PilBut, Enertech, BFiG, Negawat; Cities of Trzcianka, Chelmno, Bierun, Stanislawow, Poswietne

Project team: Electrotek, Fundacja Efektywnego Wykorzystania Energii centrum w Krakowie (FEWE-Krakow), NAPE, Energored Sp. z o.o.

Strengthen the curriculum in energy efficiency and environmental protection for courses offered by technical universities; introduce improved pedagogical techniques, such as use of case studies and interactive exercises and lecture formats. Establish Energy and Environmental Assessment Centers to assist Polish businesses while affording a teaching and training opportunity for students.

Polish partners: Warsaw University of Technology (PW), Silesian University of Technology (PS), Krakow Academy of Mining and Metallurgy (AGH), Krakow Polytechnic University (PK)

Project team: Electrotek, University of Tennessee/Central and East European Center (UT), Alliance of Universities for Democracy (AUDEM)

Assist USAID to implement the Development Credit Authority (DCA) program, to foster lending mechanisms for projects to reduce energy consumption and greenhouse gas emissions.

Polish partners: BISE bank

Project team: Electrotek, NAPE

1.3 Project Approach and Philosophy

In any energy efficiency program, there are many "players":

- the resident or tenant of a facility
- the organization or enterprise that pays the energy bills
- the utility
- the energy services provider
- local, regional, or national government
- the public, which is affected by energy-derived pollution

Fostering energy efficiency is not a technical problem; it is an institutional and a social problem. To be successful, an energy efficiency program must address the basic needs, objectives, or problems of each entity. Saving energy is not an end in itself; it is only a tool to accomplish other goals, and it must meet the needs of all the parties involved.

For example, the residents of a housing estate pay a monthly rent that includes a fixed amount for heat. They pay the same, regardless of how much heat they use. Why would they want to conserve energy? To enlist the residents' cooperation, a thermal renovation program has to be designed to meet their real needs. The energy efficiency measures must:

- give them more comfort
- eliminate moisture problems
- make their building look better
- help them share in the energy savings
- make sure their experience with the project was pleasant

How did we do this?

More comfort. Improving the thermal properties of a building will make cold flats warmer. In the old concrete element construction buildings, we have found some apartments so cold that they had ice on the inside of the walls! The residents will be enthusiastic about improvements that will warm a cold apartment. Conversely, some apartments are chronically overheated; as heat to the building is increased to try to make the cold apartments warm, the warm apartments become too hot. Part of the thermal improvement design must be to rebalance the building. Where thermostatic radiator valves or other controls are used, overheating can be reduced.

Eliminate moisture problems. The concrete element buildings are typically characterized by cold walls, humid interior air, moisture from cooking and washing, and chronically bad ventilation. This results in condensation on interior walls and ceilings, and mold and mildew (fungus). Often simple weatherization measures will cure this problem. In Handlová, Slovakia, the conservation measures installed in older (1950's construction) buildings eliminated the internal moisture problems that had been the source of residents' complaints to the City for years. The City wished to privatize these buildings, and once the moisture problem was solved, the residents were willing to take ownership of their apartments.

Improve building appearance. Repairing water leaks, replacing broken glass, repairing or improving entry way doors, and repairing (and repainting) wooden window frames all save energy. They also make the building look better, so people take more pride in their homes. As a result, they will care more about all aspects of the building operation. FEWE-Krakow is training energy efficiency technicians and implementing demonstration projects in several Polish cities. In such projects, it is important for the technicians to make a low-cost but visible improvement, such as fixing a crack in the building facing, while making the "invisible" improvements of caulking and weatherstripping. In some cases, the energy technicians have provided seeds, plants, and tools for the residents to plant flowers and landscape the area around the building. Such things may seem trivial or irrelevant from an engineering perspective, but they are crucial in having the residents associate energy efficiency with pleasant living conditions and a better quality of life, and in helping to instill a pride of ownership in the residents that will motivate them to keep the building (and its conservation improvements) in good repair.

Share in energy savings. Residents tend to react cynically to announcements that a project is going to save them money. When heat is part of the rent, and heat prices (and rents) are rising inexorably, the residents know they will be paying more for their energy/heat no matter what any "expert" says. In the Kraków Low Emissions energy efficiency experiment, we designed a rebate program, so the residents would receive a small share of the reduction in heat costs the housing estate (and the Wojewoda's subsidy fund) would pay. We explained this was but a part of the savings, but the residents were appreciative and more cooperative when they saw they would receive some tangible benefit from the energy savings. Indeed, the fact that the rebate amount was based on the measured energy savings was instrumental in motivating the residents to use their thermostats; without this, they will simply set the thermostat valve to "maximum" and take all the heat they can. Mr. Piotrowski, of the Pradnik Bialy Zachód Estate, took an even simpler approach, by using some of the energy savings money to make improvements to his estate's buildings, playgrounds, etc. In a Hungarian hospital energy savings project, we used a share of the savings to buy some medical equipment, and labeled it "Paid for by the technical staff from savings in energy costs." It is important to visibly and continuously reinforce that less money spent on energy will result in more money to spend on useful things.

Communication. One of the biggest mistakes in an energy efficiency project is to just tell people what you are going to do, without explaining it or giving them a chance to ask questions. At the beginning of an early thermal renovation project, we had an open meeting for all building inhabitants. They met the technicians that would be working in their homes. They met the representatives from the engineering companies who were designing the project, the housing cooperative management, and the district heat utility. We found that the residents had simply been told, "technicians are going to be working in your building." Understandably, the residents were upset and suspicious. By listening to their concerns, and treating them as part of the "team," not an obstacle to be overcome, it was easier to schedule and complete the work. In fact, the residents, who knew their building better than we ever could, were full of helpful suggestions and pointed out problem areas and changes to the original heat systems that made the project more effective. Technicians were trained to explain all aspects of the project to the residents as they were doing the work. The technicians were told to try to answer all questions, even if the question seemed "silly." After all, we were working in people's homes, and they had a right to know what we were doing and why. And this leads to perhaps the most important guideline:

Public relations. The overall experience must be positive for the residents. The technicians have to be polite and pleasant. Absolutely no smoking, drinking, or eating in someone's home. All dust and waste materials have to be cleaned up; the job site must be spotless when the technician leaves. If a resident doesn't want a technician to go in a certain room, work with a certain window, etc., the customer's wishes have to be obeyed. In the Krakow Low Emissions experiment, FEWE hired and trained people registered with the unemployment office. We explained that the American money would be used up after the 4 test buildings; the technicians' future employment depended on their creating a demand for their services; this required satisfied, even delighted, customers. Residents were given questionnaires to evaluate the work, and to report any especially positive or negative experiences. In America, technicians' pay is based on these customer evaluations, as well as the speed and quality of the work. Teaching the technical and mechanical skills was easy; the "people skills" were difficult. Less than one in four technicians had the personality for the client interaction necessary for the work. However, the benefits were apparent to those who pleased the customers; one group of FEWE contract technicians has since formed their own successful small business weatherization enterprise.

The previous paragraphs give an example in some detail how to meet the needs of the residents, but the needs of all parties must be addressed, and these needs are different. Table 1 briefly lists the partners in an energy efficiency program, and some of the main issues or objectives of each. The key to designing and implementing a viable program is not to force-fit a particular type or structure, but to examine each particular situation, and devise a structure, technologies, incentives, financing mechanism, etc., that is beneficial to all parties.

The objective is not to find an "energy efficiency formula" - there is none. Instead, the technical assistance should change people's perspective, to convince them that they can benefit from more efficient and cleaner use of energy, and to motivate them to develop their own programs and initiatives. Once credibility for the viability of energy saving is established through a small but practical demonstration, we must challenge the participants to expand the scope of activities and apply their ingenuity and business skills to uncover other economically viable ways to use energy conservation to help them achieve their ultimate goals. The steps we followed were:

- Assess the situation; what are the problems facing the parties involved?
- Trace the money; what are the real costs, and what expenses are really being paid?
- Establish a demonstration project that will result in tangible benefits to as many parties as possible. In addition to any technical assistance, it is important that a physical improvement or a piece of equipment is seen to be purchased with the US funding. The project must be structured so it is in the interests of the Polish partners to have it succeed; the Polish enterprises may see this as a potential future business activity or may directly benefit from cost savings, pollution reduction or comfort improvements. The Polish partners must cost share any investments; some of their own money must be at risk to insure that they work for project success.
- Solicit comments from the Polish parties. Be responsive to their suggestions and make appropriate modifications. Most projects fail for organizational, political or personal reasons, not from technical problems.
- Establish a rigorous quality control system. Solicit honest feedback. Fix problems quickly and openly.
- Disseminate results. In doing so, stress the Polish participation and innovation, and build the reputations of the Polish partners.
- Document the results, including suggestions to improve similar projects in the future.
- Work with the Polish partners to identify additional opportunities. Help them make the activity self-sustaining. Follow-on activities not financed by USAID should be a required result of any demonstration project.

Each activity of this USAID project was separately custom-crafted to motivate future actions by the Polish individuals and organizations. While “energy” and “pollution” are often viewed as technical issues, the truth is that they are, ultimately, social issues that must be addressed in personal or organizational, not engineering, terms. In the remainder of this report, the activities listed above are described in more detail. But while the USAID R4 evaluation system looks at “number of projects implemented,” “dollars leveraged,” “SMEs helped,” etc., the real measure of success or failure will be seen in the coming years as the concepts introduced under the USAID foreign assistance adapt and spread, or fail to do so. Thus, the narrative will attempt both to quantify the results and to describe the perceptions and actions of the Polish partners that are expected to lead to future replication.

Customer – residential	More comfort, eliminate moisture problems Improve building appearance and operation Reduce costs Understand what will be done and why Overall pleasant experience, responsive to their needs and concerns Environmental improvement
Customer – industrial	Reduce costs Improve product quality, reduce waste Safe, healthy work environment Reliable equipment and processes Reduce emissions (meet local, national, or European Union requirements)
Energy Services Contractor	Make a profit Retain jobs – employment
District heat utility or other energy utility	Retain or attract customers Reduce operating expenses Motivate customers to pay their utility bills Increase profits Reduce emissions to meet national or European Union requirements
Housing estate	Reduce costs Reduce resident complaints Motivate residents to help with building maintenance Reduce vandalism Induce residents to pay rent on time
City government	Reduce energy costs for city-owned buildings and services (housing, schools, hospitals, etc.) Improve public services Privatize city-owned housing Create employment Eliminate budget deficits (e.g., district heat, housing authority) Improve local environment - reduce harmful emissions
National government	End energy subsidies Create employment Increase GDP Reduce energy/fuel imports Reduce emissions

TABLE 1: Basic Goals or Objectives of Parties Involved in Energy Projects

2. UTILITY ACTIVITES

2.1 Modern Planning Methods for Power Distribution Utilities

The objective of this activity was to improve the planning and management methods of Poland's electricity distribution utilities, resulting in:

- Least-cost investment strategies for the utilities, and lower operating costs
- Increased value of the utilities when privatized, and earlier privatization
- Consideration of demand-side strategies and customer service benefits in utility planning procedures
- Development of rational, cost-based tariffs for energy

Beginning in 1997, we held a series of workshops at ZET and at GZE to describe the principles and process of Integrated Resource Planning (IRP) and Least Cost Planning. We described the information/data and software to support IRP and asked each utility to prioritise areas of technical assistance where we could help. ZET decided to undertake a comprehensive data and information system integration, using a proprietary software system from Germany. They developed an ambitious schedule for converting the utility, department by department, to the new system. However, the German software did not include load forecasting, and ZET requested assistance in that area. GZE first asked for assistance in developing distribution system planning – technical and financial/investment analyses. They also were interested in obtaining a modern load forecasting program. The resulting activities for each utility were:

- Implementation of an end-use-based load forecasting program, *Energy 2020*, developed by Systematic Solutions, and modified for each utility. The implementation included development of a base forecast for ZET and for GZE.
- Implementation of a corporate financial model for GZE, developed by CNEX.
- Implementation in GZE of a distribution system load flow and investment planning model, *DistCo*, developed by Electrotek.

The results of the IRP (and DSM) work were summarized in a seminar held in Zabrze in November 1999. Presenters included staff from GZE, ZET, CNEX, Electrotek, and Nashville Electric Service. Representatives from 5 other Polish power distribution companies attended the seminar.

2.1.1 Load Forecasting

One of the first steps in planning is to forecast the demand for energy. This allows for a much better targeting of resources to most efficiently and cost-effectively service load. We procured and installed an end-use load forecasting model from Systematic Solutions (Energy 2020) in Zaklad Energetyczyny Torun (ZET) and Gornoslaski Zaklad Elektroenergetyczny S.A. (GZE) and trained utility personnel in its use. Both utilities have incorporated the program in their planning procedures and developed load forecasts.

ZET is using Energy 2020 to forecast demand and sales, as a primary input to their entire management information system. ZET has revised the basic forecast models extensively, to customize the program for their service territory characteristics. They developed their first system load forecast with Energy 2020 in 1998 but then made extensive changes to the model, integrated it with their German management information system software, and produced a new base forecast in 1999.

GZE completed installation and training in Energy 2020 in late 1999. Because of manpower constraints in GZE, they arranged for Silesian Technical University to assist them with the data collection and model modification. A base load forecast was produced in October 1999. The GZE Strategic Planning Department is using Energy 2020 as part of its planning procedures.

2.1.2 Corporate Financial Model

CNEX (Central Maine Power Co.) had developed a proprietary corporate financial model and, under other USAID projects, modified and installed it in NEK (the national electric utility in Bulgaria) and in Prague Electric (a power distribution company in the Czech Republic). Earlier, as part of this contract, CNEX had generalized the model to apply to other Czech electric and gas distribution utilities, added a tariff section, translated it into Czech, and implemented it in the Czech Ministry of Industry and Trade. Based upon the favourable response from the Czechs, we decided to demonstrate the model to Polish utilities, to see if it would be useful here.

ZET began the implementation of the corporate model, but the company soon decided to implement an entirely new company-wide integrated information system, based on a German software product. This necessitated restructuring all data bases, information flows, and accounting procedures in ZET, and they determined that the CNEX corporate model would duplicate some of the features of the German information system and software. However, ZET kept and expanded the Energy 2020 load forecast program; the Energy 2020 load forecast is the input or “driver” to their planning process. For the remainder of the project, ZET concentrated on working with SSI to integrate Energy 2020 into all aspects of their planning and information system structure.

GZE completed implementation of the CNEX corporate model, adapting it for Polish conditions and GZE characteristics. The model was also made completely bi-lingual (Polish and English). The Finance Department and Strategic Planning Department of GZE worked with CNEX to accomplish this. The model will be used by the Strategic Planning Department to screen investment and network expansion/reinforcement options.

2.1.3 Distribution Planning Model

There are several computer programs for evaluating electric utility IRP options. The programs are designed to compare the utility’s energy resources with expected demands and select the best option for meeting that demand with adequate reliability. “Best” means “least cost,” with the utility’s having the capability to assign costs to externalities, such as emissions. “Adequate reliability” levels are met by either 1) modelling the power system and making sure it meets a minimum reliability index (e.g., Loss of Load Probability is less than X; no load lost after any single contingency and less than Y MW lost after any 2 contingencies, etc.) or 2) assigning a cost to loss of load or unserved energy and minimizing overall costs – investment, operating, and reliability. What differentiates "IRP" from "traditional" expansion planning is that *all* alternatives are considered – constructing generation, purchasing power, reinforcing the transmission or distribution network, managing or conserving load, shedding non-critical loads, etc. – rather than just identifying the least cost generation mix.

However, these software packages are designed for utilities that generate a significant portion of their energy, especially vertically-integrated utilities. We could not find an IRP program that addressed the needs of the Polish power distribution utilities, so Electrotek decided to adapt a distribution system planning program originally developed under contract to the Electric Power Research Institute (EPRI). The resulting program, DistCo, models the distribution network, performs a load flow to check for overloaded equipment, calculates system losses, and includes reliability (i.e., costs of outages) in its evaluations of alternatives.

Project staff worked with GZE to install DistCo, train GZE staff in its use, identify a test area for initial analysis, and identify and evaluate alternatives for system reinforcement in the test area. The test case was the city center area of Katowice, which is mostly served from a 6-kV radial MV network fed by the Dab and Torkat substations. The service from the Dab substation to Station 510 (Mickiewicza) is nearly overloaded and the load is projected to grow at about 5% per year. Also, extra capacity is needed to add new loads in the downtown area. There are two fields (bays) in the Dab substation serving Sta. 510 with one carrying 5MW at peak load and the other carrying 4.2 MW. The cables in both feeders are paralleled and are at planning capacity, or will be shortly. Because it is a downtown area, new construction can be expensive. Four major alternatives were examined:

- <u>New MV feeders</u>. The capability to add more 6 kV feeders is uncertain. Besides, it is generally not economical to build such low voltage feeders today. The costs for installing the equipment are nearly the same as for higher voltage cables. Fortunately, there is already a 22 kV bus at Dab and also at Francuska substation, but there is little load being served at 22 kV. Thus, one option is to run a 22 kV cable (double circuit for reliability) from Dab to the vicinity of Sta. 510. Ties to the 22 kV lines from Francuska should be made for reliability. Once the 22 kV lines are in the area, there are two alternatives for serving the load: 1) Install a 20/6 kV stepdown and continue to serve the load at 6 kV. 2) Install 20 kV/400V stations and move the 400 V load currently served from the 6 kV system to the 20 kV system. <u>Advantages</u>: The 22 kV buses already exist. A relatively large capacity gain is achieved for an investment that is smaller than putting in a new substation. <u>Disadvantages</u>: It is relatively expensive to bury new cables in a downtown area. New MV/LV station transformers must be acquired. The 6 kV transformers cannot be used.

- <u>New HV/MV Substation</u>. This would involve siting a new substation in Katowice and building 110 kV lines to it. This option would be particularly attractive if a large new industrial or commercial facility were to be built in the downtown area. <u>Advantages</u>: It would provide ample capacity for new growth at a low $/kW. <u>Disadvantages</u>: It is difficult to build new facilities downtown, particularly HV lines. Unstable earth from coal mines in the area presents a problem. Also, if the new load doesn't materialize, the investment is wasted.

- Distributed Generation or Industrial Co-generation. The total load from Sta. 510 is about 10 MW. It is possible that 1 or 2 MW of generation installed at Sta. 510 or downline could alleviate the overloading situation for a few years. It may be necessary to install generation, even if another option is chosen, to handle the load while the new system modifications are made. Advantages: May be done relatively quickly if fuel supplies (i.e., natural gas) are nearby. May be less expensive option than a major construction project. Larger customers may be willing to install cogeneration for emergency or economic reasons. If so, there would be no need for capital outlay by the utility. Disadvantages: Capacity is limited; therefore, if high growth is anticipated, the solution is viable for only a short time. Customer co-generation may be unreliable. A clean fuel must be available. Noise and other environmental concerns may eliminate viability.

- Load Management or Energy Efficiency. The load that stresses the system appears to be winter heating load. At this time, this load is assumed to be resistive heating. Thus, there may be some opportunity for controlling heating load or switching to a different fuel to alleviate the peak demand. Efficiency measures may reduce demand for heat. Advantages: May be implemented relatively quickly and at relatively low cost on the demand side. Disadvantages: Does not provide much extra capacity for the growth that GZE anticipates. Therefore, could be a short-term solution.

The DistCo analysis recommended adding 22kV feeders and converting some of the load served at 6kV to 22kV. The details of the particular solution of the test case are not as important as the overall results:

- GZE and its largest power region subsidiary (Katowice) have adopted the IRP methodology, are using it to examine supply, distribution and end-use options for system reinforcement, and have explicitly included quality of service in the evaluation through assessment of service reliability to the customers.

- GZE's Strategic Planning Department will use IRP in developing system plans and making recommendations to the Board. The Strategic Planning Department has begun to implement this methodology in all Power Regions.

- The load flow of DistCo has improved the distribution system engineering analysis capability of GZE and its Power Regions.

2.2 Energy Efficiency and Customer Energy Services Activities for Power Distributors

Our goal was to have GZE initiate customer energy activities in an environment where:

- As a power reseller, GZE earns revenues and makes profits on the kWh it sells,

- The Ministry of Economy has instructed GZE to increase its electricity sales to stimulate demand for coal,

- Current wholesale power tariffs (paid by GZE to PSE) offer no financial incentive for GZE to change the magnitude or timing of customers' energy use, and

- GZE could find no overloaded areas in its distribution system that could benefit from load management.

Obviously, at the beginning GZE management was not enthusiastic about energy efficiency activities! However, we identified reasons for GZE to promote energy efficiency that were consistent with its long-term goals:

- Help industrial customers be more competitive, so they stay in business and increase production. This results in a healthier regional economy and, ultimately, more energy sales.

- Promote energy-efficient electric technologies that can supplant more polluting coal- or oil-based technologies, thus increasing GZE's sales.

- Helping the customers encourages them to pay their utility bills quicker and to look to GZE as a potential partner for future energy-related projects (e.g., municipalities may be more willing to discuss replacement of coal boilers with heat pumps, instead of just installing gas boilers).

- As GZE seeks to increase its tariffs, energy efficiency measures can help keep customers' total energy costs level, thus softening their opposition to tariff increases.

- Energy services projects with industrial customers can open the door to the customers' including GZE as a partner in future co-generation projects.

- Energy efficiency reduces pollution; GZE employees benefit from this, too.

- Energy services activities can provide additional work for GZE personnel and additional profits for GZE. For example, the profits from providing high efficiency street lighting can more than make up for those lost from reduced energy sales.

Under a previous USAID contract, we had helped GZE implement energy efficiency projects at a wire manufacturer (FdG) and a carbon electrode manufacturer (ZEW). The FdG project helped the manufacturer stay in business; the City of Gliwice was about to close it due to the high pollution of the previous manufacturing process. FdG also realized significant cost savings, and they have invested in several other energy efficiency measures. During the present USAID project, GZE hosted a seminar (to which USAID was invited) to describe the FdG project, and as a result of news coverage, many of their customers called to ask about energy services work. GZE held a follow-up workshop with 14 of their large customers, where they discussed future joint energy efficiency and co-generation projects. (This project is the winner of the Association of Energy Engineers' 2000 Environmental Project of the Year Award.)

ZEW was working to overcome some initial technical difficulties with the US products installed when the floods of the summer of 1997 resulted in an explosion and fire at the factory. ZEW had to rebuild almost the entire pitch transport system, and because of the energy efficiency demonstration they chose to replace the previous coke-fired steam system with an electric pipe tracing system. They worked extensively with GZE staff to design and implement this; the result is a cleaner installation and better quality control of the manufacturing process. For GZE, it also represents a significant increase in their electricity sales to ZEW while reducing ZEW's overall costs.

These demand-side management (DSM) projects demonstrated real benefits for GZE and its customers, and they also showed the importance of rigorous contract agreements and monitoring and verification procedures for resulting savings. GZE established a "power trade" subsidiary company, OBROT, which is working with customers and individual GZE power regions to identify, promote, and implement energy efficiency projects.

In the present USAID contract, our original plan was to have GZE develop additional industrial energy efficiency projects. Several such projects were designed, and financing was located, but they were delayed for various reasons. POCH chemical factory wanted to delay their project because sales were down initially in 1998, and they wanted to see if they would rebound. (POCH is going ahead with the project designed, but the delay made it too late for inclusion in these USAID activities.) ZAMET foundry agreed to a project, but their parent company, in Warsaw, did not give approval to the local management. (ZAMET also changed its mind and decided to implement the proposed project, but that decision was too late for it to be included in the USAID activity.) Huta Lazicka steel works developed a business plan for major energy efficiency and quality control investments, but the mill was sold, and the planned renovations were also delayed. In fact, these delays are a reality, in any country, for planned industrial investments. What is significant is that after initial assistance from GZE, and despite some second-guessing by the customers, all three companies are still proceeding with the suggested projects. GZE is committed to implement an industrial DSM and co-generation program, and they are continuing to work with these customers (POCH, Zamet, etc.) as well as several others. These projects will be supported by GZE without USAID financial assistance.

In order to achieve our USAID program targets by the close of the assistance project (December 1999), and to make sure GZE had established a viable mechanism and organisation to support DSM, in late spring 1999 we selected alternative DSM projects that could be implemented quickly:

- City of Zabrze – street lighting
- Town of Gieraltowice – street lighting and thermorenovation
- Town of Rudziniec – street lighting

The first such project, a high efficiency street lighting project in Zabrze, was supported by GZE's power region office in Zabrze. A staged implementation is planned, resulting in the installation of high-efficiency lighting throughout the town. We contributed to the first stage, which was completed in summer 1999.

The second project, in Gieraltowice, was really two projects: street lighting and weatherization of a historic city-owned castle. Replacement of lights in one area and thermal renovation of the castle were completed in October, 1999. Gieraltowice plans to work with GZE to replace additional street lights in 2000.

The third project, in Rudziniec, installed high-efficiency street lighting in two villages. This is also the first step of a larger project planned by GZE, which will include street lighting and also decorative lighting to highlight some of the old (15^{th} – 17^{th} century) wooden churches in the area and to install security systems and fire alarms in the churches. The initial phase of Rudziniec was small ($10,000), but it is a project that was identified, designed, and supported totally by GZE (i.e., it is modelled after the projects we helped GZE with, but it was done entirely by GZE staff).

GZE's objectives in this and the other DSM projects are:

- Improve relationships with customers, including local municipalities
- Develop procedures for identifying and designing DSM projects
- Prepare contracts for performance contracting and other DSM programs
- Develop measurement and verification procedures for repayment of DSM investments
- Improve the customer contact and recruitment procedures to be followed by the Customer Energy Services Department
- Develop co-generation and independent power production opportunities
- Reduce line losses and distribution overloads
- Introduce efficient electrical technologies to replace processes using other fuels
- Develop a profitable business for GZE and earn a return on energy efficiency services
- Improve the local economy

While lighting efficiency projects can reduce GZE's revenues, the nighttime tariff is not very profitable. GZE feels it is more beneficial to obtain the municipality's goodwill and encourage prompt payments. GZE is also using the municipal street lighting projects as an entry to sell decorative lighting services (the fixtures and the energy) to improve the appearance, and the tourist draw, of historic buildings in Silesia (the Gliwice radio tower, historic wooden churches, other churches and public buildings, etc.). Longer range, GZE feels it can make a profit from the energy services work. These three projects demonstrated the feasibility of this, including benchmarking the true costs of implementing a shared savings project.

In a closing seminar (December 1999) on energy efficiency projects, almost all municipalities recounted overcoming opposition by the local utility as a major obstacle to street lighting modernization. GZE staff were in attendance and explained that they, unlike most utilities, were actively supporting such energy efficiency activities.

2.2.1 Modernisation of the Street Lighting System in Zabrze.

Zabrze's street lighting system consists of 9560 points, of which 2092 had already been replaced by the City using high-efficiency (70W, 150W and 250W) lights. The remainder of the lighting consisted of fittings over 10 years old, using mainly 400W and 250W mercury bulbs. The installed power of the total Zabrze street lighting system is 2.2 MW. The Zabrze Power Region of GZE has already installed a sophisticated controller to schedule the lights.

Each year, the City replaces about 200 lighting points, using its own funds. The USAID/GZE DSM project helped mobilize external financing sources to allow Zabrze to complete the renovations quicker. The USAID DSM demonstration project consisted of the modernisation of the lighting system in 3 Maja Street and adjacent Jordana Street.

In 3 Maja Street, there were 122 very old lighting pylons on both sides of the street. These pylons use 250W (92 pylons) and 400w (30 pylons) mercury bulbs. The pylons and fittings were replaced with 61 modern lights, each using 250W sodium bulbs. The result is a 56% energy savings. The pylons on 3 Maja Street were in disrepair and were scheduled to be replaced. By using high efficiency lights, Zabrze could purchase fewer new pylons, resulting in a significant capital savings. Maintenance costs for the old structures are high; the modernisation will reduce those expenses, too.

In Jordana Street, 59 lights and fittings using 400W bulbs were replaced with new fittings and 250W high efficiency bulbs.

The work in these two streets is the first phase of a comprehensive modernisation of the lighting system in Zabrze using external financing. The 3 Maja and Jordana Street projects completed in 1999 involved investment of about USD 100,000. The USAID grant was 30% of this (USD 30,000). The entire project is about USD 1,200,000. (Most of this will be implemented over the next 3 years.) In this report, only the initial USAID-assisted part is described.

Municipal funds were used for some of the project, but the majority of the financing came from bank loans that GZE has helped to arrange. GZE helped to finance the remainder of the project, together with commercial loans, and GZE will be repaid from a share of the savings.

The GZE Power Region Zabrze prepared materials for the tender for the modernisation of the lighting system in 3 Maja and Jordana Streets. The materials were passed to the municipal government on June 15. The project implementation began just after signing the Agreement (July 1) and finished in September.

Number of lamps replaced	181 lights become 120
Power before modernisation	58.6 kW
Power after modernisation	30 kW
Savings per year – kWh (%)	115,916 kWh
Energy savings per year (PLN)	22,101
Annual maintenance savings (PLN)	3,500

Capital savings (PLN)		295,000	
Cost (PLN)		370,000	

Operating hours (hours/year):	day: 1389	night: 2664	total: 4053
Electricity prices (PLN/kWh):	day: 0.3053	night: 0.1309	

Emissions Reductions (kg/year):

SO_2	1050
CO_2	89226
CO	1155
NO_x	420
Dust	5248

2.2.2 Modernisation of the Street Lighting in Rudziniec

The project consisted of replacing old mercury lamps with high efficiency sodium lamps in 2 villages of the local administrative unit Rudziniec. This pilot project was implemented in the late summer and fall of 1999. It consists of replacement of 66 lamps, with an energy savings of 40,125 kWh/year (40%). (400W lamps replaced with 250W lamps)

The project in Rudziniec was developed entirely by GZE staff, and is the first step in a planned modernization of lighting for communes throughout the region. The total project is about six times the size of the pilot DSM project. The USAID contribution for the pilot project is 18,000 PLN, or 50% of the cost. Rudziniec provided the remainder of the funds. For the entire project, GZE will provide at least 50% of the funding through a performance contract, to be repaid from resulting savings. The GZE Power Region Pyskowice will be the ESCo. GZE is also working with the communes to install high efficiency decorative lighting on several of the historic wooden churches (15^{th} to 17^{th} Century) in the area. This will preserve GZE's energy sales without, it is hoped, markedly increasing the communes' energy costs (compared to the present lighting system using the mercury lamps).

Number of lamps replaced		66	
Connected load – before (kW)		26.4	
Connected load – after (kW)		16.5	
Savings per year – kWh (%)		40,125 (37.5%)	
Savings per year (PLN)		7650	
Cost (PLN)		36,134	
Operating hours (hours/year):	day: 1389	night: 2664	total: 4053
Electricity prices (PLN/kWh):	day: 0.3053	night: 0.1309	

Simple payback time is 4.7 years. USAID contribution is USD $5,000 (about 50%).

Ecological reductions are (kg/year):

Dust	770.07
SO_2	154.014
CO_2	13,091.19
CO	169.42
NOx	61.61

2.2.3 Street Lighting Modernisation and Thermorenovation in Gieraltowice

The USAID DSM demonstration project that was completed in 1999 consisted of modernisation of 164 street lights in Gieraltowice and the thermorenovation of the Przyszowice Castle. In addition, the GZE Power Region in Gliwice helped finance the replacement of an additional 20 lights.

The lighting modernisation is a combination of 1) replacing mercury bulbs with high efficiency sodium bulbs of lower wattage, and 2) in areas where it is now too dark, bringing the lighting level up to the European Union norms by replacing mercury bulbs with sodium ones of similar wattage, instead of adding a second light fixture (and bulb) to the existing pylon. The project can be summarized as:

- Replacing 6x400W mercury bulbs with 6x250W sodium bulbs
- Replacing 83x250W mercury bulbs with 83x150W sodium bulbs
- Replacing 74x125W mercury bulbs with 74x150W sodium bulbs, instead of adding another 74x125W mercury bulbs
- Replacing 1x150W mercury bulb with a 150W sodium bulb, instead of adding a second 125W mercury bulb

	Current State	Proposed Modernization	Conventional Alternative
Number of lamps			
400W	6	0	6
250W	83	6	83
150W	1	158	1
125W	74	0	149
Power (kW)	32.556	25.2	41.931
Energy use (kWh)	131,949	102,136	169,946
Energy cost per year (PLN)	25,159	19,474	32,403
Investment cost (PLN)	-	95,609	36,580

The street lighting modernization will result in savings of 29,813 kWh/year (23%) compared to the present system. This results in a cost savings of 5,685 PLN/year. The investment costs are 95,609 PLN. However, compared to the work that is needed to bring the lighting system up to standard using conventional technology, the high efficiency lighting saves 67,810 kWh/year (40%) and 12,929 PLN/year from a net capital investment (high efficiency vs. conventional) of 59,029 PLN.

The thermorenovation consisted of weatherization and some roof insulation in the Przyszowice Castle. The work was performed by the SME firm Negawat. (Negawat also did some weatherization work in the Children's Rehabilitation and Adaptation Clinic in Gliwice, to train the technicians. This was done in cooperation with a municipal energy efficiency initiative sponsored by USAID/OAR-Poland, implemented with Energie Cites Poland.) The energy audit of the Castle estimated energy savings of 222 GJ/year (19%) and 40.4 kW (17.8%) in heat demand reduction. This results in a savings of 26,300 PLN/year (40%). The cost of the work is 120,050 PLN (USD$ 30,000).

The USAID contribution for the total project (heating and lighting) was about USD$ 27,000 (50%). The City provided the other USD$ 27,000 from its own funds. However, if you include the cost of the additional 20 lights that GZE renovated (outside of the USAID "financing"), the total project cost was $56,800, with the USAID share of $27,000 amounting to 47.5%.

GZE is particularly interested in the thermorenovation work because they wish to encourage implementation of ground source heat pumps. To be most effective, such heating technologies should be installed in buildings with adequate thermal envelopes. (Themorenovation is also required for the total project to be eligible for financing under Poland's Thermomodernisation Law.) GZE is preparing the designs and energy analysis for a heat pump addition to the Castle; this project will be implemented in the year 2000, without any USAID funding.

Ecological savings are: (metric tons/year)	Heat Project	Light Project	Total
CO_2:	35.59	25.320	60.91
SO_2:	0.178	0.298	0.48
Dust:	1.225	1.489	2.71
CO	0.196	0.328	0.52
NOx	0.071	0.119	0.19

2.3 Results and Information Dissemination – Power Distribution Utilities

GZE and ZET are in the first group of power distribution utilities to be privatized; that is scheduled for 2000. The management of both utilities credit USAID technical assistance with helping significantly to modernize their utilities. ZET is using the Energy 2020 load forecast as the basis for their planning. GZE has adopted Energy 2020 also, and ZET has helped them in implementing the program and developing a base load forecast. The Strategic Planning Department of GZE is also using DistCo for IRP evaluation of planning alternatives, and their distribution engineers are using DistCo's load flow capabilities for technical evaluation and loss assessment of their networks.

Perhaps the most visible contribution, however, is in energy efficiency. This project's objective, and challenge, was to change people's perspectives. The technical side of energy efficiency is well understood, but how can you get people and companies motivated to save energy and reduce pollution? The original projects, at the wire plant (FdG) and the carbon electrode factory (ZEW) were done despite the fact that no Polish power distribution utility had ever promoted such DSM projects and when there were no obvious monetary incentives for GZE to implement them. GZE management had the vision to institute an energy efficiency program for longer term benefits, and the results of the program have convinced them they made the right decision.

GZE has made promotion of customer energy efficiency an integral part of its corporate policy. The GZE subsidiary OBROT (Power Trading Company) is actively designing and implementing customer energy services projects, in cooperation with GZE's power regions. GZE, through OBROT, is establishing an Energy Services Company (ESCo) for this purpose, and has been negotiating with American ESCos to help in the design, financing, and implementation of energy efficiency projects. In this, GZE distinguishes itself from most of the other 33 Polish distribution utilities; however, ZET has also reversed its earlier position on DSM and is investigating energy efficiency initiatives as a way to attract or retain customers. In this area, GZE is providing some assistance to ZET, and GZE staff have made presentations on their DSM programs to meetings of the Association of Polish Distribution Utilities.

GZE's President, Piotr Kukurba, has been anxious to expose his staff to modern utility practices. He felt an initial trip he made to the US in 1995 (sponsored by USAID) was invaluable in helping him learn how to manage a modern electric utility, and he wanted his staff to have the same advantage. He has co-funded visits of GZE staff to the US (meeting with Central Maine Power, Nashville Electric Services, Potomac Electric Power, Baltimore Gas and Electric, and Southern California Edison) and 2 visits of NES staff to GZE.

In November 1999, GZE and ZET hosted an information dissemination seminar where they, together with representatives from Nashville Electric, CNEX and Electrotek, presented the results of the USAID work. Staff from five power distribution companies attended, presentations papers and reference materials were prepared in Polish, and the seminar was reported in the Polish press and radio. GZE and ZET will continue to work with other utilities directly and through the Polish Association of Power Distribution Utilities to transfer the information and experiences developed through the USAID project.

GZE staff have already made presentations on their energy efficiency activities to the Polish Association of Power Distribution Utilities, to the ENEF '98 energy efficiency conference in Slovakia, and to an AEE regional conference in Hungary.

GZE has also initiated a training and personnel exchange program with the Lviv Power Distribution Utility (Lvivoblenergo) in Ukraine. This cooperation, funded initially by GZE and more recently supplemented with a small USAID Ecolinks grant, has covered all aspects of utility finances and accounting, planning, operations, maintenance, information systems, and energy efficiency.

2.4 Assistance to Heat Companies for Tariff Design and Submissions to URE

In January 1999 the Energy Regulatory Agency (URE) was given authority to approve tariffs of heat companies. The regulations were ambiguous; URE would support recovery of "justified costs," but there was no definition of what constituted a "justified cost." USAID wanted to provide technical assistance to Poland's heat utilities to enable them to prepare tariff submissions that were acceptable to URE in format, level of detail, quality of calculations, etc. Whether URE actually approved the requested tariff level would be a decision for URE; we wanted to make sure that the utilities could provide enough reliable information to URE to enable URE to evaluate their requests.

The scope of this activity was to work with three heat companies to help them prepare tariff submissions for URE, and then inform other heat companies about techniques, data, procedures, etc. that were found to be useful in this process. The Association of Heat Companies of Northern Poland (RECOP) is an active group of over 50 companies of various sizes that cooperate to exchange technical data and develop common accounting and data collection practices. We reached agreement with three RECOP heat utilities – Malbork, Koscierzyna, and Bytow – to participate in this technical assistance project, and to help disseminate the results to other Polish heat companies.

The full names of the Polish partners are:

- Zaklad Energetyki Cieplnej "KOSPEC" Sp. z o.o. in Koscierzyna (KOSPEC)
- Przedsiebiorstwo Energetyki Cieplnej w Malborku Sp. z o.o. in Malbork (MPEC)
- Przedsiebiorstwo Energetyki Cieplnej Sp. z o.o. in Bytow (BPEC)
- Rada Energetyki Cieplnej Okregu Polnocnego (RECOP).

The work in Poland was coordinated and led by NAPE. Polish and foreign experts (from Trigen Energy Corp. and from CNEX) worked with the three heat companies to show them various techniques for cost allocation, load forecasting, tariff design, and financial management. We reviewed the requirements of the Energy Law and discussed ways that URE and the utilities could work together to arrive at mutually acceptable tariffs. We reviewed the companies' proposed tariff submissions to URE, and offered suggestions to make those submissions more responsive to URE's format and data requests. The CNEX strategic corporate financial model was adapted to be relevant to Polish heat companies, and this was given to the three utilities. The format for this technical assistance was a series of workshops, first with the three companies together, and then several sessions with each company individually.

The main dissemination of results was a seminar organized exclusively for the members of the RECOP (80 participants). The project was also described to the Country-Wide District Heating Conference (400 participants). For the RECOP seminar, the Polish and American presenters prepared reference materials in a "workbook" format. This was translated into Polish, given to the RECOP members and the regional URE office, and also made available to other Polish heat companies, by request. Some of these materials are being incorporated by the Polish partners into a book on tariff structure and cost allocation.

Of the 3 heat companies, Bytow's tariff was accepted in September 1999. Malbork completed all work for the new application, but under URE's guidelines, new investments are not recognized as "justified costs." Since Malbork's investments were low in 1998, they would not be able to cover their 1999 investments if they submitted a tariff in keeping with URE's guidelines; they are in the middle of a very large investment program now. They decided to delay submission of the new tariff until 2000, when they will be able to have the tariff include depreciation of the 1999 investments. Malbork felt the USAID project has helped tremendously; for example, NAPE and its consultants have revised and modernized their cost accounting system as part of the assistance.

Koscierzynia submitted its tariff twice in 1999, and both times it was refused because URE felt KOSPEC's heat losses were too high for their service to single family buildings. As the project ended, they are still debating this with URE; the URE representative had no technical background, and similar loss numbers have been accepted by URE staff in the Gdansk regional office for other heat companies. KOSPEC felt it could "live with" the present tariffs for the next six months and will delay submitting a new tariff application until then. However, this has documented the problem of inconsistency in evaluation procedures among URE regional offices, and NAPE is working with URE's central office to try to develop more uniform definitions and guidelines.

Wieslaw Matysek (President of RECOP) and the RECOP companies were enthusiastic in their feedback to NAPE about the tariff seminar. They felt the presentations were very impressive (especially that of Trigen), and the written materials will be useful.

3. ACTIVITIES WITH BUSINESS SUPPORT ORGANIZATIONS, SMALL BUSINESSES, UNIVERSITIES, LOCAL GOVERNMENTS

These activities focused on the non-utility aspects of the energy sector. This included training and capacity building, demonstration projects, and generally providing support to companies interested in providing energy efficiency services. The activities covered:

- Enhancing energy-related courses in technical universities
- Providing assistance to businesses and local governments wishing to reduce energy costs
- Providing assistance to companies (especially small and medium enterprises) wishing to provide energy efficiency services
- Facilitating negotiations between Energy Service Providers (e.g., ESCos), their customers, and financial institutions

Targets for these activities included establishing or supporting Business Support Organizations (BSO), establishing or assisting SMEs, and implementing energy efficiency projects.

3.1 Energy Audit Training - NAPE

NAPE is a Business Support Organization (BSO), providing assistance and training to all sectors of the Polish economy. They have been providing energy audit training and certification in Poland for several years. Certification from NAPE that the auditor had passed the course was necessary for energy audits to qualify for a variety of Polish government financing options. NAPE developed, and sells, a software program, Energy Auditor, that provides the methodology and format for presenting and evaluating energy audits and energy efficiency alternatives.

The USAID assistance was designed to upgrade and update NAPE's energy audit courses and publications to cover:

- New technologies
- Performance contracting and ESCos
- New project structures responsive to the changes in Poland's economy and energy sector
- New financing sources, especially including Poland's Thermomodernisation Law

A series of audit courses was prepared, both to train "new" energy auditors and to "upgrade" or re-certify people who had previously taken NAPE's audit courses. In 1999 especially the courses were upgraded to conform to the requirements of the Thermomodernisation Law. Auditors previously trained within the standard courses participated in 9 supplementary one-day courses on "New Regulations Concerning the Thermomodernisation Law". Some manufacturers and vendors of thermomodernisation equipment and technologies (such as wall insulation) ordered special one-day courses on "Basic Knowledge On Thermomodernisation Issues". NAPE also organized a one-day course for bank officers dealing with applications for the thermomodernisation "bonus" under the new Law.

In 2000 NAPE plans to continue the standard energy audit courses and add additional courses depending on the market demand. They have remodelled their offices to provide a modern, computerized training facility.

Below is the full list of courses given by NAPE under this contract. The initial ones (1997, early 1998) were supported by USAID. The later ones were provided on a commercial basis by NAPE:

1997

Course	Date	Number of participants
Primary course for energy auditors	24-28.02 and 19-21.03.1997	34
Supplementary course for energy auditors – how to set up and successfully conduct an Energy Service Company (ESCo)	3-4.03.1997	31
Primary course for energy auditors expanded to cover ESCOs	7-11 and 23-25.04.1997	25
Primary course for energy auditors	16-23.05 and 4-6.06.1997	32
Primary course for energy auditors	22-26.09 and 22-24.10.1997	24
Supplementary course for energy auditors – how to set up and successfully conduct an Energy Service Company	20-21.10.1997	30
Supplementary course for energy auditors concerning new regulations	6-7 and 27-28.10.97	10

1998

Course for energy industry auditors	10-14.01.98 part I	26
Course for energy industry auditors	28.02.98 part II	26
Energy management in local communes	2-3.03.98	25
Course for energy auditors	23-27.03.98 part I	32
Course for energy auditors	22-24.04.98 part II	32
Course for energy industry auditors	4-8.05.98 part I	23
Course for energy auditors	11-15.05.98 part I	37
Course for energy auditors	18-22.05.98 part I	33
Course for energy auditors.	3-5.06.98 part II	33
Course for energy industry auditors	15-17.06.98 part II	23
Course for energy auditors	18-20.06.98 part II	
Course for energy auditors	5-9.10.98 part I	27
Course for energy auditors	19-23.10.98 part I	29
Polish Army Personnel energy auditors' course	26-30.10.98	24
Energy Course for Army Technical Staff.	26-30.10.98	20

1999

Course	Date	Number of participants
Primary course for energy auditors	18-22.01.99 and 22-24.02.99	31
Primary course for energy auditors	25-29.01.99 and 17-19.03.99	19
Primary course for energy auditors	22-26.03.99 and 21-23.04.99	31
Primary course for energy auditors	10-14.05.99 and 14-16.06.99	31
Supplementary course on new regulations	20.05.99	30
Supplementary course on new regulations	21.05.99	30
Primary course for energy auditors	24-28.05.99 and 23-25.06.99	24
Supplementary course on new regulations	7.06.99	32
Supplementary course on new regulations	8.06.99	31
Supplementary course on new regulations	9.06.99	30
Supplementary course on new regulations	17.06.99	21

Supplementary course on new regulations	18.06.99	32
Basic knowledge on thermomodernisation for Atlas	5.08.99	25
Basic knowledge on thermomodernisation for PHSC	26.08.99	16
Thermomodernisation issues for Banks	30.08.99	37
Supplementary course on new regulations	7.09.99	27
Supplementary course on new regulations	23.09.99	27
Primary course for energy auditors	27.09-1.10.99 & 25-7.10.99	20
Primary course for energy auditors	15-19.11.99 & 13-15.12.99	18

3.2 Other BSO Activities - NAPE

In addition to its energy audit training and other seminars, NAPE's BSO activities included:

- Publications about energy efficiency, directed to businesses providing energy services or organizations looking for ways to reduce their energy costs.
- Establishing a web site and Internet Secretariat for businesses to ask questions and obtain information about energy efficiency technologies, procedures, financing, energy audits, consultants, etc.
- Assisting the State Energy Conservation Agency (KAPE) to establish an energy efficiency project information data base. Providing assistance to KAPE and the Ministry of Economy in developing secondary legislation for the Thermomodernisation Law.
- Helping Warsaw University of Technology (PW) to enhance its energy-related courses and pedagogical methods.

3.2.1 Publications

NAPE prepared the following publications, partly supported with USAID funds:

"Energy Conservation Bulletin" is published quarterly. The bulletin contains discussion on actual problems of energy conservation and is disseminated to 2,000 firms and companies as a supplement to "Energy and Fuel Economy".

"Energy Auditing in Industry" has been prepared and will be published in February 2000.

These publications helped shape the climate for establishment of ESCO companies. NAPE assisted in creating the company FINESCO that started operation in November 1999. FINESCO, with capital of about USD$10 million, is the strongest financially among all companies of this type in Poland and offers services for all types of clients: public sector, industry, and utilities.

3.2.2 Internet Secretariat

NAPE has established (under the USAID contract) an Internet "Secretariat" to provide advice and answer questions from energy auditors, energy services providers (ESCOs), and other organizations with questions about energy use or energy efficiency. At first, this concentrated on dissemination of information about energy auditing and training. NAPE has now established a service for auditors to ask questions or request specific energy-related information. This mainly addresses problems that arise in the course of the daily work of the auditors.

NAPE offers this mostly to individuals who have taken their training courses, but it is being expanded to function as a network or "bulletin board" for energy services companies, equipment and materials vendors, and customers. NAPE is also augmenting the Secretariat to provide distance learning training. They have been working with AEE, ASHRAE, and the Green Buildings Initiative to provide information and reference materials, via the Internet, to interested Polish organizations and individuals.

3.2.3 Assistance to KAPE

From 1997 – 1999 NAPE assisted KAPE while the Thermomodernisation Law was being established. This included development of energy audit requirements, financial evaluation procedures, and project monitoring and verification guidelines for projects funded under this Law. USAID assistance was especially targeted to design the software platform and remotely accessible project data base to support the Thermomodernisation Law. The USAID funds (approximately $25,000) enabled KAPE to develop a system specification; the EU Phare program then contributed over 200,000 Euros to implement the system specified using USAID funds. The data base system makes possible the verification of energy audits, prioritization of proposed projects for funding, and collection of the data about the actual progress (monitoring) of the projects. The table below shows the number of projects submitted for the Thermomodernisation bonus, and supported by the KAPE data base as of 10 January 2000.

Number of applications (total)	148
- positive	78
- negative	49
- undergoing review and verification	11
- refused	9
Type of projects submitted	
- single family houses	77%
- multi family houses	20%
- local heat sources	3%

Value of projects submitted	12 676 828 PLN
Value of credits	8 636 988 PLN
Value of bonus	1 153 598 PLN

3.2.4 Support to Warsaw University of Technology (PW)

NAPE worked with the Warsaw University of Technology (PW) in this USAID project through two organizational structures of PW:

- Faculty of Environmental Engineering
- Research Center for Power and Environmental Protection.

NAPE had suggested to PW for several years that some of their energy courses needed to be updated. In January 1997 NAPE signed an agreement with the Faculty of Environmental Engineering at PW represented by Prof. Stanislaw Mankowski, the Dean of the Faculty and Prof. Robert Rabjasz, the head of the post graduate course "District heating, heat and energy auditing" for cooperation in post graduate course organization.

NEPA organized a week of lectures related to energy services (e.g., ESCos) and new technologies (e.g., cogeneration). The first course took place in May 12-16, 1997 with lectures given by NAPE staff and Larry Markel. The reaction of the students was very positive, and Prof. Mankowski agreed to make the additional materials a permanent part of the course curriculum. Expanded lectures were given during this course in 1998 and 1999. The NAPE-PW cooperation will continue, with enhancements to additional courses planned for the future.

Warsaw University of Technology was also one of 4 Polish technical universities to take part in a task carried out by the University of Tennessee/Alliance of Universities for Democracy (UT/AUDEM), "Technical Training and Municipal/NGO/University Networking for Energy Efficiency/Environmental Management in Poland". This is described in Section 3.4.

3.3 Seminars on "Financing Energy Efficiency Projects"

FEWE-Krakow and the Polish Network Energie Cites (PNEC) conducted a series of training seminars for representatives from SMEs, local governments, heat distribution companies, ESCos, housing estates, environmental agencies, banks, and other financial institutions. These seminars were typically 2 to 3 days and were held at various cities around Poland, in member cities of PNEC and/or the USAID Local Government Partnership Program. Over 400 people attended these seminars, in addition to the lecturers. Typical seminars included:

- Introduction of energy efficiency techniques
- Presentations by experts in lighting and thermorenovation from FEWE-Krakow or PNEC
- Presentations by local heat company representatives
- Project structures, including performance contracting and ESCos
- Presentations by financial institutions, followed by interactive meetings in small groups
- Case studies – projects already completed or underway
- Practical demonstration of thermorenovation techniques

The seminars included much interaction with the attendees and extended question and answer sessions. Written reference materials and copies of the presentations were given to all participants. Seminar attendees frequently contacted FEWE-Krakow and PNEC afterwards to obtain more information, ask questions, request assistance applying for financing, etc. In its role as a BSO, FEWE followed up with these requests. PNEC also published a quarterly newsletter describing energy and environmental programs, specific technologies, sources of financial assistance, updates on new laws, etc.

As a result of the FEWE/PNEC seminars, several cities decided to establish ESCos or develop projects through ESCos. The demonstration projects in Trzcianka, Chelmno and Bierun (described in section 3.5) were direct results of these seminars.

The ESCo PilBut, established along the guidelines presented in a seminar, implemented the street lighting efficiency project in Trzcianka. PilBut has since implemented over five large efficiency projects. (PNEC conducted the initial technical review of Trzcianka's requests for bids, and PilBut's proposal, at no cost to the USAID contract.)

Chelmno established EnerTech, an ESCo whose stock is owned by the city and its residents. After completion of the demonstration project in a school, Chelmno has assigned several other projects to EnerTech for implementation.

Bierun established a foundation, BFiG, which, as an ESCo, has undertaken an ambitious conversion of all the city's buildings from local coal-fired boilers to natural gas. Together with the fuel conversion, BfiG has commenced thermal renovations of all the buildings, so the resulting cost of energy (gas is more expensive than coal) is not excessively higher than it was before the conversions.

	DATE	PARTICIPANTS	PLACE
1	27.11-29.11.96	SMEs, local communities	Lubliniec-Kokotek
2	9.12-13.12.96	SMEs	Czchów
3	6.02-7.02.97	PNEC, local communities, hospitals, inhabitants co-operative societies, schools	Nowy Sacz
4	26.02-28.02.97	SMEs	Bielsko-Biala
5	12.03-14.03.97	SMEs	Lubin
6	3.04-4.04.97	PNEC, local communities, hospitals, inhabitants co-operative societies, schools	Kutno
7	21.05-23.05.97	SMEs	Ziebice (Otmuchów)

8	5.06-6.06.97	PNEC, local communities, hospitals inhabitants, co-operative societies, schools	Rybnik
9	19.06-20.06.97	PNEC, local communities, hospitals inhabitants, co-operative societies, schools	Kraków
10	8.10-10.10.97	SMEs	Sandomierz
11	28.05-30.05.98	PNEC, SMEs, Ukrainian cities	Brzozow

In addition to Poles, people from Ukraine, Lithuania, Slovak Republic, and Czech Republic attended various seminars. The problems, and solutions, of the Poles were seen to be relevant region-wide. At the final seminar in Brzozow representatives (mostly mayors and deputy mayors) from 33 Ukrainian cities attended. The Ukrainians were impressed by the accomplishments of PNEC and, with help from the Poles, have established a "Municipal Network of Energy Saving Communities" in Western Ukraine. There has been continued cooperation between the Polish and Ukrainian municipal networks, with several visits between the two. Also, PNEC has worked with the Ukrainians, the Alliance to Save Energy (Ukraine office) and the West Ukrainian Municipal Network to develop energy efficiency projects in Ukraine. (USAID has also given this cooperative effort a small grant through Ecolinks.)

3.4 Assistance to Universities

Another activity was to work with Polish technical universities to strengthen their curricula in energy efficiency and environmental protection. This activity was titled "Technical Training and Municipal/NGO/University Networking for Energy Efficiency/Environmental Management in Poland". A major goal was to introduce improved pedagogical techniques, such as use of case studies and interactive exercises and lecture formats. In the US, the Department of Energy has established Energy and Environmental Assessment Centers at 15 universities. These centers use students, well-supervised by experienced university faculty, to conduct quick assessments of local businesses at no charge. A similar activity in the Czech Republic a year earlier had been very successful; Czech Technical University in Prague established an Assessment Center, and Czech Tech and two other technical universities (Liberec and Ostrava) made major additions to their curricula and pedagogical techniques.

This task was carried out by staff from the University of Tennessee (Central and East European Center, Department of Management, and Energy Assessment Center), the Alliance of Universities for Democracy (an organization of over 110 US, British and Central and East European Universities), and Prof. Karel Kabele of Czech Technical University. The project was "kicked off" at the 1997 AUDEM annual meeting in Warsaw and the results were announced at the 1998 annual meeting in Nitra, Slovak Republic.

Four Polish technical universities were involved: Warsaw University of Technology (PW), Silesian University of Technology (PS), Krakow Academy of Mining and Metallurgy (AGH), and Krakow Polytechnic University (PK)

This activity consisted of 4 phases:

- Introductory meetings with Polish universities at AUDEM annual meeting. The program was explained and a schedule agreed to. Each Polish university discussed its problems and goals, and the project team prioritized the subjects to be covered in subsequent workshops. After the AUDEM meeting the UT/AUDEM team visited each Polish university to explain the program to a group of about 12 – 20 faculty.
- A week-long workshop was held in Krakow in February 1998 to present environmental and energy efficiency technologies and course pedagogy. The methodology for the Assessment Center Audits was also taught. Each Polish university sent 7 to 8 faculty to this workshop.
- Three faculty from each university visited Tennessee in July 1998 for 2 weeks. They visited local governments, various businesses, NGOs and environmental centers, and classes at UT.
- In September 1998 the UT team returned to Poland and assisted a team from each Polish university to conduct Energy and Environmental Assessments at 3 Polish businesses (Hortex fruit processor in Warsaw, Battery Recycling Plant in Silesia, and Krakow Cable Factory).

The assessment results and curriculum changes were presented to the AUDEM universities at their annual meeting in November 1998.

AGH has incorporated the materials in its Fuels and Energy Program and has established a chair in Energy Efficiency.

PK also improved their pedagogical techniques and course materials. They plan to establish an Assessment Center, and have conducted at least 3 energy/environmental audits since the USAID activity ended.

PS also established an Assessment Center. This was in early 2000, after this USAID contract ended, so the details were not known in time to be described in this report.

PW probably made the most immediate use of the materials. Six academic teachers from PW participated in the Energy Efficiency Environmental Management Workshop held in Krakow, February 13-18, 1998 and three of the teachers visited the University of Tennessee and several businesses, local governments, and NGOs for two weeks in July 1998.

As the result of the workshop, visit to the University of Tennessee and the materials collected during this collaboration, several new elements have been introduced to the curricula of PW. New course materials and new pedagogical techniques (especially use of interactive exercises and case studies, instead of straight lectures) have been introduced in the following courses:

- "Law and economics in environmental engineering- part I" (Jerzy Sowa)
- "Law and economics in environmental engineering- part II" (Aleksander Panek, Andrzej Wiszniewski)
- "Methods of energy effectiveness analysis" (Teresa Jędrzejewska-Scibak, Maciej Mijakowski)

- "Economics of municipal enterprises" (Aleksander Panek, Andrzej Wiszniewski)

Materials from TVA have been passed to the Institute of Land and Water Engineering (at the same Faculty of PW) and have been used for the preparation of some lectures in the course "Hydrotechnics and water reservoirs" (Andrzej Szamowski).

PW faculty decided that the best way to implement the idea of the Energy Assessment Center at Warsaw University of Technology was to invite the Research Center for Power and Environmental Protection to participate in this project. The Center, established on July 1, 1997 by the Rector of the Warsaw University of Technology, is an independent unit for interdisciplinary research, services, education and promotion in the field of power industry and environmental protection. The Deputy Director of the Center Krzysztof Wojdyga was one of the participants in all phases of the project carried out by the University of Tennessee. As the result of the project all procedures for assessment (including interviewing and data acquisition) have been adopted by the PW center and the Center's service offerings have been extended to offer assessments to SMEs. Pilot assessments have been carried out by several students as thesis projects. The problem of continuing financial support (the role of DOE in USA) has not been solved yet, but the Center has committed to continue to offer this type of service. The Rector is very supportive, as he feels this will help the center obtain new clients and will create really interesting part time jobs for students.

3.5 Demonstration projects

This project supported 5 energy efficiency projects implemented by small enterprise ESCos: PilBut, Enertech, BFiG, and ProEsco. The projects involved thermal renovation (schools and residences) and installation of efficient street lighting. The project descriptions have been reported to USAID in detail; the following table presents a summary of their scope and results. All the ESCos involved are continuing to implement additional projects.

3.6 Information Dissemination and Technology Transfer Seminars

Two seminars were held to disseminate the results of the USAID activities: one in Warsaw in June 1999 and one in Krakow/Lopuszna in December 1999.

3.6.1 Seminar "How to increase energy efficiency in Polish gminas" - Warsaw June 25, 1999

This seminar was organized by NAPE, with assistance from FEWE-Krakow. The scope of the seminar was:

- Presentation of the present legal situation in thermorenovation – the Thermomodernisation Act and its secondary legislation
- Presentation the financing rules of thermorenovation investments under the Act
- How to conduct energy audits

Company	Project description:	Projected amount [$]:	Cost share structure [$]:	Environmental effects[t/year]:	Annual energy savings and simple payback:	Schedule:
PilBut, private ESCo	modernization of street lighting in Trzcianka (Pila voivodship)	130,000 total $20,650 for 1998 (Phase I town only)	-USAID: 20,000 -City: 20,000 -Environmental: 90,000	*PHASE I:* -SO2: .664 -CO2: 56.4 -CO: .73 -NOx: 2.7 -part. *3.3* *TOTAL PROJECT:* -SO2: 4.4 -CO2: 372.6 -CO: 4.8 -NOx: 1.8 -part.: 21.9	*PHASE I:* 16.605 kW (47%) 66.4 MWH/yr $19,615/yr Payback 3.9 years *TOTAL PROJECT:* 109.6 kW 438 MWH/yr $35,000/yr	Phase I completed March/98
Enertech, municipal ESCo	school thermal modernization in Chelmno (Torun voivodship)	38,000	-USAID: 20,480 -EnerTech: 14,650 -Commercial banks:2,850	-SO2: 1 -CO2: 106 -CO: 2.86 -NOx: .5 -part.: 1.42	270 MWH/yr $ 9,250 (97/98 - the base year - was a mild winter; savings were understated) Payback 4.1 years	completed 9/98
ProEsco, private ESCo	modernization of street lighting in Stanislawow	106,000	-USAID: 10,000 -Commercial banks: 96,000	-SO2: 1.9 -CO2: 158 -NOx: 0.8 -part.: 9.5	48 kW 185 MWH/yr $21,000 Payback 4.9 years	completed 12/98
BFIG, municipal foundation and private ESCo	1st phase: 48 apartment buildings thermomodernizat ion and conversion to gas in Bierun Phase II 150 bldgs.	600,000	-USAID: 25,000 -City: 10,000+ for audits. Implementation phases will be financed by City, ESCos and commercial banks	-SO2: 13.5 -CO2: 25 -NOx: 3.8 -part.: 49.8 (phase I estimate)	Preliminary estimates from audits show approx. 5 year simple payback	Audits completed summer 1999. Implementa -tion commencin g in 2000
ProEsco, Private ESCo	Modernisation of street lighting in Poswietne	77,200	-USAID: 10,000 -Commercial banks: 57,200 -State budget: 10,000	SO2: 2 -CO2: 172 -part.: 10	50 kW 200 MWH/yr. $15,500 payback 5 years	Completed 11/99

- Bank criteria for thermorenovation credits
- ESCO activity on energy efficient enterprises
- Presentation of the thermorenovation projects financed by USAID

Session I: How to finance thermorenovation investments

Presentation of the seminar purpose
Financing rules for energy efficient investments
Scope of energy audit for households
Scope of energy audit for energy sources and networks
Example audit fulfilling the bank requirements to obtain a thermorenovation credit
Bank criteria for thermorenovation credits

Session II: Role of USAID in thermomodernisation investment development in Poland

Projects supporting SMEs
Low cost energy saving projects
Coal stove replacement by gas
Thermorenovation at school buildings
USAID Assistance for SMEs to establish auditing companies (ESCO)
Experience with ESCO activity in street-lighting
Summary

The seminar was attended by over 90 people, representing the Ministry of Interior, local governments (mayors, deputy mayors, housing authorities, heat departments, etc.), boards of household cooperatives, household owners, heat companies, financial institutions and other parties interested in thermorenovation. The attendees received information about the status of the Thermomodernisation Act and its Secondary Legislation (law and regulation, technical potential, audits) and about successful projects financed by USAID. Feedback to NAPE afterwards by the attendees was extremely positive.

3.6.2 Seminar "Municipal Energy Projects and Environmental Protection" – Krakow, December 6-8 1999

This seminar was hosted by Energored and PNEC, with assistance from NAPE. The opening session took place in Krakow. Opening presentations were given by:

- Zbigniew Leraczyk, Member of Parliament and President of PNEC
- Mark Toner, US Consulate
- Pawel Krzeczunowicz, USAID
- Zinowij Kurawskij, Consul General of Ukraine in Krakow

More technical and project-specific presentations followed:

- Lawrence Markel, Project Manager
- Adam Gula, AGH & FEWE
- Andrzej Czerwinski, President of Nowy Sacz
- Aleksander Panek, NAPE
- Lech Zak, PilBut and ZE Plock
- Jewgien Januszewicz and Swiatislaw Klucznik, mayors of Ukrainian cities

The next days' sessions were held in Lopuszna, covering:

- Examples of low-cost energy savings methods and demonstrations of thermal renovation techniques
- Presentations of projects of this USAID contract (Section 3.5), of other USAID-Poland contracts, and of other PNEC and LGPP cities
- Energy efficient lighting technologies
- Developing long-term investment plans for Polish cities
- Quality and environmental management in communes (i.e., local governments)
- Bank credit policies and financing sources (BISE Bank)

There was much discussion, some of it quite lively and controversial as SMEs, local governments, and financial institutions discussed shortcomings of present laws and financing policies. There were 75 attendees, including 3 Ukrainian mayors. As with the June seminar, feedback was extremely positive, and PNEC is continuing to develop and implement energy efficiency projects.

3.7 DCA Assistance

USAID has implemented the Development Credit Authority (DCA) program to promote financing of energy efficiency projects that reduce greenhouse gas emissions. The DCA program will provide partial loan guarantees to Polish financial institutions making loans to finance such projects. NAPE prepared a series of memoranda and assessments for USAID, which resulted in USAID's obtaining approval from the Office of Management and Budget for the DCA project in Poland. NAPE also worked with the Polish financial institution, BISE (Bank for Social Development) to help them meet the DCA criteria when designing project financing. NAPE assisted BISE by helping them design the application procedure for the loan guarantee and develop verification criteria for the applications.

The assessments prepared for USAID by NAPE were:

- Market assessment of thermal renovation projects and investments in Poland's housing sector
- Cash flows for sample projects under Poland's Thermomodernisation Act
- A recommended criterion for assuring that candidate DCA projects result in adequate reductions of greenhouse gases.