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INDUSTRY ENERGY EFFICIENCY SUMMARY REPORT

POLAND

PREPARED BY:

INTERNATIONAL RESOURCES GROUP, LTD.
Washington, DC

U.S. EMERGENCY ENERGY PROGRAM FOR EASTERN & CENTRAL EUROPE

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
BUREAU FOR EUROPE
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Introduction

Under the U.S. Agency for International Development (A.I.D.) Emergency Energy Program, two Energy Audit Teams from International Resources Group (IRG) visited five cogeneration power plants and four industrial facilities in Poland. The goals in conducting these energy audits were to:

- foster improved management of energy resources by recommending "low-cost/no-cost" improvement measures;
- transfer energy auditing and economic project analysis techniques to relevant personnel in the plants;
- provide low-cost equipment to support the improvement of energy efficiency.

In light of dramatic increases in energy prices for both the power and industrial sectors in Poland during the past two years, attention to energy-efficiency issues will be vital to the survival of many industrial enterprises as they attempt to compete in an international market economy. For power producers, particularly district heating facilities, energy efficiency represents a way to reduce input costs in the face of uncertainty about how quickly energy subsidies will be removed from the residential sector. Thus, energy efficiency, combined with education in strategic planning and economic analysis of operations and investments, has great potential to revive the Polish industrial sector, plagued by economic troubles since the late 1980s.

The Industrial Energy Efficiency Project is a USAID project that has attempted to address some of the obstacles to furthering development of the industrial and power sectors in Poland. By focusing on technological, economic, and managerial aspects of energy efficiency, the IRG Audit Teams introduced plant representatives throughout Poland to many fundamental precepts upon which Western industry has been built. This report summarizes project findings, particularly those that relate to plant engineering, decision-making practices, and management.

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Summary

The legacy of central planning, energy sector subsidies and emphasis on heavy, capital-intensive industry has caused the nations of Eastern and Central Europe, including Poland, to develop some of the most energy-intensive and energy inefficient economies in the world. On the average, the countries in the region require nearly two and half times the amount of energy used by OECD countries to produce one unit of GNP. In the industrial sector, energy inputs frequently are the largest single factor in product costs. With the collapse of the Council for Mutual Economic Assistance (CMEA) and the subsequent move toward market economies, rationalized energy use has become imperative.

A number of constraints affect the improvement of energy efficiency in Poland, including:

- Less than adequate and/or antiquated technology and equipment design;
- Work force-related problems;
- Poor infrastructure (eg., communications, financial systems, roads, water quality, and mechanical contractors);
- Limited experience in decentralized planning and decision-making;
- An unrealistic and highly subsidized pricing system; and
- Inappropriate government policies and regulatory structure.

Inadequate and/or Antiquated Technology

With a few exceptions, technology and equipment in the Eastern Europe energy sector average approximately 30 to 40 years behind the state-of-the-art technology found in the West. Plants use little instrumentation, monitoring and control of pollutants from industrial sources is extremely limited, and there is a severe lack of automatic control systems used in manufacturing processes. These facts combine to distort energy resource allocation, stimulate excess (and wasteful) use of energy and, in the industrial sector, adversely affect production efficiency, plant profitability, and local environmental quality.

In most cases, the equipment and technology are antiquated by Western standards and will require massive rebuilding to become truly competitive. Meanwhile, energy is a significant cost factor, and many low-cost steps are available to improve the efficiency of use, including:

- Replacement of steam traps,
- Installation of computerized load management systems,
- Computerized process control,
- Improving insulation, and
- Use of waste heat.

In Poland, the age of boilers ranges from more than 40 years to about 10 years, with most of local or Russian design, although there are other Western European designs such as Austrian (Panker). Most of the newer boilers (less than 20 years old) are Polish. There are few automatic control systems and operating adjustments are made by hand. This results in a tendency by operators to set conditions on the "safe" side, with these results:

- Excess air levels are far too high,
- Fuel feed rates are seldom near the optimum,
- System changes lag changes in demand, and
- Operation upsets are not noticed in time to take appropriate corrective actions.

Many cogeneration plants in Poland produce significant amounts of steam or hot water for internal use, sale to commercial customers, and/or delivery to district heating systems. The Polish Foundation For Energy Efficiency estimates that 25 percent of this thermal energy is wasted because there are few or no incentives for producers, distributors, or users to conserve. In general, individual users are not metered, but are charged a flat fee regardless of use. The fee is often included in the rent and is raised unilaterally to cover costs. Sources of loss include:

- Leaks throughout the system,
- Poor insulation, and
- The habit of opening windows to control temperature.

Most district heating plants are located at large population centers and some are also cogeneration plants. Many large industrial complexes usually have cogeneration facilities on site. However, owing to heavily subsidized electricity, it makes no business sense to operate cogeneration plants except when steam or hot water is needed. Therefore, most of the cogeneration facilities are substantially under-utilized.

The dominant fuel for power plants as well as district heating plants is coal. With few exceptions, most plants are old and lack of good instrumentation and modern control systems. In many cases spare parts are either missing or unavailable, creating problems in conducting routine maintenance and repairs.

Work-Force Related Problems

Under the central economic system, workers in the industrial sector (as elsewhere) were paid little, given little responsibility, and not rewarded for good performance. Consequently, most employees developed an indifferent attitude toward work. Over-staffing at plants is also a common feature since job security has historically been guaranteed and worker incentives were practically non-existent under the centralized economic system.

These two factors have combine to decrease efficiency of the work force, in both actual production and cost control. Since 1990, however, there have been major changes in the management of labor in Poland; these have been primarily prompted by privatization initiatives. Although bonuses for management and workers have been allocated at some plants, there is still room for increased worker productivity and overall efficiency.

Planning and Decision Making Practices

Under the centralized economic system, capital investment decisions were made by the government. A typical feature of this system was that emphasis was placed on production capacity, rather than productivity or efficiency. The management at many facilities do not understand the concept of the competitive "bottom line," which has a profound effect on plant

operations. Moreover, there is a lack of personnel throughout the industrial sector with sufficient knowledge of financial management and analysis to assist with strategic planning; consequently, there are few well developed long-term planning strategies in evidence. Capabilities to conduct economic evaluations of proposed projects are weak, and often do not embody an understanding of market-driven investment principles.

It is difficult to formulate specific long-term strategies for the industrial sector as a whole, since privatization is only in its initial stages. More importantly, due to numerous constraints, it is difficult to plan for long-term raw material supplies, making any detailed long-term plan subject to change.

In general, management and supervisory personnel in the power and cogeneration sectors are competent and as well-trained technically as their counterparts in the United States. Consequently, short-term decision-making in technical aspects of plant operations are relatively effective. Long-term strategic decisions are not as easily managed.

Long-term strategic planning has not been successful for a number of reasons. Most plants lack personnel with experience or training in strategic planning, and thus, management has little understanding of the techniques for evaluating and comparing alternative courses of action. Moreover, the seriousness of short-term problems, such as availability of energy inputs and capital for investment, prevent existing resources from being used to serve long-term energy efficiency problems. Accounting and record-keeping systems further complicate the process of strategic planning, since they are not geared to supply the necessary information for making long-term projections. Finally, with no national framework of objectives to guide local management in setting long-term objectives, plants are usually unable to develop cohesive, comprehensive strategic plans.

Energy Pricing Policies

In a free market environment, energy prices are the primary force that encourages producers and consumers to use energy efficiently. Currently in Poland, there are a number of policies which prevent prices from serving as a tool to encourage energy savings. These include:

- Fuel prices - Under the previous regime, fuel prices were heavily subsidized. While the present government has reduced controls on most items, it has retained a large influence in setting fuel prices. Specifically, Polish coal is still being sold at rates below world competitive prices.

- Electricity pricing - The Polish government sets the prices at which the power grid pays for electricity and at which electricity is sold. In each case encountered by the Audit Team, the grid was selling electricity for less than it was buying it. This means the government is subsidizing the sale and, in addition, is paying for distribution expenses (and losses).

- Thermal Energy Pricing to Consumers - Most district heating systems in Poland sell thermal energy to residential customers on the basis of the area to be heated, rather than on the quantity of heat used. The charge for thermal energy

usually is included in the rent and is adjusted unilaterally by the district heating system to cover costs. This system has a number of problems:

Consumers have no incentive to conserve thermal energy. The most common means of controlling room temperature is to open windows. The Polish Foundation for Energy Efficiency estimates 25% of the thermal energy in the district heating systems is lost in this way.

Since the district heating system passes its costs on to consumers, there is little incentive for the plants to operate the system efficiently. In Warsaw, it is estimated that 1-1.5% of the water pumped into the system was lost by leaks. In a system the size of Warsaw, this loss is more than 1,000 gallons/minute of heated water. (In Łódź, a single company operated both the power plants and the district heating system. There, a great deal of attention is given to overall system efficiency).

Few residences have meters, thus there is almost no way to charge consumers for the heat they actually use. In some residential complexes it may not be possible to isolate individual units for metering. Possible actions to correct this situation include: 1) requiring all new living units to have individual meters; 2) offering discounts to existing customers who install meters; and 3) separating the heating charge from rent and requiring regulatory approval to increase the charge.

Energy Management Practices

For most Polish industries, energy costs (including natural gas as feed stock) comprise less than 27% of total production costs, which is below world standards. For this reason, most plants have not made it a priority to establish annual goals for improvement in energy consumption per unit of production. Lack of instrumentation to sub-meter fuel and electric power usage within a large manufacturing facility is the main reason plant managers are not able to measure the energy efficiency for each production unit. Under these conditions, it has been difficult to institute any system of incentives or penalties related to energy use by production department.

In several instances, the operating and maintenance functions of the plant are managed separately. Poor performance and lack of accountability have been direct results of this practice. Due to distorted energy cost structure, management decisions related to energy-efficiency practices are fundamentally affected. For example, plants which burn fuel oil and natural gas tend to monitor boiler efficiency more closely than plants that burn domestic coal, a highly subsidized fuel. In addition, electric power from the grid remains unrealistically inexpensive. As a result, there is a general lack of interest in improving electrical efficiency for equipment or industrial processes.

As Poland expands its market economy, the value of energy will rise to world levels, and inefficient energy use will become increasingly expensive; this process has already begun, with three of the four industrial plants visited (Steel Plant Ostrowiec, Cement Plant Wierzbica, and Kedzierzyn Nitrogen Works) indicating that electricity load-management systems are a top priority for investment. Ultimately, all plants will be forced to give more attention to improving energy utilization.