INDUSTRY ENERGY EFFICIENCY SUMMARY REPORT

BULGARIA

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Introduction

Bulgaria is in the early stages of the continuing transition from a centrally planned economic unit of the Council for Mutual Economic Assistance (CMEA) to a free market economy. While political independence began in 1989, economic changes did not initiate until late 1990, when CMEA infrastructure, trading patterns, and financial arrangements were discarded in favor of the international market-oriented economy.

Fundamental economic changes that have occurred since the CMEA's collapse happened so suddenly, industrial facility managers were unable to plan and implement an orderly transition. In the new economic climate that emerged, energy became a major issue to the survival of industrial facilities, since many price controls for energy were removed at the same time traditional energy-supply relationships were disrupted.

Under the U.S. Agency for International Development (A.I.D.) Emergency Energy Program, two Energy Audit Teams from International Resources Group (IRG) visited eight industrial facilities in Bulgaria. 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.

The Industrial Energy Efficiency Project has attempted to address some of the obstacles to furthering development of the industrial and power sectors in Bulgaria. By focusing on technological, economic, and managerial aspects of energy efficiency, the IRG Audit Teams introduced plant representatives throughout Bulgaria 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.

As Bulgaria completes its transition to a market economy, economic and political imperatives are changing the approach of industry to many issues, including those of profitability, management, decision-making, employee health and safety, and overall efficiency.

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

- Lack of appropriate technology;
- Work force-related problems;
- Poor infrastructure (eg., communications, financial systems, roads, water quality, and mechanical contractors);
- Limited experience in decentralized planning and decision-making;
- A subsidized pricing system; and
- Government financing policy.

Inadequate Technology

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.

Many facilities are characterized by inadequate thermal insulation, non-functioning steam traps, and leaks in the air and flue gas duct joints. In general, steam distribution and condensate return systems in Bulgarian industrial plants are in poor condition. Steam pressure is often too high and in some cases almost half of the recoverable condensate is being discharged to drains. In addition, refrigeration systems are not operated according to accepted operating procedures. "Housekeeping" inadequacies (lack of painting, failure to replace damaged pipe insulation, and others) are apparent and maintenance is lax in non-production equipment in some facilities, although this may be as much the result of resource scarcities as management inattention.

Work Force Related Problems

Under the centrally-planned economic system, salaries of plant managers in Bulgaria were only slightly higher than worker salaries and were unrelated to enterprise profitability. These factors nullified incentives for industrial managers to improve economic efficiency and profitability. Similarly, the low priorities assigned to plant cleanliness, neatness, and worker safety reflect priorities and incentive structure of the former system. In general, factories were overstaffed, due to an abundant, inexpensive labor force.

Planning and Decision-Making Practices

Under the former system, export of manufactured products was arranged through state-owned trading organizations representing an entire "combine", or group, of manufacturers. When these "combines" became separate enterprises, managers of the production facilities were responsible for sales as well as production, despite the fact the production unit probably had no relevant experience. Adherence to the government production quota was the controlling factor in industry, while profitability, efficiency, and environmental protection were of secondary importance to industrial managers.

Industrial decision-making under the former system for most important decisions occurred at very high levels of government, despite the fact government decision-makers generally had little knowledge of plant specifics. Although routine decisions about production goals occurred regularly, others were made on an *ad hoc* basis, causing bureaucratic delays.

Until 1990, individual industrial plants used the same procedures as all other state-owned facilities. Under this system, income from an enterprise was passed on to the State, and the State allocated an operating budget to the plant. With the demise of this system, plants rely on the State for some capital funding; however, the State is limited by lack of local and convertible currencies in meeting investment needs. Furthermore, this system does not include mechanisms to economically evaluate capital investments. Thus, such allocations are largely determined within the framework of the system.

Plants have no standardized decision-making process for capital investments, and noticeably lacking is experience in developing strategic planning documents and investment programs. There are no formal procedures or organizational structure for identifying and implementing programs in energy savings and management has little background in economic or financial analysis of investments. This lack of experience has an important adverse effect, since capital resources are extremely scarce, and plants have been "rationing" such funds to only those activities necessary for continued production. Allocation of funds is based on one simple principle -- economic survival -- as perceived by plant managers.

Pricing System

Historically, Bulgaria had functioned under a system of subsidized and regulated prices, of both domestic and international supplies, which in turn subsidized its energy-intensive domestic and export industries. With the end of the Soviet-supported Comecon price subsidies and the onset of democratic reform, all prices were eventually decontrolled by late 1990 with the exception of energy prices. Owing to their importance to the domestic political economy

and severe degree of subsidization, reactive to international levels, the domestic political economy was viewed as incapable of absorbing the dramatic energy price increases necessary to achieve world market or true "cost-recovery" levels. As a result, fuel prices were adjusted in various steps, with the first major increase occurring in June 1990, the second in February 1991 and the third in June 1991. Since June 1991 adjustments to oil and natural gas prices largely reflect inflation and currency devaluation.

In a free market environment, energy prices are the primary force that encourages producers and consumers to use energy efficiently. Before 1990, energy conservation was not a primary industrial concern, due to low energy costs under the CMEA pricing system. Removal of price subsidies, and realignment of the Bulgarian currency have forced industry to face world prices for almost all production inputs, necessitating major operational and management changes.

The degree of price subsidization and the rate of increase in various fuel prices has varied greatly across fuel group and by consumer class. The greatest increase applied to the industrial sector, which formerly was subsidized relative to household or general consumers. Retail natural gas prices originally increased some 10-to-12 times above their June 1990 levels, measured in Leva, but have declined from their peak 1991 levels since being linked to the price of high sulfur fuel oil in October 1991. By contrast, brown coal prices have increased by over 15-to-30 times their early 1990 levels in Leva, but remain some 40-to-60 percent below true production costs. Again the cross-subsidy has shifted from the industrial to the household consumer class, owing to the political reality of rising energy prices biting into already austere personal income, and the ability of industrial users to pass on some of their higher fuel costs. Electricity prices have, similarly, been increased more rapidly for industrial than household consumers, but the degree of escalation has been less severe, rising by four (household) to five (industrial) times their June 1990 levels when measured in Leva , and roughly half this amount in dollar terms.

Government Financing Policy

Previously, industrial managers were required to seek funding from the government for capital improvements; government policy on such financing, however, was somewhat arbitrary, insofar as capital for favored plants was appropriated without repayment obligations. Less favored plants were required to borrow capital from the government at modest interest rates (a 6% rate was common). Enterprises which were heavily in debt now face annual nominal interest rates of 50 - 60 percent. Although inflation-adjusted rates (real rates) are fairly low, the nominal increase has strained industrial cash flow, since industrial sales prices have not always kept pace with inflation. Moreover, the government has yet to reduce the historically high industrial tax rates. This combination of high tax and nominal interest rates is a serious economic concern for industry.

Energy Management Practices

Attention to energy conservation issues varied widely in the industrial plants audited by IRG. Factory personnel themselves are generally aware of energy-saving measures that should be implemented, but even though plants often have the resources to implement these opportunities, they choose not to do so. Lack of action on these issues are the result of some

or all of the following:

- Management and factory staff aren't aware of the magnitude of energy losses. Instead, the focus has been on obvious, large energy inefficiencies that would require major capital investments to address;

- Poor communication between plant technical personnel and plant decision-makers prevent management from learning about energy losses or inefficiencies that can be remedied;

- Management is overwhelmed with other urgent problems arising from the current political and economic upheaval;

- Plant staff lack the necessary training to conduct economic analyses of energy losses/savings potential.

In addition, neither management nor technical staff were given guidance or encouragement on energy efficiency from the previous regime, and consequently were simply unaware of the magnitude of easily preventable energy losses and the value of small energy-saving initiatives. Indeed, many plant engineers are more interested in complex technologies. Overall, managers have not, until recently (through the energy audits and in-plant training programs) been aware of the magnitude or value of what appeared to be small energy losses. For example, few plants considered the effective performance of steam traps or condensate recovery programs -- both of which are low-cost -- to be high payback initiatives.

With the demise of the former government, myopic production considerations ceased to be the focus of enterprise management. Instead, efficiency and profitability, hallmarks of free market economies, are gaining transcendence. However, even in instances where industrial managers and technical staff are aware of the importance of efficient energy use, institutional issues have inhibited widespread improvement in energy efficiency. Lack of financial resources (local or hard currency) and the unavailability of most instrumentation needed for energy audits, monitoring, and control, have made the purchase of even inexpensive equipment and control systems difficult for most plants.