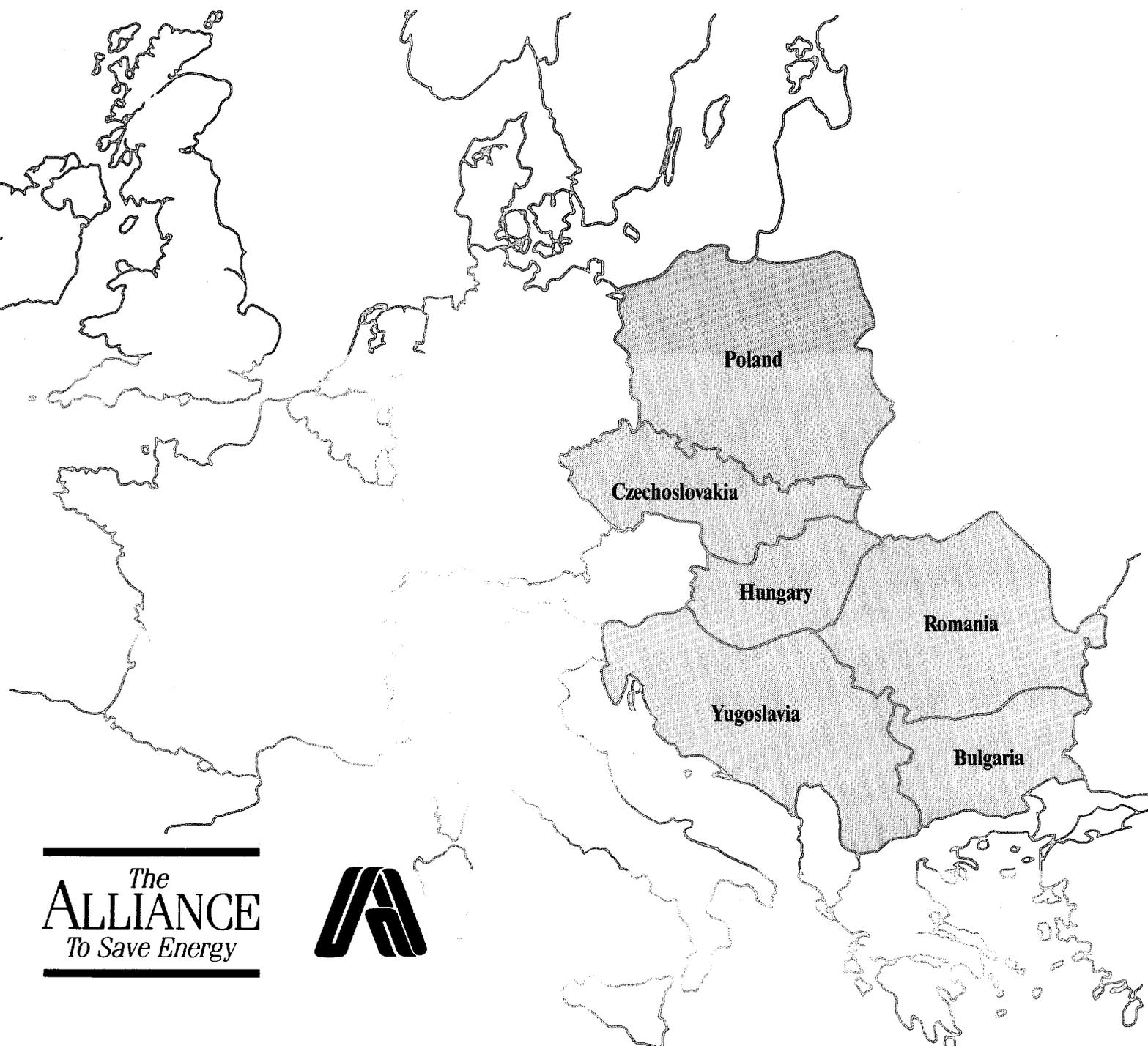


PN-ACB-646

Business Opportunities In Eastern Europe For Energy-Efficient Industrial Products



The
ALLIANCE
To Save Energy



Includes Results of the U.S. Agency for International Development's Industrial Energy Efficiency Program

The Alliance to Save Energy is a nonprofit coalition of business, government, environmental and consumer leaders dedicated to increasing the efficiency of energy use. The Alliance conducts research, pilot projects, education programs and policy advocacy.

Business Opportunities in Eastern Europe For Energy-Efficient Industrial Products

Mark Hopkins
Director of Corporate Relations

The Alliance to Save Energy
1725 K Street, N.W., Suite 509
Washington, D.C. 20006-1401
(202) 857-0666

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Executive Summary

The economic reform process in Eastern Europe is creating significant potential business opportunities for U.S. firms that market energy-efficient products. Although this process has caused a painful economic readjustment, the Alliance recommends that U.S. firms begin to establish business relationships in the region. By acting now, U.S. businesses will be in a position to profit from the economic expansion that the reforms are likely to produce.

The economic reform process is now well under way in most of Eastern Europe, especially in the energy sector. Energy used in industry is no longer centrally controlled and prices have generally risen toward world levels. Three countries -- Hungary, Poland, and Czechoslovakia -- have freed most other prices, lowered trade barriers, allowed foreign investment, and made their currency convertible. These reforms are producing a rapid growth in the private sector economy, especially in Hungary.

However, decades of inefficient central planning and subsidized energy prices have resulted in massive energy waste and pollution throughout Eastern Europe. On average these countries use twice as much energy per unit of output as their Western

European neighbors. The Alliance estimates that improving the energy efficiency of the region's industrial sector could save \$14.5 billion a year in reduced energy costs. We estimate that the potential market for energy-efficient industrial products in the region is \$20 billion.

Because industrial facilities throughout the region lack even the most basic energy conservation equipment, there is an enormous potential for low-cost/quick-payback energy saving improvements. The U.S. Agency for International Development's Industrial Energy Efficiency Program recently demonstrated this potential by conducting energy audits and installing U.S. energy-efficient equipment at 48 industrial facilities in Eastern Europe.

The AID program achieved extremely cost-effective energy savings through industry improvement of energy management procedures, use of flue gas and electric demand analyzers, and installation of low-cost flow meters and steam traps. The audits also identified a need for a wide range of energy-efficient products such as lighting systems, energy management controls, high efficiency burners, industrial pipe insulation and energy-efficient motors.

Introduction

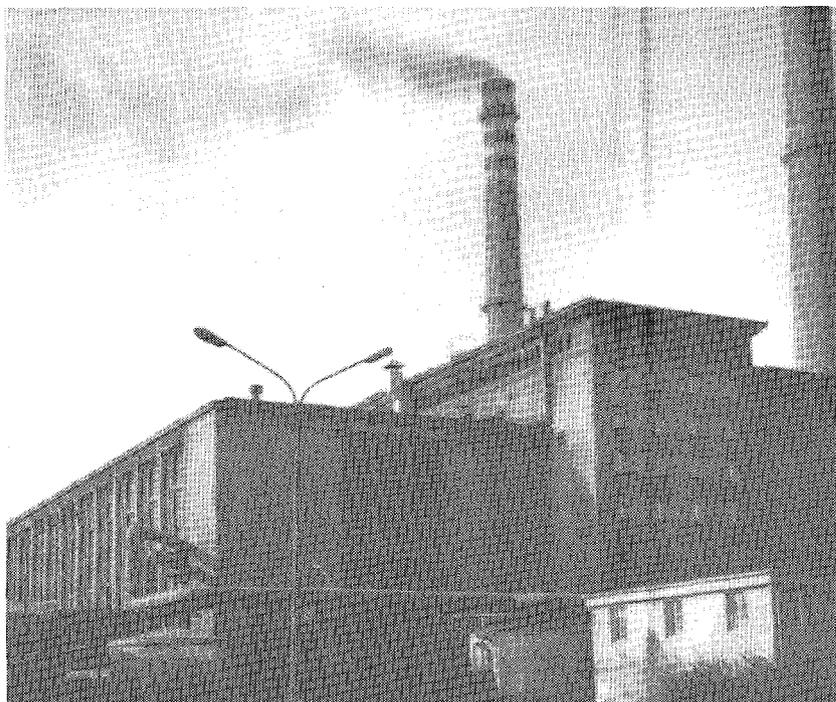
Environmental problems and high capital costs associated with energy production are forcing countries throughout the world to examine the least-cost energy path -- energy efficiency. From Southeast Asia to Eastern Europe governments and utilities are adopting policies and creating model programs to encourage the installation of energy-efficient technologies. This emerging trend is opening up enormous new markets for U.S. businesses that manufacture energy-efficient products and provide energy services.

The Alliance to Save Energy's *World Export Program* assists the U.S. business community in identifying and exploring this new market potential. Our program includes seminars, trade missions, and publications. We are supported by restricted project funding from government agencies and unrestricted support from corporate and foundation contributors.

Last year we began our export pro-

gram with a series of workshops with manufacturers of energy-efficient products to identify industry needs.

During the spring of 1991, the Alliance, supported by the Trade and Development Program and in partnership with the International Institute for Energy Conservation, organized U.S. participation in a trade mission to Thailand for U.S. manufacturers of energy-efficient products. We also published a "A Resource Guide for Exporting Energy Efficient Products" to provide manufacturers with information about government programs that can help them increase exports.



In July 1991 the Alliance, supported by the U.S. Agency for International Development, held a day-long workshop tailored to the needs of U.S. businesses that manufacture energy-efficient products. The workshop explored trading opportunities in Eastern Europe and highlighted an AID project that provided energy audits and American-made energy-efficient equipment in 48 industrial facilities throughout Eastern Europe.

This report discusses the current economic and energy situation facing Eastern Europe and AID's initial program to identify ways to improve the energy efficiency of industry in the region. It identifies business opportunities for providers of energy-efficient products and services, and it lists a number of sources for obtaining additional information.

A Message From the Chairman and Co-Chairman

Energy will power the restructuring of Eastern Europe toward marketplace economies. The hallmark of free enterprise is economic efficiency -- and so must it be in Eastern Europe's energy sector. The necessity of economic and energy efficiency in Eastern Europe opens promising new opportunities for U.S. businesses and industries, particularly those that market energy-efficient technologies and services.

The U.S. Agency for International Development has identified the urgent and substantial need for energy-efficient products and services in six Central and Eastern European countries. We at the Alliance to Save Energy have been working with the private sector to encourage U.S. manufacturers to seize these opportunities. We hope that business and industry will join us in tapping these markets to enhance U.S. competitiveness, improve our trade picture and help promote a clean environment in Eastern Europe and around the world.



Sen. Timothy E. Wirth



Sen. James M. Jeffords

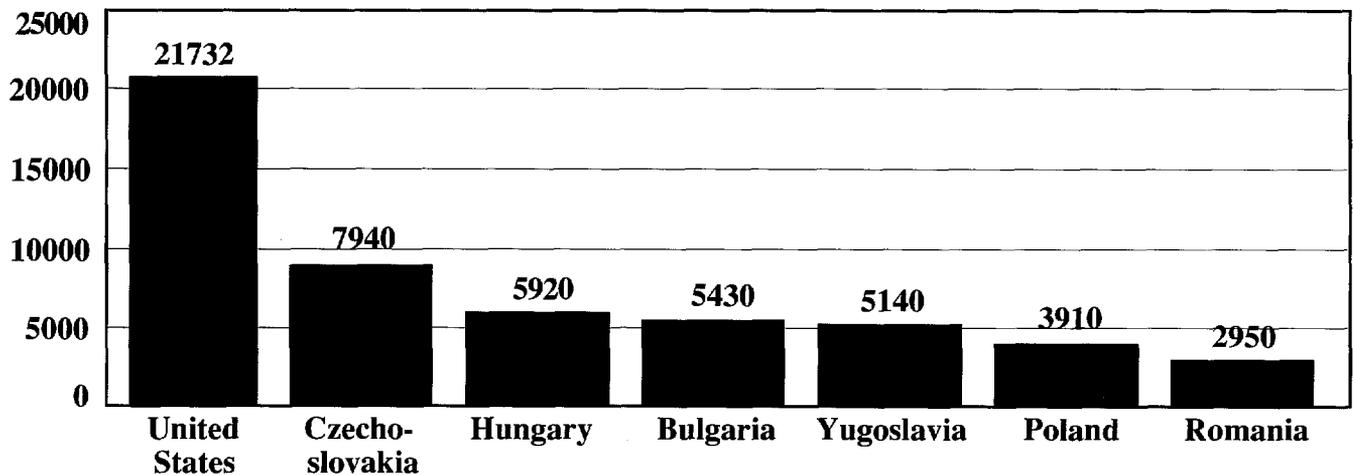
Eastern Europe: Economies in Transition

During the past several years, six countries in Central and Eastern Europe¹ -- Poland, Czechoslovakia, Hungary, Romania, Bulgaria and Yugoslavia² -- have moved to adopt economic reforms designed to transform them from command economies to market economies. Each government has begun to establish free markets and democratic institutions. The three leading reform countries -- Hungary, Czechoslovakia and Poland -- have freed most prices, lowered trade barriers, allowed foreign investment, and made their currencies convertible. These reforms have enabled a rapid growth of private-sector businesses, especially in Hungary.

Some observers predict that the next few years likely will be a period of transition and recession in these countries: inflation will occur as realistic prices are established; unemployment will result as inefficient enterprises are closed; and massive dislocations will be inevitable while the labor force is retrained.³ After the transition to free-market economies, Eastern Europe should begin a period of sustained growth.

The region's proximity to Western European integration in 1992 should further foster economic opportunities. In fact, many observers believe that in the later half of the

**Comparison of Per Capita Income
Based on Purchasing Power Parity in 1990**
in Thousand Dollars



Source: PlanEcon

decade, this turnaround will lead to a higher rate of growth in Eastern Europe than in the West.⁴

In anticipation of this rebound, some Western European and U.S. firms are pursuing business opportunities that will strategically position them for a promising future in Eastern Europe. The energy sector in the region is one of the largest areas of potential business opportunities. U.S. businesses that market energy-efficient products should build relationships with Eastern European partners now in order to partake in the coming economic expansion.

Are Economic Indicators Reliable?

The transition to a market economy, combined with a collapse in exports to the Soviet Union and the abrupt increase in energy costs, has induced a well-publicized recession throughout Eastern Europe. Inflation during 1990 was especially severe, although it is now subsiding in most countries. The region's economic output is projected to fall as much as seven percent this year, and industrial output is falling even faster.

However, the projected decrease in economic activity may overstate the situation for two reasons. First, enterprise managers may be underreporting industrial production in order to lower taxes and leave production that can be bartered for other items. Second, production from the emerging private sector is poorly reported, since governments still rely on old economic reporting systems that were designed primarily to gather information from state-controlled enterprises.

Energy Efficiency in Eastern Europe: An Emerging Policy Agenda Presents Opportunities for U.S. Business

Restructuring the energy sector in Eastern Europe is a critical component of the reform process. On average, these countries use twice as much energy per unit of output as West European countries. Outdated and energy inefficient manufacturing facilities is one of the reasons many enterprises in

"In spite of fuel mix differences from country to country . . . a common priority is improving the efficiency of energy use and energy systems."

**Dr. Carol Adelman
AID Assistant Administrator**

Eastern Europe produce goods that are not competitive in world markets.

Major environmental pollution problems exist in the region, primarily because of heavy coal use (the use of low-quality brown coal is especially a problem). The close link between energy use and environmental

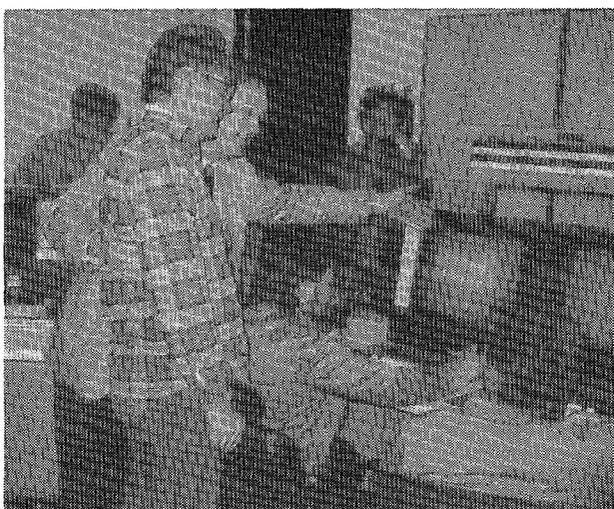
pollution presents Eastern European countries with a difficult problem: how to realize long-term, environmentally compatible growth while addressing short-term economic and social problems.⁵ This is a major dilemma, not only for policymakers throughout the affected region, but also for those in the West who are trying to be of assistance.

Increasingly, policymakers in Eastern Europe are realizing what their counterparts from around the world already have learned: improving energy efficiency is one of the best ways to meet energy demand in a less capital intensive and polluting way. Adopting policies that encourage the use of energy-efficient technologies can provide the same energy service, but use far less energy (often at one-half to one-tenth the cost of expanding new supplies).⁶

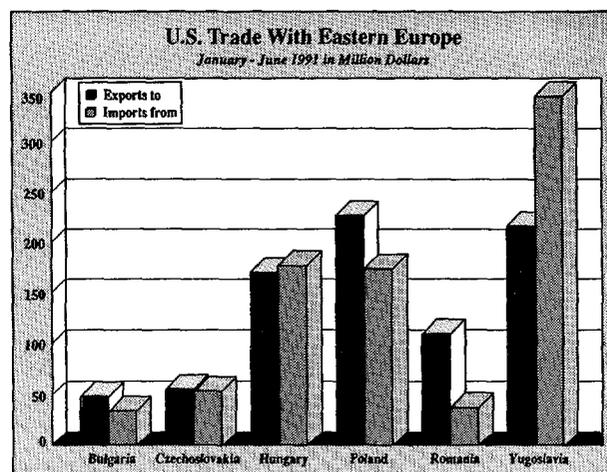
For instance, the United States has reduced energy use per dollar of GNP by 40 percent since the 1970s, in large part by installing more energy-efficient technologies. Western Europe and Japan have also made

major improvements in energy efficiency. Given Eastern Europe's high energy intensity, the potential for similar or even greater efficiency improvements is clear.

Eastern Europe represents an enormous new market for energy efficient products of all kinds. Potential products include diagnostic and monitoring equipment, insulation, energy management control systems, high efficiency burners, lighting equipment and controls -- in fact, virtually every energy-efficient product currently manufactured.



U.S. energy auditor inspects a Honeywell management control system recently installed in an East European industrial facility.



Source: U.S. Department of Commerce

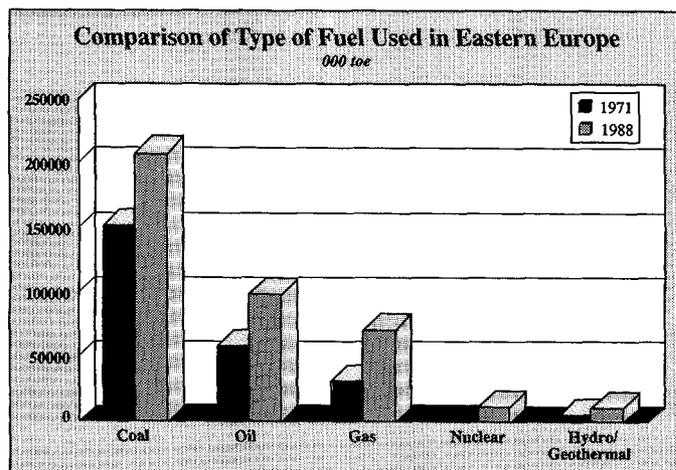
Demand for these products is emerging as economic reforms cause energy prices to rise. In many cases these technologies are not manufactured or currently available in Eastern Europe, especially in the case of advanced technology. Opportunities also exist for the energy-efficient service industry, which includes engineering, performance contracting, and demand-side management firms. For American businesses that market energy efficient products, the energy problems in the region offer unique new market opportunities for export, licensing and joint ventures. The Alliance estimates that the market for efficient industrial products and services in Eastern Europe is \$20 billion.

Energy Supply In Eastern Europe

Energy production in Eastern Europe is dominated by coal, and the pollution stemming from its use is horrendous. Poland produces most of the region's hard coal, (although the quality of Polish coal reserves is declining), but much of its better-quality coal is exported for hard currency. All countries in the region mine and use poor-quality and very polluting soft coal. As a percentage of total energy use, coal use fell by 15 percent between 1971 and 1988, while use of natural gas rose by 60 percent and oil use remained relatively constant. The use of

hydro, geothermal and nuclear energy is modest, although nuclear power production grew from virtually nothing a decade ago to 3 percent of total energy use by 1988. In some countries, nuclear power provides a significant portion of electricity generating capacity -- 26 percent in Hungary, 16 percent in Czechoslovakia, and 15 percent in Bulgaria.

While Eastern Europe has plenty of domestic coal, its proven oil reserves are minimal. In 1989, 88 percent of the region's oil was imported -- three-quarters from the former Soviet Union. In addition, one-half of Eastern Europe's natural gas is imported from the former Soviet Union.



Source: International Energy Agency

Eastern European energy policy, while increasingly influenced by the West, will likely also be influenced by the former Soviet Union for many years to come. While the latter likely will remain a major supplier of energy to the region, there is a fundamental difference from before -- energy exports are now at market-level prices and payment is in hard currency. It is also likely that the Soviets will encourage Eastern Europe countries to begin gas-for-oil switching, because of Soviet oil production problems and an abundant supply of natural gas.

Energy Demand In Eastern Europe

Energy Use and Intensity

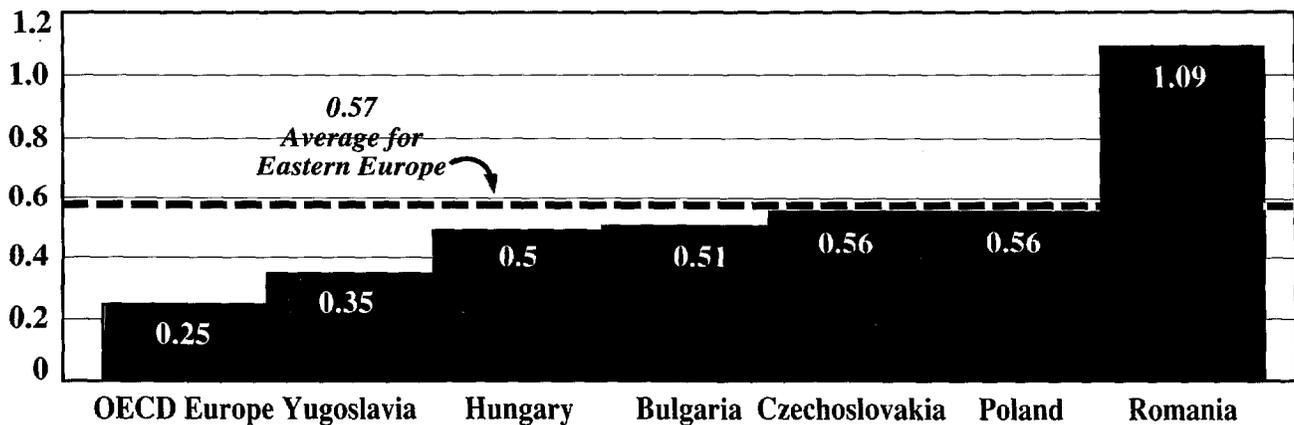
During the past four decades, policies in Eastern Europe emphasized increasing economic output at the expense of energy efficiency or market-based energy pricing. Except in Yugoslavia, governments throughout the region regulated and subsidized energy prices. These policies created a situation where energy prices did not cover the cost of production for all energy sources -- electricity, gas and oil.

In the past, this lack of energy price signals based on market conditions, in combination with inefficient central planning, has caused serious distortions in these economies.

As a result, Eastern European countries are, on average, twice as energy intensive as Organization for Economic Cooperation and Development (OECD) countries,⁷ even though per-capita energy consumption is similar to Western Europe.⁸ Furthermore, high reliance on coal, especially soft coal, and lack of capital for air pollution abatement equipment has resulted in Eastern European SO₂ concentrations that are four times as high as those in Western Europe.⁹

Fortunately, each of these countries has begun to allow energy prices to rise to world levels or to relate directly to the cost of production.

Comparison of Industrial Sector Energy Intensity *toe/th USD*



Source: International Energy Agency

**COMPARISON OF THE SHARE OF HEAVY AND OTHER INDUSTRY GROSS OUTPUT
IN 1987 (%) ACCORDING TO**

	Heavy Industry ⁽¹⁾	Other Industry
Eastern Europe	37	63
Japan	34	66
USA	33	67

Source: PlanEcon and OECD

(1) Heavy industry is defined as: basic metals industry (ferrous and non ferrous) plus non metallic minerals industry (mainly construction material) plus all chemical industry (including oil refining) plus energy industry except utilities.

Eastern Europe's high level of energy intensity is often dismissed by the argument that its industrial sector has a higher proportion of energy-intensive, heavy industry than Western nations. However, as the table above illustrates, only a very small portion of its higher energy intensity can be attributed to industrial composition differences.¹⁰ The primary explanation for Eastern Europe's industrial energy intensity is massive energy waste.

Energy Efficiency Potential

Eastern European energy waste can be reduced by continued reform, use of sound energy management techniques and installation of energy-efficient end-use equipment. If Eastern Europe was as energy efficient as Western Europe its energy intensity would be

reduced by 44 percent (.62 to .35 toe/ThUSD).¹¹ This potential decrease, which takes into account the structural differences between Western and Eastern Europe, means cost-effective energy efficiency improvements could reduce overall Eastern European energy use by 218 million tons of oil equivalent a year. This represents a conservation potential of over 8.65 quadrillion Btu per year, worth \$25.8 billion a year in reduced overall energy costs.¹²

More than half of these energy savings could be achieved in the industrial sector (122 Mtoe and \$14.5 billion a year). The Alliance estimates the potential market for energy-efficient industrial products (with paybacks of less than three years) in Eastern Europe is \$20 billion.¹³ While this estimate is an approximation, it nonetheless demonstrates that enormous potential market exists.

Future Energy Demand

As Eastern European countries continue to reform their economies, energy demand likely will tend to increase for several reasons. Eastern European households presently own fewer home appliances than their neighbors in the West, but increased prosperity should result in more appliance purchases and energy use in the

and other office technologies are purchased.

Additionally, Eastern Europe's transportation sector uses less energy per capita than in Western Europe because the region has fewer autos (although vehicles are often very polluting), and a much higher proportion of people use public transportation than

"This represents a conservation potential . . . worth \$25.8 billion a year in reduced overall energy costs. More than half of these savings could be achieved in the industrial sector . . . the potential market for energy-efficient industrial products in Eastern Europe is approximately \$20 billion."

residential sector. Similarly, Eastern Europe's service sector is a much smaller component of economic activity than its counterpart in the West. Energy use in commercial buildings will likely increase as more buildings are constructed and more computers, copiers

in Western Europe. However, as their economies rebound, the demand in these countries for transport energy, especially imported oil, likely will rise as more and more households can afford to purchase automobiles.

The Energy Dilemma Of Eastern European Industry

The State of Industrial Energy Management

East European plant managers realize their facilities waste energy, and they are very interested in identifying ways to eliminate waste and improve efficiency. However, they generally lack information about modern energy-saving technologies and management techniques that are common in the West. Under the former system of central allocation of subsidized energy, plant managers had no reason or incentive to learn about -- much less install -- energy-efficiency improvements. Given concerns about

"The primary explanation for Eastern Europe's industrial energy intensity is massive energy waste."

energy-related pollution and the need to pay world prices for energy in hard currency, a powerful incentive clearly has emerged: social and economic survival.

Industrial facilities throughout most of the region lack even the most basic low-cost energy-conservation equipment. For instance, many plants lack flue gas analysis equipment. This technology, which is relatively inexpensive and quickly pays for itself through reduced energy costs, enables technicians to optimize the performance of

"Industrial facilities throughout most of the region lack even the most basic low-cost energy conservation equipment."

oil and gas burners, thereby reducing their energy consumption.

Many facilities lack other monitoring and control equipment, such as temperature and flow gauges needed to monitor energy use in equipment, and simple control systems to regulate performance. Fortunately, this type of equipment usually is inexpensive and

quickly pays back the investment. Some equipment, especially sophisticated analysis tools, is not manufactured in Eastern Europe and may be one of the first markets for energy-efficiency product exports to the region.

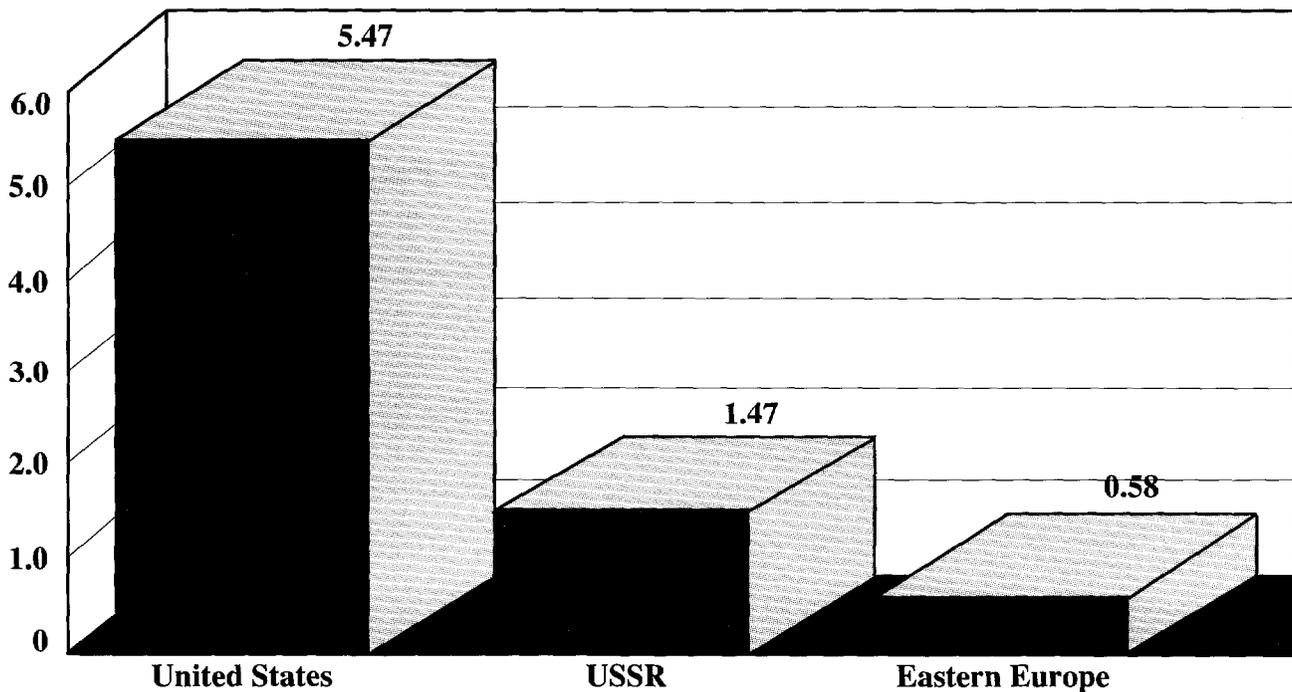
Almost all industrial plants in Eastern Europe lack other energy efficiency measures typically found in the West. These include equipment such as energy-efficient lighting and control systems, high efficiency oil and gas burners and automatic control systems for boilers, energy management control systems for buildings and industrial

processes, waste heat recovery systems, and energy-efficient motors and adjustable-frequency drives.

Paying for Energy Efficiency Improvements

Significant energy savings can be achieved through better energy management and relatively low-cost -- and quick payback -- conservation improvements. In many instances, savings are so dramatic that enterprises will be able to recover their costs within days, weeks or months.

**Comparison of Eastern Europe GNP
Based on Purchasing Power Parity in 1990**
in Trillion Dollars



Source: PlanEcon

However, because enterprises have limited hard currency available to them, only measures with a very high rate of return, perhaps 300 percent or more, will be purchased. Although it is hoped that enterprises will be able to pay for these improvements out of their cash flow, additional Western technical and financial assistance also may be needed. In the case of relatively simple technology -- steam traps, pipe insulation, etc. -- some of these items are locally produced,¹⁴ although these products reportedly are of poor quality.

One of the most critical long-term problems facing government policymakers and industrial managers in Eastern Europe is overcoming the lack of capital needed to pay for efficiency improvements that have higher first costs and longer payback periods. During Communist rule enterprises were not permitted to make and accumulate profits and most trade was conducted with other Eastern European countries or the former Soviet Union, which paid for goods in nonconvertible currency. As a result, most enterprises started the reform process lacking capital resources, although some now are generating capital. It remains to be seen to what extent they will have the capital needed to invest to efficiency improvements.

The lack of private capital markets in these countries further hinders investment in efficiency. Private banking systems and

stock exchanges are only now being established and are modest in size. For instance, only five firms are listed on the Polish stock exchange. This means enterprises face the problem of upgrading their facilities with virtually no internal capital resources or access to equity or debt financing.

Imports of more advanced and, for these countries generally expensive, Western technology will likely be limited to enterprises that export to the West and therefore generate outside hard currency. The exception will be those enterprises able to attract Western business partners, which will provide an infusion of investment capital.

Eastern European countries, unlike the former Soviet Union, belong to the International Monetary Fund and World Bank, although these institutions have been slow to respond with support for energy efficiency investments. Regional energy efficiency could also be stimulated if Western governments and multinational lending institutions adopted policies to provide capital specifically for energy efficiency improvements.

Another potential financing option is private sector-initiated performance contracting, which has been used extensively in the United States as a way to upgrade cash-poor schools and other facilities. U.S. business should explore this opportunity, and government policy should encourage its use.

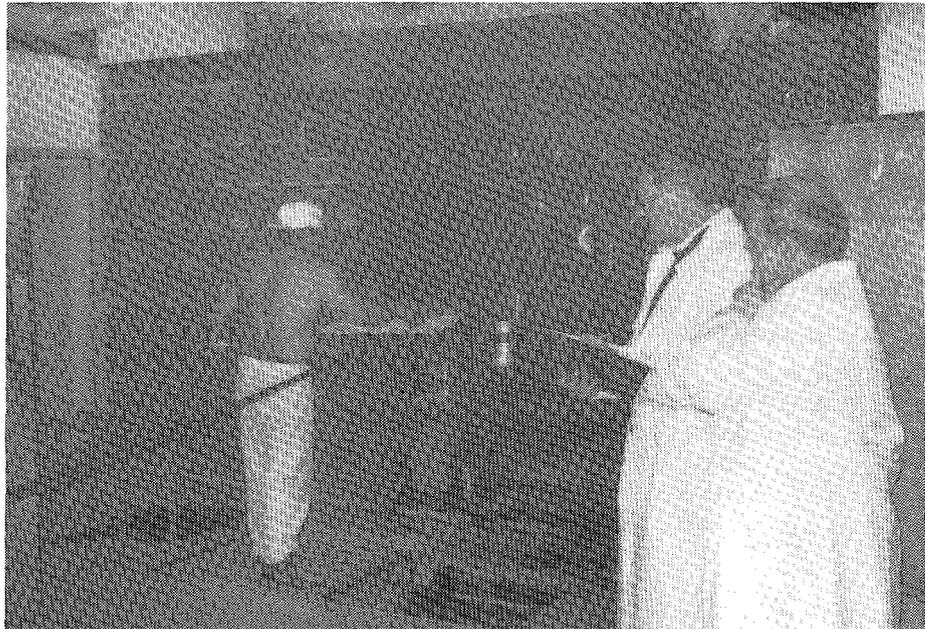
The U.S. Assistance Effort In Eastern Europe

Several U.S. assistance efforts have been initiated to address the massive energy problems facing Eastern Europe. U.S. policy in the region strives to foster the region's economic transition and to encourage democracy and social development. The two key legislative programs to accomplish this include Support for Eastern European Democracy Act of 1989 and the Foreign Operations, Export Financing, and Related Programs Appropriations Act of 1991.

The U.S. strategy for energy sector assistance to Eastern Europe focuses on: energy prices; sector restructuring, efficiency and privatization; promotion of U.S. business involvement; pollution reduction; and cooperation and integration into regional and global energy markets.

The program to accomplish this includes technical assistance and training; a utility partnership program; and technical cooperation on energy efficiency, clean coal and renewables.

*Auditors ponder
the operations
at the oldest
working ovens
of FSV Bakeries
in Budapest.
The small line
still makes
specialty breads
the old-fashioned way.*

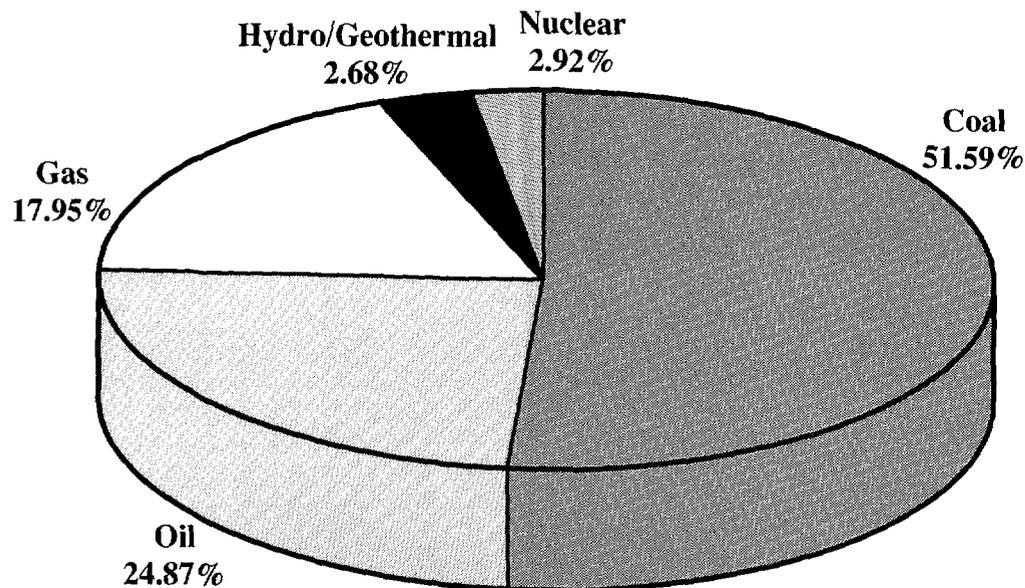


Energy efficiency efforts include support for energy efficiency centers in Poland and Czechoslovakia (see "Resource Guides" section for more information).

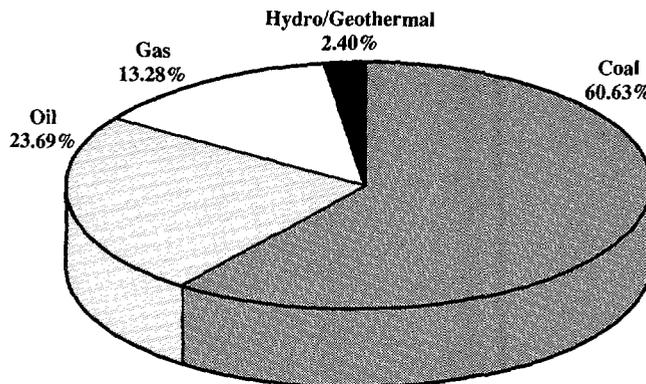
President Bush designated the Deputy Secretary of State as Coordinator of U.S. Assistance in Eastern Europe. The

Coordinator heads an interagency Coordinating Council comprised of the U.S. agencies that provide assistance. One of the Council's main responsibilities is to review U.S. assistance projects to ensure that they reflect the recipient countries needs.

Type of Fuel Used in Eastern Europe in 1988



Type of Fuel Used in Eastern Europe in 1971



The U.S. Agency For International Development's Emergency Energy Program

The U.S. Agency for International Development is the government agency that administers U.S. economic and humanitarian assistance programs in more than 80 developing countries worldwide. AID's Bureau for Europe is responsible for administration of the East European assistance program, which includes a component responsible for energy and environment issues.

One of the Bureau's first initiatives is the Emergency Energy Program for Eastern and Central Europe, which was developed in response to the rapidly changing energy market (i.e. the move to hard currency for Russian energy supplies and uncertainty of Middle East oil supplies). The initiative was designed to:

- 1) improve industrial energy efficiency;
- 2) increase oil refinery energy efficiency;
- 3) improve oil purchasing practices; and
- 4) improve the analytical basis for energy price reform.

The first part of the project, the Industrial Energy Efficiency Program, is near completion; the remaining portions of the project are under way.

Industrial Energy Efficiency Program

The Industrial Energy Efficiency Program was designed to identify and quickly implement no-cost and low-cost/quick/payback measures to improve energy efficiency in Eastern European industries. Based on past AID experience, it was estimated that an average of 15 percent energy savings could be achieved if energy management was improved and low-cost/quick-payback conservation measures were installed.

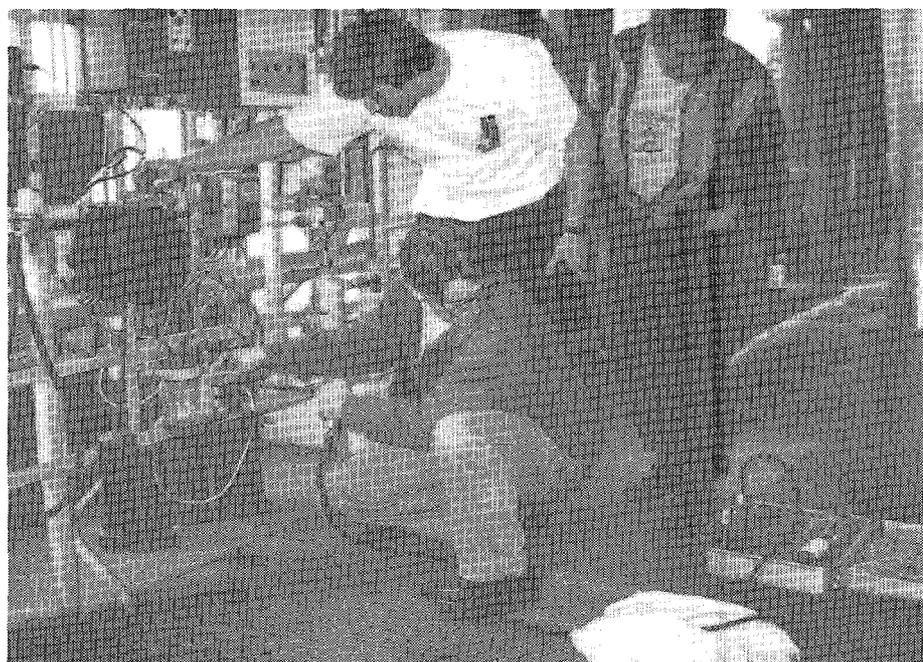
In cooperation with the host governments, AID sent experienced energy audit teams¹⁵ to six Eastern Europe countries in February 1991. The host governments helped the teams select for audit 48 industrial facilities equally divided among the six countries. Industrial sectors included metals, machinery, food processing, and district heating plants; the enterprises generally were of medium size, employing 500 to 1000 persons.

Selected plants had significant energy savings potential, a receptive management,

were economically viable, and were similar to other facilities that could benefit if the same measures were employed. During a week-long visit to each plant, teams collected energy consumption information, made specific measurements of energy use, and reviewed plant operations and processes. Audit teams also conducted in-plant seminars on energy management and the use of instrumentation.

The energy audits identified no-cost energy management practices, low-cost/quick-payback energy saving opportunities, and, in some cases, other cost-effective energy efficiency equipment with longer paybacks. Based on audit recommendations, AID provided over \$1 million of U.S.-manufactured energy efficiency equipment to the 48 industrial plants; the audit teams helped install and evaluate the effectiveness of the equipment.

In July 1991, the Alliance held a workshop on energy efficiency business opportunities in Eastern Europe for U.S. manufacturers. The workshop provided an opportunity for the audit teams to present the preliminary results of their work. The presentations were followed by one-on-one



meetings between product manufacturers and audit team members to discuss specific business opportunities in Eastern Europe.

AID Emergency Energy Assistance Program for Eastern Europe

Examples of Low-Cost Energy Conservation Measures Installed at 48 Industrial Facilities in Eastern Europe

COUNTRY	TYPE OF FACILITY	CONSERVATION IMPROVEMENTS	EQUIPMENT COST (\$)	ESTIMATED SAVINGS (\$/YEAR)	SIMPLE PAYBACK PERIOD	ENERGY SAVINGS (TOE)
HUNGARY	Chemical	Steam/Electric Meters, Combustion Analyzer	\$33,007	\$179,000	5 weeks	1,441
	Glass	Production Optimization, O ₂ /CO Meters, Natural Gas Meters	\$44,803	\$3,005,000	6 days	22,495
	Bakery	Electric Power Analyzer, Steam Maintenance	\$11,147	\$8,100	16 months	47
ROMANIA	Iron & Steel Works	Furnace Combustion Equipment, Electric Power Analysis Equip.	\$31,317	\$660,728	2 weeks	8,063
	Combined Heat & Power	Combustion Analyzers, Thermometers, 386 Laptop, Flow Meters	\$34,799	\$6,809,773	3 days	65,386
	Fertilizer Plant	Boiler Equipment, Thermometer, AC Power Analyzer	\$30,265	\$1,316,717	8 days	11,180
BULGARIA	Iron & Steel Mill	Flue Gas Analyzer, Flowmeter, Steam Leak Detector	\$15,352	\$51,867	3.5 months	696
	Poultry Slaughter-House	Oxygen Analyzer, Steam Traps, Fluor. Lights, Temp/Humid Meters	\$32,150	\$110,732	3.5 months	576
	Milk	Oxygen Analyzer, Steam Traps, Fluorescent Lights	\$30,335	\$99,999	3.5 months	1,308
POLAND	Cement	Thermometer, O ₂ Analyzer, Load Management PC	\$16,299	\$53,260	3.7 months	1,322
	District Heat	O ₂ Analyzers, Steam Traps, Thermometer	\$11,144	\$58,000	9.5 weeks	1,116
	Steam Power	O ₂ Analyzers, Cleaner Steam Traps Thermometers, Condensers	\$22,037	\$143,000	5 weeks	8,790
CZECHOSLOVAKIA	Brewery	Valves, Pipe Insulation, Boiler Blowdown Rec. Unit	\$9,852	\$34,976	3.5 months	219
	Rubber	Steam Traps, Combustion Analyzer, Steam Metering Equipment	\$28,231	\$247,299	1 month	1,444
	Pharmacy	Heating Control System, Combustion Analyzer	\$36,768	\$538,619	5 weeks	2,445

Results of AID's Program

Because the impacts of rising energy prices, privatization and competition were being felt at the plant level, audit teams reported that plant management and technicians were very concerned about energy waste and open to the team's ideas for improvements.

U.S. energy auditors identified numerous no-cost and low-cost /quick-payback energy conservation opportunities in every industrial facility they visited in Eastern Europe.

Optimization of industrial processes yielded significant energy savings. For instance, at a glass manufacturing facility, energy auditors found that one of the four existing glass melting furnaces was not needed. Instead of operating four furnaces at 64 percent load, plant managers could maintain production and reliability by operating three furnaces at 85 percent load. Managers implemented this recommendation, which will save the plant nearly \$2.3 million a year in energy costs.

At a hot strip rolling mill, auditors analyzed boiler operation and found that

boiler efficiency could be improved by 3 percent if combustion efficiency tests were performed on a regular basis. The cost of this equipment -- about \$25,000 -- is dwarfed by the more than \$600,000 in yearly savings -- a two-week payback on the investment.

Low-Cost/Quick Payback Conservation Measures Frequently Recommended at Plants in Eastern Europe

- * Continuous single/multi-probe oxygen analyzers for stack gas analysis.
- * Infrared thermometers to identify sources of heat loss.
- * Heat meters for submetering heating systems.
- * Steam flow meters, leak detectors, and steam traps.
- * Electric power demand analyzers.
- * Other diagnostic equipment, such as pressure recorders, temperature/humidity meters, industrial stethoscopes, and gas flowmeters.

Although the AID audits primarily addressed no-cost, low-cost/quick-payback options, auditors also found many other cost-effective opportunities for installing energy-efficient equipment in such areas as lighting, burners, energy management controls and industrial pipe insulation.

AID summarized the preliminary findings of its initiative as follows:

- 1) Significant energy efficiency gains can be made at little cost. The program's engineers estimate that in general, at least 15 percent can be saved by improved energy management and installation of low-cost efficiency equipment; in some cases, those savings may reach 40 percent.
- 2) Energy pricing, energy efficiency and structural reform at the plant level are closely linked.
- 3) There is a strong interest in advanced U.S. management practices and energy efficiency technologies.
- 4) Rising energy costs and widespread energy waste create opportunities for U.S. exports of efficient products and services.
- 5) A market approach is emerging to boost energy efficiency through energy pricing,

competition, and expansion of private capabilities to provide energy efficiency services and equipment.

Energy Efficiency Improvements

The following is a list of energy-efficient products most recommended for the audited industrial plants.

- * Energy-efficient lighting and control systems.
- * High efficiency oil and gas burners and automatic control systems for boilers.
- * Energy management control systems for building and industrial processes.
- * Energy-efficient refrigeration systems.
- * Waste heat recovery systems.
- * Electricity demand management systems.
- * Industrial pipe insulation.
- * Condensate extraction boilers.
- * Incinerators with heat recovery units.
- * Waste heat boilers.
- * Variable speed controls for electric motor drives.

Resource Guides: Taking the Next Step

Alliance to Save Energy

World Export Program

Alliance project to help U.S. manufacturers of energy-efficient products take advantage of overseas markets. Activities include workshops, trade missions and publications.

Energy Efficiency 2000

A United Nations-sponsored information sharing program to alert manufacturers of upcoming European conferences on energy efficiency topics. The Alliance serves as a U.S. contact for this information.

Contact: Mark Hopkins

Phone: (202) 857-0666

"A Resource Guide for Exporting Energy-Efficient Products"

Available for \$15 pre-paid from:
The Alliance to Save Energy
1725 K Street, N.W., Suite 509
Washington, D.C. 20006-1401

CORECT (Committee on Renewable Energy Commerce and Trade)

U.S. Department of Energy
1000 Independence Ave., SW, CE-54
Washington, D.C. 20585
Phone: (202) 586-5517

Promotes U.S. energy efficiency industry overseas.

Eastern Europe Business Information Center

U.S. Department of Commerce
Room 7412
14th and Constitution Avenue, N.W.
Washington, D.C. 20230
Phone: (202) 377-2645
Fax: (202) 377-4473

The Eastern Europe Business Information Center provides U.S. businesses with information on new opportunities for trade and investment in Eastern Europe. Contact the address above to receive the "Eastern Europe Business Bulletin."

American Building Products Export/Import Council

1090 Vermont Ave., N.W.
Suite 1200
Washington, D.C. 20005
Phone: (202) 289-4558
Robert T. Erwin Jr., AIA --
Executive Director

ABPEIC is a trade association representing firms involved in the international trade of building products.

Eastern European Energy Efficiency Centers

The Energy Efficiency Center

Prague, Czechoslovakia
Jaroslav Marousek, Exec. Dir.
Slezka 9
Suite 204
120 29 Praguez
Czechoslovakia
Phone: +42 (2) 256-104
Fax: +42 (2) 258-556

The Polish Foundation for Energy Efficiency

Warsaw, Poland
Zbigniew Bochniarz, Exec. Dir.
ul. Gorskiego 7-111p
00-003 Warszawa
Poland
Phone & Fax: +48 (22) 273-271

U.S. liaison (stationed at both centers):
Marc Ledbetter

Contact in U.S.: William Chandler, Pacific
Northwest Laboratory (202) 646-5242

European Community --

Hungary Energy Centre

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Ian Brown, Senior Advisor
H-1051 Budapest
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International Institute for Energy Conservation

Contact: Russell Sturm
420 C Street, N.E.
Washington, D.C. 20002
Phone: (202) 546-3388
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Nonprofit organization to foster the adoption
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Newsletters

Eastern European Energy Report

Eastern European Marketing Group
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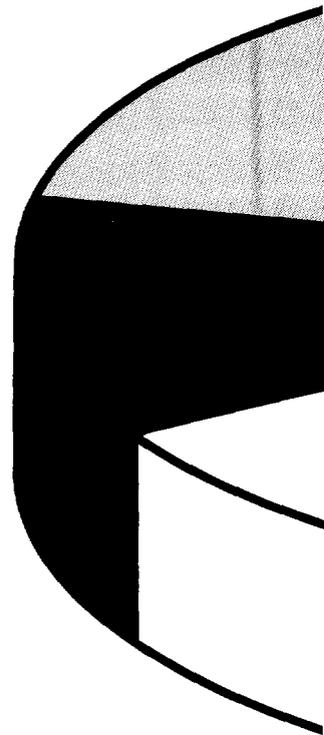
A Survey of Eastern European C Uniqueness Within A Common

Although it is possible to generalize about Eastern Europe as a whole, there are differences between countries. Hungary and Czechoslovakia, for example, have economies that are in relatively good shape and are excellent prospects for reform. Poland is working hard on reform, but its economy is weak. In Bulgaria and Romania, the reform process is sluggish and the economies are weak. Yugoslavia is in the midst of a civil war which has ravaged the economy, and its government has virtually suspended economic reform efforts. The following survey provides quick snapshots to highlight the differences among the countries in the region.

**Comp
Based c**

**Yugoslav
\$123.1 Bill**

**Romania
\$68.6 Billion**

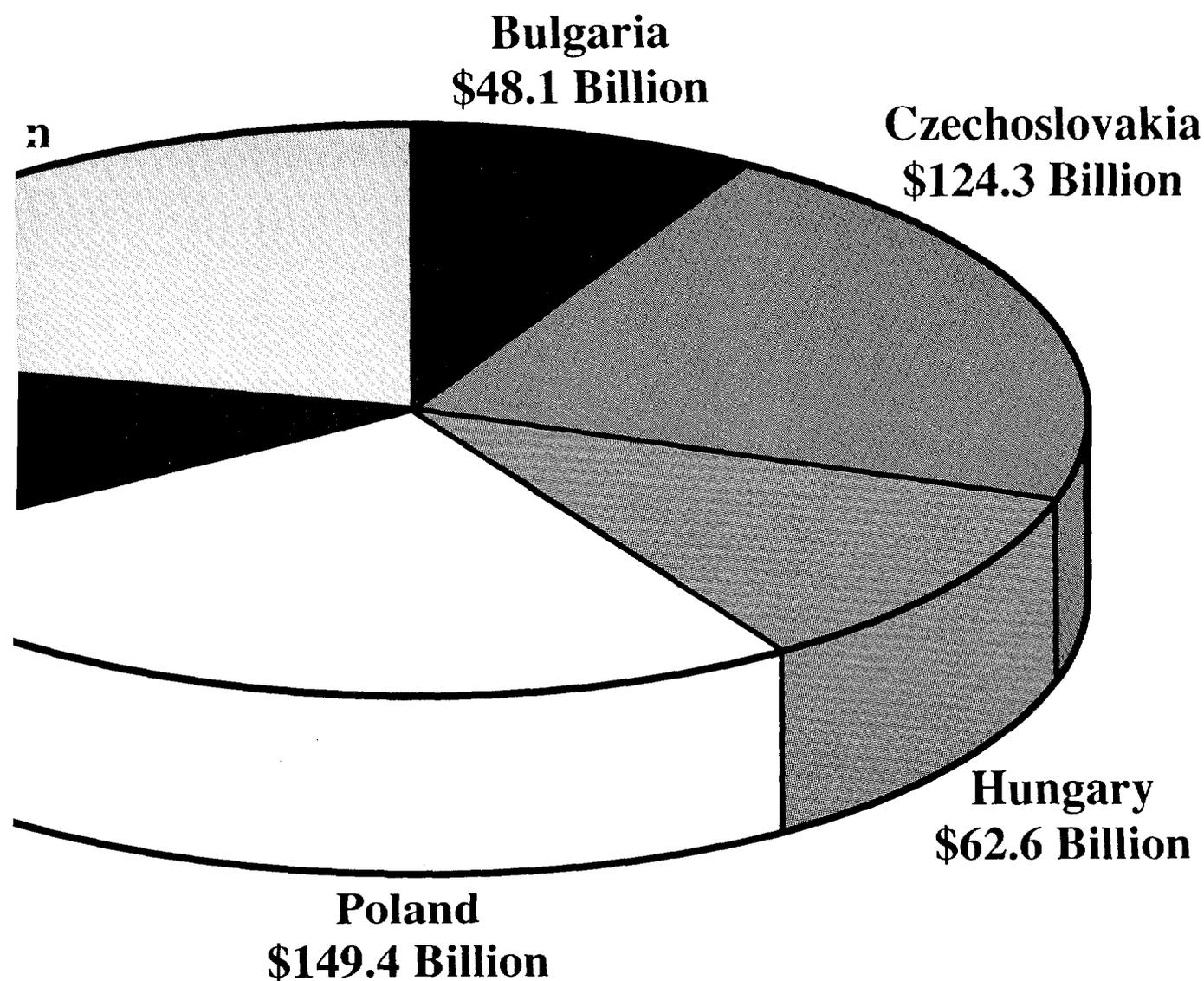


Source: PlanEcon

ountries:

Dilemma

Comparison of Eastern European GNP and Purchasing Power Parity in 1990



Hungary



Hungary has long been a leader in economic reform among Eastern European countries.¹⁶ As early as 1968, Hungary began a limited program to introduce cooperative enterprises, establish private ownership, and abolish input/output allocation in industry. These reforms were expanded in 1985 with the adoption of a policy to decentralize some industrial management decisionmaking.

Since the collapse of the one-party system, considerable progress has been made toward the further privatization of Hungarian industry. Private businesses, for example, account for 25 percent to 50 percent of Hungary's economy, and their numbers are growing.¹⁷

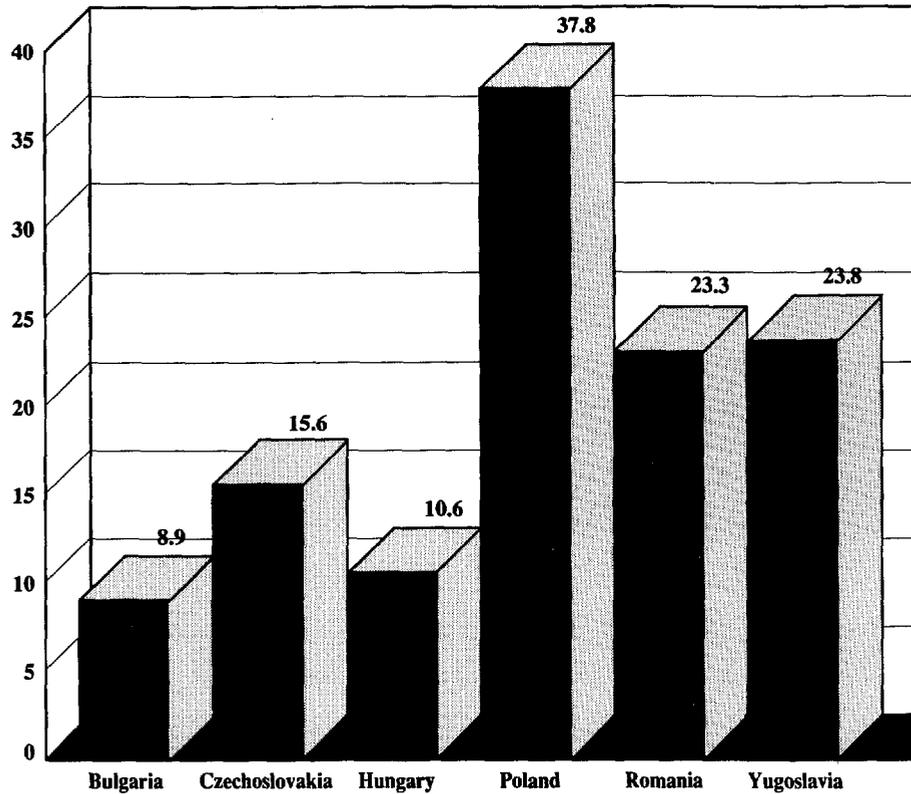
Hungary also has greatly liberalized foreign investment regulations and attracted \$1.25 billion in foreign investment in 1990 -- more than all the other countries in the region combined.¹⁸ It has also done a good job in redirecting exports away from the former Soviet Union to the West; export to the OECD increased 26 percent last year.

Hungary has a population of more than 10.5 million people, one-quarter of which live in the capital, Budapest. Industry accounts for 40 percent of GNP, with mining, metals, engineering industries, food products, textiles, chemicals, and pharmaceuticals predominating. In 1987, three-quarters of Hungary's imports and exports were to the former Soviet Union and Eastern Europe countries.

Hungary is lacking in natural resources and imports 42 percent of its energy resources. It consumed 1.32 quads of energy in 1989, divided relatively equally between coal, natural gas and oil. The Eastern European country most reliant on nuclear power, Hungary generated 27.4 billion kilowatt-hours of electricity in 1989.

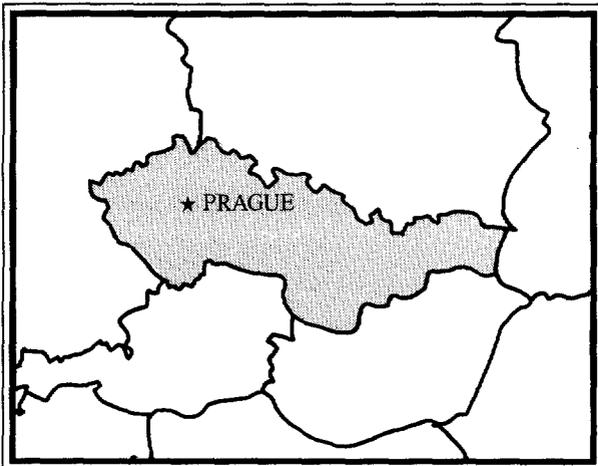
Comparison of Eastern European Population in 1990

Millions



Source: Almanac 1991

Czechoslovakia



Czechoslovakia is comprised of two republics -- Czech and Slovakia, the former holding most of the industry. Its people are well-educated and literate. Industry accounts

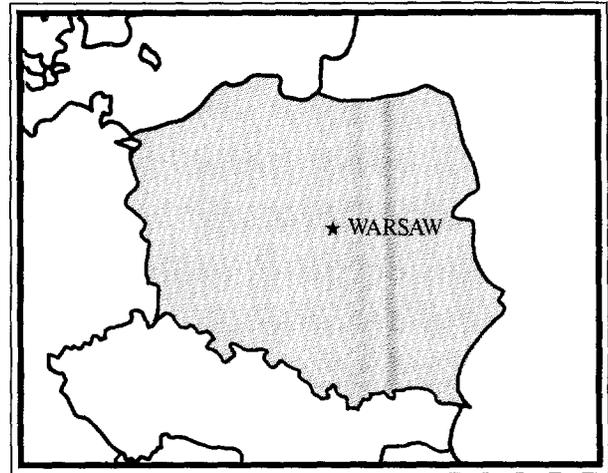
for 50 percent of GNP, with iron and steel, machinery and equipment, cement, sheet glass, motor vehicles, armaments, chemicals, ceramics, wood and paper products predominating. Although interest rates remain high, inflation is being brought under control and employment rates are high.

Although Czechoslovakia's economy was one of the most centrally controlled prior to the November 1989 revolution, its economic restructuring is well advanced. In January 1992 Czechoslovakia's enterprises will be formally privatized, although most enterprises already are being operated by local plant managers.

Czechoslovakia, which has a population of more than 15.7 million people, consumed 3.16 quads of energy in 1989. The country produces 70 percent of its total energy needs; coal, the main domestic energy source, supplies 56 percent of its energy demand, and the country's nuclear program supplied 27 percent of its electricity in 1988. However, Czechoslovakia produces virtually no oil and imports 98 percent of its consumption from the former Soviet Union.

The State Energy Inspectorate and the centrally administered energy allocation program have been abolished. Energy prices are still set by the two republics, but they do reflect world prices. Electricity averages about \$.05 Kwh and high cost penalties are assessed if demand projections are exceeded. The country has begun to develop energy standards for new buildings, and each industrial facility is required to employ an energy manager.

Poland



Poland has a population of more than 38 million people and is by far the region's largest market. Poland's Solidarity-lead government last year adopted a crash program to move the country to a free market economy. This undertaking included eliminating official price fixing and allowing private ownership of business. The Polish currency, the zloty, was devalued in May and many receive another devaluation soon. The zloty is now convertible into dollars.

Although economic restructuring is now well under way, it has spurred a severe recession, including a 12-percent drop in gross domestic product and a 24-percent drop in personal consumption in 1990. Inflation fell to 240 percent in 1990 (after running at a 640 percent level in 1989) and currently is at

roughly 5 percent per month. One bright spot -- exports to OECD countries increased by 44 percent last year.

Major Polish industries include machine building, iron and steel, mining, chemicals, shipbuilding, food processing, glass, beverages and textiles. Pollution from excessive use of Poland's indigenous energy source, coal, is a major problem.

Poland consumed 6.01 quads of energy in 1989, 78 percent of it through the burning of coal. Production of domestic coal fell by almost 17 percent in 1990. That reduction reflected the closing of unprofitable mines that resulted from economic restructuring. Poland is the largest electricity producer in Eastern Europe, generating 135.4 billion Kwh of electricity in 1989, virtually all with coal.

Most industrial enterprises are in the midst of changing ownership from government to private parties. In a number of cases workers are offered the chance to purchase stock in the companies which employ them.¹⁹ Plant managers now are permitted to make their own management decisions and are very interested in improving energy efficiency and locating joint venture partners in the West.

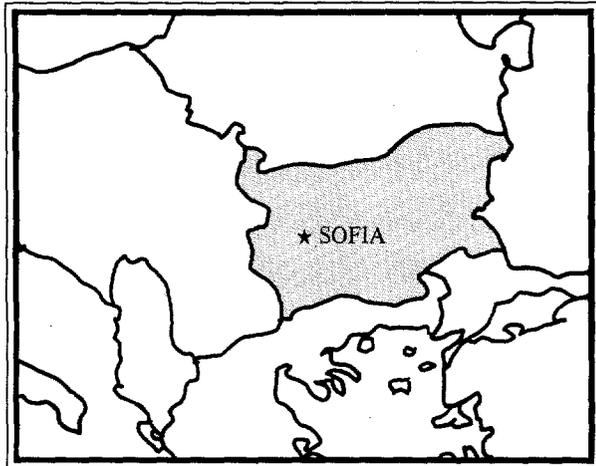
During the past several years, more than 1 million new businesses were founded in Poland.

But not all reforms have been pursued. For instance, many factories continue to pay a tax on assets that is not related to productivity or profit. Also, many of Poland's largest industrial facilities have so far avoided layoffs, partly because wages are such a small portion of production costs.

Although much of Polish industrial equipment is outdated and needs to be replaced, the lack of investment resources continues to be a problem.

Poland's hard currency debt, at \$40 billion, is a significant burden. In March 1991, the Paris Club indicated that it would forgive 50 percent of Poland's debt if the country continued to work toward creation of a free market. In addition, President Bush recently eliminated 70 percent of Poland's \$3.8-billion debt to the United States. And the World Bank is setting up a new \$400-million investment program in Poland that could be used to purchase energy-efficient technologies.

Bulgaria



Bulgaria the most energy import-dependent country in Eastern Europe. Bulgaria consumed 1.58 quads in 1989, but it only produced .65 quads domestically. It imports almost 60 percent of its energy needs, including virtually all of its oil and natural gas. Most of the country's domestic energy production is solid fuels, either brown coal or lignite, while 36 percent of its electricity comes from nuclear energy.

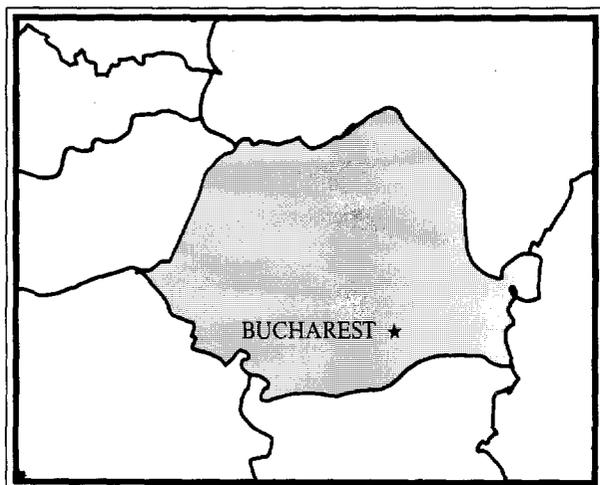
Considerable concern has been expressed about Bulgaria's growing reliance on nuclear energy. In June, the Vienna-based International Atomic Energy Agency, after an inspection of Bulgaria's Kozloduy nuclear power plant, recommended that it be shut down because of its poor condition. Bulgaria has refused to close the facility, citing a need

for the power.²⁰

Bulgaria's post-Communist government faces major problems in trying to renovate the country's aging industrial infrastructure. Its difficult external debt problem makes foreign investment difficult. Foreign debt now stands at \$10.4 billion, more than half owed to Germany, Japan, Britain and Austria. The government has suspended principal and most interest payments on the debt it owes to Western governments and banks.

The Bulgarian government has undertaken a number of important steps to restructure its economy. These include floating its currency, the lev, and making it internally convertible. Bulgaria is in the midst of a wholesale privatization of industry and is establishing a Western accounting and tax structure. The government has increased energy prices to reflect world prices and also has begun to restructure the state ownership of the power company, coal mines and gas stations -- including privatization of the latter. Major industries include food processing, machine and metal building, electronics, and chemicals.

Romania



The Romanian economy is in a tail-spin. GDP fell 8 percent in 1990 and is expected to fall another 6 percent in 1991. Inflation is averaging roughly 15 percent a month and is expected to endure as the government continues to print money. Romania has shifted to a negative trade balance, as exports virtually have collapsed.

Romania is more than twice as energy intensive as most other Eastern European countries. It consumed 3.35 quads of energy in 1989, primarily natural gas (48 percent), coal (27 percent), and oil (21 percent). Of the total, Romania itself produced 2.73 quads, importing 19 percent of its energy needs.

Despite its obvious problems, Roma-

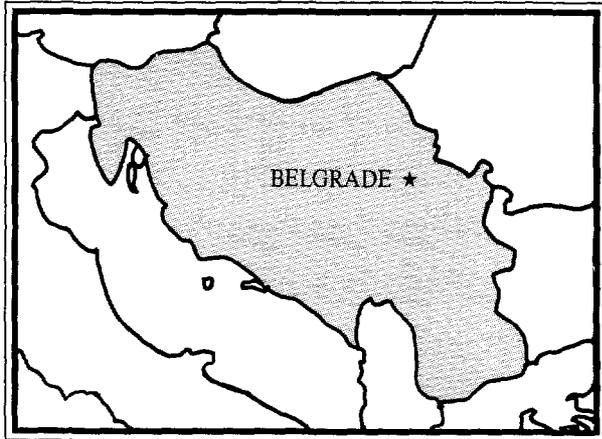
nia has begun to undertake some economic reforms. It has devaluated its currency, the leu, three times during the past 18 months. Privatization is proceeding under a law which calls for converting state enterprises to commercial/joint stock ownership, splitting up large enterprises and utilities, and giving 30 percent of the equity to the people, while the remaining 70 percent is sold.

Although reform in Romania lags behind that undertaken in Czechoslovakia, Hungary and Poland, more than 134,000

"Romania is more than twice as energy intensive as most other Eastern European countries."

private businesses have been established since the fall of Ceausescu. More than half of those new businesses are one-person operations; private business revenues only represent a small percentage of Romanian GDP at present.

Yugoslavia



For 30 years Yugoslavia relied on its decentralized, semi-market system known as the "labor-managed market economy." This system emphasized worker self-management and fostered perhaps the most advanced consumer economy in Eastern Europe. Now, civil war in Yugoslavia pits its largest republic, Serbia, against the republic of Croatia which, along with Slovenia, declared independence from the rest of the country in June 1991.

Slightly larger than Wyoming, Yugoslavia produces about two-thirds of its energy needs, mostly solid fuels and hydro-electricity, although it imports 60 percent of its oil. Industry -- metals, machinery, petroleum, chemicals, textiles, food processing, building materials, pulp and paper, and motor vehicles

enterprises -- accounts for about 47 percent of energy consumption.

Yugoslavia is considerably more energy efficient than the rest of Eastern Europe, primarily because its energy prices reflect world energy prices. Electricity is priced at levels similar to those found in the United States -- \$.04 to \$.10 per Kwh -- which fosters conservation. Higher prices, coupled with strict new environmental regulations similar to those in the EEC, make investments in energy efficiency attractive to plant managers. In many ways, Yugoslavia's energy demand more closely resembles that in OECD countries than its cousins in Eastern Europe.

Because the Yugoslavian civil war has greatly diminished federal power, free market programs that are under way elsewhere in Eastern Europe have been abandoned in Yugoslavia. Industrial production in the country is expected to fall by at least 50 percent in 1991.²¹ The suspension of hard currency withdrawals have left Yugoslavia's banking system in disarray. It is no wonder that the International Monetary Fund and World Bank have backed away from a \$5-billion loan package that had previously been earmarked for Yugoslavia.

Absent the civil war, Yugoslavia would represent one of the best opportunities for U.S. manufacturers of energy-efficient products. Unfortunately, until the country can stabilize the political, economic and ethnic situation, companies are not likely to undertake trade ventures or make investments.

End Notes

1. Czechoslovakia, Hungary and Poland are geographically considered part of Central Europe; however, for simplicity, we will refer to all six states as Eastern Europe. Other countries often identified as part of Eastern Europe -- the Baltic States and Albania -- are not addressed in this paper.
2. Movement to freer markets in Yugoslavia occurred earlier. Economic reform efforts during the past year have been limited because of civil war in the country.
3. H. Kissinger. "Soviet Good Will -- Don't Count on It." Washington Post, August 13, 1991. p. A17.
4. PlanEcon Report. ed. Jan Vandous (Washington, D.C.: PlanEcon, Vol. VIII, #27, 28, 29, July 20, 1991). p. 2.
5. Congressional testimony submitted by John P. Banks, Associate, International Resources Group, to the House Committee on Science, Space and Technology, Subcommittee on Energy, July 16, 1991, p. 1.
6. M. Philips. The Least-Cost Energy Path for Developing Countries: Energy-Efficient Investments for the Multilateral Development Banks (Washington, D.C., International Institute for Energy Conservation, September 1991). p. 3.
7. The Energy Situation in European Economies in Transition, International Energy Agency (Paris, IEA, April 1990). p.2.
8. M.D. Levine, et al. Energy Efficiency, Developing Nations, and Eastern Europe: A Report to the U.S. Working Group on Global Energy Efficiency, Washington. D.C.
9. op. cit. The Economic Situation in Eastern Europe in 1990.
10. Ibid. p. 14.
11. Ibid. p. 2.
12. Ibid. p. 16.
13. Calculation for estimated market for energy-efficient products.

The Alliance to Save Energy used the following method to estimate the market for energy-efficient industrial products in Eastern Europe:

1. 34 percent of potential savings in the industrial sector (which represents 15 percent of industrial energy use) can be achieved through no-cost or low-cost measures (similar to findings in AID energy audits of industrial plants) that have an average payback of two months.

2. An additional 35 percent of potential savings can be achieved through low-cost measures with an average payback of one year ($.35 \times \$14.5 \text{ billion} = \5.08 billion in savings investment @ one-year payback = \$5.08 billion).

3. An additional 31 percent of potential savings can be achieved through cost-effective efficiency measures with an average payback of three years ($.31 \times \$14.5 \text{ billion} = \4.5 billion in savings investment @ three-year payback = \$13.5 billion).

Total Energy Savings = \$14.5 billion
Total Market for Products = \$19.4 billion

14. Personal conversation with Marc Ledbetter at The Polish Foundation for Energy Efficiency.
15. Energy audit teams include engineers from Resource Management Associates, International Resources Group, and RCG/Hagler, Bailly.
16. Barbara Lee and John Nellis. *Enterprise Reform and Privatization in Socialist Economies* (Washington, D.C.: World Bank Discussion Papers #104, 1990) p. 10.
17. Peter Maass. "Flood of Investment Capitalizes on New Hungary," *The Washington Post*, November 10, 1991, p. H1.
18. Paul Hofheinz. "New Light in Eastern Europe," *Fortune*, July 29, 1991, p. 146.
19. Personal conversation with Jerry Decker, International Resources Group.
20. Report on Eastern Europe (Munich, Germany: RFERL Research Institute, Vol. 2, #28, July 12, 1991). p. 29.
21. "Yugoslavia's Civil War Balkanizes Economy," *The Washington Post*, August 29, 1991.

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