

**INTERNATIONAL DEVELOPMENT ASSISTANCE/  
FOR ENERGY CONSERVATION PROJECTS:  
AN INVENTORY**

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**Draft Final Report**

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## Introduction

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No inventory has been prepared of the various types of international energy assistance to developing countries. As a result, the Offices of Industrial Programs (OIP) and Building Energy Research and Development (BERD) of the U.S. Department of Energy, which monitor on-going international activities relevant to their missions, have no single resource to which they can refer. The two offices have thus sponsored this work by Hagler, Bailly & Company to compile such an inventory. In addition, they asked Hagler, Bailly to prepare descriptions of the major agencies that assist developing countries in the areas of energy conservation and efficiency.

In selecting agencies for the inventory, we relied on our experience in the field of international energy assistance. The selected agencies include: the two largest international donor agencies -- the World Bank and the United Nations Development Programme (UNDP); the regional banks with the largest energy programs -- the Asian Development Bank and the Inter-American Development Bank; and the principal agency within the UN system that implements energy conservation programs -- the United Nations Industrial Development Organization (UNIDO). Because of the growing role of the U.S. Agency for International Development in funding activities relevant to the missions of OIP and BERD and our familiarity with its energy program, we have also included it in our agency descriptions. Aid from these five funding agencies -- World Bank, UNDP, ADB, IADB, and AID (most of UNIDO's funds come from the UNDP) -- represents a major portion of all energy assistance to developing countries.

Most of the information contained in this report has come from interviews, unpublished reports, working papers, and internal agency project lists. One member of our team was in Europe during the study and interviewed officials at UNIDO in Vienna, the Commission of the European Communities in Brussels, the European Investment Bank in Luxembourg, and the International Energy Agency in Paris. Another member of our study team interviewed officials at the United Nations in New York

and the World Bank in Washington. We are assisting the World Bank and AID in the design and implementation of energy conservation programs; this ongoing work has provided the background for the sections on those two agencies. We have also interviewed the energy staff of the Asian Development Bank during trips to Manila on other assignments.

Just as there is no source of systematic information on energy conservation activities across agencies, no agency discussed in this report has inventoried its own energy conservation projects or knows precisely what percentage of its funds supports energy conservation activities. Such data are lacking because support for energy conservation activities is a recent development; moreover, it is frequently part of a larger project and difficult to single out. Finally, energy conservation activities are mainly in the planning or design stage at present.

Our findings on energy assistance are summarized in Exhibit 1. For each of the agencies discussed in this report, we provide data for 1982 or 1983 on:

- Total assistance to developing countries
- Expenditures for energy projects and percentage of total assistance
- Expenditures for projects with energy conservation elements and percentage of expenditures for energy projects.

The first two types of data -- total assistance and expenditures for energy projects -- are generally available. The difficulty lies in the fact that much of this assistance is in the form of multi-year loans for large capital projects. Thus, totals for any given year do not accurately represent outlays. However, it is much more difficult to establish a precise figure for energy conservation expenditures, mainly because most projects are multifaceted. For instance:

- A refinery project will include funds both to expand production and to use energy more efficiently
- Most power generation expansion projects include some funds for conservation measures

Exhibit 1

ASSISTANCE TO DEVELOPING COUNTRIES<sup>+</sup>  
(Million dollars)

	<u>Date</u>	<u>Total assistance</u>	<u>Total energy assistance</u>	<u>% of total</u>	<u>Assistance to projects with energy conservation elements*</u>	<u>% of energy funds</u>
World Bank	1983	15,000.0	2,974.0	20.0	161.0	5
UNDP	1983	308.4	23.7	7.7	5.5	23
UNIDO**	1982	91.9	13.0	14.0	1.3	10
Asian Development Bank	1982	1,731.0	514.0	36.0	N/A	N/A
Inter-American Development Bank						
Loans	1982	2,744.0	197.0	29.0	N/A	N/A
Grants	1982	49.0	3.5	7.1	N/A	N/A
Commission of the European Communities	1982	985.0	76.2	7.7	0.65-0.7	0.9-1.0
USAID	FY 1984	<u>1,342.0</u>	<u>37.0</u>	2.8	<u>3.5-4.0</u>	9.5-10.8
<b>Total</b>		<b>22,159.4</b>	<b>4,425.4</b>	<b>20.0</b>	<b>170.7/171.3</b>	<b>4</b>

<sup>+</sup>The International Energy Agency provides no direct assistance to developing countries.

\*Estimates.

\*\*Seventy percent (70%) of these funds come from the UNDP; not included in Total

NOTE: The International Energy Agency is not included because they provide no development assistance.

SOURCE: Hagler, Bailly & Company. See section on each agency.

- Programs to strengthen energy agencies will include promotion of conservation as well as pricing studies, data collection, or consideration of renewable energy technologies.

On the basis of the information in Exhibit 1, however, we can make a rough generalization: of the 1 year total of \$4.4 billion in energy assistance, only approximately \$170 million, or 4 percent, was committed to energy conservation activities. We can also make the more certain generalization that energy conservation's share of international development assistance is growing and will continue to grow. Such a conclusion is clear from the projects that will be initiated as a result of the Energy Sector Assessment Programme launched by the UNDP and the World Bank, and the projects in the planning stage at UNIDO and the World Bank.

In addition to determining energy project expenditures, we were also asked to specify energy conservation expenditures by sector and type of activity. Over the years, the largest share of international assistance to the energy sector has been allocated to power generation for oil-fired power plants and related transmission and distribution systems. Thus, the donor agencies have tended to look first at conservation opportunities in the power sector and in industry. Industry has been the initial focus of conservation efforts in developing countries for other reasons, too. The industrial sector in developing countries consumes 30 to 40 percent of commercial energy and tends to be concentrated. In addition, it is amenable -- through government involvement -- to direction or encouragement. Finally, it easily understands the connection between saving energy and improving profitability. The planning and design of industrial energy conservation projects has been completed, and many projects are moving into the implementation stage.

The building sector has been slower to receive attention, for a number of reasons:

- The heating and cooling needs of largely tropical, low-income developing countries are quite different from those of industrial nations
- International funds for low-income housing support only the most modest design and construction

- Large commercial and institutional buildings that may have large cooling loads are generally not funded from development assistance.

On the other hand, there are indications that the building sector is receiving more attention from some of the donor agencies. While buildings in developing countries may not account for a large percentage of total energy consumed, they are a major consumer of electricity, and the principal fuel for electricity generation in developing countries is imported oil. In addition, the payback for building energy conservation projects is as attractive as the payback for industrial projects.

As part of structural adjustment efforts in Korea, the World Bank has advanced proposals for government adoption of a new building code to encourage energy conserving design and construction. UNIDO has provided two loans to Hungary to support research in the building sector, and AID has a buildings conservation component in a number of its projects (Djibouti, Philippines). A major AID-supported effort aimed at commercial buildings is under way in cooperation with the Association of Southeast Asian Nations (ASEAN).

Where the residential or domestic sector has received attention, the effort has largely involved fuelwood and reforestation projects or efforts to introduce more efficient cookstoves. The transportation sector, although a major user of imported petroleum, has received little attention in the past because of the sensitive political question of subsidies for gasoline and diesel fuels and restrictions on automobile imports. The World Bank has supported policy studies to encourage more market-based pricing, and AID has begun to study ways of encouraging conservation in the transportation sector.

Energy conservation activity to date has consisted of assessments, planning, institutional development and strengthening, training, and energy audits. Most donor agencies and most developing countries receiving assistance are new to energy conservation programs. The energy agencies in some countries were established only in the early 1980s. Considerable expenditures have been made to assess country energy needs, to train personnel, and to plan and design programs. Rudimentary public education programs are being supported to convince the public of the need and benefit of more

efficient energy use. Some countries are beginning to move toward the implementation of energy conservation programs with the establishment of auditing programs, the training of private-sector personnel, and the support of private-sector financial institutions that can fund audits and retrofit programs.

We devote one chapter to each of the agencies we have studied; our sources are listed at the end of each chapter. The amount of detail available on individual projects varies considerably. For some agencies, only lists of project titles are available; for others, descriptions from various reports were available. To provide a full picture of a project, we would have to supplement the information provided to us for the inventory with the relevant project papers.

According to the World Bank's 1983 Annual Report, \$16.1 billion was lent by the Bank for energy projects between 1976 and 1983. Electric power projects accounted for 74 percent of the funds lent over this period; in 1983, despite a decline in relative importance, electric power projects still accounted for 59 percent of energy project loan funds. During the 1976-1983 period, oil and gas projects accounted for 18 percent of loans, coal projects 2 percent, and "other," including energy conservation, for 5 percent. The number and size of loans by project type are shown in Exhibit 1.a.

Energy activities at the World Bank can originate from a number of different divisions:

- Energy Division, which is conducting the country energy assessments of the joint UNDP/World Bank Energy Sector Assessment Programme; this division will carry out any follow-on work
- Industry Division, which has funded energy conservation projects and increasingly includes energy conservation features in the industrial projects that it funds
- Regional Divisions and country offices within the Divisions; these offices have funded power-sector projects and are increasingly incorporating conservation aspects in their projects.

While total energy loans by the Bank have been growing, a ceiling of 25 percent of total Bank lending has been placed on energy lending. Of the \$871 million that the Bank has lent to projects other than electric power or fossil fuel development, \$250 million or 29 percent has gone to Brazil for alcohol fuel development. No figures are available on funding of energy conservation projects. All the conservation projects that the Bank has supported have been in the industrial sector.

While the bulk of Bank lending in the power sector is aimed at increasing generation capacity and expanding distribution, it is recognized that increasing

Exhibit 1.a

WORLD BANK LENDING FOR ENERGY, 1976-1983  
(Million dollars)

	<u>1976-78</u>		<u>1979-82</u>		<u>1983</u>		<u>Total</u>	
	<u>Number of loans</u>	<u>Loan amount</u>						
Electric power	56	3,047	80	7,201	15	1,758	151	12,006
Oil and gas	3	210	43	1,686	17	1,037	63	2,933
Coal	1	10	5	309	3	18	9	337
Other, including energy conservation	--	--	7	710	5	161	12	871
<b>Total</b>	<b>60</b>	<b>3,267</b>	<b>135</b>	<b>9,906</b>	<b>40</b>	<b>2,974</b>	<b>235</b>	<b>16,147</b>
Percentage of total World Bank lending	8.9	14.8	13.6	21.2	16.4	20.5		

SOURCE: The World Bank, Annual Report 1983.

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available electricity by reducing waste and losses is more cost effective than installing new capacity. A joint UNDP/World Bank effort is under way in some developing countries (Zimbabwe, Panama, Sri Lanka) to identify power system efficiency projects. Before the approval of Bank loans for power system projects, the efficiency of the existing system is carefully appraised. It has not been possible to determine, however, the portion of Bank power sector loans that has been devoted to improving efficiency.

A report prepared by the World Bank Energy Department Library listed five projects, authorized by the Bank in 1983 and totaling nearly \$161 million, which contained energy conservation components (see Exhibit 1.b). A close reading of the projects-approved section of the 1983 Annual Report, however, reveals as many as eleven other Bank-supported projects with significant energy conservation elements (see Exhibit 1.c). Bank loans to these projects was \$755 million. Total World Bank lending in 1983 was approximately \$15 billion; projects identified as having energy conservation elements accounted for almost \$1 billion, or 6 percent, of the total.

While the size of committed loan funds does not indicate that priority has been given to energy conservation, an increasing proportion of Bank loans is expected to be targeted on conservation activities in the future. The joint UNDP/World Bank Energy Sector Assessment Programme will have spent \$5.5 million by the end of fiscal 1984 to conduct assessments in 77 countries. Completion of the assessments and follow-on energy planning, energy efficiency activities, and training are projected to cost \$33.5 million (see Exhibit 1.d). Efforts are under way to raise this money through country contributions to a special energy account established by the UNDP. The funds will then be turned over to the World Bank to implement recommendations resulting from the assessments.

The World Bank itself has 36 pending projects totalling more than \$2.3 billion that have industrial energy conservation elements (see Exhibits 1.e and 1.f). Many of the pending Bank loans are intended for energy conservation activities in the power sector and in petroleum refineries. Other targets for energy conservation assistance are the cement, fertilizer, steel, and chemicals industries.

Exhibit 1.b

WORLD BANK ENERGY CONSERVATION PROJECTS APPROVED IN 1983  
(Total: \$160.9 million)

Bangladesh -- \$28.5 million -- energy efficiency and refinery rehabilitation project. Project includes the following activities:

- Increase capacity utilization of a refinery
- Substitute domestic natural gas for imported fuel oil
- Provide institutional support to Bangladesh Petroleum Corporation
- Assist government in preparing a national industrial energy conservation plan
- Study use of domestic natural gas.

Cyprus -- \$10.2 million -- \$6.6 million to the Electric Authority to introduce energy conservation measures, and \$3.6 million for comprehensive energy planning and conservation program, which will include the following activities:

- Collect energy data
- Conduct energy planning
- Make energy pricing recommendations
- Strengthen energy audit capacity
- Establish the Applied Renewable Energy Center and conduct demonstrations.

Exhibit 1.b (continued)

WORLD BANK ENERGY CONSERVATION PROJECTS APPROVED IN 1983

Hungary -- \$109 million -- industrial energy diversification & conservation project. Project includes the following activities:

- Substitute natural gas for oil
- Substitute domestic coal for oil in the aluminum industry
- Implement energy rationalization and conservation in the petroleum refining industry
- Secure National Bank funding of waste heat recovery, industrial efficiency, and coal switching projects
- Foster energy agency institutional support
- Promote technology transfer to substitute low-quality domestic coal for imported metallurgical coal
- Develop pollution-minimizing boilers to increase use of indigenous coal.

Pakistan -- \$12 million -- refinery engineering and energy efficiency project. Hydrocracker project to allow secondary processing of domestic fuel oil and establish an energy conservation unit within the State Petroleum Refining and Petrochemical Corporation.

Zimbabwe -- \$1.2 million -- petroleum supply study. Study of fuel alternatives to reduce imports of electricity and petroleum products.

SOURCE: World Bank, Energy Department Library, Energy Projects Press Releases FY 83, August 1983.

Exhibit 1.c

ADDITIONAL PROJECTS WITH POSSIBLE ENERGY  
CONSERVATION/EFFICIENCY OR FUEL CONVERSION COMPONENTS

<u>Country</u>	<u>Loan</u>	<u>Project</u>
Equatorial Guinea	\$2.4 million	Provide technical assistance to Department of Petroleum Affairs and strengthen overall management of energy sector.
Indonesia	\$300 million	Power sector project: improve operational efficiency of distribution networks, reduce system losses, and provide training.
Mali	\$24 million	Includes efforts to improve management and operation of Energie du Mali.
Pakistan	\$7 million	Includes study of using local, high-sulfur coal in thermal power plants.
Yemen Arab Republic	\$19 million	Includes technical assistance to Yemen General Electricity Corporation to improve use of generation and transmission facilities.
Senegal	\$7.7 million	Improve efficiency of phosphate mining and processing.
Tanzania	\$18 million	Provide consulting services to pulp paper mill and to convert mill to burn fuelwood as well as oil and coal.
Tunisia	\$4.5 million	Includes technical assistance to prepare investment projects in energy sector.
India	\$200 million	Includes fuel efficiency improvements of electric locomotives.
Republic of Korea	\$122 million	Includes efforts to improve transportation to accommodate increased movement of coal through 1990.
Pakistan	\$50 million	Provide technical assistance to improve efficiency of Pakistan Railways.

Note: The loan amount is the value of the total project and not just the energy conservation component.

SOURCE: World Bank, Annual Report 1983.

Exhibit 1.d

UNDP/WORLD BANK JOINT PROGRAM: ESTIMATED FINANCIAL REQUIREMENTS -- 1983-86  
(\$ million in 1982 prices)

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>Total</u>
<b>Energy Sector Assessment Programme</b>					
60-country base programme	2.50 <sup>*</sup>	2.50 <sup>*</sup>	2.50	2.50	10.00
16-small country programme	<u>0.25<sup>**</sup></u>	<u>0.25<sup>**</sup></u>	<u>0.25</u>	<u>0.25</u>	<u>1.00</u>
Sub-total	2.75	2.75	2.75	2.75	11.00
<b>Energy Sector Management Programme</b>					
Energy Management Assistance Programme	1.50	1.50	2.00	2.00	7.00
Energy Efficiency Programme (industry, transport, and major energy-using sectors)	3.00	5.00	5.50	5.50	19.00
(Power Loss-Reduction Project)	(2.00)	(3.50)	(3.50)	(3.50)	(12.50)
	(1.00)	(1.50)	(2.00)	(2.00)	(6.50)
Rural/Renewable Energy Pilot Programme	1.00	1.50	2.50	3.00	8.00
Manpower and Institutional Development Programme	<u>0.50</u>	<u>0.50</u>	<u>0.50</u>	<u>0.50</u>	<u>2.00</u>
Sub-total	6.00	8.50	10.50	11.00	36.00
<b>TOTAL</b>	<b>8.75</b>	<b>11.25</b>	<b>13.25</b>	<b>13.75</b>	<b>47.00</b>

\*Funds committed by UNDP/World Bank.

\*\*Funds promised by a donor country.

SOURCE: A Progress Report: The Joint UNDP/World Bank Energy Sector Assessment Programme and Energy Sector Management Programme, November 1982.

Exhibit 1.e

WORLD BANK "ENERGY PROJECTS UNDER PREPARATION," JANUARY 1984

<u>Country</u>	<u>Loan</u>	<u>Project</u>
<b>Power Projects (with possible energy conservation elements)</b>		
Ghana	\$20 million	Rehabilitate sub-stations and distribution network, provide technical assistance and training.
Niger	\$7.5 million	Provide power sector planning, technical assistance, and training.
Bangladesh	\$35 million	Extend, rehabilitate and maintain power distribution network.
India	\$200 million	Rehabilitate thermal power plant.
Belize	TBD	Rehabilitate and expand transmission and distribution facilities, conduct energy studies, institutionally strengthen Ministry of Energy and Communications.
Brazil	\$250 million	Implement energy conservation, substitute electricity for oil.
Chile	\$90 million	Partially convert to coal-fired power generation.
Dominican Republic	\$46.5 million	Rehabilitate thermal plant; provide technical assistance for reduction of distribution losses; provide studies and training.
Guyana	\$15 million	Rehabilitate generation and distribution plant.
Nicaragua	\$16 million	Will include training and technical assistance to institutionally improve Institute of Nicaraguense de Energia.
India	\$100 million	Convert several cement plants from coal to dry process.
Pakistan	\$150 million	Will include support for Government's Structural Adjustment Program in Energy.

Note: The loan amount is the value of the total project and not just the energy conservation components.

Exhibit 1.e (continued)

WORLD BANK "ENERGY PROJECTS UNDER PREPARATION," JANUARY 1984

<u>Country</u>	<u>Loan</u>	<u>Project</u>
<b><u>Other Energy Sources and Energy Planning</u></b>		
Sri Lanka	\$70 million	Will include support for Government's Structural Adjustment Program in Energy.
Jordan	\$30 million	Will include energy conservation and energy planning.
Yugoslavia	\$80 million	Will include technical and energy audits for Yugoslav fertilizer industry.
<b><u>Energy Conservation</u></b>		
Pakistan	\$80 million	Rehabilitate and introduce energy efficiency measures in six existing cement plants.
Romania	TBD*	Save energy and improve processes in steel industry
Turkey	TBD**	Energy saving investment in selected industries (2 projects).
Yugoslavia	\$10 million	Feasibility studies for energy conservation/conversion projects in steel, cement, chemicals, and coal industries.
Yugoslavia	TBD	Improve energy efficiency in selected enterprises.
Brazil	\$100 million	Implement energy conservation and rationalization in refinery and fertilizer sectors.

Note: The loan amount is the value of the total project and not just the energy conservation components.

Exhibit 1.e (continued)

WORLD BANK "ENERGY PROJECTS UNDER PREPARATION," JANUARY 1984

<u>Country</u>	<u>Loan</u>	<u>Project</u>
<u>Refineries</u>		
Kenya	\$50 million	Convert refinery.
Zaire	\$3 million	Refinery engineering, management, and economic studies.
Ghana	\$6.9 million	Will include assistance to rehabilitate and rationalize refinery.
Philippines	\$20 million	Implement refinery energy conservation measures.
Thailand	\$50 million	Rehabilitate refinery.
Bangladesh	\$60 million	Establish secondary refining capacity at petroleum refinery
Pakistan	\$28.5 million	Convert refinery.
Ecuador	\$50 million	Rehabilitate and expand refinery.

TBD = Loan amount to be determined.

\*\$80 million, see Exhibit 6.

\*\*\$130 million, see Exhibit 6.

Note: The loan amount is the value of the total project and not just the energy conservation component.

SOURCE: World Bank, Energy Department Library. Quarterly Summary of Energy Projects Under Preparation, January 1984.

Exhibit 1.f

ADDITIONAL PROPOSED ENERGY CONSERVATION PROJECTS

<u>Country</u>	<u>Loan</u>	<u>Project</u>
Egypt	\$125 million	Rehabilitate fertilizer plant.
Romania	\$80 million	Achieve industrial energy savings (also listed in Exhibit 1.e).
Turkey	\$130 million	Achieve energy savings (also listed on Exhibit 1.e).
Peru	\$50 million	Conserve energy.
Bangladesh	\$60 million	Petroleum refinery.
Zambia	\$50 million	Convert refinery.
Portugal	\$85 million	Achieve industrial energy conservation.
Colombia	\$100 million	Oil refinery
Uruguay	\$70 million	Modernize refinery and convert to gas.

SOURCE: World Bank, Industry Department. "Projects with Energy Component (FY84-FY86)," 10/11/83.

Another indication of the growing interest in improving energy efficiency in developing countries is a proposal pending before the Bank from the Industry and Energy Departments for a major industrial energy conservation research project. Research done for the Bank by Hagler, Bailly has shown that in most developing countries a coordinated, comprehensive energy conservation program could save as much as 20-25 percent of current industrial energy consumption. At present, however, developing countries lack the data and understanding to develop such programs. Under the energy conservation research project, a number of developing countries will be selected for studies; data from these countries will be collected and analyzed to determine what constitutes energy efficiency. The research will address three sectors and their major energy-consuming subsectors:

- Industry -- cement, steel, fertilizer, oil refining, copper, and pulp and paper
- Transportation -- heavy and light road vehicles and railways
- Buildings -- large, urban commercial buildings.

The requested funding level for this project is \$364,000.

The 1983 World Bank report, Energy Transition in Developing Countries, projects Bank spending for energy projects at \$4 billion per year from 1983 to 1987; the 1983 level was nearly \$3 billion. In its 1983 Annual Report, however, the Bank views its projected spending level as small compared with the total investment required.

The following table in the World Bank's 1983 Annual Report projects required energy investments for 1982-1992 in developing countries:

Electric power	\$ 658.4 billion ( 46%)
Oil	465.9 billion ( 33%)
Refineries	123.3 billion ( 9%)
Natural gas	90.1 billion ( 6%)
Coal	<u>88.7 billion ( 6%)</u>
Total	\$1,426.4 billion (100%)

No estimates were made for energy conservation needs.

**Documents:** World Bank. Annual Report 1983, 1984.

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**World Bank Interviews:** Khurshid Ahmed, Energy, East Asia & Pacific Region.

Harold Dunkerly, Water Supply and Urban Development.

Esref Erkmén, Energy, East Africa Region.

Gary James Gaskin, Energy Conservation Specialist, Energy Department.

Emmanuel Njomo, Country Programs Department, East Asia and Pacific Region.

Kashinath Sheorey, Power & Energy Development, Middle East & North Africa, Europe Region.

Bocar Madani Thiam, Energy, West Africa Region.

Most funds for technical assistance to developing countries within the United Nations system come from the UNDP. In 1983, the UNDP contributed \$308.4 million in development assistance to 952 projects. Energy assistance accounted for \$23.7 million or 8 percent (see Exhibit 2.a). While total assistance from the UNDP fell by 43 percent between 1981 and 1983, energy conservation assistance grew by 15 percent in 1982 and by 5 percent in 1983. In 1983, the UNDP authorized only two energy conservation projects, with 95 percent of these funds going to the joint UNDP/World Bank Energy Sector Assessment Programme.

Project information from the UNDP derives from its computer on-line data base, known as Project Institutional Memory. The largest single project is the ongoing Energy Sector Assessment Programme being conducted in cooperation with the World Bank. The UNDP is contributing \$3.9 million to the program, which will result in energy assessment studies and reports on 77 developing countries. A list of the 49 projects is presented in Exhibit 2.b. Project data sheets have been requested for projects over \$250,000. Project titles and the designation of UNIDO as the implementing agency indicate that most of the UNDP-supported work is in the industrial sector.

Within the UN system, developing country projects are implemented by the UN Department of Technical Cooperation for Development or by one of the specialized UN agencies (e.g., UNIDO, FAO, UNESCO). Implementing agencies within the UN system get nearly all of their funds for energy assistance from the UNDP. On occasion, the UNDP itself will oversee the implementation of a project, but usually it approves projects and disburses funds to another UN agency for implementation.

The UNDP solicits funds from UN member governments and other governments and organizations. Most money contributed to the UNDP goes into a fund that is allocated to member nations. The largest portions go to those countries with the lowest per-capita GNP on the basis of 5-year Indicative Planning Figures (IPFs). The way

Exhibit 2.a

UNDP ASSISTANCE TO DEVELOPING COUNTRIES

	<u>1981</u>	<u>1982</u>	<u>1983</u>
Total assistance (million dollars)	504.7	541.9	308.4
Number of projects	1,165	1,296	952
Energy sector assistance (million dollars)	22.8	14.8	23.7
Percent of total assistance	5.0	3.0	8.0
Number of energy sector projects	54	44	45
Energy conservation assistance (million dollars)	3.4	3.9	4.1
Percent of energy sector assistance	15	26	17
Number of energy conservation projects	8	15	2

SOURCE: Interview, UNDP.

## Exhibit 2.b

## UNDP ENERGY CONSERVATION PROJECTS, 1973-1983

<u>Country, first year of operations</u>	<u>Implementing agency<sup>1</sup></u>	<u>Funding (\$ 000)</u>	<u>Project title</u>
<b>Africa</b>		<b>555</b>	
Ethiopia, 1979	UN/TCD	440	Energy Survey and Planning
Mauritius, 1983	WB	70	Energy Planning
Uganda, 1979	UN/TCD	45	Overall Energy Assessment
<b>Asia &amp; the Pacific</b>		<b>8,774</b>	
Bangladesh, 1982	ASDB	1,129	Energy Planning Project
Bhutan, 1983	UNCHS	112	Housing Technology and Design
China (PRC), 1982	Gvt.	1,000	Advisory Services and Training
China (PRC), 1982	UNIDO	371	Energy Conservation
China (PRC), 1983	Gvt.	423	Combustion and Thermal Energy
India, 1980	UNIDO	300	Indian Oil Development
India, 1980	UNIDO	372	Petroleum Refining Industry
India, 1982	UNIDO	72	Energy Conservation
India, 1982	UNIDO	19	Energy Conservation
Malaysia, 1982	UN/TCD	217	Energy Management
Pakistan, 1983	UNIDO	189	Energy Savings
Philippines, 1982	UNIDO	1,578	Industrial Energy Management
Regional Asia, 1979	UN/TCD	23	Energy Matters <sup>2</sup>
Korea (ROK), 1975	UNDP	95	Energy Conservation <sup>2</sup>
Korea (ROK), 1978	WB	221	Energy Policy Study <sup>2</sup>
Korea (ROK), 1978	ASDB	679	Energy Conservation
Korea (ROK), 1979	UN/TCD	212	Heat and Power Generation <sup>2</sup>
Korea (ROK), 1979	WB	484	Development Planning <sup>2</sup>
Korea (ROK), 1982	WB	225	Structural Adjustment Studies
Thailand, 1979	ASDB	971	Energy Master Plan Study
Thailand, 1980	UNIDO	79	Energy Saving Scheme
Thailand, 1982	UNIDO	3	Electrical/Thermal Power <sup>2</sup>
<b>Arab States</b>		<b>31</b>	
Djibouti, 1981	UN/TCD	31	Utilization of Energy <sup>2</sup>
<b>Europe</b>		<b>1,312</b>	
Cyprus, 1978	UN/TCD	358	Energy Conservation
Hungary, 1983	UNIDO	106	Energy Conservation
Poland, 1983	UN/TCD	248	Fields of Competence
Romania, 1982	UN/TCD	200	Railway Construction
Turkey, 1983	UNIDO	400	SEKA Pulp and Paper

Exhibit 2.b (continued)

UNDP ENERGY CONSERVATION PROJECTS, 1973-1983

<u>Country, first year of operations</u>	<u>Implementing agency<sup>1</sup></u>	<u>Funding (\$ 000)</u>	<u>Project title</u>
<b>Latin America</b>		<b>4,203</b>	
Barbados, 1982	UNESCO	141	Energy-Saving Device
Bolivia, 1972	UN/TCD	1,276	Energy Resources
Brazil, 1978	UNDP	895	Strengthening of Personnel
Brazil, 1982	UNIDO	319	Energy Conservation
Belize, 1979	UN/TCD	472	Energy Development
Caribbean, 1982	UNDP	20	Energy-Saving Device
Ecuador, 1977	UN/TCD	1	USO Racional de la Energie <sup>2</sup>
Jamaica, 1974	UNDP	2	Alternative Energy Sources <sup>2</sup>
Jamaica, 1982	UNESCO	7	Feasibility Study
Peru, 1977	UN/TCD	114	National Energy Balance <sup>2</sup>
Peru, 1979	UN/TCD	148	National Energy Balance <sup>2</sup>
Peru, 1982	UN/TCD	129	Energy Studies
Latin America, 1973	IDB	582	Transport System <sup>2</sup>
Uruguay, 1982	FAO	97	National Fishery Institute
<b>Interregional &amp; global</b>		<b>4,521</b>	
Global, 1979	UNDP	26	Nonconventional Energy Study <sup>2</sup>
Interregional, 1981	ILO	120	MGS of Energy Resources
Interregional, 1982	WB	458	Power System
Interregional, 1983	WB	3,917	UNDP/WB Energy Program
<b>Total</b>		<b>19,396</b>	

- <sup>1</sup>ASDB = Asian Development Bank.  
 FAO = Food and Agricultural Organization.  
 Gvt. = Government of recipient country.  
 IDB = Inter-American Development Bank.  
 ILO = International Labor Organization.  
 UNCHS = United Nations Centre for Human Settlements (HABITAT).  
 UNDP = United Nations Development Programme.  
 UNESCO = United Nations Educational, Social, and Cultural Organization.  
 UNIDO = United Nations Industrial Development Organization.  
 UN/TCD = United Nations/Department for Technical Cooperation for Development.  
 WB = World Bank.

<sup>2</sup>Completed.

SOURCE: United Nations Development Programme, Programme and Project Management System, computer printout, February 18, 1984.

in which projects are selected for support with UN funds is left to the discretion of the recipient nation. A country may decide to support an agricultural project and have the funds allocated through FAO, or it may decide to invest in industrial energy conservation, in which case the UNDP would allocate the requested funds (following a review of the merits of the project) to UNIDO for implementation, or it may decide on both courses of action.

The distribution of energy conservation projects by start-up year and implementing agency is shown in Exhibit 2.c. Generally, UNDP energy funds go to the World Bank for implementation. Seventy-three percent of the funds for projects starting in 1983 went to the World Bank. UNIDO remains an important recipient of funds for industrial energy conservation activities; it received 27 percent of UNDP funds for energy conservation projects that started in 1982 or 1983. In fact, UNIDO received 78 percent of its 1982 funds and 71 percent of its 1983 funds from the UNDP.

**Documents:** The Joint UNDP/World Bank Energy Sector Management Programme. November 1982.

"Programme and Project Management System On-Line Enquiry Facility," 2/18/84.

Unfinished Business: A Report on the Global and Interregional Programme of the United Nations Development Programme, no date.

"The United Nations Development Programme and Energy," press release, no date.

United Nations Development Programme: Compendium of Approved Projects as of 30 September 1982.

**UNDP Interviews:** Linda Schreiber, Chief, Documentation and Statistics Office, Bureau of Programme Policy and Evaluation.

Andre Wilmots, Principal Technical Advisor, Energy Office.

Exhibit 2.c

UNDP ENERGY CONSERVATION PROJECTS 1973-1983 BY IMPLEMENTING AGENCY<sup>1</sup> AND YEAR OF PROJECT INITIATION

	1973-1979		1980		1981		1982		1983		Total	
	No. of projects	Funding (\$ 000)										
UNIDO	--	--	3	751	--	--	5	2,343	4	714	12	3,808
UN	8	2,827	3	391	1	31	2	417	1	248	15	3,914
World Bank	2	705	--	--	--	--	2	683	2	3,987	6	5,375
UNDP	4	1,018	--	--	--	--	1	20	--	--	5	1,038
ASDB	2	1,650	--	--	--	--	1	1,129	--	--	3	2,779
Other <sup>2</sup>	<u>1</u>	<u>582</u>	<u>--</u>	<u>--</u>	<u>1</u>	<u>120</u>	<u>4</u>	<u>1,245</u>	<u>2</u>	<u>535</u>	<u>8</u>	<u>2,482</u>
Total	17	6,782	6	1,142	2	151	15	5,837	9	5,484	49	19,396

- <sup>1</sup>ASDB = Asian Development Bank.  
 FAO = Food and Agricultural Organization.  
 Gvt. = Government of recipient country.  
 IDB = Inter-American Development Bank.  
 ILO = International Labor Organization.  
 UNCHS = United Nations Center for Human Settlements (HABITAT).  
 UNDP = United Nations Development Programme.  
 UNESCO = United Nations Educational, Social, and Cultural Organization.  
 UNIDO = United Nations Industrial Development Organization.  
 UN/TCD = United Nations/Department for Technical Cooperation for Development.  
 WB = World Bank.

<sup>2</sup>UNCHS (1), China (2), UNESCO (2), IDB (2), FAO (1), ILO (1).

SOURCE: United Nations Development Programme, Programme and Project Management System, computer printout, February 18, 1984.

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UNIDO began to support energy management and conservation projects in a significant way in 1981, when it committed a million dollars to 16 projects. Before 1981, UNIDO spent \$599,000 on seven industrial energy conservation projects. From 1981 through 1983, it spent nearly \$5 million on energy conservation, or 2 percent of its budget (see Exhibit 3.a). In 1982, UNIDO supported a total of 55 energy-related technical assistance projects for an expenditure of \$13 million, or 14 percent of its budget. In 1983, it spent roughly \$2.6 million for industrial energy conservation projects. Plans for 1984 and beyond call for spending more than \$8.5 million on 27 projects.

The largest project yet to be supported by UNIDO is a planned \$3.2 million effort in Southern Europe -- Portugal, Greece, Yugoslavia, and Turkey. Within each country, a number of energy intensive sectors, including steel, will be selected for energy audits, the installation of energy monitoring instruments, training, and technical assistance to implement recommendations growing out of the audits.

Projects under way (see Exhibit 3.b) entail improvements in energy performance in the Chinese aluminum industry, the transfer of Japanese energy conservation technology to small and medium-sized enterprises in the countries of Southeast Asia, and a major effort in the sugar industry in the Caribbean. Among the largest UNIDO projects in industrial energy conservation are those that focus on creating or strengthening the agencies that conduct training and provide technical assistance to industries in their countries. Such projects include a nearly completed \$1.2-million effort to set up a Tanzanian industrial R&D organization, on-going support to establish an energy management consulting service in the Philippines (\$1.6 million), and the creation of an Energy Management Training Institute in the Republic of Korea (\$792,000). Pending projects include one in Senegal for an energy saving office (\$684,000) and one in the People's Republic of China to establish a Technical Service Center for Energy Conservation (\$900,000)

Exhibit 3.a

UNIDO EXPENDITURES FOR ENERGY PROJECTS

	<u>Energy management and conservation projects<sup>1</sup></u>		<u>All energy projects</u>		<u>Total UNIDO project budget (\$ 000)<sup>2</sup></u>
	<u>Number of projects</u>	<u>Amount (\$ 000)</u>	<u>Number of projects</u>	<u>Amount (\$ 000)</u>	
1981	16	1,087	N/A	N/A	88,600
1982	21	1,308	55	13,000	91,900
1983	<u>26</u>	<u>2,601</u>	N/A	N/A	<u>93,500</u>
Subtotal	<b>63</b>	<b>4,996</b>	<b>N/A</b>	<b>N/A</b>	<b>274,000</b>
1984 and beyond	<u>27</u>	<u>8,594*</u>	N/A	N/A	
<b>TOTAL</b>	<b>90</b>	<b>13,590*</b>			

\*Funding level for 9 planned projects is yet to be determined.

SOURCE: <sup>1</sup>United Nations Industrial Development Organization, "UNIDO's Energy Management and Conservation Activities," no date.

<sup>2</sup>United Nations Industrial Development Organization, Annual Report of the Executive Director 1982. Vienna, 1983.

Exhibit 3.b

1983 UNIDO INDUSTRIAL ENERGY CONSERVATION PROJECTS  
(\$000)

<b><u>Workshops</u></b>	<b><u>325</u></b>	
Interregional	102	Workshop on energy conservation in metallurgical industries
Interregional	51	Seminar on energy saving in the cement industry
Regional LA-AF	63	Symposium on industrial energy management
Regional Asia	87	Workshop on waste heat recovery
Regional Latin America	22	Seminar on strengthening training capacity in energy conservation
<b><u>Training</u></b>	<b><u>1,023</u></b>	
Interregional	60	Training for energy conservation in the aluminum industry
Interregional	12	Training for energy management in the glass industry
Regional Africa	70	Seminar on industrial energy management
China	74	Training to increase reliability and economy of locomotive diesel engines
India	276	Training of petroleum refining management
Korea	86	Energy Management Training Institute
Philippines	435	Establish an energy management consulting service
Romania	10	Technical assistance to improve design and manufacture of diesel engines
<b><u>Technical Assistance</u></b>	<b><u>937</u></b>	
China	194	Energy conservation in the aluminum industry; research, training, introduction of new technology and equipment
India	139	Petroleum refining energy management and conservation
India	19	Study on energy conservation opportunities in the ceramic industry
Pakistan	127	Energy saving in industry
Regional Asia	166	Transfer of Japanese energy conservation technologies to ASFAN countries
Thailand	2	Energy conservation plan
Brazil	214	Technical assistance and training for energy conservation
Hungary	39	Assistance to increase technology transfer to laboratories studying building construction and operations
Hungary	37	Assistance for research on the links between energy conservation and indoor air pollution

Exhibit 3.b (continued)

1983 UNIDO INDUSTRIAL ENERGY CONSERVATION PROJECTS  
(\$000)

<b><u>Institutional Support</u></b>	<b><u>291</u></b>	
Angola	23	Advisory services to National Directorate of Petroleum for petroleum refining and petrochemical industry energy management
Tanzania	247	Establish industrial R&D organization devoted in part to energy management and audits
Pakistan	21	Master plan for the iron and steel industry
<b><u>Research</u></b>	<b><u>25</u></b>	
India	25	Research in the aluminum industry to utilize waste heat
<b><u>Not Yet Determined</u></b>		
<b>Total</b>	<b>2,601</b>	

SOURCE: United Nations Industrial Development Organization, "UNIDO's Energy Management and Conservation Activities," no date.

In 1984 and beyond, UNIDO plans to spend more than \$8.6 million for industrial energy conservation (see Exhibit 3.c). It is not possible, with the information available, to categorize these activities precisely, since many projects contain more than one element. However, technical assistance projects will represent the major area for expansion of UNIDO aid (see Exhibit 3.d).

**Documents:** Annual Report of the Executive Director 1982. Vienna, 1983.

"Energy Development and Industrialization," October 6, 1982.

"Management and Conservation of Energy in Industry," December 1982.

"UNIDO's Energy Management and Conservation Activities," no date.

**UNIDO Interview:** Edward Epremian, Special Technical Advisor, Special Assistant to the Executive Director, Vienna.

Exhibit 3.c

JNIDO INDUSTRIAL ENERGY CONSERVATION PROJECTS  
(1984 and pending)

<b><u>Workshops</u></b>		<b><u>70</u></b>	
Regional Arab States	70	Seminar for technical managers in energy management and conservation	
<b><u>Training</u></b>		<b><u>1,120</u></b>	
Interregional	NA	Training manual for small- and medium-sized industrial enterprises	
Interregional	NA	Industrial energy efficiency training	
Interregional	54	In-plant training	
Interregional	54	Manpower training for energy management and conservation analysis	
Zimbabwe	148	Industrial energy efficiency training program	
Fiji (1984)	148	Industrial energy efficiency training program	
Korea	716	Energy Management Training Institute	
<b><u>Technical Assistance</u></b>		<b><u>4,679</u></b>	
Interregional	NA	Energy management for LDCs	
Ethiopia	NA	Energy conservation engineering technical advisory services	
Regional Africa	186	Assistance to energy saving in the silicate industry	
Pakistan (1984)	62	Energy saving in industry	
Philippines (1984, 1985)	1,144	Continued support to the energy management consulting service	
Sri Lanka	NA	Energy conservation in industry	
Argentina	NA	Energy conservation	
Brazil	NA	Energy conservation in industry	
Regional LA	46	National use of energy in the sugar cane industry	
Hungary	61	Assistance to increase technology transfer to laboratories studying building construction and operations	
Regional Europe	3,180	Energy conservation in Europe	

Exhibit 3.c (continued)

UNIDO INDUSTRIAL ENERGY CONSERVATION PROJECTS  
(1984 and pending)

<b><u>Institutional Support</u></b>	<b><u>1,720</u></b>	
Senegal	684	Assistance in the establishment of an energy saving office
China	900	Institutional strengthening for the Technical Service Centre for Energy Conservation
Thailand	NA	Energy savings center
Colombia	136	Pilot center for energy conservation in industry
<b><u>Research</u></b>	<b><u>5</u></b>	
Hungary	5	Continued support to study links between energy conservation and indoor air pollution
<b><u>Not Specified</u></b>	<b><u>1,000</u></b>	
Turkey	600	Energy management and conservation
Yugoslavia	NA	Thermal insulation for external construction
Egypt	400	Energy conservation in industry
<b>Total</b>	<b>8,594</b>	

SOURCE: United Nations Industrial Development Organization, "UNIDO's Energy Management and Conservation Activities," no date.

Exhibit 3.d

UNIDO ENERGY CONSERVATION PROJECTS

	1983		1984 & planned	
	<u>No. of projects</u>	<u>\$000</u>	<u>No. of projects</u>	<u>\$000</u>
Workshops, seminars	5	325	1	70
Training	8	1,023	7	1,120*
Technical assistance	9	937	11	4,679*
Institutional support	3	291	4	1,720*
Research	1	25	1	5
Not specified	<u>--</u>	<u>--</u>	<u>3</u>	<u>1,000*</u>
	26	2,601	27	8,594

\*Funding levels for some projects have not been determined.

SOURCE: United Nations Industrial Development Organization, "UNIDO's Energy Management and Conservation Activities," no date.

Asian Development Bank support for energy-sector projects has grown from \$15 million, 12 percent of total loans in the late 1960s, to \$514 million, 36 percent of total loans in 1982 (see Exhibits 4.a and 4.b). On the basis of available information, it is not possible to specify which of the funded projects include energy conservation activities.

In 1981, the ASDB completed a regional energy survey that sought to describe needs and prospects in the energy sector. The survey recommended three priorities for the ASDB:

- Support the development of renewable and indigenous energy resources
- Promote energy conservation
- Strengthen the ability of national planning staffs to prepare comprehensive energy plans and policies.

The loans approved in 1982 took into account the recommendations from the 1981 survey.

The Asian Development Bank made 11 energy sector loans in 1982. Of these loans, five were earmarked for the development of indigenous energy resources (three hydro, two natural gas); four for the provision of extra high voltage electricity transmission and distribution lines; and two for construction of natural gas pipelines. Each of the energy sector projects also included funds for institutional strengthening and for training.

The only explicit energy conservation activities in 1982 were technical assistance grants to the Philippines and Korea for industrial energy audits. In addition, preparatory work was undertaken for an energy conservation technical assistance project in the Philippines. The ASDB reported that the principal energy policy development in the region in 1982 was the decision

Exhibit 4.a

ASIAN DEVELOPMENT BANK LOANS FOR ENERGY SECTOR PROJECTS:  
3-YEAR MOVING AVERAGES (1968-1970 through 1980-1982)

	<u>Energy loan</u>		<u>Total loan</u>
	<u>\$ million</u>	<u>% total</u>	<u>\$ million</u>
1968-1970	15.4	12.0	128.4
1969-1971	50.6	25.4	199.3
1970-1972	89.9	33.1	271.9
1971-1973	106.4	32.2	330.5
1972-1974	114.4	26.7	428.4
1973-1975	125.1	23.0	543.2
1974-1976	141.2	21.3	661.3
1975-1977	170.5	22.0	774.2
1976-1978	202.5	21.5	940.4
1977-1979	264.0	24.0	1,098.9
1978-1980	319.0	24.9	1,282.0
1979-1981	395.9	27.2	1,454.9
1980-1982	458.7	28.4	1,614.6
Cumulative (1968-1982)	2,957.2	25.7	11,501.5

SOURCE: Asian Development Bank, Annual Report 1982.

Exhibit 4.b

ASIAN DEVELOPMENT BANK LOANS AND GRANTS  
(Million dollars)

	1981		1982	
	Amount	Number	Amount	Number
Total loans	1,678.0	54	1,731.0	56
Energy sector loans	480.0	N/A	514.0	11
Grants for technical assistance and regional activities	16.6	62	18.5	80
Energy sector grants	N/A	N/A	5.2	29

SOURCE: Asian Development Bank, Annual Report 1982.

by a number of countries to raise gasoline prices "as part of their energy conservation programs."

In 1982, the ASDB held an Energy Planning Coordination Meeting to improve coordination among donors that provide loans and assistance for energy projects in Asia. Other regional energy activities in 1982 included a seminar on utility rates, a rural electrification survey, a review of "refinery rationalization needs," a study of the energy situation in the transportation sector, and initiation of an electricity transmission planning program.

The Asian Development Bank is now preparing a directory of its energy projects that will be available sometime this year. Six projects, for which news releases were issued in 1983 and 1984, contained possible industrial energy conservation elements. Technical assistance grants for unspecified amounts were made to Western Samoa and Vanatu for energy planning activities. Each grant provides funds to prepare 10-year energy development plans and to establish an energy office. Another technical assistance grant will support the publication of the second annual Asian Electric Power Utilities Data Book; publication is scheduled for April 1984. At the end of 1983, the ASDB made a loan to Indonesia for \$135 million for the Power XVIII Project. One of the goals of the project is to increase the amount of electricity available to the industrial sector and to discourage industrial and commercial enterprises from setting up their own power plants. The ASDB made a technical assistance grant to Pakistan for a feasibility study and followed it with a loan for \$130.9 million (USAID also contributed \$52 million) to construct a 450-MW combined cycle power plant. The plant will use four gas turbines and four heat recovery boilers.

**Documents:** Asian Development Bank. Annual Report 1982. Manila, 1983.

Asian Development Bank, News Releases  
109/83, 11 November 1983; 125/83, 6 December 1983; 142/83, 20 December 1983; 8/84, 23 January 1984; 9/84, 23 January 1984; 10/84, January 1984.

**ASDB Interviews:** V. V. Desai and Kari Nyman, Energy Planning Unit, Asian Development Bank, Manila.

Loans for energy sector projects from 1961 through 1982 have accounted for the largest share of total IDB loans over this period. Twenty-seven percent of IDB loans went to energy projects, compared with 23 percent for agriculture, the next largest sector. Two types of projects were the target of \$6 billion: increases in generation capacity and additions to transmission and distribution lines, and construction of main and distribution gas lines.

In 1982, the IDB lent nearly \$797 million, or 29 percent of its total loan funds to seven energy projects -- four hydroelectric, two electricity transmission, and one oil and gas exploration (see Exhibit 5.a). In addition, the IDB made three technical assistance grants to energy projects of almost \$3.5 million, or 7 percent of the year's technical assistance grants (see Exhibit 5.b). One of the grants will establish an energy management course as part of a master's degree program at a Central American management school. The IDB also contributed \$89,000 to OLADE to organize a seminar on investments required to develop energy resources in Latin America.

Although the IDB has identified only seven energy projects that received its support in 1982, a close reading of IDB-approved projects reveals at least four other projects that could have an impact on the energy sector (see Exhibit 5.c). One of the projects will fund energy research at an institution in Colombia. Three other projects will establish credit for the industrial sector. While energy conservation or efficiency may not be a specified feature of the projects, the availability of funds to buy new equipment, to increase production, to improve productivity, or to adapt new processes will create opportunities to save energy.

In 1981, the IDB released a study report titled Investment and Financing Requirements for Energy and Minerals in Latin America. According to the report, \$242-\$282 billion would be needed over the 1980-1990 period for investments in oil, natural gas, coal, alcohol, and electricity production, or \$22-\$26 billion per year.

Exhibit 5.a

IDB ENERGY LOANS, 1982  
(Million dollars)

Argentina	400.0	Construction of a hydroelectric plant
El Salvador	66.0	Completion of a hydroelectric plant
Nicaragua	34.4	Increase in existing hydroelectric generation capacity
Brazil	102.0	Electricity transmission lines
Paraguay	24.0	Electricity transmission lines
Bolivia	134.0	Oil and gas exploration
Ecuador	<u>36.0</u>	Feasibility studies for three hydroelectric plants
<b>Total</b>	<b>796.4</b>	

SOURCE: Inter-American Development Bank. Annual Report 1982

Exhibit 5.b

IDB ENERGY TECHNICAL ASSISTANCE GRANTS, 1982  
(Million dollars)

Barbados	1.500	Pilot projects to study wind turbines
Bahamas	0.485	Development of an investment program for future electricity demand
Institute Centroamericano de Administracion de Empresas (INCAE)	<u>1.500</u>	For general management training programs and to establish an energy management course
<b>Total</b>	<b>3.485</b>	

SOURCE: Inter-American Development Bank. Annual Report 1982.

Exhibit 5.c

IDB 1982 LOANS WITH POSSIBLE ENERGY ELEMENTS

Colombia	\$20 million	Scientific research and technological development; funds will go to a research center that has energy as one of its four priority concerns.
Costa Rica	\$25 million	Industrial recovery program; credit will be available through commercial banks for industrial enterprises to purchase machinery and equipment.
El Salvador	\$40 million	Industrial recovery program; credit will be available through commercial banks for industrial enterprises to purchase machinery and equipment.
Guyana	\$ 6 million	Industrial credit; credit program to increase production and productivity.

SOURCE: Inter-American Development Bank, Annual Report 1982.

In addition to estimating energy investment requirements, the study considered the potential effects of energy conservation and concluded that \$3-\$5 billion a year could be saved by 1990, while petroleum export earnings could be increased by \$6-\$9 billion. The study did not estimate the investments needed to achieve these savings and added earnings.

From the available information, the IDB does not appear to have assigned a high priority to the support or encouragement of energy conservation. The IDB 1983 Annual Report discusses energy conservation activities in individual countries, but not IDB activity. In this connection, the report mentions a revival of Brazil's CONSERVE project to promote industrial energy conservation, and activities in Colombia, Costa Rica, Nicaragua, and Peru to establish centers to develop and encourage industrial energy conservation activities.

**Documents:** Inter-American Development Bank. Annual Report 1982.

Inter-American Development Bank. Investment and Financing Requirements for Energy and Minerals in Latin America, June 1981.

Development assistance from the European Communities to developing countries totaled \$985 million in 1982; \$76.2 million or 7.7 percent went to energy projects. Most EC aid goes to the so-called associated countries (former colonial territories of member nations that have signed the Lome Convention). Detailed information on aid to these countries was not available.

The Commission of the European Communities increased its energy assistance to non-associated developing countries from \$850,000 in 1979 to \$4 million in 1982 and an estimated \$5 million in 1983 (see Exhibit 6.a), only a small part of this aid is used to promote energy conservation. The best estimate of the EC officials interviewed is that 1982 expenditures for industrial energy conservation aid to non-associated developing countries were between \$650,000 and \$750,000 or 16 percent to 18 percent of total energy assistance to these countries. Such aid is expected to reach about \$1 million for 1983, or 20 percent. Over 75 percent of the funds spent through 1982 (the most recent year for which detailed data is available) were used for studies of energy demand or for the provision of resident experts to energy planning organizations in a few developing countries (see Exhibit 6.b).

Another potential source of EC funds is the related European Investment Bank (EIB) which has provided hard and soft loans to developing countries for energy projects and has \$150-250 million available in 1984. EIB has funded no industrial energy conservation projects in the past, however.

Among major EC-funded programs have been the provision of experts to the National Energy Institute in Ecuador and training in China and the countries of the Association of Southeast Asian Nations. The work in Ecuador (which received \$2.9 million from 1979 to 1982, or 44 percent of all energy project funds) included an assessment of the potential for energy savings in industry. In 1982, the provision of energy experts represented the largest share of EC energy assistance -- 47 percent (see Exhibit 6.c). Advisors were provided to five

Exhibit 6.a

EC ENERGY ASSISTANCE TO DEVELOPING COUNTRIES, 1979-1983

	<u>ECU</u>	<u>Million dollars</u>
1979	94,000	0.85
1980	646,000	0.58
1981	1,950,000	1.76
1982	4,533,000	4.01
1983	5,500,000	4.95

SOURCE: Commission of the European Communities. "Cooperation in Energy Programming: Situation up to 1982," 10 November 1983.

Exhibit 6.b

EC ENERGY ASSISTANCE BY TYPE OF ACTIVITY  
TO DEVELOPING COUNTRIES, 1979-1982

	<u>Million ECU</u>	<u>U.S. \$ millions</u>	<u>% of total</u>
Studies	2.223	1.998	31
Energy advisory services	3.208	2.884	45
Training	1.328	1.194	18
Seminars	0.277	0.249	4
Information visits	0.137	0.123	2
	<b>7.173</b>	<b>6.448</b>	

SOURCE: Commission of the European Communities. "Cooperation in Energy Programming: Situation up to 1982," 10 November 1983.

Exhibit 6.c

1982 EC ENERGY ADVISORY SERVICES PROJECTS

	<u>000 ECU</u>	<u>\$ 000</u>
Ecuador -- National Energy Institute	702	632
Kenya -- Energy Planning	500	450
Sri Lanka -- Energy Planning	140	126
Angola & Mozambique -- Energy Planning	150	135
Latin America -- Energy Planning in OLADE	130	117
Latin America -- Energy Planning in Andean Pact Countries	<u>500</u>	<u>450</u>
Total	2,122	1,910

SOURCE: Commission of the European Communities. "Cooperation in Energy Programming: Situation Up to 1982," 10 November 1983.

countries and two organizations in Latin America. In 1982, seven training programs were also funded, the largest of which entailed the training of 360 Chinese specialists (see Exhibit 6.d).

In the area of methodological studies, the EC has provided aid to research institutes in France, Brazil, Senegal, India, Thailand, China, and Iraq. The aid is used to assess energy requirements in developing countries and the means to meet these requirements. Among the other EC-funded studies is an ongoing one on industrial energy requirements in developing countries.

Projects in 1983 included improvements to ten factories in Sri Lanka, industrial energy audits in Thailand, seminars on industrial energy savings in Tunisia and Peru, and a two-phase program in Portugal for industrial energy conservation.

One additional EC activity is a periodic survey of international cooperation in energy programs for developing countries. The results of the most recent survey will be available in the second quarter of 1984.

**Documents:** Commission Report to the ACD-EEC Council of Ministers on the Administration of Financial and Technical Cooperation in 1982, under the Lome Convention, 29 July 1983.

Directorate-General for Energy, "Cooperation in Energy Programming Situation Up to 1982." Brussels, 10 November 1983.

16th and 17th General Reports to the European Communities, 1982, 1983.

**EC Interviews:** Van Scholz, Directorate-General for Energy, Brussels.

Mr. Akerman and Mr. Gerardini, European Investment Bank, Luxembourg

Exhibit 6.d

1982 EC ENERGY TRAINING PROJECTS

	<u>000 ECU</u>	<u>\$ 000</u>
Turkey -- 30 energy planners	216	194.4
Thailand -- staff at Asian Institute of Technology	129	116.1
Asia -- 10 energy planners	180	162.0
China -- 5 experts in combustion technology	25	22.5
China -- 360 specialists	300	270.0
Brazil -- 15 energy planners	112	100.8
China -- 4 energy planners	<u>70</u>	<u>63.0</u>
Total	1,032	928.8

SOURCE: Commission of the European Communities. "Cooperation in Energy Programming: Situation Up to 1982," 10 November 1983.

The IEA provides no direct aid to developing countries. Prior to 1983, the only activity that the IEA-supported involving energy and developing countries was a workshop that it sponsored on the basic energy data requirements of developing countries for use in world energy modeling. IEA projects in 1983 and 1984, which entail less than \$100,000 in administrative expenses, include:

1. Jointly sponsoring a seminar in Lima (Peru) with the Latin American Energy Organization (OLADE)
2. Conducting research on basic energy statistics
3. Holding a workshop on energy investment
4. Supporting joint RD&D projects with selected developing countries.

The Lima seminar -- International Cooperation for Rational Use of Energy in the Industrial Sector -- was held in July 1983 with the participation of OLADE and a number of Latin American countries. The seminar brought together energy policy makers and managers and sought to share with them IEA experience in energy data collection and analysis. The proceedings have been published by the OECD.

Research on basic energy data collection and analysis was initiated in the mid-1970s to supplement UN energy data collection efforts. Although the research has been suspended, it is expected to be resumed on at least a modest scale. A workshop on energy investment is now planned for the end of 1984 at IEA headquarters.

Individual developing countries can participate in some IEA-sponsored R&D activities, and are currently signatories to 14 technical agreements. Two of these agreements are related to energy conservation: a joint R&D geothermal project in Mexico and an enhanced oil recovery project in Egypt.

For 1984 and 1985, no increase in IEA funding is expected, and the level of effort is likely to be the same as in 1983. The IEA is unlikely to become an aid agency in the foreseeable future for two reasons: member nations do not believe that the IEA mission includes development assistance, and the IEA deals with much proprietary information that member nations do not wish to be disseminated.

**IEA Interviews:** Bjorn Barth, Director, Office of Oil Market Developments, IEA

Dietrich Barth, Head, Energy Conservation Division, IEA.

Of the agencies discussed in this report that provide development assistance, AID and the World Bank are the only two that have established comprehensive energy conservation programs. Initially, the largest share of AID energy assistance was allocated to the study and demonstration of renewable energy technology, but an increasing share of its energy assistance is now allocated to energy planning and conservation projects. Thirteen multi-year projects totalling nearly \$62 million dollars, with major energy conservation components costing at least \$33 million, have been identified (see Exhibit 8.a).

In 1984, \$37 million were requested for AID energy activities -- 2.8 percent of the total request of \$1.342 billion for "functional development assistance." The funding for energy activities is likely to grow in the next few years, as pending projects are approved.

At present, much AID-supported energy work is of a preliminary nature: conducting national energy assessments, assisting in the establishment of energy offices, and training personnel to plan and implement energy activities. In a number of countries, the foundations have been laid for major energy conservation projects in the industrial and building sectors. Energy projects at AID can originate with country missions, regional bureaus, or the agency-wide Office of Energy. Among the field mission and regional bureau projects are:

- Preliminary energy assessments of 33 countries in Africa
- Introduction of DOE-II to analyze energy conservation opportunities in large commercial buildings in Southeast Asia, a joint effort with ASEAN
- Design of a program in the Philippines to enhance energy conservation technology transfer in the industrial sector and commercial

Exhibit 8.a

AID PROJECTS WITH ENERGY CONSERVATION COMPONENTS

Country	contribution (\$ 000)	component (\$ 000)	Project
<b>Africa:</b>			
Energy Initiatives for Africa	*	*	Project includes energy assessments of 33 countries and identification of energy conservation opportunities.
Djibouti: Energy Initiatives	4,000	N/A	Conservation component (its share of the budget is being increased) is largely for building energy conservation. The targets will be improved building design and insulation, more efficient refrigerators, and improvements to window air conditioners.
<b>Asia:</b>			
ASEAN: Building Energy Conservation	N/A	N/A	Testing and implementing DOE II.
India: Alternative Energy Resources Development	5,000	500	Technology transfer for increased energy efficiency in the transportation and industrial sectors.
Philippines: Technology Transfer for Energy Management	1,000	10,000	Project is in the planning stages; it will provide training and consulting services to encourage private-sector energy conservation services in the industrial and commercial sectors.
<b>Latin America &amp; The Caribbean:</b>			
Caribbean Region: Alternative Energy Systems	7,600	N/A	Among project activities will be studies of energy conservation policies and potential conservation measures and programs.
Central America: Regional Industrial Energy Efficiency	6,000	6,000	An extensive program for the industrial sector of training, audits, and public information activities.
Costa Rica: Local Energy Development	1,000	220	An industrial energy auditing program is awaiting selection of a contractor to be initiated.

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Exhibit 8.a (continued)

AID PROJECTS WITH ENERGY CONSERVATION COMPONENTS

Country	TOTAL AID contribution (\$ 000)	Energy conservation component	Project
Dominican Republic: Energy Conservation & Resource Development	11,500	6,584	Project will support audits of over 100 industrial plants, training for Dominicans to conduct audits, and a loan program to implement recommendations from the audits.
Ecuador: Alternative Energy Sources	2,700	259	Support will be provided to the National Energy Institute to develop an energy advisory service and to study the potential for energy conservation in the industrial sector.
Jamaica: Energy Sector Assistance	13,400	7,850	Training of Jamaican public- and private-sector energy personnel, audits of industrial and commercial facilities, and a private-sector administered loan finance to fund audits and retrofits.
<b>Near East:</b>			
Egypt: Industrial Energy Audits and Audit Training	**	**	Officials of the Egyptian Organization for Energy Planning and Analysis will be trained to conduct energy audits and audits will be carried out at 15 industrial facilities.
<b>Worldwide:</b>			
Energy Conservation Services Program	2,000	2,000	Energy conservation planning, program design, and implementation for the industrial, building, power generation, and transportation sectors.
<b>TOTAL</b>	<b>63,200</b>	<b>33,413</b>	

\*Budget undergoing revision.  
\*\*Project at the RFP stage.

SOURCE: Hagler, Bailly & Company, U.S. Agency for International Development Energy Conservation Initiatives.

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building sector, and develop a private-sector energy services industry

- Pending procurement to hire contractors to conduct industrial energy audits and train local personnel in Costa Rica, Egypt, and Jordan
- Providing resident energy conservation advisors at the sub-ministerial level in Liberia, the Sudan, and Ecuador
- Providing funds to commercial lending institutions for loans to private-sector industrial energy conservation projects throughout Africa in Jamaica, and in the Dominican Republic
- Establishment of a regional industrial energy conservation center in Central America
- Implementation of building energy conservation measures in Djibouti.

A major project of the Office of Energy is the 4-year Energy Conservation Services Program, which is providing technical assistance, training, and program design and implementation to all AID missions. Particular attention will focus on conservation in the industrial, power generation, transportation, and building sectors. Activities have included a 6-week energy auditing training program for Sri Lankan engineers, industrial energy audits, and feasibility studies. The Energy Conservation Services Program is also assisting in the design of the Technology Transfer for Energy Management project in the Philippines.

**Documents:** Hagler, Bailly & Company. U.S. Agency for International Development Energy Conservation Initiatives, 1984.

U.S. Agency for International Development. Congressional Presentation Fiscal Year 1984, 1983.

**AID Interviews:** Robert Archer, Bureau for Latin America and the Caribbean, USAID

Pamela Baldwin, Office of Energy, Bureau for Science and Technology, USAID

Jim Bever, Bureau for Near East, USAID

Weston Fisher, Bureau for Africa,  
USAID

Robert Ichord, Bureau for Asia, USAID.