



The Market for Energy Efficiency Technology and Services in the Philippines



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Prepared for:

Export Council for Energy Efficiency

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Acronyms

AC	Alternating Current
ASEAN	Association of South East Asian Nations
CEPALCO	Cagayan Electric Power and Light Company
CFL	Compact Fluorescent Lamp
CFC	Chlorofluorocarbon
DBP	Development Bank of the Philippines
DC	Direct Current
DCS	District Cooling System
DOE	Department of Energy
DOST	Department of Science and Technology
DOTC	Department of Transportation and Communications
DSM	Demand Side Management
DTI	Department of Trade and Industry
EDUFI	Energy Development Utilization Foundation, Inc.
ENMAP	Energy Management Association of the Philippines
ERB	Energy Regulatory Board
ESCO	Energy Services Company
ESL	Energy Saving Lamp
FATL	Fuels and Appliance Testing Laboratory
FOEL	Fuel Oil Equivalent Liters
GATT	General Agreement on Tariffs and Trade
GFI	Government Financing Institution
gWh	Gigawatt-hour
HECS	Household Energy Consumption Survey
HID	High Intensity Discharge
HVAC	Heating, Ventilation and Air-Conditioning
IFC	International Finance Corporation
IPP	Independent Power Producers
kWh	Kilowatt-hour
MERALCO	Manila Electric Company
MMBFOE	Million Barrels of Fuel Oil Equivalent
NCSO	National Census and Statistical Office
NEA	National Electrification Administration
NIC	Newly Industrialized Country
NPC	National Power Corporation
NRES	New and Renewable Energy Sources
OATS	Open Access Transmission Services
ODS	Ozone Depleting Substances
PCIERD	Philippine Council for Industry and Energy Research and Development
PDP	Power Development Program
PECCI	Philippine Energy Conservation Center, Inc.
PEI	Preferred Energy, Incorporated
PEPOA	Philippine Electric Plant Owners Association
PHILACOR	Philippine Appliance Corporation
PNOC	Philippine National Oil Company
PSMAI	Philippine Sugar Millers Association, Inc.
REAP	Renewable Energy Association of the Philippines

REC	Rural Electric Cooperatives
SPUG	Small (Strategies) Power Utilities Group
TTEM-DLF	Technology Transfer for Energy Management-Demonstration Loan Fund
USAID	United States Agency for International Development
USTDA	United States Trade & Development Agency
WTO	World Trade Organization

Executive Summary

The Philippine Energy Plan formulated by the Philippines Department of Energy (DOE) identifies improving the efficiency of energy use as one way to achieve the country's energy and environmental goals. According to the plan, the implementation of demand side management (DSM) programs is expected to result in a cumulative energy savings of over 15.3 million barrels of fuel oil equivalent (MMBFOE), with an investment of P1.9 billion (about US\$ 47.5 million) by the year 2005.¹ Peak demand savings will range from 20 megawatts (MW) to 450MW in 1996 and 2005, respectively. This is quite an ambitious target given that the distribution utilities tasked to carry out the DSM programs are only beginning to understand the DSM concept and rationale.

In recent years, there has been a growing awareness of the benefits of energy efficiency in the Philippines, especially among utilities and the owners of commercial buildings and shopping malls. This has been brought about largely by a number of government-driven programs on energy efficiency, particularly building audits and information campaigns. However, the effort to improve awareness needs a strong backup in terms of availability of funds/credit in order to increase the probability for successful implementation of an energy efficiency program. One of the government's priorities is to address the problem of scarcity of funds among industrial/commercial establishments to support the implementation of energy conservation projects using new technologies.

The Philippines DOE has initiated the Technology Transfer for Energy Management - Demonstration Loan Fund Program (TTEM - DLF), a financial assistance scheme made available to private sector implementers of energy efficiency projects. Those that cannot be accommodated under the DOE-TTEM may tap government financing institutions (GFIs) such as the Development Bank of the Philippines (DBP). International organizations such as the World Bank have likewise expressed interest in financing the implementation of DSM-related projects in the Philippines.

This report provides information on the energy efficient technologies and services currently available in the Philippine market. It also looks into the prevailing interest among commercial building and mall operators in the benefits of energy efficient technologies and highlights potential investment opportunities and areas where joint ventures between Filipino companies and foreign partners can be forged.

To gauge the level of interest of Filipino companies in energy efficiency, the authors of this report sent a questionnaire to some 220 companies in the greater Manila area. Of this number, 46, or 20%, responded to the survey. These included 10 companies selling electric motors, 4 distributing compressors, 8 dealing with lights and lighting fixtures, 7 suppliers of commercial cooling systems, 3 involved in building maintenance, 2 energy services companies (ESCOs), and 10 commercial buildings and shopping malls. The unwillingness of respondents to provide sensitive market information and the limited time and opportunity for one-on-one follow-ups were major constraints encountered in the study. Corporate officers would often delegate the job of responding to the survey to lower ranked sales representatives who were unable to give

¹ US\$1 = 40 Philippine pesos, as of mid-1998.

sufficient product/market information. Nevertheless, the survey was able to determine the various products available in the market, and the major suppliers that carry these products, as well as suppliers with an interest in improving market penetration of energy efficient technologies in the local market. Of the 46 companies that responded to the survey, 32, or 70%, signified interest in a possible commercial relationship with U.S. companies (see Annex 4).

As part of the survey, commercial buildings—in particular, shopping malls and office buildings—were identified as a potential market for energy efficiency activities. Thirty top-ranking commercial offices and hotels/malls (in terms of electricity consumption) were covered by the survey (see Annex 3). Of these, 10 respondents signified their interest in employing energy efficient technologies to reduce electricity expenditures. The list of these 10 commercial offices and hotels/shopping malls is included in Annex 4.

According to a study on DSM potential in the Philippines funded by the United States Trade and Development Agency (USTDA), there is vast potential for energy savings in the following commercial sector end-uses: air-conditioning, 39%; lighting, 32%; office equipment and other end-uses, 10%. The findings of this study confirm this potential. Among the technologies currently available in the market, lighting, space cooling, and refrigeration systems are the most commonly used. According to the Household Energy Consumption Survey (HECS) report published by the Government of the Philippines, 7,225 of 8535 (or 85%) of households surveyed already use fluorescent lamps, while about 3% use compact fluorescent lamps (CFLs). Moreover, 41% of households surveyed use refrigeration. On the other hand, air-conditioning systems are considered indispensable in commercial buildings, hotels, and shopping malls. In fact, a tour of Manila hotels and shopping malls would show that they are among the coolest places in town. However, information regarding energy efficient technologies is still insufficient and not readily available. A more deliberate information and education campaign targeted toward these three products alone should have a significant impact.

Finally, a discussion on the Philippine Energy Plan is also presented in the light of the expected economic trend and structural and institutional reforms in the energy sector. This expected scenario will serve as a critical backdrop to the market transformation process for energy efficiency in the Philippines.

Introduction

The International Institute for Energy Conservation (IIEC) commissioned Preferred Energy Incorporated (PEI) to undertake a study on the market for energy efficient technologies and services in the Philippines. This was intended to complement IIEC's efforts to establish a voluntary energy efficiency program for the commercial buildings sector, in cooperation with local partners. The study focused on electric motor systems (compressors and pumps) for commercial and industrial applications, commercial air-conditioning and ventilation equipment and control systems, energy service companies (ESCOs), and commercial buildings and shopping malls.

The primary research component of the study was a survey of the various market players, particularly manufacturers of equipment, traders, engineering companies, energy service companies (ESCOs), and selected commercial establishments. The survey also identified companies interested in developing and promoting energy efficient technologies and opportunities for joint ventures between foreign partners and Filipino investors.

This report uses the latest available data and information gathered from various government agencies and private sector institutions. These include monthly reports from the Department of Trade and Industry (DTI) and the National Census and Statistical Office (NCSO) on relevant commodity imports for the years 1993 up to 1997. From the Department of Energy (DOE), inputs were collected from the Philippine Energy Plan (1996 - 2025), including studies and policies related to energy efficiency activities. The DOE-NCSO Household Energy Consumption Survey (HECS) also provided interesting insights on consumer behavior relative to lighting, air-conditioning, and refrigeration. The relevant industry associations provided time-series data on local sales and domestic production. Moreover, the National Power Corporation (NPC) provided information regarding its internal policies and programs as well as future activities related to energy efficiency. Another important output of the study was a list of commercial offices and shopping malls that included the top thirty commercial-sector consumers of electricity in Metro Manila.

Market Drivers for Energy Efficiency

Electricity Demand

Based on the DOE Energy Plan, the demand for electricity (Table 1) is projected to grow at double-digit levels over the next 10 years. This projection assumes an electricity-to-GDP elasticity of 1.7 between 1996 and 2005, 1.2 between 2005 and 2015, and 1.1 between 2015 and 2025. Even with the current slowing of the economic growth rate, it is expected that new capacity will still be needed. Energy efficiency programs therefore can have the beneficial effect of delaying capacity additions while providing high-quality energy services.

Energy Efficiency and DSM Programs

The DOE energy plan projects that the implementation of energy conservation and demand-side management programs will significantly reduce energy consumption. The intensified activities of the Power Patrol Program and the full implementation of the various DSM activities initiated by the DOE's working group are expected to effectively influence the consumption patterns of different sectors of the economy (Power Patrol is a DOE-led program whose goal is to educate the public about energy conservation). By 2025, the expected energy savings will be 829 MW, equivalent to 813 million barrels of fuel oil equivalent (MMBFOE), with a net savings of P307 billion. DOE expects the annual growth of energy demand to decline by an average of about 5.4 percent as a result of energy efficiency and DSM programs (Table 2).

This expectation appears high and will be realized only if there is concrete adoption of energy efficient technologies by the target end-users concerned. Therefore, a more focused approach, in addition to the information dissemination campaign of the Power Patrol Program, is required to facilitate the implementation of projects by private sector. First, the distribution utilities must undertake necessary studies and work closely with their largest customers. They will do this only if there is enough financial incentive to do so, that is, they must be able to recoup their possible lost revenues. Second, there must be effective mechanisms to provide the distribution

Table 1: Electricity Demand

System Load Forecast							
	1996	2000	2005	2010	2015	2020	2025
Sales (gWh)	33,532	55,559	93,313	148,112	219,751	313,988	426,349
Growth Rate, %	-	13.4	10.9	9.7	8.2	7.4	6.3
Demand (MW)	5,855	9,681	16,256	25,564	37,928	54,194	73,587
Growth Rate, %	-	13.4	10.9	9.7	8.2	7.4	6.3

Source: Philippine Energy Plan 1996-2025

Table 2: Peak Demand Savings from the DSM Program (in Megawatts, MW)

Program	1996	2000	2005	2010	2015	2020	2025
I/C Agreements	3	56	113	207	212	218	223
Motor Duty Reduction	0	19	77	199	204	209	214
Refrigerator Standards	0	7	38	68	70	71	73
Ballast Standards	0	7	51	94	96	99	101
Fluorescent Lamp Change-Out	0	33	69	82	84	86	88
Window Aircon Standards	17	42	80	82	84	86	88
Commercial New Construction	0	3	8	20	21	21	22
Fan Standards	0	2	10	16	16	17	17
Low Income Lighting	0	1	1	1	1	1	
CFL Loans	0	9	3	0	0	0	0
TOTAL DSM	20	179	450	769	789	808	826

Source: Philippine Energy Plan 1996-2025

utilities with the capital and operating resources to implement the DSM program.

Legislative Initiatives and Government Programs

Energy conservation was initially integrated into Philippine law in the early 1970s, during the first global energy crisis. This was the Batas Pambansa (Republic Act) 73, which was extended under Batas Pambansa 872. Batas Pambansa 872 mandated the development of building energy use standards for commercial buildings and required all industrial, commercial, and transport establishments consuming 1 million fuel oil equivalent liters (FOEL) or more to submit quarterly energy consumption reports to the DOE (those consuming two million FOEL were required to submit an additional annual report). Standards on building construction materials, design of offices, and commercial and industrial buildings to promote energy conservation were also to be developed under Batas Pambansa 872.

However, Batas Pambansa 872 expired in 1986. Since then, the DOE has drafted a new version of the Energy Conservation Bill, which was introduced, but not acted upon, in the last Philippine Congress. A revised version of the proposed legislation is expected to be introduced in the next Congress, in late 1988/early 1999. The bill would mandate the adoption of energy conservation measures by the residential, commercial, and industrial sectors.

The bill, as previously formulated, would direct DOE to:

- Plan, develop, and implement the overall national energy conservation programs and activities, with an emphasis on integrated resource planning (IRP) and demand side management (DSM).
- Set, in consultation with DTI and DOST, standards of energy consumption for oil-powered or electric driven machinery and equipment.

- Periodically review, in coordination with the DOTC, fuel consumption patterns of the transport sector and recommend appropriate measures to improve the consumption efficiency of the sector.
- Require industrial, commercial, and transport establishments consuming more than 1 million liters of fuel oil equivalent (MMLFOE), including liquid fuels and electricity, to submit to DOE their annual fuel and electric consumption, as well as production statistics, in order to properly monitor energy consumption and utilization efficiency.
- Require industrial, commercial, and transport establishments consuming 2 MMLFOE, including liquid fuels and electricity, to submit, on an annual basis, energy conservation programs, and to employ qualified engineers to act as full-time energy managers and liaison officers with the DOE and be responsible for the planning and formulation of programs for the efficient use of energy and administration of energy conservation programs.
- Regulate, in consultation with appropriate government departments and agencies, the use of air conditioners in offices and in commercial and industrial establishments, including but not limited to requiring the use of thermostats and setting them to certain temperatures that will conserve energy but still assure reasonable convenience to users.

The bill likewise would provide incentives to the private sector for the adoption of energy conservation measures. These include:

- **Tax and Duty-free Importation of Capital Equipment.** The importation of machinery, equipment, and spare parts shall be exempted 100% from customs duties and national internal revenue taxes, subject to conditions that said equipment, machinery and spare parts are not manufactured domestically and that they will be used exclusively by the proponent enterprise for energy conservation projects.
- **Tax Credit on Domestic Capital Equipment.** A tax credit equivalent to 100% of customs duties and national internal revenue taxes on machinery, equipment, and spare parts, which would be waived had these items been imported, shall be given to proponents who purchase said machinery, equipment, and spare parts from domestic manufacturers provided that said items are needed and will be used exclusively by the proponent for energy conservation projects.

A copy of the draft bill is shown in Annex 2.

Building Energy Codes

In 1994, DOE, in coordination with the Department of Public Works and Highways (DPWH), implemented the Guidelines for Energy Conservation Design of Buildings and Utility Systems as a referral code to the National Building Code. The guidelines, which aimed to attain efficient energy utilization in buildings, contain energy conservation guidelines for the design of buildings and their services and provide recommendations on the design of buildings as well as the retrofit of existing units, (however, residential units and premises using large quantities of process heat are not covered). To complement the existing energy efficiency building code for large commercial establishments, program efforts also focused on institutionalizing mechanics to ensure compliance with the code. Incentives are given to building owners and designers whose building designs comply with the standard code by more than 20% percent.

DSM Requirements

Department Circular No. 95-08-007 directs all electric utilities to consider alternative methods of meeting future demand. All electric utilities are enjoined to develop and submit a demand side management plan to the Energy Regulatory Board (ERB) every 2 years for review and approval beginning on, or before, January 1, 1996, for Class A Utilities (e.g., Meralco, PEPOA members); July 1, 1996, for Category A Cooperatives; and January 1, 1997, for lower than Category A Cooperatives (see Annex 1).

Although the rules have been defined, the most formidable barrier to the adoption of demand side management measures by industry is the low priority these projects have in terms of allocation of limited capital resources. Because of this barrier, several bilateral and multilateral donor agencies had been tapped as possible sources of funding.

Financing Programs

One of the financing sources is the DOE's TTEM Demonstration Loan Fund. The TTEM was a 6-year project funded through a \$4.27 million assistance from the USAID and contribution, in kind, from the Government of the Philippines. The project provided technical assistance and funding for the implementation of energy conservation technologies in industrial and commercial establishments in the Philippines. At the end of the project, 30 technology demonstrations had taken place with 17 participating companies. Financial payback periods ranged from 0.3 to 2.9 years, with an average of 1.8 years. All \$2.4 million set aside in the development loan fund had been loaned, and all loans were repaid. Participating companies saved a total of 109,331 barrels of oil per year. The estimated financial rate of return was greater than 12 percent for all 11 of the firms, and greater than 28 percent for 8 of the firms.² Despite these positive impacts, these successful energy saving technologies were not widely replicated because the successes were not widely marketed.

Due to the relative success of the TTEM project, the DOE decided to continue the project on its own. In 1996-97, some PhP 34 million was allocated for funding to qualified projects. Six projects from three participating companies were approved during the period, totaling PhP 21 million. Projects included steam system improvement and replacement of equipment to improve efficiency. For 1998, another PhP 10 million has been allocated.

Other international organizations such as the IFC think the Philippine market is ready for DSM and energy efficient end-use products. Government Financing Institutions (GFIs) such as the Development Bank of the Philippines - Window III Department have also financed a number of industrial modernization and productivity enhancement projects-- many of which have significantly improved the energy efficiency of those industries.

Energy Efficiency in Commercial Buildings

Commercial buildings, hotels, and shopping malls are large users of electricity. Information gathered from the Manila Electric Company, which serves Metro Manila and suburban areas,

² Donald G. McClelland, et. al., CDIE Impact Evaluation, USAID, Energy Conservation in the Philippines, 1996

indicated that as of May 1997, the total monthly average consumption of the top 30 commercial buildings and shopping malls amounts to 18.4 million kWh. The average electricity consumption per month for the top 10 shopping malls ranges from 483,580 kWh to 1.4 million kWh, while the average monthly electricity consumption for the top 10 commercial offices ranges from 228,375 kWh to 602,000 kWh. These office buildings and shopping malls are shown in Annex 3.

Assuming a conservative 10% reduction of electricity consumption by the above commercial buildings and shopping malls in the Meralco area, energy savings could translate to about 39,320 barrels of oil per year, or about \$707,764 of valuable foreign exchange annually. Further, the operating hours of commercial buildings correspond already to Meralco's system peak. Therefore, energy efficiency improvements would help the utility avoid or delay investment in new generating capacity.

The survey of commercial buildings and malls revealed that 9 out of 10 respondents have already incorporated some form of energy efficiency technology in their building design/operation (Table 3). Half, or five, of these office buildings/ shopping malls are already utilizing both energy efficient lighting and building management systems (BMSs) for air-conditioning equipment; two are equipped with BMSs but require energy efficient lighting, while one uses energy efficient lighting but has no air-conditioning control system. Only one building, the oldest among those surveyed (circa 1988), does not utilize any energy efficient

Table 3: Commercial Buildings Reporting Use of Energy Efficiency Technologies

Shopping Malls/ Building Offices	Year Constructed	Energy-Efficient Lighting		A.C. Control System	
		Yes	No	Yes	No
Airport Citimall	1997	X		X	
SM Megamall	1995		X	X	
Shangrila EDSA Plaza	1990		X	X	
Manuela Metropolis	1995	X			X
Manuela Mandaluyong	1988		X		X
SM Megamall	1991	X		X	
JMT Corporate Condo.	1993	X			X
PhilStockExchange Ctr.	1992	X		X	
Tower One Exch. Plaza	1994	X		X	
Robinson Plaza Galleria	1988	X		X	

technology. This indicates that buildings constructed prior to 1990 are less likely to be equipped with energy efficient technologies. On the other hand, there is still some room for improvement in recently constructed buildings, as some have only partially implemented energy efficiency programs. A market opportunity is open in the planned construction of other buildings and/or expansions by developers. From the survey, it was gathered that five building owners have ongoing building construction, while plans are under way for the construction of six more office building/shopping malls.

Moreover, audit studies conducted under the ASEAN-U.S. Project on Energy Conservation in 1988 likewise confirm the need for energy efficiency in commercial buildings in the Philippines. The audit report of 11 buildings concluded that 1.7 million kWh of electricity can be saved by adopting conservation measures on lighting alone; savings from improved motors and air-

conditioners/air cooling systems were estimated at 1.1 million kWh and 1 million kWh, respectively. These findings indicate that with minimal or no additional investment, a typical building can reduce power consumption by around 15 % (see Annex 6).

Among the measures recommended, the following appeared to be common:

- **Combination of delamping and installation of high-efficiency reflectors.** Besides potentially increased lighting levels, this option has the added benefit of reducing the heating load to the air-conditioning system.
- **Installation of thermostats, or resetting thermostats to 25.5 C.** Many buildings, including new ones, have no thermostats because they are an additional cost to the building owner. The higher electric expense arising from this practice is typically borne by the building occupant(s) and not by the building owner. Those buildings with thermostats normally have them set at very low temperatures, resulting in additional loads for compressors and motors.
- **Improvement of chiller efficiency and recalibration of AC systems control.**

Energy Efficiency Retrofits

Both the primary survey as well as audit studies shown in the above discussion point to the large potential market for the retrofitting of commercial buildings, particularly those constructed before 1990. Ten of the commercial buildings/malls signified their interest in retrofitting projects, while nine are interested in partnerships with U.S. companies to undertake retrofits. However, information on the benefits of retrofitting, as well as the availability of high energy efficiency products (particularly, U.S.-made products), is not readily available. In fact, there appears to be very little information on the technical specifications and prices of U.S.-made energy efficient products.

The lack of current product and price information discourages the potential buyer from further considering U.S.-made products. This barrier is significant in the case of the Philippine market because first cost is a paramount consideration, and because very low cost (and low efficiency) ASEAN imports are widely available. This problem is particularly acute outside of Metro Manila, varying from province to province. A more deliberate information dissemination campaign could create bigger opportunities for U.S. products to enter a relatively open market for energy efficient technologies/services.

Expected changes in the present Philippine economic environment—that is, the deregulation of the oil industry, liberalization of the country's import and export tariffs brought about by the ratification of the General Agreement on Tariffs and Trade (GATT), the Philippines' accession into the World Trade Organization (WTO), and the mandate for Philippine utility companies to implement integrated resource planning (IRP)—are likely to expand the Philippines' need for energy efficiency. These factors, along with the DSM program by power utilities and other Philippine government energy efficient initiatives and equipment standards, can be expected to increase the use of energy efficient equipment technologies/services in the Philippines. Most of these would be in retrofits to reduce the cost of operation and maintenance.

Information dissemination on the use of energy efficient technologies and the results of retrofitting projects done in-country and elsewhere would help to increase awareness and generate positive action among commercial building developers/owners. One such activity is

the Green Building Voluntary Program, which educates the customers on the various energy-efficient end-use technologies. This program, spearheaded by the Manila Electric Company (MERALCO), in cooperation with IIEC, is an offshoot of the study on DSM potential in the Philippines funded by the USTDA.

New Construction

In light of the recent construction boom, the above findings are important inputs that can be used to improve energy efficiency levels, especially those of new buildings. According to data from the Philippine Statistics Office, the growth rate of the construction industry was 49.8% between 1992-95. With the recent economic crisis in Asia, this growth rate may experience a temporary setback, but it is generally expected to regain momentum because most developers have already completed plans and may have simply deferred implementation of projects. On the other hand, those that have not started construction are currently concentrating on development planning activities while they wait for the economy to improve. Nine of the 10 commercial establishments surveyed plan to construct new buildings and shopping malls during the next several years.

Likewise, special economic zones have been established in different parts of the country. Infrastructures such as roads and highways, communications facilities, air and seaports, as well as reliable electric service, are made available in these special zones to attract investments in these areas. There are at least 18 special economic zones around major urban centers throughout the country. Investment incentives continue to be enhanced. The Omnibus Investment Code was made more attractive by the Foreign Investment Act of 1991, which provides incentives comparable to other member states of the Association of South East Asian Nations (ASEAN). These incentives include tax holidays, 100 percent foreign ownership, and full repatriation among others. This favorable investment climate can likewise improve the prospect for U.S.-based energy efficiency companies to penetrate the local market.

Other Developments

New developments in the HVAC industry will greatly affect existing buildings that use CFC refrigerants. The Philippines will phase out the use of six ozone-depleting substances (ODSs) next year as part of the government's commitment to the Montreal Protocol on substances (see Table 4) that deplete the ozone layer. The Montreal Protocol was signed by the Philippine government in 1988 and was ratified by the Senate in March 21, 1991. The ODSs are identified as CFC-11 new, CFC-12 new, CFC-114, CFC-115, Halon 1211, and Halon 1301. The phaseout of the ODS are meant to protect human health and the environment from the damaging effects of ozone layer depletion. Table 4 shows the Philippine ODS phaseout schedule under RA 6969 of the Department of Environment and Natural Resources and the commitment to the Montreal Protocol.

Based on the schedule in Table 4, new appliances can no longer utilize CFCs beginning in 1998. However, CFCs being used in servicing the old equipment containing the said substance would still be allowed until the year 2009. The Alternatives for Controlled CFCs

Table 4: Philippine ODS Phaseout Schedule

Substances	Year
CFC - 11 (new)	1998
CFC - 11 (service)	2010
CFC - 12 (new)	1998
CFC - 12 (service)	2010
CFC - 113	1996
CFC - 114	1998
CFC - 115	1998
Halon 1211	1998
Halon 1301	1998
Carbon Tetrachloride	1996
Methyl Chloroform/1.1, 1 TCA	1996

New - refers to CFCs being used in the production of new equipment/appliances

Service - refers to CFCs being used in servicing old equipment containing the said substance

Source: DENR-EMB

Future trends, such as the use of District Cooling Systems (DCSs), should also be considered. A DCS is an integrated community energy system whereby one of the major energy demands of the community, such as cooling for air-conditioning, is planned, developed, and operated on a central basis. This enables critical decisions regarding issues such as environmental aspects, energy efficiency, health and safety, etc., to be taken with a long-term perspective and based on the very latest international codes.

Current Status and Potential of Energy Efficient Technologies and Services

The following sections present the available energy efficient technologies and services in the Philippines. The descriptions of the products or services were obtained from company brochures and information provided by marketing or technical staff who responded to the survey. Statistical data were obtained from the DTI and the NCSO. The generation of the required data and other information for this report was limited by the time, accessibility and availability of companies, and the willingness of respondents to share sensitive information.

As noted earlier, the market for energy efficient technologies in the Philippines is relatively new. The market penetration rate (% market share) of these energy efficient technologies therefore is still largely undetermined, though this could be determined through a nationwide end-use market assessment. With the implementation of DSM and strict adherence to building codes (approval to new construction), the growth prospect for energy efficient products/services is very promising.

There are other factors that could affect the investment in and acceptability of energy efficient products/services. The need of industries to become competitive in the international market as well as the clamor for environmental protection will urge industries to look for more energy efficient solutions.

Electric Motors

Status of Market

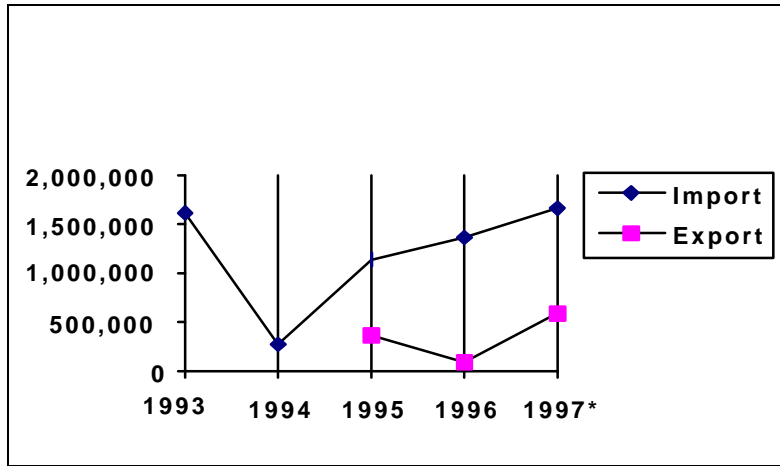
According to the Department of Energy, the industrial sector used 34.2% (12,559 gWh) of the country's total electricity consumption in 1996. Electric motors account for about (75%) of such consumption. Similarly, electric motors and drive systems are one of the largest components of electrical demand in commercial facilities. Therefore, the proper selection and operation of electric motors using high efficiency and solid-state speed drives is one way for industries to achieve significant energy savings. Although not yet in great demand, high-efficiency motors and adjustable speed drives are already available in the Philippine market. These are supplied by foreign companies through subsidiaries or importers and distributors. Some of the brands available in the market are: a) Baldor motors and drives, which are wound with ISR-Inverter Spike Resistant wire, up to 100 times more resistant to transient spikes; b) the Leroy-Somer Compabloc 2000, available in 10 case sizes with ratings through 90 kW and reduction ratios of 1/16 to 1/160 (up to 1/6300 as combined reducer); c) the Franklin (USA) Submersible Pumps; d) U.S. Motors (Hollowshaft); and e) Sew Gear Reducer and Gear Motors.

The Philippines is predominantly an importer of electric motors. As shown in Figures 1 and 2, imports exceeded exports by a large margin from 1993 to 1997. Importation of both DC and

AC motors (Tables 5 and 6, respectively) basically showed upward trends, except in 1994, when importation declined. The majority of the DC motors that were imported during the period were motors with an output not exceeding 750 W, while the majority of AC motors imported were single-phase motors with an output not exceeding 225kW. However, there is no data available regarding the efficiencies of these motors. Nonetheless, because the demand for motors appears to be highest in the above output categories, any attempt to introduce efficiency improvements in motors will have the bigger impact if introduced at such capacity levels. On the other hand, exports of motors (both AC and DC) were considered negligible over the last 5 years. This could only mean that, at this point, there is really not much in-country manufacturing. Whatever capability is available appears to be only for low-capacity motors.

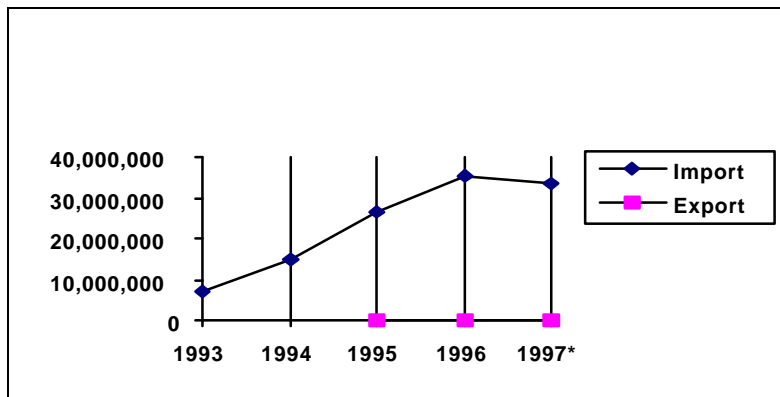
The supply of electric motors to the Philippines comes from various countries. In general, there appears to be no significant pattern for such supply in terms of country of origin. For the lower

Figure 1: Value of Imports vs. Exports, DC Motors (in Philippine Pesos)



Source: Bureau of Export and Trade Promotion -Department of Trade and Industry (BETP-DTI);
* Jan.-Oct. only

Figure 2: Value of Imports vs. Exports, AC Motors (in Philippine Pesos)



Source: BETP-DTI; * Jan. - Oct. only

Table 5: DC Motors Importation, Quantity

Type	1993	1994	1995	1996	1997*
1. Electric Generators, DC, of an output not exceeding 750W	1,385	268	12	-	1
2. Motors, DC, of an output not exceeding 750W	4,871	776	2,937	3,254	5,420
3. Motors, DC, of an output exceeding 225W but not exceeding 375 kW	-	-	3	40	6
4. Motors, DC, of an output exceeding 75 kW but not exceeding 225kW	-	-	14	32	30
5. Motors, DC, of an output exceeding 375 kW	-	-	12	4	7
6. Motors, DC, of an output exceeding 750W but not exceeding 75kW	-	-	334	362	231
Total	6,256	1,044	3,312	3,692	5,695

Source: BETP-DTI

*Jan. - Oct. only

capacity motors, most come from Taiwan and Japan, supporting the theory that demand for electric motors is highly price sensitive; importation comes mainly from countries nearer the Philippines and those known for lower labor costs, like Taiwan. Japan, on the other hand, is a major source of secondhand or surplus units, which also indicates that motors are imported based on price and required specifications, not necessarily on brand or country of origin. There appears to be no problem in sourcing high-efficiency motors as long as the questions of price and technical specifications are settled.

Some of the known companies distributing electric motors in the Philippines are Gotesco Marketing, Inc., Eastman Industrial Supply, and Avesco Marketing. Gotesco acts as the exclusive Philippine agent or representative of 20 renowned product brands and distributes these products through a nationwide network of dealers. Some of the product lines carried on exclusive distributorships are York Air-Conditioning and Refrigeration, Inc, USA, for water chillers and refrigeration equipment; ITT Bell & Gossett, USA, for centrifugal pumps/HVAC pumps and process pumps; Danfoss Denmark for variable speed drives and refrigeration control, and Franklin Motors, USA, for submersible motors. For additional trade statistics on AC and DC motors, please refer to Annex 8.

Potential for Investment

The sugar industry offers a strong opportunity for motor efficiency improvement. According to an energy audit study of 17 sugar mills in the Philippines, conducted by Energy Development Utilization Foundation Inc. (EDUFI) in cooperation with the DOE and the Philippine Sugar Millers Association, Inc. (PSMAI), in almost all cases, motors at sugar mills were either old, previously rewound, oversized for the application, or some combination thereof. Moreover, most of the motors are operating on part-load indicating that either the motors are oversized for operation or they are driving a variable mechanical load on the shaft. Of the 105 units surveyed

(ranging in sizes from 11 to 200 hp) the average loading is 63.4%. Over 28% of motors have loading of less than 50%. Hence, the study recommends proper sizing and load matching of motors and the use of high efficiency motors and variable speed drives.

The computed payback for a 50-hp motor at a loading of 90% averages less than 2 years.³ However, in the Philippines the common practice is the use of rewind or surplus motors, because new motors are always more expensive than rewind motors. Thus, a new motor, while technically more efficient, is too expensive for most companies. Further, because information on the comparative higher performance and operating efficiency of new motors is not readily available, the use of new motors is not given preference. It is critical that in addition to incentives to encourage investment in new motors, information drives be undertaken to educate would-be users on the benefits of high-efficiency motors.

To encourage the use of new high-efficiency motors, the DOE has included the utilization of high-efficiency motors and variable speed drives in the new Energy Conservation Bill currently under congressional deliberation. Because there are no local manufacturers of energy-efficient

Table 6: AC Motors Importation, Quantity

Type	1993	1994	1995	1996	1997*
1. Universal motors of an output not exceeding 3.75kW	15,601	32,859	11,134	6,926	13,992
2. Universal motors of an output exceeding 3.75kW but not exceeding 225kW	4,005	3,988	5,434	2,769	4,538
3. Universal of an output exceeding 225kW	1,267	11,001	-	-	-
4. AC motors of an output exceeding 225kW single phase	5	2	1	-	-
5. AC motors of an output not exceeding 225kW, single phase	363,899	315,737	1,354,000	1,635,261	2,217,193
6. AC motors of an output not exceeding 750W, multiphase	37,002	86,260	68,135	47,269	90,696
7. AC motors of an output exceeding 750W but not exceeding 75kW, multiple phase	17,183	31,807	16,353	12,930	17,360
8. AC motors of an output exceeding 75kW but not exceeding 225kW, multiphase	98	458	229	576	-
9. AC motors of an output exceeding 225 kW multi-phase	101	5,418	-	-	-
Total	439,161	487,530	1,455,286	1,705,731	2,343,779

Source: BETP-DTI

*Jan. - Oct. only

³ EDUFI, "Biomass Cogeneration Potential in the Philippine Sugar Milling Industry", 1994

motors and variable speed drives, the bill proposes the reduction of import duty from 30.0 to 10.0 percent as incentive to promote high-efficiency motors. Motor efficiency criteria shall be established, and rewinding companies will be certified to ensure that only the best rewinding standards are used. A list of certified rewinding companies will be disseminated to industrial customers.

A study done by Resources Management International (RMI) for the Cagayan Electric Power and Light Company (CEPALCO), *Feasibility Study on an Energy Efficiency Program Based on Demand-Side Management in the Philippines*, identified the food, chemical, pulp and paper, wood, mining, cement, textiles, and metals sectors as other industries that have energy savings potentials.

The RMI study included a market value assessment of energy efficiency technologies that used a sample of high-energy-consuming sectors to determine the national market value for each. Findings showed there is a large potential for energy savings in motors in all the industry sectors evaluated except the textile sector. The highest energy savings potential is in the metals sectors, valued at US\$25.5M (47.5%), followed by the food sector, valued at US\$10.4M (19.4%), (see Annex 7).

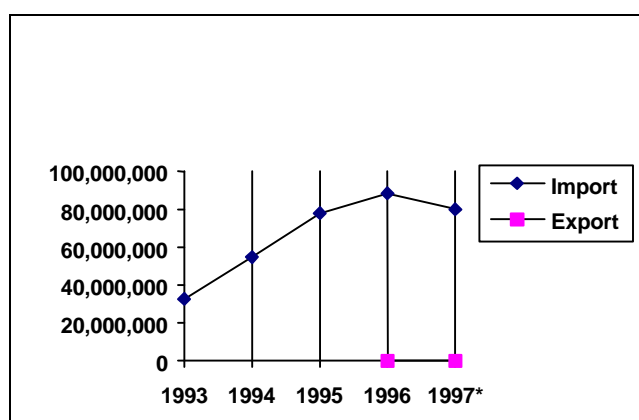
Distributors and engineering firms that deal with motors appear to agree with the above findings. According to the survey conducted among suppliers of electric motors, 6 of 10 respondents signified interest in a possible joint venture or distribution agreement for energy efficient products and services. These companies currently plan to expand their business to include other product lines such as chemical pumps for water treatment, fans and blowers, elevators, cooling towers, electrical products and air-conditioning units, and building control systems. Aside from the distribution of imported products, some of the companies also provide consultancy, engineering and design services, and three companies are also manufacturers. Therefore, the potential for investment in a joint venture with a trading company of high efficiency motors looks promising (see Annex 5 for further information).

Compressors

Status of Market

The Philippines is a net importer of compressors. Import/export data over the past 5 years shows imports outnumbering exports by a wide margin (Figure 3). Based on importation statistics, there are five types or classifications of compressors imported to the Philippines. These are the hermetically sealed and open-type refrigerating equipment, air compressors mounted on a wheeled chassis for touring, air compressors for motor vehicles, and other air or gas pumps and compressors. Among these types, the majority of imports in 1995 and 1996 consisted of hermetically sealed refrigerating equipment. Imports for these products involved US\$33.8 million (43.6%) of the total value of imported compressors in 1995 and US\$59.5 million (67%) of the total value of imported compressors in 1996 (see Table 7). This information suggests that the use of compressors is highest in the refrigeration or cooling sector. Importation of this type of equipment has been increasing.

Figure 3: Value of Imports vs. Exports, Compressors (in Philippine Pesos)



Source: BETP-DTI

Table 7: Compressors Importation, Quantity

Type	1993	1994	1995	1996	1997*
1. Open Type Compressors, used in refrigerating equipment	10,079	9,292	43,927	25,819	12,741
2. Hermetically Sealed Compressors, used in refrigerating equipment	528,713	676,295	1,056,076	899,532	894,157
3. Air Compressors Mounted on a Wheeled Chassis for Towing	2,307	7,868	14,012	19,414	-
4. Air Compressors for Motor Vehicles	-	-	62,748	25,887	28,891
5. Other Air or Gas Pumps and Compressors	91,176	158,542	93,241	174,915	181,359
Total	632,275	851,997	1,270,004	1,145,567	1,117,148

Source: BETP-DTI

*Jan. - Oct. only

Aside from the refrigeration sector, the use of compressors for industrial applications is also believed to be on the upswing, considering the growth of the industrial sector in recent years. Import figures show that the value of other types of compressors, not classified as refrigeration, amounted to US\$43.8 million (56.4%) in 1995 and \$59.5 million (67%) in 1996.

Compressors sold in the Philippine market are basically imported and distributed by foreign-affiliated suppliers that have established distribution companies in the country. The largest suppliers of hermetically sealed refrigerating equipment are Singapore, Malaysia, Japan, and the U.S.A. What little exports of compressors there were in the past 5 years to Singapore and People's Republic of China. The Philippines still has to develop its capability and market for compressors.

Ingersoll-Rand Philippines, Inc., is one of the foreign-affiliated suppliers of air compressors. It has introduced into the market the SSR range of rotary screw air compressors with a new series of two-stage models from 200 - 300 kW. These provide increased reliability and significant energy savings over the comparable single-stage compressors. Atlas (Copco) Philippines, Inc., is also supplying industrial compressors to the food, mining, metals, textiles, and chemical sectors.

The Philippine Appliance Corporation (PHILACOR), one of the local manufacturers/assemblers of refrigerators, formerly manufactured compressors for its refrigerators. However, it has since switched to importing this equipment and now manufactures refrigerators using both imported and local parts. PHILACOR manufactures White Westinghouse, one of the leading brands of refrigerators.

Because compressors are a basic piece of equipment for industrial processors, the performance of the industries themselves may indicate the demand for compressors. Based on the information below (Table 8), manufacturing industries as a whole doubled production between 1990 and 1995, representing an annual increase of about 15 percent. For further trade statistics on compressors and pumps, see Annex 9.

Potential for Investment

Compressors are used both in small and large industries and are among the most energy-intensive pieces of equipment. With the new rate restructuring being introduced by the NPC, most industries will have to lower their production costs. One way of doing this is to use more energy efficient equipment.

The refrigeration manufacturing/assembly industry has a large potential for improvement. According to a report by RCG/Hagler Bailly, Inc., the use of a more efficient compressor, increased thickness of the insulation, and an improved door gasket can reduce electricity use by 30 - 40%, with a 15 - 20% increase in manufacturing cost.⁴ In the Philippines, industry figures show that in the past 5 years, over 80% of compressors imported into the country were compressors needed for refrigeration. Moreover, refrigerators are second only to lights in terms of end-use in Philippine households.

⁴ RCG/Hagler Bailly, Inc., Demand-Side Management Action Plan for the Philippines, July 1994

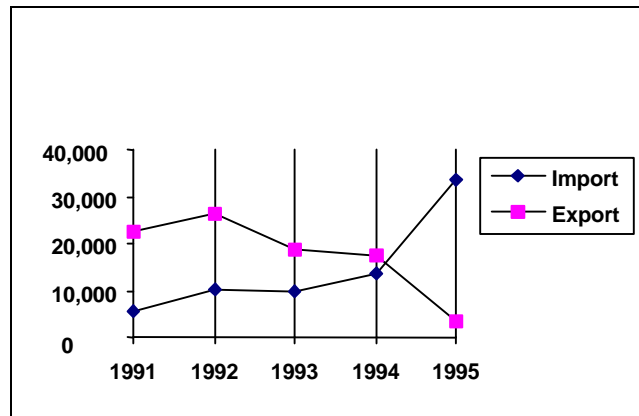
According to the latest (1995) DOE-commissioned Household Energy Consumption Survey (HECS), some 41% of households use a refrigerator and/or freezer. Average electric consumption for refrigeration amounts to 535.19 kWh per year. Likewise, industry figures show that the number of imported refrigerators more than doubled to 33,500 in 1995 from the previous year's level of 13,600 units. At the same time export volume steadily declined from a peak of 26,300 in 1992 to 3,541 in 1995 (Figure 4). The above trends suggest a growing domestic demand for refrigerators. This growing trend has been observed to be continuing despite the currency turmoil that recently hit the country. Sales of refrigerators and freezers as documented by the Philippine Electrical Electronics and Allied Industries Federation and National Statistical Coordination Board, continued to increase by about 3.2%, from 585,243 in 1996 to 603,250 in 1997 (Table 9).

Table 8: Index of Value of Production of Key Manufacturing Enterprises

Selected Industries	1990	1991	1992	1993	1994	1995
Food	176.2	187.9	216.5	210.9	237.9	235.7
Beverage	181.4	222.1	235.5	236.7	268.6	271.8
Textile	193.5	212.4	201.1	170.1	163.9	189.0
Petroleum Products	118.1	157.1	167.2	159.3	148.4	204.4
Paper & Paper Products	154.2	186.5	176.2	178.4	210.1	255.8
Chem. & Chem. Products	132.9	152.9	183.7	228.8	251.3	283.3
Total Manufacturing	200.2	241.0	256.0	301.0	342.4	400.9

Source: 1996 Philippine Statistical Yearbook

Figure 4: Value of Imports vs. Exports, Refrigerators (in Philippine Pesos)



Source: BETP-DTI

As part of DOE's DSM program, negotiations between the Fuels and Appliance Testing Laboratory (FATL) of DOE and the manufacturers of refrigerators are ongoing. This negotiation involves the implementation of a Performance Testing and Labeling Program for refrigerators in the market, similar to that being implemented for room air-conditioners (see related discussion in the next section). A set of energy efficiency standards will be formulated for that purpose. To encourage manufacturers to produce energy efficient models, mandatory or voluntary labeling and certification of energy efficient units shall be implemented beginning in 1998.

DOE implementation of this energy labeling program for refrigerators will increase the manufacture and use of energy efficient compressors. This will in turn improve the level of awareness among consumers concerning the efficiency of refrigerators and will most likely refocus the standard marketing pitch for refrigerators in the Philippines from capacity (e.g. bigger freezer compartment) and durability to include energy efficiency. Likewise, as identified in the earlier cited RMI Feasibility Study, there appears to be a good potential for retrofitting using higher efficiency compressors. The potential savings from using higher efficiency

Table 9: Domestic Sales Data for Refrigerators/Freezers

Type	1993	1994	1995	1996	1997
REFS (1-D)	241,571	300,035	383,599	457,697	484,583
REFS (2-D)	52,253	57,531	67,053	75,362	65,084
REFS NO FROST	0	0	0	14,860	23,736
OTHERS	0	23	24	300	364
FREEZERS	27,378	17,055	37,419	37,024	29,483
Total	321,202	374,644	488,095	585,243	603,250

Source: Association of Home Appliance Manufacturers

compressors in the food and chemical industries total US\$8.9M.

The PEI conducted a survey that identified about 20 companies dealing with compressors. Two of these companies are interested in a possible joint venture with U.S. companies to provide energy efficient products and services in the Philippines. Both companies are basically distributors of imported products, although one is engaged in manufacturing as well as providing engineering, consulting, and design services. Both companies have plans for expansion. One company wanted to expand its activity into industrial maintenance/services, while the other is interested in distributing any refrigeration-related value products (see Annex 5).

Commercial Cooling Systems

Status of Market

The air-conditioning industry in the Philippines has made major breakthroughs in its 37 years of existence. As early as 1953, the manufacturing of air-conditioners was pioneered by Aircon Inc. The enterprise was engaged in the local manufacture of air conditioners, locally designed

by an ingenious Filipino designer. Today, room air-conditioning units have been replaced by packaged self-contained units in restaurants, hotels, many offices, and other commercial establishments.

The main target clientele of commercial air-conditioning systems are industries (for example, the electronics industry) and commercial office buildings, including hotels and shopping malls.

Some of the known air-conditioning manufacturers in the Philippines are Alen Engineering, Concepcion Industries Inc., and Koppel Inc. Concepcion Industries has made a technological breakthrough in air-conditioning by producing cooling power with less energy consumption through the following:

- Scientifically designed heat transfer coils that trap and extract heat and moisture efficiently. The cooling surface contributes to high energy efficiency.
- Revolutionary lanced sine wave aluminum fin design that increases cooling power and consumes less energy.
- Specially designed plastic molded axial flow. A slinger-fan lowers operating costs by spreading the condensate over the outdoor coil to achieve evaporative condensing of the hot refrigerant.
- Sensitive temperature thermostat that senses the slightest change in room temperature and adjusts cooling accordingly; this maintains comfort levels and maximizes energy efficiency.
- Microcomputer thermostat that maintains an almost constant room temperature while maximizing energy savings.
- High performance rotary compressor that uses less energy and yields much more power than conventional compressors.

The air-conditioning industry, particularly the industrial models, continues to grow proportionately to the increase in building construction. The growth rate for buildings in the past 5 years has been increasing at the rate of 9.87%. Today, air-conditioning is a necessity and an inherent part of major construction projects.

The Philippines imports seven types of air-conditioners (Table 10). These include air-conditioning machines incorporating a refrigerating unit and valve for reversal of the cooling/heat cycle as well as for motor vehicles incorporating a refrigerating unit and others. Importation figures show an upward trend (Figure 5), with the most significant volume coming from parts of air-conditioning machines, indicating that the Philippines has a large manufacturing industry for air-conditioners. Imports of air-conditioning equipment come mainly from Japan, the U.S., and the Republic of Korea. Historical figures show that the majority of air-conditioning equipment over 2 hp was sourced out of Japan, while units below 2 hp came from the U.S. and South Korea. Detailed trade statistics on air-conditioners can be found in Annex 10.

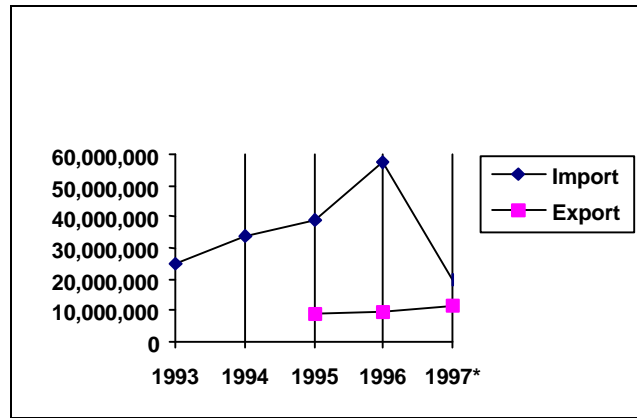
Table 10: Air-Conditioning Machines Importation, Quantity

Type	1993	1994	1995	1996	1997*
1. Air Conditioning Machines incorporating a refrigerating unit & valve for reversal of the cooling/heat cycle	96	232	78	328	-
2. Air Conditioning Machines incorporating a refrigerating unit other than those of sub-item 7415501	883	5,124	12,492	12,336	-
3. Air Conditioning Machines, for motor vehicles, incorporating a refrigerating unit	1,088	2,872	1,223	867	-
4. Air Conditioning Machines, not incorporating a refrigerating unit	2,346	2,872	2,250	3,856	2,247
5. Parts for Air Conditioning Machines of subgroup 741.5	2,362,616	2,921,359	2,627,114	2,663,114	2,627,609
6. Air Conditioning Machines, over 2Hp capacity, window or wall type, self contained	2,337	1,289	329	149	1,159
7. Air Conditioning Machines, 2Hp or below, window or wall type, self contained	2,712	11,070	19,612	34,986	53,350
Total	2,372,078	2,944,818	2,663,098	2,731,636	2,684,365

Source: BETP-DTI

*Jan. - Oct. only

Figure 5: Value of Imports vs. Exports, Air-Conditioning Machines (in Philippine Pesos)



Source: BETP-DTI

*Jan. - Oct. only

However, despite its active aircon manufacturing/assembly industry, the Philippines has remained a net importer of air-conditioners, as shown in Figure 5. Exports during the past 5 years still followed an increasing trend though at a slower rate of increase. Indications therefore point to increasing domestic production to meet domestic demand, because net imports experienced a drastic downward trend from 1993 to 1996, while exports have increased since 1995. Philippine-made air-conditioning units are exported to such places as Hong Kong, Singapore, Taiwan, the Czech Republic, and Australia. The effective implementation of the testing and energy efficiency standards will encourage manufacturers to produce better quality appliances and to improve exports.

The implementation of energy efficiency testing for room air-conditioners, which began in 1993, has improved the quality of these appliances in the market. Annex 11 shows the list of certified room air-conditioners as of December 1997. This includes the majority of brands in the market today. For units under 12,000 kJ/h capacity, 40 locally manufactured models had been tested and labeled, while 16 models were imported. For units 12,000 kJ/h and above, 45 models were tested and labeled, while 23 models were imported. For the year 1997, the efficiency standard for locally available energy efficient air-conditioning units has been set at an EER of 8.3 at 12,000 Btu/hr. cooling and an EER of 9.95 at 15,000 Btu/hr. cooling. This is computed to reduce annual energy consumption by 10 to 15 percent. These potential savings can be further increased by increasing the EER standard to 9 or 10, because most of the air conditioners tested have an EER of over 9. A higher EER can be achieved by further improvement in the speed motors and fans, which could result in an efficiency improvement of 28.2% or a reduction in consumption by 22%, as done in the highly developed countries.

Current minimum EER standards on a year-to-year basis are shown in Table 11. By increasing the minimum standard yearly, DOE hopes to continue the trend in market transformation and soon bring the country's standards to a level similar to that of other countries. These minimum efficiency standards and labeling program shall be extended to duty-free goods. Based on these efficiency standards, it can be concluded that most of the brands are not only meeting the

Table 11: Target for Energy Efficiency Standards

Classification of RACs	1997	1998	1999	2000	2001	2002
Those with cooling capacity below 12,000 kilojoules/hour	8.3	8.7	8.7	8.7	9.1	9.1
Those with cooling capacity above 12,000 kilojoules/hour	7.8	7.8	8.2	8.2	8.2	8.6

Source: Data from FATL- DOE

standards but are in fact more efficient than the set minimum standard. On this basis, it may be a good time to consider increasing the minimum standard to further improve the energy efficiency of products in the future.

Potential for Investment

The growth in real estate development, particularly in the commercial buildings sector, will necessarily expand the market for commercial air-conditioners. As in the other ASEAN countries, economic development in the Philippines has been accompanied by changes in the commercial buildings sector. Large air-conditioned office buildings and shopping complexes are replacing traditional, less energy-intensive low-rise buildings and small shops. Air-conditioning has emerged as the largest single commercial end-use and represents an estimated 12% of system peak demand. According to the RCG/Hagler Bailly study, more than one-half of all electricity used by the commercial sector goes to air-conditioning. Sales of air-conditioners (Table 12) have grown steadily since 1992 after experiencing a negative growth rate in 1991. After 1991, room air-conditioner sales grew at an average of 25% annually, from 44,400 units to 90,000.

The survey of commercial buildings and shopping malls revealed a potential for energy efficient technologies using a centralized air-conditioning system with automated controls for the air handling unit (AHU). This covers new malls and office buildings that are either on the drawing board or soon to be constructed. Almost all the building owners surveyed mentioned a plan to construct/develop new malls/office buildings in the future. Seven new buildings/malls are identified and ready for implementation.

Moreover, of the 22 companies surveyed, five are involved in supplying commercial air-conditioning and ventilation equipment and are interested in expanding their businesses through joint ventures and by acting as a distributing agent for U.S. technologies. Three out of five

Table 12: Domestic Sales Data on Air-Conditioners

Type	1993	1994	1995	1996	1997
ROOM AIRCON	65,778	90,651	111,422	153,597	191,673
SPLIT TYPE AC	3,355	5,714	8,357	12,815	17,579
PACKAGED AC	4,191	7,311	9,090	12,643	16,146
Total	74,324	103,676	128,869	179,055	225,398

Source: Association of Home Appliance Manufacturers

companies have plans to undertake expansion activities. One company intends to expand to the

Visayas and Mindanao regions to manufacture a computer-based control system for process control. Another wants to manufacture air-conditioning units or distribute imported environment-friendly a/c products or accessories. A third company planned to go into humidity equipment and control. Among the companies interested, four distribute imported products; one also manufactures products as well as provides engineering, consulting, and design services (see Annex 5 for more detail on company interests).

Lamps

Status of Market

In the Philippines, fluorescent lamps are the most commonly used source of light, especially in urban areas. However, in rural areas, households still use incandescent lamps mainly because they are cheaper and widely available. Compared with incandescent lamps, fluorescent lamps are preferred because they give off less heat, are considered brighter, and are more energy efficient. Compact fluorescent lamps (CFLs) are also used but only by a small number of households. Findings of the DOE-HECS showed that of the 8,535 households surveyed in 1996, 85% use fluorescent, 81% use incandescent, and 2.68% use CFLs. Energy for lighting is relatively minor compared to other energy uses in the buildings sector, but it nevertheless constitutes a substantial component of electrical energy use. As pointed out earlier, the most common energy conservation measures that can be adopted in most buildings are delamping and replacement of lighting fixtures to accommodate the installation of reflectors. Existing technologies allow a wide range of choice in the design of new lighting systems and in modifying the required existing ones. In this regard, it is possible to choose the most efficient light sources that can provide the illumination required.

Large lamp and bulb manufacturers in the country are General Electric and Philips. Both offer a wide range of products from household applications to street lighting, and account for the bulk of lamps and bulbs both consumed locally and exported. The Philips plant can produce 40 million units of incandescent bulbs, 6.2 million units of fluorescent lamps, and 15.7 million units of specialty lamps. At present, the bulk (70-90%) of the manufacturer's cost is the cost of raw materials. About 50-90% of these raw materials are imported⁴.

In recent years, several research efforts have been devoted to the development of lamps that use less energy. Lamps that can reduce energy consumption by as little as a fraction of a watt can result in energy savings. At present, none of these producers of lamps and bulbs manufactures energy saving lamps and bulbs in the country. The energy saving lamps and bulbs found in the local market are imported by several manufacturers and suppliers, namely Philips, General Electric, Hitachi, Electrobus National, Sylvania, etc.

Philips and General Electric dominate the supply of energy saving lamps (ESLs) in the country due to their wide range of ESL products. However, almost all of these ESLs are imported from their respective mother companies. The energy saving lamps supplied by the aforementioned suppliers are the following:

⁴ Office of Energy Affairs, Non-Conventional Resource Division, Financing Energy Services for Small Scale Energy-Users, August 1991

- PL, SL, and TLD Lamps from Philips are low in wattage and are most efficient. PL lamps have a built-in ballast and require replacement of existing lighting fixtures (similar to that used for incandescent bulbs), whereas the SL bulb can be screwed into the same light/bulb receptacle. The potential saving ranges from 20 to 50% depending on the PL and SL series selected. The TLD lamp is similar to the fluorescent lamp.
- General Electric BIAX lamps can be used as an incandescent substitutes for up to 150-watt lamps as well as replacements for longer conventional fluorescent lamps. These high efficiency lamps achieve lumens/watt values that range from 57 to 81%.
- ESL for street lighting and parks.

Different types of lamps, ranging from miniature indicator bulbs to special purpose bulbs, are imported into the Philippines. Over the last 5 years, importations have increased. The value of imported lamps from 1993 to 1996 increased by 63.7%. In 1995, about US\$105.4 million worth of lamps was imported into the country. The most prominent item was the flashlight bulb, most likely because of the power shortage the Philippines was experiencing at that time. Other items include ballasts for high-intensity discharge lamps and tubes and discharge lamps, valued at US\$3.9 million and US\$2 million, respectively. These items are basically used for street lighting and parks. Another significant import was the straight tube fluorescent lamp (10 watts and above), valued at US\$1.2 million.

In 1996 the biggest imported category was “parts of other electric lamps” (worth US\$9.2 million), followed by “other ballasts for discharge lamps” and “tubes and discharge lamps,” valued at US\$6.9 million and US\$3.8 million, respectively. This could be indicative of a growing lamp manufacturing industry.

On the other hand, Philippine exports of lamps (Figure 6) have also increased. Between 1995 and 1996, the value of lamps exported to other countries increased by 7.68%. From 1995 to October 1997, the total value of exports was about US\$44.6 million. In 1995, Philippine exports of incandescent lamps between 100 and 200 watts were valued at US\$7.6 million. This item was followed by incandescent lamps exceeding 200 watts, valued at US\$2.1 million. Additional trade statistics for lamps are found in Annex 13.

Potential for Investment

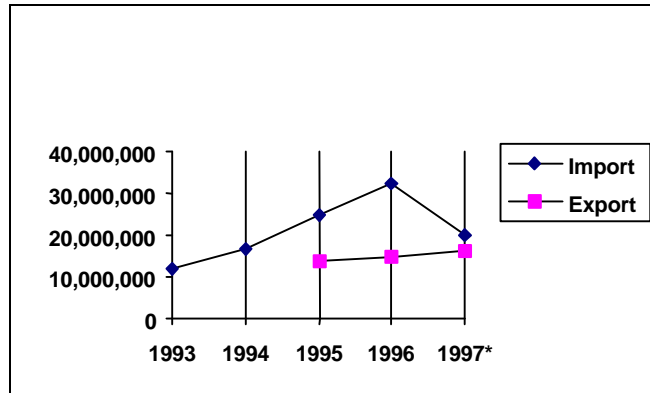
In existing facilities (commercial buildings, industrial facilities, streets, households) it is expensive to replace inefficient luminaires. To avoid the initial cost of new equipment, more efficient lamps can be substituted. This would reduce the energy use and still maintain lighting levels in existing installations without capital expenditures. Delamping and relamping to a lower wattage can save substantial amounts of energy. This approach is inexpensive, has an immediate payback, and does not require highly skilled people. Lighting efficiency in many installations can be improved by 10 to 50% simply by installing more efficient lamps in existing fixtures.

The market for energy efficient lamps or energy saving lamps (ESLs) includes commercial and industrial establishments, residential homes, and streetlighting. Energy efficient lamps would have broad applications in all the concerned sectors.

Because fluorescent lamps are the primary lighting source in all sectors, lamp manufacturers should be encouraged to switch from 40-watt and 20-watt lamps to 36-watt and 18-watt lamps, respectively. As in other countries, the program is attractive to manufacturers because smaller and more efficient lamps use less material and cost less to manufacture than traditional lamps.

With regard to magnetic ballasts, which use approximately one-fifth of the energy required for

Figure 6: Value of Imports vs. Exports, Lamps (in Philippine Pesos)



Source: BETP-DTI

fluorescent lighting, the DOE, through the FATL, shall test ballast performances and offer to manufacturers a voluntary labeling program, such as a wattage loss number printed on ballast. Standards should likewise be attached to avoid illegally manufactured ballasts.

The government is planning a program to promote the use of energy saving lamps. The initial stages of the program will focus on completing the CFL reliability testing and working with manufacturers to increase lamp reliability, after which a low-interest loan or other promotion methods will be carried out by the distribution utilities. To reduce the price of CFLs, an import duty reduction for CFL components shall be pursued.

In industry, replacing incandescent bulbs with compact fluorescent lamps, replacing standard fluorescent tube lamps with energy-saving fluorescent tube lamps, replacing mercury vapor lamps with sodium lamps, or replacing large incandescent lamps with metal halide lamps are usually the most applicable measures that would yield savings.

The survey indicated that out of 19 companies, 6 are interested in joint venture partnership with U.S. companies. These partnerships could be in the areas of distribution of U.S. technologies. These companies have plans to expand their activities, such as luminaire assembly, special power supplies, emergency lighting systems, and sensors.

Building Automation Systems

Description of Product

Building automation systems integrate sensors, controllers, transducers, microprocessors, and other devices to monitor and control building services (that is, air-conditioning, ventilation, lighting, etc.) to achieve design goals for functionality and performance. The improvement in the business climate and the corresponding market for higher quality services have given building owners and developers the incentive to incorporate building automation systems into new construction. Developers have begun to highlight automatic controls and computer-based systems in their marketing materials and have popularized the term “intelligent buildings.”

The trend toward building automation started in Europe and America in mid-sixties, caught on in the other ASEAN countries in the late seventies, and reached the Philippines in the eighties. Because of its potential effectiveness in providing better security and safety for people and property, building automation systems could increase building occupancy and help command higher rental income.

The larger and more complex a building or facility is, the more systems and equipment are required to operate and manage it. The result is a complex assortment of control and monitoring systems with different computer interfaces and networks. Each should be able to run the building in its specialized way and “talk intelligently” to each other. Otherwise, inefficient building management and high energy consumption could result, which would mean increased maintenance and operational costs, a poor work environment, and a lack of security.

A building automation system can integrate all building operations into one monitoring and control system—HVAC/R lighting system, security and access control, fire alarms and protection, power monitoring process controls, historical data gathering, elevators, etc.

Status of Market

Commercial and residential buildings in the Philippines have traditionally overlooked the potential of building automation systems. Probably the first example of building automation in the country is the headquarters of the Asian Development Bank in Pasig City. This building was recognized by an international body for its energy efficient design. A team from IIEC conducted an audit of the building, however, and found opportunities for improvement. This indicates that even the perceived energy efficient buildings can benefit from a reappraisal of their systems in the light of recent technological advances.

For most buildings, the optimization of power use and functionality of building services is a low priority. This is one reason why even the most basic control (that is, a thermostat) in the most energy-intensive building service (that is, air-conditioning) is lacking in many buildings, including relatively new ones. The building administration group is one of the areas where personnel quality is often inadequate to fully appreciate the benefits of building automation systems. Hourly energy consumption monitoring alone is difficult to implement. In several meetings of the Energy Managers’ Association of the Philippines, it has been pointed out that obtaining management support for energy efficiency projects is difficult even for those companies with competent technical staff.

The only areas where building automation systems may be seriously considered are very high-end new building construction and in special situations where the production process, such as in an electronics assembly plant, requires very stringent air-quality requirements. In both cases, energy consumption is a minor consideration. In the former, high-end buildings need to have distinguishing characteristics that will attract prospective clients. Having “intelligent” features is one aspect that marketing departments use to sell the building.

Despite the limited market, several companies are actively involved in developing the demand for building automation systems. These include the following:

- Filipinas Multi-Line Corporation is the exclusive distributor of the “SAUTER” line of controls. The company also distributes HVAC/R and lighting controls of Paragon Electric Co. Inc.
- Jardine-Nell, a subsidiary of Jardine Davies, Inc., started as a distributor of Honeywell building automation systems in early 1997.
- Raco Haven Automation Philippines, Inc., is the exclusive distributor of Johnson Controls, which supplies the Metasys Facility Management Systems.

Aside from the ADB Building, there are no existing buildings that can be considered intelligent buildings. The reason is economics: building administrators, building owners, developers, and architects need to prove that incorporating such energy efficient technologies could significantly save energy and thereby reduce building operating and maintenance costs. So far, the only exception is the ongoing construction of the ABS-CBN Broadcasting Building, currently under construction. The 15-story building, designed to house commercial offices and technical/broadcasting facilities, will feature energy efficient technologies, namely:

- building energy management, to reduce electrical power load for the building from 19.5 MW. to 9.5 MW, with no reduction in building functions;
- cogeneration, to improve electricity supply to the building by using online generation for essential power load and using waste heat to produce chilled water using non-electric chillers;
- electrical load shedding system, to integrate an electrical/cogeneration power system designed to reduce peak load demand and control excess power usage beyond optimum the load requirement;
- building management system (BMS), to control and/or monitor all electrical and mechanical systems for operational efficiency/preventive maintenance and security/fire safety;
- heat pumps, used for air-conditioning to all nontechnical areas. The decentralized system requires a reduced central chiller plant capacity and an overall reduction in electrical load. Operational flexibility includes individual heat pump unit operation (that is, not being dependent on central chiller plant operation);
- waste water management, to recycle waste water from STP and cooling towers to reduce overall onsite demand for water. The daily load on the building will be reduced from 850 cubic meters to approximately 300 cubic meters because of this recycling strategy. Water

management includes use of dual flush systems and separate plumbing systems for potable and nonpotable water throughout the building; and

- high efficiency exterior glazing system, to reduce solar heat gain on the building and thereby the overall cooling load demand.

Potential for Investment

Building automation systems can provide cost-effective solutions to a building, enhancing its marketability, functionality, and energy efficiency. With the current growth rates in the commercial buildings sector in the Philippines, there may be a good market opportunity for such building automation technologies. However, being a new technology, market resistance and limited awareness may be formidable barriers.

Private building owners and developers have begun to adopt some limited applications of building automation systems to facilitate maintenance and control and increase competitiveness. In the survey conducted among commercial building/mall operators, this trend was confirmed. As cited earlier, almost all the buildings surveyed are already equipped with building control mechanisms in one way or another, although there is a need to reinvestigate for the purpose of improving current systems. All the respondents are interested in energy efficiency and have signified their desire to utilize these technologies in future development efforts. More information dissemination on the effectiveness of “intelligent buildings” would result in higher acceptance rate for these systems.

Energy Service Companies (ESCOs)

Description of the Service

An energy service company (ESCO) as defined in this study is an organization that provides a wide range of services related to the implementation of energy efficient products, technologies, and equipment to owners of industrial, commercial, institutional, agricultural, and/or domestic facilities. The services provided generally include the financing of the energy-efficient options so that the facility owner has to put up little or no capital. The compensation for the ESCO services is often paid by the facility owner from the monetary savings resulting from the reduced energy consumption. In most cases, the compensation is based on demonstrated performance, in terms of energy efficiency improvement or some measure of performance. The range of services offered by a typical ESCO may include the following:

- Preliminary feasibility analysis
- Detailed audits of facilities
- Design of energy efficiency options
- Engineering
- Construction management
- Installation services

- Financing
- Operation
- Maintenance
- Performance monitoring

The Need for ESCOs in Developing Countries

Despite the significant benefits of energy efficiency to facility owners and to society, experience has shown that most customers are reluctant to invest their own funds in options for energy efficiency improvement. Barriers to customer investment in energy efficiency include lack of knowledge or experience with the appropriate technologies, limited availability of capital, lack of motivation, the need for rapid paybacks, management priorities, and transaction costs related to the identification and installation of energy efficient equipment.

Utilities in developing countries have limited experience, capabilities, and staff resources for implementing energy efficiency options. Moreover, the senior management of most utilities in developing countries view their business as one of producing and supplying energy, rather than investing in customer's facilities to improve energy efficiency. As a result, utilities in developing countries have exhibited very little interest or motivation toward energy efficiency improvement. Similarly, government agencies in developing countries have a number of important problems to address, and while energy efficiency is gaining in importance as a problem of national priority, governments often lack the necessary expertise or implementation capability to undertake widespread programs for implementing energy efficient technologies or equipment.

As a result of these barriers there has been relatively little activity with respect to energy efficiency in most developing countries. This presents an opportunity for ESCOs, which offer an excellent vehicle for implementing energy efficiency options quickly, efficiently and cost effectively.

Status of Market

The establishment of ESCOs in the Philippines started in the 1990s with the introduction of demand-side management (DSM) programs. Based on the above definition of an ESCO, there are 10 existing registered companies that would likely be considered as ESCOs and that are beginning to provide the services of an ESCO (see Annex 14 for a list of these companies). According to inquiries by the Energy Development and Utilization Foundation, Inc. (EDUFI), a company can be considered an ESCO if it offers electromechanical design for increasing the efficiency of facilities and utilities, provides energy audits, installs energy conservation devices, or monitors control of the electrical system and mechanical sewerage. To date, Philippine ESCOs are doing limited activities and cannot be compared to the ESCOs in the United States.

The Energy Specialist Company (ESCO) is pioneering the energy services business in the Philippines. ESCO is a joint venture company of the COMFAC Global Group of the Philippines, ELECTRIC EYE Services Pte., Ltd. (headed by Dr. Lee Eng Lock, an acknowledged Asian HVAC expert), and Super Symmetry USA. The partnership has successfully completed more than 50 energy efficiency and clean-room projects. Among these projects is the successful conversion of PHILAMLIFE Building to one of the most energy

efficient buildings in the Philippines. Through retrofitting with energy efficient technologies, PHILAM saved about 23,400 kWh/mo., or P 162,192.93/ month.⁵

The ESCo partnership has also completed a detailed energy audit of the building complex of MERALCO. The technical and financial proposals for the installation of a high accuracy data acquisition system, energy engineering, and design and project management have been forwarded for approval by MERALCO management. Once implemented, this project will be used by MERALCO as an impetus to promote its own Demand Side Management Program.

Prospects for ESCOs

Despite technical, financial, institutional, and regulatory barriers, ESCOs can be successful mechanisms for implementing energy efficiency options in developing countries. The increasing recognition of environmental issues will favor energy efficiency as a beneficial resource, which will soon be recognized and accepted by governments, utilities, facility owners, and equipment manufacturers. As earlier discussed, many industrial firms in the Philippines have significant potential for cost effective implementation of a wide range of efficient technologies, products, and equipment. And because the high cost of constructing new energy facilities is leading to higher electric rates, if not massive shortages of electric power and other energy sources, the need to implement innovative energy conservation measures is becoming more imperative.

International programs, such as those of the World Bank and other multilateral financing institutions, are essential to the future success of ESCOs. In late 1992, these organizations made a major policy decision to emphasize energy efficiency and to require consideration of energy efficiency in any new energy system development loans. In the next several years, the multilateral financial institutions are likely to make more financing available for energy efficiency improvements in developing countries.

Likewise, the Department of Energy issued Department Circular No. 95-08-007 (refer to Annex 1), which cites the need to adopt regulatory approaches or strategies to effectively encourage investment in DSM by electric utilities and to enjoin utilities to develop and submit a DSM plan or program periodically to the ERB for its review and approval. Likewise, the ERB was enjoined to encourage the use of a collaborative process involving all participants in the development of a comprehensive policy on DSM and the criteria or regulatory framework for the implementation of DSM projects. The DOE's order instituting DSM by utilities is now with ERB and in the final stage of legal review prior to its approval.

To ensure the success of DSM, the departmental order defines the role of the DOE, ERB, electric utilities, and consumers of electricity. The role of the DOE is to initiate and conduct the testing of all electric appliances and equipment for household and office use to determine the energy efficiency ratings and the appropriate minimum energy efficiency standards for all electric appliances/equipment manufactured in or imported into the country. The role of the ERB is to develop and implement a regulatory framework to enjoin electric utilities to invest in DSM project and to adopt other rate-making methodologies to provide utilities with economic incentives for investing in DSM programs. Utilities, on the other hand, will be responsible for developing a DSM plan or plans, and will be free to set their DSM goals and choose which

⁵ Gonzales, Ding. "Role of Energy Service Company in Energy Efficiency", presented by during the Advance Energy Management Training Course, UP-National Engineering Center, Aug. 1997

DSM load shape objective is most appropriate for their specific circumstances. The role of consumers of electricity shall be to provide inputs in the planning, implementation, monitoring, and evaluation of DSM plans, and to assist in the conduct of research, information, education, and communication activities; resource mobilization; and other efforts in support of DSM.

A critical factor in the future role and success of ESCOs in the Philippines will be the ability to demonstrate successful applications of the ESCO concept. The DOE has recognized the role of ESCOs in the implementation of energy efficiency and DSM programs. To support the development of the ESCO industry, the DOE will spearhead the program with complementary support from private ESCOs. One of the activities to be implemented is the energy audit. Under this program, advisory services (in the form of technical assistance) shall be extended to industry and other energy-intensive establishments to help them observe and measure patterns of energy utilization and analyze the results to help them more rationally use available energy sources. It shall continually collect energy flow data and identify energy cost saving areas and corrective measures that can yield energy savings and ultimately improve energy efficiency.

Under Department Circular No. 95-08-007 issued by DOE in August 1995, grants and/or soft loans will be provided to ESCOs and/or electric distribution utilities to ensure the success of DSM in the Philippines.

Apart from DOE, private institutions such as the Energy Development and Utilization Foundation Inc. (EDUFI), Energy Management Association of the Philippines (ENMAP), and Preferred Energy, Incorporated (PEI), support DSM and the development of ESCOs into a viable industry capable of promoting energy conservation in target industries and formulating innovative financing and benefit-sharing schemes as well, as actual project implementation.

Overview of the Energy Sector

Key Institutions

Following are the key players in the Philippine energy sector: DOE, the National Power Corporation, the Energy Regulatory Board, the National Electrification Administration, the Philippine National Oil Company, the Manila Electric Company, and the Philippine Council for Industry and Energy Research and Development.

Department of Energy (DOE)

The DOE is the central body responsible for policy formulation and the planning and management of the overall energy sector, as well as for ensuring a continuous energy supply at affordable costs and with due consideration to environmental concerns as provided for in Republic Act 7638. Together with other attached agencies, the DOE shall strive to address these concern through the following:

- Formulation of clear policies and responsive plans and programs;
- Intensive development of indigenous energy sources;
- Effective coordination of downstream energy activities;
- Judicious conservation and efficient utilization of energy;
- Enhancement of private sector participation in energy projects; and
- Close coordination and cooperation with other government agencies and private sector entities.

National Power Corporation (NPC)

The NPC is a government-controlled corporation mandated to undertake power generation activities utilizing hydroelectric power, coal, geothermal, and other alternative energy sources. NPC's past and future power development programs show that it has concentrated and will continue to focus on the use of petroleum-based fuels, geothermal, large hydropower, and coal for power generation. Early this year, efforts were initiated to include the New and Renewable Energy Sources (NRES) program in NPC's Power Development Program (PDP) to promote the use of indigenous resources and increase the contribution of NRES to the Philippines' energy generation mix. The NRES program was to open a window that will accommodate up to 50 MW per year of NRES capacity in the PDP starting 1998. However, this policy was put on hold pending the passage of the Omnibus Power Industry Act, which was deliberated, but not passed, in the last Congress. Under the Act, a Small (Strategic) Power Utilities Group (SPUG) was to be created for the main purpose of serving the power generation and transmission needs of areas not connected to the main NPC grids, which include isolated or remote communities referred to as the "small island grids." The SPUG would have the role of fulfilling NPC's missionary electrification mandate of small island grids and remote towns with due regard to

society and the environment. Its service area covers 44 islands and 9 isolated towns located in 30 provinces nationwide—16 provinces in Luzon, 7 in the Visayas, and 7 in Mindanao.

Energy Regulatory Board (ERB)

The ERB was created under Executive Order # 172. ERB's main roles are as follows: a) to fix and regulate the rates and other cost adjustments charged by private electric utilities, including the National Power Corporation (NPC) and electric cooperatives; b) to test and calibrate electric watt-hour meters of private electric utilities; c) to issue certificates of public convenience and necessity for the operation of electric power utilities and services (except electric cooperatives) and establish areas of operation and other conditions, requirements, standards, specifications, rules and regulations concerning the operation of such power utilities and service; d) to review purchase contracts between independent power producers (IPPs) and the NPC, including private electric utilities; and e) to fix and regulate the rate schedule or prices of piped gas to be charged by duly franchised gas companies that distribute gas by means of underground pipe system and prices of other energy resources. ERB will also oversee the implementation of the DSM regulatory framework, the setting of Open Access Transmission Services (OATS) Tariff, and other functions to ensure competition in the electric industry, including related tasks to provide just and reasonable electric rates and fair profit margins for utilities and better services for end-consumers under the most competitive conditions as possible, without sacrificing environmental concerns.

National Electrification Administration (NEA)

By virtue of Presidential Decree 269, signed by the late President Marcos in 1969, the NEA was created as a government-controlled corporation primarily tasked to undertake countryside electrification programs on an area coverage basis. NEA is also responsible for establishing Rural Electric Cooperatives (RECs), primarily to distribute electric power to rural areas. The NEA provides technical and financial assistance to electric cooperatives for the setting up of distribution networks all over the country. Today the NEA has supervisory control over 120 electric cooperatives that distribute power to some 3 to 4 million rural households. These cooperatives, while mainly focused on grid electrification, also have the option of using alternative energy sources such as photovoltaic (PV) systems to fulfill their rural electrification mandate.

Philippine National Oil Company (PNOC)

Under Presidential Decree # 334, the PNOC was directed to handle energy resource development activities and provide and maintain a sustainable and reliable supply of petroleum products for domestic requirements. The Company shall promote a) the exploration, development, and utilization of conventional energy sources like oil, natural gas, and geothermal energy; b) the exploration, discovery, development, and utilization of alternative energy sources such as solar, wind, tidal, and other new and renewable energy systems; and c) the discovery, development, and adoption of technologies that enhance conservation and the efficient use of energy.

Manila Electric Company (MERALCO)

MERALCO is the country's largest electric distribution company, servicing the National Capital Region. Its franchise area covers 9,328 sq. km. and includes 15 cities and 96 municipalities in Metro Manila, the entire province of Bulacan, Rizal, and Cavite and parts of the province of Laguna, Quezon, and Batangas, and about 18 barangays in Pampanga. The largest and most advanced of the Philippines' electric distribution utilities, MERALCO has a continuous system upgrade and expansion program. On average it expects to spend about P6 B annually for the next 5 years. MERALCO has created a DSM unit that is now in charge of the company's DSM program. Aside from its medium-term plan, MERALCO will embark on a streetlight modernization program to upgrade and convert MERALCO's streetlighting facilities from mercury vapor lamps to high-pressure sodium (HPS) lamps.

Philippine Council for Industry and Energy Research & Development (PCIERD)

The PCIERD, part of the Department of the Science and Technology (DOST), is a government research planning and policymaking body. It is the central agency for the planning, monitoring, and promotion of scientific and technological research for applications in the industrial, energy, utility, and infrastructure sectors. PCIERD has the authority to specify national research and development goals, draw corresponding plans and policies, and set priorities for research in its delineated sectors. PCIERD supported several projects on energy conservation for industry and buildings and was responsible for implementing collaborative work under the ASEAN-U.S. Project on Energy Conservation in Buildings, which resulted in the Guidelines for Energy Conserving Design of Buildings and Utilities Systems. The Council is very much involved in DSM and has classified this as a priority program.

The following private companies and NGOs also play an important role in the adoption of RES and energy conservation technologies:

- The **Renewable Energy Association of the Philippines (REAP)**, composed of highly qualified consultants, managers, experts, and professionals in various fields of science and technology, is involved in the product development, manufacture, and marketing of RES.
- The **Energy Management Association of the Philippines (ENMAP)** is a private organization of energy managers and engineers in the industrial and commercial sectors that is active in disseminating energy conservation information and providing technical consultancy services.
- The primary concern of the **Cagayan Electric Power and Light Company (CEPALCO)** is to provide efficient and reliable electric service at reasonable rates. CEPALCO is proposing a DSM demonstration program for its industrial customers to accelerate learning of the practicalities of the planning, design, implementation, and evaluation of DSM.
- The **Energy Development and Utilization Foundation, Inc. (EDUFI)** was created to promote and sustain the economic and social well-being and industrial growth of the country through the comprehensive dissemination of information, consultation, research and development, training and education, and demonstration of appropriate technologies on energy development, utilization, and management and conservation.
- The **Philippine Energy Conservation Center, Inc. (PECCI)** is a private nonprofit corporation whose goal is to enhance the profitability/competitiveness of

industrial/commercial enterprises by improving energy productivity and efficiency through the wider application of energy conservation and energy management technologies. PECCI works under the umbrella of EDUFI in following and implementing basic energy policies designed to boost the national economic energy development and utilization thrusts.

The Energy Situation and Medium-Term Energy Development Program

“Energy must be adequate, reliable, and affordable to industries to enable them to provide continuous employment and low cost goods and services, and the ordinary citizen to enable them to achieve a decent life.” This is a quote from the DOE’s vision statement for the Philippines 2000, designed to support the government’s desire to become a Newly Industrialized Country (NIC) by the turn of the century. To ensure the fulfillment of this vision, the DOE has firmed up plans and programs to promote sustainable development and the use of the country’s natural resources, encourage technology breakthroughs, and integrate environmental concerns into the planning and implementation of energy programs.

The 1996-2025 Philippine Energy Plan provides a longer term perspective of the country’s energy needs, and plans for the intensive development of untapped indigenous energy resources. The plan is also geared toward diversifying energy resources by tapping alternative options that include the possible use of nuclear power; the accelerated development, use, and commercialization of new and renewable energy sources; and enhanced utilization of natural gas.

To achieve energy self-sufficiency, the plan calls for using indigenous energy resources and the full implementation of energy efficiency and demand-side management. The contribution of indigenous sources to the total energy supply is targeted to increase from about 43.7% in 1996 to 47.4% in 2005, while contributions of DSM and energy efficiency are expected to increase from 2.02% in 1996 to 18.92% in 2005. As such, savings from energy conservation measure and concurrent higher growth in the supply of indigenous energy sources are expected to reduce somehow the share of imported energy. However, in spite of this planned effort to tap indigenous energy sources, fuel oil consumption will continue to grow at 5.8% between 1996 and 2005 because rapidly rising energy requirements will necessitate a higher use of imported energy.

Hence, by year the 2025 the share of indigenous energy will eventually slip to 41%. In absolute terms, gross energy demand will increase from 218.95 MMBOE in 1996 to 1,392.6 MMBOE in 2025. This is driven primarily by the substantial increase in the fuel requirement for power generation, resulting in a share of 28.3% in 1996 and 48% by 2010. On the other hand, the demand of diesel oil and kerosene is pegged at an annual average growth rate of 4.6% and 4.3%, respectively. For diesel oil, the total demand will rise from 39.3 MMBLS in 1996 to 144.5 MMBLS in 2025. For kerosene, the total volume will reach 4.6 MMBLS in 1996 to 15.56 MMBLS in 2025.

The DOE projects that energy conservation and demand side management programs can significantly reduce energy consumption. An example of a DOE-led energy conservation

program is the Power Patrol program, which was started in 1993. Power Patrol's objective is to educate the public about energy conservation through seminars/ training programs and information dissemination.

Power Patrol in Metro Manila was launched on January 30, 1994, and has been replicated nationwide to cover the 12 regions of the country. A Power Patrol Regional Council has now been established. Power Patrol will help the regional council by formulating local chapters; institutionalizing the program through task forces on commercial, industrial, and household sectors; and including Power Patrol in the curriculum set for grades 5 and 6 pupils nationwide.

Likewise, the government shall embark on its information campaign program by including commercial and residential sectors, in view of their dependence on power supplied by the utility. Implementation of the Power Patrol Program is projected to save about 813 MMBFOE, amounting to P377 billion, by the year 2025.

Other programs being pursued by the DOE as part of the DSM program include the implementation of the Energy Conservation Bill, the Performance Testing and Labeling Program of all Electrical Appliances, and the Guidelines for Energy Conserving Design of Buildings and Utility Systems.