Cagayan Electric Power and Light Company, Inc.

Business Plans
for
CFL Distribution Programs

MACROFRAMEWORK AND BACKGROUND

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Prepared by

SOLUZIONA PHILIPPINES, INC.

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Introduction

The Efficient Lighting Initiative (ELI) is an energy efficiency program funded by the Global Environment Facility (GEF), and is administered globally by the International Finance Corporation (IFC) as a feasible quick response solution towards the reduction of greenhouse gas emissions, especially carbon dioxide or CO2. The efficient use of energy results in savings on power consumption.

Two of the Philippines' largest investor-owned utilities worked with ELI-Philippines, together with the latter's international and local consultants, to develop business plans for the distribution of Compact Fluorescent Lamps (CFLs) among their respective customers, through leasing or installment. These utilities are the Manila Electric Company (MERALCO), and the Cagayan Electric Power and Light Company, Inc. (CEPALCO). The underlying objective for the distribution program is to overcome the major obstacle to the use of the highly energy efficient CFLs – their high first cost.

While CFLs last 6-10 times more than incandescent bulbs, they cost 10-15 times as much. In addition, public perception of CFL technology has been damaged by the proliferation of poorly made, poor quality products in the Philippine market place. Together with a continuing information campaign about the benefits of ELI-qualified CFLs, a distribution program is believed to be essential in attaining ELI's objective of transforming the residential lighting market.

This document serves as a framework and provides background information on energy efficiency and efficient lighting, their economic and environmental benefits, reforms in the Philippine electric power industry, RA 9136, and the state of Demand Side Management (DSM) in the Philippines, among others. The business plans for each of the utilities and their respective CFL programs are contained in separate volumes.

1.0 ELI Program Objectives

1.1. Institutions Behind ELI

The Restructured Global Environmental Facility (GEF) is a trust fund of the International Bank for Reconstruction and Development (IBRD or World Bank). The GEF provides grant and concessional funding to developing countries for projects and programs that protect the global environment. The IBRD acts as Trustee and Implementing Agency of the GEF. In 1996, IBRD appointed the International Finance Corporation (IFC) to be the Executing Agency of the GEF. In 1999, IFC appointed Union Fenosa Ingeniería S.A. ("Union Fenosa" or "UFISA") as administrator of the GEF Efficient Lighting Initiative (GEF/ELI) Program in the Philippines and South Africa. The ELI Program is also being implemented in Argentina, Peru, Latvia, Czech Republic, and Hungary.

Union Fenosa is one of Spain's major electric utilities in terms of installed capacity and number of customers. The company has evolved into a "multi-utility" by virtue of its involvement in sectors corollary to its core electric business including telecommunications, water, gas, and mining. Its international group business interests are carried under Union Fenosa Internacional, predominantly in electricity, gas and water for Latin America, Eastern Europe, Southern Africa, and Asia including the Philippines. Soluziona, previously known as Iberpacific, is Union Fenosa's branch in the Philippines and is directly responsible for implementing the ELI Program here.

1.2. ELI-Philippines' Objectives

ELI Philippines has the following specific objectives:

A. Implement strategies towards sustainable market transformation, by

- Increasing demand for energy efficiency services
- Improving accessibility of capital
- Making efficient lighting products available
- Generating competition to produce downward pressure on prices
- Producing policy impacts that provide context for sustained market transformation (i.e., curb influx of inferior quality CFLs)
- Paving the way for the establishment of a long term council for energy efficiency

B. Promote energy efficient lighting through "ELI-Qualified" products

- Compact Fluorescent Lamps
- 32w/36w T-8 Linear Fluorescent Lamps
- High-Frequency, Low-Loss Electronic Ballasts
- High Pressure Sodium Street lighting
- Qualification & updates at www.efficientlighting.net

The action plan to implement the above strategies and attain ELI's objectives consists of a menu of activities to overcome the barriers to adoption of energy efficient lighting in the residential sector particularly disadvantaged communities and in the commercial, industrial, and institutional sectors including street lighting.

It is worth noting here that ELI was created to address Global Warming, particularly the reduction of greenhouse gas emissions especially carbon dioxide, through energy efficiency, specifically efficient lighting. When demand for electricity is reduced, greenhouse gas emissions associated with electric generation are avoided.

2.0 Other ELI-Philippines Initiatives: NACEEL and ESCO Industry Development

2.1 The National Advisory Council for Energy Efficient Lighting

Aside from supporting the CFL Smartlight Program and the establishment of an ESCO community, ELI Philippines worked towards the creation of the National Advisory Council for Energy Efficient Lighting or NACEEL. Composed of industry leaders from the private and public sectors, NACEEL aims to champion ELI's energy efficiency interventions in the Philippines, serving as magnets in attracting sectoral participation in the program. With the NACEEL Board composed of key decision-makers in the energy industry, their advice and counsel are essential in steering ELI towards the realization of its global energy and environmental objectives.

2.2 ESCO Industry Development

Another major ELI initiative is the development of an Energy Service Company (ESCO) industry in the Philippines. In May 2001, ELI-Philippines sponsored a symposium among players of the ESCO industry in the Philippines such as ESCO companies, suppliers and financial institutions. The seminar aimed, among others, to promote awareness of international performance contracting and project financing models, and to accelerate possible ESCO transactions by clearing barriers and establishing strategic alliances among players.

2.2.1. The Energy Services Company

The ESCO industry is basically the business of performance contracting with respect to energy services. For the ESCO industry, the performance contract between the ESCO and the customer is based on future energy savings. The main attraction of such a contract for the customer would be that it enables expenses to be redirected into a revenue stream without any up-front capital costs.

2.2.2. Economic Benefits of Performance Contracting

When performance contracting is implemented in cooperation with an ESCO, a number of benefits are available to the local economy:

1. Less energy costs per unit of production.
2. Increased productivity
3. Promotion of energy efficiency, not merely energy conservation
4. Increased employment while reducing the needed capitalization for the same quantity of energy
5. Improvement of the environment

2.2.3. Environmental Value

1. Reduction of greenhouse gas emission
2. Healthier and more productive population
3. Lower medical costs
4. Response to global climate change concerns

2.2.4. ESCO Services

Services by the ESCO include:

1. Energy Audit - for cost-effective savings
2. Investment Grade Energy Audits - create the basis for the project. They are a critical part of managing the risks associated with performance contracting.
3. Financing - may be provided by the ESCO, or the ESCO may arrange for the project to be financed by a third party.
4. Construction Management - ensures that the project goes into the ground as specified
5. Project Management - exists for the life of the project and it is the project manager's responsibility to make sure the projected savings are achieved each year of the project.
6. Maintenance - of new or existing equipment
7. Training - for Operations and Maintenance Personnel
8. Monitoring, Measurement and Savings Verification - offers all parties critical indicators regarding the success of the project.
9. Guaranteed Results and Risk Acceptance - provide the owner assurance regarding the promised results.

2.2.5. ESCO Market Opportunities

While an ESCO company's functions consist of standard project and construction services, as listed above, their application together for performance contracting in energy is another business opportunity that is opening up in the Philippines.

In a deregulated environment, the independent energy service providers play an important role in implementing DSM. The Philippine Energy Plan 2000-2009 estimates that energy demand would grow by 170% from its 2000 level of 256 million barrels of fuel oil equivalent (MMBFOE) to 445 MMBFOE by year 2009. The power sector will continue to be the biggest user of energy.

The Energy Plan also recognizes that technology innovations and more informed energy users should promote more efficient energy use in the country. As a result, the Energy Plan projects energy savings from the implementation of energy efficiency and DSM programs to reach 15.71 MMBFOE by 2009, from the 4.12 MMBFOE as of 2000, for a compounded growth rate of 16% per annum.

There are other factors that make the ESCOs an emerging industry:

- Many factories and buildings are seeking ISO 14001 Certification.

- Increasing prices of crude as well as power notwithstanding the planned privatization of NPC brought about by the exchange rate factor under the "CERA arrangement". In the Makati Business District alone, based on a listing of 255 buildings constructed since 1972, 178 or 70% are more than 20 years old, 30 are 15-19 years old, and only 47 are less than 15 years old. These buildings need to retrofit their facilities to make their operations efficient and cost effective to be able to attract more occupants.

- The Market Assessment Study on Energy Efficient Lighting Products by Arthur Andersen revealed a less than eight-percent penetration for CFLs nationwide. About one-third practice energy conservation as a form of efficient energy practice. While energy conservation is not the same as energy efficiency, the practice of energy conservation creates a certain level of awareness that could be transformed into an ESCO market.

3.0 Reforms in the Electric Power Industry

3.1 Recent Philippine Economic Performance; Prospects

Per the latest economic update from NEDA, the economy continued its momentum in the third quarter of 2002 as growth in the non-agricultural sector offset the slight decline in agriculture. The generally stable economy motivated households to increase their spending.

Real GDP in the third quarter rose 3.8% despite the contraction in agriculture, bringing real GDP growth rate for the three-quarters of 2002 to 4.1%. With this result, government is confident about realizing the government's projections for the Philippine economy in 2002, which is 4.0%-4.5% for GDP growth, and 4.5%-5.0% for GNP.

On the side of aggregate demand, the overall resilience of the economy is due to private consumption, which grew at its fastest rate of 4.1% in four and a half years, and robust investments in fixed capital. These results are attributed to the maintenance of inflation and interest rates on a downward trend despite rising fuel prices. Consumption also drew strength from stable income growth of Filipinos working overseas. The drop in government spending, meanwhile, is expected to be temporary in view of enhanced tax collection efforts.

As to prospects of the economy, sustained growth in private spending, replenishment of inventory levels, and continuing growth of the country's external trade partners will maintain economic growth momentum. The expected recovery of agriculture, specifically crops, in the fourth quarter, along with the continuing strength of the non-agricultural sector will keep production humming in 2003 and beyond.

3.2 Republic Act No. 9136

The modest yet satisfactory performance and prospects of the Philippine economy can be attributed partly to the reforms that the Philippine government has been instituting. These reforms including liberalization, deregulation, and privatization aim to enhance our investment climate and level the playing field for those willing to invest in our country. One of the key reforms being implemented is in the electric power industry.

On 8 June 2001, President Gloria Macapagal-Arroyo signed into law Republic Act 9136, or the Electric Power Industry Reform Act of 2001 (EPIRA). The said enactment was the culmination of more than seven years of public hearings and floor deliberations in Congress. Among other benefits, R.A. 9136 is designed to bring down electricity rates and to improve the delivery of power supply to end-users by encouraging greater competition and efficiency in the electricity industry. Key features of the law are: consumer empowerment, higher efficiency, open access, industry accountability, competition in generation and supply, and electricity unbundling.

With the lingering economic and financial crisis, energy demand in the Philippines has not required additional capacity and its attendant investments. Net installed capacity as of end 2000 is 13,196 MW, of which only 9,937 is actually available for consumption, as level of dependability of plants relies on normal wear and tear over their designed economic life. Demand, including 10% power reserve, is projected to be met comfortably by power supply due to scheduled capacity additions from 2002 to 2003.

3.2.1. Power Generation Mix

The country's energy plan framework has adopted the promotion of "clean technologies and energy efficiency" as a strategy to attain the objectives of the energy sector. As of the end of year 2000, the power generation in the Philippines is still highly dependent on fossil fuel as shown in Table 1. Power generated from imported coal, local coal and oil accounts for nearly 60% of total electricity generated nationwide.

Table 1: Power Generation Mix (End -2000)

Power Generation Mix (End -2000)	
Imported Coal	32%
Local Coal	6%
Geothermal	25%
Oil-Based	21%
Hydroelectric	16%
Total	**100%**

Source: Medium-Term Phil. Development Plan

The Philippine Energy Plan for 2000-2009 envisions major energy efficiency programs starting with industries followed by commercial establishments, the transport sector and even the households. The objective is to eliminate wasteful use of energy. If said efficiency measures are implemented as planned, the Philippine economy can realize savings of as much as $2.1 billion in terms of displaced oil importations.

Furthermore, this will allow the country to postpone investments of approximately $700 million for the installation of more than 700MW in additional power generation capacity. This will likewise translate to a direct reduction in greenhouse gas emissions, which squarely addresses ELI goals.

When it comes to demand side management, the country should also learn from the experiences of other countries, such as the energy crisis in the US State of California in 2000 and 2001.

3.2.2. The California Syndrome

In the US, deregulation has produced tangible results across a wide spectrum of industries: airlines, banking, and natural resources, among others. It is meant to create a vibrant industry though the benefits can not be expected to be realized overnight. Deregulation may also have ill effects that are likely not to be felt in the short term, but remaining unchecked, said effects may lead to a surprise explosion. In the California experience from mid-2000 to middle of 2001, it was unnoticed by many that the first casualty in utility deregulation was demand-side management (DSM).

The state has been experiencing a power crisis since the middle of the year 2000. One of the factors identified to have caused the problem is the near demise of utility-funded DSM programs. California, by many estimates, would have 1000 MW more power available today had it merely maintained energy-efficiency spending levels at 1993 levels, instead of allowing them to plunge by half. Demand in the state grew by 2.5 per cent a year over the past two decades. In certain areas, such as Silicon Valley, demand grew at rates in excess of 8 per cent a year. Simply put, unmanaged demand led to a growth rate that outpaced supply growth.

4.0 Demand-Side Management in the Philippines

DSM practice addresses both the balance between demand and supply, and environmental concerns. More efficient use of energy means less greenhouse gas emission. Setting-up new plants creates trade-offs between environmental impact concerns and power shortages. More often than not this situation is always reasoned out from an economic perspective, as experienced during the resolution of the California crisis.

Already beset by both political and economic problems the Philippine power sector cannot afford to have a haphazardly done restructuring that might solve a short-term difficulty but create a bigger problem in the future. R.A. 9136 or EPIRA as enacted has made sure that this will not happen by giving more teeth to DSM implementation.

4.1 R.A. 9136's Provisions on DSM

RA 9136 or the Electric Power Industry Reform Act (EPIRA) contains several provisions on DSM. Section 2 declares that it is the policy of the State to "encourage the efficient use of energy and other modalities of demand side management". Section 4 defines DSM as "measures undertaken by distribution utilities to encourage end-users in the proper management of their load to achieve efficiency in the utilization of fixed infrastructures in the system".

The meat of the law with respect to DSM is contained in Section 43. This provision essentially entrusts to the Energy Regulatory Commission (ERC) the responsibility for giving DSM the push that it needs in terms of cost recovery and returns for the electric cooperatives and utilities that ultimately have to implement DSM projects.

4.1.1. DSM Demonstration Projects

In 1999 the Philippine Department of Energy (DOE) funded by grants from USAID, conducted a number of demonstration projects on the effectiveness of DSM. Different technologies for lighting, motor efficiency, manufacturing processes, and others were used to reduce energy consumption. The demonstration was undertaken by DOE together with an energy consulting company, Navigant Consult. The projects demonstrated not only the technical feasibility and the practicality of the measures, but also their economic viability. USAID employed two utility companies, MERALCO and CEPALCO, in their respective franchise areas for the demonstration projects to transfer knowledge and let the local companies gain experience in developing the system across industries.

Together with Navigant, MERALCO and CEPALCO conducted five and three demonstration projects respectively. MERALCO's projects were for (1) Universal Robina, a food manufacturing company – lighting and motors; (2) Kimberly Clark Philippines, a manufacturer of home-use paper products - motors; (3) Continental Steel, a steel products manufacturer – lighting; and (4) Vitarich, producer of animal and aqual feed, - compressed air system.

CEPALCO's projects meanwhile, were for Del Monte Philippines, a food company, for lighting, and R.I. Chemicals, a producer of chemical products, for motor efficiency and manufacturing process.

The demonstration projects yielded very attractive Benefit/Cost ratios which ranged from 2.1 to 9.7, as well as Payback Periods the longest of which was three years, with the rest well shorter than that, as shown in the table below:

Table 2: Benefit/Cost Results of DSM Demonstration Projects

Company	DSM Project	Benefit/Cost Ratio	Payback (Years)
1. Del Monte Phil.	Improving Lighting Demand	2.1	2.8
2. R.I. Chemicals	Optimizing Motor Efficiency	4.4	1.3
3. R.I. Chemicals	Optimizing Manufacturing Process	2.7	2.1
4. Universal Robina	Optimizing Lighting Efficiency	2.9	2.8
5. Universal Robina	Optimizing Motor Efficiency	2.7	3.0
6. Kimberly Clark Phil.	Improving System Efficiency	3.8	1.5
7. Continental Steel	Improving Lighting System	5.5	1.0
8. Vitarich Corporation	Optimizing Compressed Air System Efficiency	9.7	0.85

The demonstration clearly showed that DSM could be a profitable undertaking for the customer whose demand is lowered. Many companies and decision-makers, however, continue to regard disbursements for DSM projects as an expense rather than as an investment. Until the passage of R.A. 9136, utilities have not been required by law to invest time, effort and resources to plan and implement DSM projects. Previous efforts of electric cooperatives and private utilities can be described at best as energy conservation, as shown by the Market Assessment Study on Energy Efficient Lighting Products done by Arthur Andersen for ELI in 2000. The results of this study are discussed more in Chapter 6. Furthermore, DSM has not been promoted as a mitigating measure to climate change, except to the extent of requiring environmental clearances prior to setting up new power plants. Reduction of greenhouse gas emission as directly related to reducing demand for electricity has not been emphasized.

4.2. Standard and Default DSM Plan for Electric Cooperatives and Utilities

In October 2001, a Collaborative Group composed of stakeholders in the Power Industry including regulatory agencies, electric cooperatives and investor-owned utilities, agreed on a proposal to amend certain provisions of the 1996 DSM framework. Among the Group's output is a list of Standard and Default Plans to be followed by utilities and electric cooperatives. Under the proposal, the utility or electric cooperative must submit

a standard DSM plan for approval by the Energy Regulatory Commission. The Standard Plan has eight programs from which the utility or electric cooperative should implement four, of which two must be lighting-related.

On top of the list of the Standard Plan is the High-Efficiency CFL Lighting Program, which promotes the change from incandescent lamps to High Efficiency (ELI compliant) CFLs.

The complete list of Standard and Default Plans are shown in the Tables 3 and 4 in the next two pages.

Table 3.0: Standard DSM Plan

Programs	Technology/Practice		Target Customers				Related Activities	Load Shape Objective
	Base	DSM	Res	Com	Ind	Oth		
1. High-efficiency CFL Lighting Program	Incandescent lamp	High Efficiency (ELI-compliant) Compact Fluorescent Lamp	✓	✓			Informa-tion Campaign, CFL Leasing/ Installment	Clipping, Conserva-tion, Flexible
2. High-efficiency Linear Fluorescent Lighting Program	T-12 Fluorescent Lighting w/ electromagnetic ballast	High Efficiency Fluorescent Lighting w/ high-frequency low-loss electronic ballast	✓	✓	✓		Lighting Retrofit	Clipping, Conserva-tion, Flexible
3. High-efficiency Street lighting	Mercury Vapor Street lighting	HPS Street lighting				✓	New Street lighting Projects	Clipping, Conserva-tion, Flexible
4. HVAC - Rm AC/Ref	Low EER models	High EER models	✓				Information Campaign	Conserva-tion, Clipping
- AC Mainten-ance	Lack of regular maintenance	Improved efficiency due to maintenance	✓	✓	✓		Information Campaign, Mainten-ance Activity	Conserva-tion, Clipping
5. Motor Efficiency Program	Low efficiency motors	High efficiency/variable speed drive motors		✓	✓		Information Campaign, ESCO	Conserva-tion, Clipping
6. Power Factor Correction	Low Power Factor, High Inductive Loads	High Power Factor Loads, New capacitors		✓	✓		Information Campaign, ESCO	Clipping
7. Energy Audit	Wasteful technologies and practices	Energy efficient technologies and practices	✓	✓	✓		Energy Audit	Conserva-tion, Clipping, Load Shifting, Flexible, Valley Filling, Load Develop-ment

Table 4.0: Default DSM Plan

Programs	Technology/Practice		Target Customers				Related Activities	Load Shape Objective
	Base	DSM	Res	Com	Ind	Oth		
1. High-efficiency CFL Lighting Program	Incandescent lamp	High Efficiency (ELI-compliant) Compact Fluorescent Lamp	✓				Information Campaign, CFL Leasing/ Installment	Clipping, Conserva-tion, Flexible
2. High-efficiency Linear Fluorescent Lighting Program	T-12 Fluorescent Lighting w/ electromagnetic ballast	High Efficiency Fluorescent Lighting w/ high-frequency low-loss electronic ballast		✓	✓		Lighting Retrofit	Clipping, Conserva-tion, Flexible
3. Power Factor Correction	Low Power Factor, High Inductive Loads	High Power Factor Loads, New capacitors		✓	✓		Information Campaign, ESCO	Clipping
4. Consumer Efficiency Awareness Program	Lack of knowledge on Energy Conservation/ Efficiency	Increased knowledge on Energy Conservation/ Efficiency	✓	✓	✓	✓	Information campaign (not to duplicate concurrent information campaigns), Educational Campaign in schools	Conserva-tion

4.2.1. Mechanics of Default DSM Plan

Under the proposal, should the utilities not meet the deadline for submission of a Standard Plan, they shall be considered by ERC as under a Default Plan. The Default Plan has the following programs:

1. High Efficiency CFL Lighting Program, to promote the change from incandescent lamps to high efficiency, ELI-qualified CFLs
2. High Efficiency Linear Fluorescent Lighting Program, to promote the change from T-12 fluorescent lighting with electromagnetic ballast to high efficiency fluorescent lighting with high frequency low-loss electronic ballast
3. Power Factor Correction, from low power factor, high inductive loads to high power factor loads and new capacitors
4. Consumer Efficiency Awareness Program, to increase knowledge among the utilities/coops customers on energy conservation and energy efficiency

The utility or electric cooperative is considered under the Default Plan after a 15-calendar day grace period from deadline of submission of Standard Plan. All four programs as listed above must be implemented by the utility within three years from date of approval.

The proposed DSM framework also recommends a timeframe as follows:

- 120 calendar days preparation of Plan and approval by utility board/management from date of approval of DSM amendments by ERC
- 120 calendar days review and approval by ERC

5.0 Economic Benefits of Energy Efficiency

Energy efficiency is an initiative that benefits all parties that get involved. For a utility-led CFL distribution, for example, following are just some of the benefits:

To consumers:

- Lower Power Bills. Even when sharing savings with the utility and no money down, participants reap small positive cash flow every month from using the energy efficient CFLs.
- Avoided Lamp Purchases. In addition to the direct bill savings, participants benefit from avoided lamp purchases since CFLs last longer than incandescent lamps.
- High quality products. Well-run CFL programs can help assure that consumers avoid poor quality and potentially unsafe lighting products.
- Potential Maintenance Savings. For industrial and business establishments, maintenance costs associated with lamp purchase and replacements are avoided, and thus saved.

To the Utility:

- New Business Line. For the utility, leasing or selling efficient products will serve as an important venture into a new business model essential to business prosperity in a competitive power market in which both supply and demand-side services are vital to customer satisfaction and corporate responsibility.
- Regulatory Compliance. Utilities in the Philippines are required to implement DSM programs for their consumers, and have the opportunity to recoup revenue losses from DSM activities.
- Customer Retention. This is an opportunity for the utility to boost its corporate image and build a basis for future customer retention.
- System Benefits. The utility has the potential to avoid the provision of costly peak power, leveling its load profile, and concentrating on shifting power usage to profitable periods.
- Market Research. The utility has the potential to obtain more information about its clients and thus more effectively target future value-added sales and services to its customers.

To Society

- Mitigating Global Climate Change. Reducing energy consumption results in reduction in greenhouse gas emissions, particularly carbon dioxide
- Improving Urban Air Quality. Aside from cutting CO2 emissions, increasing lighting efficiency will result in direct environmental benefits in potentially two major urban areas: Metro Manila and Cagayan de Oro City.
- Transformation to Efficient Economy. By promoting efficient lighting, the utility can keep consumers' power bills in check by making sure that valued customers derive every possible bit of useful energy out of every kilowatt-hour purchased and consumed. At the same time, the consumer is steered towards

environmental responsibility, all with positive cash flow for consumers and a positive benefit/cost ratio for the utility.

The business plans for CFL distribution will show computations of energy savings and avoided lamp purchases from the point of view of consumers. Together with the above economic and environmental benefits, consumers and society as a whole will be motivated to follow the energy efficiency path.

6.0 Compact Fluorescent Lamps

The Compact Fluorescent Lamps (CFL) is a lighting technology that provides both attractive lifecycle economics and environmental benefits compared to the traditional incandescent lamp. Due to a lack of awareness of CFLs, coupled with their high first cost, they have been grossly underutilized by households until recently.

Like tubular fluorescent lamps, CFLs are highly efficient. They use about one-quarter the power of regular incandescent lamps to deliver the same light output. For instance, a 20-watt CFL produces the light output of a 75-watt incandescent lamp. While high-quality CFLs cost 10-15 times the cost of incandescent lamps, they last 6-10 times longer. Given their efficiency and longevity, each high-quality CFL in use can provide very substantial net benefits over the life of the lamp.

6.1 Market Description

In November 2000, Arthur Andersen completed a study for ELI called "A Market Assessment Study on Energy Efficient Lighting Products in Philippine Urban Centers". The study describes the local CFL market as follows:

- CFL Products. The local market is crowded with over 50 different CFL brands and variants offered through various channels and outlets.
- Price Reduction. GE and Phillips have introduced CFL variants at PhP 160 apiece while other brands offer low-cost CFLs at buy-one-take-one for PhP 99 and 3-for-Php 100 bargains.
- Degree of knowledge. A majority of households are familiar with CFLs due partly to the influx of low-cost CFLs in various areas of the local market.
- Market penetration. CFLs have caught up with incandescent lamps in the local market, reaching 64 percent of the target households and 77 percent of the large firms.
- New manufacturers. Most of the CFLs in the local market are imported, primarily from low-cost Asian producers, as Philips closed the last CFL-manufacturing plant in the Philippines in 1999.
- New establishments (suppliers). At least 50 CFL importers are supplying the local market through numerous supermarkets, hardware stores, and informal retail outlets such as sidewalk stalls and vendors.
- Number of products tested. The Department of Trade and Industry (DTI) has issued Import Commodity Clearances or ICCs to only 18 CFL importers compared to at least 50 CFL brands being sold in the local market. ELI initially identified CFL models from five brands - General Electric, Maxlite, National, Osram, and Philips - which meet the ELI quality requirements.

In addition, the study reveals that other efficient lighting products such as fluorescent lamps and electronic ballasts are in a similar situation as CFLs in the Philippine market.

6.1.1. Other Findings from the AA Study

The Arthur Andersen study indicated that "the local CFL market has gone through big changes since the mid-1990s. The unknown and expensive CFL has evolved to a popular and readily accessible lighting product for households as well as for commercial and industrial firms."

The study further found that "The CFL's dramatic transformation is attributed partly to changes in the business environment. First, the country has built adequate energy and power resources, due partly to the deregulation and liberalization of the electric power industry. Second, while it recently grappled with a politico-economic crisis, the country has implemented business and institutional reforms that will enable it to recover from the crisis. Third, the market benefited from low-cost CFL imports and the emergence of informal channels."

6.2 ELI Voluntary Technical Specification

To address market barriers to increased penetration of energy-efficient lighting, ELI develops and promotes voluntary technical specification that includes rigorous quality criteria. ELI will also promote a labeling system to help consumers identify energy efficient-lighting products that meet these specifications. These specifications include, among others:

1. Efficiency as measured by lumens per watt
2. Reliability, which is durability under frequent switching on or off
3. Power Characteristics, which include electromagnetic and radio frequency interference, power factor, tolerance of voltage variation, and transient protection
4. Operating Characteristics which include lamp start, starting temperature, lifetime, and safety
5. Light Characteristics which include correlated color temperature, color rendering, lumen maintenance, and stabilized light output; and
6. Others which include labeling, warranty, and quality of production

A sampling of ELI specifications for CFLs follows:

- 6,000 hours lamplife
- 60 lumens per Watt for 15-Watt lamps; 45 lumens per Watt for lamps with lesser Wattage
- Lumen maintenance, such that at 2,000 hours, lumen output is still at 80% of original

Annex "A" to this report contains the complete Voluntary Technical Specification of ELI as of 10 July 2002. The specification is updated from time to time and can be viewed at *www.efficientlighting.net*

7.0 Development of Business Plans for CFL Distribution Program

Two investor-owned utilities, CEPALCO and MERALCO, together with ELI-Philippines, international and local consultants, have prepared the business plans for the utilities' respective CFL programs: the CEPALCO Megalight Program and the MERALCO Smartlight Program. They are contained in separate volumes.

7.1 CEPALCO'S Megalight Program

The CFL program shall aim for the promotion and use of CFLs among the residential customers of CEPALCO, an investor-owned utility based in Cagayan de Oro City in Northern Mindanao. Starting October 2001, CEPALCO has been implementing a pilot program for CFL distribution in a residential subdivision in the city. Armed with lessons learned and experiences from the pilot, the company has conceptualized and designed a scaled up program for a bigger volume of CFLs, expanding the scope within its franchise area. Aside from direct benefits to CEPALCO customers, the scaled up CFL distribution program is also expected to provide valuable inputs to other utilities, electric cooperatives and other interested parties that would like to implement energy-efficient lighting.

7.2 MERALCO'S Smartlight Program

MERALCO is the Philippines' biggest utility, distributing power to Metro Manila and nearby provinces, with total power sales of 22.7 billion kilowatt-hours in 2001. Its CFL program consists of several phases. The first phase is an Education and Information Campaign that aims to educate and inform MERALCO customers on the wise use of electricity, the benefits of energy efficiency and use of energy-efficient ELI-qualified CFLs. Another volume for the subsequent phases shall contain a menu of options for the possible distribution of CFLs to MERALCO customers.

Final Report

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Annex "A" **Revised July 10, 2002**

IFC/GEF Efficient Lighting Initiative

Voluntary Technical Specification
Compact Fluorescent Lamps

Background

Developing countries often share common market barriers to the use of energy-efficient lighting. Barriers include inadequate information about the energy, economic and environmental benefits of efficient lighting, and a lack of credible sources of such information.

To address these barriers, ELI develops and promotes voluntary technical specifications that include rigorous technical and quality criteria. ELI has a labeling system that helps consumers identify energy efficient lighting products that meet the ELI specifications. ELI programs include marketing, educational, market building, and financing activities. Each participating country tailors its activities to meet the needs of the local market. These activities supported by US$15 million in Global Environment Facility funding, and by additional local and international funding. Lighting manufacturers whose products meet the ELI specifications are invited to launch product promotions and advertising campaigns in cooperation with ELI's local marketing programs.

Manufacturers interested in ELI should review the ELI voluntary technical specifications to determine whether or not their products could comply. They should then review the ELI qualification protocol for guidance on how their lighting products could receive the ELI label.

Compact Fluorescent Lamps

Compact fluorescent lamps (CFLs) are an important energy efficient lighting technology that is promoted through ELI. ELI-labeled CFLs are available in a wide variety of lamp dimensions, with variouswattages, lumen outputs, efficiency levels and prices. For a current list of ELI-labeled products, see <www. efficientlighting.net>

Definitions for this Specification

Ballast
Refers to an electrical device with an electric-discharge lamp to obtain the necessary circuit conditions (voltage, current and waveform) for starting and operating the lamp.

Compact Fluorescent Lamp (CFL)
Refers to any compact fluorescent lamp/ballast combinations designed for applications furnished with a socket originally intended to operate standard incandescent bulbs. CFLs may eitherunitary (a single, non-separable unit containing lamp and ballast, also often referredto as self-ballasted), or, modular (designed so that the lamp may be removed from the ballast and replaced by the consumer).

Dimmability
Unless otherwise indicated, the requirements set forth in this specification apply to non-dimmable CFLs, and also to dimmable CFLs that are operating at maximum power.

Efficiency
Calculated as initial lumens measured with the CFL in optional operating position divided by the measured input power and expressed as lumens per watt (lm/W).

Fluorescent Lamp
Refers to an electric discharge lamp that generates visible light through fluorescence when attached to an operated by an appropriate ballast.

Input Power
Power drawn by the CFL in stable operation after an initial burn-in period of 100 hours. Input power shall be the power drawn measured in watts (W) by the specific lamp and ballast combinations being tested during stable operations at maximum power.

Luminous Flux
Lumens generated by the CFL in stable operation after an initial aging period of 100 hours. Luminous flux shall be measured as the lumens generated by the specific lamp and ballast combination included in the CFL being tested during stable operation at maximum power in the vertical base up (VBU) position.

Normal Operation
These specifications require that measurements be taken from CFLs operating at rated voltage and temperature. Measurements shall be taken from CFLs in the vertical base up (VBU) position after an initial burn in period of 100 hours, with stable light output and power supply unless otherwise noted.

Standard References
- IEC International Electrotechnical Commission
- EN European Norm (European Union Standard)
- IESNA Illuminating Engineering Society of North America
- CIE Commission Internationale d'Eclairage (International Illumination Commission)
- ANSI American National Standards Institute
- ISO International Standard Organization

Compact Fluorescent Lamp (CFL) shall meet the following ELI performance specifications. *Items that must be clearly indicated in the CFL product package are indicated in italics.*

Laboratory and Test Requirements	Performance Specifications
Laboratory Facility	Must be accredited according to ISO 17025 or equivalent standard. Accreditation document must be provided to ELI.
Testing Conditions	Performed at 25 C in an atmosphere with maximum relative humidity of 65%.
Position and Initial Burn-in	Measurements should be recorded from the products in the VBU position, after an initial burn-in period of 100 hours at stabilized light output and current.
Test Data and Sample Size	Test data must be from the model for which qualification is sought. Values indicated on the application form shall be calculated as the average of the data from all the units tested. Measurements of electrical characteristics must be submitted for at least 10 units of the same CFL model. Measurements of photometric characteristics must be submitted for at least three units of the same CFL model.
Longevity of Test Results	Test results must be less than two years old, unless manufacturer can document to ELI's satisfaction that older test results accurately portray the performance of the present model.

Efficiency Specifications

The CFL package must clearly state the performance of the following characteristics, as defined in IEC 60969:

- Rated input power in watts, and
- Light output in lumens.

Efficiency shall be calculated from luminous flux and input power for the specific lamp and ballast combinations in the CFL measured at 25 °C and 220 V. To qualify, CFLs of any tube configurations shall meet the following minimums.

If CFL has either an integral or a separate ballast

- At input power of <15 W: ≥45 lm/W
- At input power of ≥15 W and >4000 CCT: ≥55 lm/W
- At input power of ≥15 W and ≤4000 CCT: ≥60 lm/W

If CFL has a translucent cover

- At input power of ≤14W: ≥ 40 lm/W
- At input power of 15 to 19 W: ≥ 48 lm/W
- At input power of 20 to 24 W: ≥ 50 lm/W
- At input power of ≥25 W: ≥55 lm/W

If CFL has a reflector

- At input power of <19 W: ≥33 lm/W
- At input power of ≥19 W: ≥40 lm/W

Power Characteristics	**Performance Specifications**
Electromagnetic and Radio Frequency Interference	Comply with the CISPR 15 or relevant local regulations
Power Factor	Measured in vertical base up positions, and as defined in ISO 61000. CFLs for inclusion in ELI programs in Latvia, Hungary and the Czech Republic must comply with the power quality limits set by IEC 61000-3-2. CFLs for ELI countries must have a power factor of 0.5 or greater at maximum power as defined by IEC 61000.
Tolerance of Voltage Variation	Manufacturers must state in the application that CFL will perform within specified parameters at a range of nominal voltages ± 10% of rated voltage without reduction in the rated life.
Transient Protection	CFLs must comply with IEC 61547.

Operating Characteristics	**Performance Specifications**
Lamp Start	CFL must continuously illuminate within 1.5 seconds of being switched on at minimum rated starting temperature and maximum power. Prior to measurement CFL must be switched off for at least 30 minutes.
Starting Temperature	*CFL package must declare the minimum starting temperature and any other conditions (such as installation in an enclosed luminaire) that would affect either reliable starting or the starting time.*
Lifetime	CFLs must have a minimum rated lifetime of 6,000 hours as defined in IEC 60969 *Lifetime shall be clearly indicated in hours on product packaging.*
Safety	CFLs must meet all local safety requirements and the requirement of IEC 60968 for unitary CFLs and applicable parts of IEC 61199 and 60598 for modular CFLs.

<table>
<tr><th>Light Characteristics</th><th>Performance Specifications</th></tr>
<tr><td>Correlated Color Temperature</td><td>Correlated color temperature (CCT of CFL must appear on product packaging (as defined in IEC 60969 and measured in accordance with IES LM-16-1984. 'Colorimetry of Light Source" and the 1993 IESNA Lighting Handbook).</td></tr>
<tr><td>Color Rendering</td><td>Color Rendering Index (CRI) of at least 80 for fluorescent lamps with a diameter less than 2.0 cm. CRI of at least 70 for all other lamps (as defined in IEC 60969 measured in accordance with CIE 29/2).</td></tr>
<tr><td>Lumen Maintenance</td><td>After 2,000 hours of operation the luminous flux of CFLs must be ≥80% of initial levels (measured in accordance with IES LM-66-1991 or IEC 60969 for unitary CFLs, IEC 60901 for modular CFLs).</td></tr>
<tr><td>Stabilized Light Output</td><td>The time to 75% of stabilized light output after switch-on shall not exceed 100 seconds, or, the time to 80% of stabilized after switch-on shall not exceed 120 seconds (measured in accordance with IEC 60969).</td></tr>
<tr><th>Other</th><th>Performance Specifications</th></tr>
<tr><td>Comparison of CFL to GLS on Label**</td><td>Lumen output noted on package must be the luminous flux as reported to ELI for the specific lamp and ballast combination in the package. Where the packaging or other literature claims that the rated luminous flux of the CFL is equivalent to, or exceeds that, of an equivalent GLS filament lamp the lamp rating must comply with the following requirements:
<table>
<tr><th>CFL
Luminous Flux
Claim (lm)</th><th>Rated Wattage of equivalent
GLS filament lamp</th></tr>
<tr><td>≥214</td><td>≤ 25 W</td></tr>
<tr><td>≥386</td><td>≤ 40 W</td></tr>
<tr><td>≥ 530</td><td>≤50 W</td></tr>
<tr><td>≥660</td><td>≤ 60 W</td></tr>
<tr><td>≥874</td><td>≤ 75 W</td></tr>
<tr><td>>1100</td><td>≤ 90 W</td></tr>
<tr><td>≥1246</td><td>≤ 100 W</td></tr>
<tr><td>≥2009</td><td>≤ 150 W</td></tr>
</table>
In addition, manufacturers must notify ELI if the CFL exhibits ≥10% light output degradation due to:
• Operation outside of rated temperature range or,
• Operations in other that VBU position or,
• Any other factors.</td></tr>
<tr><td>Warranty</td><td>Purchaser may return the CFL to point of purchase with no explanation necessary within 12 months from the date of purchase for a full refund. Written warranty in at least one applicable local language must be included with CFL when purchased. Manufacturer shall provide a local address for customer contacts and complaints.</td></tr>
<tr><td>Quality of Production</td><td>CFL must be manufactured under a Quality Assurance System in accordance with ISO 9000-2000 or equivalent (equivalency to be determined by ELI).</td></tr>
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Reference Specifications

- IEC – 61547 Equipment for General Lighting Purposes – EMC Immunity Requirements.
- IEC – 60969 Self-Ballasted Lamps for General Lighting Service: Performance Requirements.
- IEC – 61199 Single-Capped Fluorescent Lamps: Safety Requirements.
- IEC – 60968 Self-Ballasted Lamps for General Lighting Service: Safety Requirements.
- IEC – 60901 Single-Capped Fluorescent Lamps: Performance Requirements.
- IEC – 61000-3-2 Electromagnetic Compatibility – Limits for Harmonic Current Emissions (equipment input current ≤ 16A per phase).
- EU Ecolabel Criteria for Single-Ended Lightbulbs.
- Propuesta De Norma De Eficiencia Energética Para Lamparas Fluorescentes Compactas – LFC's, Peru May 1999.
- ANSI C78.5 – 1997 Specifications for Performance of Self-Ballasted Compacted Fluorescent Lamps U.S.A., 1997.
- Minimum Specifications for Promotional CFLs: IFC/GEF Poland Efficient Lighting Project, Poland 1997
- Pacific Northwest National Laboratories Subcompact Fluorescent Lamp: Bulk purchase program features and specifications, U.S.A., 1998
- ENERGY STAR® Compact Fluorescent Lamp Specifications, U.S.A., 1999
- European Wide Initiative for the Promotion of Efficient Lighting in the Residential Sector; Campaign CFLs Quality Charter.

Inquiries

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