

Global Environment Facility

MOHAMED T. EL-ASHRY
CHIEF EXECUTIVE OFFICER
AND CHAIRMAN

March 26, 1999


Dear Council Members:

The World Bank, as the Implementing Agency for the project entitled, *Argentina, Peru and South Africa: IFC/GEF Efficient Lighting Initiative Tranche I*, has submitted the attached proposed project document for CEO endorsement prior to final approval of the project document in accordance with World Bank procedures.

Over the next four weeks, the Secretariat will be reviewing the project document to ascertain that it is consistent with the proposal included in the work program approved by the Council in February 1998, and with GEF policies and procedures. The Secretariat will also ascertain whether the proposed level of GEF financing is appropriate in light of the project's objectives.

If by April 23, 1999, I have not received requests from at least four Council Members to have the proposed project reviewed at a Council meeting because in the Member's view the project is not consistent with the Instrument or GEF policies and procedures, I will complete the Secretariat's assessment with a view to endorsing the proposed project document.

Sincerely,


for Mohamed T. El-Ashry
Chief Executive Officer and
Chairman


Attachment: *Argentina, Peru and South Africa: IFC/GEF Efficient Lighting Initiative Tranche I project*

cc: Alternates, Implementing Agencies, STAP

OFFICE MEMORANDUM

DATE: March 25, 1999

TO: Mr. Mohamed El-Ashry, CEO/Chairman, GEF

FROM: Lars O. Vidaeus, GEF Executive Coordinator 

EXTENSION: 34188

SUBJECT: IFC/GEF Efficient Lighting Initiative First Tranche Project Document

1. Please find attached 75 copies of the Project Document for the above-mentioned project for review by Secretariat staff, prior to circulation to Council and your final endorsement. The Project Document represents the three first tranche countries of the seven country US\$15 million IFC/GEF Efficient Lighting Initiative (ELI), which was initially endorsed by the GEF Council during Summer 1998. This first tranche program includes an allocation of US\$6.6 million for program activities in the three countries, as well as the full ELI administrative budget of US\$2.75 million. Both sums are consistent with allocations in the Project Concept Document that was endorsed by Council. As described in the Tranche I Project Document, it is important that the full budget allocation for program administration and management be made available from the program's outset in order to maximize available efficiencies in establishing these program-wide functions. IFC anticipates submitting the Project Document for the second tranche covering the final four ELI countries in late 1999, following Tranche II appraisal which will commence once the first tranche implementation is satisfactorily underway.

2. During the appraisal process of the past six months, IFC has evaluated the conditions in each of the three ELI Tranche I countries of Argentina, Peru, and South Africa. The Project Document is fully consistent with the objectives and scope of the proposal endorsed by Council as part of the Intersessional Work Program in July 1998. Specifically, the ELI Project Document effectively addresses the objective of supporting the GEF's Operational Program Number 5, building country programs for Tranche I that are directly responsive to the removal of barriers to efficient lighting market development identified in each country, and that capitalize on local conditions and capacity to build these markets domestically. The attached ELI Tranche I GEF Project Document provides a summary of the results of the appraisal process and requests Council final endorsement for US\$9.35 million of GEF funds.

3. The Project Document describes the first tranche country program designs that have emerged through the appraisal process. While the budget allocations between country programs are consistent with the concept approved by Council, further information developed during appraisal has resulted in several changes in the budget allocations between program elements within each country. In all three countries, the program shifts have resulted, in part, from the GEF Secretariat's direction to minimize the use of product subsidies in the program design. This has resulted in a strategic reordering of the program approaches in each country. Specifically, in Peru and Argentina, the public education and marketing effort was increased substantially, reflecting more accurate information about costs of undertaking these efforts and identification of specific opportunities to execute effective marketing and education programs in each country. In addition, the electric utility program element was

substantially expanded in all three countries in order to capitalize on several immediate opportunities that were identified during appraisal. The transaction support and market aggregation budgets were reduced in Argentina and South Africa, to reflect the identification of more efficient delivery mechanisms for these activities than were considered during the Project Concept phase. The importance of these program elements remains unchanged, however, as they remain fundamental to the program plan in all three first tranche countries.

4. Budget allocations have been proposed in each country to allow comprehensive market assessments. These assessments will precede program implementation for each country. The assessments will serve dual purposes: first, to further refine and evaluate the opportunities identified for each program element during appraisal, and-second, to establish a baseline against which program impacts will be measured through ELI's central monitoring and evaluation function. This latter function reflects the IFC appraisal team's efforts to respond to lessons learned in previous GEF projects. These lessons include the importance of establishing concrete baselines and the need to build a monitoring and evaluation function explicitly within the management structure of the program. This refinement of the monitoring and evaluation function is an outcome of the appraisal process that is further reflected in the attached project document..

5. The economic analysis of the first tranche country programs is summarized in Section VIII, "Program Impacts," with greater detail provided in Annex D. The appraisal results indicate a lower benefit-cost ratio than was implied in the PCD. The PCD estimated the cost of avoided emissions for Tranche I countries at US\$ 0.61 per tonne of CO₂. The revised analysis presented in the attached Project Document estimates a cost of avoided emissions for Argentina, Peru and South Africa of US\$1.79 per tonne of CO₂. This difference is the result of a decision by IFC to include administrative costs as well as program costs, and to recalculate ELI's cost-effectiveness based on a highly conservative scenario in response to comments from the GEF Council members from France and Germany. Specifically, high efficiency lighting product prices are assumed to remain at very high levels throughout the analysis period, even though the program is designed to substantially lower market prices both directly through the program and on a sustained basis through enhanced competition and induced higher volume sales. In adopting this, and a variety of other conservative assumptions, IFC wishes to establish a robust estimate of the minimum direct and indirect (market acceleration) impacts of the program. .

6. The estimates of co-financing contributions from IFC and from private sector partners remain unchanged from those presented in the PCD. The appraisal process identified a variety of opportunities for developing co-financing through private sector investments in efficient lighting transactions and the establishment of new consumer financing mechanisms, which supported the estimates developed in the PCD. However, these transactions remain in the early stages of development, pending commencement of ELI transaction support activities, and the subsequent commitment of the partners. Specifically, although IFC has substantial lines of credit in place with local financial institutions in each of the countries which may be used to support ELI's objectives, the credit decisions for such transactions remains with the local financial institutions with whom IFC works. As is the nature of such private sector investments, their eventual size and the development time required to complete them is also subject to change as project development progresses.

7. The Project Document is fully responsive to the comments made during work program endorsement by the GEF Secretariat, STAP, and Council members, each of whose comments are addressed as follows:

- 7.1. As requested by the GEF Secretariat, the incremental cost analysis has been revised to show the sustainability of investments in energy efficient lighting in each Tranche I country, and how the GEF grant will be used to overcome barriers as discussed in GEF's operational policies. In addition to establishing cost-effective investment opportunities, and lowering the barriers to the efficient uptake of that technology through private sector investments, ELI's structured learning facility will also serve to enhance the sustainability and replicability of the initiative by supporting on-going post-program market activity. Please see Appendix A (paragraphs 8-11) and Appendix E (paragraphs 4-6) for these revisions.
- 7.2. In response to direction from the GEF Secretariat, the proportion of the ELI budget allocated for direct product subsidies has been substantially reduced. Please see Section X, Tranche I Project Budget and Use of GEF Funds, paragraph 139.
- 7.3. Also in response to a request by the GEF Secretariat, additional incremental cost information has been included in Appendix A.
- 7.4. In response to a request from the GEF Secretariat we have provided a detailed breakdown of the project administration and overhead costs, now contained in Section X, Tranche I Project Budget and Use of GEF Funds, Table X-2. Every effort has been made in the program design to capture efficiencies inherent in administering a multi-country effort. ELI's RIEs provide a vehicle with which to capture these efficiencies, while providing IFC a reliable management mechanism for administering a multi-country program.
- 7.5. As requested by the GEF Secretariat, we have better defined the nature of NGO participation in program implementation, particularly in terms of NGOs' capacity to increase consumer awareness. Specific examples of planned NGO involvement are included in paragraphs 80, 81, 92, 93, and 128.
- 7.6. As requested by the GEF Council Member from Switzerland, we have described how the consumer market and the commercial, industrial and institutional (C/I/I) market are treated respectively. Both market barriers and program approaches to these market segments have been treated separately (see Sections IV – VI respectively).
- 7.7. As also requested by the Swiss Council representative, the program approaches presented in the ELI Project Document recognize that in the C/I/I sectors, lighting efficiency does not depend solely on efficient components, but also on the overall design of lighting systems. In fact, appropriate design is important for any lighting application. In recognition of this factor, ELI will work with lighting design professional schools and professional associations to disseminate good design principals as described in Section V (paragraphs 61-65).
- 7.8. **As** further requested by the Swiss representative, the ELI Tranche I Project Document reflects a deliberate effort during appraisal to develop synergies available through

cooperation with other existing and emerging energy **efficiency** programs. These complementary efforts have been described in Section III, Project Background (paragraphs 29, 35, and 41) and ELI's efforts to leverage them are likewise described throughout Section VI, Country Programs.

- 7.9. In answer to the concerns of the GEF Council Member from Germany, we have limited the technical detail included in the ELI Project Document. However, the promotion of efficient lighting product quality is an important market development strategy under ELI. The technical specifications that ELI will work to develop, as discussed in the project document details on the public education efforts in each country (Sections V and VI), will contain provisions relating to parameters such as color temperature, color rendering index, and flicker, which are not described in this document.
 - 7.10. Also relating to the comments from the German representative, as well as from the Council Member from France, the projected impacts of ELI have been recalculated and the new estimates provided are more conservative than those presented in the Project Concept Document (see Section VIII and Appendix E, paragraph 8). It is also specifically the intent of ELI to tailor the general types of program approaches discussed to the specific needs of targeted participants, as was identified in the appraisal process.
 - 7.11. In response to a request by the Council Member from the U.S., we have included a description of the monitoring and evaluation (M&E) process to be adopted in implementing ELI, as well as an overview of indicators that will be used in measuring the market transformation impacts of ELI. The management and administration of the M&E activities are described in Section IX, the budget allocation in Section X, and the M&E approach and plan is described in Section XI. Appendix D includes a description of the preliminary indicators to be adopted in the M&E plan.
8. Please send us a copy of your outgoing letter to Council for our records. Many thanks.

Attachments

cc: Messrs./Mmes. A. Raczynski, M. Riddle, L. Boorstin, D. Younger, C. Breslin, G. Schramm, R. Sturm, S. Keller, C. Granda, J. MacLean, S. Bimer, S. Sethi

IFC/GEF Efficient Lighting Initiative (ELI)

Tranche I

Argentina, Peru and South Africa

Project Document
March 1999

International Finance Corporation
Technical and Environment Department
Environment Division
Environmental Projects Unit

INTERNATIONAL FINANCE CoRPoRation
GLOBAL ENVIRONMENT FACILITY

EFFICIENT LIGHTING INITIATIVE (ELI)
TRANCHE I: ARGENTINA, PERU AND SOUTH AFRICA
PROJECT DOCUMENT

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CURRENCY EQUIVALENT

(February 1999)

Argentinean Peso	1 .00	= US\$1.00
Peruvian Nuevo Sol	3.42	= US\$1.00
South African Rand	6.00	= US\$1.00

(All references to “\$” in the document are to US\$)

UNITS AND MEASURES

1 Metric Ton (mt or tonne)	= 1000 kg
1 MW (Megawatt)	= 1 X 10 ³ kW (kilowatts)
1 MWh (Megawatt hour)	= 1 X 10 ³ kWh (kilowatt hours)
1 GWh (Gigawatt hour)	= 1 X 10 ⁶ kWh
1 TWh (Terawatt hour)	= 1 X 10 ⁹ kWh
1 TJ (Terajoule)	= 1 X 10 ¹² joules
1 GJ (Gigajoule)	= 1 X 10 ⁹ joules
1 MJ (Megajoule)	= 1 X 10 ⁶ joules

ACRONYMS and ABBREVIATIONS

CAI	Crosscutting Activities Implementor
CENERGIA	Centro de Conservacion de Energia y del Ambiente
CFL	Compact Fluorescent Lamp
CO₂	Carbon Dioxide
DSM	Demand-Side Management
ELI	Efficient Lighting Initiative
FEU	Fundacion Ecologica Universal
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GLS	General Lighting Service
IFC	International Finance Corporation
kWh	Kilowatt Hours
kW	Kilowatt
LRMC	Long-Run Marginal Cost
NGO	Non-Governmental Organizations
PELP	Poland Efficient Lighting Project
PAE	Proyecto para Ahorro de Energia
RIEs	Regional Implementing Entities
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value Added Tax

LIGHTING TECHNOLOGY DEFINITIONS

Incandescent Lighting	Inefficient, century-old light bulb technology based on a heated filament emitting heat with a light by-product.
Fluorescent Lighting	More efficient, recently improved lighting technology based on controlled charging of gas particles energizing a fluorescent material-coated tube, which in-turn emits light.
Ballast	Packaged controller used by fluorescent lighting (and several other types of energy efficient lighting) to initiate and maintain illumination of the fluorescent tube.
Low-loss electromagnetic ballast	Traditional core and coil ballast technology whose efficiency is improved by use of higher quality components.
Electronic ballast	Most efficient type of new ballast. Common in North America. Replaces core and coil/magnetic construction with electronics.
T-12 fluorescent tube	Traditional, large diameter, less efficient type of linear fluorescent tube still common globally.
T-8 fluorescent tube	New, smaller diameter, more efficient type of linear fluorescent tube now available globally.
Compact fluorescent lamp	Compact fluorescent tube and ballast combination designed to replace either incandescent light bulbs or entire incandescent luminaires.
Luminaire	Lighting technical term for a lighting fixture, including associated electronics and the housing that contains them.
Lighting controls	Dimmers, switches or other equipment designed to control lighting technology and the delivery of light.
High Intensity Discharge (HID) Lighting	A family of very high efficiency lighting technologies (including sodium, and metal halide), available primarily in high lumen packages, commonly used in commercial, industrial and public lighting applications.

PROJECT SUMMARY

Project Name:	IFC/GEF Efficient Lighting Initiative (ELI) Tranche I: Argentina, Peru, South Africa
Project Duration:	3 years
Implementing Agency:	World Bank
Executing Agency:	International Finance Corporation (IFC)
Requesting Countries:	Argentina, Peru and South Africa
Eligibility (FCCC Ratification):	Argentina FCCC Ratification: March 11 1994 Peru FCCC Ratification: June 7 1993 South Africa FCCC Ratification: August 29 1997
GEF Focal Area:	Climate Change
GEF Programming Framework:	Operational Program #5:

Project Description: Advances in lighting technology have created new products which promise significant economic and environmental benefits through large increases in energy efficiency. In many developing countries, these new, efficient lighting products still face significant barriers to widespread acceptance. The IFC/GEF Efficient Lighting Initiative (ELI) is intended to take lessons learned in the IFC/GEF Poland Efficient Lighting Project (PELP) and other efficient lighting projects and apply them to a selected set of developing countries in order to significantly accelerate the penetration of energy efficient lighting technologies. IFC has devised a program which will blend use of five basic program intervention types as follows: (i) public education, marketing, and standards; (ii) electricity distribution company programs; (iii) financial transaction support and financial instrument development; (iv) market aggregation; and (v) financial incentives. A key program objective is to mobilize additional private sector resources and to achieve structured learning for the GEF. This document defines the ELI Tranche I program, including ELI country programs in Argentina, Peru, and South Africa, as well as describing the ELI administrative, management, and monitoring and evaluation elements, and the international, crosscutting activities that will be coordinated across all seven ELI countries. The Tranche II project document, describing country activities in the Czech Republic, Hungary, Latvia and the Philippines will be presented to the GEF in late 1999, following the conclusion of appraisal work for those countries, and the start-up of Tranche I country activities.

Costs and Financing (in US\$ million):

GEF:	Tranche I	Tranche II	Total
- Preparation (PDF B South (Africa)	\$ 0.225		\$ 0.225
- Project	\$ 6.6	\$ 5.65	\$ 12.250
-Administrative	\$ 2.75		\$ 2.75
-Total GEF	\$ 9.575	\$ 5.65	\$ 15.225
IA:	\$ 3-5	\$ 2-5	\$ 5-10 IFC (est.)
Co-Financing :	\$16-40	\$14-40	\$ 30-80 (est.)
TOTAL PROJECT COST:	\$28.5-50	\$21-50	\$ 50.225-105.225 (est)
ASSOCIATED FINANCING:	NA		
IA CONTACT:	Dana R. Younger, IFC/GEF Coordinator Tel: (202) 473-4779; Fax: (202) 974-4349 Email: dyounger@ifc.org		

I. EXECUTIVE SUMMARY

Introduction

1. The GEF Council provided its initial endorsement for US\$15 million in concessional funding to implement the Efficient Lighting Initiative (ELI) as part of the July 1998 intersessional work program. ELI is a multi-faceted effort to accelerate the growth of markets for energy efficient lighting technologies in seven selected GEF – eligible recipient countries. As indicated in the Project Concept Document, the project will be implemented in two stages. Country programs are scheduled to begin implementation in June 1999, following completion of project appraisal for the first countries included in ELI's first **tranche** (Argentina, Peru and South Africa) and subject to final GEF Council and CEO endorsement and IFC management approval. Country programs for the four countries (Czech Republic, Hungary, Latvia, and the Philippines) in the second Tranche are expected to commence in December 1999, following completion of the project appraisal for those country programs and subject to final GEF Council endorsement. This document serves as the GEF Project Document for the ELI Tranche I country programs in Argentina, Peru, and South Africa.

2. The global market for efficient lighting technologies has experienced immense change over the past five years, with greatly expanded global manufacturing capacity, rapid technological innovation, and sharply reduced product prices. The potential diffusion of new lighting technologies into rapidly expanding building and facility infrastructure in many developing country economies promises a wealth of social, economic, and environmental benefits. These market conditions create an opportunity for ELI countries to bypass some of the inefficient uses of capital and environmental costs associated with the development path followed by the industrialized countries.

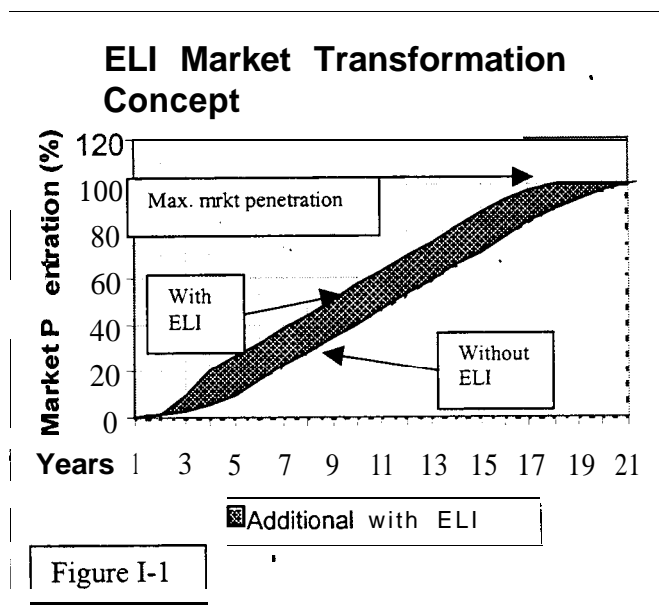
3. However, developing country economies have, so far, largely failed to adopt efficient lighting technologies despite the benefits they represent. This missed opportunity results from a set of well-documented barriers that often characterize emerging markets. These include: lack of information, high up-front product costs, lack of financing mechanisms, and relatively undeveloped markets with little price competition and limited product availability.

4. ELI is a market acceleration effort. As described in the ELI Project Concept Document, the program draws upon elements of the IFC/GEF Poland Efficient Lighting Project (PELP), a GEF pilot phase project, as well as a variety of other GEF and non-GEF energy efficiency promotion efforts from around the world, and applies the lessons learned from this body of experience to a coordinated multi-country initiative. ELI's impact will be measured less by short-term increases in sales of efficient lighting products than by the indirect influence ELI has in nurturing and stimulating expanded post-program markets for energy efficient lighting over the medium term. These indirect effects will be measured by indicators such as:

- Expanded consumer knowledge of efficient lighting options;
- Increased availability of efficient lighting technology;
- Enhanced competition between efficient lighting products;
- Lower retail prices;

- Increased availability of consumer financing for efficient lighting purchases; and
- Increased capacity among lighting professionals to provide efficient lighting services.

5. ELI seeks to accelerate the rate of maturation of fledgling efficient lighting markets, increasing sales volumes in the ELI countries to levels that otherwise might not have been reached until significantly later in the product development and marketing cycle. ELI's objective is to shift the market penetration curve followed by new products in order to realize economic



and environmental benefits that otherwise would have been lost (see Figure I-1).

6. Figure I-1 represents the penetration of efficient lighting products into an example market over time as a percentage of the total final saturation at market maturity.¹ The area beneath the lower curve shows the projected market penetration of efficient technology without ELI's intervention. By accelerating technology uptake, ELI increases the rate of market penetration, thus shifting the product penetration curve at the early stages of market development. ELI increases the penetration of efficient technology by the

amount represented by the shaded area between the two curves. This area represents the relative scale of increased benefits associated with saving electricity and avoiding the emissions of greenhouse gases (GHGs) that would not have occurred but for the intervention of ELI.

7. The program approaches that define ELI are applicable to the full range of efficient lighting technologies. Local market conditions will determine which technologies are promoted in each country. ELI will seek to build markets through efforts in the residential, commercial, and industrial sectors, again as determined by the opportunities present in each country. ELI's objective impacts are also, by definition, sustainable in their focus on enhanced market performance and mobilization at private sector financing.

¹ Figure I-1 shows 20 years between the introduction of a hypothetical efficient lighting technology and achievement of maximum market penetration. This is probably an underestimate, based on experience with now-common lighting technologies. However, ELI's cost benefit analyses include only the first ten years of the program's impact – inclusive of the two year program period plus the initial 8 years following the program. This conservative assumption was used in order to avoid the uncertainty involved with projecting technology and market development more than a decade into the future. Year zero is the beginning of ELI. The X axis has also been set to zero for purposes of illustration, although actual penetration for most products has already begun.

Experience From PELP

8. PELP showed that broad public education campaigns can leverage price concessions and other contributions from manufacturers, increase competition between products, boost consumer demand, and lower prices in a sustained way. This experience also indicates that short-term product price incentives, while not of primary importance in building sustained market impact, can be very effective as a promotional tool to support larger marketing efforts and leverage producer promotions and marketing initiatives. PELP also demonstrated that an efficient lighting program can cost-effectively lower peak electricity consumption, thus enabling electricity distribution companies to defer significant capital investment. ELI will leverage this successful demonstration of “distributed utility” investment to engage the electricity industry as a delivery mechanism for the program.

The ELI Opportunity and the ELI Program

9. In addressing the barriers to market development, ELI adopts the lessons of past market transformation interventions in applying five program elements in a variety of combinations in each ELI country market. These elements (described in detail in Section V below) include:

- Public education, marketing and standards; raising awareness of and confidence in efficient lighting technology in the market;
- Electricity distribution company programs – using partnerships with electric utilities to deliver ELI programs;
- Transaction support and financial instrument development working with financial and other institutions to deliver consumer financing on a brand scale and to demonstrate financing mechanisms for energy efficiency investment;
- Market aggregation – organizing large consumer groups to establish market pull in support of ELI market development efforts;
- Financial incentives – applying subsidies on a limited basis in support of ELI’s complementary program activities.

10. To support and enrich its country-specific programs, ELI will establish a network of crosscutting activities to be administered in all participant countries. Coordinating market development efforts across all participant countries will allow ELI to exert greater leverage on the global market. IFC’s local and international contacts and its capacity to facilitate private sector financing for transactions that emerge through ELI further enhance this influence. ELI’s structured learning elements will allow program implementers in the seven ELI countries to learn from each other and will support multilateral comparisons and dissemination of program effects to other interested parties. ELI will build a central repository of international experience that will enable effective technology transfer and enhance replication of ELI’s experiences and the body of knowledge it develops.

Delivering the ELI Program in Tranche I

11. IFC has developed a management structure to administer ELI that addresses the complexity of undertaking a seven country effort and which seeks to exploit the opportunities for structured learning inherent in such a multilateral effort. IFC staff and consultants will direct the monitoring and evaluation function, directly engage the international lighting industry in the program, and supervise the multi-country program IFC will engage three Regional Implementing Entities (RIEs) to administer the program on a regional basis. These entities will have established administrative capacity in the ELI countries, as well as institutional experience with product marketing and electricity demand management that will enhance program implementation. The IFC will also engage a Crosscutting Activities Implementor (CAI) who will work in association with the RIEs to ensure that each ELI country program benefits from opportunities for shared learning and that ELI's monitoring and evaluation efforts and other programmatic efforts are implemented consistently across regions. An important output of ELI is a structured learning facility – administered by the CAI, and resident on the Internet – which will be accessible to all interested parties. This facility will support the development and implementation of each ELI country program, as well as provide access to a central repository of ELI prototype technical standards, bidding processes, financial structures, and other models developed during program implementation.

12. The development of the ELI Tranche I programs has been informed by the experiences and insights of a strong network of local institutions and potential cooperating partners. In each ELI country, the RIEs will administer ELI through a mix of private companies, local NGOs, professional associations, universities, and individual professionals who will serve as the local implementation team for ELI. This work will be coordinated with relevant government agencies in each country. This engagement of local partners represents ELI's strategic approach to build a sustained impact in two ways: by transforming local markets for energy efficient lighting; and by establishing an institutional legacy through strengthened local capacity to deliver efficient lighting services.

Budget and Impacts of Tranche I

13. The budget for Tranche I contains US\$6.6 million for program activities in Argentina, Peru and South Africa. Tranche I also includes a US\$ 2.75 million administrative budget for all seven ELI countries. Under a multi-country initiative such as ELI, management and administrative expenses are associated with establishment of accounting and oversight capabilities, monitoring and evaluation protocols and other program support infrastructure that will be used in all participant countries. The total administrative budget must be available at the inception of ELI program implementation as it is not linked exclusively to program activities in any one ELI country. Rather, it is important for program efficiency and the timely implementation of both ELI tranches to establish the management and administrative infrastructure on a program-wide basis. It is expected that Tranche II appraisal will be complete by the end of the third quarter of 1999, at which time the second Tranche will be presented to Council for implementation approval.

14. As a market transformation effort, ELI is designed to accelerate the maturation of markets for efficient lighting technologies. Because these markets are at early stages of development in the ELI participant countries, the benefits of ELI will be realized largely in the years after termination of program activities (see Figure 1). During this period, the program is projected to yield over US\$ 165.3 million in net benefits and avoid emissions of more than 4.5 million tonnes of CO₂, in the three ELI Tranche I countries alone. (See Section VIII, Project Impacts, and Appendix E, Economic and Environmental Analysis).

II. RATIONALE FOR GEF FINANCING

15. The Tranche I countries of Argentina, Peru, and South Africa represent an immediate opportunity to apply proven market intervention approaches to accelerate the development of national markets for efficient lighting technology. ELI's timing – leveraging rapid technological innovations and global market maturation over the recent past – can yield particularly large impact in each of the Tranche I countries because of their early stage of development, the resident capacity of local ELI partner organizations to deliver the program, and the opportunities present in each of these countries to influence the nature of substantial new building infrastructure with long-term impacts.

16. ELI's strategic combination of programmatic elements will seek to reduce the specific barriers that hinder the growth of efficient lighting markets in the Tranche I countries in direct support of GEF Operational Program #5. By aggregating supply and demand for energy efficient lighting products and organizing networks of stakeholders in the private, NGO and government sectors, ELI will work to accelerate the lighting markets in the participating countries from repositories for outmoded and obsolete lighting technologies to vital participants in the rapidly evolving global market for cutting edge, environmentally friendly products. Energy efficient lighting will be promoted as standard practice, instead of as a hard to find, low volume, premium priced specialty item. Barriers such as a lack of financing, high up front cost, an absence of product quality standards, and limited consumer information about the benefits of efficient lighting, will each be targeted through specific ELI programs that are tailored for each country environment.

17. ELI presents an opportunity for substantial leveraging of GEF resources. IFC's role in the project presents an opportunity to build upon structures that ELI will establish in the three Tranche I markets to generate additional private sector investment in support of ELI objectives. For example, ELI's approach to addressing existing consumer finance barriers to efficient lighting market development presents one such leverage point, applying GEF funds as security against larger capital pools created in the private sector. In addition, a number of leverage opportunities emerged through the appraisal process, including possible commitments for substantial complementary program investments by the national utility in South Africa, and by privatized distribution companies in Peru and Argentina. ELI provides direct support for national strategies to address the historically disadvantaged population in South Africa through the government's established housing and electrification initiatives. In addition, ELI complements energy sector restructuring policies in Peru and Argentina, working directly with

national agencies to establish a **programmatic** foundation to mobilize private sector capital in support of national strategies to address national energy sector needs.

18. The ELI Tranche I expected benefits to the global environment appear substantial. The program's GHG emission avoidance impacts are highly cost-effective (\$1.79/tonne for Tranche I), and the viability of these projected impacts have been demonstrated in PELP and other previous programs upon which ELI is based (see Lessons Learned, Chapter XIII). The sustainability of ELI's efforts, which is fundamental to the market acceleration focus of the program, further enhances the program's considerable direct net economic and environmental benefits. The sustainability of these impacts is enforced by rooting ELI's impacts in the marketplace, and by building local institutional capacity to deliver efficient lighting services through local NGOs and private sector organizations that will deliver the programs on a national level in coordination with and support of appropriate government agencies.

III. PROJECT BACKGROUND

19. Recent technological innovations have created opportunities to improve the energy efficiency of lighting services for domestic, commercial, and industrial applications. These technical advances simultaneously promise equivalent or improved service, lower operating costs and correspondent reductions in GHG emissions associated with electricity savings.

20. For example, recent advances in fluorescent lamp design and improvements in electronic ballast technology have resulted in substantial performance and efficiency improvements. The combination of electronic ballasts and improved lamps can result in efficiency improvements of 50% over the conventional fluorescent tubes and electromagnetic ballasts that currently dominate lighting, markets in ELI participant countries. Continued improvements in compact fluorescent lamps (CFLs) have made them a cost-effective replacement for incandescent light bulbs for consumers in most parts of the world. Over its life, one 15-watt CFL replaces ten 60-watt incandescent lamps and avoids the need to burn 350-400 pounds of coal, or **almost** one barrel of oil, in a power plant. This in turn avoids the release of 600-800 pounds of CO₂.

21. The developing world's demand for lighting products, and the electricity to power them, is growing rapidly. Global consumption of inefficient incandescent lamps stood at 10 billion units in 1997, with a 3 to 5 percent projected annual growth rate. Efficient lighting products have gained significant market shares in North America (both linear fluorescent electronic ballasts and CFLs) and Western Europe (principally CFLs), but this is not the case in the rest of the world. The efficiency of commercially available lighting products varies widely, often within a single national market.

22. The increasing demand for both electricity and lighting services in emerging economies offers new opportunities for more energy efficient alternatives. The growth in the market for energy efficient lighting products in these regions is constrained by limited product availability and high prices, the limited availability of financing to cover the higher capital cost of these technologies and low consumer knowledge of the potential benefits. If these three barriers can be sufficiently addressed, market economics will drive sustained growth of efficient lighting products and yield reductions in electricity consumption and its associated GHG emissions.

Country Information

23. In developing ELI, IFC selected countries which appeared to offer promising prospects for implementing efficient lighting programs because of conditions in the market and availability of local institutional infrastructure to assist in program implementation. The ELI countries were chosen through a review of economic and technical characteristics relevant to the lighting market, and opportunities present in these countries for structured learning. The country selection process was described in detail in the ELI Project Concept Document.

24. The countries of Argentina, Peru, and South Africa constitute the first Tranche of the ELI program. In each of these three countries, immediate opportunities will allow ELI to move quickly into implementation. The timing of these opportunities, and the readiness of local partners for program implementation dictated the selection of the Tranche I countries as it was not administratively feasible to launch the programs simultaneously in all seven countries.

Argentina Background

Economic Situation

25. Argentina has a land area of 1.1 million square miles and a population of 35.2 million. Since 1989, a comprehensive economic restructuring program has significantly strengthened Argentina's economy. Economic growth averaged more than 8% between 1991 and 1994, and inflation fell to its lowest level in 50 years. In 1996, GDP was US\$197.3 billion, or about US\$ 8,600 per capita. More recently, the global economic crisis has contributed to an economic slow-down, with GDP growth slowing to an estimated 4% in 1998. Most analysts expect the economy to slow further in 1999, projecting real GDP growth of just 2%.

Energy Sector

26. Argentina's recent economic reform has involved restructuring and privatization of the energy sector. In the electricity sector during 1992, the government separated generation, transmission, and distribution activities. In addition, generation facilities were divided horizontally, resulting in many distinct companies that operate as independent power producers. Argentina's power sector is now largely in the hands of private enterprises. Only 10 of the 40 generation companies operating in the country are still state-owned. All of the distribution companies serving the greater Buenos Aires area and most of the 19 provincial distribution companies have been privatized. Argentina's tariff system only provides limited incentives for distribution companies to invest in end-use energy efficiency. For example, Edenor, a privatized distribution company in Buenos Aires, would gain a small amount for every CFL adopted among clients in the R2 tariff group (high income consumers), but would lose a large amount for every CFL adopted by clients in the R1 tariff group (low-income consumers). However, the appraisal team determined that the economics of efficient lighting investments are attractive for consumers in both tariff groups.

Energy Resources and Consumption

27. Argentina has a total installed generation capacity of 16,605 MW, with hydroelectric and nuclear sources providing more than half the country's electricity, and oil and natural gas sources supplying the remainder (coal consumption is quite small). Since peak demand is only 10,426 MW, Argentina has a surplus of electricity generation capacity. It is projected that total generation will increase from 68.3 TWh in 1996 to 134.4 TWh in 2010. A total of 43.7% of this new generation is expected to be from fossil fuel plants (mainly natural gas). Total annual energy consumption is projected to increase to 118 TWh by 2010. Thus, Argentina should continue to experience an electricity generation surplus throughout the first decade of the next century

Energy Efficiency Experience

28. The Argentine government has established an office to promote the rational use of energy (URE) within the Secretary of Energy. Since 1993, URE has identified opportunities for energy efficiency improvements in multiple sectors and has promoted programs towards this end. URE's most significant efforts to date have been implemented through a cooperative agreement with the European Union. An important program to be carried out under this agreement is ARGURELEC, which will promote energy efficiency in residential and public lighting at a policy level in conjunction with Edenor and other Argentine distribution companies. ELI will complement and coordinate its efforts closely with this initiative.

29. There are three additional energy efficiency initiatives underway in Argentina that ELI will also complement. First, the EU and the U.N. Economic Commission for Latin America and the Caribbean (CEPAL) have recently sponsored an initiative to develop legislation that promotes energy efficiency in Argentina. As a result, there is now some interest in the Argentine Legislature to pass such legislation during 1999. Second, the Inter-American Development Bank (IDB) is considering establishing a financing facility to support energy efficiency activities, such as ESCOs. Third, the IFC is implementing an effort to develop more efficient public streetlighting investments which is supported by a GEF medium-sized grant facility.

Characterization of Lighting Market

30. Argentina's residential lighting market is dominated by incandescent lamps. In 1994, lighting sales included 115 million incandescents, but only 200,000 CFLs. Although annual CFL sales increased to more than 1 million units by 1997, CFLs still have not achieved significant penetration of the residential market. In the commercial lighting sector, efficient T-8 thin-tube linear fluorescent tubes make up 35% of the fluorescent market, a healthy share relative to many other Latin American countries. Nonetheless, significant market barriers still hinder a widespread shift from the less efficient T-12 to T-8 tubes. For example, T-8s tend to suffer premature failure when installed in luminaires (fixtures) using low quality electromagnetic ballasts common in Argentina. These performance failures have eroded consumer confidence and impeded penetration of the new technology. In addition, increased penetration of electromagnetic ballasts for fluorescent lamps has also been hindered. Although manufacturers

have the capability to make high efficiency ballasts, there is currently limited demand for the higher cost product, despite attractive economics through electricity savings. Manufacturers believe that consumers must be educated on the benefits of higher efficiency products before they will be willing to pay the price premium. Further, they do not believe that they can deliver this information to customers with credibility.

Definition of Potential Environmental and Economic Benefits

3 1. Some evidence suggests that lighting in Argentina is more energy intensive than in the United States or Europe. The average power required in Argentina to produce a useful light level of 100 lux is estimated to be 6.5 W/m², compared to an average of 3 W/m² in the EU, and 1.3 W/m² for state-of-the-art lighting systems. If the current lighting equipment used in Argentina were replaced by state-of-the-art systems, energy savings would be approximately 80%. If the energy efficiency of installed lighting equipment in Argentina were improved only to the average level in Europe, CO₂ emissions would still be reduced by 4.37 million tons per year. As an example of the savings associated with specific technologies, if incandescent light bulbs were replaced with CFLs in every application where doing so would be cost-effective (based on electricity tariffs and hours of use per day), the energy savings would be 2.02 TWh. Furthermore, if the current sales of T-12 fluorescent tubes were replaced with T-8s (which is cost-effective for all applications), the annual energy savings would amount to an additional 0.12 TWh.

Peru Background

Economic Situation

32. Peru has a land area of 496,223 square miles and a population of 25.6 million of which 70% reside in urban areas. In 1990, Peru embarked on a bold economic reform agenda. The government liberalized interest rates, eliminated price controls, reduced trade restrictions, and sold state companies in the mining, telecommunications and electricity sectors. As a result, Peru's economy grew between 6-7% in 1997, while inflation slowed to approximately 7.5%, and capital inflows surged to record levels. More recently, Peru has suffered from the effects of El Nino and the international financial crisis, which reduced GDP growth to 1% in 1998.

Energy Sector

33. A significant component of Peru's recent economic reform has been restructuring and privatization of the energy sector. In 1992, the government enacted the Electric Power Licensing Law, which sought to: (i) achieve vertical separation of generation, transmission and distribution activities; (ii) introduce private sector participation in these activities; and (iii) set electricity tariffs according to marginal costs and free market principles. Since the passage of the law, Peru has privatized a significant and growing percentage of its electric power generation and distribution companies. The government plans to complete the privatization of its remaining distribution companies during 1999. Peru's tariff system encourages distribution companies to promote energy efficiency in certain limited situations. This incentive arises when the amount that distribution utilities can charge for peak hour electricity is less than the amount that they

must pay to generation companies. In these instances, utilities would save money by reducing peak hour demand through DSM initiatives.

Energy Resources and Consumption

34. Peru has an installed generation capacity of 5,192 MW, of which diesel and fuel oil plants provide 52% and hydroelectric facilities supply 48%. General demand for power has been growing at approximately 5% annually and is projected to reach 4,415 MW by 2010. As a result, Peru expects considerable excess generating capacity (66%) in the near future. Nevertheless, Peru will experience supply constraints in its southern grid throughout 1999 due to a flood-damaged hydroelectric facility located near Cusco and a serious shortfall of rain, which has further reduced hydroelectric production. As a result, many generation companies must rely on inefficient, expensive thermal plants to make up the lost power production. The government therefore aims to reduce peak load demand in the southern region by 20 MW through energy conservation programs, including DSM measures.

Energy Efficiency Experience

35. Peru gained its most significant experience with energy efficiency in 1994, when the country faced an electricity shortfall. To avoid this problem, the Ministry of Energy and Mines (MEM) created a national Energy Savings Program (PAE) to administer a series of energy efficiency initiatives aimed at reducing peak hour demand by 100 MW. PAE implemented these programs in conjunction with CENERGIA, a local NGO dedicated to energy conservation. The PAE-CENERGIA campaign successfully avoided the crisis, but mainly served middle and high-income citizens in the capital city of Lima. The PAE program has been continued since 1994 in a scaled-down form because of its cost saving benefits. ELI will complement and coordinate with this ongoing effort, specifically targeting the previously underserved constituencies of low-income families and those living outside of Lima.

Characterization of the Lighting Market

36. Peru's residential lighting market is still dominated by incandescents. Although the PAE-CENERGIA campaign raised CFL sales from 40,000 in 1994 to 415,000 in 1995, sales subsequently dropped when intensive CFL promotion ceased. In 1998, lighting sales included 23.3 million incandescents and 250,000 CFLs. As for the commercial lighting market, most of the linear fluorescent tubes installed in Peru are the less efficient T-12 type. Although most companies could save money by replacing T-12 tubes with the higher efficiency T-8s, many are unaware of this opportunity. In addition, some companies have the mistaken impression that T-8 tubes provide less light because they are thinner in diameter. Encouragingly, an increasing number of companies have been willing to switch from T-12 to T-8 linear fluorescent tubes over the past two years.

Definition of Potential Environmental and Economic Benefits

37. In Peru, **40%** of electricity consumption is during evening peak hours (6:00 –10:00pm) in the residential sector. Of this amount, 58% is defined by lighting usage. Thus, residential

lighting is the most important end use during peak hours. Since peak energy production is provided largely by fossil fuels, residential lighting has a significant environmental impact. From a global environment perspective, an estimated 250,100 kg of CO₂ is emitted in the country's northern grid and 230,100kg in the southern grid for every TJ of peak electricity consumption. Therefore, any improvements in residential lighting efficiency will significantly reduce GHG emissions.

South Africa Background

Economic Situation

38. The Republic of South Africa has a total land area of 47 1,445 square miles and a population of 42.3 million. In 1997, GDP was US\$115.5 billion, which corresponds to US\$3,041 per capita. However, South Africa suffers from extreme income inequality with much of the black majority remaining significantly impoverished. While final figures for 1998 are not yet available, the economy was adversely affected by the global slowdown that began in Southeast Asia in the middle of 1997. As a result, economic growth was negative for 1998.

Energy Sector

39. At present, the state owned electricity company Eskom generates the vast majority of South Africa's electricity (approximately 95%). It also owns and operates the national transmission system. Eskom accounts for roughly 57% of end use electricity sales, with a series of redistributors accounting for the remainder. In the residential sector, Eskom serves 20% of customers, and municipal distribution companies (Munics) serve the rest. Of these Munics, roughly **60% are** presently financially insolvent. In 1997, the South African government began restructuring the electricity sector. The plan involves dividing South Africa into a small number of regional electricity distributors (REDS), which would purchase electricity from generators (Eskom and IPPs). The formation of the REDS would be the first step in the gradual unbundling of Eskom's generation, transmission and distribution activities. It is unclear, however, when the government will implement this plan. In early 1999, Eskom announced its own major company restructuring which is intended to reposition the company to compete in the emerging South African energy sector business environment. The restructuring will create a small regulated utility company under the preview of the National Electricity Regulator (NER) and a new unregulated subsidiary, Eskom Enterprises to undertake strategic investments in expanded energy management services (including efficiency services) and other ventures (including possible marketing of efficient technologies).

Energy Resources and Consumption

40. The nation's electricity generating capacity of more than 40,000 MW is primarily coal-fired, but also includes one nuclear power station two gas turbine facilities, two conventional hydroelectric plants and two hydroelectric pumped-storage stations. Given South Africa's abundant coal resources, it is likely that coal will continue to be the dominant energy source in the future. The development of several natural gas fields in the region could, however, eventually make gas a more feasible option. Due to lower than forecasted economic growth,

South Africa currently has excess generation capacity. Electricity demand growth is expected to remain low or be negative for several years. Eskom has decommissioned three plants with a combined capacity of nearly 1,500 MW, and has mothballed an additional three plants with a combined capacity of 3,800 MW. Eskom, however, predicts the need to recommission one or more of these plants in the next several years. The success of the DSM program that Eskom implements in conjunction with ELI will be a critical factor in determining how long the country can wait before recommissioning these plants.

Energy Efficiency Experience

41. Residential lighting in South Africa is highly coincident with peak load demand. In response, Eskom has recently begun several residential DSM lighting pilot projects to see if DSM solutions might be applied to reduce peak demand. These projects have included CFL promotions in conjunction with a supermarket chain, marketing to its own employees, and additional marketing efforts targeting schools. In addition, Eskom has been running an energy efficient lighting awareness campaign through its *ElektroWise* program. This initiative is information-based, including data sheets informing customers how they can reduce their lighting load and save money. In working with Eskom, ELI will build upon the achievements and incorporate the lessons of these energy efficiency initiatives.

Characterization of the Lighting Market

42. Incandescents heavily dominate South Africa's residential lighting market at all socioeconomic levels. Four percent of low-income customers use some form of fluorescent lighting, but virtually none use CFLs. Among the highest income customers, roughly eight percent use one or more CFLs. Eskom has estimated that given the current tariff system and high interest rates for consumer finance, the price of CFLs must not exceed 20 Rands each in order to entice customers to purchase them based solely on their energy saving features. Alternatively, if the market price of CFLs remains at 80 Rands, zero interest loans would be required in order to provide an attractive leasing option to consumers. South Africa's residential lighting market is expanding rapidly due to massive electrification efforts targeting historically unserved portions of the black population. At present, the electrification level for the lowest income citizens is only 3%. In coming years, Eskom plans to electrify roughly 250,000 low income households per year and Munics plan to electrify an additional 100,000 to 150,000 households per year.

43. Since coal is the nation's primary source of energy, improved lighting efficiency can directly provide a range of environmental benefits. Eskom has estimated that the average annual energy savings per CFL is 1,050 kJ. This translates to an average CO₂ savings per CFL of 87 kg. In addition to GHG emission reductions, Eskom estimates that each CFL can save 88 liters of water per year due to reduced consumption by power plants. Other environmental benefits include reduced acidic deposition and health and visibility impacts arising from local air pollution.

IV. MARKET BARRIERS TO ENERGY EFFICIENT LIGHTING IN TRANCHE I COUNTRIES

44. The three countries that constitute ELI's first **tranche** face similar market barriers to increased penetration of energy efficient lighting. These barriers, which are typical of immature markets for energy efficient technology, include:

- *Inadequate Information* about efficient lighting technology and its application, and a lack of credible sources for obtaining such information;
- *High First Cost* keeps sales volumes low despite attractive life-cycle economics;
- *Inadequate Financing*, such as consumer credit or low transaction cost financing, to facilitate purchases;
- *Limited Availability* of products through traditional retail and product service channels;
- *Risk* involved in buying a new product without adequate standards or national regulation to certify performance;
- *Lack of Incentives*, especially in the rental housing and commercial buildings sectors, to invest in more efficient technology; and
- *Low electricity prices*, often as a result of tariff structures that don't reflect the costs.

Residential Sector Barriers

Inadequate Information

45. There is limited consumer understanding of efficient lighting in all three Tranche I countries. Beyond typical manufacturer advertising, the only previous activities undertaken to create consumer awareness have been organized promotional events reaching limited audiences. Consumer awareness of CFLs in Peru has increased substantially since 1995, when a national promotional campaign was first implemented. However, in some provincial cities, including ones in the southern region currently facing electricity supply shortages, only about 60% of consumers are familiar with CFLs². In South Africa, Eskom found that throughout all socioeconomic levels there is little awareness of energy efficient lighting and even lower awareness of CFLs³. Thirty-four percent of high income households were aware of CFLs. Only three percent of newly electrified households were similarly aware.

² Proyecto de Ahorro de Energia, March/April 1998.

³ In June 1998, Eskom conducted a customer survey to help ELI characterize the residential market for lighting technologies, including identifying barriers to CFL penetration into the South African market. Eskom found that three barriers were most significant – awareness, affordability, and accessibility.

High First Cost

46. In Argentina and Peru, retail prices for CFLs have dropped over the past few years, but CFLs still require a much higher initial investment than incandescents. In Argentina, high quality CFLs still cost between \$21 and \$24, depending on wattage. Even though the installation of CFLs can yield a positive cash flow over time for many applications, most consumers continue to buy incandescents due to their lower first cost. In Peru, surveys of willingness to pay showed that 47% of consumers in the City of Arequipa, 53% in Cusco, and 30% in Tacna would not pay between US\$7-\$10 for a CFL. In South Africa, the current market price of CFLs (over 60 rands/\$10) is a serious deterrent to purchase, especially for a new technology. A CFL price acceptable to low income customers may be closer to 20-30 Rands (\$3.30 - \$5).

Inadequate Financing

47. Consumers in Argentina and Peru would be more inclined to buy efficient lighting products if financing was more accessible. However, consumers typically face a high cost of capital from traditional commercial lenders (4-5% per month in Argentina), and even higher rates from small loan companies. No consumer financing programs applicable for efficient lighting- investments are yet available in Argentina or Peru. In South Africa, the historically disadvantaged population has long suffered a lack of access to consumer credit with which to capitalize such purchases. Consumer microcredit is now growing rapidly but has not included lighting purchases.

Limited Availability

48. CFLs are widely available in major cities of Argentina and Peru. In these areas, distribution channels are well developed to supply CFLs to stores that cater to most socioeconomic levels. In the rural interior of these two countries, distribution channels are less developed and energy efficient lighting products are generally less accessible. South African respondents from all income groups in an Eskom survey stated that for them to purchase CFLs, the bulbs would have to be highly accessible at the distribution points that they already use, which are mainly chain stores and to a lesser extent hardware stores. At present, CFLs are stocked in all central urban area chain stores but less so in hardware stores. Further, those chains do not generally service black townships. CFLs are not present at all in rural areas. The distribution networks that currently supply lighting and other electrical products to those retail outlets that do not carry CFLs are largely unaware of the technology. Since customers are also unaware, smaller retailers feel little pressure to stock the bulbs. Most distributors and retailers that do carry the technology do not understand its advantages. They also do not understand the variety in quality of CFLs, and have a tendency to source lower-priced, lower-quality CFLs.

Absence of Market or Regulatory Mechanisms to Ensure Product Quality

49. As in many emerging market countries, the residential lighting market in Argentina and Peru is being adversely affected by an influx of low quality, lower-priced CFLs. This is also true to

some extent in South Africa. Unable to distinguish between the high- and low-quality products, many consumers purchase the less expensive option, and are dissatisfied with the results. The end result could be serious damage to the market for energy efficient lighting. Absence of quality standards, testing, and product labeling remain a significant barrier hindering market growth for efficient lighting in all three countries.

Commercial Sector Barriers

50. South Africa does not manufacture many energy efficient lighting products are not manufactured in South Africa. Instead, the country imports high-cost products from the major international manufacturers as well as lower-cost imports from their smaller competitors. All such products are subject to high import tariffs. IFC will learn more about commercial sector barriers to efficient lighting technologies when Eskom's current market research being funded by a PDF Block B grant is complete in the coming month or two. Therefore, discussion below concerns only Argentina and Peru, though barriers are likely to be similar for South Africa.

Inadequate Information

51. According to a survey of businesses in Lima conducted in Peru by CENERGIA in March 1996, 26% had not adopted any measures to conserve energy and only 16% had installed energy efficient lights. Many companies are unaware that they could save money through lighting retrofits, the installation of lighting control systems, or the replacement of T-12 linear fluorescent tubes with T-8s. The situation is similar in Argentina based on survey work conducted by URE.

Inadequate Financing

52. Argentine commercial banks tend to be reluctant to provide loans for efficient lighting purchases such as in public buildings and streetlighting. Innovative financing mechanisms such as performance contracting are only just beginning to be introduced in Argentina. Peru's private sector currently has inadequate financing mechanisms structured to facilitate purchases of efficient lighting products. At present, businesses pay for such purchases using their own internal funds or as part of larger loans from commercial lenders. There is little experience with or awareness of performance contracting and third party financing - two innovative approaches to financing investments in efficient technology, which allow the energy savings to finance capital purchases.

Split Incentives for Energy Conservation

53. The problem of split incentives is a barrier for energy efficient lighting retrofits in all ELI countries. Builders often do not invest in efficient lighting because the owners, not the builder, would reap the energy savings. Likewise, landlords do not install energy efficient lighting because their tenants, not the landlord, would benefit from the lower energy use.

Absence of Market or Regulatory Mechanisms to Ensure Product Quality

54. Neither Argentina nor Peru has in place any regulatory or voluntary quality standards or

product labeling for commercial efficient lighting products. As a result, purchasers unfamiliar with these new products perceive high risk in investing in more expensive equipment because they cannot be confident that it will perform as advertised. Opportunities to shift the commercial market towards high efficiency lighting products are lost.

V. PROGRAM ACTIVITIES – ELI TRANCHE I

Program Design Strategy

55. The ELI program consists of five program elements:

- Public education, marketing and standards;
- Electricity distribution company programs;
- Transaction support and financing;
- Market aggregation; and
- Financial incentives.

56. These program elements represent a “tool box” of efficient lighting market transformation strategies derived from broad global experience. The five program elements are inter-related, mutually reinforcing and designed as a package to maximize long-term market impact. Each general program element is described below as it applies to Tranche I program design.

57. The program targets two main end-user groupings: (i) the residential sector, including very small commercial applications; and (ii) the commercial, industrial and institutional/public **(CM)** sectors. The residential program focuses on compact fluorescent lamp (CFL) technology in all Tranche I countries. The C/I sector programs promote several technologies: T-8 tube lamps and electronic ballasts, controls, and efficient luminaires – for indoor applications, and high intensity discharge lamps for industrial and public lighting applications. In general, all program elements are mobilized to address the residential sector. The C/I sector programs are more opportunistic and project-oriented, reflecting the larger sizes of lighting projects in these large end-user sectors, and therefore rely more on the transaction support and financing program component to achieve their goals. The program descriptions below provide specifics about how each program element is applied to residential and C/I sectors in Tranche I.

58. For each Tranche I country, the program designs developed during appraisal are based on: (i) country-specific market conditions, opportunities, barriers and institutional capacities of market actors and prospective program partners; (ii) opportunities to convene, build on, and leverage existing capacities and market development efforts already underway by lighting industry, utility, government agencies and NGOs in-country; and (iii) opportunities to identify and promote efficient lighting technologies which have compelling economics. The country program descriptions below relate the program designs to these assessments. IFC’s ELI appraisal team established relationships with a wide variety of local stakeholders and potential partners including electric distribution utilities, equipment manufacturers, equipment distributors and vendors, lighting engineers and electrical contractors, lighting project developers and energy service companies (ESCOs), financial institutions, regulators and government officials from relevant energy and environmental agencies, and NGOs active in

energy efficiency and environment activities. These stakeholders provided input to the program designs during the appraisal process. Several of them have offered preliminary commitments to contribute to the program implementation representing a variety of leveraged resources.

59. Some elements of the country program designs described below (in Section VI) are subject to additional refinement as ELI enters the initial stage of implementation. The appraisal process to date has created a broad menu of program elements and identified specific applications for them in each country. The final program designs need to be developed in concert with the Regional Implementing Entities (RIEs) and selected local partners and refined based on further market assessments. For example, early implementation work will include thorough utility cost/benefit analyses of lighting programs sufficient to identify opportunities for electric distribution companies to benefit from implementing such programs. These market assessments will include surveys of consumer attitudes toward efficient lighting in order to better design the ELI public education campaign, as well as confirming economic feasibility of various C/I/I lighting retrofit projects in order to target the transaction support work. Further, the dynamism of these emerging local markets will create new opportunities through ELI's relationships with selected implementation partners. Therefore, ELI will develop its programs flexibly to allow ongoing optimization based on new opportunities and information. In some cases, conditions are such that program design is complete. These are cases where: (i) time-sensitive opportunities exist in the market requiring a rapid response to exploit (for example, the residential electrification program in South Africa and the power shortage in southern Peru); (ii) the opportunity is central to ELI objectives; (iii) sufficient information is available to inform the program design; and, (iv) viable local partners and stakeholders are ready to participate and prepared to make significant contributions in their respective roles. These cases are highlighted in the country program descriptions below.

60. The further market assessments to be commissioned by the ELI RIEs for each country will have two purposes: (i) to complete research required to finalize program designs and recruit local participants; and (ii) to establish formal baselines against which the ELI program impact can be evaluated and progress monitored. These assessments will also enable IFC staff and consultants to work with the RIEs to fine-tune the programs. In the case of South Africa, a comprehensive market assessment is underway, funded by a GEF PDF Block B grant. This work provides a comprehensive model to be applied through ELI's structured learning facility for subsequent assessments to be commissioned for Argentina and Peru. The assessments will cover: (i) cost/benefit analysis of efficient lighting applications for end-users and utilities under prevailing local conditions, including analyses of the tariff structure and load profiles of potential electric distribution company program partners; (ii) further identification and recruitment of utility partners, based in part on opportunities revealed in the cost/benefit analysis; (iii) structured profile of market actors and further analysis of their institutional capabilities and interests to make final selection of local implementing partners; (iv) consumer attitudes on efficient lighting and identification of education and media channels to inform the consumer education strategy; (v) description of major manufacturers, distributors and retailers and other characteristics of the lighting industry addressing both residential and C/I/I markets; and (vi) current data on market activity including product availability, sales, manufacturing, market penetration, pricing, relevant import duties and taxes, case studies of sample projects (in the C/I/I sectors), power tariffs and regulation, and current technology standards. These assessments will be

completed within the first four to six months following program start-up. Their focus is to provide practical information to inform the program designs and formalize the implementation roles of the local partners. The assessments will also represent the first step in implementing ELI's monitoring and evaluation plan by establishing an adequate baseline against which program activities can be measured via key indicators.

Public Education, Marketing and Standards

61. Where appropriate, ELI will: (i) launch and underwrite advertising and public education campaigns targeted mainly at residential end-users; (ii) assist in development, adoption and promulgation of technical standards and labeling for efficient lighting; (iii) form an appropriate advisory committee (including NGO, government agencies, industry and technical representation) in each country; (iv) undertake education of design professionals; and (v) support targeted marketing to C/I/I sectors. The ELI marketing and public education program is expected to leverage substantial additional investment by private lighting companies and electric utilities in marketing campaigns to promote their own products and programs. ELI's efforts will concentrate on activities that the industry cannot credibly undertake themselves, such as providing broad educational messages. ELI's program will not replace industry marketing investments, but rather are expected to induce additional investment in complementary messaging by industry. While it is difficult to measure the level of industry investment either before, during, or after the program because of the proprietary nature of this information, experience from PELP indicates that the level of promotional activity by industry can be expected to increase with the addition of such public educational programs.

62. Consumer education and technology marketing efforts are the foundation of ELI's strategy; they support other program elements by establishing greater consumer awareness and by addressing consumer and design professionals' concerns about product quality and economics. In the **Tranche I** country markets, most potential purchasers currently do not understand the benefits of efficient lighting, are uncertain of the technology's performance or distrustful of manufacturer claims, and may not understand how to apply the technology appropriately. In response, the ELI program is built around a strong marketing and education effort. In its public education and marketing work, ELI will speak impartially on behalf of the economic and environmental benefits of efficient lighting generally. Culturally appropriate marketing materials and logos for the advertising campaign and product labeling will be developed. Whenever appropriate, the logo designed for PELP with GEF funds will be adapted for use in ELI countries. The consumer education and marketing effort is intended to link the public identity of ELI to high quality, efficient lighting technology; environmental responsibility; and economic sustainability. This will enhance the effectiveness of the ELI logo, and maximize ELI's capacity to leverage investments from the lighting industry in their own marketing promotions in support of ELI. Cooperative education programs with schools will also be developed. ELI's marketing and public education campaign is targeted at the residential sector. Additional marketing efforts focused on the C/I/I sectors will also be developed in conjunction with the transaction support and market aggregation programs.

63. Lack of quality technical standards for efficient lighting products is a barrier to market development; it results in variable lighting equipment quality available in the marketplace and

undermines the consumer confidence needed to grow the market. Therefore, development of appropriate technical standards is a high priority for ELI in each of the first **tranche** countries. The product quality specifications developed through ELI will reflect achievable levels of technical energy efficiency improvement, local conditions, and the current realities of the international lighting market. In establishing ELI performance standards, the program will work through collaborative processes locally to assign the ELI logo where the standard is met. The standards will be adopted in each country through the appropriate local academic and regulatory institutions. Consumers will be able to identify complying products by the ELI logo, which will be promoted as a consumer's badge of surety. The lighting industry will be invited to participate in marketing the logo on their products that meet ELI standards. ELI's ability to provide international credibility and experience will be important in building local market confidence in new efficient lighting technologies.

64. As part of its public education activities ELI will organize an advisory committee in each country made up of key stakeholders including lighting industry representatives, technical and professional associations, environmental and energy NGOs, consumer groups, electricity company representatives, and relevant government agencies. ELI will gather input from these stakeholders on the development of ELI activities on an ongoing basis, as appropriate. The committee will provide ELI with a local perspective and assist in building key constituencies for ELI's implementation.

65. Professionals in the engineering, building and product design fields often have inadequate experience with the new technologies to know how to incorporate them into their projects. Experience with PELP indicated that new product design and improved applications can result from educational efforts targeting engineers and architects. PELP sponsored a successful energy efficient luminaire design competition for students in Polish industrial design programs that resulted in a high level of academic and professional interest, and yielded several innovative designs. A similar effort to involve lighting professionals will be considered for the Tranche I countries. ELI will work through local professional schools and professional associations to leverage access to this group. Professional education is a critical component supporting the C/I/I sector efforts, as well as a means to help guarantee ELI's sustained impact on the market.

Distribution Utility Programs

66. Electricity distribution companies represent an important potential conduit for promoting efficient lighting. Utilities have access to capital, administrative capacities and systems, and regular interactions with electricity users through their billings and collection systems, which make them a ready vehicle for a variety of consumer financing and marketing activities. Further, despite an apparent interest in maximizing sales of electricity, utilities have financial interests, both short-term and long-term, in shaping their load profiles and managing their demand, and, to varying degrees, regulatory responsibilities to act in society's economic interests. Different local conditions make local electricity distribution companies in each Tranche I country potential participants in ELI for different reasons. Argentina and Peru are in various stages of privatization and face a variety of system generation and transmission constraints. South Africa is experiencing tremendous demand for new electricity services from a large electrification program aimed at unelectrified black townships. The appraisal team has identified specific opportunities for collaboration with electricity distribution companies in each Tranche I country, particularly for "distributed utility" and utility-based CFL

finance programs. The utility programs will complement the market aggregation, marketing, consumer education and market research and analysis efforts in each country and be supported directly by ELI's procurement, performance standards development, and financial transaction support activities.

67. During implementation, ELI will enter into consultations with interested electricity distribution companies to further develop the opportunities identified in each country, and secure collaboration with a representative number of these key players. As an initial step and to inform these consultations, ELI will commission cost/benefit analysis of efficient lighting EE/DSM from the utilities' perspective. This information is essential for gaining participation of utilities. These cost/benefit analyses will identify distribution efficiency improvements and avoided cost potential of target load management programs. The analyses will evaluate load curves, lighting usage coincidence with system peak demand, both short-term and long-term utility marginal costs of power, and the local tariff structure. A potential outcome of the analysis will be recommendations for regulatory and tariff changes to bring into alignment the utility and societal interests. Such input is critical in the Tranche I countries, where electricity sector reform is currently an issue of great significance on the national policy agenda.

68. The PELP DSM Pilot program successfully demonstrated that a high-density installation of CFLs in a residential community can reliably reduce peak demand and generate real capital savings for distribution utilities through deferred capital investments in infrastructure. ELI will disseminate this experience with "distributed utility" investments to electric distribution companies and seek to develop specific applications of the DU concept in the Tranche I countries. These electricity industry partnerships will utilize a variety of approaches, as determined by the business conditions facing the local electricity industry in each ELI country.

69. Electric distribution utilities can provide financing of CFLs to residential customers and collect finance payments as a surcharge on the utility bill. This finance technique reduces financing transaction, billing and collection costs, improves collections performance, and makes the delivery of financing economical to provide in the small amounts typically needed for lighting investments. There are several successful international models of these types of programs (e.g., CFE's Ilumex in Mexico and EDF in Martinique). During appraisal, IFC identified initial utility candidates for undertaking such a program in each of the first tranche countries. During implementation, the ELI RIEs will work with local utility partners to design such programs as a vehicle for ELI's market aggregation, consumer education, and financial transaction support facilities. ELI will then assist its utility partners to structure and arrange financing for the programs. ELI, in its role as a funder of last resort, and with its focus on leverage, might provide credit enhancement for these programs, (e.g., as a loan loss reserve, or a targeted financial incentive as an inducement to the utility). ELI will use its multi-country sphere of operations to provide technical assistance in the implementation of these utility programs, including transferring best practices from other utilities that have experience with similar arrangements.

Transaction Support and Financing

70. Financing for efficient lighting projects has little precedent in Tranche I countries. ELI will offer transaction support and financial advisory services to structure and arrange financing from domestic and international commercial sources for replicable, model transactions in both the residential and C/I/I sectors. ELI will establish financing modalities that overcome the high initial cost barrier currently inhibiting the purchase of cost-effective efficient lighting products and allow these products

to be self-financing through energy cost savings. The transaction support and financing work will also address credit risk barriers and small transaction size barriers. ELI's approach will be to aggregate sufficiently large demand for capital and arrange credit-worthy finance structures. These initial transactions may involve strategic use of GEF resources (such as through partial loan guarantees), so as to create attractive business opportunities for commercial financial institutions. This activity provides opportunities for considerable leverage of GEF funds, both through replication of the models demonstrated, and by combining GEF funds with private capital. IFC expects to mobilize, directly and indirectly, total commercial financing of US\$16-40 million in the Tranche I countries through ELI program activities. IFC may also consider commercial investments in efficient lighting projects and help provide access to IFC funds already available through its lines of credit at commercial banks or other financial institutions.

71. To support ELI's promotion of CFLs in the residential sector, two financing strategies will be used. First, a utility-based CFL finance program will be undertaken with partner electric distribution utilities. Second, in geographic areas where the CFL promotion campaign is targeted, various existing consumer finance methods will be mobilized to support CFL sales. These two financing methods can be complementary and even offered in the same geographic areas. CFL purchases are too small to justify the costs of initiating new finance transactions with individuals. Therefore, both ELI strategies for delivering credit to the residential sector rely on adapting existing mechanisms where the financing relationship and billing/collections systems are already established. In-country research to date and evaluation of existing international models indicate that CFL financing can be provided economically with these strategies and significant numbers of households can be reached.

72. Besides the utility partnerships, ELI will seek to mobilize residential CFL financing through three main vehicles: (i) credit cards, offered by banks, specialized household finance institutions, and major retailers, which typically cover the urban population; (ii) micro-credit organizations and credit cooperatives, which typically cover smaller towns and rural areas; and, (iii) pay-on-paycheck schemes, typically provided to employees of very large employers, particularly public sector institutions such as government agencies and schools. In South Africa, where pre-pay electric metering systems are widely in use, ELI is investigating use of the pre-pay token sales network as a channel for delivering CFLs and financing. Retailer and distributor networks provide additional channels for delivering consumer financing. All of these finance distribution channels can concurrently provide a conduit for ELI's CFL education and promotion initiative. ELI will coordinate its promotion and marketing activities with these financing initiatives in order to capitalize on their complementarity.

73. The C/I/I sectors represents a significant part of the potential market for energy efficient lighting in the Tranche I countries. Much of the lack of development of this market relates to the limited experience amongst lighting service companies and financial institutions in packaging and marketing the transactions necessary to undertake efficient lighting retrofit projects, and to specify high value efficient lighting technology in new facilities. With a lack of well-prepared projects ready for investment, and relatively high transactions costs associated with developing pioneer projects, the **CM** market remains undeveloped. ELI seeks to overcome these barriers by: (i) assisting lighting-related companies to market, develop and finance model transactions; (ii) assist lighting companies to develop their turnkey lighting project and energy service company (ESCO) business operations; and (iii)

promote development of a pipeline of projects, working with groups and associations of large end-users to develop and buy lighting projects.

74. The appraisal team identified through local partners in each Tranche I country a variety of **CM** lighting retrofit projects with simple payback periods (ratio of capital cost to annual energy cost savings) of two to four years, sufficient to allow projects to be self-financing from energy cost savings. Starting with these projects, ELI will assist in project marketing and development of appropriate finance and contract structures for implementing similar projects. This assistance will include arranging financing for projects with interested financial institutions. For the initial demonstration projects, ELI can provide limited financial support for project development to address “pioneer project” transaction cost barriers. Lighting companies and financial institutions will be selected for assistance that have strong interest in developing on-going business in this field. Therefore, model transactions will be developed to establish on-going institutional capacity in these markets. Tranche I countries, to varying degrees, each have an existing base of lighting businesses -- manufacturers, distributors, electrical contractors and engineers. ELI will seek to propagate specialized lighting project development capacity (such as the ESCO business model) in the companies with which it works by providing training and facilitating partnerships. In addition to working to build model transactions, ELI will assist in developing project finance facilities, establishing ESCO business tools such as model energy service contracts and measurement and verification techniques, facilitating partnerships with international firms as appropriate, and assisting in business planning.

Market Aggregation

75. ELI will undertake market aggregation activities on both the demand and supply side of the market. In nascent efficient lighting markets such as the ELI Tranche I countries, demand-side market aggregation of large consumer blocks can amplify the leverage of individual purchasers to increase the market size, drive down prices, and provide a focus for producer competition. Market aggregation can also induce new market entrants, provide a significant opportunity to apply new technical standards, and spur technology improvements to meet local needs. In Tranche I, the conduits for such efforts related to residential CFLs will include electricity distribution utilities, large residential housing blocks, consumer associations, large employers, and retail operations. In the C/I/I sectors, larger energy users with multiple facilities, as well as associations of energy users, can be consolidated for joint development and implementation of multiple projects. ELI will develop formal affiliations with existing end-user associations in the multi-family residential, and C/I/I sectors. These associations are expected to serve as strategically important delivery mechanisms for ELI. Demand side market aggregation efforts will be closely coordinated with and will reinforce all other ELI program elements. They will feed directly into ELI’s transactional support activities and provide a source for sustainable commercial transactions. The resulting transactions will spur increases in sales and help to establish enduring relationships between large purchasers of lighting products that can help transform local lighting markets.

76. In its supply side market aggregation work, ELI will promote efficient technologies through collaborative, voluntary initiatives with lighting manufacturers and suppliers. One approach which ELI will attempt to establish involves organizing the lighting industry to eliminate low-efficiency

technology. Known as “market washing,” this approach would organize suppliers, acting in concert and supported by ELI’s independent marketing/education campaign, to agree to substitute high efficiency for low efficiency products collectively. In Thailand, the Electricity Generating Authority of Thailand has successfully organized the Thai industry and key consumer groups around such a plan to “wash the market” of low efficiency T-12 fluorescent lamps, substituting T-8s in their place. In Tranche I countries, ELI will seek coordinated action from manufacturers for a similar effort. As a credible and independent source of product information ELI can allay consumer concerns about new technology in support of such an effort, thus addressing manufacturer’s concerns about such an aggressive action.

Financial Incentives

77. ELI is budgeting a relatively small portion of its funds to be used on a limited basis for financial incentives, including targeted product price subsidies. Financial incentives will be strategically applied in three ways: (i) as subsidies during short term promotions in direct support of consumer education and marketing efforts; (ii) to buy down the costs of CFLs to overcome in the short-term high initial cost barriers in selected segments of the residential sector; and (iii) as a short-term inducement to overcome high first-time or other extraordinary development and project costs that might impede a model C/I/I sector lighting efficiency transaction from proceeding. While financial incentives and product subsidies have been effectively utilized by a variety of market transformation and utility DSM programs, ELI does not rely on such incentives as the fundamental driver of any of the Tranche I country programs. However, experience suggests that judicious use of financial incentives can significantly accelerate market development, particularly when combined with public education programs, and when leveraging significant private sector investment. ELI will retain flexibility in how such incentives might be used. Decisions about the precise application of financial incentives will be made following further market research, as program designs are completed, and in the course of program implementation.

VI. COUNTRY PROGRAM DESIGNS

Argentina Programs

Market Overview

78. The market for energy efficient lighting in Argentina is largely undeveloped. Sales volumes of energy efficient lighting products remain low and there have been no formal efforts to undertake consumer education, electricity industry demand-side activities, or other initiatives to build this market. Preliminary data suggests that public knowledge of energy efficient lighting options in Argentina is quite low and the penetration of new lighting technologies into homes and small businesses is limited. It also appears that consumers are distrustful of product performance claims made by manufacturers and issues of product quality assurance appear to be important barriers to consumer acceptance of new technology. Argentina is relatively prosperous and has highly capable technical and institutional resources, but relatively little has been done to promote lighting efficiency to date. The ELI Tranche I appraisal indicated that coordinated

market interventions can achieve quite substantial impact under the conditions present in the Argentine market.

79. Three important initiatives are being established which will complement the ELI program in Argentina: (i) the IFC/GEF Argentina Streetlighting Project, supported by a US\$736,250 GEF medium-sized project grant, and focused on transaction support and financing of efficient public streetlighting projects; (ii) the Inter-American Development Bank's market development initiative for ESCO establishment and finance in Argentina; and (iii) a utility-oriented DSM program targeting residential and public lighting, known as ARGURELEC, under development with funding from the European Union. IFC initiated coordination with all three of these programs during ELI's appraisal, and the ELI program plan for Argentina reflects opportunities for leverage these complementary efforts.

Public Education, Marketing and Standards

80. To establish the foundation for expanding the efficient lighting market, ELI will employ a full menu of public education and marketing program tools. Since ELI is addressing a relatively uninformed and undeveloped consumer base in Argentina, the initial focus will be on product demonstration, consumer education, and engagement of stakeholders who can be key to boosting short-term demand. The ELI Argentina Program will undertake a variety of efficient lighting promotion activities that will be leveraged by coordinated aggressive lighting industry marketing efforts. ELI will provide impartial advice to promote efficient lighting technology to consumer and commercial markets and the professional lighting community. ELI will use popular media, as well as other communication fora to inform consumers directly about efficient lighting economics and applications, as well as to educate lighting and design professionals in order to influence the technologies adopted in new facilities.

81. ELI will also work with established technical institutions in Argentina to support efficient lighting technology performance standards. As in most ELI countries, Argentine consumers encounter a wide range of quality in the efficient lighting options available to them and they lack the necessary information to distinguish between technically sound and inadequate products. An important part of the ELI Argentina public education effort will be the promotion of product quality and efficiency specifications, a recognizable logo and accompanying labeling. The Argentine National Standards Institute (RAM), and the Lighting Professional Association (AADL), have both expressed interest in participating in this process and will help to develop the local framework for qualification of products under the specification. ELI will utilize lighting professionals at Argentine universities to engage the Argentine academic and professional lighting communities in the ELI education and marketing effort. Targeted educational outreach, including mechanisms such as a sponsored luminaire design competition, will be used to leverage both new product development and local capacity building among lighting professionals.

Electric Utility Programs

82. ELI will work with selected electric distribution companies to introduce DSM concepts and develop demonstration projects. ELI will capitalize on existing IFC relationships with private Argentine distribution companies to recruit utilities to participate where appropriate. For example, **Edenor**, a privatized distribution company based in Buenos Aires and an IFC investee company, has expressed interest in exploring investments in DSM technologies to lower their daily peak electricity demand, including developing a residential CFL finance program. **Edenor** has recently experienced high growth in electricity consumption and is concerned that their residential lighting loads are highly coincident with peak demand. Because of this concern, **Edenor** has also stated an intention to participate in the ARGURELEC program. A number of privatized distribution utilities, provincial utilities and cooperative utilities are also candidates for ELI participation and have expressed interest. As a first step in developing this opportunity, ELI will conduct comprehensive cost/benefit analyses of the economics of electric distribution company promotion of efficient lighting; including application of the distributed utility concept. Preliminary assessments of the Argentine tariff structure suggests that electricity distribution companies may face substantial revenue losses from reductions in demand by residential consumers in all but the highest use (high income) category. Therefore, ELI will proceed cautiously in its efforts to engage Argentine utilities in order to ensure that any activities that are developed are in the utility's financial interests and therefore likely to be sustainable.

Transaction Support and Financing

83. In Argentina, there are currently no financing facilities that provide low transaction cost consumer credit for residential sector efficient lighting investments. To promote CFLs in the residential sector, ELI will organize financing programs that allow consumers to purchase efficient lighting products over time. ELI will seek to develop such finance programs with electric distribution companies as part of its utility program. ELI will also explore several existing consumer finance vehicles for adaptation to the ELI lighting market program.

84. The ELI appraisal identified attractive conditions for investments in efficient lighting retrofit projects in the Argentine C/I/I end-user sectors. During appraisal, lighting manufacturers, distributors and electrical contractors indicated interest in developing such projects in this market. In addition, commercial banks have expressed interest in providing financing. Therefore, based on opportunities identified in the market assessment, ELI will concentrate on developing several demonstration projects through its menu of C/I/I transaction and financing support services. Several general opportunities were identified in the appraisal process through coordination with the IFC/GEF Argentina Efficient Streetlighting Program and the IDB's ESCO development initiative. IFC will work through its financial institution partners and its private utility investees to develop financial structures that generate transactions in support of ELI.

Market Aggregation

85. Conditions identified during appraisal indicate an important role for market aggregation strategies in Argentina for ELI. Specifically, such aggregation efforts could provide an

important source of downward pressure on efficient lighting product prices. Argentina enjoys a substantial base of institutional and commercial entities that could serve as partners in a bulk procurement scheme. ELI will provide these partners with technical advice, model innovative consumer financing arrangements and assistance in negotiating with manufacturers. Market aggregation efforts will be coordinated with the ELI public education and quality labeling activities to create additional demand for high quality products. ELI will also organize lighting manufacturers and distributors to identify shared industry objectives for increasing markets for energy efficient technologies and applications for “market washing” programs. Although high efficiency T-8s currently make up 35% of the market for linear fluorescent tubes in Argentina, this figure has failed to increase over the past five to six years despite attempts by individual manufacturers to affect a transition. Subject to the findings of the further market assessment, market washing activities may also be undertaken to increase substantially the saturation of improved electromagnetic ballasts and more efficient electronic ballast, as well as T-S lamps.

Product Financial Incentives

86. The prices of efficient lighting technology in Argentina remain extremely high. Argentine CFL prices, for example, are substantially higher than those in Peru – despite Argentina’s higher sales volumes. Incentives can play an important role as a promotional tool to boost product sales volumes in the short-term. Potential applications for incentives identified during appraisal include boosting the large-scale efficient lighting product procurements, compensating financial institutions and developers for initial transaction costs of model financing transactions, encouraging electric distribution company demand management activities, and leveraging product marketing partnerships with manufacturers. Incentives will be only made available for a limited time, on a competitive basis, with care taken to leverage contributions from lighting industry source or other stakeholders.

Peru Programs

Market Overview

87. Of all ELI participant countries, Peru has the most extensive experience promoting efficient lighting. The Peruvian national government’s “Proyecto para Ahorro de Energía” (PAE) program has successfully raised consumer awareness of energy efficiency in general and CFLs specifically since 1995. In addition, CENERGIA, based in Lima, is one of the most technically capable NGOs dedicated to energy efficiency in South America. ELI activities in Peru will build on the foundation laid by PAE and CENERGIA to strengthen Peruvian consumer demand for energy efficient lighting products.

88. An immediate opportunity exists for ELI to develop utility programs in the southern region of Peru. The destruction of the Machu Pichu hydroelectric facility near Cusco through El Nino-related storms in 1998 has caused the Peruvian government and three electricity distribution companies on the southern grid to set a DSM goal for immediate peak load electricity demand reductions of 20 MW. Although sales of CFLs have dropped from their peak during the main PAE promotion activities, retail prices have continued to fall to US\$8-9 per CFL. As a result, CFL technology is now within the range of affordability for a large portion of the Peruvian

population. In this context, a public education effort, coupled with manufacturer promotions and the advent of consumer financing facilities, could accelerate greatly the growth of the market. Peru's well-established micro-credit and other consumer finance instruments provides fertile ground for developing model financial structures through ELI that enable the consumer market to attract the first-cost barrier and access cost-effective levels of efficient lighting technology.

89. In the CM sectors, the ELI appraisal team found considerable interest in Peru from lighting equipment manufacturers and financial institutions for developing, implementing and financing efficient lighting retrofit projects and developing lighting ESCOs. ESCOs could provide the impetus for substantial activity in the CM sectors where the economics of efficient lighting are compelling. The IDB efforts to develop ESCOs in Peru presents a good opportunity to leverage additional results in this area.

Public Education, Marketing and Standards

90. All ELI Peru activities will be accompanied by an array of public education activities coordinated with PAE, which continues a national campaign aimed at energy conservation activities generally including lighting help, and structured specifically to strengthen and extend the EE message that PAE has been conveying to Peruvians. PAE has laid an excellent foundation for ELI's public education and technology marketing effort, but their campaigns have been primarily targeted to higher income residential consumers. ELI will capitalize on the experience of PAE to extend the message to other key lighting consumer groups in support of specific initiatives of ELI. In support of this effort to build consumer awareness and confidence in new efficient lighting, ELI will coordinate its efforts between the Argentineans and Peruvians on product performance standards, in order to establish if feasible a Peruvian/South American standard supported by the ELI logo.

Electric Utility Programs

91. Two significant opportunities in the electric utility distribution sector emerged during appraisal: (i) with Edelnor, a privatized utility in the Lima area, where poor bill payment practices among low income customers presents an opportunity for demand management using CFL technology; and, (ii) distribution companies in southern Peru, which face power shortages in the immediate future. ELI will engage these companies in developing CFL finance programs that target residential lighting use that is coincident with peak demand. Edelnor estimates a program size of 300,000 CFL units and preliminary ELI appraisal estimates indicate potential to distribute directly 250,000 CFLs in southern Peru.

Transaction Support and Financing

92. ELI's financial transaction support strategy targets both residential sector consumers and larger CM sector users. In each case, ELI will provide technical support to facilitate the establishment of model transactions which can then be folded into the other elements of ELI to encourage replication in the marketplace. Two financing initiatives will be organized supporting the ELI Peru program's work in the residential sector. First, a utility-based CFL finance program will be undertaken with partner electric distribution utilities, mentioned above. IFC has

commenced development of two such complementary transactions to ELI in Peru: a US\$2.5 million transaction through a private ESCO intermediary, and a US\$3 million capitalization of a consumer finance facility through a private utility. Second, in geographic areas where the CFL promotion campaign is targeted, existing consumer finance facilities will be mobilized to support CFL sales. Peru has a strong base of consumer and micro-credit finance networks that ELI will mobilize to reach a significant number of households. For example, three financial institutions in aggregate have over 750,000 households as existing customers in both urban and rural areas. IFC expects ELI to work with **Financiera Solucion**, a credit card company, **Banco de Trabajo**, offering household loans, and **FENCREP (Federacion Nacional de Cooperativos de Ahorro y Credito)** representing the credit cooperatives, in developing consumer financing facilities for efficient lighting investment. The project appraisal also indicated opportunities for **pay-on-paycheck** schemes, which can be provided to public sector employees, as well as through large private employers.

93. A primary means of approaching the C/I/I market will be through industry associations. The IDB's ESCO development effort in Peru focuses on industrial sector end-users and will work through several strong industry associations in Peru representing, in particular, the finance, mining, and petroleum industries. These industry associations provide a natural conduit for implementing ELI's market aggregation, consumer education, and model transaction strategies in this important sector.

94. Public lighting represents a special case. Based on the experience of **Luz del Sur**, a Lima-based private distribution company evaluated during appraisal, it appears that there exists economic potential for efficient lighting retrofits in the public streetlighting sector. ELI will seek to design appropriate institutional, contractual and financial arrangements for developing and implementing projects in this sector as part of the model transaction and ESCO business development programs discussed above. ELI will bridge the experience of the IFC/GEF Efficient Streetlighting (MSP) in Argentina, which is actively developing models of cost-effective public lighting finance projects.

Market Aggregation

95. In addition to the utility-based program to aggregate the residential market for CFLs, ELI will work with a variety of industry associations, including the substantial mining and petroleum sectors and the health care industry, as well as national government agencies and municipalities, to organize consumer purchasing pools. These consumer pools will provide an attractive venue for lighting industry promotions, provide a defined market for newly-emerging ESCOs to launch new financing instruments and to encourage industry to introduce efficient lighting technology with appealing performance and cost characteristics.

Financial Incentives

96. As in other ELI countries, financial incentives will be applied in Peru only in very targeted, short-term applications. They will be used to raise awareness and familiarity of energy efficient lighting technology in support of ELI's public education strategy or to market a broader initiative with the capacity to sustain itself once the subsidy is removed. One example would involve the

use of subsidies to compensate for transactions costs of first-time start-up consumer credit mechanisms targeting CFLs or other efficient lighting products.

South Africa Programs

Market Overview

97. In May 1998, South Africa's dominant electricity generation, transmission, and distribution company, Eskom, signed an agreement with IFC to implement a US\$225,000 PDF Block B grant for future development of the ELI South African program. Under the PDF, Eskom investigated opportunities for promoting efficient lighting in the residential sector, (focused on the low-income and newly electrified communities, plus existing disadvantaged group household markets), as well as opportunities in the C/I/I lighting market. The ELI work plan for South Africa reflects the findings of the PDF work completed to date. Most ELI South Africa activities will take place in close coordination with Eskom, which has signaled its willingness to commit substantial co-financing resources that may potentially triple the scale of the ELI program activities in South Africa. As a result, a relatively large portion of the ELI South Africa budget is allocated to electric utility program activities that complement and leverage the potential Eskom investment in particular with the municipal utility sector.

98. South Africa is mid-way through a household electrification program that will produce over 4 million new hook-ups in previously **unelectrified** black townships. Incandescent lights are being supplied with many of these new connections. The electrification program represents a one-time opportunity to introduce efficient lighting infrastructure directly along with new electric service to newly connected homes. Eskom faces a major threat to its profitability from the impacts on its load profile associated with these new consumers. Specifically, Eskom's new customers use a high proportion of their electricity for lighting, which is highly coincident with Eskom's system peak demand. Therefore, Eskom's immediate business interests are helping to drive its commitment to ELI. The ELI program in South Africa is intended to leverage this commitment in order to expand the impacts of the initiative and to institutionalize EE market transformation techniques in South Africa through local capacity building.

99. While Eskom generates virtually all electricity in South Africa, it directly services approximately 40% of all residential sector customers, with the balance served by **municipally-owned** electric distribution utilities ("Munics"), which are therefore a critical target for ELI programs. Electricity sales are an important source of revenue for South African municipalities, but few local governments appreciate the potential for demand-side investments to **cost-effectively** reduce their peak loads. In addition, some 40% of Munics are bankrupt and therefore incapable of undertaking effort to assist their customers in financing product purchases. ELI will work with private sector partners and Eskom to develop DSM program designs that yield substantial benefits to both consumers and Munics.

Public Education, Marketing and Standards

100. Eskom's market research shows that current awareness of energy efficient lighting is low across all income segments and energy consuming sectors in South Africa. ELI will carry out a broad-based public education campaign coordinated with Eskom's *Elektro Wise* initiative. The campaign also will build partnerships and develop linkages with external institutions including schools' curriculum bodies, marketing and design groups, and groups within the lighting product supply chain. ELI will work specifically with low-income Black South Africans through existing small business and community development initiatives in the townships. The tools developed for the public education campaign will be consistent with the exception of language-across all residential market segments. Evidence from past marketing efforts targeting black townships suggest that traditional advertising is ineffective for this consumer group. ELI will deploy alternative methods that have proven successful for this target group in conducting its outreach efforts.

101. ELI will build upon relationships developed through Eskom's collaboration with the lighting industry on special efficient lighting promotions over the last few years. ELI will also initiate programs with more informal retail outlets including small shops and smaller vending agents in these communities traditionally underserved by retail services. Through these and other channels, ELI will also create an industry forum to maintain ongoing communication throughout the supply chain. ELI will collaborate with the South African Bureau of Standards and Eskom to establish the product quality specifications. In addition, ELI will work with Eskom to adapt the ELI program logo and product labels and test them in focus groups and field studies around the country.

102. Residential luminaires currently available in the South African market do not easily allow the use of CFLs. ELI will promote the design of affordable, CFL-friendly luminaires through a national design competition. This competition will build the awareness of interested parties in the South African luminaire manufacturing industry and should result in the development of widely replicable luminaire designs that can be locally produced, possibly generating new employment. The competition will link to small-scale, township-based manufacturers to give them access to new energy efficient designs. ELI will engage South African professional associations and engineering and architectural schools through professional association newsletters and conferences.

Electric Utility Programs

103. Most ELI activities in South Africa are being undertaken as part of an electric utility program, first with Eskom, and secondly with selected Munics. The initial priority is for Eskom to provide a CFL, instead of an incandescent lamp, with each new domestic hook-up at the time of new customer connection. Spurred by its involvement with the ELI PDF, Eskom has developed an electrification package that includes efficient lighting. Eskom will test this package to determine customer acceptance and support mechanisms in early 1999 before implementing it nationally in the ongoing electrification project. ELI and Eskom will then promote these technical solutions amongst the Munics. The CFL program is also being tested for

implementation in conjunction with the South African government's ambitious Reconstruction and Development Program (RDP) to build one million new homes by the end of 1999. In addition to the system benefits, energy efficient lighting should dramatically lower the cost of lighting service to new low-income customers.

104. Due to historical inequities in South African housing, low-income households have historically been underserved by retail services of all types. ELI will help to create new distribution chains to make energy efficient lighting products available to low-income electricity consumers. ELI will work with Eskom to distribute energy efficient lighting directly from Eskom retail pay stations-in low-income areas. If successful, this approach can also be adapted to middle- and high-income households. Eskom is currently testing this option in Soweto. With assistance from ELI, Eskom will investigate ways to provide the vendors with inventory financing to allow them to sell or lease efficient lighting products.

Transaction Support and Financing

105. A residential sector CFL finance program is being developed by ELI to address the high initial cost barrier and allow end-users to acquire CFLs with payments over time matched to their energy cost savings. The program is designed to deliver financing to several distinct residential subsectors: (i) Eskom's (typically low income) pre-pay customers, (ii) Eskom credit billing customers, (iii) municipal utility customers. A version of this program will also be prepared for implementation by interested Munics, with Eskom assisting interested Munics by transferring its financing and collections systems to the Munics. For Munics, the Development Bank of South Africa (DBSA) is a likely source of funding for this program and is expected to be an ELI partner in approaching municipal utilities.

106. The appraisal team identified several other finance delivery mechanisms that ELI might adopt in South Africa, including: (i) product financing with utility bill collections, or via the pre-pay meter system; (ii) financing through pre-pay token vendors, (iii) lighting distributors and retailers financing, and (iv) other channels of consumer/household finance such as micro-credit enterprises. ELI will likely encourage financing to be delivered through multiple methods to support the development of a variety of product distribution channels.

107. The ELI appraisal in South Africa identified strong economics for efficient lighting retrofit projects in the C/I/I end-user sectors. Some lighting manufacturers, distributors and electrical contractors have expressed an interest in developing and implementing projects in this market. ELI will work to establish model transactions and help to arrange financing and technical information for entities interested in entering into ESCO-type deals. Eskom has also indicated interest in developing a financing program for C/I/I sector customers with energy efficiency finance payments incorporated into the customer's utility bill.

Market Aggregation

108. ELI will seek to organize consumer groups into buying blocks. ELI will use its strategic partners in South Africa, including Eskom and the Munics, as organizing vehicles for large groups of consumers (including building contractors and tradesmen). Bulk purchase consortia

organized through Eskom, the **Munics**, and through large retail store chains, can provide ELI with additional leverage to help establish its performance standards and product labeling system and thereby address consumer concerns about product quality.

Financial Incentives

109. Due to Eskom's significant financial commitment to promoting energy efficient lighting, it is not expected that it will be necessary to use ELI program resources to provide product financial incentives to Eskom customers. However, ELI might be required to deploy subsidies on a limited basis as a component of the promotional activities to be developed with manufacturers for **Munic** customers.

VII. CROSSCUTTING AND MULTI-COUNTRY ACTIVITIES

Introduction

110. In addition to administrative and management efficiencies, the multi-country structure of the ELI program also provides opportunities to spur greater global market impacts, as well as to ensure a more effective program within the target countries. In order to take full advantage of the leverage inherent in this multi-country effort, and achieve ELI's full potential as a market transformation initiative, each country program must function as a component of a central, integrated, multi-country program. This multi-country program will include several crosscutting, multi-country activities which aim to exploit opportunities for shared learning and program replication (both among and beyond the target countries), and for capitalizing on the leverage presented by a coordinated multi-country effort.

Overview of ELI's Crosscutting, Multi-Country Activities

The individual crosscutting activities are described below:

111. *Program monitoring and evaluation:* While local program evaluation will be carried out in each country by third party contractors under the supervision of the **RIEs** for each region, the overall program monitoring and evaluation (M&E) for ELI will be designed and managed centrally by a contractor responsible directly to IFC. This will establish continuity in the measurement standards and processes used in each country. The result should be better **program-**wide data, and more robust aggregate evaluation results.

112. *Technical specifications development:* ELI will seek to establish a single program-wide product standard, as appropriate, for each technology it supports. These product specifications, which will support ELI's market aggregation, product certification, bulk purchase, and price subsidy activities, will be adapted for local country conditions. This will maximize market efficiencies and magnify the impact of the program to the global lighting industry. Thus, the development and administration of these specifications will be undertaken, wherever appropriate, on a multi-country basis in order to leverage their global relevance and potential market influence.

113. *Product quality assurance:* The certification and testing of products will be undertaken on an international basis, as appropriate. The intent is to establish an ELI standard of excellence that can be adopted by the industry on a regional or even a global scale, where appropriate. This effort will seek to support product testing infrastructure within the ELI countries where it exists already. The intent is to strengthen a product performance testing infrastructure that will cost-effectively support the development of regional efficient lighting markets.

114. *Structured learning:* Perhaps the greatest leverage point of the multi-country program design will emerge from ELI's centrally managed structured learning initiative. By engaging all ELI country-level consultants, local implementing partners, and RIEs in formalized information sharing, the individual participants can leverage each others' successes and avoid repeating difficulties encountered elsewhere in the program. Further, by centralizing a structured repository for all ELI experience (which will be accessible on the internet), as well as establishing an open conduit for accessing ELI specifications, methodologies, and even technologies, ELI can leverage the experience in any one country to other countries both within and outside ELI.

115. *Program design:* A subset of the structured learning function is ELI's coordinated country-level program design process. The five ELI market accelerator strategies provide a template from which the individual country programs are derived. The conditions in each country dictate which elements of the program will be emphasized, and what form they will take in each country. The ELI program design process will maximize the benefits from shared knowledge of relevant past and current experiences in all ELI countries. The country-level program design will thus result from a collection of inputs:

- concepts and approaches described in and opportunities identified during the project appraisal;
- past experience of the RIEs and their local project managers and local partners; and
- current experiences and ideas of their counterparts in other ELI countries, as well as information and opportunities developed during market studies undertaken as the first step of implementation.

This creative process will be facilitated through the structured-learning process as administered centrally within ELI.

116. *Manufacturer communications and engagement:* ELI's primary objective is to accelerate the growth of the global market for energy efficient lighting technology. A key driver in this market is the lighting industry itself. The industry's efforts to innovate and adapt new technology, aggressively market efficient technologies, and drive the development of the developing country markets for efficient technology, will largely determine the success of ELI, as well as its sustained impact. ELI has already received significant attention from the lighting industry, which is attracted to ELI because the program represents a single conduit for accessing market development activities in seven countries in four widely dispersed geographic locations.

117. From the industry perspective, ELI can perform an honest broker function with tremendous value for all manufacturers collectively. In the process of introducing new high-value

technologies, such a credible third party can play a role that no single manufacturer can effectively play itself. ELI's capacity to aggregate multiple government and non-governmental actors in a variety of procurement and other market development initiatives, to establish performance standards and evaluate products, and to provide credible consumer information for the marketplace, all represent valuable market development roles that ELI will fulfill through its interactions with lighting manufacturers.

118. International Market Aggregation: A variety of market aggregation opportunities will emerge during each country's market conditioning activities. By establishing an identity with the international lighting industry, ELI will be able to leverage the buying power of each individual country program through multi-country/multi-program market aggregation activities. For example, a manufacturer in Asia might be induced to invest in the product innovation required to meet performance specifications particular to the Peruvian market (for which functional products might not currently exist because of producer inattention to a small, nascent and immature market). The attraction of the ELI complex of countries – allowing producers to feed their products into multiple markets through a single conduit – can induce expanded investments for such emerging markets. These markets are often deemed unattractive to manufacturers absent such an aggregation program, and without the market conditioning activities developed for each country within ELI.

119. Program Marketing and Logo Development: Where culturally appropriate and legally permissible, ELI will trade on a central ELI marketing program. This program will ideally feature a common international program identity and logo (using the logo from the PELP program, from which the ELI program was derived). Such a common marketing theme can leverage each country-level marketing effort for greater regional and international market impacts. It will allow substantial cost efficiencies and provide a very large ELI target for the global lighting industry.

120. The implementation, management and administration of ELI's crosscutting activities is summarized in Table 1X-2.

VIII. PROGRAM IMPACTS

121. The ELI program components that have been tailored for the first tranche countries will yield substantial environmental and economic benefits for a wide range of beneficiaries. As shown below in Table VIII- 1, it is estimated that ELI will reduce CO₂ emissions by more than 4 million metric tonnes. If the reductions that occur during the two years of program implementation alone are considered ("direct impacts"), the costs are US\$15.80/tonne. When the reductions resulting from the expected market accelerate effects ("indirect impacts") are also considered, the cost drops to less than US\$2.00/tonne. Since ELI is primarily a market transformation program, it is essential to include both the direct and indirect impacts. The direct impacts can be thought of as a short-term by-product of the activities that are intended primarily to transform the market for the long-term.

Table VIII-1: Projected Amount and Cost of CO₂ Reductions due to ELI⁴

Country	Estimated Total Avoided GWh	Estimated Total Avoided CO ₂ (Tonnes)	Cost in US\$/metric tonnes CO ₂ (Direct Impacts Only)	Cost in \$/metric tonne CO ₂ (Total Impacts)
Argentina	2,424	652,163	\$26.07	\$3.76
Peru	3,630	1,299,561	\$13.98	\$1.98
South Africa	2,262	2,622,000	\$13.10	\$1.17
Total	8,316	4,573,724	\$15.80	\$1.79

122. In addition, the ELI activities are estimated to generate significant economic benefits for the participating countries. An analysis was conducted for each of the three Tranche I countries to assess the net benefits and the benefit/cost ratio of the program from a societal point of view. The analysis was calculated for direct impacts, as well as for direct plus indirect (“total”) impacts. As shown in Table VIII-2 below, the analysis estimates that ELI activities in the Tranche I countries will generate net benefits of over US\$165 million. The complete analysis is detailed in Annex E.

Table VIII-2: Projected Net Benefits for ELI Tranche I (in US\$ Million)

Country	Net Benefits – Direct Impacts	Net Benefits - Total Impacts
Argentina	\$4.3	\$23.7
Peru	\$15.8	\$55.2
South Africa	\$8.4	\$86.4
ELI Tranche I	\$28.5	\$165.3

IX. PROGRAM MANAGEMENT AND ADMINISTRATION

Overview

123. Central administration of ELI at a regional level will capture economies of scale that deliver significant leverage for GEF funding in each of the seven ELI countries. Part of this leverage will be realized through the market aggregation and other crosscutting programmatic activities that benefit from engaging private sector entities across the global lighting industry. Additional leverage will accrue from administrative economies that can result from a program management structure that consolidates oversight over multiple country programs. Further leverage emerges through IFC, whose private sector mandate and established financing relationships provides a basis for arranging complementary private sector investment or promoting financing by commercial financial institutions as a sustaining outgrowth of the ELI program. Finally, the

⁴ Note: During the appraisal process, IFC gathered additional data that allowed it to refine its projections. All assumptions are shown in the tables at the end of Appendix E.

Regional Implementing Entities – western electricity utilities with a strategic interest in participating in the program – are expected to administer ELI at-cost, supplementing GEF resources with their own resources in order to realize its effective implementation.

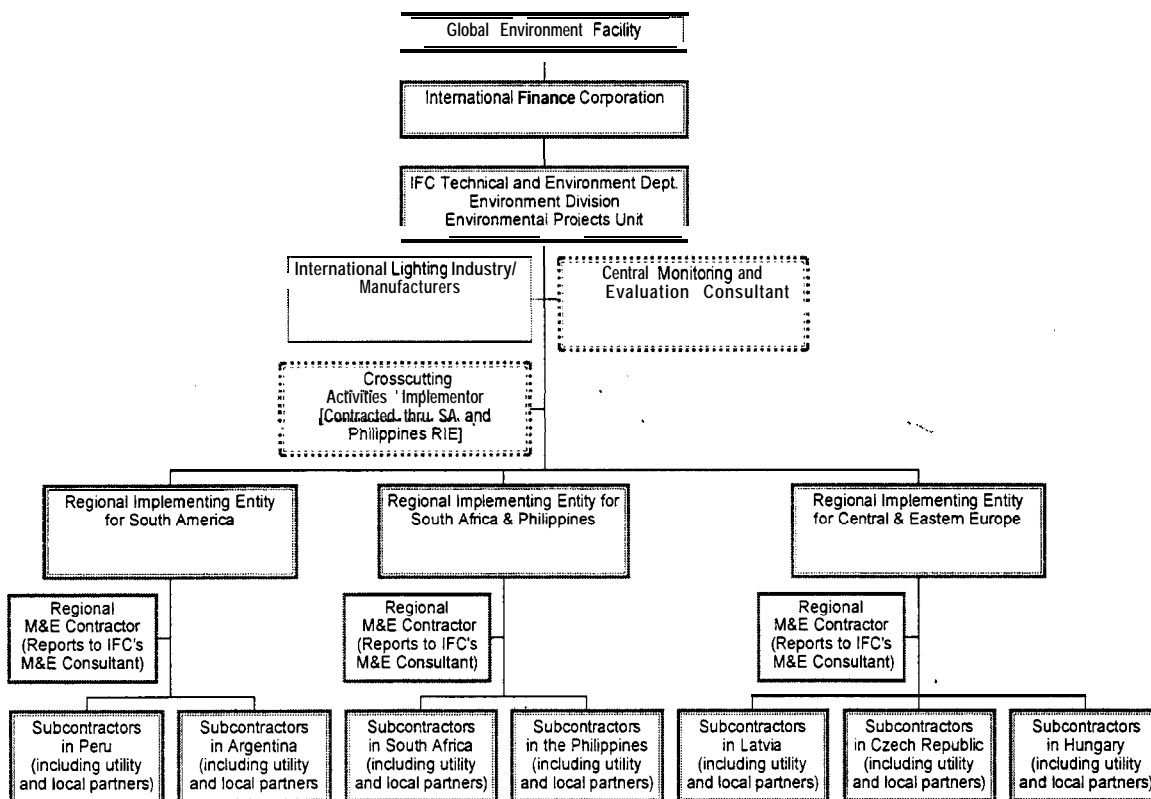
Program Administration and Management Structure

124. As the private sector arm of the World Bank Group, IFC serves as the GEF executing agency for ELI, acting through the World Bank, as GEF Implementing Agency. The proposed ELI program management structure enables IFC to oversee program implementation, a network of regional implementing entities, as shown below in Table IX-1. IFC's direct involvement in ELI implementation will enable development of opportunities for leveraging GEF-funded ELI activities with additional private sector investment or financing generated through spin-off transactions.

125. Because of the geographic diversity of the project countries, it was not possible to identify a single suitable implementing entity with the capacity to administer and manage the global implementation of ELI in all seven countries. Therefore, IFC disaggregated the ELI countries into regional management groupings that would still preserve the efficiency of a greater degree of central management, while providing effective oversight and management of program implementation in each individual ELI country. The three regional groupings are: (i) Argentina and Peru (ii) Czech Republic, Hungary, and Latvia; and (iii) the Philippines and South Africa. Disaggregating the seven ELI countries according to region also provides an opportunity to sequence the implementation of ELI activities, which will create a more manageable implementation process. Sequencing will also provide an opportunity to better develop program designs and build stronger networks of local partners in those countries with lesser developed utility, lighting market, and public and non-governmental institutional capacity in place. These benefits led to the decision to divide ELI into two tranches for program implementation as described in the Project *Scheduling* section of the Project Concept Document:

- (i) Tranche I: Peru, Argentina, and South Africa;
- (ii) Tranche II: Czech Republic, Hungary, Latvia, and Philippines

Table IX-1: ELI Program Management Structure



126. Although IFC surveyed and engaged many local entities with expertise and capacity in the efficient lighting sector in each ELI country, none of the in-country entities were deemed to have the capacity and presence to assume the multi-country program management and administration role on its own. ELI will therefore apply the management structure successfully used in PELP to each of the three regions. Like PELP, ELI will rely on an experienced international utility company partner with strong financial and administrative capability and established local capacity as the responsible regional implementing entity for each region. Each RIE will then engage local entities for a substantial role in country-level program implementation working as subcontractors.

127. Three RIEs will each carry primary implementation responsibility for a multi-country region. The RIEs will contract with IFC to administer contracts, engage local consultants and partners, and support regional monitoring and evaluation programs. IFC will provide guidance to the RIEs in engaging local partners that build on relationships established during project appraisal and that support ELI's implementation objectives.

128. The RIE responsible for South Africa and the Philippines will also form an association with a fourth entity (the Crosscutting Activities Implementor) which will manage the global crosscutting activities (see *Section VII*). The fund management and monitoring responsibilities

for these crosscutting activities will be administered through the RIE, who will contract directly with IFC for these services.

Role of IFC

129. IFC will retain full fiduciary responsibility for administration of GEF funds. It will execute this responsibility through direct oversight of the three RIEs. In addition, IFC staff and consultants will directly engage in supervision of program elements where its experience and capabilities bring considerable leverage to the GEF program activities. For example, IFC has specific experience providing transaction support in the finance and energy sectors in the ELI countries. IFC will leverage this capacity, coupled with its access to additional local and international partners and resources, both to expand the scope of the ELI activities, and to help build local institutional capacity to sustain ELI objectives beyond the life of the GEF grant.

130. IFC will also participate with engagement of the lighting industry and on crosscutting relevant initiatives. This role will be important in realizing the ELI objective of launching a substantial effort by the international lighting industry to develop and expand the market for efficient technology in the seven ELI countries, and more broadly on the four ELI continents. Finally, IFC will retain supervisory control over the monitoring and evaluation (M&E) component of the program to ensure that the GEF's requirements are met. IFC will work through an M&E expert consultant to oversee the M&E for each region and to ensure continuity in the data developed for use in a program-wide M&E program. The consultant will have expertise with market transformation and GHG mitigation projects.

Management of Monitoring and Evaluation Functions

131. The M&E responsibilities for each country program will be contracted by the RIEs to specialized M&E firms in each region. These regional firms will coordinate with IFC's M&E consultant in implementing the global M&E plan for ELI. The IFC will retain oversight responsibilities for the multi-country M&E process through its M&E consultant who will be responsible for developing a multi-country M&E protocol and plan, coordinate the regional M&E efforts on behalf of IFC, and ensure adherence to the global protocol and continuity of data developed by the regions. The RIEs will be contractually bound to provide to the regional M&E firm full access to the program data and to support the M&E effort by generating on-going monitoring reports in support of the M&E protocol developed by IFC's M&E consultant. Finally, the M&E consultant will aggregate the regional results into a global program evaluation.

Management of Crosscutting Multi-Country Activities

132. The functional operation of the multi-country activities coordinated through the Crosscutting Activities Administrator (CAI) are described in depth in Section VII: Crosscutting and Multi-Country Activities. The management of those activities, and the implementor roles are described in Table process is described in Table 1X-2, below.

Table 1X-2: Management Structure of ELI Crosscutting and Multi-Country Activities

<i>ELI Crosscutting Program Element</i>	<i>Implementor</i>
<i>Program Monitoring and Evaluation</i>	<i>Development of M&E Plan: Managed, by IFC; implemented by central M&E consultant . Local monitoring and data gathering: managed and administered by Regional Implementing Entities with input from M&E contractor, implemented by local contractors.</i>
<i>Technical Specifications Development</i>	<i>Coordinated by CrossCutting Activities Implementor; Management oversight by IFC; Administered by Regional Implementing Entity for SA and Phil.; Implemented by technical experts.</i>
<i>Product Quality Assurance</i>	<i>Coordinated by CrossCutting Activities Implementor globally and by Reg. Impl. Entities regionally; Administered by RIEs, Implemented by technical experts and local partners.</i>
<i>Structured Learning</i>	<i>Managed and implemented by CrossCutting Activities Contractor; Administered by RIE for SA and Phil.</i>
<i>Program Design</i>	<i>Coordinated by Crosscutting Activities Contractor; Supported by IFC, Administered by RIEs; Implemented by RIEs and local partners.</i>
<i>Manufacturer Communications and Engagement</i>	<i>Global communication: Managed, administered and implemented by IFC; results disseminated through Crosscutting Activities Implementor; Regional communications: managed by IFC, administered and implemented by RIEs; Results disseminated through Crosscutting Activities Implementor.</i>
<i>Multilateral Market Aggregation</i>	<i>Program-wide efforts: Managed by IFC, Implemented by RIEs; Regional efforts: implemented by the RIEs and locally by RIEs with local partners.</i>
<i>Program Marketing and Logo Development</i>	<i>Managed by IFC; implemented by the Regional Implementing Entities.</i>

X. TRANCHE I PROJECT BUDGET AND USE OF GEF FUNDS

Background

13 3. The budget for Tranche I of ELI includes funding for all program activities to take place in Argentina, Peru and South Africa, as well as the management and administration budget for the entire seven country initiative. The ELI PCD described how implementation will proceed in two parts, with Tranche I undertaken to establish program management, administration, and to develop the global structured-learning and monitoring and evaluation infrastructure, as well as to commence country program work in the three countries where immediate opportunities dictate an earlier start-up.

134. Program designs, and thus budget allocations, were developed based on local conditions in each country. For example, the lack of prior energy efficiency promotion campaigns in Argentina requires that a larger percentage of the total program budget be targeted for public education activities. In Peru and South Africa, partnerships with organizations that have energy efficiency program experience has resulted in budget allocations that complement existing programs or capabilities. Finally, a small portion of each country program budget is allocated for crosscutting activities to be undertaken in conjunction with other ELI countries.

135. As shown in Table X-1 below, the total GEF budget for ELI is US\$15 million. Eighteen percent, or US\$ 2.75 million, of the ELI budget has been designated for management activities. These activities include administrative costs incurred by the Regional Implementing Entities (RIEs), monitoring and evaluation costs, and centralized program support costs for activities undertaken by the Crosscutting Activities Implementor (CAI).

Table X-1: ELI Tranche I and II Program and Management Budgets (in US\$ Million)

ELI	Program Budget	Mgt. & Admin Budget ⁵	Total
Tranche I	\$ 6.6 million	\$ 2.75 million	\$ 9.35 million
Tranche II	\$ 5.65 million		\$ 5.65 million
Total	\$ 12.25million	\$ 2.75 million	\$ 15.0 million

ELI Management and Administrative Budget

136. The entire ELI administration and management budget will be required concurrent with the implementation of Tranche I. This will enable IFC to establish the administrative infrastructure necessary to implement the project in a timely and efficient manner. Two RIEs (one for Argentina and Peru, one for South Africa) and the CAI must all be contracted for activities to be executed under Tranche I of ELI. Because the same RIE will administer ELI both in South Africa in Tranche I and Philippines in Tranche II, the total administrative budget applicable to ELI activities in both countries must be available during Tranche I. The CAI will also be contracted during Tranche I start-up, therefore the ELI management budget that will need to be encumbered during Tranche I is almost US\$ 2.2 million. IFC requests that the remaining US\$ 550,000 of the total ELI management budget also be made available during Tranche I to allow flexibility in negotiating monitoring and evaluation services and to allow competitive consideration of all potential RIE candidates during a single selection process followed by negotiation of contracts.

⁵Includes monitoring and evaluation, program management, administration, and multi-country crosscutting activities (including structured learning).

137. The budget for activities not directly tied to specific country programs includes three components: M&E costs; administrative costs incurred by the RIEs; and centralized program support costs for activities undertaken by the CAI. The ELI management and administrative costs for both tranches, combined, are summarized in Table X-2 below.

Table X-2: ELI Management and Administration Budget

Component/Activity	Global	Region 1 (Argentina, Peru)	Region 2 (Philippines, South Africa) (+ Crosscutting Activities)	Region 3 (Czech Rep., Hungary, Latvia)	Total
Regional Mgt./Admin.					
<i>Total RIE Budget</i>		\$ 480,000	\$ 525,000	\$ 510,000	\$ 1,515,000
Country Prog. Mgt		\$ 205,000	\$ 230,000	\$ 215,000	
Administrative Support/Legal		\$ 175,000	\$ 195,000	\$ 195,000	
Direct Expenses		\$ 100,000	\$ 100,000	\$ 100,000	
Crosscutting Activities	\$ 320,000				\$ 320,000
Structured Learning	\$ 260,000				
Prog. Design Coordin.	\$ 20,000				
Tech Specs/Product Quality	\$ 40,000				
Monitoring and Evaluation					\$ 915,000
<i>Regional M&E Activities</i>		\$ 200,000	\$ 200,000	\$ 200,000	\$ 600,000
During Program		\$ 150,000	\$ 150,000	\$ 150,000	\$ 450,000
Post Program Mrkt Eval.		\$ 50,000	\$ 50,000	\$ 50,000	\$ 150,000
<i>Global M&E Program Coord.</i>					\$ 315,000
M&E Plan	\$ 50,000				
Prog. Eval. Coordination	\$ 145,000				
Post Program Mrkt Eval.	\$ 120,000				
ELI Program Mgt. And Admin Total					\$ 2,750,000

ELI Program Budgets

138. Budget allocations under ELI have been made based on projected needs in each Tranche I country with regard to the five program areas described previously: (i) Public education; (ii) Electric utility programs; (iii) Transaction support; (iv) Market aggregation; and (v) Product financial incentives. Table X-3 shows the allocation of ELI program funds among these program areas. It also provides additional budget detail for certain components of these program areas, including activities undertaken locally in conjunction with multi-country crosscutting initiatives (indicated by "CC"). In addition, the Table shows the projected costs of undertaking a comprehensive market study at the outset of program implementation in each country. Further explanation of the allocation of funds among these program areas is provided below.

- Public Education: In order to establish a consistent system of ELI product quality specifications and to globalize the ELI program identity, ELI will coordinate the testing of

product performance on a multi-country basis. Thus, equal allocations have been made to each of the three Tranche I countries under this crosscutting activity.

- Utility Partnerships: The differences in the budget allocation for utility activities among the Tranche I countries reflects variations in the opportunities presented by the electricity sector profiles in each country, and the corresponding interest of distribution companies in each market. In South Africa, because of a need to engage the **Munics** in the delivery of programs directed to the black townships and leverage the very strong potential commitment of resources to ELI made by Eskom, half of the ELI program budget will be spent on utility sector activities.
- Transaction Support: It is expected that ELI's allocation of funds for model transactions in Argentina will be lower than other Tranche I countries because of the transactional orientation of the complementary IFC/GEF Argentina Efficient Streetlighting Project.
- Market Aggregation: While significant opportunities for aggregation exist in all three Tranche I countries, it is expected that South Africa's substantial distance from other ELI countries will greatly reduce opportunities to engage the South Africa program in any multi-country market aggregation efforts
- Product Financial Incentives: Consistent with the strategic approach that defines ELI, and in keeping with guidance from the GEF, the ELI budget includes only minimal allocations for financial incentives, including subsidies. The final budget allocations for subsidies have been reduced significantly from the level estimated in the ELI Project Concept Document.

Table X-3: ELI Tranche I Draft Implementation Budget

<i>Program Area</i>	<i>Argentina</i>	<i>Peru</i>	<i>South Africa</i>	<i>Total</i>
Preliminary Market Assessment	\$ 50,000	\$ 50,000	\$20,000	\$120,000
Public Education	\$925,000	\$800,000	\$775,000	\$2,500,000
Product Testing (CC)	\$75,000	\$75,000	\$75,000	\$225,000
Quality Specifications & Labeling (CC)	\$50,000	\$50,000	\$50,000	\$150,000
Local Structured Learning & Training (CC)	\$75,000	\$125,000	\$75,000	\$275,000
Consumer Education	\$650,000	\$500,000	\$500,000	\$1,650,000
Professional Education	\$75,000	\$50,000	\$75,000	\$200,000
Electric Utility Programs	\$500,000	\$400,000	\$1,000,000	\$1,900,000
Transaction Support	\$250,000	\$450,000	\$480,000	\$1,180,000
Market Aggregation	\$100,000	\$100,000	\$100,000	\$300,000
Local Market Aggregation	\$50,000	\$50,000	\$100,000	\$200,000
Intl. Market Aggregation (CC)	\$50,000	\$50,000	\$0	\$100,000
Product Financial Incentives	\$175,000	\$300,000	\$125,000	\$600,000
Direct Product Promotion	\$175,000	\$300,000	\$125,000	\$600,000
Total Budget	\$2,000,000	\$2,100,000	\$2,500,000	\$6,600,000

Notes: Country budget contributions to locally based crosscutting activities total \$750,000.

XI. MONITORING AND EVALUATION

Introduction

139. IFC will centrally contract a monitoring and evaluation (M&E) consultant to develop a comprehensive ELI M&E plan. The RIEs will be responsible for the regular generation of program monitoring inputs to support the implementation of the M&E plan, as well as for administering the regional M&E programs. During implementation, regular IFC project supervision and financial controls will supplement formal ELI M&E efforts. Program evaluation will be performed by the M&E contractor on an ex-post basis using standard World Bank guidelines for GEF climate change mitigation projects. This post-program evaluation will take place in two phases. The first will be a program evaluation of the direct program impacts during the two-year implementation and will be completed immediately upon program completion. The second will be an evaluation of long-term market impacts, to be undertaken two years following the conclusion of ELI.

140. ELI's M&E program builds upon lessons learned from the development, implementation and evaluation of PELP, as well as from other lighting market transformation efforts undertaken during the past five years in North America, Europe, Latin America and Asia. ELI's M&E plan will be designed to assess both the direct impacts and the "market transformation" effects of the GEF funded activities on GHG emissions in participant countries. The ELI M&E plan will define a protocol for measuring the contributions to GHG emissions reductions from efficient lighting products that are installed as the direct result of a GEF-funded program activity. The evaluation of market acceleration effects will consider the broader stimulus to local markets for energy efficient lighting products created by the combined impact of ELI program activities. Both the direct impact and market transformation evaluations will collect and apply socio-economic and cross-sectional energy consumption data where appropriate, as well as engineering analyses of projected savings.

Administering and Implementing the M&E Plan

141. Upon approval of the Tranche I Project Document, IFC will engage an independent M&E contractor to work closely with IFC staff and ELI's Regional Implementing Entities to develop a comprehensive evaluation plan for ELI. Environmental benefits will be evaluated using the World Bank's *Greenhouse Gas Abatement Investment Project Monitoring and Evaluation Guidelines for GEF Projects* (June 1994), as well as the World Bank's pending *Monitoring and Evaluation of Market Development in World Bank-GEF Climate Change Projects*. The M&E contractor will be responsible to IFC and will ensure that the M&E activities undertaken regionally meet ELI's program guidelines to allow a consistent program-wide evaluative process across all seven countries.

142. ELI has been designed primarily as a market transformation initiative and the full effect of ELI must therefore be measured by evaluating its indirect market impacts on a longitudinal basis. A key element of the ELI M&E plan will be the post-program market transformation evaluation to be completed after conclusion of ELI program implementation. This evaluation will be

augmented by a subsequent review of market changes to be undertaken fully two years (lighting seasons) after the completion of each ELI country program.

143. Responsibility for implementing the M&E plan regionally will reside with the RIEs. In administering the regional M&E activities, the RIEs will engage M&E contractors, under guidelines set forth by IFC. By virtue of their direct knowledge of the program objectives and implementation, and their proven capacity to conduct such evaluations on large-scale programs under their management, the RIEs represent a very efficient delivery mechanism for ELI's M&E plan. In this way, ELI M&E activities will be thoroughly integrated into the various country program components and integrated across programs to exploit economies of scale and to allow comparative analyses between countries.

144. Market analyses will be undertaken under the direction of the RIEs at the outset of each country program implementation. In addition to providing key data to influence the final country program plans, these analyses will establish an efficient lighting product market baseline against which the market transformation effects of ELI will be measured. Subsequent market research will track market impacts including prices, sales, and availability of energy efficient lighting products.

145. The feasibility and sustainability analyses will include estimates of ELI's "free riders" and "free drivers" when calculating cost-effectiveness. These data will be used to estimate ELI's benefits in terms of avoided electricity generation, reduced peak electricity generation capacity needs, and GHG emission reductions, and attempt to measure the persistence of these benefits once the programs are complete. ELI will also be evaluated to assess project sustainability, including analyses of the financial feasibility of subsequent non-GEF supported, commercial efficient lighting projects.

146. Feedback from monitoring activities will also allow the continual adjustment of ELI program designs to maintain the project's responsiveness to its objectives. The ongoing monitoring results will be used to modify the project's operation including marketing and information activities, the determination of incentive levels, product distribution approaches, and manufacturers' eligibility status for continuing project participation. Monitoring data will also provide a check on and oversight of project lighting manufacturer participants' sales and price performance throughout the implementation process. A preliminary list of market transformation indicators and a more detailed description of the methodology to be deployed in the ELI program evaluation is included in Appendix D: Monitoring and Evaluation Process and Indicators.

XII. STAKEHOLDER PARTICIPATION AND IMPLEMENTATION ARRANGEMENTS

147. Country consultations conducted in 1997 and appraisal activities conducted in 1998/1999 resulted in strong expressions of support to IFC for ELI by host country government agencies, electric utilities, NGOs, lighting manufacturers, financial institutions, and various private sector firms. All major international manufacturers of energy efficient lighting were represented at one of two one-day seminars hosted by IFC in October 1997 and September 1998 to review the ELI concept and preliminary program plans. During early program implementation, ELI will offer

additional opportunities for stakeholder participation at the national and local level. Specifically, ELI will undertake comprehensive market assessments as a first step in program implementation that will rely heavily on input from local stakeholders, including local governments, private financial intermediaries, consumer groups, equipment installers, locally represented lighting manufacturers and retailers, and NGOs.

148. ELI will also support national climate change mitigation efforts and country action strategies. Early in the implementation phase, ELI will establish within each country advisory committees comprised of appropriate representatives of NGOs, government agencies, research institutions and other selected interested parties. The purpose of the committees will be to provide input to the development of individual country implementation plans and to provide an independent review of the activities to be carried out under those plans.

149. Local implementation partners will perform most of the tasks required in the targeted countries. Building upon the experience of PELP, it is a goal of ELI to establish – through these partners – a sustained local capacity to develop and deliver expert lighting and program management services even after ELI’s formal conclusion.

XIII. LESSONS LEARNED

150. ELI will build on lessons learned from “Market Pull” initiatives undertaken over the last several years in North America and Europe which used financial incentives and private sector involvement to accelerate development of the market for energy efficient technologies. The lessons of these efforts indicate that subsidy-based incentives are less important to their success than the power of market aggregation, which can organize fledgling demand for new technology and provide a focus through which industry competitive dynamics can emerge. There is a large body of lighting program experience from which to design future lighting programs with a high degree of cost-effectiveness. This experience comes not just from OECD countries but from developing countries as well. GEF-funded projects in Poland, Mexico, and Thailand show that CFL and other efficient lighting programs can clearly be cost-effective if properly conceived and designed. Specifically, ELI builds on IFC’s experience with PELP, applying in seven countries the substantial lessons of leverage and market development that emerged from PELP.

151. Experience shows that programs designed to accelerate the uptake of efficient lighting technology can deliver significant long-term GHG reductions through an indirect program impact on long-term market transformation. In many cases these indirect impacts are difficult to assess because of the absence of pre-project baselines. In addition to the need to establish a baseline measure of pre-program market activity, full market acceleration effects can only be properly assessed if indirect impacts are monitored at a point some years past project completion.

152. The body of experience with programs designed to promote the uptake of efficient lighting technology indicates that such efforts need to address issues beyond cost-effectiveness. In fact, in most cases, efficient lighting technology represents an attractive and cost-effective investment when considered over the medium-term investment horizon. Rather the impediments to market development for efficient lighting result from a range of quality, information gaps, compatibility,

availability, and consumer acceptance issues for some of these products. These earlier experiences are taken into account in the design of ELI. The body of experience in developing countries yields a range of lessons that have informed the development of ELI, including:

- High first cost is a major barrier, even where life cycle costs are comparatively lower than the inefficient alternative.
- Uncertain product **performance** erodes consumer confidence in efficient technology.
- Operating conditions, including high ambient temperatures, unfavorable orientation, poor power quality, and other factors can combine to lower expected lighting product performance.
- Marketing efforts that focus on the non-energy benefits of energy efficient lighting products, such as reductions in fire hazard, discomfort from excessive heat generation, and long product life, can be highly effective.
- Promoting CFL-dedicated luminaires can avoid “snap-back” -- the future replacement of energy efficient products with less efficient incandescent lamps.
- Public school education programs can be successful in building awareness in the residential sector.
- Public education has often proven most successful with print media and educational efforts involving NGOs and local governments. Program promotion through television advertising has not proven to be as cost-effective.
- NGOs have made valuable contributions in overcoming political and legal difficulties in the design and implementation of programs in several countries.
- Direct mail solicitation proved ineffective in engendering program participation in Jamaica. Direct contact with consumers in utility customer service offices proved much more effective. Likewise, in Mexico, utility offices proved to be a highly successful vehicle for product promotion.
- In Peru, with the influx of several new but lower-quality product brands, the lack of quality product certification linked to quality standards created consumer distrust of the technology broadly, thus undermining a CFL promotion program’s effectiveness.
- Utility DSM programs can raise equity issues in terms of cross-subsidies between customer groups. Poorly considered program designs can also negatively impact the business interests of participating utilities under certain operating conditions. It is thus important to fully understand the tariff structure and load profile of participant utilities before designing a program that is dependent on utility participation.

153. In applying these lessons, ELI builds on the experience of earlier programs which sought to achieve direct impacts through program-induced efficient lighting sales primarily from product subsidies. Specific examples of these demonstrations include the Mexican Ilumex GEF project, the Jamaica DSM program, and Brazilian subsidy and CFL give-away programs. These demonstrations achieved CO₂ reductions at approximately US\$25-\$40/ton. ELI captures some of the lessons of these programs -- including the demonstration of product leasing in Ilumex -- and adds a focus on directly engaging and transforming the market as its approach. ELI thus applies more directly the lessons of market-oriented programs in Thailand, Poland and Denmark where direct CO₂ reductions were achieved at the cost of US\$5-10/ton. Besides the direct impacts of these programs, their greatest impact resulted from the indirect/market acceleration

effects they had. For example, Thailand achieved a complete replacement of the country's stock of T-12 fluorescent lamps with more efficient T-S lamps, saving 10% of electricity consumption at an estimated cost of less than US\$1/ton CO₂. Because sustained impact is a key objective of ELI, both the Thai and Poland market transformation successes provide important models for the approach ELI takes. Specifically, given PELP's impact on the Polish market, the indirect program impact over the five years after the program's completion is expected to generate an additional 1.6 million CFL sales, essentially doubling the combined direct and indirect impact cost-effectiveness to US\$3-4/ton CO₂, reduced.

XIV. PROJECT RISKS

154. Specific risks involved with ELI include: (i) technology risk, including failure of targeted lighting products to perform as claimed by their manufacturers; (ii) market risk, the failure to induce increased sales of energy efficient lighting technologies; (iii) institutional and regulatory risk, including: a) shifts in political influences and competitive strategies which might cause governments or electric utilities to oppose ELI initiatives; and, b) changes in electricity system tariffs and regulations such as to impede ELI's ability to build important constituencies in the electricity sector; and (iv) macroeconomic risk associated with national, regional or global economic conditions that counter ELI's market development objectives. ELI will address risks (i) through (iii) with the following measures:

- adopt high quality product performance standards and develop credible technical testing capacity;
- diversify the tools used in the program by deploying a variety of complementary program elements;
- diversify the lighting technology that the program supports;
- engage multiple local partners in implementing the program and use competitive bidding processes wherever appropriate;
- undertake thorough project appraisal and design activities, drawing on related program experience globally and knowledge of local partner capabilities in each ELI country;
- perform comprehensive market analyses as the first stage of implementation;
- build country-level project implementation plans on market analyses, monitor progress locally relative to a set of program-wide success indicators, and adapt the **workplan** to changing conditions and program monitoring results;
- utilize local advisory committees and independent technical reviews to influence implementation plans and to build local constituencies;
- conduct adequate planning for program evaluation and feed monitoring data into the implementation process;
- mobilize substantial co-financing commitments by private sector and other program participants;
- define clear channels of responsibility in the multi-country management and administration structure.

155. Macroeconomic risk cannot easily be mitigated, but country implementation plans will be designed to be flexible enough to adapt to shifts in the economic and political landscape. This flexibility is also intended to allow individual country programs to take advantage of unforeseen opportunities that may emerge during the life of the program.

156. The diversity of countries within ELI diversifies the performance risk of ELI as a whole, providing multiple opportunities for success with the range of strategies adopted across the program. The greater size of this multi-country effort provides economies of scale in program development and implementation, and aggregates more market opportunities to interest lighting manufacturers in making significant investments of their own resources towards support of anticipated market growth.

XV. PROJECT SUSTAINABILITY

157. ELI addresses sustainability at the most fundamental level through its primary objective of accelerating markets for efficient lighting technology. By definition, ELI is designed to allow markets for efficient technology to sustain themselves by addressing fundamental impediments to their growth. To do this, ELI addresses a number of short-term concerns to reshape markets in a sustainable way. These include: (i) educating consumers and lighting professionals about how to adapt efficient lighting technologies to their lifestyles and their professions; (ii) supporting the technical, financial and professional infrastructure necessary to maintain accelerated market growth for technically sophisticated, but more expensive, efficient lighting products; and (iii) promoting cost-effective lighting technology.'

158. ELI will be implemented locally through private sector and NGO channels and administered by IFC to stimulate and accelerate local lighting markets. ELI is structured to build capacity among these local implementors to enable them to play key roles in the lighting market on an ongoing basis where necessary to sustain ELI's impacts. Care will be taken to ensure that ELI activities are indeed market strengthening and lead to higher volumes of energy efficient lighting product sales that should prove to be sustainable once program activities and GEF funding have been exhausted. Involvement and engagement of commercial financial institutions during ELI, if successful, should increase the availability of financing sources for efficient lighting after the program ends. Replication is expected to occur through a variety of financing modalities (ESCOs, utility finance programs, and consumer or municipal finance programs) whose creation and further development ELI seeks to spur.

ANNEX A

INCREMENTAL COST ANALYSIS

Broad Development Goal

1. The broad development goal of ELI is the accelerated market penetration of efficient lighting technology through the removal of specific market barriers. ELI's underlying premise is that consumers, municipalities and the private sector are potentially well suited to undertake profitable investments related to efficient lighting, but specific assistance is required in first identifying and assessing these opportunities and second, in overcoming institutional, financing and scale barriers. Successful projects will provide a multiplier effect by demonstrating the potential profitability of efficient lighting projects and ventures to commercial operators and lenders, hence making financial resources commercially available in the future.

2. Expanded investment in energy efficient lighting offers national economic and environmental benefits for the participating countries, including but not limited to the following: (i) avoided capital costs for new power and transmission/distribution capacity (particularly for expensive peak load generation facilities); (ii) reduced costs for fossil fuel purchases and reduced foreign exchange requirements if such fuels are imported; (iii) reduced electricity costs to lighting consumers, and (iv) cost-effective reductions of pollution from thermal electric power generation.

Global Environmental Objectives

3. The global environmental objective of ELI is to decrease greenhouse gas (GHG) emissions associated with electricity generation. By decreasing electricity consumption, ELI will enable the three Tranche I countries to avoid the emission of about 4.5 million tonnes of CO₂ from additional sales of energy efficient lights over a ten year time period. A summary of the incremental costs and benefits of ELI Tranche I follows in Table A-1.

Table A-1: ELI Tranche I. Incremental Costs and Benefits

	Baseline	Alternative	Increment
Global Environmental Benefits	<ul style="list-style-type: none">• Slow penetration of efficient lighting technologies due to persistence of market barriers. High use of incandescents and other inefficient lighting technologies leads to considerable greenhouse gas emissions.	<ul style="list-style-type: none">• Barriers to improved lighting technology reduced or eliminated. Faster penetration of more efficient lighting technologies. Over 4.5 million tons of CO₂ emissions avoided due to earlier installation of energy efficient lighting	<ul style="list-style-type: none">• More energy efficient lighting products used in host country markets. More than 4.5 million tons of CO₂ emissions reduced relative to baseline case.

		equipment.	
Domestic Benefits	<ul style="list-style-type: none"> • Slowly improving level of lighting services and electricity system efficiency. • Level of consumer confidence in efficient lighting products improves slowly. • Slowly increasing availability of efficient lighting products. • Slowly decreasing prices for efficient technology. 	<ul style="list-style-type: none"> • Efficient investments in power sector yield reliable power for society at lower cost. • Considerably heightened consumer awareness of efficient lighting options. • Widely available high quality lighting products. • Efficient technology is affordable for high percentage of consumers. 	<ul style="list-style-type: none"> • More efficient, lower cost electricity distribution. • More consumers gain access to lighting services at a lower cost with improved local environment benefits.

COSTS: ARGENTINA

Costs*	Baseline	Alternative	Increment
a) Consumer education and marketing programs	None known	US\$925,000	US\$925,000
b) electricity utility programs	EU's ARGURELEC program allocates roughly US\$600K to efficient lighting promotion in utility sector	Complimentary efforts totaling US\$1.1million	US\$500,000
c) financial transaction support	1) Estimated US\$200K IDB ESCO dev't program investment targets lighting. 2) IFC/GEF Streetlighting Prog. Targets US\$730K to efficient public lighting.	Complementary efforts totaling US\$1.18million.	US\$250,000
d) market aggregation	None known	US\$100,000	US\$100,000
e) financial incentives	None known	US\$175,000	US\$175,000

COSTS: PERU

Costs*	Baseline	Alternative	Increment
a) Consumer education and marketing programs	Estimated \$1million Peruvian gov't investment thru PAE program in effic.	Complementary efforts totaling US\$1.8million.	US\$800,000

	lighting promotion.		
b) electricity utility programs	None known	US\$400,000	US\$400,000
c) financial transaction support	Estimated US\$200K IDB ESCO dev't program investment targets lighting.	Complementary efforts totaling US\$650,000.	US\$450,000
d) market aggregation	None know-n	US\$100,000	US\$100,000
e) financial incentives	None known	US\$300,000	US\$300,000

COSTS: SOUTH AFRICA

Costs*	Baseline**	Alternative	Increment
a) Consumer education and marketing programs	None known	US\$775,000	US\$775,000
b) electricity utility programs	None known***	US\$1,000,000	US\$1,000,000
c) financial transaction support	None known	US\$480,000	US\$480,000
d) market aggregation	None known	US\$100,000	US\$100,000
e) financial incentives	None known	US\$125,000	US\$125,000

- *Costs consider on-going lighting efficiency promotion during two year in-country program period.
- **There are no efficient lighting programs existing or planned which focus on ELI's target population: the historically-disadvantaged.
- ***Eskom's efficient lighting program investments in ELI-related activities of US\$2million will not focus on ELI's target population of the historically-disadvantaged, it is thus not detailed above.

Baseline

4. For each country participating in ELI, the baseline situation can be measured in terms of: (i) the current level of use of high-efficiency lighting technologies; (ii) activities of commercial entities undertaking market development and manufacturing expansion in the area of efficient lighting; (iii) the degree of acceptance by households and other users of high-efficiency lighting technologies; (iv) initial capital costs compared to low-efficiency lighting alternatives; (v) level of interest by utilities to promote efficient lighting; and (vi) existing government programs and policies regarding energy efficiency.

5. In the absence of GEF support, the baseline scenario for many high-efficiency lighting technologies is one in which market penetration will continue to expand at a slow but regular pace. Specifically, the rate of uptake of high efficiency lighting technology in each target ELI country would be expected to remain significantly lower than that which is economically optimal for several years to come, absent a coordinated market intervention such as ELI.

6. Relatively small domestic markets in the three Tranche I countries constrain the development of local manufacturing capacity. The high relative costs and lack of available credit continue to limit the use of high-efficiency lighting technologies as an option for reducing electricity costs to consumers, providing superior lighting services, reducing high peakload system demands on utilities, and reducing GHG emissions.

7. The current volume of CFL sales in each of the ELI countries is dwarfed by the sales of standard incandescent lamps to the residential sector, as shown in Table A-2 below. CFL market growth in the target countries is generally expected to remain less than the expected average annual growth in global CFL sales because of the marketing and financing risks to individual manufacturers or importers in actively developing these immature markets. While all of the target countries have national energy plans that call for increased energy efficiency, these plans generally lack specific implementation programs as well as the economic and financial basis to achieve their goals without additional private sector innovation and capital mobilization.

Table A-2: Comparison of Annual Sales of Incandescent and Compact Fluorescent Lamps

	Argentina	Peru	South Africa
Incandescent	115,000,000	16-20,000,000	80,000,000
CFL	1,000,000	300,000	100,000

Note: Figures for incandescent lamps refer to the residential sector only. CFL figures represent the total estimated market per year for each country.

ELI Objectives and Global Environmental Benefits

8. ELI is expected to have a catalytic effect by helping to develop appropriate commercial structures, which could provide financing mechanisms that would otherwise not become available. In each of the target countries, higher purchase prices for efficient lighting as compared to incandescent lamps is cited as the primary market barrier. ELI's main objective is to overcome the initial price barrier in order to achieve an effective acceleration and expansion of the market for high-efficiency lighting technologies which, in turn, will heighten producer competition and lower prices. This also requires ELI's help in advising on changes in regulations, educating the public about the advantages of efficient lighting and establishing quality standards that can overcome risk aversion by potential customers.

9. If successful, ELI's multi-faceted programs are expected directly to increase the market share of CFLs and other energy efficient lighting equipment from the current fraction of less than one percent (see Table A-3), to something in the range of 3% to 15% of total light points in use by the end of the two-year program period. Depending on the characteristics of the national markets, this would represent up to half of the potential total market for these technologies. This

acceleration in the market development process will yield substantial societal benefits into the future as the market continues its course of maturation. Table A-3 shows the expected incremental efficient lighting technology sales for each ELI country expressed in terms of CFL-equivalent. To disaggregate the impacts according to a variety of technologies would unduly complicate the analysis by placing too much reliance on extensive assumptions about penetration levels of multiple technologies, thus a decision was made to present the impacts in terms of a single indicator: CFL-equivalent. Assumptions behind the figures in this table are given in Appendix B, the Economic and Environmental Analysis.

Table A-3: Incremental CFL Sales Due to ELI in Tranche I Countries.

Program Year	Argentina	Peru	South Africa
1	195,000	280,000	125,000
2	440,000	387,000	190,000
3	330,000	354,000	240,000
4	363,000	389,000	275,000
5	399,000	428,000	325,000
6	439,000	471,000	400,000
7	483,000	518,000	465,000
8	531,000	570,000	490,000
9	585,000	627,000	505,000
10	643,000	690,000	520,000
Total	4,408,000	4,714,000	3,535,000

10. Increased use of energy efficient CFLs and other lamps will reduce electric energy consumption per light point by about 75%. This, in turn, will reduce required power generation to serve lighting loads and attendant distribution and transmission losses. Reduced generation will lead to less fossil fuel consumption and, as a consequence, reduced GHG emissions.

11. As the precise design and ultimate success of ELI's market development projects is not yet known, it is only possible to provide indicative projections of the likely reductions in carbon emissions as a consequence of ELI activities. Because markets in the ELI Tranche I countries for high-efficiency lighting are currently small and immature, the real, long-term benefits of ELI will be the permanent removal, or at least reduction, of market barriers and financing obstacles that until now have hindered the large-scale switch-over to high-efficiency lighting technologies. Consumers that have been exposed to the benefits from energy efficient lighting installations are expected to continue using them thereafter. Hence, the following estimates of potential carbon savings, which cover only a limited time period, most likely understate the reductions in carbon emissions that will likely result from these changes.

12. Table A-4 (below) estimates the projected reductions in electricity consumption and resulting reductions in carbon dioxide emissions from thermal power generation. The table covers the projected effects over an initial ten-year period, which includes the projected two-year active program implementation period of ELI. The assumptions and data underlying these projections are provided in Appendix E, the Economic and Environmental Analysis.

Table A-4: Estimated CO₂ Reductions from ELI

Country	Estimated Avoided GWh	CO ₂ Emissions Factor (gm CO ₂ /kWh)	Estimated Avoided CO ₂ (Tonnes)
Argentina	2,424	269	652,163
Peru	3,630	358	1,299,561
South Africa	2,262	1,159	2,622,000
Total	8,316	n/a	4,573,724

The Main Components of Incremental Costs and Their Relation to Barrier Removals

13. Incremental costs are the costs that must be incurred to remove the identified barriers which prevent the more widespread adoption and market penetration of energy efficient lighting. The main barriers, and the actions needed to remove them, are shown in Table A-5.

Table A-5: Barriers to CFL Purchases and Corresponding ELI Activities

Main Barrier Types	Project Activities to Remove the Barriers
Ignorance of potential consumers about the benefits of CFLs and other efficient lighting technologies	Public education campaigns and demonstrations
Risk aversion of potential customers because of fear of non-performance and shorter than promised life expectancies	Development of quality assurance programs, testing facilities and product labeling programs, combined with extended warranties from manufacturers
Unfamiliarity of potential users with the unusual characteristics of CFLs and other efficient lighting technologies	(a) Public information and demonstration programs (b) Collaboration with lighting and luminaire manufacturers to develop suitable luminaires and fixtures optimized for CFL use and other efficient lamps
High initial costs of technology	(a) Increase market size to promote price competition, reap quantity discounts, and reduce unit costs; (b) Establish administratively efficient credit facilities (c) Develop promotional price discount programs with interested manufacturers

Lack of financing	<ul style="list-style-type: none"> (a) Offer partial credit guarantees to financial institutions; (b) Attract additional capital from IFC and other private sources; (c) Develop and arrange to provide financing from commercial sources for long-term leasing programs (d) Develop joint programs between financial institutions and electric distribution utilities for the distribution of lamps on credit or under leasing arrangements and the collection of repayments from beneficiaries
Governmental regulations prohibiting utilities to include repayment charges for lamps in their bills, with the power to cut services in case of non-payment	Provide assistance to regulatory authorities, utilities and financing institutions to remove these barriers
Lack of awareness by utilities about the advantages to their operations (e.g. peakload operations) from the widespread use of energy efficient lamps	Education programs, training and demonstration programs for utility management and staff, technical assistance to identify business opportunities and to develop suitable DSM programs

Project Incremental Costs

14. The total incremental costs associated with ELI Tranche I include all funds of the initial US\$9.35 million GEF grant (US\$6.6 million for project costs and US\$2.75 million for administrative costs) to the extent that they are not recovered for repatriation to GEF (as will be possible with partial guarantees). These costs are summarized in Table A-6 below. The incremental costs are expected to be incurred at the individual country level and at the level of the Regional Implementing Entities engaged by IFC to administer the program.

15. Project incremental costs will include both direct expenditures and transaction support mechanisms. Direct expenditures will be associated with activities including high-efficiency lighting promotion, public education, market aggregation measures, electric utility programs and creation of effective, low transaction cost credit programs. These direct costs will make up the majority (87.4%) of the total use of GEF funds. In addition, about 12.6% of the total GEF funds will be used for transaction support, including possible partial loan guarantees.

16. While it is possible that all of the partial loan guarantees that may be issued through ELI would be called, this is considered unlikely. IFC assumes closer to 25 percent of the guarantees will be called, leaving about US\$885,000 of the GEF funds available for potential re-use or repatriation to the GEF. Other portions of the GEF funds will be used for other methods of transaction support.

17. An estimated total of up to US\$1.18 million of the total US\$6.6 million GEF project funds for ELI Tranche I countries may be used to provide partial guarantees to local financial partners. Leverage will be achieved because the guarantees will be partial (at not more than a 50% level)

and because each dollar of GEF resources could potentially roll over to be applied to more than one transaction over the life of the program. If the GEF funds were used only once and the guarantees were in fact called, then the leverage achieved by this component of the program would be 1: 1. IFC expects the actual average level of guarantee to be lower, and at least a portion of the GEF funds to roll over to be used on more than one project over the life of ELI.

Administrative Incremental Costs

18. A total of US\$2.75 million of GEF funds will be used for administrative costs associated with management of ELI Tranche I and II., including the crosscutting activities. These funds will leverage additional contributions made by the Regional Implementing Entities and IFC associated with the additional work, expertise and risk that they assume in their management and administrative roles – costs which they will absorb for ancillary strategic purposes related to their core businesses.

Table A-6: Expected Use of GEF Funds and Incremental Costs (All figures in US\$ Million)

GEF Funds Available	9.35	
Country Program Funds ⁶	6.6	
Possible Guarantees	1.18	
Grants	5.42	
Project Administrative Costs	2.75	
Expected Recovery for Repatriation to GEF	<i>If 25% of guarantees called</i>	<i>If 100% guarantees called</i>
Non-Grant Investments	1.18	1.18
Losses	-.295	-1.18
Returns on Performing Investments	.885	0
Net Program Incremental Cost	8.465	9.35

⁶ Includes \$2 million for Argentina, \$2.1 for Peru, and \$2.5 million for South Africa.

ANNEX B

SUMMARY OF DISBURSEMENT ARRANGEMENTS

1. The total GEF grant for administration and implementation of ELI activities in all seven participating countries is **US\$15 million**. Of this amount, **US\$9.35 million** will be made available to IFC from the GEF Trust Fund through the World Bank's Trust Fund Division in association with the implementation of Tranche I. Disbursements are expected to be made to two new trust funds that will be established for administration and program implementation, respectively. The commitments to and disbursements from these trust funds are described below:

- i) Administration: **US\$2.75 million** will be made available by the World Bank in a commitment disbursed to **IFC** for administration of ELI activities in all seven participating countries over the three-year life of the project. Disbursements will then be made from this trust fund. These funds will cover the expenses of the three regional implementing entities that will administer programs and provide crosscutting services for the program across all seven countries.
- ii) Program Implementation: **US\$6.6 million** will be made available by the World Bank via a commitment to IFC for program implementation in the Tranche I countries (**US\$2.0 million** for Argentina, **US\$2.1 million** for Peru, and **US\$2.5 million** for South Africa). Disbursements will be made to two of the three regional implementing entities for implementation purposes.

ANNEX C

TIMETABLE OF KEY PROJECT EVENTS

Time taken to prepare the project	1.3 years
IFC management approval granted to project concept	May 1998
GEF Council approval	August 1998
Country appraisals	Sept. 1998 – February 1999
GEF Council/ CEO Endorsement	April 1999 (est.)
IFC Management approval	June 1999 (est.)
Project implementation initiated	July 1999 (est.)

ANNEX D

MONITORING AND EVALUATION PROCESS AND INDICATORS

ELI Evaluation Components

1. ELI will undertake three types of evaluation. The intention is to provide a comprehensive assessment of the initiative's effectiveness in terms of several indicators: (i) operational efficiency; (ii) energy and demand savings and the corresponding greenhouse gas mitigation impacts; and (iii) the sustained impact of ELI's programs in accelerating the growth of the market for energy efficient lighting. The evaluation will therefore assess ELI's effectiveness in terms of its mandate through Operational Program #5 of the GEF, to remove barriers to market penetration for efficient lighting technology. The ELI evaluation program has three components:

- Impact Evaluation;
- Process Evaluation; and
- Market Assessment.

ELI Program Evaluation

2. Upon commencement of Tranche I implementation, IFC will work with an independent evaluation contractor to prepare a full-scale monitoring and evaluation (M & E) plan for ELI. The plan will use the World Bank's June 1994 Greenhouse Gas Abatement Investment Project Monitoring and Evaluation Guidelines as a guide. The M&E program also will examine market development, using the World Bank's pending Monitoring and Evaluation of Market Development in World Bank-GEF Climate Change Projects as a guide. These guidelines will be supplemented as appropriate by:

- (i) standard M & E approaches used for determining the impact and cost-effectiveness of electric utility DSM programs (for example, Total Resource Cost test, Utility Cost test, and Barakat & Chamberlain's Value test);
- (ii) environmental monitoring/modelling approaches to quantify GHG abatement effects attributable to ELI, as well as other environmental benefits; and
- (iii) monitoring of other program performance variables deemed important to IFC and the GEF, including the market sustainability indicators, the market development indicators, and market intervention indicators.

The evaluation contractor will provide objectivity in the M & E activities and ensure that information generated is provided in a form suitable for the GEF and IFC's purposes.

3. In addition to evaluating ELI's direct impacts during the program period, the M&E program will assess ELI's sustained market impacts. These include evaluation of the market conditions related to manufacturing, distribution, sales, availability, price, and product attributes and characteristics of CFLs available in each ELI country at the conclusion of the project, as well as

two years after the official project conclusion. The results of this evaluation will indicate changes in the marketplace as measured against pre-project baselines, which will be established as a part of the market assessments undertaken at the outset of the project.

4. The ELI program design ensures that the necessary data is generated by the program implementors at the country level, and is monitored by the RIEs throughout program implementation. Because ELI's M&E plan will be implemented by the RIEs through regionally contracted experienced M&E consulting firms, the data developed on a local basis will conform to a standardized format developed by the global M&E contractor, working with IFC. For example, in evaluating the effectiveness of ELI's critical public awareness and educational program, the global evaluation contractor will develop a standardized surveying guideline which the RIEs will adopt in assessing changes in public knowledge of, and attitudes towards, energy efficient lighting in each ELI country.

Indicators by Program Goal

5. Based on the two primary ELI program goals, the M&E plan will be built around indicators which reflect these goals and enable an assessment of ELI's success relative to these goals.

(a) GOAL: Establish and expand healthy, active, and sustainable markets for energy efficient lighting products.

- Increased sales of efficient lighting technologies
 - *Measurement Method:* industry data; retailer surveys; wholesaler surveys; consumer surveys
- Reduced prices of efficient lighting technologies
 - *Measurement Method:* industry data; retailer surveys; wholesaler surveys; consumer surveys
- Increased availability of a broader array of efficient lighting products
 - *Measurement Method:* industry data; retailer surveys; wholesaler surveys; consumer surveys

Note: "sustainability" measure will require longitudinal studies, including evaluation of program impact approximately 2 years following program conclusion.

(b) GOAL: Reduce greenhouse gas emissions via increased penetration of energy efficient lighting technology.

- Reduced electricity consumption per unit of lighting services consumed
 - *Measurement Method:* consumer surveys (including electricity bill assessments and site surveys), building surveys, efficient lighting technology sales data, electricity generation and dispatch models and fuel analyses of electricity generation

Market Assessment: Measuring the Market Transformation Impact

6. ELI's Process Evaluation will examine the internal workings of a DSM Program. ELI's Impact Evaluation will measure the direct impact of ELI's programmatic efforts to overcome barriers to market development. In addition, ELI will undertake a comprehensive Market Assessment to assess changes in both the supply and the demand for efficient lighting technologies in the target countries. The purpose of this evaluation is to assess the extent to which ELI has successfully affected the market for energy efficient equipment. This Market Assessment will address issues such as the availability of products, dealers' awareness levels and experience regarding equipment, responses by manufacturers to demand for products and changes in technologies, and changes in retailer practices.

7. The Market Assessment will not operate independently of the other M&E efforts. Specifically, the Market Assessment results will define the baseline energy usage patterns and conservation activity, a critical element for impact evaluation. Factors such as hours of operation for lighting equipment, temperature settings for heating and cooling, and insulation levels will also be collected through market assessment activities.

8. The research activities for market assessment consist of various qualitative and quantitative methods applied as part of the overall evaluation. Because of this, they often are not described separately in evaluation plans for each DSM Program. Rather, the evaluation of the market for DSM is accomplished using the results of the data collection performed through the process evaluation, with the addition of outside secondary sources (such as census data), as appropriate and available.

9. The following market transformation indicators will be tracked to support market assessment analyses.

Strategy 1: Product Financial Incentives

- (i) Tranche I expected input: \$0.6 million
- (ii) Indicators:
 - Short-term, medium-term, and long-term wholesale and retail prices of energy efficient lighting technologies
 - Volume of sales of energy efficient lighting technologies
- (iii) Measurement Method: Industry data; Store surveys;

Strategy 2: Public Education Programs

- (i) Tranche I expected input: \$2.5 million
- (ii) Indicators:
 - Public awareness of energy efficient lighting technologies
 - Penetration of energy efficient products into homes and businesses.
- (iii) Measurement Method: Public surveys

Strategy 3 : Transaction Support

- (i) Tranche I expected input: \$1.18 million
- (ii) Indicators:
 - Number of deals supported for the finance of energy efficient lighting technologies
 - Amount of new financing provided for energy efficient lighting technologies
- (iii) Measurement Method: Annual Reports of implementing entities; IFC and affiliated financial institution lending reports and selected interviews

Strategy 4: Market Aggregation

- (i) Tranche I expected input: \$0.3 million
- (ii) Indicators;
 - Number of bulk purchase pools created
 - Price of energy efficient technologies procured through bulk purchase pools
 - Number of manufacturers participating in bulk purchase pools
 - Number of end-users participating in bulk purchase pools
- (iii) Measurement Method: Annual reports of implementing entities; Surveys of manufacturers

Strategy 5: Electric Utility Programs

- (i) Tranche I expected input: \$1.9 million
- (ii) Indicators:
 - Number of utilities implementing efficient lighting programs
 - Amount invested by utilities in lighting sector DSM
 - Number of energy efficient lighting products procured through utility programs
- (iii) Measurement Method: Annual reports of implementing entities; Survey of utilities.

ANNEX E

ECONOMIC AND ENVIRONMENTAL ANALYSIS

Introduction

1. IFC's appraisal team conducted analyses of the environmental and economic benefits of ELI activities in the three Tranche I countries. The environmental analysis estimates the amounts of greenhouse gas emissions that will be avoided as a result of electricity savings derived from the installation of energy efficient lighting technology associated with the ELI programs. The economic analysis evaluates ELI's overall cost-effectiveness from a national perspective in each Tranche I country.

Environmental Analysis

2. Table E-1 below shows the projected cost to the GEF, in dollars per metric tonne of CO₂ reductions resulting from Tranche I of ELI. For each country, the \$/tonne value was calculated twice: once for direct impacts only, and again for both direct and indirect impacts. Direct impacts are based only on the projected growth in the efficient lighting market that takes place during the program period. Indirect impact is the incremental growth that takes place after the program period due to the market acceleration impacts of the program. The average costs are about US\$15.80/tonne if only direct impacts are accounted for, and under US\$2.00/tonne if all projected impacts are taken into account. ELI is a market transformation program and its value is primarily in the indirect impacts created by accelerated market expansion and penetration of efficient lighting technologies. The direct impacts are essentially a short-term result of the activities that will transform the market in the long-term – the actual objective of ELI. Detailed calculations of program benefit estimates are presented in Tables E-3 through E-5 at the end of this Annex.

3. The estimated cost per tonne of avoided CO₂ is lower for South Africa than for Argentina and Peru. This is partly due to South Africa's higher CO₂ emission factor. Every kilowatt hour of electricity not consumed saves 1,169 grams of CO₂, as compared to 269g/kWh for Argentina and 356g/kWh for Peru. It is also due to the fact that the US\$ 2.5 million ELI budget for South Africa is expected to leverage another US\$ 1.5 million in funding for efficient lighting technology adaptation from the electric utility Eskom.⁷ ELI will also work with electric utilities in Argentina and Peru to leverage additional program funds, but only in South Africa has a utility made an explicit commitment to support ELI activities at this stage.

⁷ Eskom's total contribution to ELI activities is expected to be on the order of \$4.5 million, but \$3.0 million of that is estimated to have been spent on energy efficiency in the absence of ELI.

Table E-1 : Projected Cost to GEF in \$/tonne of CO₂ Reductions due to ELI Tranche I⁸

	Cost in \$/tonne CO₂ Direct Impacts	Cost in \$/tonne CO₂ All Impacts
Argentina	\$26.07	\$3.76
Peru	\$13.98	\$1.98
South Africa	\$13.10	\$1.17
ELI Tranche I	\$15.80	\$1.79

4. A common methodology was used to calculate the cost in \$/metric tonne of CO₂ for each ELI Tranche I country to better allow comparisons across countries. To obtain the \$/tonne value, the analysis starts with an estimate of total program impacts in terms of incremental sales of CFLs (this estimation methodology is described in detail below). The incremental sales figure is then multiplied by the level of energy savings per CFL to yield the total amount of energy savings. Finally, to obtain CO₂ savings, the energy savings are multiplied by an emissions factor. The \$/tonne value is obtained by dividing the GEF contribution by the CO₂ savings.

5. For each country, the \$/tonne value was calculated twice: once for direct impacts only, and again for both direct and indirect impacts. Direct impacts are based on only the projected incremental sales of efficient lighting products that take place during the program period. Indirect impacts are the incremental sales that take place after the program period due to the market transformation impacts of the program.

Assumptions Used in the ELI Cost/Benefit Analysis

6. Since markets are volatile by nature, it is difficult to project the costs and benefits associated with energy efficiency market transformation programs. During the appraisal process, a number of simplifying assumptions was made to allow conservative projections of overall program cost-effectiveness. The analyses were designed to draw a reasonable expected lower boundary on projected program performance. ELI evaluation activities will comprehensively review each individual program component during and after implementation to perform a detailed analysis of actual program performance.

Program Approach Proxy Assumption

7. A variety of different program activities are planned for each participant country involving different partners, approaches and technologies. The time and expense of completely modeling the projected cost-effectiveness of each planned program approach in each participant country would have exceeded the resources available during the appraisal process. Therefore, IFC utilized its experience to date with the PELP CFL Subsidy program approach and its calculated cost-effectiveness, to serve as the proxy for all program approaches to be implemented under

⁸ These are higher than costs first cited in the ELI Project Concept Document. In the course of the appraisal, IFC was able to gather additional data that allowed it to refine its estimates.

ELI⁹. In practice, this means that the ELI cost-benefit analysis was performed as if the entire program budget in each country were to be used to provide retail price incentives on CFLs sold into the consumer market.

8. The CFL Subsidy program was chosen as the proxy approach for two reasons: First, accumulated experience with energy efficiency programs at North American electric utilities indicates that residential energy efficiency programs are usually less cost-effective than programs intended for the commercial or industrial sectors. Second, reductions in the global prices for efficient lighting products since PELP will tend to make all program approaches in all sectors more cost-effective. ELI will develop programs aimed at opportunities in the commercial, industrial and residential sectors. Using a residential program approach is therefore a conservative proxy. The cost-effectiveness of the PELP CFL Subsidy program approach was assumed to be a conservative assumption for the lower boundary for the projected cost-effectiveness for all ELI program approaches.

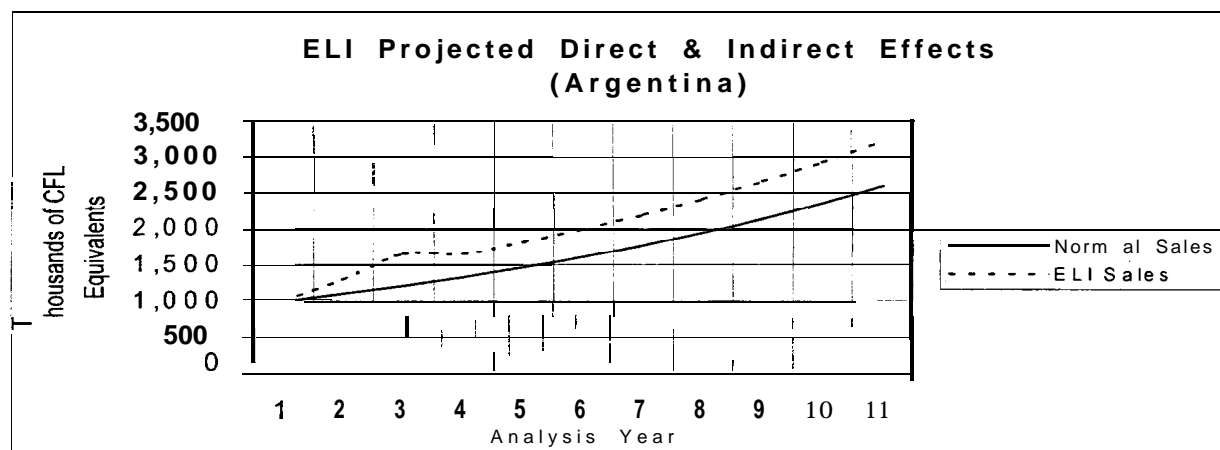
Program Effects Assumptions

9. The use of the CFL Subsidy approach as a proxy allows both the direct and indirect effects for all ELI program approaches involving all efficient lighting technologies to be estimated in terms of incremental CFLs sold into participant country markets. These effects are referred to as “CFL equivalents.”

10. It is assumed that ELI will directly cause an incremental increase in equivalent CFL sales during the two years of implementation in participant countries above and beyond normal growth in the market. The distribution of these increased sales across the two years was based upon the programs to be run in each country and existing local market conditions as described below. In year three of the analysis, directly following conclusion of program implementation, it was assumed that the discontinuation of ELI will cause a short-term stagnation in market acceleration. This assumption is based on understanding that ELI partners may not be able to continue ELI’s public education function at the same level as during the program. In the analysis it is assumed that ELI’s market acceleration effects, as represented by sales of CFL equivalents, may not increase in the year following termination of program activities. However, it is further assumed that the sustainable elements of ELI’s program activities,, such as financing options and improved market conditions resulting from increased sales volumes will result in a resumption of market growth in the fourth year of the analysis. From then on, sales will increase at the same rate as they would have had ELI not taken place. The effects of these assumptions are shown in Figure E-1 below.

⁹ The PELP CFL Subsidy program promoted the sale of an incremental 1.2 million CFLs to residential and small commercial consumers in Poland over a two year period at a cost of US\$ 3.15 per unit, including the applied incentive, marketing and administrative costs.

Figure E-1: ELI Direct and Indirect Impacts (all technology/CFL equivalent) for Argentina



11. The acceleration of ELI participant country markets should continue until energy efficient lighting products reach their maximum levels of penetration. The ELI cost-benefit analysis considers ten years of program effects although ELI's acceleration benefits may extend over 15 to 20 years. Given the uncertainty involved with projecting market behavior over a decade into the future, the projection period was not extended. However, even this time-limited analysis shows attractive benefits in terms of cost per tonne of avoided GHG emissions. The specific assumptions used to determine direct and indirect impacts are as follows:

Argentina: Argentina poses a situation somewhat analogous to Poland at the beginning of PELP. There appears to be a large potential market for energy efficient lighting laying dormant, waiting for a catalyst to bring together information and capital to create market transformation. Based on this assessment of the Argentine potential, the direct impact of ELI, the market for energy efficient lighting is expected to grow significantly between the first and second years of ELI Argentina.

Peru: In Peru, the market situation is substantially different from Argentina. Lower incomes and much broader knowledge of efficient lighting options, due to the PAE program, suggest a less precipitous growth in the market for energy efficient lighting during the two ELI program years. Given PAE, the segments of the Peruvian population most likely to quickly adopt energy efficient lighting have probably already done so. Significant penetrations of energy efficient lighting into the broader population is dependent upon the establishment of consumer credit mechanisms that essentially let efficient lighting investments pay for themselves over time.

South Africa: The analysis of ELI's direct and indirect impacts in South Africa are somewhat more complex than for Argentina and Peru because they are drawn from Eskom's Integrated Electricity Plan (IEP). Based on the best data available, the IEP makes assumptions about newly electrified, township, and suburban households. Eskom sets a DSM target and then worked

backwards to determine the annual penetration of energy efficient lighting in new and existing households of each type necessary to reach their target. The model does not distinguish between “natural” sales (i.e., sales that would occur even without a DSM program) and sales attributable to a DSM program.

12. It is assumed that without GEF support, Eskom would have moved ahead with programs for the township and suburban markets, but would not have put programs in place to reach the electrification (the lowest income) market. Therefore, the GEF funding is assumed to have impacts (direct and indirect) solely on CFL sales to the electrification sector.

13. It is also assumed that without GEF support the market for efficient lighting in the electrification sector would remain non-existent throughout the period of the analysis (i.e., penetration = 0%). The electrification sector is almost completely unserved by “modern” technologies, so this assumption is reasonable. As a result, the GEF receives credit for stimulating all CEL sales to the electrification sector over the period of the analysis.

Economic Analysis

14. A Total Resource Cost (TRC) test was conducted for each of the Tranche I countries to assess the net benefits and the benefit/cost ratio of the program from a societal point of view. The same methodology was used for all countries. The benefits of the program are considered to be energy bill savings and avoided purchases of incandescent lamps.

15. The analysis does not attempt to quantify other local environmental benefits such as reductions of acid rain precursors and particulate emissions, though it is clear that such benefits will occur. Therefore, the analysis underestimates the net benefits of the program. The costs of the program are considered to be: (i) consumer purchases of CFLs, (ii) GEF contribution to program cost, and (iii) other contributions to program cost.

16. The TRC test was calculated for direct impacts, and for direct plus indirect impacts. Table E-2 shows projected net benefits and benefit/cost ratio for each of the ELI Tranche I countries. In total, the ELI program in the Tranche I countries is estimated to achieve total net benefits of over US\$165 million. Details of the TRC calculations are included in Tables E-6 through E-8 attached at the end of this Annex.

Table E-2: Projected Net Benefits and Benefit/Cost Ratio for ELI

	Net Benefits, Direct Impacts	Net Benefits, All Impacts	Benefit/Cost ratio, Direct Impacts	Benefit/Cost ratio, All Impacts
Argentina	US\$4.3 mil.	US\$23.7 mil.	1.27	1.42
Peru	US\$15.8 mil.	US\$55.2 mil.	2.07	2.34
South Africa	US\$8.4 mil.	US\$86.4 mil.	2.25	4.92
ELI Tranche I	US\$28.5 mil.	US\$165.3 mil.	1.89	3.04

Limitations of the Analysis and Critical Factors

17. Although the economic and environmental analyses are based on the best available data, they are nonetheless subject to uncertainties. Some uncertainties which are consistent across all **Tranche I** countries are:

- technology risk, including failure of targeted lighting products to perform as claimed by either their manufacturers or by ELI;
- market risk, in that ELI activities could fail to lead to increased sales of energy efficient lighting technologies;
- institutional and regulatory risk, such as developing country governments or electric utilities responding negatively to ELI initiatives or failing to make planned electricity tariff changes; and
- macroeconomic risk created by unexpected changes in national, regional or global economic conditions, including energy prices.

The Risks and Sustainability section of the Project Document explains how ELI's project design will guard against these risks. Limitations of the analysis and critical factors that are specific to each country are covered below.

Limitations of the Analysis

Argentina and Peru: The CFL proxy is a gross assumption that does not take into account specific technical and economic challenges involved with the specific efficient lighting technologies to be promoted in the various markets. In addition, the market transformation aspect of ELI makes any impact estimate imprecise because the bulk of program impacts are through indirect effects which are heavily influenced by exogenous factors beyond the control of the initiative. To compensate for these limitations, at each point in developing this analysis an attempt has been made to err on the side of conservatism. For example, the analysis assumes static product prices over the course of the analysis, although an express objective of ELI is to reduce those prices. The analysis also does not account for the health, employment and education benefits of ELI, and therefore underestimates project benefits. These benefits are discussed in detail in the country Appraisal Documents.

South Africa: In addition to those limitations noted above under Argentina and Peru, the additional large and unresolved issue in South Africa is the exact magnitude and nature of the non-GEF resources available to support ELI activities. Until the structure of local program activities is known, and until Eskom has committed funding to supporting them, all the estimates for direct and indirect CFL sales are highly speculative. In addition, Eskom has not yet made any estimation of the level of free-drivership (e.g., inward investment by CFL manufacturers in building a plant in Southern Africa that could lower CFL prices by avoiding import tariffs) that the program might create.

Critical Factors

Argentina: The Argentine government committed itself to a strategy of CO₂ reduction during the COP5 meeting held in Buenos Aires in November 1998. It remains to be seen whether and how this commitment will translate into specific support for ELI. A recent, extended power outage in the Buenos Aires region will also put pressure on Argentine electric utilities to improve service, potentially creating opportunities for establishing distributed utility projects with ELI support.

Peru: There are conflicting estimates of the duration of the current window of opportunity to develop programs in the southern region of the country. This opportunity has been created by a power shortage caused by weather damage to a hydropower facility. If the facility is repaired more quickly than expected, the interest expressed by regional utilities in energy efficient lighting programs may dissipate.

South Africa: In August 1997, the South African government unveiled a plan to begin a gradual unbundling of Eskom's generation, transmission and distribution activities. Most likely the cumulative impact of these changes would be to raise rates, strengthening the price signal for consumers to move to efficient technologies. In the meantime, Eskom's generation unit is fighting to raise the time-of-use tariff differential for its sales to redistributors. This move alone could give the redistributors (municipal electrical authorities) much greater incentive to promote ELI than they have currently.

Table E-3: Cost to GEF of CO₂ Emission Reduction for ELI in Argentina

Year	Annual Proxy CFL sales (# of lamps) direct impacts	Annual Proxy CFL sales (# of lamps) indirect impacts	Electricity savings (MWh) direct impacts	Electricity savings (MWh) indirect impacts	CO ₂ savings (tonne) direct impacts	CO ₂ savings (tonne) indirect impacts	ELI Program Costs (US \$)	CO ₂ mitigation costs (US\$/tonne) direct impacts	CO ₂ mitigation costs (US\$/tonne) indirect impacts
	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]	[i]
1	195,000		107,250		28,850		\$1,224,500	\$42	
2	440,000		242,000	-	65,098		\$1,224,500	\$19	
3	-	330,000	-	181,500	-	48,824	-	-	
4	-	363,000	-	199,650	-	53,706	-	-	
5	-	399,000	-	219,450	-	59,032	-	-	
6	-	439,000	-	241,450	-	64,950	-	-	
7	-	483,000	-	265,650	-	71,460	-	-	
8	-	531,000	-	292,050	-	78,561	-	-	
9	-	585,000	-	321,750	-	86,551	-	-	
10	-	643,000	-	353,650	-	95,132	-	-	
Total	635,000	3,773,000	349,250	2,075,150	93,948	558,215	\$2,449,000	\$26.07	\$3.76

Notes and assumptions:

- [a] Baseline increase in CFL sales during program period.
- [b] Sales due to ELI market transformation effect after program.
- [c] [a] * measure life (in years) * annual kWh savings
- [d] [b] * measure life (in years) * annual kWh savings
- [e] [c] * emission factor (metric tonne CO₂/kWh)
- [f] [d] * emission factor (metric tonne CO₂/kWh)
- [g] \$2 million in program costs from ELI budget.
- [h] [g]/[e]
- [i] [g]/
([e]+[f])

Table E-4: Cost to GEF of CO₂ Emission Reduction for ELI in Peru

Year	Annual Proxy CFL sales (# of lamps) direct impacts	Annual Proxy CFL sales (# of lamps) indirect impacts	Electricity savings (MWh) direct impacts	Electricity savings (MWh) indirect impacts	CO ₂ savings (tonne) direct impacts	CO ₂ savings (tonne) indirect impacts	ELI Program Costs (US \$)	CO ₂ mitigation costs (US\$/tonne) direct impacts	CO ₂ mitigation costs (US\$/tonne) indirect
	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]	[i]
1	280,000		215,600		77,185		\$1,285,500	\$16.65	
2	387,000		297,900		106,680	-	\$1,285,500	\$12.05	
3	-	354,000		272,580	-	97,584	-	-	
4	-	389,000	-	299,530	-	107,232	-	-	
5	-	428,000	-	329,560	-	117,982	-	-	
6	-	471,000	-	362,670	-	129,836	-	-	
7	-	518,000	-	398,860	-	142,792	-	-	
8	-	570,000	-	438,900	-	157,126	-	-	
9	-	627,000	-	482,790	-	172,839	-	-	
10	-	690,000	-	531,300	-	190,205	-	-	
Total	667,000	4,047,000	513,590	3,116,190	183,865	1,115,596	\$2,571,000	\$13.98	\$1.98

Notes and assumptions:

- [a] Baseline increase in CFL sales during program period.
- [b] Sales due to ELI market transformation effect after program.
- [c] [a] * measure life (in years) * annual GWh savings
- [d] [b] * measure life (in years) * annual GWh savings
- [e] [c] * emission factor (metric tonne CO₂/kWh)
- [f] [d] * emission factor (metric tonne CO₂/kWh)
- [g] \$2.1 million in program costs from ELI budget.
- [h] [g]/[e]
- [i] [g]/([e]+[f])

Table E-5: Cost to GEF of CO₂ Emission Reduction for ELI in South Africa

Year	Annual Proxy CFL sales (# of lamps) direct impacts	Annual Proxy CFL sales (# of lamps) indirect impacts	Electricity savings (GWh) direct impacts	Electricity savings (GWh) indirect impacts	CO ₂ savings (tonne) direct impacts	CO ₂ savings (tonne) indirect impacts	ELI Program Costs (US \$)	CO ₂ mitigation costs (US\$/tonne) direct impacts	CO ₂ mitigation costs (US\$/tonne) indirect impacts
	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]	[i]
1	125,000	-	80,000	-	92,720	-	\$1,530,500	\$17	
2	190,000	-	121,600	-	140,934	-	\$1,530,500	\$11	
3	-	240,000	-	153,600	-	178,022			
4	-	275,000	-	176,000	-	203,984			
5	-	325,000	-	208,000	-	241,072			
6	-	400,000	-	256,000	-	296,704			
7	-	465,000	-	297,600	-	344,918			
8	-	490,000	-	313,600	-	363,462			
9	-	505,000	-	323,200	-	374,589			
10	-	520,000	-	332,800	-	385,715			
Total	315,000	3,220,000	201,600	2,060,800	233,654	2,388,467	\$3,061,000	\$13.10	\$1.17

Notes and assumptions:

- [a] First order estimate of the number of transactions ELI will be able to support/subsidise
- [b] Eskom's DSM targets under its Seventh Integrated Electricity Plan (IEP7) and netting out "natural sales" - [a]
- [c] [a] * measure life (in years) * annual kWh savings
- [d] [b] * measure life (in years) * annual kWh savings
- [e] [c] * emission factor (metric tonne CO₂/kWh)
- [f] [d] * emission factor (metric tonne CO₂/kWh)
- [g] Assumes total ELI budget of \$2.5 million
- [h] [g]/[e]
- [i] [g]/([e]+[f])

Table E-6: Total Resource Cost Test for ELI Activities in Argentina

Year	Annual Proxy CFL sales (# of lamps) direct impacts	Annual Proxy CFL sales (# of lamps) indirect impacts	--- Benefits ---					
			Direct Impacts		Indirect Impacts		Gross Benefits	
			PV, avoided baseline tech purchases	PV of avoided kWh	PV, avoided baseline tech purchases	PV of avoided kWh	Benefits, direct impacts	Benefits, direct and indirect impacts
	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]
1	195,000	-	\$863,109	\$5,799,191		-	\$6,662,300	\$6,662,300
2	440,000	-	\$1,770,480	\$11,895,177		-	\$13,666,257	\$13,666,257
3	-	330,000			\$1,207,145	\$8,110,757	-	\$9,317,902
4	-	279,000			\$927,806	\$6,233,888	-	\$7,161,693
5	-	307,000			\$928,108	\$6,235,919	-	\$7,164,027
6	-	338,000	-	-	\$928,933	\$6,241,459	-	\$7,170,391
7	-	371,000	-	-	\$926,934	\$6,228,029	-	\$7,154,963
8	-	408,000	-	-	\$926,707	\$6,226,503	-	\$7,153,210
9	-	449,000	-	-	\$927,120	\$6,229,277	-	\$7,156,397
10	-	494,000	-	-	\$927,308	\$6,230,539	-	\$7,157,846
Total	635,000	2,976,000	\$2,633,589	\$17,694,968	\$7,700,061	\$51,736,369	\$20,328,557	\$79,764,987

Year	--- Costs ---						Direct impacts only		Direct and indirect impacts	
	ELI Program costs (US\$)	Other program contributions (US\$)	Value of CFL Proxy Sales (US\$) direct impacts	Value of CFL Proxy Sales (US\$) indirect impacts	Present Value Total Costs (US\$) direct impacts	Present Value Total Costs (US\$) total impacts	Benefit /Cost ratio	Net benefits (US\$)	Benefit /Cost ratio	Net benefits (US\$)
	[i]	[j]	[k]	[l]	[m]	[n]	[o]	[p]	[q]	[r]
\$1	\$1,224,500		\$4,485,000		\$5,709,500	\$5,709,500	1.17	\$952,800	1.17	\$952,800
\$2	\$1,224,500		\$10,120,000		\$10,313,182	\$10,313,182	1.33	\$3,353,075	1.33	\$3,353,075
\$3			-	\$7,590,000	-	\$6,272,727			1.49	\$3,045,175
\$4	-	-	-	\$6,417,000	-	\$4,821,187	-	-	1.49	\$2,340,506
\$5	-	-	-	\$7,061,000	-	\$4,822,758	-	-	1.49	\$2,341,269
\$6	-	-	-	\$7,774,000	-	\$4,827,042	-	-	1.49	\$2,343,349
\$7	-	-	-	\$8,533,000	-	\$4,816,656	-	-	1.49	\$2,338,307
\$8	-	-	-	\$9,384,000	-	\$4,815,476	-	-	1.49	\$2,337,734
\$9			-	\$10,327,000	-	\$4,817,622	-	-	1.49	\$2,338,776
\$10			-	\$11,362,000	-	\$4,818,597	-	-	1.49	\$2,339,249
Total	\$2,449,000		\$14,605,000	\$68,448,000	\$16,022,682	\$56,034,747	1.27	\$4,305,875	1.42	\$23,730,240

Notes and assumptions:

[a] Baseline increase in CFL sales during program period.

[b] Sales due to ELI market transformation effect after program.

[c] [a] * present value of baseline technology purchases (see inputs sheet item [18])

[d] [a] * present value of energy savings (see input sheet, item [17])
 [e] [b] * present value of baseline technology purchases (see inputs sheet item [18])
 [f] [b] * present value of energy savings (see input sheet, item [17])
 [g] [c] + [d]
 [h] [g] + [e] + [f]
 [i] \$2 million in program costs from ELI budget.
 [j]
 [k] [a] * measure price (see input sheet)
 [l] [b] * measure price (see input sheet)
 [m] PV of ([i] + [j] + [k])
 [n] PV of ([i] + [j] + [k] + [l])
 [o] [g] / [m]
 [p] [g] - [m]
 [q] [h] / [h]
 [r] [h] - [n]

Table E-7: Total Resource Cost Test for ELI Peru

Year	Annual Proxy CFL sales (# of lamps) direct impacts	Annual Proxy CFL sales (# of lamps) indirect impacts	--- Benefits ---					
			Direct Impacts		Indirect Impacts		Gross Benefits	
			PV, avoided baseline tech purchases	PV of avoided kWh	PV, avoided baseline tech purchases	PV of avoided kWh	Benefits, direct imp&s	Benefits, direct and indirect impacts
	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]
1	280,000	-	\$842,748	\$12,691,093	-	-	\$13,533,842	\$13,533,842
2	387,000	-	\$1,058,908	\$15,946,276	-	-	\$17,005,184	\$17,005,184
3	-	354,000	-	-	\$880,558	\$13,260,469	-	\$14,141,027
4	-	204,000	-	-	\$461,309	\$6,946,933	-	\$7,408,242
5	-	224,000	-	-	\$460,487	\$6,934,550	-	\$7,395,037
6	-	246,000	-	-	\$459,739	\$6,923,293	-	\$7,383,032
7	-	271,000	-	-	\$460,419	\$6,933,527	-	\$7,393,945
8	-	298,000	-	-	\$460,264	\$6,931,201	-	\$7,391,465
9	-	328,000	-	-	\$460,545	\$6,935,430	-	\$7,395,975
10	-	361,000	-	-	\$460,801	\$6,939,274	-	\$7,400,075
Total	667,000	2,286,000	\$1,901,656	\$28,637,369	\$4,104,122	\$61,804,675	\$30,539,026	\$96,447,823

Year	--- Costs ---						Direct impacts only		Direct and indirect impacts	
	ELI Program Costs (US\$)	Other program contributions (US\$)	Value of CFL Proxy Sales (US\$) direct impacts	Value of CFL Proxy Sales (US\$) indirect impacts	Present Value Total Costs (US\$) direct impacts	Present Value Total Costs (US\$) total impacts	Benefit /Cost ratio	Net benefits (US\$)	Benefit /Cost ratio	Net benefits (US\$)
	[i]	[j]	[k]	[l]	[m]	[n]	[o]	[p]	[q]	[r]
\$1	\$1,285,500	-	\$5,440,400	-	\$6,725,900	\$6,725,900	2.01	\$6,807,942	2.01	\$6,807,942
\$2	\$1,285,500	-	\$7,519,410	-	\$8,004,464	\$8,004,464	2.12	\$9,000,720	2.12	\$9,000,720
\$3	-	-	-	\$6,878,220	-	\$5,684,479	-	-	2.49	\$8,456,548
\$4	-	-	-	\$3,963,720	-	\$2,978,002	-	-	2.49	\$4,430,241
\$5	-	-	-	\$4,352,320	-	\$2,972,693	-	-	2.49	\$4,422,344
\$6	-	-	-	\$4,779,780	-	\$2,967,867	-	-	2.49	\$4,415,164
\$7	-	-	-	\$5,265,530	-	\$2,972,254	-	-	2.49	\$4,421,691
\$8	-	-	-	\$5,790,140	-	\$2,971,257	-	-	2.49	\$4,420,208
\$9	-	-	-	\$6,373,040	-	\$2,973,070	-	-	2.49	\$4,422,905
\$10	-	-	-	\$7,014,230	-	\$2,974,718	-	-	2.49	\$4,425,356
Total	\$2,571,000	-	\$12,959,810	\$44,416,980	\$14,730,364	\$41,224,705	2.07	\$15,808,662	2.34	\$55,223,118

Notes and assumptions:

[a] Baseline increase in CFL sales during program period.

[b] Sales due to ELI market transformation effect after program.

[c] [a] * present value of baseline technology purchases (see inputs sheet item [18])

[d] [a] * present value of energy savings (see input sheet, item [17])
 [e] [b] * present value of baseline technology purchases (see inputs sheet item [1 S])
 [f] [b] * present value of energy savings (see input sheet, item [17])
 [g] [c] + [d]
 [h] [g] + [e] + [f]
 [i] \$2.1 million in program costs **from** ELI budget.
 [j]
 [k] [a] * measure price (see input sheet)
 [l] [b] * measure price (see input sheet)
 [m] PV of ([l] + [j] + [k])
 [n] PV of ([l] + [j] + [k] + [l])
 [o] [g] / [m]
 [p] [g] - [m]
 [q] [h] / [h]
 [r] [h] - [n] .

Table E-8: Total Resource Cost Test for ELI in South Africa

Year	Annual Proxy CFL sales (# of lamps) direct impacts	Annual Proxy CFL sales (# of lamps) indirect impacts	--- Benefits ---					
			Direct Impacts		Indirect Impacts		Gross Benefits	
			PV, avoided baseline tech purchases	PV of avoided kWh	PV, avoided baseline tech purchases	PV of avoided kWh	Benefits, direct impacts	Benefits, direct and indirect impacts
	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]
1	125,000	-	\$189,045	\$6,138,500	\$0	\$0	\$6,327,546	\$6,327,546
2	190,000	-	\$261,226	\$8,482,292	\$0	\$0	\$8,743,518	\$8,743,518
3	-	240,000	\$0	\$0	\$299,973	\$9,740,431	\$0	\$10,040,403
4	-	275,000	\$0	\$0	\$312,472	\$10,146,282	\$0	\$10,458,753
5	-	325,000	\$0	\$0	\$335,713	\$10,900,964	\$0	\$11,236,677
6	-	400,000	\$0	\$0	\$375,623	\$12,196,883	\$0	\$12,572,506
7	-	465,000	\$0	\$0	\$396,966	\$12,889,887	\$0	\$13,286,853
8	-	490,000	\$0	\$0	\$380,280	\$12,348,084	\$0	\$12,728,363
9	-	505,000	\$0	\$0	\$356,292	\$11,569,169	\$0	\$11,925,461
10	-	520,000	\$0	\$0	\$333,522	\$10,829,825	\$0	\$11,163,348
Total	315,000	3,220,000	\$450,272	\$14,620,792	\$2,790,840	\$90,621,525	\$15,071,064	\$108,483,429

Year	--- Costs ---						Direct impacts only		Direct and indirect impacts	
	ELI Program costs (US\$)	Other program contributions (US\$)	Value of CFL Proxy Sales (US\$) direct impacts	Value of CFL Proxy Sales (US\$) indirect impacts	Present: Value Total costs (US\$) direct impacts	Present: Value Total Costs (US\$) total impacts	Benefit /cost ratio	Net benefits (US\$)	Benefit /Cost ratio	Net benefits (US\$)
	[i]	[j]	[k]	[l]	[m]	[n]	[o]	[p]	[q]	[r]
1	\$1,530,500	\$600,601	\$1,041,667	\$0	\$3,172,767	\$3,172,767	1.99	\$3,154,779	2.0	\$3,154,779
2	\$1,530,500	\$750,751	\$1,583,333	\$0	\$3,513,258	\$3,513,258	2.49	\$5,230,260	2.5	\$5,230,260
3	\$0		\$0	\$2,000,000	\$0	\$1,652,893			6.1	\$8,387,511
4	\$0		\$0	\$2,291,667	\$0	\$1,721,763			6.1	\$8,736,990
5	\$0		\$0	\$2,708,333	\$0	\$1,849,828			6.1	\$9,386,849
6	\$0		\$0	\$3,333,333	\$0	\$2,069,738			6.1	\$10,502,768
7	\$0		\$0	\$3,875,000	\$0	\$2,187,336			6.1	\$11,099,516
8	\$0		\$0	\$4,083,333	\$0	\$2,095,396			6.1	\$10,632,968
9	\$0		\$0	\$4,208,333	\$0	\$1,963,219			6.1	\$9,962,243
10	\$0		\$0	\$4,333,333	\$0	\$1,837,756			6.1	\$9,325,592
Total	\$3,061,000	\$1,351,351	\$2,625,000	\$26,833,333	\$6,686,026	\$22,063,954	2.25	\$8,385,038	4.92	\$86,419,475

Notes and assumptions:

[a] First order estimate of the number of transactions ELI will be able to support/subsidise

[b] Eskom's DSM targets under its Seventh Integrated Electricity Plan (IEP7) and netting out "natural sales" - [a]
 [c] [a] * present value of baseline technology purchases (see inputs sheet item [IS])
 [d] [a] * present value of energy savings (see input sheet, item [17])
 [e] [b] * present value of baseline technology purchases (see inputs sheet item [18])
 [f] [b] * present value of energy savings (see input sheet, item [17])
 [g] [c] + [d]
 [h] [g] + [e] + [f]
 [i] Assumes total ELI budget of \$2.5 million
 [j] From Eskom's internal budgeting assumptions, December 1998.
 [k] [a] * measure price (see input sheet)
 [l] [b] * measure price (see input sheet)
 [m] PV of ([I] + [j] + [k])
 [n] PV of ([I] + [j] + [k] + [l])
 [o] [g] / [m]
 [p] [g] - [m]
 [q] [h] / [h]
 [r] [h] - [n]

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