**PROJECT BRIEF**

|  |  |
| --- | --- |
| 1. Identifiers: |  |
| **Project Number:** | GE-P071019 |
| **Project Name:** | **Vietnam: Demand-Side Management and Energy Efficiency Project** |
| **Duration:** | 4 years (2003-2006) |
| **Implementing Agency:** | World Bank |
| **Executing Agencies:** | Ministry of Industry (MoI) and Electricity of Vietnam (EVN) |
| **Requesting Country**  | Vietnam |
| **Eligibility:** | Vietnam ratified FCCC on December 3, 1998 |
| **GEF Focal Area:** | Climate Change |
| **GEF Programming Framework:** | OP 5 |
| **2. Summary:**Given the substantial electricity demand growth projected over the next decade in Vietnam, the Government of Vietnam and World Bank have agreed on a long-term strategy to help meet the power sector’s resource requirements. This strategy includes a proposed 12-year IDA/GEF demand-side management (DSM)/ energy efficiency (EE) assistance program (1998-2010), which is designed to achieve significant and sustainable reductions in Vietnam’s energy consumption and peak power demand. The program would, in the course of 3-4 phases, test, develop and scale-up successful and sustainable business models to promote DSM/EE and facilitate investments. This would be achieved by: (i) developing a large-scale DSM program within the power utility (Electricity of Vietnam, EVN) and its power distribution companies (PCs) to reduce loads during peak periods and in congested networks; (ii) testing, developing and expanding business models and mechanisms for supporting a commercially sustainable EE service industry; and (iii) identifying domestic sources and designing mechanisms for project financing to support a large-scale EE investment program. The global objective of the GEF support would be to reduce greenhouse gas emissions in the energy sector through the systematic removal of barriers to EE investments.The first phase of this DSM/EE program is now under implementation under the Swedish Sida-supported DSM component of the IDA-supported *Transmission, Distribution and Disaster Reconstruction Project*. As a result of Phase 1 efforts, EVN management has now accepted the need for DSM options to complement its large-scale supply-side investments. This Brief presents a proposed framework for a broader and longer-term assistance program as well as a detailed proposal for the program’s second phase to be implemented in conjunction with the IDA/GEF-supported System Efficiency Improvement, Equitization and Renewables (SEIER) Project. (Subsequent phases would be consistent with the objectives and approaches as defined above and be included in future IDA/GEF energy investment operations.) The project consists of two components: (i) a second phase DSM component under EVN; and (ii) implementation of a pilot commercial EE program by the Ministry of Industry (MoI). The EVN component would consist of four large DSM programs and supporting activities to achieve major reductions in peak load, improve system load factors, transform select lighting markets, and assist customers with ongoing tariff reforms. The MoI component would seek to test and develop business models and mechanisms to support commercial EE services and investments in industrial and commercial facilities. Total estimated impacts include over 120 MW of peak load reduction and more than 3,000 GWh in electric energy savings, representing a reduction in carbon dioxide equivalent emissions of 3.6 million tons. |

|  |
| --- |
| 3. Costs and Financing (Million US$): |
| Project Financing |  |
| IDA (DSM Component of SEIER Project) |  5.20 |
| Global Environment Facility (PDF B) |  0.22 |
| Global Environment Facility (Project) |  5.50 |
| **Subtotal** |  10.92 |
| Project Co-Financing |  |
| Commercial Banks and End-Users |  7.30 |
| EVN |  0.77 |
| MoI |  0.45 |
| **Subtotal** |  8.52 |
| Total Project Cost (with PDF B) |  **19.44** |
| Total Project Cost (without PDF B) |  **19.22** |
|  |  |
| Associated Financing |  |
| End-Users |  2.00 |
| **Subtotal** |  2.00 |
|  |  |
| **4. OPERATIONAL FOCAL POINT ENDORSEMENT:** |
| Name: Mr. Pham Khoi NguyenTitle: Vice Minister, Ministry of Science, Technology and Environment (MoSTE)Chairman, GEF-Vietnam CommitteeDate: August 6, 2001 |
| **5. IMPLEMENTING AGENCY (IA) CONTACTS:** |
| Mr. Robin BroadfieldEAP GEF Regional CoordinatorTel: (202) 473 4355Fax: (202) 522-1666 | Mr. Jas SinghEAP Task Team LeaderTel: (202) 458-0140Fax: (202) 522-1648 |

Table of Contents

**A. Project Development Objective 1**

1. Project Development Objective 1

 2. Key Performance Indicators 1

 3. Global Objective 1

**B. Strategic Context 1**

1a. Sector-related Country Assistance Strategy (CA) goal supported by the project 1

 1b. Global Operational Strategy/Program Objective addressed by the Project 2

 2. Main sector issues and Government strategy 2

 3. Sector issues to be addressed by the project and strategic choices 8

**C. Project Description Summary 10**

1. Project Components 10

 2. Key policy and institutional reforms to be sought 13

 3. Benefits and target population 13

 4. Institutional and implementation arrangements 13

**D. Project Rationale 14**

1. Project alternatives considered and reasons for rejection 14

 2. Major related projects financed by the Bank and/or other development agencies 14

 3. Lessons learned and reflected in proposed project design 15

 4. Indications of borrower and recipient commitment and ownership 15

 5. Value added of Bank and Global support in this project 16

**E. Summary Project Analysis 16**

1. Economic 16

 2. Financial 16

 3. Technical 16

 4. Institutional 17

 5. Environmental 17

 6. Social 18

 7. Safeguard Policies 18

 8. Business Policies 18

**F. Sustainability and Risks 18**

1. Sustainability 18

 2. Replication Plan 19

 3. Critical Risks 19

**Annexes**

**Annex 1:** Project Design Summary 21

**Annex 2:** Incremental Cost Analysis 23

**Annex 3:** Description of the Project 29

**Annex 4:** Vietnam Energy Efficiency Market 41

**Annex 5A:** STAP Roster Technical Review 50

**Annex 5B:** World Bank Team Response to STAP Reviewer Comments 55

A: Project Development Objective

1. Project development objective (see Annex 1)

The objective of the proposed 12-year IDA/GEF demand-side management (DSM)/energy efficiency (EE) assistance program (1998-2010) is to achieve significant and sustainable reductions in energy consumption and peak power demand in Vietnam. The program would, in the course of 3-4 phases, test, develop and scale-up successful and sustainable business models to promote DSM/EE and facilitate investments. This would be achieved by: (i) developing a large-scale DSM program within Electricity of Vietnam (EVN) and its power distribution companies (PCs) to reduce loads during peak periods and in congested networks; (ii) testing, developing and expanding business models and mechanisms for supporting a commercially sustainable EE service industry; and (iii) developing domestic sources and mechanisms for project financing to support a large-scale EE investment program. The first phase (Phase 1) of this DSM/EE program is now under implementation under the ongoing IDA/Swedish Sida-supported DSM program under the IDA-supported *Transmission, Distribution and Disaster Reconstruction Project*. This proposal represents the second phase of the program. The objectives of this second phase are: (a) to develop and expand DSM business programs and test new market transformation efforts; and (b) develop sustainable business models and mechanisms to support EE investments in commercial and industrial facilities.

2. Key Performance Indicators (see Annex 1)

The key performance indicators for this Project will include: (i) total energy saved and corresponding reduction in carbon dioxide emissions resulting from the DSM and EE investments catalyzed under the Project; (ii) peak demand reductions resulting from utility load management and energy efficiency programs; and (iii) total commercial activity and investments for Vietnam’s energy service industry. Detailed performance indicators will be prepared and agreed upon during Project Appraisal.

3. Global Objective (see Annex 1)

The global objective of the Project is to contribute to the reduction of greenhouse gas (GHG) emissions in the energy sector through the systematic removal of barriers to DSM and EE investments. This will be achieved by supporting large-scale DSM and commercial energy efficiency programs in Vietnam and building capability to design, deliver and evaluate such programs within the power utilities, government agencies and private sector. The Project will build upon efforts under Phase 1 and expand impacts further in subsequent phases.

B: Strategic Context

1a. Sector-related Country Assistance Strategy (CAS) goal supported by the project (see Annex 1):

Document number: 18375-VN (August 20, 1998) – Updated IDA/R2001-0160 (October 3, 2001)

Date of latest CAS discussion: May 30, 2000; CAS update discussion: October 25, 2001

This Project is in full compliance with the Bank’s Country Assistance Strategy (Report 18375) which sees IDA’s role for the power sector as filling an important niche not covered by other players in the sector and directly assisting the government in its poverty alleviation efforts. The energy sector has contributed substantially to economic growth. Its continued development is essential to sustaining industrial growth and employment generation. The report “Fueling Vietnam’s Development: New Challenges for the Energy Sector” (April 1999) identifies the key issues and lays out a strategy for the sector. IDA lending and support will shift towards extending access in rural areas, increase the efficiency in the entire energy chain and create creditworthy institutions as well as improve corporate governance and rationalize sector management, shift towards mobilization of external financial resources for the sector to ensure the country meeting its energy demands, providing services that will facilitate private participation in the energy sector, and advisory services for putting in place a transparent and independent regulatory framework and for promoting private participation in distribution and renewable energy power plants. This Project along with the associated IDA/GEF System Energy Efficiency Improvement, Equitization and Renewables (SEIER) Project will seek to help address these issues.

This proposed GEF Project is consistent with the CAS focus through: (i) improving economic management through effective DSM programs; (ii) raising productivity in selected sectors by reducing energy costs; (iii) promotion of private sector participation and investment in the energy and related sectors by developing a commercial energy service industry; and (iv) environmental protection through energy efficiency improvements.

1b. Global Operational Strategy/Program Objective addressed by the Project

The project is consistent with the objectives of the GEF Operational Program No. 5: Removal of Barriers to Energy Efficiency and Energy Conservation. The Project would support a long-term programmatic approach to the development of sustainable investments in DSM and energy efficiency. The Project was designed with significant inputs from three stakeholder workshops, which provided for active participation and strong ownership among the Vietnamese agencies.

The Government of Vietnam (GOV) is committed to environmentally sustainable development, as indicated by their ratification of the UNFCC on December 3, 1998. As part of related efforts, the Ministry of Science, Technology and Environment (MoSTE) and the Institute of Meteorology and Hydrology participated in the Asia Least-cost Greenhouse Gas Abatement Strategy (ALGAS) development for Vietnam which identified energy efficiency as a key priority. Several other environment-related projects have been supported by UNDP, the Asian Development Bank (ADB) and other bilateral organizations. In addition, the GOV is developing a National Environment Protection Strategy (2001-2010) and a National Environment Protection Action Plan (2001-2005).

2. Main sector issues and Government strategy

**Energy Sector.** The energy sector can provide an essential underpinning to future economic growth in Vietnam. Today, it contributes over a quarter of total foreign exchange earnings, from oil and coal exports. Energy demand has been growing at 13-15 percent per year, faster than GDP, over the last five years. Continued expansion in energy and electricity supply and delivery infrastructure will enable rapid growth in the agricultural and industrial sectors and sustain economic growth. It can also help alleviate poverty by providing energy access to the poor and mitigate environmental degradation by encouraging the shift from traditional to commercial energy, as well as appropriate fuel choices in expanding commercial supplies.

New challenges have emerged in the energy sector requiring structural and institutional reforms that are both more difficult and more complex. First, to meet the economic growth targets, electricity supplies will need to grow to support economic growth rates. But this growth will need to be both efficient and more equitably distributed through aggressive DSM and rural energy programs, as today 79 percent of the rural population consumes less than 20 percent of total electricity. Second, although Vietnam is a resource rich country, it should strive to develop the energy sector along an environmentally sustainable path. The promotion of more efficient use of electricity and reduction in peak loads will ease constraints on the national system, reduce the need for new generation and system capacity and reduce energy generation requirements leading to corresponding emission reductions. Recent natural gas discoveries offshore also provide an opportunity to make environmentally and economically beneficial energy use choices. Vietnam is also well endowed with renewable energy resources to generate electricity to serve rural communities. However, only a quarter of its hydro resources are developed, and little to none of its other renewable resources. Third, Vietnam has to invest almost 5.3 percent of its GDP, twice the rate of its ASEAN neighbors, in energy infrastructure. Fundamental reform of energy tariffs, with respect to both level and structure, and increased investments in DSM are required to ease financing constraints and ensure long-term efficiency in investment and resource utilization decisions throughout the economy. Since two thirds of the required investments will need to come from overseas development assistance (ODA), export credits and foreign direct investments, public financial resources and government guarantees for private investment should be selectively used. Fourth, attracting foreign private investment will require the creation of an enabling environment and legal framework. The Government needs to embark on restructuring and rationalization of the energy state owned enterprises, creating a regulatory system and developing a mechanism to coordinate policy and investment decisions in the energy sector.[[1]](#footnote-1)

**Electricity Tariffs.** Fundamental reforms of the energy tariffs are required to ease financing constraints and ensure long-term efficiency of investment and resource utilization. Retail electricity tariffs, currently uniform across Vietnam, are set by the GOV, and have been raised periodically since March 1992. Currently, the average tariff is about 728 Vietnamese Dong (D)/kWh, inclusive of the 10 percent value-added tax (VAT). The most recent estimates of long-run marginal cost (LRMC) for retail tariffs are in the range of D1,125/kWh (US¢7.5/kWh). The achievement of an average tariff of US¢7.0/kWh is the development objective of IDA’s ongoing tariff and sector dialogue with the GOV. The GOV, however, recently delayed the planned tariff increase to US¢5.6/kWh scheduled to be effective on October 1, 2001, due to concerns for negative economic development after the September 11 terrorist attacks in the U.S. Given EVN’s sizeable investment plans over the next decade to meet critical power shortages, and the associated increase in projected borrowing, the GOV has recognized that it would be essential to implement the required increases in power tariffs in a phased manner to achieve satisfactory financial performance of EVN, compliance with financial covenants and financial sustainability of the power sector. It will also be critical for cost-based power tariffs to be introduced to improve the overall economic and financial viability of DSM and EE investments.

**IDA Support.** On June 25, 2002, the Bank’s Executive Board approved the associated IDA/GEF-supported SEIER Project. The overall objectives of the proposed project are to contribute to the Government’s poverty alleviation program in rural areas and to improve the overall efficiency of power system services in the country. The Project’s main development objectives are to: (a) **improve overall system efficiency and reduce investment needs** through (i) optimization of the transmission system to reduce transmission losses; and (ii) reduction of generation capacity increases by effective DSM; (b) **enhance energy access for the poor** in remote areas by (i) upgrading of the 110 kV sub-transmission and the MV distribution lines for rural electrification; (ii) rehabilitation of small hydro plants and construction of a hybrid wind-diesel power plant supplying electricity to rural areas and an island; and (iii) development of community- based utilities to provide renewable energy to remote communes not accessible by the grid; and (c) **sustain reform of the power sector** through (i) separation of generation, transmission and distribution by institutionalizing transfer pricing and distribution margins; (ii) improvement of corporate governance by instituting more effective financial management and information technology; and (iii) equitization of districts and communes in north, center and southern parts of the country to develop a creditworthy distribution sector. The proposed project is expected to provide energy to about 10,000 households in the remote rural areas of Vietnam, using renewable energy, including some of the poor and remote communes identified in the government’s special commune program.

**DSM and Energy Efficiency.** From 1992-97, Vietnam experienced unprecedented economic growth, averaging 8.2 percent annually. During this same period, energy demand grew 30 percent faster than GDP and electricity 70 percent faster. The ability of Vietnam to continue to meet such an aggressive economic growth rate will require substantial expansion of the energy sector and, in particular, the electric power sector. The Bank estimates that the power utility, EVN, will experience almost a threefold increase in demand over the next 10 years, from about 30,800 GWh in 2001 to over 70,400 GWh by 2010, with annual demand growth of 13-15 percent. (In 2001, EVN’s peak demand increased by some 18 percent over 2000.) Generation-level peak power demand is also projected to increase from the 2001 level of 5,655 MW to more than 16,000 MW by 2010, requiring an associated capital investment of more than US$15 billion (over $1 billion per year). Thus, the GOV and Bank have concluded that it is essential for DSM and EE programs to be developed and strengthened in order to meet the country’s resource requirements and minimize the local and global environmental impacts of this growth.

In 1997, EVN, with World Bank assistance, commissioned the “Demand-Side Management Assessment for Vietnam,” which identified important opportunities for cost-effective electricity savings in a number of sectors and end-use applications. It recommended a two-phased approach for implementing DSM, which would save an estimated 700 MW of capacity and more than 3,550 GWh/yr by the year 2010. Under Phase 1, supported by a SEK 29 million (about US$2.8 million) Swedish Sida grant under the *Transmission, Distribution and Disaster Reconstruction Project* (Credit 3034-VN), a DSM Cell within EVN has been established, a supporting DSM policy review and framework has been completed, pilot load research efforts have been initiated, screening and assessments of possible DSM programs have been conducted, pilot load management, lighting and marketing programs have been launched, a DSM business plan for Phase 2 has been developed, and energy audit capability has been developed within EVN, and; the Ministry of Construction (MoC) has developed an EE building code, and MoSTE has developed and will introduce EE lighting and industrial motor standards. Overall project coordination is being managed by MoI. As a result of Phase 1 efforts, EVN management has accepted the need for DSM options to complement its large-scale supply-side investments. It was recommended that Phase II would: (i) expand DSM program implementation and evaluation; (ii) increasingly shift DSM functions to EVN’s subsidiary PCs; (iii) expand the load management program; (iv) enforce the building code and appliance standards and develop an expanded standards regime; (v) develop financing mechanisms for future DSM activities; (vi) build local capacity to perform full-scale commercial and industrial energy audits and investment plans; and (vii) promote private sector participation in providing EE services.

DSM: Since the completion of the DSM Assessment, EVN has experienced increasing peak demand shortages, making the need for targeted load management and other DSM measures more critical. These system capacity constraints occur during evening peak hours (6-10pm), with daily peak loads 2-3 times those of off-peak hours, which has resulted in periodic brownouts, low system load factors and major investment requirements in capacity enhancements to meet demand for only a few hours of the day. The projected annual increases in electricity demand over the next few years (over 15 percent), combined with the ongoing efforts to increase grid-based electrification to remote areas, will only exacerbate this situation. The major contributors to the increase in peak loads and energy consumption are various end uses (motors, process loads, lighting etc.) in large industrial and commercial customers and lighting loads in the residential and small commercial customers. EVN has instituted a few programs, primarily focused on time-of-use (TOU) metering for large consumers, and has installed about 4,300 TOU meters. However, EVN and its PCs lack the investment capital required to fully implement TOU metering for production, commercial, service and agricultural (irrigation) customers with transformer capacity over 100 kVA, as the existing tariff regulations allow, and have experienced some customer resistance to TOU metering. Some of the PCs have sought funds to procure load control equipment (ripple control technology) to test their viability during peak hours and critical system power shortages, but have been unable to develop a customer recruitment strategy or program plan for deployment of these systems. These measures are important first steps but the DSM efforts need to be developed on a more systematic basis, and with greatly improved planning and implementation, which the Phase I efforts are helping to address. Furthermore, while the TOU and load control efforts will contribute to peak load reduction in larger customers, there is also a need to target the lighting loads in the residential sector, which is a significant contributor to the peak load and energy consumption.

DSM Policy Framework: The policy framework influencing the implementation of DSM in Vietnam is governed by the legal system that includes a set of Laws, Decrees, Decisions, Circulars and other legal documents issued by National Assembly, Government, and Ministries. Laws generally lay down a legal framework that is then subsequently elaborated by a Decree. Decrees are prepared by Ministries, and often specify the processes by which the provisions of a Law are implemented.

The original policy framework was established by the 1983 Decree on Regulations on Electricity Supply and Usage, which is currently being revised. In 1996, in accordance with a Decision of the Government, MoI began to prepare an Electricity Law for Vietnam. However, it has been difficult to achieve consensus on the new Law, which is at present in its 14th draft. The National Assembly is expected to approve the new Law before the end of 2003.

Among the most important Decrees (currently in preparation) affecting the electricity industry are:

1. Decree on the Establishment and Approval of Electricity Tariff
2. Decree on the Organization and Operation of the Electricity Regulatory Directorate of Vietnam
3. Decree on Electricity Operation and Usage
4. Decree on Energy Conservation and Efficient Use

The proposed Electricity Law has a number of provisions that relate to DSM and EE. For example, there is recognition of the need to introduce cost-based tariffs, develop a National Policy for Electric Power Development that includes DSM, and encourage the use of high efficiency equipment and implementation of DSM measures. In the drafting of the Decrees, the Government of Vietnam has demonstrated its recognition of the importance of energy efficiency and DSM, and its commitment to implementation of appropriate DSM measures. The Decree on Energy Conservation and Efficient Use requires MoI to develop and to submit to the government a five-year plan for energy development based on: (i) shifting the economy to a more efficient structure; (ii) increasing the efficiency of energy use; (iii) developing energy efficient technology; (iv) promoting fuel substitution; and (v) establishing norms for energy using equipment and appliances. (See a more detailed description about this Decree on page 6.) The other Decrees also contain provisions to promote DSM and EE.

The first phase DSM project activities included a detailed assessment of the existing policy framework governing DSM, the roles and responsibilities of MoI and EVN, and recommendations for supplemental regulatory instruments to allow and encourage DSM to be implemented by EVN and its PCs. This comprehensive study concluded that no new policy measures or regulations were needed for EVN to implement DSM programs, launch informational campaigns or provide relevant customer incentives provided that such programs did not unduly conflict with its core business. However, any DSM programs that could significantly affect off-peak sales or provide national social benefits, which are clearly beyond EVN’s mandate, would require some regulatory instruments, perhaps in addition to financial incentives to EVN and the PCs, in order for such programs to proceed. At present, the Government is considering these issues. However, at the present time, it has been agreed that EVN will only develop DSM programs that are commercially sound and cost-effective from EVN’s perspective. With this approach, no additional regulatory instruments would be required.

Commercial Energy Efficiency: In addition to utility-sponsored activities, there is a small but growing number of commercially-oriented firms that are providing energy services to commercial and industrial customers. These include about six entities that are now developing and implementing energy efficiency projects. A small number of these firms have been pioneering more complex service models to grow their respective businesses and facilitate transactions in energy efficiency during recent years. These models have involved vendor financing of EE equipment costs to allow end-user payments to be staggered based on energy savings over a fixed period; deferred payment (as a lump sum) for equipment after its performance has been demonstrated; phasing EE investments into several smaller projects and using the proceeds of one to finance the next; and basing equipment/service payments on guaranteed performance of energy savings. However, these firms have encountered a number of constraints to business growth which range from limited equity and financing to low awareness and credibility/risk sharing of energy savings. In addition, there are some 40 firms that are interested in entering the market, provided conditions improve and the overall understanding of these projects among end-users is enhanced. Of these, there are eleven local equipment manufacturers, seventeen equipment suppliers (importers and distributors), eight technical services providers (energy auditors, engineering consulting, etc.) and four financial services providers. Some are fully private local firms, some are quasi-public entities, some are research institutes and others are international or joint-venture companies. It was, therefore, concluded by MoI and the Bank that there is considerable opportunity to support this emerging commercial market through GOV/GEF support. As electricity tariffs continue to increase, state-owned enterprise (SOE) reform progresses, and economic and energy demand growth rates persist, it is expected that there will be a greatly expanding market for these emerging businesses to tap.

Decree on Energy Conservation and Efficient Use: A draft Decree has been developed by MoI, in consultation with other line ministries and broad public consensus, which establishes a broad regulatory framework for the promotion of energy conservation and efficiency. The Decree is, in part, based on the Energy Conservation Promotion Act from Thailand. The latest draft Decree would regulate the energy conservation and efficiency in production, buildings and equipment, power intensive machines and residential use. Specifically, the Decree would require large factories (over 1,500 toe/year and/or 750kW or 4.5 GWh/year electricity demand) to meet certain requirements specified by MoI, commercial buildings (over 1,000 square meter floor area) to meet certain requirements developed by MoC, establishment of national standards (initially voluntary) for energy intensive equipment by MoSTE and MoI and building codes developed by MoC, creation of energy efficiency norms for specialized equipment prevalent in various ministries, required energy audits in facilities specified under the Decree, guidelines for a financial framework for the promotion of EE, and other relevant provisions. The Decree would not create an energy efficiency fund, but the GOV intends to create an Inter-Ministerial committee of MoI, MoSTE and Ministry of Finance to prepare a Prime Ministerial decision for such a Fund to support EE investments and activities. The Decree also addresses a number of other relevant issues, such as measures to reduce or eliminate import tariffs on selected EE equipment, to support its implementation.

This draft Decree places responsibility for the state management of energy conservation and EE with MoI, but requires other ministries to co-operate in this function. The Provincial Peoples’ Committees (PPCs) are made responsible for control of EE activities in provinces and cities. Provincial Departments of Industry and Departments of Construction are responsible to implement EE in the provinces and cites under guidelines laid down by the corresponding Ministry and with authorization for the PPCs.

EE Equipment Standards: The DSM assessment also identified motors and lighting as the two largest electric power end-uses and recommended the development and implementation of minimum performance standards, which would effectively remove the least-efficient equipment (mostly imports) from the market in a very cost-effective manner. This work, initiated under the IDA/Sida project, has resulted in the development of equipment standards for industrial motors and lighting systems as well as testing, labeling, marketing and enforcement plans. Once this initial phase is completed, there remains substantial work to follow-up these standards with standardized testing protocol and facilities, enforcement mechanisms and training, ongoing labeling to promote further efficiency improvements, transfer of technology to local manufacturers to produce more efficient equipment, updating of standards as efficiency levels improve, and development of standards for other equipment such as refrigerators and air conditioners. This work is considered an important component of the country’s EE program and should be supported by the GEF. However, due to current GEF funding constraints and the imminent passage of the Decree on Energy Conservation and Efficient Use, this activity should be put on hold until GEF funds are available and the local institutional arrangements for this work have been clarified, appropriate working groups and budgets established under the appropriate ministries, and long-term plans have been developed.

Building Code: The development of an EE commercial building code was also recommended as a low-cost measure to improve building efficiency, particularly given the high construction rates experienced in HCMC and Hanoi. While the IDA/Sida project has developed an appropriate code (for high rise office buildings and hotels) and draft implementation/enforcement plans, there would be need for significant additional assistance in the future, such as training of building inspectors to assess compliance, technical assistance/training to developers, architects, and engineers to comply with and possibly surpass code requirements, demonstration efforts and/or design competitions to promote further improvements, technical assistance to the building supply chain to improve building inputs and construction practices, mechanisms to better link energy costs with office tenants, and development of codes for other commercial buildings (e.g., apartments, supermarkets, hospitals, schools and government buildings) and industrial facilities. As with the standards work, this is an important element of the EE program and should be supported by the GEF. UNDP previously agreed to support the continuation of this work. However, given current GEF funding shortfalls, it is expected that this activity may be delayed.

**Complementary Activities**

UNDP: UNDP is also developing a number of fully complementary initiatives to support energy efficiency programs within the country. The proposed UNDP-GEF Energy Efficiency Public Lighting Project (PDF B approved July 2000) would seek to remove barriers to EE lighting systems in the public sector. The proposed project would seek to assist local governments to promote and implement new and efficient lighting systems through innovative delivery mechanisms, impact appropriate regulations of public lighting system, facilitate standards for street lighting and schools, provide technical assistance to local manufacturers, and develop mechanisms to extend lighting services to unmet areas. The proposed Promotion of Energy Conservation in Small and Medium Enterprises (SME) Projects (PDF B approved July 2001) under MoSTE would promote energy conservation in SMEs, largely through publicly-funded provincial energy conservation centers in Vietnam, and support information dissemination, market development and access to financing. Agreement has been reached with GOV that the Bank and UNDP programs will seek to complement one another by focusing on different approaches (the Bank would focus on market-based EE development, while UNDP would target public policy/social EE programs which would rely on greater public budgetary support) and markets (the Bank would focus on larger, commercially-viable projects in larger end-users, while UNDP would target SMEs only).

Other Donors: In addition to the Bank and UNDP, there are a number of other parallel programs that have been initiated by other development agencies. Through bilateral support, largely from European sources, the Master Plan for Energy Conservation & Efficiency (EC&E) Program was developed under MoSTE (now referred to as the Vietnam Energy Conservation Program or VECP). This program has proposed a broad national-level framework to promote energy efficiency, with supporting policy frameworks, mandated energy audits and public auditors, creation of publicly funded provincial energy conservation centers, a range of technical assistance activities (mostly to SOEs and SMEs), and creation of a public fund to provide investment support to end-users. The program has already worked to develop an impressive grass-roots network of energy auditors and capability, within MoSTE and its provincial DoSTEs and has initiated several pilot efforts in industries. The program has contributed positively to the overall energy efficiency activity over its seven years of operation and is working closely with UNDP to further its efforts. With the approval of the proposed Energy Conservation & Efficiency Decree, the future role of MoSTE and the VECP will need to be clarified, along with future funding arrangements. In addition to the VECP, Japan, along with the French and other bilateral donors, have conducted a number of individual energy audits and EE renovations in specific factories.

3. Sector issues to be addressed by the project and strategic choices (see also Annex 2)

It is proposed that IDA/GEF support a phased, 12-year (1998-2010) programmatic approach to efficiency activities in Vietnam. This program has begun with the IDA/Sida DSM project and would continue to build upon initial program results and efforts in 2-3 additional operations. The rationale is to provide a longer-term vision for development assistance, scale-up mechanisms and business models tested in earlier operations, and develop timely intervention mechanisms as programs, markets and reforms develop (see Annex 3, Figure A3-1). Where efficiency activities may contain potential conflicts with EVN’s financial interests (e.g., DSM reduces electricity sales during off-peak/low load hours) and/or activities clearly beyond EVN’s mandate, programmatic support will be provided through and implemented by MoI. This proposal along with the associated SEIER Project, would seek to address the main short- to medium-term energy sector issues described in Section B2 and, in particular, expand EVN’s DSM programs and test new models to support DSM and EE investments.

As noted previously, the rationale for supporting a DSM program within EVN and its PCs is clear and would form a core component of the IDA/GEF assistance program. The phased DSM program would seek to build upon activities initiated under the IDA/Sida project through the large-scale implementation of successful pilot activities, development of a broader portfolio of programs, improvement in EVN’s DSM planning and evaluation abilities, and development of timely and appropriate assistance as sector reforms deepen and the landscape for DSM changes. Given EVN’s business priorities, much of this program would focus on load management measures, such as TOU metering, voluntary load control, and tariff reforms, and should be supported with IDA financing. However, such load management efforts are not expected to achieve sufficient peak reductions alone and EVN has expressed its desire to support more energy efficiency measures, particularly efficient lighting in residential areas to shave peak loads and reduce new investment requirements in these areas. EVN also sees that CFL promotion in rural areas can help mitigate the effects of ongoing tariff reforms in these areas. Where barriers exist to these measures, GEF funds will be mobilized to support efforts to overcome these barriers. Given existing tariff and reform issues, it is not expected that the DSM regulatory framework would establish tariff surcharges in the near-term and, thus, the program would be restricted to purely commercial pursuits (i.e., cost-effective load management) or incremental cost financing for market transformation efforts. EVN’s DSM Cell is also interested in improving load research data and information (both customer and end-use profiles), enhancing its audit and customer consultation expertise, and mitigating the effects of ongoing tariff rationalizations through public awareness of DSM measure. IDA/GEF and other donor funds are being sought to support these initiatives.

In terms of providing assistance to end-users, the development of an initially small but commercially-oriented service industry to act as “project agents”[[2]](#footnote-2) and provide support in any or all areas of project development and implementation would offer the most suitable mechanism to address EE barriers on a replicable and sustainable basis. Because the industrial sector in Vietnam is still largely state-owned and marginally creditworthy, the commercial EE pilot program will initially target those creditworthy energy users – e.g., commercial buildings, hotels, other office buildings, certain high growth industrial sub-sectors - that are able to access financing on their own. The strategy would be to build-up core competencies among participating project agents in simple and replicable technical renovation categories initially and develop more complex business models, technical innovations and financing schemes in subsequent phases. As initial projects are developed and implemented, successful business models would be identified and mechanisms developed to scale-up their operations. Initial phases will include monitoring systems designed to identify strengths and weaknesses of program models as well as feasibility studies for further market development, such as the potential for utility and non-utility energy service companies (ESCOs), various market assessments, and options for financing programs, which could then be further developed and/or implemented in subsequent phases with IDA/GEF support.

**Barriers to DSM and Energy Efficiency.** While substantial opportunities clearly exist for DSM and EE improvements in Vietnam, there are a number of key barriers that have prevented the development of meaningful impacts to date. These include:

(i) *inadequate information and skepticism*, from and for end-users, equipment manufacturers/suppliers and service providers (including EVN) on potential DSM/EE improvements, costs and benefits of DSM/EE measures, potential low-cost measures, and new technologies/practices;

(ii) *lack of technical expertise*, by end-users, manufacturers/suppliers and potential service providers on modern efficient technologies and practices, efficiency potentials, DSM planning and implementation, energy audits and inspections, actual performance of EE measures, limited understanding of third party EE services (e.g., ESCOs);

(iii) *high capital investment costs*, due to prevailing higher costs of EE equipment, limited local manufacturing capability and import tariffs on EE equipment, which currently discourage end-users from selecting high-efficiency equipment despite their overall lower life-cycle costs, particularly given limited abilities of households to purchase EE lighting and current short-term priorities among many Vietnamese firms;

(iv) *high project development costs*, due to audits and technical studies required to properly determine investment requirements and ensure appropriate project design, real and perceived risks of projects developed by auditors with limited track record and technologies/ equipment with limited tested performance under Vietnamese conditions;

(v) *lack of affordable financing*, due to a lack of commercial lending culture in Vietnam, weak banking sector and very limited term lending, restrictive lending terms, dominance of SOEs and dependence on public budgets for project investment capital, foreign capital requirements for imported EE equipment, relatively small investment sizes for EE, and limited credit available to residential sector;

(vi) *poor customer creditworthiness*, due to the poor financial status of many of the SOEs, which limit DSM and EE investments;

(vii) *limited interest of end-users*, due in part to a production or core business priority bias, the sometimes limited financial significance of the operating cost reductions from energy savings and the ownership of savings benefits from SOEs/municipal agencies;

(viii) *limited local EE and high quality equipment*, given the current manufacturing capability within Vietnam and low domestic demand for high-efficiency products; and

(ix) *low energy tariffs*, particularly in residential households, which has served to discourage investments in high-efficiency appliances and other DSM measures.

Collectively, these issues have discouraged any sizeable investments in efficiency measures.

C: Project Description Summary

1. Project Components (see Annex 3):

**Table 1. Financing Requirements for Full Phase 2 DSM and Energy Efficiency Program**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Component** | **Indicative Costs (US$M)** | **% of Total** | **IDAa financing (US$M)** | **% of IDA financing** | **GEF financing (US$M)** | **% of GEF financing** |
| 1. EVN’s DSM Program |  |  |  |  |  |  |
| a. Expanded time-of-use metering |  2.25 |  11.7 | 2.25 | 100.0 | 0.00 |  0.0 |
| b. Pilot direct load control program |  0.72 |  3.7 | 0.60 |  83.3 | 0.00 |  0.0 |
| c. CFL promotion b |  1.79 |  9.3 | 0.89 |  49.7 | 0.90 |  50.3 |
| d. FTL market transformation |  0.81 |  4.2 | 0.00 |  0.0 | 0.75 |  92.6 |
| e. Supporting programs and technical assistance |  2.65 |  13.8 | 1.46 |  55.1 | 0.60 |  22.6 |
| 2. MoI’s Pilot Commercial EE Program |  |  |  |  |  |  |
| a. Training |  1.20 |  6.2 | 0.00 |  0.0 | 1.09 |  91.0 |
| b. Project financing and sub-grants |  8.40 |  43.7 | 0.00 |  0.0 | 1.10 |  13.1 |
| c. Program marketing, evaluation and administration |  1.40 |  7.3 | 0.00 |  0.0 | 1.06 |  75.7 |
| Total Project Costs | 19.22 | 100.0 | 5.20 |  27.1 | 5.50 |  28.6 |

Notes:

a. IDA financing for Phase 2 is provided under the recently approved, associated SEIER Project.

b. Project costs do not include the US$2 million associated financing from end-users for the CFL program.

This second phase of the DSM/EE program, which would seek to address the key barriers noted previously, consists of two components: (i) a second phase DSM component under EVN; and (ii) implementation of a pilot commercial EE program by MoI. For the EVN component, a total investment of US$8.22 million would be sought to support the continuation of EVN’s DSM activities initiated under the IDA/Sida project and, specifically, implement four large DSM programs and supporting activities to achieve major reductions in peak load, improve system load factors, transform select lighting markets, and assist customers with ongoing tariff reforms. US$5.20 million has already been approved under the IDA SEIER Project, US$0.77 million would be made available from EVN’s internal funds, and US$2.25 million in GEF grant funds are now sought. The MoI component would seek to test and develop business models and mechanisms to support commercial EE services and investments in industrial and commercial facilities, which would require an estimated $11.0 million in total project financing ($3.25 million GEF, $7.3 million private sector, $0.45 million MoI). (See Table 1, above, for a further breakdown of project financing requirements.) Project performance indices will be monitored during implementation of Phase 2 which will then be used as a basis for developing appropriate intervention strategies for future phases and the need for further GEF support (see Annex 3 for further details).

The full second phase DSM/EE program will consist of the following elements:

**Component 1. EVN’s DSM Program.** The main focus of this component would be to build upon Phase I DSM results and expand the use of DSM to help EVN and its PCs improve management of loads, load curves and load factors. DSM is also viewed by EVN as a means to help mitigate the effects of ongoing power tariff reforms. Based on the studies and assessments conducted under Phase 1, the second phase has been designed to achieve over 120 MW in system peak reduction and electricity savings of about 500 GWh through the implementation of several DSM measures. The program would be managed by EVN and implemented with support from its PCs. (Annex 3 contains a detailed summary of the programs, costs, sources of funds, savings and cost/benefit analyses.) EVN’s Phase 2 program would include:

a) Expanded TOU Metering: EVN and its PCs would procure and install 5,600 TOU meters in about 4,000 large- and medium-sized customer premises to help rationalize electricity consumption during peak periods. This would be combined with a marketing and customer consultation component to assist end-users to better understand the TOU rates and identify options to shift load to off-peak or low-load hours. The associated IDA credit would allow EVN and its PCs to procure and install these meters in remaining customer premises as well as support project marketing and administration.

b) Pilot DLC Program: EVN, in collaboration with PC HCMC and PC Hanoi, would introduce a pilot direct load control (DLC) program using ripple control systems to curtail demand of about 2,000 customer end-use loads (e.g., air conditioning and water heating systems)on a voluntary basis. This would allow EVN to shut-off the equipment for up to a pre-specified maximum number of hours each year during system shortages and seasonal peaks. The equipment (central stations, receivers, communication systems) would be purchased with the associated IDA credit and EVN would use its counterpart funds to pay for program administration and incentives for participating customers.

c) CFL Promotion: The promotion of compact fluorescent lamps (CFLs), which typically use 12-18 W and provide comparable lumen output to incandescents, could significantly reduce lighting loads, which coincide heavily with EVN’s system peaks, and reduce electricity costs for end-users. However, incandescent bulbs typically cost $0.20-0.40 each versus $2.00-3.00 for CFLs. Under this program, EVN would promote sales of 1 million CFLs to Vietnamese households located in areas of high loads and network congestion. EVN would procure CFLs in bulk and distribute them through their PC branch offices, and possibly lighting retailers and/or community-based NGOs. Over the three-year program period, EVN would use declining discounts, combined with marketing efforts, to promote the use of the more efficient lamps. GEF funds would be used to test the program in the first year and IDA funds would be used in the second and third years. EVN has also proposed a DSM learning grant to test alternative CFL delivery mechanisms, such as performance-based contracts with program subcontractors (e.g., PCs, lighting distributor/retailers, NGOs, companies) to market and sell CFLs as well as test and develop small revolving fund(s) in one or more PCs to offer interest-free financing to end-users, allowing them to receive the CFLs and payback the costs over a 6-12 month period through their electric utility bills.

d) FTL Market Transformation: EVN also plans to promote the use of high-efficiency 18/36 W T-8 fluorescent tube lamps (FTLs), which have about the same lumen output and retail price as conventional 20/40 W T-10 lamps but consume 10 percent less electricity. Given the small number of manufacturers of FTLs in Vietnam, EVN proposes to increase the market share of T-8 lamps by offering a marketing grant to participating manufacturers to support their costs in actively marketing the more efficient lamps. EVN would also launch a parallel campaign to educate consumers about efficient FTLs as well as low-loss electronic ballasts. GEF funds would provide for the incremental cost of the marketing efforts to both the manufacturers and EVN, and EVN’s internal funds would support project management and administration. The GEF-supported learning grant would also be available for providing end-user financing for efficient ballasts and, like the CFL program, would be repaid through customers’ electricity bills.

e) Supporting Programs and Technical Assistance: In addition to the four DSM programs noted above, EVN will initiate complementary activities to support these efforts. Such activities will include load research (both facility and end-use levels) to determine customer class and end-use profiles and energy savings potential/impacts, DSM program planning and policy support, development and implementation of 1-2 new pilot DSM programs, DSM business opportunities studies (e.g., fee-for-service audits and consultations, utility-based ESCO, and capacitor, EE equipment and load management system leasing, etc.), DSM program monitoring and evaluation, and support to the DSM Center (equipment, staffing, institutional development).

**Component 2. Pilot Commercial EE Program.** The Phase 2 program will also include a pilot commercial energy efficiency program, which would seek to test appropriate business models and mechanisms to catalyze a small and sustainable service market to support EE investments in Vietnam. This would be achieved by supporting a small group of commercial service providers or “project agents” in all phases of EE project identification, development and implementation. These project agents could include energy auditing and engineering firms, equipment leasing companies, equipment suppliers, installation and construction contractors, and ESCOs. Given the existing poor financial conditions among many industrial enterprises, the pilot program will initially focus on private commercial buildings, hotels, other office buildings and selected creditworthy industrial sub-sectors capable of accessing financing on their own. The pilot program would be restricted to four major cities (e.g., Haiphong, Hanoi, Da Nang, and Ho Chi Minh City), in order to allow MoI to better manage and focus market development, training, and project monitoring/administration efforts. Energy efficiency measures would be limited to simple and replicable technical investment lines, such as lighting, motor drives and pumps, cooling/heating and electrical supply systems, in order to gradually build-up competence among project agents, facilitate the development of technical program standards to help ensure equipment performance and evaluation/monitoring, and stimulate the market for EE equipment in these initial areas. Future phases would seek to build upon successful business models from Phase 2 to support larger-scale investments.)

MoI would manage this 4-year pilot program, which is expected to require about $3.25 million in GEF funds and mobilize about $7.3 million in private financing. An Administrative Unit or AU (a commercial bank) would be responsible for managing and disbursing the sub-grants (to help support audit costs and offer initial investment bonus grants) and technical assistance would be made available to the AU to support assessments of the proposals. Through ongoing audit programs within EVN and MoSTE, along with work under the PDF B grant, it is expected that an initial pipeline of investment proposals would be developed and available by Project effectiveness. Specific activities under the pilot program are expected to include:

a) Comprehensive Project Agent Training Program: The program would support a major training program to provide basic technical, financial and business knowledge to project agents to facilitate the development and implementation of project proposals as well as some customized technical assistance to develop their marketing and business plans. Technical training would be provided for energy auditing, technical system analyses and recommended efficiency improvements in the four end-use systems targeted, financial analyses of EE investments and technology options, various contractual options for EE services, project management, energy savings verification, etc.

b) Audit and Investment Grants: The program would provide partial grant support for energy audits and subproject investment grants to project agents and their customers. For the audit grants, the program would offer full or partial grant reimbursements for energy audits with some conditions that the customer is willing to proceed to the investment stage if viable EE measures are identified based on agreed payback (or similar) thresholds set upfront. As agent capabilities improve and awareness and confidence in EE measures increases, the percentage of audit costs eligible for grant reimbursement will be reduced during the program period. To ensure that the project agents and customers also have incentives to actually implement the recommendations of the audit report, a portion of the audit payment may be held until the project is under implementation. The GEF grant would also be used to offer some sub-grants (as a percentage of the project investment) for customers and agents that have fully implemented EE investments and submitted commissioning certificates subject to AU/MoI inspection. Again, this would be used to reduce barriers to customer skepticism of performance and gradually be reduced as agent reputations and technical expertise improve.

c) Program Marketing, Monitoring and Administration: The program would also offer support for: (i) program marketing (e.g., identification and recruitment of project agents, raising awareness of potential customers of EE services, case study development and dissemination to project agents and end-users, etc.); (ii) program administration and monitoring (e.g., AU management fees, technical support, program database development and monitoring, post-installation inspections, evaluation and reporting); (iii) technical assistance to MoI and the AU; and (iv) feasibility studies for expanding successful business models, developing more complex models, establishing various financial mechanisms and instruments (e.g., credit lines, dedicated funds, guarantees, supplier credit/leasing arrangements, etc.) and support policy reviews to support project pipelines, and further market expansion in future IDA/GEF operations.

2. Key policy and institutional reforms to be sought

The following policy and institutional reforms are being sought under the associated IDA/GEF SEIER Project, which would allow this Project to fully realize its objectives and impacts:

The principal institutional reform would be capacity building to define and implement institutional structures for improving system efficiency, creating a creditworthy distribution sector and sustainable institutions for renewable energy development. The Project would also support improvement in system efficiency, corporate business and information management systems and increased decentralization and commercialization of management through: (a) introduction of appropriate government regulations on energy efficiency and DSM; (b) implementation of EVN’s comprehensive and modern information technology (IT) Strategy; (c) separation of power plants and independent accounting units with explicit, incentive-based power purchase agreements with EVN; and (d) introduction of cost-based bulk power tariff replacing the internal bulk tariff between EVN and the PCs.

3. Benefits and target population

The project will provide measurable, cost-effective reductions in energy use, greenhouse gas emissions and other pollutants. Preliminary estimates of direct energy savings benefits over a ten year period (to be further analyzed and finalized by Project Appraisal) total about 120 MW in peak load reduction and 3,018 GWh, resulting in over 746 thousand tons of oil equivalent (toe) and 3.6 million tons of carbon (see Annex 2 for further details).

In addition to the environmental benefits, EVN and its PCs will substantially benefit from reduced peak loads, network congestion and new investment requirements from its DSM programs. EVN’s CFL program is also expected to offer major social benefits to households, particularly in rural areas, by reducing the impacts of planned electricity tariff increases. EVN’s DSM programs could also help reduce public resistance to expected tariff reforms as the utility offers information and support in helping consumers use their electricity more efficiently. Industrial, commercial and residential consumers will benefit from reduced power supply constraints, more access to energy efficiency products and services, reduced power bills and reduced energy related environmental impacts in their facilities from the activities initiated under the Project. Finally, project agents will benefit from increased business prospects for providing commercial services and technical assistance to expand their capabilities.

4. Institutional and implementation arrangements

a. **Implementation period.** 2003-2006.

b. **Executing agencies**. The executing agencies would be EVN and MoI.

EVN would assume overall responsibility for Component 1. This would include the development of detailed DSM program designs and implementation plans, preparation of evaluation plans, overall DSM planning functions, analysis of all market and load research data, procurement of all equipment, procurement and management of consultants and contractors, coordination of program implementation with the PCs and other agencies, and reporting to IDA/GEF. Since EVN does not have direct interface with energy consumers, the PCs would have primary responsibility for recruiting customers for the load management programs, installation of meters and DLC receivers, reselling of CFLs and proving data requirements to support EVN’s load analysis and evaluation efforts.

MoI will maintain overall responsibility for the Component 2. This would include selection and supervision of the AU and technical advisors, procurement and management of all training program consultants, program marketing, monitoring, administration and reporting, and coordination among the various program agents, customers, AU and advisors.

D: Project Rationale

1. Project alternatives considered and reasons for rejection

The Project has been developed during implementation of the Phase 1 project as well as through three stakeholder workshops. For the second phase of EVN’s DSM program, the approach proposed is fully consistent with the original DSM Assessment and the design has incorporated implementation experience over the last two years as well as feedback from a stakeholder workshop implemented in September 2001. The project considered additional efforts to support the codes and standards work initiated under the Sida-supported first phase. However, given the very low demand for EE equipment at present, combined with the limited government capacity to test and enforce national standards, it was determined that an initial focus on creating greater market demand for EE equipment would be a more appropriate priority at this stage. As the program and markets develop further, the appropriateness for national standards and codes would improve as well as the prospects for successful introduction and implementation.

For the pilot commercial energy efficiency program, the strategic approach has been developed in consultation with government agencies, other activities initiated to date in Vietnam, and through two workshops in April 2002 involving potential program agents, government agencies, commercial end-users, financial companies and equipment suppliers. It was originally proposed that the Project include an EE financing program, either through a dedicated credit line or possible guarantee facility, to support commercial transactions. However, ongoing consultation with stakeholders and relevant agencies clearly indicated that there is, at present, a lack of commercial lending culture in Vietnam, weak banking sector and very limited and restrictive term lending. Most of the potential program agents and end-users noted that project financing in Vietnam is more often mobilized through internal end-user funds, supplier credit, foreign partners, and government budgets (for state-owned enterprises), thus, any dedicated financing facility would not be appropriate under the current climate. Furthermore, there was a concern that the creation of a financing facility may prematurely and unduly distort traditional financing mechanisms. Thus, the design was revised to focus on sub-grants as a means of stimulating investments rather than providing project financing directly. As the banking sector undergoes further reforms and more term lending becomes available, the design and development of appropriate financial instruments and programs could be undertaken in future phases of the program. The project also considered providing large support to a few new or existing entities to establish commercial ESCO businesses, such as utilities, provincial energy conservation centers or research institutes. However, given the relatively small market for EE in Vietnam today, the fact that there were a number of small firms already developing businesses in this area and no simple method to select the players, it was determined that such a strategy would create unfair competition and possibly even drive out the smaller players from the market.

2. Major related projects financed by the Bank and/or other development agencies

|  |  |  |
| --- | --- | --- |
| Sector Issue | **Project** | **Latest Supervision****(PSR) Ratings****(Bank-financed projects only)** |
| Bank-financed |  | Implementation Progress (IP) | DevelopmentObjective (DO) |
| Utility DSM and energy efficiecny | Brazil IBRD/GEF Energy Efficiency Project | U | S |
| Energy efficiency | China IBRD/GEF Energy Conservation Project(Phase 1) | S | S |
| Energy efficiency | China GEF Energy Conservation Project(Phase 2) | -- | -- |
| Energy efficiency | China GEF Efficient Industrial Boilers | S | S |
| Utility energy efficiency | Poland IBRD/GEF Krakow Energy Efficiency Project | S | S |
| Energy efficiency | Romania GEF Energy Efficiency Project | -- | -- |
| Utility DSM and energy efficiency | Sri Lanka IDA/GEF Energy Services Delivery | HS | HS |
| Energy efficiency | Uruguay IBRD/GEF Energy Efficiency Project | -- | -- |
| Other development agencies |  |  |  |
| UNDP-GEF | Vietnam Energy Efficient Public Lighting |  |  |
| UNDP-GEF | Vietnam Energy Conservation in SMEs |  |  |

IP/DO Ratings: HS (Highly Satisfactory), S (Satisfactory), U (Unsatisfactory), HU (Highly Unsatisfactory)

3. Lessons learned and reflected in proposed project design

For EVN’s DSM program, Bank/GEF experience has shown the need for proper incentives for utilities to undertake DSM, thus EVN’s programs have been restricted to those that directly coincide with their system peak. Previous operations have also shown the need for strong marketing efforts by DSM units, role of manufacturer agreements and linkages to parallel commercial financing programs (*Thailand Promotion of Electricity Energy Efficiency* and *Jamaica DSM Project ICRs*), the need to develop sustainable DSM institutional arrangements given ongoing restructuring plans (*DSM in Thailand: A Case Study, ESMAP Technical Paper No. 8* and *Operating Utility DSM Programs in a Restructuring Electricity Sector, ESMAP Workshop Proceedings*), the need to include distribution utilities in DSM implementation efforts, and design of DSM programs in the local context - all which have been addressed during project preparation.

For the pilot commercial EE program, operational experience has also shown the need for market mechanisms to develop sustainable programs and, in particular, support for EE project developers/service providers to assist end-users to identify, design, package, mobilize financing, procure, install and commission energy efficiency projects in order to develop sustainable, replicable, commercially-oriented programs (*China Energy Conservation Mid-Term Review* and *Promoting Energy Efficiency and Renewable Energy: GEF Climate Change Projects and Impacts*). The program design has also taken into account the need to develop parallel marketing efforts to end-users, select a few demonstrations for wider dissemination, and keeping a clear focus on transactions and investments (*ESCO Practitioners Workshop, ESMAP Workshop Proceedings*).

4. Indications of borrower and recipient commitment and ownership

Commitment by the GOV is very high. The development of the Decree on Energy Conservation and Efficient Use, which is expected to be passed in the summer of 2002, clearly demonstrates the Government’s commitment to energy efficiency on a national basis. During project preparation, three stakeholder workshops (one for EVN and two for MoI) were held and over 200 officials and representatives actively participated in the discussions on existing barriers and potential strategies to overcome them, identified key implementation issues that would need to be addressed, and offered their support for the Project objectives. In addition, EVN and MoI have worked very closely with the Bank during project preparation and have provided adequate staff and counterpart resources to support the development of these programs.

5. Value added of Bank and Global support in this project

The proposed Project, along with the associated SEIER Project, will provide GOV with key support needed to help reduce energy demand and use energy more efficiently. The Bank team has worked very closely with the EVN and MoI counterparts to supervise the first phase for the DSM program and develop this second phase effort. Of particular interest to the GOV is the need for greater investment levels in EE that other programs and donors have been unable to provide or generate so far. Furthermore, the Bank has been able to offer considerable experience on DSM and EE programs elsewhere, particularly in Asia, which has greatly helped the Vietnamese counterparts select elements from other programs suitable to Vietnam. Finally, the Bank actively encouraged the use of a participatory approach to project design, which has allowed the design to better reflect the needs of all stakeholders and will help ensure that the Project impacts are fully realized.

E: Summary Project Analysis

1. Economic

[ x ] Summarize issues below [ ] To be defined [ ] None

Economic evaluation methodology:

[ ] Cost benefit [ ] Cost effectiveness [ x ] Incremental Cost [ ] Other (specify)

The incremental cost analysis of the Project, along with the global environmental benefits, are outlined in Annex 2, including preliminary quantitative estimates. These figures will be confirmed and updated at Project Appraisal.

For the associated IDA credit, an economic analysis was made for EVN’s DSM program. Using the standard benefit/cost assessment methodology for DSM economic analyses, the present value of the net benefits (NPV) to EVN were calculated to be US$59.9 million, with a benefit/cost (B/C) ratio of 3.6 and an economic internal rate of return (EIRR) of 467 percent.

2. Financial

[ x ] Summarize issues below [ ] To be defined [ ] None

For the associated IDA credit, a financial analysis of EVN’s DSM program was conducted. The financial analysis shows the NPV for EVN to be US$76.9 million, with a B/C ratio of 4.9 and EIRR of 563 percent.

3. Technical

[ x ] Summarize issues below [ ] To be defined [ ] None

For the EVN component, the technical issues will be easily managed. Each DSM program plan will include technical equipment performance specifications to ensure that all goods (e.g., meters, receivers, lamps) meet the performance requirements. For the MoI component, the program design requires elements to help ensure that the program does not suffer from early technical and performance failures. Efforts will be made to focus early investments on simple and replicable technical retrofit categories to ensure that core competencies can be built among project agents. Proper review of initial proposals by the AU, rigorous training of program agents and customized assistance provided by MoI will also help ensure that technical risks are minimized and/or explicitly addressed. By Project Appraisal, ongoing work under the PDF B will develop technical safeguards and procedures to ensure that the technical aspects of the subprojects are sufficiently addressed.

4. Institutional

4.1 **Executing agencies.** In order to ensure successful implementation of the Phase 2 program and ensure that these activities are sustained and even expanded under future IDA/GEF-supported phases, the creation of appropriate project management boards within EVN and MoI are essential. EVN has already established a DSM Cell, under the Phase 1 project, and will gradually increase the size and capabilities of this Cell as implementation of the second phase begins. The Bank will need to actively monitor staff enhancements to the Cell and ensure that it is fully capable of managing all aspects of the Phase 2 program. In addition, there remains a need to better and more formally clarify the roles of each PC for each DSM program and appropriate PC DSM working groups, which were created during Phase 1, to be formalized. For MoI, a DSM Project Management Board (PMB) was established under Phase 1 to supervise and coordinate all project activities. MoI and the Bank have agreed that this DSM PMB will be responsible for the preparation of the pilot commercial EE program. However, by Project Appraisal, MoI will need to present a plan for implementation of the program which will require, at a minimum, assigning new staff to the PMB with skills appropriate and necessary for implementation of the program. In addition, MoI must select and appoint an AU to be responsible for the sub-grants, which is underway and will be completed by Appraisal. All of these institutional issues are under active discussions and will be addressed/finalized by or during Project Appraisal.

4.2 **Project management.** As noted above, the project would be managed by EVN’s DSM Cell and MoI. Each would maintain responsibility for overall management, coordination and reporting of their respective programs to the Bank.

4.3 **Procurement issues.** As executing agencies, EVN and MoI would be responsible for procurement of related goods and consulting services for their respective components. Both agencies have implemented previous Bank projects and are fully conversant in Bank procurement guidelines.

4.4 **Financial management.** For EVN, no major financial management issues are envisaged. It is expected that EVN will use part of its GEF DSM learning grant to establish a revolving fund for energy-efficient lighting equipment to be provided to customers that would then repay through their electricity bills. For these funds, appropriate financial management procedures would be developed and agreed by Project Appraisal. For the MoI component, the AU management of the sub-grants would require appropriate financial management procedures safeguards. MoI will prepare an Operation Manual, which would layout detailed procedures for applications to the AU, criteria for approvals, flows of funds, ex-post reviews, financial management procedures, reporting, etc. It has been agreed that MoI will develop an outline for the Manual by Project Appraisal and a complete draft will be submitted to the Bank by Project Negotiations.

5. Environmental

5.1 This project will result in major positive impacts on the environment, in terms of improved energy efficiency, reduced air pollution, and reduced greenhouse gas emissions. No major adverse environmental issues are associated with the project. Since the Project would support a number of subprojects that have yet to be identified, MoI will prepare an Operation Manual, which would include environmental screening and safeguards to ensure no subprojects with potential negative environmental impacts are supported with the project funds. MoI will develop and submit an outline of this Manual by Project Appraisal.

5.2 Environmental category and justification/rationale for category rating: C – Not required

Since this project will only involve the installation of meters, DLC receivers and retrofit of existing equipment (e.g., lighting, motors and pumps, air conditioners and chillers, capacitors, etc.) and no new construction or greenfield development, no adverse environmental impacts are expected.

6. Social

6.1 No social hardships are anticipated as a result of the project.

6.2 **Participatory approach.** Project design has included consultations with a wide range of stakeholders, including government officials, EVN and its PCs, research institutes, end-users, commercial service providers, equipment manufacturers/distributors, financial institutions, nongovernmental organizations and other donors. Major awareness campaigns and marketing efforts supported under the Project will target the entire country and benefit all sectors and end-users. Access to the training activities, technical information/case studies and incentive grants will be open to all interested parties in the targeted sectors and business areas. And, the Project will continue to recruit additional program agents, end-users, and equipment manufacturers/ distributors as implementation proceeds.

7. Safeguard Policies

7.1 Do any of the following safeguard policies apply to the project?

|  |  |
| --- | --- |
| **Policy** | Applicability |
| Environmental Assessment (OP 4.01, BP 4.01, GP 4.01) | No |
| Natural habitats (OP 4.04, BP 4.04, GP 4.04) | No |
| Forestry (OP 4.36, GP 4.36) | No |
| Pest Management (OP 4.09) | No |
| Cultural Property (OPN 11.03) | No |
| Indigenous Peoples (OD 4.20) | No |
| Involuntary Resettlement (OD 4.30) | No |
| Safety of Dams (OP 4.37, BP 4.37) | No |
| Projects in International Waters (OP 7.50, BP 7.50, GP 7.50) | No |
| Projects in Disputed Areas (OP 7.60, BP 7.60, GP 7.60) | No |

8. Business Policies

8.1 Check applicable items:

[ ] Financing of recurrent costs **(OMS 10.02)**

[ ] Cost sharing above country 3-yr average **(OP 6.30, BP 6.30, GP 6.30)**

[ ] Retroactive financing above normal limit **(OP 12.10, BP 12.10, GP 12.10)**

[ ] Financial management **(OP 10.02, BP 10.02)**

[ ] Involvement of NGOs **(GP 14.70)**

F: Sustainability and Risks

1. Sustainability

Sustainability was a key consideration in the decision to develop the programmatic approach adopted while designing this phased, 12-year program. Initiatives developed under the first phase as well as those under this Project will be actively supported and further expanded in subsequent phases with Bank/GEF support. The concept is to provide a longer-term vision for development assistance, a framework for scale-up of mechanisms and business models tested in earlier operations, and provisions for developing timely intervention mechanisms as programs, markets and reforms develop.

In addition, the program itself would seek market-based, commercial funding for DSM and EE investments. The load management programs under EVN are cost-effective and will help demonstrate to EVN and GOV the potential commercial merits and impacts for further DSM measures to help meet the rapidly growing electricity demand within the country. EVN’s market transformation activities are designed to achieve large, sustained impacts on the CFL and FTL lighting markets and the DSM learning grant would, in part, be used to set-up permanent revolving funds that could operate in perpetuity and continue to promote energy-efficient equipment. For the pilot commercial EE program, the focus on improving program agent capability will lead to sustained market activity that will eventually be entirely financed by the private sector. Early successes with participating agents in the program would in turn lead to increased business for them and deepen the level of market activity and momentum. Support may be required in the future to facilitate commercial financing of EE projects, but these future operations would develop local commercial lending and, thus, eventually replace the need for any further Bank/GEF support in this market.

2. Replication Plan

This Project would build on efforts under the first phase and expand measures deemed appropriate for Vietnam. The second phase would also be closely supervised and lessons learned incorporated into subsequent phases. Of particular interest is the ability for different business and transaction models to work within the Vietnamese context and be supported by existing legal, financial and commercial frameworks.

The programmatic approach will allow activities to be tested, refined and introduced on a national scale. There is also significant potential for the design of this program to be of interest to other relatively smaller countries in the region (e.g., Lao PDR, Cambodia) and globally, that are beginning to consider launching DSM and/or EE initiatives to curb demand growth, promote market-based environmentally sustainable development, etc. In particular, the use of simple load management programs to achieve significant, measurable and cost-effective reductions in peak loads and supporting the development of an emerging EE service market, where the banking sector is not yet ready to provide large-scale financing, could be of considerable interest to other countries.

Critical Risks

|  |  |  |
| --- | --- | --- |
| **Risk** | **Risk Rating** | **Risk Minimization Measure** |
| *From Outputs to Objectives (see Annex 1)* |  |  |
| No major changes in customer consumption patterns | N |  |
| Customer willingness to accept and adopt of EE measures during and beyond project | M | Adequate market research to help ensure effective and appropriate program designs and marketing efforts. |
| Power quality supports EE equipment | M | Project activities will focus in areas with suitable power quality and associated IDA project will seek to improve power quality throughout EVN’s system. |
| Proper energy pricing between EVN and PCs | S | Bulk power tariff study will be conducted under associated IDA project and appropriate remedies will be sought. |
| Ability for project agents to operate successful businesses | M | Proper and rigorous training and identification of agents along with customized technical assistance. |
| Ability of agents to find innovative ways to share project performance risks to encourage customer investments | M | Training to agents on different successful project structures worldwide. |
| Continued economic development of sectors and creditworthiness of large end-users | M | Ongoing IDA assistance to SOE reforms. |

Critical Risks (Continued)

|  |  |  |
| --- | --- | --- |
| **Risk** | **Risk Rating** | **Risk Minimization Measure** |
| *From Components to Outputs (see Annex 1)* |  |  |
| Sustained EVN and PC management support and proactivity in DSM program | M | Ongoing dialogue as well as strong attention to early program successes. |
| Ability of DSM Cell to develop and implement successful programs | M | Technical assistance to DSM Cell, close supervision, ongoing dialogue with EVN on Cell staffing. |
| Ability and willingness for end-users to accept and invest in EE measures | M | Marketing to end-users, high quality agents, training to agents in selling EE services and projects. |
| DSM incentives are not misused by EVN/PC staff or customers | M | Proper program design, financial management system, close supervision. |
| Ability of lighting manufacturers to increase production of EE products at competitive prices | N |  |
| MoI ability to successfully manage program | M | Careful attention to DSM PMB staffing, close supervision, technical assistance to MoI. |
| Ability for project agents to recruit interested and creditworthy customers | M | Marketing to end-users, high quality agents, training to agents in selling EE services and projects. |
| Ability for project agents to find alternative options for financing projects | M | Focus on creditworthy customers, recruiting leasing companies as agents, AU ability to offer financing, sharing of financing options between agents. |
| Ability for equipment suppliers to provide high quality EE equipment | N |  |

Risk Rating – H (High Risk), S (Substantial Risk), M (Modest Risk), N (Negligible Risk)

Annex 1: Project Design Summary

**Vietnam DSM and Energy Efficiency Project**

|  |  |  |  |
| --- | --- | --- | --- |
| **Hierarchy of Objectives** | **Key Performance Indicators** | **Monitoring & Evaluation** | **Critical Assumptions** |
| **Sector-related CAS Goal:** | **Sector Indicators:** | **Sector/ country reports:** | **(from Goal to Bank Mission)** |
| 1. Reduce infrastructure bottlenecks2. Increase competitiveness3. Private sector development4. Protect the environment | * Quantified capacity (MW) and energy (GWh) savings
* Operating cost reductions through EE investments
* Increased commercial EE service providers and transactions
* Quantified reductions in emissions and local pollutants from EE investments
 | * MoI and EVN statistics
* Project progress reports
* Project surveys and evaluation reports
 | **CAS and GEF Objectives to Bank Mission:** Promotion of environmentally sustainable development |
| Global Objective:Reduction of greenhouse gas emissions | Quantified CO2 emission reductions from EE investments |  |  |
| Development Objective: | Outcome / Impact Indicators: | Project reports: | (from Objective to Goal) |
| Achieve significant and sustainable reductions in energy consumption and peak power demand | * Peak load (MW) reduction
* Energy (GWh) savings
* Sustained increased sales of CFLs and T-8 FTLs
* Total commercial EE projects and investments
* Number of project agents
 | * MoI, EVN, and AU project progress reports
* Supervision missions
* Surveys and DSM evaluation reports
* Project agent proposals
 | **Development and Global Objectives to CAS*** Stable macroeconomic conditions
* Appropriate energy pricing
* Ongoing SOE and banking reforms
 |
| GEF Operational Program:Sustainable removal of commercial barriers to DSM and EE investments | * Information and skepticism barriers of EE removed
* Load effects of DSM programs demonstrated
* Local capacity to deliver DSM and EE enhanced
* Lighting/EE service markets developed and transformed
 | * MoI, EVN, and AU project progress reports
* Supervision missions
* Surveys and DSM evaluation reports
* Project agent proposals
 |  |
| Output from each Component: | **Output Indicators:** | **Project reports:** | **(from Outputs to Objective)** |
| 1. EVN’s DSM Program1. TOU metering
2. DLC program
3. CFL promotion
4. FTL program
5. Supporting programs
 | 1. TOU meters installed
2. DLC systems installed/active
3. CFLs sold and installed
4. T-8 FTLs marketing campaigns launched

e1. Load research meters installed and profiles developede2. Commercial DSM business opportunities assessed and appropriate plans developede3. DSM planning and policy support developed/initiatede4. DSM pilot programs assessed and implementede5. Monitoring and verification plans developed/implemented | * EVN progress reports
* Supervision missions
* Surveys and DSM evaluation reports
* Lighting manufacturer sales data
 | * No major changes in customer consumption patters
* Customer willingness to accept and adopt EE measures during and beyond project period
* Power quality supports EE equipment
* Ability of lighting manufacturers to increase production of EE products at competitive prices
* Proper energy pricing between EVN and PCs
 |

|  |  |  |  |
| --- | --- | --- | --- |
| Output from each Component: | **Output Indicators:** | **Project reports:** | **(from Outputs to Objective)** |
| 2. Pilot Commercial EE Programa. Trainingb. Sub-grantsc. Program marketing, evaluation, and administration | a Training programs developed and deliveredb. Customers successfully recruited, audits completed and projects implementedc1. Marketing materials developed and deliveredc2. End-users trained and educated on EEc3. Case studies developed and disseminatedc4. Monitoring and evaluation plans developed and implementedc5. Studies to scale-up program in future phases launched and completed | * MoI and AU project progress reports
* Project agent proposals
* Supervision missions
* Surveys and evaluation reports
 | * Ability for project agents to operate successful businesses
* Ability for agents to find ways to share project performance risks to encourage customer investments
* Continued economic development of sectors and creditworthiness of large end-users
 |
| **Project Components / Sub-components:** | **Inputs: (budget for each component)** | **Project reports:** | **(from Components to Outputs)** |
| 1. EVN DSM Programa. TOU meteringb. DLC programc. CFL promotiond. FTL programe. Supporting programs | 1. Total cost $8.2 milliona. $2.2M (IDA)b. $0.8M (IDA)c. $1.8M (IDA/GEF)d. $0.8M (GEF)e. $2.6M (IDA/GEF/EVN) | * EVN progress reports
* Supervision missions
* Bank disbursement reports
 | * Sustained EVN and PC management support and proactivity in DSM program
* Ability of DSM Cell to develop and implement successful programs
* Ability and willingness for end-users to accept and invest in EE measures
* DSM incentives are not misused by EVN/PC staff or customers
* Ability of lighting manufacturers to increase production of EE products at competitive prices
 |
| 2. MoI Pilot Commercial EE Programa. Trainingb. Subproject grantsc. Program marketing, evaluation and administration | 2. Total cost: $11.0 million (GEF: $3.25M, MoI: $0.45M, commercial: $7.3M)a. $1.2M (GEF/MoI)b. $1.1M (GEF)c. $1.4M (GEF/MoI) | * MoI and AU progress reports
* Supervision missions
* Bank disbursement reports
 | * MoI ability to successfully manage program
* Ability for project agents to recruit interested and creditworthy customers
* Ability of project agents to find alternative options for financing projects
* Ability of equipment suppliers to provide high quality EE equipment
 |

Annex 2: Incremental Cost Analysis

##### **Overall Context for Energy Efficiency in Vietnam**

Energy efficiency in Vietnam over the coming decade is critical for the country’s continued economic growth and for the global environment. Energy efficiency and conservation investments are necessary to limit the otherwise huge increase in primary energy supply required to sustain the fast pace of growth of Vietnam’s economy and to mitigate the economic and environmental consequences of expanded energy consumption. The Government has shown its commitment to the promotion of energy efficiency through the development and imminent passage of the proposed Decree on Energy Conservation and Efficient Use, which would provide a broad policy framework for a comprehensive set of initiatives to promote more efficient use of energy in all sectors. In addition, the GOV has supported a number of programs, in concert with other donors, to launch programs to support these goals.

From 1992-97, Vietnam experienced unprecedented economic growth, averaging 8.2 percent annually. During this same period, energy demand grew 30 percent faster than GDP and electricity 70 percent faster. The ability of Vietnam to continue to meet such an aggressive economic growth rate will require substantial expansion of the energy sector and, in particular, the electric power sector. The Bank estimates that the power utility, Electricity of Vietnam (EVN), will face an almost threefold increase in demand over the next 10 years, from about 25,800 GWh in 2001 to over 70,400 GWh by 2010, with annual demand growth of 10-15 percent. (In 2001, EVN’s peak demand increased by some 18 percent over 2000.) Generation-level peak power demand is also projected to increase from the 2001 level of 5,655 MW to more than 16,000 MW by 2010, requiring an associated capital investment of more than US$15 billion.

In 1997, EVN, with World Bank assistance, commissioned the “Demand-side Management Assessment for Vietnam,” to assess the potential for demand-side management (DSM) to help meet the country’s future electric power requirements. DSM is a resource planning and energy service tool that encourages electricity consumers to utilize energy more efficiently through a variety of measures, including time-of-use (TOU) tariffs, power factor penalties and correction measures, energy audits and retrofits, load research and management, information/education campaigns, incentive mechanisms to encourage adoption of energy-efficient equipment and other DSM programs targeted for specific industrial, commercial and residential end-uses. This DSM Assessment identified important opportunities for cost-effective electricity savings in a number of sectors and end-uses and recommended a two-phased DSM program, which would reduce the peak load by an estimated 700 MW and save more than 3,550 GWh/yr (about 3.5 million toe) by the year 2010. Under Phase 1, supported by a SEK 29 million (about US$2.8 million) Swedish Sida grant under the *Transmission, Distribution and Disaster Reconstruction Project* (Credit 3034-VN), a DSM Cell within EVN has been established, a supporting DSM policy review and framework has been completed, pilot load research efforts have been initiated, screening and assessments of possible DSM programs have been conducted, pilot load management, lighting and marketing programs have been launched, a DSM business plan for Phase 2 has been developed, and energy audit capability has been developed within EVN; the Ministry of Construction (MoC) has developed an EE building code; and, MoSTE has developed and will introduce EE lighting and industrial motor standards. Overall project coordination is being managed by MoI. It was recommended that Phase II would: (i) expand DSM program implementation and evaluation; (ii) increasingly shift DSM functions from to EVN’s subsidiary power distribution companies (PCs); (iii) expand the load management program; (iv) enforce the building code and appliance standards and develop an expanded standards regime; (v) develop financing mechanisms for future DSM activities; (vi) build local capacity to perform full-scale commercial and industrial energy audits and investment plans; and (vii) promote private sector participation in providing EE services.

#### Barriers to Energy Efficiency

Despite the potential for cost-effective EE improvements in all sectors, there are inherent commercial barriers as well as some barriers unique to Vietnam that have prevented any significant DSM/EE investments to date. These include:

* *Inadequate information and skepticism* from and for end-users in all sectors, equipment manufacturers, utilities, and service providers on the potential for EE improvements and estimated impacts. Many end-users are unaware of the difference between low and high-efficiency products, in terms of life cycle costs, equivalent levels of output, longer equipment lives, supply sources, other benefits (e.g., lower heat from CFLs, improved performance of systems from efficiency motors and adjustable speed drives, reduced maintenance costs, etc.) or potential low-cost measures and new technologies/practices. Other end-users are aware but are skeptical of the savings estimates, given the very low penetration rate of these newer products in the local markets.
* *Limited technical expertise* of end-users, manufacturers/suppliers, utilities, and potential service providers on modern efficient technologies and practices, proper energy auditing and detailed project design, alternative business and transaction models to support EE investments, estimating and verifying energy savings, etc. This lack of demonstrated and credible technical expertise heavily contributes to the information barrier noted above.
* *Deficiency in locally available EE equipment*, given the limited awareness and understanding of EE measures as noted above. Local suppliers and manufacturers supply equipment in demand and, thus, face little market pressure to improve product efficiencies and qualities. The resulting lack of EE equipment, in turn, serves to discourage those end-users that are interested in EE improvements. Those that do seek this equipment find supply lines difficult, face high import duties and restrictions, have difficulty identifying suitable, high quality equipment, etc.
* Commercial and industrial customers as well as service providers face *high project development costs and perceived risks*, due to the need for energy audits and technical studies to identify potential EE improvements without the assurances that high return projects exist. Where service providers bear the initial costs of these audits, end-users have been skeptical of the savings estimates developed by auditors with limited track record and technologies/equipment with little or no demonstrated performance under Vietnamese conditions. Comparing potential investments in EE versus core business costs (i.e., increased production), consumers view conventional investments as more risk-free than future revenue streams derived from less tangible sources such as energy savings.

Barrier Removal Strategy

To remove the key barriers noted above, the Project has been designed to increase public awareness about EE measures, achieve increases in the technical abilities of those promoting EE improvements, establish track records in DSM and EE projects, and demonstrate commercially-viable business models to support DSM/EE investments and transactions. Specifically, the Project would support barrier removal in the following ways: (a) achieve transformation of the lighting markets (for CFLs and T-8 fluorescent tube lamps (FTLs)) by a combination of declining subsidies, bulk procurement of lamps, intensive marketing, interest-free financing on utility electricity bills, and manufacturer partnerships/negotiations; and (b) support for EE transactions in the commercial/industrial sectors by testing and developing alternative business models for service providers to facilitate EE improvements through (i) marketing of EE and information dissemination to end-users; (ii) extensive training of project agents; (iii) grant funds to support project development (i.e., energy audit) costs; and (iv) investment grants to encourage initial projects to help build project agent experience and reputations in the market. In both the EVN and MoI components, funds will also be sought for technical assistance to all relevant parties to ensure successful implementation and full realization of the Project impacts.

Project Benefits

The Project activities will result in large and measurable peak load reduction, energy savings and associated carbon dioxide (CO2) emissions reduction. However, more important than the actual savings derived during the Project period is the removal of key market barriers, sustained market transformation, significant capacity enhancements and firm foundations laid for future DSM and EE programs. These can then be further built upon in future years through subsequent Bank/GEF-supported operations. And as these business models develop and sustain themselves based on their commercial merits, savings will persist and grow even further.

*Energy Savings*: Energy savings would be derived from EVN’s CFL and FTL programs as well as EE investment projects undertaken by the project agents.[[3]](#footnote-3) The total cumulative energy savings from these initiatives is estimated at 827 GWh from equipment installations completed during the project period. (See Table A2-1.) However, since these markets will be significantly more developed after the project has been completed, the full ten year energy savings would be much higher, i.e., 3,018 GWh (see Table A2-2).

*Global Benefits*: Based on the energy savings estimates from each measure, the total amount of carbon dioxide (CO2) equivalent emissions derived from the Project is estimated at almost 1 million tons (over the life of the equipment installed under the Project) and 3.6 million tons over the life of equipment installed over a 10-year period (see Table A2-2).

**Table A2-1. Summary of Direct Project Benefits**

|  |  |  |
| --- | --- | --- |
| **Project Component** | **Peak Reduction (MW)** | **Energy Savings (GWh)** |
| EVN’s DSM Programs |  |  |
|  *TOU Metering* |  69.7 |  -- |
|  *Direct Load Control* |  3.1 |  -- |
|  *CFLs* |  33.4 |  302 |
|  *FTLs* |  14.4 |  193 |
| MoI’s Commercial EE Program |  -- |  331 |
| **Total** |  **120.5** |  **827** |

**Table A2-2. Summary of Total Project Benefits**

|  |  |  |  |
| --- | --- | --- | --- |
| **Project Component** | **Indicator** | **During Project Period** | **Over 10 Year Period** |
| EVN’s DSM Programs | GWh |  496 |  1,478 |
| Tons CO2 |  594,983 |  1,773,498 |
| MoI’s Commercial EE Program | GWh |  331 |  1,540 |
| Tons CO2 |  397,263 |  1,848,264 |
| Total | GWh |  827 |  3,018 |
| Tons CO2 |  992,246 |  3,621,762 |

Note: Total energy savings includes savings for the life of the equipment installed under the Project. CO2 reduction estimates includes total carbon dioxide and CO2 equivalents.

**Incremental Costs**

Implementation of the barrier removal strategy noted previously would require funding of incremental costs, which would be the difference between the cost of implementing the baseline scenario versus that of the GEF Project alternative. GEF funds are sought to support part of this incremental cost. Descriptions and explanations for the baseline scenario, GEF Project alternative and incremental costs are further elaborated below.

Baseline Scenario

While there have been a growing number of initiatives designed to encourage EE in Vietnam, few have actually led to major reductions in energy use. This is to be expected, since Vietnam is in an early stage of its EE programs and, thus, most of the efforts to date have been on pilot or demonstration bases designed to increase local planning and implementation capabilities. For the DSM activities under EVN, most of the first phase effort was to review regulatory requirements, develop basic load research and DSM planning capability, and implement a few pilot programs. As a result of Phase 1 efforts, EVN management has now accepted the need for load management options that complement its large-scale supply-side investments, and the associated SEIER Project has provided for IDA funds to support these measures. EVN has been more reluctant to make major investments in EE measures, even in end-uses that correspond to system peaks, due perceived skepticism of their load reduction benefits (since load reduction would be heavily dependent on energy use patterns). In the absence of any GEF support, EVN would have limited its DSM activities to load management and load shifting programs (e.g., TOU metering, DLC, load research and DSM planning/pilots) and would not have pursued any lighting programs. Thus the total DSM program cost would have been only $4.7 million ($4.3 million from IDA and $0.4 million from EVN).

Without any lighting programs, sponsored by EVN or other agency, it is not expected that the market for more efficient products would grow much, if at all. According to the results of a survey of about 3,000 households conducted under the Phase 1 DSM efforts, lighting accounted for almost 40 percent of the total peak load of which an overwhelming majority were in the residential sector. Of the residential lighting load, about 17 percent (302 MW) were incandescent bulbs and 83 percent (1,478 MW) were FTLs. The current penetration of CFLs and T-8 FTLs is currently very low. The number of CFLs in the residential sector is estimated to be about 0.5 million, or only 0.6 percent of total lamps, and efficient T-8 FTLs are estimated to be 4.4 million (representing about 8.1 percent of all FTLs). For the purpose of the baseline analysis, it is conservatively assumed that the number of CFLs and FTLs would increase by 5 percent per year without any government-sponsored market intervention. Thus the total market for these efficient lighting alternatives would remain at very low levels over the next 5-10 years. (Annex 4 contains further elaboration of the residential lighting markets in Vietnam today.)

For the pilot commercial EE program, interviews with about 40 active agents and potential program participants show that existing investments for simple EE retrofits were in the order of $200,000 per year in 2001. Those few companies that have implemented a number of projects indicated that there are a number of barriers to market development, as noted previously, that have and will continue to prevent any major increases in their services. For the purpose of the baseline analysis, it is assumed that the existing agent industry expands their overall businesses by 5 percent per year (due to increased business of existing agents and new agents entering the market), although the trend in past years has been much lower. This would lead to an overall estimated investment amount of about $905,000 over the 4-year program period in the absence of any GEF or other donor support.

Global benefits under this scenario would have been very modest, since EVN’s load management programs would not have yielded in any CO2 reductions, the lighting markets would have remained dominated by conventional lighting products, and the existing EE service provider market would continue to develop slowly. Thus, the baseline investment scenario would have yielded emissions reductions of about 334 thousand tons of CO2.

*The total estimated cost for implementation of the baseline scenario is $4.7 million.*

GEF Project Alternative

The proposed alternative will seek to demonstrate the benefits of EE programs to complement EVN’s load management efforts by transforming the markets for CFL and FTL lighting equipment. Furthermore, the Project will help test and develop promising business models for EE service providers to facilitate EE investments and improvements in commercial and industrial customer premises. These initiatives, which are developed on a least-cost basis, will be complemented by public campaigns, information dissemination, technical assistance and monitoring and evaluation activities to collectively help overcome and remove the barriers identified earlier.

Under this alternative scenario, additional support would be provided in the following areas to help address, partially remove or fully remove the barriers identified (in addition to those measures that would have taken place under the baseline scenario):

* In order to achieve major increases in the market share of CFLs in the residential lighting market, a comprehensive 1 million CFL program would be launched to intensively market the more efficient lamps, offer declining subsidies, provide interest-free loans to be recovered by EVN and its PCs through customer electricity bills, bulk procurement of lamps by EVN to achieve cost reductions from manufacturers and test alternative delivery models (e.g., sales through PCs, retail outlets, NGOs, performance contracts, etc.). It is expected that this will lead to a substantial increase in CFL sales (about three times the baseline) and achieve a significant cost reduction (estimated at about 15-30 percent) in retail CFL prices as economies-of-scale are realized. EVN has agreed to implement the 3-year program and borrow IDA funds to operate the program in the second and third years given the load reduction benefits. But, grant support will be sought for the first year of the program (or first 200,000 CFLs sold) in order to test the overall program design, delivery mechanisms, use of subsidies, prevention of potential abuses, demonstrated load reduction effects, etc. before the IDA funds would be used. The total estimated cost of this Project alternative would be $1.79 million.
* To transform the FTL market from 20 W and 40 W (T-10) lamps to 18 W and 36 W (T-8) lamps, a major marketing effort would be launched to promote the T-8 FTLs in concert with manufacturer agreements to increase production of T-8 lamps and correspondingly reduce T-10 lamp sales. This is required to reduce the perceived risks by manufacturers that customers will accept the T-8 lamps and to increase customer awareness and understanding that the T-8 lamps provide the same lumen output at about the same retail cost but use about 10 percent less electricity. EVN would administer the program, enter into agreements with the local manufacturers and importers, and administer the marketing efforts. A target increase in sales of 6 million T-8 lamps is expected during the Project period. The total cost of this Project alternative would be $0.81 million.
* To support the development and catalyze the expansion of a commercial service industry to promote EE improvements and investments in commercial and industrial facilities, major support would be provided to existing and new project agents to expand their EE business activities. This would be achieved through intensive training activities, marketing of EE to end-users, technical assistance to agents to develop marketing and business plans and close initial deals, grant support for energy audit costs and investment bonuses for early projects in order to stimulate deal flow in the early years. The grants would be decreased over the program period, as project agent abilities, reputations, and EE awareness builds in the market. (Issues such as project agent equity, access to commercial financing sources, market-based risk sharing arrangements would not be addressed during this phase but would be candidates for future support.) The total cost of this Project alternative would be $3.0 million.
* In addition to the key initiatives noted above, support would be required for technical assistance, capacity building, monitoring and evaluation to ensure proper implementation, management and reporting of the Project alternative. The total cost of this Project alternative would be $1.62 million.

*The total estimated cost for implementation of the GEF Project alternative is $11.92 million.*

Total Incremental Costs

The total cost of the GEF Project alternative is US$11.92 million, as compared with the baseline case of $4.7 million. Thus, the incremental cost of the GEF Project alternative would be $7.22 million, of which GEF support in the amount of only $5.5 million is requested. The balance of $1.72 would be financed by IDA, MoI and EVN. Incremental benefits of the proposed alternative would include both the CO2 emissions reductions resulting from project implementation as well as further replication of EE measures resulting from the market development and transformation initiatives implemented under the Project. Energy savings derived from equipment replaced during the Project period are estimated to amount to over 827 GWh (about 204 thousand toe), which would lead to the reduction of 1.0 million tons of CO2 equivalent. Over a 10-year period, where much of the market transformation benefits will accrue, the total estimated energy savings would be 3,018 GWh (about 746 thousand toe) corresponding to about 3.6 million tons of CO2 equivalent. Over the 10-year period, the GEF cost per ton of CO2 equivalent are estimated to be about US$1.52 per ton. (A summary of the costs and benefits is summarized in Table A2-3, below.)

**Table A2-3. Incremental Cost Matrix**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Baseline** | **GEF Alternative** | **Increment** |
| **Domestic Benefits** | * Only load management programs implemented by EVN and PCs
* Low growth in EE lighting adoption
* Very low growth in existing agent businesses
 | * Transformation of lighting markets through EVN programs
* New pilot DSM programs implemented by EVN
* Significant increase in agent businesses and transactions
* Increased awareness in EE by consumers and financial institutions
 | * Removal of skepticism to DSM and EE by utilities, consumers, and manufacturers
* Additional energy savings of 3,018 GWh
* Significant development of agent (ESCO) industry
 |
| **Global Environmental Benefits** | Reductions in GHG based on low level of agent business. | Reductions in GHG based on market transformation of lighting and higher level of agent business. | 3.6 million tons of carbon reduced. |
| **Costs by Component (US$M)**EVN DSM ProgramMoI Commercial EE Program |  4.70 0.00 |  8.22 3.70 |  3.52 3.70 |
| **Total Costs** |  4.70 |  11.92 |  7.22 |
| **GEF Incremental Costs** |  |  |  5.50 |

Note: All figures will be subject to confirmation at Project Appraisal.

**Annex 3: Description of the Project**

IDA/GEF will support a phased, 12-year (1998-2010) programmatic approach to demand-side management (DSM) and energy efficiency (EE)activities in Vietnam. This program has begun with the Phase 1 DSM project and would continue to build upon initial program results and efforts in 2-3 additional phased operations. The rationale is to provide a longer-term vision for development assistance, establish a framework for scale-up of mechanisms and business models tested in earlier operations, and develop timely intervention mechanisms as programs, markets and reforms develop (see Figure A3-1, p. 40). While the spirit of the original two-phase DSM program will be maintained, it is clear that there also exists scope for supporting EE programs outside EVN, particularly where there are potential conflicts with EVN’s financial interests and/or activities clearly beyond EVN’s mandate. Thus the IDA/GEF assistance program would also include measures to catalyze service companies and manufacturers to provide more EE equipment and services to energy end-users through a variety of business models.

The second phase of the program would consist of two components: (i) a second phase DSM component under EVN; and (ii) implementation of a pilot commercial EE program by MoI. For the EVN component, a total investment of US$8.22 million would be sought to support the continuation of EVN’s DSM activities initiated under the IDA/Sida project and, specifically, implement four large DSM programs and supporting activities to achieve major reductions in peak load, improve system load factors, transform select lighting markets, and assist customers with ongoing tariff reforms. US$5.20 million has already been approved under the IDA SEIER Project, US$0.77 million would be made available from EVN’s internal funds, and US$2.25 million in GEF grant funds are now sought. A pilot commercial EE component, also supported under the associated GEF project, would require an estimated $11.0 million in total project financing ($3.25 million GEF, $7.3 million private sector, $0.45 million MoI) and would be managed by MoI. The full second phase DSM/EE program will consist of the following elements:

**Component 1. DSM Program (Second Phase) Under EVN**

The main focus of this component would be to build upon Phase I DSM results and expand the use of DSM to help EVN and its PCs better manage loads and load curves and improve system load factors. DSM is also viewed by EVN as a means to help mitigate the effects of ongoing power tariff reforms, particularly in the rural areas. Based on the studies and assessments conducted under Phase 1, the second phase has been designed to achieve over 120 MW in system peak reduction and electricity savings of about 500 GWh through the implementation of several DSM measures (impact estimates include both the GEF and associated IDA-financed components.). The program would be managed by EVN and implemented with support from its PCs. (Subsequent phases, which would seek to develop a large-scale portfolio of DSM measures by EVN and its PCs and may include support to create an ESCO unit under EVN, could be included in future IDA/GEF energy operations.) EVN’s Phase 2 program would include four major programs and some supporting activities as noted below. (See Table A3-1 for a budget breakdown of the various DSM programs.)

**1a. Expanded Time-of-Use Metering (US$2.25 million).** EVN introduced a time-of-use (TOU) tariff in 1998 and has supported this with TOU metering since then. The TOU tariff is applicable for large customers with loads over 100 kVA or consumption in excess of 10,000 kWh per month. By the end of 2001, EVN and its PCs had installed about 4,300 TOU meters in customer premises. Many of the customers have responded to the new tariff schedule by shifting loads from the peak hours to off-peak or low load periods. Despite the beneficial load shifting effects of these efforts, EVN has been reluctant to expand these efforts due to competing uses for their limited investment capital and some customer resistance to TOU metering. For example, a number of customers have responded by installing stand-by generation units and disconnecting from the grid during peak times to avoid peak pricing. Others have done so in order to ensure consistent and reliable power supply.

Given the significant potential for EVN to use TOU meters to encourage large customers to shift their energy consumption to off-peak hours, EVN would expand their TOU metering under this program. These meters would be deployed in about 4,000 new customer premises (5,600 meters in total) by 2005 for production, commercial, service and agricultural (irrigation) customers with transformer capacity over 100 kVA, as the existing tariff regulations allow, to help rationalize electricity consumption during the peak periods. A key element of the program would be the marketing and information campaigns that would accompany the TOU meter installations, so customers could understand the TOU tariff and meter and receive information on load shifting and EE options they could consider to avoid an increase in their overall electricity bill (and help better ensure the peak load reduction benefits to EVN). The program would also include a comprehensive monitoring and evaluation component to identify the benefits of TOU tariffs, define customer segments that provide the greatest load shifting benefits, and identify options for future modifications of the TOU tariffs and programs to improve their impacts. The associated IDA credit would allow EVN and its PCs to procure and install additional meters in remaining customers that meet the above criteria as well as support program administration, marketing and information, and monitoring. The total estimated peak load reduction from this program is about 70 MW and would save an estimated $46 million in new capacity investments by EVN and its PCs.

**Table A3-1. Project Budget Breakdown for EVN’s Phase 2 DSM Program (all costs in USD)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sub-Component** | **Total Cost** | **GEF** | **Associated IDA** | **EVN** |
| A. TOU Metering |  |  |  |  |
| Equipment and installation |  2,070,000 |  0 |  2,070,000 |  0 |
| Marketing |  120,000 |  0 |  120,000 |  0 |
| Administration |  60,000 |  0 |  60,000 |  0 |
| *Sub-total* |  *2,250,000* |  *0* |  *2,250,000* |  *0* |
| B. Pilot DLC |  |  |  |  |
| Equipment and installation |  510,000 |  0 |  510,000 |  0 |
| Marketing |  60,000 |  0 |  60,000 |  0 |
| Incentives |  120,000 |  0 |  0 |  120,000 |
| Administration |  30,000 |  0 |  30,000 |  0 |
| *Sub-total* |  *720,000* |  *0* |  *600,000* |  *120,000* |
| C. CFL Program |  |  |  |  |
| Equipment and installation |  75,000 |  0 |  75,000 |  0 |
| Marketing |  240,000 |  100,000 |  140,000 |  0 |
| Incentives |  900,000 |  300,000 |  600,000 |  0 |
| Learning grant |  500,000 |  500,000 |  0 |  0 |
| Administration |  75,000 |  0 |  75,000 |  0 |
| *Sub-total* |  *1,790,000* |  *900,000* |  *890,000* |  *0* |
| D. FTL Program |  |  |  |  |
| Marketing |  750,000 |  750,000 |  0 |  0 |
| Administration |  60,000 |  0 |  0 |  60,000 |
| *Sub-total* |  *810,000* |  *750,000* |  *0* |  *60,000* |
| E. Supporting Programs |  |  |  |  |
| Expanded load research |  900,000 |  0 |  900,000 |  0 |
| DSM business opportunities |  250,000 |  250,000 |  0 |  0 |
| DSM planning, policy and pilots |  430,000 |  0 |  400,000 |  30,000 |
| Program monitoring and evaluation |  370,000 |  350,000 |  0 |  20,000 |
| Staff, facilities and equipment |  700,000 |  0 |  160,000 |  540,000 |
| **TOTAL** |  **8,220,000** |  **2,250,000** |  **5,200,000** |  **770,000** |

**1b. Pilot Direct Load Control Program (US$0.72 million).** Under this program, EVN, in collaboration with PC HCMC and PC Hanoi, would introduce a pilot direct load control (DLC) program using ripple control systems to curtail demand of about 2,000 customer end-use loads (e.g., air conditioning, refrigeration, water heating, etc.). The DLC technology would allow EVN to shut-off selected end-use equipment for up to a pre-specified number of hours each year during system shortages and seasonal peaks. The equipment (central stations, receivers, communication systems) would be purchased with the associated IDA credit and EVN would use its counterpart funds to pay for program administration and incentives to the program participants.

The DLC program would be targeted to medium to large commercial customers such as hotels, offices, services, administrative buildings, food stores, etc. Receivers would be installed on end-use equipment and controlled from central stations at the PC centers. A 25 percent control strategy would be used, whereby controlled end-uses would be switched off for 15 minutes each hour on a rotating basis. The targeted end-uses will be selected so that there is little or no loss in comfort, convenience, or productivity due to the appliance load control. The load control will be exercised only when the power system is experiencing a significant supply/demand imbalance, and the customers will be guaranteed that the control will be exercised for a maximum of 60 times in a year. There would be negligible energy savings or revenue losses from the program, since the equipment targeted typically operates with a duty cycle less than 1.0 and, thus, would recuperate any energy deficit by operating at full capacity following a shut-off period. The estimated peak load reduction from the DLC program about 3 MW.

**1c. CFL Promotion (US$1.79 million).** Currently, most electrified urban and rural households use 60-100 W incandescent light bulbs. The promotion of compact fluorescent lamps (CFLs), which typically use 12-18 W and provide comparable lumen output to incandescent bulbs, could significantly reduce lighting loads, which coincide heavily with EVN’s system peaks, and reduce electricity costs for end-users. However, incandescent bulbs typically cost $0.20-0.40 versus $2.00-3.00 for CFLs. Under this program, EVN would promote sales of 1 million CFLs to Vietnamese households in areas of high loads and network congestion by procuring CFLs in bulk packages and distributing them through their PC branch offices, and possibly through lighting retailers and/or community-based NGOs. Over the three-year program period, EVN would use discounts, combined with marketing efforts, to promote the use of the more efficient lamps and these discounts would decline over the life of the program (about $1.50/lamp for the first 200,000 CFLs, $1.00/lamp for the next 300,000, and $0.60/lamp for the remaining 500,000 CFLs). (Implementation of a pilot CFL program is now underway in Phase I and results and lessons learned would be reflected in the detailed design of this program.) Even with the price reduction achieved through bulk purchase and EVN discounts, it is expected that the initial cost of the lamps may still be a barrier to some of the rural customers. Therefore EVN has proposed to develop and test an interest-free loan mechanism for financing the purchase of lamps for select rural customers. One or more revolving loan funds would be created at the PC level to finance some of the CFLs sold under the program. The loan principal would be recovered by the PCs through the electricity bill over a 6-12 month period, thus replenishing the revolving fund(s).

Most of the bulk procurement and discounted sales of the CFLs would be financed with the associated IDA credit, given the major load reduction benefit potential for EVN. However, GEF grant support is being sought for the first year of the program (or first 200,000 CFLs sold) in order to test the overall program design, delivery mechanisms, use of subsidies, etc. to refine the design in the latter years. It also proposed that a GEF DSM Learning Grant be provided to EVN which would be used to test alternative delivery mechanisms for the CFLs, such as performance-based contracts with various program subcontractors (e.g., PCs, lighting distributors/retailers, NGOs, companies) to market and sell CFLs as well as develop and test the revolving fund concept in one or more PCs. This program would provide energy savings of 39 GWh and peak load reduction of over 33 MW during the project period. More importantly, the program is designed to help achieve a sustained expansion of the residential CFL market by demonstrating the benefits of the CFLs and achieving economies-of-scale to help reduce the prevailing market costs of the CFLs by some 15-25 percent.

**1d. FTL Market Transformation (US$0.81 million).** Under the Project, EVN would initiate a program to promote the use of high-efficiency 18/36 W T-8 FTLs, which have about the same lumen output and retail price as conventional 20/40 W T-10 lamps but consume about 10 percent less electricity, in all sectors. The two major local manufacturers of FTLs in Vietnam today, DIMEXCO and RALACO, now possess the capability to produce T-8 lamps and could substantially increase their production. However, given the very low penetration of lamps today (see Annex 4 for a description of the market), these manufacturers are unwilling to alter their production volumes without a significant change in the overall market demand. Thus EVN proposes to work with the manufacturers to increase the production of T-8s and phase out the traditional FTL, develop a cooperative advertising and promotion program with the manufacturers, and launch an information and promotion campaign to increase customer awareness and acceptance of the T-8s and low-loss electronic ballasts. GEF funds would provide for the incremental cost of the marketing efforts to both the manufacturers and EVN and EVN’s internal funds would support project management and administration. The GEF-supported DSM learning grant would also be available for providing end-user financing for efficient ballasts and, like the CFL program, would be repaid through customers’ electricity bills.

The first year of the proposed program would be focused on working with the manufacturers to get a commitment from both to manufacture increasing numbers of T-8 FTLs. The cooperative information, advertising and promotion campaign will be developed in the first year, and launched at the beginning of the second year. As noted above, the program would also include the promotion of efficient ballasts with the T-8s. The program is expected to increase the installation of T-8s by 3 million units (plus 50,000 efficient ballasts) per year, leading to energy savings of 25 GWh and peak load reduction of over 14 MW during the program period. As with the CFL program, the more important benefit will be the sustained increase in production and sales of the T-8 lamps even after the program has ended.

**1e. Supporting Programs and Technical Assistance (US$2.65 million).** In addition to the four DSM programs noted above, EVN will initiate complementary activities to support these efforts. Such activities will include load research (both facility and end-use levels) to determine customer class and end-use profiles and energy savings potential/impacts, DSM program planning and policy support, development and implementation of 1-2 new pilot DSM programs, DSM business opportunities studies (e.g., fee-for-service audits and consultations, utility-based ESCO, capacitor and EE equipment leasing, load management system operations, etc.), DSM program monitoring and evaluation, and support to the DSM Center (equipment, staffing, institutional development).

GEF funds are being sought by EVN to support measures necessary to fully realize the impacts of the DSM efforts noted above, including the assessments and development of commercial DSM business opportunities and DSM program monitoring and evaluation. The assessment of DSM business opportunities will consist of technical assistance for defining capabilities and interest within various EVN groups in establishing new commercial business lines and for conducting appropriate feasibility studies and developing business plans that would take advantage of EVN’s resources to offer DSM-related services to customers. As the power sector in Vietnam restructures, EVN will be looking to spin-off potential profit business centers which may include the DSM Cell or other entities (e.g., Institute of Energy, PECCs 1-4) that would be interested in providing such services.

The program monitoring and evaluation component would provide technical assistance for developing an overall methodology for program evaluation, implementing a program monitoring and tracking system, development of a database for DSM measures and programs, conduct program process and impact evaluations, and training of EVN staff to develop and implement evaluation plans for all the programs, particularly the energy efficiency activities which require a higher level of evaluation complexity. Detailed program and evaluation plans are now being developed by the DSM Cell and are expected to include: (i) assessment of baseline penetration rates for CFLs and T-8 FTLs through customer surveys, manufacturer and retailer sales data, customer billing data, and complementary load research; (ii) determination of actual load reduction effects from specific end-uses through end-use metering; (iii) refinement of impact assumptions (e.g., operating times, coincidence factors, free rider rates, etc.) through surveys (both program participants and non-participants) and supplemental load research; and (iv) establishment of actual program impacts through engineering estimates, EVN system and load forecast analyses, sample measurements of pre- and post-program consumption patterns for EVN’s TOU and DLC program participants; and (v) evaluation of program strategies and market transformation efforts through surveys and select interviews (e.g., EVN and PC staff, manufacturers and distributors, focus groups).

The results of the benefit/cost analysis for the DSM programs (including supporting activities) are shown in Table A3-2, below.

**Table A3-2. Benefit/Cost Analyses for All DSM Programs (Including Supporting Activities)**

|  |  |
| --- | --- |
| Perspective | Economic Analysis (in USD million) |
|  | Benefits | **Costs** | **NPV** | **B/C ratio** |
| EVN (Financial) | 96.39 | 19.50 | 76.89 | 4.9 |
| **PCs (Financial)** | 27.95 | 21.77 | 6.18 | 1.3 |
| **Customers (Financial)** | 21.17 | 2.57 | 18.60 | 8.2 |
| **National (Economic)** | 88.56 | 7.82 | 80.74 | 11.3 |

Assumptions: The avoided cost of DSM programs were determined based on construction and operation costs for a gas turbine plant for peak periods (US$54/kW/year and 7.82 USc/kWh at generation level). Other assumptions include: LRMC of 3.904 USc/kWh (at generation level), 5.166 USc/kWh (at 110 kV level), 9.373 USc/kWh (below 6 kV), ave. BST for all PCs 3.33 USc/kWh, economic BST of 5.17 USc/kWh, ave. retail tariff of 3.33 USc/kWh, T&D losses of 15 percent, discount rates of 10 percent (economic) and 7 percent (financial), 10 percent VAT, exchange rate of US$1.00 = 15,000 VND.

**Component 2. Pilot Commercial Energy Efficiency Program**

In addition to EVN’s DSM activities, a pilot commercial EE program is proposed to test and develop appropriate business models and mechanisms to catalyze a small and sustainable EE service market resulting in increased EE investments in Vietnam. This will be achieved by training and supporting a small group of service providers (“project agents”) who can develop commercial business services to assist customers in all phases of EE project identification, development, financing and implementation. These project agents would include energy auditing and engineering firms, equipment leasing companies, equipment suppliers, installation and construction contractors, and energy service companies (ESCOs). To date, over 40 candidate firms have been identified and confirmed interest in participating in the program. The program will initially focus on private commercial buildings, hotels, other office buildings and select creditworthy industrial sub-sectors capable of accessing financing on their own. EE measures would be initially limited to simple and replicable technical end-use systems, such as lighting, motor drives, controls, pumps, cooling/heating, and electrical supply systems (as compared with more complex industrial process improvements) in order to gradually build up competence among project agents, facilitate the development of technical program standards to ensure equipment performance, support project evaluation/monitoring, and stimulate the market for EE equipment in these initial areas. The program will initially concentrate efforts in four major cities (Haiphong, Hanoi, Da Nang, and Ho Chi Minh City), in order to allow MoI to better manage and focus market development, training, and project monitoring/administration efforts. (Future phases would seek to build upon successful business models from Phase II, expand the geographical and technical boundaries of the pilot phase, test new and more complex models {e.g., performance contracting}, and develop appropriate local financing mechanisms to support larger-scale investments and pipelines.)

MoI would manage this 4-year pilot program, which is expected to require $3.25 million in GEF funds and mobilize about $7.3 million in private financing. An Administrative Unit or AU (a commercial bank) would be responsible for managing and disbursing the sub-grants (to help support audit costs and offer initial investment bonus grants) and technical assistance would be made available to the AU to support assessments of the proposals. Through ongoing audit programs within EVN and MoSTE, along with work under the PDF B grant, it is expected that an initial pipeline of investment proposals would be developed and available by Project effectiveness. Specific subcomponents under the pilot program are as follows:

**2a. Comprehensive Training Program (US$1.2 million).** A major training program will be delivered to develop the basic technical, financial and business skills of project agents to enable them to effectively market, sell and deliver EE services on a commercial basis. This will include assistance with the development, financing and implementation of EE project proposals as well as customized technical assistance to develop the agents’ marketing and business plans. Given the significant gap in actual project experience for many of the project agents in taking retrofit projects through the entire project cycle from identification/customer recruitment through financial closure to full implementation, the training component will be designed to provide project agents with a mix of technical and business skills appropriate to delivering solutions which result in actual EE project investment and implementation. Comprehensive training will be provided in energy auditing, technical system analyses, EE technologies, risk management, financial analyses, various contractual options for EE services, project management and energy savings verification. Customized assistance will also be provided to advanced agents in how to facilitate energy efficiency projects, including identifying/recruiting prospective customers, identifying profitable retrofit investments, selling benefits, structuring and presenting commercial EE offerings and investment proposals, and identifying and matching the most appropriate sources of finance with customers and projects.

This set of training activities would be planned over the 4-year period, with more of the work to be conducted within the first two years, to strengthen and enhance project agent capabilities by covering the major themes noted below through general training courses, seminars and workshops, training materials and more customized technical assistance mechanisms. By Project Appraisal these training courses would be further developed and refined.

* EE Service Industry Opportunities: This training will focus on providing a general introduction to EE service business model options practiced worldwide including energy auditing, equipment supply and leasing, energy systems design, installation and commissioning, monitoring and verification of energy savings, maintenance and project financing. Different contractual options (from both international and local sources) for EE services would be reviewed and discussed. This training module would also provide a detailed explanation of the pilot program and explain how agents can participate and develop new business services. This module will be aimed at attracting a wide range of potential agents and stimulating creative thinking on new and emerging business opportunities in EE services.
* Energy Auditing: This training activity will be designed to develop project agent capabilities to conduct “in-depth” energy audits in commercial, industrial and water plant systems including (a) data collection for preliminary analysis; (b) energy equipment measurements and instruments needed to accurately calculate operating system efficiencies; (c) energy efficiency calculations; (d) energy efficient technology information sources and options; (e) estimating EE project costs; (f) methods for verifying, measuring and calculating post-construction EE savings; (g) conversion of EE opportunities identified in audits into commercial proposals; and (h) preparing grant applications for audit and investment bonus grants.
* Marketing & Sales of EE Services: This series will be aimed at addressing key needs for project agents to: (i) analyze and segregate the market and refine customer focus; (ii) identify and pre-qualify customer prospects; (iii) get appointments and make sales presentations to appropriate levels of decision-makers; (iv) contractual options for EE services providers covering different phases and scopes of EE services; (v) structure and negotiate service offering agreements; (vi) financing options for EE costs; (vii) estimate revenues and profitability from different types of EE services; and (viii) generate market strategies and sales plans for EE business opportunities.
* EE Technologies and Systems: This training series will provide in-depth exposure to a wide range of EE technologies including: (a) standard prevalent systems in use in Vietnam; (b) domestic and international EE technologies and practices; (c) manufacturing methods for EE technology supply; (d) certification and standards procedures; (e) procurement; (f) import duties and requirements; (g) installation and maintenance; (h) warranties and performance guarantees; and (i) sources of information for EE technology updates.
* EE Financial & Project Analysis: This course will seek to provide training in project development and the conversion of technical opportunity into relevant business information required for commercial decision making. Specific training will be provided in (i) risk identification, analysis, allocation and contractual options for risk sharing and structuring; (ii) calculating financial returns and other decision data for customers, project agents and financial services providers related to EE projects; (iii) identifying and satisfying customers’ financial needs; and (iv) financing options for EE costs.
* EE Implementation Contracting: This training will focus on building the commercial and delivery capability requirements of project agents for professional implementation of EE projects including: (a) phases and management of activities options for implementation; (b) project scheduling; (c) procurement and contractual needs for design, financing, supply, installation and commissioning services; (d) resource and manpower requirements; (e) commercial, insurance and legal aspects of project implementation; and (f) options for alliances, joint ventures and other service structures for combining service capabilities to deliver EE solutions.
* Measuring, Verifying and Maintaining Energy Savings: This component will focus on providing comprehensive training in the “post-construction” phase of the EE project including (a) commissioning and verification of EE equipment “start-up” performance; (b) customer and supplier agreements and protocols for verification of EE performance; (c) EE equipment maintenance needs and agreement formats; (d) adjusting for energy price and occupation/activity level variations; and (e) optimization of installed technologies.
* Customized Technical Assistance: This element of the training program will focus ongoing technical assisting for more advanced project agents to assist in overcoming market barriers and with developing business plans aimed at creating long term commercial business revenues and profits from various components of the EE service industry chain including (a) business and market plan development; (b) customer recruitment; (c) project packaging and selling; (d) equipment supply and/or manufacturing; (e) design engineering; (f) measurement and testing; (g) financial services; (h) installation contracting; (i) maintenance; and (j) comprehensive ESCO services.

The above training themes shall be conducted at a general level to a wide array of project agents and in restricted and customized settings for more advanced project agents. The training activities will be developed progressively over the 4-year project period and based on feedback from project agents, reviews of proposals by AU and MoI, and periodic program assessments. The training program will target project agents, but would also be available for MoI and AU staff, interested financial institutions, end-users and other appropriate parties (e.g., EVN staff, project staff from UNDP and other donor programs, etc.). The training would be delivered using a variety of mechanisms and approaches including lecture-style presentations, facilitated discussions, workshops and seminars, case study work, training manuals, individual agent support work, etc.

While the financial services industry in Vietnam is at a very early stage of development (a significant proportion of investments are self-financed by owners using both their own funds and low-interest and no-interest informal loans from extended family), the pilot program will provide some training and support material to both formal and informal financial institutions on how to structure offerings for financing EE projects. It is expected that most initial projects will be self-financed by customers or supplier credit schemes, however, over time the development of more commercially oriented financing sources, such as leasing and commercial lending, is expected to pick up and lead to an increase in EE investments.

**2b. Audit and Investment Grants (US$1.1 million).** The program will provide partial grant support for energy audits (US$0.48 million) and subproject investment grants (US$0.62 million) to project agents and their customers. The purpose of these grants is to stimulate the market for EE services by overcoming market barriers such as (a) high project development costs from initial audits; (b) skepticism of customers to actual investment opportunities; (c) limited credibility of project agents to prepare and implement EE projects; and (c) perceived risks associated with committing to EE investments. It is expected that these grants will leverage about US$7.3 million of private sector investment into EE technologies during the program. The ***audit grants*** will be used to defray the initial costs of project identification and development and allow agents to generate and provide customers with structured information leading to customer decisions regarding EE technology applications and investments. To ensure that the project agents and their customers have incentives to implement the recommendations of the audit reports, a portion of the audit payment may be held until the project is under implementation so that the incentive is tied to investment decisions rather than the completion of audit reports. Efforts will also be made to tie audit grant applications with some conditions that commit the customer to proceed to the investment stage if viable EE measures (agreed payback or similar thresholds set upfront) are identified. It is also planned that the percentage of GEF grant reimbursement for the audit costs will be reduced as the Project progresses, agent capability and credibility improve and the market develops.

The GEF grant would also be used to offer some ***investment bonus grants*** (expected to be a percentage of the total project investment amount) for customers and agents that have fully implemented EE investments and submitted program commissioning certificates subject to AU/MoI inspection. In the initial years and for selected projects, larger sub-grants may be offered to projects where customers and agents agree to allow case study information on the project to be developed and disseminated to other sub-sectors that could benefit from the renovation. As with the audit grants, in order to shift to more commercial terms and to stimulate early project implementation, these investment bonus grants shall be provided on a diminishing percent basis over the 4-year term of the program. Table A3-3, below, summarizes the projected financing requirements of the program from the GEF and private sector sources.

**Table A3-3. Pilot Commercial EE Program Business Plan**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Total** |
| ***GEF Financing*** |  |  |  |  |  |
| Energy audit grants |  24,000 |  96,000 |  180,000 |  180,000 |  480,000 |
| Project investment bonuses |  48,800 |  195,200 |  195,200 |  180,800 |  620,000 |
| **Total** |  **72,800** |  **291,200** |  **375,200** |  **360,800** |  **1,100,000** |
| ***Project Financing*** |  |  |  |  |  |
| Small projects (US$10-20k) |  76,800 |  307,200 |  691,200 |  1,007,423 |  2,082,623 |
| Medium projects (US$20-60k) |  96,000 |  384,000 |  864,000 |  1,259,279 |  2,603,279 |
| Large projects (US$60k+) |  120,000 |  480,000 |  1,080,000 |  1,574,098 |  3,254,098 |
| **Total** |  **292,800** |  **1,171,200** |  **2,635,200** |  **3,840,800** |  **7,940,000** |

 Note: Project financing includes the GEF project investment bonus.

A local financial institution shall be contracted by MoI to act as the Administrative Unit (AU) with responsibility for administering the sub-grants based on agreed-upon and publicly available program procedures. The AU will be selected on a competitive process and will have to demonstrate the necessary internal capabilities and controls to manage and disburse the funds. For some of its functions (e.g., audit report screenings, investment proposals), the AU will require the capability to carry out the technical evaluation of EE projects. It is planned that technical advisory support shall be made available to the AU with project funds to support these AU-led technical appraisals and reviews. Specific funding tasks to be carried out by the AU include: (a) carrying out financial and technical evaluation of proposals for funding based on defined program criteria; (b) administering appropriate terms and conditions for the disbursement of funds to customers; and (c) disbursing funds and keeping appropriate records of fund disbursements.

GEF funds disbursed by the AU to program participants are not intended to displace the primary sources of financing arranged by program agents and their clients through their preferred channels. One of the potential advantages of using a local financing institution (and several local banks and leasing companies have been contacted and confirmed their interest in participating in the program) is that in addition to administering the program grants, the AU can offer financial services to customers for EE projects, where required.

**2c. Program Marketing, Monitoring and Administration (US$1.4 million).** The program would also offer support for overall marketing of the program to various stakeholders, periodic monitoring and evaluation of the program achievements and benefits, and administration of the program by MoI, the AU and other institutions responsible for program implementation. Specific activities are expected to include:

* Program marketing (e.g., identification and recruitment of project agents, raising awareness of potential end-use customers of EE services, case study development and dissemination to project agents and end-users, including non-participants);
* Program administration and monitoring (e.g., AU management fees, technical support, program database development and monitoring, post-installation inspections, evaluation and reporting);
* Technical assistance to MoI and the AU; and
* Feasibility studies for expanding successful business models, developing more complex models, establishing various financial mechanisms and instruments (e.g., credit lines, dedicated funds, guarantees, supplier credit/leasing arrangements, etc.), and appropriate policy reviews, to support project pipelines, and further market expansion in future IDA/GEF operations.

Substantial activity will be required to market the program to all stakeholders in the initial years due to the early stage of development of the EE service market. As the program is geared towards “testing and developing business models”, it will be critical that structured feedback mechanisms be established to periodically review and assess successes and failures of various business models developed and facilitate corrective actions. Dissemination of successful case studies and lessons learned is also an important aspect to support efficient market development. The program marketing, monitoring and administration component will be managed by MoI and it is expected that this program will establish a strong resident capability within the GOV for the long-term support for this emerging industry. GEF funds would be used to support program marketing efforts, monitoring and evaluation, technical assistance and feasibility studies for future phases. However, GEF funds will not be used to support any MoI administration costs, such as staff and/or office space, which would be supported with MoI counterpart funds.

An important aspect of the program will be the inherent plans for replication and sustainability within the project design and commercial models supported. Specifically, the program is designed to support replication by end users that do not participate in the program directly, by: (i) developing capabilities with project agents to provide energy efficiency services to end users on a fully commercially-sustainable basis, even after program has been completed; and (ii) case studies will be developed and disseminated on successful projects to non-participating end users and project agents for further replication. The case studies would provide the technical, financial and logistical information on successful projects for end users to consider, either with or without project agent facilitation. Sustainability will be based on the demonstrated commercial merits of the energy efficiency service business and investments to both project agents and end users. Over time, the training and administration costs will decline as the energy efficiency business gains more credibility, market barriers are removed, and local capabilities are further developed.

Table A3-4 summarizes the cost breakdown for each component as well as the GEF financing requirement for the Pilot Commercial EE program.

 **Table A3-4. Project Budget Breakdown for Pilot Commercial EE Component (all costs in USD)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sub-Component** | **Total Cost** | **GEF** | **MoI** |
| A. Training |  |  |  |
| Energy auditing | 200,000 |  |  |
| EE service industry opportunities | 100,000 |  |  |
| Marketing & sales of EE services | 150,000 |  |  |
| EE technologies & systems | 150,000 |  |  |
| EE finance & project analysis | 150,000 |  |  |
| EE equipment procurement & implementation contracting | 100,000 |  |  |
| Savings measuring and verification | 100,000 |  |  |
| Customized technical assistance | 250,000 |  |  |
|  *Sub-total* | *1,200,000* | *1,090,000* | *110,000* |
| B. Sub-grants |  |  |  |
| Energy audits | 480,000 |  |  |
| Investment bonus grants | 620,000 |  |  |
|  *Sub-total* | *1,100,000* | *1,100,000* | *0* |
| C. Project administration |  |  |  |
| End-user/agent marketing, information dissemination | 250,000 |  |  |
| MoI administration\* | 300,000 |  |  |
| AU administration | 150,000 |  |  |
| Program monitoring and evaluation | 250,000 |  |  |
| Technical assistance to MoI and AU | 250,000 |  |  |
| Feasibility studies for future phases | 200,000 |  |  |
|  *Sub-total* | *1,400,000* | *1,060,000* | *340,000* |
| **TOTAL** | **3,700,000** | **3,250,000** | **450,000** |

\* MoI program administration costs will be supported by MoI counterpart funds only.

Project Indices for Future Phases: Project performance indices will be monitored during implementation of Phase 2 which will then be used as a basis for developing appropriate intervention strategies for future phases and the need for further GEF support. For EVN’s programs, the capabilities within the DSM Cell and related divisions would be monitored in areas of DSM planning and incorporation of DSM impacts in system expansion plans, DSM program design and implementation, DSM program evaluation planning and implementation, load research implementation and analysis, overall management capability and an assessment of commercial DSM businesses for EVN. With fully successful outcomes in these key functional areas, future GEF support in subsequent phases would be limited to addressing new institutional challenges for DSM implementation under a restructured sector, removal of market barriers for new targeted end uses, support for new commercial DSM ventures (e.g., utility-based ESCOs), etc. rather than for continued support in capacity building efforts specifically addressed under Phase 2. For MoI’s program, a key focus would be on the ability for project agents to identify, develop, implement and monitor projects with decreasing government or program intervention over time (with the exception of commercial financing) and MoI’s capacity to manage the overall program, development of appropriate informational databases and monitoring plans for further market development, etc. Close monitoring and achievement of these key indices under Phase 2 would allow future GEF intervention to focus on developing more sophisticated business models for project agents, such as energy performance contracting, and addressing improved access to commercial financing for agents and end users, through establishment of a dedicated energy efficiency fund or loan guarantee program.

**Figure A3-1: Framework for IDA/GEF DSM/EE Program**

*Future Phases*

*Phase II (SEIER)*

Utility DSM (TA & pilots)

load management/DSM pilots

business plan development

basic load research

pilot audits

[*DSM Cell under EVN*]

*Phase I (T&D/Sida)*

Equipment Standards

industrial motors

lighting

Commercial Building Code

Utility DSM

(4 large-scale programs)

load management/control

lighting DSM programs

expanded load research

DSM planning/evaluation

utility-based ESCO study

[*Shift DSM functions to PCs*]

Commercial EE (pilot)

market catalyzation

develop service industry

test business models

4-5 technical systems

4 large cities

UNDP or WB to follow-up

Utility DSM (portfolio of large -scale programs)

load management/control

expanded DSM programs

expanded load research

DSM planning/evaluation

customer consultations

utility-based ESCO

[*PC-driven DSM programs*]

Commercial EE

market expansion

scale-up successful models

new models (ESCOs)

financing mechanisms

expanded technical systems

country-wide program

Annex 4: Vietnam Energy Efficiency Market

While overall energy consumption in Vietnam is not large by global standards today, it is now the second fastest growing economy worldwide and energy requirements are growing at staggering levels (10 – 15 percent annually). The Asia Least-Cost Greenhouse Gas Abatement Strategy Study (ALGAS) conducted in 1994-6 concluded that the overall technical potential for end-use efficiency was about 180 million toe by 2010 at a cost far less than supply-side options. The DSM Assessment conducted in 1995-6 concluded that EVN alone could achieve some 3.5 million toe in energy savings by implementing a portfolio of DSM programs. Other studies have confirmed that there is significant potential in various industrial sub-sectors for energy intensity reductions through cost-effective energy efficiency (EE) improvements as well as a focus on market transformation efforts in key end-uses. A summary of each key sector is provided below.

The *industrial sector*, dominated by state-owned enterprises (SOEs), consumes over 40 percent of all energy consumed in Vietnam (see Table A4-1) and, by all accounts, represents the sector with greatest energy savings potential. Pilot audits conducted by MoSTE concluded that energy use could be reduced by about 30 percent with equipment retrofits, with investment paybacks of only 3-5 years. Further estimates indicate that EE improvements in the sector could save 700-840 thousand toe/yr (estimated savings of US$37-47 million per year), with payback periods under 3 years. Within the sector, it was estimated that savings of 50 percent could be achieved in the cement sector, 35 percent in the ceramics industry, and 25 percent in power plants. A number of other donors, including Japan and France, have supported industrial energy audits and found significant financially-viable investment opportunities for energy saving, although no country- or sector-wide EE potential estimates were made. Other reports and studies have confirmed that, given high equipment ages and out-dated technologies, there were indeed significant savings potential and targeted equipment retrofits and replacements of energy-using equipment, such as boilers, motors, energy management/control systems, etc. could have short payback periods and high returns. However, the sustainability of these renovations would be highly uncertain as SOE reforms progress and these facilities are either modernized or shut down. Furthermore, many of these SOEs were not financially-viable and, thus, would not be able to attract the necessary commercial financing for these investments despite their potentially high returns.

Energy use in the *commercial and municipal sectors* is not a huge contributor to total consumption today, though its impact on the total demand is expected to double over the next 10 years due to an estimated 15 percent annual growth rate in high rise building construction. While older buildings have employed more traditional design practices and have limited central air conditioning (and thus have had relatively low energy use), newer buildings are expected to require substantially more energy to support modern comfort and technology requirements. Much of the new building construction is now being designed and financed from non-domestic sources, often resulting in developers seeking to minimize construction costs and reduce investment payback periods; thus opportunities for EE retrofits do exist. For buildings, lighting will continue to dominate the energy savings opportunities in the short-term, though it is estimated that HVAC systems will surpass lighting use in this sector by 2010. This sector represents an attractive target sector given the potential for simple and replicable retrofit projects with fairly creditworthy customers. Hotels, in particular, represent a potentially attractive sub-sector, given their high energy consumption and creditworthiness, although many of the newer hotels have employed reasonably efficient equipment and practices.

The *residential sector*, while not a major energy user today, continues to dominate the peak demand, accounting for over 65 percent. Given Vietnam’s low per capita electricity consumption of only 309 kWh/yr (in 2001) and growing household electrification rate, about 75 percent of all households today, it is expected that increased services to rural areas will be a focus of future IDA support which will further increase this sector’s contributions to EVN’s peak demand over the next 5-10 years. The major end-use is this sector is lighting, although it is projected that air conditioners, refrigerators and fans will also become major contributors to overall demand in this sector as economic growth continues. Given the very low per capita incomes in this sector and low prevailing electricity prices, promotion of energy saving equipment has been severely constrained, despite cost-effective solutions.

**Table A4-1. Electricity Demand and Supply Overview**

|  |  |  |
| --- | --- | --- |
|  | **1995** | **2000** |
| Total Electricity Sales (GWh) | 11,185 | 21,394 |
| Peak Demand (MW) | 2,679 | 4,477 |
| Sales by Sector (%) |  |  |
| *Agriculture and Forestry* | 5.6 | 3.6 |
| *Industry and Construction* | 41.3 | 41.6 |
| *Service and Trade* | 9.0 | 7.2 |
| *Residential* | 44.1 | 47.5 |
| Average Consumption (KWh per capita) | 156.0 | 274.6 |

**Commercial and Industrial Market**

The commercial and industrial sectors in Vietnam currently consume approximately one-half of the total electrical power demand. Total electrical power used in these sectors was about 11,800 GWh in 2001, with about 78 percent consumed by the industrial sector, 20 percent from buildings (commercial and government buildings, hotels, hospitals, schools) and about 2 percent from water processing facilities (see Figure A4-1). Energy demand in these sectors is also growing at a very rapid rate (10-15 percent per year) as illustrated in Figure A4-2.

**Figure A4-1. Electric Power Consumption By Sub-sector (2001)**

**Figure A4-2. Growth Rates in Selected Sub-Sectors**

Within the industrial sector, which is dominated by SOEs, certain export oriented sub-sectors such as textile and food processing are growing profitably and quickly due to the strategic advantages Vietnam possesses with respect to natural resources and low-cost labor. The buildings sector energy consumption, while a relatively smaller percentage of overall energy consumption today, is increasing rapidly as the economy of Vietnam progresses and the demand for modern facilities and office space increase. Finally, water processing is keeping pace with increasing population demand and development.

Due to the emerging nature of the Vietnamese economy, the focus of industry and commercial establishments historically has been on “growth,” not “efficiency and conservation.” However, with the limited available investment capital and perceived risks associated with the transitional economy, investors have often been more concerned to minimize expenditures when building and maintaining facilities; the result being that they usually purchase lower cost, less efficient equipment. This has resulted in a large base of existing facilities operating with inefficient equipment and this base of demand represents a significant component of the total country energy demand. The technical opportunity for saving energy consumption through efficiency retrofits in the creditworthy industrial and commercial markets has been estimated (based on analysis in 2002) at 716 GWh per year, with savings within each sector ranging from 8-11 percent.

The combination of high growth rates, coupled with a large base of inefficient equipment, creates conditions for substantial potential for efficiency retrofits. Other macro-economic factors affecting the market for EE retrofits include: (a) trade liberalization which is exposing Vietnamese industries to increased global competition, and hence cost competitiveness, and easier access to imported modern technologies; (b) future increases in electric power tariffs, which will make EE retrofits more financially attractive; (c) banking reforms, which will make access to commercial financing for EE more accessible and less restrictive; and (d) SOE reforms, which will force inefficient industries to improve overall efficiency and productivity, which would include reducing energy and other operating costs, or be shut down.

Pilot Program Market: A market assessment conducted under the PDF B grant analyzed the market in Vietnam and recommend market sectors and technology opportunities which would best match the “commercial market criteria” in order to focus program efforts in a direction most likely to generate short-term successes. The potential commercial transaction volume for identified sectors and technologies has then been further refined by estimating the potential capacity for local project agents to “develop” and “deliver” projects under the Project’s activities. This market research has consisted of: (i) a review of past studies and research on EE potential in the Vietnamese market; (ii) walk-through energy audits in target facilities; (iii) interviews with facility managers to discuss attitudes and barriers to EE investment; (iv) interviews with local project agents to gauge their capability to provide a range of EE solutions and understand local experiences in overcoming barriers to EE investments; and (v) interactive stakeholder workshops in Hanoi and Ho Chi Minh City with government, commercial building, industrial, energy auditing, equipment supplier, research institute and financial sector stakeholders. The result of the above market research has been the selection of specific sectors and technology areas, which are believed to meet the market criteria required for program success, within the constraint of project agent capacity to deliver EE solutions over the 4-year life of the program.

While the overall market potential for EE in Vietnam is large, commercial transactions require: (i) end users who have access to or can mobilize project financing capital; (ii) service providers who can facilitate project development and implementation; and (iii) awareness by end-users that EE measures are viable and profitable. Based on these criteria and consultation with a wide range of stakeholders and market actors, the following sub-sectors were identified as having potential for energy savings as well as a high percentage of creditworthy owners with access to capital:

* 3-5 star hotels;
* Commercial office buildings;
* Textile factories;
* Food processing plants; and
* Water treatment and supply facilities.

While public buildings represent a larger share of the “buildings” market from an energy consumption standpoint, this segment does not represent a short-term commercial market for EE retrofits due to the absence of any formal EE procurement program within the government, very limited ability for financing and budgetary support, centralized decision-making, lack of life-cycle cost analyses for equipment purchase and incentive lapses, where public agencies may not benefit from energy saving projects due to corresponding budget reductions. Hotels and office buildings, while a smaller share of the total market, represent a more commercially viable short-term opportunity for EE service providers due to the fact that investment decision-making is possible (companies are mostly privately owned) and many owners are creditworthy. Although most of the industrial sector is dominated by SOEs with limited ability to access capital for EE retrofit investments, certain sub-sectors are profitable and growing. Market research has shown that many textile and food processing facilities meet these conditions and, thus, could be attractive candidates for EE investments. Additionally, water supply plants are being privatized and combine the elements of: (i) energy costs representing a significant percentage of their operating cost; (ii) private decision-making structures; and (iii) access to capital.

Thus, for the proposed pilot program, it has been estimated that the total market potential for the targeted customer classes is US$40-50 million in total. This is based on the viability of technical retrofits, status of creditworthy customers, the capacity for existing and new project agents to grow their businesses, and the creditworthiness of the targeted end-users. However, given the need for significant initial training and marketing, the very early stage of the market and the realistic penetration rates of the service market, it is expected that the program could achieve about US$7.3 million over the 4-year period. While relatively small, this has been determined to be adequately sized to make a significant and sustainable stimulus to the market and allow the industry to achieve a critical mass of business that could then be capable of expansion in later years. Market analysis has estimated that the above investment could result in more than 47 GWh of energy savings per year by the end of the program. (See Figure A4-3 for a breakdown of energy savings by sub-sector for the pilot program.)

Pilot Program Technologies: As noted above, a number of detailed audits and interviews were conducted to better analyze the potential EE retrofit market in Vietnam and identify potential cost-effective projects and technologies. While the pilot program would be flexible to allow all commercially viable projects to be implemented, an initial focus on simple and replicable technologies will be strongly encouraged early on to help build a solid base of project successes. Thus it is expected that initial technology training would focus on these key areas:

* replacement of incandescent bulbs with CFLs;
* replacement of 40 W with 36/32 W fluorescent lamps;
* replacement of standard magnetic ballasts with low-loss ballasts;
* introduction of Variable Speed Drives (VSDs) for motor drives, fans and pumps;
* combustion efficiency improvement (for diesel generators);
* high efficiency air conditioners and chillers;
* efficient water heaters and insulation; and
* more efficient electrical supply systems (e.g., transformers, capacitors).

All of the technologies listed are available in Vietnam and can be replicated in a large number of target commercial and industrial facilities. As the portfolio of projects grows and project agents improve their technical abilities and sophistications, it is expected that this list will continue to grow and develop. And, as the industrial sector becomes more financially viable and commercially attractive to service providers, the potential for a greater number of industrial projects and technologies will further increase.

**Figure A4-3. Pilot Commercial Program Savings Potential**

Project Agents: The total market potential has been further refined to reflect the potential capacity for local project agents to develop and deliver EE projects to end-use customers. This supply side of the market is comprised of local equipment manufacturers, equipment suppliers, and technical services providers (e.g., energy auditors, engineering consultants, technical institutes), which are collectively referred to as project agents, as well as financial services providers. Among local manufacturers and equipment suppliers the players include a mix of major international companies and joint ventures (e.g., ABB, Carrier, Danfoss, GE, LG, National, Osram, Philips, Toshiba) and local Vietnamese companies, some of which represent and distribute imported equipment. Some companies who manufacture locally are also able to import and distribute other products. In addition, there are a growing number of service providers that are seeking business in EE retrofits. Examples include: (i) local companies such as Thang Long Lighting and Enerteam who are transacting under models with some performance-based clauses; and (ii) international firms and/or joint ventures, such as Danfoss and Philips, who are suppliers of EE equipment. Some of these companies have already begun pioneering more complex service models to grow their respective businesses and facilitate transactions in EE improvements. These models have involved vendor financing of EE equipment costs to allow end-user payments to be staggered based on energy savings over a fixed period; deferred payment (as a lump sum) for equipment after its performance has been demonstrated; breaking EE investments into several smaller projects and using the proceeds of one to finance the next; and basing equipment/service payments on guaranteed performance of energy savings. However, these firms have encountered a number of constraints to business growth which range from limited equity and financing to low awareness and credibility/risk sharing of energy savings. As a result, the total market activity has remained limited. It was estimated that the market activity for commercial EE retrofits in 2001 was only about US$200,000.

Over 40 companies have now been identified in Vietnam with relevant capabilities and interest in the program (see Table A4-2, below). These would serve as the initial base of project agents, although additional agents would be identified and recruited throughout the program period. The program would offer a broad range of training to assist these agents to develop their businesses and technical competence. As these service providers further develop their technical and business skills, as well as achieve more project successes, the level of technical, financial and contractual complexities would naturally continue to progress leading to further options for risk sharing and project financing to help increase penetration of EE services in the market.

**Table A4-2. Breakdown of Potential Project Agents**

|  |  |
| --- | --- |
| **Business Type** | **Number** |
| Local Equipment Manufacturers | 11 |
| Equipment Suppliers | 17 |
| Technical Service Providers | 8 |
| Financial Service Companies | 4 |
| TOTAL | 40 |

**Residential Sector**

The estimated number of households in Vietnam in 2000 was 16.7 million, of which 12.8 million were rural and 3.9 million urban households. Of the rural households, some 9.5 million have grid-based electricity services. According to the results of a survey of about 3,000 households conducted under the Phase 1 DSM efforts, the major end uses in the residential sector are lighting, cooking, fans, refrigerators, air conditioners and miscellaneous appliances. Lighting is by far the most important of these end uses and it is estimated from the survey results that residential lighting contributed about 305 kWh in electricity consumption and 133 W per household to the peak load, or a total of 4,088 GWh and 1,780 MW of the peak load in 2000. This represented about 20 percent of the electricity consumption and 36 percent of the total peak. Of the residential lighting load, about 17 percent (302 MW) is from incandescent bulbs and 83 percent (1,478 MW) from FTLs.

The current penetration of CFLs and efficient T-8 FTLs is very low. The number of CFLs in the residential sector is estimated to be about 0.5 million or only 0.6 percent of the total lamps installed to date. The number of efficient FTL (T-8 tube lights) is estimated to be 4.4 million (representing about 8.1 percent of all FTL). Efforts to transform the markets from incandescent lamps to CFLs and T-10 FTLs to T-8 FTLs would, therefore, represent substantial energy savings as well as reductions in EVN’s system peak loads. The potential for energy savings through the promotion of CFLs was also noted as a priority area for carbon emissions reduction from the ALGAS Study.

Compact Fluorescent Lamps (CFLs): CFLs represent an excellent opportunity for energy savings in Vietnam. As replacement of incandescent lamps with CFLs can yield reductions in energy consumption of as much as 70-80 percent. CFLs can also provide peak reduction benefits because in the residential sector, lighting loads are major contributors to the system peak load. However, the installation of CFLs is at present limited by a number of barriers including:

* high initial cost, with the average CFL costing about 10-times the cost of an incandescent lamp;
* lack of customer awareness of the benefits of CFL (e.g., energy savings, longer life, reduced heat output);
* limited product availability;
* concerns over CFL failure or breakage sooner after installation;
* low residential tariffs; and
* confusion about the relative merits of the different lamps available and lack of understanding of the quality issues (due to low quality imports).

CFLs are currently available in Vietnam, but, due to the barriers cited above, their current market penetration is very low in the residential sector. The 3,000 household survey conducted by EVN, which covered four PC service territories (PC Hanoi, PC Ho Chi Minh City, PC 1 and PC 2), found that the average number of lamps per household in urban areas is 7.1 and in rural areas 5.9, leading to an overall residential lighting market of over 83 million lamps. Of these, the survey found that 34.7 percent of the lamps are incandescent bulbs and 0.6 percent are CFLs (the rest are fluorescent tube lamps). These results clearly illustrate very low existing penetration of CFLs among the residential household sector and large opportunities for savings if the market could be expanded.

CFLs available in the Vietnamese market today can be roughly categorized into three different types according to their qualities:

* “high quality”: imports from Europe/US with a efficacy ~ 60 Lm/W, and a lifetime of 10,000 hours;
* “medium quality”: domestic Vietnamese production and imports from neighboring Asian countries with a efficacy ~ 50 Lm/W, and a lifetime of 5,000 to 6,000 hours; and
* “low quality”: imports with a low efficacy, and a lifetime of only 1,000 hours.

Both imported and domestic CFLs are readily available in local retail outlets. Imported CFLs range substantially in quality and mainly come from China, Singapore, Spain, Thailand and the United States. The domestically manufactured CFLs come mostly from the two major producers of CFLs in Vietnam, Dien Quang Lamp Company (DIMEXCO) in Ho Chi Minh City, and Rang Dong Light Source and Vacuum Flask Company (RALACO) in Hanoi. These companies manufacture a range of CFLs from 5 to 20 W. The combined production capacity is estimated to be about 3 million units per year, but the current production level is a small fraction of this capacity due to the lack of market demand and most of the sales today are to commercial customers.

Under the Phase 1 efforts, EVN has done extensive analysis on the potential for increasing the sales of CFLs through a combination of declining discounts, bulk procurement, marketing and revolving fund activities. These analyses have concluded that there is significant scope to achieve a sustained increase the penetration of CFLs in the residential sector. It was determined that a 3-year program designed to sell one million new CFLs would significantly expand the residential market (about four times the current size) and could affect a reduction in the prevailing market price of CFLs by some 15-25 percent (see Figure A4-4).

**Figure A4-4. Residential CFL Market Transformation**

Efficient Fluorescent Tube Lights (FTL): Thin fluorescent tube lights (T-8 lamps) are about 10 percent more efficient that the standard fluorescent tube lights (standard or fat FTL, or T-10 lamps). T-10 FTLs require 20 W (2-foot lamps) and 40 W (4-foot lamps) compared with the T-8 lamps, which use 18 and 36 W, respectively. Energy savings can be increased further if the low-loss electronic ballasts are used with the T-8 FTLs. Since the cost of the T-8 lamps is about the same as the T-10 lamps, the potential for transforming the market is high. The potential benefits of such replacement are also very high since FTLs represent a high proportion of the lighting loads in the residential (and small commercial) sector. However, until now, the installation of T-8 lamps has been constrained by the following barriers:

* Reliance of the large manufacturers on the production of T-10 lamps;
* Lack of customer awareness of the benefits of T-8 lamps;
* Customer skepticism of the quality and savings potential of the T-8 lamps;
* Limited availability of sufficient numbers of T-8 lamps in the market; and
* Perception of power quality issues with T-8 lamps, due to the higher starting voltage requirements, and the effect of large voltage fluctuations on T-8 performance and life.

Due to these barriers, the current market penetration of T-8 lamps is very low, particularly in the residential sector. The survey conducted by EVN found that 65 percent of the lights installed in both urban and rural households in Vietnam today are FTLs, with only about 5.2 percent T-8 lamps. Almost none of the households surveyed use the low-loss electronic ballast with the T-8 lamps, representing further lost opportunities for energy savings.

The local producers of FTLs in Vietnam today include:

* Dien Quang Lamp Company (DIMEXCO), Ho Chi Minh City
* Rang Dong Light Source and Vacuum Flask Company (RALACO), Hanoi
* Dong-A Electric Joint Venture, Hanoi
* Song Hong Construction Company

DIMEXCO has a production capacity of 18 million units per year (3 assembly lines of standard FTL with capacity of 12 million units/year and 1 assembly line of T-8 FTLs with capacity of 6 million units per year). RALACO has a total production capacity of 20 – 25 million units per year (4 assembly lines, of which 2 have the ability to produce T-8 FTLs). As with the CFLs, the actual production of T-8 lamps is considerably less than the capacity, due to the lack of market demand for them, and most of the T-8 lamps are sold to the commercial sector. Philips expects to open its first local manufacturing plant near Ho Chi Minh City in late 2002 and is considering producing T-8 FTLs.

Under the Phase 1 efforts, EVN has concluded that there is scope to expand the residential sales of T-8 lamps by some 6 million units over 2 years and, thus, achieve a critical mass of demand to sustain and further grow the T-8 product lines, while gradually phasing out the T-10 FTLs. Since the cost differential of the more efficient lamps is negligible, EVN would focus its efforts on informational and marketing campaigns, along with negotiations with the major local manufacturers, to achieve these results. (See Figure A4-5 for the expected shift in sales as a result of the program.)

**Figure A4-5. Residential T-8 FTL Market Transformation**

Annex 5A: STAP Roster Technical Review

**Prepared by**

**Evan Mills**

**Lawrence Berkeley National Laboratory**

I have reviewed The World Bank’s Vietnam Demand-Side Management and Energy-Efficiency Project proposal. I believe you have designed an effective suite of activities. I can offer the following evaluation and suggestions for your consideration.

**General**

The proposed activity merits consideration and approval by the GEF Secretariat and Council. It promises to cost-effectively secure significant and sustainable reductions in greenhouse-gas emissions in Vietnam, and to establish a market-based model for doing so elsewhere in the region. It appears to be highly consistent with The Bank and GEF’s programs and strategic directions, and embodies many state-of-the-art strategies for achieving its results. Several (prudent) conservatisms are embedded in the analysis, suggesting that actual benefits may be higher than estimated.

The proposal is impressive in both its detail and the depth of consideration afforded to key issues. Considerable and focused effort has been made to address the needs of diverse stakeholders, incorporate lessons learned from prior activities, support capacity-building, and provide for education of the public and other stakeholders. It is also good to see a sophisticated real-world strategy for simultaneously addressing supply- and demand-side issues and opportunities.

I am pleased to see a number of ways in which the proposal design represents what might be called “programmatic leapfrogging” vis-à-vis what is done in industrialized countries, i.e., bringing state of the art perspectives techniques to the design of programs for developing countries rather than reinventing the wheel. Examples include the targeting of DSM measures to reducing loads in congested areas of the electrical distribution network as well as during peak periods, emphasis on measurement and verification, etc. In this light, I also endorse the spirit of developing commercially viable methods of perpetuating (and financing) energy-savings investments (as opposed to a command-and-control approaches (e.g. standards) that necessitate indefinite public-sector involvement. The proposed initiatives will complement future standards, which, by definition, represent a floor from which more aggressive voluntary initiatives can build.

The phased, 12-year program approach is wise given the need to build momentum and test a variety of strategies while developing domestic technical and economic capability to perpetuate the activities beyond the timeframe of the Project.

**Program Design Issues**

The project reflects the considerable effort made to obtain input from a diversity of stakeholders through a variety of workshops, studies, while being technically relevant based on a variety of data gathering activities. The balance of direct investment and education/technical assistance seems appropriate and important to achieving long-run sustainable market transformation. Many “best practice” strategies are included in the program design.

For example, I strongly agree with The Bank’s decision to refer to “project agents” rather than “ESCOs” as the private-sector parties. In the US, ESCOs represent only about one-third of the investment in efficiency projects, with the rest being made up of the types of parties such as those described in the proposal.

I can offer the following thoughts as means of potentially increasing the efficacy of these initiatives.

• A large number of “marketing” activities are (appropriately) identified throughout the document. The degree of cross-linkages among these is not clear. There may be scope for coordination, or even a special entity that provides cross-cutting marketing services in support of many or all of the projects. This may garner cost savings and/or other efficiencies. A loose analogy might be the ENERGY STAR program in the US, which centralizes a form of market research and program-design capacity that arches across multiple sectors and technologies.

• The Project’s focus on peak load management is admirable. Considerable cutting-edge work is underway in California (e.g. via the California Energy Commission) on topics such as “demand-responsive buildings”. Review of those activities may yield ideas that would sharpen the proposed Project’s treatment of this issue.

• Within the area of lighting, the issue of product quality CFLs (lifetime, lumen output, lumens per watt, power factor, total harmonic distortion) may be worth adding to the list of barriers; this has been shown to be a big issue in China (Fu Min *et al*. 1997) and Annex 4 mentions a range of quality among products available on the Vietnamese market and that some CFLs are today imported from China. If Chinese-made CFLs are going to be displaced by (western-quality) Vietnamese-made ones, then consumers may garner additional non-energy benefits (longer CFL life, higher efficiency, lower mercury content, and better color rendering). The proposal discusses the issue of low-quality CFLs and notes that some of the medium-quality ones are made in Vietnam. The project could stipulate that only premium-quality (efficiency, light output, life) models will be promoted under the program. No mention was made of quality issues for fluorescent tube lamps, but this, too, can be an issue (especially in the Asian manufacturing context).

• I recommend that the lighting programs (all end-user sectors) take more of a “systems approach” to the proposed lighting technology substitution. For example:

- If Vietnam is like most developing countries, lighting applications involve optical inefficiencies beyond those inherent in the types of bulbs used. For linear fluorescents, it would be possible to further increase the energy savings by looking at the layout of lighting systems (e.g. different spacing and types of luminaries such as downlights versus wrap-around linear fixtures; task lighting with CFL in combination with overhead ambient lighting). Analyses cast in terms of lighting power density (watts per square foot) rather than one-for-one bulb-level comparisons would help to capture added savings. State-of-the-art efficient lighting today involves a blend of task and ambient design solutions.

- This thinking can also be applied to the residential sector, where homes often have crude (at best) light fixtures with the result that considerable amounts of light are wasted (even if the bulbs are efficient). Moreover, since CFLs have a different (somewhat linear) shape than incandescents, experience around the world has shown considerable consumer dissatisfaction with light levels for lamp replacements that ostensibly provide equal light output. Also, there may be opportunities to replace fluorescents tubes with CFLs (e.g. for task lighting in cottage-industry applications).

- It is thus suggested that a modest effort be undertaken to promote optically efficient fixtures and efficient lighting system design in addition to the core initiative. Perhaps a small subset of homes and businesses could be targeted to demonstrate the incremental savings achievable. The ELI program may have dealt with this question could offer some results that are transferable to the proposed project.

• It appears that the CFL savings estimates are predicated on the assumption that their usage is largely coincident with peak load (assumptions should be more explicitly noted). To achieve this, effective information must be provided to encourage users to install the CFL in the highest-use fixture in the home.

• For the CFL “bulk purchasing” activity, analysis should be done of the potential adverse impacts on mid-market players who may lose profits due to this “end run”. This has repeatedly come up during programs in other countries. The proposed three-year phase out is a wise strategy for minimizing such adverse impacts, but may still create unintended market disruptions in the interim. Perhaps there are useful lessons from other lighting programs, such as the ELI program.

• The Pilot Commercial EE Program description states that motor drives and pumps, cooling/heating and electrical supply systems are “simple and replicable”. This is an oversimplification, as these end uses have considerable complexity (e.g. in comparison to lighting).

• It is refreshing to see a structured analysis of risk factors. This should be done more often during the formulation of new energy-efficiency initiatives. A primary project risk would be the under-attainment of energy-saving targets. The mitigation plans proposed are good, and could be augmented with more emphasis on the inclusion of building commissioning (quality assurance aimed at verifying proper installation and utilization of efficiency strategies) as components of the Project’s risk-management strategy. Passing reference is made to commissioning under the “Comprehensive Training Program.” Its importance cannot be underestimated. “Commissioning Certificates” are mentioned under Annex 3. Does the proposed project put in place the mechanism for developing (and quality-controlling) these certificates? If so, this should be stated clearly.

• A brief and less-than-convincing argument is made in Annex 4 for not pursuing energy management in publicly-owned buildings. Based on the background provided to me, I believe this is a valid conclusion, for the near term, but should be elaborated upon a bit for the benefit of other reviewers. Perhaps a very modest component of this project could be devoted to identifying how to penetrate this difficult but important sub-sector. Future Phases of the project should certainly refocus on “government leadership by example” (Borg *et al.* 1998). Another consideration is that the ESCO industry in North America has been particularly popular and successful among publicly-owned buildings (Osbourne *et al.* 2002).

• Mention is made of the large number of un-electrified households in Vietnam today (nearly 25% of the total). The document refers to plans to electrify these areas, emphasizing the importance of lighting. In the spirit of The Bank’s goals of sustainable development, energy efficiency, and environmental protection, consideration should be given to alternatives based on renewable-powered white LED lighting systems (Mills 2002; Mills and Johnson 2002). While this is beyond the scope of the current Phase, it may be relevant to Future Phases. The carbon emissions reductions achievable by replacing current kerosene-based lighting could be even greater than those from addressing lighting in already electrified households.

Project Agents (ESCOs, etc)

• In Central Europe, ESCOs have shown particular interest in public lighting. Given the proposal’s discussion of UNDP’s technical efforts in this niche, perhaps the current project could complement the activity by supporting ESCO examination of this particular end use area.

• Under “Commercial Energy Efficiency” a number of types of firms are identified who stand to comprise the evolving energy services market. One key issue is the credibility of savings estimates made by ESCOs. Some insurance companies have created “Energy Savings Insurance” products that, among other things, reduce risk by bringing to bear external (and disinterested) engineering expertise and critique of savings projections. An interesting additional facet of ESI is that contracts can be structured so that debt service (linked to projected energy savings) is virtually guaranteed by the insurer. This can justify lower costs of capital and reduced barriers to securing financing. ESI providers are interested in working in Asia, and some may already be doing so.

• A related, and more complicated, issue is the market’s handling of uncertainties in energy savings estimates. Sophisticated investment decision-makers combine risk (uncertainty/volatility) and return to get a modified Rate of return that can be compared to other investments. ESCOs and others in the energy services and policy communities have failed to do so. Fostering innovation in this area may be another way in which this project “leapfrogs” over what is done in developed countries today. Taking initiative in this area would be a natural activity for The Bank.

• The Comprehensive Training Program, as described in the document, is impressive and well-conceived. A complementary addition would be to create a “project agent certification” process for people successfully completing the training. This would serve a variety of goals, including raising the credibility of this emerging sector and thereby reducing the perceived risks described earlier under “barriers”. I believe that the National Association of Energy Service Companies (U.S.) in the states has had success with their certification efforts.

In addition, the establishment (and subsequent periodic analysis) of a database of projects could prove invaluable in evaluating the progress of Project Agents. The proposal itself states that “it will be critical that structured feedback mechanisms be established to periodically review and assess successes and failures of various business models developed and facilitate corrective actions.” This form of data collection also serve in the certification process if, as is done in the US, those seeking certification need to submit real projects for evaluation (see Osbourne *et al*. 2002).

**Other (Clarifications; Calculations)**

• Clarification is needed regarding some of the conclusions show in Table A2-2. The results suggest no change over time in the emissions factors associated with power production, i.e., 1200 tons of CO2 per GWh. My understanding is that the emissions factors are based on gas-fired, combined cycle plants only, since this is expected to be the displaced generation source for the system over the 4-year project period. Since EVN's system average is much higher, actual carbon savings may be greater than those estimated (since not all savings will be purely on peak, especially in the case of lighting). In addition, savings beyond the project period may defer more-polluting generation. Conservatisims in the analysis should be noted for the benefit of reviewers.

• A proxy gas turbine ($54/kW-year) appears to be used to estimate the capacity cost benefits of the proposed programs. My understanding is that avoided transmission and distribution costs are also included in the cost-benefit analysis. The underlying assumptions should be noted.

• Values for the role of incandescent lighting in the household sector differ throughout the report. The ultimate savings potential would be higher if the Annex 4 value were assumed.

• The discussion of measurement and verification is rather cursory, and difficult to evaluate.

• The discussion of “Other Donors” is not clear as to potential complementarities versus redundancies with the proposed program.

• To help readers better differentiate between the work already accomplished under Phase 1 and that proposed for Phase 2, I would suggest elevating the table entitled ”Framework for IDA/GEF DSM/EE Program” (Annex 3) up into the main body of the report in conjunction with mention of these two phases.

• “Barriers” are mentioned a number of times in the report before they are enumerated (on page 13). It may help some readers if the specifics were presented earlier (even if in abbreviated form).

• The $500k “Learning Grant” under the CFL Program budget should be defined/described in the text.

• The terms “energy conservation” and “energy efficiency” are used together in a number of places. It would be useful to define and differentiate between their meanings, or settle on a single term if the distinction is not important to the overall presentation of the Project.

## Additional Notes & Suggestions

I have also submitted a marked-up copy of the review draft with a variety of editorial suggestions for your consideration.

# References

Fu Min, G., E. Mills, and Q. Zhang. 1997. "Energy-Efficient Lighting in China: Problems and Prospects." Energy Policy 25 (1): 77-83 (January). (Also in the *Proceedings of the 3rd European Conference on Energy-Efficient Lighting*, Newcastle, UK.) Lawrence Berkeley Laboratory Report No. 36822. http://eande.lbl.gov/emills/PUBS/china.html

Mills, E. 2002. "The $230-billion Global Lighting Energy Bill.” *Proceedings of the First European Conference on Energy-Efficient Lighting*, International Association for Energy-Efficient Lighting, Stockholm, pp. 368-385.

Mills, E. and S.G. Johnson. 2002. “The Specter of Fuel-Based Lighting: A Dramatic Opportunity for Technology Leapfrogging in the Developing World.” Lawrence Berkeley National Laboratory, Issue Paper.

Borg, N., E. Mills, N. Martin, and J. Harris. 1998. "Energy Management in the Government Sector: An International Review." Lawrence Berkeley National Laboratory Report No. 40403. Also in *Proceedings of the 1997 ECEEE Summer Study*, Prague, Czech Republic. Panel 4, ID 150, pp. 1-24. European Council for an Energy-Efficient Economy, Copenhagen, Denmark. http://eande.lbl.gov/emills/PUBS/energy.html

Osborn, J., C. Goldman, N. Hopper, and T. Singer. 2002. *Assessing U.S. ESCO Industry Performance and Market Trends: Results from the NAESCO Database Project.* Lawrence Berkeley Laboratory Report No. 50304. http://eetd.lbl.gov/ea/EMS/reports/50304.pdf

Annex 5B: World Bank Team Response to STAP Reviewer Comments

Comment: *A large number of “marketing” activities are (appropriately) identified throughout the document. The degree of cross-linkages among these is not clear. There may be scope for coordination, or even a special entity that provides cross-cutting marketing services in support of many or all of the projects. This may garner cost savings and/or other efficiencies.*

Response: Although the overall approaches and markets are quite different between the two components, efforts will be made to coordinate and possibly collaborate on more general energy efficiency marketing efforts.

Comment: *Within the area of lighting, the issue of product quality CFLs (lifetime, lumen output, lumens per watt, power factor, total harmonic distortion) may be worth adding to the list of barriers; this has been shown to be a big issue in China… If Chinese-made CFLs are going to be displaced by (western-quality) Vietnamese-made ones, then consumers may garner additional non-energy benefits (longer CFL life, higher efficiency, lower mercury content, and better color rendering)… The project could stipulate that only premium-quality (efficiency, light output, life) models will be promoted under the program.*

Response: We agree that product quality must be addressed in the program design. Given the very low penetration of CFLs in Vietnam today, low quality imports have not as yet been a significant problem in the market. Ongoing efforts to improve local CFL quality in neighboring countries has also helped. EVN’s CFL program will include equipment and performance specifications, which are relatively easy to enforce since EVN will be procuring all the lamps. These specifications will be developed based on locally available equipment (locally produced and imported), minimum quality requirements, life-cycle costs of equipment, etc. but will not seek premium-only restrictions. The specifications will also include some acceptance testing, warrantee requirements, etc. to help ensure that all lamps promoted and distributed under the program are of acceptable quality.

Comment: *If Vietnam is like most developing countries, lighting applications involve optical inefficiencies beyond those inherent in the types of bulbs used. For linear fluorescents, it would be possible to further increase the energy savings by looking at the layout of lighting systems (e.g. different spacing and types of luminaries such as downlights versus wrap-around linear fixtures; task lighting with CFL in combination with overhead ambient lighting). Analyses cast in terms of lighting power density (watts per square foot) rather than one-for-one bulb-level comparisons would help to capture added savings. State-of-the-art efficient lighting today involves a blend of task and ambient design solutions.*

Response: For the commercial pilot EE program, all lighting projects will be developed and designed by the participating project agents based on review of their customers’ systems. It is expected that the agents will consider many of these points.

Comment: *This thinking can also be applied to the residential sector, where homes often have crude (at best) light fixtures with the result that considerable amounts of light are wasted (even if the bulbs are efficient). Moreover, since CFLs have a different (somewhat linear) shape than incandescents, experience around the world has shown considerable consumer dissatisfaction with light levels for lamp replacements that ostensibly provide equal light output... It is thus suggested that a modest effort be undertaken to promote optically efficient fixtures and efficient lighting system design in addition to the core initiative. Perhaps a small subset of homes and businesses could be targeted to demonstrate the incremental savings achievable.*

Response: Pilot CFL programs are now underway under Phase 1 efforts and EVN and its PCs will be assessing a range of issues with CFL adoption, including customer responses to technology and lighting levels, power quality, fixtures, etc. Issues that are deemed important and are cost-effective will be addressed by the DSM Cell in the final program plan.

Comment: *It appears that the CFL savings estimates are predicated on the assumption that their usage is largely coincident with peak load (assumptions should be more explicitly noted). To achieve this, effective information must be provided to encourage users to install the CFL in the highest-use fixture in the home.*

Response: We agree. The CFL program will seek to distribute only 1-2 lamps per household and information will be provided under the program to help ensure that these lamps are used in the rooms with the highest lighting demand.

Comment: *For the CFL “bulk purchasing” activity, analysis should be done of the potential adverse impacts on mid-market players who may lose profits due to this “end run”. This has repeatedly come up during programs in other countries. The proposed three-year phase out is a wise strategy for minimizing such adverse impacts, but may still create unintended market disruptions in the interim.*

Response: The program is designed for the PCs and perhaps other selected organizations to serve as distribution outlets only for the program period. Since CFLs are virtually nonexistent in rural areas now, it is not expected that such delivery mechanisms would distort traditional CFL distribution chains. A key aspect of the program design is that lighting distributors eventually serve as the medium- to long-term outlet for EE lights. Thus, lower sales of less efficient lighting products should be more than offset by higher sales of CFLs.

Comment: *A brief and less-than-convincing argument is made in Annex 4 for not pursuing energy management in publicly-owned buildings. Based on the background provided to me, I believe this is a valid conclusion, for the near term, but should be elaborated upon a bit for the benefit of other reviewers. Perhaps a very modest component of this project could be devoted to identifying how to penetrate this difficult but important sub-sector. Future Phases of the project should certainly refocus on “government leadership by example”. Another consideration is that the ESCO industry in North America has been particularly popular and successful among publicly-owned buildings.*

Response: Public buildings, in fact, were considered as an original target for this program. However, there was a concern that there is central decision-making for all public projects and major budgetary constraints that we felt would impede the program. In the program design workshops, all the prospective agents recommended that the program not to rely on this market, since decisions took very long, financing was very difficult and there were incentive lapses (i.e., agencies would not necessarily benefit from reduced energy costs, since their state and provincial budgets could just be correspondingly reduced). Thus, while we have not excluded this market, it would not seem reasonable to focus on this market in the near-term. We do intend, in future phases, to explicitly address this market.

Comment: *Mention is made of the large number of un-electrified households in Vietnam today (nearly 25% of the total)… In the spirit of the Bank’s goals of sustainable development, energy efficiency, and environmental protection, consideration should be given to alternatives based on renewable-powered white LED lighting systems. While this is beyond the scope of the current Phase, it may be relevant to Future Phases. The carbon emissions reductions achievable by replacing current kerosene-based lighting could be even greater than those from addressing lighting in already electrified households.*

Response: This is an interesting suggestion and it will be considered by the team. However, the LED technology, as we understand, is far from commercial, and is not considered to be best practice in rural lighting programs. The cost of LEDs is about one hundred times the cost of incandescents and we are unaware of any large-scale programs in the world which have successfully and cost-effectively employed such technology.

Comment: *Under “Commercial Energy Efficiency” a number of types of firms are identified who stand to comprise the evolving energy services market. One key issue is the credibility of savings estimates made by ESCOs. Some insurance companies have created “Energy Savings Insurance” products that, among other things, reduce risk by bringing to bear external (and disinterested) engineering expertise and critique of savings projections. An interesting additional facet of ESI is that contracts can be structured so that debt service (linked to projected energy savings) is virtually guaranteed by the insurer. This can justify lower costs of capital and reduced barriers to securing financing. ESI providers are interested in working in Asia, and some may already be doing so.*

Response: This is an interesting idea, but it has not been adopted in any developing country as far we are aware. Furthermore, such insurance products are far from common in developed countries, since they raise transaction costs. The insurance market in Vietnam is very underdeveloped and the introduction of such a sophisticated model at this stage is not warranted. Furthermore, such an instrument would appear more appropriate if ESCOs are willing to guarantee savings but are seeking third parties to share risk. Under the pilot commercial EE program, it is unlikely that most of the projects will involve guaranteed savings, given the very small balance sheets of the prospective agents at this time. These issues will be revisited in future phases.

Comment: *The Comprehensive Training Program, as described in the document, is impressive and well-conceived. A complementary addition would be to create a “project agent certification” process for people successfully completing the training. This would serve a variety of goals, including raising the credibility of this emerging sector and thereby reducing the perceived risks described earlier under “barriers”. I believe that the National Association of Energy Service Companies (U.S.) in the states has had success with their certification efforts.*

Response: Given the very early stage of development of the service market in Vietnam today, the key objective is to catalyze the market rather than control or create barriers to market entry. Furthermore, it is not clear to us that existing program entities would be well-suited to provide or be eligible for such certifications at this stage. As the market develops further, in future phases, this issue will likely need to be addressed either by government certification or some industry association service quality measures. We understand that it took some 15 years of ESCO operations in the U.S. before NAESCO introduced its certification process. However, we will consider issuing certification for successful completion of program training courses.

Comment: *In addition, the establishment (and subsequent periodic analysis) of a database of projects can prove invaluable downstream in evaluating the progress of Project Agents. The proposal itself states that “it will be critical that structured feedback mechanisms be established to periodically review and assess successes and failures of various business models developed and facilitate corrective actions.” This form of data collection also serve in the certification process if, as is done in the US, those seeking certification need to submit real projects for evaluation.*

Response: We agree. Under the program administration and monitoring component, a database of projects will be developed to track a number of program performance indicators, including aggregate investment figures, energy savings, technologies used, emissions reductions, etc.

Other comments were made on the overall presentation of the Brief. These comments were well-received and will be incorporated, as appropriate, before the final Brief is submitted to the GEF.

Ramon Prudencio C. de Mesa

M:\ProjectDocs\Climate Change\Vietnam DSM Energy\GEF Project Brief 082602.doc

September 4, 2002 5:49 PM

1. For a complete discussion of the energy sector issues in Vietnam, please refer to the SEIER Project Appraisal Document (Report 24192-VN), which was endorsed by the GEF CEO on May 29, 2002, and approved by the World Bank’s Executive Board on June 25, 2002. [↑](#footnote-ref-1)
2. For the purposes of the pilot commercial energy efficiency program, it was decided to use the term “project agent” rather than ESCO to represent service providers. The rationale is that there are several misconceptions about whether companies that only provided support to part of a project (e.g., energy audit, project design, financing, installation, etc.) were actual ESCOs or companies were required to provide some savings guarantees in order to be considered ESCOs. Thus the Bank team and MoI concluded that a more neutral term like project agent would minimize confusion and better allow participating Vietnamese firms to provide the types and range of services they wished to offer rather than seeking to expand their level of services based on their perceptions of Western ESCO models. Agents may include energy auditors, equipment suppliers, leasing companies, ESCOs, installation contractors, engineering companies. [↑](#footnote-ref-2)
3. While EVN’s load management programs, such as their TOU metering and direct load control, may save some energy, their primary purpose is to shift loads from peak to off-peak hours, so no energy savings estimates have been included in this analysis. [↑](#footnote-ref-3)