



INTERNATIONAL INSTITUTE FOR
ENERGY CONSERVATION (IIEC)

Vietnam Demand Side Management and Energy Efficiency (DSM/EE) Project

MONITORING AND EVALUATION CONSULTANCY SERVICES
FOR EVN'S DSM PHASE 2 PROGRAM

FINAL EVALUATION OF CFL PROGRAM (PHASES 1 & 2)

Prepared for

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EXECUTIVE SUMMARY

BACKGROUND

The CFL Program was designed during the Phase 1 of EVN DSM program based on a pilot program conducted in Phase 1. The pilot program indicated that there was a high percentage of use of incandescent lamps during the system peak period, households had an average of 2-3 incandescent lamps and had low awareness of CFLs. The results indicated that there were no major barriers for the implementation of a large scale CFL program in the rural sector [areas] and a high percentage (~80%) of consumers expressed their interest in purchasing CFLs in the future.

CFL PROGRAM OBJECTIVES

The objectives of the CFL program were consistent with EVN's overall DSM objectives in easing investment in system expansion as a result of rapid demand growth. The social objectives of the program were to provide assistance to rural people in reducing electricity costs and the objectives of GEF in reducing GHG emissions to improve the global environment.

The intended program strategies included the provision of a subsidy for CFLs to rural consumers, a signal to CFL manufacturers for increased sales and marketing and the promotion of market transformation from incandescent lamps to CFLs.

The primary objectives of the CFL Program are summarized as follows:

- to ease EVN's investment in system expansion caused by rapid demand growth;
- to help people in rural areas to reduce cost of electricity consumption;
- to increase awareness of CFLs for rural people
- to reduce GHG emissions and improve global environment

The primary strategies for achieving the above objectives are:

- to subsidize CFLs for poorer rural communities
- to provide a signal to the manufacturers to increase their sales and marketing of CFLs; and
- to promote market transformation towards the use of CFLs instead of incandescent lamps.

The overall objective of the CFL Program was the procurement and distribution of 1 million CFLs over the three-year period of the Phase 2 DSM program (2004-2007). The original intention was to procure 300,000 lamps in year 1, 400,000 lamps in year 2 and 300,000 lamps in year 3. However, due to the higher than expected interest in Phase 1 the quota of lamps earmarked for Years 2 and 3 was combined (700,000 CFLs) and completed in Year 2.

The evaluation of the Phase 1 program considered all design and implementation aspects. Information for the evaluation was sourced from EVN, customer surveys and CFL suppliers. The customer surveys included Participating Users, Non Participating and Non-Users.

The final evaluation of the CFL program considered both Phases (1 and 2) covering 1 Million CFLs and determined the overall impacts of the program. The surveys focused on the Program participants and more emphasis was placed in determining the overall market impacts resulting from the EVN Program

IMPACT EVALUATION

A summary of the program impacts of the overall EVN CFL Program are given in the Table below.

<i>Direct System Impacts and Benefits</i>	
<i>Energy Savings (MWh/yr)</i>	<i>45,900</i>
<i>Lifetime Energy Savings (MWh)</i>	<i>243,300</i>
<i>Demand Saving (MW)</i>	<i>30.1</i>
<i>EVN Benefit / Cost Ratio</i>	<i>99.10</i>
<i>Consumer Benefit / Cost Ratio</i>	<i>7.23</i>

The following is a summary of conclusions from the Impact Evaluation:

- The program was found to be extremely cost effective to both EVN with the benefit to EVN around 99 times more than the costs, and the consumers with benefits 7.2 times more than the costs.
- The EVN benefits are high because the target consumers (residential) have subsidised tariffs (less than the avoided cost of supply).
- The demand savings are somewhat lower than estimated, because the program design was based on a 75W incandescent lamp being replaced by a 20W CFL, while, in reality lower wattage incandescent lamps and a significant number of fluorescent tube lights have been replaced by the CFLs.
- The average wattage of the replaced lamps was 58W. Around 18% opted to use the CFLs for new fittings and their impacts were based on the assumption that alternatively they would have used incandescent lamps on the basis that a holder suitable for either an incandescent lamp or CFL was already installed.
- The indirect demand reduction through CFL market transformation is estimated to be around 280 MW based on sales information obtained from some leading CFL manufacturers. This is the result of significantly high increase in CFL sales commencing in 2005 (the year of the launch of the EVN CFL program) and maintained in 2006.
- The direct impact of the EVN Program was 30.1 MW (90.1%) compared to the estimated 33.4MW in the EVN Phase 2 DSM Plan. Using the same proportions, the indirect system impact is 252.15 MW.
- The average bill savings for consumers was estimated to be 15.2%.

PROCESS EVALUATION

The following is a summary of findings from the Process Evaluation for Phase 2:

- Around 79% of the participating consumers opted to purchase the maximum number (2) of lamps. A significant percentage (82%) of the participants was found to be new users of CFLs and a small number (12%) have since purchased CFLs outside the EVN program.
- As in the case in Phase 1, there was a significant number (39%) who used the CFLs as replacement of existing 20W / 40W fluorescent tube lighting. This figure was even higher than in Phase 1 which was 23%. Additional follow-up questions were asked to confirm this fact in order to prevent misinterpretation.
- The EVN marketing strategies were proved to be effective with EVN Notices at Branch offices, TV advertisements, brochures and banners being the most popular. All respondents believed that the marketing material provided by EVN was easy to understand.
- The overall failure rate of the CFLs was less than 0.5% and the failed lamps were replaced by EVN under the program. The lamp failures mostly occurred within 6 months after purchase.
- Overall satisfaction with the performance of the CFLs was very high (~92%) and the key factors that influenced consumers to participate in the program was saving potential and discounted price offered by EVN. The unsatisfied consumers stated light quality and level of savings as the primary reasons.

MARKET EVALUATION

The market evaluation focused on determining the impact of the EVN CFL program on the transformation of the CFL market in Vietnam. In the Phase 1 evaluation the market effects were determined from surveys of key market participants (manufacturers, distributors and retailers). In the Phase 2 evaluation, detailed CFL sales information were gathered from two major retailers and also the import-export data during the period 2003 – 2006.

The summary data of CFL imports and exports during the period 2003 to 2006 is given in Table below

Item	2003	2004	2005	2006
Import	4,433,213	9,447,391	1,259,557	1,806,474
Export	6,978,807	17,017,458	4,439,669	308,910
Total	11,412,020	26,464,849	5,699,226	2,115,384

The inferences from the above figures are:

- There has been a rapid decrease in the no: of CFLs exported since 2005, indicating that a significantly higher domestic demand since the introduction of the EVN program in 2005.
- The decrease in import numbers since 2005 could be attributed to the fact that the local manufacturers have increased their production and customer preference for local products.
- It should be noted that the above figures were obtained from official sources. However, there is a possibility that the numbers may not be a true reflection of the actual situation considering the current practice of some imports of CFLs from China being trans-shipped to neighboring countries like Lao PDR and Cambodia.

A summary of the estimated system benefits based on sales information provided by leading local CFL manufacturers is given in the Table below.

	Unit	Lamp Types				Total
Type of Replaced Lamp	In / FI	In	In	In	In	In
Wattage of Replaced Lamp	Watts	40	60	75	100	
CFL Wattage	Watts	9	11	15	20	
No: of Lamps Replaced	#	882,220	3,297,513	441,446	1,504,030	6,125,209
Peak Savings – System Level	MW	22.8	134.6	22.1	100.3	279.8
Total Energy Savings	GWh/yr	22.4	132.5	21.7	98.7	275.4
Total Lifetime Savings	GWh	184.4	1,089.3	178.6	811.2	2,263.40

The key findings of the market evaluation are summarised below:

- All suppliers have experienced a significant increase in sales in 2005 and the trends in 2006 are even higher.
- Rang Dong have experienced a growth of around 150% since the introduction of the EVN Program in 2005 and expects an annual growth of around 50% in 2007.
- Philips have experience a growth of around 80% since the introduction of the EVN Program and expects this trend to continue in 2007.

- All have attributed the overall increase in awareness of CFL as a contributory factor in the increased sales.
- There is strong evidence that the EVN program has had an impact in stimulating the CFL market in Vietnam. Experience in other countries (India and Sri Lanka) have shown that utility endorsement in a technology provides the confidence for consumers to adopt that technology.
- The significant increase in CFL sales immediately after the launch of the Phase 1 EVN CFL program is an indication of widespread adoption in the use of CFLs.
- The Table above shows a technical potential of around 280 MW from the sales of two major suppliers. It is difficult to predict the actual demand impacts on the EVN system. The direct impact of the EVN Program was 30.1 MW (90.1%) compared to the estimated 33.4MW in the EVN Phase 2 DSM Plan. Using the same proportions, the system impact is 252.15 MW.
- Increase in awareness of CFLs in the rural sector and a promotional campaign in the urban sectors are seen as options for maintaining the high growth in CFL sales.
- There is strong evidence that the EVN Program stimulated the market that has resulted in substantial increase in sales.
- The significant increase in CFL sales ranging from 80% to 150% during the first year of the EVN program indicates that the program had a significant impact in the growth of the use of CFLs in Vietnam.
- The results of EVN Phase 1 and Phase 2 program show that only a small percentage of eligible households could participate in the program because of the limitation on the number of lamps sold under the program. The overall participation is around 10%.
- There is strong evidence of increased awareness of the benefits of CFLs amongst consumers and as a consequence a substantial increase in market penetration could be expected in the coming years.

1 INTRODUCTION

Over the last decade, Vietnam experienced unprecedented economic growth; averaging 8.2 percent annually from 1992 to 1997. During this period, energy demand grew 30% faster than GDP and the demand for electricity was 70% faster than GDP. Such significant economic growth will require substantial expansion of the energy sector and, in particular, the electric power sector. It is estimated that the power utility, Electricity of Vietnam (EVN), will face a threefold increase in demand over the next 10 years, from 26,600 GWh in 2000 to over 70,400 GWh by 2010, with annual demand growth of 10-13 percent. The maximum demand is projected to increase from 6,100 MW (in 2000) to around 17,000 MW by 2010, requiring a corresponding capital investment in generation capacity of around US\$18 billion.

A "Demand-Side Management Assessment for Vietnam" study was commissioned by EVN in 1997, with World Bank assistance, to determine the potential for demand-side management (DSM) in meeting the country's future power resource requirements. The DSM Assessment concluded that DSM had a potentially significant role to play in managing the growth of electricity demand in Vietnam and 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 680 MVA of capacity and more than 3,550 GWh/yr (about 5 million toe) by the year 2010. Under the scope in the first phase, supported by a grant from SIDA (about US\$3.0 million), a DSM Cell was established within EVN. The functions of the DSM Cell included building load research capability, implementation of a pilot load management and several other pilot DSM programs, development of energy audit capability within EVN, and development of a policy framework for initial and future DSM activities. In addition, Phase one also included the development of an energy efficiency (EE) building code and the introduction of EE standards for appliances including lighting and industrial motors. The DSM Project Management Board of the Ministry of Industry (MOI) managed this phase.

Under Phase 2 of the DSM program, EVN implemented a number of initiatives aimed at reducing peak load demand on the electricity network. The main components of the EVN DSM initiative are: (a) promotion of compact fluorescent lamps (CFLs); (b) transformation of the fluorescent tube lamp (FTL) market to efficient, "thin-tube" (T8) lamps; (c) an expansion of the time of use (TOU) metering; (d) a pilot direct load control (DLC) program; (e) and supporting programs. The supporting programs include load research activities; a study of the DSM regulatory framework and business opportunities; DSM screening and implementation of pilot programs; and a consultancy on program monitoring & evaluation.

The International Institute for Energy Conservation (IIEC) was engaged for the provision of consulting services for the design and implementation of a program monitoring and evaluation framework in compliance with the objectives of EVN management (cost-effectiveness and efficiency) and that of the GEF (environmental and climate change benefits).

This report provides details of the combined evaluation of the Phase 1 and 2 of the Compact Fluorescent Lamp (CFL) Program implemented by EVN during 2005-2006.

2 OVERVIEW OF THE CFL PROGRAM

2.1 Background

The CFL Program was designed during the Phase 1 of EVN DSM program based on a pilot program conducted in Phase 1. The pilot program indicated that there was a high percentage of use of incandescent lamps during the system peak period, households had an average of 2-3 incandescent lamps and had low awareness of CFLs. The results indicated that there were no major barriers for the implementation of a large scale CFL program in the rural sector and a high percentage (~80%) of consumers expressed their interest in purchasing CFLs in the future. Based on the evaluation of the Phase 1 program conducted in 2006, EVN made certain refinements in the implementation plan of Phase 2

2.2 Program Objectives

The objectives of the CFL program were consistent with EVN's overall DSM objectives in easing investment in system expansion as a result of rapid demand growth. The social objectives of the program were to provide assistance to rural people in reducing electricity costs and the objectives of GEF in reducing GHG emissions to improve the global environment.

The intended program strategies included the provision of a subsidy for CFLs to rural consumers, a signal to CFL manufacturers for increased sales and marketing and the promotion of market transformation from incandescent lamps to CFLs.

The primary objectives of the CFL Program are summarized as follows:

- to ease EVN's investment in system expansion caused by rapid demand growth;
- to help people in rural areas to reduce cost of electricity consumption;
- to increase awareness of CFLs for rural people
- to reduce GHG emissions and improve global environment

The primary strategies for achieving the above objectives are:

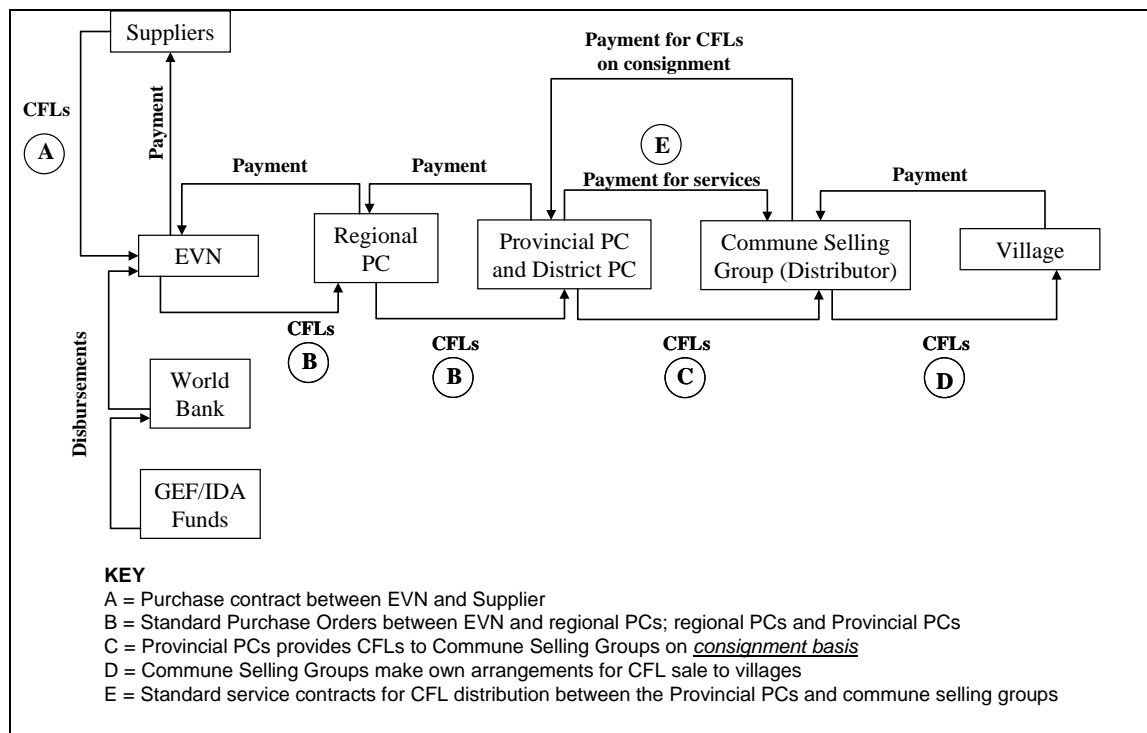
- to subsidize CFLs for poorer rural communities
- to provide a signal to the manufacturers to increase their sales and marketing of CFLs; and
- to promote market transformation towards the use of CFLs instead of incandescent lamps.

The overall objective of the CFL Program was the procurement and distribution of 1 million CFLs over the three-year period of the Phase 2 DSM program (2004-2007). The original intention was to procure 300,000 lamps in year 1, 400,000 lamps in year 2 and 300,000 lamps in year 3. However, due to the higher than expected interest in Phase 1 the quota of lamps earmarked for Years 2 and 3 was combined (700,000 CFLs) and completed in Year 2.

2.3 Program Description

The aim of the Year 1 program was the procurement and distribution of 300,000 lamps. The procurement would involve the selection of one supplier from a bulk tender procedure. The distribution of the lamps was conducted through the Provincial PCs to the Commune selling Groups via the District PCs as shown in Fig 1.

The Phase 1 program was implemented using only 3 PCs (PC1, PC2 and PC3) and the distribution was through the District PCs. Hence, the Commune Selling Groups were not utilized in this Phase. The method of procurement and program design for Years 2 and 3 of the program will be reviewed based on the results of review of CFL program marketing experience.



The program included contracts for CFL Distribution Services, which were awarded by the Provincial PCs to the Commune Selling Groups participating in the CFL program. The contracts covered the costs for the cooperatives to distribute promotional materials, sell and distribute lamps, collect payments, service of warranties, etc. The program design included the provision of a subsidy to rural consumers, from 33% in Year 1 to 20% in Year 3. The subsidy was combined with marketing efforts to promote the use of the more efficient lamps in and outside the distribution program; this is an important point since a key long-term goal of the CFL program is to promote a market transformation toward the use of CFLs instead of incandescent lamps.

The payment terms for the consumers included an option of a single payment of the entire subsidized price or 50% initial payment with balance in three months (with 2% reduced subsidy). The design also included a limitation of 2 CFLs per household to prevent abuse of the subsidy and reselling lamps.

2.3.1 Modifications to Original Design

The Phase 1 CFL program included several changes to the original design which was aimed at achieving results in a short space of time. The basic design of Phase 1 continued in the Phase 2 of the program. The objective was to test the design and minimize risks by initially dealing with only EVN consumers. The key changes were as follows:

- There was no subsidy provided to consumers as the purchase price of CFLs (and hence, the selling price) was significantly lower than estimated;
- There were no provisions for payment in installments and hence, required upfront payment of the total price.

- Eligible consumers were only the ones having an EVN electricity account in the three selected PCs in Phase 1 and all the 10 PCs in the Phase 2. The consumers were located in towns in the franchise areas of the District PCs

- The distribution of CFLs was done by the District PCs directly to the EVN consumers.

With these modifications EVN was able to achieve the sales targets of Phase 1 in a relatively short period of time.

The success of the Phase1 sales continued during the Phase 2 with the procurement of 700,000 CFLs using the same procurement process as Phase 1. Hence the DSM program target of 1,000,000 CFLs was met in Year 2 of the program. There are no plans of continuing the CFL program in Year 3.

In Phase 1 the distribution of CFLs was restricted to electricity account holders and this approach was adopted to test the other features of the program, primarily the CFL warranty system. With the success of Phase1, the distribution of CFLs in Phase 2 was expanded to both direct sales and commune sales. Considering the program is primarily focused on the rural sector, the role of community organizations in the distribution of CFLs was considered critical for the sustainability of the program. Having successfully tested this distribution approach in Phase 2, any future CFL program could adopt the same approach.

3 EVALUATION APPROACH

3.1 Program Evaluation Objectives

During the 15 March 2006 DSM training workshop the objectives were defined for both the CFL program and the evaluation of the CFL Program. Table 4.1 defines the objectives, indicates in which evaluation they were addressed, and indicates the method used for the analysis.

Table 4.1: Evaluation Objectives and Methods

<i>Program and Evaluation Objective</i>	<i>Evaluation</i>	<i>Method</i>
<i>Energy and Peak Savings - Determine energy (MWh) and peak demand (kVA) savings associated with the program. Peak demand savings are defined as the average savings in demand that occur during the hours of 6pm to 10pm.</i>	Impact	Engineering Calculations using manufacturer lamp data and engineering estimates for other factors such as operating hours of lamps
<i>Environmental benefits – determine reduced pollutant emissions - such as GHG emissions</i>	Impact	Engineering estimates – pending availability of valid data
<i>Program is cost effective - Evaluate cost effectiveness of program</i>	Financial Analysis	Participant and Utility Test – pending availability of data
<i>Reduce investment cost in power plants – evaluate impact of DSM savings on power plant building plans</i>	Process	Survey at EVN – pending availability of valid data
<i>Raise awareness of CFLs – evaluate change in consumer awareness and satisfaction with CFLs</i>	Process	Surveys of customers
<i>Improve customer service - evaluate how consumers have responded to the CFL program and their satisfaction with the program</i>	Process	Surveys of customers
<i>Assist poor communities – evaluate benefits to poor customers</i>	Process	Surveys and participant test analysis
<i>Build market for CFLs - evaluate how CFL manufacturers, distributors and retailers responded to the program and possibly changed their way of selling CFLs</i>	Market	Surveys of manufacturers, distributors and retailers
<i>Prepare recommendations on how could the program be improved</i>	All	Analysis of overall evaluation results

The following sections describe the impact, process and market evaluations as well as the program cost-effectiveness analyses.

3.2 Impact Evaluation

3.2.1 Objectives

The primary objectives of the impact evaluation were to:

- Determine the energy savings and demand reduction associated with Program participation,
- Estimate the cost of the energy and demand reductions delivered by the Program, and

- Assess the cost-effectiveness of the Program as a whole.

Specific objectives of the impact evaluation were to assess:

- How cost-effective is the Program for EVN, Program participants and the country? Could Program cost-effectiveness be improved? If so, how?
- How many CFLs have been installed as a *direct* consequence of the Program's intervention in the market? How many CFLs have been installed as an *indirect* consequence of the Program's intervention in the market (e.g., as a result of EVN's endorsement of the CFLs)
- How many of the Program participants would have installed a similar number of CFLs even if the Program had not been implemented?
- How have customers' lighting loads changed as a result of installing the CFLs?
- How have customers' uses of lighting and total energy consumption for lighting changed as a result of installing the CFLs?
- Are the CFLs installed under the Program still in place? If not, why not?

3.2.2 Approach

Net energy savings and demand reductions attributable to the Program were derived from engineering estimates of participants' pre- and post-installation electricity consumption.

The calculation for **Total Energy Savings** is:

$$\text{Total Energy Savings} = (\text{number of lamps sold in program}) \times (\text{average wattage of replaced lamps} - \text{wattage of CFLs}) \times \text{average operating hours of lamps}$$

The calculation for **Net Energy Savings** is:

$$\text{Net Energy Savings} = (\text{Total Energy Savings}) \times \text{Net to Total Ratio} / (1 - \text{Network Loss Factor})$$

The calculation for **Total Peak Demand Savings** is:

$$\text{Total Peak Demand Savings} = (\text{number of lamps sold in program}) \times (\text{average wattage of replaced lamps} - \text{wattage of CFLs}) \times \text{Coincident Factor}$$

The calculation for **Net Peak Demand Savings** is:

$$\text{Net Peak Demand Savings} = (\text{Total Peak Demand Savings}) \times \text{Net to Total Ratio} / (1 - \text{Network Loss Factor})$$

Lifetime net energy and peak demand savings were calculated in a similar manner using, for energy savings calculation, the estimated average lifetime operating hours of the lamps.

The **Coincident Factor** is an estimate of the percentage of lamps that are operating during EVN's system peak demand (6pm and 10pm on weekdays).

The **Net to Total Ratio** is an estimate of the percentage of the measured savings directly determined (the Total Savings) that actually occur due to the CFL program. Net to Total Ratio equals Net Savings divided by Total Savings. The Net to Total Ratio can be greater than 100%.

The Net to Total (NTT) Ratio was determined subjectively with consideration of various factors such as:

- Customers who receive CFLs but do not use them or stop using them because they are dissatisfied
- Free-riders – participants who received program incentives, but would have purchased CFL without incentive

- Free-drivers (customers) – participants who bought CFLs without receiving incentives but were influenced by program
- Change in operating hours after CFLs are installed – perhaps due to cost of lighting being less with CFL
- Free-drivers (manufacturers and vendors) – additional sales of CFLs because of influence of program, but not directly receive incentives
- Other factors discovered during survey process

The **Loss Factor** is used to allow for reduction in energy or peak load due to reduced loading on network and hence reduced network losses. Note that magnitude of network losses is proportional to the square of line current. Consequently a greater loss factor is generally used at the time of system peak.

This analysis assumes that the baseline consists of incandescent or fluorescent lamps replaced by CFLs operating at the same number of hours, and the same diversity factor, as the new CFL lamps that are installed. It is also assumed that the CFLs replace incandescent or fluorescent lamps that are currently working and are not additions in lighting. Annual savings for each year will equal the savings for that year plus the savings from the prior year(s) until the operating-hour lifetime of the CFLs has expired.

The environmental benefits may be estimated for the DSM program by multiplying the energy savings by factors representing the average EVN emission rate of pollutants per unit of electricity delivered to their customers. The equation is:

$$\text{Emissions (SO}_x, \text{NO}_x, \text{CO}_2, \text{CO, PM)} = \text{Net MWh saved} \times \text{Emission Factor (tonne/MWh)}$$

This analysis is dependent on the availability of emissions data from EVN that would include average EVN system emission factors and information to account for transmission and distribution (T&D) losses. T&D loss information is needed because for every kWh of electricity saved at the customer site there is need to produce more electricity at the power plant to account for the T&D losses.

Information to determine the NTT ratio came from surveys of participants and others involved in the program implementation.

3.3 Process Evaluation

3.3.1 Objectives

The focus of the process evaluation was to understand three key elements:

1. The level of customers' participation in and satisfaction with the Program;
2. How well specific marketing strategies worked relative to others, and
3. How effectively EVN's internal procedures and systems performed.

Specific objectives of the process evaluation were to assess:

- The relative differences and similarities between participants and non-participants — to ascertain if the Program has had broad market appeal rather than being limited to certain groups.
- The appropriateness of various marketing materials from the perspective of customers.
- The effectiveness of Program delivery mechanisms and an assessment of Program administration and implementation issues. How else can Program design and/or marketing be improved?
- How satisfied have customers been with the CFLs and with the Program overall? What are the barriers to increased participation in the Program, as expressed by customers?

- To what extent and how do retailers believe that the Program has influenced overall market take-up of CFLs? How do the retailers and EVN area office personnel believe the Program could be improved?

The process evaluation defined improvements that can be made in how the program is operated. As indicated above the process evaluation addressed progress with respect to the following program objectives:

- Reduce investment cost in power plants
- Increase DSM capabilities in EVN and PCs
- Raise awareness of CFLs
- Improve customer service
- Assist poor communities

In the evaluation, the specific topics that were covered included:

- Program Design
 - The program mission
 - Assessment of program logic
 - Use of new practices or best practices
- Program Implementation
 - Quality control
 - Operational practice – how program is implemented such as how incentives are paid and how CFLs are distributed
 - Program targeting, marketing, and outreach efforts
 - Program timing
- Program Administration
 - Program oversight
 - Program staffing
 - Management and staff training
 - Program information and reporting
- Market Response to Program
 - Customer interaction and satisfaction
 - Market allies interaction and satisfaction
- EVN Response to Program
 - Has program gained support in EVN and changed load forecasts used by EVN
 - Has program had an impact on EVN plans for building power plants

3.3.2 Approach

In order to address the objectives outlined above, quantitative and qualitative methods were used to analyse the key characteristics and behaviors of the following groups:

- Participants - residential customers who purchased CFLs

- Non Participants - residential customers who were eligible but did not participate in the Program but are current users of CFLs (Phase 1 only)
- Non Users - residential customers who were eligible but did not participate in the Program and are currently non-users of CFLs. (Phase 1 only)
- Trade allies - suppliers and retailers of CFLs.
- Program Administrators - personnel responsible for Program implementation and management – EVN DSM Cell.

Market research Consultants were appointed to conduct face-to-face surveys. For the Phase 1 evaluation surveys were conducted with participating, non-participating and non-users in PC1, PC2 and PC3. The number of surveys conducted for each customer category is summarised in Table 4.2. The last two categories (Non-participants and Non-Users) were targeted to understand consumer perceptions and determine reasons for non-participation. During the program, the Consultants had feedback from relevant EVN and PC staff on issues related to distribution and warranty. EVN prepared monthly sales reports to the management.

In the Phase 2 evaluation, surveys were conducted only with participating customers in 9 PCs. The emphasis in Phase 2 was primarily on program participants and understanding the overall market impacts of the EVN program. It was decided to focus the surveys only on participants as information obtained on the other two categories in Phase 1 was considered adequate. The number of surveys conducted for each PC is summarised in Table 4.3. The questionnaire used for the survey is given in Appendix 1.

Table 4.2 – Breakdown of Survey Respondents

Category	Survey Sample	
	Phase 1	Phase 2
Participating Users	150	300
Non-Participating Users	75	0
Non-Users	75	0
Total	300	300

The number of surveys conducted in each PC in Phase 2 is given in Table 3.3 below.

Table 4.3 – Survey Respondents in Phase 2

Power Company	No: of Respondents
Hanoi	35
Hai Phong	34
Hai Duong	34
Ninh Binh	34
Da Nang	35
Thai Nguyen	30
Dong Nai	30
HCMC	35
Ba-Ria Vung	33
Total	300

3.4 Market Evaluation

3.4.1 Objectives

The market evaluation is an assessment of the continuing potential for the Program to affect the market in the future, and a re-assessment of the Program's design parameters in the light of post Program participation and changes in the market. The objectives of the market evaluation specifically concentrated on understanding:

- How successfully the Program penetrated its target markets.
- The need to re-evaluate Program eligibility criteria and incentive levels.

Specific objectives of the market evaluation were to assess:

- What is the current penetration of CFLs in the marketplace? What does this imply for refinement of the Program design?
- Has the Program achieved acceptance with a broad cross-section of customers, or is it more popular with specific sub-segments? What market segments are over- and under-represented in Program participation? What does this imply for refinement of the Program design?

- How much remaining market is there for the Program? Is this remaining market potential likely to be comprised of customers that are essentially similar to current participants, or very different from those participants?
- If different, what are the key benefits and criteria likely to be used by those customer segments representing the Program's remaining market potential?

3.4.2 Approach

The market effects study evaluated how CFL manufacturers, distributors and retailers responded to the program and possibly changed their way of selling CFLs. In particular, the evaluation estimated whether more CFLs are being sold in Vietnam as a result of the program. This was done by evaluating how CFL manufacturers, distributors and retailers have reacted to the program and possibly changed their activities. The market effects evaluation consisted of surveys and market participants (manufacturers, distributors, and retailers), reviews of market sales data, and analysis of the survey results and collected data.

The Phase 2 evaluation included gathering of CFL sales information from major retailers and manufacturers to determine market impacts. The Trade Allies interviews were conducted with five CFL suppliers and the questionnaire used for the interviews with the traders is given in Appendix 2.

3.5 Program Cost Effectiveness

Two financial tests were evaluated for this program on a lifecycle basis. These two tests are the *Participant (Customer) Test* and the *Utility Cost Test*.

The Participant Test (PT) shows difference between all costs paid by customer and the energy costs savings they receive and thus indicates the how valuable the program is to customers.

$$PT = \text{energy cost savings to consumers during lifetime of measure} \div \text{total costs paid by consumer}$$

The Utility Cost Test (UCT) shows difference in costs paid by utility and the value of the energy they do not have to produce or buy and thus indicates how valuable the program is to EVN and the PCs.

3.6 Survey Methodology

The Phase 2 surveys focused on participating customers in all 9 PCs and the actual sample selected on the basis of random sampling from participating customer lists provided by the PCs. The survey focused on obtaining information on the following key aspects.

1. Lamp purchase information
 - a. Whether or not the lamps were purchased before the EVN program
 - b. Did the current program made any specific influence in the purchase decision
2. Information on the use of CFLs for various applications
 - a. Where were the lamps used
 - b. Were the lamps used in the existing replacements or in the new installations
 - c. What would have been the savings with the replaced lamps – which lamp ratings were replaced
3. Information on the usage pattern

- a. How many hours the lamps are being used and what will be the benefit accruing from the replacements
4. Information on what influenced the purchase decisions
 - a. How well the EVN marketing plans worked in the program uptake?
 - b. Are the resulting benefits (quality of light etc) satisfactory

Survey activity captured 300 responses from all 9 PCs across the country. The analysis presented in the next section is primarily based on the descriptive statistics. The information obtained on the usage pattern and what was replaced has been used to project technical savings (demand and energy) over the program tenure.

4 IMPACT EVALUATION

4.1 Overall CFL Sales

The total sales in Phase 1 and Phase 2 were 956,641 from the 1 Million lamps procured. The balance of the CFLs was used for marketing, warranty service, quality testing and a holding balance at each PC. The impact evaluation was conducted for the whole program (Phase 1 and Phase 2).

4.1.1 CFL Sales in Phase 1

The Phase 1 program commenced on 1 November 2005 and the total sales as of 31 July 2006 were 284,941 CFLs. The remaining CFLs account for warranty services, marketing, failures and balance in the respective PCs. The program was open to approximately 782,379 households of which 19.2% participated in the program. The summary of participation and sales is given in Table 5.1 below.

Table 5.1 – Phase 1 Participation and Sales

	Total	PC1	PC2	PC3
I. Communes of Program Implementation				
Number of communes involved	347	65	216	66
Total of households of the communes	891,061	116,770	643,030	131,261
Number of electrified households	782,379	108,575	544,193	129,611
Number of households bought CFLs	150,384	77,771	47,958	24,655
II. Lamp Accounting				
Number of lamps assigned	300,000	150,000	100,000	50,000
Lamps transferred to QUATEST 1 for quality testing	300	150	100	50
Number of lamps sold	284,941	143,289	93,545	48,107
Lamps for marketing	357	214	53	90
Defective and broken lamps during program	2,330	1,395	558	377
Lamps kept for warranty service	2,872	1,625	763	484
Average CFLs per household	1.89	1.84	1.95	1.95
Balance	9,251	3,327	4,977	947

4.1.2 CFL Sales in Phase 2

The Phase 2 program commenced on 1 June 2006 and the total sales as of 30 November 2006 were 671,000 CFLs. The remaining CFLs account for warranty services, marketing, failures and balance in the respective PCs. The program was open to approximately 4.9 Million households of which 6.8% participated in the program. The summary of participation and sales is given in Table 5.2 below.

Table 5.2 – Phase 2 Participation and Sales

	Total	PC 1	PC 2	PC 3	PC Hanoi	PC HCM City	PC Hai-Phong	PC Dong-Nai	PC Hai-Duong	PC Ninh-Binh
I. Communes of Program Implementation										
Number of communes involved	2,639	522	1,086	529	31	183	71	108	55	54
Total of households of the communes	5,305,403	816,647	2,323,228	731,257	100,590	683,601	127,609	387,798	40,000	94,673
Number of electrified households	4,949,944	793,072	2,040,407	717,804	100,590	676,469	127,609	359,320	40,000	94,673
Number of households participated in the program	335,843	151,883	64,091	37,619	10,039	12,483	17,059	32,558	5,000	5,111
II. Lamp Accounting										
Total of lamps received	699,490	289,740	139,860	89,890	20,000	40,000	40,000	60,000	10,000	10,000
Number of lamps saved for warranty service	13,442	5,966	2,543	1,581	337	707	798	1,130	200	180
Marketing lamps	4,526	628	2,096	1,535	57	51	100	55	0	4
Broken and defective during the lamp selling time	1,822	931	432	254	17	37	12	113	10	16
Sold lamps	671,700	281,475	133,688	80,351	19,589	39,205	39,090	58,702	9,800	9,800
- To households	597,870	262,999	125,016	70,908	17,770	23,960	32,161	48,844	6,504	9,708
- To other customers	73,830	18,476	8,672	9,443	1,819	15,245	6,929	9,858	3,296	92
Average number of CFLs per household	2.00	1.85	2.09	2.14	1.95	3.14	2.29	1.80	1.96	1.92
Balance	8,010	740	1,101	6,169	0	0	0	0	0	0

4.2 Assessment of Program Impacts

The program impacts was assessed for both Phase 1 and Phase 2 together in order to be consistent with the assumptions and methodology. In the Phase 1 evaluation, the impacts of the CFLs installed in new fittings were not considered. However, following discussions with EVN and the World Bank consultants it was agreed to incorporate the impacts in the Final Evaluation.

The average energy savings and load reduction was estimated for total number of lamps distributed during the Phase 1 and 2 programs by multiplying energy savings and load reduction per customer or per lamp with total number of households that purchased the lamps or total number of lamps that were sold during Phase 1 and 2.

In order to ascertain the benefits accruing out of the program the weighting technique applied set the number of lamps per customer (or households) for survey sample to that of actual sales population. The number of lamps per customer as per the sales data (Table 5.1 and 5.2) was found to be consistent with the survey data. All other analysis parameters (energy savings per lamp and load reduction per lamp) were then adjusted accordingly. The weighted survey data was then used to estimate the final impacts.

Following steps were taken to apply weighting;

1. The average number of lamps for each PC in the survey sample was hard set to the average number of lamps as provided by the actual sales data.
2. The total number of lamps for a PC was then estimated as product of average number of lamps and number of survey respondents for that PC.
3. The weighted "kVA Load Reduction on Grid" was estimated as weighted average number of lamps as estimated at step 2 divided by average number of lamps per customer from survey data multiplied by the average "kVA Load Reduction on Grid" estimated from survey data.

In a similar way, as explained in step 3 above, the weighted "kWh Reduction ALL" was calculated

4.3 Overall Program Benefits

4.3.1 Methodology

The peak load reduction (kW) and energy (kWh) savings were estimated using the methodology as follows;

1. The load of CFL as load on the grid was estimated to be 20W.
2. Load reduction was estimated only in cases of replacements of Incandescent and Fluorescent lamps. In the case of new installations, it was assumed that these were "replacements" of incandescent lamps (in the absence of the EVN program) and their wattages were in similar proportions to the survey responses.
3. The actual load of a replaced 40W and 20W fluorescent tubes were considered to be 50W and 28W respectively to including the power of ballast. Note that average quality ballasts have a power rating of 10- 12W while electronic ballasts are generally rated at 6-8W.
4. Consequently when a CFL was used to replace an incandescent lamp the load savings is the difference between the power rating the incandescent lamp and the CFL (20W).
5. In case of fluorescents, when a CFL was used to replace a fluorescent lamp, the load savings is the differential of the rating of the fluorescent lamp and the CFL.
6. The load difference was multiplied with average number of hours of operation of the lamp to calculate energy savings per day.

7. When calculating energy savings, the actual difference between the wattage of CFL (20W) and the lamp that it replaced (incandescent or fluorescent) was considered.
8. Savings resulting from both lamps (where applicable) were combined and total savings per respondent (household) were calculated
9. Finally average daily energy savings by PC and for entire survey population were calculated.
10. Coincidence factor (percent of lamps that are operating at the time of system peak) = 65%¹

4.3.2 Energy and Demand Impacts

In the program design it was assumed that the CFLs purchased under the program will be used as ***replacements for existing incandescent lamps***. However, the survey results revealed that only 43% of the CFLs were used as replacements for incandescent lamps. Around 39% was used as replacement for fluorescent tube lights and 18% for new fittings. Hence, the overall demand and energy impacts are lower than anticipated. The comparative figures in the Phase 1 survey was – 59% replacing incandescent, 23% replacing fluorescents and 18% new fittings.

In the Phase 2 survey, to minimize customer misinterpretation of the survey question regarding the replacement of existing fluorescent tube lights follow-up questions were asked if they actually replaced the light fitting and replaced with a screw-type holder suitable for the CFL. The results indicate that 74% of the respondents confirmed the installation of the holder.

4.3.3 Wattage of Replaced Lamps

The CFLs offered by EVN was 20W, which is equivalent to a 100W incandescent lamp. The design document specified a single size and type of CFL equivalent to a 75W incandescent lamp. The survey responses to the wattage of the incandescent lamps and fluorescent lamps replaced by the CFLs are given in Table 5.3 below.

¹ The survey data suggested that only about 36% lamps were installed in lounge rooms/verandahs, 12% in bedrooms, 26% in kitchens, 8% in bathrooms, 4% in toilets and 14% in other areas. Considering that in rural living lounge rooms/verandahs, kitchens and to some extent bedrooms are likely the activity areas at the time of system, a 65% coincidence factor is reasonable.

Table 5.3 – Wattage of the Replaced Lamps

Wattage	Phase 1			Phase 2		
	CFLs Replaced	CFLs in New fittings	Total	CFLs Replaced	CFLs in New fittings	Total
Incandescent Lamps						
40W	80,262	23,935	104,198	53,510	22,596	75,906
60W	21,701	6,472	28,173	74,633	31,635	106,268
75W	43,402	12,943	56,345	90,626	38,414	129,040
100W	14,201	4,235	18,436	69,302	29,375	98,677
Fluorescent Lamps						
20W	29,326	-	29,326	91,064	-	91,064
40W	48,463	-	48,463	170,745	-	170,745
Total			284,941			671,700

4.3.4 Customer Benefits

The survey revealed that incandescent and fluorescent lamps of different wattages were replaced with the CFLs purchased under the EVN program. The Table below provides a summary of customer benefits for the different scenarios and Table A provides a summary of the overall customer benefits resulting from the program.

Table 5.4 Summary of Customer Benefits

Type of Replaced Lamp	In / FI	In	In	In	In	FI	FI
Wattage of Replaced Lamp	Watts	40	60	75	100	28	50
CFL Wattage	Watts	20	20	20	20	20	20
CFL Life	Hours	6,000	6,000	6,000	6,000	6,000	6,000
Cost of CFL (Average)	VND	21,909	21,909	21,909	21,909	21,909	21,909
Average Usage	Hours/day	3.1	3.1	3.1	3.1	3.1	3.1
Energy Savings per Unit	kWh/yr	22.6	45.3	62.2	90.5	9.1	33.9
Lifetime Energy Savings	kWh	120	240	330	480	48	180
Ave Customer Tariff	VND/kWh	700	700	700	700	700	700
Energy Cost Savings	VND/yr	15,841	31,682	43,563	63,364	6,336	23,762
Lifetime Cost Savings	VND	84,000	168,000	231,000	336,000	33,600	126,000
Payback Period	Months	16.6	8.3	6.0	4.1	41.5	11.1
Benefit /Cost Ratio		3.8	7.7	10.5	15.3	1.5	5.8

Table 5.5 – Overall Customer Benefits

Type of Replaced Lamp	In / Fl	In	In	In	In	Fl	Fl
Wattage of Replaced Lamp	Watts	40	60	75	100	20	40
No: of Lamps Replaced	#	180,103	134,441	185,385	117,114	120,390	219,207
Cost of CFL (average)	VND	21,909	21,909	21,909	21,909	21,909	21,909
Energy Savings per Unit	kWh/yr	22.6	45.3	62.2	90.5	9.1	33.9
Lifetime Energy Savings	kWh	120	240	330	480	48	180
Ave Customer Tariff	VND/kWh	700	700	700	700	700	700
Total Cost of CFLs	MVND	3,946	2,945	4,062	2,566	2,638	4,405
Energy Cost Savings (Total)	MVND/yr	2,853	4,259	8,076	7,421	763	5,209
Lifetime Cost Savings	MVND	15,129	22,586	42,824	39,350	4,045	27,620
Payback Period							8.08
Benefit /Cost Ratio							7.23

4.3.5 EVN Benefits

Table 5.6 summarises the accrued benefits to EVN from the whole CFL program (Phase 1 and Phase 2)

Table 5.6 – Summary of EVN Benefits

System Impacts		
Energy Savings (MWh/yr)	45,900	
Lifetime Energy Savings (MWh)	243,300	
Demand Saving (MW)	30.1	
Cost Benefit Analysis		
Assumptions	Avoided Energy Costs (c/kWh)	6.15
	Avoided Capacity Costs (\$/kW)	1,500
	Average System Loss (%)	11
	Annual Cost of Capital (%)	5
	Average Customer Tariff (c/kWh)	4.4
	Exchange Rate (VND/\$)	15,850
Results	Avoided Energy Costs (\$)	2,822,011
	Avoided Capacity Costs (\$)	45,105,430
	Capacity Cost Savings Annualized (\$)	1,503,514
	Reduced Supply Costs (\$)	49,430,956
	Customer Bill Savings (\$)	2,026,059
	Net Benefit (\$)	47,404,896
	Program Costs (\$)	237,500
	PC Incentives (\$)	240,820
	Total Costs (\$)	478,320
	Net Benefit / Cost Ratio	99.11

4.3.5.1 Environmental Benefits

Based on an emission factor of 1 kg CO₂ per kWh electricity, the annual greenhouse gas (GHG) reduction is **45,875** tons and lifetime GHG savings is **243,265** tons

4.4 Conclusions on Specific Objectives

As outlined in Section 4.2.1, the impact evaluation was to assess the following specific objectives:

- How cost-effective is the Program for EVN, Program participants and the country? Could Program cost-effectiveness be improved? If so, how?
- How many CFLs have been installed as a *direct* consequence of the Program's intervention in the market? How many CFLs have been installed as an *indirect* consequence of the Program's intervention in the market (e.g., as a result of EVN's endorsement of the CFLs)
- How many of the Program participants would have installed a similar number of CFLs even if the Program had not been implemented?
- How have customers' lighting loads changed as a result of installing the CFLs?
- How have customers' uses of lighting and total energy consumption for lighting changed as a result of installing the CFLs?
- Are the CFLs installed under the Program still in place? If not, why not?

4.4.1 Program Cost effectiveness

The program was found to be extremely cost effective to both EVN and the consumers where the benefits to EVN was around 99.1 times more than the costs, while the consumers benefits were 7.2 times more than the costs. The EVN benefits are high because the target consumers (residential) have subsidised tariffs (less than the avoided cost of supply).

The cost effectiveness for the consumers could be increased if the right wattage of incandescent lamps is replaced with the CFLs. Alternatively, installation of lower wattage (11W or 15W) CFLs would increase the benefits to the consumers based on the survey findings of the average wattage of the incandescent lamps currently in use.

4.4.2 Market Interventions

The CFL Program was designed to be implemented in three phases over a 3 year period with the installation of 1 Million lamps. However, based on the high interest in Phase 1 (300,000 lamps) it was decided to procure 700,000 lamps in Phase 2. The target sales of the EVN program were achieved during a span of just over 12 months. In addition, there is strong evidence of a significant increase in sales outside the program which could be attributed to the marketing efforts under the EVN program. There have been significant market transformation impacts of nearly 20 times the direct impacts. The market transformation impacts of the CFL Program are detailed in Section 6 (Market Evaluation).

4.4.3 Customer Behavior

The Phase 1 program participants cited EVN sponsorship (27%), lamp warranty (24%) and discounted price (19%) and saving potential (36%) as the key reasons for participation. The first three reasons (EVN sponsorship, warranty and discounted price) are specific attributes of the EVN program. Hence, it could be concluded that the majority of the participants were influenced by the EVN program features.

In Phase 2, the program participants cited saving potential (35%) as the main reason for participation, followed by discount price (27%), lamp warranty (25%) and EVN sponsorship (12%). It appears that the

consumers are more aware of the benefits of using CFLs and that the key features of the EVN program (discount price and lamp warranty) helped promote the sales.

The overall lamp failure rate was 0.43% indicating that the overall quality of CFLs provided under the program was good. All failed lamps were replaced under the existing warranty.

5 PROCESS EVALUATION

The process evaluation is focused on the responses received from the consumer surveys conducted on participants in the Phase 2 Program in the 9 PCs.

5.1 Purchase and Location of CFLs

5.1.1 CFL Purchase

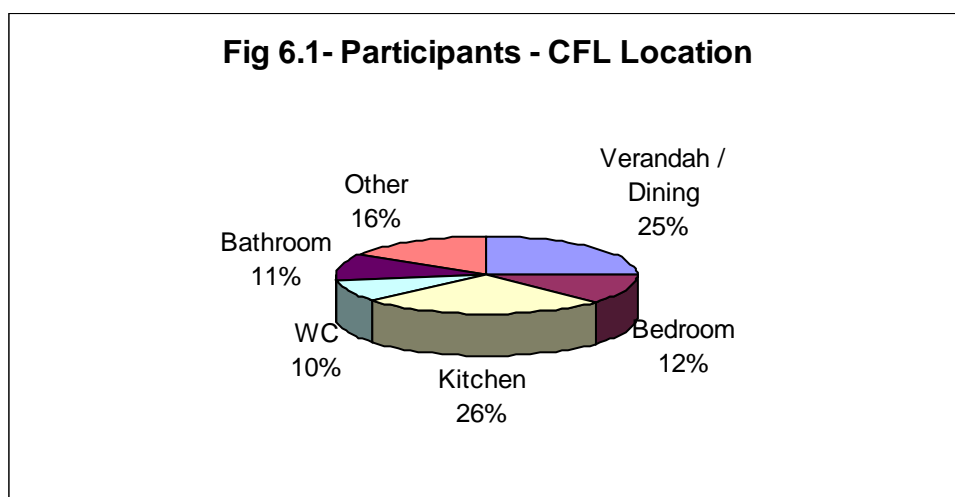
The Program offered a maximum of 2 CFLs per household. The survey results indicated that 79% purchased the maximum quota (2 CFLs) and another 12% purchased 1 CFL. However, 9% indicated that they purchased 3-4 lamps which showed that there was some flexibility in the program guidelines.

One of the key purposes of the EVN program was to create a purchasing mechanism among the consumers spread over the 9 PCs. As key indicator to assess this is how many consumers had purchased CFLs before the program, a specific question captured the response related to this fact. Around 82% of the consumers did not purchase the CFLs before the program from retailers; the intent to develop the energy efficiency awareness has been met.

5.1.2 Location of the Purchased CFLs

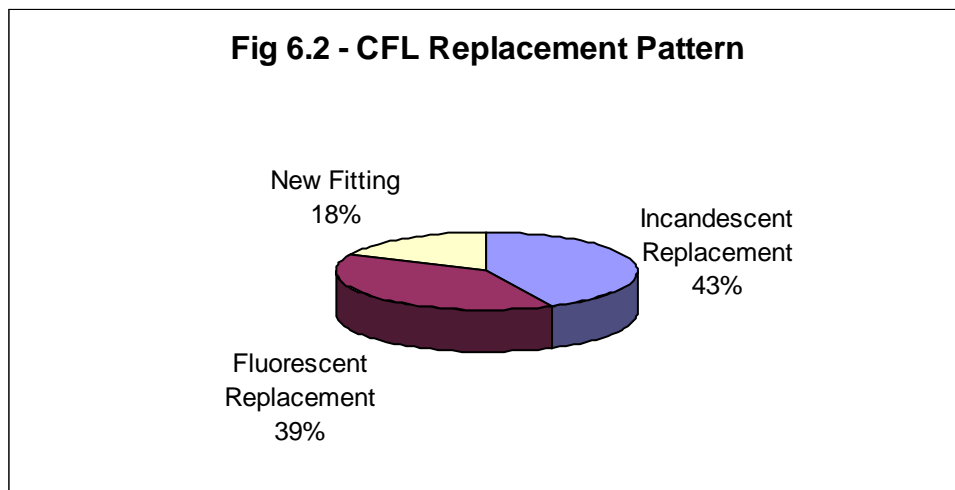
One of the key purposes of the program evaluation is to ascertain to what extent the EVN benefited from the promotion. Key factors and a dialogue on key challenges are presented below.

Lamps replaced in the high use areas are perceived essential to accrue better benefits. The Figure 6.1 reveals that most lamps replaced were in high usage areas - Verandah/Lounge (25%) and Kitchen (26%). The "Other" category include outside lighting (security) and breeding facilities.



5.2 Replacement Patterns

The program design was based on the customers purchasing CFLs as a replacement for incandescent lamps. However, the survey results indicated that a significant number of CFLs were used as replacements for fluorescent lamps and also as new fittings, as shown in Fig 6.2.



In order to ensure that the respondents understood the difference between incandescent and fluorescent lamps, photographs were provided in the questionnaire so that they could accurately identify the type of lamp replaced. In order to confirm the replacement of a fluorescent lamp with a CFL a follow-up question was asked if they removed the fluorescent fitting and installed a holder suitable for the CFL. Around 74% of the respondents indicated that a new holder was installed for the CFL.

The impact on the use of CFLs purchased for new fittings was treated as if they have otherwise used incandescent lamps on the basis that a holder suitable for either an incandescent lamp or CFL was already installed.

5.2.1 Wattages of the Incandescent Lamps Replaced

Given the diverse ratings in the incandescent and fluorescent lamps category, it is important to note the distribution from the perspective of program benefits. The Table 6.1 below shows the differentiation of the lamps. Least savings are envisaged in the 40 Watts incandescent and 20 Watts fluorescent lamps given the 0.5 power factor of the 20 Watts CFLs.

Table 6.1 – Wattages of Incandescent Lamps Replaced

	Lamp 1 replacement	Lamp 2 replacement	Average
Incandescent lamp 40 Watts	11%	8%	10%
Incandescent lamp 60 Watts	9%	20%	15%
Incandescent lamp 75 Watts	18%	16%	17%
Incandescent lamp 100 Watts	14%	11%	13%
Fluorescent lamp 20 Watts	13%	21%	17%
Fluorescent lamp 40 Watts	35%	24%	30%

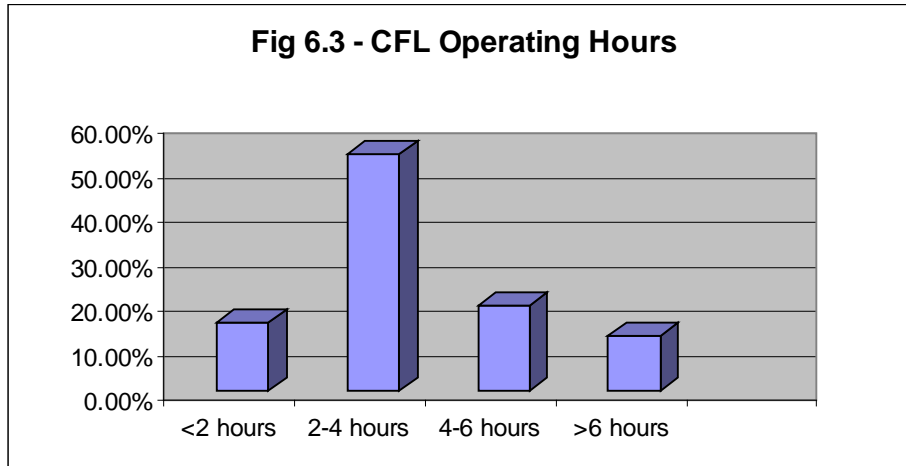
For the new fittings the equivalent incandescent lamp wattages were taken in the same ratios as given above.

5.2.2 Performance of CFLs

Around 95.5% of the respondents indicated that the CFLs purchased under the EVN program were still operating. Of the lamps that failed, 18% failed within 3 months of purchase and 18% between 3 to 6 months from purchase. The survey indicated that 46% of the lamps that failed the failure occurred after 9

months. This is unlikely since the Phase 2 program duration was only 7 months and a possible explanation is that some consumers purchased CFLs during Phase 1 which failed after 9 months. All failed lamps were replaced under the existing warranty. The total number of failed lamps in Phase 2 was 1,822 (from 700,000) compared to Phase 1 2,330 (from 300,000). The overall failure rate is less than 0.5%.

The daily average hours of operation of the CFLs was predominantly in the 2-4 hour range, as shown in Figure 6.3.



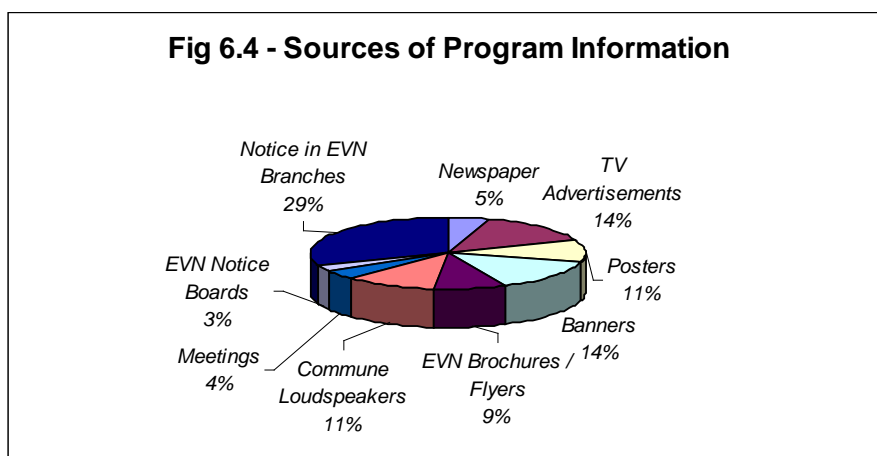
5.3 Motivation and Marketing Strategies

5.3.1 Motivation to Purchase CFLs

Around 35% of the respondents indicated that the level of savings from the use of CFLs was the key factor in the decision to purchase CFLs. This indicates the increased level of awareness on the benefits of CFLs. Around 27% indicated discounted price as the key motivator

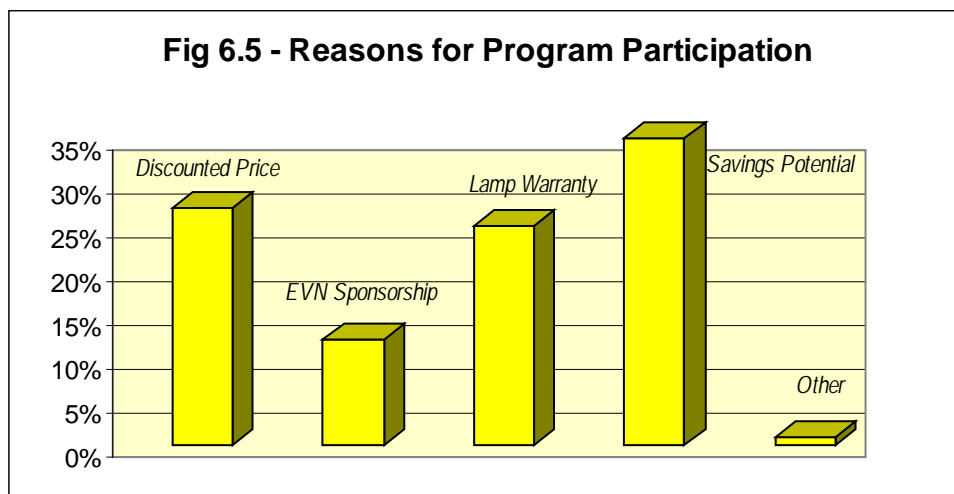
5.3.2 Marketing Strategies

Several marketing strategies were adopted by EVN in the promotion of the program and a summary of the responses from the program participants regarding where they heard about the program is given in Fig 5.4. The use of EVN Notices in their Branches, TV advertisements, brochures and banners appears to be the most effective in the promotion of the program



5.3.3 Reasons for Participation

The potential for savings in electricity bills and discounted price offered by EVN appear to be the key factors affecting the consumer’s decision to participate in the program. The summary of the responses to the reasons for participation is given in Fig 6.5.



All respondents (100%) indicated that the advertising material produced by EVN was easy to understand.

5.3.4 Customer Satisfaction

An overwhelming majority (92%) of the respondents said that they were happy with the performance of the CFLs. From the unsatisfied respondents the quality of light (50%) and level of saving (32%) were considered to be the primary reasons.

The extent of satisfaction on the following key Program aspects were targeted in the surveys - CFL purchase procedure, type (brand) of CFLs offered, location of EVN outlets, selling price of CFLs and length of warranty. The summary of the responses is given in Table 6.2.

Table 6.2 – Customer Satisfaction on Key Program Aspects

Aspect	Good	Unsatisfactory	No Idea
EVN Purchase Procedure	87.3%	3.0%	9.7%
Brand of CFLs offered	79.7%	2.7%	17.6%
Location of EVN Outlets	88.7%	1.7%	9.6%
Price of CFLs	84.0%	8.0%	8.0%
Length of Warranty	87.0%	1.7%	11.3%

5.3.4.1 Perceived Program Impacts

The respondents indicated that savings in electricity bills have been achieved since the installation of the CFLs. Around 12% of the participants have since purchased CFLs outside the program. The estimated savings, as reported by program participants, in their electricity bills in the 9 PCs is given in Table 6.3. The overall average savings is estimated to be 15.2%

Table 6.3 – Estimated Savings in Electricity Bills

<i>PC</i>	<i>Current Average Electricity Bill (VND/mth)</i>	<i>Previous Average Electricity Bill (VND/mth)</i>	<i>Estimated Savings (%)</i>
<i>Hanoi</i>	77,360	93,800	17.5
<i>Hai Phong</i>	67,724	75,621	10.4
<i>Hai Duong</i>	45,206	61,676	26.7
<i>Ninh Binh</i>	62,794	76,176	17.6
<i>Da Nang</i>	92,556	105,500	12.3
<i>Thai Nguyen</i>	57,091	92,727	38.4
<i>Dong Nai</i>	118,800	135,833	12.5
<i>HCMC</i>	336,900	349,633	3.6
<i>Ba-Ria Vung</i>	87,733	125,000	32.2

5.4 Conclusions on Specific Objectives

As outlined in Section 4.3.1 the specific objectives of the process evaluation were to assess:

- The relative differences and similarities between participants and non-participants — to ascertain if the Program has had broad market appeal rather than being limited to certain groups.
- The appropriateness of various marketing materials from the perspective of customers.
- The effectiveness of Program delivery mechanisms and an assessment of Program administration and implementation issues. How else can Program design and/or marketing be improved?
- How satisfied have customers been with the CFLs and with the Program overall? What are the barriers to increased participation in the Program, as expressed by customers?
- To what extent and how do retailers believe that the Program has influenced overall market take-up of CFLs? How do the retailers and EVN area office personnel believe the Program could be improved?

The process evaluation defined improvements that can be made in how the program is operated. The process evaluation addressed progress with respect to the following program objectives:

- Reduce investment cost in power plants
- Increase DSM capabilities in EVN and PCs
- Raise awareness of CFLs
- Improve customer service
- Assist poor communities

5.4.1 Program Delivery Mechanisms

The phased approach of the CFL program enabled EVN to test key program elements (e.g. warranty system) prior to expanding the program to all PCs. In Phase 1 the monthly reporting system was refined to enable

proper program tracking and management reporting. Before implementation of Phase 2, the staff from all PCs had the opportunity of meeting at a DSM Training Program conducted by DEM and IIEC in March 2007. The experiences of implementing the Phase 1 program were discussed at this forum. Overall the program administration and implementation was well managed.

5.4.2 Customer and Retailer Perceptions

The actual duration of both Phases of the program was significantly less than originally planned, indicating that the marketing strategies adopted by EVN were very effective. There was also evidence of increased level of awareness on the benefits of CFLs. An overwhelming majority (92%) indicated their satisfaction with the performance of CFLs and the ratings for key aspects of the EVN program (purchase procedure, CFL brand, location of EVN outlets, price and warranty) ranged from 80 to 89%.

The retailer surveys (see Section 6 - Market Evaluation) confirmed the strong influence of the EVN Program in increasing awareness resulting significant increase in sales. The suggestions for program improvement are given in Section 7.

5.4.3 Assessment of Specific Program Objectives

5.4.3.1 Reduce Investment Costs in Power Plants

Although the system demand impacts (12.3MW) of the program was less than the design estimates (33.4MW), the demand impacts resulting from market transformation was estimated at 78.2MW. This together with the forecast trends in increased CFL sales will assist EVN in addressing the forecast high growth in demand over the next planning horizon.

5.4.3.2 Increase DSM Capabilities in EVN and PCs

The EVN DSM Program is just completing its second three-year phase and the CFL program is considered the most successful program to date. The CFL program was administered and implemented solely by the staff at EVN and PCs. In addition, training programs on DSM Planning and study tours to Malaysia and Thailand assisted in building the capacity of EVN.

5.4.3.3 Raise Awareness of CFLs

The market transformation results and confirmation from the retailers indicate significant increase in awareness among the consumers on the benefits of CFLs.

5.4.3.4 Improve Customer Service

The promotion of CFLs by EVN to reduce customer bills while maintaining or improving the quality of lighting was appreciated by consumers as confirmed by the level of satisfaction of the EVN program.

5.4.3.5 Assist Poor Communities

The CFL program was targeted at the rural sector to improve the welfare of poor communities. The surveys have indicated an overall average savings on electricity bills of 15.2%.

6 MARKET EVALUATION

The market evaluation focused on determining the impact of the EVN CFL program on the transformation of the CFL market in Vietnam. In the Phase 1 evaluation the market effects were determined from surveys of key market participants (manufacturers, distributors and retailers). In the Phase 2 evaluation, detailed CFL sales information were gathered from two major retailers and also the import-export data during the period 2003 – 2006.

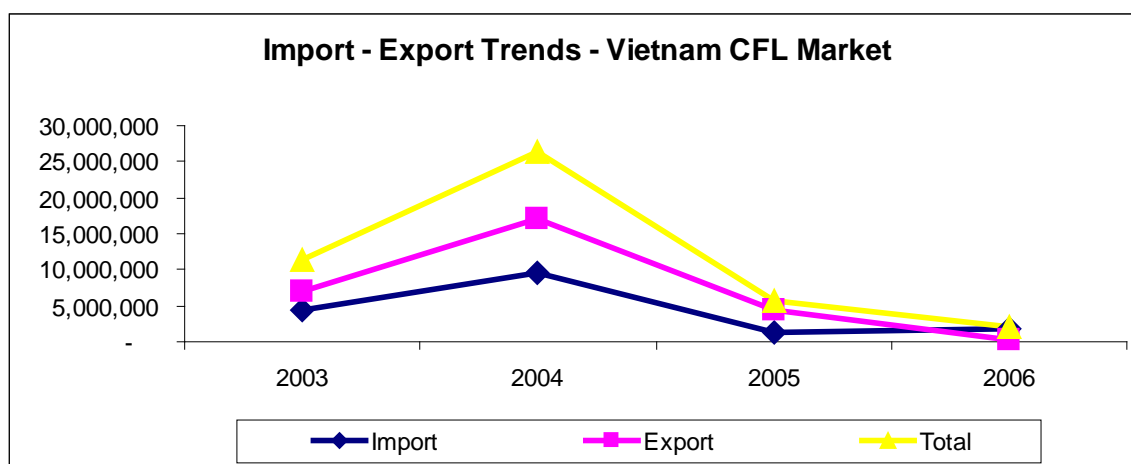
6.1 Comparison of Export and Import market

The summary data of CFL imports and exports during the period 2003 to 2006 is given in Table 7.1 and Figure 7.1 below

Table 7.1 – Summary of CFL Import-Export for 2003-2006

Item	2003	2004	2005	2006
Import	4,433,213	9,447,391	1,259,557	1,806,474
Export	6,978,807	17,017,458	4,439,669	308,910
Total	11,412,020	26,464,849	5,699,226	2,115,384

Figure 7.1 – Import-Export Trends in Vietnam CFL Market



The figures show that there has been a rapid decrease in the no: of CFLs exported since 2005, indicating that a significantly higher domestic since the introduction of the EVN program in 2005. The decrease in import numbers since 2005 could be attributed to the fact that the local manufacturers have increased their production and customer preference for local products.

It should be noted that the figures in Table 7.1 were obtained from official sources. However, there is a possibility that the numbers may not be a true reflection of the actual situation considering the current practice of some imports of CFLs from China being trans-shipped to neighboring countries like Lao PDR and Cambodia.

6.2 Results from Market Surveys

Market surveys were conducted in conjunction with the Phase 1 and Phase 2 evaluations of the EVN CFL program. A general observation was that qualitative data was somewhat easy to obtain from the suppliers.

However, more specific sales data was difficult to obtain and could be attributed to the fact that the EVN program involved the selection of a single supplier following competitive bidding and there was no real incentive to make an effort to provide the information.

6.2.1 Results from Phase 1 Surveys

Surveys were conducted amongst a cross-section of major CFL suppliers in order to determine the influence of the EVN program on the overall CFL market. The key responses are summarized in Table 7.2 below.

Table 7.2 Summary of Supplier Responses

<i>Supplier</i>	<i>CFL Brands</i>	<i>Impact of EVN program on Sales</i>	<i>Suggestions for improvement</i>
HCM machinery & Electrical Appliance JSC	Philips	2004-2005: 50% increase 2005-2006: 66% increase	More EVN advertisements in mass media
OSRAM GMBH	Osram	Supplier for EVN program Unspecified increase in sales over the last 2 years	Reduction of import duty for CFL components
Philips Vietnam	Philips	Overall reduction in sales of around 25%	EVN need to encourage local CFL manufacturers to supply for EVN program Govt. tax incentives for local manufacturers
Rang Dong Lighting	Rand Dong	2004: 20 Billion VND 2005: 40 Billion VND 2006: 60 Billion VND (8 months)	Reduction of import taxes for electronic components Financial assistance for research & Development to improve CFL product quality
Sao Nam Ltd	Philips	2004: 4930 Million VND 2005: 6897 Million VND 2006: Estimate 15% more than 2005	Propose banning the import of and manufacture of Incandescent lamps

The key findings are summarised below:

- All suppliers, except Philips, have experienced a significant increase in sales in 2005 and the trends in 2006 are even higher. The reported increase in annual sales over the last two years ranged from around 50% to 150%.
- All suppliers have been aware of the EVN program and indicated that the marketing efforts of the program were probably the main reason for increased sales.
- There was a general heightened awareness amongst consumers about CFLs and energy savings, implying that the awareness campaigns are working.
- Accurate sales information was difficult to obtain from the suppliers and hence, the impact of increased sales that may have been influenced by the EVN program was hard to ascertain.

6.2.2 Results from Phase 2 Surveys

The surveys were conducted with the three largest CFL manufacturers / retailers in Vietnam. These included Rang Dong Light Source and Vacuum Flask Joint Stock Company, Philips Electronics Vietnam Limited and

Dien Quang Company. Unfortunately, Dien Quang Company failed to provide sales information requested. A summary of the sales information from Rang Dong and Philips is given in Table 7.3.

Table 7.3 – Summary of CFL Sales Data

<i>Name of Company</i>	<i>CFL Ratings (W)</i>	<i>Sales in 2005</i>	<i>Sales in 2006</i>	<i>Sales in 2007</i>
<i>Rang Dong Light Source and Vacuum Flask Joint Stock Company</i>	5	77,310	208,345	Projected sales 12,000,000
	7	101,005	89,160	
	9	224,371	260,715	
	11	750,446	1,949,111	
	13	29,869	13,845	
	15	269,293	1,010,557	
	18	101,136	9,446	
	20	484,187	1,504,030	
	TOTAL	2,046,871	5,045,209	
	Other incl. exports		3,132,070	
<i>Philips Electronics Vietnam Limited</i>	5	150,000	270,000	Projected sales 2,000,000
	8	30,000	54,000	
	11	30,000	54,000	
	14	150,000	270,000	
	18	240,000	432,000	
	20	-	-	
	TOTAL	600,000	1,080,000	

The key observations are summarized below:

- Rang Dong have experienced a growth of around 150% since the introduction of the EVN Program in 2005 and expects an annual growth of around 50% in 2007.
- Philips have experience a growth of around 80% since the introduction of the EVN Program and expects this trend to continue in 2007.
- All have attributed the overall increase in awareness of CFL as a contributory factor in the increased sales. There has been a significant increase in awareness in local communities and unions as a result of the marketing efforts in the EVN program.
- Increase in awareness of CFLs in the rural sector and a promotional campaign in the urban sectors are seen as options for maintaining the high growth in CFL sales.

6.3 Estimated System Benefits

Based on the market information, the domestic sales in 2006 were 6,125,209 from the two major suppliers. In order to estimate the system benefits the following assumptions were made:

- CFLs of ratings 5, 7, 8 and 9 Watts replace 40 Watts incandescent lamps
- CFLs of ratings 11,13, and 14 Watts replace 60 Watts incandescent lamps
- CFLs of 18 Watt rating replace 75 Watts incandescent lamps
- CFLs of 20 Watt rating replace 100 Watts incandescent lamps

A summary of the estimated system benefits is given in Table 7.4. It should be noted the benefits is the technical potential based on ideal conditions where the right wattage incandescent lamps are replaced with the correct CFL. However, as the survey results show the reality is somewhat different where fluorescent tube lights are replaced with CFLs.

Table 7.4 Summary of Estimated System Benefits

	<i>Unit</i>	<i>Lamp Types</i>				<i>Total</i>
<i>Type of Replaced Lamp</i>	In / FI	<i>In</i>	<i>In</i>	<i>In</i>	<i>In</i>	
<i>Wattage of Replaced Lamp</i>	Watts	40	60	75	100	
<i>CFL Wattage</i>	Watts	9	11	15	20	
<i>No: of Lamps Replaced</i>	#	882,220	3,297,513	441,446	1,504,030	6,125,209
<i>CFL Life</i>	Hours	6,000	6,000	6,000	6,000	
<i>Average Usage</i>	Hours/day	2	2	2	2	
<i>Coincidence Factor</i>	%	65	65	65	65	
<i>Network Losses</i>	%	11	11	11	11	
<i>Peak Savings per Unit</i>	Watts	31	49	60	80	
<i>Peak Savings – System Level</i>	MW	22.8	134.6	22.1	100.3	279.8
<i>Energy Savings per Unit</i>	kWh/yr	22.6	35.8	43.8	58.4	
<i>Total Energy Savings</i>	GWh/yr	22.4	132.5	21.7	98.7	275.4
<i>Lifetime Energy Savings per Unit</i>	kWh	186	294	360	480	
<i>Total Lifetime Savings</i>	GWh	184.4	1,089.3	178.6	811.2	2,263.40

The key observations from the market survey are as follows:

- There is strong evidence that the EVN program has had an impact in stimulating the CFL market in Vietnam. Experience in other countries (India and Sri Lanka) have shown that utility endorsement in a technology provides the confidence for consumers to adopt that technology.
- The significant increase in CFL sales immediately after the launch of the Phase 1 EVN CFL program is an indication of widespread adoption in the use of CFLs.
- The Table 7.4 shows a technical potential of around 280 MW from the sales of two major suppliers. It is difficult to predict the actual demand impacts on the EVN system. The direct impact of the EVN Program was 30.1 MW (90.1%) compared to the estimated 33.4MW in the EVN Phase 2 DSM Plan. Using the same proportions, the system impact is 252.15 MW.

6.4 Conclusions on Specific Objectives

As outlined in Section 3.4.1, the market evaluation was to assess the following specific objectives:

- How successfully the Program penetrated its target markets.
- The need to re-evaluate Program eligibility criteria and incentive levels.

- What is the current penetration of CFLs in the marketplace? What does this imply for refinement of the Program design?
- Has the Program achieved acceptance with a broad cross-section of customers, or is it more popular with specific sub-segments? What market segments are over- and under-represented in Program participation? What does this imply for refinement of the Program design?
- How much remaining market is there for the Program? Is this remaining market potential likely to be comprised of customers that are essentially similar to current participants, or very different from those participants?
- If different, what are the key benefits and criteria likely to be used by those customer segments representing the Program's remaining market potential?

6.4.1 Market Penetration

There is strong evidence that the EVN Program stimulated the market that has resulted in substantial increase in sales. However, quantification of the increase in sales was difficult as the initial design did not allow for continuous monitoring of sales from the key retailers. Hence, there was no obligation for the suppliers to provide accurate figures of sales before and during the EVN program.

With sole source procurement it is difficult to get cooperation from other suppliers and there is scope for EVN to improve its relationship with the key stakeholders considering the benefits to the suppliers with EVN endorsing the use of CFLs.

However, the significant increase in CFL sales ranging from 80% to 150% during the first year of the EVN program, indicates that the program had a significant impact in the growth of the use of CFLs in Vietnam.

6.4.2 Market Potential

The results of EVN Phase 1 and Phase 2 program show that only a small percentage of eligible households participated in the program. The overall participation is around 10%.

The target sector in the EVN program is residential which provides the largest benefits to EVN. However, there is also scope in the commercial sector, primarily in the hotels and small commercial enterprises (restaurants, retail shops etc).

Following the completion of Phase 2, the awareness of the benefits of CFLs will increase significantly nationwide and as a consequence a substantial increase in market penetration is expected.

7 PROGRAM REFINEMENTS

Considering that the EVN CFL Program has been completed and there are no plans for extension of this program, it is expected that market transformation will take place via the private sector. This section outlines some refinements should EVN decide to implement a similar program in the future.

7.1 Program Marketing

Overall the marketing activities undertaken by EVN proved to be effective in promoting the use of CFLs. However, maximum benefits of CFLs are only accrued if they are used as replacement of existing incandescent lamps of the right wattage in areas of high usage. Hence, future consumer awareness programs should be refined to include the following:

- CFLs to be used as replacement of incandescent lamps that are located in high usage areas (in excess of 4 hours per day).
- The wattage of the replaced incandescent lamp should be 60W or greater.
- Existing 20W / 40W fluorescent lighting should not be replaced with CFLs

7.2 Product Range

The Phase 1 and 2 program procured 20W CFLs which is equivalent to a 100W incandescent lamp. However, the surveys indicated that the majority of the incandescent lamps replaced were below 60W. Hence, offering consumers CFLs of a range of wattages would maximize savings.

7.3 Product Quality

The EVN program used a sole supplier and ensured that the product met the required technical specifications. The surveys indicated that there are many CFLs currently in the market which are of lower quality and cheaper than the lamps offered by EVN.

The two key responses from non-participants and non-users for opting not to participate in the EVN program was high cost and bad experience in using CFLs. These responses indicate that cheap low quality lamps are readily available in the market. Hence product quality is an issue that EVN should address for a sustainable CFL program.

One way to address this is to introduce minimum technical standards for CFLs that are imported and manufactured locally. Product testing was included in the activities of the Phase 1 program but this need to be expanded and a regulatory framework set in place. This could be included as a part of the appliance standards and labelling program currently undertaken by the Ministry of Industry.

7.4 Program Promotion

There is strong evidence that the awareness level of CFLs is high in Vietnam especially since the launch of the EVN program. The Phase 1 (and Phase 2) involves the distribution of CFLs via EVN's regional offices – RPC, PPC and DPC. This approach was considered appropriate to initiate the program and it is envisaged that the time is right for a market driven program with endorsement from EVN. This will ensure that a

competitive market will be established with quality products. There are several international examples of similar programs which EVN could consider for the future.

8 ATTACHMENTS

8.1 Impact Evaluation – Calculation Sheets

8.1.1 Impact of EVN Program

Assumptions

Based on discussions with EVN and information from the customer surveys, the following assumptions were used in the calculations:

1. The wattage of the fluorescent lamps replaced included the wattage of the magnetic ballasts (28W and 50W).
2. The average use of CFL per day was 3.1 hours
3. Coincidence Factor = 65%
4. Cost of CFLs including VAT (10%) was VND 22,000 for Phase 1 (300,000 lamps) and 25,000 for Phase 2 (700,000 lamps).
5. The peak demand reduction is the reduction of active power demand measured in Watts (W). The power factor of CFLs and FTLs has not been considered.
6. Avoided capacity cost is \$1,500 per kW and avoided cost of energy is 6.15 c/kWh
7. Peak system losses = 2 * average losses
8. Distribution costs paid to PCs
 - a. VND 3,500 per CFL (Phase 1)
 - b. VND 4,200 per CFL (Phase 2)
9. EVN Program Costs (Phase 1 and 2)

a. Marketing Program Design:	\$59,000
b. Production of Marketing Materials:	\$13,600 (Phase 1)
c. Production of Marketing Materials:	\$50,600 (Phase 2)
d. Quality Testing (Phase 1):	\$5,300
e. Quality Testing (Phase 2):	\$8,400
f. Marketing on TV:	\$20,000
g. Warehouse and Transportation:	\$50,000
h. Program Management - EVN:	30,000
Total:	\$237,500

CFL Program - Energy, Peak Demand and Cost Savings								
VIETNAM - Year 1+2								
Inputs	Units	Lamp Types						Total
		1	2	3	4	5	6	
No. of Lamps Replaced	#	180,103	134,441	185,385	117,114	120,390	219,207	956,641
Wattage of Incand./ Fluoro Lamp+ ballast	Watts	40	60	75	100	28	50	
Type of Replaced Lamp		Incan	Incan	Incan	Incan	Fluoro	Fluoro	
Wattage of CFL	Watts	20	20	20	20	20	20	
Power factor of Replaced Lamp	%	100%	100%	100%	100%	50%	50%	
Usage per day	Hours	3.1	3.1	3.1	3.1	3.1	3.1	
CFL Lifetime	Hours	6,000	6,000	6,000	6,000	6,000	6,000	
Power Factor of CFLs	%	50%	50%	50%	50%	50%	50%	
Coincidence Factor	%	65%	65%	65%	65%	65%	65%	
Leakage Factor	%	0%	0%	0%	0%	0%	0%	
Network Losses	%	11%	11%	11%	11%	11%	11%	
Program Cost per CFL - Installed	\$/Lamp	1.38	1.38	1.38	1.38	1.38	1.38	
Energy Cost per kWh	c/kWh	4.4	4.4	4.4	4.4	4.4	4.4	
Avoided Capacity Cost per kW	\$/kW	1,500	1,500	1,500	1,500	1,500	1,500	
Annual Cost of Capital	%	5%	5%	5%	5%	5%	5%	
GHG Savings per GWH	Tons/GWH	1,000	1,000	1,000	1,000	1,000	1,000	
Results								Total
Savings at Customer Level	Watts	20	40	55	80	8	30	
Peak Savings per Unit	Watts	20	40	55	80	8	30	
Annual Energy Savings - per unit	kWh	22.6	45.3	62.2	90.5	9.1	33.9	
Lifetime Savings - per unit	kWh	120.0	240.0	330.0	480.0	48.0	180.0	
Peak Savings - Network Level	MW	3.0	4.5	8.5	7.8	0.8	5.5	30.1
Total Energy Savings - Annual	GWH/yr	4.6	6.8	13.0	11.9	1.2	8.4	45.9
Total Energy Savings - Equip. Lifetime	GWH	24.3	36.3	68.7	63.2	6.5	44.3	243.3
Energy Cost Savings - Annual	Million \$	0.2	0.3	0.6	0.5	0.1	0.4	2.0
Avoided Capacity Costs	Million \$	4.5	6.7	12.7	11.7	1.2	8.2	45.1
Capacity Cost Savings - Annualized	Million \$	0.2	0.3	0.6	0.6	0.1	0.4	2.3
Annual Savings - Energy & Capacity	Million \$	0.4	0.6	1.2	1.1	0.1	0.8	4.3
Lifetime Savings - Energy & Capacity	Million \$	2.3	3.4	6.4	5.9	0.6	4.1	22.7
EVN Avoided Marginal Losses	Million \$	0.16	0.24	0.45	0.42	0.04	0.29	1.6
CFL Cost	Million \$	0.25	0.19	0.26	0.16	0.17	0.30	1.3
Annual Cost Saving - per unit	VND	15,841	31,682	43,563	63,364	6,336	23,762	
Payback to Customer	Months	16.6	8.3	6.0	4.1	41.5	11.1	
Lifetime Cost Savings - per unit	\$	5.3	10.6	14.6	21.2	2.1	7.9	
	VND	84,000	168,000	231,000	336,000	33,600	126,000	
Benefit / Cost ratio		3.8	7.7	10.5	15.3	1.5	5.8	
GHG Savings -Annual	Tons	4,579	6,837	12,963	11,911	1,224	8,361	45,875.8
GHG Savings - Equipment Life	Tons	24,284	36,254	68,738	63,163	6,493	44,334	243,265.2
Overall Benefits								
Total Cost Savings	\$	180,001	268,729	509,520	468,190	48,129	328,625	1,803,193
	MVND	2,853	4,259	8,076	7,421	763	5,209	28,581
Total Cost of CFLs	\$	248,953	185,834	256,254	161,884	166,413	303,005	1,322,343
	MVND	3,946	2,945	4,062	2,566	2,638	4,803	20,959
Overall payback period								8.80
Life-time Cost savings	\$	954,490	1,424,987	2,701,828	2,482,669	255,212	1,742,596	9,561,782
	MVND	15,129	22,586	42,824	39,350	4,045	27,620	151,554
Overall Benefit / Cost Ratio								7.23

EVN Benefits		
		US\$
MWh/yr	45875.77	2,822,011
MW	30.1	45,105,430
Annualized		1,503,514
Red Supply Costs		49,430,956
Cust Bill Savings		2,026,059
Net Benefit		47,404,896
Program Costs		237,500
PC Incentives		240,820
Total Costs		478,320
B/C		99.11

8.1.2 Market Impacts

Assumptions

Based on discussions with EVN and information from the customer surveys, the following assumptions were used in the calculations:

1. CFLs of ratings 5, 7, 8 and 9 W replace 40W incandescent lamps.
2. CFLs of ratings 11, 13 and 14 W replace 60W incandescent lamps.
3. CFLs of rating 18W replace 75 W incandescent lamps
4. CFLs of rating 20W replace 100W incandescent lamps
5. The average use of CFL per day is 2 hours (considering urban usage patterns)
6. Coincidence Factor = 65%
7. The peak demand reduction is the reduction of active power demand measured in Watts (W). The power factor of CFLs and FTLs has not been considered.
8. Peak system losses = 2 * average losses

CFL Program - Energy, Peak Demand and Cost Savings						
VIETNAM - Market Evaluation						
Inputs	Units	Lamp Types				
		1	2	3	4	
No. of Lamps Replaced	#	882,220	3,297,513	441,446	1,504,030	6,125,209
Wattage of Incand./ Fluoro Lamp	Watts	40	60	75	100	
Type of Replaced Lamp		Incan	Incan	Incan	Incan	
Wattage of CFL	Watts	9	11	15	20	
Power factor of Replaced Lamp	%	100%	100%	100%	100%	
Usage per day	Hours	2	2	2	2	
CFL Lifetime	Hours	6,000	6,000	6,000	6,000	
Power Factor of CFLs	%	50%	50%	50%	50%	
Coincidence Factor	%	65%	65%	65%	65%	
Leakage Factor	%	0%	0%	0%	0%	
Network Losses	%	11%	11%	11%	11%	
Program Cost per CFL - Installed	\$/Lamp	1.58	1.58	1.58	1.58	
Energy Cost per kWh	c/kWh	4.4	4.4	4.4	4.4	
Avoided Capacity Cost per kW	\$/kW	1,500	1,500	1,500	1,500	
Annual Cost of Capital	%	5%	5%	5%	5%	
GHG Savings per GWH	Tons/GWH	1,000	1,000	1,000	1,000	
Results						Total
Savings at Customer Level	Watts	31	49	60	80	
Peak Savings per Unit	Watts	31	49	60	80	
Annual Energy Savings - per unit	kWh	22.6	35.8	43.8	58.4	
Lifetime Savings - per unit	kWh	186.0	294.0	360.0	480.0	
Peak Savings - Network Level	MW	22.8	134.6	22.1	100.3	279.8
Total Energy Savings - Annual	GWH/yr	22.4	132.5	21.7	98.7	275.4
Total Energy Savings - Equip. Lifetime	GWH	184.4	1,089.3	178.6	811.2	2,263.4
Energy Cost Savings - Annual	Million \$	1.0	5.9	1.0	4.4	12.2
Avoided Capacity Costs	Million \$	34.2	202.0	33.1	150.4	419.7
Capacity Cost Savings - Annualized	Million \$	1.7	10.1	1.7	7.5	21.0
Annual Savings - Energy & Capacity	Million \$	2.7	16.0	2.6	11.9	33.1
Lifetime Savings - Energy & Capacity	Million \$	22.2	131.1	21.5	97.6	272.4
EVN Avoided Marginal Losses	Million \$	0.79	4.64	0.76	3.45	9.6
CFL Program Cost	Million \$	1.39	5.20	0.70	2.37	9.7
Annual Cost Saving - per unit	VND	15,841	25,039	30,660	40,880	
Payback to Customer	Months	18.9	12.0	9.8	7.3	
Lifetime Cost Savings - per unit	\$	8.2	13.0	15.9	21.2	
	VND	130,200	205,800	252,000	336,000	
Benefit / Cost ratio		5.2	8.2	10.1	13.4	
GHG Savings -Annual	Tons	22,432	132,530	21,725	98,691	275,379.1
GHG Savings - Equipment Life	Tons	184,374	1,089,291	178,562	811,162	2,263,389.6
Overall Benefits						
Total Cost Savings	\$	881,719	5,209,238	853,926	3,879,164	10,824,048
	VND	13,975	82,566	13,535	61,485	171,561
Total Cost of CFLs	\$	1,391,514	5,201,125	696,287	2,372,287	9,661,213
	VND	22,056	82,438	11,036	37,601	153,130
Overall payback period						10.71
Life-time Cost savings	\$	7,247,006	42,815,658	7,018,574	31,883,538	88,964,775
	VND	114,865	678,628	111,244	505,354	1,410,092
Overall Benefit / Cost Ratio						9.21

8.2 Summary of Results from Phase 1 Evaluation

The Phase 1 CFL program was evaluated in September 2006 and covered the procurement and sale of 300,000 CFLs. The lamps were distributed in PC1, PC2 and PC3. The program commenced in November 2005 and completed in June 2006. The summary of the findings are given in this Section

IMPACT EVALUATION

The impact evaluation determined the system peak demand and energy impacts resulting from the program. The evaluation revealed that the demand and energy impacts were lower than anticipated for the following reasons:

- In the program design it was assumed that the CFLs purchased under the program will be used as replacements for existing incandescent lamps. However, the survey results revealed that only 59% of the CFLs were used as replacements for incandescent lamps. Around 23% was used as replacement for fluorescent tube lights and 18% for new fittings.
- The CFLs offered by EVN was 20W, which is equivalent to a 100W incandescent lamp. The design document specified a single size and type of CFL equivalent to a 75W incandescent lamp. The survey revealed that only 36% of the incandescent lamps replaced were 75W and over.

A summary of the program impacts are given in the Table below.

<i>System Impacts</i>	
<i>Energy Savings (MWh/yr)</i>	<i>12,000</i>
<i>Lifetime Energy Savings (MWh)</i>	<i>63,900</i>
<i>Demand Saving (MW)</i>	<i>7.9</i>

PROCESS EVALUATION

Program Participants

The following is a summary of findings from the Process Evaluation:

- Around 50% of the consumers were already using CFLs prior to the implementation of the EVN program. Most (67%) opted to purchase the maximum number (2) of lamps.
- There was a significant number (23%) who used the CFLs as replacement of existing 20W / 40W fluorescent tube lighting. In addition, the wattage of the incandescent lamps replaced was much lower than the program design assumption of 75W. These, together with 18% opting to use the CFLs for new fittings, resulted in lower than expected peak demand and energy savings.
- The EVN marketing strategies were proved to be effective with EVN Notice Boards, brochures and banners being the most popular. Almost all respondents believed that the marketing material provided by EVN was easy to understand.
- The failure rate of the CFLs was less than 1% and the failed lamps were replaced by EVN under the program. The lamp failures mostly (90%) occurred 3 to 6 months after purchase.
- Overall satisfaction with the performance of the CFLs was very high (~94%) and the key factors that influenced consumers to participate in the program was EVN sponsorship and saving potential.

- Suggestions for program improvement included the provision of purchasing more than 2 lamps, choice of lamp wattage and different brands.

Non Participating Users

The following is a summary of findings from the Process Evaluation:

- Most respondents (33%) are using CFLs because of the energy saving potential. However, a significant percentage (27%) is using CFLs as a replacement for existing 20W / 40W fluorescent tube lighting which result in less saving. Overall, most (92%) are satisfied with the performance of the CFLs.
- Around 87% of the respondents are aware of the EVN program and the key reasons for non participation are lamp cost (28%) and the unsuitability for existing fittings (18%).

Non Users

The following is a summary of findings from the Process Evaluation:

- Most respondents are currently using fluorescent lighting in high usage areas like verandah, bedrooms and kitchen. Around 93% believe that CFLs will reduce electricity consumption and the high price has been identified as the major barrier in using CFLs.
- A great majority (93%) was aware of the EVN program and the key reasons for non participation included EVN purchase procedures, no choice on the CFL brand and bad experience in using CFLs.
- Most (83%) recall seeking EVN advertisements and felt that the material was easy to understand.

MARKET EVALUATION

The key findings of the market evaluation are summarised below:

- All suppliers have experienced a significant increase in sales in 2005 and the trends in 2006 are even higher. The reported increase in annual sales over the last two years ranged from around 50% to 150%.
- All suppliers have been aware of the EVN program and indicated that the marketing efforts of the program were probably the main reason for increased sales.
- There was a general heightened awareness amongst consumers about CFLs and energy savings, implying that the awareness campaigns are working.

PROGRAM REFINEMENTS

Program Marketing: Overall the marketing activities undertaken by EVN proved to be effective in promoting the use of CFLs. However, there are consumer misconceptions about which lamps should be replaced, wattage and usage areas. Hence, future consumer awareness programs should be refined to include these.

Product Range: The Phase 1 program procured 20W CFLs which is equivalent to a 100W incandescent lamp. However, the surveys indicated that the majority of the incandescent lamps replaced were below 60W. Hence, offering consumers CFLs of a range of wattages would maximize savings.

Product Quality: The two key responses from non-participants and non-users for opting not to participate in the EVN program was high cost and bad experience in using CFLs. These responses indicate that cheap low quality lamps are readily available in the market. Hence product quality is an issue that EVN should

address for a sustainable CFL program. This could be included as a part of the appliance standards and labelling program currently undertaken by the Ministry of Industry.

Program Promotion: There is strong evidence that the awareness level of CFLs is high in Vietnam especially since the launch of the EVN program. The Phase 1 (and Phase 2) involves the distribution of CFLs via EVN's regional offices. This approach was considered appropriate to initiate the program and it is envisaged that the time is right for a market driven program with endorsement from EVN. This will ensure that a competitive market will be established with quality products. There are several international examples of similar programs which EVN could consider for the future.

CONSIDERATIONS FOR PHASE 2 CFL PROGRAM EVALUATION

Review of the responses from the customer surveys conducted in the Phase 1 evaluation, it was felt that some questions may have been misunderstood by the respondents and/or required further clarification. In addition, formal training of the surveyors to ensure correct understanding and interpretation is considered important.

Following discussions with EVN it was agreed that the final evaluation will incorporate the one million CFLs procured under Phase 1 and Phase 2 of the program. The customer surveys will be focussed on participants in order to clarify if some of the program design assumptions have been complied with. The key issue was what lamp (type and wattage) was replaced by the purchased CFL, as this would have a significant impact on the program system benefits.

In addition, at EVN's request the Phase 2 evaluation placed greater emphasis on the impact of the overall CFL market in Vietnam.

8.3 Customer Survey Questionnaire

Interview Code: _____

Interviewer: _____

Date/Time of Interview: _____

EVN Phase 2 DSM Program COMPACT FLUORESCENT LIGHTING PROGRAM (PHASE 2) PARTICIPATING CUSTOMER SURVEY

Customer Details

Customer Name	
Address	
Province	
Electricity Supplier	PC1 / PC2 / PC3 / PC4 / PC5 / PC6 / PC7 / PC8 / PC9 (circle)
Utility Account No.	

CFL



Incandescent Lamp



Fluorescent Lamp



1. PROGRAM PARTICIPATION

I'd like to begin our survey by finding out if you participated in the program.

EVN introduced a CFL Program in October 2005 where Domestic Customers were entitled to purchase up to 2 lamps from the district offices of the PCs at discounted prices.

Q 1-1	Have you purchased CFLs under the EVN Program?			
	Yes	1	go to	Q 2-1
	No	2	End survey	

2. PROGRAM PARTICIPATING USERS

I would now like to ask you more details about your participation in this program

Q 2-1	Have you purchased any CFLs directly from the retailers before this program was introduced?			
	Yes	1		
	No	2		
Q 2-2	How many lamps did you purchase under the EVN scheme?			
	One	1		
	Two	2		
Q 2-3	Where were the lamp(s) installed?	Lamp 1	Lamp 2	
	Verandah / Lounge/Dining area	1	1	
	Bedrooms	2	2	
	Kitchen	3	3	
	Toilet.....	4	4	
	Bathroom	5	5	
	Other (outside, breeding facilities, etc)...	6	6	
Q 2-4	Were the CFLs used as replacement of existing lamps or in new installations? Show photos of lamps in Page 1	Lamp 1	Lamp 2	
	Replacement of Incandescent lamps	1	1	go to Q 2-5
	Replacement of Fluorescent tube lamps	2	2	go to Q2-6
	New fittings	3	3	go to Q 2-7
	Other (specify)	4	4	
Q 2-5	What was the wattage of the incandescent lamps replaced?			
	a) Incandescent Lamps	Lamp 1	Lamp 2	

	40W	1	1	
	60W	2	2	
	75W	3	3	
	100W	4	4	
	Cannot remember	5	5	
Q 2-6	What is the reason for replacing a fluorescent tube with a CFL?			
	Better quality of Light	1		
	Level of saving	2		
	Looks	3		
	Other (specify)	4		
Q 2-7	Did you remove the fluorescent tube fitting and install a holder for the CFLs?			
	Yes	1		
	No	2		
Q 2-8	What was the wattage of the fluorescent tube you replaced?	Lamp 1	Lamp 2	
	20W (0.6m)	1	1	
	40W (1.2m)	2	2	
Q 2-9	Are the lamps still operating?	Lamp 1	Lamp 2	
	Yes	1	1	Go to Q 2-13
	No	2	2	Go to Q 2-10
Q 2-10	After how long did the lamp(s) fail?	Lamp 1	Lamp 2	
	Within 3 months	1	1	
	Between 3 and 6 months	2	2	
	Between 6 and 9 months	3	3	
	After 9 months.....	4	4	
Q 2-11	Were the lamps replaced by EVN during the warranty period?			
	Yes	1	1	Go to Q 2-13
	No	2	2	Go to Q 2-12
Q 2-12	Why did you not use the warranty?			
	Reason:			
Q 2-13	On an average, how many hours a day the lamps are in use?	Lamp 1	Lamp 2	
	Less than 2 hours	1	1	
	Between 2 to 4 hours	2	2	
	Between 4 - 6 hours	3	3	
	More than 6 hours	4	4	

Q 2-14	Where did you hear about the CFL Program?												
	Newspaper	1											
	Advertisement on TV.....	2											
	Poster.....	3											
	Banner.....	4											
	EVN Brochure / Flyers	5											
	Commune Loudspeaker.....	6											
	Notice Board.....	7											
	Meetings.....	8											
	Notice of EVN's Branches.....	9											
	Other (specify).....	10											
Q 2-15	Were the advertisements / EVN literature easy to understand?												
	Yes	1	goto	Q 2-17									
	No	2	goto	Q 2-16									
Q 2- 16	Why was it difficult to understand?												
	Reasons:												
Q 2-17	Why did you decide to participate in the CFL Program? <i>Multiple responses allowed</i>												
	Sponsored by EVN	1											
	Discounted Price	2											
	Manufacturers Warranty	3											
	Savings Potential	4											
	Other (specify)	5											
Q 2-18	Are you satisfied with the performance of the CFLs?												
	Yes	1	goto	Q 2-20									
	No	2	goto	Q 2-19									
Q 2- 19	What aspects were you not satisfied with?												
	Quality of light	1											
	Looks	2											
	Level of saving	3											
	Other (specify)	4											
Q 2-20	How do you rate the following aspects of the program?												
	EVN approval process												
	Type of CFLs												
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Good</td> <td style="padding: 5px;">Unsatisfactory</td> <td style="padding: 5px;">No Idea</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> </tr> </table>			Good	Unsatisfactory	No Idea						
Good	Unsatisfactory	No Idea											

Location of EVN outlets

Price of CFLs

Length of warranty

Q 2- 21 Do you have any suggestions for improving the program?

Suggestions:

Q 2-22 What is your current average monthly electricity bill? (VND)

Q 2-23 What was your average monthly electricity bill before installing CFLs? (VND)

Q 2-24 How many CFLs you have purchased outside EVN program? (*enter zero if none*)

THANK YOU VERY MUCH FOR YOUR COOPERATION

8.4 CFL Supplier Survey Questionnaire

EVN Phase 2 DSM Program

Compact Fluorescent Lighting Program – Final Evaluation

Survey of CFL Suppliers / Manufacturers

Company Name	
Address	
Contact Person	
Category	CFL Manufacturer / CFL Supplier
Brands of CFLs sold	
Information on CFL Sales over the last 2 years <i>(Have the sales increased over the last 2 years? If so, how much?)</i>	
Awareness of EVN CFL Program <i>(Are they aware of the EVN program?)</i>	
Impact of EVN Program on CFL sales <i>(Has the program helped in increasing sales?)</i>	
Other Comments <i>(Any suggestions on how EVN could help in promoting CFLs)</i>	

Record of CFL Sales 2004 - 2006

Year	CFL Wattage	Lamps Sold	Revenue (VND)
2004	5W		
	9W		
	11W		
	15W		
	18W		
	20W		
2005	5W		
	9W		
	11W		
	15W		
	18W		
	20W		
2006	5W		
	9W		
	11W		
	15W		
	18W		
	20W		