

Institute (EEI) and another one is operated by the Metropolitan Electricity Authority (MEA). EEI is an autonomous institute established under the Industrial Development Foundation under the Ministry of Industry. EEI is accredited by TLAS and other recognized international accreditation schemes to ISO/IEC 17025. EEI is capable of testing a wide range of electrical and electronics products including all appliances that participate in the Thailand Energy Labeling Program of EGAT.

MEA, a state-owned enterprise responsible for electricity distribution in the greater Bangkok area, established their testing facilities to support energy efficiency promotional activities in Thailand. Their first testing facility for three-phase electric motor was established in 2001 and the second testing facility for fluorescent lamp ballasts was completed in 2002. Both received ISO/IEC 17025 accreditation. The MEA laboratory provides testing services for private enterprises and government agencies but does not perform testing services for EGAT's energy efficient ballast program.

#### **2.9.4 Standards and Labeling Program**

Thailand began voluntary labeling for several products as part of EGAT's DSM program. EGAT's energy labels for appliances use a scale of 1 to 5 (where 5 is the highest efficiency level and 3 is the average of all models tested). The label is widely-recognized by the populace as the "No.5 Energy Efficiency Label". Even though the first energy conservation campaign targeted tubular fluorescent lamps, the first labeled appliance was the single-door refrigerator. EGAT's promotional campaigns had nationwide impacts and the labeling program has since expanded to cover five additional appliances (including air-conditioners, electromagnetic ballasts for fluorescent lamps, compact fluorescent lamps or CFLs, electric fans, and rice cookers). Figure 31 illustrates the No. 5 Energy Efficiency Label.

EGAT's Energy Efficient Ballast program debuted on February 1, 1998, to promote the production and consumption of low watt loss electromagnetic ballasts. Low watt loss electromagnetic ballasts qualified under this program must have internal losses less than 6 watts. This program is a voluntary program and only the No.5 label will be given to manufacturers and distributors. For some reason, EGAT does not emphasize the energy efficiency aspects of low watt loss ballasts but highlights the function of "less heat generated by this efficient ballast". They have named this low watt loss ballast the "No.5 Safety Ballast".

In addition to EGAT's energy labeling program, the Thai Green Label Scheme was initiated by the Thailand Business Council for Sustainable Development (TBCSD) in October 1993 as a TBCSD council project. It was formally launched in August of 1994 by the Thailand Environment Institute (TEI) in association with the Ministry of Industry. TISI, EPPO and EGAT are all involved in supporting the scheme. Electronic and electromagnetic ballasts for fluorescent lamps which meet the Thai Green Label criteria can carry the Thai Green Label. (See Figure 31.)



Figure 31: Green Label and EGAT's No.5 Energy Label

The success of energy labeling in Thailand paved the way for other energy conservation strategies; and EPPPO studied the cost-benefit ratio of implementing the Minimum Energy Performance Standards (MEPS) for six products including electromagnetic ballasts. Recommendations for implementing a low loss ballast standard of 6-watt were approved by the Thai Cabinet and passed to TISI. The recommendations were circulated to relevant stakeholders for review and are expected to be effective in 2005.

## **2.10 Vietnam**

### **2.10.1 Country Overview**

Vietnam is the third largest country in the region in terms of population, with a populace of 82 million. Vietnam is well-endowed with fossil fuel energy resources (oil, gas and coal) as well as renewable energy resources, i.e. hydropower, biomass, wind and solar energy. Oil and gas together account for over 60% of the total primary energy supply.

From 1992 to 1997, Vietnam experienced unprecedented economic growth, averaging 8.2% annually. During the same period, electricity demand grew 70% faster than GDP. The peak demand was 6,430 MW (2002) and is expected to increase to 9,620 MW by 2005. The power company, Electricity of Vietnam (EVN), is experiencing system capacity constraints during the evening peak, resulting in periodic brownouts and low system load factor. To maintain sustainable economic growth with enough reserve capacity to ensure safe and reliable operation of the power grid, it is estimated an average of additional 800 to 1000 MW per year must be connected to the grid during 2002-2005. This new capacity will annually increase from 1,300 MW to 1,500 MW from 2006-2010.

Given massive requirements for generating capacity, the government of Vietnam considers energy conservation and the efficient use of energy as important additional energy resources necessary for sustainable economic development and reduction of negative environmental impacts. Various donor agencies (World Bank, Sida-Sweden, and UNDP-GEF) have provided technical and capacity-building assistance to develop and strengthen a number of energy conservation projects such as EVN's DSM program, an energy efficiency building code under the Ministry of Construction (MoC), energy efficient lighting and industrial motor standards under the Ministry of Science and Technology (MoST) and the proposed UNDP-GEF Energy Efficiency in Public Lighting Project (VEEPL).

### **2.10.2 Ballast Market Overview**

The domestic fluorescent lamp ballast demand in Vietnam is estimated to be 4-6 million units per annum. The local production capacity is around 3-4 million units with a wide range of quality levels. There are three reputable ballast manufacturers in Vietnam (Vietnam-Hungary Electric Machines Manufacturing Company, the Wires and Cables Union of Enterprises (CADIVI) and the Electric Light Company, Dien Quang). The ballasts produced from these companies are typically of good quality but still show high power losses. There are also a number of small manufacturers (run by cooperatives) that produce poor quality, inexpensive ballasts. These poor quality ballasts occupy the majority of the market.

There are mixed uses of T8 and T12 fluorescent tubes in Vietnam; consequently, ballasts are available for 18, 20, 36, and 40-watt tubular fluorescent lamps. Electronic ballasts have not penetrated the Vietnamese market, most likely due to the quality of power supply and the higher cost per unit. Vietnam imports fluorescent lamp ballasts in quantities of 2-3 million units per annum, mainly from Thailand. (Most units imported are the standard electromagnetic ballasts.)

## **2.10.3 Institutional Framework**

### **Energy Policy and Regulatory Body**

The Prime Minister's Office and the Ministry of Industry (MoI) are responsible for the formulation of Vietnam's Energy Policy and for the regulation of service quality by the agencies operating in the energy sector. The electricity company, Electricity of Vietnam (EVN) is operated by the Prime Minister's Office and MoI. MoST is responsible for the implementation of the Master Plan for Energy Conservation and Efficiency as well as standards and labeling.

### **Electricity Utility**

The electricity industry in Vietnam is dominated by the Electricity of Vietnam (EVN). EVN is a state-owned corporation that operates in the areas of generation, transmission, distribution and sales of electric power. Under the control of EVN, there are seven distribution companies, four transmission companies, an energy research institute. At the end of 2002, EVN also acquired fourteen large and medium-sized power plants, dozens of small diesel and mini-hydro stations. As of 2002, EVN had a total of 8,860 MW installed capacity, of which IPPs accounted for roughly 7 %. The total energy produced in the same year was 35 GWh.

Of seven distribution companies, three operate on a regional basis (Power Company No. 1,2,3), while the other 4 cover large cities (Hanoi's Power Company, Ho Chi Minh's power Company, Hai Phong's Power Company and Dong Nai's Power Company).

In addition to the core power business, EVN has managed five consulting arms namely: the Institute of Energy and Power Consulting Companies No. 1, 2, 3, and 4, as well as two electro-mechanical manufacturers. EVN's consulting arms provide services to projects specified in the Master Plans for the Power Sector's development, planning for the development of regional network and consulting services for EVN's clients.

### **Standards, Accreditation and Testing Body**

The Directorate for Standards and Quality (STAMEQ), a governmental body under the Ministry of Science and Technology (MoST), is responsible for standardization, metrology, and quality management. STAMEQ's main activities are to form the rules and regulations on standardization, to structure and maintain national standards, and to provide the product quality certification, testing and calibration of laboratory accreditation. The national standards (published by STAMEQ) are known as Vietnam Standards (TCVNs). TCVNs are intended for voluntary adoption (unless made compulsory under the decisions promulgated by the Minister of Science, Technology and Environment) or by specific references to standards in other laws and regulations. Table 14 illustrates the current TCVNs regarding fluorescent ballasts.

**Table 14: Vietnamese National Standards for Fluorescent Lamp Ballasts**

<b>National Standard Number</b>	<b>Reference Standard</b>
TCVN 6478:1999 Ballasts for tubular fluorescent lamps General and Safety requirements 49Tr(A4)	IEC 60920
TCVN 6479:1999 Ballasts for tubular fluorescent lamps. Performance requirements 29Tr(A4)	IEC 60921

Source: The Directorate for Standards and Quality (STAMEQ)

The Vietnam Laboratory Accreditation Scheme (VILAS) operates in accordance with ISO/IEC Guide 58 (TCVN 5954-95) "Calibration and testing laboratory accreditation system-general requirements for operation and recognition". VILAS accredits laboratories based on the general requirements of ISO/IEC 17025:1999 (TCVN ISO/IEC 17025:2001) and technical requirements for specific fields. STAMEQ has been a full member of International Laboratory Accreditation Cooperation (ILAC) and Asia Pacific Laboratory Accreditation Cooperation (APLAC) since 1992 and 1995, respectively.

There are at least four testing laboratories (Electrical testing laboratory, VILAS 036, Electrical-thermal-electronic laboratory, VILAS 024, Electric-electronic testing laboratory, VILAS 028, and Electromagnetic Compatibility Laboratory, VILAS 060) that provide performance and safety tests for ballasts. However, these labs are not likely to be accredited in accordance with ISO/IEC 17025 standards.

#### **2.10.4 Standards and Labeling Program**

The energy standards and labeling program is still in the early stages and there is no S&L program currently under implementation. In 2000, UNDP-GEF approved the Vietnam Energy Efficiency Public Lighting Project (VEEPL) to remove barriers to energy efficient lighting systems in the public sector. The project also seeks to assist local governments to promote and implement new and efficient lighting systems through innovative delivery mechanisms, impacting appropriate regulations for the public lighting systems, facilitating standards for street lighting and schools, providing technical assistance to local manufacturers, and developing mechanisms to extend lighting service to new areas.

The Vietnam Standard and Consumers Association (VINASTAS) aims to implement the "Labeling Program for High Efficient Lighting Products in Vietnam 2004-2006 Program". Lighting products (including fluorescent ballasts) are given first priority to be labeled due to the large portion of electricity consumption and their popular use. The label is proposed to begin with a voluntary endorsement label (2004-2006) and become a comparative mandatory label after 2006.

## Chapter 3: Analysis and Recommendations

### 3.1 Projection of Ballast Consumption Growth

Projecting the amount of future ballast consumption in the ASEAN region is challenging due to information barriers at the industrial and national levels in most countries. As described in Chapter 1, all ballast trade figures and consumptions shown in Table 3 are derived from interviews and calculations based on assumptions which differ from country to country. Based on all the available facts and figures, fluorescent lamp ballast consumption in each ASEAN member country is not directly proportional to the GDP growth but rather to activities in two specific industries: power and construction.

Higher electrification rates and increasing amounts of electrified households have connected new consumers into the lighting market. This has had an impact on regional electricity peak demand and energy saving as illustrated by results of an analysis in the following section (see Figures 34 and 35). . New investment in the building and construction industries (especially commercial and residential buildings) has added new demand to the lighting market. For emerging economies like Cambodia, Lao PDR, Myanmar, and Vietnam, higher rates of rural electrification and expansion in the building and construction industries play significant roles in driving higher domestic demands for lighting products (including fluorescent lamp ballasts). Conversely, ballast demands in ASEAN member countries where electrification rates are high are more dependent upon new investment in the building and construction industries due to minimal replacement of ballasts after first installation.

Therefore, to properly forecast the consumption of fluorescent lamp ballasts in each ASEAN member country and extrapolate that for the region, the availability of information on power sector reform and new construction starts (among other things) are vital inputs to the forecasting methodology. Since none of ASEAN countries are able to provide comprehensive statistical data for both industries (particularly the building and construction industries) projection of the ballast demand growth in ASEAN was not possible. (Further studies focusing on the two industries are required to consolidate and sort relevant data).

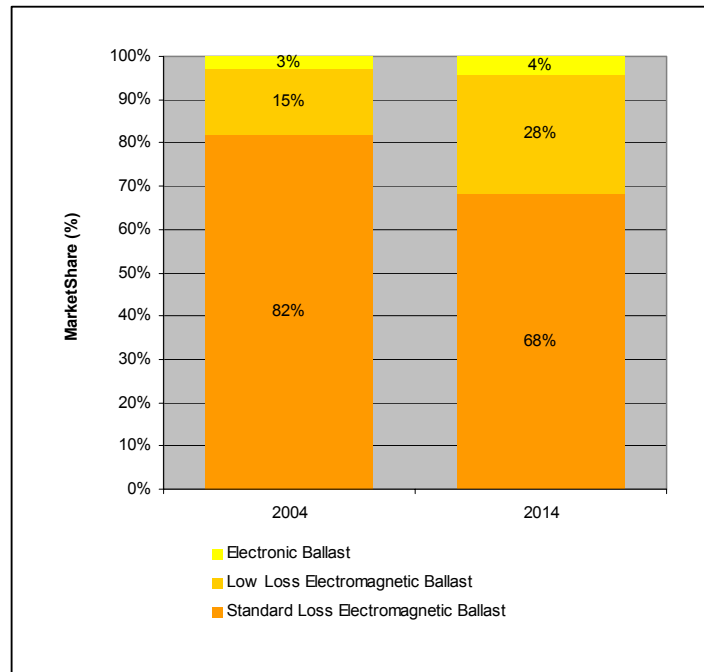
However, a number of in-country energy efficiency efforts for lighting products (including fluorescent lamp ballasts as discussed in Chapter 2) are likely to influence the market share of different of fluorescent lamp ballasts in the region. Those initiatives are shown in Table 15.

**Table 15: Energy Efficiency Initiative Related Lighting Products in ASEAN**

Country	Energy Efficiency Initiative	Year Implementation
Lao PDR	Demand-Side Management Program	2006
Philippines	Lighting Market Transformation Program	2005
Thailand	Minimum Energy Performance Standard (MEPS) for fluorescent lamp ballasts	2005
Vietnam	Labeling Program for High Efficient Lighting Products	2006

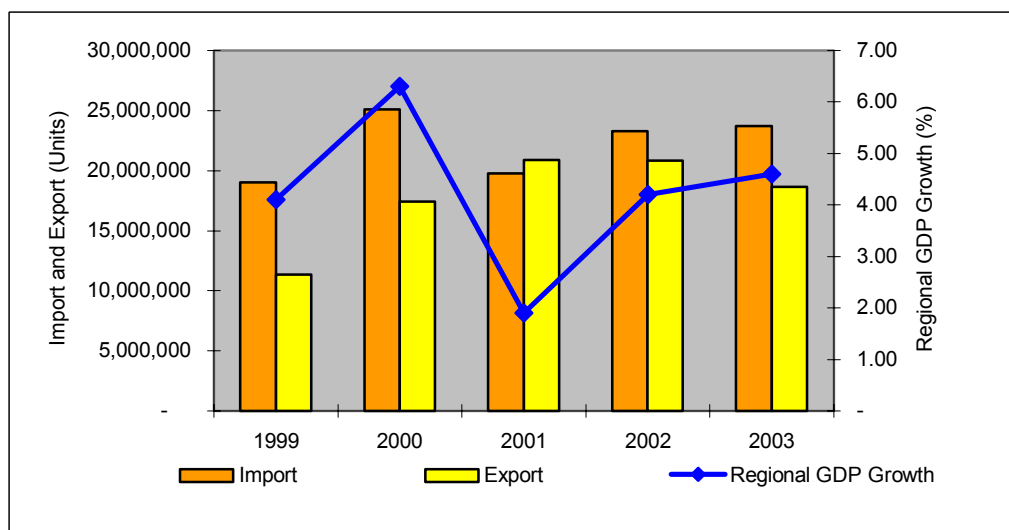
Since fluorescent lamp ballast consumption in these 4 countries represents only about 36% of the total consumption in the region, composition of the market share for different types of ballast will not be significantly changed unless there are additional energy efficiency

initiatives in other ASEAN member countries, and significant progress of the ASEAN Energy Standards and Labeling Program is made. Figure 32 represents the market share of standard low loss and electronic ballasts in 2004 and the expected market share in 2014 resulting from energy efficiency efforts afoot regionally.



**Figure 32: Marketshare of Different Types of Fluorescent Lamp Ballast in 2004 and 2014**

Although a country’s GDP growth appears to have no direct relationship with the growth of domestic ballast demand, the trendline of ballasts imported by ASEAN and the increases in regional GDP (1999-2003) seem to have some correlations. (See Figure 33.) Based on GDP growth rates as stated by the Asian Development Bank, the amount of ballasts imported by the ASEAN region is expected to be constant over the next two years.



**Figure 33: Regional Import and Export of Ballast for Discharge Lamps or Tubes Compared to Regional GDP Growth**

### **3.2 Potential Energy Savings from More Efficient Fluorescent Lamp Ballasts in the ASEAN region**

Although the EE&C-SSN has made fluorescent lamp ballasts a priority product in their regional energy standards and labeling program, the benefits, in terms of peak demand reduction and energy savings, from implementing such a program for fluorescent ballasts have never been assessed. The energy impacts from the ASEAN S&L program for fluorescent lamp ballasts were analyzed for two scenarios described below.

The variable considered in the two scenarios is penetration of more efficient ballasts due to the introduction of the ASEAN S&L program. (The growth rate of fluorescent lamp ballasts in the region is expected to remain constant over the next 10 years). The ASEAN regional S&L program for fluorescent lamp ballasts will be introduced in 2006. The program will mainly focus on the use of low watt loss electromagnetic ballasts rather than electronic ballast because low watt loss electromagnetic ballast has already been introduced in most member countries through various energy conservation programs. Also low watt loss electromagnetic ballasts have much lower premium price compared with their electronic counterparts. (The assumptions for the impact analysis are discussed more fully in Appendix D). Given available data obtained from survey questionnaires, expert interviews and statistical bodies, a preliminary assessment of the peak demand forecast and energy saving of promoting the energy standards and labeling program for fluorescent lamp ballasts in the ASEAN region are as follows:

#### **Scenario I**

ASEAN introduces a voluntary energy labeling program that endorses more efficient (lower watt loss) fluorescent lamp ballasts that are both imported and locally manufactured. This energy labeling program is introduced with the support of ballast manufacturers in the region for production of ballasts and instigation of a public awareness campaign to promote efficient lighting. As a result of the S&L program, the low watt loss electromagnetic ballasts will penetrate the standard loss electromagnetic ballast market share at a rate of 5% per year.

#### **Scenario II**

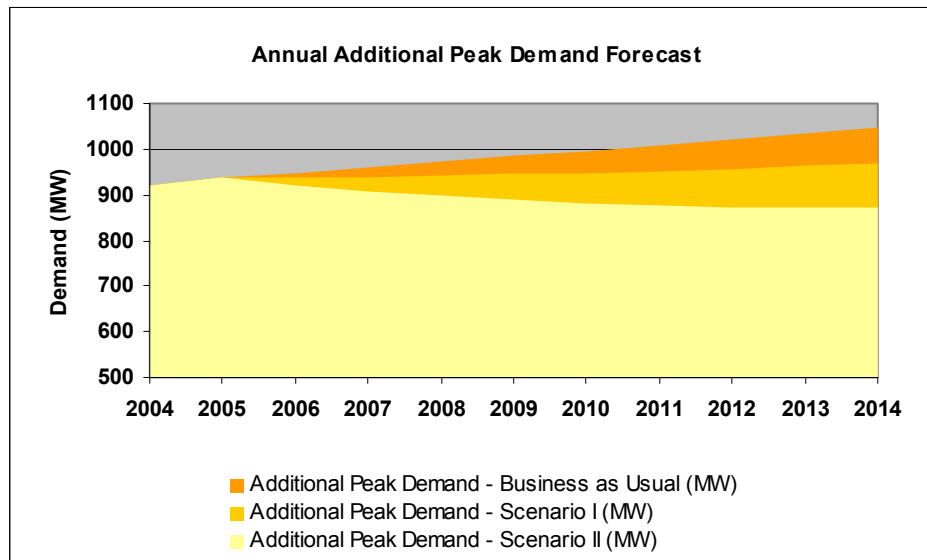
ASEAN introduces a more aggressive mandatory S&L program for fluorescent lamp ballasts (i.e., energy performance classifications with a minimum requirement). This energy labeling program is introduced with the support of ballast manufacturers in the region for production of ballasts and instigation of a public awareness campaign to promote efficient lighting. As a result, low watt loss electromagnetic ballasts will penetrate the standard loss electromagnetic ballast market share at a rate of 10% per year.

#### **Impacts**

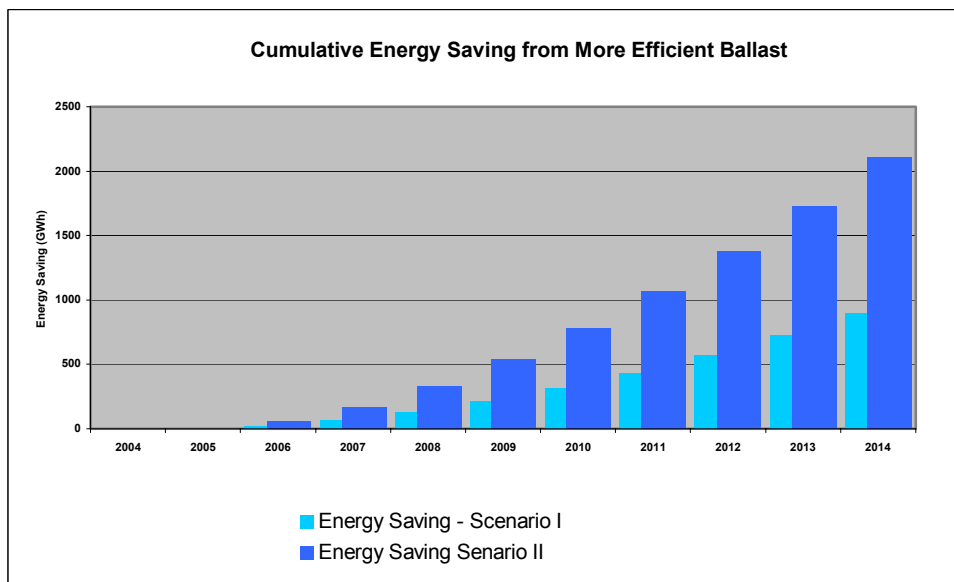
Without improvement of fluorescent lamp ballast efficiency, ASEAN member countries must build additional capacity on the order of one 1-GW power plant a year to cope with the energy losses from over 100 million fluorescent lamp ballasts consumed annually in the region. With modest growth (3% annually) the additional power plant capacity required by ballast losses will increase to 1.2 GW annually in 2014.



With the introduction of an energy S&L program promoting more efficient fluorescent lamp ballasts (including low loss electromagnetic ballasts and electronic ballasts) complemented by manufacturers' support and public awareness campaigns to promote efficient ballasts, ASEAN could potentially save between 100 MW to 200 MW in peak demand over a ten-year period with the corresponding reduction in energy consumption estimated to be 900-2100 GWh. (Details of the analyses are found in Appendix D).



**Figure 34: Impacts of the ASEAN S&L Program for Fluorescent Lamp Ballasts on Electricity Peak Demand. Source: IIEC**



**Figure 35: Impacts of the ASEAN S&L Program Fluorescent Lamp Ballast on Cumulative Energy Saving. Source: IIEC**

### **3.3 Barriers, Recommendations, and Follow-On Projects**

**Barrier 1--Data:** One of the key barriers that could impede development of the regional S&L program in ASEAN is the statistical data barrier. Although there are statistical bodies in most ASEAN member countries, only Indonesia, Malaysia, Philippines, Singapore, and Thailand record statistics related to ballasts. Statistical data for the remaining member countries are not retrievable to-date. More difficult still is the fact that most available ballast statistics (excepting Thailand) are recorded for “ballasts for discharge lamps or tubes” which covers *all* types of ballasts, making it impossible to segregate “ballast for fluorescent lamps” from the total figures.

**Recommendation 1 to Overcome this Barrier:** The statistical barrier needs to be overcome to design an appropriate implementation plan for the regional S&L program and establish an efficiency benchmark suitable for the region. The availability of accurate data will enable ASEAN to measure success over time using this baseline. Towards filling this data gap the following projects are suggested:

**Follow-on Project 1.1:** Establish a mechanism to track ballast trade data in each ASEAN member country and categorize ballasts for discharge lamps (or tubes) in a sub-category for fluorescent lamp ballasts. In addition, a sub-category for fluorescent lamp ballasts should be classified according to different types of fluorescent lamp ballasts, standard electromagnetic, low watt loss electromagnetic and electronic ballasts.

**Follow-on Project 1.2:** Conduct a detailed study on the energy efficiency profiles of various types of fluorescent lamp ballasts in each member country and the region.

**Follow-on Project 1.3:** Conduct a detailed feasibility study that includes market surveys on the supply chain, customer awareness and preferences, fluorescent lamp ballasts saturation, and ballast usage profiles.

**Barrier 2--Standards Vintage:** The different “vintages” of fluorescent lamp ballast standards in member countries are barriers for both the regional S&L program and for regional trade. For example, in Cambodia, Lao PDR, and Myanmar, there are no standards for fluorescent lamp ballasts. The quality and reliability of fluorescent lamp ballasts manufactured in (and imported to) those countries depends on the manufacturers’ quality assurance programs. Generally, low quality and unreliable fluorescent lamp ballasts are cheaper and therefore, more widely used than standard fluorescent lamp ballasts.

Once the regional energy performance standards program for fluorescent lamp ballasts is implemented, ASEAN member countries that do not have national standards may not be able to promote the program successfully due to the lack of regulatory prohibitions on substandard ballasts entering their domestic markets. (ASEAN member countries that have already implemented their national standards for fluorescent lamp ballasts will not face this barrier).

**Recommendation 2 to Overcome this Barrier:** Because the development for the regional program may take time, those countries that do not have national standards for fluorescent lamp ballasts should establish their own standards with close collaboration (and assistance from) both ASEAN member countries and leading industrialized countries or experts.

**Follow-on Project 2.1:** To overcome the barrier of differing standards vintages, a project that assists member countries evaluate their national standards needs to avoid sub-standards product dumping is needed.

**Follow-on Project 2.2:** Conduct a feasibility study on the market impact of the establishment of national standards for fluorescent lamp ballast in those countries. The study should indicate, for example, energy saving potential, changes in supply and demand mechanisms, etc.

**Follow-on Project 2.3:** Corresponding to the follow-on project 2.1, those countries that do not have national standards should establish their own national standards and accreditation body including accredited testing laboratory, at least for general household appliances including fluorescent lamp ballast. The establishment of new governmental organizations may take longer time and have to reform some related Ministries' responsibilities.

**Follow-on Project 2.4:** Publicly promote new standards at national levels. The promotion campaigns should focus on the benefits in terms of socio-economic, environment, national collaboration, etc., of the program that people (and the country) will gain in the short-, medium-, and long-term.

**Barrier 3—Maturity of Member Country Programs:** Since regional harmonization cannot occur without all member countries cooperation, the differences in maturity of each member country's energy conservation or efficiency program is a potential barrier. However, as the preceding analysis reveals, the enormous benefits of energy efficiency improvement through S&L strategies for fluorescent lamp ballasts in the ASEAN region are significant.

**Recommendation 3:** To achieve significant energy savings and ancillary benefits, ASEAN must ensure that the regional S&L program acts in a complementary manner to national energy efficiency initiatives in each ASEAN member country.

**Follow-on Project 3.1:** To achieve the benefits via this program, the S&L program must be complementary to national energy efficiency programs in each country; therefore, a project that aims to dovetail and coordinate with national EC programs (nationally and regionally) is needed. (This project would be the next phase of this program.)

**Follow-on Project 3.2:** To leverage instruments like the Kyoto Protocol, each country must link with national greenhouse gas offices to ensure that best use is made of this mechanism. A project by which these efforts to harmonize national EC and S&L programs with international expert GHG offices is needed in order to achieve such leverage.

## Appendix A: Import and Export Data

Table A-1: Average Annual Import and Export of Ballast for Discharge Lamps or Tubes by Region, 1999-2002

Average Annual Import and Export of Ballast for Discharge Lamps or Tubes by Region (Units), 1999-2002											
	ASEAN	North Asia	South Asia	Middle East	Oceania	Europe	Africa	North America	South America	Others	Total
<b>IMPORTS</b>											
Brunei	11,270									75000.00	86,270
Cambodia	762,398										762,398
Indonesia	182,538	1,685,613	9,752		31,090	353,744	379	11,485	479	48,370	2,323,449
Lao PDR	318,566										318,566
Malaysia	1,048,100	1,227,359	200	1,834	472,440	536,963		15,695	450	40,474	3,343,513
Myanmar	385,119										385,119
Philippines	346,141	821,835	652	6,218	111,170	276,909		50,153		50,688	1,663,766
Singapore	3,384,665	560,614	42,560	35,503	1,886,423	1,973,553	17,598	29,662	63	40,102	7,970,741
Thailand	106,222	1,759,669	2,416	3,731	32,915	251,019	600	1,264,994	585	25,348	3,447,499
Vietnam	1,252,143										1,252,143
<b>TOTAL</b>	<b>7,797,163</b>	<b>6,055,089</b>	<b>55,580</b>	<b>47,285</b>	<b>2,534,038</b>	<b>3,392,188</b>	<b>18,576</b>	<b>1,371,989</b>	<b>1,577</b>	<b>279,981</b>	<b>21,553,464</b>
<b>% of TOTAL IMPORT</b>	<b>36%</b>	<b>28%</b>	<b>0%</b>	<b>0%</b>	<b>12%</b>	<b>16%</b>	<b>0%</b>	<b>6%</b>	<b>0%</b>	<b>1%</b>	
<b>EXPORTS</b>											
Indonesia	282,910	2,111,561	106,673	210,651	3,440	23,668	10,594	19,333	3,542	15,173	2,787,545
Malaysia	1,027,632	74,419	17,448	7,910	1,016	25,792	2,600	59,213	8,320	1,093	1,225,443
Philippines	6,821	9,293		31,272	3,690	528,002	8,396		123	457	588,054
Singapore	1,141,397	531,584	143,424	58,818	126,933	944,464	9,313	3,767	5,337	34,268	2,999,306
Thailand	6,776,715	2,427,572	278,893	166,075	196,777	320,969	220,369	141,000	51,900	135,952	10,716,221
<b>TOTAL</b>	<b>9,235,475</b>	<b>5,154,430</b>	<b>546,439</b>	<b>474,726</b>	<b>331,856</b>	<b>1,842,896</b>	<b>251,271</b>	<b>223,313</b>	<b>69,221</b>	<b>186,943</b>	<b>18,316,569</b>
<b>% of TOTAL EXPORT</b>	<b>50%</b>	<b>28%</b>	<b>3%</b>	<b>3%</b>	<b>2%</b>	<b>10%</b>	<b>1%</b>	<b>1%</b>	<b>0%</b>	<b>1%</b>	

**Table A-2: Average Annual Import and Export of Ballast for Discharge Lamps or Tubes by ASEAN Member Country, 1999-2002**

Average Annual Import and Export of Ballast for Discharge Lamps or Tubes by ASEAN Member Country (Units), 1999-2002											
	ASEAN	Brunei	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
<b>IMPORTS</b>											
Brunei	23,260					5,010			18,250		
Cambodia	762,398								27,233	735,165	
Indonesia	182,538					13,740			49,413	119,385	
Lao PDR	318,566									318,566	
Malaysia	1,048,100			45,537				1,536	820,412	180,616	
Myanmar	385,119					1,871			145,583	237,666	
Philippines	346,141			8,497		4,677			24,739	308,228	
Singapore	3,384,665					1,359,146		2,146		2,023,373	
Thailand	106,222		20	617		98,431		218	6,921		16
Vietnam	1,252,143			9,125		5,347			39,970	1,197,703	
<b>TOTAL</b>	<b>7,809,153</b>										
<b>EXPORTS</b>											
Indonesia	282,910					21,769		14,708	156,277	81,032	9,125
Malaysia	1,027,632	5,010	7,049	48,333			1,871	5,458	830,757	123,808	5,347
Philippines	6,821					101			6,720		
Singapore	1,141,397	18,250	27,233			852,537	145,583	21,668		36,158	39,970
Thailand	6,776,715		735,165	299,347	318,566	556,504	237,666	632,722	2,799,042		1,197,703
<b>TOTAL</b>	<b>9,235,475</b>										

**Table A-3: Import/Export, Production and Consumption of Fluorescent Lamp Ballasts in ASEAN**

Import/Export, Production and Consumption of Fluorescent Lamp Ballast in ASEAN						
ASEAN Member Countries	% share of Fluorescent Ballast in Total Ballast Import	Fluorescent Ballast Import (unit)	% share of Fluorescent Ballast in Total Ballast Export	Fluorescent Ballast Export (unit)	Domestic Production Capacity (unit)	Estimated Domestic Consumption (unit)
Brunei	100%	86,270	0%		-	86,270
Cambodia	100%	762,398	0%		-	762,398
Indonesia	50%	1,161,725	70%	1,951,282	50,000,000	49,210,443
Lao PDR	100%	318,566	0%		-	318,566
Malaysia	50%	1,671,757	70%	857,810	9,000,000	9,813,947
Myanmar	100%	385,119	0%		3,000,000	3,385,119
Philippines	50%	831,883	70%	411,838	10,000,000	10,420,245
Singapore	50%	3,985,370	70%	2,099,514	-	1,885,856
Thailand	50%	1,723,749	70%	7,501,355	25,000,000	19,222,395
Vietnam	100%	1,252,143	0%		5,000,000	6,252,143
<b>TOTAL</b>		<b>12,178,980</b>		<b>12,821,598</b>	<b>102,000,000</b>	<b>101,357,382</b>

Note: Use % share of fluorescent lamp ballasts imported/exported to/from Thailand for ASEAN member countries, except emerging economy countries, Cambodia, Lao PDR, Myanmar and Vietnam.

## Appendix B: List of Manufacturers in ASEAN

Country	Name	Address
Malaysia	Advance Industries SDN BHD	No. 3, First Floor, Batu 12 ½, Jalan Puchong, 47100 Puchong, Selangor Darul Ehsan MALAYSIA Tel.: 60 3 8061 2790 Fax: 60 3 8061 2793
	AMP & Volt (M) Sdn Bhd	53, Jalan 10/91, Taman Shamelin Perkasa, 56100 Kuala Lumpur Malaysia Tel.: 60 3 9283 1648 Fax: 60 3 9283 1649
	Chee Keong (Malaysia) SDN BHD	Lot 44, Jalan Cetak, Tasek Industrial Estate, Tasek 31400 Ipoh, Perak Darul Ridzuan MALAYSIA Tel.: 60 5 5451 411, 547 9170 Fax: 60 5 5460 055, 547 9077 <a href="http://www.parabolite.com">www.parabolite.com</a>
	Escatec Mechatronics Sdn Bhd	8 Jalan Firma 2/1, Kawasan Perindustrian Tebrau 1, 81100 Johor Bahru, Johor Darul Takzim, Malaysia Tel.: 60 7 354 6090 Fax: 60 7 354 6100 <a href="http://www.escatec.com">www.escatec.com</a>
	Hisda Jaya Corp.SDN. BHD.	101, Jalan 1, Kawasan 3, Taman Klang Jaya, 41200 Klang, Selangor Darul Ehsan MALAYSIA Tel.:60 3 3323 4007 Fax: 60 3 3323 2941
	Juan Kuang Energy Saver Sdn Bhd	10, Jalan Firma 1/5, Kawasan Perindustrian Tebrau 1, 81100 Johor Bahru, Johor, Malaysia Tel.: 60 7 358 2846 Fax: 60 7 353 0598 <a href="http://www.jkenergysaver.net/">www.jkenergysaver.net/</a>
	K C Hong Industries Sdn Bhd	No 23 Jalan 10/108C, Taman Sungai Besi, 57100 Kuala Lumpur, Wilayah Persekutuan, Malaysia Tel.: 60 3 7981 5396 Fax: 60 3 7980 9608 <a href="http://www.luxram.com.my">www.luxram.com.my</a>
	Leader Electrical Appliances Mfg. SDN BHD	38C, Jalan SS/25, Damansara Jaya, 47400 Petaling Jaya Selangor Darul Ehsan MALAYSIA Tel.: 60 3 7725 3605, 7725 3487 Fax: 60 3 7725 3654 <a href="http://www.leb.com.my">www.leb.com.my</a>
	Luen Heng Industries Berhad	Lot 17, Medan Tasek, Tasek Industrial Estate, 31400 Ipoh, Perak Darul Ridzuan, Malaysia Tel.: 60 5 545 1899 Fax: 60 5 5469787

	Safer Asia SDN. BHD.	Lot 159, Rawang Integrated, Industrial Park, 48000 Rawang, Selangor Darul Ehsan, MALAYSIA Tel.: 60 3 6092 6212 Fax: 60 3 6092 9161 www.saferasia.com
	Success Electronics & Transformer Manufacturer Sdn Bhd.	No.5 & 7, Jalan TSB 8, Taman Industri Sungai Buloh, 47000 Sungai Buloh, Selangor Darul Ehsan, Malaysia Tel.: 60 3 6157 2788 Fax: 60 3 6157 2722 <a href="http://ses.success.com.my/cms/default.asp">http://ses.success.com.my/cms/default.asp</a>
	Techsteel Corporation Berhad	B1-15/5 Jalan Selaman 1, Dataran Palma Off Jalan Ampang, 68000 Ampang, Selangor Darul Ehsan, Malaysia Tel.: 60 3 4270 2267 Fax: 60 3 4270 2269 www.tacamsteel.com
	Tridonicatco Sdn Bhd	No 1 Jalan Canggih 9, Taman Perindustrian Cemerlang, 81800 Ulu Tiram, Johor Darul Takzim, Malaysia Tel.: 60 7 863 1300/2300 Fax: 60 7 863 3700
	Vantage Industries Sdn Bhd	Lot 125 & 126, Hala Perusahaan Menglembu 11, 31450 Menglembu, Perak Darul Ridzuan, Malaysia Tel.: 60 5 282 1693 Fax: 60 5 282 5862
The Philippines	Advance Metal Company	#593 McArthur Highway, 1400 Caloocan City, The Philippines Tel.: 63 2 367 8510, 367 8511, 367 8485
	Andyco Enterprises	4 Palansa Street Sta. Mesa Heights 1100 Quezon City, The Philippines Tel.: 63 2 714 8165, 714 8272 Fax: 63 2 716 5491, 983 8379
	Genlite Industries	98-A M. Dioquino Street 20th Avenue, Cubao, 1109 Quezon City, The Philippines Tel.: 63 2 929 3570 Fax: 63 2 434 4441
	Homita Electrical and Electronics	Juvie Street, Sitio Malinis Bagbaguin, 1440 Valenzuela, The Philippines Tel.: 63 2 9837852 Fax: 63 2 4434605
	Kopez Manufacturing	7841 Kaingin Road, Apolonio Samson, Quezon City, The Philippines Tel.: 63 2 364-3105 Fax: 63 2 361 8313
	Matsushita Electric Works	Unit D-1, Corinthian Plaza, Garden Level 121 Paseo de Roxas Ave. Legaspi Village, Makati Metro Manila, The Philippines Tel.: 63 2 811 3370 Fax: 63 2 811 3375
	New CHP Industrial Corp	5063 Modesto St., Mapulang Lupa Valenzuela Metro Manila, The Philippines

		Tel.: 63 2 241 1123, 244 6209, 445 0609 Fax: 632-445 0607, 241 1225
	Transcore Industries	2331 R. Fernandez Street Gagalangin Tondo Metro Manila, The Philippines Tel.: 63 2 252 9680, 253 8948 Fax: 63 2 233 1098
	16/35MM Production Supply	UG 17 Star Centrum Building 317 Sen. Gil J. Puyat Avenue, Bel-Air 2, 1200 Makati, The Philippines Tel.: 63 2 817 5707, 843 8615, 893 3849 Fax: 63 2 893 3848
Thailand	C.S.International Electronics Co., Ltd.	999/47-48, M. 9, Sukhumvit Rd., Teprarak, Amphur Muang, Samutprakarn, 10270, Thailand, Tel.: 66 2 758 1261, 756 8801-1 Fax: 66 2 384 3833
	Advance Electric and Electronic Co.,Ltd.	23/218 Moo 8 Pongsirichai Soi 2, Phetkasem Rd., Oomyai, Sampran, Nakhonpathom 73160, Thailand Tel.: 66 2 431 2193 Fax: 66 2 420 9161
	Armstrong Industry (Thailand) Co.,Ltd	100/21 Nonsi Rd., Sathupadit, Yannawa, Bangkok 10120 Thailand Tel: 66 2 294 5254 Fax: 66 2 294 4792
	Be Prompt Trading & Service Co.,Ltd.	28/14 Worrajak Rd., Ban-Batr, Pomprab, Bangkok Thailand Tel.: 66 2 621 0988 - 9 Fax: 66 2 621 0988 - 9
	Buntanaphan Electric Co.,Ltd.	179 Sri Praya Rd., Bangrak, Bangkok 10500, Thailand Tel.: 66 2 236 0054 Fax: 66 2 266 5426 www.electric.co.th
	Dyno Electric Co.,Ltd.	137/7 Moo 17, Puttamonthon Sai 2, Bangramad, Talingchan, Bangkok 10170, Thailand Tel.: 66 2 448 1746 Fax: 66 2 448 1667
	Eastern Syntec Co.,Ltd.	1179/21-25 Rintangrodfaisaipaknam Rd., Khong-Tan, Khongtoey, Bangkok, 10110 Thailand Tel.: 66 2 249 3976 Fax: 66 2 249 7798 www.aeroflex.co.th
	Energy Development (Thailand) Co.,Ltd.	109/69 Moo 4 Ramintra Rd., Kannayao, Bangkok 10230, Thailand Tel.: 66 2 919 7626-7 Fax: 66 2 518 2610 www.kinglightenergy.com
	Estel (Thailand) Co.,Ltd.	

79/5 Moo2, Tambon Mahasawat  
Bangkruay, Nonthaburi 11130 Thailand  
Tel.: 66 2 9852080-90  
Fax: 66 2 985 2310-3



	www.estel.co.th
GE Lighting (Thailand) Co.,Ltd.	191 Silom Complex Bldg., 22nd Flr., Silom Rd. Bangrak Bangkok 10500, Thailand Tel.: 66 2 266 2621 Fax: 66 2 266 2626 www.gelighting.com
Grand Lite Industrial Co.,Ltd.	59/20-22 Puttabucha Rd., Moo 7, Bangmod, Jomthong, Bangkok, Thailand Tel.: 66 2 427 3314 – 5 Fax:
Lamptan Lighting (2001) Co.,Ltd.	32/6 Rachadaphisek Rd. Wat Thapra, Bangkokyai Bangkok, Thailand Tel.: 66 2 457 9564-6 Fax: 66 2 458 0137
Leader Electric Bangkok Co.,Ltd.	286, Soi Suksawat 23, Suksawad Rd.,Bangpakok,Rajburana,Bangkok, 10140, Thailand Tel.: 66 2 428 0138 - 40 Fax: 66 2 428 6972 www.leaderbangkok.wethai.com
Lighting & Equipment Co., Ltd.	539/2, 16/F Gypsum Metropolitan Tower, Sriayudhya Rd., Rahtave, Prayathai, Bangkok, 10400, Thailand, Tel.: 66 2 248 8133 # 340 Fax: 66 2 248 8144 www.le-lighting.wethai.com
MKP Co.,Ltd.	205/7-9 Ratchadapisek Rd., Dindang Bangkok 10320, Thailand. Tel.: 66 2 276 0941-5 Fax: 66 2 276 0946
Mongkol Industrial Works Co.,Ltd.	119 Moo 2 Suksawadi Rd., Bangjak, Prapradang Samutprakarn, Thailand. Tel.: 66 2 462 6121, 462 5922 Fax: 66 2 463 2993
Osram (Thailand) Co.,Ltd.	100/44-46 Sathornnakorn Tower 24th Flr, Sathorn Nua, Silom Bangrak Bangkok 10500, Thailand Tel.: 66 2 636 7475 # 204 Fax: 66 2 636 7477
Philips Electronic (Thailand) Co.,Ltd	60/14 Moo 11, Bangna-Trad Rd., Km. 3, Prakanong, Bangkok 10260, Thailand Tel.: 66 2 399 3980 - 9 Fax: 66 2 398 2083 www.philips.co.th
PRD Technologies Corporation Ltd	151 Ladprao Rd., Ladprao soi 95, Bangkok 10310, Thailand Tel.: 66 2 932 2154 Fax: 66 2 932 3116 www.prctechnologies.co.th
Racer Electric (Thailand) Co., Ltd.	137, Moo 9 Petchkasem 91, Suanluang, Kratumban, Samutsakorn, 74110, Thailand Tel.: 66 2 811 1741 – 5, 66 2 420 0293 Fax: 66 2 420-0393 www.racerlighting.wethai.com

Saengmitr Electric Co., Ltd	Sangmitr Building, 77/21-24, Moo 11, Suanpak Rd., Taling Chan Bangkok, 10170 Thailand, Tel.: 66 2 882 2033 Fax: 66 2 882 2044~48 www.saengmitr.wethai.com
Saengmitr Lighting Co.,Ltd.	1-1/3 Moo 10 Sri Piboon Soi, Salathamsop Bangkok 10170, Thailand Tel.: 66 2 441 1396, 66 2 888 7663-5 Fax: 66 2 441 1956
Safe-T-Cut (Thailand) Co.,Ltd.	999/47-48 Moo. 9, Sukhumvit Rd., Theparak, Muang, Samutprakarn 10270 Thailand Tel.: 66 2 758 1261, 66 2 380 2222 Fax: 66 2 394 7908 www.safe-t-cut.com
Save-Fi Group (1995) Co.,Ltd.	137/1 Moo 2 Suwanatra Soi, Bang Kayang, Muang, Pathumtani, Thailand Tel.: 66 2 975 2739 - 42 Fax: 66 2 598 2391
Slyvania (Thailand) Co.,Ltd.	19 <sup>th</sup> Flr, Ploenchit Center Bldg., 2 Sukhumvit Soi 2 Rd. Klongtoey, Bangkok 10110, Thailand Tel.: 66 2 656 9039 Fax: 66 2 254 3369 www.sli.co.th
SP Electric Industry Co.,Ltd.	390/10 Moo 1, Soi Phetkasame 96, Phetkasame Rd., Bangkae, Bangkok 10160 Thailand Tel.: 66 2 809 1771 - 3 Fax: 66 2 444 1069 www.transformerthailand.com
Sunny Engineering Co., Ltd.	2931-2933 Ladprao Rd., Ladprao, Bangkok, 10230 Thailand Tel.: 66 2 370 2728, 66 2 731 1417-20 Fax: 66 2 370 1672
TECHNICAL AUTOMATION SALE & SERVICE CO., LTD.	33/17 Moo 5, Kukoot, Lumlookkar, Pathumtani, Thailand Tel.: 662 987 7660 -3 Fax: 66 2 987 7664
Teeramongkol Electric LP.	3761/270-272 Yudee New District Rd., Bangklo Bangkorlam Bangkok 10120, Thailand Tel.: 66 2 289 4665 Fax: 66 2 291 2722
Teeya Phaiboon Co., Ltd.	59/2 Soi Soonvijai 14, New Petchburi Rd. Bangkok, Huaykwang, Bangkok, Thailand Tel.: 66 2 718 2450 Fax: 66 2 718 2252
Thai Energy Conservation Co.,Ltd.	306/16 Moo 1, Soi Petkasem 96, Bangkae, Bangkok 10160 Thailand Tel.: 66 2 809 1601-4 Fax: 66 2 809 1605 www.econo-watd.wethai.com

	Thai Toshiba Lighting Co.,Ltd.	Bangkadi Industrial Park, 144 Moo 5, Tivanon Road, Amphur Muang, Pathumthani 12000, Thailand Tel.: 66 2 501 1425-9 Fax: 66 2 501 1431 www.toshiba.co.th
	Thai Unilux Co.,Ltd.	99/160-162 Tessabarn Songkror Rd. Prachanivet 1, Ladyao, Jatujak Bangkok 10900, Thailand Tel.: 66 2 954 3306 - 8 Fax: 66 2 589 4887 www.thaicommerce.net/thai-unilux
	Thaisun Electric Co.,Ltd.	395/20 Charoenkrung, Pradu 1, Bangklo, Bangkolam, Bangkok 10120, Thailand Tel.: 66 2 289 2678 Fax:
	Thong Russamee Electric Works Co.,Ltd.	538/3 Suksawad Lane 29 (Radburana 22) Suksawad Road, Radburana Bangkok Thailand Tel.: 66 2 427 7464 Fax: 66 2 428 0589
	Thorn Lighting (Thailand) Ltd.	246 Timesquare Building, 21st Flr, Sukhumvit Rd., Bangkok 10110, Thailand. Tel.: 66 2 2500898-9 Fax: 66 2 267 8437 www.thornlighting.com
	Witsanu Electric LP.	1546 Teparak, Mahamongkut, Sumrongnua, Samutprakarn, Thailand Tel.: 66 2 385 0614, 66 2 385 3087 Fax:
	Woslo-Schwabe (Thailand) Co.,Ltd.	250 Industrial Estate, Chalongkrung Rd. Lamplatiw, Ladkrabang Bangkok, Thailand Tel.: 66 2 326 0036, 66 2 326 1131 Fax: 66 2 326 0572 www.vossloh-schwabe.com
Vietnam	Dien Quang Lamp Company	125 Ham Nghi street, distrist 1, HCM City, Vietnam Tel.: 84 8 8290135, 8216734, 8213359, 8225265 Fax: 84 8 8251518 www.dienquang.com
	Phuong Dong Dong Tien Private Enterprise	304 Dien Bien Phu, Ward 4, Dist. 3, Hochiminh City, Vietnam Tel: 84 8 8326714, 8334234 Fax: 84 8 8334721, 8344607
	Rang Dong Lamp and Thermos Company	15 Ha Dinh, Thanh Xuan District, Hanoi, Vietnam Tel: 84 4 858-4310/ 4165 Fax: 84 4 8585038
	Viet Nam Electric Wire and Cable Company (CADIVI)	70-72 Nam Ky Khoi Nghia, Dist. 1, Hochiminh City, Vietnam Tel: 84 8 8292972, 8299443 Fax: 84 8 8299437

## Appendix C: List of Testing Laboratories in ASEAN

Country	Name	Address
Indonesia	PLN (Persero) Jasa Teknik Kelistrikan	Jl. Duren Tiga 12760 JAKARTA, Indonesia Tel.: 62 21 798 0190 Fax: 62 21 797 5414
Malaysia	SIRIM QAS Sbn. Bhd.	Building 12, SIRIM Complex, 1, Persiaran Dato' Menteri, P.O. Box 7035, 40911 Shah Alam, Selangor, Malaysia Tel.: 60 3 55446161, 55446060 Fax: 60 3 55446272 www.sirim.my
The Philippines	The Lighting and Appliance Testing Laboratory (LATL)	PNOC-ERDC Compound, Commonwealth Avenue, Ciliman, Quecon City 1128, The Philippines Tel.: 63 2 929 5453, 927 7201, 927 7137 Fax: 632 929 5474
Singapore	PSB Corporation	1 Science Park Drive, Singapore 118221 Tel.: 65 6778 7777 Fax: 65 6776 1568 www.psbcorp.com
Thailand	Electrical and Electronics Institute	Bangpoo Industrial Estate, Soi 8, 975 Moo 4, Sukumvit Road, K.M. 37, Praeksa, Muang, Samutprakran 10280, Thailand Tel.: 66 2709 4860-8 Fax: 66 2 324 0917-8 www.thaieei.com
	Metropolitan Electricity Authority (MEA)-Testing Laboratory-Samsen Branch	809 Samsen Road, Nakornchaisri, Dusit District, Bangkok 10300 Tel.: 66 2 241 5382, 2430121, 2430131 Fax.:

Note: Testing Laboratories mentioned above have been accredited to ISO/IEC 17025.

## Appendix D: Impact Analysis

### Assumptions used in the analysis

Due to the lack of comprehensive fluorescent lamp ballast consumption data, the analysis of the impacts of energy efficiency standards and labeling programs for fluorescent lamp ballasts gives emphasis to reduction of electricity peak demand from 2006 to 2014. The corresponding energy savings are derived from the accumulation of decreased energy consumption due to more efficient fluorescent ballasts over the next ten years. The assumptions used in the analysis are given in Table D-1.

**Table D-1: Assumptions for Impact Analysis**

Particular	Assumption	Basis or Source
Year effective of S&L program	2006	
Regional Market Size	100 million units (2004)	Based on survey questionnaires, statistical data and industry interviews
Ballast market growth	2% per annum	
Average watt loss and daily usage hours	Standard Ballast= 10 W Low Loss Ballast = 6 W Electronic Ballast = 3 W Daily usage hours = 6 hrs.	Based on survey questionnaires and industry interviews
Coincidence Factor for fluorescent lamps	0.6	
Penetration rate of low loss magnetic ballasts	Business as Usual: 2% per annum Scenario I: 5% per annum Scenario II: 10% per annum	
Penetration rate of electronic ballasts	Business as Usual: 0.1% per annum Scenario I: 0.1% per annum Scenario II: 0.1% per annum	

### Energy Savings and Benefits Calculation

Given the limitation of available data, the energy savings calculations are based on units of energy loss of each type of fluorescent lamp ballast and new ballasts purchased over the next ten years. The following equations are used in the calculation of electricity peak demand and energy demand for new ballasts included in the analysis.

$$\text{Electricity Peak Demand (MW)} = \Sigma [\text{Number of each type of new ballasts (in million)} \times \text{Average nominal watt loss (W)} \times \text{Coincidence Factor}] \quad (1)$$

$$\text{Energy Demand (GWh)} = 365 \times \text{Daily operating hours} \times \Sigma [\text{Number of each type of new ballasts (in million)} \times \text{Average nominal watt loss (W)}] / 1000 \quad (2)$$

### Potential Peak Demand and Energy Saving

The potential 100 to 200 MW peak demand saving and 500 to 1,000 GWh cumulative energy saving over 10-year period, shown in Table B-4, are conservatively estimated from the assumptions on daily usage patterns of energy efficient fluorescent lamp ballasts. The number of energy efficient fluorescent lamp ballasts increases as per assumptions in scenario

I and II. The analysis of benefits from energy S&L programs in this report does not include other indirect social, environmental, and economic benefits.

**Table D-2: Analysis of Demand Growth due to New Fluorescent Lamp Ballasts in ASEAN and Potential Saving**

Analysis Parameters																																	
Base year	2004																																
Annual Ballast Consumption (million units)	100																																
Coincident factor of ballast in system peak	0.80																																
Hours of lamp operation per day	6																																
	Watt Loss (W)																																
Standard Loss Electromagnetic Ballast	10																																
Low Loss Electromagnetic Ballast	6																																
Electronic Ballast	3																																
Business As Usual																																	
Ballast Market Growth	2%																																
Low loss for standard loss market penetration rate	2.0%																																
Electronic for standard loss penetration rate	0.1%																																
Additional Electricity Demand	2004			2005			2006			2007			2008			2009			2010			2011			2012			2013			2014		
Type of fluorescent lamp ballast	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)			
Standard Loss Electromagnetic Ballast	82.0%	82.0	820.0	82.0%	83.6	836.4	80.3%	83.6	836.2	79.6%	83.4	834.0	76.9%	83.3	832.8	75.3%	83.2	831.7	73.7%	83.0	830.5	72.2%	82.9	829.3	70.7%	82.8	828.1	69.2%	82.7	826.9	67.7%	82.6	825.8
Low Loss Electromagnetic Ballast	15.0%	15.0	90.0	15.0%	15.3	91.8	16.6%	17.3	103.9	16.2%	19.4	116.2	19.6%	21.5	128.7	21.4%	23.6	141.5	22.9%	26.7	164.5	24.3%	28.0	167.7	25.8%	30.2	181.2	27.2%	32.5	195.0	28.6%	34.8	209.0
Electronic Ballast	3.0%	3.0	9.0	3.0%	3.1	9.2	3.1%	3.2	9.6	3.2%	3.4	10.1	3.2%	3.5	10.5	3.3%	3.7	11.0	3.4%	3.8	11.5	3.5%	4.0	11.9	3.5%	4.1	12.4	3.6%	4.3	12.9	3.7%	4.5	13.5
<b>Total Additional Electricity Demand</b>		<b>100.0</b>	<b>919</b>		<b>102.0</b>	<b>937</b>		<b>104.0</b>	<b>949</b>		<b>106.1</b>	<b>960</b>		<b>108.2</b>	<b>972</b>		<b>110.4</b>	<b>984</b>		<b>112.6</b>	<b>996</b>		<b>114.9</b>	<b>1009</b>		<b>117.2</b>	<b>1022</b>		<b>119.5</b>	<b>1035</b>		<b>121.9</b>	<b>1048</b>
<b>Total annual additional Energy Demand (GWh)</b>			<b>1963</b>			<b>2002</b>			<b>2026</b>			<b>2051</b>			<b>2076</b>			<b>2102</b>			<b>2128</b>			<b>2155</b>			<b>2183</b>			<b>2211</b>			<b>2239</b>
Scenario I																																	
Ballast Market Growth	2%																																
Low loss for standard loss market penetration rate	5%																																
Electronic for standard loss penetration rate	0.1%																																
Additional Electricity Demand	2004			2005			2006			2007			2008			2009			2010			2011			2012			2013			2014		
Type of fluorescent lamp ballast	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)			
Standard Loss Electromagnetic Ballast	82.0%	82.0	820.0	82.0%	83.6	836.4	77.8%	81.0	809.6	73.6%	79.4	793.7	70.1%	75.9	759.6	66.5%	73.4	734.3	63.1%	71.1	710.8	59.9%	68.8	688.0	56.8%	66.6	666.0	53.9%	64.5	644.7	52.4%	62.4	624.0
Low Loss Electromagnetic Ballast	15.0%	15.0	90.0	15.0%	15.3	91.8	19.1%	19.9	119.2	23.0%	24.4	146.4	26.7%	28.9	173.3	30.2%	33.3	200.0	33.5%	37.7	226.4	36.7%	42.1	252.7	39.7%	46.5	278.8	42.5%	50.6	304.8	45.2%	55.1	330.6
Electronic Ballast	3.0%	3.0	9.0	3.0%	3.1	9.2	3.1%	3.2	9.6	3.2%	3.4	10.1	3.2%	3.5	10.5	3.3%	3.6	10.9	3.4%	3.8	11.4	3.4%	3.9	11.6	3.5%	4.1	12.3	3.6%	4.2	12.7	3.6%	4.4	13.3
<b>Total Additional Electricity Demand</b>		<b>100.0</b>	<b>919</b>		<b>102.0</b>	<b>937</b>		<b>104.0</b>	<b>938</b>		<b>106.1</b>	<b>940</b>		<b>108.2</b>	<b>942</b>		<b>110.4</b>	<b>945</b>		<b>112.6</b>	<b>948</b>		<b>114.9</b>	<b>953</b>		<b>117.2</b>	<b>957</b>		<b>119.5</b>	<b>962</b>		<b>121.9</b>	<b>968</b>
<b>Total annual additional Energy Demand (GWh)</b>			<b>1963</b>			<b>2002</b>			<b>2005</b>			<b>2008</b>			<b>2013</b>			<b>2019</b>			<b>2026</b>			<b>2035</b>			<b>2044</b>			<b>2055</b>			<b>2067</b>
Scenario II																																	
Ballast Market Growth	2%																																
Low loss for standard loss market penetration rate	10%																																
Electronic for standard loss penetration rate	0.1%																																
Additional Electricity Demand	2004			2005			2006			2007			2008			2009			2010			2011			2012			2013			2014		
Type of fluorescent lamp ballast	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)	Market Share (%)	Estimated new ballasts/year (million units)	Watt Loss due to new Ballast installed (MW)			
Standard Loss Electromagnetic Ballast	82.0%	82.0	820.0	82.0%	83.6	836.4	73.7%	76.7	767.0	66.3%	70.3	703.3	59.6%	64.5	644.9	53.6%	59.1	591.4	48.2%	54.2	542.3	43.3%	49.7	497.2	38.9%	45.6	456.0	35.0%	41.8	418.1	31.5%	38.3	383.4
Low Loss Electromagnetic Ballast	15.0%	15.0	90.0	15.0%	15.3	91.8	23.2%	24.1	144.8	30.6%	32.4	194.7	37.2%	40.3	241.6	43.2%	47.6	296.9	48.5%	54.6	327.6	53.3%	61.3	367.5	57.7%	67.6	405.3	61.5%	73.6	441.3	66.0%	79.3	475.8
Electronic Ballast	3.0%	3.0	9.0	3.0%	3.1	9.2	3.1%	3.2	9.6	3.2%	3.3	10.0	3.2%	3.5	10.5	3.3%	3.6	10.9	3.3%	3.8	11.3	3.4%	3.9	11.7	3.4%	4.0	12.0	3.5%	4.1	12.4	3.5%	4.3	12.8
<b>Total Additional Electricity Demand</b>		<b>100.0</b>	<b>919</b>		<b>102.0</b>	<b>937</b>		<b>104.0</b>	<b>921</b>		<b>106.1</b>	<b>906</b>		<b>108.2</b>	<b>887</b>		<b>110.4</b>	<b>868</b>		<b>112.6</b>	<b>851</b>		<b>114.9</b>	<b>836</b>		<b>117.2</b>	<b>823</b>		<b>119.5</b>	<b>812</b>		<b>121.9</b>	<b>802</b>
<b>Total annual additional Energy Demand (GWh)</b>			<b>1963</b>			<b>2002</b>			<b>1968</b>			<b>1939</b>			<b>1916</b>			<b>1897</b>			<b>1883</b>			<b>1872</b>			<b>1865</b>			<b>1862</b>			<b>1862</b>

**Table D-3: Summary Demand Growth due to New Fluorescent Lamp Ballasts in ASEAN and Potential Saving**

Description	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Additional Peak Demand - Business as Usual (MW)	919	937	949	960	972	984	996	1009	1022	1035	1048
Additional Peak Demand - Scenario I (MW)	919	937	938	940	942	945	949	953	957	962	968
Additional Peak Demand - Scenario II (MW)	919	937	921	908	897	888	881	876	873	872	872
Peak Demand saving, base case vs. scenario I, (MW)	0	0	10	20	30	39	48	56	65	73	80
Peak Demand saving, base case vs. scenario II, (MW)	0	0	27	52	75	96	115	133	148	163	176
Energy Demand from new Ballasts - Business as Usual (GWh)	1963	2002	2026	2051	2076	2102	2128	2155	2183	2211	2239
Energy Demand from new Ballasts - Scenario I (GWh)	1963	2002	2005	2008	2013	2019	2026	2035	2044	2055	2067
Energy Demand from new Ballasts - Scenario II (GWh)	1963	2002	1968	1939	1916	1897	1883	1872	1865	1862	1862
Cumulative Energy saving from EE Ballasts - Scenario I, (GWh)	0	0	22	65	128	211	313	434	572	727	899
Cumulative Energy saving from EE Ballasts - Scenario II, (GWh)	0	0	58	170	330	535	781	1064	1382	1730	2106

