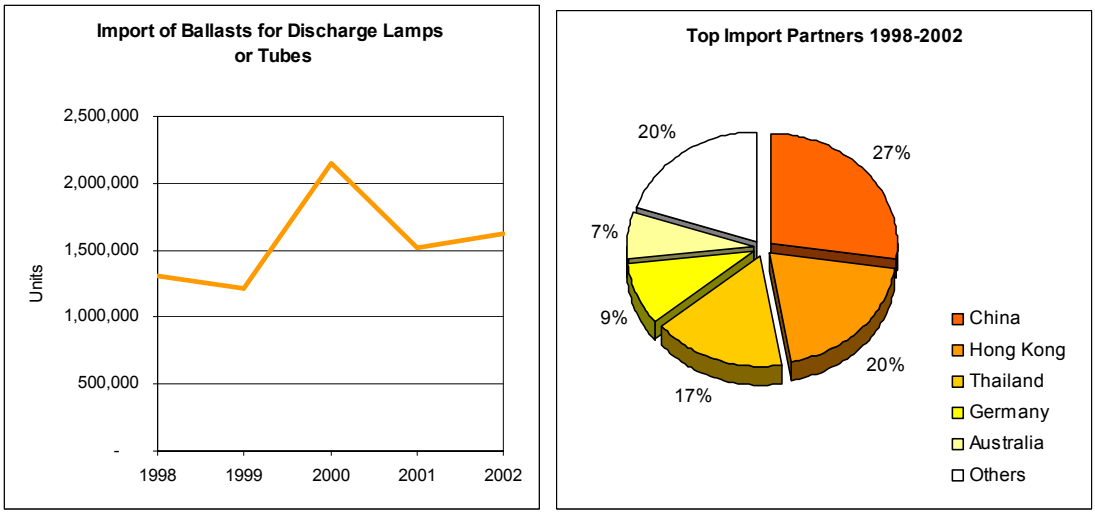
production capacity is 8-10 million units. Most of them are located in Metro Manila. Among these manufacturers, only one produces a small number of electronic ballasts.

Based on survey questionnaires and telephone interviews, limited numbers of low-loss electromagnetic ballasts are manufactured in the Philippines, approximately 200,000 to 300,000 units per annum, despite the fact that Philippine manufacturers are capable of producing more low-loss magnetic ballasts and the mandatory labeling program for fluorescent lamp ballasts is already in place. The majority of the low loss ballast production is for export purposes.

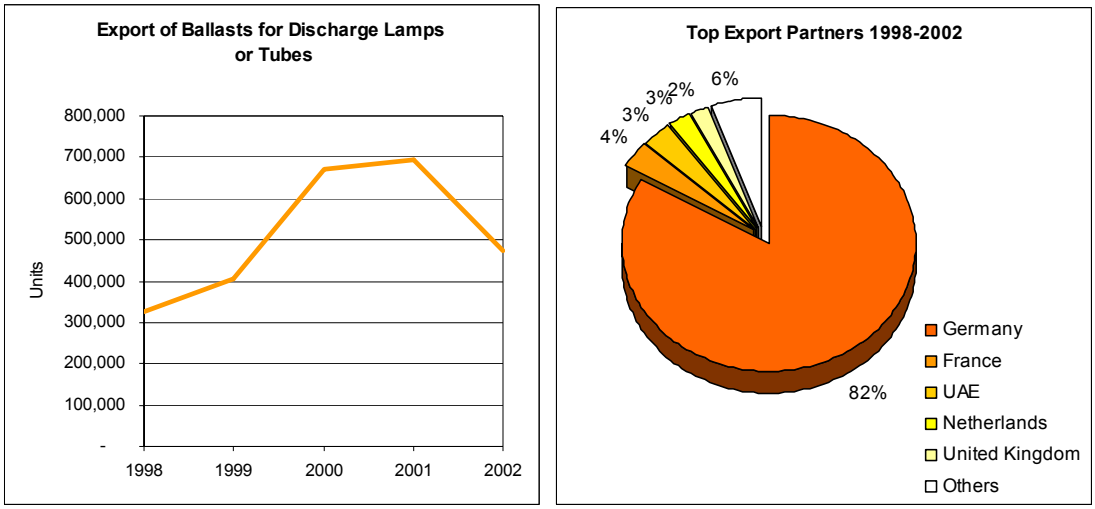
Given the gap between domestic demand and local production capacity, the Philippines should annually import about 10 million units. However, based on Import Commodity Clearance (ICC) records from the Bureau of Product Standards (BPS), volumes of imported ballasts that obtained ICC marks from BPS have varied in a range of 500,000 to 1 million units per year since 2000. There is no single explanation as to why the total supply is still below the market demand, however, it is expected that this may be due to the illegal trade of ballasts. Most fluorescent lamp ballasts imported are the standard loss electromagnetic type.



Source: The United Nations Statistics Division (UNSD)

Figure 17: Philippines' Import of Ballasts for Discharge Lamps or Tubes, 1998-2002

Although the ballast production capacity is lower than the demand, the Philippines still exports small amounts of low loss magnetic ballasts and electronic ballasts to European and Latin American countries.



Source: The United Nations Statistics Division (UNSD)

Figure 18: Philippines' Export of Ballasts for Discharge Lamps or Tubes, 1998-2002

2.7.3 Institutional Framework

Energy Policy and Regulatory Body

The Philippines' Department of Energy (DOE) is responsible for long-term policy, planning, strategy formulation and the monitoring of national energy programs. The DOE has drafted the 10-year Energy Plan (1999-2008). The objectives of which are to achieve include security of energy supply, affordable and reasonable energy prices and socially and environmentally compatible energy infrastructures and projects. The plan's main activities are energy self-sufficiency, deregulation/liberalization and private sector participation, and development of renewable energy sources for off-grid areas.

Under the Philippines Department of Energy, various organizations are responsible for the Philippine Power Industry, i.e. the National Power Corporation (NAPOCOR), and the National Electrification Administration (NEA) which will be illustrated in the next section. The Energy Regulatory Commission (ERC)[11] is the sole authority responsible for pricing, quality of service, and competition regulation. The ERC is also working on determining, fixing, and approving transmission and distribution, wheeling charges, and retails rates. The ERC also fixes and regulates the rates and charges to be imposed by Distribution Utilities on their Captive End-Users including self-generating entities.

Electricity Utility:

NAPOCOR was the sole authority for the production and high voltage transmission of electricity until 1987 when the power sector was opened to private sector participation. It also has the mandate to develop the economy's hydropower resources. NAPOCOR through its Strategic Power Utilities Group (or SPUG) is also mandated to extend electricity service to

[11] The Energy Regulatory Commission (ERC) was created under Republic Act No. 9136, otherwise known as the Electric Power Industry Reform Act (EIRA). Said Act abolished the Energy Regulatory Board (ERB) created under Executive Order No. 172, as amended.

remote areas. SPUG installs decentralized diesel generators and assists local distribution utilities in the installation of distribution lines.

The NEA is in charge of the government's program of total electrification of the economy through the 119 electric cooperatives, which are owned by the member-consumers.

The distribution and sale of electricity to end-users throughout the country is performed by 142 distribution utilities, composed of 119 electric cooperatives, 17 investor-owned companies, and 6 local-government owned utilities. As of 2000, these utilities served 10.2 million customers, 5.3 million of which were connected to electric cooperatives. The Manila Electric Company (MERALCO), an investor-owned company, purchases power from NAPOCOR and other Independent Power Producers (IPPs) and distributes power in Metro Manila and its surrounding areas. NAPOCOR serves most of the rest of the country through the aforementioned private distribution companies and electrical cooperatives.

Standards, Accreditation, and Testing Body

The Bureau of Product Standards (BPS) under the Department of Trade and Industry (DTI) is the Philippines' National Standard Body (NSB). BPS is mandated to develop, implement and coordinate standardization activities in the Philippines.

Fluorescent lamp ballasts are one of the products under mandatory certification by the Bureau of Product Standards (BPS). Under this mandatory certification, a product (whether locally produced or imported) is required to pass certain qualification requirements before it can be sold in the market. Local manufacturers are required to undertake factory and product assessment through BPS. This involves a company audit wherein the manufacturer's plant is assessed in its capability to produce consistent product quality. The production process is checked for compliance as to applicable standards, and the product is evaluated for conformance to minimum standard requirements. Under new BPS procedures, companies are assessed on the basis of the ISO 9000 series standards. Although companies are not required to obtain an ISO 9000 certification, the assessment procedures applied are similar.

Importers of products covered by the mandatory standards are required to obtain an Import Commodity Clearance (ICC) from the BPS. Import shipments are subject to sampling and testing, including those that have been certified abroad, as meeting international standards.

Figure 19: Philippines Standard (PS) Quality and/or Certification Mark

All types of ballasts for fluorescent lamps are now covered by a mandatory certification standard. The safety standards for electromagnetic ballasts were implemented in 1982 and immediately followed by implementation of mandatory ballast general performance standards. In 1996, the safety and performance certification for electronic ballasts were mandated after completion of the Philippines National Standards or PNS. Shown below are the current PNS standards with respect to fluorescent ballasts.

Table 10: Philippines National Standards for Fluorescent Lamp Ballasts

National Standard Number	Reference Standard
PNS 12-1: 1996 – Ballast for Tubular Fluorescent Lamps: General & Safety Requirements	IEC 60920
PNS 12-2: 1996 – Ballast for Tubular Fluorescent Performance Requirements	IEC 60921
PNS 12-3:1999 - Lamps and related equipment-Electromagnetic ballast – Energy standards and labeling requirements	N/A
PNS 135-1: 1997 – AC Supplied Electronic Ballast for Tubular Fluorescent Lamps – General & Safety Requirements	IEC 60928
PNS 135-2: 1993 – AC Supplied Electronic Ballast For Tubular Fluorescent Lamps – Performance Requirements	IEC 60929

Source: Lighting and Appliance Testing Laboratory (LATL)

BPS also acts as an accreditation body under the DTI-BPS Laboratory Accreditation Scheme. BPS is a member of Asia Pacific Laboratory Accreditation Co-operation (APLAC). The Lighting and Appliance Testing Laboratory (LATL) is the only accredited lamp and ballast testing laboratory (according to ISO/IEC 17025). LATL is a government body operated under the Energy Research and Testing Laboratories Services (ERTLS) under the Department of Energy (DOE). Accreditation covers electrical testing of compact fluorescent lamps on the following performance characteristics: light output, power input, input voltage, power factor, input current, and efficiency. LATL initiated the development of an energy efficiency standard and labeling for fluorescent lamp ballasts in 1997.

2.7.4 Standards and Labeling Program

The Philippines appliance energy efficiency certification and labeling program is a government-driven initiative. It is a joint program of the Philippines Department of Energy (DOE) and the Department of Trade and Industry-Bureau of Product Standards (DTI-BPS). The domestic institutional framework for energy labeling programs of household appliances and lighting systems is shown in the Figure 20.

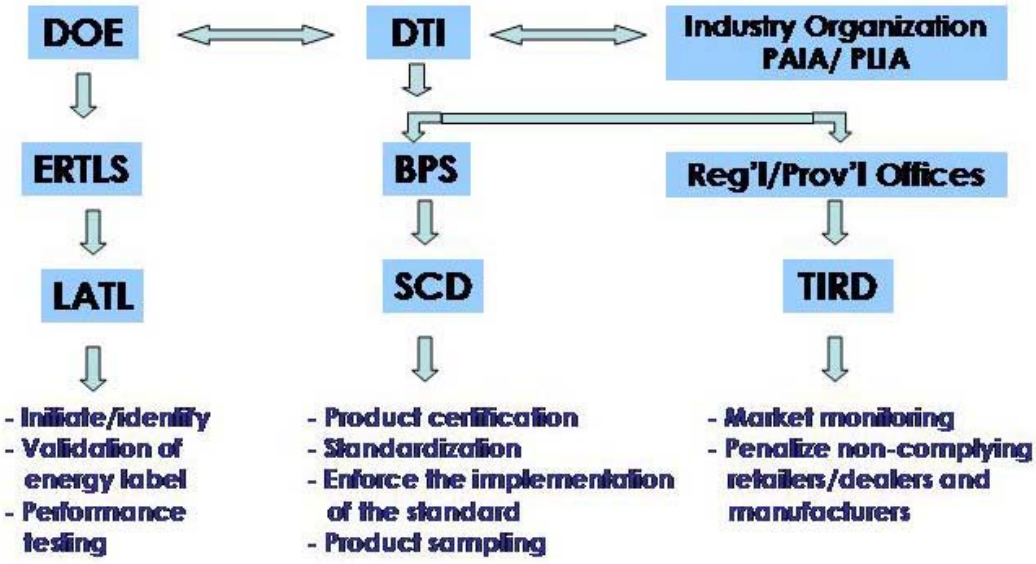


Figure 20: Institutional Framework for the Energy Labeling Program for Household Appliances and Lighting Systems

The Philippines began its first energy efficiency standards and labeling (S&L) program for Room Air-Conditioners (RAC) in 1992. Following the success of the RAC initiative, the S&L program for refrigerators was introduced in 1999. The implementing guidelines of the S&L programs for fluorescent lamp ballasts and compact fluorescent lamps (CFLs) were signed in late 2002. Labeling of CFLs also began in 2002 but labeling of ballasts began in September 2003. The Philippines is also considering to enhance its S&L strategy to cover more products and equipment such as tubular fluorescent lamps, electric fans and industrial fans and blowers.

In November 2000, BPS approved and endorsed implementation of standard PNS 12-3:1999 ("Lamps and related equipment-Electromagnetic ballast – Energy standards and labeling requirements"). This standard prescribes the maximum power loss and labeling requirements of electromagnetic ballasts (shown in Table 11). Suppliers and importers are required to label the individual fluorescent lamp ballast by power consumed or power losses. (Figure 21 illustrates the label for electromagnetic ballasts.) Implementing guidelines were signed by the stakeholders in August of 2002, and product testing and labeling commenced in September of 2003. The market monitoring (to verify compliance of manufacturers and retailers on the labeling program) will begin in July of 2004.

Table 11 : Classification of Maximum Ballast Power Loss

Pre-heat ballast power loss				
Ballast Rating	**Class A**	**Class B**	**Class C**	**Class D**
1x18/20 W and 1x36/40 W	Up to 7 W	Above 7 W up to 8 W	Above 8 W up to 10 W	Above 10 W up to 12 W
Rapid start ballast power loss				
Ballast Rating	**Class A**	**Class B**	**Class C**	**Class D**
1x18/20 W and 1x36/40 W	Up to 12 W	Above 12 W up to 13 W	Above 13 W up to 15 W	Above 15 W up to 18 W
2x36/40 W	Up to 17 W	Above 17 W up to 17 W	Above 18 W up to 20 W	Above 20 W up to 30 W

Source: Lighting and Appliance Testing Laboratory (LATL)

Figure 21: Energy Label for Electromagnetic Ballasts in the Philippines

2.8 Singapore

2.8.1 Overview

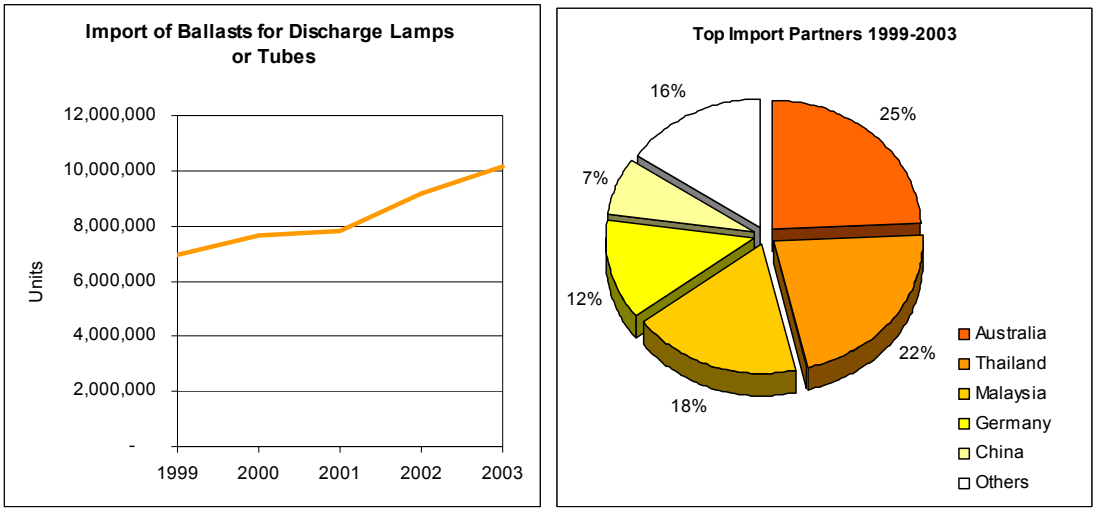
Singapore is a small island nation without indigenous energy resources. With 4.3 million people in 692.7 square kilometers, Singapore is the most densely-populated independent country in the world. However, Singapore enjoys a highly-developed and successful free-market economy characterized by a remarkably open trading environment with stable prices. The economy depends heavily on exports, particularly in electronics and manufacturing. Singapore's per capita GDP is one of the highest in the world.

The electricity industry in Singapore is being restructured to implement an electricity market structure. Energy conservation has been actively promoted and pursued at a national level through a series of fiscal and non-fiscal policies with the objective of improving overall system efficiency through better load management.

2.8.2 Ballast Market

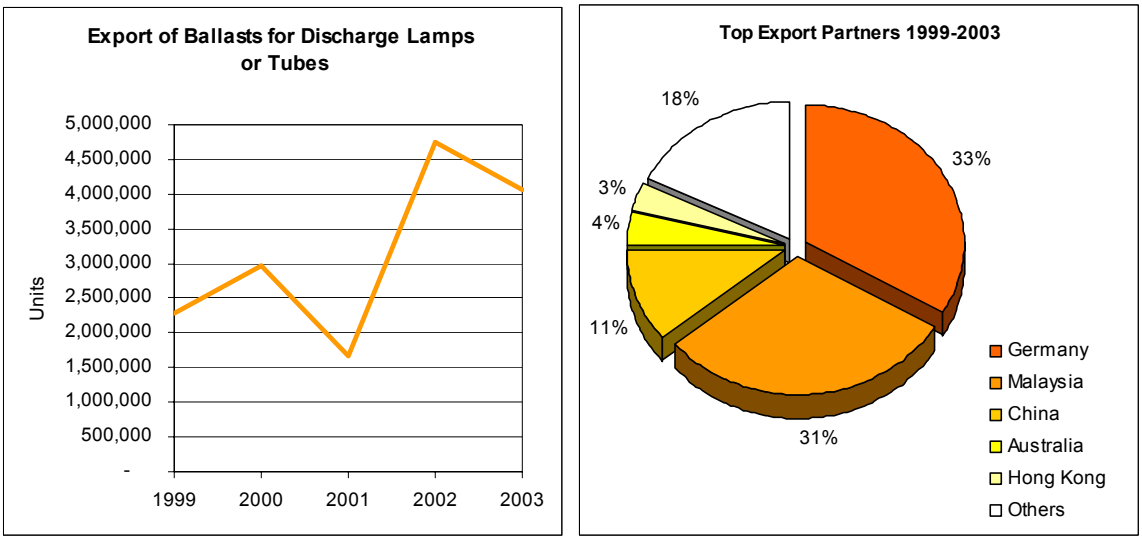
There is no fluorescent lamp ballast manufacturer in Singapore. Consequently, demand for fluorescent lamp ballasts is served by importation. According to 2001-2003 import/export statistics provided by the Singapore Trade Statistics and the United Nations Statistic Division, approximately 9-10 million units of ballasts for discharge lamps or tubes were imported annually into Singapore. Of those 10 million, 3-4 million units are re-exported to other countries. The majority of imported ballasts are from Australia, Thailand and Malaysia. The largest export market is Germany.

It is difficult to estimate the marketshare of various ballast technologies, however, based on interviews with government officials low watt loss electromagnetic and electronic ballasts are expected to acquire a higher share, compared with other countries in the region.



Source: The United Nations Statistics Division (UNSD)

Figure 22: Singapore's Import of Ballasts for Discharge Lamps or Tubes, 1999-2003



Source: The United Nations Statistics Division (UNSD)

Figure 23: Singapore's Export of Ballasts for Discharge Lamps or Tubes, 1999-2003

2.8.3 Institutional Framework

Energy Policy and Regulatory Body

Energy efficiency programs and projects in Singapore have been collaborative efforts among the National Energy Efficiency Committee (NEEC) and other private sector organizations such as trade associations, NGOs, etc. NEEC was formed in 2001. Members of the NEEC Main Committee are representatives of various government agencies. The NEEC Main Committee is assisted by four sub-committees (the Industry Sub-Committee, the Building Sub-Committee, the Transportation Sub-Committee and the Consumer/Household Sub-Committee; there is also an R&D Working Group). In addition to energy efficiency, NEEC also promotes energy conservation through the use of cleaner fuel sources and renewable energy resources.

Electricity Utility

There are four major electricity generation companies in Singapore: PowerSenoko Ltd., PowerSeraya Ltd., Tuas Power Ltd., and Semb Corp Cogen. The total generating capacity at the end of 2000 was about 6,600 MW. Combined Cycle plants (including gas turbine plants) and the Ministry of Environment's incinerator power plants represent about 19% and 3.5% of total generating capacity respectively. The total electricity generated in 2000 was about 31,000 GWh. The transmission and distribution networks in Singapore are fully-underground cable systems.

Standards, Accreditation, and Testing Body

SPRING Singapore (Standards, Productivity and Innovation for Growth) was established in 2002. As the national standards body, SPRING is empowered by law to establish and publish Singapore's standards for products, processes, and services. National standards published by SPRING Singapore are known as Singapore Standards (SS).

SPRING also administers the Consumer Protection (Safety Requirements) Registration Scheme which requires all traders and manufacturers of consumer products to ensure that the products they sell meet specified safety standards requirements. Ballasts for tubular fluorescent lamps are listed as controlled goods under this scheme. Table 12 below shows the current SS standards with respect to fluorescent ballasts.

Table 12: Singapore National Standards for Fluorescent Lamp Ballasts

National Standard Number	Reference Standard
SS 490: Part 2: 8: 2001– Ballast for Tubular Fluorescent Lamps: General & Safety Requirements	IEC 60920
SS 491: 2001	IEC 60921
SS 490: Part 2: 3: 2002– AC Supplied Electronic Ballast for Tubular Fluorescent Lamps – General & Safety Requirements	IEC 60928
SS 380: Part 2: 1996	IEC 60929

Source: SPRING Singapore

Figure 24: Singapore Safety Mark

The Singapore Accreditation Council (SAC) (formed in 1996) is the national agency for accreditation of conformity assessment bodies. SAC operates under SPRING and the Singapore Laboratory Accreditation Scheme (SAC-SINGLAS). It is a national agency that evaluates the technical competence of testing and calibration laboratories based on the general requirements of ISO/IEC 17025 and the specific technical requirements of each field.

There are a number of electrical and electronic testing laboratories being accredited under SAC-SINGLAS to ISO17025. However, PSB Corporation's Testing Group is the largest testing service, product certification, and inspection service in Singapore. PSB Corporation's Testing Group was officially designated as a Conformity Assessment Body (CAB) and registered by SPRING Singapore. PSB has established two subsidiaries in China and Thailand.

2.8.4 Standards and Labeling Program

The Singapore Green Labeling Scheme (SGLS), a voluntary labeling scheme, was launched in 1992. The scheme promotes the use of a wide range of environmentally–friendly products, including ballasts. Generally, no energy performance is shown on the Green Label. A new comparative label, the "Energy Labeling Scheme", was launched in 2002 under the umbrella of the SGLS. Currently, only two categories of electrical appliances (refrigerators and air-conditioners) are covered by the scheme. The Energy Labeling program is administered by the Singapore Environment Council (SEC) as part of the Singapore Green Labeling Scheme (SGLS) and supported by the National Energy Efficiency Committee (NEEC) and the National Environment Agency (NEA). (Figure 25 illustrates Singapore's "green label" and "energy label".)

Figure 25: Singaporean Green Label and Energy Label

2.9 Thailand

2.9.1 Overview

Thailand produces a modest amount of crude oil but significant amounts of natural gas. Thailand is also endowed with abundant agriculturally-based biomass resources. However, nearly 60% of the total energy demand in Thailand is dependent on imported energy. Oil dominates fuel use, approximately 70% share in the final energy consumption. Electricity consumption represents about 18% of the final energy consumption with the rest being coal, lignite, and natural gas. The electrification rate in Thailand is greater than 99%.

The government of Thailand has been promoting energy conservation in all sectors through various strategies, including energy efficiency and renewable energy use. Thailand was the first country in Asia to introduce a nation-wide demand-side management (DSM) program in which energy conservation was one of the key components. The DSM program (led by the Electricity Generating Authority of Thailand or EGAT) has delivered successes and has become a model for DSM initiatives for other countries around the world. As of June 2000, it was estimated that the program has conserved 755 MW of peak demand and 3,610 GWh of energy.

The first energy efficiency standards and labeling program focused on a single lighting product: fluorescent tubes. The program was successful as it transformed the domestic market from (T12) fluorescent tubes to higher efficiency models (T8s) within 2 years. Following the success of the fluorescent tube program, energy efficiency standards and labeling has been expanded to cover seven more products including electromagnetic ballasts for fluorescent lamps. Mandatory Minimum Energy Performance Standards (MEPS) for fluorescent lamp ballasts are also under consideration by the Thai government.

2.9.2 Ballast Market

General Situation

Domestic fluorescent lamp ballast consumption has been steady over the past five years, accounting for 18 to 20 million units per annum. The growth of the ballast market is dependent upon the local building and construction market. Standard electromagnetic ballasts account for 65% of the total demand. Low watt loss electromagnetic and electronic ballasts account for 32% and 3%, respectively.

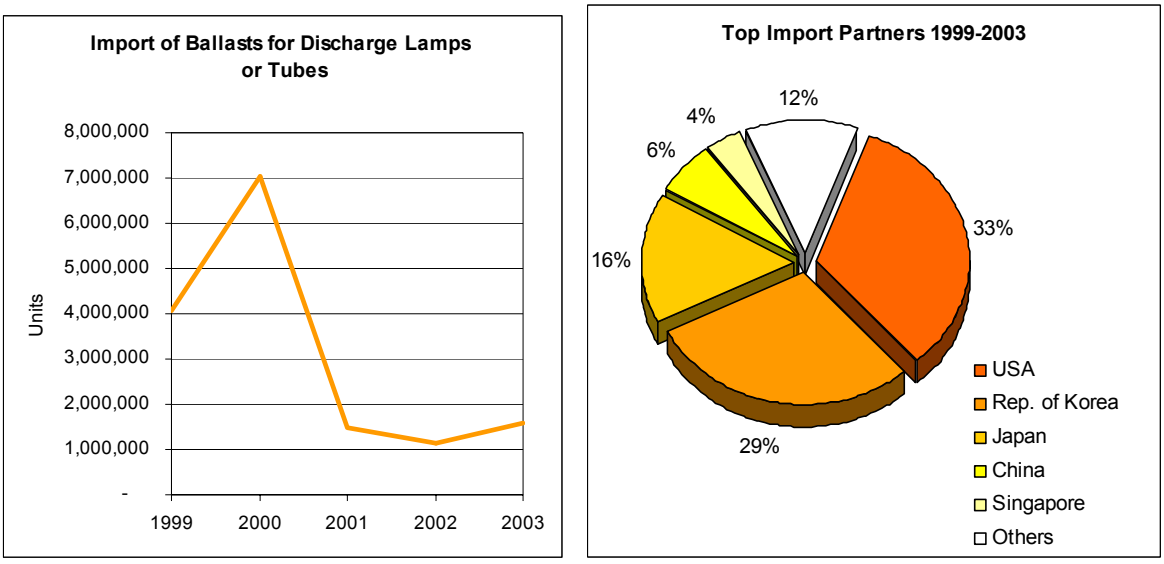
The 18W and 36W T8 fluorescent tubes dominate the largest market share in lamp consumption. The 32-watt circular fluorescent lamps are still available but capture only a small marketshare. Ballasts used in the residential sector are normal power factor (PF 0.3-0.5) ballasts, while industrial and commercial facilities are the most extensive users of high power factor (PF 0.8-0.9) ballasts.

Since fluorescent lamp ballasts are included in the list of controlled goods, all ballast manufacturers and importers must register with the Thai Industrial Standard Institute (TISI) and all ballast specifications must comply with the TIS 23/2521 BE regulation. There are about 36 ballast manufacturers and importers registered with TISI. Some importers claim to be manufacturers but they hire (or commission) other manufacturers to produce ballasts under their brand names. It is difficult to determine the actual unit production capacity of each local manufacturer; however their combined annual production capacity is approximately 25-

28 million units. Of this total, 90% is the standard electromagnetic ballast, followed by low loss magnetic ballasts (8%) and electronic ballasts (2%). Based on interviews, ballasts require a large space for stocking, thus, manufacturers and distributors normally do not keep a large stock but will manufacture or distribute by order.

Import and Export

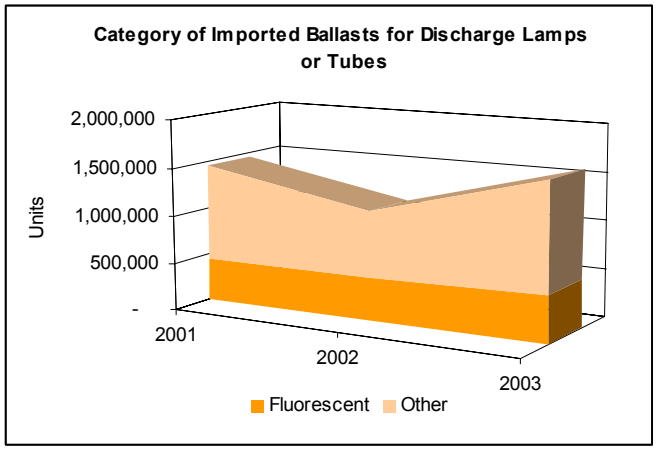
Based on 1999-2003 import/export statistics obtained from the United Nations Statistic Division and the Customs Department of Thailand, there was a fluctuation of ballasts imported by Thailand between 1999 and 2000. The imported volumes have become quite steady from 2001 to 2003 at approximately 1.5 million units per annum. Given comprehensive statistical data, provided by the Customs Department of Thailand which categorizes import and export data into ballasts for fluorescent lamps and other lamps. The fluctuation of imported ballasts before 2001 was mainly caused by non-fluorescent lamps which basically are High Intensity Discharge (HID) lamps for industrial and street lighting applications. China and USA were the main suppliers for HID lamp ballasts for Thailand in the past 5 years.



Source: The United Nations Statistics Division (UNSD)

Figure 26: Thailand's Import of Ballasts for Discharge Lamps or Tubes, 1999-2003

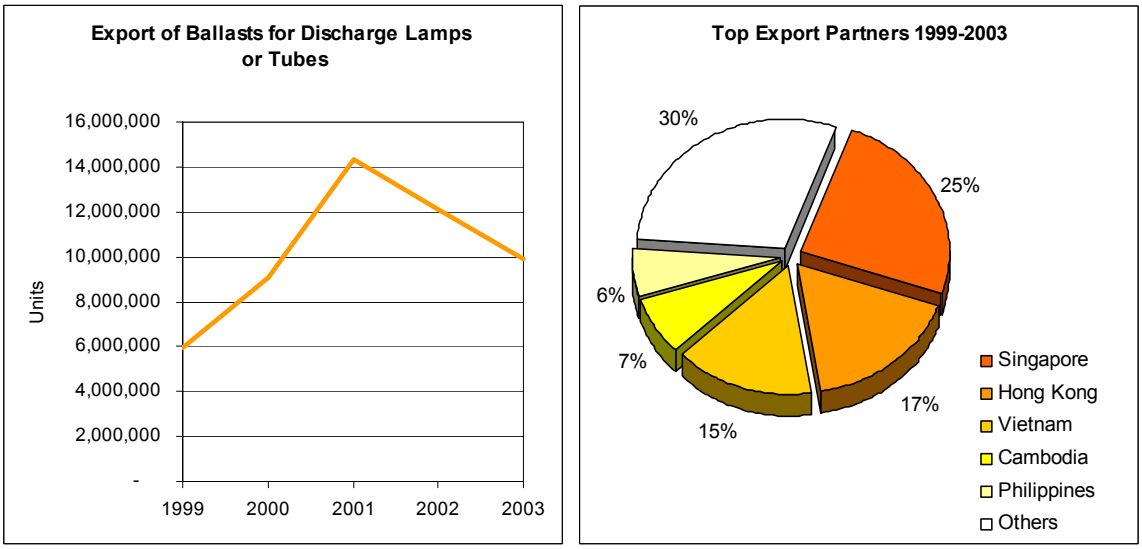
During the past 3 years, ballasts for fluorescent lamps had approximately 30% share in the total ballasts imported (about 500,000 units per annum). Although the import statistic does not provide types, models, or sizes (given main countries of origin, i.e. Japan, Korea, and some European countries such as Germany and Italy), the majority of imported fluorescent lamp ballasts seem to be high-quality electronic ballasts.



Source: The Customs Department of Thailand

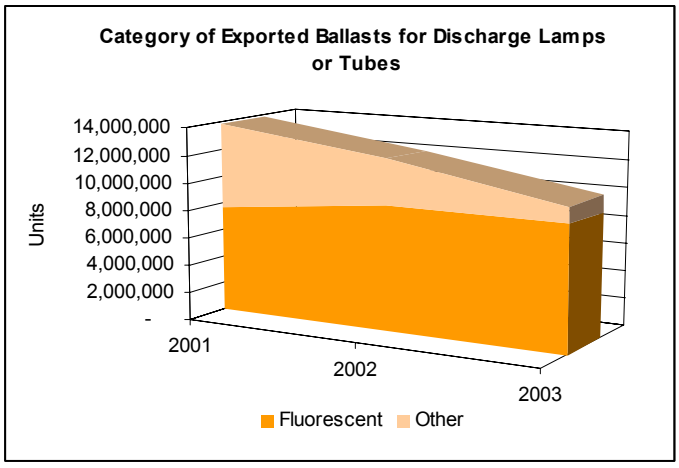
Figure 27: Category of Imported Ballasts for Discharge Lamps or Tubes, 2001-2003

Among ASEAN member countries, Thailand is the largest ballast exporter. Similar to imported ballasts, fluctuation in export volumes were caused by non-fluorescent lamps ballasts, as shown in Figure 29. Key export partners for non-fluorescent lamp ballasts are Singapore, Hong Kong and Malaysia. For fluorescent lamp ballasts, approximately 8-9 million units are exported annually. Around 85% of the total exportation is to neighboring ASEAN countries, as seen in Figure 28.



Source: The United Nations Statistics Division (UNSD)

Figure 28: Thailand's Export of Ballasts for Discharge Lamps or Tubes, 1999-2003



Source: The Customs Department of Thailand

Figure 29: Category of Exported Ballasts for Discharge Lamps or Tubes, 2001-2003

2.9.3 Institutional Framework

Energy Policy and Regulatory Body

As a result of the establishment of the Ministry of Energy (October 2002), various government agencies and state enterprises responsible for energy-related matters previously under different ministries have been transferred to the Ministry of Energy.

The National Energy Policy Office (NEPO) was established in 1992 under the Office of the Prime Minister as an administrative unit for the National Energy Policy Committee (NEPC). NEPO changed its name to EPPO (the Energy Planning and Policy Office) in October 2002 and moved to operate under the newly-established Ministry of Energy. EPPO's major responsibilities are planning, analysis, and strategy development, including broad socio-economic analysis and evaluation of the implementation of the national energy policies.

DEDE (formerly the Department of Energy Development and Promotion or DEDP) is responsible for the implementation of national policies on energy efficiency, renewable energy, and water resources. It is also in charge of developing education and training schemes for consultants and energy managers. DEDE's activities primarily receive financial supports from the ENCON[12] fund. 60-70% of their total budget is derived from this source.

Electricity Utility

The electricity industry is dominated by three state-owned utilities, Electricity Generating Authority of Thailand (EGAT), Metropolitan Electricity Authority (MEA) and Provincial Electricity Authority (PEA). EGAT is responsible for electricity generation and transmission systems for the whole country. EGAT sells electricity to two major state-run distribution utilities, MEA and PEA. At the end of 2003, EGAT had a total installed capacity of 25,377.8

12 The Energy Conservation and Promotion Fund or the ENCON fund was established under the energy conservation act, 1992. The capital and assets of the ENCON fund are basically derived from levies imposed on petroleum products and other additional sources such as surcharges on power consumption and accruing interests.

MW. MEA is responsible for providing power services in Bangkok and surrounding areas, covering an area of 3,192 square kilometers. PEA is responsible for providing power services to all other provinces outside the greater Bangkok area and also for implementing rural electrification. At the end of 2003, PEA had achieved more than 99% electrification.

Standards, Accreditation, and Testing Body

Administration of all standardization works is the responsibility of the Thai Industrial Standard Institute (TISI) under the Ministry of Industry. TISI is responsible for conducting standards-related activities to enhance public awareness, understanding and extending implementation of standards and carrying out legal works under the Thai Industrial Standards laws and other relevant laws. National standards published by TISI are known as Thai Industrial Standards (TIS). TISs are implemented in both voluntary and mandatory manners.
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The test procedures and requirements for electromagnetic ballasts for fluorescent lamp are set out in the standard TIS 23-2521. This standard was based on the IEC 60082 which was withdrawn years ago. It is assumed that IEC60921, the more recent version of IEC60082, is broadly equivalent to the TIS standard. TIS standards for both electromagnetic and electronic ballasts are compulsory standards. Therefore, ballasts sold in Thailand must meet all specifications as stipulated in the standards and labeled with the TIS compulsory standard mark. Moreover, all manufacturers and importers are required to register with TISI. Table 13 shows the current TIS standards regarding fluorescent ballasts and Figure 30 shows the TIS Compulsory Standard Mark.

Table 13: Thai National Standards for Fluorescent Lamp Ballasts

National Standard Number	Reference Standard
TIS 23-2521 - Standard for Ballast for Fluorescent Lamps	IEC 60082, 60921
TIS 885-2532 – AC Supplied Electronic Ballast for Tubular Fluorescent Lamps – Safety Requirements	IEC 60928
TIS 1506-2541 – AC Supplied Electronic Ballast for Tubular Fluorescent Lamps – Performance Requirements	IEC 60929

Source: Thai Industrial Standard Institute (TISI)

Figure 30: TIS Compulsory Standard Mark

The Thai Laboratory Accreditation Scheme (TLAS) was established in 1987 under the responsibility of TISI. TLAS is a member of both APLAC and ILAC (whose MRA was signed in October 2001 and November 2001, respectively).

There are two main accredited laboratories capable of testing ballasts for fluorescent lamp according to IEC standards in Thailand. One is operated by the Electrical and Electronic