

Setting	
Country	Thailand
Location	Bangkok
Project start date	November 2007
Project end date	May 2008
Technology keywords	Lighting in Building
Host sector (type of host for the project)	Asian Institute of Technology (AIT), School of Environment, Resources and Development (SERD)

Technical summary of the project	
Objective of the project	To save electricity and reduce CO ₂ emission at power generation by improvement of lighting system.

Project description

In total, AIT consumes about 13,000 MWh/year of electricity (on an average from 2003 to 2007) which leads to about 9,300 tons/year of CO₂ emission at power generation. SERD consists of 6 buildings which consume about 1,000 MWh/year which leads to about 720 tons of CO₂ emission in 2007. The Energy building consumes about 120 MWh/year and generates about 86.4 tons of CO₂/year. Lighting consumes about 38% and 27% of the total electricity consumption during weekday and weekend, respectively.

Many of the existing lighting fixtures at the Energy Building were equipped with T8 (36 W) lamps with magnetic ballasts and covered with gloomy covers which reduce amount of illuminance on the working space. The measured illuminance of the existing T8 fixtures in 5 selected rooms was in a range of 148-380 lux which is lower than standard of 300-500 lux.

T5 (28 W) lamps with electronic ballasts and reflectors were selected to replace the existing fixtures. T5 lamp with electronic ballast consumes about 31 W or about 32% saving as compared to 46 W of T8 with magnetic ballast. Table A compares characteristic of each type of lamp. However, the length of T5 (1,163.2 mm) is shorter than T8 (1,213.6 mm). Adaptors can be used to fit T5 into the existing T8 fixtures or use new reflectors. As the existing fixtures gave low illuminance, therefore, high efficiency reflectors (95% reflectance) were bought which can be fitted with T5 without using adaptors. Each reflector can hold two T5 lamps.

Type of Lamp	Lumen	Lumen/W	Lifetime Service (Hours)	Power Consumption (W)	% Saving as Compared with T8
T8-36 W	2,500	70	15,000	46	-
T5-28 W	2,700	95	20,000	31	32
Master T8-32 W	3,050	95	15,000	33	28

TABLE A: CHARACTERISTIC OF EACH TYPE OF LAMP

Master T8 lamps (32 W) with electronic ballast were selected to replace the existing T8 lamps of reflector-type fixtures. Master T8 can be fitted into the existing T8 lighting fixture.

One hundred and forty-eight T5 and 145 Master T8 lamps were used to replace the existing T8 lamps. After the modification, measured illuminance of T5 with reflectors was in a range of 377-726 lux, an increase of about 90-150%, while Master T8 gave light output of about 152-721 lux, an increase of about 70%. Figure A compares the existing fixtures and new reflectors in room ET 109. Both have 2 FL inside. The measured illuminance of each type was 150-200 and 550-650 lux respectively.



Existing Fixture-Acrylic
Diffuser Type, T8, 2 x 36 W
with Magnetic Ballast
150-250 lux



New Fixture-Profile Mirror
Louver Type with Aluminum
Reflector, T5, 2 x 28 W with
Electronic Ballast
550-650 lux

FIGURE A: EXISTING AND NEW FIXTURES IN ROOM ET 109

Moreover, other energy saving measures for lighting was also implemented. Those were:

- Replacement of the existing lighting fixtures with reflectors and reduce no. of fluorescent lamps (FL) from 3 to 2 (save 46 W per fixture);
- Replacement of the existing T8 FL with 13 W compact fluorescent lamps (CFL) at corridors and toilets;
- Installation of occupancy sensor and 3 W Light Emitted Diode (LED) in one toilet;
- Installation of individual pull switches. In a large room, many lights were turned on even though there were only a few occupants. Individual pull switches were installed to turn off unused lights and to reduce unnecessary electricity consumption;
- Rearrangement of lighting switches. The existing switches were connected to many lamps. The rearrangement was mainly put into groups so that users can turn on only necessary lights for their works.

The investment for all measures was about 243,000 Baht. Energy saving was about 23,530 kWh/year or about B. 78,840/year (B. 3.35/kWh). This saves about 40% of total energy consumption for lighting system and about 22% of average overall energy consumption of the Energy Building. This saving can also mitigate CO₂ emission about 17 tons/year (0.72 kg/kWh). Payback period on the investment is about 1.8 year excluding the cost of reflectors because the reflectors had to be changed anyway due to their low light outputs which cause visual discomfort. However, if the cost of reflectors is included, payback period is about 3.1 years. Further monitoring can be done by measurement with energy meter at the main circuit breaker of Energy Building and the results can be compared with the old records before the lighting renovation.

If all measures are introduced to all 6 buildings of SERD whose overall electricity consumption is about 1,000 MWh, estimated savings would be about 220 MWh/year or 737,000 Baht/year, which could reduce about 158 tons of CO₂/year.

Environmental and social benefits

(Estimate of) Greenhouse Gases abated (in metric tons of CO ₂ -equivalent)	Annual: 17 tons/year Up to and including 2012: 85 tCO ₂ -equivalent Up to a period of 10 years: 170 tCO ₂ -equivalent Up to a period of 15 years: 225 tCO ₂ -equivalent
Number of reduction units (EAU, CER, ERU, AAU)	
Socio-economic aspects What social and economic effects can be attributed to the project and which would not have occurred in a comparable situation without that project?	The project reduces energy consumption and CO ₂ emission.
Methodology used (if applicable: approved baseline methodology or study done - refer to this; and monitoring organisation)	

Economic data

Capital costs	243,000 Baht (B. 1,500/reflector, B.50 for T5, B.65 for Master T8, and B.200 for single electronic ballast and B.300 for double electronic ballast). These prices were lower than market prices because this program has been promoted by EGAT. B. 2,700 for occupancy sensor.
Financing scheme	Financial support by Dr. Brahmanand Mohanty, Prof. Sivanappan Kumar, SERD and AIT.
Financing organisation (if third party)	None

Project developer

Name of the project developer	Ms. Pinnukarn Kosonkarn
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Contact person	

Host organisation

Name of Host organisation	Asian Institute of Technology (AIT)
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Contact person	Mr. Sonti Mearsa (In charge of Buildings and Facilities Maintenance Unit)

Technology provider

Name of Technology provider	Demand Side Management Office (DSM), Electricity Generating Authority of Thailand (EGAT). EGAT provided some technical assistance and coordination with equipment suppliers under their new program called "Thai people against global warming with new thinner tube fluorescent lamps (T5)"
E-mail and/or web address	napaporn.p@egat.co.th , http://www.egat.co.th/dsm/t5
Contact person	MS. Napaporn Phumaraphand

Technology provider

Name of Technology provider	Thai Energy Conservation Co., Ltd. (Electronic ballast)
E-mail and/or web address	thaien@bkk.loxinfo.co.th , http://www.econowatd.com
Contact person	Mr.Sanya Wongsiripornphan

Technology provider

Name of Technology provider	Saengmitr Electric Co., Ltd (Lighting reflector)
E-mail and/or web address	suchan@delight.co.th , http://www.saengmitr.com
Contact person	Mr.Suchan Kamkuaenkaew

Technology provider

Name of Technology provider	Asia Lamp Industry Co., Ltd. (Fluorescent lamps)
E-mail and/or web address	marketing@asialamp.com , http://www.asialamp.com
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