



**Asia-Pacific
Economic Cooperation**

EWG 06 2015A

Establishing Educational Pathways for Lighting Best Practices

**An APEC regional collaboration with university lighting centers
and research institutions**

**APEC Energy Working Group/Expert Group on Energy Efficiency and Conservation
Presented by Dr. Cary Bloyd,
Pacific Northwest National Laboratory, The United States**



INTRODUCTION

- Lighting consumes about 25% of world energy use and can be as high as 30% in developing economies
- Implementing highly efficient lighting is one of the most effective ways to achieve deep energy savings
- Among building professionals, there is a lack of knowledge on how to best achieve these savings and which strategies and practices should be employed
- Unifying lighting best practices and supporting educational program has the potential to increase the adoption rate of advanced lighting solutions



OBJECTIVES

- Conduct pre-workshop surveys and organize two workshops for representatives from university lighting design centers, building professionals, industry and government representatives from APEC members
- Identify key barriers and establish a unified list of lighting best practices and strategies that have high energy saving potentials
- Develop an educational pathway by sharing information and experiences on real lighting projects and disseminate for professionals and the regulatory community

WORKSHOP 1: BANGKOK, THAILAND

- Hosted by King Mongkut's University of Technology Thonburi (KMUTT) on 2-3 June 2016
- 20 speakers & participants and 45 attendants from 11 APEC economies, 30% were female





WORKSHOP 2: SHANGHAI, CHINA

- Co-hosted by KMUTT, UC Davis and Tongji University, on 15-16 September 2016
- 17 speakers & participants from 7 APEC economies, 45% were female





LIGHTING BEST PRACTICES

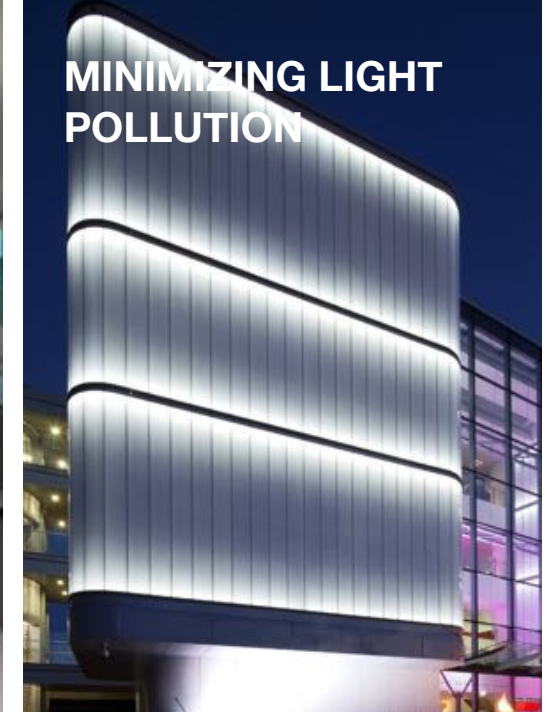
**DAYLIGHTING FOR
THE TROPICS**



**TASK-AMBIENT
LIGHTING SYSTEMS**



**MINIMIZING LIGHT
POLLUTION**



ADVANCED DESIGN & SPECIFICATION



ADAPTIVE LIGHTING



- Three program levels and eight courses are proposed
- A guidebook is developed - describing course outline, learning objectives, teaching methods and tools - including examples of class activities

(available at http://publications.apec.org/publication-detail.php?pub_id=1832)

Program Level	Course Name
Fundamental	1. Lighting and Seeing
	2. Today's Lighting Technology
Intermediate	1. Minimizing Light Pollution
	2. Task-Ambient Lighting Systems
	3. Daylighting for the Tropics
	4. Lighting Control Technology
Advanced	1. Innovative Daylighting Design
	2. Adaptive Lighting



Task-ambient Lighting Systems

Educational Program for Lighting Best Practices:

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Program Level
Intermediate

Pre-requisite
Lighting and Seeing

Best Practices
**Task-ambient Lighting
for Offices**



Figure 1 | Task-ambient Lighting systems in real buildings

Course Outline

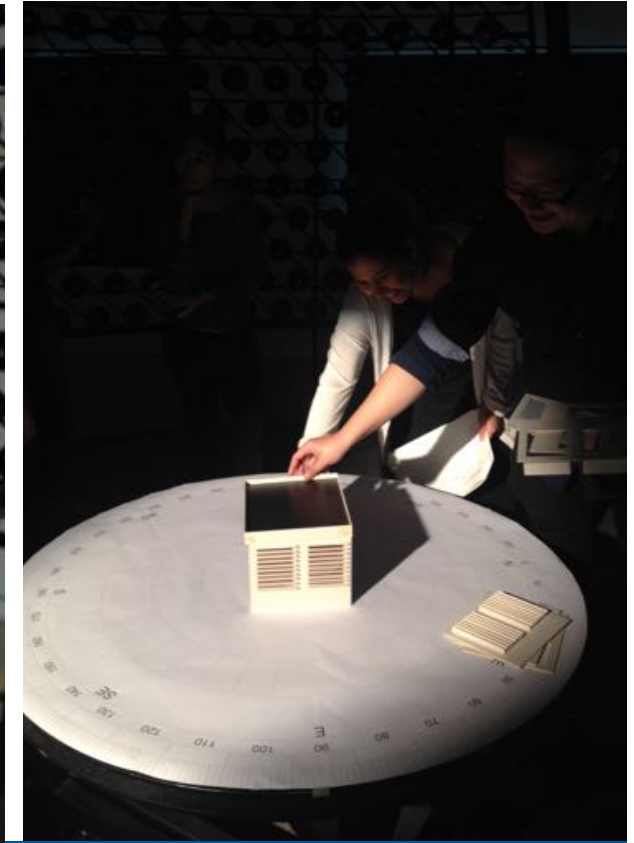
This course is recommended for interior designers, architects, lighting designers, green building/LEED consultants, electrical engineers, facility managers, municipality/utilities, lighting and office furniture industry. This course introduces benefits and principles of task-ambient lighting systems for offices that are not only energy-efficient, but can provide flexible and good quality lighting for today's workplace and multi-generation workforce.

Example of a curriculum guidebook



Pilot Training & A Webpage resource

- Training on ‘Daylighting’ organized by KMUTT; participants are architects and engineer from Thailand, Malaysia and The Philippines
- A webpage resource on the education program with course materials & case studies has been developed as collaborative effort

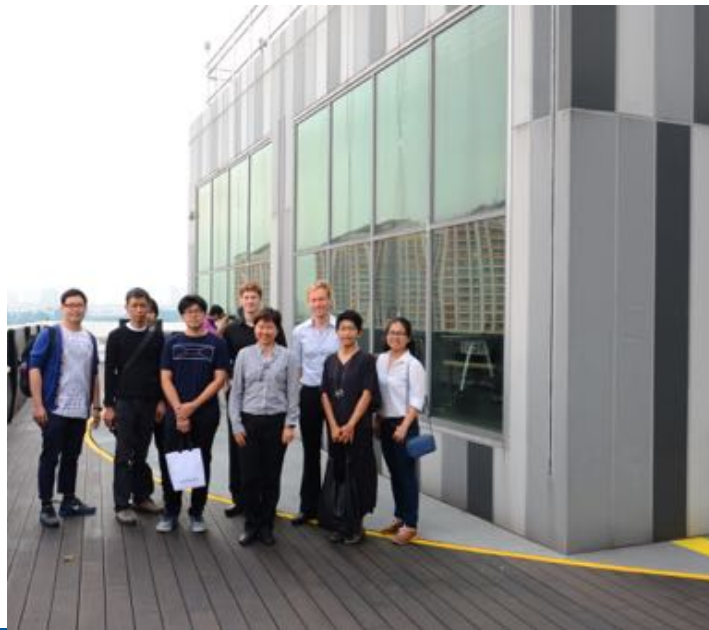




Continuing efforts



- Lab visits and discussion on possible research collaborations between lighting centers in Thailand and Singapore



- Possibility to host a lighting design research symposium - in conjunction with existing lighting conference in the APEC region