

**Workshop to Support the Development of National Lighting Design Centers  
in APEC Region (EWG 14/2012A):**  
APEC Expert Group on Energy Efficiency and Conservation

### Background

The energy used in the operation of buildings contributes to almost 40% of greenhouse gas emissions. Electric lighting accounts for 20-25% of this overall energy use; as such, best-practice lighting strategies and technologies represent one of most effective near-term opportunities for energy efficiency and greenhouse gas mitigation. Adaptive lighting controls, daylighting and solid-state technology (LED) represent a few of the emerging technologies and best practices that can achieve very large savings.

However, the uptake of new technologies and design practices has typically been slow, principally due to knowledge and experience barriers within the lighting design industry. Universities are in an ideal position to bridge these barriers by engaging both the profession and the industry in a range of activities; these may include research, demonstration, testing, education and training. University-based research and demonstration centers have proven to be effective at translating lighting design research into practice and accelerate broader adoption of best-practice technologies. Our long-term objective is to establish such a regional center at KMUTT and other APEC economies.

### Purpose

The two-day roundtable conference was hosted by King Mongkut's University of Technology Thonburi (KMUTT) in Bangkok. It aims to understand how to effectively translate lighting design research into practice with a university research center model based on input from regional experts and stakeholders – government agencies, utilities, lighting industry and professional associations. Specific agenda items included:

1. Understand the potential of lighting design research for sustainable design
2. Learn from effective collaboration models and operational strategies of the successful centers
3. Generate strategies and recommendations that will allow university's regional lighting centers to be developed and function effectively

### Workshop Activities



Day 1: A series of presentations on current lighting design research and operational models by successful lighting centers; energy efficient lighting policies and implementations by government agencies.

Day 2: Input from all stakeholders on shared vision, mission, and goals; group discussions on strategies and recommendations on next steps to the development of lighting design centers in APEC region.

### Opportunities of lighting design research for sustainable design

Forty speakers and participants from 12 APEC economies contributed to this U.S. led APEC workshop (Australia, New Zealand, China, Indonesia, Japan, Malaysia, The Philippines, Singapore, Chinese Taipei, Thailand, USA, and Viet Nam). The presentations by lighting experts, especially the experiences from California (CLTC and SMUD), clearly demonstrated the benefits of collaborative efforts between a university-based lighting center, local

government, utilities, and industry partners in accelerating the adoption of advanced lighting and best practice. California has avoided building 30 new power plants due to efficiency programs for appliances and building design. To achieve this large reduction in energy use it was suggested that, apart from R&D, testing, demonstration and education, a lighting center should also engage in developing building codes and standard.

There seemed to be common interests among stakeholders in the following focus areas: *adaptive lighting controls for LED, task-ambient lighting systems, daylighting in the tropics, and daylight harvesting*. Due to dramatic increased in urban areas of towns and cities in Asia and the recent widespread use of LED, there were also emerging areas in *urban lighting and health effects of light*, particularly the potential health risks of blue spectrum from white LED on the retina. The significance of lighting design research that take into account human factor (e.g. visual and psychological perception of the luminous environment and behavior) and architectural integration was also highlighted as these factors could have an impact on the success of energy efficient lighting and design application in real buildings.

In addition to the reduction of energy use, these are opportunities of lighting design research:

- Contribute to quality lighting that satisfies users' need for visual comfort, safety, and security
- Create product innovations that are user-centered and market driven
- Boost tourism and local economy (urban lighting), while minimising light pollutions
- Promote health and well-being

#### **Shared Vision and Mission**

'*Light for Life*' - Towards net-zero energy and better lighting for health and well-being is the shared vision for lighting design centers in APEC region was developed at the workshop. The mission has also been identified as research and development, demonstration, testing, training and education to raise awareness for the general public. The R&D activities will be of collaborative, market-driven, and multi-disciplinary nature.

#### **Strategies**

- Share knowledge and information among lighting experts in APEC region
- Seek allied partners and institutions that have mutual interests and can provide supports, academically and financially
- Create credibility by engaging in unbiased studies and publishing white paper and case studies
- Engage in multi-disciplinary lighting research to strengthen the integrity of study
- Create base line of electricity use for lighting in each type of application – for future comparisons
- Translate lighting design research into full-scale demonstration projects with integrative measures e.g. users' behavior, envelop design, and smart controls
- Communicate the knowledge using media that is suitable for each group of users such as design guideline for designers and tips for home owners – via new channels such as mobile apps

#### **Next Steps**

- Set up an advisory committee (volunteers from the attendees) to gather and distribute information and updates on lighting research and the development of lighting design centers in APEC region. Potentially, this can be done using the existing knowledge sharing platform supported by Chinese Taipei and managed by USA (University of Pennsylvania)
- Explore the mechanism to allow equipment sharing as sophisticated equipment and certified laboratory can be expensive and requires high maintenance, which will be difficult to obtain for newly established lighting design centers
- For APEC economies that are interested in developing a lighting design center (e.g. Thailand, The Philippines, Singapore and Malaysia) a steering committee should be set up from key stakeholders to provide guidance on the center's roadmap
- Alignment of research capabilities with government policies and needs from industry; and there should be an alignment with the university's vision and directions
- Establish clear short-term and long-term goals with KPI for evaluation; budget and action plan for at least 5 years; then should start with a small but high impact project that can demonstrate the effectual of a lighting design research center, which could gain confident from future funders