

LEDs Quality and Efficiency: What Are the Challenges?

My Ton

ECO-Asia Clean Development & Climate Program



**Asia-Pacific
Economic Cooperation**



Australian Government

**Department of Climate Change
and Energy Efficiency**

PRESENTATION OVERVIEW

- The dimensions of LEDs challenges:
 - Industry: Technological, production, measurement
 - Consumers: Quality
- The way forward:
 - Standards
 - Regional Cooperation
 - Information

Industry challenges

- **Production:**

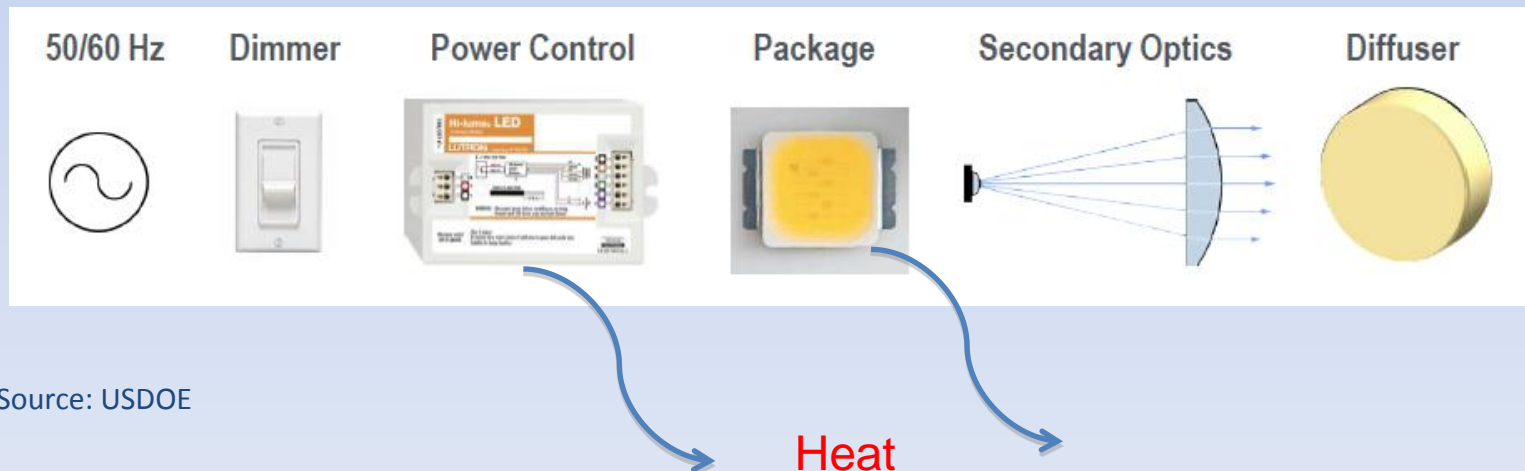
- Ultra-high brightness (UHB) LEDs chips are limited to expert-production manufacturing.
- Much of the profit in the LED industry is in chip production, with much lower margins in the packaging and application stages.
- LED chip production accounts for 70% of profits while LED chip packaging accounts for the remaining 30%.



Industry Challenges

- **Technological:**

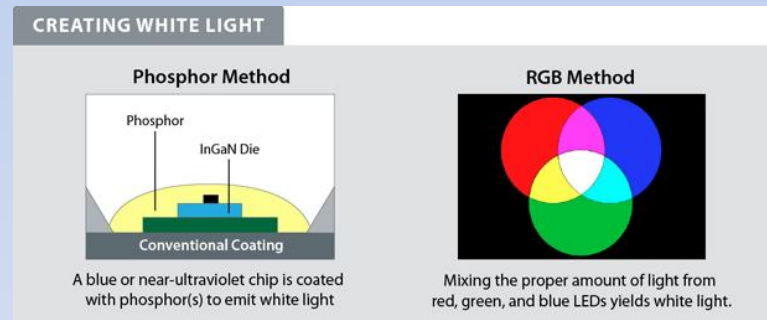
- LEDs are directional – they are more ideally suited for fixtures than lamps.
- LEDs require electronic “drivers” not unlike fluorescent ballasts.
- High-power LEDs require good thermal management.



- Source: USDOE

Industry challenges

- **Measurement/Quantification of Performance:**
 - Measuring tools and metrics have not yet evolved to fully capture LED technology's unique features.
 - It is difficult to directly compare the characteristics of light from an LED source to a traditional source, and even to another LED source.



- These present significant challenges when measuring and comparing LED performance against the performance of traditional light sources.

Industry challenges

- **Measurement/Quantification of Performance:**
 - CCT and CRI have been used for many years in describing conventional lighting, but they are not adequate for LEDs.
 - Two light sources with identical CCTs can render object colors very differently due to the differences in spectra.
 - CCT provides an indication of whether a light source may appear yellowish or bluish in color.
 - “Duv” is being used a supplemental metric to prevent excessively greenish or pinkish hues in LEDs.

INDUSTRY CHALLENGES

- **Measurement/Quantification of Performance:**
 - CRI has been found to be inaccurate for RGB (red, green, blue) LED systems.
 - CRI value is poor at predicting the quality of the appearance of saturated red objects, and doesn't correspond well to human perception of color quality.
 - The US National Institute of Standards and Technology (NIST) has developed a Color Quality Scale (CQS) that is intended to replace or supplement the current CRI.

Industry challenges

- **Performance and Efficiency:**

- Currently, the most efficient white LEDs emit light in the 4500K to 6500K CCT range
- LED light fixtures (luminaires) and lamps mix LEDs of various color temperatures to reach a target CCT by balancing the highest efficacy sources with warmer LEDs, which are less efficient.
- The nominal CRI for neutral (4000K to 4500K) and cool white (5000K or higher) LEDs is typically 70 to 75 (CRI of 50 – 60 is adequate for street & outdoor lighting applications).
- The leading high-efficiency LED manufacturers now claim a CRI of 80 for phosphor-converted, warm-white devices.

INDUSTRY CHALLENGES

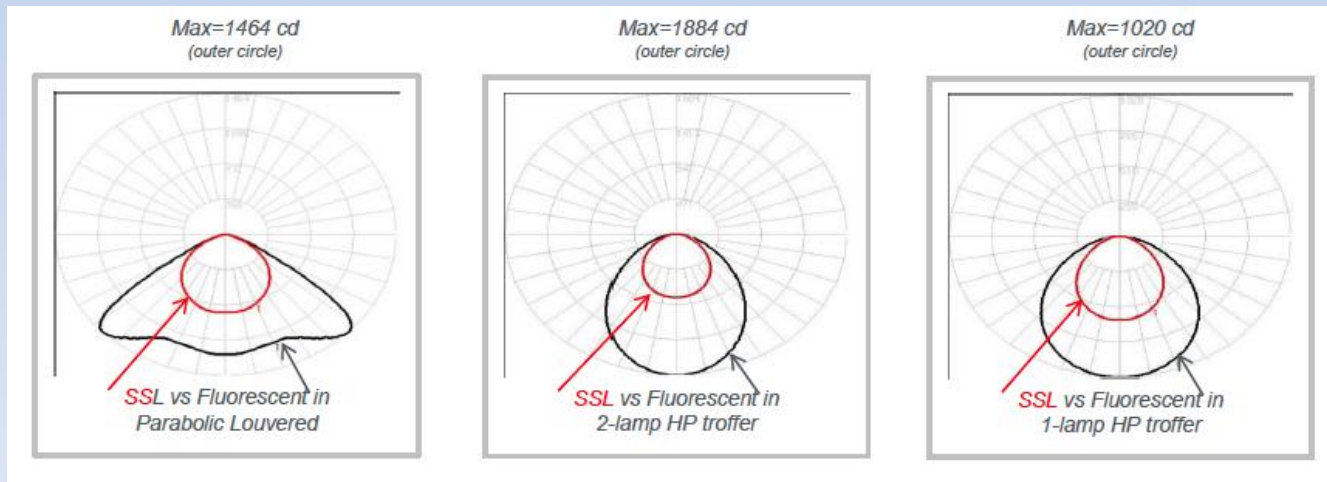
- **Life and Reliability:**

- LEDs don't "burn out," they get progressively dimmer over time.
- LED rated life is based on the number of operating hours until the LED reaches 70 percent of its initial light output.
- Good-quality white LEDs in well-designed fixtures and lamps are expected to have a useful life of about 30 000 hours.
- A primary cause of LED failure is heat, which must be removed from the device by conduction or convection.

Consumer challenges

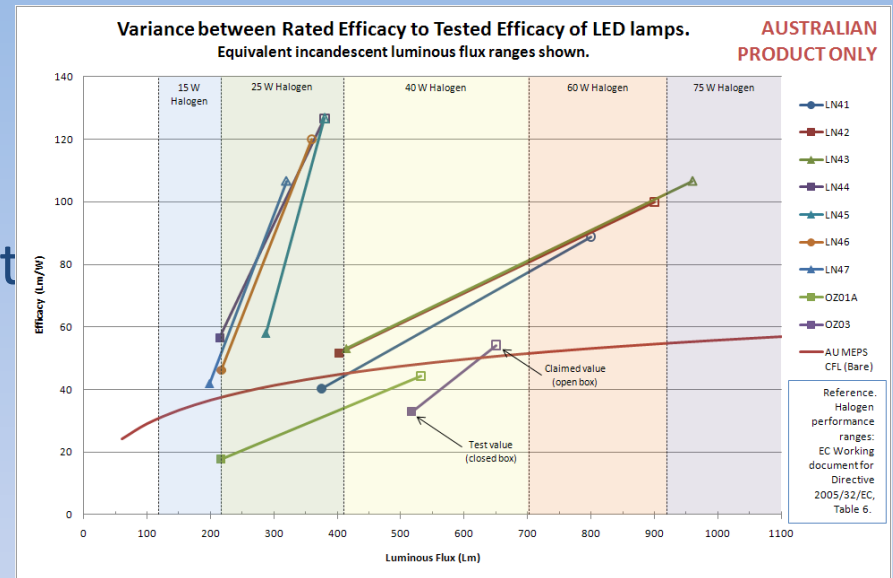
- These challenges affect products in the market:
 - Some products are not yet ready to compete with current technologies in the same category.

Manufacturer	CALIPER RL #	Likely to Meet Light Output Expectations	Likely to meet Color Quality Expectations	Likely to Meet Lifetime Expectations
1	1-A19	N	Y	Y
1	25-r30	-	N	Y
2	2-B10	N	N	N
2	19-r16	N	N	N
2	20-r16	-	N	-
2	24-r20	-	N	N
2	29-r30	N	N	N
3	3-A19	-	Y	-
3	4-A19 (LF)	N	N	-
3	6-B10	N	Y	-
3	7-C7	N	N	N
3	15-r16	-	N	N
3	16-r16	-	Y	-
3	17-r16	N	N	N
3	23-r20	-	N	-
4	5-A19	-	Y	Y
4	32-r30 (LF)	-	Y	Y

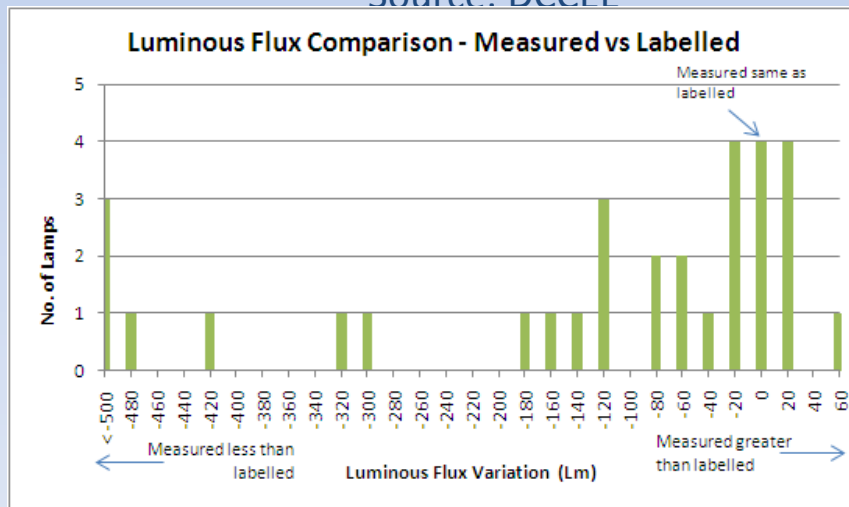


Consumer challenges

- These challenges affect products in the market:
 - Some products fail to meet manufacturers' performance claims.



- Source: DCCFE



The way forward

- Given the current situation with LEDs, policymakers need to address two critical areas:
 - Set standards for LED products.
 - Help users select quality, efficient products by providing useful information.

Both of these areas require significant resources, and policymakers should consider regional cooperation.

SOME RECOMMENDATIONS

- **“Roadmap”**: Policymakers should develop a “roadmap” for Asia based on LED industry development progress and potential impacts in order to streamline decision-making, maximize resources, and keep pace with the developments of the LED industry.
- **Harmonize**: A regional effort to harmonize standards and labeling for LEDs would help to speed up adoption of quality LEDs, reduce confusion, and send the right message to suppliers of quality LEDs in Asia.

Some recommendations

- **Emphasize quality:** An initial step for the world would be to identify some common quality and performance characteristics for LEDs to ensure that minimum quality criteria like energy, light output, and lifetime performance would be uniform throughout the region.
- **Leverage regional institutions:** There are three regional initiatives that can serve as suitable vehicles for such a regional effort:
 - The Asia Lighting Compact
 - The Regional Center for Lighting
 - lites.asia.
 - *A coordinated effort from these organizations might foster uniform standards within the region*

The way forward

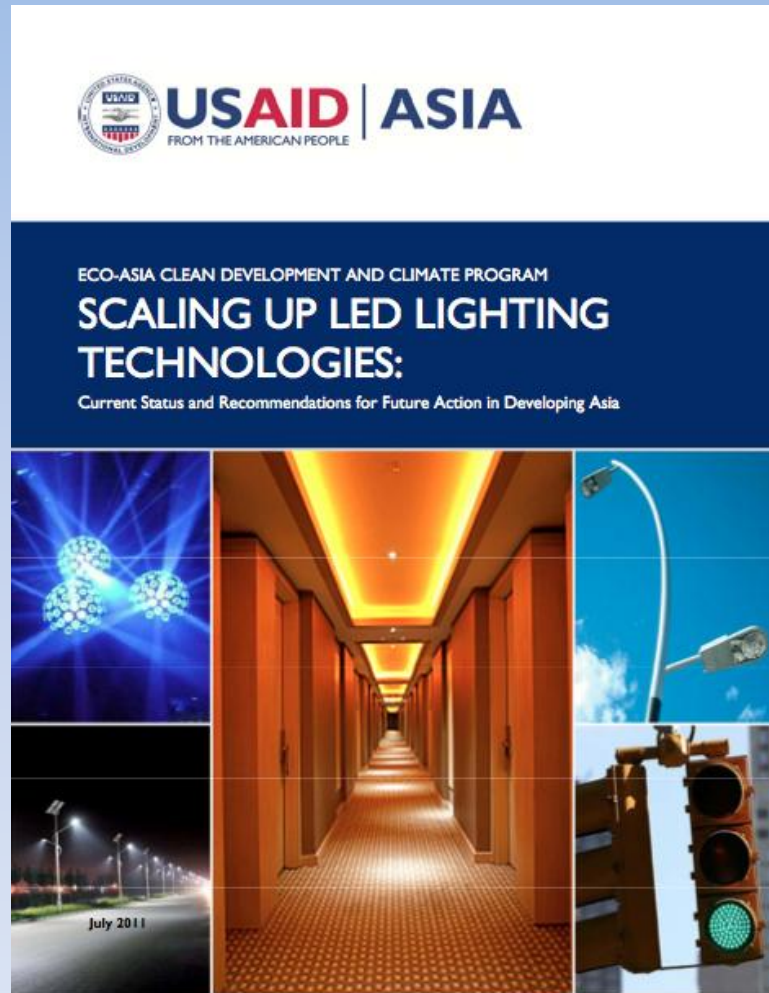
- **Policymakers and standards-setting agencies should focus on the following LED application areas:**
 - Area, parking, street, and/or outdoor lighting: These are high-duty applications and a high-interest area.
 - Traffic lights and transportation-related signals: These are also high-duty applications and can yield significant savings both in energy and maintenance costs.
 - Signage and architectural applications: These applications have been increasing in numbers.
 - Off-grid lighting applications: These have the potential to serve a large percentage of Asia not yet connected to the grid.

Some recommendations

- **Develop guidelines for municipalities:** Currently, many municipalities and agencies are in the throes of “LED-fever,” which is sometimes the result of being misled by exaggerated and unverified claims of LED performance and quality. They need reliable information to help their procurement.
- **Develop guidelines (and labels) for consumers:** Consumers are also being misled by exaggerated and unverified claims. Standard guidelines and labels, as well as reliable selection guides should be developed to help consumers in making sound purchases. This would ensure consumer confidence in LED products in the long run.

THANK YOU!

www.cleanenergyasia.net



PAPER FROM:

**APEC LED WORKSHOP: *POLICIES TO PROTECT AND
EDUCATE CONSUMERS***

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