Efficient Lighting in Asia: Regional Position Paper

Current Status, Opportunities and Constraints

Prepared by the lites.asia Secretariat on behalf of the lites.asia Stakeholder group

1. Introduction

Almost all countries¹ in the Asia region have government policies targeted at improving the efficiency of lighting in the domestic, commercial and/or industrial sectors. Policies range from relatively simple replacement subsidy and awareness campaigns, through to fully developed programmes that have successfully removed the least efficient lighting products from the market (refer to Appendix 1, Figure 3 for a summary of policies addressing efficient lighting in the region). However, prior to, and during the lifetime of the *lites.asiaⁱ* initiative, a number of constraints have been identified which are limiting the ability of regional governments to progress their efforts to improve efficient lighting. Therefore, based on available evidence, this paper seeks to identify and summarise:

- The potential energy and cost savings, and the associated reductions in emissions and realisation of other benefits, that are possible with a continued move to more efficient lighting in the region;
- The current policies targeting the improvement of lighting efficiency of countries in the region, and the opportunities to accelerate the transition to more efficient lighting;
- The physical, technical and human resources constraints that are limiting the progress of countries in achieving their policy goals;
- Proposals that may assist countries in delivering higher efficiency lighting and yielding maximum benefits without hampering national economic and social development goals or other international commitments.

This paper has been prepared by the *lites.asia* secretariat based on the knowledge and experience gathered by the secretariat during the four years *lites.asia* has served as a forum for national lighting efficiency regulators and policy makers in the region. During the preparation of the paper, additional information and comments were provided by contacts in relevant government, institutions and standards agencies in 13 countries in the region². While we would like to acknowledge and thank the wide range of stakeholders that have provided input, it should be noted the views expressed do not necessarily represent the views of other countries in the region.

2. Scope

2.1. Geographical coverage

This paper focuses on countries in the Asia region. "Asia" is broadly defined as bounded East-West by the Indian subcontinent to Japan, and North-South by Mongolia to Australia³ (refer to Appendix 1, Figure 2 for a full list of list of countries covered by the report).

Refer to References and Endnotes^{xvii} for a list of respondents providing additional information.
 Currently the Pacific Island Countries (PACs) are not included in the analysis and resulting recommendations. However, the inclusion of PACs in any resulting actions may be considered appropriate.



^{1.} Note that all references to countries includes both sovereign nations and other types of jurisdictions, for example, Hong Kong is a Special Autonomous Region of China. Refer to Appendix 1, Figure 2 for a list of countries included within the paper.

However, the majority of the paper primarily addresses the issues facing the regions' transitioning and less developed economies.

2.2. Lighting Technology and Applications

The primary focus of the paper is on-grid lighting technologies used in the domestic environment. However, much of the discussion is equally applicable to all indoor and outdoor lighting technologies and applications.

3. Potential Benefits from Transition to Efficient Lighting in Asia

The UNEP en.lighten initiative has undertaken "country lighting assessments"**Error! Bookmark not defined.** for the majority of countries around the world. These country assessments show that, across Asia, lighting currently consumes over one million million kWh of electricity a year, or 14.5% of the 7,000 TWh/year of total electricity used in the region; costing the region's economies, and primarily the region's consumers, approximately \$137 billion each year (refer to Appendix 1, Figure 4 for a country by country breakdown).

The transition to efficient lighting would reduce the region's lighting electrical consumption by around one third, resulting in annual savings of approximately 320,000 million kWh of electricity, 220 million tonnes of CO_2 emissions and \$37billion in electricity costs. However, the developed countries (Australia, Japan, South Korea and New Zealand) and the two regional giants (China and India) rather distort this analysis. Nevertheless, even when these countries are excluded, the remaining countries still have the potential to save approximately 40 TWh/year of electricity, 22.5 million tonnes of CO_2 emissions and almost \$4 billion in electricity costs each year (refer to Figure 1).

	National Electricity	Lighting Share of Electricity	Electricty Cost of Lighting	Efficient lighting Saving Potential	Efficient Lighting Electricity Saving	Efficient lighting Cost Savings	Efficient Lighting Saving Potential	Efficient Lighting Saving Potential
Country Name	TWh	% of total	million\$	TWh	% of total electricity use	million\$	% of current lighting costs	Mt CO2
Bangladesh	38.564	12.5%	38.56	0.80	2.06%	74.61	51.70%	0.10
Bhutan	0.184	13.2%	1.08	0.01	6.11%	0.31	28.47%	0.00
Brunei Darussalam	3.419	13.3%	25.83	0.20	5.73%	8.26	31.98%	0.14
Cambodia	2.143	14.9%	28.99	0.10	4.89%	9.57	33.03%	0.12
DPR Korea (North)	17.995	9.7%	70.43	0.53	2.95%	13.36	18.96%	0.25
Hong Kong								
Indonesia	147.962	15.0%	1961.93	9.35	6.32%	650.60	33.16%	7.17
Lao PDR	2.874	17.3%	32.71	0.13	5.97%	9.43	28.84%	0.03
Malaysia	105.431	16.6%	2037.20	5.74	5.45%	554.86	27.24%	3.83
Mongolia	4.078	13.0%	28.20	0.16	3.96%	6.18	21.90%	0.09
Myanmar	5.185	14.3%	44.24	0.26	5.09%	9.67	21.85%	0.05
Nepal	2.705	21.2%	69.02	0.19	7.18%	20.46	29.64%	0.00
Pakistan	74.350	15.5%	1379.22	4.06	5.46%	408.12	29.59%	1.97
Papua New Guinea	2.757	15.9%	111.76	0.13	4.80%	31.61	28.28%	0.08
Philippines	55.619	15.0%	1885.89	3.51	6.32%	760.96	40.35%	1.67
Singapore	41.069	10.7%	709.81	1.55	3.77%	237.01	33.39%	0.79
Sri Lanka	8.380	15.0%	244.80	0.56	6.69%	114.04	46.58%	0.24
Taiwan								
Thailand	146.666	12.4%	2099.47	6.54	4.46%	670.70	31.95%	3.40
Timor-Leste	0.068	19.9%	1.74	0.00	6.76%	0.51	29.14%	0.00
Viet Nam	85.498	14.1%	1123.34	4.26	4.98%	337.62	30.06%	1.66

Figure 1: Potential Electricity, Cost and Emissions Savings from the Transition to Efficient Lighting in Asia (excluding Australia, China, India, Japan, South Korea and New Zealand

Source: UNEP en.lighten initiative^{xxii}; except national electricity consumption data for Lao PDR, personal communication from Viengsay Chantha (Lao PDR Ministry of Energy and Mines)



In addition to the direct benefits, the transition also has the potential to:

- Offset investment in generating capacity and/or release generating capacity in areas where electricity demand is growing rapidly and insufficient supply is potentially hampering economic and social development;
- Release domestic, commercial, industrial and public sector expenditure that was previously spent on electricity to supply inefficient lighting for more productive, economically beneficial and socially desirable purposes.

4. Barriers to the Transition to Efficient Lighting

As noted above, almost every country in the region has implemented at least some policies aimed at moving elements of their economy to more efficient lighting. These policy actions range from a single bulk procurement of CFLs to give to the lowest income groups, to fully integrated inefficient lighting phase-out programmes such as those in Australia (largely complete) and China (ongoing); Appendix 1, Figure 3 provides a high level summary of policies known to be implemented in the region. However, the vast majority of countries in the region lie somewhere between the two extremes and almost all have yet to maximise the potential benefits of a complete removal of inefficient lighting from the market and implementation of performance requirements to ensure the quality of the replacement products. Given the clear benefits of a more complete transition to efficient lighting in all countries in the region, there are clearly significant barriers holding back the transition.

4.1. Barriers to Transition, Existing Actions to Offset Barriers and Proposals for Future Action

The UNEP identifies 4 critical elements for the development of a successful strategy for a country to transition to efficient lightingⁱⁱ:

- The implementation of minimum energy performance standards;
- The establishment of functional monitoring, verification and enforcement systems;
- The development of environmentally sound management strategies;
- The implementation of supporting policies.

A number of these barriers and associated solutions are unique to each country and the UNEP provides a framework to identify local solutions though their lighting toolkitⁱⁱⁱ and other resources. However, from the feedback received from participants during the lifetime of *lites.asia^{iv}* and elsewhere, a number of the barriers appear generic to most countries and it may be appropriate to address some of these on a transnational basis. These barriers are broadly grouped in the following subsection, although it is important to note many are interlinked.

4.1.1. Test Methods and Standards of Performance

The limitations of the existing International Electrotechnical Commission (IEC) CFL test method (IEC 60969 v1.2) and the divergence of national standards of performance for CFLs were identified as issues at least as far back as RightLight conference in Shanghai in 2005^v. At the time it appeared the international consensus reached at the meeting would lead to rapid resolutions of the issues identified and a move towards national adoption of internationally harmonised tiers of CFL performance based on an appropriate IEC test



methodology. However, this has proved not to be the case with more complicated underlying factors identified.

A proposed revision to the CFL test methodology was submitted to the IEC for consideration in 2006 and proposals for harmonised tiers of performance in 2008^{*vi*}. A number of the proposed revisions to the test method have been integrated into the current (2013) draft version of IEC 60969, albeit with significant revision, and the proposed tiers of performance are only now being considered as a potential Technical Specification^{*vii*}. This experience has highlighted a number of barriers for the very high proportion of countries in the region that look to the IEC for test methods⁴ and, should they be available, performance standards.

The IEC process and outputs are largely focused on manufacturer, not regulation. The long standing rejection of the proposals for CFL tiers of performance to be developed by the IEC was at least partially premised on the argument that the IEC publishes test methods, whereas regulators set performance requirements on a national or regional basis. However, the setting of performance requirements by regulators requires a test methodology that is fit for the purpose of regulation, delivered in a timely manner, and for the individual regulators to have sufficient national capacity to develop the performance requirements.

Addressing the first issue, test standards as currently developed by the IEC are primarily focused on management of quality of manufacture and are not specifically designed for regulatory purposes (for example in terms of test sample sizes). Further, and likely related, the test methods are developed for standardised conditions broadly reflecting operating conditions in temperate climates with reliable electrical supplies. However, these are not the conditions faced by many of the countries within the region which experience tropical hot and wet climates, and often less than stable electricity supplies.

Secondly, there is the issue of timeliness. As noted above, the revisions to the CFL test methodology have so far taken 7 years since initial consideration and are yet to be finalised. This leaves regulators with the challenge of using clearly outdated and inappropriate test methodologies, adopting draft versions of the revised methodology that may not be the final version adopted at the international level, or developing their own national standards. Such a situation is clearly not sustainable, particularly as the lighting market is in a state of flux with the rapid development of LED lamps and the impending arrival of OLEDs (although it is noted that the IEC and CIE are developing test methods for these products).

Finally there is the issue that regulators are required to develop performance requirements. This is challenging on a number of levels. Many countries in the region lack the appropriate technical skills or knowledge of available products to develop appropriate performance standards^{viii}. Yet there are few obvious international forums through which knowledge can be shared and performance criteria and thresholds developed collaboratively. Hence, regulators and national bodies proceed with the best intentions, but this can lead to unintended consequences^{ix}. Further, the resultant standards are rarely aligned with standards elsewhere resulting in, in the case of CFLs, an estimated 40+ separate performance specifications currently in use globally^x. Such a divergence of performance specifications hampers trade of a truly globally traded product and restricts collaboration between testing laboratories and regulators on compliance and enforcement issues. Should a similar situation develop with LEDs, it would be a missed opportunity of epic proportions.

^{4.} At least 19 countries in the region base national lighting test methods on IEC standards. Refer to Appendix 1, Figure 5.



Existing Actions and Proposals to Offset Test Methods and Standards of Performance Barriers

There are a number of actions already underway that are attempting to alleviate these barriers, in particular:

- *lites.asia* is enabling the sharing of information in the Asia region on the IEC standards under development and has supported a small number of delegates from the region to participate in IEC meetings, together creating a voice for the concerns of the region;
- Performance specifications for LEDs are being developed in other international groups, for example the IEA 4E Solid State Lighting (SSL) Annex. Further, *lites.asia* has cooperatively developed criteria to measure the performance of some LED products in tropical/regional electrical conditions;
- Efforts are being made by a small number of countries at higher levels of the IEC to encourage the organisation's wide acceptance of need for the development of tiers of performance that are acceptable to the broad range of countries that may adopt them;
- The Barrier Removal to the Cost Effective Development & Implementation of Energy Efficiency Standards and Labeling (BRESL) project is attempting to develop harmonised performance and labelling requirements for CFLs among a number of countries in the region.

Nevertheless, further effort is required to bring together this work and achieve concrete outcomes. Therefore, significant further action is proposed through the:

- Continuation of lites.asia as a regional forum consisting of policy makers and technical specialists from across the region to:
 - Continue the sharing of information on IEC and national standards initiated by *lites.asia* with a view to potential harmonisation⁵;
 - Support the ongoing participation in IEC meetings by delegates from national committees to increase the understanding of regional issues;
 - Identify regionally appropriate operating conditions and performance criteria for lighting products to be proposed to the IEC.

In order not to result in the same fate as the actions following RightLight 6, *lites.asia* as a regional forum is developing political and institutional support from a number of countries, and credibility within participating countries and with external actors. However, as a next step it requires regional countries to adopt any resulting outcomes which will always be challenging given the competing national priorities outlined below. The recent strong political commitment from the leaders of the Association of South East Asian Nations (ASEAN) to develop a single market for goods and services by 2015 presents the perfect opportunity to invest in regional outcomes. Further, the challenging deadline for harmonisation gives both political motivation and commitment to action. Therefore, it is suggested a proposal is made to the ASEAN Joint Sectoral Committee for Electrical and Electronic Equipment (JSCEEE)

^{5.} Should sufficient funding be available it is proposed the sharing of information through the existing lites.asia workshops and support for delegates from the region to attend IEC meetings is continued.



and their policy equivalent the Energy Efficiency and Conservation Sub-Sector Network (EEC-SSN)^{xi} to work together with *lites.asia* to:

- Develop and agree to regional harmonised lighting energy efficiency performance standards;
- Share information and participate in the IEC (through national delegates from participating countries).

While cooperation with the ASEAN Committees would be focused on the 10 regional members of ASEAN (plus possibly the +3 and/or candidate countries, refer to Appendix 1 Figure 2), it would be hoped that the wider *lites.asia* country grouping would be able to participate and benefit from the outcomes.

Should the IEC agree to proceed with work on performance requirements for lighting products, this regional cooperation would better position the Asia region countries to input into the IEC work.

4.1.2. Monitoring, Verification and Enforcement Systems and Infrastructure

20 of the 27 countries within the region have MEPS, Labelling and/or Certification programmes for lighting products (refer to Appendix 1, Figure 6 and Figure 7). In most cases the associated monitoring, verification and enforcement (MV&E) programme is not exclusive to lighting products, but is part of a wider compliance programme encompassing many products in terms of process.

The specific systems employed are by default unique to the institutional structures and cultures of the individual country. Nevertheless, even for countries with advanced MV&E systems there are still significant lessons to be learned from countries operating differing systems, and more so in countries where MV&E systems are still being developed. This is evidenced by the ongoing lively exchanges of such experience during the *lites.asia* workshops. Further, some of the specific technical skills and infrastructure requirements are very resource intensive, both to develop and to maintain the ongoing technical capacity to continue functioning, and to adapt to new requirements and/or products. This is particularly true of lighting testing facilities.

Given the low value of the majority of lighting products, the testing required to establish the quality of a product is disproportionate in equipment, technical skills and time; and consequently cost. This inevitably limits the amount of commercial testing that is undertaken, which in turn limits the number of independent laboratories that can economically be supported in any particular region. This has led to shortages of laboratory capacity across the region. Excluding China⁶, India, Korea, Japan and Taiwan there are known to be only 20 laboratories accredited to test to national CFL specification and less for LEDs (refer to Appendix 1, Figure 8 and Figure 9). Given that several billion lamps are sold within the Asia each year, it is not surprising this shortage of laboratories has been highlighted many times as a major reason for poor quality lamps within the region^{xii}.

Existing Actions and Proposals to Offset Monitoring, Verification and Enforcement Barriers

Beginning with the testing capacity issue. There have been a number of efforts to increase the number of accredited laboratories within the region. For example, recently India has

^{6.} In this instance, the reference to China includes Hong Kong.



made a concerted effort to develop the testing capacity for LEDs within the country. The IEA 4E SSL Annex is another example, this time supported by a group of governments from around the world, that has recently organised comparative laboratory testing of LEDs in a number of countries in the region to increase the capacity for LED testing. Similarly, there have been a number of donor supported activities that have sought to develop laboratory capacity in individual countries, but this tends to be on a one-off project basis with no provision for ongoing commercial operation/maintenance of equipment/intellectual capacity where government funding is not available on a continual basis.

There is no clear solution to this issue until there is sufficient regional alignment of test methods, performance standards and certification procedures to enable mutual recognition agreements to flourish, and sufficient inter-country confidence to allow the volume of cross border testing of products to make more laboratories viable. While the ASEAN commitment to harmonisation does create the vision for such a situation being possible in the future in at least part of the region, an interim solution has to be found to increase the capacity of existing laboratories (particularly in the development and maintenance of human capacity), and to develop additional laboratory capacity where possible.

An independent knowledge and skills base that can deliver such capacity building already exists in the region in the form of the not for profit Global Efficiency Lighting Centre (GELC) based in Beijing, a recognised partner of the UNEP enlighten initiative. However, while the knowledge and training capacity exists, individual countries that have testing laboratories which would benefit from training or round robin testing managed by the GELC rarely have sufficient funds to pay for such services. Similarly, the GELC is a self funded organisation and so cannot deliver the services without covering costs. Therefore it is proposed:

- A funding mechanism be considered by one or more members of the donor community (ideally as part of an overall strategy proposed below) that will fund:
 - Individual countries to call on GELC laboratory capacity building services;
 - Staff exchanges between individual laboratories and the GELC to allow the maintenance of skill levels and the development of capacity to test new products as they enter local markets;
 - Round-robin testing to align the performance of laboratories throughout the region and enable demonstration of competence facilitating increasing levels of certification.

Moving to the wider MV&E capacity building issue. The ongoing *lites.asia* workshops are one of the primary forums for exchange of MV&E knowledge within the region, along with similar ad hoc and regular forums for other products. There are also occasional specialist conferences and workshops held within the region on these issues. However, MV&E systems are complex, and the number of individual and organisations involved in any one country are often numerous and therefore existing exchanges are limited in impact. In some cases, eg currently in Vietnam, donors are assisting with the development of the MV&E systems, but often such interventions are short term and the institutional knowledge and experience is not absorbed and maintained.

There certainly appears to be a requirement to continue the level of exchange already occurring related to lighting MV&E through *lites.asia* or another similar body. To more rapidly strengthen overall MV&E capacity within the region, there also appears to be a role for a



regional body that can deliver training and capacity building in a similar way to the proposed GELC services for test laboratories. This could be part of an expanded role for *lites.asia* or another specific organisation. But investigations should continue to identify funding support and a delivery mechanism. Engagement with JSCEEE/EEC-SSN may also assist in identifying an appropriate approach to addressing this need and in targeting relevant national agencies within ASEAN countries.

Increased capacity in product testing and MV&E could also enable, and indeed benefit, from the development of means by which countries could share information on MV&E activities (such as compliance test results), therefore pooling limited regional resources available for MV&E.

4.1.3. Industry Transition

The development of national capacity to manufacture lighting products is important for many countries in the region⁷. This may be existing manufacturing capacity that countries wish to transition to newer efficient lighting products, the expansion of existing efficient lighting production capacity or the development of a completely new industry. However, in almost all cases, the desire to develop the industry is a function of the drive for economic development.

Paradoxically, this drive to increase national manufacturing capacity presents a critical barrier to the actual transition to more efficient lighting. Not surprisingly, there is reticence in introducing high quality/efficiency product requirements until the local manufacturing base is able to compete at that level. However, the failure to introduce such quality thresholds in itself is a barrier to the development of MV&E systems that will be necessary at some time in the future, and hence allows the continued supply of poor quality products from elsewhere. This keeps product prices low and hampers the development prospects of the national manufacturers, slowing the whole transition process. All the time consumers are receiving poor quality products which fail to stimulate demand and economic and social gains are lost.

Proposals to address Industry Transition Barriers

Two areas appear to need to be addressed:

- An acceptance by the international community that, for periods of time, the MEPS, labelling and other regulatory measures may need to be set lower in some countries than elsewhere. This is not a failure to live up to international expectation, but a rational response to local circumstance. Hence, a one size fits all approach to MEPS and labelling thresholds is not appropriate and tiers of product performance are necessary for lighting products. This then presents the transitioning country with the option to adopt internationally recognised "lower" performance requirements as an initial step allowing the development of MV&E capabilities without unduly hampering economic development.
- Support with the technological development of local industry. Obviously the
 international community is unlikely to directly support the local industry development.
 However, the provision of technical knowledge in the design and manufacturer of
 efficient products is likely to significantly accelerate the development of the industry
 to a competitive level, and bring forward the time when the country is prepared to
 move to more stringent regulatory requirements.

^{7. 13} countries in the region currently have manufacture lamp some kind, refer to Appendix 1, Figure 10.



Again the GELC has the skills and experience to provide such services and funding mechanisms should be considered to support this technical service provision at appropriate times.

4.1.4. Donor Coordination

Many bi-lateral and multilateral donors are active within the region, and a number have, or are currently supporting lighting efficiency related projects. In all cases the donors are responding to individual country request and their own project selection criteria. However, at present there appears to be limited regional collaboration between donors, and no apparent inter-organisation strategy. In at least some cases the donor interventions are leading to good short term solutions (eg CFL giveaways reducing electricity demand and benefiting poor), but they are not necessarily the most appropriate interventions for the long term social and economic development of the region as a whole.

Proposals to address Donor Coordination Barriers

It is proposed that a regional donor coordination group is established to develop a well structured and coherent strategy for the development and market delivery of efficient (quality) lighting products to the region. Possibly working with or through ASEAN or *lites.asia* as suggested above, and/or with the UNEP enlighten initiative, donors can then implement projects in response to individual country needs, but within an umbrella strategic framework that ensures individual actions are not only immediately beneficial but are also accelerating the long term regional transition to more efficient lighting.



Appendix 1: Supporting Information on Asia Countries

Figure 2: Listing of Countries in the Asia Region and their Affiliation to Regional Organisations and the IEC

	APEC	ASEAN	BRESL	IEC
Country Name	member	member	member	member
Australia	Yes	No	No	Full
Bangladesh			Yes	
Bhutan				
Brunei Darussalam	Yes	Yes		
Cambodia	No	· Yes	No	Associate
China	Yes	+3	Yes	Full
DPR Korea (North)				
Hong Kong	Yes			
India		Dialogue		Full
Indonesia	Yes	· Yes	Yes	Full
Japan	Yes	+3		Full
Lao PDR	No	· Yes	No	Affiliate
Malaysia	Yes	· Yes		Full
Mongolia				
Myanmar		Yes		
Nepal				
New Zealand	Yes	· No	No	Full
Pakistan	No	· No	Yes	Yes
Papua New Guinea	Yes	Candidate		
Philippines	Yes	Yes		Full
Republic of Korea (South)	Yes	+3	No	Full
Singapore	Yes	Yes		Full
Sri Lanka	No	· No	No	Associate
Taiwan/Chinese Taipei	Yes	No	No	No
Thailand	Yes	Yes	Yes	Full
Timor-Leste		Candidate		
Viet Nam	Yes	Yes	Yes	Associate

Sources: APEC^{xIII}; ASEAN^{XIV}; BRESL^{XV}; IEC^{XVI}



Figure 3: Summary of Efficient Lighting Related Policy Interventions in the Asia Region, ASEAN and ASEAN +3 Countries

	National energy policy	National energy efficiency policy	Formal phase-out commitment	Bulk procurement/ giveaways	Subsidy programmes	Tax or financial incentive programmes	Communica	ations/awareness	programme	Inclusion of efficient lighting in building codes	Other policies
Country Name							Consumers	Retailers	Industry/ commercial		
Australia	Yes	Yes	First phase complete. Review	No	Yes (state based)	No	Yes	Yes	Yes	Yes	Engagement in regional and international actions to promote harmonisation. Benchmark testing of lighting products.
Bangladesh				Yes (k)	Yes (k)		Yes (k)				U U U U U U U U U U U U U U U U
Bhutan											
Brunei Darussalam				Yes (f)	Yes (f)		Yes (n)				
Cambodia	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Additional polices to support energy efficient lighting and appliance planning
China	Yes	Yes	Yes	Yes	Yes	-	Yes	-	-	Yes	Phase-out policy initiated in 2012 and due for completion in 2016 (review in 2014)
DPR Korea (North)											
Hong Kong				Yes (f)	Yes (f)						
India				Yes (e)	Yes (e)		Yes (e)				
Indonesia	Yes	Yes	No	Yes	Yes	No	Yes	No	No	Yes	Standards and labelling systems establishment
Japan			Voluntary (f)								
Lao PDR	Not yet (power policy	Being Drafted	Under consideration	n/a	n/a	n/a	Yes	n/a	Yes	n/a	-
Malaysia	Yes	Yes	Yes	Yes	Yes	No	Yes	In planning	Yes	Yes	2009-2012, Sales Tax exemption for Malaysian manufacturers producing efficient CFL, Tubes and LEDs and 4 appliances.
Mongolia											· · · · · · · · · · · · · · · · · · ·
Myanmar											
Nepal											
New Zealand	Yes	Yes	No	No	Previously	No	Yes	Yes	Yes	Yes	Websites, calculators and lighting design advice
Pakistan	-	-	-	Yes	Yes	Yes (0% Customs Import Duty)	Yes	-	Yes (BRESL Project for CFL &	Yes	Recently joined the UNEP enlighten initiative and has developed associated National Appropriated Mitigation
Papua New Guinea											
Philippines			Yes (e)	Yes (e)	Yes (e)		Yes (e)			Under development	
Republic of Korea (South)	Yes	Yes	Yes (beginning 2014)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-
Singapore							Yes (n)			Yes (n)	
Sri Lanka	No	No	No	No	Yes previously had but not	Yes only for skylights	General awareness	No	Yes	Yes	Not at policy level
Taiwan/Chinese Taipei	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	-
Thailand	-	Yes	Yes	Yes	Yes	Yes	Yes	-	-	Yes	LED lighting retrofit: Rebate 1-2 THB/kWh saving; Demonstration retrofitting in government offices
Timor-Leste							Yes (n)				
Viet Nam	-	Yes	No	Yes	Yes	Not yet	Yes	Not yet	Not yet	Yes	-
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ountry) Country in Asia Region

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Country Name Image: Country Name	23.44% 27.47% 28.47% 31.98%
Australia 22.33 1,131,623 55.668 248.77 420.17 43.87 36.37 17.6% 11.76 4.73% 9.75 2.32% 11,803.20 2,766.37 Bangladesh 148.69 100,357 6.564 39.54 52.64 5.20 3.07 13.1% 1.87 4.73% 1.10 2.10% 382.78 105.16 Bhutan 0.73 1,516 0.507 0.18 0.75 0.02 0.00 13.2% 0.01 6.11% 0.00 0.04% 1.08 0.31 Brunei Darussalam 0.40 14,008 1.029 3.42 13.05 0.46 0.34 13.3% 0.20 5.73% 0.14 1.11% 25.83 8.26	23.44% 27.47% 28.47% 31.98%
Bangladesh 148.69 100,357 6.564 39.54 52.64 5.20 3.07 1.1.0 4.73% 1.10 2.10% 382.78 105.16 Bhutan 0.73 1,516 0.507 0.18 0.75 0.00 13.2% 0.01 6.11% 0.00 0.04% 1.08 0.31 Brunei Darussalam 0.40 14,008 1.029 3.42 13.05 0.46 0.34 13.3% 0.20 5.73% 0.14 1.11% 25.83 8.26	27.47% 28.47% 31.98%
Bhutan 0.73 1,516 0.507 0.18 0.75 0.02 0.00 13.2% 0.01 6.11% 0.00 0.04% 1.08 0.31 Brunei Darussalam 0.40 14,008 1.029 3.42 13.05 0.46 0.34 13.3% 0.20 5.73% 0.14 1.11% 25.83 8.26	28.47% 31.98%
Brunei Darussalam 0.40 14,008 1.029 3.42 13.05 0.46 0.34 13.3% 0.20 5.73% 0.14 1.11% 25.83 8.26	31.98%
Cambodia 14.14 11,242 0.270 2.14 5.24 0.32 0.36 14.9% 0.10 4.89% 0.12 2.27% 28.99 9.57	33.03%
China 1,338.30 5,926,612 579.587 3,846.23 8,058.99 607.24 439.76 15.8% 184.80 4.80% 133.83 1.66% 80,280.94 21,617.98	26.93%
DPR Korea (North) 24.35 28,000 9.500 17.99 73.15 1.74 0.82 9.7% 0.53 2.95% 0.25 0.34% 70.43 13.36	18.96%
Hong Kong	
India 1,170.94 1,727,111 168.063 749.06 1,920.82 113.87 109.97 15.2% 41.28 5.51% 39.86 2.08% 9,398.08 2,622.01	27.90%
Indonesia 239.87 706,558 24.611 147.96 427.32 22.19 17.03 15.0% 9.35 6.32% 7.17 1.68% 1,961.93 650.60	33.16%
Lapan 127.45 5,458,837 266.796 1,006.32 1,201.80 104.04 44.48 10.3% 30.60 3.04% 13.08 1.09% 18,660.21 5,245.78	28.11%
Lao PDR 6.50 9,500 2.973 2.87 1.63 0.38 0.08 17.3% 0.13 5.97% 0.03 1.79% 32.71 9.43	28.84%
Malaysia 28.40 237,797 36.412 105.43 223.59 17.55 11.69 16.6% 5.74 5.45% 3.83 1.71% 2,037.20 554.86	27.24%
Mongolia 2.76 6,200 0.832 4.08 12.23 0.53 0.29 13.0% 0.16 3.96% 0.09 0.72% 28.20 6.18	21.90%
Myanmar 47.96 50,200 2.136 5.19 13.42 0.74 0.13 14.3% 0.26 5.09% 0.05 0.34% 44.24 9.67	21.85%
Nepal 29.96 15,722 1.028 2.70 3.95 0.57 0.00 21.2% 0.19 7.18% 0.00 0.01% 69.02 20.46	29.64%
New Zealand 4.37 134,822 9.603 38.56 32.59 4.80 0.62 12.5% 0.80 2.06% 0.10 2.06% 144.33 74.61	51.70%
Pakistan 173.59 176,870 21.598 74.35 182.58 11.56 5.61 15.5% 4.06 5.46% 1.97 1.08% 1,379.22 408.12	29.59%
Papua New Guinea 6.86 9,480 0.766 2.76 1.28 0.44 0.26 15.9% 0.13 4.80% 0.08 6.05% 111.76 31.61	28.28%
Philippines 93.26 199,589 18.822 55.62 80.22 8.34 3.95 15.0% 3.51 6.32% 1.67 2.08% 1,885.89 760.96	40.35%
Republic of Korea (South) 48.88 1,014,483 73.699 458.53 520.31 47.23 23.08 10.3% 14.32 3.12% 7.00 1.34% 3,816.13 952.83	24.97%
Singapore 5.08 208,765 11.585 41.07 28.96 4.40 2.25 10.7% 1.55 3.77% 0.79 2.73% 709.81 237.01	33.39%
Sri Lanka 20.86 49,552 3.038 8.38 11.99 1.26 0.54 15.0% 0.56 6.69% 0.24 2.03% 244.80 114.04	46.58%
Taiwan	
Thailand 69.12 318,522 33.085 146.67 296.10 18.21 9.45 12.4% 6.54 4.46% 3.40 1.15% 2,099.47 670.70	31.95%
Timor-Leste 1.12 701 0.00 0.07 0.20 0.01 19.9% 0.00 6.76% 0.00 1.73% 1.74 0.51	29.14%
Viet Nam 86.94 106,427 16.20 85.50 129.68 12.03 4.70 14.1% 4.26 4.98% 1.66 1.28% 1,123.34 337.62	30.06%
Totals (all) 3,712.84 17,644.494.38 1,344.43 7,093.40 13,712.66 1,027.03 714.86 14.5% 322.73 4.55% 226.21 1,65% 136.341.32 37.227.99	27.30%
Totals (ASEAN) 591.67 1.862,608.52 147.18 595.86 1,219.21 84.64 49.99 14.2% 31.65 5.32% 18.85 1.55% 9,949.41 3,248.68	32.65%
Totals (ASEAN +3) 2,106.29 14,262,540.35 1,067.26 5,906.95 11,000.31 843.15 557.31 14.3% 261.37 4.43% 172.76 1.57% 112,706.68 31,065.27	

Figure 4: Statistics on Population, GDP, Energy Consumption, Emission and Potential Savings from Efficient Lighting in the Asia Region, ASEAN and ASEAN +3 Countries

 Colour Coding:
 Country X
 Country in Asia Region

 Country Y
 Country member of ASEAN

 Country Z
 Country one of the ASEAN "+3"

Source: UNEP en.lighten initiative^{xxii}.; except values in italics for Lao PDR and New Zealand, personal communication from Viengsay Chantha (Lao PDR Ministry of Energy and Mines) and Terry Collins (New Zealand Energy Efficiency and Conservation Authority) respectively



Figure 5: National Test Methods, Relationship to IEC Standards and Participation in IEC Committees by Countries in the Asia Region, ASEAN and ASEAN +3 Countries

	CFL st	andard	LED sta	andard	Incandesce	nt standard	IEC me	ember			Committee	participatio	n	
Country Name	National performance standard for CFLs	Copy, or based on, IEC standard	National performance standard for LEDs	Copy, or based on, IEC standard	National performance standard for GLS	Copy, or based on, IEC standard	Current	Planned	TC34 current	TC34 planned	SC34A current	SC34A planned	SC34D current	SC34D planned
Australia	Yes	Yes with minor revisions	No	Under consideration	Yes	Yes with minor revisions	Full	-	Participat ing	-	Participat ing	-	Participat ing	-
Bangladesh	Yes	Yes(a)												
Bhutan														
Brunei Darussalam	Yes	Yes (f)												
Cambodia	No	Yes with minor revisions	No	Yes (minor modifications)	No	Yes (minor modifications)	Associate	-	n/a	-	n/a	-	n/a	-
China	Yes	Yes with minor revisions	Yes	-	-	-	Full	-	Participat ing	-	Participat ing	-	Participat ing	-
DPR Korea (North)														
Hong Kong	Yes	Yes with minor revisions (d)												
India	Yes	Yes with minor revisions (d)	Yes (e)				Full							
Indonesia	Yes	Сору	Yes	Yes with minor revisions	Yes	Сору	Full	-	Participat ing	-	Participat ing	-	Participat ing	-
Japan			Yes (f)				Full							
Lao PDR	No	Yes	No	n/a	No	Yes	Affiliate	Yes	n/a	n/a	n/a	n/a	n/a	n/a
Malaysia	Yes	IEC	Yes	IEC	Yes	IEC	Full	-	Observer	-	Observer	-	Observer	-
Mongolia														
Myanmar	Yes	Yes (m)												
Nepal														
New Zealand	Yes	Copy, with minor revisions	Yes; (ENERGY STAR®)	Yes; (ENERGY STAR®)	-	-	Full	-	Participat ing	-	Observer	-	Participat ing	-
Pakistan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	Participat ing	-	Participat ing	-	Participat ing	-
Papua New Guinea														
Philippines	Yes (e)	Yes (e)					Full		Observer		Participa nt		Observer	
Republic of Korea (South)	Yes	Copy, with minor revisions	Yes	Copy, with some revisions	Yes	Copy, with minor revisions	Full	-	Participat ing	-	Participat ing	-	Participat ing	-
Singapore							Full							
Sri Lanka	Yes	Yes, partially adopted	To be published soon	Yes	Yes	Yes	Associate	-	No	-	No	-	No	-
Taiwan/Chinese Taipei	Yes	Yes	Yes	Yes	Yes	No	No	-	n/a	-	n/a	-	n/a	-
Thailand	Yes	Yes	No	Yes	Yes	Yes	Full	-	Participat ing	-	Participat ing	-	Observer	-
Timor-Leste														
Viet Nam	Yes	Yes	-	-	-	-	Associate	-	No	-	No	-	No	-

Country in Asia Region Country member of ASEAN Country one of the ASEAN "+3" Colour Coding: Country) Country Y

ountry Z

Source: lites.asia survey - November 2013^{xvii}; except (a) Asep Suwarnaat 2013^{xxiii}, (d) CLASP^{xxiv}, (e) lites.asia^{xxv}, (f) and (m) UNEP en.lighten initiative^{xxvi}, IEC^{xvi}



Figure 6: CFL Performance Standards, Labelling, Product Registration and Compliance Actions in the Asia Region, ASEAN and ASEAN +3 Countries

					CF	Ls				
Country Name	MEPS	HEPS	Comparative labelling	Endorsement labelling/	Import registry	Domestic product	Mandatory testing	Market surveillance	Registry of non- compliant products	Fines or penalties
Australia	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Bangladesh	Voluntary (a)	No (a)	Voluntary (a)							
Bhutan										
Brunei Darussalam			Under Development (f)							
Cambodia	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes
China	Mandatory	Voluntary	Mandatory	Voluntary (CQC label)	All products require registration for label	All products require registration for label	Yes	Yes	No Register. Sometimes published	Yes
DPR Korea (North)										
Hong Kong	Mandatory (d)		Mandatory (f)	Voluntary (f)						
India	Mandatory (e)			Voluntary (e)						
Indonesia	Being implemented in parallel with label	No	Being implemented	No	Yes	Yes	Yes	Yes	No	Yes
Japan	Yes (f)		Yes (c)							
Lao PDR	No	No	No	No	Yes	Yes	n/a	n/a	n/a	n/a
Malaysia	Mandatory	-	Voluntary	Voluntary	Mandatory	Mandatory	Mandatory	Mandatory	-	Mandatory
Mongolia										
Myanmar										
Nepal										
New Zealand	Yes - Mandatory	Yes - (ENERGY STAR®) - Voluntary	-	Yes - (ENERGY STAR®) -	Yes - (ENERGY STAR®) - Voluntary	Yes (no local production)	Yes - (ENERGY STAR®) - Voluntary	Yes - (RightLight/	No	Yes
Pakistan	Voluntary	-	Under consideration	-	-	-	Under consideration	-	-	Under consideration
Papua New Guinea										
Philippines			Mandatory (d)							
Republic of Korea (South)	Mandatory	Voluntary	Mandatory	Voluntary	Yes	Yes	Yes	Yes	Yes	Yes
Singapore				Voluntary (f)						
Sri Lanka	Mandatory	Not available currently	Mandatory	Not available currently	Yes , mandatory at customs	No	Yes, mandatory	Yes, still not effective	No	Yes, mandatory
Taiwan/Chinese Taipei	Mandatory	-	Mandatory	Voluntary	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
Thailand	Voluntary	Voluntary	Voluntary	-	-	-	Yes	Yes	-	Yes
Timor-Leste										
Viet Nam	Yes (from 2014)	Voluntary	Yes	Voluntary	Yes	Yes	Yes	Yes	-	Yes

Source: lites.asia survey - November 2013^{xvii}; except (a) Asep Suwarnaat 2013^{xxiii}, (c) Karou Yamaguchi^{xxvii}(d) CLASP^{xxiv}, (e) lites.asia^{xviii}, (f) UNEP en.lighten initiative^{xix}



Figure 7: LED Performance Standards, Labelling, Product Registration and Compliance Actions in the Asia Region, ASEAN and ASEAN +3 Countries

					LE	Ds				
Country Name	MEPS	HEPS	Comparative labelling	Endorsement labelling/	Import registry	Domestic product registry	Mandatory testing	Market surveillance program	Registry of non- compliant products	Fines or penalties
Australia	Under consideration	No	Under consideration	No	Under consideration	Under consideration	Under consideration	Under consideration	No	Under consideration
Bangladesh										
Bhutan										
Brunei Darussalam										
Cambodia	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes
China	Under development	Voluntary (CQC label)	Under consideration	Voluntary (CQC label)	Under consideration	Under consideration	Under consideration	No	No	No
DPR Korea (North)										
Hong Kong			Voluntary (f)							
India	Yes (f)	No (e)	No (e)	No (e)						
Indonesia	Under development	To be considered	To be considered	To be considered	-	-	-	-	-	-
Japan										
Lao PDR	No	No	No	No	Yes	Yes	n/a	n/a	n/a	n/a
Malaysia	Mandatory	-	Voluntary	-	Mandatory	Mandatory	Mandatory	Mandatory	-	Mandatory
Mongolia										
Myanmar										
Nepal										
New Zealand	No	Yes - (ENERGY STAR*)	-	Yes - (ENERGY STAR®)	Yes - (ENERGY STAR*)	-	Yes - ENERGY STAR*)	Yes - (ENERGY STAR*)	-	Yes
Pakistan	-	-	-	-	-	-	-	-	-	-
Papua New Guinea										
Philippines										
Republic of Korea (South)	No	Voluntary	Voluntary	Voluntary	Yes	Yes	Yes	Yes	Yes	Yes
Singapore										
Sri Lanka	Not available currently	Not available currently	Not available currently	Not available currently	No	No	No	No	No	No
Taiwan/Chinese Taipei	Mandatory	-	voluntary	Voluntary	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
Thailand	-	-	Voluntary	-	-	-	-	-	-	-
Timor-Leste										
Viet Nam	=	-	-	=	-	=	=	=	=	-

Colour Coding:	Country X	Country in Asia Region						
	Country Y	Country member of ASEAN						
	Country Z	Country one of the ASEAN "+3"						
Source: lites.asia survey - November 2013 ^{xvii} ; except (e) lites.asia ^{xviii} , (f) UNEP en.lighten initiative ^{xix}								



Figure 8: Availability and Accreditation of Public and Private Test Laboratories for CFLs in the Asia Region, ASEAN and ASEAN +3 Countries

	CFL standard	Public/go	overnment laboratories	s for CFLs	Pri	vate laboratories for C	FLs
Country Name	National performance standard for CFLs	Number of public/govnt test laboratories	Number accredited to test to national standards	Number accredited to test to international standards	Number of private test laboratories	Number accredited to test to national standards	Number accredited to test to international standards
Australia	Yes	1	-	-	3	3	-
Bangladesh	Yes						
Bhutan							
Brunei Darussalam	Yes						
Cambodia	No	None	-	-	None	-	-
China	Yes	20+	20+	20+	40+	40+	40+
DPR Korea (North)							
Hong Kong	Yes						
India	Yes	5 (e)	5 (e)				
Indonesia	Yes	6	2	2	1	None	None
Japan		5+	5+				
Lao PDR	No	No	-	-	No	-	-
Malaysia	Yes	1	1	-	1	1	-
Mongolia							
Myanmar	Yes						
Nepal							
New Zealand	Yes	3	2	3	None	-	-
Pakistan	Yes	2	1	-	-	-	-
Papua New Guinea							
Philippines	Yes (e)	1 (o)	1 (o)		2 (0)	2 (o)	
Republic of Korea (South)	Yes	5	5	5	3	3	-
Singapore		1	1				
Sri Lanka	Yes	2	Both test to Standard, neither accredited	-	None	-	-
Taiwan/Chinese Taipei	Yes	7	4	2	2	3	-
Thailand	Yes	2	2	2	2	2	2
Timor-Leste							
Viet Nam	Yes	2	2	2	-	-	-

Colour Coding:	Country X	Country in Asia Region
	Country Y	Country member of ASEAN
	Country Z	Country one of the ASEAN "+3"
		xv/ii

Source: lites.asia survey - November 2013^{xvii}; except (e) lites.asia^{xviii}, (o) lites.asia surveys – June 2012^{xxviii}



Figure 9: Availability and Accreditation of Public and Private Test Laboratories for LEDs in the Asia Region, ASEAN and ASEAN +3 Countries

	LED standard	Public/go	vernment laboratorie	s for LEDs	Pri	vate laboratories for LE	EDs
	National performance standard for LEDs	Number of public/govnt test laboratories	Number accredited to test to national standards	Number accredited to test to international	Number of private test laboratories	Number accredited to test to national standards	Number accredited to test to international
Country Name Australia	No	1	-	standards	3	3	standards
		_			-	-	
Bangladesh							
Bhutan							
Brunei Darussalam							
Cambodia	No	None	-	-	None	-	-
China	Yes	3+	3+	3+	40+	40+	40+
DPR Korea (North)							
Hong Kong							
India	Yes (e)	4.00	Unknown (i)				
Indonesia	Yes	-	-	-	-	-	-
Japan	Yes (f)	5+	5+				
Lao PDR	No	No	-	-	No	-	-
Malaysia	Yes	1	1	-	1	1	-
Mongolia							
Myanmar							
Nepal							
New Zealand	Yes; (+ENERGY STAR®)	3	2	3	N/A	-	-
Pakistan	Yes	-	-	-	-	-	-
Papua New Guinea							
Philippines		1 (0)	1 (0)				
Republic of Korea (South)	Yes	5	5	5	3	3	1
Singapore							
Sri Lanka	To be published soon	Under development	No	-	None	-	-
Taiwan/Chinese Taipei	Yes	11	5	5	10	5	5
Thailand	No	1	1	1	-	-	-
Timor-Leste							
Viet Nam	-	2	2	2	-	-	-

Colour Coding:	Country X	Country in Asia Region
	Country Y	Country member of ASEAN
	Country Z	Country one of the ASEAN "+3"

Source: lites.asia survey - November 2013^{xvii}; except (e) lites.asia^{xviii}, (i) Shyam Sujan, 2012^{xxix}, (o) lites.asia surveys – June 2012^{xxviii}



Figure 10: Countries with Production Capacity for CFLs, LEDs, Incandescent and Other Lamp Types in the Asia Region, ASEAN and ASEAN +3 Countries

	CFL production		LED production		Incandescent lamp		Other lamp production	
	Domestic	International	Domestic	International	Domestic	International	Domestic	International
Country Name	production	quality	production	quality	production	quality	production	quality
Australia	No	-	Assembly only	-	No	-	Not known	-
Bangladesh	Yes (k)		Yes (k)					
Bhutan								
Brunei Darussalam								
Cambodia	No	-	No	-	No	-	No	-
China	Yes	-	Yes	-	Yes	-	Yes	-
DPR Korea (North)								
Hong Kong								
India	Yes (e)		Yes (e)					
Indonesia	Yes	Yes	Yes	Yes	Yes	Yes	Yes - Linear Flourescent	-
Japan			Yes					
Lao PDR	No	-	No	-	No	-	No	-
Malaysia	Yes	-	Yes	Yes	-	-	-	-
Mongolia								
Myanmar								
Nepal								
New Zealand	No	-	No	-	No	-	Luminaires	-
Pakistan	Limited facility	-	-	-	Limited facility	-	Limited facility	-
Papua New Guinea								
Philippines								
Republic of Korea (South)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Singapore								
Sri Lanka	Part assembling	No	Part assembling	No	Part assembling	No	No	No
Taiwan/Chinese Taipei	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Thailand	Yes	Yes	Yes	Yes	Yes	Yes	Yes - Linear Flourescent	Yes (LFL)
Timor-Leste								
Viet Nam	Yes	Yes	Yes	Yes	Yes	Yes	Yes - Linear Flourescent	Yes
Viet Nam	Yes	Yes	Yes	Yes	Yes	Yes	Yes - Linear Flourescent	Yes

Colour Coding:	Country X	Country in Asia Region		
	Country Y	Country member of ASEAN		
	Country Z	Country one of the ASEAN "+3"		

Source: lites.asia survey - November 2013^{xvii}; except (e) lites.asia^{xviii}, (k) Md. Sajjadul Bari, 2013^{xx}



References and End Notes

- i *lites* stands for Lighting Information and Technical Exchange for Standards and *lites.asia* seeks to facilitate policy maker cooperation within the Asia region. Since the inaugural meeting in October 2009, membership of the lites.asia network has increased to over 600 participants from 20 economies, with delegates actively participating in IEC meetings, sharing knowledge on local standards and labelling electronically and in regional meetings, plus a number of other cooperative actions.
- ii United Nations Environment Programme (UNEP). 2013. The Rapid Transition to Efficient Lighting: An Integrated Policy Approach: http://www.enlighteninitiative.org/Resources/Publications.aspx.
- iii United Nations Environment Programme (UNEP). 2012. Achieving Global Transition to Energy Efficient Lighting Toolkit: http://www.enlighteninitiative.org/Resources/Publications.aspx.
- iv A number of these barriers were actually identified at the time of the formation of *lites.asia* and the activities of the *lites.asia* initiative to date have been the first attempts to address some of the barriers. Refer to http://www.lites.asia/about.
- v Special Session of the RightLight 6 Conference on Compact Fluorescent Lamps, 18 May 2005: http://www.egeec.apec.org/www/UploadFile/Shanghai-Communique.pdf accessed on 21/8/2013.
- vi The proposed revisions to the to the IEC test method were submitted by the Australian representative at the relevant IEC committee following development by a CFLi working group established as a result of the outcomes of the Special Session of the RightLight 6 Conference on Compact Fluorescent Lamps. Similarly, a finalised version of the tiered performance standards originally proposed by the working group was submitted to the IEC for consideration in 2008, again through the Australian IEC representative.
- vii The strong ongoing regional desire for CFL Tiers of Performance was again reiterated by the "Resolution Supporting the Proposed IEC Technical Specification on Self Ballasted CFL Performance Tiers" passed by participants from 10 countries present at the lites.asia meeting in New Delhi, India, 2-4 October 2012, refer: http://www.lites.asia/files/otherfiles/0000/0178/Meeting_Report_Delhi_October_2012.pdf. The resolution was subsequently relayed to the relevant IEC committee.
- viii Which is one of the reasons so many countries are mandated to adopt IEC standards where they exist as evidenced by the number of countries in the region using the current CFL test method as the basis for national regulation despite the obvious shortcomings, refer to Appendix 1 **Error! Reference source not found.** (although it should be noted that the adoption of IEC standards is also strongly related to the desire for harmonisation).
- ix Australia experienced such unintended consequences when setting efficiency standards for Halogen lamps in 2009. The performance requirements set in consultation with industry



ultimately appeared to be challenging for manufacturers and have required adjustment due to the inability of industry to supply compliant products.

- x The exact current number of CFL performance specifications is unknown.
- xi The Joint Sectoral Committee for Electrical and Electronic Equipment (JSCEEE) is one of the working groups under the ASEAN Consultative Committee on Standards and Quality (ACCSQ). ACCSQ is charged with implementation of mutual recognition arrangements of test reports, certifications & conformity; and harmonise national standards, technical regulations & conformity assessment requirements. To date the JSCEEE has primarily been concerned with harmonisation of safety standards. However, given the recent restating of the desire for wider harmonisation of product requirements, there is a strong possibility the Committee would be receptive to an approach for action. The Energy Efficiency and Conservation Sub-Sector Network (EEC-SSN) is the energy efficiency policy equivalent of the JSCEEE.
- xii Including the Eco-Asia, Confidence in Quality: Harmonization of CFLs to Help Asia Address Climate Change, 2010 (www.lites.asia/.../confidence-in-quality-harmonization-of-cfls-tohelp-asia- address-climate-change) and at numerous *lites.asia* meetings.
- xiii APEC: http://www.apec.org/About-Us/About-APEC/Member-Economies.aspx accessed on 20/8/2013.

xiv ASEAN: http://www.asean.org/asean/asean-member-states accessed on 20/8/2013.

xv BRESL: http://www.bresl.com/ accessed on 20/8/2013.

xvi IEC: http://www.iec.ch/about/profile/members.htm accessed on 5/11/2013.

xvii *lites.asia*, Survey of Needs for Capacity-Building Support for Efficient Lighting in Southeast Asia and Pacific, November 2013.

Respondents:

Australia: David Boughey, Assistant Manager, Lighting and Equipment Energy Efficiency Team, Department of Industry;

Cambodia: Sarikh Uk, Chief of Office of Information and WTO, Institute of Standards of Cambodia (ISC);

China: Stuart Jeffcott, Operations Manager, lites.asia;

Indonesia: Ardi Moeharyoso/Awang Riyadi, President/Head of Section for Energy Efficiency Technology Application, AILKI (Indonesia Luminaire Association)/Directorate of Energy Conservation;

Lao PDR: Viengsay Chantha, Acting Director of State Owned Enterprises Management Division, Department of Energy Management, Ministry of Energy and Mines;

Malaysia: Hafiza Yob, Regulatory Officer, Energy Commission of Malaysia;

New Zealand: Chris Forsman, ENERGY STAR Programme Manager, Energy Efficiency and Conservation Authority;

Pakistan: Noman Rafiq, Company Secretary ECF, Energy Conservation Fund (ENERCON);

Republic of Korea (South): Seongkuk Hur, Principal Engineer, Korea Institute of Lighting



Technology;

Sri Lanka: Francis Nimal Perera/ Sanath Kithsiri Kumarajaperumage, President/Head, Energy Efficiency Services, Energy Management Division, Sri Lanka Energy Managers Association/Sri Lanka Sustainable Energy Authority;

Taiwan/Chinese Taipei: Austin Yang, Researcher, Industrial Technology Research Institute;

Thailand: Pitarn Chaichinda/Asawin Asawutmangkul, Director, Demand Side Management and Planning Division/ Senior Engineer, Bureau of Energy Efficiency Promotion, Electricity Generating Authority of Thailand (EGAT)/ Department of Alternative Energy Development and Efficiency (DEDE);

Viet Nam: Doan Thi Thanh Van (and submitted to Mr Dang Hai Dung, Ministry of Industry and Trade, for confirmation), Head of Electronic and Electric Division, Vietnam Standards and Quality Institute (VSQI).

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