

Bringing Order to a Global Commodity - the International CFL Harmonisation Initiative: First Year Progress and Lessons Learned

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Abstract

The current international CFL market is characterised by a large array of product offerings from which consumers often have difficulty identifying appropriate products for their needs, a number of testing protocols by which the performance of CFLs are measured, and an array of non-harmonised performance specifications which are used for regulation of markets or programmes. Such complexity for a relatively simple product brings restrictions on trade, complexity in market surveillance and the potential for poor quality products to sour the market, high compliance costs for manufacturers, and ultimately, higher product costs to consumers.

The International CFL Harmonisation Initiative has the ultimate aim of:

“Delivering higher-quality, low-cost CFL lighting products to consumers worldwide.”^[1]

While this is certainly an ambitious, and even audacious, goal, it is currently being pursued by a number of international stakeholders who are working together to create an enabling environment to facilitate international trade of CFLs.

This paper provides an overview of the remarkable progress to date in engaging the international community in the development of the initiative. In particular, this paper reports on the development of a revised uniform testing protocol for CFLs soon to be submitted to the IEC for review and adoption, and the testing programme currently underway to validate the protocol.

The paper concludes with lessons that have already been learned by the facilitators which may be of assistance to others seeking to initiate similar harmonisation activities.

Introduction

CFLs have been available for over 20 years and have been actively promoted by manufacturers and energy efficiency advocates as energy saving devices for residential and commercial applications. Uptake of CFLs continues to accelerate around the globe and CFLs are now available in a wider variety of styles, at a lower cost and in more outlets than ever before. However, the increasing use of CFLs, and the intense price competition, has brought issues of product performance and quality to the fore. In an attempt to continue to maximize the penetration of CFLs into the marketplace, government regulators and programme managers have developed a range of performance measures, performance requirements, and standards and labeling systems to promote CFLs and protect consumer confidence. In fact, at the time of writing, the authors are aware of at least 38 separate minimum or premium performance standards and/or labeling systems around the world:^[1]

- 13 minimum CFL standards are in place (9) or under consideration (4);
- 25 CFL labeling programs are in place (24) or under consideration (1); and
- One-third of existing programs are mandatory, while two-thirds are voluntary.

Unfortunately, many of these programmes are using differing techniques for measuring the performance of CFLs.

While there is no doubt that such activities have led to benefits at the local level, it is recognised that they have also introduced a new set of barriers to the wider adoption of CFLs, most notably:

- An increase in costs for manufacturers as they seek to meet the product development and compliance actions necessary to access the diverse markets, costs that are ultimately passed on to consumers as higher price, or, as a reduction in competition as some manufacturers withdraw from supplying smaller economies/niche markets, again increasing the costs to consumers;

- A stretching of financial and human resources at the local (programme, national or regional) level as local actors struggle to develop and enforce each performance, standard or labeling system.

Hence there is recognition that a move towards a pan-national harmonisation of performance measures, the establishment of a limited number of performance tiers that could be adopted at the local level, and the potential development of a system that would share the burden of enforcement would be beneficial to all. Further, given the globally traded nature of CFLs, any attempt at such harmonisation actions would be fully in line with commitments made by a large proportion of nations at the World Trade Organisation and other regional trading fora to attempt to harmonise standards and labeling systems wherever possible.

In May 2005, at the 6th International Conference on Energy Efficient Lighting in Shanghai, more than 80 delegates participated in a special session discussing many of the CFL performance issues concerning harmonizing CFL specifications around the world. At this session, the delegates agreed in principle to pursue international CFL harmonisation, including further research on the issues of creating a uniform testing procedure, the potential for the development of a range of performance specifications, and an investigation into the opportunities for developing mechanisms for greater enforcement of activity to maintain product quality levels.

The International CFL Harmonisation Initiative

As a result of the special-session in Shanghai, and the commitments made by the participants, the International CFL Harmonisation Initiative was formed. This initiative has the ultimate aim of:

“Delivering higher-quality, low-cost CFL lighting products to consumers worldwide”^[2]

While this is certainly an ambitious, and even audacious, goal, it is currently being pursued by a number of international stakeholders who are working together to create an enabling environment to facilitate international trade of CFLs. The stakeholders have the common vision of reducing the number of product types that manufacturers have to produce to serve different international markets, while developing a transparent, practical, and inexpensive compliance mechanism that increases confidence in CFL quality and performance.

To achieve this goal, the International CFL Harmonisation Initiative has four main objectives:

- To create a uniform international testing method, covering the performance features of self-ballasted CFLs;
- To identify a number of performance specifications for self ballasted CFLs to facilitate international comparisons of CFL performance requirements;
- To propose internationally acceptable mechanisms to assist programme managers, policy makers and enforcers to ensure the products that are delivered to their consumers are of suitable quality; and
- To propose and promote these initiatives to the wider international lighting community.

This paper provides an overview of the remarkable progress to date in engaging the international community in the development of the initiative and the actions underway to develop the new uniform testing protocol and the testing programme being undertaken to validate the protocol. (Progress on the performance specifications and compliance are presented in a second EEDAL paper^[3]).

The paper concludes with some key lessons that have already been learned by the facilitators of the initiative, lessons that may prove useful for other groups seeking to undertake similar harmonisation initiatives in the future.

Development of a Comprehensive Testing Protocol for CFLs

An analysis of CFL testing protocols specified by regulators and programme operators in the Asia Pacific Economic Cooperation (APEC) trading region^[4] (which is thought to be representative of much of the rest of the world including the European Union) shows that the testing protocols used in national programs are mostly drawn from three principle sources: 1) the IEC (International Electro-technical Commission), 2) ANSI (American National Standards Institute), and 3) IESNA (Illuminating Engineering Society of North America). Economies in North America tend to use IESNA and ANSI testing standards, while the rest of the world tends to use IEC testing standards. The analysis then examines in detail the various protocols used within each specification to test the various CFL performance criteria and concludes by saying:

“[The] consistency in testing standards reviewed in this paper suggests there is a good foundation for various national programs to adopt a common set of testing conditions.

The next logical step is to develop a harmonised testing procedure for CFLs through revision of the current IEC standard since it is the one practiced most widely around the world.^{44]}

However, the authors' discussions with a variety of test laboratories demonstrate that the existing test methods require considerable interpretation and this may also introduce variations in results, depending upon the assumptions made by individual laboratories. As a consequence, there is a need not only for a single test method, but one that is sufficiently clear and robust that it can be easily followed, and the results replicated by different laboratories. In addition, the existing test methods do not all specify the full range of tests relating to the performance criteria set by most CFL standards, labels or programmes. Having all potential tests contained within the single test method will also clarify the requirements for manufacturers and laboratories, and improve the potential for products to conform to regulatory requirements. Hence, the protocol working group began the drafting of a new Test Method for electronic self-ballasted CFLs largely based on the existing IEC 60969 test protocol. At the time of preparation of this paper a final version of the protocol (version 13^[6]) had been issued and this is the version undergoing verification testing (see the following section) at present.

The initial development process leading to the issuing of the version 13 of the protocol draft drew on work done by the Joint Standards Australia/Standards New Zealand Technical Committee EL-041-08, and by the National Lighting Test Centre in Beijing. Later and more comprehensive drafts were developed through open forum meetings in Korea (as part of the 2nd Forum of the International CFL Harmonisation Initiative) and a special consultative meeting of Chinese Manufacturers called by the China Association of Lighting Industries (CALI), through one-to-one discussion with industry experts, and through numerous individual submissions for manufacturers, testing houses, regulators and programme operators from the Americas, Europe and Asia.

While there are extensive changes to the detail of the IEC 60969 protocol to address some of the issues related to minimizing of laboratory interpretation, the key changes to the protocol are:

1. **The removal of all references to performance requirements:** Unlike IEC 60969 the new draft protocol contains no performance requirements and only describes relevant test methods. This facilitates easier adoption by a range of actors who must respond to differing market conditions. A separate working group is examining potential tiers of increasingly stringent CFL performance based on the criteria measured through use of the protocol, tiers that may be adopted by regulators/programme operators if appropriate to their needs.
2. **Changes to existing scope, definitions and protocols:**
 - a. **Scope of the Protocol:** The protocol is now more restrictive in scope to allow for tighter testing definitions. The proposed scope includes all self-ballasted CFLs (integral electronics for start, control and stable operation), of all voltages and wattages and of all cap types, with the exclusion of cold cathode and non-general purpose lamps;
 - b. **Individual Lamp Failure:** To avoid the potential situation where lamps have not ceased to operate but are providing only a "glow" output (obviously a situation not acceptable to consumers), the definition of lamp failure has been revised to be the point when the lamp fails to illuminate or falls below 50% of initial luminous output;
 - c. **Lamp "on" Time:** As a clarification, the protocol now clearly states that any time measurement (e.g. aging, lifetime) is only the summation of the periods when the lamp is illuminated and NOT the summation of the on and off cycles;
 - d. **Voltage of Tests:** In most previous protocols, either the rated lamp voltage and/or the nominal country voltage are defined as the voltage at which tests are to be performed. In recognition of the fact that real life supply voltages vary significantly from nominal voltages (both upwards and downwards), the voltage for testing is now set at (generally) the most stressful conditions for the lamp within its rated voltage range, hence ensuring a minimum level of performance for the consumer.
3. **Adoption of a range of test methods for characteristics not previously included in the protocol:** In particular, new tests have been developed (or adopted from existing programme or national protocols) for:
 - a. **Starting Time:** a measure of how long the lamps takes to reach initial constant illumination, hence providing sufficient light for consumer safety;
 - b. **Low Temperature Starting Time Test:** necessary for some regulators/programmes operating in extreme northerly or southerly latitudes;
 - c. **Run-up:** a measure of how fast a lamp reaches 80% of its final luminous output, a key time period related to consumer satisfaction;

- d. **Switch Withstand Test:** Used by a number of regulators/programmes as a more realistic representation of real-life operation and consequentially lamp lifeⁱ;
- e. **Power Factor Test:** A criteria being increasingly specified by regulators/programme operators wishing to manage load on generation and distribution equipment
- f. **Mercury Content Test:** Another increasingly important aspect as environmental issues wider than energy consumption and product performance come to the fore, the mercury content being particularly important given its high toxicity and the potential to use additional mercury to improve lamp performance.ⁱⁱ

Discussions are currently underway with the IEC on the most appropriate route for the submission of version 13 of the protocol as the basis for revisions of the existing international standard. Following the verification testing any amendments required due to anomalies identified during the tests, and additional comments received from stakeholders, will be fed directly to the IEC for consideration during their formal review procedures.

Comparative Protocol Verification Testing

Based on Version 13 of the protocol, a major comparative testing programme has commenced to:

- Highlight any deficiencies in the proposed testing procedures and reveal any difficulties testing laboratories have in undertaking the tests as described;
- Provide direct evidence of proposed testing procedures that demand excessive levels of detail and provide the necessary empirical data that can subsequently be used in revising the protocol to lower the costs of testing for manufacturers and those groups concerned with standards and programme compliance and enforcement;
- Provide empirical data to facilitate selection of the most appropriate testing protocol where more than one method has been proposed (in particular the switch withstand test).

Testing is being undertaken on a single batch of Philips CFLsⁱⁱⁱ by the following laboratories:

Intertek (USA)
National Lighting Test Centre (China)
Lighting Association Laboratories (UK)
LATL (Philippines)
Delta (Denmark)
Osram (USA)

Sufficient lamps from the same batch have been procured to allow supply to additional manufacturer, government or independent laboratories should they wish to join the comparative verification testing group.

The comparative tests are being conducted following the recommended procedures in IEC Guidelines^[6]. All results are being collected, analysed and published on an entirely anonymous basis, ie all data will be made publicly available, but each data set will not be explicitly linked to the specific laboratory undertaking that test. Data analysis is being conducted by an internationally recognised, independent expert. Where clarifications are required, the Working Group advisory panel will act as arbiters. Should any disputes arise that cannot be resolved firstly by the Working group leader and test coordinator or, failing that, the Advisory Committee, a panel drawn from members of an internationally recognised body will be contracted and their verdict will be final.

ⁱ Note that there is significant disagreement on the cycle times to be used for the switch withstand test, but little publicly available empirical data to support any particular cycle. Therefore, as part of the verification testing, testing of multiple cycles will be undertaken with results made public to inform the debate;

ⁱⁱ Note: the mercury test currently proposed is based on an Australian-developed method and requires specialist testing by Chemical *not* lighting laboratories. As a number of other methods of measuring mercury content are also under development in the USA and Europe, the mercury test is not being included in the verification testing and will be further developed as the results of these alternative measurement techniques become known.

ⁱⁱⁱ Ideally testing would have been undertaken on a range of lamps from various manufacturers. However, given the costs associated with such testing activities, this has not proved possible. However, manufacturers are invited to test their own lamps following the proposed protocol (result data sheets, further instructions, etc can be supplied) and submit the resultant test data to further enhance the verification/revision process.

Results to Date

The testing programme has only been running since the beginning of June this year. As soon as analysed results begin to become available (first results are expected early August 2006), these will be made public on the International CFL Harmonisation Website.

Mobilising Stakeholder Participation

Within a few months of the start of the CFL initiative, formal public support had been gained from 22 manufacturers, governments, regulators and programme operators. The mobilization of this support base has been vital in providing legitimacy for the project, especially in the early stages when widespread knowledge of the initiative was limited. Since then, stakeholder participation in development and evolution of proposals under each of the elements of the programme has mushroomed, with over 100 separate submissions having been made during the development of the draft protocol, the verification testing methodologies and the early proposals on performance tiers. Significant effort has been placed into the mobilisation of this stakeholder participation to ensure the outcomes of the project are in line with market needs and that these outcomes are appropriate for ultimate adoption around the globe. The primary communication tool has been the initiative website (www.apec-esis/cfl/www/). The website includes:

- Background information on the initiative, current news and other material such as a library of CFL-related information;
- Details of each of the working groups, including the group leaders and facilitators, historical actions, ongoing activities and future plans; and
- The ability to download and review any of the project documents and post comments live.

The website provides full transparency to all activities, something considered of great importance to maintain stakeholder confidence in the process. This transparency is further supported by regular (typically 6 monthly) review and reporting meetings which are normally held in collaboration with major lighting or energy efficiency conferences around the world. Additional market communications are undertaken by ad hoc promotion through the 22 core supporters group, and through e-newsletters, bulletin alerts, etc.

Nevertheless, despite this high level of participation, it became clear that a number of key stakeholders (i.e., those that regulate or consume a high proportion of the world production of CFLs) were not visibly participating in the programme. Further investigation revealed that this was sometimes due to their low awareness and lack of detailed understanding of the initiative, and sometimes simply caution as the formal positions of their organisations related to the initiative were developed. Having recognised this as an issue, the various working group facilitators are now working hard to develop closer communication ties (often on a one-to-one basis) with these key stakeholders to ensure their active understanding and participation in the development process. It should be noted the aim of transparency is maintained even in one-to-one interactions, with any major outcomes being reported on the website wherever possible.

Lessons Learned

While it is still early in the development cycle of the International CFL Harmonisation Initiative, a number of key lessons can already be drawn and these may assist the smooth development of Harmonisation Initiatives for other products:

1. **Identify key stakeholders to the success of the harmonisation initiative as soon as possible and develop an effective communication programme to target these key stakeholder and seek their “buy-in” to the project goals.** While this may seem obvious, in practice there are a very large number of potentially relevant stakeholders around the globe; e.g., manufacturers, government regulators and standards enforcement agencies, programme operators, standard development organizations, testing laboratories, retailers, and of course, consumers. The goal of providing a forum through which all these global stakeholders can participate can lead to a communications strategy that relies heavily on low-cost mass media tools (print, Internet, e-newsletters, etc). While this is a vital activity, it is important to recognise that there *may* be a much smaller number of *key* stakeholders (often manufacturers, standards development bodies and/or major programmes) that are critical to the success of the initiative. For example, if 80% of the products for which harmonisation is being sought are purchased by two or three programmes/countries, then the buy-in of the programme managers and regulators in these countries is vital in order to give credibility to

the initiative among other stakeholders; hence their buy-in is critical to overall success. Therefore, it is highly recommended that, very early in the project, sufficient resources are allocated to identify potential key stakeholders and then develop a proactive communications strategy to engage these key stakeholders to obtain their “buy-in” to the project, and to maintain their participation throughout.

2. **Develop initial proposals at the earliest opportunity.** Ideally, initial proposals for all elements of the initiative will be developed in full consultation with all stakeholders. However, in practice it is extremely difficult to motivate stakeholders to submit ideas/proposals based on general concepts. Experience indicates that a set of proposals for each element of the initiative should be developed at the earliest opportunity and opened for discussion. This then provides stakeholders with a clearly defined starting point that can lead to informed discussions and alternative proposals. Ultimately the initial proposals may be discarded and more appropriate routes followed as a result of submissions by stakeholders; however, an initial set of proposals is required to provide focus for the initial stakeholder participation.
3. **Maintain a fully transparent development process.** In order for stakeholders to maintain confidence in the initiative, it is necessary for each stage of the development process to be open for scrutiny. Again, while this may seem a prerequisite and members of the body coordinating the process may think the process is indeed transparent; this may not *appear* to be the case among stakeholders. Simple issues such as a delay in the posting of a current document under discussion or the comments received can make it appear to stakeholders that a parallel and non-transparent development process is occurring from which they are excluded, even if the delay is perhaps caused by resourcing problems. Therefore it is highly recommended that:
 - a. Names, affiliations and contact details for all members of the project coordination/facilitation team are published and any changes highlighted immediately;
 - b. Clear timelines of activities are published (e.g., dates for issuing proposals, receiving comments, holding of consultation meetings, etc.), and these timelines followed, or at least any changes publicly announced with the associated reasoning; and
 - c. All project documentation published in full, including each iterative draft version of proposals, comments received, actions taken and any associated background material.

[It should be noted that at times discussion with stakeholders must be conducted with some level of confidentiality, especially in areas where there is clear commercial interest. However, such discussions should be limited where possible, and any resultant actions made public at the first possible opportunity.]

4. **Establish an effective project management system.** In order to ensure that the initiative remains transparent *and* progresses sufficiently rapidly to maintain focus among stakeholders, it is extremely important that
 - a. A central management/facilitation body is established with members having clearly defined roles and time-based objectives;
 - b. A clear target end point achieving the overall project goal is set;
 - c. Clear timelines and associated activity plans are developed for each element of the initiative, and responsibilities for implementation are clearly allocated; and
 - d. Regular (monthly) reviews of the progress towards the objectives of each individual element and the timelines established for that element are conducted.
5. **Obtain Sufficient Levels of Funding for the Initiative.** CFLs are one of the simplest technologies of the globally traded energy-efficient products available. Nevertheless, by the completion of the project, the coordinators estimate that the organisations providing the core funding for the coordination of the harmonisation initiative will have invested in excess of USD \$750,000. This is in addition to all the voluntary input during consultation and review provided by stakeholders from around the world. Failure to have a large proportion of the required budget in place before project initiation will result in significant delays during project implementation and risk losing the focus of stakeholders and overall project momentum.

References

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- [2] Communiqué issued following the Special Session on CFL Harmonisation at the Right Light 6 Conference in Shanghai, May 10th, 2005. The communiqué can be viewed by following the “events” link of the International CFL Harmonisation Initiative website at www.apec-esis/cfl/www
- [3] EEDAL 2006 Paper Number 176 “Rationalising the Tower of Babel and Slaying the Dragon of Poor Quality: Developing an International Performance Specifications for CFLs and a Practical International Compliance System for Testing and Marking”, Ellis et al
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- [5] Version 13 of the protocol can be viewed at (<http://www.apec-esis.org/cfl/www/index.php?pagelid=1065>).
- [6] IEC Guide 43-1:1997 (Guidelines for third-party certification and accreditation)

