# Improving International Energy Efficiency Standards: A Collaborative Multi-national Approach

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Waide Strategic Efficiency

*Improving International Energy Efficiency Standards: A Collaborative Multi-national Approach.*

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## Glossary

| | |
|---|---|
| ABNT | Associação Brasileira de Normas Técnicas (Brazilian Technical Standards Organisation) |
| AFNOR | Association Française de Normalisation (French Association for Standardization) |
| AHAM | American Home Appliance Manufacturers' association (USA) |
| AHRI | Air-conditioning, Heating, & Refrigeration Institute (USA) |
| ANAB | ANSI-American Society for Quality National Accreditation Board |
| ANSI | American National Standards Institute |
| AS | Standards Australia |
| ASI | Austrian Standards Institute |
| BSI | British Standards Institute |
| CAB | Conformity Assessment Board (IEC) |
| CB | Council Board (IEC) |
| CD | Committee Draft (a first Committee Draft) of an International Standard (IEC or ISO) |
| CDV | Committee Draft for Vote of an International Standard (IEC or ISO) |
| CEA | Consumer Electronics Association (USA) |
| CEM | Clean Energy Ministerial |
| CEN | Comité Européen de Normalisation |
| CENELEC | Comité Européen de Normalisation d'Electricité |
| CFL | compact fluorescent lamp |
| CFLi | compact fluorescent lamp with integrated ballast |
| CLASP | Collaborative Labeling and Appliance Standards Program |
| CNIS | China National Institute of Standardisation |
| Commission | European Commission |
| CoP | Joint SEAD/IEA-4E/IEA Standards Coordination Community of Practice |
| DIN | Deutsches Institut für Normung (German Standards Organization) |
| DKE | Deutsche Kommission Elektrotechnik (German Electrotechnical Commission) |
| DOE | US Department of Energy |
| EESCC | Energy Efficiency Standardization Coordination Collaborative |
| EPA | US Environmental Protection Agency |
| ETSI | European Telecommunications Standards Institute |
| EU | European Union |
| European standard | A standard adopted by a European standardization organization |
| FDIS | Final Draft International Standard (IEC or ISO) |
| FTC | US Federal Trade Commission |
| Harmonized standard | A European standard adopted on the basis of a request made by the Standard Commission for the application of Union harmonization legislation |
| GMG | general management group (postulated) of the CoP |

| | |
|---|---|
| ICT | information and communication technology |
| IEA | International Energy Agency |
| IEA-4E | IEA Implementing Agreement for Efficient Electrical End-Use Equipment |
| IEC | International Electrotechnical Commission |
| IEEE-PES | Institute of Electrical and Electronics Engineers – Power and Engineering Society (USA) |
| IESNA | Illuminating Engineering Society of North America (USA) |
| International standard | A standard adopted by an international standardization body |
| IPR | intellectual property rights |
| ISO | International Organization for Standardization |
| ITU | International Telecommunications Union |
| JIS | Japanese Industrial Standard |
| MEPS | minimum energy performance standards |
| METI | Ministry of Economy, Trade and Industry (Japan) |
| MS | Member State (of the European Union) |
| MSB | Market Strategy Board (IEC) |
| MT | maintenance team (IEC or ISO) |
| National standard | A standard adopted by a national standardization body |
| NC | National Committee (IEC or ISO) |
| NDRC | National Development and Reform Commission (China) |
| NEMA | National Electrical Manufacturers Association (USA) |
| NIST | National Institute of Standards and Technology (USA) |
| NP | A new work item proposal (IEC or ISO) |
| NRDC | Natural Resources Defence Council (USA) |
| NSB | National Standards Body |
| PAS | Publicly Available Specifications (IEC or ISO) |
| PSWG | product-specific working groups (postulated) of the CoP |
| PT | project team (IEC or ISO) |
| SAC | Standardization Administration of China |
| SAG-E | Strategic Advisory Group on Energy of the ISO |
| SC | Sub-committee (IEC or ISO) |
| SDO | Standards Development Organization (non-government, USA) |
| SEAD | Super-Efficient Equipment and Appliance Deployment (SEAD) initiative of the CEM |
| SG1 | Strategic Group 1 of the IEC |
| SMB | Standards Management Board (IEC) |
| SSL | solid state lighting |
| Standard | A technical specification, adopted by a recognized standardization body, for repeated or continuous application, with which compliance is not compulsory |

| | |
|---|---|
| SWG | Special Working Group of the Market Strategy Board (IEC) |
| TC | Technical committee (IEC or ISO) |
| TAG | Technical Advisory Group (ANSI) |
| TMB | Technical Management Board (ISO) |
| UN | United Nations |
| UCOSOC | United Nations Economic and Social Council |
| UNI | Italian Organization for Standardization |
| US(A) | United States (of America) |
| WG | working group (IEC or ISO) |
| WSC | World Standards Cooperation of the ISO, IEC and ITU |
| WTO | World Trade Organization |

# EXECUTIVE SUMMARY

Equipment energy efficiency policy, especially minimum energy performance standards (MEPS) and energy labeling, is reliant on accurate, repeatable and representative energy test procedures and energy efficiency metrics. Historically these have been developed by national, regional or international standards bodies and thus are aligned to a varying degree internationally. Where international alignment does not occur there are extra costs to be borne by industry not only in terms of repeated testing and certification costs but also in terms of the development of additional product platforms to meet the specific needs of each local market. Society at large is also disadvantaged because energy efficiency levels and regulations are less comparable from one market to another and technology is transferred less rapidly. To help examine means to strengthen international product energy efficiency standardization processes, the Super-Efficient Appliance Deployment (SEAD) initiative of the Clean Energy Ministerial has commissioned the current investigation, to examine how product energy efficiency regulator interests can be most effectively reflected within international standardization efforts. The report explores the issues under pinning international product energy efficiency standardization, past experience of regulator engagement and documents recent developments in international dialogues among product energy efficiency regulators, experts and the international standardization community. It examines the structures of international, national and regional standards bodies and puts forward specific suggestions about how product energy efficiency regulators can better interface with these entities to ensure regulatory needs are properly reflected in international product energy efficiency standards.

## *Principal findings*

The engagement of product energy efficiency regulators with standardization is essential if standards that are fit for regulatory purpose are to be produced. Past experience of such engagement has produced mixed results, with both positive and negative experiences; however, the current climate is very favorable to stronger, productive engagement, and preliminary dialogue with the secretariats of the International Electrotechnical Commission (IEC) and International Organization for Standardization (ISO) has revealed that such engagement would be both welcomed and supported.

Regulator voices will be stronger within the standardization processes if they present a common position. This suggests that the establishment of a parallel process through which a group of equipment energy efficiency regulators may derive informed yet common positions on product energy efficiency standardization will result in better outcomes within the international standardization committees.

The establishment of the SEAD/IEA-4E/IEA[1] Standards Coordination Community of Practice (CoP) provides a platform for equipment energy efficiency regulator positions on standardization to be established and for coordinated responses to be delivered to international standards bodies. This could potentially be achieved via the establishment of a formal “liaison” with each standards committee or working group of interest (see section 6.2). The existing “liaison” mechanism by which third-party organizations may be invited to be represented within IEC or ISO standards committees presents a viable mechanism through which a coordinated group representing equipment energy efficiency regulator interests could participate directly within IEC or ISO standards committees.

## *Recommendations for the Community of Practice*

### *Initiate high-level contact and cooperation*

It is recommended that the CoP should initiate contact with senior IEC and ISO committees, such as the IEC’s Standards Management Board and the ISO’s Technical Management Board, to help facilitate high-level support for working-level cooperation with individual product standards development committees and to foster agreement on broad matters of principle.

Participation at future IEC AGMs, such as the meeting recently held in Delhi in October 2013, could be an ideal opportunity to announce the CoP to the IEC community and open the way to stronger engagement.

[1] IEA = International Energy Agency, IEA 4E = the IEA Implementing Agreement for Efficient Electrical End-Use Equipment

The development of a set of guiding principles for product energy efficiency standardization in the form of an advisory document, that would be submitted into the IEC and ISO structures at the Strategic Management Board (SMB) and Technical Management Board (TMB) levels respectively, would facilitate the issuance of guidance from these committees to all their technical committees (TCs) and sub committees (SCs) to abide by these principles whenever energy efficiency test standards are under development or revision.

*Establish appropriate internal working mechanisms and governance procedures*

For liaison status to be both granted and function properly, the CoP will need to satisfy IEC/ISO requirements for a liaison organization and be able to take appropriate action to establish and follow up liaison activities at the TC/SC or working group (WG) levels. This requires the development and adoption of a minimum level of governance structures, in order to address:

- the mission and general guiding principles of the CoP
- how the CoP should represent itself to third parties
- the identification or formation and membership of product-specific working groups (PSWGs)
- procedures to be followed when entering into liaison status with international standards organizations
- procedures to be followed once liaison status has been established with international standards organizations
- burden-sharing mechanisms between the CoP's constituent parts to agree the division of labor, nature of resources to be committed, etc.

Some of these actions have been partially addressed already; however, work remains to be done for each of them if the CoP is to be able to engage effectively with international standards bodies.

*Establish product-specific working groups (PSWGs)*

At a practical level it will be necessary to identify or establish product-specific working groups for all the products the CoP wishes to work on. It is recommended that the CoP makes a documented decision regarding which PSWGs it wishes to establish and that it then agrees the set of measures necessary to establish and operate them. The most practical approach would be to build upon the existing IEA-4E and SEAD product working groups but agreement will be needed to both enshrine this and to: clarify mandates, formulate and required working and reporting requirements and determine the nature of engagement between the PSWGs and the CoP as a whole and with relevant IEC/ISO committees.

*Establish liaison status with relevant IEC and ISO committees*

Following the advice supplied by the IEC/ISO Secretariats, it is recommended that the CoP should set about establishing liaison status with specific TCs and SCs. Establishing such liaisons need not wait for all the other recommended actions to be completed first and can be initiated as soon as the CoP has agreed its own internal procedures and mechanisms for external engagement and has established a dedicated liaison officer who would act as the point of contact with each TC or SC in question. Once liaison status has been requested, however, the CoP will need to be able to respond to enquiries from the two liaison officers, i.e. the CoP's liaison officer and the counterpart within the TC or SC in question.

Before attempting to initiate liaison status, the CoP, or any more formally established successor organisation, also needs to agree with which TCs, SCs or even WGs it may wish to establish liaisons and what type of liaison it would seek A, B or D (described in section 6.2). Discussions among the CoP thus far have indicated that the most relevant TCs are:

- SSL (4E/SEAD) → IEC TC34
- Televisions/Home Entertainment (SEAD) →IEC TC100
- Network Standby (4E/SEAD/IEA) → IEC TC100?[2]
- Distribution Transformers (SEAD) →IEC TC14
- Motor Systems (Fans, etc.) (4E) →IEC TC2
- Commercial Refrigeration (SEAD) → ISO TC86 SC7
- Residential Refrigeration (4E/SEAD) → IEC TC59

[2] The location of network standby work within IEC is unclear to the project team but TC100 has been proposed as a possible home.

- Air Conditioners (SEAD) → ISO TC86 SC6.

Of these, it is recommended that the CoP begins with IEC TC59 (household and electrical appliances) and IEC TC100 (Audio, video and multimedia systems and equipment) as these entities have shown a willingness to establish liaison status with third party organizations and the CoP is well placed to engage with them on standardization issues. However, it should be noted that the groups of most interest are at the SC and WG level within these TCs, e.g. SC59M for Household Refrigeration.

# 1. Introduction

This report presents a summary of the findings of an investigation into how harmonization of international product energy efficiency test procedures, efficiency metrics and regulatory settings can be strengthened and the role that Super-Efficient Appliance Deployment (SEAD) initiative of the Clean Energy Ministerial can play in promoting this. Specifically, it presents a synthesis of activities carried out under the project entitled "SEAD Technical Management Organization", conducted by Waide Strategic Efficiency (UK), Energy Efficient Strategies (Australia) and Grasteu Associates (USA), commissioned by SEAD and under contract to CLASP.

This project, which began in September 2012, catalogs existing standardization processes and explores the options to bolster the quality and alignment of international standards for energy efficiency policy purposes.

- It documents case studies of how successful, internationally aligned test procedures and efficiency metrics have occurred in the past.
- It characterizes the management structures, procedures, committees and processes used by national and international standardization bodies to develop, adopt and maintain product energy efficiency test procedures.
- It identifies a subset of product types that are considered to be good candidates for a pilot effort by SEAD for greater engagement with international standardization processes.
- It provides a basis for stakeholder dialogue to explore options to build a positive response to these issues and strengthen international energy efficiency test standards, in order to make them better suited to policy maker's needs and to improve international alignment.

Options to build a more enduring support process or structure to provide greater policy-oriented engagement with energy efficiency standardization, bolster the quality of standards and enhance alignment are also examined.

## 2. Harmonization of international product energy performance test standards: issues and opportunities

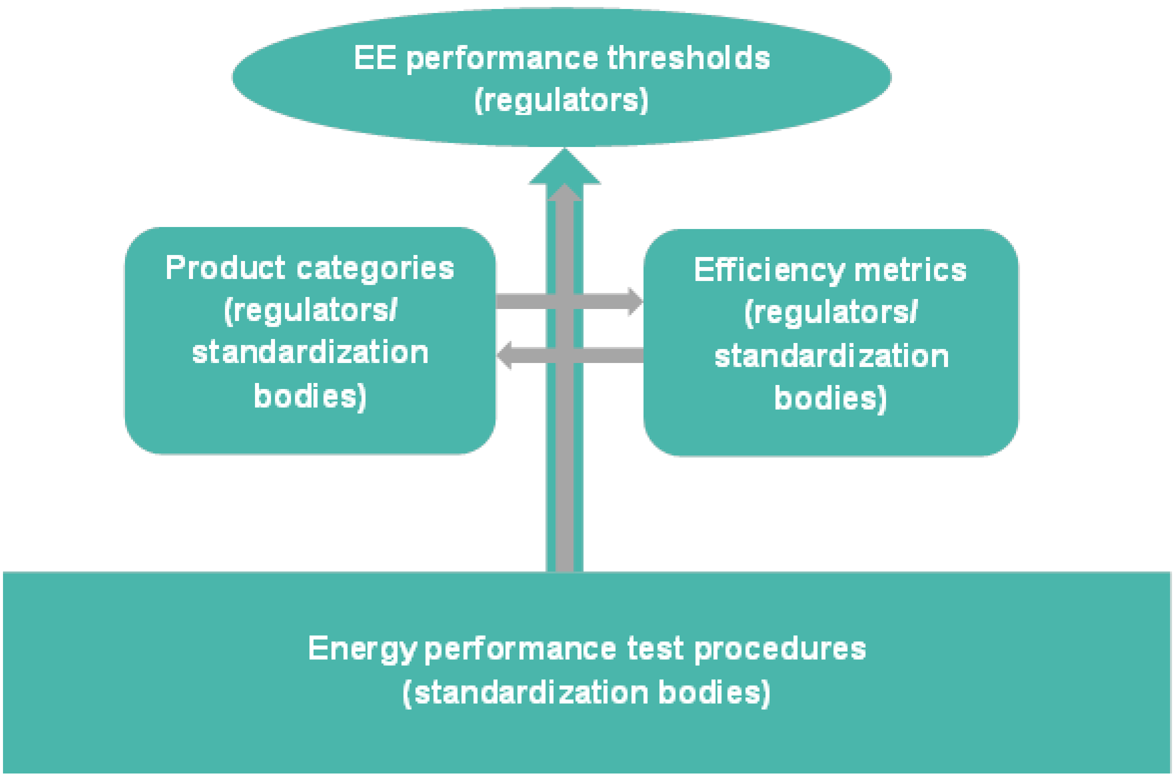
### 2.1 A lexicon of standards

Minimum energy performance standards (MEPS) and energy-labeling schemes require the specification of **energy performance thresholds**, which are determined according to agreed **energy efficiency metrics**. Metrics are a measure of efficiency expressed in terms of energy used per unit of useful service provided. The determination of useful service commonly entails dividing products into **product categories** that provide sufficient homogeneity of service. Thus, efficiency metrics are also a function of the product categorization adopted.

The manner in which energy and service levels are measured is set out in a **test procedure**[3]. Efficiency metrics and product categorizations are commonly specified in **energy efficiency regulations**, which reference a test procedure.

All product efficiency regulations therefore rest on a tri-partite hierarchy of standards needs where test procedures are at the bottom, product categorization and efficiency metrics are in the middle, and performance thresholds are the final output (Figure 1). While product energy efficiency regulators are always engaged in the process of setting the energy efficiency performance thresholds specified in regulations they are often, but not always, so engaged in the development and approval of energy performance test procedures and in many jurisdictions this task is left to the standardization bodies. The development of product categories and efficiency metrics is typically undertaken by both standardization bodies and by product energy efficiency regulators although often not within the same process.

**Figure 1. Standardization elements needed for efficiency performance thresholds**




[3] The terms test protocol and test standard are also often used interchangeably with the term test procedure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All of the above tri-partite elements are necessary to prescribe an efficiency regulation, but the agencies involved in the development of the various elements often differ. In general, government-appointed equipment energy efficiency regulators set the performance thresholds, select the efficiency metric and specify the product categories to be used in their regulations. Test procedures referenced in the regulations are usually derived by national and international standards bodies that are not directly answerable to the equipment energy efficiency regulators. Most countries have one or more national standardization body that is charged with developing and maintaining national test and measurement standards. Almost all of these national bodies are also members of equivalent international standardization bodies of which the principal ones are: the International Electrotechnical Commission (IEC), the International Organization for Standardization (ISO) and the International Telecommunications Union (ITU) (see section 4). These international standardization bodies follow set procedures for developing and adopting test and measurement standards. Once an International Standard has been adopted, many economies then adopt it at the national level, in full or in part. This process shares the burden of test standards development across economies and facilitates greater international alignment. Some economies, however, are more likely than others to adopt or align with International Standards. While some countries have a policy to adopt international standards without modification, some may make local amendments and others often prefer to opt for national or regionally aligned standards in place of International Standards. Most commonly, however, nations align their test standards with some part of the international standards portfolio but not all of it.

## 2.2 Benefits of greater alignment

The benefits of international efficiency test standards harmonization are well characterized, as outlined below.[4]

- Enhanced transparency and clarity across economies: when test procedures, product categories and efficiency metrics are aligned, it permits direct comparison (benchmarking) of product efficiency across peer economies and can inform prioritization and efficiency standards and labeling policy decisions.
- A propensity towards lower-cost, higher-quality, more rapid and more ambitious domestic regulations: harmonized test procedures and efficiency metrics facilitate the use of analyses from other economies to determine and justify the adoption of regulations set at specific efficiency levels. They also facilitate discussion of the techno-economic potentials associated with attaining higher efficiency levels through being able to draw relevant information from other economies.
- Lower costs and higher quality of tests: the cost and expertise needed to develop and maintain test procedures is shared.
- Reduced manufacturer costs for testing and production: globally traded products that attain a sufficiently high harmonized efficiency rating will be accepted for sale in any economy that adopts the test procedure, efficiency metric or efficiency standard concerned.
- Accelerated market and manufacturer learning, lower consumer costs, and promotion of innovation: a common set of high-efficiency thresholds supports the market for high-efficiency products as manufacturers know that attainment of a given performance threshold will open up a larger market for their products. This drives up the volume of higher-efficiency products and lowers production costs through economies of scale, thereby accelerating the market-transformation effect. Furthermore, manufacturers have greater long-term incentives to pioneer even more efficient products as a result of the certainty that efficiency thresholds are globally linked, thus facilitating technology transfer.

In principle, however, whether or not they are internationally aligned, it is important to remember that energy efficiency test procedures and efficiency metrics need to satisfy as best as possible the following requirements:

- be repeatable (i.e. the same product measured repeatedly in the same test laboratory will produce the same results)
- be reproducible (i.e. the same results will be recorded if the same product is tested in different laboratories, assuming the laboratories have been accredited to do the test)

[4] Waide et al. (2011), CLASP Harmonization Study (Executive Summary). Available from http://www.clasponline.org/Resources/Resources/StandardsLabelingResourceLibrary/2011/Opportunities-for-appliance-EE-harmonization

- be representative (i.e. the results measured under the test are representative of the average of what would be expected when the product is used *in situ*)
- be affordable (i.e. the cost of doing the test is not prohibitive)
- be viable (i.e. practicable and not unduly burdensome but also being enforceable in such a way that their intent and prescriptions cannot be readily circumvented).

## 2.3 Problems currently encountered

Common problems with current test procedures and efficiency metrics include:

- lack of representativeness, which means that the reported energy consumption of a product can be unacceptably divergent from what is found in practice or, more seriously still, that the energy efficiency metric may not produce an accurate ranking of *in situ* product efficiency
- inappropriate or overly constrained product categorization may lead to technology "silos" i.e. limit competition among technologies that have differing overall efficiency but essentially provide the same service
- deficiencies in reproducibility, creating a barrier to effective enforcement
- tolerances that may be unacceptably generous and thereby undermine public policy and compliance objectives
- test procedures that are not always ready and available when needed for regulatory purposes, leading to unacceptable delays in regulatory development
- the revision of test procedures in ways which alter the positioning of products on an efficiency scale used in energy efficiency regulations without those responsible for the regulatory processes having adequate opportunity to recalibrate their performance requirements
- rapidly changing product characteristics or technologies which may modify energy use, efficiency and performance in ways that render test procedures obsolete unless regularly maintained and updated.

### *Contributing factors*

Current standards organizations were not established to meet the needs of energy efficiency policymakers and regulators; as a result, the test standards they produce do not always satisfy government energy efficiency policy objectives.[5,6] Given the degree of institutional separation of standardization bodies from regulatory authorities and their divergent composition and interests, it is not surprising that there are some poor outcomes from a public policy perspective.

The deficiencies described in the previous sub-section have multiple causes, including the following.

- **Most regulatory agencies are only weakly engaged** with the test procedure development and maintenance processes, often on account of limited resources but also because of a lack of appreciation of the importance of test procedure development to public policy goals.
- Standards bodies and committees rely heavily on self-financing from the private sector, which leads to **committees being strongly represented by product manufacturers** with a vested interest in the outcome. In some respects this interest is extremely helpful because it is the engine that powers the development of most test standards and because it brings invaluable industry know-how into the process; however, it may also result in a bias towards industrial interests ahead of public policy concerns.
- In general, industry is most concerned to have a common and fair basis for competition that is both affordable and viable; however, this **does not necessarily mean that the measurements accurately represent what happens when a product is being used**, especially for a parameter as intangible as energy efficiency. The treatment of tolerances, schedules and revisions are also common sources of concern.
- Standards committees often **lack relevant or timely information** to inform standards development and lack dedicated financing or other resources to fill gaps in their knowledge.
- Standards committee participants are commonly engaged in standardization as **a side-line** to their main professional activities.
- The current IEC/ISO focus is on fairly representing all participant interests, as defined by individual stakeholders on their respective national committees. Participation in the IEC is managed through national

[5] Harrington, 2009, IEA http://iea.org/work/2009/standards/Harrington.pdf
[6] Waide, 2009, IEA http://iea.org/work/2009/standards/Waide.pdf

committees that each have a single vote, and whose voting position is decided by a majority of its members. Committee membership is largely *ad hoc*, and governments seldom commit resources to participate. **If there is misalignment between corporate and government interests within national committees, government may also be at a disadvantage** depending on the governance structures in place, which vary by country. Outcomes may be distorted on account of underlying commercial relationships between participants, imbalanced participation among industry members, corporate representation across multiple national committees, etc.

- Standards organizations are structurally slow moving and often cannot keep pace with the needs of energy efficiency policymakers, particularly in the case of fast-developing products. **Only rarely do standards organizations go beyond establishing test methods to also develop energy performance metrics and performance/efficiency levels** (the "IE" levels for electric motors are a rare example of where they have done, see Appendix A), although this is because equipment energy efficiency regulators usually prefer to maintain control over those aspects and standardization bodies do not feel empowered to specify such requirements unless they are indicative and broadly agreed.
- **There is no permanent framework within which to consistently address energy efficiency** — standards bodies maintain a broad focus on test methods (e.g. safety and performance), and while inclusion of energy efficiency test procedures and metrics is recognized to be important, it has a slightly lower priority.

## 2.4 Opportunity and activities

Recent efforts by both national and international standardization organizations indicate that there is an appetite for greater dialogue with energy efficiency policymakers on the issues discussed in this document. These efforts include the following.

- The ISO and the IEC, respectively established the SAG-E (Strategic Advisory Group on Energy) and SG1 (Strategic Group 1) advisory committees on energy efficiency and renewable energy, with encouragement from the International Energy Agency (IEA); however, their principal purpose has been to identify gaps in the current portfolio of International Standards and to propose the initiation of new standardization efforts to address them. They report their suggestions to the technical management boards of the two organizations, which in turn decide whether or not to communicate them to specific standards development technical committees. The SG1 and SAG-E have not been engaged directly with specific technical committees and have no involvement in the maintenance of existing standards. Despite these limitations, it should be stressed that the ISO and IEC Secretariats have made it very clear that they welcome greater representation from the policy community on their product energy efficiency test procedure committees.
- The American National Standards Institute (ANSI) has recently announced the formation of an Energy Efficiency Standardization Coordination Collaborative (EESCC)[7] in the USA. The EESCC is intended to be a cross-sector, neutral forum and focal point for broad-based coordination among energy efficiency activities involving or impacted by standardization (i.e. standards, codes, conformance activities) and regulations. The objectives of the collaborative are to assess the energy efficiency standardization landscape and to carry out the development of a standardization roadmap and compendium.

Options to engage with these initiatives are analyzed and discussed in sections 5, 6 and Appendix B.

[7] http://www.ansi.org/standards_activities/standards_boards_panels/eescc/overview.aspx

# 3. Opening the dialogue

## 3.1 Case studies

To help initiate and inform a dialogue between equipment energy efficiency regulators on how best to strengthen international product energy efficiency standardization, a number of case studies looking at previous attempts to harmonize international test procedures and efficiency thresholds used in regulations were examined (Table 1).

This assessment reveals mixed experiences. In the case of external power supplies, the relevant technical committee within the IEC rejected overtures from equipment energy efficiency regulators and expressed no desire to develop a test procedure for this product group. As a result, a set of leading energy efficiency regulators teamed together to develop their own scheme, which was eventually adopted by most power-supply producers and used in MEPS regulations in some economies. Regulator-supported attempts to develop an internationally harmonized set of quality criteria for compact fluorescent lamps with integrated ballasts (CFLi) were also rejected by the IEC's TC34, and as a result CFL quality criteria are still fragmented.

At the opposite end of the spectrum, there have also been successful regulator-supported or -initiated efforts to develop acceptable internationally harmonized test procedures for electric motors, and TVs via the IEC, both of which have been incorporated into leading energy efficiency regulations. In the case of motors there has even been success in developing an internationally agreed standard, which comprises sets of energy efficiency thresholds that are now widely used in MEPS and labeling regulations. There has also been considerable success in harmonizing international air conditioner test procedures and promising signs with regard to domestic refrigerators. This experience has shown that successful attempts by equipment energy efficiency regulators to engage with international standardization processes have required persistence and patience and have usually taken a considerable amount of time and facilitated negotiation to develop consensus positions. Historically, the presence of these qualities has not been a guarantee of success, however, as reactions are quite sensitive to the agendas of the leading individuals involved in the relevant standardization committees, which may be informed by other concerns. Nonetheless it is clear that regulator views will only be reflected in standardization processes when they engage with those processes and that in most cases they will be welcomed. A set of case studies, addressing attempts to establish internationally harmonized energy performance test procedures for electric motors, air conditioners, refrigerators, external power supplies and televisions, is presented in Appendix A.

## 3.2 Joint SEAD, IEA, IEA-4E workshop in Japan

A joint SEAD, IEA-4E and IEA workshop hosted by the Japanese Ministry of Economy, Trade and Industry (METI) was held in Tokyo on November 7–8, 2012. Some 29 government energy efficiency officials and experts from 12 economies participated at this event with the aim of collaborating on initiatives to deliver greater international comparability of energy efficiency policies for appliances and equipment. The meeting issued a communiqué that recognized the substantial benefits to governments, industry and consumers of such comparability and concluded that improved co-operation between governments and international standardization organizations is a high priority.

In particular, the workshop identified opportunities where International Standards can accelerate and expand the alignment of national and regional appliance energy efficiency policies. Participants noted that internationally accepted product definitions, test methods, efficiency metrics, and performance classes often make it easier and faster for national governments to implement effective energy efficiency policies. Further, when these national policies are based on International Standards:

- manufacturers benefit as the costs of complying with disparate policies and certification requirements are reduced
- consumers benefit from lower product costs and accelerated innovation
- equipment energy efficiency regulators benefit from enhanced transparency and clarity across economies, and from lower administrative costs
- economies benefit from reduced barriers to trade.

**Table 1. Summary of international-alignment case studies: matrix of products**

| Product | Test method | Efficiency metric | Efficiency classes | Comments | Where adopted | Time to develop | Degree of regulator engagement |
|---|---|---|---|---|---|---|---|
| Electric motors | IEC/NEMA | Output over input power, measured across a range of outputs | Based on US/EU MEPS & HE levels (modified) | Basic elements pre-existed; some movement from Europe on test method & efficiency metric/levels; issue with frame sizes; minimal direct government input | Global – most economies have already adopted new IEC test procedures & all likely to in future | ~10 years | High, via experts through multinational process |
| External power supplies | Government/Energy Star (IEC not interested) | Output over input power, averaged across a range of outputs, plus no load | Set of equations derived from Energy Star | No IEC interest in test method or efficiency metrics, so engagement ceased | USA, EU, CN + de facto global | Developed jointly with AU/CN/USA & EU within 2–3 years | Entirely via government-appointed experts |
| Lighting | IEC | Range of measures typically based on lumens per watt + other performance measures, e.g. CRI, lumen depreciation, life | Some international classes, but does not cover all lighting types | Industry-dominated committee; little interest in assisting government develop efficiency agenda; rapid technology change in LEDs made this area complex | Most of world except North America use IEC standards for lighting products | Government attempted to define metrics & classes for CFLi over 3-year period, but IEC TC34 was not interested | Medium, via experts supported by a number of governments |
| Household refrigeration | ISO/IEC (new method in development) (many existing) | Not well developed; wide range of existing regional approaches | Wide range of classes & possible levels | Minimal government input; good outcome despite low level of resourcing; suppliers have some incentive to align test procedures | Broad adoption in Europe, Asia, Africa, Latin America, partial alignment in AU/NZ, JP, KR & partial alignment to new draft standard in new US test procedure | Global test method will have taken 8 years to finalize | Low – partial expert funding from 3 governments |
| Air conditioning | ISO (some regional methods with seasonal requirements) | EER/COP, but this needs to be expanded to cover other conditions in addition to T1/H1 test conditions | Generally based on EER/COP, but little alignment with level; many regions moving to seasonal values | ISO working on calculation method to determine seasonal ratings based on defined test points; proceeding slowly, little direct government input; variable output systems given little credit under rated capacity at T1/H1, hence drive towards seasonal | Broad adoption in Europe, Asia, Africa, Latin America; partial alignment in JP & North America | ISO test method accepted globally by default; some divergence in recent times with movement towards seasonal ratings; latest version took 3 years | Low – partial expert funding from 2 governments |
| Televisions | IEC | Energy per unit of screen area | Range of thresholds & classes could be developed as international families based on existing requirements; yet to be progressed | Some issues regarding minimum luminance levels; very rapid technology change makes thresholds & classes a challenge (automatic backlight control, screen technologies, 3-D technology) | Broad adoption in Europe, Asia (but not CN), Africa, Latin America, North America; Economies may use different editions | Over 5-year period, big IEC effort to develop globally applicable test method suitable to cover new technologies; kept up to date | Medium, via experts supported by several governments |
| Distribution transformers | IEC | Efficiency of conversion (typically at specified load, but could be at any load or across all loads) | No development work undertaken, but existing schemes could be used as basis | Some technical issues regarding conversion efficiency between 50Hz & 60Hz, but calculation is straightforward | Adopted in all countries outside North America | Latest version is forecast to take 3.5 years | Low |

*Abbreviations:* AU = Australia; CFLi = compact fluorescent lamp with integrated ballast; CN = China; CRI = Color Rendering Index; EER/COP = Energy Efficiency Ratio/Coefficient of Performance; EU = European Union; HE = high efficiency; IEC = International Electrotechnical Commission; ISO = International Organization for Standardization; JP = Japan; KR = South Korea; LED = light-emitting diode; MEPS = minimum energy performance standards; NEMA = National Electrical Manufacturers Association.

## 3.3 Formation of the CoP

During the Tokyo workshop (see section 3.2), participants from the International Energy Agency (IEA), the IEA Implementing Agreement for Efficient Electrical End-Use Equipment (IEA-4E) and SEAD, pledged to work together to develop more effective mechanisms for engaging with the IEC and the ISO in pursuit of these common objectives. Participants acknowledged the need for continued dialogue among equipment energy efficiency regulators, standardization organizations, product manufacturers, test laboratories, and other stakeholders in order to promote further alignment of standards in the most effective and sustainable manner. It was therefore agreed that representatives from IEA-4E, SEAD, and the IEA would convene an informal "community of practice" to identify necessary follow-up activities. As of April 2013 this community of practice, known hereafter as the CoP, has subsequently held two teleconference meetings and is planning to develop common activities among its members. At the request of the SEAD Secretariat, the project team developing this report, were asked to adapt the project tasks to include the provision of analysis and advice to the CoP in order to address the options for its future development.

## 3.4 Selection of priority product areas

The project was tasked with identifying at least three product areas that offer promising near-term opportunities for SEAD governments to constructively promote the adoption of energy efficiency metrics, test protocols, and/or efficiency classes by standards-setting organizations. Following extensive discussion of potential product opportunities at the Tokyo workshop (see section 3.2) it was agreed by the participants that the following product areas should be the initial focus of attention (the corresponding IEC and ISO Technical Committees that manage these products are also indicated):

- SSL (4E/SEAD) → IEC TC34
- Televisions/Home Entertainment (SEAD) →IEC TC100
- Network Standby (4E/SEAD/IEA) → IEC TC100[2]?
- Distribution Transformers (SEAD) →IEC TC14
- Motor Systems (Fans, etc.) (4E) →IEC TC2
- Commercial Refrigeration (SEAD) → ISO TC86 SC7
- Residential Refrigeration (4E/SEAD) → IEC TC59
- Air Conditioners (SEAD) → ISO TC86 SC6.

In each of these cases it was considered that:

- the products use significant amounts of energy and present important energy savings potentials
- the products are widely traded internationally and hence there is higher benefit from greater international alignment of test procedures
- the CoP network can bring strong technical expertise to bear in international standardization processes.

# 4. The international standardization bodies: IEC, ISO and ITU

## 4.1 Introduction

Three principal international standardization organizations address broad areas of standardization:

- the International Electrotechnical Commission (IEC)
- the International Organization for Standardization (ISO)
- the International Telecommunications Union (ITU).

All three bodies are sister organizations based in Geneva, Switzerland, and all have global membership. They are organized in a very similar manner and, in the case of the IEC and the ISO, share many aspects of their governance.

- The IEC is the most relevant body dealing with electrical equipment energy efficiency standardization, but the ISO and the ITU are larger standards bodies in general.
- The ISO is concerned with all aspects of standardization not covered by the IEC and the ITU and is the principal body addressing international energy efficiency standardization for all non-electric equipment.
- The ITU is concerned with telecommunication standardization.

The membership of all three bodies is comprised of national standards bodies (NSBs) and operated on a one-country, one member body and one-vote basis, i.e. each country is permitted one NSB member body and each country has a single vote in any voting procedure. When appropriate, these bodies cooperate with each other to ensure that International Standards fit together seamlessly and complement each other. Joint committees are established to ensure that International Standards combine all relevant knowledge of experts working in related areas. Details of leading NSBs are provided in Appendix B.

In 2001, the ISO, the IEC and the ITU formed the World Standards Cooperation (WSC) (see also www.worldstandardscooperation.org) in order to strengthen the standards systems of the three organizations. The WSC also promotes the adoption and implementation of international consensus-based standards worldwide. In addition, the ISO, the IEC and the ITU have a close relationship with the WTO, which particularly appreciates the contribution of International Standards to reducing technical barriers to trade. All three organizations also work closely with other organizations via a liaison mechanism. For example, the ISO liaises with UN specialized agencies that perform technical harmonization or technical assistance functions, including the UN Economic and Social Council (ECOSOC). In total, the ISO collaborates with over 700 international, regional and national organizations (see also www.iso.org/iso/home/about/organizations_in_liaison.htm). These organizations take part in the standards development process, and in addition share expertise and best practices. This work does not obviate the need for greater engagement with product energy efficiency regulators in order to produce International Standards that better serve regulator needs as is supported by the IEC and ISO Secretariats (see section 6).

## 4.2 IEC

Founded in 1906, the IEC (www.iec.ch) is the world's leading organization for the preparation and publication of International Standards for all electrical, electronic and related technologies. These are known collectively as "electrotechnology". The IEC provides a platform to companies, industries and governments for meeting, discussing and developing the International Standards they require. All IEC International Standards are fully consensus-based and represent the needs of key stakeholders of every nation participating in IEC work. Every member country, no matter how large or small, has one vote and a say in what goes into an IEC International Standard. Over 10,000 experts from industry, commerce, government, test and research labs, academia and consumer groups participate in IEC standardization work.

The IEC is a not-for-profit, non-governmental organization that develops International Standards and operates conformity assessment systems in the fields of electrotechnology. It operates on an annual budget of approximately CHF 20 million. Funding comes from the following sources:

- membership fees — based on the member country's economic capacity and electricity consumption
- income from sales — IEC International Standards are sold at recommended IEC catalogue prices by IEC Central Office, National Committees (NCs) and other appointed sales outlets

- income from certification activities — the three global Conformity Assessment Systems pay the IEC administrative fees for managing and providing the online infrastructure for their operations.

In addition to the direct operations costs of the IEC, industry and National Committees invest an estimated US$2 billion each year towards expert participation in IEC work.

The IEC's members are National Committees (NCs) and there can only be one per country. Individuals participate in the IEC's work through the National Committees. There is no single model for the structure of an NC, but in order that it can consider all the different aspects of a particular technical area, it must be fully representative of all of the country's interests in the field of electrotechnical standardization and conformity assessment. An NC's decision-making processes should enable all stakeholders to have a real influence on its technical and management activities. On becoming a member of the IEC, each NC agrees to open access and balanced representation from all private and public electrotechnical interests in its country.

NCs each pay membership fees, and in exchange may participate fully in IEC work. Individuals participate in the IEC's work through the NCs (e.g. via ANSI in the USA). By participating in the creation of a standard, an NC can be sure that the interests of its country have been taken into account.

There are two membership types for NCs:

(i) **full members** (60, including all the National Standards Bodies (NSBs) of the SEAD, IEA and IEA-4E member countries), wherein the NC has access to all technical and managerial activities and functions, at all levels of the IEC, including voting rights in the IEC Council

(ii) **associate members** (21), wherein the NC has full access to all working documents but limited voting rights in the technical work and no eligibility to access managerial functions within the IEC.

Individuals can participate as:

(i) **experts** — i.e. individuals with specialist knowledge in a particular technical field. Each NC (National Committee) participating in a technical committee's (TCs) work can appoint experts to take part in specific technical work through working groups (WGs), project teams (PTs) or maintenance teams (MTs). Experts participate in IEC technical work in a personal capacity and do not represent their company/organization or NC.

(ii) **delegates** — representatives of their NC at a TC (Technical Committee) or SC (Subcommittee) meeting which should be fully briefed by their NC before attending a meeting. For TC/SC meetings, each NC participating in the committee assigns a head of delegation, who is responsible for speaking and voting on behalf of the NC during the meeting, but may invite other delegates from their NC delegation to speak if required.

## *Governance and organization*

The organizational structure of the IEC is set out in Figure 2.

The rules and procedures that govern the IEC are mostly held in common with the ISO and are set out in:

- ISO/IEC Directives, Part 1 (2012) (www.iec.ch/members_experts/refdocs/iec/isoiecdir-1%7Bed9.0%7Den.pdf)
- ISO/IEC Directives, Part 2 (2011) ( www.iec.ch/members_experts/refdocs/iec/isoiec-dir2%7Bed6.0%7Den.pdf).

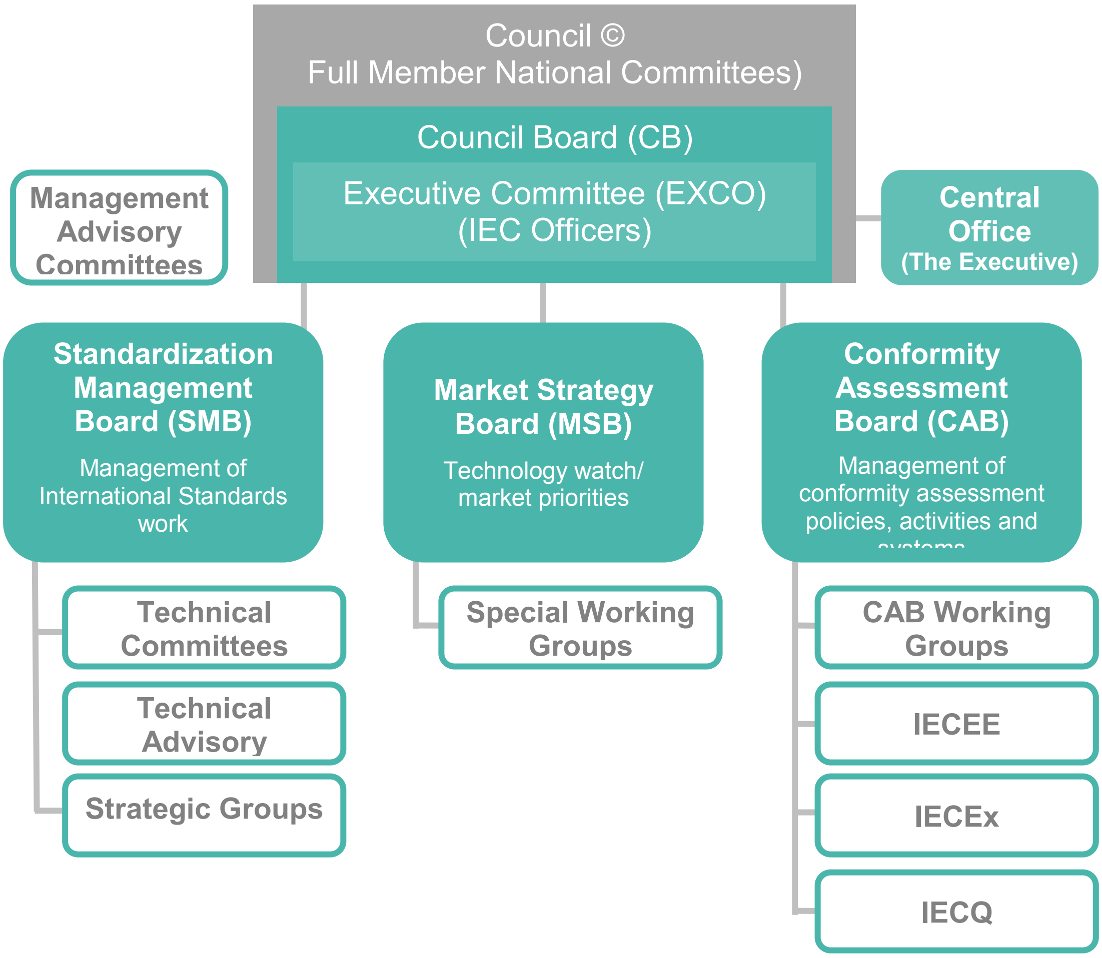
### *Council*

The IEC Council is a legislative body that is the supreme governing body of the IEC. It sets IEC policy and long-term strategic and financial objectives. It also delegates the management of IEC work to the Council Board (CB), with specific management responsibilities in the spheres of standards, conformity assessment and market strategy being assumed, respectively, by the Standardization Management Board (SMB), the Conformity Assessment Board (CAB) and the Market Strategy Board (MSB).

Its members are:

- the presidents of all IEC Full Member National Committees
- the current IEC Officers and all Past Presidents
- the Council Board members.

**Figure 2. IEC organogram**




Only the Presidents of Full Member National Committees have the right to vote, with one vote per country. The Presidents of Associate Member National Committees are not members of Council but are encouraged to attend meetings as observers.

In addition to being responsible for financial matters, the Council elects IEC Officers and the members of the CB, SMB and the CAB. The Council is also responsible for approving applications for IEC membership and proposed amendments to IEC Statutes and Rules of Procedure, and for resolving appeals from the Council Board. The Council meets at least once a year at the IEC General Meeting, usually on the last day. In between meetings, Council members vote by correspondence.

The CB is a decision-making body equivalent to the Board of Directors in a company. All of the CB's decisions and proceedings of interest are reported to Council, which has delegated responsibility for day-to-day management and operational functions to the CB.

The CB is chaired by the IEC President and comprises:

- 15 members elected by the Council (including one from each financial Group A country)
- the IEC Officers as *ex officio* members, without vote.

CB members do not represent their NC as such or any particular industry or association when participating in the CB's work. They are expected to work for the good of the entire IEC community.

The CB makes IEC policy recommendations to Council, takes operational decisions (except on financial issues, for which the IEC Treasurer is alone responsible to Council) and implements Council policy. It receives extensive reports from the SMB, CAB and MSB, to whom the Council has delegated the standardization, conformity assessment and market strategy work. As the need arises, it may also set up advisory bodies (e.g. the Sales Advisory Group) or *ad hoc* working groups for specific matters, and appoints their chairs and members.

*Standardization Management Board*

The Standardization Management Board (SMB) (Figure 3) meets three times a year and oversees the management and supervision of the IEC's standards work. The SMB is a decision-making body and reports to the CB. It comprises:

- a chair, who is an IEC Vice President
- 15 members elected by the Council and their alternates (alternative representatives) appointed by the NC
- the IEC General Secretary, who is an *ex officio* member without vote.

The SMB is responsible for:

- the setting up and disbanding of TCs and SCs
- approval of TC and SC scopes
- appointment of TC/SC chairs and allocation of secretariats
- allocation of standards work
- allocation of timelines for standards production
- approval and maintenance of the Directives
- reviewing the need for, and planning for, IEC work in new fields of technology
- maintenance of liaisons with other international organizations.

The SMB has also set up sub-groups:

- Advisory Committees to advise, guide and coordinate IEC work under the auspices of the SMB with the aim of ensuring consistency
- Strategic Groups[8] to provide strategic guidance and roadmaps on specific areas of technical activity that require coordination for both new initiatives and ongoing work.

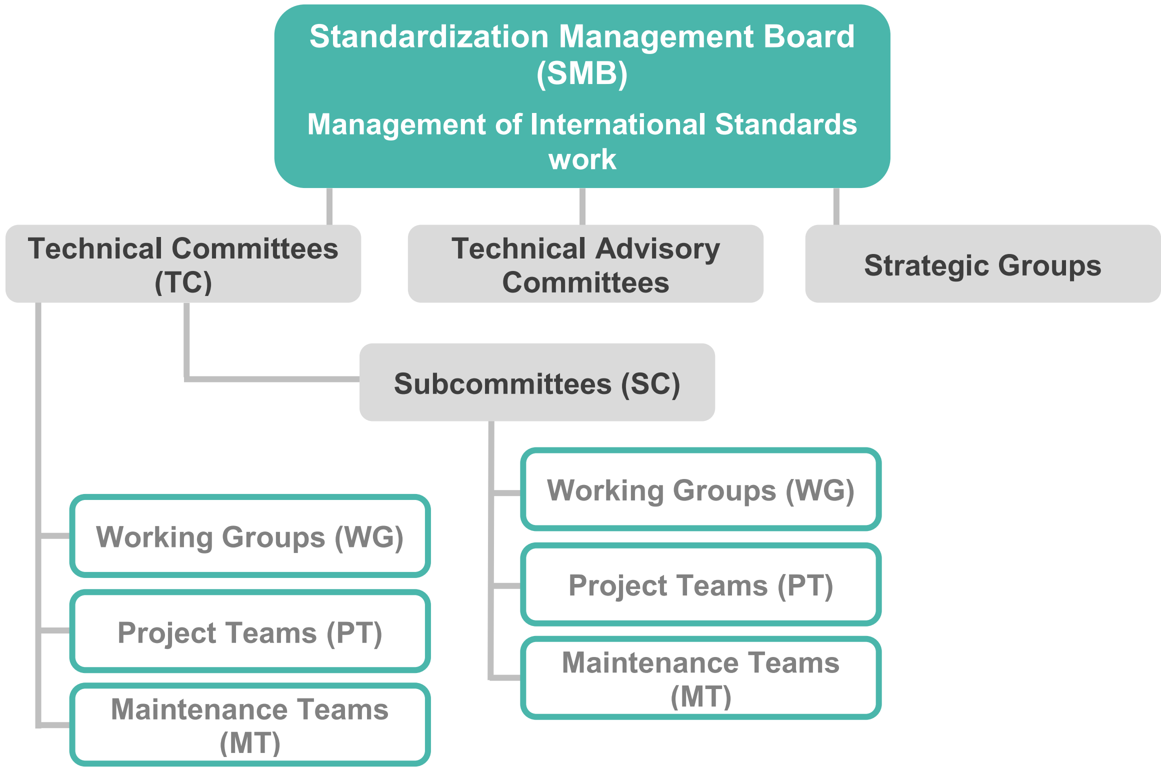
A subcommittee may be created by parent technical committees when it considers that its field of technical activity generates too many work items to be efficiently handled by itself.

Some 174 TCs (Technical Committees) and SCs (Subcommittees), and about 700 Project Teams (PT) /Maintenance Teams (MT) carry out the standards work of the IEC. In all, some 11,000 experts worldwide participate in the technical work of the IEC. The standards development work is conducted by Working Groups, whose guiding rules and principles are:

- technical committees or subcommittees may establish working groups for specific tasks
- a working group shall report to its parent technical committee or subcommittee through a convener appointed by the parent committee
- a working group comprises a restricted number of experts individually appointed by the P-members (Participating members – see Committee Structures below), A-liaisons (see section 6.2) of the parent committee and D-liaison (see section 6.2) organizations, brought together to deal with the specific task allocated to the working group
- the experts act in a personal capacity and not as the official representative of the P-member or A-liaison organization (see ISO/IEC Directives, Part 1, section 1.17) by which they have been appointed, with the exception of those appointed by D-liaison organizations (see ISO/IEC Directives, Part 1, section 1.17.3.4). However, it is recommended that they keep close contact with that P-member or organization in order to inform them about the progress of the work and of the various opinions in the working group at the earliest possible stage[9].

[8] Examples include the SG1 (Strategic Group 1) for IEC and the SAG-E (Strategic Assessment Group for Energy) for ISO, both of which are mandated to provide guidance on gaps in energy efficiency and renewable energy standards
[9] Section 6 of this report contains a discussion of the types of "liaison" organizations referred to above.

Figure 3. IEC Committee structures




*Market Strategy Board*

The Market Strategy Board (MSB), which reports to the CB, identifies the principal technological trends and market needs in the IEC's fields of activity. It sets strategies to maximize input from primary markets and establishes priorities for the technical and conformity assessment work of the IEC, improving the European Commission's response to the needs of innovative and fast-moving markets. It may establish Special Working Groups (SWGs) under the leadership of an MSB member to investigate certain subjects in depth or to develop a specialized document. It meets at least once per year and comprises a chair, 15 top-level technology officers as members appointed from industry, and (*ex officio*) the IEC Officers.

*Conformity Assessment Board*

The CAB oversees the management and supervision of the IEC's conformity assessment activities, including of IEC conformity assessment systems, and is intended to represent the IEC conformity assessment community. It is responsible for:

- setting the IEC's conformity assessment policy
- promoting and maintaining relations with international organizations on conformity assessment matters
- creating, modifying and disbanding conformity assessment systems
- monitoring the operation of conformity assessment activities
- examining the continued relevance of the IEC's conformity assessment activities in general.

The CAB is a decision-making body and meets at least once per year, reporting to the CB. It delegates the management and overall operational responsibility related to the IEC's conformity assessment systems to the management body of each conformity assessment system. It comprises:

- the chair, who is an IEC Vice President, elected by Council for a 3-year term and eligible for re-election for one additional term
- 12 members elected by the Council and their alternates (alternative representatives) appointed by the NC; individual members may serve up to two 3-year terms, but there are no limits on alternates

- the chair and secretary (without vote) of each conformity assessment system and of the standalone scheme of the European Commission
- the IEC Treasurer, as an *ex officio* member without vote
- the IEC General Secretary, as an *ex officio* member without vote.

### Committee structure

As previously mentioned a great many Technical Committees and Subcommittees, comprising about 700 Project Teams (PT)/Maintenance Teams (MT) carry out the IEC's standards work. These working groups are composed of electrotechnology experts from around the world, the great majority of whom come from industry, while others from commerce, government, test laboratories, research laboratories, academia and consumer groups also contribute to the work. Certain multinationals in the electrotechnical field have a particularly strong engagement, most notably ABB, General Electric, Schneider Electric and Siemens.

TCs report to the Standardization Management Board. A TC can form SCs if it finds its scope is too wide to enable all the items on its work program to be dealt with. The SCs report on their work to the parent TC. The scope (or area of activity) of each TC and SC is defined by the TC/SC itself, and then submitted to the SMB or parent TC for approval.

TC membership is composed of the IEC NCs (National Committees), all of which are free to take part in the work of any given TC, as either:

- P-Members (Participating members), who are obliged to vote at all stages and to contribute to meetings, or
- O-Members (Observer members), who follow the work as observers, receiving committee documents and having the right to submit comments and to attend meetings.

IEC TCs and SCs prepare technical documents on specific subjects within their respective scopes that are then submitted to the Full Member National Committees for vote with a view to their approval as International Standards. Distribution of documents for standards production is 100% electronic, thereby improving efficiency and reducing costs.

IEC Project Committees are established by the SMB to prepare individual standards that do not fall within the scope of an existing technical committee or subcommittee. Project Committees are disbanded once the standard has been published.

Each National Committee of the IEC handles the participation of experts from its country. Organizations or individuals wishing to take part in the work of an IEC TC or SC should contact their NC for permission to participate.

### Standards development process

International Standards and other publications – IEC TCs/SCs develop International Standards and other types of publications for specific areas of electrotechnology. These publications fall into two broad categories:

- normative publications, which reflect agreements on the technical description of the characteristics to be fulfilled by the product, system, service or object in question
- informative publications, which provide background information such as implementation procedures or guidelines.

#### *Preliminary stage*

The first stage of development comprises projects envisaged for the future but not yet ripe for immediate development, or preliminary work such as better definition of a project for new work, data collection or round-robin tests necessary to develop standards. These steps, which are not formally part of the standardization process, are known as the preliminary stage and are applied to work items where no target dates can be established. This stage can be used for the elaboration of a new work item proposal and the development of an initial draft.

*Proposal stage*

A proposal for new work generally originates from industry via a National Committee. A new work item proposal is approved after a 3-month commenting and voting period if a simple majority of the committee's P-members approve the new work item and if the minimum number of experts (4 or 5) are nominated by P-members who have approved the new work item proposal. A new work item proposal (NP) is a proposal for a new standard; a new part of an existing standard; or a Technical Specification[10] and may be made by:

- a national body
- the secretariat of that technical committee or subcommittee
- another technical committee or subcommittee
- an organization in liaison
- the technical management board or one of its advisory groups
- the Chief Executive Officer.

*Preparatory stage*

During this phase a Working Draft is prepared, generally by a project leader within a project team. **Working drafts (if not supplied with the proposal) must be developed within 6 months of the proposal being adopted**. The preparatory stage ends when a working draft is available for circulation to the members of the technical committee or subcommittee as a first committee draft (CD) and is registered by the office of the Chief Executive Officer. The committee may also decide to publish the final working draft as a PAS[11] to respond to particular market needs.

*Committee stage*

At this point the document is submitted to the National Committees as a committee draft (CD) for comment. A **committee draft should be available within 12 months**. The committee stage is the principal stage at which comments from national bodies are taken into consideration, with a view to reaching consensus on the technical content. As soon as it is available, a committee draft is circulated to all P-members and O-members of the technical committee or subcommittee for consideration, with a clear indication of the latest date for submission of replies. **A period of 2, 3 or 4 months is available for national bodies to comment**.

*Enquiry stage*

Before passing to the approval stage, a bilingual (English/French) Committee Draft for Vote (CDV) is submitted to all National Committees for a 5-month voting period. This is the last stage at which technical comments can be taken into consideration. The CDV is considered approved if a majority of two-thirds of the votes cast by P-members is in favor and if the number of negative votes cast by all National Committees does not exceed one-quarter of all the votes cast. A revised version is then sent by the committee secretary to the IEC Central Office within 4 months for Final Draft International Standard (FDIS) processing. If a CDV is approved with no negative votes and there are no technical changes, it can proceed directly to publication. When the document is planned to be a Technical Specification (and not an International Standard), only the first criterion of two-thirds of the votes being in favor needs to be fulfilled, and the revised version is then sent to Central Office to be published.

[10] A Technical Specification is very similar to an International Standard but does not have as thorough approval. Technical Specifications are issued according to the ISO/IEC Directives, Part 1, 3.1.1.1 as a "prospective standard for provisional application" in the field of ... because there is an urgent need for guidance on how standards in this field should be used to meet an identified need. Technical Specifications are not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Technical Specifications must be reviewed not later than 3 years after publication with the options of: extension for another 3 years; conversion into an International Standard; or withdrawal

[11] Publicly Available Specifications (PAS). A PAS may be an intermediate specification, published prior to the development of a full International Standard, or, in IEC may be a "dual logo" publication published in collaboration with an external organization. It is a document not fulfilling the requirements for a standard. A proposal for submission of a PAS may be made by an A-liaison or D-liaison or by any P-member of the committee. The PAS is published after verification of the presentation and checking that there is no conflict with existing International Standards by the committee concerned and following simple majority approval of the P-members voting of the committee concerned. A PAS shall remain valid for an initial maximum period of 3 years. The validity may be extended for a single period up to a maximum of 3 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn

*Approval stage*

The FDIS is circulated to the National Committees for a 2-month voting period. Each National Committee's vote must be explicit: positive, negative or abstention. No comments are allowed with a positive vote. An FDIS is approved if there is a two-thirds majority of P-members voting positively and if less than 25% of all votes are negative. If the document is approved, it progresses to the final publication stage; if it is not approved, it is referred back to the TC or SC for reconsideration.

*Publication stage*

This is entirely the responsibility of the Central Office and leads to publication of the International Standard, normally within 1.5 months of the FDIS having been approved. Once a final draft International Standard has been approved, only minor editorial changes are introduced into the final text.

### *Summary of IEC committees addressing product energy efficiency*

The relevant IEC committees dealing with products of interest to the CoP (see section 3) are shown in Table 2.

**Table 2. IEC Committees and International Standards addressing products of interest to the CoP**

| Product | TC/SC | Examples of relevant standards |
|---|---|---|
| SSL | TC34 | |
| Televisions/Home entertainment | TC100 | IEC 62087: methods of measurement for the power consumption of television sets, video recording equipment, set top boxes, audio equipment and multifunction equipment for consumer use |
| Network standby | TC100?[1] | Not yet developed |
| Distribution transformers | TC14 | |
| Motor systems (fans, etc.) | TC2 | IEC 60034-30: Efficiency classes of single-speed three-phase, cage-induction motors |
| Residential refrigeration | TC59 (SC59M) | IEC 62552 – Household Refrigerating Appliances – Characteristics and Test Methods |

## 4.3 ISO

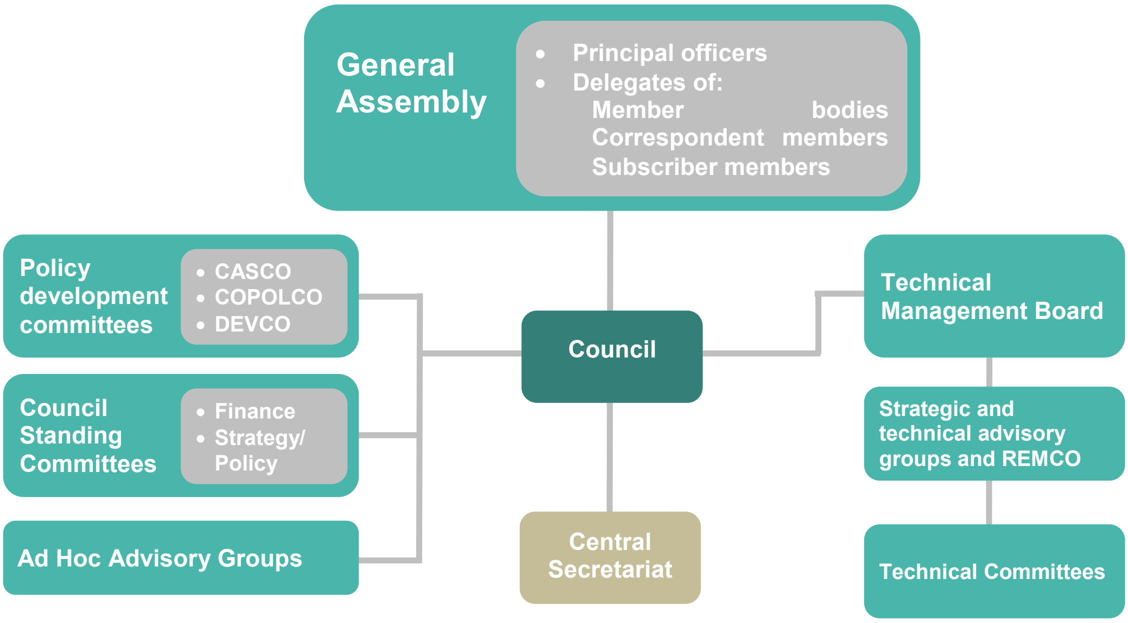
The ISO (www.iso.ch) is the world's largest developer of voluntary International Standards. International Standards give state-of-the-art specifications for products, services and good practice, helping to make industry more efficient and effective. Developed through global consensus, they help to break down barriers to international trade. The ISO's mandate is to develop and maintain standards covering all areas that are not addressed by the IEC or the ITU, thus it has a broader focus than the other two international standards bodies. The governance and standards-making process of the ISO is very similar to that of the IEC (described in detail in section 4.2).

### *Structure and governance*

The ISO is an independent, non-governmental organization made up of members from the national standards bodies of 164 countries. Members play a vital role in how the ISO operates, meeting once a year for a General Assembly that decides strategic objectives. The ISO has a Central Secretariat in Geneva, Switzerland, that coordinates the system. Operations at the Central Secretariat are directed by the Secretary General. The General Assembly is the ultimate authority for ISO work. This annual meeting is attended by members (full members) and Principal Officers, including the President, the Vice President (policy), the Vice President (technical management), the Treasurer and the Secretary General.

The ISO Council takes care of most governance issues (Figure 4). It meets twice a year and is made up of 20 member bodies. Membership to the Council is open to all member bodies and rotates to make sure it is representative of the member community. Beneath the Council are a number of bodies that provide guidance and management on specific issues:

Figure 4. ISO organogram




- CASCO provides guidance on conformity assessments (see also www.iso.org/iso/home/about/conformity-assessment/casco.htm)
- COPOLCO provides guidance on consumer issues (see also www.iso.org/iso/home/about/iso-and-the-consumer/copolco.htm)
- DEVCO provides guidance on matters related to developing countries' Council Standing Committees – advice on financial and strategic matters and Ad hoc Advisory Committees, which can be established to advance the goals and strategic objectives of the organization (see also www.iso.org/iso/home/about/iso-and-developing-countries/devco.htm).

**The ISO Central Secretariat** – while the General Assembly and the Council map out the ISO's strategic direction, day-to-day operations are run by the Central Secretariat in Geneva, Switzerland. The Central Secretariat is under the direction of the Secretary General, who is also one of the Principal Officers.

For more details on the structure of the ISO, see www.iso.org/iso/home/about/about_governance.htm. For more details on the ISO's Strategic Plan see www.iso.org/iso/home/store/publications_and_e-products/publication_item.htm?pid=PUB100263; and for more on the ISO's Code of Ethics see www.iso.org/iso/home/store/publications_and_e-products/publication_item.htm?pid=PUB100011.

**Conformity Assessment** – Conformity assessment is the process used to show that a product, service or system meets specified requirements, such as are set out in an International Standard. While these requirements are likely to be contained within an ISO standard, the ISO itself does not perform conformity assessments. The main forms of conformity assessment are certification, inspection and testing; although testing is the most widely used, certification is best known.

**Harmonization of conformity assessment** – the ISO has produced standards to help make conformity assessment activities as uniform as possible. These standards explain what a body needs to do to be seen as capable of performing conformity assessments such as laboratory testing, inspection or management system certification.

### *Governance of technical work*

Technical work is carried out under the overall management of the Technical Management Board (TMB), which reports to the ISO Council. Its role is defined in the statutes of the organization. Specifically, it is responsible for setting up and managing the technical work. It is also responsible for the Directives, which are essentially the rules for the development of International Standards, and it deals with all matters of strategic planning, coordination, performance and monitoring of technical committee activities.

For more details on this, see:
www.iso.org/iso/home/standards_development/governance_of_technical_work.htm and
www.iso.org/iso/home/standards_development/list_of_iso_technical_committees/iso_technical_committee.htm?commid=54996

Under the ISO's global relevance policy, an International Standard must be able to be implemented as broadly as possible by affected industries all around the world.

### *Summary of ISO committees addressing product energy efficiency*

The only ISO committees currently identified as being of direct interest to the CoP are TC86/SC6, which addresses air conditioners, and TC86/SC7, which addresses commercial refrigeration.

## 4.4 ITU

The ITU (www.itu.int) is the United Nations specialized agency for information and communication technology (ICT). It allocates global radio spectrum and satellite orbits, develops the technical standards that ensure networks and technologies seamlessly interconnect, and strives to improve access to ICTs for underserved communities worldwide. It "is committed to connecting all the world's people – wherever they live and whatever their means. Through their work, they protect and support everyone's fundamental right to communicate."

The ITU aims to be at the heart of the ICT sector, brokering agreement on technologies, services, and allocation of global resources such as radio frequency spectrum and satellite orbital positions, to create a seamless global communications system that is robust, reliable, and constantly evolving.

In addition to the 193 Member States, ITU membership includes ICT regulators, leading academic institutions and some 700 private companies.

#### *Committee structure*

The ITU is split into the following sectors.

(i) Office of the Secretary General.

(ii) Radio communication (ITU-R) – see www.itu.int/ITU-R/index.asp?category=information&rlink=sector-organization&lang=en)
Lvl 1 – Radio communication Conference; Lvl 2 – Radio communication Assembly, Radio Regulations Board; Lvl 3 – Study Groups and Special Committee, Conference Preparatory Meeting, Radio communication Advisory Group; Lvl 4 – Director; Lvl 5 – Radio communication Bureau; Lvl 6 – Space Services Department (SSD), Terrestrial Services Department (TSD), Study Groups Department (SGD), Informatics, Administration and Publications Department (IAP).

(iii) Standardization (ITU-T) – ITU-T is split into multiple different sections, including (see also www.itu.int/en/ITU-T/groups/Pages/default.aspx):

- TSAG, which acts as an advisory body to study groups, membership and staff of ITU-T and is responsible for working procedures and the organization of the ITU-T work program
- Study Groups, which are technical groups where representatives of the ITU-T membership develop Recommendations (standards) applicable to various fields of ICT
- Regional Groups are subsets of ITU-T Study Groups and aim to ensure that ITU-T Recommendations address the needs of all regions of the world
- Focus Groups, which are formed in response to immediate ICT standardization demands, are open to organizations outside ITU's membership, and are afforded great flexibility in their chosen deliverables and working method
- Joint Coordination Activities, which for a given subject coordinate standardization work across ITU-T Study Groups in consultation with ITU-R and ITU-D and act as the first point of contact for organizations interested in contributing to ITU-T's work

- Global Standards Initiatives (GSI) – a package of work conducted through co-located meetings of Study Groups and rapporteur groups falling under a particular Joint Coordination Activity
- Committees, which are responsible for the harmonization of standardization terms and definitions employed by ITU-T Study Groups
- CTO Group, which organizes meetings of high-level, private sector executives to identify standards priorities and ways for ITU-T to best meet the needs of the private sector.

(iv) Development (ITU-D) – the mission of ITU-D is to help ensure that the benefits of ICT are shared by all the world's inhabitants. ITU-D is split into two main study groups (see also www.itu.int/net3/ITU-D/stg/index.aspx):

- Study Group 1 – concerning environment, cyber-security, ICT applications and Internet related issues
- Study Group 2 – concerning information and communication infrastructure and technology development, emergency telecommunications and climate change adaptation.

(v) ITU TELECOM – this is the annual ITU Telecom World Conference (see also www.itu.int/ITUTELECOM/index.html).

# 5. Towards a government energy efficiency standards coordination organization

## 5.1 Goals

The goals for any new government energy efficiency standards coordination organization as set out by the CoP Tokyo communiqué are:

- to facilitate dialogue and coordination between governments so that common approaches to the testing, rating and ranking of products can be developed
- to strengthen capacity for equipment energy efficiency regulators to engage directly with international standards committees in order to increase the prospects of international test procedures being fit for regulatory purpose.

## 5.2 Why are the normal standards committee processes insufficient?

Standardization committees in the IEC and the ISO, and in the national standardization bodies (NSBs) that comprise their membership, tend to be dominated by manufacturer representatives who are concerned about standardization of the products they produce. Membership is not exclusive to industry, and a range of other stakeholders usually also participate (e.g. government-designated representatives, representatives of testing and certification labs, professional bodies, and consumer or environmental non-governmental organizations (NGOs)), but the industries affected by the relevant standards understandably commit the greatest resources to staff standardization committees at the national and international levels. This means that their voices tend to predominate in standardization committee decision making and to some extent voting procedures, which are managed by national committees. To some degree industry domination tends to occur because the representation and input from other stakeholder groups is relatively modest by comparison, usually on account of resource constraints that limit participation by these other groups (rather than by design).

Product energy efficiency regulators in particular could potentially have a powerful influence on the deliberations of their national and international standards bodies were they to be more proactively engaged in the standardization process. In practice, however, most regulators have neither the time nor the resources to send representatives to all the relevant international technical committees to ensure their concerns are heard. In part, this is because much of the work of these committees pertains to issues that may not directly concern product energy performance regulators, but it also reflects that prevalent funding of regulatory processes is often insufficient to maintain a permanent presence in the standardization working committees of interest. Historically, some regulators have exercised close control over the test standards used in domestic equipment energy efficiency regulations and have therefore felt less inclined to engage in international standardization processes. However, there has been a shift in recent years towards a policy of adoption of international test procedures wherever possible in most countries.

Disengagement of government from International Standards development means that the needs or desires of governments are not conveyed to standards committees. Indeed, currently there is no process to develop a consensus approach by interested governments towards testing approaches. Consequently, standards committees are sometimes oblivious to government needs or views. Conversely, in rare cases there may be several conflicting views from government representatives. Under these circumstances it is unsurprising that international test methods are sometimes perceived not to meet government needs.

While industry and government may have disparate or misaligned views in the process of standards development, in practice both stakeholder groups have an interest in the development of fair, competent test procedures that are globally applicable. Large manufacturing organizations that sell into multiple markets would have significant benefits if there were greater alignment of testing procedures across different regions. So while this is an obvious point of confluence in objectives, practical experience would suggest that most large manufacturers have not made this an area of corporate policy driving the development of good global test procedures. Anecdotally, most manufacturers use the standards process as an information-gathering function rather than as a means of driving positive, long-term changes.

Given the potential alignment of desires to produce global standards, manufacturers could provide an important strategic partner in the development of new and revised standards. Manufacturers understand many of the issues that are important to consider when measuring product performance and energy consumption, and provide a substantial pool of knowledge and understanding in the field of test procedures. With strategic input and vision from government on longer-term objectives, a much more productive and open relationship with industry could be established in the development of good test procedures.

In summary, industry tends to predominate the membership of standards committees (especially at the international level) and equipment energy efficiency regulators tend to be less engaged. This has significant consequences because often the standards that are produced under such circumstances will tend to reflect the concerns of industry rather than those of regulators. In particular, industry is likely to be more concerned with developing energy measurement standards and energy efficiency metrics that are:

- repeatable, i.e. produce the same result each time they are tested
- reproducible, i.e. produce the same result when tested in different test laboratories
- inexpensive.

However, there is likely to be less concern with making standards and metrics that are representative, i.e. product energy and efficiency ratings that are consistent with the equivalent values when the product is in actual use.

Indeed, representative standards and metrics are likely to be somewhat more complex to measure (e.g. they may require full- and part-load testing and the derivation of a formula or formulae to convert these results into locally representative values) and hence may appear in the first instance to be more expensive. However, international test procedures that are unable to represent conditions at a regional level are more likely to generate unaligned local requirements and deviations, and thus increase total testing and product platform costs for traded products in the medium term.

Industry generally has in interest in metrics as they want to understand how their products are likely to be assessed and compared. But development of a global approach to produce representative efficiency metrics may be beyond the interest or capability of many standards committees and their members. The derivation or application of representative standards and metrics often requires access to more information on the actual use of the equipment in question (or distribution data for climate or other regional factors), which members of standards committees may not have or may not be able to obtain readily. Inclusion of these parameters takes more effort, which will naturally make the production of standards more time-consuming. Both of these factors may create disincentives for industry-dominated committees (especially where there is little strategic vision) to address them, particularly in the absence of proactive engagement of equipment energy efficiency regulators, whose mandate is more clearly concerned with saving energy and considering issues of public good (including consumer protection and environmental impact).

## 5.3 What is needed?

In general, equipment energy efficiency standardization processes that focus on all four of the primary public policy concerns are needed, i.e. energy efficiency standards should be:

- repeatable
- reproducible
- inexpensive
- representative
- and enforceable.

The use of these key principles, and building on the common strategic interests of industry and government, should lead to more fruitful development of international test procedures. To some extent, it is important to understand during the development of a test procedure how the measurements made are likely to be applied in an energy policy and/or an energy-efficiency metric. While many standards committees will have useful contributions to make in the development of efficiency metrics, there needs to be strategic guidance from government to ensure that the overall approach is acceptable in a policy context.

Building on a foundation of test procedures and metrics, many equipment energy efficiency regulators would like to develop families (or menus) of informative energy efficiency thresholds that could potentially be used by many different regulators within their local policies and programs. Again, within the context of a strategic framework from government, standards committees could make a substantial contribution to this or even jointly develop such thresholds.

In principle, agreement on a common international menu of efficiency thresholds would enable globalized industry to manufacture products to each of the thresholds in accordance with the global scale of demand. This could bring benefits from standardized product platforms that would enable more rapid technology transfer, lower testing costs, and facilitate comparison of product efficiency regulations (benchmarking). While this scenario is generally deemed to be desirable in principle, equipment energy efficiency regulators have sometimes expressed concerns in practice about the competency of existing standardization committees to derive such thresholds, and concerns about a potential conflict of interest and lack of mandate. These concerns arise because most standards committee members come from the industries that manufacture these products (and hence could be seen to be laying the technical foundation for softer regulation[12]) and many have little experience with public policy concerns. A specific concern is the membership of many of the standardization committees, which tends to be comprised of relatively junior staff within their parent organizations with limited experience in wider energy policy issues.

If international standardization processes are to be improved so as to better reflect the needs of energy efficiency policy while addressing these concerns, it is clear that equipment energy efficiency regulators will need to become more closely engaged in their derivation and have a means to articulate their interests that will be given due weight in the standards formulation process. The remainder of this document sets out some initial thinking about the type and nature of engagement that could be envisaged and the mechanisms that could facilitate it.

### *Higher- and lower-level engagement*

Communication regarding issues of governance and/or the most appropriate channels of communication between equipment energy efficiency regulators and standardization bodies and their sub-elements will require the establishment of a channel for communication at a higher level.

In theory, issues of general principle that are relevant to all product energy efficiency standardization processes can be formulated in a generic manner and communicated at a higher level into the standardization process prior to internal dissemination to the relevant technical committees (TCs), subcommittees (SCs) and working groups (WGs) that need to consider these issues. In certain cases, some specific requests could be made at a high level about specific issues or even products. If issues could be communicated in a coherent manner into the standards boards (i.e. the Standardization Management Board (SMB) of the IEC and the Technical Management Board (TMB) of the ISO), it is hoped that this would facilitate initiation and progress of work in specific areas. It is not expected that the management boards would undertake direct intervention or management of particular issues, but they could provide a framework of support and clear communication to the relevant groups about broad expectations and directions.

Management board support will be an important element of a new process. However, where detailed technical issues are to be addressed, these would need some strategic resources to be applied at the relevant working group or subcommittee level to provide direct input into the work. Engagement at this level will provide a mechanism that allows direct communication between equipment energy efficiency regulators (or their representatives) and the TCs, SCs and WGs specifically concerned with the topic of interest.

### *Coordination of government input*

There are two important aspects to consider when examining the issue of government inputs to such a process.

First, there needs to be a process of formal or semiformal liaison between selected governments to identify key areas of interest. Areas of interest may be very broad or could be as focused as addressing specific shortcomings in a specific test procedure. Most probably, however, the interest in undertaking common actions will be screened by product type to prioritize cases where:

[12] In theory, this concern could be obviated were it possible to ensure that the standards committees developed a suitably wide range of performance thresholds – from lax to very stringent – that could then be selected by regulators according to their needs

- there is interest in making improvements to existing international test procedures
- test procedures do not currently exist and where new test procedures are warranted
- the development of an efficiency metric and/or efficiency thresholds are of interest.

Given that there are potentially a large number of products and therefore a larger number of test procedures and associated issues that could be of interest in different countries, there is a need to identify areas that are most urgent or where this is the greatest common interest. At least in the first instance, it is expected that the maximum number of standardization processes that could be examined in parallel would be between 5 and 10. In this type of collaboration there would need to be some broad consensus on general approaches to the issues under discussion and the direction that will provide a satisfactory resolution from a government perspective. In many cases, only a few governments may have an interest in a specific topic, i.e. not every government would have an interest in every possible topic. However, it is important to emphasize that without some broad consensus of topics and products, it would be difficult to communicate coherently with the relevant management boards of the IEC or the ISO. Where it is not possible to obtain some sort of broad consensus, then it would be better to avoid the use of this high-level process.

The second element of government coordination is to allocate selected resources to participate in (and to some extent guide) the technical work in the relevant working group or committee. A few anointed technical experts who have the explicit imprimatur of a government coordination body should provide a sound basis for enhanced influence in the standards process. Coordination would also enable scarce resources to be strategically placed across a range of product areas. There is little point in having, for example, six government representatives in one specific committee and none in three other committees of interest. An important consideration is that any embedded experts in this process who aim to represent government interests should have a good grasp of technical issues as well as a clear strategic vision of what is possible in meeting broader government objectives within the framework of international standards development.

## 5.4 Factors to consider when assessing the viability of new mechanisms

To be viable, any mechanism needs to be mindful of:

- the existing governance of the key international standardization bodies (the IEC, the ISO and the ITU) and of their associated membership of NSBs
- existing forums for dialogue and cooperation between equipment energy efficiency regulators and/or standardization bodies
- the resources available to equipment energy efficiency regulators for this purpose and their capacity to engage
- the limited focus of product energy efficiency regulators compared to the broader focus of product standardization TCs, SCs and WGs
- timetables both for regulatory and standardization development and for maintenance
- distinctions between general standardization issues and product-specific issues
- the potential need to develop new institutions (whether formal or informal) and their associated procedures and governance.

The way in which these factors influence the viability of any resulting mechanism to strengthen the collective voice of equipment energy efficiency regulators within the standardization process is considered the subsequent sections.

## 5.5 What mechanisms can be envisaged?

### *At the higher level*

At the higher level, equipment energy efficiency regulators need to identify key areas of common interest in terms of products and/or topics and some broad strategic objectives. This may be best achieved through some sort of forum and working group under a broader international flagship such as IEA-4E or SEAD.

Equipment energy efficiency regulators need to establish a channel of communication with key international standardization bodies to address:

- dialogue about the means of communicating their interests to the standardization bodies and processes and related procedural and/or governance issues
- general issues of principle regarding product energy efficiency standardization
- obtaining, in principle, support from management boards to address these issues in the relevant technical committee or working group.

Within the ISO and the IEC, advisory committees addressing energy efficiency standardization (and also renewable energy) were initiated in 2008–9 and continue to have a role. In the case of the ISO there is the SAG-E, and in the case of the IEC there is the SG1. While they have some very general interest in energy efficiency issues, their primary focus is to identify topics or fields in the field of energy generally where standardization may be warranted (i.e. a more general anticipation of where energy standards may be required in the future for a wide range of purposes).

These committees have advisory status and are able to communicate proposals or issues regarding energy efficiency standardization to the SMB in the IEC or the TMB in the ISO. While they may make recommendations, these are non-binding on the SMB and TMB; however, the latter two bodies do have the authority to make binding requests upon Technical Committees (although in practice, management boards rarely intervene directly in TC matters but more commonly communicate with TCs about matters of general concern or principle), and hence interacting directly with these committees might be preferable to communicating through the SAG-E and SG1. In addition, although the SAG-E has some regulator representation, the SG1 has very little, and those who participate in such committees are more usually generalists with a much broader set of interests in general energy issues, rather than experts in product energy efficiency standardization. Hence the diluted focus of SG1 and SAG-E is another reason why product energy efficiency regulators may prefer to establish a separate direct channel of engagement with the SMB and TMB that focuses on government interests with respect to product energy efficiency issues.

Thus there is a need for the establishment of an engagement with the IEC/ISO to determine the most appropriate means of communicating higher-level concerns to these bodies, be it through the SAG-E/SG1, the SMB/TMB, their permanent secretariats, or some other route. This is also likely to need issues of legitimacy, procedures and governance to be addressed, which will require equipment energy efficiency regulators to develop their own position on these topics so that they can speak with a clear voice and maximize the prospects of their being granted full access.

Note: the ITU does not currently have any equivalent body to the SG1 and SAG-E.

### *At the lower level*

At a minimum, a two-way mechanism by which equipment energy efficiency regulators can fast track access to TCs/SCs/WGs on key issues, and by which the TCs/SCs/WGs can fast track access to regulators when dealing with equipment energy efficiency standardization, is required. This needs to be a mechanism by which regulator voices are not “drowned out” by the presence of other standardization committee members, and by which key concerns can be raised externally among regulators and subsequently aired in the standardization committee but, conversely, also be discussed first in the standardization committee and then aired among regulators. Equally, it is important that the standardization committee should be assured that the technical communications delivered by any nominated representative reflect the informal views of multiple governments and thus a mechanism will be need to be formulated to ensure this is the case.

In practice this could entail:

- two parallel processes (one among equipment energy efficiency regulators and the other within the international standardization committee, i.e. the existing committee process with some amendments to facilitate product energy efficiency regulator dialogue)
- a conduit to convey information between the two processes
- direct engagement between the two processes (or their representatives) when appropriate, e.g. the presence of selected product energy efficiency regulator representatives within the standardization committees
- in principle, strategic support from the standardization management boards (SMB and TMB) to give added weight to regulator input.

Among equipment energy efficiency regulators, the natural home in the short-term in which to stage their dialogues would appear to be within the SEAD/IEA/IEA-4E CoP; however, if the process becomes more established and influential, over the longer term it is likely that thought will need to be given to:

- the permanency of this structure
- more formal internal procedures and governance
- inclusiveness, and the ability of other regulatory bodies and dialogues to have their voices heard to maximize legitimacy and influence.

Indeed it is possible that adequately addressing these issues could be a prerequisite for formal IEC/ISO/ITU cooperation at the management-board level.

## 5.6 Implications for the structure and work of a government energy efficiency standards coordination organization and the future development of the CoP

If the CoP is, at a minimum, the incubator of this process it needs to consider the development of a roadmap to a long-term, sustainable, viable and legitimate structure. It also seems likely that it will necessitate an internal process within the CoP which differentiates the discussion and procedures on product standardization issues into higher-level (general) and lower-level (product-specific) issues, i.e. a structure where there is a general CoP management group (GMG) and a set of product-specific working groups (PSWGs).In time these may evolve into separate entities.

The initial set of PSWGs could be established to mirror the list of priority product groups agreed at the SEAD/IEA/IEA-4E workshop in Tokyo (section 3.2), with one PSWG per product type. The PSWG's are likely to cover relatively broad product groups, with special sub-groups focused on specific product issues/proposals under review/development being formulated.

The PSWGs could be staffed with experts nominated by each CoP country's regulatory lead member and tasked with reviewing the international standardization issues and needs for the product of interest. In the event that the PSWG are not new entities, these steps would not be necessary or relevant. Each PSWG could begin with a product standardization status review focused on the status and adequacy of international:

- energy measurement standards
- service measurement standards
- energy efficiency metrics and associated product groupings
- energy efficiency threshold menus.

In each case they should consider and assess the fitness for purpose of the existing International Standards, including their adequacy in terms of repeatability, reproducibility, cost-effectiveness and representativeness. They should also:

- aim to document all relevant international and national standards for the product concerned
- address the composition and nature of the participants in the existing standardization committees and the hierarchy of decision making within these committees[13]
- assess the status of international harmonization of these standards and obstacles that may need to be confronted in strengthening international harmonization of standards.

The findings of the PSWG reviews should then be written up and reported to the CoP GMG for review and comment. The next step could then be for the PSWGs to prepare a roadmap for engagement with the relevant international standards' TCs/SCs/WGs. These roadmaps would identify issues and objectives, and regulatory timing needs. They would further map these against the current work program(s) for the international TC/SC/WGs in question and prepare a hierarchy of objectives and opportunities for interventions in anticipation of the establishment of an agreed conduit for dialogue with the TC/SC/WGs between the CoP and the IEC/ISO/ITU hierarchies.

[13] Specifically, whether the committee membership reflects a rounded set of interests including a representative set of government appointed experts, whether the committee has a track record of working with regulators and whether its hierarchy is receptive to do so

## 5.7 Collective engagement with the international TC/SC/WGs: a burden-sharing approach

While CoP equipment energy efficiency regulators should aim to develop a common understanding of their standardization needs for any given product group and communicate this to the appropriate standards body's management board for endorsement, the need to have representation directly within the TC/SC/WGs responsible for the products of interest will not be negated. Indeed, management board support with no resources at the TC/SC/WG level is likely to result in no concrete action, or, worse still, new activity that is not in alignment with regulator views and directions.

As it is likely to be costly for each national regulator to provide such representation in each standardization committee, it would be helpful if members of the CoP were to agree to develop a common process to ensure the CoP has at least one representative present in each of the most important standardization TC/SC/WGs (two may be necessary for large, important committees). The derivation of a common strategy will entail each economy assessing their expected *a priori* participation within given standardization committees and then agreeing the roles of representatives and division of collective responsibilities within the agreed strategic framework and long-term broader policy objectives. Where possible, general support from the standardization management boards should be solicited for the issues being raised with the aim of strengthening the influence of the designated CoP representatives within the product-specific TC/SC/WG in question.

It would also be helpful if each TC/SC/WG were to directly inform CoP equipment energy efficiency regulators when they are planning to develop new energy efficiency standards or launch maintenance/revision processes for existing standards, at least for standards identified as being of specific interest to the CoP.

Equally it would be beneficial for CoP equipment energy efficiency regulators to inform standardization committees when they are planning new regulatory processes for a given product and whether they have any specific standardization needs (confirming current approaches, modifying existing approaches, or identifying new measures not currently addressed).

## 5.8 The need to engage with each economy's NSB

National equipment energy efficiency regulators within the CoP may also wish to proactively engage with their NSBs to increase the chances that the positions taken by NSB representatives within the international standardization processes are informed by and aligned with the regulatory position. Some countries appear to have a formal mechanism to facilitate specific government input into NSB decisions, while other countries will need to undertake direct liaison efforts to communicate these issues. Government interaction mechanisms with their NSBs are discussed further in Appendix B.

## 5.9 What incentive do standardization committees have to listen to the concerns of equipment energy efficiency regulators?

Embracing the concerns of regulators will maximize the prospects of standards developed through international standardization bodies being adopted into energy efficiency regulations, conversely, the ultimate sanction, should standardization bodies and/or their committees fail to engage with equipment energy efficiency regulators, is that International Standards may not be deemed to be fit for regulatory purpose and hence are much less likely to be used as the standard of choice within regulations. Were this to happen, it would greatly reduce the relevance of the International Standard. This eventuality also increases the risk of non-alignment in international regulations and the standards they use, which will add to industry costs in both testing and product platforms: this will create pressure to design products optimized to each set of regulations and hence each set of test standards. While non-use of a standard is the ultimate sanction of equipment energy efficiency regulators, it is a fairly blunt instrument and in many cases is difficult to apply, because many countries have clear polices to use International Standards where possible (sometimes this is not qualified).

It should be noted that while many multinational corporations may not welcome divergence in International Standards (at least at senior levels within their company hierarchies), local manufacturers can sometimes prefer unaligned standards as this situation may hinder international competition (non-tariff barriers). Even within multinationals, policies expressed at senior levels are not always consistent with the positions taken by their representatives within the standardization committees. Hence there is likely to be benefit from the CoP engaging with senior management within relevant multinationals to help ensure there is more accountability of their representatives within standards bodies and that there is clarity about the benefits of greater international harmonization.

## 5.10 Facilitating softer dialogues and information exchanges

Regardless of any need for the CoP to establish a formal position on some aspect of standardization (which is discussed in section 5.11), there is a need to facilitate dialogue with the international standardization bodies and their relevant committees. This could be facilitated by an agreement with the international standardization bodies to instigate a certain set of procedures/agreements such as:

- sharing work programs with the CoP
- notification of the CoP whenever new energy efficiency standardization processes for energy-using products are planned (including new maintenance efforts)
- provision of advanced notice and actively seeking engagement of the CoP and regulator representatives whenever the development of a menu of energy efficiency thresholds is to be considered
- agreement not to attempt such a process without engagement of the CoP or a representative sample of regulator representatives
- agreement to abide by the general product energy efficiency standardization principles developed by the CoP
- agreement to place adequate attention on addressing the representativeness of energy measurements and energy efficiency metrics and ensuring they are applicable in any economy
- permission for CoP-nominated representatives to participate in the standardization development process for all areas that concern energy efficiency.

In a *quid pro quo* arrangement, the CoP may also wish to consider options for granting observer status to its PSWGs for a nominated representative of the international standardization committee.

Alternatively, the PSWGs may wish to instigate measures to facilitate the collation and sharing of technical information, such as data gathered within regulatory processes addressing the actual use of the equipment in the economies of the CoP membership that could be used to inform thinking about the design of energy efficiency metrics that are representative of *in situ* usage conditions.

More generally, facilitation of information exchange and dialogue could be enhanced were there to be agreement with the international standardization bodies to:

- grant access to nominated CoP representatives to the working documents of relevant standardization committees and working groups
- create a common information exchange portal such as a “Drop Box” site
- establish designated liaison officers who are tasked with facilitating the dialogue between the CoP and the relevant TC/SC/WGs.

## 5.11 How are regulator opinions to be developed collectively, and what formal approval processes will be needed to assure their mandate and legitimacy?

The SEAD/IEA-4E/IEA CoP is a new mechanism for equipment energy efficiency regulators from leading economies wherein regulators can air views on standardization and formulate common positions on certain aspects of standardization. It is anticipated that any future government energy efficiency standards coordination organization will need to formally adopt positions that would be communicated to the standardization bodies.

In principle there are several ways common positions could be formulated. For example, working groups, such as the PSWGs, could report their recommendations to the GMG of the CoP, which could then review these recommendations with the aim of drafting a common position statement for submission to an international standardization body. The position statement could carry the names and positions of all the national regulators that support it. This arrangement would not preclude the option that individual regulators within the CoP may disagree with some or all of the position statement and not wish to sign it. Nor should signature be construed as intent to adopt the resulting International Standard at a later date although this would usually be the objective of regulator support.

Alternatively, it may be agreed that CoP position statements are only submitted for consideration by a standardization body when there is full consensus (or at least no disagreement) within the CoP on their substance. This arrangement may be the easiest to operate in practice but does not allow CoP action in the event of there not being a consensus.

Another arrangement could be to establish a voting procedure using either a simple one-country one-vote system (similar to the system used in the ISO and the IEC) or a qualified majority voting system (such as is used in the EU) with rules about how substantial a majority is needed before a CoP position statement can be issued (noting that in the event of no consensus but sufficient majority to issue a statement, only those CoP regulators supporting the motion would have their signatures added to the statement and those not doing so would have the right to indicate they do not support the position taken).

If voting and representative signatures are required, procedures may also need to be established to ensure equipment energy efficiency regulators participating in the CoP have sufficient authority to be considered as national regulators able to represent their country, or more probably their organization, for voting/decision-making purposes within the CoP. These procedures would clearly need to be light enough to avoid becoming a barrier to participation in the CoP, but sufficient to ensure that there is no risk of falsely representing national regulatory processes within the CoP.

These cases are intended to be illustrative of how a common position approval mechanism could be established to enable CoP positions to be developed and approved prior to being submitted for consideration by the international standardization bodies. In practice, as the development of more formal procedures can become a barrier to action and engagement, it may be sufficient to operate on a full consensus basis to begin with and add clarification to any position or document issued by the CoP regarding the positions held by CoP participants and a suitable disclaimer. In the longer term, however, a need to develop more formal procedures may become necessary; this issue could be addressed in the thinking of any organizational road map and elaborated upon as the CoP matures.

Similar processes could be developed to establish more formal CoP positions on both generic topics, such as a common CoP position paper on the principles that need to be considered when developing energy efficiency standards for energy-using products, and for positions to be taken regarding specific product standards; however, in most cases, softer mechanisms can be imagined that simply address the formation of a dialogue and the procedures to be followed.

# 6. Findings from IEC/ISO dialogues

## 6.1 IEC/ISO dialogue

To explore these ideas, meetings were held in Geneva in February 2013 with the IEC and ISO Secretariats to canvas their views. The Secretariats of both organizations were very positive towards the idea of greater engagement by product energy efficiency regulators in equipment energy efficiency standardization and made a number of specific suggestions about how it would best be possible for the CoP to work with their standardization processes. These are presented in detail for both the IEC and the ISO in sections 6.2 and 6.3, although the process and recommendations are essentially the same in both cases.

The dialogue with both organizations centered on how agreement between product energy efficiency regulators (CoP) and international standardization bodies could be reached to instigate the following types of procedures/practices:

- sharing standardization development work programs with the CoP
- notifying the CoP whenever new energy efficiency standardization processes for energy-using products are planned (including new maintenance efforts)
- agreeing to strive to observe any general product energy efficiency standardization principles developed by the CoP
- agreeing to place adequate attention on addressing the representativeness of energy measurements and energy efficiency metrics and endeavoring to make them broadly applicable in any economy
- granting permission for CoP nominated representatives to participate in the standardization development process for all areas that concern product energy efficiency
- provision of advanced notice coupled with actively seeking engagement of the CoP and its designated representatives whenever the development of a menu of energy efficiency thresholds is to be considered
- agreeing not to attempt a process to develop a menu of energy efficiency thresholds without engagement of the CoP or a representative sample of product energy efficiency regulator representatives.

## 6.2 Discussions with the IEC

The IEC Secretariat has stated that it:

- strongly welcomes CoP engagement
- has already identified and prioritized the need for the TCs and NSBs to work more closely with regulators
- is in the process of developing a NSB toolkit to encourage and assist NSBs to work with regulators
- has launched a "significant initiative" to develop standardization for energy-using systems.

Furthermore, the CAB WG12 has been working expressly on the idea of energy efficiency thresholds, with the thought of having the same menu adopted worldwide; however, this initiative is at an early stage. The need to have regulator engagement and support is fully recognized, especially as many TCs are said to be uncomfortable with attempting to develop menus of energy efficiency thresholds in their standards.

The Advisory Committee on Energy Efficiency (the new body that has been created to replace the SG1), was due to hold its first meeting on July 1, 2013 and a call for members had been issued. The IEC Secretariat indicated that CoP members or their representatives would be welcome to join.

The IEC Secretariat agreed that in principle it is both desirable and possible to establish:

- a structure that allows high-level concerns of principle to be communicated by product energy efficiency regulators to the whole IEC structure and then communicated downwards
- enhanced access for regulators to TCs/SCs/WGs of interest to communicate product-specific concerns regarding product energy efficiency standardization.

The Secretariat reported that in order for the CoP to establish cooperation with specific TC/SC/WGs, the best mechanism would be to establish formal "liaison" status with individual standardization technical committees (TCs) or subcommittees (SCs). It is also possible to establish a type of liaison with individual working groups (WGs). The mechanism and rules for doing this are discussed in ISO/IEC Directives, Part 1 (pp. 20 and 21), and are set out immediately below.

### *Establishing a liaison*

The specific requirements to establish a liaison are as follows:

- liaison with a third entity needs to be agreed on a case-by-case basis with each TC, SC or WG
- in the case of a TC or SC, liaison is established with a named organization
- in the case of liaison with a WG, a named individual needs to be identified.

The text below is taken from ISO/IEC Directives, Part 1, section 1.17.1 General requirements applicable to all categories of liaisons:

- in order to be effective, liaison shall operate in both directions, with suitable reciprocal arrangements
- the desirability of liaison shall be taken into account at an early stage of the work
- the liaison organization shall accept the policy based on the ISO/IEC Directives concerning copyright (see section 2.13 of ISO/IEC Directives, Part 1), whether owned by the liaison organization or by other parties. The statement on copyright policy will be provided to the liaison organization with an invitation to make an explicit statement as to its acceptability. The cooperating organization is not entitled to make any charges for documents submitted
- a liaison organization shall agree to ISO/IEC procedures, including intellectual property rights (IPR) (see section 2.13 of ISO/IEC Directives, Part 1)
- liaison organizations shall accept the requirements of section 2.14 of ISO/IEC Directives, Part 1, on patent rights
- technical committees and subcommittees shall review all their liaison arrangements on a regular basis, at least every 2 years, or at every committee meeting.

The text below is taken from ISO/IEC Directives, Part 1, section 1.17.2 Liaisons at the technical committee/subcommittee level:

- Section 1.17.2.1 Category A and B liaison. The categories of liaison are the following:
    - Category A: Organizations that make an effective contribution to the work of the technical committee or subcommittee for questions dealt with by this technical committee or subcommittee. Such organizations are given access to all relevant documentation and are invited to meetings. They may nominate experts to participate in a WG (see section 1.12.1 of ISO/IEC Directives, Part 1)
    - Category B: Organizations that have indicated a wish to be kept informed of the work of the technical committee or subcommittee. Such organizations are given access to reports on the work of a technical committee or subcommittee
    - Category C liaison is reserved for ISO/IEC JTC 1
- Section 1.17.2.2 Acceptance criteria:
    - the liaison organizations shall be international or broadly based regional organizations working, or interested in, similar or related fields
    - technical committees and subcommittees shall seek the full and, if possible, formal backing of the organizations having liaison status for each document in which the latter is interested
- Section 1.17.2.3 Establishment of liaisons:
    - liaisons are established by the Chief Executive Officer in consultation with the secretariat of the technical committee or subcommittee concerned. They are centrally recorded and reported to the technical management board (for the ISO or SMB for the IEC)

The text below is taken from ISO/IEC Directives, Part 1, section 1.17.3 Liaisons at the working group level:

- Section 1.17.3.1 Category D liaison. The category of liaison is as follows:
    - Category D: Organizations that make a technical contribution to and participate actively in the work of a working group.
- Section 1.17.3.2 Acceptance criteria:
    - liaison organizations can include manufacturer associations, commercial associations, industrial consortia, user groups and professional and scientific societies

  - liaison organizations shall be multinational (in their objectives and standards development activities) with individual, company or country membership and may be permanent or transient in nature
  - a liaison organization shall be willing to make a contribution to the ISO or the IEC as appropriate
  - a liaison organization shall have a sufficient degree of representativity within its defined area of competence within a sector or subsector of the relevant technical or industrial field.

Liaisons other aspects:

- Section 1.17.3.3 Management of liaisons
  - Category D liaisons shall be submitted for approval to the technical management board (or SMB) by the committee secretary, with a clear indication of the WG/PT/MT concerned. The submission shall include a rationale for the setting-up of the liaison, as well as an indication of how the organization meets the acceptance criteria given in section 1.17.3.2. The committee secretary is responsible for administering D-liaisons
- Section 1.17.3.4 Rights and obligations
  - Category D liaison organizations have the right to participate as full members in a working group (see section 1.12.1 of ISO/IEC Directives, Part 1)
  - Category D liaison experts act as the official representative of the organization by which they are appointed.

*How common is liaison status?*

Many other organizations have liaison status with the IEC. For example, in the case of TC100 the following liaison arrangements exist:

- Liaison A (whole TC or SC with participation):
  - CIE (International Commission on Illumination), EACEM (European Association of Consumer Electronics Manufacturers), EBU (European Broadcasting Union), EC (European Commission), ECMA (European Computer Manufacturers Association), ICC (International Color Consortium), ITU (International Telecommunication Union), ITU-R (International Telecommunication Union — Radiocommunications Bureau), ITU-T (International Telecommunication Union — Telecommunication Standardization Bureau)
- Liaison B (whole TC or SC without participation):
  - EBU (European Broadcasting Union)
- Liaison D (on a WG-by-WG basis, with participation):
  - DVD Forum, AES (Audio Engineering Society), EBU/TC100 (European Blind Union), EICTA-TRPG (Digital Europe Technical and Regulatory Policy Group), SMPTE (Society of Motion Picture and Television Engineers), VESA (Video Electronics Standards Association).

## 6.3 Discussions with the ISO

Discussions with the ISO Secretariat were very consistent with those with the IEC in that the Secretariat welcomed closer cooperation with the CoP and with energy efficiency regulators in general, and proposed that the establishment of formal liaison status with the appropriate parts of the organization would be the most productive means to pursue this. The liaison mechanisms used by the ISO are the same as those used by the IEC and are set out in their joint statutes in ISO/IEC Directives, Part 1, pp. 20 and 21, as discussed above. The ISO Secretariat also discussed the criteria that prospective liaison organizations would usually need to satisfy in order to be invited to establish liaison status with the ISO, as follows:

- be not-for-profit
- ideally be a legal entity somewhere (although this may not necessarily be binding)
- be open to members worldwide or over a broad region
- have activities and membership demonstrating that the organization has the competence to contribute to the development of International Standards or the authority to promote their implementation.

# 7. Recommended actions

Given the stated goals of the CoP and the productive nature of the discussions with the IEC and the ISO, the project team proposes the following recommendations.

## 7.1 Initiate contact with senior IEC and ISO committees

Both the IEC and the ISO Secretariats have welcomed the CoP initiative and the instigation of closer cooperation with their respective organizations. Both have also indicated that cooperation would best be served by cooperation on matters of principle at higher levels of their organizations and that this would also help facilitate cooperation with specific standardization committees.

Given this, it is recommended that the CoP should aim to establish cooperation at the higher level with the IEC and the ISO by:

- submitting a letter to the governing councils of the IEC and the ISO to introduce the CoP, setting out its goals and characteristics (description of membership, activity, etc.) and requesting that cooperation be established with each of these entities. It is recommended that the CoP work with the Secretariats to determine how such a letter would best be submitted to each organization, including optimal wording to be used and timing
- working with the Secretariats to help secure SMB and TMB support for the establishment of liaison status with all relevant TCs, SCs and WGs
- developing a set of guiding principles for product energy efficiency standardization in the form of an advisory document that would be submitted into IEC and ISO structures at the SMB and TMB levels, respectively, with the intention that these committees would issue guidance to all their TCs and SCs to abide by these principles whenever they develop or adapt product energy efficiency test standards.

To facilitate this cooperation it is also recommended that the CoP aims to deliver a presentation on its function, goals and aspirations regarding greater cooperation with the IEC and the ISO at the most appropriate future meetings of these organizations.

## 7.2 Establish appropriate internal working mechanisms and governance procedures

For liaison status to be both granted and function properly, the CoP will need to satisfy IEC/ISO requirements for a liaison organization and be able to take appropriate action to establish and follow up liaison activities at the TC/SC or WG level. This requires the development and adoption of a minimum level of governance structures, to address:

- mission and general guiding principles of the CoP
- how the CoP should represent itself to third parties
- the identification or formation of PSWGs
- procedures to be followed when entering into liaison status with international standards organizations
- procedures to be followed once liaison status has been established with international standards organizations
- burden-sharing mechanisms between the CoP’s constituent parts to agree the division of labor, nature of resources to be committed, etc.

Some of these actions have been addressed in part already; however, work remains to be done for each of them if the CoP is to be able to engage effectively with international standards bodies.

## 7.3 Establish product-specific working groups (PSWGs)

At a practical level it will be necessary to establish product-specific working groups for all the products the CoP wishes to work on. It is recommended that the CoP makes a documented decision regarding which PSWGs it wishes to establish and that it then agrees the set of measures necessary to establish and operate these.

## 7.4 Establish liaison status with relevant IEC and ISO committees

Following the advice supplied by the IEC/ISO Secretariats, it is recommended that the CoP should set about establishing liaison status with specific TCs and SCs. Establishing such liaisons need not wait for all the other recommended actions to be completed first and can be initiated as soon as the CoP has agreed its own internal procedures and mechanisms for external engagement and has established a dedicated liaison officer who would act as the point of contact with each TC or SC in question. Once liaison status has been requested, however, the CoP will need to be able to respond to enquiries from the two liaison officers, i.e. the CoP's liaison officer and the counterpart within the TC or SC in question.

Before attempting to initiate liaison status, the CoP also needs to agree with which TCs, SCs or even WGs it may wish to establish liaisons and what type of liaison it would seek (A, B or D). Discussions thus far have indicated that the most relevant TCs are:

- SSL (4E/SEAD) → IEC TC34
- Televisions / Home Entertainment (SEAD) →IEC TC100
- Network Standby (4E/SEAD/IEA) → IEC TC100? [1]
- Distribution Transformers (SEAD) →IEC TC14
- Motor Systems (Fans, etc.) (4E) →IEC TC2
- Commercial Refrigeration (SEAD) → ISO TC86 SC7
- Residential Refrigeration (4E/SEAD) → IEC TC59
- Air Conditioners (SEAD) → ISO TC86 SC6.

Of these, it is recommended that the CoP begins with IEC TC59 (household and electrical appliances) and IEC TC100 (Audio, video and multimedia systems and equipment) as these entities have shown a willingness to establish liaison status with third organizations and the CoP is well placed to engage with them at a technical level. However, it should be noted that the groups of most interest are at the SC and WG levels within these TCs, e.g. SC59M for household refrigeration.

## 7.5 Recommended sequence of actions

Potential next steps, for the CoP:

- make introduction/seek recognition by SMB with the aim of achieving high-level endorsement
- aim to produce 1 or 2 pages summarizing the CoP's activities and the objectives of greater engagement
- simultaneously seek to gain liaison status with selected TC/SC/WGs
- produce a brochure aimed at TCs listing ways the IEC and CoP plan to work together (repeat exercise for ISO)
- work on product energy efficiency standardization guidelines document
- develop longer term plan to ensure sustainability.

# 8. How might the CoP be implemented?

Implementing these actions will require attribution of resources linked to an implementation schedule. To assist the CoP in thinking through the options a draft implementation plan has been developed and budgeted (expressed in terms of person days of effort).

The supposition behind this plan is that the CoP would like to fully engage with the IEC and ISO on the eight priority broad product groupings mentioned in section 7.4. Other assumptions are as follows:

- A secretariat (temporary or permanent) will be needed to support the operation and administration of the CoP
- The CoP will establish Product Specific Working Groups (PSWGs) or designate an existing SEAD or 4E group to be the PSWG for a particular product area for each product listed in section 7.4
- The PSWGs will comprise at least one Principal Expert and at least three Review Experts
- The role of the Principal Expert is to participate in all the relevant IEC or ISO meetings concerning energy efficiency standardisation for the product group they are responsible for, to report the discussions to the PSWG, to assist in drafting and reviewing standards and to convey the interests of the PSWG into the IEC or ISO standardisation processes.
- The role of the Review Experts is to review the IEC or ISO documents, prepare a common position with other PSWG members, provide relevant input to the Principal Expert to be conveyed into the IEC/ISO standardisation process and to review the standardisation work developed by the Principal Expert
- Both the Principal and Review Experts will liaise with the CoP Secretariat and report on the activity of their PSWG to the CoP. Both types of experts will thus be responsible for developing a plan of work for the PSWG, seeking approval from the CoP and implementing the approved plan
- The large majority of the CoP's engagement effort and resources will be focused at the product-specific level rather than the higher level (e.g. Secretariats, SMB, TMB, Ad hoc Advisory Groups, etc.) and that any liaison activity at the higher level will be to facilitate liaison at the product-specific level and to have general issues of principal agreed (e.g. broad adoption of guidelines on product energy efficiency standardisation).
- While there are likely to be significant in-kind contributions to the PSWG efforts from existing activity already funded in SEAD, IEA4E and at the individual government level these are not reflected (i.e. deducted) from the person-day budgeting presented below. Rather it is assumed that implementation of this plan would involve discussions and agreement on how to attribute in-kind and wholly new resources in order to meet the need among the CoP members. This activity is afforded its own timeline within the project schedule and is assumed to be quite intensive in the early months, and hence one of the reasons regular monthly CoP meetings are proposed and also why the estimated drain on Secretariat time is relatively high early in the process.

## 8.1 Summary of relevant IEC and ISO committees

It is evident that the most appropriate form of engagement of the CoP and PSWGs with IEC and ISO will be contingent on:

- the standardization activity that the CoP wishes to undertake
- the existing work plans of the relevant IEC/ISO committees, working groups, project teams or maintenance teams
- the receptiveness of the product specific IEC/ISO counterparts to engagement with the CoP

To help to understand this, the associated level of effort and the likelihood of success, Table 3 sets out a summary of the relevant IEC and ISO Technical Committees (TCs), their subcommittees (when applicable), working groups/project teams/maintenance teams (when applicable), their existing energy efficiency standardisation program of work, their expected receptiveness to working with the CoP (based on past experience and insights from IEC or ISO insiders), the expected degree of priority for the CoP (the consultants provisional opinion) to address a specific standardisation effort, and the lead organisation from within the CoP for the given product group.

**Table 3. IEC/ISO committees and standards addressing products of interest to the CoP**

| Product type (no. of subproducts) | CoP PWG lead organisation | IEC/ISO TC | Expected receptivity to cooperation | SC and title | WG/PT/MT and title | Standards under development | Priority of Standard to CoP |
|---|---|---|---|---|---|---|---|
| **SSL** (3 main groups) | SEAD/4E | IEC TC 34 | Low | | | | |
| Lamps | | | | SC 34A: Lamps | PT 62663: Non-ballasted single capped LED lamps for general lighting | IEC 62663-2 Ed. 1.0. Non-ballasted LED lamps for general lighting – Part 2: Performance requirements | High |
| | | | | | PT 62861: Principal component reliability testing for LED-based products | IEC/TS 62861 Ed. 1.0 - Principal component reliability testing for LED-based products | Unknown |
| | | | | | WG PRESCO: Maintenance of International Standards regarding specifications for lamps and glow starters issued by SC 34A | IEC 62717 Ed. 1. LED modules for general lighting – Performance requirements | High |
| | | | | | None | PNW 34A-1665 Ed. 1.0. Organic light emitting diode (OLED) panels for general lighting – Performance requirements | Unknown |
| Control gear | | | | SC 34C: Auxiliaries for lamps | WG COMEX | IEC 62442-3 Ed. 1.0. Energy performance of lamp control gear – Part 3: Control gear for halogen lamps and LED modules – Method of measurement to determine the efficiency of the control gear | Unknown |
| Luminaires | | | | SC 34D: Luminaires | PT 62722: LED luminaire performance | IEC 62722-2-1 Ed. 1.0. Luminaire performance – Part 2-1: Particular requirements for LED luminaires | High |
| **Distribution transformers** (2 main groups) | SEAD | IEC TC 14 | Unknown | | | | |
| Distribution transformers | | | | | PT 60076-20: Energy efficiency | IEC 60076-20 Ed. 1.0. Power transformers – Part 20: Energy efficiency for transformers 36kV and below | High |
| Power transformers | | | | | PT 60076-20-2: Energy efficiency for transformers above 36 kV | IEC 60076-20-2 Ed. 1.0. Power transformers – Part 20: Energy efficiency for transformers of above 36kV | High |

*(continues over)*

*(Table 3 continued)*

| Product type (no. of subproducts) | CoP PWG lead organisation | IEC/ISO TC | Expected receptivity to cooperation | SC and title | WG/PT/MT and title | Standards under development | Priority of Standard to CoP |
|---|---|---|---|---|---|---|---|
| **Motor systems (fans, etc.)** (1 main product group with many variants) | 4E | IEC TC 2 | High | | WG 31: Efficiency classes | IEC 60034-30-1 Ed. 1.0. Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE-code) | High |
| | | | | | | IEC 60034-30-2 Ed. 1.0. Rotating electrical machines – Part 30-2: Efficiency classes of variable speed AC motors (IE-code) | High |
| | | | | | WG 12: Rating and performance | IEC 60034-1 Ed. 13.0. Rotating electrical machines – Part 1: Rating and performance | High |
| | | | | | WG 28: Performance as determined by tests | IEC 60034-2-1 Ed. 2.0. Rotating electrical machines – Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles) | High |
| | | | | | JWG 14: Energy efficiency in industrial automation (EEIA) managed by TC 65 | | |
| **Commercial refrigeration** (≥5) | SEAD | ISO TC 86 | Probably high | | | | |
| Retail display cabinets | | | | SC 7: Testing and rating of commercial refrigerated display cabinets | | ISO/NP 23953-1. Refrigerated display cabinets – Part 1: Vocabulary | High |
| | | | | | | ISO/DIS 23953-2. Refrigerated display cabinets – Part 2: Classification, requirements and test conditions | High |
| Beverage coolers | | | | ? SC 7: Testing and rating of commercial refrigerated display cabinets ? | | | Unknown |
| Professional refrigeration equipment | | | | SC 3: Testing and rating of factory-made refrigeration systems (excluding systems covered by ISO/TC 86/ SC 5, SC 6 and SC 7) | | Nothing under development and no current international standards for professional refrigeration equipment | High? |
| Vending machines | | | | SC 3: Testing and rating of factory-made refrigeration systems (excluding systems covered by ISO/TC 86/ SC 5, SC 6 and SC 7) | | Nothing under development and no current international standards for vending machines | High? |

*(continues over)*

*(Table 3 continued)*

| Product type (no. of subproducts) | CoP PWG lead organisation | IEC/ISO TC | Expected receptivity to cooperation | SC and title | WG/PT/MT and title | Standards under development | Priority of Standard to CoP |
|---|---|---|---|---|---|---|---|
| Ice cream makers | | | | SC 3: Testing and rating of factory-made refrigeration systems (excluding systems covered by ISO/TC 86/ SC 5, SC 6 and SC 7) | | Nothing under development and no current international standards for ice cream makers | Unknown |
| Cold stores | | | | ? SC 3: Testing and rating of factory-made refrigeration systems (excluding systems covered by ISO/TC 86/ SC 5, SC 6 and SC 7) ? | | Nothing under development and no current international standards for cold stores | Unknown |
| **Residential refrigeration** (1 product group with many variants) | SEAD/4E | IEC TC 59 | High | SC 59M: Performance of electrical household and similar cooling and freezing appliances | | IEC 62552-1 Ed. 1.0. Household refrigerating appliances – characteristics and test methods – Part 1: General requirements<br>IEC 62552-2 Ed. 1.0. Household refrigerating appliances – Characteristics and test methods – Part 2 – Performance requirements<br>IEC 62552-3 Ed. 1.0. Household refrigerating appliances – Characteristics and test methods – Part 3: Energy consumption and volume<br>IEC/TS 62833 Ed. 1.0. Test report format for the refrigerator performance, standard IEC 62552 2nd edition | High |
| **Air conditioners** (≥6) | SEAD | ISO TC 86 | Probably high | SC 6: Testing and rating of air-conditioners and heat pumps | WG 1: Air-source air-conditioners and heat pumps | ISO/WD 5151. Non-ducted air conditioners and heat pumps – Testing and rating for performance<br>ISO/WD 13253. Ducted air-conditioners and air-to-air heat pumps – Testing and rating for performance<br>ISO/WD 15042. Multiple split-system air-conditioners and air-to-air heat pumps – Testing and rating for performance<br>ISO/DIS 16494. Heat recovery ventilators and energy recovery ventilators – Method of test for performance<br>ISO/AWI 18326. Single-duct portable air conditioners and heat pumps – Testing and rating for performance | High<br>High<br>High<br>Unknown<br>Unknown |
| | | | | | WG 11: Water chilling packages using the vapour compression cycle | ISO/DIS 16345. Water-cooling towers – Testing and rating of thermal performance | Unknown |

*(continues over)*

*(Table 3 continued)*

| Product type (no. of subproducts) | CoP PWG lead organisation | IEC/ISO TC | Expected receptivity to cooperation | SC and title | WG/PT/MT and title | Standards under development | Priority of Standard to CoP |
|---|---|---|---|---|---|---|---|
| **Televisions/Home entertainment** (1 product group with many variants) | SEAD | IEC TC 100 | High | | | | |
| TVs | | | | | MT 62087 | IEC 62087-1 Ed. 1.0. Methods of measurement for the power consumption of audio, video and related equipment – Part 1: General (TA12) | High |
| | | | | | | IEC 62087-2 Ed. 1.0. Methods of measurement for the power consumption of audio, video and related equipment – Part 2: Media (TA12) | High |
| | | | | | | IEC 62087-3 Ed. 1.0. Methods of measurement for the power consumption of audio, video and related equipment – Part 3: Television Sets (TA12) | High |
| | | | | | None | IEC 62087-4 Ed. 1.0. Methods of measurement for the power consumption of audio, video and related equipment Part 4: Video Recording Equipment (TA12) | Unknown |
| | | | | | None | IEC 62087-5 Ed. 1.0. Methods of measurement for the power consumption of audio, video and related equipment – Part 5: Set top boxes (TA12) | Unknown |
| Smart TVs | | | | | PT 100-6: Smart television (TA1) | PWI 100-6 Ed. 1.0. Smart television | Unknown |
| **Network standby** (many) | SEAD/4E | IEC TC 100 | Unknown | | Unknown | | High |

*Abbreviations:* CoP = Community of Practice; IEC = International Electrotechnical Commission; ISO = International Organization for Standardization; JW G = Joint Working Group; MT =Maintenance Team ; PT = Project Team; PWG = Product Working Group; SC = Subcommittee; SEAD = ; SSL = solid state lighting; TC = Technical Committee; WG = Working Group.

**Table 4. Summary of IEC/ISO committees and standards addressing products of interest to the CoP: number of standards and estimate of required person-days for full CoP engagement**

| | No. of relevant SCs/WGs/PTs | No. of relevant product groups | Expected no. of working committees needed to cover broad product areas of interest | Expected no. of standards processes to address | Estimated person-days/year | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Principal experts | Review experts | Secretariat | Total effort (person-days) |
| Residential refrigeration | 1 | 1 | 1 | 1 | 31.5 | 39 | 13 | 83.5 |
| TVs | 1 or 2 | 1+ | 2 | 2 | 31.5 | 39 | 13 | 83.5 |
| Motor systems (fans, etc.) | 3–4 | 1 main group | 3 | 2 | 31.5 | 39 | 13 | 83.5 |
| Distribution transformers | 1 | 2 | 1 | 2 | 31.5 | 39 | 13 | 83.5 |
| Network standby | 1? | Many | 1 | 1 | 31.5 | 39 | 13 | 83.5 |
| Air conditioners | 2 | 3+ | 2 | 3 | 31.5 | 39 | 13 | 83.5 |
| Commercial refrigeration | 2 | 3? | 2 | 2 | 31.5 | 39 | 13 | 83.5 |
| SSL | 3–5 | 3 | 3 | 3 | 31.5 | 39 | 13 | 83.5 |
| Totals | | | | | 252 | 312 | 104 | 668 |
| CoP Secretariat higher-level function | | | | | | | | 30 |
| Total for all activities | | | | | | | | 698 |

*Abbreviations:* CoP = Community of Practice; PT = Project Team; SC = Subcommittee; SSL = solid state lighting; WG = Working Group.

**Table 5. Expected breakdown of effort needed per PSWG to actively engage with the IEC/ISO committees and standards processes**

| Task | No. days per year by expert category | | |
|---|---|---|---|
| | Principal expert | Other expert | Secretariat |
| Attending and preparing ISO/IEC meeting | 10 | | |
| CoP PWG liaison | 7 | 5 | 4 |
| Drafting standards | 3 | | |
| Drafting review material | 3 | 1.5 | |
| Wider liaison/promotion | 5 | 3 | 3 |
| Review | 3.5 | 3.5 | |
| Managing budgets and contracts | | | 6 |
| Total | 31.5 | 13 | 13 |
| Total annual effort per primary standard | 83.5 | | |
| Total annual effort per related standard | 42 | | |

**Table 6. Potential schedule of activities to implement full CoP engagement with IEC /ISO committees and standards addressing products of interest to the CoP**

| | Month | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| CoP meetings (no. of conf calls) | 1 | 1 | 1 | 1 | 1 | | | 1 | | | 1 | | | 1 |
| CoP designates a CoP secretariat (interim or final) | | | | | | | | | | | | | | |
| CoP form initial top priority PSWGs (three from the eight, all IEC) | | | | | | | | | | | | | | |
| CoP Secretariat makes initial contact with IEC Secretariat | | | | | | | | | | | | | | |
| CoP Secretariat makes initial contact with IEC SMB | | | | | | | | | | | | | | |
| CoP establishes fresh budget and in-kind contribution allocations | | | | | | | | | | | | | | |
| CoP establishes appropriate internal working mechanisms and governance procedures | | | | | | | | | | | | | | |
| Each PSWG nominates principal expert and three review experts | | | | | | | | | | | | | | |
| CoP secretariat requests liaison status with relevant TC/SC/WG | | | | | | | | | | | | | | |
| Top three priority PSWGs begin liaison with relevant TC/SC/WG | | | | | | | | | | | | | | |
| CoP reaches out to ISO Secretariat | | | | | | | | | | | | | | |
| CoP reaches out to ISO TMB | | | | | | | | | | | | | | |
| CoP form remaining top priority PSWGs (five from the eight, ISO/IEC) | | | | | | | | | | | | | | |
| Each new PWG nominates principal expert and three review experts | | | | | | | | | | | | | | |
| CoP secretariat requests liaison status with relevant TC/SC/WG | | | | | | | | | | | | | | |
| Remaining PSWGs begin liaison with relevant TC/SC/WG | | | | | | | | | | | | | | |
| Expected average person days per month (CoP secretariat) | 3 | 5 | 5 | 5 | 6 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| Expected average person days per month (PWGs) | | | | | 7 | 19 | 32 | 56 | 56 | 56 | 56 | 56 | 56 | 56 |

## 8.2 A provisional estimate of effort and timing

Table 4 summarizes the effort in person-days by actor that is estimated to be needed to fully implement the CoP's stated desire for engagement with the eight IEC and ISO product grouping standardization process. This projects that in total there would be a need for approximately 700 person days of activity per year were there to be fully active CoP engagement with 8 separate product group energy efficiency standardization activities. This effort is comprised of about 83.5 days of activity per active product group (see Table 5 for a breakdown) and an additional 30 days for general secretariat time to liaise with the CoP and to with the higher echelons of the IEC and ISO. It is worth noting that this estimate of overall activity effort is likely to be an upper estimate as it assumes that it is desirable and also possible to establish liaison status with the relevant committees/working groups for each of the eight product groups and that there will be active standards development engagement with each. In reality this is unlikely to be the case. For example, it is likely that at least one of the eight committees will not permit liaison status with the CoP. It is also thought likely that for some of the product areas the need for active standards development engagement may not be so high at present e.g. for refrigerators where the current working standard is at the FDIS (final voting for approval) stage and for electric motors where the work on efficiency classes is well advanced. In these cases the level of effort required may be significantly less, thus in practice it might be that there are 7 active liaison groups of which only 4 are in full standards development mode, making a total annual effort of about 450 person days per year for a broad based engagement.

In assessing the scale of person-day budget it is important to appreciate the following points:

- The new resources needed will be less than indicated by the degree to which the activities identified can already be covered through in-kind contributions
- The scale of effort could be further reduced by either: a) engaging with less standards processes (and with less product groups), or b) by having a less intensive engagement. This latter option could entail, less review time by Review Experts in the PSWGs, or less active engagement by the Principal Experts with the IEC/ISO standards committees. In the former case the downside would be less scrutiny by CoP representatives and hence a reduced chance of a common position being articulated and adopted and in the latter case the downside would be less active engagement in drafting the IEC/ISO standards; however, a full spectrum of possibilities of engagement exist between the fuller level of engagement articulated here and no engagement at all. For example, for less urgent product groups it could suffice to request liaison status so as to have access to the working documents and simply agree to send a CoP representative to the working group meetings. Doing this could cut the required number of person days from the average level of about 83.5 person-days per active product standard per year to about 10 (to simply observe at meetings and report to the CoP).

Note too that a typical standardization effort would involve attending an average of about 1.5 in person IEC/ISO working group meetings per year. The locations of these meetings will tend to rotate between Europe, North America and Asia and will therefore require something akin to 2 to 3 days in meetings per trip and 2 days travel. A travel budget of the order of $4000 per standard per year would therefore be needed for one CoP representative to attend two to three meetings around the world.

There is also likely to be a need for a modest travel budget for the CoP secretariat or another CoP nominee to attend an average of one IEC or ISO senior committee meeting per year (e.g. to present the CoP to the AGM or the SMB etc.).

Table 6 indicates a tentative schedule of activities that it is imagined would be needed to implement full CoP engagement with IEC/ISO across the eight product groups. Table 7 indicates a provisional estimate of the likely level of priority that will be needed for each product group and a qualitative assessment of the level of effort needed; however, the rationale behind these rankings is somewhat subjective and it would be advisable to confer with the relevant SEAD and IEA-4E working groups to clarify the expected level of engagement and scale of activity needed to ensure product energy efficiency regulator needs are properly reflected within the International Standards processes concerned.

**Table 7. Likely priority and level of CoP/Regulator engagement effort needed by product group**

| Product group | Priority | Reason | Level of effort needed |
|---|---|---|---|
| SSL | High | Ongoing alignment work needed in many areas and continuing rapid technology change requires ongoing maintenance | High –multiple product areas |
| Distribution transformers | Medium | North American test procedures are unaligned with IEC | Moderate |
| Motor systems (fans, etc.) | Medium | Despite harmonization being achieved for the most common motor types more work is needed in the small/large and specialised motors domains as well as for motor systems | Moderate |
| Commercial refrigeration | High | Unaligned test procedures between North America and elsewhere for RDC, no international test procedure for vending machines, ice cream makers or cold stores | High – multiple product areas |
| Residential refrigeration | Medium | While new IEC test procedure is at FDIS level and is poised to be adopted there will be work needed to translate this into local specifications that are currently based on the older, single test condition, test procedure and to agree how the common benchmark points | Modest |
| Air conditioners | Medium | While the new IEC test procedure is poised to be adopted there will be significant work needed to translate this into local specifications and agree the common benchmark points | Moderate |
| Televisions | Medium | Additional alignment work is needed and continuing rapid technology change requires ongoing maintenance | Moderate |

# Appendix A. International harmonization case studies

## A.1 Electric Motors

*Product description*

Three phase electric motors, typically in the range 0.75 kW to 150 kW (smaller and larger products are also covered in some jurisdictions). Typically only AC induction motors are covered (mostly three phase, sometimes single phase).

*Test Method and Background*

There are a range of test methods that can be used for electric motors. The most commonly used approach for small to medium sized motors is the so called sum of losses approach, where estimates of the losses associated with each of the key components of motor operation are separately measured and added to determine overall efficiency (by deduction where efficiency = 1 minus the sum of the losses). These losses are determined from test measurements and associated calculations. They are broken-down into stator losses and rotor losses and comprise elements such as friction and windage losses, core losses and so on. There is also an element called additional losses (or so called "stray" losses) which are losses that cannot be attributed to any of the other elements.

Prior to 2000 there were effectively three main test methods for electric motors in use around the World. These were:

- IEC60034-2A Rotating electrical machines - Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests
- NEMA MG 1-1987, Motors and Generators, Revision No. 2
- ANSI/IEEE 112-1984, Test Procedure for Polyphase Induction Motors and Generators (Method B)
- JIS C4210 Low voltage three phase squirrel cage motors for general purpose

The ANSEE/IEEE and NEMA methods are equivalent and either were considered to be generally acceptable for use in North America. While much of the content of these three main test methods was similar, there were some key differences. The most important difference between the test methods was with respect to the treatment of additional or "stray" losses: under IEEE and NEMA these are determined directly by measurement, under IEC they are assumed to be a constant 0.5% of input power for all motor sizes while under JIS these losses are ignored (i.e. assumed to be 0%). There are also some other differences such as assumed winding temperatures for the calculation of resistance based losses.

With a good deal of international collaboration, IEC decided to revise IEC60034-2 to bring it into line with the approach being used in North America, which was generally regarded as a technically superior test method but somewhat more expensive to use as accurate torque measurements, especially for larger motors, are expensive. Torque measurements are required in order to directly quantify additional losses for a particular motor under test. The revised IEC test procedure was published in 2007 after about 10 years of work in the IEC arena.

Initially the IEC committee proposed as a compromise option in the test method the use of assigned additional losses – this was based on a range of research that established typical additional losses by motor size, type and configuration (number of poles). The proponents of this approach argued that this reduced testing costs by eliminating the need to undertake torque measurements and was more realistic than previous approaches as the assigned additional losses were based on a range of actual measurements (in fact smaller motors were found on average to have substantially higher additional losses). However, the actual additional losses varied appreciably at an individual motor level, so assigning losses may have allowed poorly designed motors to claim an efficiency that was higher than was actually the case and did not reward well designed motors with low additional losses. While this approach is still an option, it is generally regarded as an inferior approach to testing and measurement of motor efficiency.

*Efficiency Metric*

The efficiency metric for electric motors is straightforward and is expressed as the ratio of mechanical output power over the electric input power at a defined point of operation. Typically motor efficiency is determined at a number of defined points (e.g. 25%, 50%, 75%, 100%, 125% of the rated capacity). The change of efficiency with load is an important parameter to consider for applications with variable loading requirements, so consideration of the efficiency curve as a function of load is considered to be the best overall metric and this is widely used. Even motors that have constant loading rarely work exactly at rated capacity, so having data across a range of outputs is important.

Many of the earlier test methods only determined the motor efficiency at rated capacity (or perhaps 75% and 100%). This gives insufficient information to determine the service efficiency for many situations as variable load output during operation is common. Motors that have higher efficiency at rated capacity also tend to have much better operating efficiency at part load (due to reduced losses across the board), although this does vary for individual motors. So the new approach for the determination of efficiency across a range of loading points is superior in terms of providing users with information for optimising product selection and it also gives great flexibility of approach for regulatory purposes.

It is important to note for this product, the energy service being provided (motor shaft power) is fairly simple to define and therefore the efficiency metric is also simple to define.

*Efficiency Thresholds*

The energy efficiency of electric motors has been regulated in North America since 1997. Europe operated a voluntary efficiency program from the late 1990’s onwards. A number of other countries also had a mixture of mandatory or voluntary efficiency levels (e.g. China and Australia).

While the precise efficiency levels were slightly different between these major programs, there was some broad equivalence of efficiency requirements across the different programs (once test method differences were taken into account). So it was possible to develop some harmonised efficiency thresholds as an adjunct to the new IEC test method that broadly satisfied current and future program requirements for these major regions. These new thresholds are fairly new and are yet to find their way into regional regulatory requirements to any great extent. But their presence provides a simple and straightforward pathway to introduce or upgrade efficiency standards and high efficiency levels at an appropriate level on a timetable that suits local requirements. Given the differences in nominal supply voltage (and therefore current) and frequency in different regions, it is important to take these into account when developing global efficiency metrics and thresholds.

*Harmonisation process and government engagement*

Even though the IEC test method for electric motors had been in existence for a long time and was in fairly extensive use internationally, there was a difference in the regional test methods in use in North America and Japan. A number of academics and analysts in the 1990s started to point out these differences and illustrated the weaknesses in the IEC and JIS test methods (and the superiority of the NEMA/IEEE methods in North America). This lead to a groundswell of international opinion that the IEC test method needed to be improved and essentially aligned with the North American approach in order to be more accurate and relevant.

Concrete action towards the harmonisation of electric motor test procedures had its origins in a private initiative SEEEM (Standards for Energy Efficiency of Electric Motor Systems) instigated by a group of interested consultants that originally came together through the Energy Efficiency in Motors and Drives (EEMODs) conference organised by the European Commission and supported by certain governments (Switzerland, Australia and UK amongst others). The SEEEM initiative was initiated in the early 2000s and helped convene a process that brought together international industry, government and experts into a common platform that aimed to harmonize motor energy efficiency standardization and agree globally accepted test procedures, informative efficiency thresholds and eventually MEPS and labelling regulations set in alignment to these thresholds. It entailed extensive meetings, workshops, conferences, analysis and broad facilitation to achieve and hence was a relatively lengthy and costly process. Nonetheless these steps were necessary to bring key stakeholders into a common dialogue, where they could develop and support a common vision of what needed to be done while establishing the level of trust needed to overcome the difficulties. With the advent of the IEA 4E Implementing Agreement, the SEEEM initiative was co-opted into in 2009 this as one of its annexes (the Electric Motor Systems Annex, EMSA http://www.motorsystems.org) and thus continues to do useful work to advance motor efficiency standardisation – most recently addressing needs of small and more exotic motor types.

In the IEC committees, there was some limited direct engagement by government officials, mainly through anointed technical consultants that participated in committee work. There is a significant input from specialised test laboratories into these committees. As with all IEC development work, the timeframes for the generation of this new test method took many years (even though the basic parameters were already in existence) and such long term resourcing can be an issue. These IEC committees were dominated by industry representatives, but many were sympathetic to the efficiency agenda in general (if not the specific agenda of particular governments).

This product was unusual as surrounding the IEC work there was a framework of consultants and academics that were also pursuing a broader efficiency agenda, either on behalf of governments or as part of a more altruistic objective. Regular conferences such as EEMODs (Energy Efficiency in Motor Driven Systems, supported by the European Commission) and work by SEEEM and more recently the IEA 4E Implementing Agreement Annex on Electric Motor Systems Annex have provided strong impetus for this work. Support for efficiency from industry groups such as the International Copper Association[14] has also provided resources for some of the development work.

*Current Status and Discussion*

While this is a successful example of a product where global alignment has been achieved for test methods, efficiency metrics and efficiency thresholds, it was a very slow and resource intensive process (10 years). There was general agreement that an existing test method (US IEEE) was technically superior and it was therefore possible to move to a harmonised global approach regarding the test method within IEC without too much controversy (although there was some disagreement within Europe on some details as noted above). Fortunately the existing efficiency metric and thresholds were already similar, so it was possible to develop uniform requirements under the new test method. There are still some issues with respect to frame sizes (these are generally smaller in Europe, which can make it difficult to attain the highest efficiency levels due to the impact of size constraints on the amount of high conductivity material that can be used).

It appears that the test method and the metric for determination of efficiency is well settled and there is strong consensus on the use of the approaches internationally. The efficiency metric for motors appears to be well accepted. It remains to be seen how extensively the current and future efficiency threshold levels developed within the IEC process will be adopted by governments and other bodies as part of the program measures for motors. But the framework has been developed and is there for use by all interested parties into the future.

## A.2 Air Conditioners

*Product description*

A large number of products fall into the category of air conditioners. For the purposes of this discussion the scope is limited to air-to-air heat pumps and air conditioners (broadly within the scope of ISO5151 and ISO13253), which cover non-ducted and ducted systems respectively and typically include products with outputs up to 50kW (or sometimes up to 100kW). Excluded from this discussion are water sourced heat pumps and chillers (typically used to circulate chilled water for cooling in large commercial buildings and with a rated output of 200kW or more).

*Test Method and Background*

The main test methods in use for air conditioners are ISO5151 and ISO13253. These standards have common test conditions for rating and performance but separately cover non-ducted and ducted systems respectively. While there are three standard rating conditions for efficiency specified for heating as well as cooling (in terms of indoor and outdoor conditions), the conditions known as H1 for heating and T1 for cooling are used almost universally around the world. There are additional conditions such as T2 (hot climates) and T3 mild climates for cooling and H2 (colder climates) and H3 (very cold climates) for heating, but apart from H2, these are not

[14] More efficient motors generally use more copper in their windings, so this support has some elements of self-interest.

widely used. In practical terms, these ISO standards really only define an efficiency test at the rated capacity (although other outputs can be measured – clarity on this issue has been included in the most recent editions).

It is important to note that these standards also specify a range of performance tests that are used to assess their suitability for use in different operating conditions. These include tests such as maximum cooling performance, minimum cooling and freeze-up, condensate control and enclosure sweat test, maximum heating, minimum heating and defrosting tests. As a general rule these tests provide an assessment of operating performance in more extreme conditions and energy consumption and energy efficiency is not usually assessed in these conditions. In effect they are used to make a judgement as to whether the product is fit for purpose in different operating environments. The remaining discussion in this section is focused on energy efficiency measurements at the standard conditions. But it is important to note that designing products to meet some of these performance tests may impact on the operating efficiency.

These ISO standards have enjoyed very widespread use around the world and almost all air conditioner programs use (or have used) these standard rating conditions for efficiency. However, despite its widespread use, there has been some regional variation from ISO conditions where seasonal ratings are required. Initially the move to seasonal type ratings (or variations from ISO conditions) were implemented because it was perceived that variations in climate and weather can substantially impact on air conditioner use and a seasonal approach, which can be tailored to the local conditions, is seen as more locally relevant (whether or not this is true in terms of comparative results is a separate discussion).

Up to the year 2000, most air conditioners had single speed compressors. The capacity output was modulated by cycling the compressor on and off. Under these conditions a single rating point at rated capacity provides a good estimate of the part load efficiency as well as operating efficiency under a range of normal use conditions (under milder weather conditions part load efficiency decreases slightly due to start losses but the operating EER increases slightly due to the decreased operating $\Delta T$). Since 2000, variable output air conditioners (most notably inverter driven units) have begun to dominate many markets. These types of units have a range of advantages, including increased efficiency at part load (which is common during normal use). The traditional single test at rated capacity (such as T1 and H1) provides little or no credit for the improved in-use performance of these products under a range of usage and weather conditions and therefore little comparative information on their efficiency under normal use. In contrast, seasonal rating systems usually do recognise the improved performance of these products under normal use. To this extent, the traditional test methods for air conditioners, including the ISO test procedure has not kept up with important technology changes. The use of local seasonal ratings is increasing (partly due to the prevalence of variable output systems) and international harmonization is decreasing from an historical base of a high degree of harmonization.

While there is still a good degree of harmonisation with respect to air conditioner test methods (in part due to the inertia embedded in the historical approaches), this is in danger of being fractured with the increasing use of seasonal ratings in many regions. Unfortunately, many of these regional approaches have technical differences, which make them unsuitable for use around the world; however, such approaches are valid as they recognise the improved performance of variable output products and are more likely to give energy efficiency rankings that reflect the real in situ use.

In response to these developments ISO has recognised the need for a global approach to the calculation of seasonal ratings and is working on a standardised calculation method to support this concept. If accepted, this could form the basis for a uniform approach (standardised rating tests and calculation methodology) while allowing different regions to customise the rating to take into account local climate and usage characteristics. This approach is currently embodied in the draft standard ISO16358, which is at the FDIS stage within ISO committee TC 86/SC6 – this was released for final vote on 15 January 2013 (voting closes in mid-March 2013) and it is expected that the standard should be published by mid-2013 if there is a positive vote. While there appears to be good consensus on the sub-committee that developed this approach, it may require some years before there is sufficient confidence in its veracity for more widespread use by regulators (given that there are already a number of established approaches to seasonal ratings). There are some interesting challenges for regulators in the area of verification and enforcement if regulatory requirements are specified in terms of a composite value like SEER that is based on multiple measured inputs. The development of ISO16358 would appear to be an opportunity that warrants close attention as a vehicle to maintain reasonable future harmonisation of air conditioner test methods.

*Efficiency Metric*

The standard efficiency metric for air conditioners has always been EER (energy efficiency ratio) for cooling and COP (coefficient of performance) for heating. In metric units, these are expressed in watts of cooling output power per watt of electrical input power. While efficiency of air conditioners is always expressed using this general approach, there is some variation in the units used in some regions. The most common deviation is BTU/h/W (British Thermal Units per hour per watt[15]) used in the USA and some other regions. Other units are sometimes used such as kJ/h/W (kilo Joules per hour per watt) (e.g. the Philippines). While it is fairly straight forward to convert between the different systems, some care is required when doing so.

When tests are only conducted at rated output under a defined test condition, a comparative measure of efficiency is fairly straight to calculate. As seasonal approaches become more commonplace, the prospects for agreement upon uniform global efficiency metrics are likely to worsen, as these necessarily have a range of different regional weightings for climate and usage.

However, a calculated seasonal efficiency metric usually relies on a set of standard rating points in order to characterise performance under a range of conditions. Certainly, under the ISO draft standard ISO16358, 2 specific test points are specified for each of the main system types in order to calculate a seasonal rating that utilises local climatic data using the approach specified in the standard (there is an option for more test points if desired). It may be possible to use the results from these specific test points as the basis for some more universal efficiency metric, but this requires further investigation and development. The ideal approach would be to report the ISO standard rating point data separately as part of a standardised international data fiche and possibly to provide a reference seasonal efficiency rating for a standardised international climate file (not intending to represent any particular climate, although it may be relevant to some regions). This data can then be used to calculate local SEER and provide some comparative reference to an international seasonal rating.

For this product, the energy service being provided (heating and cooling) is relatively straight forward to define and measure (W of output) and hence the efficiency metric itself is relatively simple (W of output per W of input). However, air conditioners are required to operate in a range of conditions and air conditioner test methods generally have a range of other performance tests that ensure reasonable performance in more extreme conditions (as set out in the previous section). There are a range of additional tests defined in the ISO standards that are used to some degree in some regions to provide a level of consumer protection. Some performance measures (such as latent cooling capacity and heating performance in very cold conditions) are necessary to ensure that products are fit for purpose in different climates. The ability (or not) to meet these additional performance requirements can have some impact on the measured efficiency under rating conditions, so this is an important consideration when undertaking international comparisons.

*Efficiency Thresholds*

If single tests at rated capacity under conditions H1 and T1 were widely used in the future, there is some chance that a global efficiency metric could be developed (in fact there are some clear patterns in the existing metrics in different regions). However, given the growing divergence of approaches with regard to seasonal rating systems for air conditioners, the chances of developing uniform efficiency metrics are becoming slimmer, given that the development of uniform metrics and associated efficiency thresholds is also likely to pose technical challenges. However, this may be not as bleak as it sounds if there can be consensus on the approach to calculating seasonal ratings as set out in ISO16358. Such an approach uses a limited number of standard test points combined with local regional weather data in order to calculate a local seasonal rating. So there could be uniformity of input test data and calculation approach, with the only exogenous variable being the local climate used to generate the seasonal aspects. This will ensure that seasonal ratings are, and are seen to be, locally relevant, which is critical for longer term alignment to any test procedure. While there would not be uniform thresholds as such, there could be groups of broad thresholds grouped by “severity of climate” categories (for example).

*Harmonisation process and government engagement*

The ISO test procedures have been established for a long time and in general terms these were used very widely around the world. While there were some regional variations, generally the ISO test conditions and approach were used very widely. A significant deviation from the ISO conditions occurred in the USA when

[15] 1 W/W is equivalent to 3.412 BTU/h/W

they introduced efficiency standards for central air conditioners based on a seasonal energy efficiency ratio (SEER) in the early 1990s (note that test conditions for room air conditioners in the USA were, and still are, based on ISO values). This seasonal rating was based on 4 test conditions (one of which was based on ISO T1), but there could be as many as 7 tests for some product types. For some time this was the only significant deviation from ISO.

Despite the US deviation on seasonal ratings, there was really no strong imperative to using a seasonal approach while the market was dominated by products with single speed compressors. Improvements in electronics and controls saw the market for variable output products grow quickly in the Japanese market from around 2000 (predominantly inverter driven single splits systems). By 2010 variable output products made up a substantial market share of product sales in many developed countries (for example, in Australia, inverter driven products make up over 80% of sales). This is impressive as there is a significant cost premium for these products and the current test methods generally do not recognise their improved efficiency during normal use (details are outlined in the previous section). Clearly other attributes are driving consumer choice (capacity, noise, flexibility of operation). So there is currently a strong driver from an industry perspective for a seasonal approach to ratings to give credit to the superior performance of these designs during normal use. Unless this is effectively addressed, this could result in a divergence of test methods. It is hoped that the forthcoming ISO16358 standard will be able to provide an internationally aligned approach to the development of seasonal rating for air conditioners.

The ISO sub-committees and working groups under TC86 undertake very detailed technical work and membership of these has traditionally been dominated by industry groups, predominantly air conditioner manufacturers. There is a significant input from specialised test laboratories into these committees. There has been some input from government funded technical consultants, but they are generally make up a small minority of the total technical input.

As there are a substantial number of standards covered by TC86 (23 published standards and 12 work items in progress as of February 2013) there is a continuous long term work load for this product area.

*Current Status and Discussion*

There is currently good international harmonisation with respect to air conditioner test methods. But this is slowly fracturing and it likely to degrade unless serious efforts are put into developing a harmonised global approach to developing seasonal ratings. The prospects for developing uniform efficiency metrics and efficiency thresholds are less likely as seasonal approaches become more prevalent. However, families of efficiency thresholds for standardised rating points may be possible if there is global agreement for a methodology to determine seasonal ratings.

## A.3 Refrigerators

*Product description*

Refrigerators and freezers for household use i.e. excluding commercial refrigeration equipment. Typically products that are regulated are restricted to those that use the vapour compression cycle, are intended for the storage of food and beverages for human consumption and are in the size range 40 litres to 700 litres.

*Test Method and Background*

Refrigerator and freezers are products that are in widespread use and consume significant amounts of electricity. Their ownership grew rapidly in households in developing countries from the late 1940s and are currently regulated for energy efficiency in a large number of countries[16] for many years (in some regions for more than 30 years).

Because of the long history of regulation, there are a significant number of different approaches to measure energy and performance of these products. There are at least five significantly different approaches around the world and many minor variations across regions. Because most of the approaches currently in force were developed a long time ago, they are almost universally inadequate in a number of respects. It is self-evident that refrigeration energy consumption and cooling performance is influenced by climate, so this perception has led to entrenched views regarding historically developed and adopted testing approaches.

[16] Around 60 countries including the EU27

The most important elements that influence the energy consumption of refrigerators and freezers are ambient temperature and user interactions (such as door openings and addition of food and drinks) and to a lesser extent defrosting energy. Only one test procedure currently in use (JIS C9801-2006) attempts to take into account changes in ambient temperature and user related loads. However, this is performed in a manner that many of the key elements are measured together and therefore their influence on the results cannot be separately determined. The test is also very complex to perform and there has been strong resistance to adopting this type of approach (despite it having many positive elements and being more reflective or normal use). Most other test methods for refrigerators and freezers measure the product in a warm to hot room with no door openings, which is far from normal use in every respect.

None of the test methods currently in use provide an attractive option for a global approach to testing of energy and performance as they all have substantial technical flaws. This posed a substantial strategic problem for this product – there was no existing method with which to align and the existing approaches are heavily embedded in regulatory approaches around the world (so there is substantial regulatory inertia). In many ways, the case of refrigerators and freezers appeared to be very unpromising in terms of harmonisation of the test method.

Despite the difficult situation, work on a new global test method commenced in 2006. Good progress has been made towards a new approach that overcomes many of the technical problems with existing test methods and that has the capability to reflect energy consumption across a range of climates and usage levels. The new IEC62552 Edition was released as a Committee Draft for Voting in early 2013 and should be published by early 2014 if the remaining processes run smoothly.

*Efficiency Metric*

The standard approach to measure efficiency for refrigerators and freezers has historically been based on energy consumption per unit volume. However, this approach has serious flaws as it penalises smaller products (which have a larger surface area to volume ratio for smaller sizes as well as other factors such as compressor size).

Given that products with different temperature compartments (refrigerator-freezers) have a mix of relative compartment sizes, the concept of adjusted volume is often used to account for small differences in these ratios. However, adjusted volume has relied on the use of a single test temperature. It still suffers from the size impact in terms of an efficiency metric. There are some other approaches being investigated that can take into account different proportions of volume operating at different temperatures (such as normalised volume being proposed for labelling in Australia).

In practice, around the world there are a range of approaches in use to define product efficiency. Each presents a range of issues.

Given that the IEC test method sets out a very different approach to existing test methods (with multiple inputs rather than a single energy value), some new investigations are certainly warranted into the feasibility of efficiency metrics under the new IEC test method that may be able to take into account different regulatory approaches and requirements.

While the energy service provided by a refrigerator or freezer is conceptually easy to define (a specified volume of space at a specified temperature), there are a range of other performance parameters that are important to assess to ensure usability and safe storage of food. The most important of these is the storage test, where the product is operated in a wide range of ambient temperatures and the product must be able to maintain suitable internal temperatures. This is usually most challenging for products with multiple compartments at different temperatures (e.g. a refrigerator-freezer), where temperature balance can be difficult to maintain under a wide range of ambient conditions (with varying heat gain). There are a range of other tests that are important such as defrost performance and frequency, pull down test (sufficient refrigeration capacity) and ice making, that have varying degrees of importance. The critical factor is that the design of products for certain climates or to meet specific performance requirements will have an impact on its energy efficiency during normal energy consumption tests. So while the efficiency metric is conceptually simple, sitting behind the main this assessment are various performance tests than are used to assess fitness for purpose and it needs to be noted that these can have a moderate impact on the measured efficiency under standard test conditions.

*Efficiency Thresholds*

Given that the feasibility of globally harmonized efficiency metrics is yet to be examined under the new IEC test method, it is not possible to assess whether the development of globally relevant efficiency thresholds is feasible or not.

*Harmonisation process and government engagement*

It is important to understand the origin of test methods for refrigeration products when considering the issue of harmonisation and alignment. Standards for refrigerator performance have been in place for a very long time – their primary function was to ensure that internal compartment temperatures were maintained within an acceptable range to safely store food. These types of standards existed as early as the 1960s (household refrigerators became common appliances in developed countries in the 1950s). In these early standards, energy was not measured in a systematic way (if at all). As environmental concerns started to increase through the 1970s and 1980s, energy consumption came onto the agenda of many organisations and governments. While there were some voluntary energy labels in Europe in the 1970s, Canada was the first to introduce a mandatory labelling scheme for refrigerators (and other products) in 1978, followed by the USA in 1980.

Inclusion of energy on an energy label meant that there had to be a test method to measure energy. ISO attempted to include an energy measurement as part of their storage test (which included freezer test packages). The US and Canada recognised the issues with test packages and frost free systems and devised an alternative approach where test packages were removed for these products and the ambient test temperature was elevated to compensate for “normal use”. Australia and New Zealand followed a pathway similar to the USA (but with more consistent testing and setup requirements across product types) while Japan and various Asian countries opted for different approaches (with Japan alone opting for a “real use” approach with 2 ambient test temperatures and door openings).

Effectively, the lack of a globally relevant test method and the rapid concern about energy consumption of appliances in the 1970s and the 1980s generated a rapid divergence of test methods around the globe. There was much written about the differences in regional test methods for refrigerators in the 1990s yet there was little progress to resolving the disparate approaches or developing a new approach that could satisfy all regions.

Partly in response to government policies which included statements on alignment of test procedures and work by regional organisation such as APEC, there was an increasing interest in resolving the issues surrounding refrigerator test procedures. Papers flagging the conceptual approach for a new global test method appeared as early as 2000.

Work started in ISO to consolidate the 4 existing test procedures for refrigerators (ISO 5155 (freezers), ISO 7371 (refrigerators without freezers), ISO 8187 (refrigerator/freezers) and ISO 8561 (forced air/frost free units)) that were in existence in 1996. While this was intended to be an editorial exercise, a range of technical changes were necessary to resolve some of the minor differences between the existing approaches.

At the ISO meeting in 2002 to discuss the consolidated draft of ISO15502, a large number of non-European countries voiced their concerns regarding the inadequacy of the draft for frost free products (and for energy testing in general for all product types). ISO accepted these points in principle and undertook to commence a full revision of the standard once ISO15502 was published (which occurred in 2005). Until this time, input into ISO for refrigerator test methods from outside of Europe had been modest because many regions had their own test methods that had been dictated by local energy regulations.

After the publication of ISO15502 in 2005, work commenced in 2006 in ISO on a new global standard. Fortunately, due to the make-up of the working group, there was a strong interest in developing a new global test method to energy consumption and performance that was relevant and practical, building on much of the work over the previous decade. Work progressed slowly and in 2007, ISO and IEC Management Boards agreed to transfer refrigerators and freezers from ISO to IEC (under TC59 – household appliances) (this arose from a US request from TC59 in 2003). Specific product performance standards moving between ISO and IEC are extremely rare. While there was some progress on technical issues after the transfer, the management of the process was not ideal in the early period within IEC as there was no formal sub-committee to manage the work. Once the sub-committee was formally constituted in 2009, work progressed at a faster pace.

The work in IEC was assisted by active participation from a number of countries involved in the Asia Pacific Partnership on Clean Development and Climate, which had a technical group undertaking investigations and providing support to the IEC work.

The IEC work now has clear objectives to develop a test method that is globally applicable by separately quantifying important aspects of the energy and performance of refrigerators and freezers as follows:

- Steady state energy consumption determined at 16°C and 32°C
- Impact of internal temperature changes quantified where there is interpolation
- Defrost and recovery energy separately quantified
- Processing efficiency (removal of user related heat loads) determined at 16°C and 32°C.

The test method is structured in a modular manner so that defined components are measured (so called LEGO blocks) and can be put together in a manner that is regionally relevant.

The text for the draft standard to be released as Committee Draft for Voting was finalised in February 2013 and should be formally released to national committees in the first half of 2013.The development of the global test method for refrigerators followed a very unusual pathway and in many ways is rather unique (and so less useful as a case study). As is often the case where a new test method is devised more or less from a clean sheet of paper (which again is extremely unusual for a well-established product), the development time is lengthy (in this case it is likely to be about 8 years to publication). But there were a number of confounding factors that slowed the process in this particular case (mostly associated with the transfer from ISO to IEC) which are certainly one off in nature, so in some respects the progress has been fairly quick, considering the amount of work undertaken.

This particular committee (as is the case with most IEC committees) is dominated by manufacturers and suppliers. There is a small group of test laboratories involved (which have made valuable input) and there were a small handful of representatives that represented government or government interests (indirectly or directly). In this respect, this modest government representation helped shape the direction of the test method in a very positive manner.

This particular committee was also unusual in that there was parallel work early in the revision process (from about 2006) within the Asia Pacific Partnership on Clean Development and Climate. A series of working groups with APP covered products such as air conditioners and refrigerators and they had a specific focus on test procedures and harmonisation. The APP group was able to garner significant resources and input from government and industry to help develop the concepts around a global test method for refrigerators. The APP group, once established, fed work into the IEC process during the standards development phase. There is no doubt that the significant development testing and data analysis within APP helped to forge a strong consensus in IEC during the development of the new global test method IEC62552 Edition 2.

*Current Status and Discussion*

There is currently poor harmonisation with respect to test methods for refrigerators and freezers. Most of the existing test methods have major technical flaws and are not suitable as the basis for a global approach. As this product has been regulated for many years in a large number of countries, the prospect for future harmonisation looked very bleak.

However, despite this poor prognosis, a new global approach for testing energy and performance for household refrigerators and freezers is well progressed and appears to have widespread support (at least in principle). It would appear that at last there is a good candidate for a global test method for this most difficult of products within the next few years. When and how this test method is incorporated into existing requirements remains to be seen. Promisingly, the US has adopted the main test conditions in the forthcoming IEC62552 Edition 2 and Australia and a number of other countries have announced transition timetables to adopt the new global test method.

Given the embryonic stage of development, at this stage there have been no investigations into efficiency metrics or efficiency thresholds that are built on IEC62552 Edition 2. This is an area where further research and investigation is warranted once the new IEC test method is established. However, the standard is written in a manner to allow for regional variations in temperature and usage. So it forms a sound basis for future alignment and a solid platform for development of common efficiency metrics and thresholds.

### A.4 External Power Supplies

*Product description*

External power supplies (usually single voltage) with a rated power of up to 250W and that convert main AC power to low voltage AC or DC output. Internal power supplies (typical with several supply voltages as used in desktop computers) are not included within this product group.

*Test Method and Background*

Energy Star started to develop criteria and an associated test method for external power supplies as early as 2003. During this development period, there was liaison between the governments of California, China and Australia regarding the development of a global approach for this product as they were proposing to regulate the efficiency of these products. Close collaboration between governments led to the development of a scheme that was to form the basis of a global approach.

In parallel to this work, the European Commission was developing a voluntary code of conduct for the efficiency of external power supplies. In the early stages, the test method used in Europe was slightly different to that used by other governments; however, eventually the code of conduct test method requirements were aligned with those used by Energy Star and other governments.

Interestingly, while the IEC had developed safety standards for external power supplies, there were no existing IEC test methods for the measurement of energy efficiency. Some approaches were made to the relevant IEC committee to see if they would wish to develop such standards, but there was little interest from existing committee members in codifying the existing test method into IEC standard and less interest in the associated efficiency metrics.

*Efficiency Metric*

Power supplies are a relatively straightforward product to define a pure efficiency metric for, expressed as power output over power input. The current Energy Star approach determines the efficiency at four load points (25%, 50%, 75% and 100% of rated capacity) and averages these to get a composite value. In theory this is not a perfect efficiency metric as the decline in efficiency with load is masked by using an average efficiency value aggregated across the four load points. However, in practice this is not a major deficiency as products with very high full load efficiency tend to also have very high part load efficiency.

The other parameter that is an important part of the overall efficiency metric for external power supplies is the no load power consumption (effectively the no load power loss).

The efficiency metric used is defined as no load power consumption plus a logarithmic function based on the rated power of the product.

*Efficiency Thresholds*

The early collaborative work with Energy Star and a number of national governments resulted in a scheme where a range of efficiency thresholds were developed extending from moderate efficiency to very high efficiency. These have been successfully adopted by several governments and regions for both mandatory and voluntary programs. The thresholds are open ended and leave room for future higher efficiency levels to be developed as needed.

*Current Status and Discussion*

This is an interesting product that is different to many others. In terms of regulation it was effectively a green field product when proposals were initially developed. There was close collaboration between a number of agencies and governments which resulted in development of an agreed global test method, an agreed efficiency metric and an agreed series of efficiency thresholds. While there was substantial liaison with industry stakeholders, the process was primarily driven by and owned by governments.

IEC was approached with respect to the development of a test method, but the technical committee concerned showed little interest in taking it forward. Nonetheless, in the absence of IEC engagement the framework established is running successfully and a number of governments have adopted the thresholds for use in their local programs at a timing that is appropriate for them. New thresholds are currently under consideration.

In some ways this is a significant success story: requirements were developed quickly, there was little opposition or dissent from industry and government controlled the process and achieved what they wanted in a timely manner. However, it did take some resources (the work was led by Energy Star who were able to provide significant momentum), the product was small and fairly inexpensive and was not previously regulated. So these specific conditions may not mean that this approach would be workable or the best option in other cases, especially those with existing test methods and existing regulatory approaches. It also completely outside the IEC process, so replication of this process is unlikely to proceed so smoothly were it to be applied to larger or more complex products.

## *A.5 Televisions*

*Product description*

Typically a television is defined as an appliance for the display and possible reception of television broadcast and similar services for terrestrial, cable, satellite and broadband network transmission of analogue and/or digital signals. Televisions usually have an internal tuner and the ability to play sound (whereas a monitor does not have a tuner, but may be able to play sound).

*Test Method and Background*

The IEC developed an international test method to cover a wide range of audio and video equipment in 2002 (*IEC62087 Edition 1 - Methods of measurement for the power consumption of audio, video and related equipment*). While this set out a method for determination of power and performance, with respect to televisions, it focused almost entirely on cathode ray tube (CRT) products, which dominated all markets up to 2003. Prior to that date few, if any, countries had regulated the energy consumption of televisions (even though ownership was generally high, total energy consumption was generally modest).

Over the period 2003 to 2008, there was a massive transformation in the technology used for televisions. What had been a market that was almost exclusively CRT based (with a hand full of projection based products), had changed to one dominated by new flat screen display technologies (mostly LCD, initially only available in small to medium sizes replacing CRT TV displays, with plasma technology supplying the large TV display market, >38 inches). The existing test methods for these new technologies in IEC62087 Edition 1 were not applicable because:

- TV display luminance level settings, which formed the core of the test methodology, were not measurable with any repeatability across non-CRT technology types.
- Plasma flat screen products had control over the brightness of individual pixels but had to limit the overall power required to drive large areas of peak brightness picture (peak white) to protect the limits of the display power supply and were sensitive to the type of test pattern used for luminance and power testing.

The power consumed by the TV was clearly dependant on the nature of the pictures being watched, in particular the brightness or average picture level (APL) of the image and this is found to vary by region depending on local TV production practices. It was clear that a new testing methodology was required for on-mode power measurement for these new technologies.

Associated with the rapid change in technology was a rapid increase in TV size. CRT products were effectively limited to around 80cm in size (around 32 inches) due to the sheer size and mass of the units (there were some projection products around, but these had issues with picture quality and did not get wide consumer acceptance). Flat screen products were less constrained by size due to their shallow depth. Sizes as large as 150cm quickly came onto the market. The power consumed by some products was spectacular (many were more than 300W, compared to CRT products averaging less than 100W). Regulatory bodies quickly grew concerned at the potential explosion in TV energy consumption in the absence of efficiency measures.

Due to active engagement through a number of government agencies, IEC worked rapidly on a new IEC test method to overcome the major issues with respect to measurement of energy and performance of televisions.

IEC62087 Edition 2 was published in 2008. This addressed the problem of luminance measurement and test pattern power measurement inaccuracies associated with LCD and Plasma display technology by measuring average power over a ten minute sequence of moving pictures representing worldwide average TV viewing (in terms of distribution of APL). This enabled the rating of TV on-mode power demand in a manner that was representative of that in normal use. Further work continued on the test method and IEC62087 Edition 3 was published in 2011. In the IEC context, this is a very rapid development of a new international test method.

In 2005, there were few programs that covered the efficiency of televisions, other than those covering standby power wastage. This was in part because the energy consumption of TVs was perceived as relatively small compared with the energy consumption of appliances such as those for heating water and controlling the temperature of living environments. The rapid proliferation of TV products and the dramatic increase in their daily usage was initially overlooked by regulatory agencies.

There are now a substantial number of programs, ranging from endorsement labels (Energy Star), comparative energy labelling and minimum energy performance standards. The majority of these programs use the IEC test method (or a close approximation to this method) as this was technically competent and available in a timely manner. So there is already active government engagement in the standards process, good alignment of test methods and active on-going development of test methods to ensure that they remain relevant for new technologies (e.g. automatic brightness control and new screen technologies).

*Efficiency Metric*

The efficiency metric for televisions has traditionally been power consumed per square centimetre of screen area. This is a reasonable measure of “efficiency”. However, there are some fixed power components for televisions (e.g. tuner, power supply, display control systems) and there may be an energy penalty associated with features such as high resolution. Some care is also required to control screen luminance levels as this clearly has a significant impact on power consumption (most televisions have a number of different display modes – what is acceptable is typically set out in local regulatory requirements). Control of the picture sequence and overall brightness (called the gamma-corrected average picture level or APL) is quite important for screen technologies that are sensitive to the brightness of the picture displayed – this is defined in the test method.

*Efficiency Thresholds*

Given that televisions usually have a fixed power component and a variable power component (based on screen area), most efficiency thresholds for televisions tend to be a fixed power level for an effective screen size and a linear component that is a function of screen area.

There are a number of programs in place around the world that define thresholds for energy labelling (ranking) and minimum energy performance standards. Given the commonality in test method and efficiency metrics, there is good potential to develop a family of global efficiency thresholds. Inevitably this will conflict to some extent with existing levels in some regions, but with some thought and compromise, future global levels could be readily defined.

Given the concern about energy consumed by very large appliances, some approaches to developing efficiency thresholds may look to placing a cap on power consumption beyond a certain size. Such an approach may have to exist as a local variant within such thresholds.

*Current Status and Discussion*

Televisions have undergone a massive technology transformation in many respects over the past 10 years. Moving from a market dominated by CRT technology (which itself was the mainstay technology for some 80 years) the market has substantially transformed to flat panel technologies  During this period, many countries have also moved to regulate the energy of televisions in some shape or form.

Due to active engagement by government and anticipation of future requirements, IEC were able to completely revise the energy and performance test method to cover these new technologies. Happily this was done within a timetable that allowed widespread adoption of the IEC test method by governments. Had IEC not anticipated this requirement, it is probable a number of divergent test methods would have proliferated. So timely input into IEC test method development and clear communication of government requirements into that process has paid dividends in this case.

With the test method largely aligned, efficiency metrics are also, at least in principle, fairly aligned around the world. This provides good potential for the development of global efficiency thresholds. Given that a substantial number of efficiency thresholds already exist, some investigation and analysis would be required to set a family of global efficiency thresholds that would be useful (possibly some fractional metric to cover existing schemes). Certainly future efficiency thresholds could be set with some collaboration and compromise by interested parties.

# Appendix B: Leading national and regional standardization bodies

## B.1 European Standards bodies: CENELEC, CEN and ETSI

The European Union has three pan-European standardization bodies that are the direct corollary of the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC) and the International Telecommunications Union (ITU): the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC) and the European Telecommunications Standards Institute (ETSI), respectively. The mandate of these bodies was increased in 1991 to facilitate the development of the European single market and standards adopted through them automatically become national standards in EU and EFTA member countries.

European standardization is organized by and for the stakeholders concerned based on national representation (CEN and CENELEC) and direct participation (ETSI), and is founded on the principles recognized by the World Trade Organization (WTO) in the field of standardization, namely coherence, transparency, openness, consensus, voluntary application, independence from special interests and efficiency ("the founding principles"). In accordance with the founding principles, it is important that all relevant interested parties, including public authorities and small and medium-sized enterprises (SMEs), are appropriately involved in the national and European standardization process. National standardization bodies should also encourage and facilitate the participation of stakeholders.

European standards play a very important role within the internal market, for instance through the use of harmonized standards in the presumption of conformity of products to be made available on the market with the essential requirements relating to those products laid down in the relevant Union harmonization legislation. Those requirements should be precisely defined in order to avoid misinterpretation on the part of the European standardization organizations.

Within the Union, national standards are adopted by national standardization bodies which could lead to conflicting standards and technical impediments in the internal market. Therefore, it is necessary for the internal market and for the effectiveness of standardization within the Union to confirm the existing regular exchange of information between the national standardization bodies, the European standardization organizations and the Commission, about their current and future standardization activities as well as the standstill principle applicable to the national standardization bodies within the framework of the European standardization organizations which provides for the withdrawal of national standards after the publication of a new European standard. The national standardization bodies and European standardization organizations should also observe the provisions on exchange of information in Annex 3 to the Agreement on Technical Barriers to Trade (1).

Certain regulations govern the operation of the European standards bodies and their relationship with the European Commission and the National Standards Bodies. The most recent is *REGULATION (EU) No. 1025/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 October 2012 on European standardization, amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No. 1673/2006/EC of the European Parliament and of the Council*.

The representation of societal interests and societal stakeholders in European standardization activities refers to the activities of organizations and parties representing interests of greater societal relevance, for instance environmental, consumer interests or employee interests. However, the representation of social interests and social stakeholders in European standardization activities refers particularly to the activities of organizations and parties representing employees and workers' basic rights, for instance trade unions.

In order to speed up the decision-making process, national standardization bodies and European standardization organizations are required to facilitate accessible information on their activities through the promotion of the use of information and communication technology (ICT) in their respective standardization systems, for example by providing to all relevant stakeholders an easy-to-use online consultation mechanism for the submission of comments on draft standards and by organizing virtual meetings, including by means of web conferencing or video conferencing, of technical committees.

The obligation of the European standardization organizations to encourage and facilitate representation and effective participation of all relevant stakeholders does not entail any voting rights for these stakeholders unless such voting rights are prescribed by the internal rules of procedure of the European standardization organizations.

Due to the importance of standardization as a tool to support Union legislation and policies and in order to avoid ex-post objections to and modifications of harmonized standards, it is important that public authorities participate in standardization at all stages of the development of those standards where they may be involved and especially in the areas covered by Union harmonization legislation for products.

Standards should take into account environmental impacts throughout the life cycle of products and services. Important and publicly available tools for evaluating such impacts throughout the life cycle have been developed by the European Commission's Joint Research Centre (JRC). The JRC is expected to play an active role in the European standardization system.

The viability of the cooperation between the Commission and the European standardization system depends on careful planning of future requests for the development of standards. EU regulation No. 1025/2012 recognizes that this planning could be improved, in particular through the input of interested parties, including national market surveillance authorities, by introducing mechanisms for collecting opinions and facilitating the exchange of information among all interested parties. Since Directive 98/34/EC already provides for the possibility to request the European standardization organizations to develop European standards, it was deemed appropriate to put in place a better and more transparent planning in an annual work program which should contain an overview of all requests for standards which the Commission intends to submit to European standardization organizations. It was further deemed necessary to ensure a high level of cooperation between the European standardization organizations and the European stakeholder organizations receiving Union financing in accordance with the Regulation and the Commission in the establishment of its annual Union work program for standardization and in the preparation of requests for standards in order to analyze the market relevance of the proposed subject matter and the policy objectives set by the legislator, and to allow the European standardization organizations to respond more quickly to the requested standardization activities.

REGULATION (EU) No. 1025/2012 establishes a committee to manage its implementation. Before bringing a matter regarding requests for European standards or European standardization deliverables, or objections to a harmonized standard before this committee, the Commission should consult experts of the Member States, for instance through the involvement of committees set up by the corresponding Union legislation or by other forms of consultation of sectoral experts, where such committees do not exist.

Several directives harmonizing the conditions for the marketing of products specify that the Commission may request the adoption, by the European standardization organizations, of harmonized standards on the basis of which conformity with the applicable essential requirements is presumed.

Decision No. 1673/2006/EC establishes the rules concerning the contribution of the Union to the financing of European standardization in order to ensure that European standards and other European standardization deliverables are developed and revised in support of the objectives, legislation and policies of the Union. It was deemed appropriate, for the purpose of administrative and budgetary simplification, to incorporate the provisions of that Decision into the latest Regulation and to use wherever possible the least burdensome procedures.

In order to achieve the main objectives of the Regulation and to facilitate speedy decision-making procedures as well as reducing the overall development time for standards, use should be made as far as possible of the procedural measures provided for in Regulation (EU) No. 182/2011, which enables the chair of the relevant committee to lay down a time limit within which the committee should deliver its opinion, according to the urgency of the matter. Moreover, where justified, it should be possible for the opinion of the committee to be obtained by written procedure, and silence on the part of the committee member should be regarded as tacit agreement.

During the preparation of a harmonized standard or after its approval, national standardization bodies shall not take any action which could prejudice the harmonization intended and, in particular, shall not publish in the field in question a new or revised national standard which is not completely in line with an existing harmonized standard. After publication of a new harmonized standard, all conflicting national standards shall be withdrawn within a reasonable deadline.

### *European Committee for Electrotechnical Standardization (CENELEC) (www.cenelec.eu)*

CENELEC is the European Committee for Electrotechnical Standardization and is responsible for standardization in the electrotechnical engineering field. CENELEC prepares voluntary standards, which help facilitate trade between countries, create new markets, cut compliance costs and support the development of a Single European Market.

CENELEC creates market access at the European level but also at the international level, adopting International Standards wherever possible, through its close collaboration with the IEC, under the Dresden Agreement.

In an ever more global economy, CENELEC fosters innovation and competitiveness, making technology available industry-wide through the production of voluntary standards.

Through the work of its members together with its experts, the industry federations and consumers, European Standards are created in order to encourage technological development, to ensure interoperability and to guarantee the safety and health of consumers and provide environmental protection.

Designated as a European Standards Organization by the European Commission, CENELEC is a non-profit technical organization set up under Belgian law. It was created in 1973 as a result of the merger of two previous European organizations: CENELCOM and CENEL.

#### *Membership*

CENELEC is an association comprised of Members who are the National Electrotechnical Committees of European Countries. At the beginning of 2013, CENELEC membership encompassed 33 countries. In addition, 13 National Committees from Eastern Europe, the Balkans, Northern Africa and the Middle East participate in the work of CENELEC as Affiliates. CENELEC concludes also cooperation agreements with European associations and federations to which we give the status of "cooperating partners". CENELEC also offer a special partnership status to countries outside Europe called Partner Standardization Body (PSB). Since 2009, CENELEC developed the concept of Technical Liaison Partnership for organizations active in rapidly evolving and innovative market segments.

The 33 current CENELEC members are national organizations entrusted with electrotechnical standardization, recognized both at National and European level as being able to represent all standardization interests in their country. Only one organization per country may be member of CENELEC.

CENELEC members have been working together in the interests of European harmonization creating both standards requested by the market and harmonized standards in support of European legislation and which have helped to shape the European Internal Market. Their commitment to implement all European Standards identically at national level and to withdraw any conflicting standard guarantees continued harmonization of the market.

The CENELEC Members have voting rights in the General Assembly of CENELEC and they provide delegations to the Technical Board, which defines the work program.

The process of accession to CENELEC membership must be considered by CENELEC as well as by the candidate member as one of the important steps towards the full participation of the concerned countries in the European Internal Market.

The CENELEC General Assembly of June 2011 adopted, in conjunction with the CEN General Assembly, the CEN–CENELEC Guide 20 "Guide on membership criteria of CEN & CENELEC" which is the Reference Document describing the criteria for membership to be fulfilled by all national CENELEC Members at any time.

The candidate organizations have to meet the criteria set out in details in the CEN–CENELEC Guide 20 and their fulfillment are assessed by independent auditors.

### *European Committee for Standardization (CEN) (www.cen.eu)*

The European Committee for Standardization (CEN) was officially created as an international non-profit association based in Brussels on October 30, 1975.

CEN is a business facilitator in Europe, removing trade barriers for European industry and consumers. Its mission is to foster the European economy in global trading, the welfare of European citizens and the environment. Through its services it provides a platform for the development of European Standards and other technical specifications.

CEN is a major provider of European Standards and technical specifications. It is the only recognized European organization according to Directive 98/34/EC for the planning, drafting and adoption of European Standards in all areas of economic activity with the exception of electrotechnology (CENELEC) and telecommunication (ETSI).

The new EU Regulation on European Standardization has been adopted by the European Parliament and by the Council of the EU and entered into force in January, 2013. It provides the legal framework within which the European standards organizations (CEN, CENELEC, ETSI) will operate. The text of the new EU Regulation (1025/2012) is published in the Official Journal of the European Union (see Issue L316 of November 14, 2012).

CEN’s 33 National Members work together to develop voluntary European Standards (ENs).

These standards have a unique status since they also are national standards in each of its 33 Member countries. With one common standard in all these countries and every conflicting national standard withdrawn, a product can reach a far wider market with much lower development and testing costs. ENs help build a European Internal Market for goods and services and position Europe in the global economy. More than 60,000 technical experts as well as business federations, consumer and other societal interest organizations are involved in the CEN network that reaches over 600 million people.

In a globalized world, the need for International Standards simply makes sense. The Vienna Agreement − signed by CEN in 1991 with the ISO, its international counterpart − ensures technical cooperation by correspondence, mutual representation at meetings and coordination meetings, and adoption of the same text, as both an ISO Standard and a European Standard.

CEN’s National Members are the National Standards Bodies (NSBs) of the 27 European Union countries, Croatia, The Former Yugoslav Republic of Macedonia, and Turkey plus three countries of the European Free Trade Association (Iceland, Norway and Switzerland). There is one member per country.

The standardization system in Europe is based on the national pillars, which are the National Standardization Bodies or the members of CEN. A National Standards Body is the one stop shop for all stakeholders and is the main focal point of access to the concerted system, which comprises regional (European) and international (ISO) standardization.

The CEN Members have voting rights in the General Assembly and Administrative Board of CEN and they provide delegations to the Technical Board, which defines the work program.

It is the responsibility of the CEN National Members to implement European Standards as national standards, which is unique in the world. The National Standards Bodies distribute and sell the implemented European Standard and have to withdraw any conflicting national standards.

## B.2 The US standards bodies: ANSI, NIST and DOE

The US product energy efficiency standardization process is characterized by diversity. Over 55 categories of domestic and commercial products are covered by MEPS, all of which are developed by either the US Congress or the US Department of Energy (DOE), and all (by statute) administered by the DOE. Mandatory product energy efficiency labeling is administered by the Federal Trade Commission (FTC) and voluntary product labeling (ENERGY STAR) by the US Environmental Protection Agency (EPA). In this section “standards” should be taken to mean test procedures and MEPS, with labeling being separately designated as such.

The processes for defining and administering product energy efficiency test procedures, MEPS, and both kinds of labels are all somewhat interdependent, but separate. For example, DOE is in the process of revamping the test procedure for tumble clothes dryers. It will revise the MEPS for clothes dryers in a separate process. The EPA has announced the launch of an ENERGY STAR voluntary label for clothes dryers and will probably, but is not required to, use the DOE test procedure to determine product label eligibility. There has never been a mandatory FTC label for dryers and there is apparently none in the works.

## *American National Standards Institute*[17]

In 1918, the American National Standards Institute (ANSI, www.ansi.org) was created from three existing institutions to lead the development of voluntary consensus standards of all types for the USA, represent US needs and viewpoints in regional and international standards-setting activities, and minimize or eliminate overlap and duplication in standards-setting activities. ANSI itself does not develop test procedures or standards, but is a limited bureaucratic entity acting primarily as a facilitator and referee. ANSI's main function is to oversee the development and use of standards by accrediting the procedures of largely non-government standards developing organizations (SDOs). ANSI accreditation for an SDO signifies that the procedures used meet the Institute's requirements for openness, balance, consensus, and due process.

ANSI also designates specific standards as American National Standards (ANS) when the Institute determines that the standards were developed in an environment that meets its criteria. ANSI also accredits organizations that certify that products and personnel meet recognized standards. The ANSI-American Society for Quality National Accreditation Board (ANAB) serves as the US accreditation body for management systems registration, primarily in areas such as quality (ISO 9000 family of standards) and the environment (ISO 14000 family of standards).

The National Institute of Standards and Technology (see subsection below) is an SDO and the most direct mechanism for the US government to participate in ANSI standardization processes. However, other agencies do occasionally participate when they perceive there to be important issues at stake. A good example of this is DOE's current role as the US coordinating entity for solid state lighting. Decisions about which standards are most appropriate for the US government's own use are left to the discretion of individual agencies. Since the mid-1990s it has been US government policy to encourage the use of voluntary consensus standards by US agencies and regulatory bodies, rather than having the government developing its own standards. ANSI is the embodiment of the USA's decentralized, largely industry-led approach to standardization, with no central government agency responsible for oversight of the entire system.

### *ANSI and energy efficiency*

As noted above, the US DOE and the US Congress are responsible for developing product energy efficiency test procedures and setting MEPS. ANSI does have an Energy Efficiency Standardization Coordination Collaborative (EESCC) which has been tasked with plotting a standardization roadmap intended to identify what standards, codes, and conformance programs are available or under development, what gaps exist, and what additional standardization activities are needed to advance energy efficiency in the United States. Phase One of the EESCC standardization roadmap focuses on five identified areas of need having to do with the diagnosis and analysis of systems within buildings and associated workforce training standards, and not with developing and establishing standards for product energy efficiency.

However, the same non-governmental ANSI SDOs that participate in IEC TCs also participate in the US DOE energy efficiency standardization processes. Table B1 shows how the product groups of interest align with the ANSI SDOs.

### *International interface*

US government and private-sector stakeholders currently participate in a wide range of standards activities, both domestically and internationally: through the IEC and the ISO, through organizations which include government representatives; through organizations consisting of private-sector entities; through professional and technical organizations whose membership is on an individual or organizational basis; and through consortia and other forums.

The US National Committee of the IEC (USNC/IEC) serves as the focal point for US stakeholders interested in the development and use of globally relevant standards for related industries. The Committee also engages in

[17] This section adapted freely from "Overview of the US Standardization System, ANSI 2007".

### Table B1. Alignment of ANSI SDOs with IEC/ISO TCs

| Product category | SDO | IEC/ISO | SDO contact |
|---|---|---|---|
| Solid state lighting | DOE, IESNA, NEMA | IEC TC 34 | DOE, James Brodrick<br>James.Brodrick@ee.doe.gov<br>(202) 586 5000 |
| Lamps and other lighting products | NEMA | IEC TC 34 | Randolph N Roy<br>(703) 841-3200 |
| Televisions | CEA | IEC TC 100 TA12 | Alayne Bell abell@ce.org |
| Domestic refrigerators | AHAM | IEC TC 59/WG 12 | Matt Williams<br>mwilliams@aham.org<br>202-872-5955 x 317 |
| Commercial refrigeration equipment | AHRI | ISO 86/SC 7 | David C. Delaquila<br>ddelaquila@ahrinet.org<br>(330) 469 2727 |
| Domestic air conditioners | AHRI | IEC TC 61/SC 61D<br>ISO 86/SC 6 | David C. Delaquila |
| Motors | NEMA | IEC TC 2/WG 31 Efficiency Classes | Bill Buckson<br>(703) 841-3200 |
| Distribution transformers | IEEE-PES | IEC TC 51 | William Bartley (Hartford Steam Boiler for IEEE, (860) 722-5483 |

*Abbreviations:* AHAM: American Home Appliance Manufacturers (independent industry organization with membership by manufacturers of major and portable appliances, floor care appliances and suppliers to the industry); AHRI: Air-conditioning, Heating, & Refrigeration Institute (independent industry organization with membership by North American and international equipment manufacturers); CEA: Consumer Electronics Association (independent industry organization with membership by North American and international equipment manufacturers and retailers); IEEE-PES: Institute of Electrical and Electronics Engineers – Power and Engineering Society (professional engineering society with open membership); IESNA: Illuminating Engineering Society of North America (professional association open to individuals meeting minimum training requirements); NEMA: National Electrical Manufacturers Association (independent industry association with membership by enterprises actively engaged in manufacturing of a range of electrical products in the USA, Canada and Mexico for sale in the USA; NEMA participates extensively in the USNC by being the Secretariat of six IEC TCs, Administrator of over 50 USNC Technical Advisory Groups, and by having representation in the USNC Council and TMC. NEMA is also represented through the USNC in the IEC Council and the IEC Standardization Management Board).

the assessment of conformance to standards in areas such as testing, certification and accreditation. As the US representative to the IEC and many related regional standardization bodies, the USNC/IEC serves as a conduit to the global standards-setting community for technical and policy positions arising from the USA and brings issues from the global arena to the USA for review, consideration, and response. The USNC/IEC is a totally integrated committee of the American National Standards Institute (ANSI). The Institute provides administrative support to the USNC and its nearly 1,400 US managerial, engineering, scientific and professional participants. However, the USNC does not speak with the voice of the US government at the IEC, unless NIST or another US government agency is participating in a specific USNC Technical Advisory Group (TAG)[18].

In 2005 ANSI published the United States Standards Strategy. This document confirms the US commitment to internationally accepted principles of standardization endorsed by the World Trade Organization (WTO)[19]. Organizations that are accredited by ANSI to develop American National Standards or to serve as US TAGs to the ISO, or organizations that are approved by the USNC to serve as US TAGs to IEC committees, are required to adhere to a set of essential requirements that are aligned with the principles of both the WTO and the National Technology Transfer and Advancement Act of 1996.

[18] The TAGs are the US "mirror" groups to the Technical Committees of International Standardization bodies

[19] Transparency, Openness, Impartiality and consensus, Effectiveness and relevance, Coherence, Development dimension according to WTO/G/TBT/9 Annex 4 of November 2000.

The diverse processes described above may or may not have significant interactions with their international counterparts depending upon the products involved. These interactions occur under the aegis of the American National Standards Institute (ANSI).

### National Institute of Standards and Technology

In 1995, Congress stepped forward with the enactment of the National Technology Transfer and Advancement Act (Public Law 104-113) which assigned the responsibility for coordinating standards policy among federal agencies to the National Institute of Standards and Technology (NIST), a non-regulatory federal agency within the Technology Administration of the US Department of Commerce.

NIST is a part of the US Commerce Department and is heavily oriented to research. NIST's scientists and engineers have played an important US government role in standards development and use for most of its 109-year history. NIST staff support the development of documentary standards through their technical participation in standards development organizations, ensuring standards that are based on science and supported by measurements and testing that promotes conformity to and acceptance of the standards. NIST provides a breadth and depth of technical expertise, a reputation as an unbiased and neutral party, and a long history of working collaboratively with the private sector.

NIST works in close collaboration with ANSI as the federal agency responsible for measurement standards (weights and measures) in the US NIST has been accredited by ANSI as a standards developer since October 5, 1984 for "Standards and guidelines for information exchange relating to automatic data processing and related systems".

The National Technology Transfer and Advancement Act or NTTAA (PL 104-113) and its implementation under OMB Circular A-119, guide US Federal agencies on the use of standards and conformity assessment practices. This legislation was designed to reduce the development of government-centric standards and promote the adoption and use of consensus based private sector standards to meet government needs, and was principally focused on the use of standards by federal agencies in procurement and regulation. NTTAA also charged NIST with the role of coordinating Federal, state and local technical standards and conformity assessment activities and coordinating these activities with the private sector. Since 1997, over 3,000 US government-specific standards have been replaced with private sector standards.

Like ANSI, NIST is generally not involved in national product energy efficiency standards setting processes in the USA, but it is active in related and complementary activities such as developing standards and protocols for "smart grid" technologies[20].

*ISO or IEC alignment*

The US standards system is highly decentralized and naturally partitioned into industrial sectors that are supported by numerous independent, private-sector standards development organizations. There are about 450 such organizations, with at least 150 more consortia. Approximately 20 standards developing organizations develop about 80% of US standards. Without any central responsibility, authority, or overly burdensome interference from government, a wide variety of US voluntary standards activities have proceeded very successfully along sector-specific lines for over a century.

*Reference: Standards & Competitiveness: Coordinating for Results Removing Standards-Related Trade Barriers Through Effective Collaboration*

*A Report prepared for Secretary Donald L. Evans as part of the Department of Commerce Standards Initiative, May 2004*

ANSI is the official US national standards body for ISO and, via the US National Committee, IEC. As a founding member of the ISO, ANSI plays a strong leadership role in its governing body, while US participation, via the USNC, is equally strong in the IEC.

Through ANSI, the USA has immediate access to the ISO and IEC standards development processes. ANSI participates in almost the entire technical program of both the ISO and the IEC, and administers many key committees and subgroups. Part of its responsibilities as the US member body to the ISO include accrediting US Technical Advisory Groups (US TAGs), whose primary purpose is to develop and transmit, via ANSI, US

[20] http://www.nist.gov/energy-conservation_pp.cfm

positions on activities and ballots of the international Technical Committee. US positions for the IEC are endorsed and closely monitored by the USNC Technical Management Committee (TMC).

The National Institute of Standards and Technology (NIST), the US government's standards agency, cooperates with ANSI under a memorandum of understanding to collaborate on the United States Standards Strategy.

In many instances, US standards are taken forward to ISO and IEC, through ANSI or the USNC, where they are adopted in whole or in part as international standards. For this reason, ANSI plays an important part in creating international standards that support the worldwide sale of products, which prevent regions from using local standards to favor local industries. Since volunteers from industry and government, not ANSI staff, carry out the work of the international technical committees, the success of these efforts often is dependent upon the willingness of US industry and government to commit the resources required to ensure strong US technical participation in the international standards process.

ANSI accredits standards that are developed by representatives of other standards development organizations, government agencies, consumer groups, companies, and others. These standards ensure that the characteristics and performance of products are consistent, that people use the same definitions and terms, and that products are tested the same way. ANSI also accredits organizations that carry out product or personnel certification in accordance with requirements defined in international standards.

ANSI designates specific standards as American National Standards, or ANS, when the Institute determines that the standards were developed in an environment that is equitable, accessible and responsive to the requirements of various stakeholders. There are approximately 9 500 American National Standards that carry the ANSI designation. The American National Standards process involves:

- consensus by a group that is open to representatives from all interested parties
- broad-based public review and comment on draft standards
- consideration of and response to comments
- incorporation of submitted changes that meet the same consensus requirements into a draft standard
- availability of an appeal by any participant alleging that these principles were not respected during the standards-development process.

As noted, ANSI does not write standards itself — it can only accredit standards written by other standards development organizations. The USA is unusual as it does not have a national standards development organization that can create and publish its own standards, taking into account input from a range of major stakeholders like industry, consumers groups, government and nongovernment organizations. The US government often uses ANSI standards in its energy efficiency regulations. Where a suitable ANS does not exist, it often writes the test procedure into its regulations. The US government is required to consider the use of international standards when undertaking a rule making, but historically these have been rarely used.

*Government interaction or influence*

While the US Government does not operate or finance a US national standards body, individual agencies do participate actively in the development of voluntary consensus standards. Additionally, the Government also is directly concerned with setting and implementing standards through legislation, regulation, or contractual obligations for sale to government purchasers.

Government can nominate representatives to participate on international standards committees through ANSI the USNC Technical Management Committee.

*Committees of interest*

A full outline of US participation in ISO activities can be found at:
http://publicaa.ansi.org/sites/apdl/Documents/Standards%20Activities/International%20Standardization/ISO/US%20TAGs%20to%20ISO/ISOTAG_Mar2013.pdf

## B.3 Germany (DKE and DIN)

DKE is the national standards body for Germany dealing with electrotechnology and hence is the direct German counterpart to IEC and CENELEC, whereas DIN is the German national standards body dealing with the standardization topics covered by ISO and CEN. As with other EU countries much of DKE and DIN's work is concentrated on CEN and CENELEC as these bodies are the only ones authorized to produce European-wide standards. The material presented below is drawn from their websites.

### DKE (Deutsch Kommitte Electrotechnish)

*Website address:* http://www.dke.de

The DKE is the official German Expertise Centre for electrotechnical standardization. It represents German interests in the European and international standardization organizations and implements the results of international standardization work in the national standards collection.

*Aims and objectives*

The DKE is the national organization responsible for the creation and maintenance of standards and safety specifications covering the areas of electrical engineering, electronics and information technology in Germany.

A joint organization of DIN German Institute for Standardization (DIN Deutsches Institut für Normung e.V.) and the VDE Association for Electrical, Electronic & Information Technologies (VDE VERBAND DER ELEKTROTECHNIK ELEKTRONIK INFORMATIONSTECHNIK e.V.). The VDE is responsible for the daily operations of the DKE.

The DKE German Commission for Electrical, Electronic & Information Technologies of DIN and VDE is a modern, non-profit service organization which ensures that electricity is generated, distributed and used in a safe and rational manner, thereby serving the good of the community at large.

The results of DKE work form an integral part of the German collection of standards. As VDE specifications its electrotechnical safety standards also form the VDE Specifications Code of safety standards.

DKE's mission is encouraging dialogue, safeguarding expertise and enhancing commitment: these are the maxims of the DKE and the factors involved in evolving the full power of standardization for comprehensive safety of electrotechnical products in the interests of the consumer and the environment, with global opening of the markets by augmenting system compatibility and removing technical trade barriers, and successful development and swift implementation of technical progress for the sake of society as a whole.

The DKE relies on the commitment and fair cooperation of everyone involved. Technical experts contribute their know-how, companies provide resources, the DKE staff organizes the processes and provides corresponding support with a wide range of services.

*ISO or IEC alignment*

DKE is the:

- German national member of the IEC and CENELEC.
- The national standardization organization (NSO), responsible for Germany within ETSI.

*Government interaction or influence*

According to the DKE website:

The standards are a measure for proper technical behaviour; this measure is also of judicial importance.

The application of standards is generally voluntary, however, application may be mandatory on the basis of legal or administrative requirements, and on the basis of contracts or for other legal reasons.

The application of standards does not release anyone from the responsibility of their actions. In this respect, everyone is acting at their own risk.

In the case of safety provisions in DIN and/or DIN VDE standards, there is a factual presumption of law that the standards are drawn up in a proper and workmanlike manner, i.e. that they are "acknowledged rules of technology" (see also Article 49 of the German Energy Industry Act).

The content of standards shall be oriented in accordance with the requirements of the public. Therefore, it is necessary that standards take into account the present state of the art.

*Under the Standards Agreement, DIN and thus the DKE are obliged to*

- take the public interest into account for standardization tasks;
- ensure that DIN standards can be used in legislation, in public administration and in legal proceedings to describe technical requirements;
- involve the relevant authorities in the performance of standardization work;
- give preference to applications for standardization work issued by the Federal Government, for which public interest is asserted by the Federal Government.

On the other hand, the Federal Government has already expressed its intention in the Standards Agreement of referring to DIN standards in legal regulations, and agreed to use DIN standards in administration and tender specifications.

The current issues of the following documents are the primary basis for the work of the DKE:

- Agreement between the Deutscher Normenausschuss e.V. (DNA) (German Standards Committee), Berlin, and the Verband Deutscher Elektrotechniker (VDE) e.V. (Association of German Electrotechnical Engineers (VDE) e.V.), Frankfurt am Main, of 13th October 1970
- Principles for standardization work of the DKE - collection DKE-GN ("blue folder")
- VDE Statutes
- VDE 0022 "Satzung für das Vorschriftenwerk des VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V. " (Rules for the specifications issued by the VDE Association for Electrical, Electronic & Information Technologies)
- VDE 0024 "Satzung für das Prüf- und Zertifizierungswesen des Verbandes Deutscher Elektrotechniker (VDE) e.V." (Statutes for the testing and certification of the Association of German Electrotechnical Engineers (VDE) e.V.)
- DIN Statutes
- Standards Agreement between the Federal Republic of Germany and DIN
- Directive for DIN Standards Committees
- Standards series DIN 820
- DIN-Merkblätter
- Principles for the use of DIN standards
- ISO/IEC Directives - Parts 1 to 3
- ISO/IEC Guides
- CEN/CENELEC Internal Regulations Parts 1 to 4
- ISO/IEC Guides
- CENELEC Memoranda

*Standards and committees*

The DKE standardizing bodies comprise the committees (K), subcommittees (UK) and working groups (AK).

In addition, there are joint committees and joint subcommittees which consist of a DKE working body in collaboration with one or more other DIN standards committees. The working bodies are generally assigned as German "counterpart committees" to the corresponding IEC and CENELEC technical committees so that generally only a single German body is responsible for the entire national, regional and international work and/or cooperation in the specific field of activity.

In order to ensure coordination and control of the standardization procedure, nine divisions have been established which are subdivided into subjects, taking into account as far as possible the various national, international and technical aspects. In order to represent the interests of the committees and working groups under the divisions, the Council nominates one of its members as divisional chairman (FBV).

The divisional chairman co-ordinates all activities within his division, including, among other things, the choice of new fields of activity or the establishment and/or dissolution of existing committees, which are submitted to the TBINK for decision. He is also responsible for mediation in standardization procedures between the objecting party on the one hand and the committees and working groups on the other; he may involve a technical advisory board for this purpose.

The technical work in the standardization bodies of DIN and DKE is performed by technical experts.

The technical experts - about 5,000 technical experts in the committees and subcommittees of the DKE - are from all major "interested circles", e.g. users, public authorities, mutual indemnity associations, vocational, technical schools and universities, trade, craftsmen, industrial manufacturers, testing institutes, insurance companies, independent experts, technical supervisors, consumers, scientists. They must be authorized by the delegating organizations (e.g. educational and research institutes, public authorities, institutes, associations, organizations) for work in the standardization bodies.

The DKE committees are staffed, as in all technical committees of DIN, according to the principle that all interested circles be represented adequately. This is ensured in agreement with the concerned associations and requires the confirmation by the responsible divisional chairman. After confirmation, the members are nominated by committees and subcommittees, said nomination being valid until the four-year term of office of the DKE Council expires. The members nominated act as experts in their fields. They are, however, required to represent the opinion of the interested circles by whom they have been authorized.

*Organizational Structure*

The official titles of the Technical Committees/Subcommittees and the detail overview are available only in German.

DKE General Board of Directors and DKE Office

Division 1 General electrical engineering, materials for electrotechnology, environmental protection

Division 2 General safety; design, installation and operation of electrical energy supply installations

Division 3 Electrical equipment for power engineering

Division 4 Electrical equipment for current supply, communication cables

Division 5 Electrical appliances for domestic and similar purposes, installation equipment

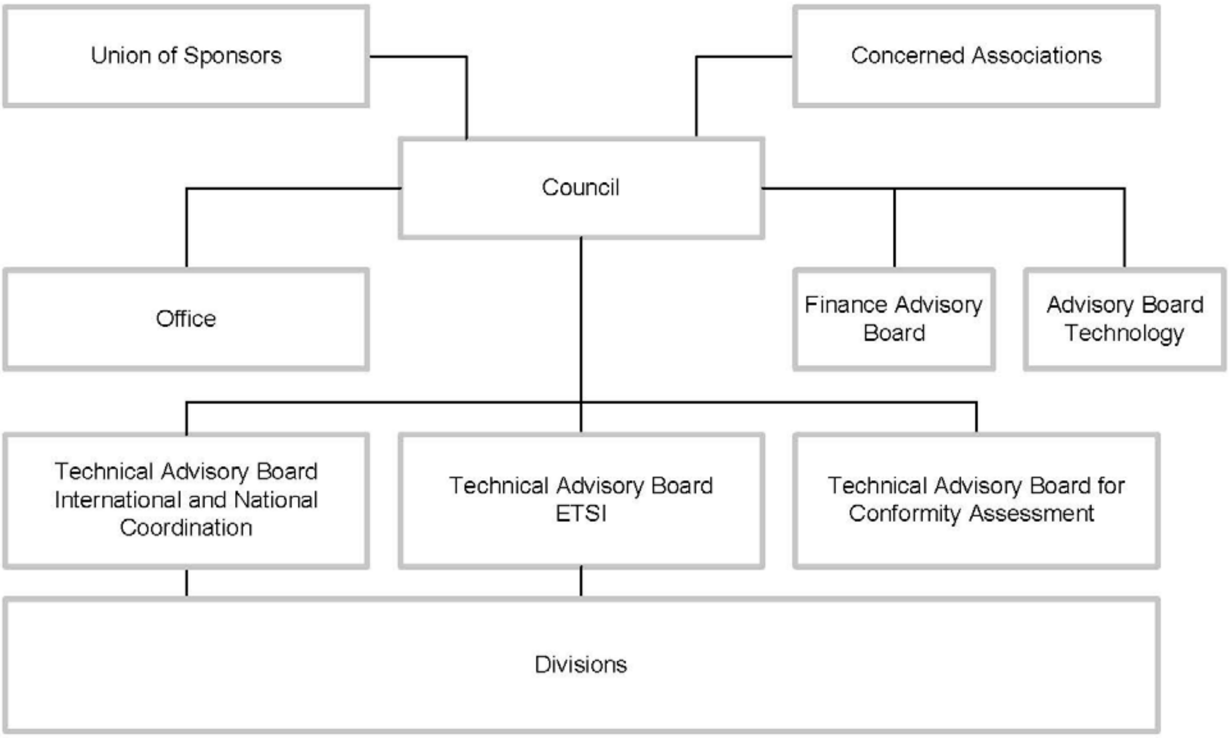
Division 6 Electronic components for telecommunication and electronics

Division 7 Information and telecommunication technologies

Division 8 Electromedical equipment, electroacoustics, ultrasonics, laser

Division 9 Process measurement and control technologies

*Governance, rules and regulations*




The administrative organs of the DKE comprise the union of sponsors, the concerned associations, the Council, the president and the vice-presidents, the Board of Directors with the business organization and the technical committees and subcommittees.

The union of sponsors is composed of companies, public authorities and other institutions supporting the work of the DKE both financially and by delegating their staff to cooperate in the DKE work.

*Council*

The Council (LA) consists of 30 leading personalities from industry, science and administration, who are appointed from major concerned associations that are affected by DKE work.

The LA is the highest decision-making body in the DKE. Its duty incorporates the general control of the DKE and international and regional cooperation in the field of electrotechnical standardization. The President of the DKE, elected by the LA from among its members, represents the DKE both within the organization and in public. He participates in decisions regarding organizational, administrative, personnel and financial issues.

*Technical Advisory Boards*

The following boards work on behalf of the LA:

Technical Advisory Board International and National Coordination (TBINK), representing the German Committee of the IEC and of CENELEC,

Technical Advisory Board ETSI (TBETSI),

Technical Advisory Board Evaluation for Conformity (TBKON).

The Permanent Advisory Group Technology (BKT) of the LA analyses areas of standardization in the field of new technologies. In addition, the Financial Advisory Board has been created by the LA as an advisory body for issues of financing.

*Board of Directors*

The Board of Directors consists of one or more managing directors. One of them assumes the role of Chairman of the Board of Directors.

The Board of Directors conducts the DKE business in accordance with the internal regulations and the guidelines approved by the Council. It is their duty to implement the decisions taken by the Council. The Board is in charge of the proper support of the technical bodies. With regard to technical aspects it is responsible to the DIN Director and the VDE Board of Directors for sound management. With regard to financial aspects it reports to the VDE Board of Directors. In legal relations the managing directors act on behalf and account of the VDE.

*Financing of DKE*

The DKE business organization finances about 95 % of its budget from the proceeds of standards prepared by the DKE and sold by the VDE VERLAG and Beuth Verlag.

The remainder is contributed by the union of sponsors, which has about 400 member companies, five associations of the electrical industry and nine associations closely connected to electrotechnical standardization.

*Committees of interest*

Commercial refrigeration (DKE / UK 511.5)

Domestic refrigeration (DKE / GUK 513.6),

Electric motors and systems (DKE/K 311 Drehende elektrische Maschinen and DKE/UK 311.1 Elektrische Maschinen, Leistungen und Abmessungen)

Lighting (DKE/K 521),

Televisions (DKE/K 742)

Transformers (DKE/K 321)

### *DIN (Deutsch Institut für Normung e. V.)*

*Website address:* http://www.din.de

DIN is very similar to DKE (in fact DKE is an off-shoot of DIN) but operates in the same areas of standardization as ISO and CEN.

With its 72 standards committees the DIN German Institute for Standardization is the responsible standardization body of the Federal Republic of Germany. Within the framework of its terms of reference, DIN is the German member in the European and international standardization organizations. The legal basis for the assignment of its' duties are: the DIN Statutes, standards series DIN 820 "Standardization" and the Standards Agreement made with the Federal Republic of Germany on 5 June 1975.

## B.4 UK (BSI)

BSI is the national standards body for the UK and is also the main standards development organization body in the UK. However, most standards development work in the UK tends to be concentrated on CEN and CENELEC as these bodies are the only ones authorized to produce European-wide standards. BSI is responsible for representing UK interests in European standards organizations such as CEN and CENELEC.

BSI is the business standards company that helps organizations all over the world make excellence a habit. For more than a century, BSI has been challenging mediocrity and complacency to help embed excellence into the way people and products work. That means showing business how to improve performance, reduce risk and achieve sustainable growth. As a global leader in helping organizations improve, clients range from high profile brands to small, local companies in 150 countries worldwide.

*Website address:* http://www.bsigroup.com/en-GB/

*Report links:* 2011 — http://www.bsigroup.com/en-GB/about-bsi/financial-information/

*Aims and objectives*

BSI Group delivers a comprehensive business services portfolio to clients, helping them raise their performance and enhance their competitiveness worldwide.

*ISO or IEC alignment*

*Standards bodies:* BSI works with standards bodies around the world to help develop best practice codes and standards, including ISO, IEC, CEN and CENELEC.

- CEN develops European standards and promotes voluntary technical harmonization in Europe in conjunction with worldwide bodies and its partners in Europe. BSI is a leading member of CEN in the development of European standards. The scope of CEN is comparable to ISO.
- CENELEC develops European standards and promotes voluntary technical harmonization in Europe in conjunction with worldwide bodies and its partners in Europe. BSI is a leading member of CENELEC in the development of European standards. The scope of CENELEC is comparable to IEC.
- ISO is a worldwide federation of national standards bodies from 140 countries including BSI. It promotes the development of standardization to aid the international exchange of goods and services. ISO's work results in international agreements, which are published as international standards.
- IEC is the global organization that prepares and publishes international standards for all electrical, electronic and related technologies.

*Partners:* Each of the BSI partners has the same authority, knowledge and expertise as BSI. BSI believes in the services they provide to support in raising standards. Partners include international standards bodies, industry associations and independent consultants who can help implement standards.

BSI produces British Standards, and is also responsible for the publication of European standards. BSI is obliged to adopt and publish all European Standards as identical British Standards (prefixed BS EN) and to withdraw pre-existing British Standards that are in conflict.

*Government interaction or influence*

The BSI role as the UK national standards body reaches across the international standards community. Users can get involved in helping to develop standards relevant to their industry, commenting on draft standards or becoming a consumer representative.

BSI represents the UK's economic and social interests across all European and international standards organization and in the development of business information solutions for British organizations of all sizes and sectors.

BSI is recognized as the UK national standards body by the UK Government. This status is formally codified in the MoU between the United Kingdom Government and the British Standards Institution in respect of its activities as the UK national standards body. The MoU recognizes BSI's status as the UK member of the international standards organizations, ISO and IEC; the European standards organizations, CEN and CENELEC; and as the national standards body participating on behalf of the UK in ETSI.

The MoU defines a number of key responsibilities for BSI as the national standards body. Its membership of the international and European standards bodies also entails a number of specific responsibilities. In addition, there are certain aspects of BSI's work that are further defined through the World Trade Organization's Technical Barriers to Trade Agreement, to which the UK Government is a signatory.

Most of BSI's responsibilities are undertaken on a day-to-day basis by BSI Publishing Ltd, a wholly owned subsidiary company of BSI Group. A Supply of Services Agreement sets the framework by which this can systematically monitored. The national standards body has the responsibility of the Director of Standards and is administered within the External Policy team. It receives some funding from the UK Government in recognition of work undertaken in the public interest. The exact scope of the activities regarded as belonging to the national standards body is listed in the BSI Code of Conduct.

The MoU can be found at: [http://www.bsigroup.com/Documents/about-bsi/BSI-UK-NSB-Memorandum-of-Understanding-UK-EN.pdf](http://www.bsigroup.com/Documents/about-bsi/BSI-UK-NSB-Memorandum-of-Understanding-UK-EN.pdf)

*Standards and committees*

BSI is recognized worldwide for providing independent objective guidance and assessments that people can trust. BSI is the market leading certification body in the UK and the USA and have more than 70 000 active client sites in 147 countries. They have 57 offices worldwide, 64 000+ customers, 30 000+ current standards, 2 600 standards published annually.

The day-to-day business of BSI is managed from three geographical regions, Europe, Middle East and Africa, the Americas and Asia Pacific, implementing global strategies locally. Global management is in place in each of our three business streams and their subdivisions to develop global strategy and solutions to meet the needs of a global client base.

*Committee number and structure*

BSI works with 9 000 committee members whose expertise help to shape best practice codes and standards, now and into the future. These experts are leaders in their chosen field. They are committed to delivering the best in standards and promoting the UK voice across the international and European standards communities.

Committee members provide the link between stakeholder interests and BSI work. This means they play a vitally important role in allowing BSI to provide users with robust standards and the best possible service as a standards body.

There are currently 1 350 BSI committees with approximately 10 000 Members. All Committee Members give their time and expertise on a voluntary basis often with the support of their employer or trade association. The commitment required varies between and within committees, depending on the current work program and the level of participation. Most committees only meet a few times each year but some members also represent the national view at European and international meetings abroad.

A list of committees, together with their Terms of Reference, can be found at: https://ecommittees.bsi-global.com/bsi/controller

*Governance, rules and regulations*

*Royal Charter:* The Royal Charter is essentially an enabling document that sets out the purpose of BSI and defines in broad terms its range of activities, including its functions as a standards body, as well as its ability to offer training, testing and certification services. It does not, to any great extent, impose specific duties or responsibilities on the company. The Royal Charter is supplemented by the Bye-laws which detail some aspects of how BSI has to be run. They cover matters such as membership, the conduct of General Meetings and the composition of the Board.

See also: http://www.bsigroup.com/about-bsi/governance/the-royal-charter/

*External policy and relations:* The External Policy team falls under the direct responsibility of the Director of Standards. It has three main areas of activity and responsibility:

- to be the principal link between BSI and its international counterpart organizations; the External Policy team coordinates the formal relationship with other national standards organizations and participates in the management structures of ISO, IEC, CEN and CENELEC
- to coordinate BSI’s relationship with central and local government departments and agencies
- to manage BSI’s activities as the national standards body.

More information can be found at: http://www.bsigroup.com/about-bsi/uk-national-standards-body/external-policy-and-relations/

*Governance framework*: the Board of the British Standards Institution is committed to the highest standards of corporate governance which it considers fundamental to the success of the business. The Company is incorporated by Royal Charter and, as such, is not required to apply FRC Codes of Governance. Nevertheless, the Board has complied throughout the accounting period with the FRC UK Corporate Governance Code 2010 on Corporate Governance wherever relevant and practical.

*Committees of interest*

IEC/ISO committees that are broadly mirrored in BSI (and CEN and CENELEC) are:

- Refrigeration and air-conditioning: ISO TC86 = CPL/061
- Audio, video and multimedia systems and equipment: IEC TC100 = EPL/100
- Performance of household and similar electrical appliances (Household appliances): IEC TC59 = CPL/059XX
- Lamps and related equipment (Lighting): IEC TC34 = CPL/034
- Power electronics: TC22 IEC = PEL/022
- Power transformers: IEC TC14 = PEL/014
- Refrigerators/freezers: IEC SC59M = CPL/059/13
- Rotating machinery: IEC TC2 = PEL/002
- Wet appliances: IEC SC59A +59D = CPL/059/01.

## B.5 Australia (Standards Australia (AS))

Standards Australia is Australia's peak nongovernment standards organization. Formed in 1922, the Australian Commonwealth Engineering Standards Association joined the IEC in 1925 and ISO in 1947 as a founding member. During the 1940s, the organization become the Standards Association of Australia, then in 1999 changed its name to Standards Australia International Limited. It was sold to SAI Global Limited in 2003.

Standards Australia is the national standards body for Australia and is also the largest and most important standards development organization in Australia. Standards development in Australia is closely linked to New Zealand in many fields and there is the option for joint committees with Standards New Zealand for most standards.

*Website address:* http://www.standards.org.au/Pages/default.aspx

*Report links:* http://www.standards.org.au/OurOrganization/AboutUs/Pages/Governance-and-Reports.aspx

*Aims and objectives*

The work of Standards Australia is intended to enhance the Australia's economic efficiency, international competitiveness and contribute to community demand for a safe and sustainable environment. It leads and promotes a respected and unbiased standards development process ensuring all competing interests are heard, their points of view considered and consensus reached.

*Mission*: As Australia's peak nongovernment standards development organization, the Standards Australia mission is to excel in the provision of contemporary, internationally aligned standards and related services for the benefit of Australia, and to contribute to innovation and productivity.

*ISO or IEC alignment*

Standards Australia represents Australia on the two major international standardization bodies, ISO and IEC. It coordinates the nomination of Australian experts on Technical Committees, Subcommittees and working groups and attendance at international meetings. Australia and participates extensively in the preparation of a wide range of IEC and ISO international standards. Standards Australia is extremely active within the International Standardization movement and a number of the senior management team members hold important voluntary offices in these international standards bodies.

Standards Australia participates in 265 ISO technical committees and subcommittees, and 80 IEC technical committees and subcommittees. It also participates in 9 JTC1 and JTC2 Subcommittees. Standards Australia has 19 Secretariats of ISO Technical Committees and Subcommittees, and 2 Secretariats of IEC Technical Committees and Subcommittees.

In general terms the Australian committee structure follows the IEC structure, due to strong coordination and committee participation in IEC by Standards Australia.

*Coordination of Australia's Participation in International Standards Development*: To ensure the integrity and effectiveness of Australia's participation in international standards work, Standards Australia acts as the coordination point for Australian representation at international standards meetings. This includes:

- ensuring that stakeholders are informed about opportunities to participate and the benefits of participating in international standards work

- receiving and reviewing nominations for delegates representing Australia at international standards meetings. This includes ensuring all delegates are supported by a balanced group of Australia stakeholders
- providing guidance documents and training to assist delegates attending international meetings.

In 2012, 180 new standards were developed, 301 Australian Standards and related products produced. Of the 180 new standards published, 53% were identical or equivalent to IEC or ISO standards. A large number of IEC and ISO standards are republished as AS standards.

Australian government policy is to generally adopt IEC and ISO standards wherever possible.

*Government interaction or influence*

Standards Australia is the nation's peak nongovernment standards organization. It is charged by the Commonwealth Government to meet Australia's need for contemporary, internationally aligned standards and related services.

Standards Australia is an independent company, not directly associated with government, although the Commonwealth Government and State governments are listed among its members. However, the important role of standards in any advanced nation's technical infrastructure means that a close and cooperative working relationship with government is essential. To ensure this, a Memorandum of Understanding has existed between Standards Australia and the Commonwealth Government since 1988. The Memorandum recognizes Standards Australia as the peak nongovernment standards body in Australia.

This Memorandum details the accord that exists between the two parties in respect to Australian standardization. Among the principal accords are that no Australian standard will contravene the World Trade Organization's requirements that national standards should not be used as nontariff barriers to free trade; and agreement that no new Australian standards will be developed where an acceptable international standard already exists.

There is also a Memorandum of Understanding between the Australian Government and Standards Australia that provides for rapid development and publication of specific standards that are used for regulatory or other purposes (mainly in the field of energy). This involves a fee for service arrangement between the parties as long as specific performance benchmarks are achieved.

The operating budget of Standards Australia is approximately AU $20 million per annum. About 25% of total income is project related activities and grants, much of which comes from the Australian Government. The Australian Government provides financial support to Standards Australia to assist with travel costs for Australian delegates to attend IEC and ISO meetings.

*Standards and committees*

Standards Australia maintains 6 920 Australian standards across all major sectors. There are 1 402 Australian Standard Amendments, and 203 Australian Standard Supplements. There are 53 Rulings, 290 Handbooks, 41 Miscellaneous Products and Publications, and 115 Technical Specifications and Reports.

Standards development occurs through 934 active committees and subcommittees (421 active Technical Committees, 513 active Subcommittees), involving 9 243 committee members and 189 active working groups. There are 2 412 nominating organizations. Standards development work is organized into sectors as follows:

- Agriculture Forestry Fishing and Food
- Building and Construction
- Communications, Information Technology and e-Commerce Services
- Consumer Products and Services and Safety
- Education and Training Services
- Energy
- Health and Community Services
- Manufacturing and Processing
- Mining
- Public Safety, Public Administration, Business and Management
- Transport and Logistics
- Water and Waste Services.

A list of all Technical Committees organized by sector can be found at http://www.sdpp.standards.org.au/

*Governance, rules and regulations*

Currently, 73 of Australia's leading industry, government and consumer organizations form the Members of the Standards Australia Council. The Council has the responsibility to elect the Board of Directors, the Accreditation Board for Standards Development Organizations (ABSDO), and to appoint new Members to the organization. The Standards Australia Council is responsible for the general oversight of standardization in Australia and the governance of Standards Australia.

*Standards development support*

- Standards Australia's National Sector Managers can assist organizations to identify the most appropriate pathway for developing an Australian standard.
- Standards Australia assists organizations seeking accreditation as a standards developing organization. While the accreditation process is overseen by the ABSDO, Standards Australia acts as a facilitator, enabling organizations to understand the Australian standards development landscape.
- Standards Australia has developed a series of guides to assist organizations with the registration, development, approval and maintenance of Australian Standards.

More information on Governance and Reports can be found at
http://www.standards.org.au/OurOrganization/AboutUs/Pages/Governance-and-Reports.aspx

*Committees of interest*

Where there are active international (ISO and IEC) standardization projects that are of special interest to Australia, special "Mirror Committees" may be established. These committees are usually formally constituted and do not have active projects but only exist to consider and have input into international standardization projects. These committees may also supply delegate to the relevant international committees preparing the standards. MCs also provide the basis for Australia's vote on the international standards. Where appropriate, a MC may raise a project to adopt the international standard as an Australian Standard; a process known as "parallel adoption".

However, while standards committees in Australia generally reflect the overall structure of related ISO and IEC committees, they are often not identical. Most committees have additional local projects, which often involve adaptation of IEC/ISO standards for local use or development of regulatory or other frameworks to support their implementation. Note that most committees under the jurisdiction of Standards Australia are joint committees with Standards New Zealand (where there is sufficient interest and participants from NZ). There are additional governance rules regarding voting and administration of joint committees.

IEC/ISO committees that are broadly mirrored in Australian Standards are:

- Refrigeration and air-conditioning: ISO TC86 = AS/NZS EL056 (previously EL15/16, EL016 and ME009)
- Audio, video and multimedia systems and equipment: IEC TC100 = AS/NZS TE021
- Performance of household and similar electrical appliances (Household appliances): IEC TC59 = AS/NZS EL015
- Lamps and related equipment (Lighting): IEC TC34 = AS/NZS EL041
- Power electronic systems and equipment: TC22 IEC = AS/NZS EL027
- Power transformers: IEC TC14 = AS/NZS EL008
- Refrigerators/freezers: IEC SC59M = AS/NZS EL060 (previously EL015/23 and ME023)
- Rotating machinery: IEC TC2 = AS/NZS EL009
- Wet appliances: IEC SC59A +59D = AS/NZS EL059 (previously EL015/4).

## B.5 Canada

Canada has two principal standardization bodies, the Standards Council of Canada and the Canadian Standards Association.

### *Standards Council of Canada*

The national standards body for Canada is the Standards Council of Canada and was established in 1970. SCC is a federal Crown corporation with the mandate to promote efficient and effective voluntary standardization in Canada, where standardization is not expressly provided for by law. SCC reports to Parliament through the Minister of Industry. SCC is the organization that represents Canada on ISO and IEC.

The Standards Council of Canada (SCC) does not develop standards itself, but it plays the important role of coordinating standards work in Canada and ensuring Canada's input on standards issues in international standards organizations.

The SCC accredits Canadian a small number of standards development organizations and also approves Canadian standards as National Standards of Canada based on a specific set of requirements regarding their development. In Canada, SCC accredits the following standards developing organization:

- ASTM International
- Bureau de normalization du Québec
- Canadian General Standards Board (CGSB)
- Canadian Standards Association (operating as CSA Group)
- ULC Standards
- Underwriters Laboratories Inc.

The most important and significant national standards body in terms of performance standards for appliances and equipment is CSA Group.

*Website address:* http://www.scc.ca/en

*Report links:* http://www.scc.ca/en/about-scc/corporate-documents/annual-reports

*Aims and objectives*

*Mandate:* To promote efficient and effective voluntary standardization in Canada, where standardization is not expressly provided for by law.

*Mission:* To lead and facilitate the development and use of national and international standards and accreditation services in order to enhance Canada's competiveness and well-being.

*Vision:* To improve Canadians' quality of life through leadership of Canada's standardization network.

*ISO or IEC alignment*

SCC joined ISO in 1972, and started selling ISO standards in 1976. SCC past members include a past president of the IEC, as well as a number of IEC executive board members (Council Board, IEC Standardization Management Board, ISO Technical Management Board). SCC is also the Chair of ISO/COPOLCO.

The standards branch is organized into three sections: Canadian Standards Development, International Standards Development and Global Standards Governance.

The International Standards Development Program facilitates and manages Canada's participation in the international standards development activities of the technical committees and subcommittees of ISO and IEC.

Through the Standards Development Organizations Advisory Committee (SDOAC), the Global Standards Governance Program facilitates and manages Canadian participation in international policy committees within ISO and IEC, and in regional organizations, including the Pacific Area Standards Congress and the Pan American Standards Commission. This includes oversight of the Consumer and Public Interest Panel and the Canadian National Committee of the IEC.

*Government interaction or influence*

*Governing Council:* The Standards Council of Canada is a crown corporation and reports to Parliament through the Minister of Industry. Oversight is provided by the Governing Council which approves the strategic direction of the organization.

The Governing Council is appointed by the federal government and reports to Parliament through the Minister of Industry. It is composed of up to 13 members who represent a broad spectrum of stakeholder interests. Members review, approve and advise SCC on its strategic direction.

*Standards and committees*

SCC does not develop standards itself, but it plays the important role of coordinating standards work in Canada and ensuring Canada's input on standards issues in international standards organizations. The SCC accredits Canadian standards development organizations and also approved Canadian standards as National Standards of Canada based on a specific set of requirements.

Expert committees representing standards developing organizations, manufacturers, governments, consumers and other interested parties develop standards at the national and international levels. The SCC supports the work of over 15 000 members from various stakeholder groups working on 1 000 national and international standardization committees.

*Governance, rules and regulations*

*Transparency:* The SCC posts summaries of completed Access to Information requests processed under the *Access to Information Act*. Requests for personal information or third-party information are not posted.

Info Source provides information about the functions, programs, activities and related information holdings of government institutions subject to the *Access to Information Act* and the *Privacy Act*. It provides individuals and employees of the government (current and former) with relevant information to access personal information about themselves held by government institutions subject to the *Privacy Act* and to exercise their rights under the *Privacy Act*.

More information about Info Source can be found here: http://www.scc.ca/en/info-source-sources-federal-government-and-employee-information

*Committees of interest*

SCC does not prepare standards itself and therefore has no mirror committees.

### *Canadian Standards Association (CSA)*

The CSA Group is a not for profit membership based association serving business, industry, government and consumers in Canada and the global marketplace. As a solutions oriented organization, CSA works in Canada and around the world to develop standards that address real needs, such as enhancing public safety and health, advancing the quality of life and helping to preserve the environment. Facilitating trade, CSA helps people understand standards through education and information products and services. Each year, thousands of people benefit from the training materials, workshops and seminars offered by the CSA Group Learning Institute.

CSA is the largest standards development organization in Canada.

*Website address:* http://www.csa.ca/cm/ca/en/home

*Report links:* 2011 — http://www.csa.ca/cm/ca/en/about-csa/annual-report

*Aims and objectives*

The core CSA values are:

- accountability —this involves applying CSA's values and mission and taking responsibility and being accountable for work and actions in the decisions that are made for colleagues, customers and members
- continuous learning — CSA is a supportive, action oriented organization. There is investment in colleagues so that every CSA employee improves their personal and professional skills. CSA works to exceed the expectations of customers and members. CSA provides experts and ensures that the highest standards of excellence and quality are continually delivered
- integrity and mutual respect — CSA works in an honest, trust based, professional and principled manner to deliver exceptional results to members and customers, striving to exceed goals. CSA embraces and

promotes an inclusive and diverse work culture where decisions are guided by the highest standards of fairness, objectivity and dignity
- safety — CSA promotes public safety and leads by example through workplace health and safety practices, the services provided and values lived by
- sustainability — CSA is dedicated to promoting sustainable solutions on behalf of stakeholders and the communities served, through environmental and economic practices, contributions to driving social good, and by the values lived each and every day.

*ISO or IEC alignment*

The involvement of CSA in ISO and the IEC is governed through SCC. Many of the delegates provided to IEC and ISO Technical Committees and Subcommittees are from CSA committees.

While alignment with international standards in Canada is an objective, most of the local efforts regarding international engagement are focused on North America and meeting the obligations under NAFTA.

*Government interaction or influence*

CSA is an independent, not for profit organization. That said, it is governed by the input of SCC, which has a Governing Council appointed by the federal government of Canada.

CSA is a member based organization governed by a Board of Directors. The majority of directors are elected by the voting membership. The others are appointed by the elected board members.

Standards are funded by CSA and stakeholders interested in the process. This can include government, industry and associations. Typically, a standard is funded through a combination of these sources. Our standards development process ensures that the content of the standard is not influenced by the way that it funded.

*Standards and committees*

CSA standards are developed by volunteer technical committees consisting of representatives from groups such as government, industry, consumer groups and users impacted by the standards. The process ensures that no one group dominates the process. The committees use a consensus based approached to determine the contents of a standard. CSA employees facilitate the standards development process.

Many standards define safety requirements intended to reduce the risk of personal injury due to electrical shock or fire. Some standards set levels of performance for products, and increasingly standards address social concerns, such as how the environment is managed or how information is being used. CSA facilitates committees of volunteer experts to develop standards using a balanced matrix approach and has published around 3 000 standards to date. About 80 of these standards pertain specifically to energy efficiency issues. More than one third of these are referenced in legislation passed by jurisdictions throughout North America.

Energy efficiency standards are listed at: http://shop.csa.ca/en/canada/energy/energy-efficiency/icat/energyefficiency&bklist=icat,5,shop,publications,energy,energyefficiency

CSA are moving to sponsored access of CSA Energy Efficiency Standards. Over time all the Energy Efficiency Standards are expected to transition over to the Energy Efficiency Web Portal (see http://Energyefficiency.csa.ca).

In the energy field, the overall structure in CSA is as follows:

- CSA Standards Policy Board
- Strategic Steering Committee on Performance, Energy Efficiency, and Renewables (C400)
- Technical Committee on Heating, Ventilation, Air Conditioning & Refrigeration C401
- Technical Committee on Industrial Equipment C402
- Technical Committee on Residential Equipment C403
- Technical Committee on Lighting C419
- Technical Committee on Solar Energy C420
- Technical Committee on Energy Management C422.

Under these Technical Committees lie a number of specific product committees.

CSA is an independent, not for profit member driven organization with over 9 000 members from all walks of life. Memberships at CSA consist of 7 500 volunteer committee members, and 1 500 sustaining and corporate sustaining members. CSA members come from all walks of life and professions. They sit on more than 1 200 committees that give input on standards for thousands of products, materials and services in hundreds of categories. Members fall into three categories:

- Volunteers — vote on standards development committees
- Associate Members — actively contribute to committee work, but do not vote on standards
- Sustaining Members — support standards development through membership dues and receive member benefits.

*Consensus:* Committee members go through a process of assessing pertinent information and concerns regarding the issues addressed by the standard. The committee must reach consensus of opinion through a ballot and public review process before a voluntary standard may be published. Even after publication, standards are reviewed, updated and fine-tuned, in an effort to reflect the latest developments in safety and technology, as well as the current realities of the marketplace.

### *Governance, rules and regulations*

The CSA organizational structure is as follows:

- the Chair and other members will be appointed by the CSA Group Board of Directors every 2 years, for a term of 2 years, and may be reappointed for further terms, not normally to exceed three terms
- the SPB shall consist of a Chair appointed from the CSA Group Board of Directors, and up to fifteen voting members according to the following matrix of interest categories:
  - Industry/Provider — 3 to 6 members
  - Government/Regulator — 3 to 5 members
  - Consumer/User — 3 to 5 members
  - General Interest — 3 to 5 members.
- a majority of the CSA Group Board of Directors shall be voting members of the SPB and individual CSA Group Directors shall be appointed to the SPB according to the matrix of interest categories set out above
- the Chair of the CSA Group Board of Directors, the President and CEO of CSA Group, and the President, Standards, shall be ex officio nonvoting members of the SPB
- the CSA Group Board of Directors may appoint nonvoting associate members, as required
- one-half of the voting members shall constitute a meeting quorum
- appointments to the SPB are individual appoints, alternate or proxies are not permitted
- meetings of the SPB shall normally be open only to members of the SPB. However, on specific request, visitors or observers may be permitted with the consent of the Chair.

For a CSA governance policy document, see also:
http://www.csa.ca/about/governance/pdf/TermsofReferenceDivisionsCommitteesJuly2012.pdf

For more information concerning corporate governance, see also: http://www.csa.ca/cm/ca/en/about-csa/corporate-governance

### *Committees of interest*

The structure of CSA Technical Committees does not match IEC and ISO exactly, but coverage is comparable in a number of committees. The mains ones of interest are:

- Air conditioners and refrigerating equipment: CSA TC HVAC&R (C401) (many subcommittees, mainly large commercial systems), ISO TC86 (SC5) = C403.26 (Room Air Conditioners)
- Audio, video and multimedia systems and equipment: IEC TC100 = Comparable to several Subcommittees under Residential Equipment (C403.19 (STB), C403.23 (TVs), C403.25 (displays), C403.27 (SNE))
- Household appliances: IEC TC59 = CSA TC Residential Equipment (C403)
- Wet appliances dishwashers: IEC SC59A = CSA SC Dishwashers (C403.3)
- Wet appliances laundry: IEC SC59D = CSA SC Laundry Appliances (C403.2)
- Refrigerators/freezers: IEC SC59M = CSA SC Refrigerators & Freezers (C403.9)

- Lamps and related equipment (Lighting): IEC TC34 = Comparable to CSA TC Lighting (TC 419) (many subcommittees)
- Power electronics: TC22 IEC = Comparable to several Subcommittees under Residential Equipment (C403.20 (EPS and chargers)
- Power transformers: IEC TC14 = Subcommittee under Industrial Equipment (C402.15 and C402.16)
- Rotating electrical machinery: IEC TC2 = CSA SC for Large Motors (C402.3 (small) and C402.5 (three phase)).

While SCC is the national standards body for Canada, the operation and administration of mirror committees (where they exist) generally rests with the applicable Canadian standards developing organization and technical committee (in many cases CSA).

## B.6 China (SAC and CNIS)

### *SAC (Standardization Administration of the People's Republic of China)*

The Standardization Administration of the People's Republic of China (SAC) is the national standards body representing China in IEC and ISO. The SAC approves and organizes the implementation of cooperation and participation in projects on international standardization. It was established in April 2001 and authorized by the State Council to exercise administrative responsibilities by undertaking unified management, supervision and overall coordination of standardization works in China. As a government authority providing horizontal functions, the SAC collaborates with other authorities to ensure that standardization is in accordance with government strategies, policies and regulations. Some work in specialized areas is devolved to other administrative departments.

Other bodies associated with the SAC are:

- the China Association for Standardization (CAS), undertaking academic research, standards development dissemination and education, training, technology exchanges and publishing (see http://www.sac.gov.cn/sac_en/KnowledgeofStandards/StandardizationOrganizationsinChina/201011/t20101123_4197.htm)
- the China National Institute of Standardization (CNIS), promoting standardization, research and development and management of standards and playing a strong role in national standards processes (see http://www.sac.gov.cn/sac_en/KnowledgeofStandards/StandardizationOrganizationsinChina/201011/t20101123_4196.htm).

*Website address:* http://www.sac.gov.cn/sac_en/

*Aims and objectives*

The SAC's main responsibilities include:

- drafting and revising the state laws and regulations on standardization; formulating and implementing policies on standardization; formulating national administrative rules on standardization and developing relevant systems; organizing the implementation of laws, rules and systems of standardization
- formulating the development programs on standardization of China; organizing, coordinating and drafting programs on the development and revision of national standards
- organizing the development and revision of national standards; examining, approving, numbering and publishing national standards
- managing funds used for the development and revision of national standards and funds used for research and standards and standardization activities
- managing and guiding scientific and technical work related to standardization, and the associated dissemination, education and training
- coordinating and administering national technical committees of standardization
- coordinating and guiding sector and local standardization work; registration of sector and local standards
- representing China in ISO and the IEC, and in other international and regional standardization organizations.

*ISO or IEC alignment*

SAC represents China in ISO and the IEC, as well as other international and regional standardization organizations. It is responsible for organizing the activities of the Chinese National Committee for ISO and the IEC, and approves and organizes the implementation of international cooperation and technical exchanges on standardization.

The Chinese government has a high-level policy of broad alignment with IEC and ISO standards. In order to assist this process, the following rules apply in China.

1. When the proposals for national standards are submitted to SAC, those intending to adopt International Standards will have priority approval.
2. Research programs that examine replacement of existing standards with International Standards will be given financial support.
3. Updating of national standards, where these are linked to a revision of an International Standard, will be provided a fast track procedure.

The SAC acknowledges that China's participation in international standardization activities is still at a low level in some areas, which in turn influences their ability to align local standards with International Standards. However, the direction is to continue to make the adoption of International Standards a key technical and economic policy in China. Further work will be undertaken to promote alignment with International Standards. China also wants to actively participate in international standardization activities in order to follow developments and to help in the adoption of more International Standards over time.

China's engagement in ISO, IEC, and other international standards bodies has grown significantly over the past 5 years as outlined in China's 11th Five-Year Plan (5YP) for 2006–10. This has included sharp increases not only in China's level of participation but also in the number of leadership positions held by China, including 47 ISO Secretariats. China has also gained permanent seats on the top governing committees of both ISO and IEC.

*Government interaction or influence*

The SAC is part of the Chinese government establishment, so standardization work is under the direct control of government.

Most standards development projects in China are initiated by the government, which grants funding and authority to technical agencies (generally quasi-governmental organizations) to carry out standards development work.

The process for international participation can be broadly summarized as:

- SAC represents China as the national standards organization for ISO and IEC as well as other international and regional standardization organizations
- SAC is responsible for organizing the activities of the Chinese National Committee for ISO and IEC as well as national standards
- SAC approves and organizes the implementation of international cooperation and exchanging projects on standardization
- after SAC has designated various industry associations or institutes to spearhead/or lead some IEC mirror committees (see the list in the previous section), SAC leaves ongoing management to them as SAC generally does not have deep technical expertise on all of the technical areas covered.

However, SAC where there was a technical area of particular interest or concern, then SAC could provide some direct influence into the process.

*Standards and committees*

There are currently some 29 994 GB standards.

Chinese standards are either mandatory or voluntary. Those concerning protection of human health, personal property and safety and those enforced by laws and administrative regulations are mandatory standards; and others are voluntary.

*Chinese standards*

— Chinese standards are classified as National, Professional, Local or Enterprise Standards.

- National Standards are developed for technical requirements and need to be unified nationwide.
- Professional Standards may be developed where no National Standards are available but unified technical requirements are needed in a certain professional field throughout the country.
- Local Standards may be developed where neither National Standards nor Professional Standards are available but unified requirements for safety and hygiene of industrial products are needed within a local area.
- Enterprise Standards may be developed within an enterprise when National Standards, Professional Standards and Local Standards are not available. However, an enterprise is encouraged to adopt National Standards, Professional Standards and Local Standards if they are available.

Moreover, national advisory technical documents may be developed in some instances, either as guidance documents or when ISO/IEC or other international standards have not been developed.

More information on the code for Chinese Standards can be found at:
http://www.sac.gov.cn/sac_en/KnowledgeofStandards/ChinaStandardizationAdministration/201011/t20101123_4194.htm

There are some 518 technical committees in China. A complete list can be found at:
http://www.sac.gov.cn/SACSearch/search%3Fchannelid%3D61613&usg=ALkJrhgbUbjz6wDY_VWzVk1-o7S65cgNow

*Governance, rules and regulations*

Chinese IEC Standardization Management Board (SMB) members come from SAC, which functions much like the IEC SMB. This authority is also responsible for reviewing, approving, adjusting, and disbanding, if necessary, SAC technical committees/subcommittees; in turn, they review, approve and monitor the progress of various standards projects.

The SAC technical committees/subcommittees and IEC Technical Committees/Subcommittees are the same in terms of standardization functions, but there are also differences. First, as in other countries and regions, Chinese electrotechnical standards bodies operate their non-IEC technical committee/subcommittee mirrors according to industry demand. Second, one SAC technical committee/subcommittee may mirror several IEC Technical Committees/Subcommittees, based on many factors such as representation, widely recognized technology division, and the effectiveness of coordination.

*Committees of interest*

Note: the following links are in Chinese. These links contain the contact details for the technical committee, as well as any other pertinent information.

IEC/ISO committees that are broadly mirrored in SAC are as follows.

- Refrigeration and air-conditioning ISO TC86 = SAC TC143: http://www.sac.gov.cn/SACSearch/search?channelid=136477&templet=WYH_EN_detail.jsp&searchword=doctitle=TC143
- Audio, video and multimedia systems and equipment IEC TC100 = SAC TC242: http://www.sac.gov.cn/SACSearch/search?channelid=136477&templet=WYH_EN_detail.jsp&searchword=doctitle=TC242
- Performance of household and similar electrical appliances [Household appliances] IEC TC59 = SAC TC46: http://www.sac.gov.cn/SACSearch/search?channelid=136477&templet=WYH_EN_detail.jsp&searchword=doctitle=TC46
- Lamps and related equipment [Lighting] IEC TC34 = SAC TC22: http://www.sac.gov.cn/SACSearch/search?channelid=136477&templet=WYH_EN_detail.jsp&searchword=doctitle=TC224
- Power electronic systems and equipment TC22 IEC = SAC TC60: http://www.sac.gov.cn/SACSearch/search?channelid=136477&templet=WYH_EN_detail.jsp&searchword=doctitle=TC60
- Power transformers: IEC TC14 = SAC TC44: http://www.sac.gov.cn/SACSearch/search?channelid=136477&templet=WYH_EN_detail.jsp&searchword=doctitle=TC44

- Performance of electrical household and similar cooling and freezing appliances [Refrigerators/freezers] IEC SC59M = SAC TC119: http://www.sac.gov.cn/SACSearch/search?channelid=136477&templet=WYH_EN_detail.jsp&searchword=doctitle=TC119
- Rotating machinery: IEC TC2 = SAC TC26: http://www.sac.gov.cn/SACSearch/search?channelid=136477&templet=WYH_EN_detail.jsp&searchword=doctitle=TC26

To assist with standardization work, SAC works closely with the following industry bodies and devolves some of the management responsibility of IEC mirror committees.

- China Electricity Council (CEC): the representative for electrical grid operators, to manage 11 IEC TC/SC mirrors).
- China Electrical Equipment Industry Association (CEEIA): the representative for electrical equipment manufacturers, to manage 70 IEC TC/SC mirrors).
- China Household Electric Appliance Research Institute (CHEARI): the representative for household appliance manufacturers, to manage 12 IEC TC/SC mirrors).
- China Electronics Standardization Institute (CESI): the representative for information and communication technology product manufacturers, to manage 30 IEC TC/SC mirrors).

## B.7 Japan (JIS)

The Japanese Industrial Standards Committee (JISC) was established in 1949. JISC is the national standards body that is the representative on ISO and IEC. JISC hosts many national committees and plays central role in standardization activities in Japan. Responsibilities include administration of accreditation and certification, participation and contribution in international standardization activities, and development of measurement standards and technical infrastructure for standardization.

The JISC also establishes and maintains Japanese Industrial Standards. The JISC Secretariat is part of the Technical Regulations, Standards and Conformity Assessment Policy Unit under the Industrial Science and Technology Policy and Environment Bureau within the Ministry of Economy, Trade and Industry.

More information can be found at: http://www.jisc.go.jp/eng/cooperation/jiscactivity201202.pdf

*Website address:* http://www.jisc.go.jp/eng/

*Report links:* 2010 Annual Report — http://www.jisc.go.jp/policy/nenji/houkoku2010eng.pdf

*Aims and objectives*

JISC consists of many national committees and plays a central role in standardization activities in Japan. The task of JISC is the establishment and maintenance of JIS, administration of accreditation and certification, participation and contribution in international standardization activities, and development of measurement standards and technical infrastructure for standardization.

*Mission:*

- development, revision and abolition of JIS
- administration of Accreditation and Certification
- development of Metrology Standards and Technical Infrastructure for Standardization and Conformity Assessment
- participation in international standardization activities (ISO/IEC).

*ISO or IEC alignment*

Japan participated in the first IEC meeting in 1906, and joined the IEC in 1910. In 1952, JISC joined ISO and in 1953 JISC joined the IEC.

Government policy is set out by the Ministry of Economy, Trade and Industry in Japan is the eventual abolition of JIS Standards and full adoption of ISO and IEC standards. This means that there is strong pressure to move to ISO and IEC standards wherever possible. JISC is unusual as it states as part of its mission eventual abolition of local JIS standards and the universal adoption of IEC and ISO standards.

ISO and IEC activities include participation as a Participating (P) Member in Technical Committees (TCs), Subcommittees (SCs) or Working Groups (WGs), which requires active participation in meeting and the obligation of voting.

Japan is vigorously taking on the role of Secretariat and convenor in a wide range of international committees, including 3 ISO/IEC joint committees (JTC1). The number of Secretariats assigned to JISC has increased in recent years, although the number remains relatively low compared to the major countries in the EU and the USA.

JISC has a Participation Status for ISO in:

- 186 Technical Committees
- 552 Subcommittees
- Japan provides Secretariat for 60 Technical Committees and Convenor for 51 Technical Committees.

JISC has a Participation Status for the IEC in:

- 89 Technical Committees
- 88 Subcommittees
- Japan provides Secretariat for 15 Technical Committees and Convenor for 9 Technical Committees.

With respect to Japan's national standards, JISC has been promoting compliance with the GATT Standards Code (developed in 1980). With the enforcement of the WTO Technical Barriers to Trade (TBT) Agreement in 1995, Japan has been further promoting consistency with international standards in order to respond to demands inside and outside of the country.

Of the more than 10 000 JIS standards, around 4 890 had equivalent international standards in 2009. Some 40% of these JIS standard were identical (IDT) to the applicable international standards, 56% were modified versions (MOD) of the applicable international standards and 4% were not equivalent (NEQ) to the applicable international standards.

*Government interaction or influence*

Japan takes a direct management role in the standards process in Japan.

Within the Ministry of Economy, Trade and Industry, the Industrial Science and Technology Policy and Environment Bureau is responsible for the management and operation of the JISC. The Technical Regulations, Standards and Conformity Assessment Policy Unit within METI provide the secretariat for JISC and cover the following areas:

- Standardization Office for Industrial Infrastructure
- Standardization Office for Consumers and Environment
- Standardization Office for Information Technology and Electrotechnology
- Standardization Office for International Affairs.

The Office for International Affairs covers ISO/IEC administrative level, bi-multilateral, technical barriers to trade (TBT) and international technical cooperation. So the management of most international issues regarding standardization is handled directly by government in Japan.

JISC appoints the secretariat to each national mirror committee within JIS, so has some influence over this process. As noted above, the officer in charge of technical committees in JISC/METI can attend mirror committee meetings where required or where there is a topic of particular interest or concern.

The broader government aim with respect to JISC standardization in Japan and the Asia region are to:

- integrate promotion of R&D and standardization
- disseminate standards and conformity assessment systems evaluating energy efficiency performance on electrical electric equipment appropriately
- cooperate on research toward standardization contributing to the development of Asian regional industries

- promote the use of existing frameworks and schemes.

The major existing frameworks and schemes with the Asia-Pacific economies that have an influence on standardization activities are:

- APEC (Asia-Pacific Economic Cooperation)
- PASC (Pacific Area Standards Congress)
- AJCEP SC-STRACAP(so called Dialogue with ACCSQ)
- IEC-APSG(Asia Pacific Steering Group) Seminar
- ASEAN group invited training program in JICA
- ERIA (Economic Research Institute of ASEAN and East Asia).

*Standards and committees*

As of 2009 there were some 10 202 JIS standards in force, with almost half of these in three divisions: Mechanical Engineering (B), Electronic and Electrical Engineering (C) and Chemical Engineering (K).

JISC is organized into divisions. The letter indicates the technical area (JIS Division), and the 4- or 5-digit number is added to locate the JIS standard within that Division.

A. Civil Engineering and Architecture
B. Mechanical Engineering
C. Electronic and Electrical Engineering
D. Automotive Engineering
E. Railway Engineering
F. Shipbuilding
G. Ferrous Metals and Metallurgy
H. Non-Ferrous Metals and Metallurgy
I. No topic
J. No topic
K. Chemical Engineering
L. Textile Engineering
M. Mining
N. No topic
O. No topic
P. Pulp and Paper
Q. Management Systems
R. Ceramics
S. Domestic Wares
T. Medical Equipment and Safety Appliances
U. No topic
V. No Topic
W. Aircraft and Aviation
X. Information Processing
Y. No topic
Z. Miscellaneous.

JIS covers industrial and mineral products with the exception of (1) medicines, (2) agricultural chemicals, (3) chemical fertilizers, (4) silk yarn, and (5) foodstuffs, agricultural and forest products that are designated under the Law Concerning Standardization and Proper Labelling of Agricultural and Forestry Products.

The structure of JISC technical committees is as follows:

1. Civil Engineering
2. Architecture
3. Iron and Steel
4. Non-Ferrous Metals
5. Welding
6. Chemical Analysis
7. Chemical Products

8. Ceramics
9. Consumer Life Products
10. Paper and Pulp
11. Medical Equipment
12. Support for Aged and Disabled
13. Protective Equipment for Occupational Safety
14. Machine Elements
15. Industrial Automation
16. Measurement Technology
17. Industrial Machinery
18. Road Vehicles
19. Aircraft and Space Vehicles
20. Railways and Rolling Stock
21. Ships
22. Distribution of Goods
23. Electrical Technology
24. Electronics
25. Information Technology
26. Basic Engineering.

*Governance, rules and regulations*

The Japanese Industrial Standards Committee is made up of a Council, under which sits a Standards Board and a Conformity Assessment Board. The Standards Board has under its direction 26 Technical Committees as of early 2013. A wide range of stakeholders such as industry, consumers, academia and regulators participate in technical committees.

The **JISC Council** consists of up to 25 members and determines the JISC's comprehensive policies as its highest decision-making body by holding well-rounded discussions on the concept of standardization policies, based on its industrial policies, technological policies, and trade policies. The Council also compiles "Regulations for the operation of the JISC," which concretely stipulate deliberation procedures at the JISC, so as to formulate rules governing the operation of various committees established under the JISC banner in an effective manner.

The **Standards Board** has established policies with the aim of promoting "standardization, R&D, and acquisition of intellectual properties in a unified manner," "strategic international standardization so as to disseminate Japan's industrial technology throughout the global market," and standardization with full consideration of the aged and the disabled, and environment-friendly standardization, and has conducted deliberations to combine these policies with concrete activities in formulating standards.

As notified under the WTO/TBT Agreement that the Japanese Government signed in 1994, JISC was notified as the national standards body. The work program for establishment and revision of JIS provides giving 60 days' notice in advance of promulgation.

According to Industrial Standardization law, any interested party can request that a draft JIS be deliberated by JISC. Recent practice is that competent industrial association or academic society prepares the draft and submits it to the competent Minister on their own initiatives in the majority of cases or prepares drafts with the entrustment of the competent Minister. The association usually forms a committee consisting of representatives of manufacturers, consumers and users, and neutral parties.

After the draft JIS is submitted to the competent Minister, the Minister asks the president of JISC whether the draft is appropriate as a JIS standard. The president of JISC consults with the Standards Board. Furthermore, the Board may ask for further deliberation by the relevant Technical Committee. When JISC considers that the draft is appropriate and rational, this is reported to the competent Minister. When the Minister considers that the draft does not unduly discriminate against any interested party, the Minister then makes a decision to formally incorporate it in the Japanese Industrial Standards and announces it in the Official Gazette.

An organizational chart and other information for JISC can be found at:
http://www.jisc.go.jp/eng/cooperation/jiscorg.pdf

*Committees of interest*

IEC/ISO committees that are broadly mirrored in JISC are:

- Refrigeration and air-conditioning: ISO TC86 (SC5) = JIS Technical Committee on Industrial Machinery
- Audio, video and multimedia systems and equipment: IEC TC100 = JIS Technical Committee on Electricity Technology
- Performance of household and similar electrical appliances (Household appliances): IEC TC59 = JIS Technical Committee on Electricity Technology
- Wet appliances dishwashers: IEC SC59A = JIS Technical Committee on Electricity Technology
- Wet appliances laundry: IEC SC59D = JIS Technical Committee on Electricity Technology
- Refrigerators/freezers: IEC SC59M = JIS Technical Committee on Electricity Technology
- Lamps and related equipment (Lighting): IEC TC34 = JIS Technical Committee on Electricity Technology
- Power electronics: TC22 IEC = Technical Committee on Electricity Technology
- Power transformers: IEC TC14 = Technical Committee on Electricity Technology
- Rotating electrical machinery: IEC TC2 = Technical Committee on Electricity Technology.

JIS has a total of some 300 mirror committees with ISO and IEC. Generally, product committees are made up of national experts, many of which are from industry, but also academics and from other technical fields. Technical committees consider any relevant IEC and ISO drafts and prepare national comments where required. The officer in charge of technical committees in JISC/METI can attend mirror committee meetings, but this only occurs where there is a need to do so. Mirror committees do not have to get specific approval from JISC before submitting comments, but JISC appoints the secretariat to each national mirror committee, so progress can be tracked.

## B.8 India (Bureau of Indian Standards (BIS))

Bureau of Indian Standards (BIS) (www.bis.org.in) – Ministry of Consumer Affairs, Food and Public Distribution. BIS is the Indian National Standards body functioning under the aegis of Ministry of Consumer Affairs, Food and Public Distribution, Govt. of India. Presently, BIS has 14 Division Councils which are formulating Indian Standards covering all areas other than those mentioned in Agricultural Produce (Grading and Marking) Act, 1937 and the Drugs and Cosmetics Act, 1940. BIS does not make technical regulations; however there are technical regulations which make compliance to BIS standards mandatory. Technical regulations are issued by various departments under different ministries of government of India or by different regulators empowered under different states.

BIS is the national standards body for India and represents India in ISO and the IEC. It is also the main standards development organization in India.

BIS is the national standards body functioning under the aegis of the Ministry of Consumer Affairs, Food and Public Distribution, Government of India. Presently, BIS has 14 Division Councils which are formulating Indian Standards covering all areas other than those mentioned in Agricultural Produce (Grading and Marking) Act, 1937 and the Drugs and Cosmetics Act, 1940.

BIS does not make technical regulations. However there are technical regulations which make compliance to BIS standards mandatory. Technical regulations are issued by various departments under different ministries of Government of India or by different regulators empowered under different states.

During the pre-India independence period, standardization activity was sporadic and confined mainly to a few Government purchasing organization. However, immediately after independence, economic development through coordinated utilization of resources was called for and the government recognized the roll for standardization in gearing industry to competitive efficiency and quality production. The Indian Standards Institution (ISI) was, therefore set up in 1947 as a registered society, under a Government of India resolution.

The Indian Standards Institution gave the nation the standards it needed for nationalization, orderly industrial and commercial growth, quality production and competitive efficiency. However, in 1986 the government recognized the need for strengthening this national standards body due to fast changing socio-economic scenario and according it a statutory status. The Bureau of Indian Standards Act enacted in 1986 and on 1 April 1987, the newly formed BIS took over the staff assets, liabilities and functions of ISI.

*Website address:* http://www.bis.org.in/

*Report links:* 2007 to 2011 — http://www.bis.org.in/org/ar.htm

*Aims and objectives*

The work of the BIS is intended to:

- ensure harmonious development of standardization, marking and quality certification
- provide new thrust to standardization and quality control
- evolve a national strategy for according recognition to standards and integrating them with growth and development of production and exports.

BIS is working towards closer bilateral cooperation with countries such as Brazil, Bangladesh, Thailand, Iran, Ethiopia, Singapore, Taiwan, Egypt, Jordan, Ghana, Kenya, Greece, South Korea, Oman, USA, Israel, Uzbekistan, Ukraine, Russia and Saudi Arabia in close association with Ministry of Commerce and Ministry of External Affairs. BIS also continued its participation in the EU-BTIA negotiations.

*ISO or IEC alignment*

BIS is a founding member of ISO, and continues to take part in international standardization activities. As a member of ISO, BIS:

- participates in its policy making bodies like Committee on Developing Country Matters (DEVCO), Committee on Conformity Assessment (CASCO), Committee on Information (INFCO) and Committee on Consumer Policy (COPOLCO)
- is also a member for the Council which comprises 18 members besides the ISO office bearers
- Director General, BIS has been nominated Regional Liaison Officer for South and Central Asia for the period 1998—2000.

BIS is also actively involved in the activities of the IEC, and has participation status in 34 Technical Committees. Director General, BIS has been elected as a member of Council Board for IEC which advises Council on various policy decision. The IEC Annual General Meeting will be held in New Delhi in October 2013.

India has a goal of harmonization with ISO and IEC standards. Further, India is a signatory to WTO Agreement on Technical Barriers to Trade (TBT). As per the agreement, member countries of WTO are required to align their national standards with international standards. A total of 5 091 Indian Standards have been harmonized with international standards as of March 2012. Considering the number of standards where corresponding ISO/IEC Standards exist, about 88% of Indian Standards are harmonized.

*Government interaction or influence*

BIS contains a Body Corporate consisting of 25 members representing both Central and State governments, Members of Parliament, industry, scientific and research institutions, consumer organizations and professional bodies with Union Minister of Consumer Affairs, Food and Public Distributions as its President and Minister of State for Consumer Affairs, Food and Public Distribution as its Vice-President. There is very strong representation by government in all levels of BIS management and technical committees.

*Standards and committees*

During 2011—12, BIS formulated 410 (260 new and 150 revised) standards. The total number of standards in force as on 31 March 2012 is 18 742.

For formulation of Indian Standards, BIS functions through the Technical Committee structure in terms of Sectional Committees, Subcommittees and Panels set up for dealing with specific group of subjects under respective Division Councils. The Sectional Committees, Subcommittees and Panels as well as their Division Councils include concerned officials of BIS and representatives of various interests such as organized consumers, consumer bodies, regulatory and other government bodies, industries, scientists, technologists, testing organizations and individual experts.

A proposal for formulation of Indian Standard(s) may be submitted by any Ministry of the Central Government, State Governments, Union Territory Administrations, Consumer Organizations, Industrial Units, Industry Associations, Professional Bodies, Members of the Bureau and Members of its Technical Committees. The proposal is taken up for formulation of standards by an appropriate Sectional Committee with approval by the concerned Division Council.

It is the policy of BIS to formulate Indian Standards on emerging technologies and withdraw obsolete standards.

Technical Committees in BIS are organized into 14 divisions as follows:

1. Production and General Engineering (PGD)
2. Civil Engineering (CED)
3. Chemical (CHD)
4. Electrotechnical (ETD)
5. Food and Agriculture (FAD)
6. Electronics and Information Technology (LITD)
7. Mechanical Engineering (MED)
8. Management and Systems (MSD)
9. Metallurgical Engineering (MTD)
10. Petroleum, Coal and Related Products (PCD)
11. Transport Engineering (TED)
12. Textile (TXD)
13. Water Resources (WRD)
14. Medical Equipment and Hospital Planning (MHD).

Committee numbers are prefixed with the relevant division code noted above. For this study, Division 4 Electrotechnical (ET) and Division 6 Electronics and Information Technology (LIT) are of most interest.

*Governance, rules and regulations*

An organizational chart can be found at: http://www.bis.org.in/org/admn-chart.htm

A full listing of all BIS Acts, rules and regulations (key documents date from the 1980s) can be found at: http://www.bis.org.in/bs/index.htm

Bureau of Indian Standards, the national standards body of India, is entrusted with the task of formulating national standards in various technology areas. These standards are formulated through various Sectional Committees/Subcommittees/Adhoc Panels. To ensure that consumer interests are effectively represented in these technical committees, BIS invites offers from NGOs and consumer activists to send their particulars and areas of interest in which they will like to participate. Depending on the technical expertise and experience of the interested parties, BIS shall consider giving appropriate representation in the relevant Technical Committees.

*Committees of interest*

BIS works towards harmonizing Indian Standards, as far as possible, with international standards formulated by ISO or IEC.

IEC/ISO committees that are broadly mirrored in BIS are:

- Household Appliances: IEC TC59 = BIS ET32
- Lighting: IEC TC34 = BIS ET23
- Power Electronics: TC22 IEC = BIS ET31
- Power Transformers: IEC TC14 = BIS ET16
- Rotating Machinery: IEC TC2 = BIS ET15.

## B.9 Other leading NSBs

### *Austria*

- Oesterreichischer Verband für Elektrotechnik (OVE) (www.ove.at) (IEC NSB).
- Austrian Standards Institute (ASI) | Österreichisches (www.as-institute.at) (ISO NSB).

### *Belgium*

- Belgian Electrotechnical Committee (BEC) (http://www.ceb-bec.be/) (IEC NSB).
- NBN "Bureau voor Normalisatie/Bureau de Normalisation" (www.nbn.be) (ISO NSB).

### *Brazil*

- Comitê Brasileiro de Eletricidade, Eletrônica, Iluminação e Telecomunicações (COBEI) (http://www.cobei.org.br/) (IEC NSB).
- Associação Brasileira de Normas Técnicas (ABNT) (www.abnt.org.br/) (ISO NSB).

### *Denmark*

- Dansk Standards (DS) (www.ds.dk) (IEC and ISO NSB).

### *Finland*

- The Finnish Electrotechnical Standards Association (SESKO (http://www.sesko.fi/portal/en/) (IEC NSB).
- Suomen Standardisoimisliitto (SFS) (www.sfs.fi) (ISO NSB).

### *France*

- Union Technique d'Electricité (UTE) (http://www.ute-fr.com/) (IEC NSB).
- Association Française de Normalisation (AFNOR) (www.afnor.fr) (ISO NSB).

### *Indonesia*

- Badan Standardisasi Nasional (BSN) (http://www.bsn.or.id/) (IEC and ISO NSB).

### *Italy*

- Comitato Elettrotecnico Italiano (CEI) (http://www.ceiweb.it/it/) (IEC NSB).
- Ente Nazionale Italiano di Unificazione (UNI) (www.uni.it) (ISO NSB).

### *Korea*

- Korean Agency for Technology and Standards (KATS) (http://www.kats.go.kr/) (IEC and ISO NSB).

### *Mexico*

- Dirección General de Normas (DGN) (www.economia.gob.mx) (IEC and ISO NSB).

### *Netherlands*

- Netherlands Standardization Institute aand Netherlands Electrotechncal Committee (NEN) (http://www.nen.nl/) (IEC and ISO NSB).

### *Russian Federation*

- Federal Agency on Technical Regulation and Metrology (GOST-R) http://www.gost.ru/wps/portal/ (IEC and ISO NSB).

### *South Africa*

- South African Bureau of Standards (SABS) (https://www.sabs.co.za/) (IEC and ISO NSB).

### Spain

- AENOR (Asociación Española de Normalización y Certificación) (http://www.aenor.es/aenor/inicio/home/home.asp) (IEC and ISO NSB).

### Sweden

- Svensk Elstandard (SEK) ( ) (IEC NSB).
- Swedish Standards Institute (SIS) (www.sis.se) (ISO NSB).

### Switzerland

- Electrosuisse (https://www.electrosuisse.ch) (IEC NSB).
- Swiss Association for Standardization (SNV) (www.snv.ch) (ISO NSB).

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