COOPERATION ON ENERGY STANDARDS IN APEC

REPORT OF THE STEERING GROUP ON ENERGY STANDARDS TO THE APEC ENERGY WORKING GROUP

March 14, 2000

DRAFT

EXECUTIVE SUMMARY

The Steering Group on Energy Standards (SGES) met seven times between March 1997 and March 2000. During this period, the Steering Group commissioned three major studies, conducted projects internally and held three energy standards related workshops. Based on its findings from these activities, the SGES has developed two recommendations for consideration by APEC Energy Ministers. These recommendations are as follows:

- **Recommendation 1:**
  Ministers endorse the general policy framework for APEC cooperation on energy standards developed by the APEC Steering Group on Energy Standards. The key elements of this framework are:
  - creation of transparency of action in the development and use of energy test procedures through the implementation of the Standards Notification Procedure endorsed by APEC Energy Ministers in Okinawa;
  - recognition and encouragement of existing regional and international laboratory/ laboratory system accreditation arrangements and support for the inclusion of energy efficiency within the mutual recognition agreements being developed in the APEC region;
  - adoption of a three-pronged, product-by-product, approach to the greater alignment of test procedures within APEC member economies. The three prongs are:
    - to adopt a common test procedure from procedures used in the region, where this is feasible;
    - to influence the development of international test procedures so that they are in a form suitable for member economies; and
    - to develop algorithms to convert results between existing member economies' test procedures.

  Ministers agree the above elements should be implemented on a progressive, multilateral or bilateral basis. The pace of implementation would vary by economy depending on the particular circumstances.

- **Recommendation 2:**

  Ministers agree to the establishment of the position of an *APEC Energy Efficiency Test Procedures Coordinator.* The Coordinator will facilitate the implementation of the general policy framework within APEC economies in a coordinated and timely fashion. These tasks will include:

  _ Developing, implementing and maintaining the web-based Standards Notification Procedure;

  _ Monitoring and reporting on international standards processes;

and

_ Coordinating APEC energy efficiency test procedures participation networks

The Energy Ministers of the APEC economies met for the first time in Sydney, Australia on 28-29 August 1996. At this meeting, the Ministers recognized that an APEC multilateral framework might provide an opportunity to overcome impediments to trade related to the use in the APEC region of differing energy efficiency standards (i.e. test procedures used to measure the energy efficiency of a product). It was felt that this could be done without affecting the integrity of individual economies' standards. Rather, reducing the negative trade implications of energy-efficiency test procedures would facilitate the greater use of energy efficiency programs with the associated energy and environmental benefits. Ministers instructed officials from member economies to work together to achieve the benefits of increased co-operation on energy standards by:

- developing firm proposals for establishing a base on which mutual acceptance of accredited test facilities and standard test results obtained at these facilities [could] be achieved;
- working towards the establishment of bases for the direct comparison of the outcomes of testing to different standards so that the need for testing to multiple standards [could] be reduced or removed; and
- developing a general policy framework that would allow for the progressive development and implementation on a bilateral or multilateral basis, and product by product, as technical details [were] established and mutually agreed.

The APEC Energy Working Group created the Steering Group on Energy Standards to carry out the above tasks related to energy standards. The SGES was always intended to be a temporary group – once the above-listed tasks were completed the SGES would have completed its mandate. With this report, the SGES believes that it has completed its mandate. As a permanent sub-group of the Energy Working Group, the Expert Group on Energy Efficiciency and Conservation would ensure that the recommendations of the SGES, as endorsed by APEC Energy Ministers, are carried out.

Steering Group activities culminated in the design of a general policy framework. The purpose of the framework is to provide a structure that will help guide future energy-efficiency standards related work within APEC economies. The framework includes a three-pronged, product-by-product plan to remove or reduce the need for testing to multiple standards based on the *Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies* and the results of several APEC sponsored workshops.

The successful implementation of the general policy framework requires the active participation by member economies in future APEC workshops and international standards processes. It also requires the existence of an infrastructure that will create transparency of action on the development and use of energy efficiency test procedures and that will monitor and coordinate related activities in the APEC region. The SGES concluded that in order for the framework to be implemented effectively, the web-based Standards Notification Procedure needs to be established and an APEC Energy Efficiency Test Procedures Coordinator should be appointed.

In October 1998, APEC Energy Ministers endorsed the establishment of a Standards Notification Procedure. Ministers agreed to consider, in the first instance, when new programs requiring the use of energy efficiency test procedures are introduced, employing test procedures already in use. In the event of the adoption of a new test procedure within their economy that varies from those already in use, they agreed to notify other economies and make the test procedure available to them. The SGES has designed a web-based system to carry this out. This system needs to be put into operation and managed on an on-going basis.

The Energy Efficiency Test Procedures Coordinator would be responsible for networking between economies and for helping to ensure the smooth implementation of the general policy framework. This would include helping members to understand better how APEC needs could be incorporated into international standards development and managing the Standards Notification Procedure.

The Coordinator, would not be responsible for developing an APEC consensus position. There would still be the need for the active participation by member economies in APEC workshops to discuss possible common actions with respect to energy efficiency test procedures as well as a need for active representation by member economies in the international standards development process and associated meetings.

The APEC Energy Efficiency Test Procedures Coordinator would report to the Expert Group on Energy Efficiency and Conservation.

Contents

1.Background

This report provides a description of the context in which the APEC Steering Group on Energy Standards (SGES) has undertaken several key activities over the past three years. It also details Steering Group findings and sets out the Group's recommendations for APEC Energy Ministers.[1]

1.1 APEC

Asia-Pacific Economic Cooperation (APEC) was established in 1989 in response to the growing interdependence among Asia-Pacific economies. APEC began as an informal dialogue group; it has since become the primary regional vehicle for promoting open trade and practical economic co-operation.

APEC member economies represent the rich diversity of the region as well as its differing levels of economic development. Despite such differences, there is a growing sense of common purpose and co-operation in the region that is aimed at sustained regional and world growth.

Osaka Action Agenda

In November 1994, at Bogor, Indonesia, APEC leaders came together to "chart the future course of [their] economic co-operation" in order to "enhance the prospects of an accelerated, balanced and equitable economic growth" through the APEC region.[2] This meeting spawned the *Bogor Declaration* that conceptualized the vision of an open trading system in the Asia Pacific region. APEC leaders implemented this vision through the *Osaka Action Agenda* at their 3rd meeting in Osaka Japan in November 1995.

The *Osaka Action Agenda* was a template for future APEC work that laid out some of the common goals of APEC members. Essentially, the Agenda represented the three pillars of trade and investment liberalization, their facilitation, and economic and technical co-operation. It stressed that for the APEC region to achieve sustained economic development, APEC economies had to pursue activities in each of these areas.

[1] In order to ensure that this report is easy to understand, Appendix 1 contains an explanation of important standards-related terms.

1 [2] APEC, *The Bogor Declaration*, 15 November 1994.

The Agenda laid out nine General Principles[3] that APEC member economies could apply in order to meet the long-term goal of free and open trade and investment no later than the year 2010 in the case of industrialized economies and the year 2020 in the case of developing economies. The Agenda expected that each APEC economy would develop its own action plan and that these action plans would elaborate on steps needed in order to achieve objectives including both concerted unilateral action to be taken in line with issue-specific guidelines and collective actions.

The Agenda also set out actions for fifteen specific areas that needed to be undertaken in order to meet the objectives of the *Osaka Action Agenda*.[4] It asked various APEC fora, including the Committee on Trade and Investment (CTI), the Economic Committee (EC) and Working Groups, to undertake other work.

Standards and Conformance was one of the areas that the agenda targeted. The agenda set out four goals under Standards and Conformance that a chosen APEC forum would be asked to pursue. These goals were to:

1. Ensure the transparency of the standards and conformity assessment of APEC economies.

2. Align APEC economies' mandatory and voluntary standards with international standards.

3. Achieve mutual recognition among APEC economies of conformity assessment in regulated and voluntary sectors.

4. Promote co-operation for technical infrastructure development to facilitate broad participation in mutual recognition arrangements in both regulated and voluntary sectors.

The Osaka Guidelines also called for each APEC economy to participate actively in international standardization activities and called for APEC economies to increase the harmonization of their standards. The articles of the *Osaka Action Agenda* continue to guide APEC work. Subsequent work programs are drawn up in accordance to Osaka objectives.

Manila Action Plan for APEC

At their 4th meeting in Manila, Philippines in November 1996, APEC Leaders drafted The *Manila Action Plan* (MAPA). MAPA zeroed in on the trade liberalization and investment objective set out in the *Osaka Action Agenda*. The action plan sought to "reduce the cost of doing business by liberalizing trade, eliminating unnecessary

[3] APEC, *The Osaka Action Agenda*, 19 November 1995.
[4] See the *Action Agenda* for a list of these areas.

administrative burdens and bringing down technical barriers to trade through the use of new technologies and/or cost-efficient processes."[5]

MAPA set out eight key undertakings as necessary in order to meet this objective. One of the undertakings dealt with Standards and Conformance. The undertaking stressed the need to "conclude mutual recognition arrangements on conformity assessment for standards and alignment with international standards."[6] MAPA then linked each undertaking with a set of activities needed to complete the scope of the undertaking. Standards and conformance related activities included ensuring the transparency of standards and conformity assessment in APEC countries and the need for voluntary sectors to enter into Mutual Recognition Agreements (MRAs) in co-operation with regional specialist bodies.

The action plan also called for the alignment, by 2000/2005, of mandatory and voluntary standards with international standards. In particular, MAPA emphasized the need to align standards on electrical and electronic appliances (air conditioner, television, refrigerator, radio and it parts, and video apparatus), food labelling, rubber gloves and condoms and machinery.

The APEC Committee on Trade and Investment (CTI) established a Sub-committee on Standards and Conformance (SCSC) by the Declaration on an APEC Standards and Conformance Framework (November, 1994). Its principle objectives are to: encourage alignment of members' standards with international standards; achieve mutual recognition among APEC economies of conformity assessment in regulated and voluntary sectors; promote co-operation for technical infrastructure development in order to facilitate broad participation in mutual recognition arrangements in both regulated and voluntary sectors; and ensure the transparency of the standards and conformity assessments of APEC economies.

1.2 Steering Group on Energy Standards

Mandate

The Energy Ministers of the APEC economies met for the first time in Sydney, Australia on 28-29 August 1996. At this meeting, the Ministers recognized that an APEC multilateral framework might provide an opportunity to overcome impediments to trade, related to the use in the APEC region of differing energy efficiency standards (i.e. test procedures used to measure the energy efficiency of a product). It was felt that this could bo done without affecting the integrity of individual economies' standards. Indeed, it was felt that reducing the negative trade implications of energy-efficiency test procedures would facilitate the greater use of energy efficiency programs with the associated energy and environmental benefits. Ministers laid out a series of energy standards related tasks,

[5] APEC, *The Manila Action Plan for APEC*, 25 November 1996.

 [6] APEC, *The Manila Action Plan for APEC*, 25 November 1996.

and instructed officials from member economies to work together to achieve the benefits of increased co-operation on energy standards by:

- developing firm proposals for establishing a base on which mutual acceptance of accredited test facilities and standard test results obtained at these facilities [could] be achieved;
- working towards the establishment of bases for the direct comparison of the outcomes of testing to different standards so that the need for testing to multiple standards [could] be reduced or removed; and
- developing a general policy framework that would allow for the progressive development and implementation on a bilateral or multilateral basis, and product by product, as technical details [were] established and mutually agreed.

Scope

An APEC Energy Working Group (EWG) was launched in 1990 with the objective to maximize the energy sector's contribution to the APEC region's economic and social well being, while mitigating the environmental effects of energy supply and use. The EWG's work program is based on the *Osaka Action Program for Energy* and priorities established by Ministers and Economic Leaders. The EWG is one of ten APEC working groups.

The EWG created the APEC Steering Group on Energy Standards (SGES) to carry out the above tasks related to energy standards.

Canada agreed to chair the Steering Group on Energy Standards. Australia, Canada, Chile, Indonesia, Japan, Korea, Mexico, New Zealand, Philippines, Chinese Taipei, Thailand and the United States agreed to be members. Other APEC economies were kept informed of SGES developments through the Energy Working Group Contact List.

At its first and second meetings (in March 1997 and June 1997, respectively), the SGES confirmed that the two major components of its role were:

- achieving the mutual acceptance of accredited test facilities and test procedure results obtained at these facilities; and
- reducing or removing the need for testing to multiple test procedures.

The Steering Group also agreed that the pursuance of multi-lateral agreements and efforts to move towards the harmonization of test procedures were generally desirable objectives. The Group, however, did concede that in some cases a sound rationale for differences might exist, due to local conditions of use and due to differences in duty cycles, electricity characteristics and local market saturation.

The SGES was always intended to be a temporary group – once the above-listed tasks were completed the SGES would have completed its mandate. With this report, the SGES believes that it has completed its mandate.

Expert Group on Energy Efficiency and Conservation

The Expert Group on Energy Efficiency and Conservation (EGEE&C) mission is "to advance economic and social well being in the Asia-Pacific region through energy conservation and the application of energy-efficient technologies." Its objectives include:

- assist in developing and enhancing trade between APEC member economies' energy products and services and energy-efficient technologies; and
- contribute to the international efforts to reduce the adverse impacts of energy production and consumption upon our global environment.

As a permanent sub-group of the Energy Working Group, the Expert Group is the logical group to ensure that the recommendations of the SGES, as endorsed by APEC Energy Ministers, are carried out.

Workplan

In order to carry out ministerial requirements, the SGES drafted a workplan that outlined five distinct tasks. The SGES then set out more detailed objectives under each task that formed the basis for SGES activities. The broad tasks are listed below:

1. Provide an overview of the existing status of harmonization and accreditation in APEC member economies.
2. Provide an overview of the trade flows of relevant energy-using products between member economies in the APEC region.
3. Develop a proposal to ensure the operation of a suitable APEC-wide laboratory accreditation scheme that covers energy performance testing in a reasonable time frame.
4. Examine the potential to convert energy test results between the various national standards that are in force in APEC member economies.
5. Develop a process for the longer term harmonization of energy performance test procedures where feasible.

From the outset, the SGES expected to complete tasks 1, 2 and 4 by commissioning major studies. The Steering Group expected to build on the results of these studies to complete tasks 3 and 5.

In order to complete task 1, the SGES hoped to compare both the magnitude of energy performance testing conducted in APEC member economies and the test procedures used in these economies. It also planned to assess the degree to which these economies recognized the results of performance testing in other economies and to identify the willingness of these economies to recognize the conformity assessment regimes of other economies.

Task 2 entailed commissioning a project to examine and report on trade flows of appliances, motors and lighting products between member economies in the APEC region. The project would ultimately characterize the regional appliance market and would detail any implications of the analysis for key product areas identified in task 1.

Task 3 required ensuring the operation of a suitable APEC wide Laboratory Accreditation Scheme that covered energy and performance standards within a reasonable time frame. The SGES found that extensive progress on mutual accreditation had already been made within the Asia Pacific Laboratory Accreditation Cooperation (APLAC) and this presented a possible vehicle with which to meet this goal of the SGES. In order to complete the task, the SGES had to investigate existing multi-lateral mutual recognition frameworks that might be suitable for energy testing and had to investigate current accreditation protocols to ensure that these were capable of being applied to the product groups of interest to the Steering Group. The SGES also had to liaise with accreditation bodies in order to monitor progress and to explore any avenues for providing assistance and had to increase member economy awareness of APLAC and other relevant fora.

The purpose of task 4 was to establish a way to reconcile different test procedures in member economies. The objective of the task was to develop an option that could be implemented in the short term that would reduce the need for multiple testing, but that would not go so far as to demand the total harmonization of test procedures.

In order to carry out the task, the SGES had to identify key product areas for preliminary examination and had to examine the links between test procedures and energy policies in member economies. The task also entailed reviewing test procedures and international standards in order to identify differences and similarities between the national test procedures of APEC economies. Finally, where possible, the task suggested developing conversion algorithms between national protocols that respected the accuracy criteria mandated by the programs of member economies.

Finally, task 5 set out to develop a process that would result in, over time, a greater harmonization of test procedures within the APEC region. The outcome of this task would be an enhanced regional consensus on energy performance test procedures, increased harmonization and a communication of these preferences to the international standards-making process.

1.3 Timeline

While section 2 of this report sets out SGES findings in detail, Exhibit 1 highlights key events that influenced and defined the scope and course of the Steering Group. Exhibit 1 lists important events by date. For reasons of clarity, the exhibit also includes the place where the event occurred.

Exhibit 2 lists upcoming/planned SGES related events in a similar format.

Exhibit 1

SGES Milestones

Event	Date	Place
3rd APEC Leaders meeting ***Osaka Action Agenda*** objective to align APEC economies' mandatory and voluntary standards with international standards	19 November 1995	Osaka, Japan
1st APEC Energy Ministers meeting APEC Energy Ministers instruct officials from member economics to ***work together to achieve the benefits of increased co-operation on energy standards*** by: establishing a base on which mutual acceptance of accredited test facilities and standard test results can be achieved working towards the establishment of bases for the direct comparison of the outcomes of testing to different standards developing a general policy framework	28-29 August 1996	Sydney, Australia
Energy Working Group (EWG 13) meeting ***Steering Group on Energy Standards (SGES) established*** to implement the APEC work program on energy standards agreed to by APEC Energy Ministers in Sydney.	15-16 October 1996	Manila, Philippines
4th APEC Leaders' meeting ***Manila Action Plan for APEC (MAPA)*** goal to align, by 2000/2005, mandatory and voluntary standards with international standards.	25 November 1996	Manila, Philippines
1st meeting of SGES determine role and objectives of SGES draft a workplan for the Steering Group approve scope of Nordicity study on energy efficiency performance testing and conformity assessment	20-21 March 1997	Vancouver, Canada
2nd meeting of SGES presentation and approval of Nordicity study: *Energy Efficiency Performance Testing and Conformity Assessment in APEC Member Economies* approve scope of Export Council study on trade flows of energy-using products begin to explore the scope of requirements for an energy efficiency laboratory accreditation scheme through APLAC	25-26 June 1997	Canberra, Australia

2nd APEC Energy Ministers meeting Ministers agreed to: pursue a multilateral approach for the acceptance of results from accredited energy efficiency testing facilities for all APEC economies; and consider when new programs requiring the use of energy efficiency test procedures are introduced, employing test standards already in use.	26-27 August 1997	Edmonton, Canada
3rd meeting of SGES development of a web-based Standards Notification Procedure	6-7 April 1998	Honolulu, Hawaii
3rd APEC Energy Ministers meeting APEC Energy Ministers endorse the establishment of a Standards Notification Procedure	9-10 October 1998	Okinawa, Japan
4th meeting of SGES presentation and approval of Export Council for Energy Efficiency study: *Overview of Trade Flows of Energy-Using Products between APEC Member Economies* approve scope of Energy Efficient Strategies study on energy efficiency test standards and regulations	30 October 1998	Honolulu, Hawaii
5th meeting of SGES proposal made for algorithm project recognition that energy efficiency should be part of other MRAs	26-27 March 1999	Mexico City, Mexico
Workshop on setting up and running an energy performance testing laboratory	6-8 July 1999	Manila, Philippines
Colloquium on the technical issues of minimum energy performance standards for air conditioners and ballasts	6-8 October 1999	Seoul, Korea
6th meeting of SGES presentation and approval of Energy Efficient Strategies study: *Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies* report on the energy performance workshop (Manila) and the minimum energy performance standards colloquium (Seoul) recommendations for Energy Ministers drafted	1-2 November 1999	Canberra, Australia
7th meeting of SGES – joint meeting with the EGEE&C discussed final report of the SGES to EWG finalized recommendations to Energy Ministers	2-4 March 2000	Wellington, New Zealand

Symposium on test procedures for domestic refrigeration appliances	6-8 March 2000	Wellington, New Zealand

Exhibit 2
Planned Activities

EWG19 meeting approve SGES recommendations to APEC Energy Ministers	April 6-7, 2000	Brunei
4th APEC Energy Ministers meeting review recommendations of the SGES	May 10-12, 2000	San Diego, USA
Study on Algorithm Development for Energy Performance Testing This project would be a strategic examination of the outcomes from the colloquium and the report of the review of energy test standards and regulations in APEC member economies. Funding for the study may not be available until April-June 2000.	2000	

2. SGES Findings

The SGES workplan, while it outlines the scope of activities that the Steering Group undertook to meet and respond to ministerial requirements, does not detail the actual projects that the Steering Group undertook. This section of the report describes SGES activities and their findings. It is important to understand, however, that this section only draws out highlights relating to each activity. For more detail, a reader is advised to consult study reports and relevant appendices of SGES minutes.

This section is set out in four parts. Part 2.1 looks at how studies 1 and 2 laid the groundwork for subsequent work. Part 2.2 focuses on activities related to conformity assessment. Part 2.3 looks at activities that relate to test procedure comparisons. Finally, Part 2.4 outlines the components of a general policy framework and the mechanisms necessary for it to work.

It is important to understand that while the report compartmentalizes SGES activities under a specific ministerial requirement, many of the activities, particularly the commissioned studies, relate to more than one requirement. Nevertheless, to facilitate the flow of the report, a judgement has been made regarding where each activity fits best.

2.1 Groundwork

Performance Testing and Conformity Assessment Study

The first project that the SGES undertook was a study called *Energy Efficiency Performance Testing and Conformity Assessment in APEC Member Economies* (Study 1). The Nordicity Group of Canada prepared this study. The study surveyed APEC economies to identify and compare laboratory facilities, accreditation standards and conformity in assessment practices, products tested and test standards. Ultimately, the study sought to assess the degree to which procedures could be harmonized and to quantify the benefits of harmonization to member economies.

The study showed that the alignment of energy performance test procedures could only effectively be carried out by the APEC member economies in the context of a broader conformity assessment infrastructure for energy efficiency. Alignment of the test procedures for the six selected energy-using products (refrigerators, refrigerator-freezers; room air conditioners; single-package air conditioners; split system air conditioners; electric motors and fluorescent lamps and lamp ballasts) could only be effective if other issues raised in this study, such as increased harmonization of accreditation programs, recognition of the energy efficiency regulatory overlay, and provision of technical infrastructure assistance, were also addressed.

KEY FINDINGS

- The laboratory accreditation programs that have been put in place in the APEC economies vary primarily by their stage of development rather than by their requirements. Some members may require technical assistance from the more developed accreditation bodies to achieve the criteria for international recognition.

- There are a number of existing bilateral mutual recognition agreements between APEC member laboratory accreditation bodies. The Asia Pacific Laboratory Accreditation Cooperation (APLAC) is working to establish a multilateral mutual recognition agreement amongst the various laboratory accreditation bodies in the region. It also fosters the development of laboratories and inspection bodies in member economies to enable them to meet the criteria for mutual recognition.

- Differences exist, for the same products, between international test procedures, national test procedures and those test procedures included in member economy program requirements. While there may be good reasons for such variations, there is scope for reducing and possibly eliminating these differences on a product-by-product basis.

The results of the study helped shape the design of subsequent work tasks. In particular, the study, by identifying the need for some members to obtain technical assistance to achieve the criteria for international recognition, paved the way for the Steering Group to seek funding for a workshop on setting up and running an energy performance testing laboratory.

Trade Flows Study

The second project that the SGES undertook was an *Overview of Trade Flows of Energy-Using Products between APEC Member Economies* (Study 2). The Export Council for Energy Efficiency of the United States prepared the study. The study set out to examine trade flows of major energy consuming products between APEC member economies in an attempt to identify products where the greatest benefits might exist from reducing trade barriers. The Steering Group selected the following products as key for the study:

- refrigerators, refrigerator-freezers and freezers;
- room air conditioners;
- electric motors;
- single package central air conditioners and split system air conditioners; and
- fluorescent lamps and ballasts.

KEY FINDINGS

- There is substantial and valuable trade between APEC member economies in energy-using products. For example:

- Trade among APEC economies in air conditioners is worth US$3,000-3,300 million per year.
- Trade flows of industrial motors is valued at about US$2,500-3,000 million per year.
- Trade flows in household refrigeration totals about US$1,000-1,100 million per year.
- Trade among APEC economies in lighting equipment (e.g. fluorescent lights and ballasts) is worth US$900-1200 million per year.
- Many of these products are regulated by APEC economies.

These findings have several implications for decision making by APEC bodies concerning drafting a program of work on harmonizing aspects of energy efficiency testing and verification within the region. Ultimately, it is important to understand that the potential to save energy is a logical and important criterion for making decisions concerning APEC programming. Yet, the magnitude of trade flows demonstrates that the potential trade risks and potential benefits from increased energy efficiency requirements are real.

2.2 Conformity Assessment

Mutual Recognition Agreements

The first ministerial requirement asked for a firm proposal on ways to reduce the need for multiple testing of products to energy efficiency standards. By reducing the need for multiple testing, firms will be able to test a product once, and then sell it anywhere in the APEC region, thereby reducing the costs of trade. In order to accomplish this objective, however, economies must have confidence in the results of testing performance laboratories in other APEC economies. As a result, it seemed to the SGES that a mutual recognition arrangement that operates through a specialist body that accredits national laboratory systems, such as APLAC, was a reasonable way to meet this objective. The SGES also recognized the existence of specialist bodies that accredit laboratories and facilitate trade at a regional and international level.

As a preliminary step, the Steering Group initiated a project to determine whether or not international laboratory accreditation protocols were adequate to engender confidence specifically in testing for energy efficiency. Under the auspices of the APLAC Technical Committee, but coordinated by the Standards Council of Canada, Canada's representative on APLAC raised a project team to study the issue.

KEY FINDINGS

- No clear consensus existed at that time on the need for an energy-efficiency guideline that would supplement ISO Guide 25 (now referred to as ISO 17025).

- Given the variability of conformity assessment regimes in APEC economies, mutual recognition would be necessary for certification and verification organizations as well as for laboratory testing in order to meet the "test once, sell anywhere" objective.

- Based on these observations, and in light of the ongoing efforts of the SCSC towards a comprehensive MRA on testing and certification for electrical and electronic products, the SGES determined that subject to its acceptability by individual economies it would be preferable to incorporate mutual recognition of energy-efficiency parameters within comprehensive MRA efforts.

Test Performance Workshop

The SGES and the Philippine Department of Energy organized a *Workshop on Setting-Up and Running an Energy Performance Testing Laboratory*. The workshop was held on 6-8 July 1999 in Manila, Philippines. More than 40 representatives from 16 member economies attended the workshop to share technical expertise and experience related to

setting-up and operating energy performance laboratories. Participants also discussed the requirements and steps needed to obtain laboratory accreditation.

The workshop focused on issues relating to energy performance testing laboratories. However, it also touched on closely related topics such as the status of energy-efficiency programs in different economies, the differences in testing standards, mutual recognition arrangements (MRAs), and future trends and possibilities in the regional and international alignment of energy performance testing and efficiency test procedures.

The workshop served as a practical step towards using mutual recognition of test results and alignment of standards as a means to overcome impediments to trade that arise from different regulatory requirements in the various economies.

KEY FINDINGS

- Energy-Efficiency Programs: Most developed economies have implemented energy-efficiency programs for many years, while developing economies have only recently started, or are still, considering such measures.

- Laboratory Requirements and Accreditation: Voluntary MRAs between laboratories increase efficiency of product verification and laboratory re-evaluation.

- Alignment of Test Procedures: The alignment of test procedures facilitates international trade and can eliminate non-tariff trade barriers by reducing the time and expense that would be otherwise spent on unnecessary repeated inspections, testing, and certification of imported products.

The workshop achieved its primary goals of increasing the understanding of technical requirements and steps needed in obtaining laboratory accreditation and to increase awareness of test procedure alignment activities and MRAs. The workshop fueled more support for the alignment of test procedures and development of MRAs, which, in the long run, can increase the availability of energy efficient products by reducing non-tariff trade barriers.

2.3 Test Method Comparison

Energy Efficiency Test Procedures and Regulations

The third study that the SGES commissioned was the *Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies* (Study 3). Energy Efficient Strategies of Australia prepared this study. Theoretically, the scope of the study covered all electrical products that are regulated for energy efficiency and that require testing.

Practically, the study focused on major product groups including air conditioners, motors, lamps, ballasts for fluorescent lamps, electric water heaters, clothes washers, dishwashers, clothes dryers and refrigerators. In order to carry out the project succinctly, the study looked at every APEC economy as a separate entity in order to identify those products regulated for energy purposes, such as performance standards and labeling, and to document the technical requirements of that regulation within each economy.

KEY FINDINGS

- A plethora of local test procedures are in use and these are likely to be restricting trade by increasing costs of trade. Furthermore, few international test procedures are "generic" and many require significant work to make them more applicable for regulatory purposes.

- For many product types, alignment of test procedures appears to be the most feasible option in the medium term.

- Conversion algorithms (computer modeling concept) appear to be a feasible and attractive option for selected products (especially water heaters). The approach, however, is very new and has yet to be proven and receive widespread acceptance.

- There needs to be a change in direction with respect to the treatment of energy performance within IEC/ISO standard development activities. There also needs to be an increased and ongoing input by APEC member economies into IEC/ISO standards development processes, especially for those products and those economies that regulate on the basis of energy and performance.

Based on this study, the SGES developed a three-pronged, product-by-product plan to remove or reduce the need for testing to multiple standards.[7] Its major elements are listed below.

1. For a few products (e.g. lamps): adopt a common test procedure from among those existing in the region.

2. For a number of products (e.g. dishwashers, ballasts & motors): influence the development of new international test procedures that could be adopted by most or all economies (e.g. through ISO or IEC).

3. For certain products (e.g. electric water heaters): develop algorithms to convert the results of one test procedure to meet the requirements of another test procedure.

16[7] The plan can be found in Appendix 2.

In particular, the second prong of this plan – influence the development of new international test procedures – has important ramifications for the APEC region. The development of international test procedures calls for a large degree of cooperation among economies. Such cooperation, however, stands to have a substantial impact on increasing the use of energy-efficient products and on increasing trade flows.

Finally, the study provided the basis for a colloquium in Seoul on energy performance standards and a symposium in New Zealand on refrigeration. The study also raised the issue of algorithm conversion and will form the basis for a study on algorithms that will be started in mid-2000.

Colloquium on Energy Performance Standards

The Korean Ministry of Commerce, Industry and Energy, and the Korea Energy Management Corporation, hosted a *Colloquium on Technical Issues of Minimum Energy Performance Standards* in Seoul, Korea on 6-8 October 1999. Thirty participants from eleven APEC economies attended the colloquium. Generally, those economies that attended were those that have, or are actively contemplating, mandatory energy performance requirements for the two product lines considered by the colloquium – namely, domestic air conditioners and ballasts for fluorescent lamps.

The main objectives of the colloquium were to:

- Exchange information;
- Examine the potential for translating between different test procedures (conversion algorithms) to reduce costs of retesting;
- Look towards the use of compatible test procedures for the testing of products.

The colloquium produced clear recommendations for mandatory energy performance requirements for both domestic air conditioners and for ballasts for fluorescent lamps.

For ballasts it was proposed that a draft Australia-New Zealand standard for the measurement of ballast energy performance and efficacy be prepared on the basis of the colloquium recommendations[8]. When publicly available, participants from the colloquium will consider the draft test procedure in detail in terms of its suitability for adoption within APEC and ultimately as the basis for a new IEC standard.

[8] It was noted that Australia will introduce Minimum Energy Performance Standards (MEPS) levels for ballasts in 2002 and therefore has an urgent need for a new test procedure to measure ballast efficacy. However, input from APEC members will be incorporated as far as possible.

KEY FINDINGS FOR AIR CONDITIONERS

- The full harmonization of test procedures, test conditions and MEPS levels are desirable objectives, but likely to be achieved at different rates.
- The harmonization of test procedures (i.e., how the tests are carried out, and the acceptable range of variability) is a medium term objective.
- The harmonization of test conditions (i.e., the rating points) is also a medium term objective (although harmonization algorithms could be implemented within a shorter time frame).
- The harmonization of MEPS levels (i.e., the minimum limit or sale-weighted EERs allowed in each economy) is a longer term objective.

KEY FINDINGS FOR FLUORESCENT LAMP BALLASTS

- Finalize agreement on major issues regarding the method of test and undertake research on outstanding technical points.
- Australia and New Zealand to prepare and make available a draft ballast test procedure in early 2000 and invite comments from APEC Economies.
- A self funded project to move the draft standard into IEC as a new work item proposal should be formed (this carries most weight if a published national standard is used as the basis for the new work item). This will require some ongoing commitment to attend IEC meetings from project participants.

Symposium on Refrigeration Appliances

A symposium on improving energy efficiency test procedures for refrigerators and freezers took place from 6-8 March 2000 in Wellington, New Zealand. Thirty-six delegates representing thirteen APEC economies attended.

Participants agreed that there was room for enhanced commonality of energy performance testing to reduce the costs of testing to manufacturers and make it easier for consumers to compare the energy efficiency of refrigerators and freezers designed and rated in different APEC economies. They also noted that the rapid growth in microprocessor controlled and innovative energy efficient refrigeration technologies and self-learning "smart" refrigerators and freezers have created new opportunities to save

energy but are already causing problems for many of the energy performance test procedures used in APEC economies.

KEY FINDINGS

- There is an urgent need to investigate the potential for conversion algorithms (with some modest additional tests) to translate the results of the different test procedures used within APEC for consistent comparisons.
- There is room for greater alignment of a range of measurement and definition issues, such as storage volume, food packs and internal compartment temperatures used in the energy consumption tests.
- Current test methods should be modified to enable some modeling of actual user behaviour and refrigerator and freezer performance.
- Test procedures should include cost-effective methods to measure the in-use impact of increasingly sophisticated "smart" refrigerator and freezer systems that would encourage further technological advancement.
- APEC economies need to be more active participants in international standards fora.
- There is a lack of knowledge of actual in-use refrigerator and freezer performance available to underpin the necessary improvements in testing procedures and practices.

Project on Test Procedure Conversion Algorithms

In anticipation of Study 3's recommendation regarding the feasibility and desirability of developing conversion algorithms, the SGES has put forward a project that will examine the development of algorithms or computer models to convert between different test procedures. The SGES expects the study to get underway in April/May 2000 once its funding is secured.

The rationale for this project is that because the test procedure for some products (particularly air conditioners and refrigerators) is a single measurement under static conditions, it is difficult to characterize the performance of the product across a range of actual use scenarios. For example, there are cases where smart controls or innovative design may actually reduce energy consumption, but when the performance of these products is measured under a single condition they may actually show greater energy consumption under standardized test procedures. Given that climate and usage patterns vary considerably around the world, the current test procedures for the above-mentioned products in particular are often inadequate.

2.4 General Policy Framework

Steering Group activities culminated in the design of a general policy framework. The purpose of the framework is to provide a structure that will help guide future energy-efficiency standards related work within APEC economies.

GENERAL POLICY FRAMEWORK

The framework consists of three elements.

First, APEC economies need to create transparency of action in the development and use of energy test procedures and help slow the further proliferation of differing procedures as economies introduce new energy efficiency programs.

Second, APEC economy energy authorities need to recognize and encourage existing regional and international laboratory/ laboratory system accreditation arrangements and monitor, and if necessary facilitate, the incorporation of energy-efficiency parameters within the mutual recognition arrangements being developed within the APEC region , such as those being developed by the Asia Pacific Laboratory Accreditation Cooperation (APLAC) and the APEC Sub-Committee on Standards and Conformance (SCSC).

Third, the alignment of energy test procedures should be guided by the three-pronged approach and associated product-by-product strategy laid out in the *Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies* and summarized in Annex 2 of this Report. The three prongs are:

1. For a few products (e.g. lamps): adopt a common test procedure from among those existing in the region.

2. For a number of products (e.g. dishwashers, ballasts & motors): influence the development of new international test procedures that could be adopted by most or all economies (e.g. through ISO or IEC).

3. For certain products (e.g. electric water heaters): develop algorithms to convert the results of one test procedure to meet the requirements of another test procedure.

The above elements should be implemented on a progressive, multilateral or bilateral basis. The pace of implementation would vary by economy depending on the particular circumstances.

The Standards Notification Procedure, endorsed by APEC Energy Ministers at their third meeting, would be the basis for achieving the first element. The establishment of an APEC Energy Efficiency Test Procedures Coordinator, plus active participation by

member economies in APEC workshops and international standards processes, would provide the basis for achieving the second and third elements.

2.5 Framework Implementation

The successful implementation of the General Policy Framework requires the active participation by member economies in APEC workshops and international standards processes. It also requires the existence of an infrastructure that will create transparency of action on the development and use of energy test procedures and that will monitor and coordinate related activities in the APEC region. SGES activities and discussions considered how to build an appropriate infrastructure. The SGES concluded that in order for the framework to be implemented effectively, the web-based Standards Notification Procedure needs to be established and an APEC Energy Efficiency Test Procedures Coordinator should be appointed.

Web-Based Standards Notification Procedure

In August 1997, APEC Energy Ministers agreed that the preparation of a Standards Notification Procedure was an important step that would create transparency of action in the development and use of energy efficiency test procedures and help slow the further proliferation of differing procedures as economies introduced new programs using such procedures.

In October 1998, Energy Ministers endorsed the establishment of a Standards Notification Procedure. The Ministers agreed to consider, in the first instance, when new programs requiring the use of energy-efficient test procedures are introduced, employing test procedures already in use. In the event of the adoption of a new test procedure within their economy that varies from those already in use, they agreed to notify other economies and make the test procedure available to them.

Early on in the process, the SGES agreed that any test procedures notification process should be web based, not least because a web-based system would best promote the transparency of APEC standards. It is important to remember that ensuring the transparency of standards and conformity was one of the undertakings of the Manila Plan for APEC (MAPA). Furthermore, a web-based system would enable broad and easy access to standards information.

Originally, the representatives suggested that the website would contain a one-page summary and provide information or a directory to other web sites for further information and details specific to a product or a member economy. Member economies would be expected to develop their own linkages and to maintain up-to-date information.

Representatives believed that such a website would help encourage the convergence of test procedures in member economies.

Australia agreed to manage the intial set-up of this web-based project. SGES representatives concluded that the manager of the site should compile an e-mail list of contact persons for each member economy so that they could be alerted when changes to standards would be made. Likewise, the web site should include red flags to alert website users who are exporters and importers to changes in standards and test procedures. In essence, it seemed that APEC should adopt a similar approach on this website as the one used by the World Trade Organization (WTO) that informs and updates that organization of changes to their economies' regulations.

STANDARDS NOTIFICATION PROCEDURE

- The energy efficiency standards web site would be part of the website of the Energy Working Group.
- The web site would be linked to other sites in each economy that use energy-efficiency test procedures as part of a domestic program.
- Economies would make available information on all energy-efficiency test procedures that exist for products that are regulated and require testing.
- Economies would update the above information at least every six months.
- Economies, when proposing to adopt a new test procedure within their economy that varies from those already in use, would have such information posted on the central website.

By the 6th meeting of the SGES, however, it became clear that it could cost US$10,000-$15,000 to complete the site. There were also questions about the on-going management of the site. New funds are required to post SGES publications on the site and to complete the list of contacts within each economy for the purposes of notification and consultation. The funds would also go towards the maintenance and management of the process of updating notifications and contacts.

Despite the issue of funding, the SGES has made progress on this web-based standard notification procedure. Upon its completion, the APEC EWG site will be a centre with a directory to other web sites that will house further information on efficiency standards in each economy. Notifications of the intent to introduce new standards and test procedures will be posted on the central site.

Energy Efficiency Test Procedures Coordinator

The SGES concluded that, in addition to the Standards Notification Procedure, the successful implementation of the General Policy Framework would require that APEC create the position of *APEC Energy Efficiency Test Procedures Co-ordinator*. The Steering group believes that the role could be up to one full-time person.

ENERGY EFFICIENCY TEST PROCEDURES COORDINATOR

- developing, implementing and maintaining the standards web site;
- managing the Standards Notification Procedure;
- monitoring international standards processes and developing a database for standards;
- coordinating APEC standards participation networks and algorithm activities within standards development where integrated with APEC priorities;
- monitoring and reporting on the delivery of the SGES work program to reduce or remove the need for multiple testing;
- prepare and compile summaries of significant changes that occur within APEC for distribution to interested parties via a newsletter and the web site; and
- provide regular reports and updates to the APEC EGEE&C.

In essence, the co-ordinator, by improving the timely flow of information and ideas between APEC economies, would help members to understand better how APEC needs could be incorporated into international standards development. Ultimately, the co-ordinator would be responsible for networking between economies and for helping to ensure the smooth implementation of the general policy framework. The co-ordinator, however, would not be responsible for developing an APEC consensus position. There would still be the need for the active participation by member economies in APEC workshops to discuss possible common actions with respect to energy efficiency test procedures as well as a need for active representation by member economies in the international standards development process and associated meetings.

Finally, while the position would involve a little travel (to attend EGEE&C meetings, relevant workshops and possibly some international standards meetings, it would mostly be a co-ordination position. The Steering Group estimated that as long as the position was linked to an organization within the energy standards area it would cost approximately US $50,000 per year.

The *APEC Energy Efficiency Test Procedures Co-ordinator* would report to the Expert Group on Energy Efficiency and Conservation.

3.Recommendations for APEC Energy Ministers

The SGES met seven times between March 1997 and March 2000. During this period, the Steering Group commissioned three major studies, conducted projects internally and held three energy standards related workshops. Based on its findings from these activities, the SGES has developed two recommendations for consideration by APEC Energy Ministers. These recommendations are as follows:

- **Recommendation 1:**

  Ministers endorse the general policy framework for APEC co-operation on energy standards developed by the APEC Steering Group on Energy Standards. The key elements of this framework are:

  - creation of transparency of action in the development and use of energy test procedures through the implementation of the Standards Notification Procedure endorsed by APEC Energy Ministers in Okinawa;

  - recognition and encouragement of existing regional and international laboratory/ laboratory system accreditation arrangements and support for the inclusion of energy efficiency within the mutual recognition agreements being developed in the APEC region;

  - adoption of a three-pronged, product-by-product, approach to the greater alignment of test procedures within APEC member economies. The three prongs are:

    - to adopt a common test procedure from procedures used in the region, where this is feasible;

    - to influence the development of international test procedures so that they are in a form suitable for member economies; and

    - to develop algorithms to convert results between existing member economies' test procedures.

  Ministers agree the above elements should be implemented on a progressive, multilateral or bilateral basis. The pace of implementation would vary by economy depending on the particular circumstances.

- **Recommendation 2:**

  Ministers agree to the establishment of the position of an *APEC Energy Efficiency Test Procedures Coordinator*. The Coordinator will facilitate the implementation of the general policy framework within APEC economies in a coordinated and timely fashion. These tasks will include:

  - Developing, implementing and maintaining the web-based Standards Notification Procedure;
  - Monitoring and reporting on international standards processes; and
  - Coordinating APEC energy efficiency test procedures participation networks

Appendix 1 Terminology

This appendix explains some of the terms used in the report. It is meant to acquaint a reader who is not conversant in standards-related terminology with key terms to ensure that the report is easy to understand.[9]

1. Types of Standards

The French language makes an important distinction between two groups of standards, a distinction that is lost in English. The first group is called étalon and refers to a standard as a unit or physical constant such as a metre, mile, kilogram or gallon. The second is called *norme* and refers to a technical specification document.

According to terminology documented by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) a standard is a: "Document, established by *consensus* and approved by a recognized *body*, that provides, for common and repeated use, rules guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context".[10] This definition is suitable for the standard referred to above as *norme*—or *normative* (written) standard. Keeping in mind the two-fold definitions of "standards", as both unit of measurement and written specification, it is possible to proceed with an outline of different types of standards.

1.1 Measurement (Physical) Standards

The science of measurement is known as *metrology*: the means by which base and derived units are given a basis of operation in the fields of science. Base units such as the kilogram, metre, or second, in addition to their derived and supplementary units, are component parts of the International System of Units, adopted by the Conférence des Poids et Mesures (CGPM). These units represent the physical standards of mass, length, and time. They are calibrated and certified by the national measurement laboratories of CGPM members to provide 'traceability' for a country's national measurement system. *Traceability* can be defined as a documented chain of measurements connecting the accuracy of a means of

[9] This appendix is adapted from Chapter 2 of Nordicity Group, *Energy Efficiency Performance Testing and Conformity Assessment in APEC Member Economies*, 1997.

[10] See *ISO/IEC Guide 2: General Terms and Their Definitions Concerning Standardization and Related* 27*Activities*, ISO/IEC, Sixth edition, 1991. This definition is also accepted by the WTO TBT Committee.

measurement to one of a higher accuracy that in turn is ultimately connected to a primary measurement standard.

Physical standards function as the foundation upon which normative standards are built and maintained. National measurement laboratories provide nationally and internationally recognized measurement and calibration capabilities necessary to support the development of normative standards and the testing and certification of products and services to those standards.

1.2 Normative (product design, performance, or process) Standards

There are different types of normative standards that can be defined according to (i) the purpose for which they were developed (for example, to measure performance, or to specify a process or a test method); (ii) how they were developed (for example, developed by consensus) and who developed them (for example, developed by manufacturers, a government, a standards development organization); and (iii) the manner in which they are adopted and applied. Definitions of the different types of standards and of the purposes that normative standards serve are outlined below.

1.2.1 Purpose of Standards

Normative standards can be classified on the basis of what they define and for what purpose they are developed. In this context, three generic types of standards can be identified as follows:

1. Product design standards specify the characteristics of a product or a group of products in order to ensure their fitness for purpose (e.g., baby walkers, traffic lights).

2 Performance standards are product standards that specify requirements for one or more performance characteristics. These kinds of standards deal with operating or testing and evaluating characteristics of a product. A performance standard stipulates that the characteristics with which a product must comply are based on tests that simulate as nearly as possible the performance that a product is required to give under actual service conditions. An example of a performance standard would be a certain mechanical strength specifying a minimum value of load on a physical structure that must be resisted. Another example is a test standard specifying minimum energy conservation requirements.[11]

[11] According to *ISO/IEC Guide 2*, a test standard is a standard "that is concerned with test methods, sometimes supplemented with other provisions related to testing, such as sampling, use of statistical methods, sequence of tests." A test method is "specified technical procedure for performing a test".

1 A process standard defines socio-economic roles and relationships and establishes rules for interpreting behavior. It facilitates interactions between people. Examples of this type of standard include driving cars on public streets on one side of the road, or quality management practices as defined by the ISO 9000 series.

1.2.2 Standards Development Process

Standards may also be classified on the basis of how or by which organization they are developed. For example, a standard can be developed through a "de facto" process. This means the standard was developed by industry within the context of market supply and demand requirements.

A standard could also be developed by an accredited standards development organization (SDO) through the voluntary standards process. In most countries, SDOs are accredited by some national standards organization, which is either a government or semi-government agency, or a private sector body.

In addition, governments develop standards that are designated as "de jure" or *regulatory standards*. Regulatory standards arise from political choices and are mandated by government authorities from the top down. These types of standards are usually driven by regulatory concerns (for example, to deal with environmental, health, or safety issues, or energy efficiency requirements). They could also be introduced to regulate market structures that may threaten to become uncompetitive or economically inefficient.

1.2.3 Application of Standards

Finally, standards can also be classified according to the way they are applied. Basically, this means that a standard can be "mandatory" or "voluntary". A "mandatory" standard is one for which the application has been made mandatory by a regulation. The ISO and IEC identify this as a regulatory standard that is a "document providing binding legislative rules, that are adopted by an authority".[12] An "authority" is a body that has legal powers and rights", and this could be a national government body, or a regional or international body.

[12] *ISO/IEC Guide 2*.

A "voluntary" standard is one that is based on a consensus of experts. Sometimes these are referred to as "voluntary consensus" standards. The word "voluntary" applies to both the preparation of the standard and its use. In the preparation, the word "voluntary" is sometimes interpreted to mean that "those concerned, freely and without coercion, gave of their time, money, and effort to achieve a given objective".[13] In use, "voluntary" could also mean that the standard is applied at the discretion of those individuals or organizations involved.

2. Conformity Assessment

The existence of a standard alone is not sufficient to ensure that the requirements declared within the standard will be realized.[14] Manufacturers, consumers and government organizations require some assurance that products will function as promised. Product testing, plant inspections, and other procedures are conducted to determine whether a manufacturer's product conforms to the specifications set forth in a standard.

The process by which fulfillment by a product, process or service of specified requirements is assured, is called *conformity assessment*. Conformity assessment is the comprehensive term for measures taken by manufacturers, their customers, regulatory authorities, and independent, third parties to assess conformity to standards.

Conformity assessment generally involves the following:

- accreditation, which is the procedure by which an authoritative body gives formal recognition that a body or person is competent to carry out specific tasks in accordance with established criteria;
- testing of products, parts, and materials performed by independent laboratories as a service to the manufacturer;
- certification, or formal verification by an unbiased third party, through testing and other means, that a product conforms to specific standards;
- quality system registration, as a result of independent audit and approval of the manufacturer's quality system; and

[13] *SO/IEC Guide 2*.

[14] While few international standards include mandatory requirements concerning energy performance, the 30ISO standard for refrigerators is an exception.

- manufacturer's declaration of conformity, which is the self-assessment by the manufacturer based on internal testing and quality assurance mechanisms."[15]

2.1 Accreditation

Laboratory accreditation is the formal recognition that a testing laboratory is competent to carry out specific tests or specific types of tests. Accreditation of labs is normally awarded following successful laboratory assessment and is followed by appropriate surveillance.

National laboratory accreditation programs world-wide that conform to international standards, generally operate in accordance with three guides published by ISO and IEC:

- ISO/IEC Guide 58, which outlines the requirements for operating calibration and testing laboratory accreditation programs.
- ISO/IEC Guide 25, which lays out the requirements that must be met by competent calibration and testing laboratories.
- ISO/IEC Guide 43, which describes the requirements for developing and operating a laboratory proficiency testing program for inter-laboratory comparisons.

As ISO/IEC Guide 43 supplements ISO/IEC Guide 58 by describing the procedures for the proficiency testing that is required by ISO/IEC Guide 58, ISO/IEC Guides 25 and 58 are the two key international standards to which laboratories and accreditation bodies must conform, and are described below in more detail.

2.1.1 Guide for Operating Laboratory Accreditation Programs: ISO/IEC Guide 58

The objectives of 1S0/IEC *Guide 58: Calibration and Testing Laboratory Accreditation Systems—General Requirements for Operation and Recognition* (1993) are to provide guidance for setting up and operating a laboratory accreditation body and to facilitate mutual recognition agreements (MRAs) between such bodies for the accreditation of testing laboratories.[16] The Guide is intended to be adopted nationally with minimal changes and can be written by national bodies to be mandatory if desired.

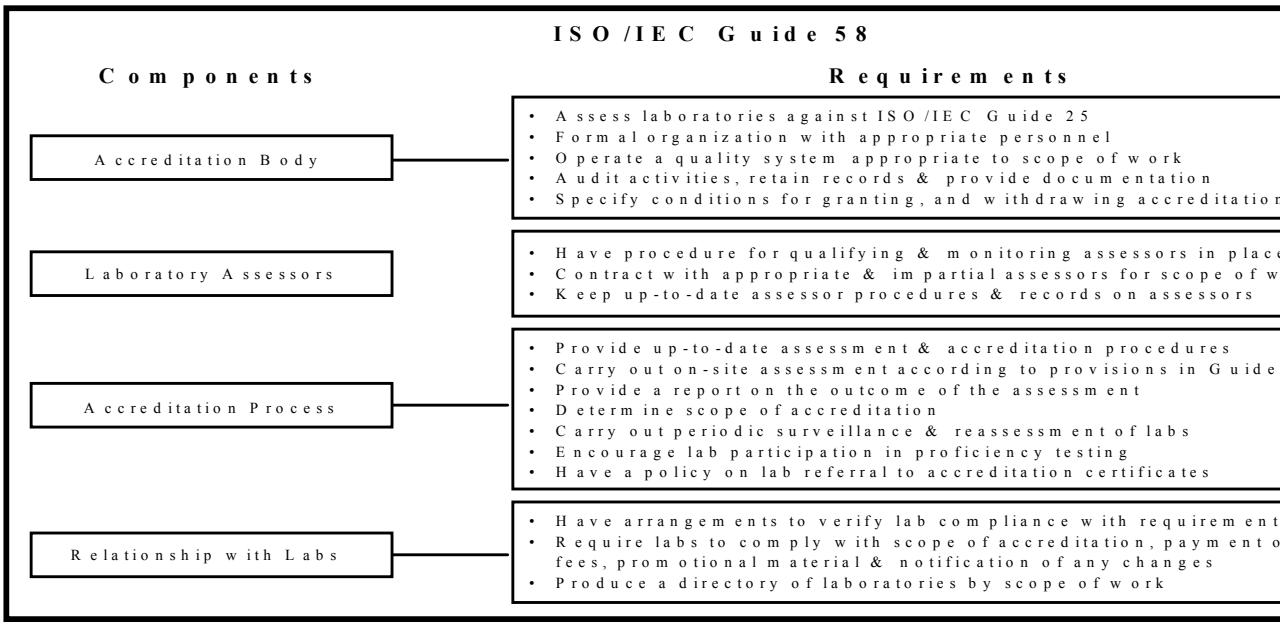
Guide 58 lays out provisions for the accreditation body, for laboratory assessors, for the accreditation process, and for the relationship between the accreditation body and the laboratory. Exhibit 3 illustrates the requirements for each of these four components in ISO/IEC Guide 58.

[15] See *Standards, Conformity Assessment and Trade Into the 21st Century*, National Research Council, U.S.A., 1995.

[16] *ISO/IEC, Guide 58: Calibration and Testing Laboratory Accreditation Systems—General Requirements for Operation and Recognition*, First Edition (Geneva: ISO, 1993).

The first component of Guide 58 sets out requirements for the organization of the accreditation body, including the necessity of having a quality system with documented policies and procedures. Accreditation bodies need to maintain appropriate records, specify the conditions for granting, maintaining and withdrawing accreditation, and provide documentation about the organizations and its processes. Accreditation bodies may find that the requirements of ISO/IEC Guide 25 may have to be interpreted for a specific calibration, test, or type of calibration or test, and any interpretations should be formulated by committees possessing the necessary technical competence.

Exhibit 3
Components of ISO/IEC Guide 58 for the Operation of Laboratory Accreditation Programs



The second component of Guide 58 states that laboratory assessors need to have the appropriate legal and technical knowledge, and communications skills to do their job effectively and impartially. The accreditation body should have an adequate procedure for training and qualifying assessors, as well as maintain up-to-date records on assessors.

The third component of Guide 58 states that the accreditation process must include:

- requirements for application for accreditation (including the minimum information that the laboratory must provide before the on-site assessment);
- requirements for the on-site assessment and assessment report;
- explanation of how the decision on accreditation is to be made;
- discussion of how surveillance and reassessment of accredited laboratories should be carried out; and
- identification of certificates that can be issued by accredited laboratories to demonstrate for which calibrations, tests or types of calibration or test, the accreditation is held.

Laboratories are also encouraged as part of the accreditation process to participate in proficiency testing or other interlaboratory comparisons organized by the accreditation body or any other body judged to be competent. 'Provisions for proficiency testing are outlined in *ISOIIEC Guide 43: Development and Operation of Laboratory Proficiency Testing* (1984).

The fourth component of Guide 58 describes the relationship between the accreditation body and the laboratory. The laboratory must accommodate and cooperate with the accreditation body at all times to ensure that it complies with the requirements of Guide 58, pays the required fees for accreditation, does not use its accreditation to imply product approval, and complies with the accreditation body's requirements for communication media such as advertising and brochures. The accreditation body must inform the laboratory without delay of any changes in its accreditation status, and should periodically publish a directory of accredited laboratories and the accreditation granted.

2.1.2 Guide for Accreditation of Laboratories: ISO/IEC Guide 25

The ISO/IEC Guide 25: General Requirements for the Competence of Calibration and Testing Laboratories, sets out the general requirements a laboratory has to meet if it is to be recognized as competent to carry out tests and/or calibrations, including sampling. The Guide covers testing and calibration using published methods, methods that are not covered by standard specifications, and new methods a laboratory has developed. The purpose of the Guide is to provide a mechanism for promoting confidence in testing and calibration laboratories to facilitate the removal of non-tariff barriers to trade, assist in the exchange of information and experience, and improve the harmonization of standards and procedures. A new draft of Guide 25 was released for comments in August 1996 given the vast increase

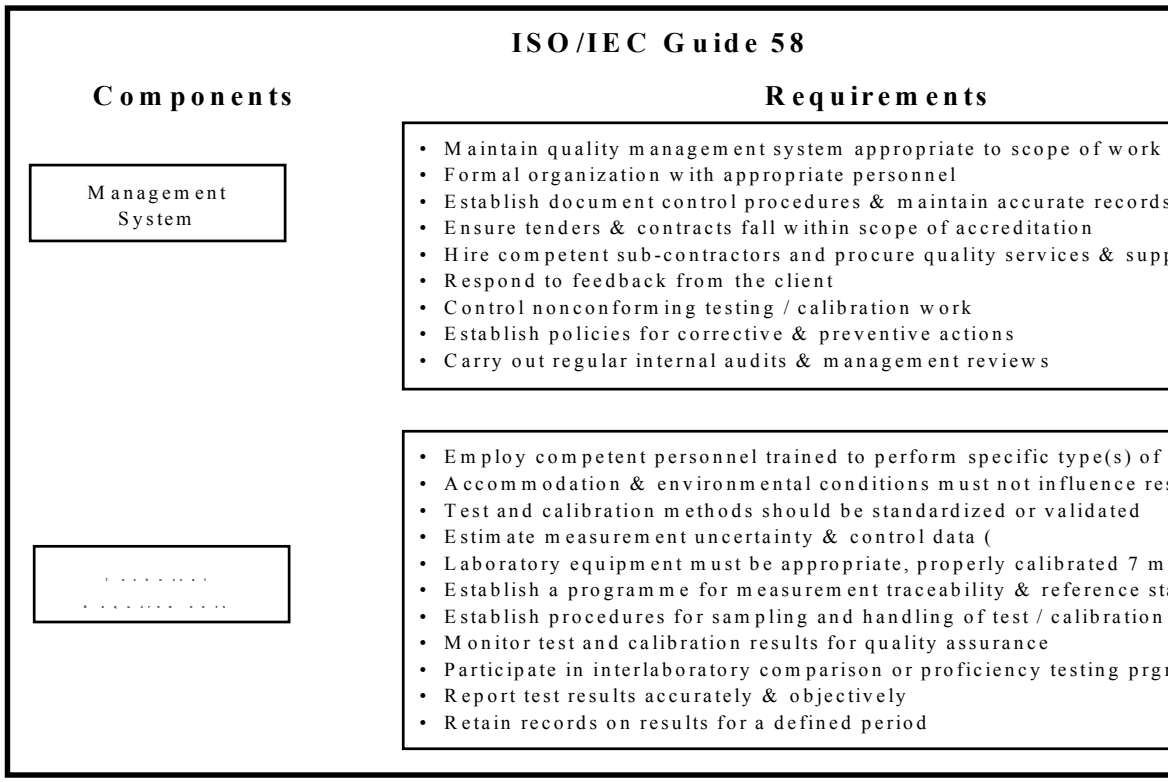
in the use of quality systems in laboratories since the 1990 edition of the Guide.[17]

The Guide is applicable to all organizations performing tests and/or calibrations, whether they are first party, second party, or third party laboratories or laboratories where testing and/or calibration forms part of inspection and certification. Some requirements do not apply to all laboratories, so each laboratory must comply with all those requirements that enable it to demonstrate its competence. If a laboratory wishes accreditation for part or all of its testing and calibration activities, it should select an accreditation body that conforms to ISO/IEC Guide 58. Laboratories that comply with ISO/IEC Guide 25 comply with the requirements of ISO 9001 or ISO 9002 for the scope of the testing and/or calibration services covered by their quality management system.

There are two main sections in Guide 25: (i) specifications for quality management system requirements and (ii) specifications for technical requirements, as illustrated in Exhibit 4. A laboratory's quality management system is to be appropriate to the scope of the activities it undertakes and all policies, systems, procedures and findings are to be documented. The second section outlines technical requirements that a laboratory must meet in order to demonstrate its competence for the types of tests and/or calibrations that it undertakes. A laboratory must take account of the many factors that determine the reliability of tests and calibrations, including human factors, accommodation and environmental conditions, test and calibration methods and method validation, equipment, measurement traceability, sampling, and handling of test and calibration items.

Exhibit 4
Components of ISO/IEC Guide 25 for the Accreditation of Laboratories

[17] *ISO/IEC, Guide 25: General Requirements for the Competence of Calibration and Testing Laboratories*, Draft (Geneva: ISO, 1996).



2.2 Testing

Testing is the action of carrying out one or more *tests*. A test is a technical operation that consists of the determination of one or more characteristics of a given product, process or service according to a specified procedure known as a *test method.*[18]

Testing is carried out by independent or government laboratories that perform testing services for clients for a variety of reasons (for example, to satisfy regulatory requirements, to ensure customer satisfaction, to provide assurance of quality and durable performance).

Testing services encompass a broad spectrum of technical activities and competencies. Materials, parts, and completed products may all be tested for their physical properties, such as strength and durability; physical dimensions; electrical characteristics, including interference with other electrical devices; acoustical properties; chemical composition; presence of toxic contaminants; and multitudes of other features.

[18] *ISO/IEC Guide 2*.

Laboratories undertake their tests according to specified *testing standards* that usually encompass specific requirements for the following:

- equipment to be used in the test;
- procedure to be followed;
- evaluation of test data and results;
- test conditions or environment under which the test is carried out.

Often testing standards are also supplemented with other provisions related to testing requirements such as sampling, use of statistical methods, and the sequence of tests.

Other dimensions of testing involve the underlying acceptability of the laboratory and its equipment and the level of training and experience of the staff and management. The former is subject, for example, to calibration requirements and the latter is subject to appropriate quality systems management standards, training requirements, and professional certification and qualifications.

2.3 Certification

Certification is "a procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements"[19] as identified in standards or other recognized documents. Certification is, by definition, a third-party activity, and it usually requires performance of product tests. It is always performed by a third party, independent of either the supplier or purchaser. Sometimes manufacturers' declarations of conformity are called "self-certification", but even in these cases manufacturers contract the services of third-party laboratories to demonstrate compliance to regulatory requirements, or purchasers' specifications.

Certification results in a formal statement of conformity—a certificate—that can be used by the manufacturer to print a *certification mark* on the product or its packaging, potentially increasing its acceptability to the buying public. A certification mark is a protected mark, whose use is authorized by a certification organization, and is applied or issued under the rules of a certification system, indicating that adequate confidence is provided that the relevant product, process or service is in conformity with a specific standard or other normative document.

The certifier often licenses the manufacturer to show compliance with regulations, meet purchasing specifications, and enhance the product's marketability. Certification may involve many different levels of complexity, and the more complex and intrusive the requirements of the certification program, the greater the costs. Sometimes multiple tests are required, and in some situations evaluation of

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[19] *ISO/IEC Guide 2*.

the manufacturer's quality assurance system is part of the certification scheme. Other certification programs require follow-up testing of additional samples taken from the factory or off the shelves in the market.

2.4 Quality Systems Registration

The ISO defines *registration* as a "procedure by which an organization or body indicates relevant characteristics of a product, process or service, or particulars of a body or person, in an appropriate, publicly available list." Increasingly, around the world, regulations for product safety and a growing market demand for independent assessment of producers' quality management systems, has been a driving force behind the recent trend for quality systems registration. The best-known and fastest-growing aspect of this trend is registration to ISO 9000 standards, a series of quality system standards published by the International Organization for Standardization.

Quality system registration is the assessment and periodic follow-up audit of a manufacturer's quality assurance system. Assessments and audits are performed by an independent party – the quality system registrar. Quality system registrars are accredited by national accreditation bodies of economies. A quality system comprises requirements such as documentation, training, statistical monitoring of results, and continuous improvement. Awareness of quality system registration has expanded rapidly in recent years, in conjunction with global growth in demand for the ISO 9000 series of standards.

Appendix 2Product-By-Product Strategies To Align Test Standards

The table in this appendix is extracted from the consultant final report *Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies* and summarizes the consultant's recommended strategies to meet APEC's alignment goals for test standards for electrical products. It rates corresponding trade levels, links products to relevant international standards and outlines a test method alignment strategy for each product. The table also discusses the feasibility of implementing the proposed strategies[20].

The table provides a map for the SGES's three-prong, product-by-product approach which is a key component of the proposed general policy framework.

[20] Originally published in Energy Efficient Strategies, *Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies*, November 1999. APEC #99-RE-01.5 ISBN 0-646-38672-7.

Summary of Test Standards for Electrical Products in APEC Economies - current status and recommended strategies

Product	Level of Trade	Efficiency Regulations	International Standard(s)	Preferred Standard(s)	Recommended Strategy	Current Alignment / Prospects	Time Scale	Short term Resources	Longer term Rresources	Issues/Comments
Air~~-~~conditioners	Large	Many, some proposed	ISO5151ISO 13253[1]	ISO5151 ISO13253 New international coding system	Alignment to ISO + additional modelling for variations and climate/use effects	Fair/ Good	Short + medium	Moderate	Minimal + Substantial	Short term alignment to ISO, modelling required to deal with inverters and climate variations
Motors	Large	Some, some proposed	IEC60034-2	IEEE/NEMA, IEC60034-2 incorp.IEEE	Complete IEC revision, align to improved IEC	Poor/ Good	Short	Minimal	Minimal	New IEC standard will be aligned with IEEE, available soon
Lamps	Large	Some, some proposed	IEC60081 IEC60901	IEC60081 IEC60901	Align to IEC	Fair/ Good	Short	Minimal	Minimal	IEC widely used, requires active alignment in APEC
Ballasts for Fluorescent Lamps	Large	Many, some proposed	None	New IEC based on Nth American methods	Develop new IEC then align	Poor/ Good	Short to medium	Moderate	Minimal	Having no IEC has created problems, fast track proposed
Electric Water Heaters	Small	Many	IEC60379, technically limited	New IEC/ISO based on modelling, covering all fuel types including solar	Physical tests + modelling of use (complex algorithm)	Very poor/ Good if method accepted	Medium	Moderate	Minimal	Computer modelling algorithm already developed to handle diverse conditions of use & climate
Clothes Washers	Moderate	Some, some proposed	IEC60456	IEC60456, but current scope very restricted, many issues to resolve	Amend & develop IEC to make more universal	Very poor/ moderate	Medium to long	Moderate	Moderate	Work required to include top loading, develop and resolve performance issues

Dishwashers	Small	Some	IEC60436, obsolete	New IEC under development	Develop new IEC then align	Poor/ Good	Medium	Moderate	Minimal	Current IEC process appears promising
Clothes Dryers	Small	Some	IEC61121, technical flaws	IEC61121, improve correction, generalise method	Complete IEC revision, align to improved IEC	Poor/ Good	Medium	Moderate	Minimal	Making IEC standard generic will improve applicability
Refrigerators	Large	Many, many proposed	ISO5155 ISO7371 ISO8561 ISO8187	None, all methods have major limitations	Investigate use of dual temperature methods, investigate modelling options	Very poor/ moderate	Medium to long	Substantial	Substantial	Many technical issues, modelling is difficult and success is not certain

[1] Other ISO standards for heat pumps include ISO13256.1 (water source to air) and a draft for multi-splits CD15042.

Table reproduced from Summary & Contents of *Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies*, by Energy Efficient Strategies, November 1999.