ENERGY EFFICIENCY PERFORMANCE TESTING AND CONFORMITY ASSESSMENT IN APEC MEMBER ECONOMIES

Prepared for:

STANDARDS COUNCIL OF CANADA (SCC) & NATURAL RESOURCES CANADA (NRCan)

Prepared by:

Hussein Rostum
Principal Author

Nordicity Group Ltd.

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EXECUTIVE SUMMARY

Nordicity Group Ltd., a company incorporated in Canada, was contracted by the Standards Council of Canada and Natural Resources Canada, to carry out a study of energy efficiency performance testing and conformity assessment of APEC member economies for the APEC Steering Group on Energy Standards, a sub-committee of the APEC Energy Working Group (EWG), to determine the feasibility of increased cooperation on energy efficiency standards.

This study demonstrates that the alignment of energy performance test standards can only effectively be carried out by the APEC member economies in the context of the broader conformity assessment infrastructure for energy efficiency. Alignment of the test procedures for the six selected energy-using products (refrigerators, refrigerator-freezers, and freezers; room air conditioners; single-package air conditioners; split system air conditioners; electric motors; and fluorescent lamps and lamp ballasts) can 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, are also addressed.

Accreditation Programs and Requirements

- Currently within APEC, there is variability in the stages of development of domestic laboratory accreditation bodies and some members require technical assistance from APEC economies with more experienced accreditation bodies to achieve international recognition.

- Ensuring that the energy efficiency scope of accreditation is built into domestic accreditation programs of APEC economies will be conducive to both the success of a MRA in the area of energy performance testing and to the expansion of energy efficiency testing infrastructure in the APEC economies.[1]

- The difference between public and private sector accreditation programs may be significant in terms of the extent to which some APEC governments are able to commit to developing the capabilities of private sector energy efficiency testing.

[1] An APLAC sub-committee is currently looking into whether there are any special requirements for energy and performance testing that need addressing through the provision of additional guidelines.

Certification and Testing Conformity Assessment Infrastructure

- While the accreditation programs of the APEC economies tend to include a certification component, there is a relatively small number of certification marks for the number of APEC members.

- A majority of the labs that responded to the *APEC Survey of Laboratories* are accredited to ISO/IEC Guide 25; however, compliance to ISO/IEC Guide 25 by labs in the APEC economies cannot be taken as a given, and technical assistance for developing cadres of qualified lab assessors may have to be arranged for economies that are still developing their conformity assessment infrastructure.

- In general, laboratories in the APEC economies are enthusiastic about improving their testing capabilities in the future, in relation to increasing the number of electrical energy-using products that they test, acquiring new test equipment, training staff for new test methods, and making partnership arrangements with laboratories in other countries.

APEC Energy Efficiency Regulatory Programs And Requirements

- The regulatory overlay that affects energy performance testing is an important factor in increasing (or reducing) harmonization of efficiency standards. Regulatory requirements need to be as transparent as possible and should, to the extent possible, only be necessitated by the needs of the local economy (e.g. climatic conditions).

- Requirements for import documentation should be included in further investigation of energy efficiency regulatory requirements in the APEC economies, since much of this documentation is related to conformity assessment requirements.

- Further study of this regulatory overlay is required to discover exactly how provisions for energy efficiency can be harmonized in the APEC economies, so that both the test standards used and the regulatory requirements implemented can be accounted for.

Review of APEC Test Standards and Practices

- The recommended order of priority for closer harmonization of the main product groups is single-package and split-system air conditioners, fluorescent lamps and ballasts, electric motors, room air conditioners, and refrigerators, refrigerator-freezers, and freezers.

- The test standards for single-package and split-system air conditioners, and fluorescent lamps and ballasts appear to be the closest to alignment among APEC members.

- There are moderately good prospects for standards alignment for electric motors; however, the issue of how best to calculate/measure "stray load losses" will have to be clarified across APEC economies before these test standards can be aligned.[2]

- On the other hand, there are still significant differences between the domestic and international standards currently in use for room air conditioners, as well as differing regulatory requirements, that will have to be resolved before alignment can take place.

- Similarly, the test standards for refrigerators, refrigerator-freezers, and freezers will likely be the most difficult to harmonize among the APEC economies due to the numerous domestic standards used by APEC laboratories that are very different from the most widely used ISO standard for testing these products, as well as to differing regulatory and labelling requirements.[3]

- Other energy-using products for which a MRA could to be considered by the APEC economies include clothes washers, clothes dryers, water heaters, dishwashers, office equipment and rice cookers.

Requirements for Facilitating Multilateral Mutual Recognition Agreements

It appears likely that an APEC multilateral MRA will have to encompass the following issues to harmonize test procedures and laboratory accreditation programs more closely:

- participation in the development of international standards to ensure that they meet regional requirements;

- increased harmonization of test standards through alignment to international standards by adopting international standards at the domestic level once they have reached a suitable stage of development;

- recognition and reduction of regulatory modifications to test standards (to the extent possible) by addressing critical issues within the standards themselves;

- alignment of accreditation programs to ensure compliance with international standards such as ISO/IEC Guides 25 and 58;

- technical assistance to help those economies with newer accreditation programs and testing facilities acquire the acceptance of test results from more established APEC economies;

[2] There are currently efforts underway to examine ways to harmonize IEC, NEMA and IEEE standards for electric motors.

[3] There may be a need for the development of a new test procedure for refrigerators to deal adequately with in-use climatic variations and new technology such as micro-processor controls.

- development of sufficient experience among all member economies in the administration of domestic accreditation programs;
- access to a credible domestic measurement system that identifies international traceability;
- transparency of documentation and procedures among members; and
- investigation into how the APEC economies can deal with the differing regulatory and import documentation requirements for energy performance of household energy-using products.

RECOMMENDATIONS

The following recommendations to the Steering Group on Energy Standards are presented within the context of the overall framework for alignment found in The *Guide for Alignment of APEC Member Economies' Standards with International Standards* developed in 1996:[4]

1. Evaluation of International Standards

Based on the survey results of this study which provide the energy performance test standards used by laboratories in a majority of the APEC economies, a thorough technical review of equivalencies between the relevant international or draft international standards should be undertaken with the aim of adopting the most appropriate international standards for the main traded energy-using products.

2. Adoption of International Standards

Member economies will need to adopt these international standards for the main traded energy-using products to the maximum possible extent, starting with those that appear to be easiest to harmonize, such as single-package and split-system air conditioners, and fluorescent lamps and ballasts.

[4] APEC Sub-Committee on Standards and Conformance (APEC SCSC), *Guide for Alignment of APEC Member Economies' Standards with International Standards* (Alexandra Point, Singapore: APEC Secretariat, 1997), pp. 3-8.

3. Reducation of Deviations from International Standards

Deviations of member economies' standards from international standards, aside from those deemed essential due to local conditions and regulatory requirements, should be reduced whenever possible.

4. Clear Identification of Deviations

For transparency, the *Guide for Alignment of APEC Member Economies' Standards with International Standards* recommends that the degree of equivalence be identified and any deviations from the international energy efficiency test standards, and reasons for the deviations, be clearly identified by each of the member economies.

5. Participation in International Standardization Activities

As a long term goal, member economies should continue to participate actively in international standardization activities, particularly in terms of activities related to energy efficiency testing, to influence the contents of international standards so as to make them suitable for adoption in the region. There is a need to coordinate APEC input into ISO, IEC and other international standards fora, and to communicate and cooperate regarding APEC regional requirements.

6. Cooperation with Specialist Regional Bodies

To promote alignment with international standards and participation in international standardization activities, the APEC Steering Group on Energy Standards and member economies should seek assistance from their standards bodies and relevant Specialist Regional/International Bodies (e.g. APLAC, ILAC). Cooperation of this nature will ensure a more efficient and effective process to work towards mutual acceptance of energy performance test results among APEC members.

7. Framework for Negotiation of a Multilateral Mutual Recognition Agreement

As the above action items do not cover technical regulations, it is recommended that an investigation of the implications of energy efficiency regulations in each of the 18 APEC member economies be undertaken in parallel with discussions related to the alignment of test standards for each of main energy-using products, most likely according to the procedures provided by the WTO for eliminating technical barriers to trade.

Secondly, the Steering Group on Energy Standards should consider the requirements for a multilateral APEC MRA that are listed in Section 7.1.5 of this report to determine how they can provide a framework to be used for long term planning of the aspects that need to be resolved before the 18 APEC member economies can work towards establishing the terms of a MRA in the area of energy efficiency. Alignment of test procedures for the products indicated is more likely to be successful 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, are also taken into consideration.

1. INTRODUCTION

Nordicity Group Ltd., a company incorporated in Canada, was contracted by the Standards Council of Canada and Natural Resources Canada, to carry out a study of energy efficiency performance testing and conformity assessment of APEC member economies for the APEC Steering Group on Energy Standards, a sub-committee of the APEC Energy Working Group (EWG).

1.1 BACKGROUND

EWG is one of ten APEC working groups and focuses on maximizing the energy sector's contribution to the region's economic and social well being. The EWG is comprised of energy officials who support and implement the decisions of the APEC Ministers Council, and are focused on five areas of strategic importance:

- energy supply and demand;
- energy and the environment;
- energy efficiency and conservation;
- energy research, development, and technology transfer; and
- minerals and energy exploration and development.

Among other initiatives, the working group is seeking increased harmonization of test methods related to energy products, appliances and services. At the thirteenth meeting of the EWG held in Philippines on 15-16 October, 1996, a Steering Group on Energy Standards, to be chaired by Canada and to report directly to the EWG, was established to implement the APEC work program on energy standards agreed to by APEC Energy Ministers at their inaugural meeting in Sydney last August.

The APEC Energy Ministers have recognized that closer harmonization of energy efficiency standards could provide opportunities to overcome standards-related trade barriers without affecting the integrity of standards of individual economies that are designed to achieve energy efficiency and environmental goals. The Ministers agreed to work together to achieve the benefits of increased cooperation 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 can be reduced or removed; and

- developing a general policy framework to allow for the progressive development and implementation on a bilateral or multilateral basis, and product by product, as technical details are established and mutually agreed.[5]

Although increased harmonization of test standards and related laboratory and conformity infrastructure appears to be generally desirable, justifiable differences may exist between APEC members due to local conditions of use, duty cycles, electricity characteristics, and local market saturation differences. This study, therefore, determines the feasibility of increased cooperation on energy efficiency standards.

1.2 STUDY MANDATE AND PROCESS

1.2.1 Study Objectives

(a) Conduct a survey of APEC member economies to identify laboratory facilities, accreditation and conformity assessment practices, products tested, and test standards used to determine and confirm energy performance.

(b) Compare the degree to which these assessment practices and standards are recognized by similar agencies in other APEC countries.

(c) Assess the degree to which these test procedures and laboratory accreditation procedures can be harmonized.

(d) Identify benefits to member economies of harmonizing, and suggest approaches to effect closer harmonization.

1.2.2 Study Process

Nordicity presented the proposed study design, including the proposed survey, consultation process, and results of preliminary research, at the meeting of the APEC Steering Group on Energy Standards in Vancouver, Canada on March 20 and 21, 1997 to representatives from Australia, Canada, Indonesia, Japan, Korea, Mexico, New Zealand, the Philippines, Singapore, Chinese Taipei, Thailand and the United States.

[5] Standards Council of Canada, *Request for Proposal: Study of Energy Efficiency Performance Testing and Conformity Assessment of APEC Member Economies* (Ottawa: Standards Council of Canada, 1997).

The survey design for the study and the products that the survey would address were reviewed and discussed, and it was agreed that representatives from each of the APEC economies would be designated to assist with the implementation of the survey and consultation process in the 18 member economies.

The survey and consultation process were carried out from early April to early June, with analysis of the results taking place in May and June. This draft report provides the analysis of the results of the survey, consultation process, and literature review; discusses a framework on which the benefits of alignment to international standards and increased mutual recognition arrangements can be assessed; and prepares draft recommendations on how to achieve increased mutual recognition.

Details of the study process, and minutes on the discussion by the Steering Group on Energy Standards concerning the process, are contained in the Steering Group's report *APEC Energy Project: Meeting Document* (March 20-21, 1997, Vancouver, British Columbia, Canada); and in the Nordicity study team's *Consultation Document and Proposed Study Design*, which is inserted in the *Meeting Document* of the Steering Group.

2. UNDERSTANDING THE TERMINOLOGY

In a multinational forum of delegates and participants from different countries, with different cultures and languages, it is often necessary to begin by having an appropriate and common understanding of the terms being used in a study. This section provides a brief outline of some of the key terms that are part of this report.

2.1 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".[6] 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.

2.1.1 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 measurement to one of a higher accuracy which 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

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

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.

2.1.2 Normative (Product Design, Performance, or Process) Standards

There are different types of normative standards which 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.

(i) 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:

- First is the product design standard which specifies the characteristics of a product or a group of products in order to ensure their fitness for purpose (e.g. baby walkers, traffic lights).

- Second is the performance standard which is a product standard specifying 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 which must be resisted. Another example is a test standard specifying minimum energy conservation requirements.[7]

- Third, a process standard defines socio-economic roles and relationships and establishes rules for interpreting behaviour. 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.

[7] 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 a "specified technical procedure for performing a test".

(ii) Standards Development Process: Standards may also be classified on the basis of how or by which organizations 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 which 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 which may threaten to become uncompetitive or economically inefficient.

(iii) 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 which is a "document providing binding legislative rules, that are adopted by an authority".[8] 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.

A "voluntary" standard is one which 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".[9] In use, "voluntary" could also mean that the standard is applied at the discretion of those individuals or organizations involved.

[8] *ISO/IEC Guide 2.*
[9] Ibid.

2.2 CONFORMITY ASSESSMENT

The existence of a standard alone is not sufficient to ensure that the requirements declared within the standard will be realized.[10] 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 fulfilment 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 to 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
- *manufacturer's declaration of conformity*, which is the self-assessment by the manufacturer based on internal testing and quality assurance mechanisms.[11]

2.2.1 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.

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

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

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; and
- ISO/IEC Guide 43, which describes the requirements for developing and operating a laboratory proficiency testing program for interlaboratory 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.

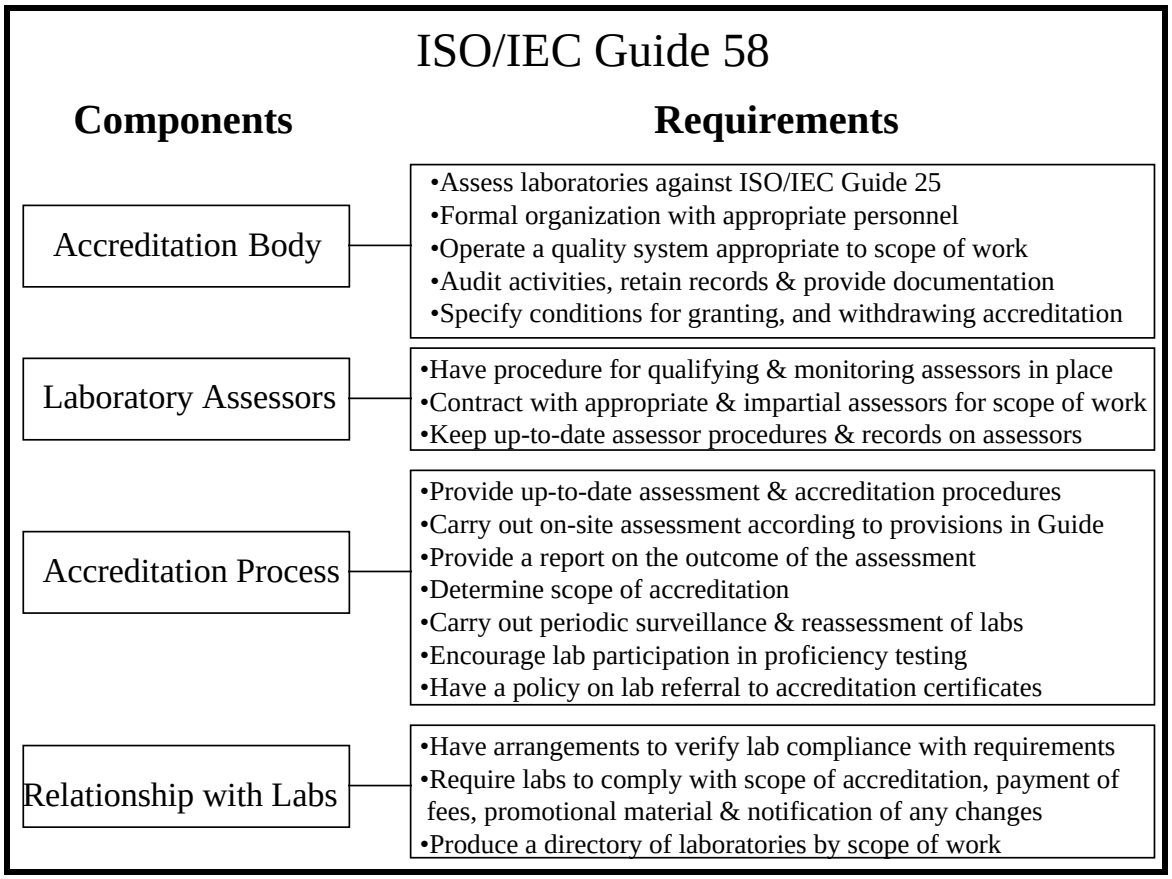
(i) Guide for Operating Laboratory Accreditation Programs: ISO/IEC Guide 58: The objectives of *ISO/IEC Guide 58: Calibration and Testing Laboratory Accreditation Systems — General Requirements for Operation and Recognition* (1993) are to provide guidance for setting up and operating a laboratory accreditation body and to facilitate mutual recognition agreements (MRAs) between such bodies for the accreditation of testing laboratories.[12] 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 2-1 illustrates the requirements for each of these four components in ISO/IEC Guide 58.

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.

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

Exhibit 2- 1 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:

- the requirements for application for accreditation (including the minimum information that the laboratory must provide before the on-site assessment);
- the requirements for the on-site assessment and assessment report;
- how the decision on accreditation is to be made;
- how surveillance and reassessment of accredited laboratories should be carried out; and

- the certificates which 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 *ISO/IEC 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.

(ii) 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.[13]

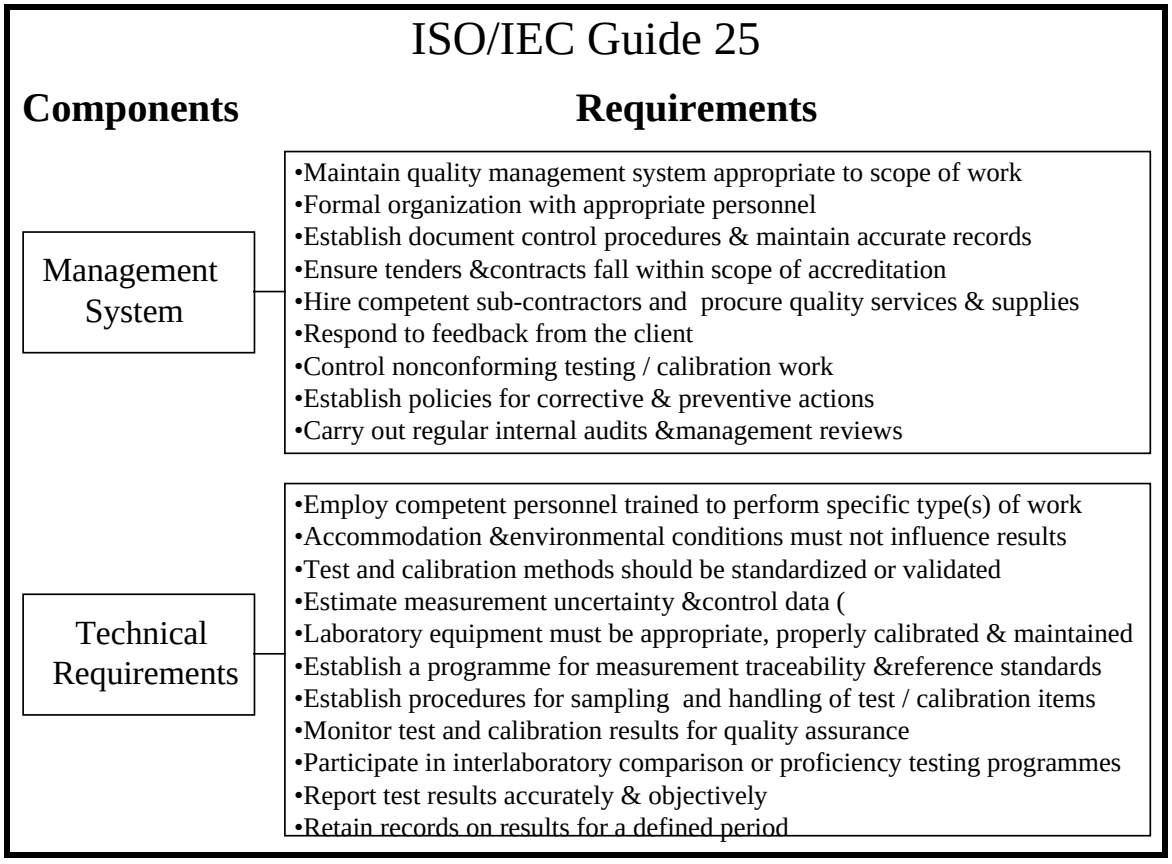
The Guide is applicable to all organizations performing tests and/or calibrations, whether they are first party, second party, and third party laboratories or laboratories where testing and/or calibration forms part of inspection and certification. Some requirements do not apply to all laboratories, 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 to 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 2-2. A

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

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 2- 2 Components of ISO/IEC Guide 25 for the Accreditation of Laboratories



2.2.2 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*.[14]

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.

Laboratories undertake their tests according to specified *testing standards* which 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.

2.2.3 Certification

Certification is "a procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements"[15] 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

[14] *ISO/IEC Guide 2*.
[15] *ISO/IEC Guide 2*.

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 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.

2.2.4 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, have 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.

2.3 SPECIALIST REGIONAL BODIES

Regional standards bodies are organizations, governmental or non-governmental, whose membership is usually limited to certain countries from a given region of the world and whose principal function, by virtue of its statutes, is the preparation and/or publication of standards, and/or the harmonization of the standards of its members.

The Asia-Pacific region now has a number of Specialist Regional Bodies (SRBs) working towards the harmonization of standards, and the streamlining of regional testing and certification policies, many of which differ from APEC in their membership. The APEC Steering Group on Energy Standards should ensure that it liaises with these Specialist Regional Bodies when appropriate to streamline the process of increased harmonization and mutual recognition agreements. These Asia-Pacific SRBs include:

- the Asia-Pacific Laboratory Accreditation Cooperation (APLAC, described in more detail below);
- the Pacific Area Standards Congress (PASC, described in more detail below);
- the newer Pacific Accreditation Cooperation (PAC) which promotes global acceptance of certificates of conformity and includes all APEC members;
- the Asia-Pacific Metrology Programme (APMP) which promotes joint technical programs that support the modernization of facilities to improve the measurement standards and calibration capacity of its members, and includes 13 of 18 APEC members;
- the Asia-Pacific Legal Metrology Program (APLMF) which is a forum for regional legal metrology issues that includes most APEC members; and
- the ASEAN Consultative Committee for Standardization and Quality (ACCSQ) which was created to develop ASEAN standards and conformity assessment capabilities and to coordinate aid from foreign standards bodies, and whose members include Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand.[16]

Two important Asia-Pacific regional organizations that are of particular interest to APEC, and whose goals and mandates for seeking harmonized solutions to standards issues complement those of APEC, are APLAC and PASC.

[16] John S. Wilson, *Standards and APEC: An Action Agenda* (Washington, D.C.: Institute for International Economics, 1995), pp. 65-7.

2.3.1 Asia Pacific Laboratory Accreditation Cooperation (APLAC)

APLAC's membership virtually mirrors that of APEC. Only two of the eighteen APEC economies are not currently members of APLAC – Mexico and Chile have not yet applied for membership. Canada and the Philippines were welcomed as new members in 1996. In addition, APLAC has two members which are not APEC members – India and Vietnam.

APLAC was initiated in 1992 to provide a forum for laboratory and inspection accreditation organizations to meet and develop procedures which would enable laboratory test data produced in one country to be accepted throughout the region, and eventually internationally through agreements with other regions or international bodies. The APLAC Memorandum of Understanding was signed in 1995 to encourage cooperation by laboratory accreditation bodies in the Asia-Pacific region, to improve standards of testing and calibration in member economies, and to promote mutual recognition of laboratories and acceptance of test data in the interest of facilitating trade within the region as well as between the region and economies elsewhere.

APLAC's primary objectives are as follows:

- to foster the development of competent laboratories and inspection bodies in member economies;
- to harmonize accreditation practices throughout the region; and
- to facilitate the recognition of laboratories and inspection bodies and the acceptance of test data and inspection reports across national borders.

APLAC has already contributed to increased information exchange amongst members, and has fostered a greater understanding of the level of development and assistance required by laboratory accreditation bodies throughout the region. APLAC has also undertaken training programs and study tours, and has developed proficiency testing programs which are open to all APLAC members.

Strong links are maintained between APLAC, the other APEC Specialist Regional Bodies,[17] the International Laboratory Accreditation Cooperation (ILAC), the European Cooperation for Accreditation of Laboratories (EAL), the ASEAN Free Trade Area, the North American Calibration Cooperation (NACC) and the World Trade Organization. For example, the International Laboratory Accreditation Cooperation (ILAC) is working to facilitate bilateral arrangements amongst the three primary multilateral accreditation bodies, APLAC, EAL and the eventual North American agreement among accreditation bodies.

[17] The APEC Specialist Regional Bodies comprise APLAC, the Asia-Pacific Legal Metrology Forum (APLMF), the Asia-Pacific Metrology Programme (APMP), the Pacific Accreditation Cooperation (PAC), and the Pacific Area Standards Congress (PASC).

APLAC's main goal is to establish a multilateral mutual recognition agreement amongst the domestic laboratory accreditation bodies in the region. Such an agreement would facilitate acceptance of test data accompanying traded goods if there was sufficient confidence established between the bodies on their abilities to accredit competent laboratories. Currently within APLAC, there is variability in the stages of development of domestic laboratory accreditation bodies, some of which may require considerable time to develop their programs to a level which will demonstrate compliance with ISO/IEC Guide 58. Some members therefore require assistance from the more developed accreditation bodies to achieve international recognition.[18] For example, Papua New Guinea's PNGLAS works in close association with NATA (Australia), using staff and assessors from NATA to assess and accredit laboratories against the same general requirements as used by NATA.[19]

2.3.2 Pacific Area Standards Congress (PASC)

PASC, a voluntary standards forum started in 1973 to strengthen regional adoption of ISO and IEC standards, is becoming increasingly important as the private-sector voice on standards and mutual recognition agreements in non-regulated sectors. All APEC members, with the exception of Chinese Taipei, are PASC members. PASC does not intend to produce regional standards, but provides a forum for consultation on matters of common interest. PASC has been effective in promoting interest in international standardization in countries in the region and in encouraging non-European standards bodies to nominate office-bearers to ISO and IEC and to participate in the technical work. However, there is some concern over PASC's lack of formal structure and limited authority to initiate programs that may hinder PASC becoming the private sector mechanism to assist APEC in standards.

Standards Australia provides the Secretariat for the PASC Standing Committee (PASC SC) that is chaired by Japan. PASC SC was established to liaise with APEC regarding standards and conformance issues. For example, in 1996, the APEC Standards and Conformance Sub-Committee (APEC SCSC) and PASC SC cooperated to develop the *Guide for Alignment of APEC Member Economies' Standards with International Standards*. PASC SC also reported close cooperation with the other Regional Bodies at the 1996 PASC meeting, noting that the U.S. APEC member was carrying out a survey to provide an information database on standards development. The year 1997 will be an important year for PASC as a number of events are to commemorate the 25th anniversary of PASC, as well as the 50th anniversary of ISO. PASC XX will be held in Honolulu, while Singapore, Columbia and New Zealand have tentatively planned to host PASC meetings from 1998 to 2000 respectively.

APEC's discussions with PASC in relation to regional harmonization of standards have thus far been positive. The activities carried out by APEC SCSC and the other APEC Working Groups

[18] APEC Sub-Committee on Standards and Conformance, *Revised Report on the Asia Pacific Economic Cooperation - Technical Infrastructure Development Survey* (January 1996), Annex B, APLAC Study Tour Interim Report. Countries visited by the APLAC Secretariat comprised Indonesia, Japan, Brunei Darussalam, Malaysia, People's Republic of China, Korea, Chinese Taipei, Vietnam, and Thailand.

[19] "The Challenge of Assessing in Papua New Guinea," *NATA News*, December 1996.

can complement a more proactive role for PASC so that it can increase its status and effectiveness within international standardization bodies and provide balance to the input from other regional standards bodies.

3. STUDY APPROACH

Section 4 of this report provides an analysis of specific product groups and associated testing standards that are a focus for this study. Sections 5 and 6 highlight the similarities and differences in the standards and regulatory infrastructures in existence in the 18 APEC economies. Finally, Section 7 summarizes the conclusions and provides suggested action items for the APEC economies and the Steering Group on Energy Standards.

3.1 SURVEY

The purpose of carrying out a survey as the main primary research source for this study was:

- to build a "bottom-up" understanding of the processes and relationships involved (accreditation, standards used, testing methods); and
- to assess the extent of similarities or differences in conformity assessment practices of APEC economy laboratories, specifically in the area of energy efficiency performance product testing.

The tasks involved in implementing this survey were as follows:

- consultation with representatives from APEC member economies regarding approach, logistics, and questions for the survey;
- presentation and discussion with APEC representatives to decide on the approach, anticipated responses, and commitments by APEC representatives to provide support for the implementation of the survey (Vancouver, March 20-21, 1997);
- survey implementation, including developing list of participants, developing and testing questionnaire, preparation of cover letters and instructions for dissemination of survey instrument (see Appendices C and F);
- set-up of survey database to compile survey results; and
- analysis and report writing.

The survey of laboratories in the APEC economies resulted in a total of 79 responses from 13 APEC members. Exhibit 3-1 illustrates the number of labs in each economy that responded to the APEC Survey of Laboratories.

Exhibit 3-1 Number of Laboratory Responses to the APEC Survey of Laboratories

APEC Economy	Number of Responses
AUSTRALIA	23*
CANADA	9
PEOPLE'S REPUBLIC OF CHINA	1
HONG KONG	2
INDONESIA	3
JAPAN	5
REPUBLIC OF KOREA	5
MEXICO	14
PAPUA NEW GUINEA	2
PHILIPPINES	2
SINGAPORE	1
THAILAND	4
USA	8**

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*One of the laboratories that responded to the survey from Australia was a New Zealand manufacturer.
**The Northbrook Office of Underwriters Laboratories Inc. (UL) completed the *APEC Survey of Laboratories* on behalf of 5 UL laboratories in the U.S. that do UL's Energy Verification Service (EVS), as well as 1 laboratory in Chinese Taipei and 1 laboratory in Hong Kong; however, UL's response has been counted throughout this study as one response from the U.S.

In addition to the economies which sent back laboratory responses to the survey, there were also three of APEC members that stated that they did not have any accredited energy performance testing laboratories in their economy for the products that were the focus of this study:

- Brunei Darussalam
- Malaysia
- New Zealand (has two labs that can do energy efficiency testing as part of electrical safety testing, as well as labs that carry out energy efficiency testing for solid fuel heaters and gas appliances)

At the time of writing, Nordicity had not received any survey responses from laboratories in Chile or Chinese Taipei.

3.2 CONSULTATION

In addition to surveying the energy efficiency testing laboratories in each of the participating APEC economies, Nordicity consulted with regulatory representatives from each of the countries through a faxed or emailed consultation guide (see Appendix D), followed by a telephone interview where appropriate. The consultation process focused on the differing levels of regulatory control over energy efficiency of consumer products, and the relationship between the voluntary standards system and government regulation in each of the APEC economies. It also determined the mutual recognition agreements that the APEC members had already negotiated

bilaterally or multilaterally, and asked how mutual recognition arrangements could be successfully negotiated in the future. The consultation process provided the information for the summary matrices of the accreditation and regulatory programs (see Appendices A and B) which formed the basis for the comparison of the similarities and differences in the conformity assessment regimes of the APEC members. Exhibit 3-2 indicates the economies that have responded to the consultation guide. Results from the consultation process are provided in the following sections of this report.

Exhibit 3-2 APEC Economies that Responded to the Consultation Guide

APEC Economy	Responded to Consultation Guide
AUSTRALIA	√
CANADA	√
PEOPLE'S REPUBLIC OF CHINA	√
HONG KONG	√
INDONESIA	√
JAPAN	√
REPUBLIC OF KOREA	√
MEXICO	√
NEW ZEALAND	√
PHILIPPINES	√
SINGAPORE	√
CHINESE TAIPEI	√
THAILAND	√
USA	√

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

3.3 LITERATURE REVIEW

A comprehensive literature review of test standards, harmonization, laboratory accreditation and harmonized conformity assessment has been carried out to provide the background information required for this study. Appendix E provides a detailed list of the literature that was reviewed, including the following sources of information:

- document search, such as the 1994 survey implemented by Australia, and material provided by Natural Resources Canada and the Standards Council of Canada;

- research at the Canadian Standards Association and Standards Council of Canada libraries on the international and domestic energy efficiency standards and test methods currently in use in the APEC economies for the products covered in this study;

- Internet research of documents from APEC member economies, the APEC Secretariat, APLAC, ILAC, EAL, etc.; and

- current APEC or other work being conducted on this subject, such as the technical infrastructure work program of the APEC Sub-Committee on Standards and Conformance, and the field work on energy efficiency that has been carried out by the International Institute for Energy Conservation (IIEC).

3.4 IDENTIFYING ACTION ITEMS FOR STEERING GROUP

The analysis of the results of the survey and consultation process in Section 4 involves identifying the equivalencies and deviations between the APEC economies, in terms of use of international and domestic energy efficiency testing standards. Sections 5 and 6 are focused on the following:

- comparison of the magnitude of energy performance testing conducted in APEC member economies (e.g., number of laboratories, number/type of products tested);
- assessment of the degree to which these economies recognize the results of performance testing conducted in other economies;
- identification of the willingness to recognize the conformity assessment regime of other economies which regulate efficiencies; and
- comparison of the test standards that are used in these economies, focusing on the extent to which they are similar or different.

This assessment illustrates the feasibility of increased cooperation between the APEC economies in the area of energy efficiency performance testing. Out of the analysis in Sections 4, 5 and 6, the study team has derived the set of conclusions and recommendations presented in Section 7.

4. REVIEW OF APEC TEST STANDARDS AND PRACTICES BY PRODUCT

4.1 PRODUCT SELECTION CRITERIA FOR THIS STUDY

Part of the approach for this study involves the assessment of a representative selection of energy-using products. The assessment of these products requires identifying the standards and related testing practices of APEC economies with respect to each product and then comparing these practices.

For all potential products, the following criteria were developed to guide product selection in the survey of laboratory testing facilities:

- Significance as tradable commodity: increasing product trade indicates higher priority.
- Relative annual energy consumption: increasing proportion of annual electricity consumption indicates higher priority.
- Potential for gains in efficiency: the greater the potential for gains in energy efficiency, the greater the benefits of energy performance standards, indicating higher priority.
- Practical product definition: fewer product differentiations facilitates harmonization, and indicates higher priority.
- Practical inventory of test methods: fewer differentiations in product test methods facilitates harmonization, and indicates higher priority.

After consultation with the APEC Steering Group on Energy Standards (Vancouver, British Columbia, Canada, March 20 to 21, 1997), the following six main product groups were selected for comparison as follows:

i. Household refrigerators, refrigerator-freezers, and freezers - meaning refrigeration appliances not exceeding 1100 litres in volume, that can provide freezing or cold internal temperatures, for the preservation of perishable food.

ii. Room air conditioners - meaning household electrical devices (not more than 10.55 kilowatts/36,000 BTU per hour) that can cool typical room-size areas.

iii. Single-package central air conditioners - meaning air-to-air devices for cooling small buildings or houses, with capacity less than 20 kilowatts, and factory-built as a single entity ("single package").

iv. Split-system air conditioners - meaning air-to-air devices for cooling small buildings or houses, with capacity less than 20 kilowatts, and factory-built in two parts connected by refrigerator piping ("split system").

v. Electric motors - meaning electrical induction motors with a power not less than 0.75 kilowatts (1 horsepower), but not exceeding 150 kilowatts (200 horsepower).

vi. Tubular fluorescent lamps and ballasts - meaning lights that rely on the electrical excitation of fluorescent gases in tubes not longer than 2400 millimeters/96 inches ("fluorescent lamps") or meaning the principle component determining the electrical current used in the light ("fluorescent lamp ballasts").

On balance, these six product groups appear to conform positively to the product selection criteria.

4.1.1 Significance as Tradable Goods

All of the six product groups are significant from a trade perspective and are likely to become more so as industrialization progresses across all APEC economies. This suggests that the choice of these six product groups as study samples is appropriate to the purpose of this project.

4.1.2 Energy Consumption Levels

All six product groups have a significant impact on energy consumption, making them excellent candidates for energy performance targeting.

- Household refrigerators, refrigerator-freezers and freezers are commonly the highest or second-highest electrical energy consumers in the household.
- Room air-conditioners are becoming widespread throughout APEC economies and are likely to become more so as local incomes progress.
- Single-package central air conditioners (and air conditioning generally) are likely to become a major factor in *peak* demand for electricity in warm-climate APEC economies.
- Split-system air conditioners will likewise be a major factor in electricity demand.
- Electric motors above fractional horsepower (i.e. at least 1 hp) are the largest single component of electricity demand in industry.
- Tubular fluorescent lamps and ballasts, although energy efficient themselves, could substitute for traditional incandescent lamps, which are commonly a major component of residential and commercial electricity demand. Accordingly,

facilitating their use through any standards harmonization initiatives has great positive potential through substitutes for much less efficient equipment.

4.1.3 Potential Gains in Efficiencies

All six product groups could show improvement in the overall energy within APEC economies, through effective energy performance standards. Technical means exist to improve their operation, such as better insulation of refrigerators, and better design and quality production in electric motors to reduce energy losses.

Moreover, the climate of the APEC region is a very significant factor in its impact on energy consumption. Except for Canada, virtually every APEC economy is "summer peaking" in its electricity demand, meaning power demand rises ("peaks") seasonally. Such peaking is difficult and expensive to accommodate at the generation stage, because "baseload" plant (cheapest in the long run) cannot be justified for temporary seasonal demand. Moreover, it will be seriously exacerbated by the growth of summertime air conditioning, whether it be room units or forms of central air. This puts a premium on trading efficient air conditioning machinery. It is noteworthy that even parts of Canada (such as the City of Toronto) tend to be summer peaking, owing to huge air conditioning loads in large commercial office towers.

Another vital aspect of efficiency is, of course, environmental benefits. Already some climatologists are pronouncing the two last years as among the warmest ever, and suspicion surrounds the emission of certain combustion gases (such as carbon dioxide) for creating warming, "greenhouse" effects. Reducing electricity consumption will help slow down the accumulation of such gases arising from fossil-fueled electric power plants.

4.1.4 Practical Product Definitions

In general, the product definitions used by respective economies' standards, of the product groups selected for this study, are similar and compatible, although many important technical differences are apparent in detail.

4.1.5 Practical Inventory of Test Methods

Overall, the widespread diffusion of the technology embedded in all the products, and the relatively limited number of scientifically valid test methods, make practical a comparison based on these product groups, although important technical differences will be noted.

4.1.6 Summary of Product Selection

Exhibit 4-1 sums up the factors supporting inclusion and exclusion of the six products in this study. While none may be ideal, all are manageable.

Exhibit 4-1: Summary Assessment of Products Selected for *APEC Survey of Laboratories*

PRODUCT	FACTORS FOR INCLUSION IN SURVEY	FACTORS FOR EXCLUSION FROM SURVEY
1. Household Refrigerators, Refrigerator-Freezers, and Freezers	• tradable item • relatively heavy household electricity consumption and rapid growth of inventory • relatively similar test methods	• many different sizes and product lay-outs • different operational factors in test methods
2. Room Air Conditioners	• tradable item • relatively heavy household electricity consumption and rapid growth of inventory • relatively similar and limited test methods	• many different sizes and configurations
3. Single-package Central Air Conditioners	• relatively heavy household, commercial and industrial electricity consumption, and rapid growth of inventory • relatively limited size differentiations • relatively similar test methods	• tradable item, but less so than others (e.g. room air conditioners)
4. Split System Air Conditioners and Heat Pumps	• relatively heavy household, commercial and industrial electricity consumption, and rapid growth of inventory • relatively limited size differentiations • relatively similar test methods	• tradable item, but less so than others (e.g. room air conditioners)
5. Electric Motors 1-200 hp.	• tradable item • major energy consumer in industry • test methods relatively limited	• many different sizes
6. Tubular Fluorescent Lamps and Ballasts	• tradable item • good potential for improving efficiency through replacement of incandescent lamps • increasing share of electricity consumption	• many different sizes • several different test methods

4.2 METHODOLOGY FOR EVALUATING EQUIVALENCIES AND DEVIATIONS IN TEST STANDARDS

First, the use of international standards for the testing of each product is summarized in a matrix by country, based on the responses from the laboratories in the APEC economies that responded to the *APEC Survey of Laboratories*.

Secondly, the use of domestic and other standards for the testing of each product is summarized in a matrix by country, based on the responses from the laboratories in the APEC economies that responded to the *APEC Survey of Laboratories*.

Thirdly, for each product, Nordicity has developed a relationship matrix allowing comparisons of some of the most commonly used international and domestic standards.

The technology for common household products is widely diffused globally. This means that there is a sufficient commonality to allow practical tolerance for different test methods by any given product because different test methods have to be realistic for products with broadly similar properties. Nevertheless, there can be significant differences in test methods and results - "significant" meaning differences sufficient to create potential trade barriers. The Nordicity methodology for the relationship matrix is designed to highlight these significant differences, by comparing standards and using six dimensions or factors of testing to identify where important differences exist. Compatible or non-significant differences are identified by the symbol (√).

These six dimensions or factors that are used in this third relationship matrix to compare significant differences, are as follows:

1. Scope - this relates to the applications of the standard. A significant difference in this factor is identified in each of the following product sections by the letter ("S").

2. Definitions - this relates to product definition in terms of what is included in the scope of the standard. A significant difference in this factor is identified in each of the following product sections by the letter ("D").

3. Equipment - this relates to specific pieces of testing equipment to be used in the test. It is identified by the letter ("E").

4. Procedure - this relates to specific procedures to be followed in order to conduct the test, for example operational factors such as opening/closing a refrigerator door. This is identified by the letter ("P").

5. Evaluation - this relates to how data is manipulated, interpreted or used in determining results. It is identified by the letter ("V").
6. Conditions - this relates to the test environment, for example the ambient temperatures in the testing area for fluorescent lamps). It is identified by the letter ("C").

In all product groups, a brief explanation of major differences is given with the comparison summary exhibit.

4.3 REFRIGERATORS, REFRIGERATOR-FREEZERS AND FREEZERS

This category of household products refers to self-contained storage appliances, not exceeding 1100 litres in volume, that can provide freezing or cool internal temperatures (or both in separate compartments), for the preservation of perishable food.

4.3.1 Use of International Standards

Exhibit 4-2 summarizes the use of international standards (those of ISO and similar international organizations) by APEC economies for the testing of refrigerators, refrigerator-freezers, and freezers.

Exhibit 4-2
Summary of International Standards Used for Energy Performance Testing of Refrigerators, Refrigerator - Freezers. and Freezers

APEC Economy	ISO 5155	ISO 7371	ISO 8187	ISO 8561
Australia	√	√	√	√
Brunei Darussalam*				
Canada	√	√		√
Chile*				
People's Republic of China	√	√	√	√
Hong Kong	not indicated	not indicated	not indicated	not indicated
Indonesia	not indicated	not indicated	not indicated	not indicated
Japan				√
Korea	not indicated	not indicated	not indicated	not indicated
Malaysia*				
Mexico		√		√
New Zealand*				
Papua New Guinea	not indicated	not indicated	not indicated	not indicated
Philippines	√	√	√	√
Singapore	not indicated	not indicated	not indicated	not indicated
Chinese Taipei*				
Thailand		√		
USA	√	√	√	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.

All of these standards prescribe a method for test of these appliances. The methods are slightly different depending on certain physical characteristics of the appliance such as:

- ISO 7371: 1995 - Household refrigerating appliances -- Refrigerators with or without low-temperature compartment -- Characteristics and test methods
- ISO 5155: 1995 - Household refrigerating appliances -- Frozen food storage cabinets and food freezers -- Characteristics and test methods
- ISO 8187: 1992 - Household refrigerating appliances -- Refrigerator-freezers -- Characteristics and test methods
- ISO 8561: 1996 - Household frost-free refrigerating appliances -- Refrigerators, refrigerator-freezers, frozen food storage cabinets and food freezers cooled by internal forced air circulation -- Characteristics and test methods[20]

Accordingly, ISO standards are the key international standards for refrigerators, refrigerator-freezers, and freezers. Some main patterns can be seen in the use of these international standards:

- Surprisingly, the international standards are commonly used by the larger APEC economies, who frequently also have their own, domestic, standard as will be apparent in Exhibit 4-3 following. Examples are the U.S.A., Canada, Australia, and Japan. This implies that many APEC economies could use a foreign domestic standard rather than an international one, if it were more convenient to do so, for example for trade reasons. An exception is the Philippines, which has a well-developed use of the ISO standards, but does not have a domestic one.
- The most recently developed (1996) international standard is ISO 8561, which relates to "frost-free" refrigeration and freezer appliances. This is logical, since most refrigerators manufactured today are frost free; however, it is possible most existing stock is still of the older, cyclic defrost type. The other ISO standards do not relate specifically to the "frost free" (automatic defrost) type of appliance.
- On balance, the international standards do not seem to have a commanding acceptance as a generic test method, as the only labs using them are those of APEC economies who also have their own domestic standards.

4.3.2 Use of Domestic and Other Standards

Exhibit 4-3 summarizes the use of domestic and other standards (as opposed to international standards) for refrigeration appliances. Most of the domestic standards listed are believed to relate directly to test methods for determining energy performance.[21]

[20] A Thailand lab referenced standard IEC 335-2-24 (1992-01) - Safety of household and similar electrical appliances - Part 2: Particular requirements for refrigerators, food-freezers and ice-makers. This is essentially a safety standard that does not directly relate to energy performance. Follow-up clarification with the responding lab regarding the exact use of this standard is required.

[21] Korean labs indicated use of two UL standards, but similar to the above footnote, these standards are safety-related.

Exhibit 4-3
Summary of Domestic and Other Standards Used for Energy Performance Testing of Refrigerators, Refrigerator - Freezers, and Freezers

APEC Economy	CAN / CSA C300	JIS C9607	US DOE Test Proc. 10 CFR; Part 430, App. A1	AHAM - HRF-1	Other Standards Used by Economy
Australia		√		√	• AS/NZS 4474 Parts 1 and 2 (replaced AS 2575.2 and AS 1430)
Brunei Darussalam*					
Canada	√	√	√	√	• CAN / CSA C390 • ASME / NIST
Chile*					
People's Republic of China	√				• GB/T8059 -1995 • GB/T8059.4 - 1993 • GB/T 12021.2 - 1989
Hong Kong	√		√		
Indonesia		√ (Sharp standard based on JIS)			
Japan		√			
Korea		√ (JIS C9307)			• KS C9305 • Korea JUN 08-12** • UL 250 • UL 471
Malaysia*					
Mexico	√			√	• NOM 072, SCFI 1994 • NMX J503/2
New Zealand*					
Papua New Guinea[22]	not indicated	not indicated	not indicated	not indicated	• not indicated
Philippines	not indicated	not indicated	not indicated	not indicated	• not indicated
Singapore[22]					
Chinese Taipei*					
Thailand					• TIS 455-2637 (1994)
USA	√	√	√	√	• BSEN 153 • NAECA

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.
**One Korean lab also noted that it used Korea's *A Marking System for the Power Consumption and Energy Efficiency of Electrical Appliances (95-370).*

Certain patterns can be seen in Exhibit 4-3.

[22] Papua New Guinea and Singapore participated in the *APEC Survey of Laboratories*, but did not indicate any labs testing to domestic or other standards for this product group.

- There is more use of domestic standards than international ones. The U.S., Japanese, and even Canadian standards are used by several countries. Australia, People's Republic of China, Korea, Mexico, and Thailand have developed their own standard as well.
- The larger economies have labs that test to both international and domestic standards, but their own domestic standards are pre-eminent in their regulatory regimes; examples are the U.S., Canada, and others..

4.3.3 Summary of Significant Differences

Exhibit 4-4 summarizes and compares the major standards used by APEC economies to test refrigerators, refrigerator-freezers and freezers.

Three ISO standards have been grouped together owing to their test method similarities, however, the new "frost-free" refrigerator appliance standard (ISO 8561) has been analyzed separately owing to its more modern scope.

The major differences are as follows:

- The 3 ISO standards 7371, 8187 and 5155 have a different scope than the ISO 8561 standard and the domestic ones.
- All the ISO standards use a lower ambient temperature test condition (C). This has a significant effect in reducing rated energy consumption.
- There is significant potential for differences in the "adjustment factor" used in data evaluation (V) for features such as "through the door ice dispensers".
- The Japanese standard has a significant procedure (P) difference, in that a specified number of door openings are included. However, the JIS standards does (since 1995) specify the appropriate ISO standard as an acceptable alternative.

4.3.4 Findings

- There will be difficulties in attaining alignment of standards for this class of products, owing to significant test differences.
- No international test standard has yet gained widespread acceptance throughout the APEC region, further limiting the immediate prospects for alignment.

Exhibit 4-4
Significant Differences in Major Refrigerator, Refrigerator-Freezer, and Freezer Standards*

	ISO 7371 8187 5155	**ISO 8561**	**Canada C300**	**U.S. AHAM HRF-1**	**Australia/New Zealand AS/NZS 4474 Parts 1 and 2 (formerly AS2575/ AS1430)**	**Japan C9607**
ISO 7371 8187 5155		S	S,C, V	S, C, V	S,C	S, C, P
ISO 8561	S		C, V	C, V	C, V	C, V, P
Canada C300	S, C, V	C, V		√	√	P
U.S. AHAM HRF-1	S, C, V	C, V	√		√	P
Australia/New Zealand AS/NZS 4474 Parts 1 and 2 (formerly AS2575/AS1430)	S, C	C, V	√	√		P
Japan C9607	S, C, P	C, V, P	P	P	P	

Key: S = Scope of test standard
D = Definitions
E = Equipment
P = Procedure during test
V = Evaluation of test data and results
C = Conditions of test

*Note: The entry of a letter (S, D, E, P, V or C) in a specific box in the matrix indicates a significant difference in that component of the two designated standards identified by the box. A "√" indicates that differences are not major.

4.4 ROOM AIR CONDITIONERS

This category of household products refers to electrical devices for cooling and conditioning the air in typical room-size areas, having a capacity not exceeding 10.55 kilowatts (36,000 BTU per hour).

4.4.1 Use of International Standards

Exhibit 4-5 summarizes the use of ISO international standards by APEC economies for the testing of room air conditioners.

There is only one major international standard as follows:

- ISO 5151:1994 - Non-ducted air conditioners and heat pumps -- Testing and rating for performance

Exhibit 4-5: Summary of International Standards Used for Energy Performance Testing of Room Air Conditioners

APEC Economy	ISO 5151
Australia	√
Brunei Darussalam*	
Canada	not indicated
Chile*	
People's Republic of China	√
Hong Kong	not indicated
Indonesia	not indicated
Japan	√
Korea	not indicated
Malaysia*	
Mexico	not indicated
New Zealand*	
Papua New Guinea	not indicated
Philippines	√
Singapore	not indicated
Chinese Taipei*	
Thailand	not indicated
USA	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.

Some main patterns can be seen in the use of ISO 5151:

- As for refrigeration appliances, the ISO standard is used by APEC economies that also have their own domestic standard. Once again, the Philippines is an exception in that it uses the ISO standard but does not have its own, domestic one.[23]
- On balance, the international standard does not have commanding acceptance as a generic test method.

4.4.2 Use of Domestic and Other Standards

Exhibit 4-6 summarizes the use of domestic and other standards (as opposed to international ones) for room air conditioners. These standards generally all relate to testing energy performance.[24]

Certain patterns can be seen in this exhibit.

- The most commonly used standards are those of Canada and the U.S.A., which, in terms of test methodology, are all virtually identical and quite compatible.
- Labs in the U.S.A. test to all the major standards - the only APEC economy to do so.

4.4.3 Summary of Significant Differences

Exhibit 4-7 summarizes and compares the major standards used by APEC economies to test room air conditioners.

There are generally few significant differences. This is because the ASHRAE standards for various forms of air conditioners have become the effective benchmarks globally for these sorts of appliances, including room air conditioners.

The few differences are:

- The Japanese and Korean definition (D) of "room air conditioner" is limited to a capacity of 3 kilowatts (approximately 10,500 BTU/hr) capacity, whereas the other standards allow larger sizes. Larger sizes in Japan and Korea are viewed as single-package (unitary) central air systems.
- The Japanese, Korean and ISO standards have a difference in Scope (S) in that they do not differentiate between louvered and non-louvered sides on the room air conditioners, whereas the Canadian and U.S. standards do. Without louvered sides, the energy performance of a room air conditioner will normally be slightly inferior

[23] A Thailand lab referenced another ISO standard, ISO R869. This is an older version of ISO 5151.
[24] Korean labs indicated use of a UL standard, but once again, the UL standard is a safety standard.

and, indeed, the U.S. federal regulations and Canadian standard set slightly lower minimum performance ratings requirements for non-louvered-side equipment.

- Overall, however, the test standards for room air conditioners show a relatively high level of compatibility.

Exhibit 4-6
Summary of Domestic and Other Standards Used for Energy Performance Testing of Room Air Conditioners

APEC Economy	CAN / CSA C368.1	JIS C9612	US DOE Test Proc. 10 CFR; Part 430, App. F	AHAM - RAC-1	ASHRAE 16	Other Standards Used by Economy
Australia					√	• AS1861.1
Brunei Darussalam*						
Canada	√			√	√	• CAN / CSA C744
Chile*						
People's Republic of China	√				√	• GB/T7775 - 1996 • GB12021.3 - 1989
Hong Kong	√		√			
Indonesia	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Japan		√				• JRA 4033
Korea		√				• KS C9306 • Korea JUN 08-05** • UL 484
Malaysia*						
Mexico						• NOM 073, SCFI 1994
New Zealand*						
Papua New Guinea[25]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Philippines	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Singapore[25]						
Chinese Taipei*						
Thailand						• TIS 1155-2536 (1993) • JIS B8615 • JIS B8616 • TISI 385-2524
USA	√	√	√	√	√	• NAECA

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.
**One Korean lab also noted that it used Korea's *A Marking System for the Power Consumption and Energy Efficiency of Electrical Appliances (95-370).*

[25] Papua New Guinea and Singapore participated in the *APEC Survey of Laboratories*, but did not indicate any labs testing to domestic or other standards for this product group.

Exhibit 4-7
Significant Differences in Major Room Air Conditioner Standards*

	ISO 5151	**Canada C368.1**	**USA ASHRAE 16**	**Japan JIS C9612**	**Australia AS1861.1**	**Korea C9306**
ISO 5151		S	S	√	S	D
Canada C368.1	S		√	S, D	√	S, D
U.S.A. ASHRAE 16	S	√		S, D	√	S, D
Japan JIS C9612	√	S, D	S, D		S, D	√
Australia AS1861.1	S	√	√	S, D		S, D
Korea C9306	D	S, D	S, D	√	S, D	

Key: S = Scope of test standard
D = Definitions
E = Equipment
P = Procedure during test
V = Evaluation of test data and results
C = Conditions of test

*Note: The entry of a letter (S, D, E, P, V or C) in a specific box in the matrix indicates a significant difference in that component of the two designated standards identified by the box. A "√" indicates that differences are not major.

4.4.4 Findings

- Room air conditioners represent a promising area for standards alignment, at least for sizes up to 3 kW (approx. 10,500 BTU/hr).
- It may be necessary to clarify the scope of room air conditioners standards, from the standpoint of treating louvered and non-louvered units in a consistent manner across APEC economies.

4.5 SINGLE-PACKAGE CENTRAL AIR CONDITIONERS

This category of household products refers to air-to-air devices for cooling houses or small buildings, with capacity not exceeding 20 kilowatts (approximately 20,000 BTU/hr), and factory-built as a single entity ("single package" or "unitary").

4.5.1 Use of International Standards

Exhibit 4-8 summarizes the use of international standards for single-package central air conditioners. As can be seen, only one international standard is in use - ISO 13253.

- This standard is only used for testing by Australian and U.S. labs. Both of these economies also have a domestic standard and accordingly, the role of international standards in APEC economies for single-package central air conditioning equipment is minimal.

4.5.2 Use of Domestic and Other Standards

Exhibit 4-9 summarizes the use of domestic and other standards for single-package central air conditioners. These standards mostly relate to energy performance characteristics, although the U.S. standard referenced is safety-related (Some of the "other" standards may also be safety-related, rather than for energy performance tests).

Certain patterns can be seen in this exhibit:

- While domestic standards are much more commonly used than international ones, most APEC economies do not appear to be testing central air conditioning equipment at all. Only Canada, U.S., Australia, Japan and Korea reference a test standard.
- Unfortunately, except for a U.S. lab testing to one Japanese standard, there is virtually no overlap of testing, except between U.S. and Canada.

4.5.3 Summary of Significant Differences

Exhibit 4-10 summarizes the comparison of the major standards used by APEC economies to test single-package central air conditioners.

The seminal standard for this class of product is ASHRAE 37. This standard sets out seven (7) different methods of test. However, the ARI 210/240 standard extends the ASHRAE 37 standard by prescribing certain extra procedures to derive part-load performance. The two standards are normally taken together, and are so presented in Exhibit 4-10. The Canadian, Australian, Japanese, Korean and ISO standards are all virtually identical to the combined ASHRAE 37 / ARI 210/240 standards.

Exhibit 4-8
Summary of International Standards Used for Energy Performance Testing of Single-Package Central Air Conditioners

APEC Economy	ISO 13253
Australia	√
Brunei Darussalam*	
Canada	not indicated
Chile*	
People's Republic of China	not indicated
Hong Kong	not indicated
Indonesia	not indicated
Japan	not indicated
Korea	not indicated
Malaysia*	
Mexico	not indicated
New Zealand*	
Papua New Guinea	not indicated
Philippines	not indicated
Singapore	not indicated
Chinese Taipei*	
Thailand	not indicated
USA	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.

Exhibit 4-9: Summary of Domestic and Other Standards Used for Energy Performance Testing of Single-Package Central Air Conditioners

APEC Economy	CAN / CSA C656	ARI 210/240	ASHRAE 16	ASHRAE 37	JIS C9612	JIS B8616	Other Standards Used by Economy
Australia			√				• AS1861.2
Brunei Darussalam*							
Canada	√	√		√			• CAN / CSA C746 • ARI 340/360
Chile*							
People's Republic of China[26]	not indicated	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Hong Kong	not indicated	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Indonesia	not indicated	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Japan					√	√	• JRA 4002
Korea					√		• KS B 6368 • KS B 6369 • KS C9306 • Korea JUN 08-05** • UL 484
Malaysia*							
Mexico	not indicated	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
New Zealand*							
Papua New Guinea	not indicated	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Philippines	not indicated	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Singapore	not indicated	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Chinese Taipei*							
Thailand	not indicated	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
USA	√	√	ASHRAE 116	√		√	• NAECA

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.
**One Korean lab also noted that it used Korea's *A Marking System for the Power Consumption and Energy Efficiency of Electrical Appliances (95-370).*

[26] The People's Republic of China and other economies marked "not indicated" participated in the *APEC Survey of Laboratories*, but did not indicate any labs testing to domestic or other standards for this product group.

Exhibit 4-10
Significant Differences in Major Single-Package Central Air Conditioners Standards*

	ISO 13253	U.S. ASHRAE 37 with ARI 210/240	Canada CSA C656	Japan JIS C9612
ISO 13253		√	√	√
U.S. ASHRAE 37 with ARI 210/240	√		√	√
Canada CSA C656	√	√		√
Japan JIS C9612	√	√	√	

Key: S = Scope of test standard
D = Definitions
E = Equipment
P = Procedure during test
V = Evaluation of test data and results
C = Conditions of test

*Note: The entry of a letter (S, D, E, P, V or C) in a specific box in the matrix indicates a significant difference in that component of the two designated standards identified by the box. A "√" indicates that differences are not major.

4.5.4 Findings

- There are excellent prospects for alignment of standards for this class of product, owing to the test method similarities.
- At present, there are relatively limited energy performance regulatory regimes for these products across APEC economies, further allowing opportunities for alignment.

4.6 SPLIT-SYSTEM AIR CONDITIONERS

This category relates to air-to-air devices for cooling and conditioning rooms, houses or small buildings with a capacity not exceeding 20 kilowatts (approx. 10,500 BTU/hr), and factory-built in two parts connected by refrigerator piping ("split system").

4.6.1 Use of International Standards

Exhibit 4-11 summarizes the use of international standards by APEC economies for testing of split-system air conditioners. A pattern is again apparent, as follows:

- The ISO standard used is the same as for room air conditioners. This is logical, as from a technical perspective, a split system is often a smaller installation than unitary central air conditioners, and often lacks the fan and ductwork of the bigger, single-package central air units.
- Nevertheless, the international standard is scarcely used by APEC economies. Only the U.S. and Australia have labs that test to this standard, and both economies have domestic standards of their own.

4.6.2 Use of Domestic and Other Standards

Exhibit 4-12 summarizes the use of domestic or other standards for testing split-system air conditioners. The same pattern as for single-package units is apparent.

- There is relatively little testing of split-system air conditioners generally.
- There is very little overlap among labs of test standards (outside Canada-U.S.), as the labs typically using their domestic standard.

Exhibit 4-11
Summary of International Standards Used for Energy Performance Testing of Split-System Air Conditioners

APEC Economy	ISO 5151
Australia	√
Brunei Darussalam*	
Canada	not indicated
Chile*	
People's Republic of China	not indicated
Hong Kong	not indicated
Indonesia	not indicated
Japan	not indicated
Korea	not indicated
Malaysia*	
Mexico	not indicated
New Zealand*	
Papua New Guinea	not indicated
Philippines	not indicated
Singapore	not indicated
Chinese Taipei*	
Thailand	not indicated
USA	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.

Exhibit 4-12
Summary of Domestic and Other Standards Used for Energy Performance Testing of Split-System Air Conditioners

APEC Economy	ARI 210/240	ASHRAE 16	ASHRAE 37	JIS C9612	JIS B8616	Other Standards Used by Economy
Australia		√				• AS1861.1
Brunei Darussalam*						
Canada	√		√			• CAN / CSA 273.3 • ARI 340/360
Chile*						
People's Republic of China[27]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Hong Kong[27]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Indonesia[27]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Japan				√	√	• JRA 4002
Korea				√		• KS B 6368 • KS B 6369 • KS C9306 • Korea JUN 08-05** • UL 484
Malaysia*						
Mexico[27]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
New Zealand*						
Papua New Guinea[27]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Philippines[27]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Singapore[27]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Chinese Taipei*						
Thailand						• TISI 1155-2536
USA	√	ASHRAE 116	√		√	• NAECA

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.
**One Korean lab also noted that it used Korea's *A Marking System for the Power Consumption and Energy Efficiency of Electrical Appliances (95-370).*

[27] These economies participated in the *APEC Survey of Laboratories*, but did not indicate any labs testing this product group to any domestic or other standards.

4.6.3 Summary of Significant Differences

Exhibit 4-13 summarizes a comparison of the major standards used by APEC economies to test split-system air conditioners.

The same assessment applies as for single-package units. The test methodologies are all very similar, being based on the ASHRAE 37 standard. There is also some use of the ASHRAE 16 standard (for room air conditioners), paralleling the ISO 5151 application. The ARI 210/240 also has to be referenced together with the ASHRAE 37 standard, for cyclic (part) load procedures.

4.6.4 Findings

- There are excellent prospects for alignment of standards for this class of product owing to the test method similarities.
- At present, there are relatively limited energy performance regulatory regimes for these products across APEC economies, further allowing opportunities for alignment.

Exhibit 4-13
Significant Differences in Major Split-System Air Conditioners Standards*

	ISO 5151	**U.S. ASHRAE 37 with ARI 210/240**	**Japan C9612**	**Canada C273.3**	**Australia AS 1861**
ISO 5151		√	√	√	√
U.S. ASHRAE 37 with ARI 210/240	√		√	√	√
Japan C9612	√	√		√	√
Canada C273.3	√	√	√		√
Australia AS 1861	√	√	√	√	

Key: S = Scope of test standard
D = Definitions
E = Equipment
P = Procedure during test
V = Evaluation of test data and results
C = Conditions of test

*Note: The entry of a letter (S, D, E, P, V or C) in a specific box in the matrix indicates a significant difference in that component of the two designated standards identified by the box. A "√" indicates that differences are not major.

4.7 ELECTRIC MOTORS

This class of product refers to alternating current (AC) electrical induction motors with a power not less than 0.75 kilowatts (1 horsepower) but not exceeding 150 kilowatts (200 horsepower).

4.7.1 Use of International Standards

Exhibit 4-14 summarizes the use of international standards by APEC economies for the testing of this class of electric motors.

Some main patterns are evident:

- The international standard has obtained fairly widespread acceptance in that several countries' labs are currently using it.
- It is not necessarily the larger APEC economies, who have their own domestic standard, who are testing to the international standard.

4.7.2 Use of Domestic and Other Standards

Exhibit 4-15 gives details of the use of domestic and other standards for testing electric motors. Some patterns are apparent:

- There is fairly widespread testing in APEC economies to the U.S. and Canadian standard, namely by Hong Kong, Korea and Mexico, as well as by the U.S. and Canada themselves.
- There is surprisingly extensive use of industrial and other standards, such as Australian Department of Defence standards, and ABB and PEMEX industrial standards.

4.7.3 Summary of Differences

Exhibit 4-16 summarizes the comparison between major standards used by APEC economies.

The Canadian C390 Standard and the U.S. NEMA MG-1 Standard have already been harmonized effectively, and hence have been grouped together. The IEEE 112 Standard is only very slightly different. There are also currently efforts underway to harmonize the IEC, NEMA and IEEE standards for electric motors.

Exhibit 4-14
Summary of International Standards Used for Energy Performance Testing of Electric Motors

APEC Economy	IEC 34-2
Australia	√
Brunei Darussalam*	
Canada	√
Chile*	
People's Republic of China	√
Hong Kong	not indicated
Indonesia	not indicated
Japan	not indicated
Korea	√
Malaysia*	
Mexico	√
New Zealand*	
Papua New Guinea	not indicated
Philippines	not indicated
Singapore	not indicated
Chinese Taipei*	
Thailand	not indicated
USA	not indicated

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.

Exhibit 4-15: Summary of Domestic and Other Standards Used for Energy Performance Testing of Electric Motors

APEC Economy	IEEE 112	NEMA MG1	CAN / CSA-C390	JIS C4207 / JIS C4203	Other Standards Used by Economy
Australia					• AS1359 • Department of Defence standards • Lloyds standards
Brunei Darussalam*					
Canada	√	√	√		• CAN / CSA C747 • ISO
Chile*					
People's Republic of China[28]	not indicated	not indicated	not indicated	not indicated	• not indicated
Hong Kong	√	√	√		
Indonesia[28]	not indicated	not indicated	not indicated	not indicated	• not indicated
Japan				√	
Korea	√	√	√		• KS C4004 • KS C4202 • KS C4005 • KS C4204 • KS C4002 • KS C4205 • KS C4210-4213 • Electrical Appliance Safety Control Law
Malaysia*					
Mexico	√ (also IEEE 114)	√	√		• NOM- 074-SCFI 1994 • NOM-016-ENER-1997 • NMX-J-075/3-ANCE-1994-6.4 to 6.4.14 • W-6000, W-2000 (CFE) • M-1000, 2241.01, 2241.02 PEMEX • ANSI 1050 • UL 1446 • UL 1004 • UL 674 • ABB Standard
New Zealand*					
Papua New Guinea[28]	not indicated	not indicated	not indicated	not indicated	• not indicated
Philippines[28]	not indicated	not indicated	not indicated	not indicated	• not indicated
Singapore[28]	not indicated	not indicated	not indicated	not indicated	• not indicated
Chinese Taipei*					
Thailand[28]	not indicated	not indicated	not indicated	not indicated	• not indicated
USA	√	√	√		

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*****APEC economies that did not respond to the *APEC Survey of Laboratories***.**

[28] These economies participated in the *APEC Survey of Laboratories*, but did not indicate any labs testing this class of product to any domestic or other standards.

Exhibit 4-16
Significant Differences in Major Electric Motor Standards*

	IEC 34-2	U.S. IEEE 112	Canada/U.S. CSAC390 / NEMA MG-1	Japan JIS C4207/4203
IEC 34-2		P, V	P, V	V
U.S. IEEE 112	P, V		√	P, V
Canada/U.S. CSA C390 / NEMA MG-1	P, V	√		P, V
Japan JIS C4207/4203	V	P, V	P, V	

Key: S = Scope of test standard
D = Definitions
E = Equipment
P = Procedure during test
V = Evaluation of test data and results
C = Conditions of test

*Note: The entry of a letter (S, D, E, P, V or C) in a specific box in the matrix indicates a significant difference in that component of the two designated standards identified by the box. A "√" indicates that differences are not major.

There are some significant differences:

- The Canadian C390 and U.S. NEMA MG-1 standard use very prescriptive procedures and give the most conservative results, with very little room for interpretation of test data. The IEEE 112 test is slightly less prescriptive in its procedures, but similar.
- The international standard (IEC) uses a slightly different evaluation of test data, assuming "stray load losses" are a fixed percentage of output. This gives a higher efficiency rating than the U.S. or Canadian standard.
- The Japanese standard also uses different data evaluation, by ignoring "stray load losses" completely, and hence giving a still higher efficiency rating.

4.7.4 Findings

- There are moderately good prospects for standards alignment; however, the issue of how best to calculate/measure "stray load losses" will have to be clarified across APEC economies.

4.8 FLUORESCENT LAMPS AND BALLASTS

This class of product relates to lights that rely on electrical excitation of fluorescent gases in tubes not longer than 2400 mm/96 in. in length ("fluorescent lamps'), or relating to the principle component determining the electrical current used in the light ("fluorescent lamp ballasts").

4.8.1 Use of International Standards

Exhibit 4-17 summarizes the use of international standards by APEC economies for testing fluorescent lamps and ballasts.

Some main patterns can be detected:

- There is fairly widespread use of international standards for testing fluorescent lamps and ballasts.
- Many economies use both international and domestic test standards.

4.8.2 Use of Domestic and Other Standards

Exhibit 4-18 summarizes the use of domestic and other standards by APEC economies for testing fluorescent lamps and ballasts.

Some main patterns are:

- There is extensive use of industrial and other standards.
- There is a considerable inventory of test standards available.

4.8.3 Summary of Significant Differences

Exhibit 4-19 summarizes the comparison between major test standards. From an energy performance standpoint, any differences are not significant.

Exhibit 4-17
Summary of International Standards Used for Energy Performance Testing of Fluorescent Lamps & Ballasts

APEC Economy	IEC 81/82	IEC 901	IEC 920/921	IEC 928/929	IES LM66-1991	Other Standards Used by Economy
Australia	√		√	√		• CIE Publication 24 • CIE Publication 25 • CIE Publication 27 • CIE Publication 43
Brunei Darussalam*						
Canada	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Chile*						
People's Republic of China			√			
Hong Kong	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Indonesia	√					
Japan		√				
Korea	√	√	√	√		• IEC 155
Malaysia*						
Mexico					√	• IES LM65-1991
New Zealand*						
Papua New Guinea	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Philippines	√		√	√		
Singapore	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Chinese Taipei*						
Thailand	√					
USA	√	√	√	√	√	• IES LM40 • IES LM9 • IES LM51 • IES LM20

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.

Exhibit 4-18: Summary of Domestic and Other Standards Used for Energy Performance Testing of Fluorescent Lamps & Ballasts

APEC Economy	ANSI-C78	ANSI-C82	CAN / CSA C654	JIS C7601 / JIS C8108	MITI Notification No. 357	Other Standards Used by Economy
Australia	√	√				• AS1680.3, AS1201, AS3963, AS2643 • BS 5225 • BSI, DEMCO, EN, SISIR, IMQ, NZI, KEMCO, CTI, JIS, MITI, others
Brunei Darussalam*						
Canada			√			
Chile*						
People's Republic of China						• GB 2313
Hong Kong						• CAN/CSA C745-93
Indonesia						• Manufacturer standards for fluorescent lamps
Japan				√	√	
Korea		√				• KS C8000-8010 • KS C8100, KS C8102, KS C8104, KS C8108 • KS 9601 • KS C9605-9610 • Electrical Appliance Safety Control Law • Technical standards of KEPCO
Malaysia*						
Mexico	√	√				• NOM-J295-1983
New Zealand*						
Papua New Guinea[29]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Philippines						• PNS 12 • PNS 135
Singapore[29]	not indicated	not indicated	not indicated	not indicated	not indicated	• not indicated
Chinese Taipei*						
Thailand						• TIS 23-2521, TIS 230-2520, TIS 236-2533 • BS 5101
USA	√	√	√			• US DOE Test Proc. 10 CFR; Part 430, App. Q • ANSI 775 • ASTM 1341 • CSA 22.2 • NAECA • EPACT

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*APEC economies that did not respond to the *APEC Survey of Laboratories*.

[29] These economies participated in the *APEC Survey of Laboratories*, but did not indicate any labs testing this class of product to any domestic or other standards.

Exhibit 4-19
Significant Differences in Major Fluorescent Lamps and Ballasts Standards*

	IEC 81/82 901	IEC 920/921	IEC 928/929	IES LM-66, LM-9	ANSI C-281, C-81 / CSA C654	JIS C8108
IEC 81/82 901		√	√	√	√	√
IEC 920/921	√		√	√	√	√
IEC 928/929	√	√		√	√	√
IES LM-66, LM-9	√	√	√		√	√
ANSI C-78, C-82 / CSA C654	√	√	√	√		√
JIS C8108	√	√	√	√	√	

Key: S = Scope of test standard
D = Definitions
E = Equipment
P = Procedure during test
V = Evaluation of test data and results
C = Conditions of test

*Note: The entry of a letter (S, D, E, P, V or C) in a specific box in the matrix indicates a significant difference in that component of the two designated standards identified by the box. A "√" indicates that differences are not major.

4.8.4 Findings

- There are excellent prospects for alignment of APEC standards for fluorescent lamps and ballasts.[30]
- There is already positive acceptance of international standards.

[30] Although not mentioned above, it should be noted that Australian safety standards for fluorescent lamps and ballasts do contain some mandatory minimum performance requirements through their limiting harmonics; however, this fact does not affect these overall findings.

5. OVERVIEW OF APEC INFRASTRUCTURE FOR CONFORMITY ASSESSMENT AND ENERGY EFFICIENCY PERFORMANCE TESTING

Before assessing the degree to which test procedures and laboratory accreditation programs can be harmonized among the APEC economies, it is first necessary to look at the infrastructure currently in place for energy efficiency testing in each of the countries. This section provides a comparison of the similarities and differences between the accreditation programs, certification components of these programs, and energy efficiency testing laboratories of the APEC economies, based on the results of the *APEC Survey of Laboratories* from laboratories in 13 of the APEC economies, as well as the consultation process.

5.1 ACCREDITATION PROGRAMS AND REQUIREMENTS

The APEC economies have all developed accreditation programs to oversee and compare local test laboratories to recognized domestic and international standards. These programs (or 'schemes') are designed to assess and formally certify the technical competence of domestic test laboratories. Some accreditation bodies also accredit overseas laboratories or recognize the accreditation of foreign schemes. This is normally the result of bilateral or multilateral arrangements between or amongst testing and certification bodies in various economies. Appendix A provides a detailed overview of the Accreditation Programs of APEC member economies.

5.1.1 Similarities and Differences Between APEC Economies

The accreditation programs that have been put in place in the APEC economies vary primarily by the developmental stage at which the program is at, rather than by the requirements of the accreditation programs, which are for the most part consistent with ISO/IEC Guides 25, 58 and 43 (of which ISO/IEC Guides 25 and 58 are the most integral). The accreditation bodies of most APEC members are also members of the Asia Pacific Laboratory Accreditation Cooperation (APLAC), with the exception of Mexico and Chile. Exhibit 5-1 demonstrates the variance among the APEC economies in terms of their compliance with the ISO/IEC guides, their membership in APLAC and the number of energy efficiency labs that are in each economy.

Accreditation programs in the APEC economies are sometimes managed by the public sector, but in other cases, they have been established by the private sector. The accreditation body is closely associated with the government in approximately half of the APEC economies: Brunei Darussalam, Chile, China, Hong Kong, Japan, Malaysia,

Mexico, the Philippines, and Singapore. The private sector is responsible for the domestic accreditation program in the remaining APEC economies: Australia, Canada, Indonesia, Korea, New Zealand, Papua New Guinea, Chinese Taipei, Thailand, and the U.S.

The stage of development of domestic laboratory accreditation bodies varies significantly among APEC members, in particular in regard to the degree to which the domestic accreditation body operates in accordance with ISO/IEC Guide 58 and accredits laboratories to ISO/IEC Guide 25. Currently within APLAC, there is variability in the stages of development of domestic laboratory accreditation bodies, some of which may require considerable time to develop their programs to a level which will demonstrate compliance with ISO/IEC Guide 58. Some members therefore require assistance from the more developed accreditation bodies to achieve international recognition.[31] For example, Papua New Guinea's PNGLAS works in close association with NATA (Australia), using staff and assessors from NATA to assess and accredit laboratories against the same general requirements as used by NATA.[32] Brunei Darussalam's Construction Planning and Research Unit in the Ministry of Development has set up a Laboratory Accreditation Scheme which accredits domestic laboratories based on the general criteria found in ISO/IEC Guide 25. Chile is in the process of implementing a state accreditation scheme, setting up a network of calibration laboratories, and establishing an Association of Metrologists to help solve problems faced by industrial measurement laboratories.

The total number of accredited laboratories (including all types of calibration and testing) for each of the APEC economies also varies greatly, depending to a large extent on the experience of the program and how recently it was established. Exhibit 5-2 illustrates the total number of accredited energy efficiency testing laboratories, ranging from no accredited energy efficiency testing laboratories in some of the APEC economies, to approximately 20 in Australia and 100 in Chinese Taipei. In the APEC economies for which there are no accredited energy efficiency testing laboratories, energy efficiency testing may be being performed by government laboratories. However, in some countries such as Hong Kong, laboratories have been accredited to carry out electrical safety testing, but a laboratory accreditation program specifically for energy efficiency testing has not yet been established.

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[31] APEC Sub-Committee on Standards and Conformance, *Revised Report on the Asia Pacific Economic Cooperation - Technical Infrastructure Development Survey* (January 1996), Annex 6, APLAC Study Tour Interim Report. Countries visited by the APLAC Secretariat comprised Indonesia, Japan, Brunei Darussalam, Malaysia, People's Republic of China, Korea, Chinese Taipei, Vietnam, and Thailand.

[32] "The Challenge of Assessing in Papua New Guinea," *NATA News*, December 1996.

Exhibit 5- 1 Details of Accreditation Infrastructure of APEC Economies

APEC Member Economy	Accreditation Program Complies with ISO/IEC Guide 25	Accreditation Program Complies with ISO/IEC Guide 58	Accreditation Program Complies with ISO/IEC Guide 43	APLAC Member*
Australia	√	√	√	√
Brunei Darussalam	√	NC	NC	√
Canada	√	√	√	√
Chile	NC	NC	NC	No
People's Republic of China	√ (as well as ISO 9000)	√	√	√ Full members include CSBTS, CNACL and the China Import Export Commodity Inspection Bureau Laboratory Accreditation Committee
Hong Kong	√	√	√	√
Indonesia	√ (as well as ISO 9000)	NC	NC	√
Japan	In planning stages	In planning stages	In planning stages	√ Full members include Standards Department, AIST; Japan Calibration Service System; and Japan Accreditation Board for Conformity Assessment
Republic of Korea	√ (as well as ISO 9000)	√	√	√
Malaysia	√	√	NC	√
Mexico	√ (as well as ISO 9000)	√	√	No
New Zealand	√ (as well as relevant aspects of ISO 9002)	√	√	√
Papua New Guinea	√	√	NC	√
Philippines	√	√	NC	√
Singapore	√	√	√	√
Chinese Taipei	√	√	√	√
Thailand	√	√	NC	√
USA	√ (as well as relevant aspects of ISO 9002)	√	NC	√ Full members include A2LA, ICBO Evaluation Service, and NVLAP

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997, and secondary research.

NC = Not confirmed (countries for which adherence to ISO/IEC Guides 25, 58 and 43 has not yet been confirmed)

* Development of a multilateral MRA between APLAC members would most likely be based on compliance with ISO/IEC Guide 58 and Guide 25.

Exhibit 5- 2 Total Number of Accredited Energy Efficiency Testing Labs in APEC Economies

APEC Member Economy Accreditation Program	Number of Energy Efficiency Testing Labs
AUSTRALIA NATA - National Association of Testing Authorities	approximately 15-20
BRUNEI DARUSSALAM Ministry of Development, Laboratory Accreditation Scheme	0
CANADA PALCAN - Program for Accreditation of Laboratories	approximately 5-6 labs
CHILE	NC
PEOPLE'S REPUBLIC OF CHINA CNACL - China National Accreditation Committee for Laboratories	29, but 8 key labs
HONG KONG HOKLAS - Hong Kong Laboratory Accreditation Scheme	0 accredited
INDONESIA KAN - National Accreditation Body	0 accredited
JAPAN Agency for Industrial Science and Technology (AIST)	4
REPUBLIC OF KOREA KOLAS - Korea Laboratory Accreditation Scheme (1992)	4 government labs
MALAYSIA SAMM (Skim Akreditasi Makmal Malaysia) Laboratory Accreditation Scheme of Malaysia, administered by the Malaysian Accreditation Council (MAC)	0 accredited
MEXICO National System of Testing Laboratories Authorization, Secretariat of Commerce and Industrial Foment (SECOFI)	approximately 22 labs
NEW ZEALAND International Accreditation New Zealand (IANZ)	0 accredited*
PAPUA NEW GUINEA PNGLAS - Papua New Guinea Laboratory Accreditation Scheme	0 accredited
PHILIPPINES Bureau of Product Standards Laboratory Accreditation Scheme (BPSLAS)	1
SINGAPORE SINGLAS - Singapore Laboratory Accreditation Scheme, managed by the Laboratory Accreditation department of PSB	2
CHINESE TAIPEI CNLA - Chinese National Laboratory Accreditation	approximately 100**
THAILAND TLAS - Thai Laboratory Accreditation Scheme	3 public labs
USA NVLAP - National Voluntary Laboratory Accreditation Program; and A2LA - American Association of Laboratory Accreditation	approximately 21 labs (NVLAP and SCC) A2LA - NC

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997, and secondary research.
NC = Not confirmed
*While New Zealand does not have any accredited labs that carry out energy efficiency testing for the products that were the focus of this study, it has two labs that can do energy efficiency testing as part of electrical safety testing, as well as labs that carry out energy efficiency testing for solid fuel heaters and gas appliances.
**Not confirmed that all 100 labs indicated are accredited.

While Exhibit 5-2 is indicative of the number of energy efficiency testing labs in the APEC economies, it is not conclusive due to the fact that not all APEC economies responded to the consultation process. However, the relatively small number of accredited energy efficiency testing labs that appear to be in existence in the APEC economies, demonstrates that the energy efficiency testing infrastructure is not as well developed as the testing infrastructure in general in most of these economies. In many of these accreditation programs, there is no scope of accreditation specifically for labs that do energy efficiency testing. More often than not, these labs are classified as electrical testing labs, a scope of accreditation in which the majority of labs carry out electrical safety testing. Ensuring that the energy efficiency scope of accreditation is built into the domestic accreditation programs of the APEC economies will thus be central to both the success of a MRA in the area of energy performance testing and to the expansion of energy efficiency testing infrastructure in the APEC economies.

5.1.2 Alignment to International and Regional Standards

As Exhibit 5-1 illustrates, the accreditation programs established by APLAC members generally operate in accordance with the two main international standards for testing laboratories: ISO/IEC Guide 58 and accredit laboratories to ISO/IEC Guide 25. Additionally, Mexico's National System of Testing Laboratories Authorization operated by SECOFI also uses these two ISO/IEC Guides for its accreditation program. However, the extent of compliance with ISO/IEC Guides 25 and 58 remains unclear for Brunei Darussalam, Chile, and Indonesia.

The APEC economies are well on their way to increased harmonization of accreditation programs due to the almost universal acceptance of ISO/IEC Guides 25 and 58 as the recognized international standard for accreditation of testing laboratories. Work should continue through APLAC to ensure the full implementation of ISO/IEC Guides 25 and 58 among members and to help increase the confidence of members in mutual acceptance of test results. If Mexico and Chile were also to become APLAC members, APEC could use this forum as a top-down approach to mutual recognition of accreditation programs, which in itself would help the process of negotiation of a MRA in the area of energy efficiency.

5.1.3 Role of Quality Systems in Accreditation Programs

The consultation guide to which 14 of the APEC economies responded, asked whether ISO 9000 is a component of the economy's domestic accreditation program. Exhibit 5-3 illustrates that a majority of respondents indicated that ISO 9000 played a role in the accreditation of laboratories in their economies.

Exhibit 5-3 ISO 9000 as Part of Laboratory Accreditation Program

APEC Economy	Yes	No
Australia	√*	
Canada		√
People's Republic of China	√	
Hong Kong		not at present
Indonesia	√	
Japan	√	
Korea	√	
Mexico	√	
New Zealand		√
Philippines		√
Singapore		not indicated
Chinese Taipei		not indicated
Thailand	√	
United States of America	√	

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.
* While ISO 9000 is not part of the NATA accreditation program in Australia, some labs are registered to ISO 9000, as well as being accredited to ISO/IEC Guide 25.

The results displayed in Exhibit 5-3 should be interpreted carefully. While ISO 9000 provides a generic system for quality management of any organization, ISO/IEC Guide 25 provides the requirements for a quality system written explicitly for laboratories, as well as addresses technical elements that are not included in ISO 9002.[33] Laboratory accreditation bodies around the world generally only accredit laboratories against Guide 25, not against ISO 9000, so representatives from the APEC economies may have been indicating this distinction by answering negatively to the inclusion of ISO 9000 in their accreditation programs.[34]

Experts in the laboratory accreditation field argue that for testing and calibration laboratories, registration to ISO 9002 should not be substituted for accreditation for ISO/IEC Guide 25. There are four essential differences between ISO/IEC Guide 25 and ISO 9002:

- Conformity with ISO/IEC Guide 58 is required for laboratory accreditation bodies, while conformity with ISO/IEC Guide 48 (*Guidelines for third-party assessment and registration of a supplier's quality system*) is required for quality system registration bodies;

[33] M. Lynne Neumann, "ISO 9000: ISO/IEC Guide 25 vs. ISO 9002," *Cal Lab*, Vol. 1, No. 5, August/September 1994 (see also http://www.cgmasi.com/ where this article was located).

[34] Annex 1 of the draft revised version of ISO/IEC Guide 25 (August 1996) includes a reference table comparing the requirements of ISO 9001/2 to those of Guide 25.

- Technically specific requirements for competence of personnel, adherence to specified calibration and test methodology, and participation in proficiency-testing programs, are contained in Guide 25;

- Assessment methods differ because a quality management system audit does not evaluate the suitability of the management system for the organization, nor does it evaluate the suitability of the technology available in the organization (in particular, Guide 25 requires the lab to have specific equipment that is calibrated, regularly maintained, traceable to domestic standards and used in suitable accommodations); and

- The scope of accreditation/registration is expressed differently in that quality registration is generally within very broad industry or product categories, while laboratories are accredited only for very specific tests or measurements, and for particular products and test specifications.

5.1.4 Mutual Recognition of Accreditation Programs

Many APEC economies are working to develop arrangements for mutual recognition of accreditation. While a multilateral MRA among APEC economies for recognition of accreditation programs has not yet become a reality through APLAC, there are a number of bilateral MRAs between APEC members that could be used as a building block for such an agreement. Exhibit 5-4 highlights the bilateral MRAs that have been concluded between APEC economies to date.

In addition to these MRAs, the bilateral agreement between NVLAP (USA) and Telarc (New Zealand) for calibration and testing may be renewed, and Telarc may also sign MRAs with MAC (Malaysia) and CNLA (Chinese Taipei) for calibration and testing. NATA also works very closely with the accreditation bodies in Malaysia and Papua New Guinea for the purpose of technical assistance, although formal mutual recognition agreements are not in place.[35] According to the consultation process carried out by Nordicity as part of this study, foreign countries also recognize the certification marks of certification organizations in some APEC economies. For example, the U.S. certification marks of UL and ETL are recognized by other countries such as China and Thailand's trading partners recognize the certification marks of the Thai government's accreditation program.

These existing bilateral agreements between APEC members illustrate that there has already been progress made towards the implementation of a multilateral APEC MRA and each subsequent bilateral agreement can also be seen as a step towards this ultimate goal. The APEC Steering Group on Energy Standards will need to establish what the full parameters will be for a

[35] APEC Sub-Committee on Standards and Conformance, *Revised Report on the Asia Pacific Economic Cooperation - Technical Infrastructure Development Survey* (January 1996), Annex 6, APLAC Study Tour Interim Report. On July 1, 1997, the New Zealand accreditation body was restructured and is now called International Accreditation New Zealand (IANZ). Telarc Ltd. is now solely concerned with quality management certification.

formal multilateral MRA to provide transparency for APEC members in any bilateral agreements on energy efficiency testing. The process of negotiating a multilateral MRA needs to be undertaken without the restriction of tight time constraints, due both to the necessity of ensuring that the integrity and quality of the results are not compromised, and to the fact that funds for training and audit visits are not always readily available.

Exhibit 5-4 Existing Bilateral MRAs Between APEC Member Economies

APEC Member Economies Accreditation Bodies	NATA (Australia)	Brunei Darussalam	PALCAN (Canada)	Chile	People's Republic of China	HOKLAS (Hong Kong)	Indonesia	Japan	Republic of Korea	Malaysia	Mexico	Telarc (New Zealand)	Papua New Guinea	Philippines	SINGLAS (Singapore)	Chinese Taipei	Thailand	NVLAP (USA)	A2LA (USA)
NATA (Australia)	■					X						X			X			X	X
Brunei Darussalam		■																	
PALCAN (Canada)			■															X	
Chile				■															
People's Republic of China					■														
HOKLAS (Hong Kong)	X					■						X			X				X
Indonesia							■												
Japan								■											
Republic of Korea									■										
Malaysia										■									
Mexico											■								
Telarc (New Zealand)	X					X						■			X				X
Papua New Guinea													■						
Philippines														■					
SINGLAS (Singapore)	X					X						X			■			X	X
Chinese Taipei																■			
Thailand																	■		
NVLAP (USA)	X		X												X			■	
A2LA (USA)	X					X						X			X				■

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997, and secondary research.
Note: Telarc New Zealand was restructured on July 1, 1997, with accreditation now the responsibility of International Accreditation New Zealand (IANZ) and Telarc Limited now concerned solely with quality management certification.

A soon-to-be established multilateral APLAC MRA for accreditation programs will likely include compliance of each of the APLAC members with ISO/IEC Guides 58 and 25. Nine APLAC member economies that participated in study tours of laboratory accreditation bodies conducted by the APLAC Secretariat from September to November 1995, acknowledged, with the exception of Chinese Taipei, that they have a need to develop or complete additional documentation if compliance of their programs with ISO/IEC Guides 58 and 25 is to be demonstrated to other bodies. In the case of accreditation programs that have only recently been established, APLAC suggests that some time be allowed for the staff and other resources of the newer programs to develop experience in the implementation of an accreditation program so that

the stability of the accreditation program does not affect the development of confidence between MRA partners. The credibility of accredited testing laboratories will also depend on the availability of competent calibration laboratories in each of the APEC member economies to provide measurement support and traceability to domestic and international standards of measurement.[36]

In terms of MRAs specifically related to energy efficiency performance testing, Exhibit 5-5 illustrates which of the economies that responded to the consultation process have such MRAs in place.

Exhibit 5-5 MRAs for Energy Efficiency Performance Testing Laboratories

APEC Economy	Yes (How Many?)	No	Actively Seeking More MRAs in this Area?
Australia	√ (5)		√
Canada	√ (1 with U.S. for electric motors testing)		no
People's Republic of China		√	√
Hong Kong		√	no
Indonesia		√	√
Japan	Many countries		√
Korea		√	√
Mexico		√	√
New Zealand		√	not indicated
Philippines		√	no
Singapore	√		not indicated
Chinese Taipei	√		not indicated
Thailand		√	√
United States of America	√ (1 with Canada)	no with Asia Pacific region countries	√

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

For Australia, Hong Kong, and Singapore, the MRAs indicated above are the same as those indicated in Exhibit 5-4, and they do not necessarily relate specifically to energy performance testing. Hong Kong is not actively seeking any MRAs in this area because it does not currently have any accredited energy efficiency testing labs. The majority of the economies that indicated that they do not currently have MRAs in this area are actively seeking more MRAs for energy performance testing, an encouraging result for the negotiation of a multilateral MRA for energy efficiency testing among APEC economies. Due to the number of economies actively seeking

[36] APEC Sub-Committee on Standards and Conformance, *Revised Report on the Asia Pacific Economic Cooperation - Technical Infrastructure Development Survey* (January 1996), Annex 6, APLAC Study Tour Interim Report. Nordicity Group Ltd. has also recently been commissioned to carry out a study on technical infrastructure development for measurement standards, laboratory accreditation, inspection bodies, and accreditation of quality system and product certification bodies, for the APEC Sub-Committee on Standards and Conformance.

MRAs, the Steering Group on Energy Standards should recommend that those economies with internationally acceptable accreditation programs join the multilateral APLAC MRA once it is in place.

In terms of the criteria that economies use when recognizing testing facilities in other countries, Australia, Indonesia, Korea, New Zealand, the Philippines and Thailand all stated in their responses to the consultation guide that international standards such ISO/IEC Guides 25, 43 and 58 were the basis for such MRAs. Australia also noted that it also used APLAC's specifications for mutual recognition of testing facilities.[37] Almost all of the APEC economies that responded to the consultation guide recognized an advantage to the increased harmonization of test standards for energy-using products, as is illustrated in Exhibit 5-6.

Exhibit 5-6 Is there an Advantage to Harmonizing Test Standards for Energy-Using Products?

APEC Economy	Yes	No
Australia	√	
Canada	√	
People's Republic of China		√
Hong Kong	√	
Indonesia	√	
Japan	Noted that it is very difficult to estimate actual economic advantage	
Korea	√	
Mexico	√	
New Zealand	√	
Philippines	√	
Singapore	√	
Chinese Taipei	√	
Thailand	√	
United States of America	√	

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

[37] Nordicity Group Ltd., APEC Consultation Process, May/June 1997, based on 14 responding APEC economies.

Economic advantages to harmonizing test standards more closely for energy-using products included:

- allowing manufacturers to test the product once for all markets
- reducing costs and time to industry for exports
- removing trade barriers;
- speeding up the market time for new products
- reducing consumer costs
- enabling more direct international comparison of products

Suggestions on measures that could be implemented to increase the likelihood of establishing MRAs for energy performance testing varied among respondents to the consultation process. In terms of test procedures, Hong Kong, the Philippines and the U.S. all thought that the increased harmonization of test standards for energy efficiency performance in the region would be the most useful measure. Korea added to this suggestion by proposing the closer harmonization of tested items, testing methods, testing conditions, and label indication methods. Mexico suggested the testing of one particular product by different energy efficiency labs in several countries to facilitate comparison of results.

Other economies focused on the accreditation aspects of a MRA. Singapore pointed out the need not only for common standards being used, but also similar accreditation systems and cooperation among interested parties. Chinese Taipei recommended incorporating existing professional/trade laboratories accreditation programs. Australia suggested that the expansion of regional multi-lateral agreements such as APLAC would be helpful. Canada proposed the establishment of a regional accreditation agency with internationally recognized criteria that included ongoing monitoring of production.

Thirdly, two countries focused on the need for technical assistance and transparency among APEC members to facilitate the negotiation of a MRA for energy performance testing. Thailand suggested that APEC should incorporate measures to facilitate needed assistance for members, such as technical training and technology transfer to help developing economies meet the required targets. Indonesia recommended the exchange of information about lab facilities, standards and labelling programs through workshops or training.[38]

It appears likely that a successful APEC MRA for energy efficiency testing will have to encompass all three of these areas:

i. increased harmonization of test standards;
ii. alignment of accreditation programs to ensure compliance with international standards such as ISO/IEC Guides 25 and 58; and
iii. technical assistance to help those economies with newer accreditation programs and testing facilities acquire the acceptance of test results from more established APEC economies.

[38] Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997, based on 14 responding APEC economies.

In addition to compliance to ISO/IEC Guides 58 and 25, APLAC similarly recognizes that a comprehensive, multilateral MRA among APLAC members would include criteria such as development of sufficient experience in administration of an accreditation program, transparency of documentation and procedures among members, and access to a credible domestic measurement system that identifies international traceability.[39] As Section 5.2.2 will demonstrate, such a MRA can be based in part on the foundation of bilateral MRAs already in existence between accreditation programs, as well as between laboratories in various APEC economies.

[39] APEC Sub-Committee on Standards and Conformance, *Revised Report on the Asia Pacific Economic Cooperation - Technical Infrastructure Development Survey* (January 1996), Annex 6, APLAC Study Tour Interim Report.

5.2 CERTIFICATION AND TESTING CONFORMITY ASSESSMENT INFRASTRUCTURE

5.2.1 Certification in APEC Economies

In general, the 14 economies that responded to the consultation program indicated that the accreditation programs of the APEC economies include a certification component and that there is a relatively small number of certification marks given the number of economies that responded (see Exhibit 5-7). For the most part, these certification marks are not energy-related, as energy efficiency is predominantly a regulatory requirement in the APEC economies. In the case of energy efficiency, therefore, energy efficiency labels tend to replace certification marks for the products covered in this study (see Section 6 for further details on energy efficiency regulatory requirements in the APEC economies).

Exhibit 5-7 Certification Component in Accreditation Program

APEC Economy	Certification Included in Accreditation Program	Number of Certification Marks
Australia	yes	about 5
Canada	yes	5
People's Republic of China	yes	3
Hong Kong	no	not indicated
Indonesia	yes	5
Japan	yes	several
Korea	yes	many (over 8)
Mexico	yes	3
New Zealand	no	not indicated
Philippines	yes	2
Singapore	yes	The Green Labelling Scheme has a mark for energy efficient products
Chinese Taipei	yes	1
Thailand	yes	3
United States of America	yes	not indicated

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

In some APEC economies, laboratories have their own certification marks, as Exhibit 5-8 demonstrates.

Exhibit 5-8 Do Laboratories in your Country have their Own Certification Marks?

APEC Economy	Yes	No
Australia		no
Canada	some, if under the umbrella of a certification organization	
People's Republic of China	yes	
Hong Kong		no
Indonesia	yes	
Japan		no
Korea	some labs have their own marks according to their testing facilities and capacity	
Mexico	yes	
New Zealand		no
Philippines		no
Singapore		no
Chinese Taipei	not indicated	not indicated
Thailand		no
United States of America	yes	

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

Exhibit 5-9 illustrates whether or not the certification marks for each of the 14 APEC economies that responded to the consultation guide, are recognized by other countries.

Exhibit 5-9 Are the Certification Marks in Your Economy Recognized by Other Countries?

APEC Economy	Yes	No
Australia		no relevant marks for energy efficiency
Canada		no
People's Republic of China	yes	
Hong Kong		no
Indonesia	yes	
Japan	yes	
Korea		no
Mexico		no
New Zealand		no
Philippines		no
Singapore	yes	
Chinese Taipei	yes	
Thailand	yes	
United States of America	yes	

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

The representative from Chinese Taipei noted that labs retaining internationally recognized marks have virtually universal acceptance. The People's Republic of China and the U.S. both stated that UL's mark was one of these marks accepted practically universally. In terms of energy efficiency, however, most of the comments gathered from the consultation guide noted that mutual acceptance of certification marks was still in its infancy.

5.2.2 Profile of Energy Efficiency Testing Laboratories

The *APEC Survey of Laboratories* that Nordicity carried out in May 1997 resulted in a total of 79 responses from 13 of the APEC economies. In addition to the economies which sent back laboratory responses to the survey, Brunei Darussalam, Malaysia, and New Zealand stated that they did not have any accredited energy performance testing laboratories in their economy.[40] At the time of writing, Nordicity had not received any survey responses from laboratories in Chile or Chinese Taipei.

[40] While New Zealand does not have any accredited labs that carry out energy efficiency testing for the products that were the focus of this study, it has two labs that can do energy efficiency testing as part of electrical safety testing, as well as labs that carry out energy efficiency testing for solid fuel heaters and gas appliances.

5.2.2.1 Products Tested

The *APEC Survey of Laboratories* began by asking laboratories in the APEC economies to state which of the key products described in Section 4 they tested for energy performance (see Appendix C for the questionnaire for the *APEC Survey of Laboratories*). Exhibit 5-10 illustrates which of the APEC economies that responded to the survey currently have laboratories that carry out energy performance testing for 6 products included in the questionnaire.

In general, almost all of the laboratories in the APEC economies test refrigerators, refrigerator-freezers, room air conditioners, and fluorescent lamp ballasts for energy efficiency. Of the laboratories in the responding economies, only the laboratories in Australia, Japan, Korea, and the U.S. currently test all 6 of the main product groups for energy efficiency. None of the laboratories that responded from Hong Kong, Papua New Guinea and Singapore currently test any of these products for energy efficiency.

None of the labs from Thailand currently test refrigerator-freezers or freezers. None of the labs from Indonesia currently test freezers. Additionally, none of the labs from either Thailand or Indonesia test room air conditioners for energy efficiency. The People's Republic of China, Indonesia, Mexico and the Philippines do not have any labs currently testing either single-package or split-system air conditioners, while labs in Thailand only test split-system air conditioners. The People's Republic of China, the Philippines, and Thailand do not have any labs testing electric motors for energy efficiency. Canada and the People's Republic of China do not have any labs that test fluorescent lamps; however, their laboratories do test fluorescent lamp ballasts.

In addition to the 6 main products covered by the *APEC Survey of Laboratories*, laboratories in the APEC economies were also asked to list three other consumer or household electrical products that they test for energy performance. In some APEC economies, these other products are also covered by regulatory and/or labelling requirements, as is explained further in Section 6.3. Exhibit 5-11 illustrates the variety of other household electrical products tested in APEC laboratories.

Exhibit 5-10 APEC Economies with Laboratories that Carry Out Energy Performance Testing for Key Products

INSERT TABLE RE QUESTION 1 - 691/reports/draftrpt/exhibits/exh-prot.doc

Exhibit 5-11 Variety of Other Products Tested for Energy Performance

APEC Economy	Other Household Electrical Products Tested by Labs Responding to Survey	Reasons for Testing in Addition to Regulatory Requirements
Australia	• Dishwashers • Clothes dryers • Clothes washers • Evaporative air-conditioning (domestic & small industrial) • Cooling towers (small units only) • Evaporative coolers • Fans • Control systems for white goods • Low voltage transformers for luminaires	• Manufacturers' requirements • Customers requirements • Research & development • Marketing reference • Comparative testing for publication in consumer magazines • Third party audits (regulations)
Canada	• Dishwashers • Clothes dryers • Clothes washers • Furnaces (gas or electric) • Water heaters • Electric ranges • Hotplate cooktops • Heat recovery ventilators • Microwaves	• Part of government's mission to increase efficiency • Manufacturers' requirements / rating data • Research & development • Marketing requirements
People's Republic of China	• Clothes washers • Fans • Microwave ovens • Rice cookers	• Client requirements (clients are public organizations, manufacturers and consumers)
Hong Kong	None reported	None reported
Indonesia	• Radio tape recorders • Personal computers • Colour monitors	• Product qualification tests • Bid sampling tests
Japan	• Clothes washers • Microwave ovens • Cooking heaters / electric ranges • Vacuum cleaners • Water heaters • Incandescent lamps • Halogen lamps	• Manufacturers' requirements • Third party audits (regulations and labelling)
Korea	• Electric heating cabinets • Coffee pots • Tungsten filament lamps • Incandescent lamps • Reflectors • Compact fluorescent lamps	• Aside from regulatory requirements, no other reasons for testing indicated in survey responses
Mexico	• High intensity discharge (HID) lamps • HID lamp ballasts • Tungsten-halogen incandescent lamps • Clothes washers	• Testing components incorporated in illumination systems
PNG	None reported	None reported
Philippines	• Household fans	• Aside from regulatory requirements, no other reasons for testing indicated in responses
Singapore	None reported	None reported
Thailand	None reported	None reported
USA	• Dishwashers • Clothes dryers • Clothes washers • Water heaters • Incandescent / reflector lamps • Compact fluorescent lamps & ballasts • High intensity discharge (HID) lamps	• Competitive evaluations • Comparison testing for manufacturers & others • Manufacturer quality

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

In addition to demonstrating the variety of other household electrical products tested in APEC laboratories, Exhibit 5-11 also shows that there are numerous non-regulatory reasons why laboratories in the APEC economies test energy-using products for energy efficiency. Many laboratories do testing work for manufacturers to determine the appropriate energy efficiency rating for a variety of household products. Energy efficiency ratings are often used for marketing purposes, or for comparative analysis that is done by consumer magazines. Energy performance testing is also vital when manufacturers are carrying out research and development for new products. Additionally, laboratories may carry out comparative testing so that government procurement officials can determine the most energy efficient products to be used in government buildings.

5.2.2.2 Assessment of Capabilities and Potential of Labs

Laboratory Compliance with International Standards

The *APEC Survey of Laboratories* asked each of the labs that responded to the questionnaire to indicate whether or not the laboratory was accredited as complying with ISO/IEC Guide 25. Exhibit 5-12 illustrates the results of this question from the laboratories in the 13 APEC economies that responded to the survey.

Exhibit 5-12 Lab Accreditation to ISO/IEC Guide 25

APEC Economy	Yes	No	Do not know
Australia	15 of 23 labs	8 of 23 labs*	
Canada	8 of 9 labs	1 of 9 labs	
People's Republic of China	1 lab		
Hong Kong	2 labs		
Indonesia		2 labs	
Japan	2 of 5 labs	1 of 5 labs	2 of 5 labs
Korea	2 of 5 labs	3 of 5 labs	
Mexico	6 of 13 labs	6 of 13 labs	1 of 13 labs
Papua New Guinea	1 lab		
Philippines		2 labs	
Singapore	1 lab		
Thailand	2 of 3 labs	1 of 3 labs	
USA	8 of 8 labs		

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*One Australian lab noted that it was accredited by NATA for various safety testing procedures, but not for energy performance testing

A majority of the labs that responded to the *APEC Survey of Laboratories* claimed that they are accredited to ISO/IEC Guide 25. Some of the labs that responded may also not have known that they had been accredited to Guide 25 as part of their domestic accreditation program. Additionally, in many of the accreditation programs in the APEC economies, there is not yet a specific scope of accreditation for energy efficiency testing, due in part to the relatively small number of labs currently performing this type of testing.

Laboratory accreditation to this international standard could provide part of the foundation for mutual recognition arrangements between APEC economies and should be addressed through the forum provided for this issue in APLAC. The *APEC Survey of Laboratories* has indicated that compliance to ISO/IEC Guide 25 by labs in the APEC economies cannot be taken as a given, just because the economy is a member of APLAC, or because the economy has an accreditation program which accredits labs based on ISO/IEC Guide 25. Allowances may have to be made and technical assistance may have to be arranged for economies such as Brunei Darussalam, Hong Kong, Malaysia, New Zealand, Papua New Guinea and Singapore, that do not yet have any labs that carry out energy efficiency testing for the 6 main products studied, or for economies that are still developing their conformity assessment infrastructure. Development of a specific scope of accreditation for energy efficiency testing under Guide 25 in all of the domestic accreditation programs in the APEC economies may also be necessary.

The *APEC Survey of Laboratories* also asked the labs that responded to the questionnaire to indicate whether or not the laboratory was accredited as complying with ISO/IEC Guide 43. The large majority of labs that responded to the survey stated that they were not accredited as complying with the requirements of ISO/IEC Guide 43. However, because the requirements of Guide 43 pertain solely to the inter-laboratory proficiency testing programs that are coordinated by domestic accreditation programs in the APEC economies, many of the labs may not have known that the proficiency testing programs in which they participate are implemented in accordance with Guide 43. Additionally, economies with newly-instituted domestic accreditation programs may not yet have implemented inter-laboratory proficiency testing programs as part of their accreditation program, as is required in ISO/IEC Guide 58.

Alignment to ISO/IEC Guide 43 among APEC economies is an issue that should be addressed through APLAC. Alignment to ISO/IEC Guide 43 should not pose a problem because proficiency testing programs will become more common as the domestic accreditation programs in some economies develop and gain more experience.

The *APEC Survey of Laboratories* also asked labs whether or not they were registered to an ISO 9000 quality system standard in their economy. Exhibit 5-13 demonstrates that fewer of the labs surveyed are registered to ISO 9000, in comparison to those that are accredited to ISO/IEC Guide 25.

Exhibit 5-13 Lab Registration to ISO 9000

APEC Economy	Yes	No
Australia	12 of 23 labs*	11 of 23 labs*
Canada	3 of 9 labs	6 of 9 labs
People's Republic of China		1 lab
Hong Kong	1 lab	1 lab
Indonesia		2 of 2 labs
Japan	2 of 3 labs	1 of 3 labs
Korea	1 of 5 labs	4 of 5 labs
Mexico	5 of 13 labs	8 of 13 labs
Papua New Guinea		1 lab
Philippines		2 of 2 labs
Singapore	1 lab	
Thailand		3 of 3 labs
USA	2 of 8 labs	6 of 8 labs

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*One Australian lab noted that is currently preparing for ISO 9000 registration, while another Australian lab noted that it is registered to ISO 9002 and is currently seeking registration to ISO 9001.

Accreditation based on ISO/IEC Guide 25 ensures that in addition to numerous technical requirements, the lab has implemented a quality management system equivalent to ISO 9002.[41] Additionally, several Australian labs noted that while project management of their laboratories is accredited to ISO 9000, the actual testing that the laboratory performs is not. The low number of labs registered to ISO 9000 is therefore due to the fact that compliance with ISO/IEC Guide 25 goes beyond the requirements of ISO 9000 anyway.

In addition to questioning labs in the APEC economies about their current capabilities, the *APEC Survey of Laboratories* also asked labs about their future plans for getting accredited to ISO/IEC Guides 25 and 43. Exhibit 5-14 illustrates that approximately half of the labs that responded to the survey have future plans for accreditation to ISO/IEC Guides 25 and 43.

[41] In fact, Annex 1 of the draft revised version of ISO/IEC Guide 25 (August 1996) includes a reference table comparing the requirements of ISO 9001/2 to those of Guide 25.

Exhibit 5-14 Future Plans for Getting Accredited to ISO/IEC Guide 25 and 43

APEC Economy	Yes	No	Do not know
Australia	2 of 23 labs*	21 of 23 labs	
Canada	4 of 6 labs	1 of 6 labs	1 of 6 labs
People's Republic of China	1 lab		
Hong Kong	1 lab		
Indonesia	1 of 2 labs	1 of 2 labs	
Japan	2 of 3 labs	1 of 3 labs	
Korea	3 of 4 labs	1 of 4 labs	
Mexico	9 of 13 labs	4 of 13 labs	
Papua New Guinea	Not indicated		
Philippines	2 of 2 labs		
Singapore	Not indicated		
Thailand	3 of 3 labs		
USA	4 of 7 labs	2 of 7 labs	1 of 7 labs

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*One Australian lab is currently applying for NATA accreditation which has equivalent provisions to the ISO/IEC Guides.

Labs that answered positively to earlier questions regarding current accreditation to ISO/IEC Guides 25 and 43 often rightly skipped this question as not relevant to them, so the response rate is slightly lower. Nevertheless, the responses to this question demonstrates that labs in the APEC economies are committed overall to improving their capabilities by aligning to the international standards that will facilitate the exchange of test results between countries.

Use of Private Sector Laboratories to do Energy Efficiency Testing

An interesting comparison among the laboratories in the APEC economies can be made from the results of the consultation guide (see Appendix D) which asked whether the economy's government relied on accredited private sector labs to carry out energy efficiency performance testing, or whether government labs were used for this purpose. Exhibit 5-15 demonstrates that of the 14 APEC economies that responded to the consultation guide, half rely on private sector energy performance testing labs. In economies such as the Philippines and Singapore, there is not yet an accredited private sector laboratory to do such testing, so energy efficiency is tested in government labs. Economies such as Chinese Taipei and Thailand use both private sector and government labs in this area, while economies such as the People's Republic of China, Indonesia and Korea rely solely on government labs for energy efficiency testing.

Exhibit 5-15 Use of Private Sector Labs for Energy Efficiency Testing

APEC Economy	Private Accredited Labs	Government Labs
Australia	√	
Canada	√	
People's Republic of China		√
Hong Kong	no accredited labs for energy efficiency testing	
Indonesia		√
Japan	√	
Korea		√
Mexico	√	
New Zealand	no accredited labs for energy efficiency testing*	
Philippines		√
Singapore		√
Chinese Taipei	√	√
Thailand	√	√
United States of America	√	

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.
*While New Zealand does not have any accredited labs that carry out energy efficiency testing for the products that were the focus of this study, it has two labs that can do energy efficiency testing as part of electrical safety testing, as well as labs that carry out energy efficiency testing for solid fuel heaters and gas appliances.

The implication of this divergence between the APEC economies in the use of private sector versus government laboratories for energy performance testing is the extent to which the governments of the APEC economies can commit to develop the capabilities of private sector energy efficiency testing laboratories further. As the next section demonstrates, laboratories in the APEC economies are enthusiastic about improving their testing capabilities in the future, but there may be a limit to how much cost governments are able to ask the private sector to bear in this area.

Current Capabilities and Future Potential of APEC Laboratories in Energy Efficiency Testing

After questioning the laboratories in APEC economies about which of the 6 main household electrical products they tested for energy efficiency, the questionnaire asked the labs to provide the reasons why they did not test for energy performance for any of these products (see Appendix C for the *APEC Survey of Laboratories* questionnaire). Possible responses included "do not have appropriate testing equipment," do not have appropriate trained personnel," and "other - please specify" (for example, "test services not required in this market" or "not part of main business"). Exhibit 5-16 illustrates the reasons why laboratories in APEC economies do not test particular products for energy efficiency, and the number of labs that gave these responses for each of the 13 economies for which laboratories responded to the survey.

Exhibit 5-16 Reasons Why Some Laboratories Indicated They do not Carry Out Energy Performance Testing for Key Products

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Exhibit 5-16 can help identify which of the APEC economies require technical assistance in the form of appropriate energy efficiency testing equipment and training of staff to facilitate the acceptance of test results throughout APEC for the 6 main products. In some economies, particularly Indonesia, Papua New Guinea, and Singapore, a large majority of the labs that responded need technical assistance to be able to carry out energy efficiency testing for most or all of the key products covered by this survey. Discussion of negotiation of a mutual recognition agreement in the area of energy efficiency, therefore, should include the need for technical assistance for some economies to facilitate the development of the appropriate infrastructure and develop the confidence necessary for the acceptance of test results from laboratories in these economies.

Three questions asked at the end of the *APEC Survey of Laboratories* demonstrate that while laboratories in some APEC economies may require technical assistance to reach the level of energy efficiency testing that is carried out in more developed economies, there is much eagerness from the labs that responded to the survey in regard to future plans for increasing the number of products tested, acquiring new testing equipment, and training staff for new test methods. Exhibit 5-17 shows that a majority of the labs have future plans for increasing the number of electrical energy-using products tested. These responses demonstrate the broad benefit of a multilateral MRA between APEC economies in the area of energy performance testing, given that the number of labs performing this testing is likely to increase.

Exhibit 5-17 Future Plans for Increasing the Number of Energy-Using Products Tested

APEC Economy	Yes	No	Do not know
Australia	6 of 23 labs	17 of 23 labs	
Canada	4 of 7 labs	2 of 7 labs	1 of 7 labs
People's Republic of China	1 lab		
Hong Kong	1 of 2 labs		1 of 2 labs
Indonesia	2 of 2 labs		
Japan	2 of 3 labs	1 of 3 labs	
Korea	5 of 5 labs		
Mexico	9 of 13 labs	4 of 13 labs	
Papua New Guinea		1 lab	
Philippines	2 of 2 labs		
Singapore		1 lab	
Thailand	3 of 3 labs		
USA	6 of 8 labs	2 of 8 labs	

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

Exhibit 5-18 shows that a large majority of the labs have future plans for acquiring new testing equipment. While these responses should be interpreted cautiously because the survey did not specify new equipment for energy performance testing, they demonstrate that labs in the APEC economies are committed to improving their capabilities.

Exhibit 5-18 Future Plans for Acquiring New Testing Equipment

APEC Economy	Yes	No	Do not know
Australia	19 of 23 labs	4 of 23 labs	
Canada	6 of 8 labs	1 of 8 labs	1 of 8 labs
People's Republic of China	1 lab		
Hong Kong	2 of 2 labs		
Indonesia	2 of 2 labs		
Japan	2 of 3 labs	1 of 3 labs	
Korea	5 of 5 labs		
Mexico	14 of 14 labs		
Papua New Guinea		1 lab	
Philippines	2 of 2 labs		
Singapore		1 lab	
Thailand	3 of 3 labs		
USA	7 of 8 labs	1 of 8 labs	

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

Exhibit 5-19 shows that a large majority of the labs have future plans for training staff for new test methods.

Exhibit 5-19 Future Plans for Training Staff for New Test Methods

APEC Economy	Yes	No
Australia	17 of 23 labs	6 of 23 labs
Canada	9 of 9 labs	
People's Republic of China	1 lab	
Hong Kong	2 of 2 labs	
Indonesia	2 of 2 labs	
Japan	2 of 3 labs	1 of 3 labs
Korea	5 of 5 labs	
Mexico	12 of 14 labs	2 of 14 labs
Papua New Guinea		1 lab
Philippines	2 of 2 labs	
Singapore		1 lab
Thailand	3 of 3 labs	
USA	7 of 8 labs	1 of 8 labs

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

As in Exhibit 5-18 above, these responses should be interpreted cautiously because the survey question did not specify training staff for new energy performance test methods. However, taken as a whole, the above three tables indicate that laboratories in the APEC economies are extremely interested in upgrading their testing capabilities. While some of these labs will need technical assistance to allow them to take advantage of the economic benefits of a MRA on energy performance testing, other labs are planning to upgrade their facilities and staff themselves as part of their ongoing commitment to the continually changing environment of energy efficiency testing.

5.2.2.3 Mutual Recognition of Facilities

According to the consultation process carried out by Nordicity as part of this study, other countries accept products tested for energy efficiency in labs in Australia, Indonesia, Mexico, Singapore, Chinese Taipei, Thailand and the U.S. Additionally, as Exhibit 5-20 illustrates, the *APEC Survey of Laboratories* asked laboratories whether or not they currently have partnership arrangements with laboratories in other countries.

Exhibit 5-20 Labs with Partnership Arrangements with Labs in Other Economies

APEC Economy	Yes	No	Do not know
Australia	9 of 23 labs	14 of 23 labs	
Canada	7 of 8 labs	1 of 8 labs	
People's Republic of China	1 lab		
Hong Kong	2 of 2 labs		
Indonesia	1 of 2 labs	1 of 2 labs	
Japan	2 of 3 labs	1 of 3 labs	
Korea	2 of 5 labs	3 of 5 labs	
Mexico	7 of 14 labs	7 of 14 labs	
Papua New Guinea	1 lab		
Philippines	2 of 2 labs		
Singapore			1 lab
Thailand	1 of 3 labs	2 of 3 labs	
USA	5 of 8 labs	2 of 8 labs	1 of 8 labs

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

Approximately half of the labs that responded to the *APEC Survey of Laboratories* have partnership arrangements with laboratories in other countries. A number of these partnerships are with parent companies in other countries. For example, the parent company of one Australian lab has partnership arrangements with other Society of General Surveillance (SGS) companies throughout the world and the Westinghouse Electric Australia Ltd. laboratory has an association with its parent company in the U.S. UL's 5 laboratories in the U.S. are also associated with UL laboratories in Chinese Taipei and Hong Kong. ABB Sistemas/Division Motores laboratory in Mexico has partnership arrangements with other ABB labs.

In the area of energy efficiency testing of lamps, Lighting Sciences Australasia sells lighting laboratory testing facilities to other countries such as Malaysia, Taiwan, and India, and maintains links with its clients. Sylvania Lighting laboratory in Australia has Sylvania counterparts in other countries, and the Optical and Photometric Technology laboratory in Australia has partnerships with Independent Test Laboratories in the U.S.

The ATCO laboratory in Australia has partnership arrangements with laboratories of major lamp manufacturing companies throughout the world.

While partnership arrangements do exist between labs, therefore, they tend to be between major manufacturers, and between parent companies and their associated laboratories, particularly in the more developed of the APEC economies. This finding a further dimension to the alignment of test standards because multinational laboratories provide the opportunity for cross-border testing. When questioned on their future plans for partnerships with laboratories in other economies, a large majority of labs responded positively, as Exhibit 5-21 illustrates. For example, one Australian lab is currently negotiating partnership arrangements with Indonesia and Papua New Guinea's National Analysis Laboratory has an ongoing commitment to making partnership arrangements with labs in other countries.

Exhibit 5-21 Future Plans for Partnership Arrangements with Labs in Other Economies

APEC Economy	Yes	No	Do not know
Australia	7 of 23 labs	16 of 23 labs	
Canada	6 of 8 labs		2 of 8 labs
People's Republic of China	1 lab		
Hong Kong	1 lab		
Indonesia	2 of 2 labs		
Japan	3 of 4 labs	1 of 4 labs	
Korea	3 of 5 labs	1 of 5 labs	1 of 5 labs
Mexico	8 of 13 labs	5 of 13 labs	
Papua New Guinea	1 lab		
Philippines	2 of 2 labs		
Singapore			1 lab
Thailand	2 of 3 labs		
USA	5 of 7 labs	2 of 7 labs	

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

Exhibit 5-21 demonstrates that labs in the APEC economies recognize the benefits of bilateral mutual recognition arrangements and their partnerships could provide a foundation for negotiation of multilateral mutual recognition arrangements between the APEC economies. However, a top-down approach to harmonize accreditation programs and test standards more closely, as well as the provision of appropriate technical assistance, will also be necessary to ensure confidence throughout the APEC economies in the mutual acceptance of test results.

6. OVERVIEW OF APEC ENERGY EFFICIENCY REGULATORY PROGRAMS AND REQUIREMENTS

Rapid economic growth, industrialization, urbanization and the emergence of a new large middle class in Asia has led to increased energy consumption with annual growth rates of 7-15%. Energy demand in Asia is increasing at a rate almost twice as fast as the rest of the world and many countries are seeking to develop alternative power sources to decrease their dependence on imported fossil fuels. Energy efficiency initiatives in Asia have generally been driven by government, rather than by utilities, in comparison to the Demand-Side Management (DSM) programs that have been widespread in North America. Asian energy policy makers are eager to learn how their neighbours have achieved success in promoting energy efficiency. While some government programs have been successful, others have become bogged down in bureaucracy and have been plagued by insufficient funding.[42]

Energy efficiency programs have also been driven by growing world-wide environmental concerns about decreasing energy use and CO_2 emissions to slow the effects of global warming and climate change. Due to varying reasons, many governments in APEC economies have implemented energy efficiency specification programs involving ratings, labels, targets and regulatory standards to help meet their country's energy and environmental goals. Efficiency specification programs can be very effective in encouraging the development, marketing and purchase of energy efficient end-use products, such as home appliances, office equipment, electric motors, home entertainment electronics, and lighting.

Ratings, labels, targets and regulatory standards often play different, but complementary roles in regulatory programs.[43] They are often most effective when used together and in conjunction with other efficiency-promoting measures such as information, education, financial incentives, targeted procurement, and research and development.[44] Appendix B provides an overview of energy efficiency regulatory programs in APEC economies.

[42] Ted Flanigan and Peter Rumsey, "Promoting Energy Efficiency in Asia: A Compendium of Asian Success Stories," (N.p.: IRT Environment/The Results Center and International Institute for Energy Conservation, n.d.), pp. 9.77-9.78 and 9.85-9.86.

[43] See Section 2.2 for definitions of these terms.

[44] International Energy Agency (IEA), *Assessment of Improving Product Efficiency Through Ratings, Labels, Targets and Regulatory Standards*, Draft Report (N.p.: IEA, 1996), pp. 9-10.

6.1 REGULATORY ENERGY EFFICIENCY PROGRAMS AND REQUIREMENTS

6.1.1 Similarities and Differences between APEC Economies

Results of the consultation process with APEC economies demonstrate the similarities and differences between the regulatory requirements for energy efficiency in the 18 member economies. Exhibit 6.1 compares the responses of representatives of the 14 APEC economies that responded to the consultation guide in regard to whether the economy uses primarily a regulatory-based approach, voluntary-based approach, or a combination of these two approaches to ensure compliance with energy efficiency performance standards.

Exhibit 6.1 Comparison of Compliance Approaches for Energy Efficiency Performance Standards in APEC Economies

APEC Economy	Regulatory-based Approach	Voluntary-based Approach	Combination of Regulatory and Voluntary-based Approaches
Australia			√
Canada	√		
People's Republic of China			√
Hong Kong		√	
Indonesia		√	
Japan			√
Korea	√		
Mexico	√		
New Zealand		√	
Philippines	√		
Singapore		√	
Chinese Taipei			√
Thailand		√	
United States of America	√		

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

In terms of regulatory-based approaches, in Canada regulations call up third party verification by an agency accredited to the domestic standards authority and import documentation requirements are also regulated. Similarly, all the energy efficiency standards in Mexico are obligatory by federal law.

The Electricity Generating Authority of Thailand (EGAT) provides an example of how Thailand has been in the forefront of implementing voluntary labelling and voluntary Minimum Energy Performance Standards (MEPS) programs as part of its DSM program. Indonesia has a voluntary standards-based compliance approach which is still being used as a demonstration project.

Australia's combination system uses primarily a self-certification approach to compliance, with a comprehensive check testing program using accredited, independent labs to verify manufacturer claims on the energy label. In the case of products found to be non-compliant, either new labels have to be issued for the appliance or, in cases where compliance with the performance requirements in the standard is not possible, retail sales of the product are stopped. These processes will also apply to energy efficiency standards for refrigerators and water heaters once they come into force. Japan combines guidelines for the rationalization of energy use under the Energy Conservation Law with voluntary programs for private companies.

As Exhibit 6-2 illustrates, even most of the APEC economies that have voluntary and combination systems for energy efficiency compliance, are using performance standards as the basis for comparison of energy performance among products.

Exhibit 6-2 Comparison of Performance Standards for Energy Efficiency of Consumer Products in APEC Economies

APEC Economy	Yes, Use Performance Standards for Some or Several Products	No, Do Not Use Performance Standards
Australia	√	
Canada	√	
People's Republic of China	√	
Hong Kong	√	
Indonesia	√	
Japan	√	
Korea	√	
Mexico	√	
New Zealand		not indicated
Philippines	√	
Singapore	√	
Chinese Taipei	√	
Thailand	√	
United States of America	√	

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

For example, in Australia, only clothes dryers and, in 1999, refrigerators and electric storage water heaters, have Australian Standards that contain references to minimum energy efficiency requirements. Canada has performance standards for 22 energy-using products, while the U.S. also has performance standards for a variety of products. Hong Kong has performance standards under voluntary labelling schemes for refrigerators and room coolers. Indonesia has been arranging performance standards for energy efficiency of consumer products that include testing condition requirements, but not minimum energy performance standards. The Philippines only has energy efficiency performance standards for room air-conditioners. The qualifying criteria developed for the voluntary-based Singapore Green Labelling Scheme are not energy efficiency

performance standards per se, but other environmental aspects such as the presence of toxic substances are also considered. Chinese Taipei has performance standards, but not for all consumer products. Thailand is in the process of developing minimum energy performance standards for various electrical products.

The implication of this extensive use of performance standards for energy efficiency is that such standards will be much easier to harmonize than more prescriptive design standards, due to the ability of performance standards to keep up with technological change. Additionally, if government regulators ensure that domestic energy efficiency regulations are standards-based, alignment of energy efficiency standards will help increase the harmonization of energy efficiency regulation. This regulatory overlay that affects energy performance testing will be a key factor in the negotiation of a multilateral energy efficiency MRA among APEC members.

In addition to minimum energy efficiency performance standards, the majority of the APEC economies that responded to the consultation guide have labelling requirements for energy-using consumer products, as illustrated in Exhibit 6-3.

Exhibit 6-3 Labelling Requirements for Energy Efficiency of Consumer Products

APEC Economy	Yes	No
Australia	√	
Canada	√	
People's Republic of China	√	
Hong Kong	√	
Indonesia	√	
Japan	√	
Korea	√	
Mexico	√	
New Zealand		not indicated
Philippines	√	
Singapore	√	
Chinese Taipei	√	
Thailand	√	
United States of America	√	

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

In Australia, when mandatory standards come into force for electric storage water heaters and refrigerators, there will be no specific label to indicate compliance with the minimum required energy efficiency level. However, in the case of refrigerators, meeting the efficiency standard will be a pre-requisite for obtaining an energy label, which is required for retail sale. In the case of electric storage water heaters, no energy label is proposed at this time, but conformity with the efficiency standard may be shown through another means, such as a multi-purpose conformity mark or through the electrical safety approval mark.

In Canada, third-party verification accomplishes labelling requirements. In the People's Republic of China, the government will label some consumer products to indicate compliance with GB 12021. Indonesia will be starting a voluntary labelling program in 1997/1998, initially for refrigerators and then air-conditioners. The Philippines also has labelling requirements for room air conditioners. Mexico has labelling requirements for all of its energy efficiency performance standards, while Korea has labelling requirements for refrigerators, air conditioners, incandescent lamps, fluorescent lamps, and fluorescent lamp ballasts. Japan has labelling requirements for air conditioners, lamps, copying machines, computers, magnetic disk drives and video tape recorders. Singapore's Ministry of the Environment offers the Green Labelling Scheme for selected products, but participation is on a voluntary basis. Chinese Taipei requires labelling when the products fall in the regulatory list. Thailand has a voluntary labelling program for fluorescent lamps, refrigerators, air conditioners, motors, and ballasts. In the U.S., labelling requirements for home appliances are governed by the Federal Trade Commission and the Department of Energy (DOE) is responsible for labelling of commercial products.

Exhibit 6-4 illustrates the type of compliance system that each of the 14 APEC economies that responded to the consultation guide use to verify conformity with minimum energy performance standards. Some economies use more than one type of compliance to ensure that products meet performance standards and labelling requirements.

Exhibit 6-4 Type of Compliance System to Verify Conformity to Energy Performance Standards

APEC Economy	Stand-alone Sanctions	Self-certification	Third Party Verification
Australia	√	√	√
Canada			√
People's Republic of China	√		
Hong Kong	√		
Indonesia			√
Japan		√	√
Korea			√
Mexico	√		√
New Zealand			voluntary system
Philippines	√		√
Singapore			√
Chinese Taipei	√		√
Thailand			√
United States of America		√	√

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

Compliance to regulatory performance standards and labelling requirements applies to imported energy-using products, as well as domestically-manufactured ones. Exhibit 6-5 illustrates which APEC economies require documentation for imported energy-using household products.

Exhibit 6-5 Requirements for Documentation for Imports of Consumer Products

APEC Economy	Yes	No
Australia	√	
Canada	√	
People's Republic of China	√	
Hong Kong		√
Indonesia		√
Japan	√	
Korea	√	
Mexico	√	
New Zealand		√
Philippines	√	
Singapore		√
Chinese Taipei	√	
Thailand	√	
United States of America	√	

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.
Note: Based on 14 responding APEC economies.

In Australia, all products which are regulated for the purposes of energy labelling (whether locally manufactured or imported) have to demonstrate compliance with the relevant domestic standard through the provision of a full test report and an application for an approved label which is submitted to the regulatory authority. In Canada, import documentation is required for product identification, intended use, and destination. Japan requires documentation for those products that fall under the Energy Conservation Law. Mexico requires a Mexican certificate of compliance to Mexican energy efficiency performance standards for those products which have to fulfill them.

The Philippines requires test certificates based on Philippine National Standards issued by the Bureau of Product Standards (BPS) counterpart standard body and recognized testing laboratories. Additionally, consumer products must be certified under the BPS certification mark scheme; however, BPS still retains the prerogative to undertake confirmation testing. Chinese Taipei requires import documentation if the product falls under the regulatory list. Thailand requires a certification form and quality control documents for imported products. In the U.S., certification reports must be submitted for all regulated products for sale in the U.S., whether manufactured or imported.

Requirements for import documentation should be included in any further investigation of energy efficiency regulatory requirements in the APEC economies due to their potential to cause trade barriers. At a minimum, the bureaucratic inconvenience of import documentation adds costs and time delays which are against the common APEC goal of facilitating trade between the economies.

6.1.2 Alignment to International and Regional Requirements

The energy sectors, primarily electrical appliances, and household air conditioning and refrigeration, are regulated sectors in the majority of the APEC countries. There is great diversity among the member economies in terms of the use of international standards in regulation and the acceptance of other countries' standards or certification procedures.

Section 4 provided a detailed exploration of which APEC economies use international test standards for each of the 6 main products covered in this study. In general, APEC economies that use international standards in energy regulation include:

- People's Republic of China
- Hong Kong
- Indonesia
- Philippines
- Singapore
- Chinese Taipei

APEC economies that do not use international standards in energy regulation include:

- Australia (uses domestic or joint Australian/New Zealand standards, but is moving to harmonize with international standards)
- Canada
- Japan (no standards arrangements in the energy area)
- Mexico
- United States (differences between standards specified in regulation and international standards may be significant on a case by case basis)[45]

In general, while government ministries or departments tend to develop and maintain ratings, labels, targets and regulatory standards, it tends to be domestic, regional or international standards setting organizations that develop energy efficiency test protocols or standards. Test standards developed by ISO and IEC must be ratified by a domestic standards organization under its own procedures. ISO has developed energy use test standards for refrigerators/freezers and air conditioners, while IEC has developed energy use test standards for clothes washing machines, clothes dryers, dishwashers, and microwave ovens. Neither ISO nor IEC have developed test standards to measure the energy use of office equipment; however, a recent proposal was circulated in sub-committee 9 of IEC Technical Committee 74 regarding the development of test methods for the energy consumption of office equipment.[46]

[45] John S. Wilson, *Standards and APEC: an Action Agenda* (Washington, D.C.: Institute for International Economics, 1995), p. 120.

[46] Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997.

ISO and IEC are involved in several specific activities related to energy efficiency tests and labels. ISO TC 207 which is developing the ISO 14000 series of environmental management standards, includes a working group which is writing guidelines for test standards developers to help them apply environmental standards to product test standards, but the scope of the committee's work does not include setting environmental performance levels. ISO TC 203 is standardizing basic concepts and methods used to define, analyze and compare technical energy systems and energyware balances. In addition to working closely with both of these committees, IEC's Advisory Committee on Environmental Aspects is writing guidelines for product committees on inclusion of environmental aspects in electrotechnical product standards.[47]

6.1.3 Regulated and Non-regulated Products

As was discussed briefly above in the comparison of similarities and differences between the regulatory requirements of the APEC economies, the energy-using products that are regulated in each of the APEC economies vary to some extent from country to country.

Exhibit 6-6 provides an overview of the regulatory requirements for each of the 6 main products covered in this study, as well as for other products that are regulated in some APEC economies. For example, room air conditioners are regulated in some way in 14 of the 18 economies for which data is available, while refrigerators/freezers are regulated in 13 of the 18 economies. These two products might represent the products for which mutual recognition arrangements would be most beneficial in terms of facilitating regional trade, but they could also be the most difficult to reach agreement on due to the additional regulatory requirements.

Similarly, single package and split system air conditioners are regulated in 8 of the 18 economies, fluorescent lamps/ballasts are regulated in 7 of the 18 economies, and electric motors being regulated in 5 of the 18 economies. MRAs for these products would also furnish benefits to APEC economies, and agreement might be easier to achieve in the shorter term for these products.

[47] International Energy Agency (IEA), *Assessment of Improving Product Efficiency Through Ratings, Labels, Targets and Regulatory Standards*, Draft Report (N.p.: IEA, 1996), p. 15.

Exhibit 6-6 Overview of Regulated Energy-Using Products in APEC Economies

APEC Member Economy	Refrigerators, Refrigerator-Freezers & Freezers	Room Air Conditioners	Single-Package Central Air Conditioners	Split-System Air Conditioners	Electric Motors	Fluorescent Lamps & Ballasts	Other Products
Australia	MEPS, L	L	MEPS (being considered)		MEPS (being considered)	MEPS (being considered)	clothes washers & dryers, dishwashers, electric water heaters
Brunei Darussalam							
Canada	MEPS, R, L	MEPS, R, L	MEPS, R, L	MEPS, R, L	MEPS, R	MEPS, R	clothes washers & dryers, dishwashers, ranges, water heaters, heat pumps, furnaces
Chile							
People's Republic of China	MEPS, L	MEPS, L	MEPS, L	MEPS, L			clothes washers, fans, rice cookers, televisions, irons
Hong Kong	L (V)	L (V)					clothes washers
Indonesia	L (V-1997/98)	L (V-1997/98)	L (V-97/98)	L (V-97/98)			
Japan	MEPS, L	MEPS (target)				MEPS	televisions, heat pumps, photocopiers, computers, magnetic disk equipment, office equipment
Republic of Korea	MEPS, R, L	MEPS, R, L				MEPS, R, L	incandescent lamps
Malaysia					MEPS		
Mexico	MEPS, L	MEPS, L	MEPS, L	MEPS, L	MEPS, L	MEPS (compact)	clothes washers, pumps, heaters and water boilers
New Zealand	L (V)	L (V)	L (V)	L (V)	L (V)	L (V)	electric water heaters, clothes washers & dryers, dishwashers
Papua New Guinea							
Philippines	MEPS	MEPS, R, L	MEPS, R, L	MEPS, R, L (V)		MEPS	
Singapore		MEPS, R					compact fluorescent lamps, clothes washers, computers
Chinese Taipei	MEPS	MEPS	MEPS	MEPS			ranges/ovens, water heaters, clothes dryers, fans
Thailand	MEPS, R, L (V)	MEPS, R, L (V)	MEPS, R, L (V)	MEPS, R, L (V)	MEPS, R, L (V)	MEPS, R, L (V)	rice cookers, windows
USA	MEPS, R, L	MEPS, R, L	MEPS, R, L	MEPS, R, L	MEPS	MEPS	dishwashers, clothes washers, water heaters, space heaters, heat pumps, office equipment

Source: Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997, and secondary research. Note: Based on 14 responding APEC economies.
Products not regulated or covered by a voluntary program in an APEC economy have been left blank. MEPS = Minimum Energy Performance Standards
R = Energy Efficiency Rating (can be provided on a label or in a list of products) L = Labelling requirements (includes energy efficiency rating) V = Voluntary program

Regulatory and Labelling Requirements by Product

The APEC Survey of Laboratories asked the laboratories in the 13 APEC economies that responded, the reasons why they tested each of the 6 main products covered in this study. Exhibit 6-7 illustrates that laboratories in less than half of the APEC economies test refrigerators, refrigerator-freezers, and freezers for regulatory requirements. In a majority of the economies, these products are tested for labelling requirements.

Exhibit 6-7 Reasons for Energy Performance Testing for Key Products Refrigerators, Refrigerator-Freezers, and Freezers

APEC Economy	Regulatory Requirements	Labelling	Other*
Australia	√	√	√
Canada	√	√	√
People's Republic of China	√	√	√
Hong Kong			
Indonesia			√
Japan			√
Korea	√	√	√
Mexico	√	√	√
Papua New Guinea			
Philippines		√	
Singapore			
Thailand		√	
USA	√	√	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*Other reasons labs indicated that they test for energy performance for these products include manufacturers' requirements, comparative testing for publication purposes in consumer magazines, research & development.

Exhibit 6-8 shows that laboratories in less than half of the APEC economies test room air conditioners for regulatory requirements. In just over half of the economies, room air conditioners are tested for labelling requirements. In Australia, regulations for energy labelling apply to air conditioners of any type up to a cooling capacity of 7.5kW (generally residential systems). No regulations for units larger than 7.5kW currently exist; however, requirements for energy labelling and/or efficiency standards are currently under consideration for packaged air conditioners for commercial applications.

Exhibit 6-8 Reasons for Energy Performance Testing for Key Products
Room Air Conditioners

APEC Economy	Regulatory Requirements	Labelling	Other*
Australia	√	√	√
Canada			√
People's Republic of China	√	√	√
Hong Kong			
Indonesia			
Japan			√
Korea	√	√	√
Mexico	√	√	√
Papua New Guinea			
Philippines	√	√	
Singapore			
Thailand		√	
USA	√	√	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*Other reasons labs indicated that they test for energy performance for these products include manufacturers' requirements, comparative testing for publication purposes in consumer magazines, research & development.

Exhibit 6-9 illustrates that laboratories in very few APEC economies test single-package central air conditioners for energy efficiency regulatory and labelling requirements.

Exhibit 6-9 Reasons for Energy Performance Testing for Key Products
Single-Package Central Air Conditioners (Ducted)

APEC Economy	Regulatory Requirements	Labelling	Other*
Australia	√	√	√
Canada			√
People's Republic of China			
Hong Kong			
Indonesia			
Japan			√
Korea	√	√	
Mexico			
Papua New Guinea			
Philippines			
Singapore			
Thailand			
USA	√	√	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*Other reasons labs indicated they test for energy performance were similar to those for room air conditioners.

Similarly, Exhibit 6-10 illustrates that laboratories in very few APEC economies test split-system air conditioners for energy efficiency regulatory and labelling requirements.

Exhibit 6-10 Reasons for Energy Performance Testing for Key Products
Split-System Air Conditioners (Non-Ducted)

APEC Economy	Regulatory Requirements	Labelling	Other*
Australia	√	√	√
Canada			√
People's Republic of China			
Hong Kong			
Indonesia			
Japan			√
Korea	√	√	
Mexico			
Papua New Guinea			
Philippines			
Singapore			
Thailand			√
USA	√	√	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*Other reasons labs indicated they test for energy performance were similar to those for room air conditioners.

Exhibit 6-11 shows that laboratories in less than half of the APEC economies test electric motors for regulatory requirements. In even fewer of the economies, electric motors are tested for labelling requirements.

Exhibit 6-11 Reasons for Energy Performance Testing for Key Products
Electric Motors

APEC Economy	Regulatory Requirements	Labelling	Other*
Australia			√
Canada	√	√	√
People's Republic of China	√		
Hong Kong			
Indonesia			
Japan	√		√
Korea	√	√	
Mexico	√	√	√
Papua New Guinea			
Philippines			
Singapore			
Thailand			
USA	√	√	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*Other reasons labs indicated that they test for energy performance for these products include manufacturers' requirements, comparative testing for publication purposes in consumer magazines, research & development.

Exhibit 6-12 shows that in laboratories in many of the APEC economies, fluorescent lamps and ballasts are tested for regulatory requirements, with Canada and China only testing the lamp ballasts for energy efficiency. Only a few of these economies test fluorescent lamps and ballasts for labelling requirements.

Exhibit 6-12 Reasons for Energy Performance Testing for Key Products
Fluorescent Lamps and Ballasts

APEC Economy	Regulatory Requirements	Labelling	Other*
Australia	√		√
Canada	√ (ballasts only)		√ (ballasts only)
People's Republic of China	√ (ballasts only)		√ (ballasts only)
Hong Kong			
Indonesia			√
Japan	√		√
Korea	√	√	
Mexico	√	√	√
Papua New Guinea			
Philippines	√	√	
Singapore			
Thailand	√		
USA	√	√	√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*Other reasons labs indicated that they test for energy performance for these products include manufacturers' requirements, comparative testing for publication purposes in consumer magazines, research & development.

These results from the *APEC Survey of Laboratories* demonstrate that for refrigerators, refrigerator-freezers, and freezers, room air conditioners, and fluorescent lamps and ballasts, the regulatory overlay that is derived from the regulatory and labelling requirements in the 13 APEC economies that responded to the survey, must be considered in any discussion of a MRA for energy performance testing. Further study of this regulatory overlay is required to discover exactly how provisions for energy efficiency can be harmonized more closely in the APEC economies, so that both the test standards used and the regulatory requirements implemented can be accounted for.

Other Products

In terms of other energy-using products for which MRAs may need to be considered by the APEC economies, Exhibit 6-13 shows that clothes washers, water heaters, dishwashers, office equipment and rice cookers may also produce economic benefits from increased harmonization. Exhibit 6-13 indicates from the results of the *APEC Survey of Laboratories* that some of these other products are also subject to regulatory and labelling requirements in many of the APEC economies and could benefit from the closer harmonization of test standards.

Exhibit 6-13 Other Products Tested for Regulatory and Labelling Requirements

Country	Other Household Electrical Products Tested by Labs Responding to Survey	Regulatory Requirements	Labelling
Australia	• Dishwashers	√	√
	• Clothes dryers	√	√
	• Clothes washers	√	√
	• Electric storage water heaters	√	
Canada	• Dishwashers	√	√
	• Clothes dryers	√	√
	• Clothes washers	√	√
	• Heat Recovery Ventilators		√
	• Water heaters	√	
	• Electric ranges	√	
	• Hotplate cooktops	√	
People's Republic of China	• Clothes washers	√	
	• Fans	√	
Hong Kong	None reported*		
Indonesia	None reported*		
Japan	• Microwave ovens	√	√
	• Vacuum cleaners	√	√
	• Water heaters	√	√
	• Incandescent lamps	√	
	• Halogen lamps	√	
Korea	• Electric heating cabinets	√	√
	• Coffee pots	√	√
	• Tungsten filament lamps	√	√
	• Incandescent lamps	√	√
	• Reflectors	√	
	• Compact fluorescent lamps	√	
Mexico	• High intensity discharge (HID) lamps	√	√
	• HID lamp ballasts	√	√
	• Tungsten-halogen incandescent lamps	√	√
	• Clothes washers	√	
Papua New Guinea (PNG)	None reported*		
Philippines	• Household fans	√	
Singapore	None reported*		
Thailand	None reported*		
USA	• Dishwashers	√	√
	• Clothes dryers	√	√
	• Clothes washers	√	√
	• Water heaters	√	√
	• Incandescent / reflector lamps	√	√
	• Compact fluorescent lamps & ballasts	√	√
	• HID lamps		√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*As indicated in survey responses

Exhibit 6-13 provides some examples of energy-using products that are regulated in a number of APEC economies that may additionally benefit from harmonization efforts. For example, Australia, Canada and the U.S. all have regulatory and labelling requirements for dishwashers, clothes dryers and clothes washers, and China and Mexico also have regulatory requirements for clothes washers. Water heaters are subject to regulatory and/or labelling requirements in Canada, Japan, and the U.S., electric fans are subject to regulatory requirements in China and the Philippines, and countries such as Japan, Korea, and Mexico are testing various types of lamps for regulatory and/or labelling requirements.

6.1.4 Special Requirements Within APEC Economies

Due to the different organizations that are involved in setting performance and test standards for energy efficiency, the regulatory and standards processes are often intertwined in a country's energy efficiency program. Some APEC economies use a regulatory process and government labs to test to energy efficiency standards. Other APEC economies have implemented a combination of regulatory and standards processes in their energy efficiency program by using private sector laboratories accredited by their domestic standards system to test products for which there are regulatory energy efficiency requirements. For example, specific electrical appliances and other energy-using products are regulated in Canada under Natural Resources Canada's *Energy Efficiency Regulations*, as well as EnerGuide labelling requirements. However, the test standards by which these products are certified are Canadian National Standards and the certification organizations which authorize an energy efficiency verification mark are accredited by the Standards Council of Canada.

Energy performance regulatory requirements sometimes make modifications to the test procedures outlined in the standards discussed in Section 4 that the APEC economies use for energy efficiency testing. Exhibit 6-14 illustrates the laboratories' responses when they were asked whether or not the energy performance regulations in their economy modify the test procedures that are being used to test refrigerators, refrigerator-freezers, and freezers for energy efficiency.

Laboratories in 4 of the economies that responded to the *APEC Survey of Laboratories* indicated that they had to modify the test procedures for refrigerators, refrigerator-freezers, and freezers; however, these modifications appear to be relatively straightforward. For example, in one Australian lab, modifications to AS 1430 and AS 2575.2 (now AS/NZS 4474) comprise using integrated temperature measurement logging instead of measurements taken only at start and finish of the cycle. [48] Another Australian lab noted that modifications to the ISO and AS/NZS standards comprise substituting the refrigerator's own thermometer for automation purposes in preliminary tests. Additionally, a Canadian lab stated that it uses modifications to the US DOE test procedure, but does not modify CAN/CSA-C390. These results from the survey would

[48] The use of integrating temperature measurement is now the preferred method in AS/NZS 4474.

indicated that for the most part, the test procedures used for refrigerators, refrigerator-freezers, and freezers are uncommon and that energy performance regulations in the APEC economies that responded to the survey do not modify these test standards to a large extent.

Exhibit 6-14 Modifications to Standards for Refrigerators, Refrigerator-Freezers, and Freezers

APEC Economy	Yes, Some Modifications to Test Procedures (due to energy performance regulations)	No Modifications
Australia	√*	
Canada	√	
People's Republic of China	√	
Hong Kong		√
Indonesia	Not indicated	
Japan	√	
Korea		√
Mexico		√
Papua New Guinea	Not indicated	
Philippines		√
Singapore	Not indicated	
Thailand		√
USA		√**

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.
*In Australia, the only modification to the test procedure in the regulation narrows the scope for labelling; the test methods are not modified.
** US DOE CFR may make modifications to the AHAM-HRF-1 standard, but no U.S. laboratories indicated in the survey that they had to make such modifications to their test procedures.

Exhibit 6-15 illustrates the laboratories' responses when they were asked whether or not the energy performance regulations in their economy modify the test procedures that are being used to test room air conditioners for energy efficiency. Laboratories in only 3 of the economies that responded to the *APEC Survey of Laboratories* indicated that they had to modify the test procedures for room air conditioners. The Fuels and Appliance Testing Laboratory in the Philippines noted that modifications to the ISO 5151 standard were for outdoor temperature conditions. One of the Mexican labs makes modifications to the NOM-073-SCFI-1994 standard because it is required to take a sample of three units to get the dataplate rating.

These results from the survey would indicate that the test procedures used for room air conditioners are modified to some extent by energy performance regulations in the APEC economies. These modifications do not appear to constitute significant barriers to product acceptance and/or trade, but they will nevertheless have to be accounted for in discussions related to the mutual recognition of energy efficiency test results from APEC members.

Exhibit 6-15 Modifications to Standards for Room Air Conditioners

APEC Economy	Yes, Some Modifications to Test Procedures (due to energy performance regulations)	No Modifications
Australia		√
Canada		√
People's Republic of China	√	
Hong Kong		√
Indonesia	Not indicated	
Japan		√
Korea		√
Mexico	√	
Papua New Guinea	Not indicated	
Philippines	√	
Singapore	Not indicated	
Thailand		√
USA		√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

Exhibit 6-16 illustrates the laboratories' responses when they were asked whether or not the energy performance regulations in their economy modify the test procedures that are being used to test single-package central air conditioners for energy efficiency. Only laboratories in the United States indicated modifications to these test procedures. These results from the survey would indicate that increased harmonization of the test procedures used for single-package central air conditioners will not have to account for a large number of regulatory modifications to these test standards.

Exhibit 6-16 Modifications to Standards for Single-Package Central Air Conditioners (Ducted)

APEC Economy	Yes, Some Modifications to Test Procedures (due to energy performance regulations)	No Modifications
Australia		√
Canada		√
People's Republic of China	Not indicated	
Hong Kong	Not indicated	
Indonesia	Not indicated	
Japan		√
Korea		√
Mexico	Not indicated	
Papua New Guinea	Not indicated	
Philippines	Not indicated	
Singapore	Not indicated	
Thailand	Not indicated	
USA	√	

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

Exhibit 6-17 illustrates that a similar situation exists for split-system air conditioners. Again, only laboratories in the United States that responded to the survey indicated modifications to the test procedures. Additionally, one Canadian lab noted that the ASHRAE and ARI standards for split-system air conditioners were the same as for single-package air conditioners without the fan tests. For non-ducted units, the tests are done without fan performance, but all of the standards noted generally include the fan performance test.

These results from the survey would indicate that increased harmonization of the test procedures used for split-system air conditioners will not have to account for a large number of regulatory modifications to these test standards.

Exhibit 6-17 Modifications to Standards for Split-System Air Conditioners (Non-Ducted)

APEC Economy	Yes, Some Modifications to Test Procedures (due to energy performance regulations)	No Modifications
Australia		√
Canada		√
People's Republic of China	Not indicated	
Hong Kong		√
Indonesia	Not indicated	
Japan		√
Korea		√
Mexico	Not indicated	
Papua New Guinea	Not indicated	
Philippines	Not indicated	
Singapore	Not indicated	
Thailand		√
USA	√	

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

Exhibit 6-18 illustrates the laboratories' responses to the *APEC Survey of Laboratories* when they were asked whether or not the energy performance regulations in their economy modify the test procedures that are being used to test electric motors for energy efficiency. Only Mexico indicated that it made modifications to these test procedures, with one Mexican lab making modifications to IEC 34-2, but not to IEEE 112. One Australian lab carries out performance testing of electric motors, but only as part of explosion safety testing procedures under AS 1359; however, performance testing to both Australian and some international standards is considered to be feasible.

These results from the survey would indicate that increased harmonization of the test procedures used for electric motors will only have to account for a limited amount of modification that energy performance regulations in the APEC economies makes to these test procedures.

Exhibit 6-18 Modifications to Standards for Electric Motors

APEC Economy	Yes, Some Modifications to Test Procedures (due to energy performance regulations)	No Modifications
Australia		√
Canada		√
People's Republic of China		√
Hong Kong	Not indicated	
Indonesia	Not indicated	
Japan		√
Korea		√
Mexico	√	
Papua New Guinea	Not indicated	
Philippines	Not indicated	
Singapore	Not indicated	
Thailand	Not indicated	
USA		√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

Exhibit 6-19 illustrates the laboratories' responses to the *APEC Survey of Laboratories* when they were asked whether or not the energy performance regulations in their economy modify the test procedures that are being used to test fluorescent lamps and ballasts for energy efficiency.

Exhibit 6-19 Modifications to Standards for Fluorescent Lamps and Ballasts

APEC Economy	Yes, Some Modifications to Test Procedures (due to energy performance regulations)	No Modifications
Australia		√
Canada		√
People's Republic of China		√
Hong Kong	Not indicated	
Indonesia	√	
Japan		√
Korea		√
Mexico		√
Papua New Guinea	Not indicated	
Philippines	√	
Singapore	Not indicated	
Thailand	√	
USA		√

Source: Nordicity Group Ltd., *APEC Survey of Laboratories*, May/June 1997.
Note: Based on responding labs in each APEC economy.

Laboratories in three of the APEC economies that responded to the survey indicated that they make modifications to the test standards for fluorescent lamps and ballasts. Taken with the analysis of the test standards for fluorescent lamps and ballasts, the survey results indicate that although there appear to be a number of APEC economies in which regulations make modifications to the test procedures, closer harmonization of the test standards used for fluorescent lamps and ballasts will likely be straightforward, in spite of the number of economies that regulate these products.

Overall for the 6 main product groups, modifications to test procedures that are made due to regulatory requirements appear to be relatively low in number, but will still be a hurdle that needs to be addressed in achieving the APEC goal for increased harmonization. Aligning test standards is not sufficient in itself - understanding the implications of regulatory requirements for this goal is necessary for a multilateral MRA among APEC economies in the area of energy efficiency to be successful.

6.2 MUTUAL RECOGNITION OF ENERGY EFFICIENCY PROGRAMS

According to the consultation process carried out by Nordicity as part of this study, Australia, Canada, Chinese Taipei and the U.S. currently have MRAs specifically related to energy performance testing with other countries in the Asia Pacific region. Australia's bilateral MRAs with HOKLAS, SINGLAS, and Malaysia may contain some energy testing components in addition to other types of testing. A few laboratories in Chinese Taipei have mutual recognition arrangements on a professional basis. The U.S. has one MRA with Canada related to energy performance testing, but not with other Asia Pacific countries. Canada's single MRA with the U.S. is related to motors testing, but Canada also has a MOU with Mexico to cooperate regarding energy efficiency.[49] MRAs between different countries specifically in the area of energy efficiency appear therefore to be limited to North America; the existing MRAs between in the Asia Pacific region are more generally for accreditation programs.

In a 1993-94 APEC SCSC survey to identify sectors in which APEC could build region-wide conformity assessment MRAs in both regulated and non-regulated sectors, there was some support for a MRA on electrical appliances, although it was a lower priority than MRAs for food and toys. Electrical appliances was picked as top priority for a MRA by Korea, Malaysia and Singapore, while Chinese Taipei and Hong Kong picked it as second priority, with Australia indicating equal interest with other sectors. Household air conditioning and refrigeration was not chosen as a priority area for a MRA by any of the 12 countries surveyed.[50]

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[49] Nordicity Group Ltd., *APEC Consultation Process*, May/June 1997, based on 14 responding APEC economies.

[50] John S. Wilson, *Standards and APEC: an Action Agenda* (Washington, D.C.: Institute for International Economics, 1995), pp. 74-79.

John Wilson in his book, *Standards and APEC: an Action Agenda*, recommends that the guiding principle of an action plan for APEC for reform in testing, certification, and laboratory accreditation in regulated sectors should be "tested once, accepted everywhere in APEC."[51] Wilson recommends that MRA negotiations should be immediately launched in regulated sectors including electrical and electronic equipment because these sectors will have the most immediate benefits in terms of lower export costs and lower consumer costs through the elimination of duplicative certification requirements.[52]

Countries that accept energy standards used in other countries:

- Canada (if practicable)
- People's Republic of China
- Hong Kong
- Indonesia
- Mexico
- New Zealand
- Philippines

Countries that do not accept energy standards used in other countries:

- Australia
- Japan (no standards arrangements in the energy area)
- Singapore (unless similar to domestic standards/codes of practice)
- Chinese Taipei
- United States (products must meet U.S. regulations)

Countries that accept energy certification issued in other countries:

- Australia
- People's Republic of China (conditional to recognition by the State Administration of Import/Export Commodity Inspection or SACI)
- Hong Kong (on a unilateral basis)
- Indonesia (on a unilateral basis)
- New Zealand (on a bilateral basis)
- Philippines
- Singapore
- Chinese Taipei (on a bilateral basis)
- United States (on a bilateral basis with Canada)

[51] John S. Wilson, *Standards and APEC: an Action Agenda* (Washington, D.C.: Institute for International Economics, 1995), pp. 86-7.
[52] Ibid., p. 87.

Countries that do not accept energy certification issued in other countries:

- Canada (responsibility lies with provincial regulatory agencies)
- Japan (no standards arrangements in the energy area)
- Mexico[53]

The use of international standards in a country's energy efficiency regulations makes it much easier to work towards closer harmonization of regulatory requirements across borders through regional organizations such as APEC. The WTO's Technical Barriers to Trade (TBT) Agreement also provides an avenue through which non-tariff trade barriers can be limited, as the agreement aims to harmonize product standards at the broadest possible level and encourages the use of international standards. The only exception to the TBT Agreement can be regulations or standards which fulfill a legitimate objective such as fundamental climatic or geographical factors, or fundamental technological problems.

It appears likely that an APEC multilateral MRA will have to encompass the following issues to harmonize test procedures and laboratory accreditation programs more closely:

- participation in the development of international standards to ensure that they meet regional requirements;

- increased harmonization of test standards through alignment to international standards by adopting international standards at the domestic level once they have reached a suitable stage of development;

- recognition of and eventual elimination of regulatory modifications to test standards (to the extent possible) by addressing critical issues within the standards themselves;

- alignment of accreditation programs to ensure compliance with international standards such as ISO/IEC Guides 25 and 58;

- technical assistance to help those economies with newer accreditation programs and testing facilities acquire the acceptance of test results from more established APEC economies;

- development of sufficient experience in among member economies in the administration of a domestic accreditation programs;

- access to a credible domestic measurement system that identifies international traceability;

[53] John S. Wilson, *Standards and APEC: an Action Agenda* (Washington, D.C.: Institute for International Economics, 1995), p. 120.

- transparency of documentation and procedures among members; and

- investigation into how the APEC economies can deal with the differing regulatory and import documentation requirements for energy performance of household energy-using products.

While increased harmonization should proceed both from the top-down, with mutual recognition of accreditation programs, and from the bottom-up, with the alignment of test protocols for energy efficiency of key traded products, the regulatory requirements that were discovered through this study also need to be investigated in more detail to ensure that energy efficiency regulations do not become trade barriers. Energy performance regulatory requirements for all tradeable products must be closely examined for each of the 18 member economies in parallel with the alignment of test standards and accreditation programs, to determine how trade restrictions can be overcome.

7. CONCLUSIONS AND RECOMMENDATIONS

Nordicity Group Ltd., a company incorporated in Canada, was contracted by the Standards Council of Canada and Natural Resources Canada, to carry out a study of energy efficiency performance testing and conformity assessment of APEC member economies for the APEC Steering Group on Energy Standards, a sub-committee of the APEC Energy Working Group (EWG). This study, therefore, determines the feasibility of increased cooperation on energy efficiency standards, and fulfills the following objectives:

(a) Conduct a survey of APEC member economies to identify laboratory facilities, accreditation and conformity assessment practices, products tested, and test standards used to determine and confirm energy performance.

(b) Compare the degree to which these assessment practices and standards are recognized by similar agencies in other APEC countries.

(c) Assess the degree to which these test procedures and laboratory accreditation procedures can be harmonized.

(d) Identify benefits to member economies of harmonizing, and suggest approaches to effect harmonization.

This concluding section first provides a summary of the findings of this study from the results of the APEC Survey of Laboratories, consultation process and secondary research. Secondly, it provides a list of recommended action items to the Steering Group on Energy Standards for the next steps that should be taken to work towards alignment of standards and development of APEC multilateral mutual acceptance of energy performance test results.

7.1 SUMMARY OF STUDY FINDINGS

- This study has demonstrated that the alignment of energy performance test standards can only effectively be carried out by the APEC Energy Working Group in the context of the broader conformity assessment infrastructure for energy efficiency. Alignment of the test procedures for the products indicated can 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, are also addressed and resolved.

7.1.1 Accreditation Programs and Requirements

- The accreditation programs that have been put in place in the APEC economies vary primarily by the developmental stage at which the program is at, rather than by the requirements of the accreditation programs, which are for the most part consistent with ISO/IEC Guides 25, 58 and 43 (of which ISO/IEC Guides 25 and 58 are the most integral). Currently within APEC, there is variability in the stages of development of domestic laboratory accreditation bodies, some of which may require considerable time to develop their programs to a level which will demonstrate compliance with ISO/IEC Guide 58. Some members therefore require technical assistance from APEC economies with more experienced accreditation bodies to achieve international recognition.

- The Steering Group on Energy Standards should work with APEC SCSC, APLAC and any other relevant international organizations and Specialist Regional Bodies, to ensure that the appropriate issues related to mutual recognition of energy efficiency test results are coordinated among these bodies. APLAC recognizes that a comprehensive, multilateral MRA among APLAC members would include criteria such as compliance to ISO/IEC Guides 58 and 25, development of sufficient experience in administration of an accreditation program, transparency of documentation and procedures among members, and access to a credible domestic measurement system that identifies international traceability.[54] For a liaison with APLAC to be most effective, it is recommended that Mexico and Chile become APLAC members so that they can benefit from APLAC's activities to promote development and harmonization.

- The total number of accredited laboratories (including all types of calibration and testing) for each of the APEC economies also varies greatly, depending to a large extent on the experience of the program and how recently it was established. In many of these accreditation programs, there is no scope of accreditation specifically for labs that do energy efficiency testing. Ensuring that the energy efficiency scope of

[54] APEC Standards and Conformance Sub-Committee, *Revised Report on the Asia Pacific Economic Cooperation - Technical Infrastructure Development Survey* (January 1996), Annex 6, APLAC Study Tour Interim Report.

accreditation is built into the domestic accreditation programs of the APEC economies will thus be central to both the success of a MRA in the area of energy performance testing and to the expansion of energy efficiency testing infrastructure in the APEC economies.[55]

- Accreditation programs in the APEC economies are managed by the public sector in approximately half of the 18 APEC member economies, but in other cases, the domestic accreditation programs have been established by the private sector. Additionally, some energy efficiency regulatory programs use private sector labs for energy performance testing, while others use government labs to carry out this verification. This difference between public and private sector accreditation programs may be significant in terms of the extent to which some APEC governments are able to commit to developing the capabilities of private sector energy efficiency testing. Laboratories in the APEC economies are enthusiastic about improving their testing capabilities in the future, but there may be a limit to how much cost governments are able to ask the private sector to bear in this area.

- APEC member economies believe that economic advantages to aligning test standards for energy-using products included:

    - allowing manufacturers to test the product once for all markets
    - reducing costs and time to industry for exports
    - removing trade barriers;
    - speeding up the market time for new products
    - reducing consumer costs
    - enabling more direct international comparison of products.

- This review of accreditation programs has demonstrated that alignment of test standards for energy efficiency is only one of the elements that will be required for multilateral mutual recognition in this area. It appears likely that a successful APEC MRA for energy efficiency testing will have to encompass the following areas: closer harmonization of test standards, alignment of accreditation programs to ensure compliance with international standards such as ISO/IEC Guides 25 and 58, transparency of documentation and procedures, and technical assistance to help those economies with newer accreditation programs and testing facilities acquire the acceptance of test results from more established APEC economies. A successful multilateral APEC MRA will also have to account for conformance to the regulatory overlay of energy efficiency regulatory and labelling requirements, discussed in further detail below.

- Several existing bilateral agreements between APEC members illustrate that there has already been progress made towards the implementation of multilateral APEC mutual

[55] An APLAC sub-committee is currently looking into whether there are any special requirements for energy and performance testing that need addressing through the provision of additional guidelines.

recognition and each subsequent bilateral agreement can also be seen as a step towards this ultimate goal. The APEC Steering Group on Energy Standards will need to establish what the full parameters will be for a formal multilateral MRA to provide transparency for APEC members in any bilateral agreements on energy efficiency testing. Every individual agreement potentially becomes a significant step towards the objective of a multilateral MRA if it is negotiated within the context of a suitable overall APEC framework.

7.1.2 Certification and Testing Conformity Assessment Infrastructure

- While the accreditation programs of the APEC economies tend to include a certification component, there is a relatively small number of certification marks for the number of APEC members. Labs retaining internationally recognized marks have virtually universal acceptance. Furthermore, for the most part, these certification marks are not energy-related, as energy efficiency is predominantly a regulatory requirement in the APEC economies. In the case of energy performance testing, energy efficiency labels tend to replace certification marks for the products covered in this study, however, mutual acceptance of certification marks is still in its infancy.

- A majority of the laboratories in the APEC economies test refrigerators, refrigerator-freezers, room air conditioners, and fluorescent lamp ballasts for energy efficiency. Of the laboratories in the responding economies only certain laboratories, which responded to the survey, in Australia, Japan, Korea, and the U.S. can test the energy efficiency of all the six product groups in this study. None of the laboratories that responded from Hong Kong, Papua New Guinea and Singapore indicated that they test any of these products for energy efficiency. Brunei Darussalam, Malaysia, and New Zealand stated that they do not currently have accredited laboratories that are testing these main product groups for energy efficiency.

- A majority of the labs that responded to the *APEC Survey of Laboratories* are accredited to ISO/IEC Guide 25. The low number of labs registered to ISO 9000 is due the fact that ISO/IEC Guide 25 provides specific requirements for laboratory quality management systems, while ISO 9000 provides a generic system for quality management of the processes and procedures of any organization. A majority of labs that responded to the survey stated that they were not accredited as complying with the requirements of ISO/IEC Guide 43. Most of those that are not currently accredited to either Guide 25 or 43 have future plans to do so.

- Laboratory accreditation to the ISO/IEC Guide 25 international standard should provide part of the foundation for mutual recognition arrangements between APEC economies. The *APEC Survey of Laboratories* has indicated that compliance to ISO/IEC Guide 25 by labs in the APEC economies cannot be taken as a given, just because the economy is a member of APLAC, or because the economy has an accreditation program which accredits labs based on ISO/IEC Guide 25. Allowances may have to be made and technical assistance may have to be arranged for economies

that are still developing their conformity assessment infrastructure. Development of a specific scope of accreditation for energy efficiency testing, to supplement ISO/IEC Guide 25, in all of the domestic accreditation programs in the APEC economies may also be necessary.[56] Alignment to ISO/IEC Guide 43 among APEC economies may not pose as big an issue because proficiency testing programs will become more common as the domestic accreditation programs in some economies develop and gain more experience.

- In general, laboratories in the APEC economies are enthusiastic about improving their testing capabilities in the future, in relation to increasing the number of electrical energy-using products that they test, acquiring new test equipment, training staff for new test methods, and making partnership arrangements with laboratories in other countries. This response indicates the broad benefit of a multilateral MRA between APEC economies in the area of energy performance testing, given that the number of labs performing this testing is likely to increase. Additionally, partnership arrangements between labs tend to be between major manufacturers, and between parent companies and their associated laboratories, particularly in the more developed APEC economies. This finding provides a further dimension to the alignment of test standards because multinational laboratories provide the opportunity for cross-border testing.

- In some economies, particularly Indonesia, Papua New Guinea, and Singapore, a large majority of the labs that responded need technical assistance to be able to carry out energy efficiency testing for most or all of the key products covered by this survey. Labs in other economies will not need technical assistance to allow them to take advantage of the economic benefits of a MRA on energy performance testing because they are planning to upgrade their facilities and staff themselves as part of their ongoing commitment to the continually changing environment of energy efficiency testing. Overall, labs in the APEC economies recognize the benefits of bilateral mutual recognition arrangements and their partnerships could provide a foundation for negotiation of multilateral mutual recognition arrangements between the APEC economies. However, a top-down approach to harmonize accreditation programs and test standards more closely, as well as the provision of appropriate technical assistance, will also be necessary to ensure confidence throughout the APEC economies in the mutual acceptance of test results.

7.1.3 APEC Energy Efficiency Regulatory Programs And Requirements

- The energy sectors, primarily electrical appliances, and household air conditioning and refrigeration, are regulated sectors in the majority of the APEC countries. There is great diversity among the member economies in terms of the use of international

[56] As mentioned above, an APLAC sub-committee is currently looking into whether there are any special requirements for energy and performance testing that need addressing through the provision of additional guidelines.

standards in regulation and the acceptance of other countries' standards or certification procedures. While some economies have implemented regulatory energy efficiency programs, others have instituted voluntary programs, or a combination of these two systems. All of these energy efficiency programs in the APEC economies that indicated their type of system during Nordicity's consultation process included both energy performance standards and labelling requirements. The implication of this extensive use of performance standards for energy efficiency is that such standards will ultimately be much easier to harmonize over the long term than more prescriptive design standards, due to the ability of performance standards to keep up with technological change. This regulatory overlay that affects energy performance testing will be a key factor in the closer harmonization of efficiency standards. Regulatory overlays will have to be as transparent as possible and should avoid making modifications to test procedures.

- The compliance approach differs from programs that rely on stand-alone sanctions to those that use self-certification or third party verification to ensure compliance with energy efficiency standards and labelling requirements. A majority of the economies also require import documentation to ensure compliance to regulatory performance standards and labelling requirements by imported energy-using products, as well as by domestically-manufactured ones. Requirements for import documentation should be included in any further investigation of energy efficiency regulatory requirements in the APEC economies. At a minimum, the bureaucratic inconvenience of import documentation adds costs and time delays which are against the common APEC goal of facilitating trade between the economies.

- The energy-using products that are regulated in each of the APEC economies vary to some extent from country to country. Laboratories in less than half of the APEC economies test refrigerators, refrigerator-freezers, and freezers for regulatory requirements; however, in a majority of the economies, these products are tested for labelling requirements. Laboratories in approximately half of the APEC economies test room air conditioners for regulatory and labelling requirements. Laboratories in very few APEC economies test single-package and split-system air conditioners for energy efficiency regulatory and labelling requirements. Laboratories in less than half of the APEC economies test electric motors for regulatory requirements and in even fewer of the economies, electric motors are tested for labelling requirements. Laboratories in many of the APEC economies test fluorescent lamps and ballasts for regulatory requirements, with Canada and China only testing the lamp ballasts for energy efficiency; however, only a few of these economies test fluorescent lamps and ballasts for labelling requirements.

- These results from the *APEC Survey of Laboratories* demonstrate that for refrigerators, refrigerator-freezers, and freezers, room air conditioners, and fluorescent lamps and ballasts, the regulatory overlay that is derived from the regulatory and labelling requirements in the 13 APEC economies that responded to the survey, must be considered in any discussion of a MRA for energy performance

testing. Modifications made to the test standards used by the laboratories as a result of regulatory requirements also need to be investigated in some cases to determine the reasons why these modifications exist, whether because existing test procedures were inadequate or because of lack of government input into the standards development process. The energy efficiency regulatory overlay is a major hurdle to address in achieving the APEC goal for closer harmonization. Aligning test standards is not sufficient - understanding the implications of regulatory requirements for this goal is necessary for a multilateral MRA among APEC economies in the area of energy efficiency to be successful. Further study of this regulatory overlay is required to discover exactly how provisions for energy efficiency can be harmonized in the APEC economies, so that both the test standards used and the regulatory requirements implemented can be accounted for.

- Other energy-using products for which a MRA may need to be considered by the APEC economies include clothes washers, clothes dryers, water heaters, dishwashers, office equipment and rice cookers. Harmonization of the test standards for these products may also produce economic benefits for APEC members.

- There are also numerous non-regulatory or non-compliance reasons why laboratories in the APEC economies test energy-using products for energy efficiency, which provide additional economic benefits to increased harmonization of test standards. Many laboratories do testing work for manufacturers to determine the appropriate energy efficiency rating for a variety of household products. Energy efficiency ratings are often used for marketing purposes, or for comparative analysis that is done by consumer magazines. Energy performance testing is also vital when manufacturers are carrying out research and development for new products. Additionally, laboratories may carry out comparative testing so that government procurement officials can determine (for deciding between contractor bids) the most energy efficient products to be used in government buildings.

- MRAs between regulators in different countries specifically in the area of energy efficiency appear to be limited to North America. The existing MRAs between Asia Pacific economies are more generally for accreditation programs, rather than specifically for energy-using products. The use of international standards in a country's energy efficiency regulations makes it much easier to harmonize regulatory requirements across borders through regional organizations such as APEC. The WTO's Technical Barriers to Trade (TBT) Agreement also provides an avenue through which non-tariff trade barriers can be limited.

7.1.4 Review of APEC Test Standards and Practices

- The path towards the complete alignment of test standards and practices for selected energy-using products involves the prioritization of those products that are the easiest to align to be aligned within APEC first. The recommended order of priority for closer harmonization of the main product groups is single-package and split-system

air conditioners, fluorescent lamps and ballasts, electric motors, room air conditioners, and refrigerators, refrigerator-freezers, and freezers.

- In the 6 main product groups examined in this study, the test standards for single-package and split-system air conditioners, and fluorescent lamps and ballasts appear to be the closest to alignment among APEC members. For the test standards for single-package and split-system air conditioners there is one key standard being used by the labs in the APEC economies that is similar to other domestic and international standards in use. This situation of having fewer standards to harmonize for single-package and split-system air conditioners is an excellent opportunity for the APEC Energy Working Group to seize upon as one of the first energy-using products for which the standards can be aligned.

- While there is much difference in the test standards for fluorescent lamps and ballasts for testing other performance aspects of the lamps, there is not much difference in regard to the test procedures for energy performance. The testing of the lamp ballast is key to its energy performance and the relatively straightforward nature of this product may also make it a good candidate for early alignment, despite the numerous test standards currently in use in the APEC economies.

- There are moderately good prospects for standards alignment for electric motors. However, the issue of how best to calculate/measure "stray load losses" will have to be clarified across APEC economies before these test standards can be aligned.[57]

- On the other hand, there are still significant differences between the domestic and international standards currently in use for room air conditioners that will have to be resolved before alignment can take place.

- Similarly, the test standards for refrigerators, refrigerator-freezers, and freezers will likely be the most difficult to harmonize among the APEC economies. For the refrigeration appliances, there are numerous domestic standards used by APEC laboratories that are very different from the most widely used ISO standard for testing these products. Due to these differences, alignment of these test standards will likely have to take place over the longer term.[58]

- A large majority of the APEC economies have also implemented regulatory and labelling requirements for refrigeration appliances and room air conditioners, adding an additional regulatory overlay that will have to be accounted for before trade barriers for these products can be reduced.

[57] There are currently efforts underway to examine ways to harmonize IEC, NEMA and IEEE standards for electric motors.

[58] There may be a need for the development of a new test procedure for refrigerators to deal adequately with in-use climatic variations and new technology such as micro-processor controls.

7.1.5 Requirements for Facilitating Multilateral Mutual Recognition Agreements

It appears likely that an APEC multilateral MRA will have to encompass the following issues to harmonize test procedures and laboratory accreditation programs more closely:

- participation in the development of international standards to ensure that they meet regional requirements;
- increased harmonization of test standards through alignment to international standards by adopting international standards at the domestic level once they have reached a suitable stage of development;
- recognition of and eventual elimination of regulatory modifications to test standards (to the extent possible) by addressing critical issues within the standards themselves;
- alignment of accreditation programs to ensure compliance with international standards such as ISO/IEC Guides 25 and 58;
- technical assistance to help those economies with newer accreditation programs and testing facilities acquire the acceptance of test results from more established APEC economies;
- development of sufficient experience among all member economies in the administration of domestic accreditation programs;
- access to a credible domestic measurement system that identifies international traceability;
- transparency of documentation and procedures among members; and
- investigation into how the APEC economies can deal with the differing regulatory and import documentation requirements for energy performance of household energy-using products.

- While increased harmonization should proceed both from the top-down, with mutual recognition of accreditation programs, and from the bottom-up, with the alignment of test protocols for energy efficiency of key traded products, the regulatory modifications (or "overlays") to standards that were discovered through this study also need to be investigated in more detail to ensure that energy efficiency regulations do not become trade barriers. Energy performance regulatory requirements for all tradeable products must be closely examined for each of the 18 member economies in parallel with the alignment of test standards and accreditation programs, to determine how trade restrictions can be overcome.

7.2 ACTION ITEMS FOR THE STEERING GROUP ON ENERGY STANDARDS

The *Guide for Alignment of APEC Member Economies' Standards with International Standards* developed in 1996 by the APEC Standards and Conformance Sub-Committee (APEC SCSC) and PASC Standing Committee (PASC SC) on standards and conformance issues, provides a framework for the Steering Group on Energy Standards to work towards mutual recognition of energy performance test results through alignment to energy efficiency test standards and cooperation with other Asia-Pacific Specialist Regional Bodies. The Guide recommends that member economies adopt international standards as their own domestic standards with as few technical deviations as possible (taking into account the specific conditions and needs of each member economy), with any deviations clearly identified, and with a general explanation of the deviations with their reasons provided. The following action items for the Steering Group on Energy Standards are presented within the context of the overall framework for alignment found in this *Guide*:[59]

1. Evaluation of International Standards

Based on the survey results of this study which provide the energy performance test standards used by laboratories in a majority of the APEC economies, a thorough technical review of the relevant international or draft international standards should first be undertaken with the aim of adopting the most appropriate international standards for the main traded energy-using products. The recommended order of priority for closer harmonization of the main product groups is single-package and split-system air conditioners, fluorescent lamps and ballasts, electric motors, room air conditioners, and refrigerators, refrigerator-freezers, and freezers. This technical review should take into account whether:

- the international standard or draft international standard being considered is applicable to the specific situation of each member economy;
- the international standard reflects the latest technologies;
- the international standard is used in practice in other countries; and
- any deficiencies in the international standard in terms of regulatory requirements or regional needs have been identified.

APEC members should also participate actively at ISO and IEC to ensure that energy efficiency test standards and other energy performance issues are adequately addressed.

2. Adoption of International Standards

[59] APEC Sub-Committee on Standards and Conformance (APEC SCSC), *Guide for Alignment of APEC Member Economies' Standards with International Standards* (Alexandra Point, Singapore: APEC Secretariat, 1997), pp. 3-8.

Member economies secondly need to adopt these international standards for the main traded energy-using products to the maximum possible extent by using the methods described in ISO/IEC Guides 3 and 21, which provide guidance on identifying the degree of equivalence with and indicating deviations from international standards.[60]

The main energy-using products should be prioritized for adoption of international standards starting with those that appear to be easiest to harmonize, such as single-package and split-system air conditioners, and fluorescent lamps and ballasts, so that the APEC Energy Working Group can build on successful alignment of these products when the time comes to harmonize more difficult product groups with deviations in test standards, for example, electric motors, room air conditioners, and refrigeration appliances.

3. Elimination of Deviations from International Standards

Deviations from international standards can exist for a number of reasons:

- international standards may be limited in scope and some criteria may not be covered because the necessary level of consensus required during the standardizing process may not have been reached; and

- specific conditions of member economies may not be adequately addressed by international standards for reasons that may include an insufficient level of protection, fundamental climatic or geographical factors, and fundamental technological problems (as recognized by the World Trade Organization's [WTO] Agreement on Technical Barriers to Trade and Agreement on the Application of Sanitary and Phytosanitary Measures).

The latter reason for deviation will likely be the most common for energy efficiency test standards, as the climatic environment for which these tests are carried out may vary widely among APEC members. Any other deviations of member economies' standards from international standards, aside from those listed above, should be removed whenever possible.

4. Clear Identification of Deviations

For transparency, the *Guide for Alignment of APEC Member Economies' Standards with International Standards* recommends that the degree of equivalence be identified and any deviations from the international energy efficiency test standards, and reasons for the

[60] ISO/IEC Guides 3 and 21 are currently under revision by ISO and IEC based on revisions suggested by the APEC SCSC/PASC SC working group that developed the *Guide for Alignment of APEC Member Economies' Standards with International Standards.*

deviations, be clearly identified by each of the member economies. The ISO/IEC Guides 3 and 21 provide guidance on indicating deviations from international standards.[61]

5. Participation in International Standardization Activities

As a long term goal, member economies should continue to participate actively in international standardization activities, particularly in terms of activities related to energy efficiency testing, to influence the contents of international standards so as to make them suitable for adoption in the region. There is a need to coordinate APEC input into ISO, IEC and other international standards fora, and to communicate and cooperate regarding APEC regional requirements.

In particular, member economies should put forward common requirements to the relevant international technical committees for consideration, propose new work items where there are no applicable international standards, provide draft requirements for inclusion in the new international standards, and undertake the role of secretariat of relevant technical committees and subcommittees, particularly where new international standards of benefit to the region are being prepared.

6. Cooperation with Specialist Regional Bodies

To promote alignment with international standards and participation in international standardization activities, the APEC Steering Group on Energy Standards and member economies should seek assistance from their standards bodies and relevant Specialist Regional/International Bodies. Cooperation of this nature will ensure a more efficient and effective process to work towards mutual acceptance of energy performance test results among APEC members.

The Steering Group on Energy Standards should also ensure that it coordinates with APEC SCSC's work program on technical infrastructure development, in as much as it relates to providing technical infrastructure assistance for accreditation bodies and accredited testing laboratories in member economies with developmental needs. APEC SCSC recognizes that domestic laboratory accreditation programs in many APEC economies are in an early stage of development and is working to help these economies develop their domestic programs and achieve mutual recognition of these accreditation programs with other APEC members. APEC SCSC is working with APLAC to identify developmental needs for accreditation programs and to develop and harmonize laboratory accreditation systems through the training of accreditation personnel, training of laboratory assessors, and setting up inter-laboratory proficiency testing programs.

7. Framework for Negotiation of a Multilateral Mutual Recognition Agreement

[61] A redraft and amalgamation of ISO/IEC Guides 3 and 21 is currently under consideration.

In order to facilitate trade in a regulated sector such as energy efficiency, it will be necessary for the Steering Group on Energy Standards to work not only to develop technical infrastructures to a mutually acceptable level, but also to encourage regulatory agencies to accept conformance certificates from other harmonized APEC economies. The above action items based on the *Guide for Alignment of APEC Member Economies' Standards with International Standards* do not cover technical regulations. It is therefore recommended that a thorough investigation of the energy efficiency regulations in each of the 18 APEC member economies be undertaken in parallel with discussions related to the alignment of test standards for each of main energy-using products, most likely according to the procedures provided by the WTO for eliminating technical barriers to trade.

Secondly, the Steering Group on Energy Standards should consider the requirements for a multilateral APEC MRA that were listed in Section 7.1.5 to determine how they can provide a framework to be used for long term planning of the aspects that need to be resolved before the 18 APEC member economies will agree to the terms of a MRA in the area of energy efficiency. Alignment of the test procedures for the products indicated will not be successful unless the other issues raised in this study, such as increased harmonization of accreditation programs, recognition of the energy efficiency overlay, and provision of technical infrastructure assistance, are also resolved because the alignment of energy performance test standards must be carried out by the APEC Energy Working Group in the context of the entire existing conformity assessment infrastructure for energy efficiency.