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Economic Cooperation

Advancing Free Trade
for Asia-Pacific Prosperity

Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions

APEC Energy Working Group

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The project organizers furthermore wish to convey their utmost gratitude to all participants of both workshops for their active contributions.

EXECUTIVE SUMMARY

The project on "*Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions" (EWG 05 2018A)* was formulated to help address the observed fragmentation of conformity assessment requirements around the globe and in the APEC region. The project was implemented over the December 2018 – November 2019 period.

As a preparatory step, UL conducted an examination of the current energy efficiency standards and labeling requirements that are in existence in the APEC and ASEAN regions from December 2018 to January 2019. As shown in Table 1 below, the results of the investigation highlighted the many differences in how the APEC and ASEAN economies address the energy efficiency of electric motors. These differences complicate conformity assessment procedures and represent significant barriers to market access for manufacturers of energy efficient motors.

Table 1: Standards and Labelling of APEC and ASEAN Regions

	Regulation	Test Standard	MEPS	Labeling
Australia	GEMS Act 2012 GEMS (Three Phase Cage Induction Motors) Determination 2019	IEC 60034-2-1	IE2	Marking
Canada	Energy Efficiency Act (Amended 2009) Energy Efficiency Regulations (Amendment 14, 2016)	CSA C390-10 IEEE 112-2004 CSA C747	CSA C390-10, Table 2, 3 NEMA MG-1, Table 12-12 (NEMA Premium – similar to IE3)	Energy Verification Mark
Chile	NCh 3086: 2008	NCh 3086:2008 (Identical to IEC 60034-2-1)	IE2	Energy Label
People's Republic of China	GB 18613-2012	GB/T 1032-2012	Grade 2 (similar to IE3)	Energy Label
Indonesia	None	SNI IEC 60034-2-2	None	Under development
Japan	Top Runner - Motor	JIS C 4034-2-1	IE3	Energy Label (Voluntary)
Republic of Korea	MOTIE-2015-28	KS C IEC 60034-2-1	IE3	Energy Label
Malaysia	None	IEC 60034-2	IE2 (Voluntary)	None
Mexico	NOM-016-ENER-2016	NOM-016-ENER-2016	Premium efficiency (similar to IE3	Marking (Mandatory) and Endorsement Label (Voluntary)
New Zealand	Energy Efficiency (Energy Using Products) Regulations 2002	AS/NZS 1359.5 (Test Method A or B)	IE2	Marking
Peru	NTP 399.450:2018	NTP IEC 60034-2-1	IE1	Energy Label
Singapore	Energy Conservation (Regulated Goods and Registered Suppliers) Regulations 2017	IEC 60034-2-1 (2014) Method 2-1-1B	IE3 (MEPS)	Marking
Chinese Taipei	Energy Management Act - Motor	CNS 14400 (IEC 60034-2-1 or IEEE 112B)	IE3 (same as Premium)	Marking
Thailand	TIS 867-2550	TIS 867-2550	IE1/IE2 (Voluntary)	Energy Label

	Regulation	Test Standard	MEPS	Labeling
		(AS/NZS 1359.5:2004 Method B)		(Voluntary)
The United States	10 CFR Part 431	IEEE 112	Premium efficiency (similar to IE3)	Marking
Viet Nam	TCVN 7540-1 TCVN 7540-2	TCVN 6627-2-1:2010 (Identical to IEC 60034-2-1:2007)	IE1	Viet Energy Star

The initial findings of UL were presented to stakeholders in the framework of a self-funded workshop.

The International Institute for Energy Conservation was subsequently recruited to prepare a recommendation report to support the future harmonization of conformity assessment efforts in the APEC and ASEAN regions. The draft report was prepared over the May– October 2019 period and circulated to target participants ahead of the workshop. The report included a critical review of the situation related to conformity assessment efforts in APEC economies and analyzed the potential for harmonization, as showed in Table 2 below.

Table 2: Critical review of conformity assessment efforts in APEC and ASEAN regions

Core Element	Summary of Current Situation	Priority in Aligning Conformity Assessment Efforts	Remark
Scope and Product Type	• Rated power outputs are within a range of 0.73 kW to 375 kW (i.e., around 1hp to 500hp) • Minimum rated power outputs starting at 0.73kW and 0.75kW, while maximum rated power outputs include 7.5kW, 150kW, 185kW and 375kW • Special designed motors usually not included	**Low**	Flexibility should be given to small economies to adopt a scope of the energy efficiency program for electric motor that fits well with the local context.
Implementation Approach	• Mandatory implementation through the Acts and regulations developed specifically for energy efficient electric motors; • Mandatory implementation through relevant standard Acts • Efficiency info on nameplate rating, energy efficiency endorsement label, and comparative energy label	**Low to Medium**	Decision on the most effective legal framework for implementation of the mandatory energy efficiency program for electric motors shall be made by each respective APEC/ASEAN

Core Element	Summary of Current Situation	Priority in Aligning Conformity Assessment Efforts	Remark
	requirements are common practices in APEC/ASEAN economies		economy. Requirements for displaying efficiency information on motors' nameplates are the most common measures.

Table 2: Critical review of conformity assessment efforts in APEC and ASEAN regions (cont.)

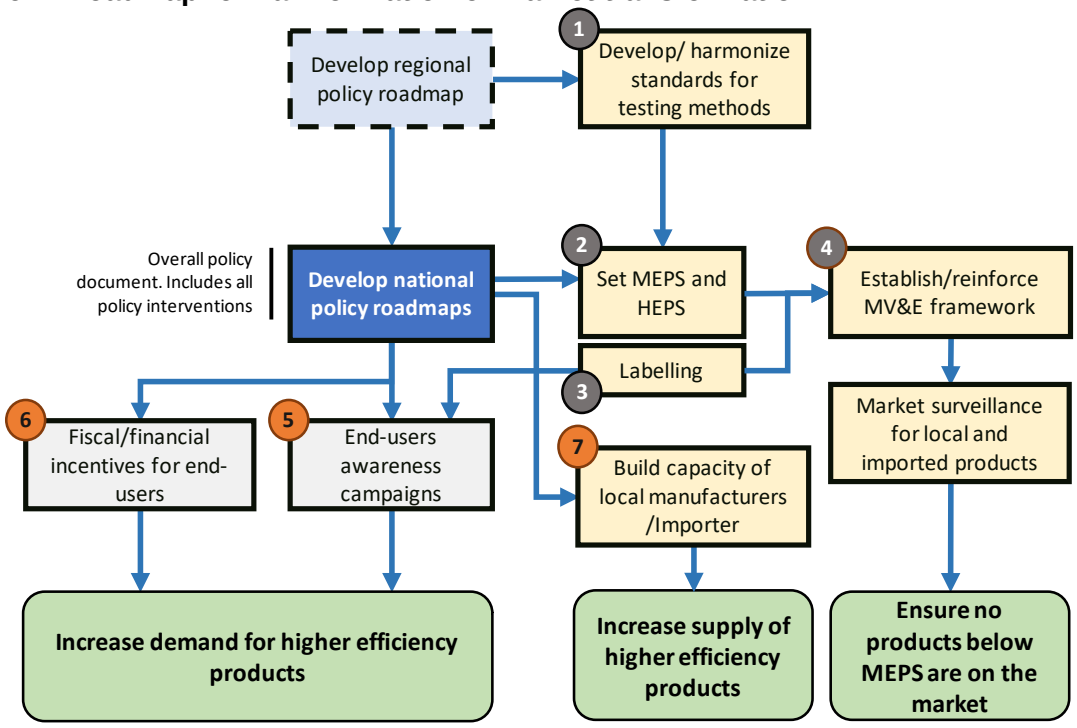
Core Element	• Summary of Current Situation	Priority in Aligning Conformity Assessment Efforts	Remark
Testing and Efficiency Standard	• Test methods are generally identical to IEC 60034-2-1 Method 2-1-1B and/or IEEE 112 Method B. • In most economies, efficiency requirements are aligned with the IE classifications specified in IEC 60034-30-1 • Some APEC/ASEAN economies without active energy efficiency programs for electric motors reference previous editions of IEC standards	**High**	IEC standards for electric motors are common among APEC/ASEAN economies, and updating relevant IEC standards for electric motors should be immediately undertaken.
Conformity Assessment and Registration	• Virtually all economies recognize the results of testing conducted by accredited laboratories. • Product registration is prerequisite for product importation and/or distribution. • Not all APEC/ASEAN economies have online registration systems. • Most economies have developed procedures for market surveillance and verification testing, and details of enforcement actions.	**Medium**	Aligning test report format, and establishment of a central registration database for both 50/60Hz will reduce cost of conformity assessment for market entry. Sharing verification test results among APEC/ASEAN economies can improve effectiveness and also reduce implementation cost.

Preliminary policy recommendations were also made in the perspective of accelerating market transformation. The recommendations and the report content were finalized following the dissemination / consultation workshop. The final report also includes a roadmap for harmonization consistent with the initial project plan. The results are presented in Table Table 3 figure 1 below.

Table 2: Priority recommendations

Recommended Action	Indicative Timeline
Harmonize test methods and efficiency classifications as specified in IEC 60034-2-1 and IEC 60034-30-1. This action can be carried through a similar approach employed by the ASEAN SHINE program for room air conditioners, i.e., establishment of a regional policy and each APEC/ASEAN member economy will develop and adopt its national policy roadmap to achieve the long-term goals set out in the regional policy roadmap.	2020 - 2021
Require that all motors display efficiency information in accordance with the marking requirement specified in IEC 60034-30-1, i.e., the rated efficiency and the IE code shall be durably marked on the rating plate, for example "IE2 - 84.0%". Each APEC/ASEAN member economy may choose to implement an energy labeling scheme to supplement the mandatory marking.	2022
Adopt mandatory MEPS for general purpose, three-phase electric induction motors with two, four or six poles; rated output between 0.75 kW – 375 kW (i.e. 1 HP to 500 HP); rated voltage up to 1,000 Volts at 50 Hz or 60 Hz; and continuous duty operation.	2022
Encourage participation in the GMEE program to improve effectiveness of conformity assessment for product registration and market entry checkpoints, and build capacity of testing laboratories, regulators and energy efficiency officials in testing and certification of energy efficient motors.	2021 - 2025

Figure 1: Roadmap for harmonization of market transformation



BACKGROUND

Electric motor systems consume about 70% of industrial electricity and 40% of total electricity worldwide. Furthermore, electric motor-driven systems account for almost half of global electricity consumption costing more than $565 billion (USD) per year. A modest efficiency gain of 1.5% would significantly contribute to meeting APEC's energy intensity reduction goal of 45% by 2035. Currently, the Super-Efficient Equipment and Appliance Deployment (SEAD) standards and labels (S&L) database contains 44 different standards and labeling efforts for motors in the APEC region alone. The fragmentation of requirements around the globe places a large burden on the motor industry, as diverging specifications have emerged in multiple markets, threatening to create non-tariff barriers and undermine deployment through the rest of the region. In light of this trend, economies benefit by striving to align requirements globally and implement programs that promote innovation and ensure access to these technologies, which, in turn, can bring energy savings across sectors.

Over the past several years, APEC leaders have repeatedly acknowledged the importance of working to achieve trade facilitation to advance sustainable economic growth. The project on *Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions (EWG 05 2018A)* has been developed as a direct response to this growing concern.

The project had three primary objectives:

1. Identify commonalities and differences in motor energy efficiency standards and labelling efforts in APEC and ASEAN;

2. Advance the ongoing public-private dialogue among APEC and ASEAN economies regarding ways to align motor energy efficiency requirements through the development and use of global standards such as IEC 60034 and more trade-friendly conformity assessment procedures; and

3. Address and prevent unnecessary market access barriers for efficient motors, increase the availability and use of energy efficient products in markets worldwide and assist APEC and ASEAN economies meet domestic energy policy objectives.

The implementation of the project was divided into 3 phases as follows:

- **Phase 1**: Update the 2008 list of standards and conformity assessment policies for motors in APEC and ASEAN;
- **Phase 2**: Develop a roadmap for harmonization within APEC and ASEAN based on outcomes and lessons learned via the ASEAN SHINE; and
- **Phase 3**: Promote recommendations of harmonization of standards and conformity assessment policies for motors among the economies.

The activities carried out over the three phases and their outcomes are described hereafter.

I. PHASE 1: UPDATE THE 2008 LIST OF STANDARDS AND CONFORMITY ASSESSMENT POLICIES FOR MOTORS IN APEC AND ASEAN

1. Mapping of standards and conformity assessment policies for motors in APEC and ASEAN

UL conducted an examination of the current energy efficiency standards and labeling requirements that are in existence in the APEC and ASEAN regions from December 2018 to January 2019 (see Table 1 for details). The results of the investigation show that there are many differences in how the APEC and ASEAN economies address the energy efficiency of electric motors. UL found that there are mandatory requirements for motor efficiency in 11 economies (Australia, Canada, Chile, People's Republic of China, Republic of Korea, Mexico, New Zealand, Peru, Chinese Taipei, the United States, and Viet Nam) with four economies (Indonesia, Japan, Malaysia, and Thailand) having either voluntary requirements or are in the process of finalizing requirements. Across the economies, different policies exist concerning the scope (classes of motors covered), test standards referenced, and conformity assessment procedures for energy efficient motors. Some economies have developed their own test standards and efficiency classes (e.g. U.S., Canada and China) while others have adopted IEC test standards as part of their regulation, but created their own rules for registration or labeling (e.g. Australia, Korea and Viet Nam). These differences complicate conformity assessment procedures around the APEC and ASEAN regions and represent significant barriers to market access for manufacturers of energy efficient motors.

Table 1: Standards and Labelling of APEC and ASEAN Regions

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Chile	NCh 3086: 2008	NCh 3086:2008 (Identical to IEC 60034-2-1**)**	IE2	Energy Label
People's Republic of China	GB 18613-2012	GB/T 1032-2012	Grade 2 (similar to IE3)	Energy Label
Indonesia	None	SNI IEC 60034-2-2	None	Under development
Japan	Top Runner - Motor	JIS C 4034-2-1	IE3	Energy Label (Voluntary)
Republic of Korea	MOTIE-2015-28	KS C IEC 60034-2-1	IE3	Energy Label
Malaysia	None	IEC 60034-2	IE2 (Voluntary)	None
Mexico	NOM-016-ENER-2016	NOM-016-ENER-2016	Premium efficiency (similar to IE3	Marking (Mandatory) and Endorsement Label (Voluntary)
New Zealand	Energy Efficiency (Energy Using Products) Regulations 2002	AS/NZS 1359.5 (Test Method A or B)	IE2	Marking
Peru	NTP 399.450:2018	NTP IEC 60034-2-1	IE1	Energy Label
Singapore	Energy Conservation (Regulated Goods and Registered Suppliers) Regulations 2017	IEC 60034-2-1 (2014) Method 2-1-1B	IE3	Marking
Chinese Taipei	Energy Management Act -	CNS 14400 (IEC 60034-2-1 or	IE3 (same as Premium)	Marking

	Regulation	Test Standard	MEPS	Labeling
	Motor	IEEE 112B)		
Thailand	TIS 867-2550	TIS 867-2550 (AS/NZS 1359.5:2004 Method B)	IE1/IE2 (Voluntary)	Energy Label (Voluntary)
The United States	10 CFR Part 431	IEEE 112	Premium efficiency (similar to IE3)	Marking
Viet Nam	TCVN 7540-1 TCVN 7540-2	TCVN 6627-2-1:2010 (Identical to IEC 60034-2-1:2007)	IE1	Viet Energy Star

The initial findings of UL were presented to stakeholders in the framework of a self-funded workshop as described below.

2. Self-funded workshop on Current Energy Efficiency Requirements for Electric Motors in the APEC and ASEAN Region

As a means to mobilize stakeholders and providing them with increased opportunities for active involvement, a self funded workshop was organized. This self-funded workshop was not part of the initial work plan. The self-funded workshop was organized under the coordination of Pacific Northwest National Laboratory, USA (EWG 05 2018A project overseer) and with the support of UL LLC (UL), wholly owned by Underwriters Laboratories Inc., and International Copper Association (ICA), the project implementers. The workshop was further supported by United for Efficiency (U4E), a global public-private partnership under Sustainable Energy for All (SEforAll) dedicated to support market transformation in favor of energy efficient appliances and equipment deployment.

By allowing an early consultation with motor stakeholders, the self-funded workshop aimed to provide a better preparation, and enhance the potential future impact of the APEC EWG 05 2018A project. The key objective of the preparatory workshop was therefore to disseminate commonalities and gaps in motor energy efficiency standards and labelling efforts in APEC and ASEAN.

The workshop organized in Hongkong China brought together policy makers, industry representatives, and key experts on higher efficiency motors.

A. Workshop Participants

Private sector participation almost doubled Economy representatives at the self-funded workshop. Industry Associations such as the International Copper Alliance (ICA), the North American Electrical Manufacturers Association (NEMA) joined individual business representatives from UL (testing laboratory), Regal Beloit (motor manufacturer), the Hong Kong and China Gas Company Limited (utility), CLP Power Hong Kong Limited (utility), the Hong Kong Electric Company (utility), and the International Energy Efficiency and Conservation (consulting firm) at the workshop.

The APEC contingent was led by the Chair of the Experts Group on Energy Efficiency and Conservation (People's Republic of China), Chinese Taipei, Hong Kong China, Thailand, the USA, and the Asia Pacific Research Centre (APERC).

The list of participants of the self-funded workshop is enclosed as Annex 2.

B. Workshop Summary

The one-day workshop took place on March 19, 2019 in Hong Kong, China, in conjunction with the Joint Meeting of the Expert Group on New and Renewable Energy Technologies (EGNRET) and Expert Group on Energy Efficiency and Conservation (EGEE&C). The agenda of the self-funded workshop is provided as Annex 1.

In addition to meeting the stated workshop objective of helping policy makers better understand the benefits of standards and labeling requirements, the workshop explored their critical role in contributing to market transformation, and international best practices. While not a stated objective of the Workshop, what became abundantly clear throughout the day was the value of bringing together private sector organizations with APEC Economy Representatives to share perspectives, offer new ideas, and engage in discussions that will lead to more collaboration and ultimately, more effective energy efficiency policies.

The workshop was called to order by the APEC EGEE&C Chair, Mr. Li Pengcheng closely followed by opening remarks from Mr. VY Ek-Chin, from the Electrical and Mechanical Services Department, Hong Kong China who offered remarks on the important role that high efficiency motors must play in meeting the APEC energy efficiency goals. The Project Overseer, Mr. Cary Bloyd (USA) introduced both the goals of the self-funded Workshop as well as how this workshop was designed to support the objectives of the broader APEC-funded project on Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions.

Mr. Mayur Karmakar (ICA) presented an overview of the United For Energy (U4E) Program's work on promoting policies to encourage the adoption of more energy efficient motors by looking at the current efficiency levels of installed motors and how efficiency have improved in motor designs from 1960 through 2013 by 68%.

Mr. Nick Lee (UL) followed by presenting the results of UL's examination of the current energy efficiency standards and labeling requirements that are in existence in the APEC and ASEAN regions (as presented in Table 1 above). The results of the investigation show that there are many differences in how the APEC and ASEAN economies address the energy efficiency of electric motors. UL found that there are mandatory requirements for motor efficiency in 11 economies (Australia, Canada, Chile, People's Republic of China, Republic of Korea, Mexico, New Zealand, Peru, Chinese Taipei, the United States, and Viet Nam) with four economies (Indonesia, Japan, Malaysia, and Thailand) having either voluntary requirements or are in the process of finalizing requirements. Across the economies, different policies exist concerning the scope (classes of motors covered), test standards referenced, and conformity assessment procedures for energy efficient motors. Some economies have developed their own test standards and efficiency classes (e.g. U.S., Canada and China) while others have adopted IEC test standards as part of their regulation, but created their own rules for registration or labeling (e.g. Australia, Korea and Viet Nam). These differences complicate conformity assessment procedures around the APEC and ASEAN regions and represent significant barriers to market access for manufacturers of energy efficient motors.

The morning session concluded with a presentation on the perspective of the US electric motor industry on standards and labeling efforts citing the importance of compliance and enforcement of such efforts if calculated energy savings are to become realized energy savings.

Following lunch, Dan Delainey (Regal Beloite) gave an overview of the Global Motor Energy Efficiency (GMEE) program that's run by the IEC and IECEE that could be leveraged by economies throughout the region as an example of a harmonized approach to motor standards. The ultimate aim of the program is to have manufacturers test their products to one standard and have that test report recognized throughout the globe to gain market access.

Mr. Larence Loh (Hong Kong China) and Mr. Watcharin Boonyarit (Thailand) delivered in-depth case studies on their economy's efforts to improve motor efficiency. Finally, Pierre Cazelles (ICA) offered some final observations and gathered individual participant takeaways before closing the workshop.

Each presentation of the self-funded workshop can be found here.

C. Conclusion

The self-funded workshop was conducted to disseminate the findings of UL's evaluation of the current requirements for energy efficient motors in the APEC and ASEAN regions, identify known gaps in information, and gather feedback from economy and industry stakeholders. The results of this workshop were built upon to guide the following implementation of activities under the APEC-funded project "Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions" (EWG 05 2018A). A key recommended outcome of the self-funded workshop was the need to inscribe efforts related to conformity assessment within a larger market transformation approach as a means to increase the potential sustainability and multiplier effect of the EWG 05 2018A project.

Based upon the evaluation survey conducted as part of the self-funded workshop, this event is estimated to have been a success, notably in terms of contents, and of improving the knowledge and capacity of the participants with regards to integrating the topics presented into their future work. The results of the evaluation carried out in the framework of the self-funded workshop are enclosed as Annex 3.

II. PHASE 2: DEVELOP A ROADMAP FOR HARMONIZATION WITHIN APEC AND ASEAN BASED ON OUTCOMES AND LESSONS LEARNED VIA THE ASEAN SHINE

3. Draft report preparation

The International Institute for Energy Conservation was recruited to prepare a recommendation report to support the future harmonization of conformity assessment efforts in the APEC and ASEAN regions. The draft report was prepared over the May– October 2019 period and circulated to target participants ahead of the workshop. The report included an updated review of the situation related to market transformation efforts related to electric motors in all APEC economies, and provided preliminary policy recommendations to accelerate this market transformation.

4. Report revision and finalization

The recommendations and the report content were revised following the dissemination / consultation workshop (see phase 3 hereafter) and the final report also includes a roadmap for harmonization consistent with the initial project plan.

The final report is attached as Annex 8.

III. PHASE 3: PROMOTE RECOMMENDATIONS OF HARMONIZATION OF STANDARDS AND CONFORMITY ASSESSMENT POLICIES FOR MOTORS AMONG THE ECONOMIES

In line with the project work plan, a workshop was organized to discuss the preliminary findings of the report and finalize them through discussion with stakeholders. A project workshop was thus organized on 28 - 29 October 2019 at the Howard Civil Service International House Hotel in Chinese Taipei.

The workshop was organized in coordination with the Pacific Northwest National Laboratory (PNNL), USA (EWG 05 2018A project overseer) and with the co-financing support from UL LLC (UL), wholly owned by Underwriters Laboratories Inc., and International Copper Association (ICA), the project implementers. The workshop was further supported by United for Efficiency (U4E), a global public-private partnership under Sustainable Energy for All (SEforAll) dedicated to energy efficiency market transformation.

1. EWG 05 2018A Workshop Participants

There were 32 participants in the workshop, including: 8 speakers, 19 participants, and 5 organizers. Half of the participants were from public sector, and representatives from 13 APEC economies (i.e., Chile, Chinese Taipei, Indonesia, Lao PDR, Malaysia, Mexico, Papua New Guinea, Philippines, Singapore, Thailand, USA, and Vietnam) participated in the workshop. The remaining participants are representatives from the Electricity Generating Authority of Thailand (utility), PNG Power Ltd. (utility), Association of Development Financing Institutions of Asia-Pacific (ADFIAP), International Copper Association (ICA), International Institute for Energy Conservation (consulting firm), UL (testing laboratory), Regal Beloit

(motor manufacturer), ASEAN Centre for Energy, and Industrial Technology Research

The workshop organized in Chinese Taipei brought together policy makers, industry representatives, and key experts on high efficiency motors.

Institute. The list of participants is enclosed as Annex 5.

2. EWG 05 2018A Workshop Summary

A. Introduction

The workshop welcome remark was delivered by Dr. Jyuung-Shiauu Chern, Lead Shepherd EWG, APEC, followed by an opening remark and introduction to the APEC clean energy activities by Mr. Cary Bloyd, a representative from PNNL and the Project Overseer. Mr. Bloyd provided information of the APEC structure, Energy Working Group (EWG) and Expert Group on Energy Efficiency and Conservation (EGEEC). He also provided a snapshot on the recent projects on Energy Efficiency and Energy Conservation implemented in 2018-2019. After the welcome and opening remarks, all participants were requested to deliver self-introduction and highlight their expectations from the workshop participation. Following the opening session, Mr. Jean-Marc Alexandre, Director Partnerships-Southeast Asia, ICA, presented a brief introduction to the project and described key project milestones and key events to be delivered by the project. He also provided updates on the workshop agenda (as shown in Appendix 1).

Mr. Alexandre then introduced to all participants the U4E Integrated Policy Approach with a specific focus on electric motors and motor systems. His presentation highlighted significant contributions of motors and motor systems to the global energy efficiency goal, tools and guidelines for market transformation, global overview of motor MEPS, and examples of potential actions under the Integrated Policy Approach. After Mr. Alexandre's presentation, a representative from the ASEAN Center for Energy (ACE), Mr. Rio Jon Piter Silitonga, shared with the participants ACE's experience in supporting regional harmonization of Energy Efficiency (EE) standards for room air-conditioners. His presentation also highlighted the

process of listing testing laboratories under the ASEAN EE Mutual Recognition Agreement (MRA).

B. MEPS, Labeling, and Supporting Policies

After the introduction session, the workshop discussed the components under the Integrated Policy Approach, including MEPS, Labeling and Supporting Policies, A representative from Viet Nam, Mr. Nguyen Hoai Nam, Head of R&D and IT units of QUATEST 3, Ministry of Science and Technology, updated the workshop participants on the Viet Nam National Energy Efficiency Program (VNEEP) on Electrical Motors. His presentation covers the overall timeline for development and implementation of MEPS and labeling programs for electrical appliances and equipment in Viet Nam, testing standards and MEPS requirements for electric motors, and labeling procedures.

Following the presentation from Viet Nam, Mr. Chwa Hock Chuan from the National Environment Agency (NEA), Singapore, presented MEPS for motors in Singapore which was recently launched in October 2018 with IE3 as the minimum requirements. He touched upon various aspects of the MEPS program in Singapore, including legislative framework, registration requirements, verification testing, as well as impacts and challenges. This is followed by a presentation from Mr. Apisit Sonkosa, a representative from the Department of Alternative Energy Development and Efficiency (DEDE) under the Thai Ministry of Energy. Mr. Sonkosa's presentation provided updates on MEPS and labeling for electric motors in Thailand which have been implemented in a voluntary manner.

A representative from Chile, Mr. Cristian de Jesús Baeza Jiménez, Superintendent of Electricity and Fuels Department in Chile, provided updates on the certification and labeling program for electric motors in Chile. He highlighted that the program currently covers 0.75-7.5kW three-phase motors with IE2 as the MEPS requirements (effective in February 2018). Chile has adopted IEC standards but testing has been one of the main challenges. The program currently relies on testing laboratories in Argentina and China for energy efficiency certification.

C. MV&E

Mr. Nick Lee, a representative from UL Chinese Taipei, presented the UL surveillance programs for energy efficiency which are the independent schemes for energy efficiency. UL has two different surveillance schemes for energy efficiency and both comply with relevant requirements specified in ISO/IEC 17065:2012. Mr. Alexandre from ICA followed with a presentation on U4E's approach to product registration which highlighted benefits of the product registration systems, as well as tools, resources and prototypes developed by U4E.

After the U4E presentation, Dan Delainey, a representative of Regal Beloite, gave an overview of the Global Motor Energy Efficiency (GMEE) program that's run by the IEC and IECEE that could be leveraged by economies throughout the region as an example of a harmonized approach to motor standards. The ultimate aim of the program is to have manufacturers test their products to one standard and have that test report recognized throughout the globe to gain market access.

D. Financing and Financial Delivery Mechanisms

This session began with a presentation delivered by Ms. Kritika Rasisuddhi, a representative from the Electricity Generating Authority of Thailand (EGAT), Thailand. Ms. Rasisuddhi provided updates on the DSM programs in Thailand, its implementation structure and the

new label designs. The High Efficiency Motor (HEM) pilot program which was launched in December 1996 and involved financial incentives for industrial customers was also discussed. After EGAT's presentation, Ms. Corazon Conde, a representative from the Association of Development Financing Institutions of Asia-Pacific based in the Philippines, presented experience in the Philippines in developing credit lines for motor programs which is a part of a 4-year project funded by the European Union, and led by the Institute of Integrated Electrical Engineers of the Philippines (IEE), Inc.

Following the experience from Thailand and the Philippines, Mr. Alexandre presented a U4E model regulation for motors which is developed as a guideline to help inform regulatory authorities and policy makers in developing and emerging economies, and set a minimum efficiency requirement to prohibit future sales of inefficient motors. The U4E model regulation for motors references IEC standards and covers all aspects of the Integrated Policy Approach.

E. Formulation of Policy Recommendations

The workshop discussed the formulation of policy recommendations on 29 October 2019, and the session commenced with a presentation delivered by Mr. Sommai Phon-Amnuaisuk, Asia-Pacific Director of the International Institute for Energy Conservation (IIEC). Mr. Amnuaisuk presented findings and recommendations from the review and assessment of MEPS and labeling programs in 24 APEC and ASEAN economies. He provided the snapshots of the current MEPS and labeling requirements in the APEC and ASEAN economies, and highlighted variations among the 24 economies in the program scopes, implementation approaches, conformity assessments and product registrations. He concluded that many technical barriers pertaining to development and implementation of MEPS and labeling for electric motors have been removed, specifically those related to testing, certification and efficiency classifications. Mr. Amnuaisuk concluded his presentation with preliminary recommendations on priority actions for harmonization of MEPS and labeling programs for electric motors in APEC and ASEAN economies, and proposed a roadmap for harmonization based on the identified priority actions.

Copies of the presentation materials in the workshop can be found here.

F. Group Discussions on Policy Recommendation

Based on the information presented in the previous session, the participants were divided into three groups to discuss and provide their comments and suggestions on the preliminary recommendations and proposed roadmap. The workshop discussion guide as shown in Appendix 2 was provided to each discussion group. Comments and suggestions from the discussion groups are captured below.

Recommended Action#1: Harmonize test methods and efficiency classifications as specified in IEC 60034-2-1 and IEC 60034-30-1. This action can be carried through a similar approach employed by the ASEAN SHINE program for room air conditioners, i.e., establishment of a regional policy and each APEC/ASEAN member economy will develop and adopt its domestic policy roadmap to achieve the long-term goals set out in the regional policy roadmap.

Comments and Suggestions:

- The workshop participants concurred that adoption of IEC standards is practical considering that most APEC and ASEAN economies have already referenced IEC standards for electric motors.
- For specific economies where motor standards have not yet been developed, e.g., Cambodia, Lao PDR, PNG, capacity building of the domestic standard bodies, motor market study, and mapping of international MEPS and labeling requirements will be required to facilitate the adoption process.
- Once the domestic standards are aligned with IEC, an agreement for regional harmonization would become unnecessary. However, development of a regional goal and timeline is still important, and the experience from the ASEAN SHINE program for air-conditioner is useful. 2020-2021 timeline for harmonization of testing standards toward the latest editions of IEC standards is considered reasonable for most economies, but some economies may require more time to transpose into domestic regulations.
- Ultimately a conformity assessment framework for APEC and ASEAN economies would be needed, and each sub-region will require at least one testing laboratory with adequate capacity to support market surveillance activities.

Recommended Action#2: Require that all motors display efficiency information in accordance with the marking requirement specified in IEC 60034-30-1, i.e., the rated efficiency and the IE code shall be durably marked on the rating plate, for example "IE2 - 84.0%". Each APEC/ASEAN member economy may choose to implement an energy labeling scheme to supplement the mandatory marking.

Comments and Suggestions:

- The workshop participants agreed that IE code marking should be mandatory. Additional recommendations on nameplate data include % efficiency, frequency, number of phases, power factor and rated power output.
- The carrot and stick approach should be implemented to ensure that motor manufacturers comply with the marking requirements. The mandatory programs should include strong penalties to discourage bad practices, together with implementation of incentives and awareness programs.
- Although an additional energy label on electric motors may confuse consumers, it is recommended that each economy reserves the right the right to continue to have economy-specific labeling requirements.
- Integration of QR coding or similar tools should be considered to facilitate tracking and verification.

Recommended Action#3: Adopt mandatory MEPS for general purpose, three-phase electric induction motors with two, four or six poles; rated output between 0.75 kW – 375 kW (i.e. 1 HP to 500 HP); rated voltage up to 1,000 Volts at 50 Hz or 60 Hz; and continuous duty operation.

- Level IE2 (defined by IEC 60034-30-1) is recommended as a starting point for economies that produce motors domestically.
- Level IE3 (defined by IEC 60034-30-1) is recommended as a starting point for economies that import all motors.

Comments and Suggestions:

- The workshop participants recommended IE2 as a regional benchmark for APEC and ASEAN economies. However each economy reserves the right to adopt more aggressive minimum requirements early, e.g., Singapore has set IE3 as the MEPS requirements.
- Market assessments are needed for economies where MEPS requirements have not yet been adopted. This is to ensure the appropriate MEPS levels are set in accordance with the local market conditions. Moving directly to IE3 might be cost prohibitive for specific economies.
- Regional milestones for adoption of more stringent benchmarks should be established. However commitments to the regional mandatory implementation should be established only after the individual market assessments are completed, particularly in the economies where IEC standards have not yet been updated or adopted.

Recommended Action#4: Encourage participation in the GMEE program and more specifically its IECEE / CB scheme to improve effectiveness of conformity assessment for product registration and market entry checkpoints, and build capacity of testing laboratories, regulators and energy efficiency officials in testing and certification of energy efficient motors.

Comments and Suggestions:

- The workshop participants agreed in principle to the benefits of the GMEE program to support conformity assessment of EE motors. However a plan should be developed to improve understanding of GMEE program, and capacity buildings needed to effectively participate in the program.

G. Conclusion and Closing

After the group discussion, representatives from ICA, UL and PNNL thanked all participants for their active contributions over the two-day workshop. Comments and recommendations from the workshop will be incorporated into the final report by IIEC. All participants were also requested to complete the workshop evaluation survey form which available as a printed copy (as shown in Appendix 3), and also as an online form. The workshop was officially closed at noon, and the visit to the UL facility was organized after lunch break.

IV. ANNEXES

1. Annex 1: Agenda of the self-funded workshop

Agenda				
8:30 AM	-	9:00 AM	Arrival & Registration	
9:00 AM	-	9:15 AM	Opening Remarks	Mr. VY Ek Chin, Assistant Director for Electricity and Energy Efficiency, Hong Kong, China
9:15 AM	-	9:25 AM	Welcome	Li Pengcheng, APEC EGEE&C Chair
9:25 AM	-	9:35 AM	Introduction to the Workshop Objectives and Agenda	Cary Bloyd, PNNL
9:35 AM	-	9:45 AM	Participant Introductions	All
9:45 AM	-	10:25 AM	Overview of U4E – Motor Replacement Program	Mayur Karmakar (ICA – U4E)
10:25 AM	-	10:45 AM	Coffee Break	
10:45 AM	-	11:15 AM	Overview of Existing Motor Efficiency Standards & Labeling Efforts	Nick Lee, Principal Engineer, UL
11:15 AM	-	12:30 PM	Industry Perspectives: Why is harmonizing standards and Conformity Assessment important	Industry Panel: Kirk Anderson, NEMA
12:30 PM	-	1:30 PM	Lunch	
1:30 PM	-	2:30 PM	Industry Perspectives: Why is harmonizing standards and Conformity Assessment important - Continued	Dan Delaney, Regal Beloit
2:30 PM	-	3:30 PM	Economy Case Studies: Economy Representatives will share details of their Standards & Labeling Programs	Mr. Lawrence LOH, Hong Kong China
3:30 PM	-	3:45 PM	Coffee Break	
3:45 PM	-	4:45 PM	Economy Case Studies: Economy Representatives will share details of their Standards & Labeling Programs	Mr. Watcharin Boonyarit, Thailand
4:45 PM	-	5:00 PM	Summary Observations & Takeaways	Pierre Cazelles, ICA

2. Annex 2: Participants of the self-funded workshop

Name	Economy	Organisation	Job Title	Email Address
Jean-Marc ALEXANDRE	OBSERVER	ICA	PARTNERSHIPS ASIA	jeanmarc.alexandre@copperalliance.asia
Cary BLOYD	United States	Pacific Northwest National Laboratory	Senior Staff Scientist	Cary.bloyd@pnnl.gov
PIERRE CAZELLES	OBSERVER	ICA	GLOBAL PARTNERSHIPS	pierre.cazelles@copperalliance.asia
Dominic CHAN	Hong Kong, China	CLP Power Hong Kong Limited	Account Manager	dominic.chan@clp.com.hk
CHAN Kam Tim Stephen	Hong Kong, China	The Hong Kong and China Gas Company Limited	General Manager - Gas Production	stephen.chan@towngas.com
IP Tat Yan	Hong Kong, China	The Hongkong Electric Company Limited	Head of Environmental Affairs	tyip@hkelectric.com
MAYUR KARMARKAR	OBSERVER	ICA	SUSTAINABLE ENERGY PROGRAM	mayur.karmakar@copperallliance.asia
KWOK Ngan Lung	Hong Kong, China	The Hong Kong and China Gas Company Limited	Senior Engineer	nl.kwok@towngas.com
LI Pengcheng	EGEEC	CNIS	EGEEC Chair	lipch@cnis.gov.cn
LIU Ren	EGEEC	CNIS	EGEEC Sec	liuren@cnis.gov.cn
LO Henry Shin-Han	Chinese Taipei	Industrial Technology Research Institute	Energy and Research Lab	henrylo@itri.org.tw
Lawrence LOH	Hong Kong, China	Electrical and Mechanical Services Department	SE/EEB7	ylloh@emsd.gov.hk
Hugh MARSHALL-TATE	APERC	Asia Pacific Energy Research Centre (APERC)		hugh.marshalltate@aperc.ieej.or.jp
NGUYEN Linh Dan	APERC	Asia Pacific Energy Research Centre (APERC)	Researcher	dan.nguyen@aperc.ieej.or.jp
Sommai PHON-AMNUAISUK	Thailand	International Institute for Energy Conservation	Vice President for Asia-Pacific	sphonamnuaisuk@iiec.org
SHUM Chung Yee	Hong Kong, China	Electrical and Mechanical Services Department	Senior Engineer/Energy Efficiency A4	cyshum@emsd.gov.hk

VY Ek Chin	Hong Kong, China	Electrical and Mechanical Services Department	Assistant Director/Electricity and Energy Efficiency	ecvy@emsd.gov.hk
YANG Xinyan	China	China Academy of Building Research	Institute of Building Energy & Environment	yangxinyan915@126.com
Warote Chainatarawong	Thailand	Ministry of Energy	Department of Alternative Energy Development and Efficiency	warote_c@dede.go.th
Watcharin Boonyarit	Thailand	Ministry of Energy	Department of Alternative Energy Development and Efficiency	watcharin_b@dede.go.th
BOR Shiau-Jiun	Chinese Taipei	n/a	n/a	n/a
Nick LEE	USA	UL	Principal Engineer - Appliance Motors, Water Pumps and Fixed Electric Fans	Nick.Lee@ul.com
Kirk ANDERSON	USA	National Electrical Manufacturers Association (NEMA)	Industry Director	Kirk.Anderson@nema.org
Dan DELANEY	USA	Regal Beloit - National Electrical Manufacturers Association (NEMA)	Agency Manager	Dan.Delaney@RegalBeloit.com
Cary BLOYD	United States	Pacific Northwest National Laboratory	Senior Staff Scientist	Cary.bloyd@pnnl.gov
MAYUR KARMARKAR	OBSERVER	ICA	SUSTAINABLE ENERGY PROGRAM	PIERRE.CAZELLES@COPPERALLIANCE.ASIA
Lawrence LOH	Hong Kong, China	Electrical and Mechanical Services Department	SE/EEB7	ylloh@emsd.gov.hk
Watcharin Boonyarit	Thailand	Ministry of Energy	Department of Alternative Energy Development and Efficiency	watcharin_b@dede.go.th
Nick LEE	USA	UL	Principal Engineer - Appliance Motors, Water Pumps and Fixed Electric Fans	Nick.Lee@ul.com
Kirk ANDERSON	USA	National Electrical Manufacturers Association (NEMA)	Industry Director	Kirk.Anderson@nema.org
Dan DELANEY	USA	Regal Beloit - (NEMA)	Agency Manager	Dan.Delaney@RegalBeloit.com

3. Annex 3: Summary of self-funded APEC Project Evaluation Survey

	Strongly Agree	Agree	Disagree	COMMENTS (Continue on back if necessary)
The objectives of the training were clearly defined	**16.67%**	**83.33%**	**0.00**	
The project achieved its intended objectives	**2/11**	**9/11**		**1 participant had no comment**
The agenda items and topics covered were relevant	**16.67%**	**81.82%**	**0.00**	
The content was well organized and easy to follow	**41.67%**	**58.33%**	**0.00**	
Gender issues were sufficiently addressed during implementation	**58.33%**	**41.67%**	**0.00**	**Participants commented that the issue was not relevant**
The trainers/experts or facilitators were well prepared and knowledgeable about the topic	**8.33%**	**83.33%**	**0.01**	
The materials distributed were useful	**75.00%**	**25.00%**	**0.00**	
The time allotted for the training was sufficient.	**41.67%**	**58.33%**	**0.00**	

1. How relevant was this project to you and your economy?

5 (very relevant)	4 (mostly relevant)	3 (somewhat relevant)	2 (a little)	1 (not much relevant
25.00%	58.33%	16.67%	0.00%	0.00%

Comments:

- the project is relevant to address climate issues
- the project helps understand how to set standard and labelling and shows international experience
- Good learning about international experience for energy efficiency – good explanation of how complex the market is
- Would have liked to hear from more APEC economies

2. In your view what were the project's results/achievements?

- Helped understand the importance of improving energy efficiency for electric motors
- Improved knowledge on efficiency standards for motors and related S&L programs
- The project highlights the need to address motors globally
- The project helped sharing information on energy efficient motors policies and implementation in different APEC economies
- The project effectively supports education and collaboration in APEC economies

- The project provided a very good update of motor market, standards and policies
- Much information was shared on diverse APEC economies energy efficiency regulations
- Effective dissemination of knowledge linking regulators and businesses
- Good exchange of experience with potential for replication throughout economies

3. What new skills and knowledge did you gain from this event?
    - Upcoming NEMA premium and IE3 equivalent motors
    - Learned about regulations and standards of other APEC economies – improved understanding of advanced standards
    - Learned about GMEE and how other economies work
    - Met a lot of key individuals focused on EE motors in APEC
    - We learned about the global certification opportunities to improve compliance of motors
    - Learnt about compliance procedures in APEC
    - International experience (India) in EE financing / GMEE compliance best practice

4. Rate your level of knowledge of and skills in the topic prior to participating in the event:

5 (very high)	4 (high)	3 (medium)	2 (low)	1 (very low)
0.00%	50.00%	33.33%	16.67%	0.00%

5. Rate your level of knowledge of and skills in the topic after participating in the event:

5 (very high)	4 (high)	3 (medium)	2 (low)	1 (very low)
8.33%	66.67%	25.00%	0.00%	0.00%

- *Improved knowledge: 50% of participants*
- *Same level of knowledge before and after: 50% participants (all declared having already high knowledge before the workshop)*

- Useful information on higher efficiency motors
- Knowledge updated

6. How will you apply the project's content and knowledge gained at your workplace? Please provide examples (e.g. develop new policy initiatives, organise trainings, develop work plans/strategies, draft regulations, develop new procedures/tools etc.).
    - Encouraged to purchase of IE3 motors to replace old ones
    - Good case studies were presented and we can use them as a reference
    - We will continue sharing with other economies to create best practices
    - We will keep in touch with the organizers and participants to support additional education and knowledge sharing on EE motors technologies
    - We will use the experience learned from the SME promotion program (EESL) to improve our current rebate programs in Chinese Taipei
    - Adjust the modelling assumptions for energy demand projections

7. What needs to be done next by APEC? Are there plans to link the project's outcomes to subsequent collective actions by fora or individual actions by economies?
    - More promotion for phasing out the production of low efficiency motors
    - Get regulators and manufacturers in a common forum
    - Share information on implementation levels for efficient motors in each APEC economies
    - We look forward to support further the harmonization of domestic regulations across APEC economies

- Work together on international standards and certification, preserving local manufacturing

8. How could this project have been improved? Please provide comments on how to improve the project, if relevant.
    - Provide follow-up information to address question 7 above
    - We hope the project approach can be extended to other equipment and appliances
    - More economies represented
    - Provide conformity assessment implementation model
    - More APEC member regulators should have joined
    - Good speakers but topics vary from broad overview to technical regulations: difficult to identify target audience

4. Annex 4: Agenda of the EWG 05 2018A Workshop

APEC Workshop on Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions

28 – 29 October 2019
Howard Civil Service International House Hotel, Chinese Taipei

Workshop Objectives

Day 1 – Monday 28 October 2019

Time	Presentation title and description	Speakers
08:30 – 09.00	Registration for Day 1	--
Introduction		
09:00 – 09.10	Opening addresses	> Dr. Jyuung-Shiauu Chern, Lead Shepherd EWG, APEC > Mr. Cary Bloyd, PNNL
09:10 – 09.20	Participants introduction: Roundtable introduction one by one	all participants
09:20 – 09.30	Project introduction and workshop objectives: General background, including results of the first workshop	Mr. Jean-Marc Alexandre, ICA
09:30 – 09.45	Introduction to the integrated policy approach	Mr. Jean-Marc Alexandre, ICA
09:45 – 10.05	ACE's experience with supporting regional harmonization of EE standards and future plans referring to the APAEC	Mr. Rio Jon Piter Silitonga, ASEAN Centre for Energy
MEPS and Standards		
10:05 – 10.45	International experience of applying MEPS for motors:	> Mr. Hoai Nam Nguyen, Ministry of Science and Technology, Vietnam > Mr. Chwa Hock Chuan, National Environment Agency, Singapore
10.45 – 10.55	Q&A	all participants
10.55 – 11.10	Coffee-break and group photo	--
Labelling and supporting policies		
11:10 – 11.40	Labeling approaches and experiences	Mr. Apisit Sonkosa, Department of Alternative Energy Development and Efficiency, Thailand
11:40 – 12.00	Q&A	all participants
12:00 – 13.30	Lunch Break	--
13:30 – 13.50	Certification and labeling of Motors	Mr. Cristian de Jesús Baeza Jiménez, Superintendence of Electricity and Fuels

Time	Presentation title and description	Speakers
MV&E		
13.50 – 14.05	The importance of compliance (MV&E): *General presentation on the critical issue of compliance and key elements to be considered*	Mr. Nick Lee, UL
14.05 – 14.25	U4E's approach to product registration:	Mr. Jean-Marc Alexandre, ICA
14:25 – 14.55	Global Motor Energy Efficiency Initiative (GMEE) - 1 passport for compliance assessment, verification, and enforcement: *Presentation on the initiative as well detailed steps for joining and proposed work plan / milestones.*	Mr. Dan Delaney, NEMA, USA
14.55 – 15.10	Q&A	all participants
15.10 – 15.25	Coffee-break	--
Financing and financial delivery mechanisms		
15.25 – 15.50	Utility Demand Side Management Programme examples / or end-user perspective	Ms. Kritika Rasisuddhi, Electricity Generating Authority of Thailand
15.50 – 16.10	Developing credit lines for motor programs - experience in the Philippines: *This presentation will build upon ADFIAP's experience in the Philippines (SWITCH HEMs project)*	Ms. Corazon Conde, Association of Development Financing Institutions of Asia-Pacific
16.10 – 16.25	U4E's Model Regulation for Motors	Mr. Jean-Marc Alexandre, ICA
16.25 – 16.45	Q&A	all participants

Day 2 – Tuesday 29 October 2019

Time	Presentation title / description	Speakers
08:30 – 09.00	Registration for day 2	--
Key takeaways from Day 1		
Formulation of policy recommendations		
09.00 – 09.30	Preliminary policy recommendations on market transformation	Mr. Sommai Phon-Amnuaisuk, IIEC
09.30 – 10.30	Group discussions on policy recommendation:	all participants
10.30 – 11.10	Reporting by Rapporteurs	all participants
11.10 – 11.30	Coffee-break (organizers wrap-up)	organizers
11.30 – 11.45	Wrap-up: roadmap based on group discussions recommendations and Q&A	Mr. Jean-Marc Alexandre, ICA / Mr. Derek Greenauer, UL
11:45 – 11.55	Closing remarks	ICA / UL / PNNL
11.55 – 13.30	Lunch Break	--
13.30 – 17.00	Site visit (All afternoon): UL Laboratory	--

5. Annex 5: List of participants of the EWG 05 2018A Workshop

Asia-Pacific Economic Cooperation

Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions (EWG 05 2018A)

28 - 29 October 2019

Howard Civil Service International House Hotel, Chinese Taipei

LIST OF PARTICIPANTS

No.	Name	Country	Company/Organisation	28 October	29 October
1	Cristian de Jesús Baeza Jiménez	Chile	Superintendence of Electricity and Fuels		
2	Henry Lo	Chinese Taipei	Industrial Technology Research Institute		
3	Tony Chang	Chinese Taipei	Industrial Technology Research Institute	Tony Wen-Ruey Chang	
4	Chern Jyuung-Shiauu	Chinese Taipei	Ministry of Economic Affairs		
5	David Liu	Chinese Taipei	UL Taiwan		
6	Debbie Lin	Chinese Taipei	UL Taiwan	Debbie Lin	
7	Dolly Hsu	Chinese Taipei	UL Taiwan		
8	Gary Chou	Chinese Taipei	UL Taiwan	Gary Chou	Gary Chou
9	Nick Lee	Chinese Taipei	UL Taiwan	Nick Lee	Nick Lee
10	Ray Sung	Chinese Taipei	UL Taiwan		

Organisers: Pacific Northwest National Laboratory; UL; International Copper Association Southeast Asia Copper Alliance; IIEC

Asia-Pacific Economic Cooperation

Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions (EWG 05 2018A)

28 - 29 October 2019

Howard Civil Service International House Hotel, Chinese Taipei

LIST OF PARTICIPANTS

No.	Name	Country	Company/Organisation	28 October	29 October
11	Tony Y Chan	Chinese Taipei	UL Taiwan	Tony Y Chan	Tony Y Chan
12	Hamzah Hilal	Indonesia	Agency for the Assessment and Application of Technology (BPPT)		
13	Sudirman Palaloi Andi	Indonesia	Agency for the Assessment and Application of Technology (BPPT)		
14	Rio Jon Piter Silitonga	Indonesia	ASEAN Centre for Energy		
15	Khammanh Sopraseurth	Lao PDR	Ministry of Energy and Mines		
16	Seumkham Thoummavongsa	Lao PDR	Ministry of Energy and Mines		
17	NurFaidarina Alias	Malaysia	Energy Commission		
18	NurHamiza Mirsa Hussain	Malaysia	Energy Commission		
19	Antonio Garrido Arciniega	Mexico	National Commission for the Efficient Use of Energy		
20	David Kari Mes	Papua New Guinea	PNG Power Ltd		

Organisers: Pacific Northwest National Laboratory; UL; International Copper Association Southeast Asia Copper Alliance; IIEC

Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions (EWG 05 2018A)

28 - 29 October 2019
Howard Civil Service International House Hotel, Chinese Taipei
LIST OF PARTICIPANTS

No.	Name	Country	Company/Organisation	28 October	29 October
21	Victor Handiria Limbia	Papua New Guinea	PNG Power Ltd		
22	Corazon Conde	Philippines	Association of Development Financing Institutions of Asia-Pacific (ADFIAP)		
23	Ian Nuñala	Philippines	Department of Energy		
24	Pee Jay Fernandez	Philippines	Department of Energy		
25	Chwa Hock Chuan	Singapore	National Environment Agency		
26	Apisit Sonkosa	Thailand	Department of Alternative Energy Development and Efficiency, Ministry of Energy		
27	Sudarat Wanansut	Thailand	Department of Alternative Energy Development and Efficiency, Ministry of Energy		
28	Kritika Rasisuddhi	Thailand	Electricity Generating Authority of Thailand (EGAT)	Kritika Rasisuddhi	Kritika Rasisuddhi
29	Jean-Marc Alexandre	Thailand	International Copper Association (ICA)		
30	Aungsanant Thipthaweecharn	Thailand	International Institute for Energy Conservation (IIEC)	Aungsanant T.	Aungsanant T.

Organisers:

Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions (EWG 05 2018A)

28 - 29 October 2019
Howard Civil Service International House Hotel, Chinese Taipei
LIST OF PARTICIPANTS

No.	Name	Country	Company/Organisation	28 October	29 October
31	Sommai Phon-Amnuaisuk	Thailand	International Institute for Energy Conservation (IIEC)		
32	Derek Greenauer	USA	UL LLC		
33	Cary Bloyd	USA	Pacific Northwest National Laboratory (PNNL)		
34	Dan Delaney	USA	Regal Beloit		
35	Huy Quang Cu	Vietnam	Ministry of Industry and Trade		
36	Hoai Nam Nguyen	Vietnam	Ministry of Science and Technology		
37	Thi Thu Trang Pham	Vietnam	Vietnam Standards and Quality Institute (VSQI)		
38					
39					
40					

Organisers:

6. Annex 6: EWG 05 2018A Workshop Discussion Guide

EWG 05 2018A – Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions

Workshop 2 – breakout session

Introduction – conduct of the breakout session:

The participants will be separated into 3 groups (7-9 participants per group, not including the organizers). There are 4 discussion themes, respectively corresponding to each of the 4 key recommendations made in the report. Each group will discuss all of the 4 themes (15 min each, i.e. 60 min in total). Under each theme, guidelines questions are provided to guide the discussion.

Before starting the discussion, each group will be invited to designate a rapporteur who will present the findings of his group during the plenary session held immediately after the groups discussion. Each group will have 5-10 min to present his results. The organizers will assist as note-takers and facilitators / moderators for each group.

After presentation of the groups discussion during the plenary, a coffee-break will take place. During this coffee-break, the organizers will prepare a final ppt to be presented as a recommended roadmap building upon the discussions held in the groups.

	Recommended Actions	Indicative Timeline
R1	Harmonize test methods and efficiency classifications as specified in IEC 60034-2-1 and IEC 60034-30-1. This action can be carried through a similar approach employed by the ASEAN SHINE program for room air conditioners, i.e., establishment of a regional policy and each APEC/ASEAN member economy will develop and adopt its national policy roadmap to achieve the long-term goals set out in the regional policy roadmap.	
	Discussion: - What should be the reference method for testing the energy efficiency of motors (IEC 60034 series or other)? - What are the steps needed / process for adoption of this method in APEC / ASEAN countries? - Would a regional agreement help? - What agencies to involve at regional level? - What agencies to involve at national level? - Is capacity needed? For whom? - Time needed for the adoption of the reference testing method at regional / national level? (suggested: 2020-2021) - Any problem / concern / issues?	

	Recommended Actions	Indicative Timeline
R2	Require that all motors display efficiency information in accordance with the marking requirement specified in IEC 60034-30-1, i.e., the rated efficiency and the IE code shall be durably marked on the rating plate, for example "IE2 - 84.0%". Each APEC/ASEAN member economy may choose to implement an energy labeling scheme to supplement the mandatory marking.	
	Discussion: - Is the IE marking useful? - Is labeling needed on top of the IE marking? - If yes, can the labeling be regional - What are the key agencies / stakeholders to involve at regional level / national level? - How to encourage manufacturers to affix the IE marking? - Is capacity building / awareness raising needed? In what forms? - What are the steps needed for the establishment of the national / regional labeling scheme(s) (suggested: 2022) - Any problem / concern / issues?	

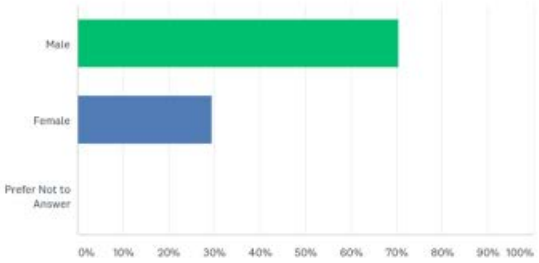
	Recommended Actions	Indicative Timeline
R3	Adopt mandatory MEPS for general purpose, three-phase electric induction motors with two, four or six poles; rated output between 0.75 kW – 375 kW (i.e. 1 HP to 500 HP); rated voltage up to 1,000 Volts at 50 Hz or 60 Hz; and continuous duty operation. • Level IE2 (defined by IEC 60034-30-1) is recommended as a starting point for countries that produce motors domestically. • Level IE3 (defined by IEC 60034-30-1) is recommended as a starting point for countries that import all motors.	
	Discussion: - What minimum MEPS should be adopted by all countries: IE1, 2, 3, 4? - Would a regional agreement / commitment by higher authorities help? (at APEC or ASEAN level)? - What are the steps needed for adoption of MEPS at the regional level? - What are the steps needed for adoption of MEPS at the national level? - What agencies to involve at regional level? - What agencies to involve at national level? - Is capacity needed? For whom? - Time needed for the adoption of the MEPS at regional / national level? (suggested: 2022) - Any problem / concern / issues?	

	Recommended Actions	Indicative Timeline
R4	Encourage participation in the GMEE program to improve effectiveness of conformity assessment for product registration and market entry checkpoints, and build capacity of testing laboratories, regulators and energy efficiency officials in testing and certification of energy efficient motors.	
	Discussion: - Is the vision of the GMEE – IECEE/CB (1 universal passport for compliance) realistic and beneficial for APEC and other economies? - What is needed to make GMEE – IECEE/CB scheme real / more effective? - Would a regional commitment of highest authorities help? (at APEC or ASEAN level) - What agencies / organizations in APEC / ASEAN need to be involved? - Time needed for the establishment of the mechanism (suggested: 2021-2025) - Any problem / concern / issues?	

7. Annex 7: Results of EWG 05 2018A Workshop Evaluation Survey

Q4: Gender:

Answered: 17 Skipped: 0



Powered by SurveyMonkey

Q4: Gender:

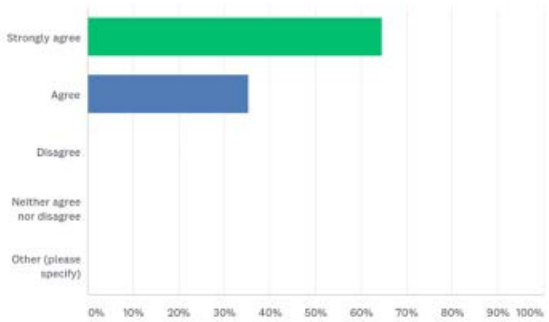
Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Male	70.59%	12
Female	29.41%	5
Prefer Not to Answer	0.00%	0
TOTAL		17

Powered by SurveyMonkey

Q5: The objectives of the workshop were clearly defined.

Answered: 17 Skipped: 0



Powered by SurveyMonkey

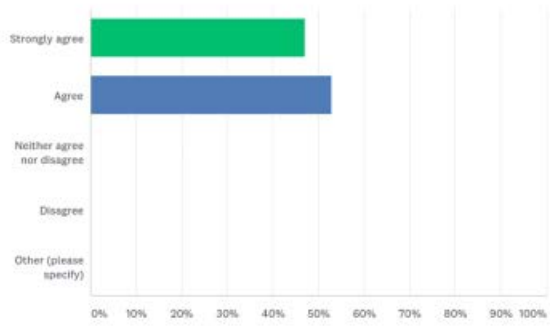
Q5: The objectives of the workshop were clearly defined.

Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Strongly agree	64.71%	11
Agree	35.29%	6
Disagree	0.00%	0
Neither agree nor disagree	0.00%	0
Other (please specify)	0.00%	0
TOTAL		17

Q6: The workshop achieved its intended objectives.

Answered: 17 Skipped: 0



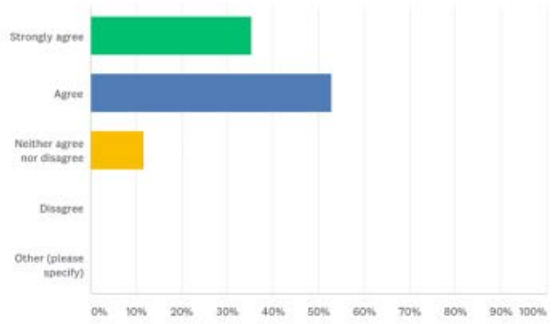
Q6: The workshop achieved its intended objectives.

Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Strongly agree	47.06%	8
Agree	52.94%	9
Neither agree nor disagree	0.00%	0
Disagree	0.00%	0
Other (please specify)	0.00%	0
TOTAL		17

Q7: The content was well organized and easy to follow.

Answered: 17 Skipped: 0



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Q7: The content was well organized and easy to follow.

Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Strongly agree	35.29%	6
Agree	52.94%	9
Neither agree nor disagree	11.76%	2
Disagree	0.00%	0
Other (please specify)	0.00%	0
TOTAL		17

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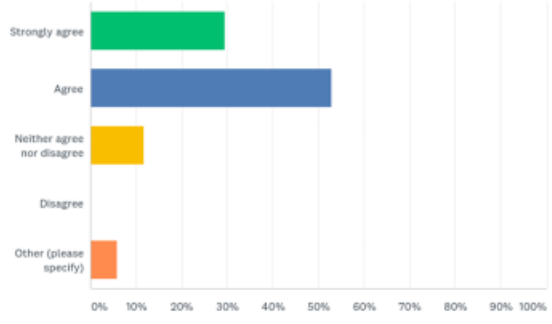
Q8: Gender issues were sufficiently addressed during implementation.

Answered: 17 Skipped: 0



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Q8: Gender issues were sufficiently addressed during implementation.

Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Strongly agree	29.41%	5
Agree	52.94%	9
Neither agree nor disagree	11.76%	2
Disagree	0.00%	0
Other (please specify)	5.88%	1
TOTAL		17

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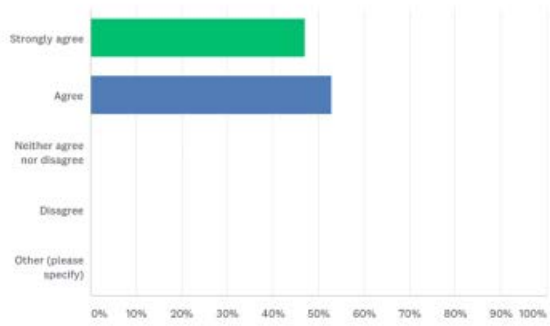
Q9: The agenda items and topics covered were relevant.

Answered: 17 Skipped: 0



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Q9: The agenda items and topics covered were relevant.

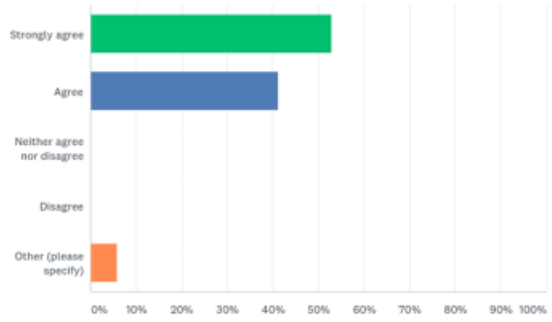
Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Strongly agree	47.06%	8
Agree	52.94%	9
Neither agree nor disagree	0.00%	0
Disagree	0.00%	0
Other (please specify)	0.00%	0
TOTAL		17

Powered by SurveyMonkey

Q10: The trainers/experts or facilitators were well prepared and knowledgeable about the topic.

Answered: 17 Skipped: 0



Powered by SurveyMonkey

Q10: The trainers/experts or facilitators were well prepared and knowledgeable about the topic.

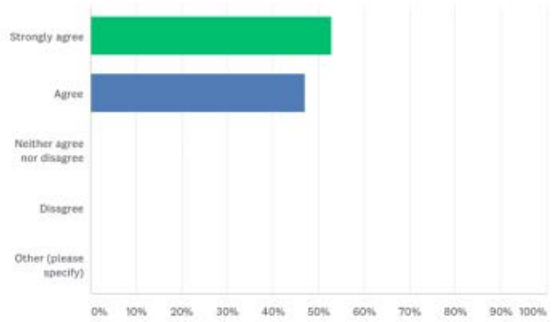
Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Strongly agree	52.94%	9
Agree	41.18%	7
Neither agree nor disagree	0.00%	0
Disagree	0.00%	0
Other (please specify)	5.88%	1
TOTAL		17

Powered by SurveyMonkey

Q11: The materials distributed were useful.

Answered: 17 Skipped: 0



Powered by SurveyMonkey

Q11: The materials distributed were useful.

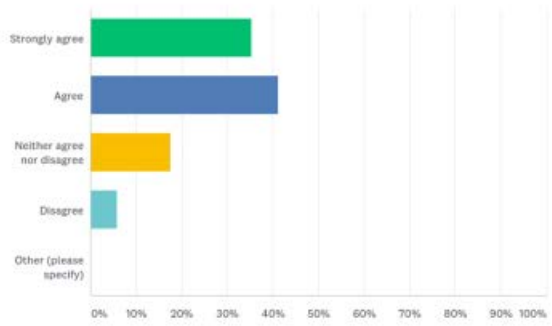
Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Strongly agree	52.94%	9
Agree	47.06%	8
Neither agree nor disagree	0.00%	0
Disagree	0.00%	0
Other (please specify)	0.00%	0
TOTAL		17

Powered by SurveyMonkey

Q12: The time allotted for the training was sufficient.

Answered: 17 Skipped: 0



Powered by SurveyMonkey

Q12: The time allotted for the training was sufficient.

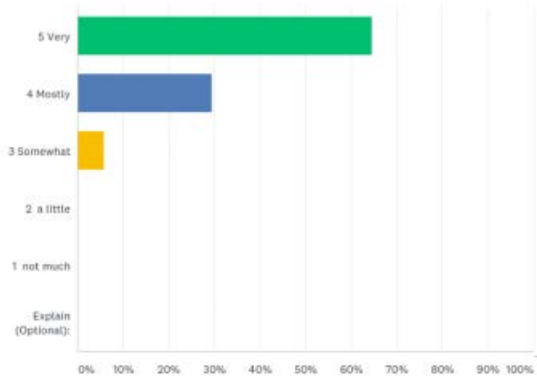
Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
Strongly agree	35.29%	6
Agree	41.18%	7
Neither agree nor disagree	17.65%	3
Disagree	5.88%	1
Other (please specify)	0.00%	0
TOTAL		17

Powered by SurveyMonkey

Q13: How relevant was this project to you and your economy?

Answered: 17 Skipped: 0



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Q13: How relevant was this project to you and your economy?

Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
5 Very	64.71%	11
4 Mostly	29.41%	5
3 Somewhat	5.88%	1
2 a little	0.00%	0
1 not much	0.00%	0
Explain (Optional):	0.00%	0
TOTAL		17

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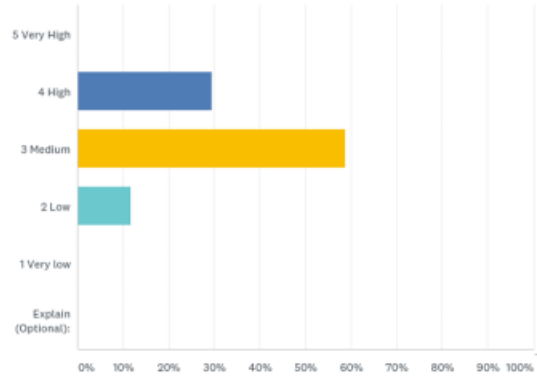
Q16: Rate your level of knowledge of, and skill in the topic prior to participating in the event.

Answered: 17 Skipped: 0



Powered by

Q16: Rate your level of knowledge of, and skill in the topic prior to participating in the event.

Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
5 Very High	0.00%	0
4 High	29.41%	5
3 Medium	58.82%	10
2 Low	11.76%	2
1 Very low	0.00%	0
Explain (Optional):	0.00%	0
TOTAL		17

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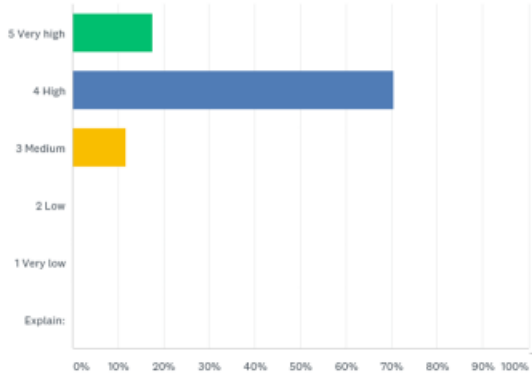
Q17: Rate your level of knowledge of, and skill in the topic after participating in the event:

Answered: 17 Skipped: 0



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Q17: Rate your level of knowledge of, and skill in the topic after participating in the event:

Answered: 17 Skipped: 0

ANSWER CHOICES	RESPONSES	
5 Very high	17.65%	3
4 High	70.59%	12
3 Medium	11.76%	2
2 Low	0.00%	0
1 Very low	0.00%	0
Explain:	0.00%	0
TOTAL		17

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8. Annex 8: Proposed Roadmap Report

Separate attachment.

Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions

(EWG 05 2018A)

Roadmap for Harmonization Report

Prepared for

Energy Working Group/Experts Group on Energy Efficiency & Conservation

By

International Institute for Energy Conservation (IIEC)

12th Floor, United Business Center II Building, 591, Sukhumvit Road,
Wattana, Bangkok – 10110 THAILAND

November 2019

Leading the Transition to Clean Energy

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Acronyms

AJEEP	ASEAN-Japan Energy Efficiency Partnership
AMO	Advanced Manufacturing Office, US DOE
ANCE	Standardization and Certification Association, Mexico
ANRE	Agency for Natural Resources and Energy, Japan
APEC	Asia-Pacific Economic Cooperation
AS/NZS	Australian/New Zealand Standard
ASEAN	Association of Southeast Asian nations
ASEAN SHINE	ASEAN Standards Harmonization Initiative for Energy Efficiency
ASQIQ	General Administration of Quality Supervision, Inspection and Quarantine
BOE	Bureau of Energy, Chinese Taipei
BPS	Bureau of Philippine Standards
BRESL	Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency Standards and Labeling Project
BSMI	Bureau of Standards, Metrology and Inspection, Chinese Taipei
CBSA	Canada Border Services Agency
CCA	Central Competent Authority, Chinese Taipei
CEL	China Energy Label
CFL	Compact Fluorescent Lamp
CIPEC	Canadian Industry Partnership for Energy Conservation
CNIS	China National Institute of Standardization
CONUEE	Comisión Nacional para el Uso Eficiente de la Energía, Mexico
CSA	Canadian Standards Association
CSPF	Cooling Seasonal Performance Factor
DEDE	Department of Alternative Energy Development and Efficiency
DGEE	General Directorate Energy Efficiency, Peru
DGNREEC	Directorate General of New Renewable Energy and Energy Conservation, Indonesia
DOE	Department of Energy
E2PO	Energy Efficiency Programme Office, Singapore
E3	Equipment Energy Efficiency
EAEU	Eurasian Economic Union
ECCJ	Energy Conservation Centre, Japan
EDPMO	Energy Department, Prime Minister's Office, Brunei Darussalam
EE	Energy Efficiency
EEC	Energy Efficiency & Conservation

EECA	Energy Efficiency and Conservation Authority, New Zealand
EECD	Energy Efficiency and Conservation Division, Myanmar
EELMS	Energy Efficiency Labeling Management System, Chinese Taipei
EELS	Energy Efficiency Labeling Scheme, Hong Kong, China
EEO	Energy Efficiency Office, Hong Kong, China
EEPSAP	National EE Policy Strategy and Action Plan
EER	Energy Efficiency Ratio
EISA	Energy Independence and Security Act
EMA	Energy Market Authority, Singapore
EMSD	Electrical and Mechanical Services Department, Hong Kong, China
EPA	The United States Environmental Protection Agency
EPAct	Energy Policy Act
EWG	Energy Working Group
FIDE	Electric Energy Savings Trust Fund, Mexico
GDE	General Directorate of Energy, MOIT, Viet Nam
GEF	Global Environment Facility
GEMS	Greenhouse and Energy Minimum Standards
GHG	Greenhouse Gas
GMEE	Global Motor Energy Efficiency
HEPS	High Energy Performance Standards
Hz	Hertz
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ILAC	International Laboratory Accreditation Cooperation
IREP	Institute of Renewable Energy Promotion, Lao PDR
JIS	Japanese Industrial Standard
KEA	Korea Energy Agency
KS	Koean Standard
kW	kilo Watts
MEELS	Mandatory Energy Efficiency Labeling Scheme, Hong Kong, China
MEM	Ministry of Energy and Mines, Lao PDR
MEMR	Ministry of Energy and Mineral Resources, Indonesia
MEPS	Minimum Energy Performance Standard
METI	Ministry of Economy, Trade and Industry, Japan
MOEA	Ministry of Economic Affairs, Chinese Taipei

MOIT	Ministry of Industry and Trade, Viet Nam
MOLIT	Ministry of Land, Infrastructure, and Transport, Republic of Korea
MOTIE	Ministry of Trade, Industry and Energy, Republic of Korea
MVE	Monitoring, verification and enforcement
NAECA	National Appliance Energy Conservation Acts, the United States
NATA	National Association of Testing Authorities
NEA	National Environment Agency, Singapore
NEECP	National Energy Efficiency and Conservation Program, the Philippines
NEMA	National Electrical Manufacturers Association
NMX	Mexican Standard
NOM	Official Mexican standard
NrCAN	Natural Resources Canada
NRDC	National Development and Reform Commission, China
NTP	Peruvian National Standards
NVLAP	National Voluntary Lab Accreditation Program
NZEECS	New Zealand Energy Efficiency and Conservation Strategy
PALS	Pacific Appliance Labelling and Standards Programme
PESLP	Philippine Energy Standards and Labeling Program
SCC	Standards Council of Canada
SDOC	Self Declaration of Conformity
SNI	Indonesian National Standard
STAMEQ	Directorate for Standards, Metrology and Quality of Viet Nam
TAF	Taiwan Accreditation Foundation
TCVN	Vietnamese National Standard
TIS	Thai Industrial Standard
TISI	Thai Industrial Standards Institute
TÜV	Technischer Überwachungs-Verein
U4E	United for Efficiency
UL	Underwriters Laboratories Inc.
VEELS	Voluntary Energy Efficiency Labeling Scheme, Hong Kong, China
VSQI	Viet Nam Standards and Quality Institute

1 BACKGROUND

The EWG 05 2018A – "Aligning Conformity Assessment Efforts for Energy Efficiency Regulations of Motors in the APEC and ASEAN Regions" project expands a 2008 project conducted by China on motor efficiency and aims to inform the regulatory and policy environments within APEC and ASEAN of the benefits of harmonization of standards and conformity assessment approaches to facilitate trade of energy efficient electric motors and accelerate progress toward energy intensity reduction in the region.

The project is divided into 3 phases: Update the 2008 list of standards and conformity assessment policies for motors in APEC and ASEAN (Phase 1) and present those findings during a self-funded Workshop; Develop a roadmap for harmonization within APEC and ASEAN based on outcomes and lessons learned via the ASEAN SHINE (Phase 2); and Promote recommendations of harmonization of standards and conformity assessment policies for motors among the economies (Phase 3) during a second, workshop.

This report provides recommendation on a roadmap for harmonization of energy efficiency programs for electric motors within APEC and ASEAN economies. The recommendations were prepared based on analysis of the current situation of energy efficiency programs for electric motors implemented in twenty four APEC/ASEAN member economies, as well as lessons learned from the ASEAN SHINE program and other regional and international initiatives for promoting energy efficient motors.

2 SITUATION ANALYSIS

2.1 SUMMARY OF ENERGY EFFICIENCY PROGRAMS FOR ELECTRIC MOTORS IN APEC AND ASEAN

Energy efficient electric motors have been promoted in the United States since the early 90s. To date, fourteen out of the twenty one APEC economies have implemented energy efficiency programs for electric motors (see Box 1). In ASEAN, Singapore, Thailand and Viet Nam have active programs promoting energy efficient electric motors, and these three ASEAN member states are also APEC member economies (see Box 2).

Box 1: Asia Pacific Economic Cooperation (APEC)

APEC has twenty one member economies (mentioned below). The word 'economies' is used to describe APEC members because the APEC cooperative process is predominantly concerned with trade and economic issues, with members engaging with one another as economic entities.

Australia	Japan	The Philippines
Brunei Darussalam	Republic of Korea	Russia
Canada	Malaysia	Singapore
Chile	Mexico	Chinese Taipei
People's Republic of China	New Zealand	Thailand
Hong Kong, China	Papua New Guinea	The United States
Indonesia	Peru	Viet Nam

Box 2: Association of Southeast Asian Nations (ASEAN)

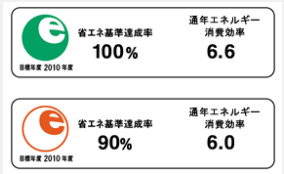
The Association of Southeast Asian Nations (ASEAN) was established in 1967 to promote, collaborate and maintain regional development in terms of economic, social and culture. ASEAN has ten member states and seven of which, except Cambodia, Lao PDR and Myanmar, are also members of APEC.

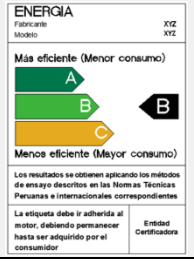
Brunei Darussalam	Myanmar
Cambodia	The Philippines
Indonesia	Singapore
Lao PDR	Thailand
Malaysia	Viet Nam

Key features of energy efficiency programs for three-phase induction motors in APEC and ASEAN economies are summarized in the table on the following pages.

Table 2-1: Key Features of Energy Efficiency Programs for Electric Motors in APEC and ASEAN Economies

Economy	Regulation	Scope	Test Standard	MEPS	Labeling
Australia	GEMS Act 2012 GEMS (Three Phase Cage Induction Motors) Determination 2019	0.73kW to less than 185kW	IEC 60034-2-1	IE2 (MEPS) IE3 (High Efficiency)	Marking (Nameplate Rating)
Canada	Energy Efficiency Act (Amended 2009) Energy Efficiency Regulations (Amendment 14, 2016)	0.75kW to 375kW	CSA C390-10 IEEE 112-2004 CSA C747	CSA C390-10, Table 2, 3 NEMA MG-1, Table 12-12 (NEMA Premium – similar to IE3)	Energy Verification Mark C SA US Energy Verified
Chile	NCh 3086: 2008	0.75kW to 7.5kW	NCh 3086: 2008 (Identical to IEC 60034-2-1)	IE2	Energy Label Eficiencia energética Más eficiente A B C D B Menos eficiente Método de ensayo: Medición de torque Norma Chilena Oficial NCh3086.Of2008

Economy	Regulation	Scope	Test Standard	MEPS	Labeling
People's Republic of China	GB 18613-2012	0.75kW to 375kW	GB/T 1032-2012	Grade 2 (similar to IE3)	Energy Label 
Japan	Top Runner - Motor	0.75kW to 375kW	JIS C 4034-2-1	Mandatory (similar to IE3)	Energy Label (Voluntary) 
Republic of Korea	MOTIE-2015-28	0.75kW to 375kW	KS C IEC 60034-2-1	MEPS (similar to IE3)	Energy Label 

Economy	Regulation	Scope	Test Standard	MEPS	Labeling
Mexico	NOM-016-ENER-2016	0.746kW to 373kW	NOM-016-ENER-2016	Premium efficiency (similar to IE3)	Marking (Mandatory) and Endorsement Label (Voluntary) 
New Zealand	Energy Efficiency (Energy Using Products) Regulations 2002	0.73kW to less than 185kW	AS/NZS 1359.5 (Test Method A or B)	IE2 (MEPS)	Marking (Nameplate Rating)
Peru	NTP 399.450: 2018	0.746kW to 149.2kW	NTP IEC 60034-2-1	IE1	Energy Label 
Singapore	Energy Conservation (Regulated Goods and Registered Suppliers)	0.75kW to 375kW	IEC 60034-2-1 (2014) Method 2-1-1B	IE3 (MEPS)	Marking

Economy	Regulation	Scope	Test Standard	MEPS	Labeling
	Regulations 2017		IEEE 112 Method B		
Chinese Taipei	Energy Management Act - Motor	0.75kW to 200kW	CNS 14400 (IEC 60034-2-1 or IEEE 112B)	IE3	Marking
Thailand	TIS 867-2550	0.73kW to less than 185kW	TIS 867-2550 (AS/NZS 1359.5:2004 Method B)	IE1/IE2 (MEPS) IE3/IE4 (High Energy Performance Standard for Voluntary Label)	Energy Label (Voluntary) 
The United States	10 CFR Part 431	0.75kW to 373kW	IEEE 112	Premium efficiency (similar IE3)	Marking
Viet Nam	TCVN 7540-1 TCVN 7540-2	0.75kW to 150kW	TCVN 6627-2-1:2010 (Identical to IEC 60034-2-1:2007)	IE1 (MEPS) IE3 (High Efficiency Level)	Viet Energy Star 

Analysis of the current situation of energy efficiency programs for three-phase induction motors in APEC and ASEAN economies in this report focuses primarily on MEPS and labeling programs for three-phase induction motors and relevant supporting mechanisms. The analysis was carried out from different perspectives which include: scope of the programs; implementation approaches (regulatory frameworks, mandatory/voluntary implementation); testing and efficiency standards; and conformity assessment and registration. Key findings from the analysis are summarized below:

2.1.1 Scope and Product Type

All MEPS and labeling programs for three-phase (cage or squirrel-cage) induction electric motors in APEC and ASEAN economies cover both open and enclosed types, and rated output powers are within a range of 0.73 kW to 375 kW (i.e., around 1hp to 500hp). The energy efficiency electric motor program in Chile has a limited coverage of 0.75kW to 7.5kW (1hp to 10hp). Peru and Viet Nam cover somewhat similar kW ranges which are equivalent to 1hp to 200hp. Australia, New Zealand and Thailand cover 0.73kW to less than 185kW. The remaining economies cover 0.75kW to 375kW. All economies cover 2, 4, or 6 poles, while some economies extend the scope to cover 8 poles motors. Some economies cover dual frequencies (50/60Hz), while some not. In terms of rated input voltages, a maximum input voltage of 600 volts is a common requirement for both 50Hz and 60Hz economies. Some 50Hz economies which reference IEC standards specify a rated voltage of electric motors up to 1,000 volts. All economies have opted for not including three-phase induction motors which are not designed for general applications, such as multispeed motors, submersible motors, etc.

2.1.2 Implementation Approach

There are two general approaches in implementing mandatory MEPS and labeling programs for electric motors in APEC and ASEAN economies:

1. Mandatory implementation through the Acts and regulations developed specifically for energy efficient electric motors; and
2. Mandatory implementation through relevant standard Acts.

Most large economies, including Australia/New Zealand, Canada, Korea and the United States, have opted for the mandatory implementation through the Energy Efficiency and Conservation Acts and regulatory documents specifying scope, efficiency requirements and other relevant implementation procedures (e.g., conformity assessment, registration, verification and enforcement). However, some economies still choose to implement MEPS and labeling programs for electric motors to promulgation of compulsory standards, such as Chile, China, Mexico, Peru, Thailand and Viet Nam.

All fourteen economies have specified requirements for marking/energy labels for three-phase electric motors. Seven economies, including Australia, Chile, Mexico, New Zealand, Singapore, Chinese Taipei, and the United States, specify that information on motor efficiency values shall be displayed on motor nameplates without specific energy labels or certification marks. The remaining economies specify requirements for energy labels or certification marks. Energy label designs include both endorsement and categorical types. It should be noted that energy efficiency labeling requirements in Japan, Mexico and Thailand voluntary.

2.1.3 Testing and Efficiency Standard

All fourteen economies adopted test methods which are identical to IEC 60034-2-1 Method 2-1-1B and/or IEEE 112 Method B. However Thailand still recognizes AS/NZS 1359.5:2004 Method B which is less stringent compared with IEC 60034-2-1 Method 2-1-1B and IEEE 112 Method B. In terms of efficiency requirements, all fourteen economies have fully aligned the efficiency requirements with the IE classifications specified in IEC 60034-30-1 Efficiency classes of line operated AC motors (IE code), except Thailand where the current MEPS requirements are between IE1 and IE2. However, Thailand aims to align its motor efficiency classes with IEC 60034-30-1, and the Thai MEPS will be equivalent to IE1. Summarized in the table below are MEPS requirements in APEC and ASEAN economies.

Table 2-2: MEPS Requirements for Three-phase Induction Motors in APEC and ASEAN Economies

Efficiency Levels	MEPS Requirement (IE Code)	Economy	Scope
Super Premium Efficiency	**IE4**	N/A	N/A
Premium Efficiency	**IE3**	Canada	0.75 to less than 150 kW
		Japan Top runner	0.75 to 375 kW
		South Korea	0.75 to 375 kW
		Mexico	0.746 to 373 kW
		Singapore	0.75 to 375 kW
		USA	0.75 to 373 kW
High Efficiency	**IE2**	Australia	0.73 to less than 185 kW
		Canada	150 to 375 kW
		Chile	0.75 to 7.5 kW
		China	0.75 to 375 kW
		New Zealand	0.73 to less than 185 kW
	IE1/IE2	Thailand	0.73 to less than 185 kW
Standard Efficiency	**IE1**	Peru	0.746 to 149.2 kW
		Viet Nam	0.75 to 150 kW

2.1.4 Conformity Assessment and Registration

MEPS and labeling programs for electric motors in the fourteen APEC economies require all motors to demonstrate compliance with MEPS and labeling requirements through submission of test reports. Virtually all economies recognize the results of testing conducted by accredited laboratories, and product registration is prerequisite for product importation and/or distribution. Although many APEC economies have implemented online registration systems, some APEC economies still rely on paper-based registration systems.

Chinese Taipei highlighted that inspection of energy efficiency requirements for electric motors is not necessarily carried out at the entry points, due to various reasons, including the lack of performance testing laboratories for certain motor products, and the fact that the majority of these

products are parts of other imported equipment and systems (such as pumps, fans and compressors).

Most economies have developed procedures for market surveillance and verification testing, and details of enforcement actions. Some economies regularly implement market surveillance and verification testing activities for household appliances, however, based on information available, implementation of market surveillance and verification testing activities for three-phase induction motors in APEC and ASEAN economies has not yet been implemented.

2.2 AUSTRALIA

2.2.1 Institutional Framework

The Greenhouse and Energy Minimum Standards (GEMS) Act 2012 established a national framework for regulating the energy efficiency of products supplied or used within Australia, while energy performance and relevant testing standards are provided for by requirements in Ministerial determinations (GEMS determinations). The products covered by GEMS determinations or GEMS products must be registered on the GEMS Register to ensure that they comply with relevant GEMS determinations.

The GEMS Regulator, based in the Commonwealth Department of Industry, Science, Energy and Resources, is the sole party responsible for the registration system, monitoring and enforcing compliance, and, more broadly, the administration of the GEMS Act. The GEMS Regulator is assisted by GEMS inspectors who use inspection, monitoring and investigation powers provided by the GEMS Act. GEMS inspectors may also be assisted by other persons to exercise powers or perform functions under the Act.

GEMS determinations are developed and updated through a consultative process. GEMS determinations reference standards which provide information on test methods and may also include energy efficiency requirements. Standards in GEMS determinations generally refer to Australian Standards, Australian/New Zealand Standards, IEC Standards or any other equivalent documents. Australian Standards are developed by Standards Australia, an independent, non-governmental, not-for-profit standards organization, which also serves as Australia's representatives of the International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC). It should be noted that Standard Australia is not responsible for enforcing, regulating or certifying compliance with Australian Standards.

2.2.2 Test Standards and MEPS

Three phase cage induction motors in Australia are covered by the GEMS (Three Phase Cage Induction Motors) Determination 2019, which establishes minimum energy efficiency requirements, and associated requirements for conducting tests, for three phase cage induction motors. The GEMS Determination 2019 covers three phase cage induction motors with:

(a) a rated output power greater than or equal to 0.73 kilowatts but less than 185 kilowatts;
(b) a rated voltage of up to 1100 volts alternating current (Vac.); and

(c) 2, 4, 6 or 8 poles.

The Australian Government has a policy in harmonizing with international standards where appropriate, and the GEMS Determination 2019 references following IEC and IEEE standards:

- IEC 60034-1 Ed. 13.0 (Bilingual 2017) Rotating electrical machines – Part 1: Rating and Performance.
- IEC 60034-2-1 Ed. 2.0 (Bilingual 2014) Rotating electrical machines – Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles).
- IEC 60034-30-1 Ed. 1.0 (Bilingual 2014) Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE code).
- IEC 60050-411 Ed. 2.0 (Bilingual 1996) International Electrotechnical Vocabulary – Chapter 411: Rotating machinery. Note: IEC 60050-411 includes all amendments up to and including IEC 60050-411 Amd.1 Ed. 2.0 (Bilingual 2007): Amendment 1 – International Electrotechnical Vocabulary – Part 411: Rotating machinery, made on 27 November 2007.
- IEEE Standard IEEE 112:2004 Test Procedure for Polyphase Induction Motors and Generators.
- IEEE Standard IEEE 112:2017 Test Procedure for Polyphase Induction Motors and Generators.

According to the GEMS Determination 2019, the motor's efficiency must be tested in accordance with the requirements mentioned in subclause 6.1.3 of IEC 60034-2-1 Ed. 2.0 (Method 2-1-1B – Summation of losses, additional load losses according to the method of residual loss). The Determination allows suppliers to register motors using test results in accordance with the recognized alternative test methods, i.e., Method B of the US test standards IEEE 112:2004 and IEEE 112:2017.

The GEMS Determination 2019 includes MEPS levels in the Determination rather than specifying the MEPS levels in the relevant Australian/New Zealand Standard (AS/NZS). The Determination aligns the motor's efficiency requirements with IEC 60034-30-1, and MEPS levels are consistent with IE2 (High Efficiency) levels, and high efficiency levels are consistent with IE3 (Premium Efficiency) levels.

Table 2-3 and Table 2-4 show the mandatory minimum efficiency levels and high efficiency requirements for 2, 4, 6 or 8 pole motors tested at 50 Hz or 60 Hz sold in Australia. The efficiency level of a motor is measured at 75% or 100% of rated load, and the motor only needs to meet the efficiency requirement at either of these loads. For a motor with a rated output power in between the values specified in Table 2-3 and Table 2-4, the efficiency value is determined in accordance with the method specified in clause 5.4.5 or 5.4.6 of IEC 60034-30-1 Ed. 1.0, which specify interpolation of nominal efficiency limits of intermediate rated powers for 50 Hz and 60 Hz respectively.

Table 2-3: Minimum Efficiency Levels for Three Phase Cage Induction Motors in Australia

Rated output power (kW)	50 Hz motors Minimum efficiency (%)				60 Hz motors Minimum efficiency (%)			
	2-pole	4-pole	6-pole	8-pole	2-pole	4-pole	6-pole	8-pole
0.73	77.4	79.6	75.9	66.2	75.5	78.0	73.0	66.0
0.75	77.4	79.6	75.9	66.2	75.5	78.0	73.0	66.0
1.1	79.6	81.4	78.1	70.8	82.5	84.0	85.5	75.5
1.5	81.3	82.8	79.8	74.1	84.0	84.0	86.5	82.5
2.2	83.2	84.3	81.8	77.6	85.5	87.5	87.5	84.0
3	84.6	85.5	83.3	80.0	87.5	87.5	87.5	85.5
4	85.8	86.6	84.6	81.9	87.5	87.5	87.5	85.5
5.5	87.0	87.7	86.0	83.8	88.5	89.5	89.5	85.5
7.5	88.1	88.7	87.2	85.3	89.5	89.5	89.5	88.5
11	89.4	89.8	88.7	86.9	90.2	91.0	90.2	88.5
15	90.3	90.6	89.7	88.0	90.2	91.0	90.2	89.5
18.5	90.9	91.2	90.4	88.6	91.0	92.4	91.7	89.5
22	91.3	91.6	90.9	89.1	91.0	92.4	91.7	91.0
30	92.0	92.3	91.7	89.8	91.7	93.0	93.0	91.0
37	92.5	92.7	92.2	90.3	92.4	93.0	93.0	91.7
45	92.9	93.1	92.7	90.7	93.0	93.6	93.6	91.7
55	93.2	93.5	93.1	91.0	93.0	94.1	93.6	93.0
75	93.8	94.0	93.7	91.6	93.6	94.5	94.1	93.0
90	94.1	94.2	94.0	91.9	94.5	94.5	94.1	93.6
110	94.3	94.5	94.3	92.3	94.5	95.0	95.0	93.6
132	94.6	94.7	94.6	92.6	95.0	95.0	95.0	93.6
160	94.8	94.9	94.8	93.0	95.0	95.0	95.0	93.6
185	95.0	95.1	94.9	93.3	95.4	95.0	95.0	93.6

Source: Greenhouse and Energy Minimum Standards (Three Phase Cage Induction Motors) Determination 2019

Table 2-4: High Efficiency Requirements for Three Phase Cage Induction Motors in Australia

Rated output power (kW)	50 Hz motors Minimum efficiency (%)				60 Hz motors Minimum efficiency (%)			
	2-pole	4-pole	6-pole	8-pole	2-pole	4-pole	6-pole	8-pole
0.73	80.7	82.5	78.9	75.0	77.0	83.5	82.5	75.5
0.75	80.7	82.5	78.9	75.0	77.0	83.5	82.5	75.5
1.1	82.7	84.1	81.0	77.7	84.0	86.5	87.5	78.5
1.5	84.2	85.3	82.5	79.7	85.5	86.5	88.5	84.0
2.2	85.9	86.7	84.3	81.9	86.5	89.5	89.5	85.5
3	87.1	87.7	85.6	83.5	88.5	89.5	89.5	86.5
4	88.1	88.6	86.8	84.8	88.5	89.5	89.5	86.5
5.5	89.2	89.6	88.0	86.2	89.5	91.7	91.0	86.5
7.5	90.1	90.4	89.1	87.3	90.2	91.7	91.0	89.5
11	91.2	91.4	90.3	88.6	91.0	92.4	91.7	89.5
15	91.9	92.1	91.2	89.6	91.0	93.0	91.7	90.2
18.5	92.4	92.6	91.7	90.1	91.7	93.6	93.0	90.2
22	92.7	93.0	92.2	90.6	91.7	93.6	93.0	91.7
30	93.3	93.6	92.9	91.3	92.4	94.1	94.1	91.7
37	93.7	93.9	93.3	91.8	93.0	94.5	94.1	92.4
45	94.0	94.2	93.7	92.2	93.6	95.0	94.5	92.4
55	94.3	94.6	94.1	92.5	93.6	95.4	94.5	93.6
75	94.7	95.0	94.6	93.1	94.1	95.4	95.0	93.6
90	95.0	95.2	94.9	93.4	95.0	95.4	95.0	94.1
110	95.2	95.4	95.1	93.7	95.0	95.8	95.8	94.1
132	95.4	95.6	95.4	94.0	95.4	96.2	95.8	94.5
160	95.6	95.8	95.6	94.3	95.4	96.2	95.8	94.5
185	95.7	95.9	95.7	94.5	95.8	96.2	95.8	95.0

Source: Greenhouse and Energy Minimum Standards (Three Phase Cage Induction Motors) Determination 2019

2.2.3 Labeling and Other Supporting Policies

2.2.3.1 Labeling

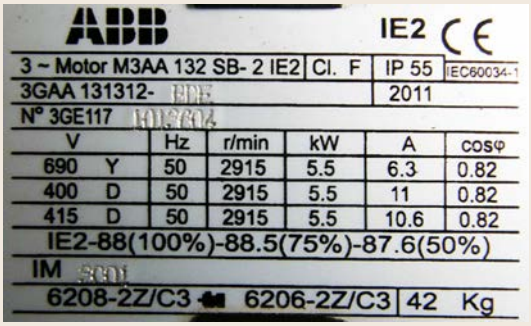
The GEMS Determination 2019 does not specify requirement for the Australian Energy Rating Label for three phase cage induction motors. However, the Determination specifies that motors shall meet the requirements mentioned in clause 10 of IEC 60034-1 whereby every motor shall be provided with a rating plate. Box 3 briefly describes information to be included on the rating plate.

Box 3: Rating Plates Requirements – IEC 60034-1

Clause 10 of IEC 60034-1 (Rating plates) specifies that every electrical machine shall be provided with a rating plate(s). The plates shall be made of durable material and be securely mounted. The rating plate(s) shall preferably be mounted on the frame of the machine and be located so as to be easily legible in the position of use determined by the type of construction and mounting arrangement of the machine. If the electrical machine is so enclosed or incorporated in the equipment that its rating plate is not easily legible, the manufacturer shall, on request, supply a

second plate to be mounted on the equipment.

IEC 60034-1 provides references for information required on the rating plates, including but not limited to: manufacturer's name or mark, serial number or identification mark, year of manufacture, number of phases, degree of protection, thermal class, rated or range of rated output, voltage, frequency, current, and speed. For motors within the scope of IEC 60034-30, information on the efficiency class (IE code) and the rated efficiency as specified in IEC 60034-30.c



2.2.3.2 Other Supporting Policies

In addition to rating nameplate requirements, educational and training activities related to energy efficient electric motors are undertaken by the Equipment Energy Efficiency (E3) program[1], and a range of activities to support consumers in purchasing energy efficient appliances has been carried out, including engagement with retailers and traders who have the direct interaction with consumers. Information and resources on education and training are available on the energy rating website: http://www.energyrating.gov.au/.

Australia is also committed to assisting neighboring economies in transitioning to more energy efficient appliances and lighting technologies. Australia's engagement internationally on appliance energy efficiency is undertaken by the Commonwealth Department of Industry, Science, Energy and Resources. Australia engages with the international community by forming agreements with various nations and currently has partnerships with the various organizations, in relation to appliance energy efficiency, including the Asia-Pacific Economic Cooperation (APEC) Expert Group on Energy Efficiency and Conservation.

2.2.4 Monitoring, Verification and Enforcement

[1] The Equipment Energy Efficiency (E3) program is a cross jurisdictional program through which the Australian Government, states and territories and the New Zealand Government collaborate to deliver a single, integrated program on energy efficiency standards and energy labelling for equipment and appliances. It is one of a number of programs implemented by the Council of Australian Governments (COAG) Energy Council, and the GEMS Act is the underpinning legislation for the program.

2.2.4.1 MVE Framework

GEMS compliance activities are focused around the following framework:

Source: www.energyrating.gov.au/suppliers/compliance

Figure 2-1: Compliance Process for Products Regulated for Energy Efficiency in Australia

The GEMS Regulator, who is responsible for monitoring and enforcing compliance with the GEMS Act, is assisted by GEMS inspectors who use inspection, monitoring and investigation powers provided by the Act.

GEMS inspectors may enter public areas of premises used in connection with the supply of motors covered by the GEMS Determination 2019 to ensure registration and labelling compliance.

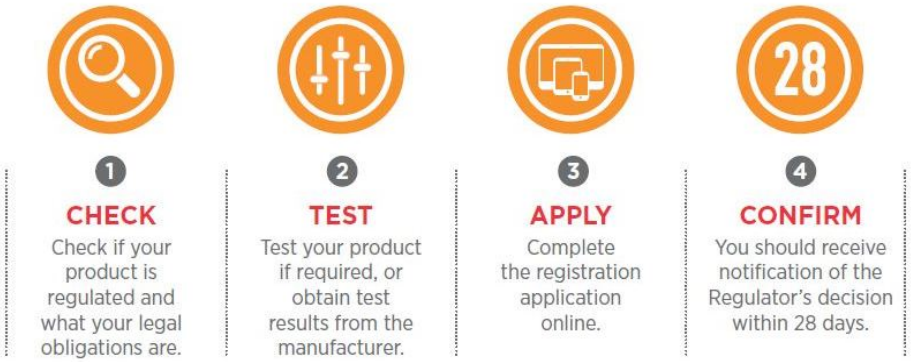
GEMS inspectors also manage a check testing program to ensure models of motors meet the determination's GEMS level requirements, often referred to as minimum energy performance standards or MEPS, and the energy efficiency claims of manufacturers and suppliers.

The GEMS Regulator also receives allegations of suspected non-compliance from a variety of sources. All allegations are assessed, and where appropriate, investigated.

The GEMS Act provides the GEMS Regulator with educative, administrative, civil, and criminal enforcement response options. Each response considers an entity's history, behaviour, motivation, and intention; and, is proportionate to the risk posed by the non-compliance.

2.2.4.2 Conformity Assessment Mechanism

All models of three phase cage induction motors under the scope of GEMS Determination 2019 must be registered on the registration system maintained by the GEMS Regulator. The conformity assessment takes place during the registration process as shown in the figure below.



Source: www.energyrating.gov.au/suppliers/registration

Figure 2-2: Registration Process for Products Regulated for Energy Efficiency in Australia

A motor test report shall demonstrate whether the specific motor model meets the MEPS requirements. The test report may show the results of testing conducted by or for the applicant, or be provided by the manufacturer of the motor.

The GEMS Determination 2019 recognizes a family of motor models which refers to several models from the same product class that all share particular characteristics as defined below. This allows the models rely on a single test report, and to be registered under a single registration in the registration system.

- Have the same brand;
- Have the same frame size;
- Have the same number of poles;
- Have the same duty type; and
- Have the same rated output power;

It should be noted that a family registration can contain no more than 10 models.

2.2.5 Financial Mechanisms

There is no financial mechanism available to promote energy efficient electric motors in Australia.

2.3 BRUNEI DARUSSALAM

Brunei Darussalam has not yet started energy efficiency activities on energy efficient motors. However Energy Efficiency and Conservation in Brunei Darussalam are the responsibility of the Energy Department, Prime Minister's Office (EDPMO) which is under the purview of the Minister of Energy at the Prime Minister's Office. Under EDPMO, the relevant entities for Energy Efficiency and Conservation policy planning and implementation are: the Energy Efficiency & Conservation (EEC) Unit; and the National Energy Efficiency & Conservation Committee (NEECC.) The Department of Electrical Services (DES), under the Prime Minister's Office, is mandated as a regulator and service

provider in the areas of generation, transmission and distribution, as well as use of electricity in Brunei Darussalam.

Eight key EEC policy options were identified for Brunei Darussalam, namely appliance standards, labeling, building regulation, energy management, fuel economy regulation, electricity tariff reform, financial incentives and awareness-raising. EDPMO in collaboration with the Brunei National Energy Research Institute (BNERI) is currently developing a national standard and labeling regulation for priority electrical appliances which include air conditioners, chillers and lamps. Equipment energy efficiency is also identified as key measures in the energy efficiency roadmap for the industrial sector.

2.4 CAMBODIA

The Ministry of Mines and Energy (MME) is responsible for energy efficiency and other energy related issues in Cambodia. The National EE Policy Strategy and Action Plan (EEPSAP) – developed by MME with support from the Ministry of Economy and Finance (MEF), the Ministry of Industry and Handicraft (MIH), the Ministry of Commerce (MOC) and the Ministry of Environment (MOE) – was submitted to the Council of Ministers for approval (MME, 2018). EEPSAP has five priority implementation areas: 1) Energy efficiency in industry; 2) Energy efficiency of end-user products; 3) Energy efficiency in buildings; 4) Energy Efficiency of rural electricity generation and distribution; and 5) Efficient use of biomass resources for residential and industrial purposes (MME, Cambodia, 2015).

EEPSAP has goals to: 1) reduce the future National energy demand by 20% by 2035, compared with business as usual projections; 2) reduce National CO_2 emissions in 2035 by 3 million tons of CO_2; 3) implement activities to promote EE&C, such as: ASEAN-Japan Energy Efficiency Partnership (AJEEP) program and a series of workshops under AJEEP; 4) implement strategy on S&L, such as: develop regulation framework, market database, testing lab, capacity building and EE&C Law for S&L; 5) establish institutional framework which consists of National Steering Committee, Technical Review Committee and Taskforce Working Group from all stakeholders; and 6) Develop 3-Year Action Plan on S&L and the process flow to develop EE&C Law.

Cambodia has not yet started MEPS and Labeling programs for electrical appliances and equipment. EEPSAP aims to develop a legal platform for Cambodia to implement mandatory energy efficiency (EE) programs, therefore, until EEPSAP gets approved, Cambodia is unlikely to initiate implementation of any mandatory MEPS and labeling programs. However, Cambodia has recognized benefits of EE, and MME has participated in various regional initiatives which help building capacity for design and implementation of EE as well as MEPS and labeling in Cambodia. Relevant stakeholders involved in development and implementation of MEPS and labeling program are shown in Table 2-5.

Table 2-5: MEPS and Labeling Stakeholders in Cambodia

Organizations	Roles and responsibilities
Ministry of Mines and Energy (MME)	Focal government agency responsible for energy efficiency and other energy related services in

Organizations	Roles and responsibilities
	Cambodia.
Electricité Du Cambodge (EDC)	Main power utility in Cambodia, responsible for generation, transmission and distribution (including system operation)
Electricity Authority of Cambodia (EAC)	The power sector regulator and responsible for granting licenses, approving and enforcing performance standards, and determining tariffs, rates and charges for electricity
Ministry of Environment (MOE)	Key agency responsible for environmental protection and natural resource conservation, including the area of climate change with support from the United Nations Framework Convention on Climate Change (UNFCCC)
General Department of Customs and Excise of Cambodia, Ministry of Economy and Finance	Manage, control of imported and exported goods and facilitate international trade
Institute of Standards of Cambodia (ISC) under Ministry of Industry and Handicraft	National standard body under the ministry of Industry and Handicraft. ISC is responsible for the Cambodia standards for products, commodities, materials, services, practices and operations, and promote general adoption of such standards.
Institute of Technology of Cambodia (ITC)	Development the technology transfer and innovative approaches to share among ministries, authorities, NGOs, private sectors and related institutions.
National Institute of Statistic (NIS) under Ministry of Planning	Focal point of statistical data in Cambodia

2.5 CANADA

2.5.1 Institutional Framework

In 1992, Parliament passed Canada's Energy Efficiency Act (the Act) and amended it in 2009[2]. The Act provides for the making and enforcement of regulations requiring energy-using products that are imported or shipped interprovincially for the purpose of sale or lease to meet minimum energy

[2] The last amendments came into force on December 14, 2017.

performance standards (MEPS), for product labeling, and for the promotion of energy efficiency and alternative energy use, including the collection of data and statistics on energy use.

The Energy Efficiency Regulations (the Regulations) were introduced in 1995 as a means to reduce greenhouse gas (GHG) emissions in Canada. They prescribe MEPS for certain consumer and commercial energy-using products. They also prescribe labeling requirements for certain products to disclose and compare the energy use of a given product model relative to others in their category. The current Energy Efficiency Regulations, 2016, was published in the Canada Gazette in April 2016. The Regulations have been amended regularly to introduce MEPS for new products and to update existing MEPS.

The Amendment 14 to the Energy Efficiency Regulations, 2016, published in October 2018, removes import-reporting requirements for electric motors when they are imported as a component of another end-use product on November 1, 2018, and adds import reporting requirements for small electric motors on April 30, 2019. The Acts and Regulations) are administered by Natural Resources Canada (NRCan) with assistance from the Canada Border Services Agency (CBSA), and the Canada Border Services Agency Act and the Customs Act are considered relevant to implementation of energy efficiency regulations for electric motors in Canada.

The Standards Council of Canada (SCC) is a federal Crown corporation responsible for promoting standardization in Canada. SCC leads and facilitates the development and use of national and international standards and accreditation services. SCC is Canada's member body to ISO and IEC and represent Canada's voice on standards-related matters at an international level, and acts as Canada's national accreditation body. SCC accredits conformity assessment bodies, such as testing laboratories and product certification bodies, to internationally recognized standards. The Canadian Standards Association (CSA) is accredited by SCC as a standards development organization. It is also accredited as a certification body. CSA is a non-profit membership association serving industry, government, consumers and other interested parties in Canada and other economies.

2.5.2 Test Standards and MEPS

Electric motors prescribed as energy-using products and regulated in Canada under the Act and Regulations 2016 include three-phase induction motors with a nominal output power of not less than 0.75 kW (1 horsepower) and not more than 375 kW (500 horsepower), and small motors with a nominal output power of not less than 0.18 kW (0.25 horsepower) and not more than 2.2 kW (3 horsepower). The requirements in the Regulations 2016 are summarized in Table 2-6.

Table 2-6: Scope of Regulated Electric Motors in Canada

Requirement	Three-Phase Induction Motor	Small Motor
Output	Nominal output power of not less than 0.75 kW (1 horsepower) and not more than 375 kW (500 horsepower)	Nominal output power of not less than 0.18 kW (0.25 horsepower) and not more than 2.2 kW (3 horsepower)
Frame size	• A NEMA design A, B or C with a	A NEMA design with a two-digit frame

Requirement	Three-Phase Induction Motor	Small Motor
	three- or four-digit NEMA frame number • An enclosed NEMA design A, B or C with a NEMA frame number of 56 • An IEC design N or H with an IEC frame number of 80 or above	number or an IEC design with a frame number of 63 or 71
Other Designs	• Having a cage or squirrel-cage design • Rated for continuous duty or S1 operation • Designed to operate at a single speed • Having a two-, four-, six- or eight-pole construction • Having an open or enclosed construction • Having an IP code from 00 to 67	• Having a two-, four- or six-pole construction • One of the following types, namely, capacitor-start capacitor-run, capacitor-start induction-run or polyphase • Having an open construction • Rated for continuous duty or S1 operation • Designed to operate at a single speed • Designed as a general purpose motor
Electrical	• Having a nominal voltage of not more than 600 V AC • Having a nominal frequency of 50 Hz, 50/60 Hz or 60 Hz	• Having a nominal frequency of 50/60 Hz or 60 Hz • Operating with alternating current
Exclusion	• Air-over motor (a motor that is cooled by air that is forced over the motor by a fan or blower that is not an integral part of the motor). • A liquid-cooled motor • An inverter-only motor • A motor that is designed to operate continuously only while immersed.	• It does not include a split-phase motor, shaded pole motor or permanent split-capacitor motor.

Energy performance of regulated electric motors shall be tested in accordance with CSA C390-10[3] or IEEE 112-2004[4]. An electric motor complies with the energy efficiency standard if it meets the standard when tested at 100% of its nominal full load. Testing standards and energy efficiency standards (MEPS), for different groups of electric motors are shown in the table below.

[3] CSA C390-10 - Test methods, marking requirements, and energy efficiency levels for three-phase induction motors

[4] IEEE 112-2004 - Standard Test Procedure for Polyphase Induction Motors and Generators

Table 2-7: Testing Standards and MEPS for Regulated Electric Motors in Canada

Category	Testing Standard	Energy Efficiency Standard (MEPS)	Period of Manufacture
Electric motors that are fire-pump motors	CSA C390-10	CSA C390-10, Table 2	On or after February 3, 1995
Electric motors that are medical-imaging motors	CSA C390-10 or IEEE 112-2004	NEMA MG-1, Table 12-12	On or after June 1, 2017
Electric motors that are part of an integral gear assembly;	CSA C390-10	CSA C390-10, Table 2	On or after November 27, 1999 and before June 1, 2016
Electric motors that are close-coupled pump motors	CSA C390-10	CSA C390-10, Table 2	On or after January 1, 2011 and before June 1, 2016
Electric motors that are vertically-mounted solid shaft normal thrust motors	CSA C390-10	CSA C390-10, Table 2	On or after January 1, 2011 and before June 1, 2016
Electric motors that **(a) have an eight-pole construction;** **(b) have NEMA U frame dimensions;** **(c) are a NEMA design C or an IEC design H;** **(d) have a nominal output power of more than 150 kW (200 HP) and are a NEMA design B or an IEC design N; or** **(e) are footless.**	CSA C390-10	CSA C390-10, Table 2	On or after January 1, 2011 and before June 1, 2016
Electric motors other than motors described in items 1 to 6	CSA C390-10	CSA C390-10, Table 3	On or after February 3, 1995 and before June 1, 2016
Electric motors other than fire-pump motors or medical-imaging motors	CSA C390-10 or IEEE 112-2004	NEMA MG-1, Table 12-12	On or after June 1, 2016

Category	Testing Standard	Energy Efficiency Standard (MEPS)	Period of Manufacture
Small motors - polyphase and has a nominal output power ≥ 0.18 kW (0.25 horsepower) but ≤ 0.75 kW (1 horsepower)	CSA C747-09[5] or IEEE 112-2004, Test Method A	Paragraph (b) of 10 C.F.R. §431.446[6]	
Small motors - polyphase and has a nominal output power > 0.75 kW (1 horsepower) but ≤ 2.2 kW (3 horsepower)	CSA C390-10 or IEEE 112-2004, Test Method B	Paragraph (b) of 10 C.F.R. §431.446	
Small motors - capacitor-start capacitor-run or capacitor-start induction-run	CSA C747-09 or IEEE 114-2010[7]	Paragraph (b) of 10 C.F.R. §431.446	

Table 2-8 summarizes MEPS levels for small motors.

Table 2-8: Minimum Efficiency Levels for Small Motors in Canada

Output (Horsepower/kW)	Average full load efficiency		
	6 Pole	4 Pole	2 Pole
Polyphase Motor			
0.25/0.18	67.5	69.5	65.6
0.33/0.25	71.4	73.4	69.5
0.5/0.37	75.3	78.2	73.4
0.75/0.55	81.7	81.1	76.8
1/0.75	82.5	83.5	77.0
1.5/1.1	83.8	86.5	84.0
2/1.5	N/A	86.5	85.5
3/2.2	N/A	86.9	85.5
Capacitor-start capacitor-run and capacitor-start induction-run			

[5] CSA C747-09 - Energy efficiency test methods for small motors

[6] The United States Code of Federal Regulations, as amended from time to time. (10 C.F.R. §431.446)

[7] IEEE 114-2010 - IEEE Standard Test Procedure for Single-Phase Induction Motors

0.25/0.18	62.2	68.5	66.6
0.33/0.25	66.6	72.4	70.5
0.5/0.37	76.2	76.2	72.4
0.75/0.55	80.2	81.8	76.2
1/0.75	81.1	82.6	80.4
1.5/1.1	N/A	83.8	81.5
2/1.5	N/A	84.5	82.9
3/2.2	N/A	N/A	84.1

Source: www.law.cornell.edu/cfr/text/10/431.446

2.5.3 Labeling and Other Supporting Policies

2.5.3.1 Labeling

The Act and Regulations do not require dealers to attach an energy label to electric motors. However, electric motors, classified as regulated energy-using products, must bear an energy efficiency verification mark from a certification body accredited for energy efficiency verification/certification by the Standards Council of Canada. An energy efficiency verification mark indicates that the energy performance of the product has been verified. It is not a safety certification mark. Under some provincial laws, a province can issue a provincial label that indicates that the product meets the provincial energy efficiency levels. NRCan accepts provincial labels as verification marks if the provincial energy efficiency standards are equivalent to, or exceed, the federal standards.

Source: www.mgmelectricmotors.com/documentation/mgm-quality/

Figure 2-3: Sample of "cCSAus Energy Verified" mark from CSA

2.5.3.2 Other Supporting Policies

NRCan has implemented several supporting policies for industrial energy efficiency:

- **Canadian Industry Partnership for Energy Conservation (CIPEC)** - CIPEC is an award-winning partnership between the Government of Canada and Canadian industry. CIPEC promotes

innovative energy management to help Canadian industry increase profitability, competitiveness and sustainability

- **Financial assistance for industrial energy management projects** - Financial assistance is available to help fund industrial facility's energy management project. NRCan will provide financial assistance of up to 50% of eligible costs, to a maximum of $40,000. This financial assistance can be combined with other funding sources. However purchase and installation of equipment and systems (with the exception of the purchase of instrumentation software and metering equipment for EMIS) are not eligible.
- **Energy management for industry** - This includes conducting energy audits, implementing energy-management information systems, implementing ISO 50001 Energy Management Systems Standard, supporting energy performance benchmarking and implementing energy best practices, and supporting employee awareness of energy efficiency.

The above mentioned supporting policies do not directly promote energy efficient motor.

2.5.4 Monitoring, Verification and Enforcement

2.5.4.1 MVE Framework

According to the Act, the Minister may designate an inspector to ensure compliance with the Act and regulations. The inspector may enter any place to: examine any energy-using product, or any other thing relevant to the administration of the Act; examine and make copies of any document or record; and conduct any tests or take any measurements. The inspector may also seize and detain any energy-using product. Non-compliance with the energy efficiency standards and labeling requirements is subject to a fine up to two hundred thousand Canadian dollars depending on its seriousness. The Minister may dispose of or destroy a non-compliant energy-using product, and the costs of the disposal or destruction shall be paid by the importer of the product.

2.5.4.2 Conformity Assessment Mechanism

Before importing, or shipping an energy-using product between provinces, a dealer must file an energy efficiency report with NRCan using the most recent version of the energy efficiency reporting template. The Regulations 2016 specifies that the following information must be provided to the Minister with respect to an electric motor:

Table 2-9: Energy Efficiency Report for Regulated Electric Motors in Canada

Energy-Using Product	Energy Efficiency Report
Electric Motors	• Nominal output power, expressed in kilowatts (horsepower) • Number of poles

Energy-Using Product	Energy Efficiency Report
	• Construction — namely, open construction or enclosed construction • Nominal efficiency value • NEMA or IEC design of motor • Motor configuration, namely, fire-pump motor, medical-imaging motor or another configuration
Small Motors	• Average full load efficiency • Type, namely, capacitor-start capacitor-run, capacitor-start induction-run or polyphase • Nominal output power expressed in kilowatts (horsepower) and the number of poles.

The inspector may conduct testing to verify compliance with energy efficiency standards.

2.5.5 Financial Mechanisms

There is no specific financial mechanism to promote energy efficient electric motors in Canada.

2.6 CHILE

2.6.1 Institutional Framework

Development and implementation of energy efficiency policy and programs in Chile was responsible by the National Energy Efficiency Program (Programa País de Eficiencia Energética, or PPEE), a program under the National Energy Commission (Comisión Nacional de Energía, or CNE)[8]. PPEE was later transformed to the Chilean Energy Efficiency Agency (AChEE) and then to the Energy Sustainability Agency (Agencia de Sostenibilidad Energetica - AgenciaSE) in 2018, a private non-profit foundation with a mission to promote, strengthen and consolidate the efficient and sustainable use of energy and implement public-private initiatives in the different sectors of energy consumption, contributing to the competitive and sustainable development of the economy. The Chilean technical standards body is responsible for development of national standards in Chile.

Chile has to date implemented 29 energy efficiency labels and another 7 are in process. In 2015, the Ministry of Energy published the National Energy Policy 2050 which includes a broad set of energy efficiency goals for 2035 and 2050, including: 70% of the main categories of appliances and equipment sold in the market are considered efficient by 2035, and 100% of the main categories of appliances and equipment sold in the market are efficient by 2050.

[8] Peer Review on Energy Efficiency in Chile, Final Report, April 2009

2.6.2 Test Standards and MEPS

The Minimum Energy Performance Standard (MEPS) for electric motors in Chile references the Chilean Standard No. 3086: 2008 "Energy efficiency - Three-phase electric induction motors - Classification and labeling" which is based on IEC 60034-2-1, and IE2[9] per IEC standards is the MEPS requirements for small three-phase squirrel cage induction motors with outputs up to 10 HP (0.75 to 7.5 kW).

The other basic requirements of the MEPS program for electric motors in Chile include:

- Operating at 380 Volts, among other combinations, other marked as 220/380, 400/600, 400/690 Volts;
- Nominal frequency of 50 Hz;
- Operating at rated speed;
- Having a two-, four-, or six-pole construction;
- Having a duty cycle S1 (classification according to IEC 60034-1); and
- Open or closed (> IP 21) with natural ventilation.

2.6.3 Labeling and Other Supporting Policies

Chile established the energy labeling program in 2005 and the label format is based on the European Union energy label, with A being the most efficient and G being the least efficient. For three-phase induction motors, the energy efficiency label, according to Chilean standard, is shown in the figure below.

Source: Labeling And Efficiency Of Induction Motors, IEC On Chilean Case, IEEE Latin America Transactions, Vol. 13, No. 5, May 2015

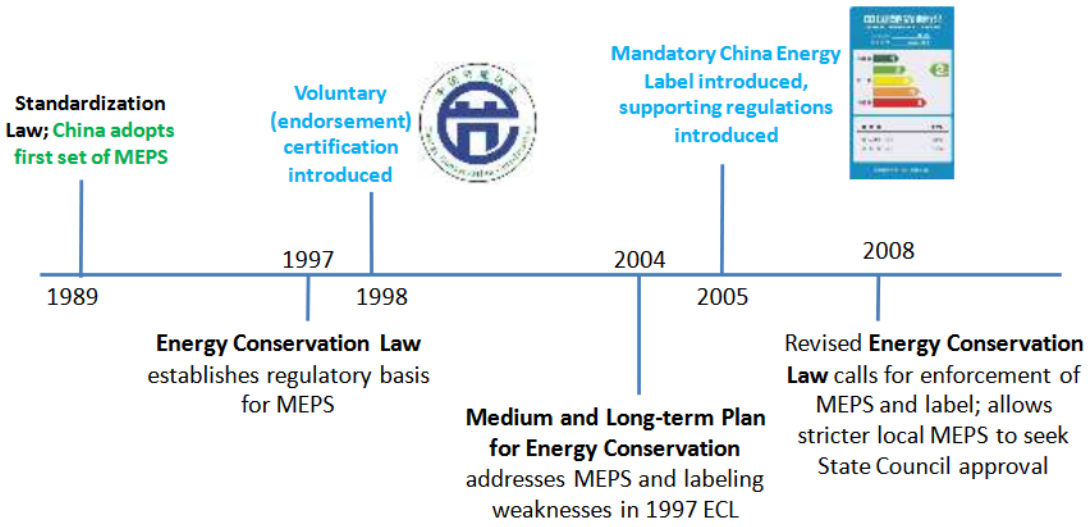
Figure 2-4: Energy Label for Three-Phase Electric Motors in Chile

[9] Overview of Retrofitting Options in Induction Motors to Improve their Efficiency and Reliability, IEEE, 2018

2.7 PEOPLE'S REPUBLIC OF CHINA

2.7.1 Institutional Framework

China introduced MEPS for appliances in 1989, however, the standards were not formally endorsed in a legal manner until the 1997 National Energy Conservation Law of China provided the regulatory basis of mandatory energy efficiency standards for energy-consuming products and equipment. A voluntary energy labeling program was later established in 1999, followed by the mandatory energy labeling program in 2005.



Source: Development and implementation of energy efficiency standards and labeling programs in China: Progress and challenges, LBNL 2013

Figure 2-5: Legislative and Regulatory Timeline of China's MEPS and Labeling Programs

The National Development and Reform Commission (NDRC) issued the Management Method for Energy Conservation Products Certification to establish the administrative framework for certifying standards and the voluntary endorsement label. The China National Institute of Standardization (CNIS) manages the China Energy Label (CEL) through the China Energy Label Center (CELC)[10], and requires manufacturers to register the products under the scope. The General Administration of Quality Supervision, Inspection and Quarantine (ASQIQ) issued legal authority for its local offices to enforce safety, efficiency and other standards.

2.7.2 Test Standards and MEPS

Electric motors were included in the MEPS program in China in 2002, and the energy performance testing standard is based on GB/T 1032: Test procedures for three-phase induction motors. The current edition, GB/T 1032-2012 is aligned with IEC 60034-2-1:2007. The energy efficiency

[10] The China Energy Label Center (CELC) was founded in May 2006 and a part of the China Standard Certification Center (CSC). CELC is in charge of all issues concerning CEL certification.

requirements for electric motors in China are based on full load efficiency, and divided into three levels, i.e., Grade 1, 2 and 3, as specified in the following standards:

- **GB 18613-2012 Minimum allowable values of energy efficiency and energy efficiency grades for small and medium three-phase asynchronous motors** – This standard is identical to IEC 60034-30. Grade 3 requirements are the MEPS requirements and directly correspond to the IE2 classification and Grade 2 to IE3. The highest efficiency Grade 1 is based on IE4. China has been planning to introduce the Grade 2 (IE3) level as MEPS for 0.75 to 375 kW but the implementation timeline has not been confirmed.

Table 2-10: Minimum Allowable Energy Efficiency Values for Motors (per GB18613-2012)

Rated power, kW	Grade 1 (= IE4)			Grade 2 (= IE3)			Grade 3 (=IE2)		
	2-pole	4-pole	6-pole	2-pole	4-pole	6-pole	2-pole	4-pole	6-pole
0.75	84.9	85.6	83.1	80.7	82.5	78.9	77.4	79.6	75.9
1.1	86.7	87.4	84.1	82.7	84.1	81.0	79.6	81.4	78.1
1.5	87.5	88.1	86.2	84.2	85.3	82.5	81.3	82.8	79.8
2.2	89.1	89.7	87.1	85.9	86.7	84.3	83.2	84.3	81.8
3	89.7	90.3	88.7	87.1	87.7	85.6	84.6	85.5	83.3
4	90.3	90.9	89.7	88.1	88.6	86.8	85.8	86.6	84.6
5.5	91.5	92.1	89.5	89.2	89.6	88.0	87.0	87.7	86.0
7.5	92.1	92.6	90.2	90.1	90.4	89.1	88.1	88.7	87.2
11	93.0	93.6	91.5	91.2	91.4	90.3	89.4	89.8	88.7
15	93.4	94.0	92.5	91.9	92.1	91.2	90.3	90.6	89.7
18.5	93.8	94.3	93.1	92.4	92.6	91.7	90.9	91.2	90.4
22	94.4	94.7	93.9	92.7	93.0	92.2	91.3	91.6	90.9
30	94.5	95.0	94.3	93.3	93.6	92.9	92.0	92.3	91.7
37	94.8	95.3	94.6	93.7	93.9	93.3	92.5	92.7	92.2
45	95.1	95.6	94.9	94.0	94.2	93.7	92.9	93.1	92.7
55	95.4	95.8	95.2	94.3	94.6	94.1	93.2	93.5	93.1
75	95.6	96.0	95.4	94.7	95.0	94.6	93.8	94.0	93.7
90	95.8	96.2	95.6	95.0	95.2	94.9	94.1	94.2	94.0
110	96.0	96.4	95.6	95.2	95.4	95.1	94.3	94.5	94.3
132	96.0	96.5	95.8	95.4	95.6	95.4	94.6	94.7	94.6
160	96.2	96.5	96.0	95.6	95.8	95.6	94.8	94.9	94.8
200	96.3	96.6	96.1	95.8	96.0	95.8	95.0	95.1	95.0
250	96.4	96.7	96.1	95.8	96.0	95.8	95.0	95.1	95.0
315	96.5	96.8	96.1	95.8	96.0	95.8	95.0	95.1	95.0
355-375	96.6	96.8	96.1	95.8	96.0	95.8	95.0	85.1	95.0

Source: Product Note, China Energy Label for low voltage motors, ABB 2017

- **GB 25958–2010 Minimum allowable values of energy efficiency and values of efficiency grade for small-power motors** - This standard is applicable to general purpose motors - small-power 3-phase asynchronous motor (10 W to 2200 W) powered by 50 Hz & 690 VAC and below voltage; capacitor running asynchronous motor (10 W to 2200 W); capacitor starting asynchronous motor (120 W to 3700 W), double-value capacitor asynchronous motor (250 W to 3000 W); and motor (6 W to 550 W) for air conditioning fan in room etc. In addition to energy efficiency requirements, low power safe area motors are subject to CCC-certification.

Table 2-11: Minimum Allowable Energy Efficiency Values for Low Power Motors (per GB25958-2010)

Rated power, W	Grade 1 (= IE4)			Grade 2 (= IE3)			Grade 3 (=IE2)		
	2-pole	4-pole	6-pole	2-pole	4-pole	6-pole	2-pole	4-pole	6-pole
10	-	35.0	-	-	31.4	-	-	28.0	-
16	54.1	39.4	-	50.1	35.6	-	46.0	32.0	-
25	60.0	50.1	-	56.0	46.0	-	52.0	42.0	-
40	62.8	58.1	-	59.0	54.1	-	56.0	50.0	-
50	67.5	63.8	-	63.8	60.0	-	60.0	56.0	-
90	69.3	65.7	-	65.7	61.9	-	62.0	58.0	-
120	73.8	67.5	-	70.5	63.8	-	67.0	60.0	-
180	75.5	71.1	66.6	72.4	67.7	62.9	69.0	62.0	59.0
250	78.1	73.8	70.2	75.2	70.5	66.7	72.0	67.0	63.0
370	79.3	75.9	74.6	76.5	72.8	71.4	73.5	69.5	68.0
550	81.0	79.3	77.2	78.4	76.5	74.2	75.5	73.5	71.0
750	-	-	-	-	-	-	77.4	79.5	75.9
1 100	-	-	-	-	-	-	79.6	81.4	78.1
1 500	-	-	-	-	-	-	81.3	82.8	79.8
2 200	-	-	-	-	-	-	83.2	84.3	81.8

Source: Product Note, China Energy Label for low voltage motors, ABB 2017

2.7.3 Labeling and Other Supporting Policies

The CEL Scheme has been mandatory since 2008. In 2012, the CEL scheme was revised, and all low voltage motors manufactured or imported to China must be certified and registered by the Label office and provided with an energy label confirming that they meet the energy efficiency levels (Grades) as defined in GB 18613-2012. The latest design of CEL launched in 2016 is shown in Figure 2-6.

Source: Product Note, China Energy Label for low voltage motors, ABB 2017

Figure 2-6: China Energy Labels for Low Voltage Electric Motors

The following motors are not included in the labeling program for electric motors in China: marine, brake motors, motors completely integrated into a machine, conical rotor motors for electric hoist and construction machinery, motors with electro-magnetic braking inside, and motors with a duty type other than S1 or S3 with a rated cyclic duration factor of 80%.

2.7.4 Monitoring, Verification and Enforcement

In China, AQSIQ, NDRC and local quality supervision and inspection bureaus are responsible for market surveillance which will be performed local governments in a non-regular time frame. Products are inspected and reported when non-compliance to applicable standards is identified. However past market surveillance efforts have been limited due to budget constraints and a focus on product safety, with very low penalties for non-compliance and lack of national guidance or requirements for market surveillance. This has resulted in inconsistent national product inspections and testing[11].

2.7.5 Financial Mechanisms

In 2009, China launched a large national financial subsidy program, the China Energy Savings program, aiming at providing financial subsidy to cover the price difference between high and low efficiency products. The goal is to encourage product manufacturers to promote highly energy efficient products and convince consumers of their acquisition. The first product group involved in the incentive program was room air conditioners (not including variable speed products). Electric motors and energy efficient cars were included in the program since 2010. Subsidies of between ten and twenty-five percent of the product cost will be given directly to motor manufacturers.

2.8 Hong Kong, China

2.8.1 Institutional Framework

Promotion of energy efficiency and conservation in Hong Kong, China is responsible by the Energy Efficiency Office (EEO), established in 1994 within the Electrical and Mechanical Services Department (EMSD). EEO develops and operates multiple energy efficiency programs, including the Energy Efficiency Labeling Scheme (EELS) which issued the first energy label for refrigerators/freezers in 1995. The energy labeling scheme was later extended to cover office equipment in 2001 and passenger cars in 2002.

EELS was later categorized into the Mandatory Energy Efficiency Labeling Scheme (MEELS) and Voluntary Energy Efficiency Labeling Scheme (VEELS). MEELS was introduced in 2009, through the Energy Efficiency (Labeling of Products) Ordinance, Cap. 598, and MEELS currently covers eight types of products, namely room air conditioners, refrigerating appliances, compact fluorescent lamps (CFLs), washing machines, dehumidifiers, televisions, storage type electric water heaters and

[11] Lessons learned from international energy labelling programs for strengthening the China Energy Label program, Nan Zhou & Nina Zheng Khanna, LBNL, ECEEE 2017 Summer Study

induction cookers. The VEELS scheme now covers 22 types of household electrical/gas appliances and office equipment, including 13 electrical appliances, 7 office equipment, and 2 gas appliances. Electric motors are not included in the VEELS and MEELS schemes.

2.8.2 Labeling and Other Supporting Policies

EEO issued the Guidelines on Energy Efficiency of Electrical Installations as a supplement to the Code of Practice for Energy Efficiency of Electrical Installations. The guidelines focus on recommended practices for energy efficiency and conservation on the design, operation and maintenance of electrical installation in buildings, and minimum full-load efficiency values tested in accordance with IEEE 112-1991 or IEC 34-2 were recommended for induction motors with output power of 5 kW or greater and annual operating hours more than 1,000 hours, as shown in the table below.

Table 2-12: Minimum Acceptable Nominal Full-Load Motor Efficiency for Single-Speed Polyphase Motors

Motor Rated Output (P)	Minimum Rated Efficiency (%)
5 kW ≤ P < 7.5 kW	84.0%
7.5 kW ≤ P < 15 kW	85.5%
15 kW ≤ P < 37 kW	88.5%
37 kW ≤ P < 75 kW	90.0%
75 kW ≤ P < 90 kW	91.5%
P ≥ 90 kW	92.0%

Source: Guidelines on Energy Efficiency of Electrical Installations, 1999 Edition, Electrical and Mechanical Services Department, the Government of the Hong Kong Special Administrative Region

2.8.3 Monitoring, Verification and Enforcement

For the MEELS scheme, EMSD regularly selects samples of listed models for compliance monitoring testing on energy performance by independent accredited laboratories to check that the products conform with the energy efficiency information submitted to EMSD. If a listed model is found not conforming with the information submitted to EMSD, its reference number will be removed from the record of listed models and the model will not be allowed to be supplied in Hong Kong, China.

2.9 INDONESIA

Law No. 30 of the Year 2007 (the Energy Law) calls for a new institutional framework in energy policy making. The Law mandates creation of the National Energy Council (Dewan Energi Nasional - DEN) to establish the National Energy Policy (Kebijakan Energi Nasional - KEN). The Energy Law also mandates the Government to establish a National Energy Master Plan (Rencana Umum Energi Nasional - RUEN) based on the National Energy Policy, and with endorsement of the National Energy Council. The National Energy Master Plan is by Law the basis for the National Energy Conservation Master Plan (Rencana Induk Konservasi Energi Nasional - RIKEN).

The Ministry of Energy and Mineral Resources (MEMR) through the Directorate General of New Renewable Energy and Energy Conservation (DGNREEC), established in 2010, is the main government agency responsible for energy conservation in Indonesia. The Directorate of Energy Conservation is one of the five Directorates under DGNREEC, and responsible for implementation of energy efficiency and conservation regulations and programs, including MEPS and energy labeling, and other government provisions on incentives and disincentives as mandated by Law.

MEMR initiated an energy labeling scheme in 1999 for refrigerators, however the program was later discontinued and replaced by a revised scheme which is currently mandatory for CFLs and air conditioners (comparative label shown in Figure 2-7). The energy labeling program is defined in RIKEN, and the Ministerial Regulation No.18/2014 on EE Label for CFLs has allowed for implementation of mandatory energy labeling for CFLs through Self Declaration of Conformity (SDOC). While the Ministerial Regulation No.57/2017 has enabled implementation of mandatory energy labeling for air conditioners through the SDOC mechanism. Besides DGNREEC, the National Standardization Agency (BSN) is responsible for standards development, while the Ministry of Trade carries out monitoring of compliance in the market.

Figure 2-7: Energy Label Design for CFLs and Air Conditioners in Indonesia

Currently, there is no MEPS and labeling program for electric motors in Indonesia. However, DGNREEC has listed electric motors as the target products for MEPS and labeling. Current Indonesia's standards related to motor energy efficiency include:

- SNI IEC 60034-1:2013 Rotating electrical machines - Part 1: Rating and performance
- SNI IEC 60034-2-1:2013 Rotating electrical machines - Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)

- SNI IEC 60034-30-1:2016 Rotating electrical machines - Part 30-1: Efficiency classes of line operated AC motors (IE code)
- SNI IEC/TS 60034-31:2016 Rotating electrical machines - Part 31 : Selection of energy - efficient motors including variable speed application - Application guide

According to the feasibility study report on regional energy standards and labeling harmonization for electric motors published by the Barrier Removal to the Cost-Effective Development and Implementation of Energy Efficiency Standards and Labeling Project (BRESL)[12], there are 4 laboratories capable of conducting test of electric motor efficiency, namely, LMK, B4T, Sucofindo and BTMP-BPPT. LMK is a laboratory owned by Indonesian Electric Supply Company (Perusahaan Listrik Negara – PLN). Sucofindo is a laboratory which under cooperation with UI and ITB. B4T a laboratory under the Ministry of Industry, and BTMP-BPPT is a laboratory under the Technology Application and Research Agency. BTMP-BPPT laboratory is the biggest laboratory with capacity to conduct energy performance testing for electric motors up to 400 kW.

2.10 JAPAN

2.10.1 Institutional Framework

Japan implements energy efficiency policies through regulation and economic incentives, such as subsidies and tax cut for installing efficient equipment. The Energy Conservation Law, enacted in 1979, is the basis of energy efficiency and conservation regulations in Japan. It requires improving the energy efficiency of industry, transport and buildings (residential and commercial). The Energy Conservation Law has regulations targeting all the main sectors (industry, buildings, and transport sectors), including: regular reports on energy efficiency and efforts for energy intensity improvement for factories and business establishments; Top Runner Program (efficiency standard) for automobiles and residential electric appliances; regular reports on energy efficiency implementation for specified-scale cargo owners and carriers.

The Ministry of Economy, Trade and Industry (METI) is responsible for designing the energy policy of the economy. Within METI, the Agency for Natural Resources and Energy (ANRE) is in charge of securing stable supply of energy, promoting efficient energy use, and regulating electricity and other energy industries. The Energy Conservation and Renewable Energy Department in the ANRE covers energy efficiency and conservation policies. In addition to ANRE, the Energy Conservation Centre, Japan (ECCJ) is in charge of implementing examination and training for qualified energy managers. The ECCJ is also involved in a number of energy efficiency activities, including energy audit/consultation, capacity building and information provision.

2.10.2 Test Standards and MEPS

[12] BRESL is a regional project funded by UNDP-GEF, aiming at rapidly accelerating the adoption and implementation of energy standards and labels (ES&L) in Asia, and in so doing bring about energy savings from the use of energy efficient appliances/equipment. The project also facilitates harmonization of test procedures, standards and labels among developing economies in Asia, when appropriate, starting with the six economies, Bangladesh, China, Indonesia, Pakistan, Thailand and Vietnam as BRESL Participating Economies

Energy efficient electric motors in Japan are promoted through the "Top Runner Program", which was introduced in 1999 to establish energy efficiency standards for machinery, equipment, and other items. As of 2015, 31 product items have been included in the Top Runner Program. Japan decided to align its national JIS with IEC, and key testing and energy performance standards for electric motors in Japan include:

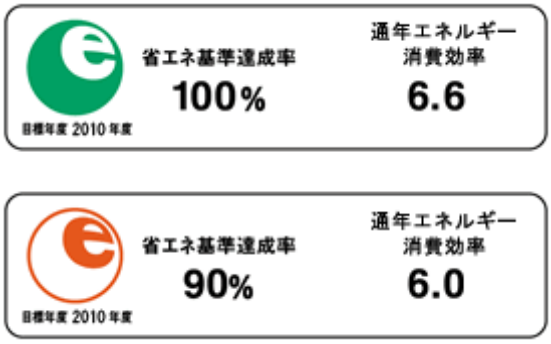
- JIS C 4034-2-1, "Rotating electrical machines - Part 2-1: Methods for determining losses and efficiency from tests of single-speed, three-phase, cage-induction motors"
- JIS C 4034-30, "Rotating electrical machines – Part 30: Efficiency classes of single-speed, three-phase, cage-induction motors (IE code)"

The program scope basically covers single speed three-phase cage-induction motors with rated voltage of 1,000 V or less, rated output from 0.75 kW to 375 kW, and 2, 4, or 6 poles. Other program requirements are similar to IEC standards. The target energy efficiency standard values for 50 Hz electric motors in Japan are aligned with the IE3 levels of IEC 60034-30.

2.10.3 Labeling and Other Supporting Policies

2.10.3.1 Labeling

The Japanese energy saving labelling program was established in 2000, and, as of March 2015, the program has covered 21 product items including three-phase induction motors. Participation in the energy saving labeling program is a voluntary scheme based on the Japanese Industrial Standard (JIS), and labeling is required to be indicated on the participants' catalogues and products themselves. The labeling system has two colors. An orange label demonstrates that the product does not achieve the target standards set out in the Top Runner Program, while a green label demonstrates that the product achieves the Top Runner standard.



Source: https://www.eccj.or.jp/labeling/01_01.html

Figure 2-8: Energy Saving Labels in Japan

In addition to the energy labels, each electric motor under the scope of the Top Runner Program shall display the below information in the location that can be readily seen on the main body of the motor, and in catalogs with performance indications, or in documents provided by the manufacturer for selecting equipment.

- Product name;
- Rated output;
- Number of poles;
- Rated voltage;
- Rated frequency or base frequency;
- Category of usage;
- Energy consumption efficiency;
- Efficiency class; and
- Manufacturer's name

2.10.3.2 Other Supporting Policies

Japan has implemented a wide range of economic incentives to support energy efficiency, including subsidies, accelerated depreciation and tax reductions for installing efficient equipment or facilities; as well as R&D subsidies for high-efficient technologies, such as high-performance heat pumps and insulation materials. ANRE manages a wide range of policy information, knowledge-sharing web resources, including internet portals for general public and business for policy information dissemination. ECCJ publishes a monthly magazine "Energy Conservation", the only magazine dealing with energy conservation in Japan. Energy Conservation Grand Prize is the annual award for excellent energy conservation activities and products, organized by ECCJ and supported by METI. The winners are widely publicized to promote high-efficient activities and products.

2.11 Republic of Korea

2.11.1 Institutional Framework

The Ministry of Trade, Industry and Energy (MOTIE), Korea Energy Agency (KEA), and the Ministry of Land, Infrastructure, and Transport (MOLIT) are responsible for energy efficiency improvements in Korea. MOTIE and MOLIT are the policymaking bodies, while KEA is the implementing agency. KEA's role is to improve energy efficiency, promote renewable energy, and reduce greenhouse gases across various sectors. KEA implements various projects through its 12 regional offices in cooperation with regional non-government organizations and research institutes.

2.11.2 Test Standards and MEPS

The Korean MEPS scheme for three-phase induction motors is based on full-load efficiency values which are determined in accordance with the test method specified in KS C IEC 60034-2-1. The MEPS scheme applies to two-, four-, six- and eight-pole motors in the range from 0.75 up to 200 kW, and to four- and six-pole motors up to 375 kW. The Korean MEPS scheme has been regularly updated, and the current version of the energy efficiency regulation for electric motors, MOTIE-2015-28, specifies the MEPS levels for three-phase induction motors, as shown Table 2-13, effective from October 1, 2015, except those with rated outputs exceeding 200 kW which have been effective from October 1, 2016.

The Korean MEPS levels are a combination of IE2 and IE3 levels. For those with rated output equivalent to or less than 37 kW, the MEPS levels will be equivalent to IE2 levels. Note that the IE2 MEPS levels for those with rated outputs less than 37kW have been replaced by the IE3 MEPS levels, shown in Table 2-14, since October 1, 2018.

The Korean MEPS scheme does not cover: totally enclosed non-ventilated motors; totally enclosed air over motors; two-speed motors; sleeve and thrust bearing motors; and permanent magnet motors. three-phase induction motors with variable speed drives for non-pump and fan applications are also excluded, for example agitators, compressors, mills, cranes, and extruders.

Table 2-13: MEPS for Three-Phase Induction Motors in Korea, Effective from October 1, 2015 and October 1, 2016

Rated output power	Semi enclosed type				Totally enclosed type			
	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole
0.75	75.5	82.5	80.0	74.0	75.5	82.5	80.0	74.0
1.5	84.0	84.0	85.5	85.5	84.0	84.0	86.5	82.5
2.2	84.0	86.5	86.5	86.5	85.5	87.5	87.5	84.0
3.7	85.5	87.5	87.5	87.5	87.5	87.5	87.5	85.5
5.5	87.5	88.5	88.5	88.5	88.5	89.5	89.5	85.5
7.5	88.5	89.5	90.2	89.5	89.5	89.5	89.5	88.5
11	89.5	91.0	90.2	89.5	90.2	91.0	90.2	88.5
15	90.2	91.0	91.0	90.2	90.2	91.0	90.2	89.5
18.5	91.0	91.7	91.7	90.2	91.0	92.4	91.7	89.5
22	91.0	92.4	92.4	91.0	91.0	92.4	91.7	91.0
30	91.7	93.0	93.0	91.0	91.7	93.0	93.0	91.0
37	93.0	94.5	94.1	91.7	93.0	94.5	94.1	92.4
45	93.6	95.0	94.5	92.4	93.6	95.0	94.5	92.4
55	93.6	95.0	94.5	93.6	93.6	95.4	94.5	93.6
75	93.6	95.4	95.0	93.6	94.1	95.4	95.0	93.6
90	94.1	95.4	95.0	93.6	95.0	95.4	95.0	94.1
110	94.1	95.8	95.4	93.6	95.0	95.8	95.8	94.1
132	94.5	95.8	95.4	94.1	95.4	95.8	95.8	94.5
160	95.0	95.8	95.4	94.1	95.4	96.2	95.8	94.5
200	95.0	95.8	95.4	94.1	95.8	96.2	95.8	94.5
225	–	96.2	95.8	–	–	96.2	95.8	–
260	–	96.2	95.8	–	–	96.2	95.8	–
300	–	96.2	95.8	–	–	96.2	95.8	–
335	–	96.2	95.8	–	–	96.2	95.8	–
375	–	96.2	95.8	–	–	96.2	95.8	–

Source: Regulation on Energy Efficiency Labeling & Standards, Notice No. 2017-61 of Ministry of Trade, Industry and Energy (MOTIE), 1 May 2017

Table 2-14: MEPS for Three-Phase Induction Motors in Korea, Effective from October 1, 2018

Rated output power	Semi enclosed type				Totally enclosed type			
	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole
0.75	77.0	83.5	82.5	–	77.0	83.5	82.5	75.5
1.5	85.5	86.5	87.5	–	85.5	86.5	88.5	84.0
2.2	85.5	89.5	88.5	–	86.5	89.5	89.5	85.5
3.7	86.5	89.5	89.5	–	88.5	89.5	89.5	86.5
5.5	88.5	91.0	90.2	–	89.5	91.7	91.0	86.5
7.5	89.5	91.7	91.7	–	90.2	91.7	91.0	89.5
11	90.2	93.0	91.7	–	91.0	92.4	91.7	89.5
15	91.0	93.0	92.4	–	91.0	93.0	91.7	90.2
18.5	91.7	93.6	93.0	–	91.7	93.6	93.0	90.2
22	91.7	94.1	93.6	–	91.7	93.6	93.0	91.7
30	92.4	94.1	94.1	–	92.4	94.1	94.1	91.7

Source: Regulation on Energy Efficiency Labeling & Standards, Notice No. 2017-61 of Ministry of Trade, Industry and Energy (MOTIE), 1 May 2017

2.11.3 Labeling and Other Supporting Policies

The Korean energy efficiency labeling scheme employ a categorical label type that indicates the energy efficiency level of each product on a 1 to 5 grading scale. Grade 1 is the most efficient, while Grade 5 is the least efficient. Although the label design for electric motors in Korea is somewhat similar to other products, it is an endorsement type without grading scale. The Korean energy label for electric motors shall display the following information: motor type, number of poles, output power, efficiency, annual energy costs, and CO_2 emissions. To qualify for the label, motors must meet the energy efficiency and other performance requirements specified in the MEPS scheme.

Source: South Korea updates MEPS scheme for low-voltage motors, ABB Product Note, 2018

Figure 2-9: Korean Energy Label for Electric Motors

2.12 LAO PDR

Through the Energy Efficiency and Conservation Policy and Strategy, Lao PDR aims to reduce its annual energy consumption growth rate from 4% to 3.5% to achieve a future reduction in energy demand of 10% by 2030. It estimates that improvement of energy efficiency of electrical appliances and equipment can achieve energy efficiency improvement in this segment by 10-50% by targeting refrigerators, air conditioners, rice cookers, TV sets, lighting and washing machines. The accompanying Roadmap and Master Plan set out actions to achieve this demand reduction target through creating an Energy Efficiency Standards and Labelling (S&L) Program and Standard Designation on High-efficiency Equipment and Electrical Appliances between 2015 and 2020, as well as a three-phase cross-sectoral promotional plan to develop, promote, and enforce these S&L schemes while increasing energy reduction targets until 2030. In addition, the Prime Minister Decree on the Promotion of Energy Efficiency and Conservation has demonstrated additional commitment and aimed to set up the necessary institutional and financial mechanisms for planning, regulating, and implementing the energy efficiency and conservation measures.

In Lao PDR, the Ministry of Energy and Mines (MEM) is responsible for energy policy and overall strategic guidance, as well as management of the sector development. With regard to development of S&L programs, the Institute of Renewable Energy Promotion (IREP) under MEM is a lead implementing agency to develop relevant regulations to control import and sell or concerned electrical appliances and equipment in Lao PDR. To date, no S&L program for ACs and other electrical appliances have been implemented in Lao PDR. Relevant stakeholders involved in development and implementation of MEPS and labeling program are shown in Table 2-15.

Table 2-15: MEPS and Labeling Stakeholders in Lao PDR

Organizations	Roles & Responsibilities
Ministry of Science and Technology (MOST)	Standardization Body (setup MEPS and HEPS for electrical appliances)
Ministry of Industry and Commerce (MOIC)	Regulating imported and sold electrical appliances Establishment of online registration system
Customs Department under Ministry of Finance (MOF)	Monitoring entry of electrical appliance
Tax Department under Ministry of Finance	Import duties or sales taxes to support market of efficient air conditioners
Electricité du Laos (EDL)	Supporting implementation of S&L programs and financial instruments (e.g. on bill financing/repayment)
Lao National Chamber of Commerce and Industry (LNCCI)	Networking and outreach to importers and distributors of room ACs
Lao Statistics Bureau under Ministry of	National survey database e.g. appliance ownership

Organizations	Roles & Responsibilities
Planning and Investment	

2.13 MALAYSIA

According to the Electricity (Amendment) Regulations 2013, gazzeted by the Minister of Energy, Green Technology and Water Malaysia, the Minimum Energy Performance Standards (MEPS) and mandatory energy labeling for 5 domestic electrical appliances and lighting products, i.e., refrigerator, air-conditioner, television, domestic fans and lighting (fluorescent, CFL, LED and incandescent), shall be enforced.

The MEPS Values for each product category are equivalent to 2-star rating of the mandatory energy labels, and they are specified in relevant national standards promulgated by the Department of Standards Malaysia. Compliance with MEPS and energy labeling is based on the review of online submission of safety and performance test reports, and issuance of the Certificate of Approval (COA) issued by Energy Commission. Product testing can be performed by any testing laboratories recognized by the Department of Standards Malaysia (as a member of ILAC and APLAC).

Malaysia has not yet initiated any energy efficiency programs for electric motors.

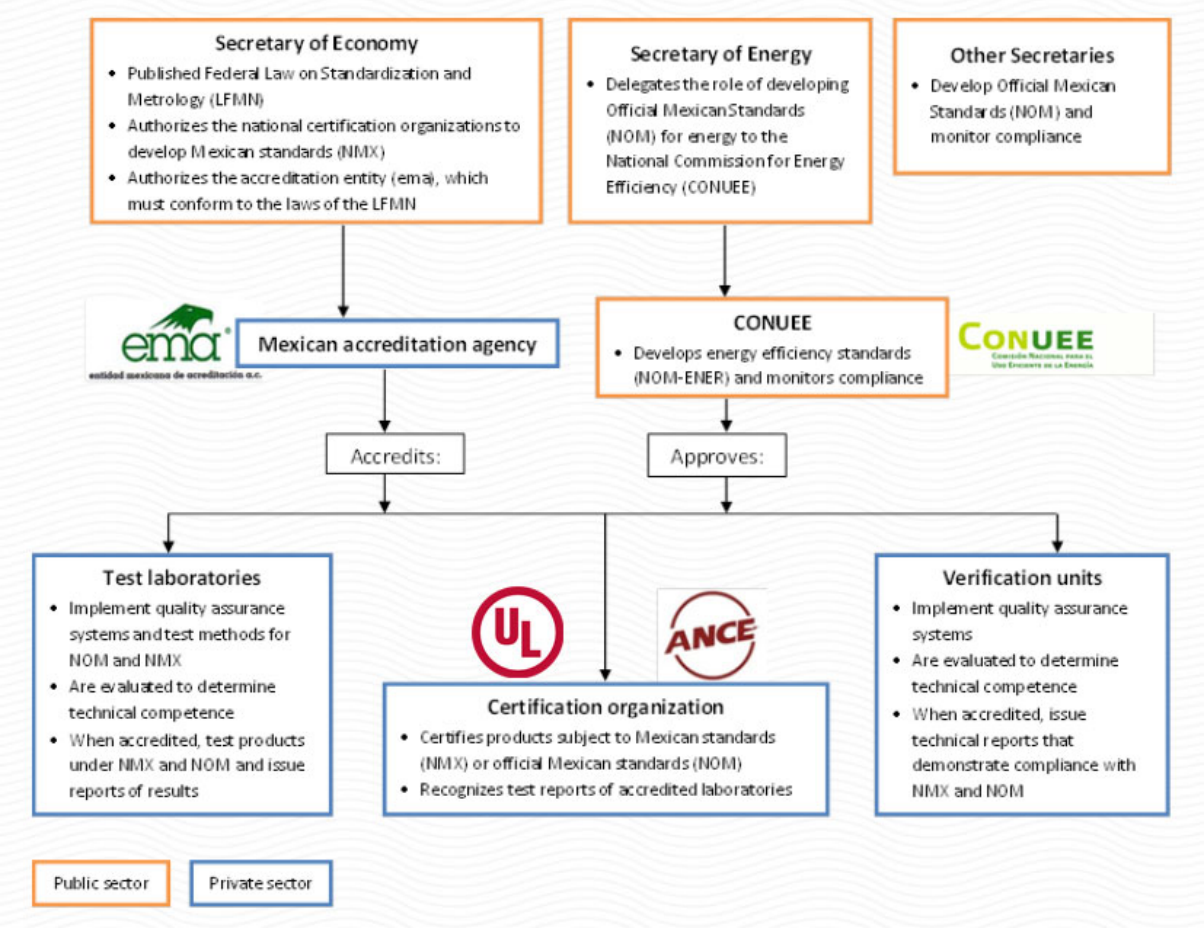
2.14 MEXICO

2.14.1 Institutional Framework

The National Commission for the Efficient Use of Energy (CONUEE or Comisión Nacional para el Uso Eficiente de la Energía)[13] is the lead federal agency in charge of energy efficiency policy and programs in Mexico. CONUEE is under the Ministry of Energy (SENER), with administrative and operative autonomy. Its main responsibilities include among others development of national energy efficiency strategy and national programs, and official Mexican standards (NOMs). NOMs are mandatory technical regulations which regulate products, processes and services when these may constitute a risk to people, animals, vegetables and the environment in general, among others. Mandatory energy efficiency requirements are prescribed in NOMs.

In addition to NOMs, development of voluntary Mexican Standards (Normas Mexicanas – NMX) is responsible by the Asociación de Normalización y Certificación - ANCE (Standardization and Certification Association). ANCE has its own laboratory for conducting various testing and it can also certify third-party testing laboratories. Requirements specified in NMXs can be mandatory in case they are referenced by NOMs. Figure 2-10 shows the institutional framework related to development and implementation of MEPS and energy labeling in Mexico.

[13] Previously known as the National Commission for Energy Saving (CONAE)



Source: Adapted from https://clasp.ngo/mexico-overview

Figure 2-10: MEPS and Labeling Institutional Framework in Mexico

Electric Energy Savings Trust Fund (FIDE), a private, non-profit trust, was established to support the Electric Energy Savings Program. FIDE provides financing, certification and technical assistance, and promotes and develops integral programs and projects on efficient use of energy. FIDE has implemented a voluntary energy label program, known as Sello FIDE, since 1995. As of February 2017, 2924 products from 83 companies were awarded to use the label. The voluntary labels need renewal once per year.

2.14.2 Test Standards and MEPS

CONUEE has implemented 32 MEPS requirements in Mexico, of which 26 are directed to regulate energy consumption in appliances and equipment, and six for systems. For electric motors, CONUEE has implemented the energy efficiency requirements for three-phase induction motors since 2002 (NOM-016-ENER-2002), and for single-phase induction motors with rated outputs from 0.18kW to 1.5kW (NOM-014-ENER-2004) since 2004. The latest update of the energy efficiency requirements for electric motors was published in 2016 (NOM-016-ENER-2016) for three-phase squirrel cage induction motor with rated outputs from 0.746kW to 373kW, rated voltages < 600 V, 60 Hz with 2, 4, 6, 8-pole, and nominal continuous operation (S1). NOM-016-ENER-2016 came into force on in

January 2017, and superseded the previous energy efficiency requirements for three-phase induction motors, issued in 2010 (NOM-016-ENER-2010).

The revised standard provides details of MEPS requirements, test method, acceptance criteria, and marking requirements. The MEPS requirements for three-phase induction motors in Mexico are aligned with IE3 levels. The MEPS regulation does not cover geared motors, brake motors, two-speed motors, motors designed for frequency inverter operation, NEMA C Design motors, and motors labeled for intermittent operation.

2.14.3 Labeling and Other Supporting Policies

2.14.3.1 Labeling

FIDE offers a voluntary energy efficiency endorsement seal for single-phase and three-phase induction motors. To display the Sello FIDE voluntary endorsement label, manufacturers are required to submit certified test results on their products to confirm that they meet the Sello FIDE requirements. A certified laboratory tests the product to verify manufacturer claims. If approved, manufacturers pay for certification and sign an agreement stipulating the length of validity of the Sello FIDE endorsement; how the Sello FIDE can be displayed; and issues related to cancellation of certification. Manufacturers can then display the Sello FIDE on their products.

Source: http://www.fide.org.mx/wp-content/uploads/2018/05/portafolio_sello_opt.pdf

Figure 2-11: Voluntary Energy Labels for Electric Motors in Mexico

2.14.3.2 Other Supporting Policies

CONUEE hosts and maintains a series of internet portals, produces publications and radio campaigns aimed at the public to raise awareness and provide information on energy efficiency. FIDE implements Educational Programme for Electrical Energy Saving and Rational Use (EDUCAREE, Educación para el Ahorro y Uso Racional de la Energía Eléctrica) now in its 18th year. The EDUCAREE programme includes courses, workshops, conferences and exhibitions presented generally in schools and museums. In 2016, almost 500,000 people attended at EDUCAREE activities in more than 1500 different schools. Besides that, EDUCAREE gave lectures to more than 200,000 employees from government institutions and private companies. EDUCAREE has free material available online in its website.

2.14.4 Monitoring, Verification and Enforcement

Monitoring, verification and enforcement of NOMs are responsible by CONUEE. Failure to comply with the standard shall be punished in accordance with Federal Law on Metrology and Standardization, and other applicable laws. Verification and Monitoring According to the Federal Law on Metrology and Standardization Act, manufacturers or importers may be required to provide to the authorities documents, reports, and data that they require in writing, and samples of products that may be requested as needed.

Appropriate Inspection bodies are able to carry out verification visits in order to monitor compliance with the laws. The costs of the verifications by acts of conformity assessment have to be paid by the manufacturer or importer to whom it is made. Another check may be performed if the first check of the product or service does not successfully comply with the requirements. This verification can be done in the same laboratory or in another accredited laboratory. If this second verification complies with the requirements, it shall be invalidated the first result. If not satisfied, it shall be confirmed as an invalid product Samples shall be selected only by authorized and competent persons.

However the above responsibilities seem to be challenging due to the limited manpower and resources[14]. As for the Sello FIDE voluntary labeling scheme, it currently does not require after-market check.

2.14.5 Financial Mechanisms

Between 1990 and 2014, FIDE conducted 1.8 million energy diagnoses, 4,000 financed projects and 2.6 million pesos in credits (of which 72% corresponded to the Home Appliances Replacement Program and the rest to the Energy Saving Financing Program). Finally, FIDE has financed 60 million compact fluorescent lamps (CFLs), among other actions.

2.15 MYANMAR

The Myanmar Government has recognized the important roles of energy efficiency and conservation in mitigating GHG emissions from the energy sector and the Ministry of Industry (MOI) is appointed as the policy making body for energy efficiency and conservation in Myanmar. The Energy Efficiency and Conservation Division (EECD) was created under MOI to be responsible for energy efficiency policy and activities in the economy. Along with the establishment of EECD, the National Energy Efficiency and Conservation Policy, Strategy and Roadmap for Myanmar was prepared under the technical assistance from Asian Development Bank (ADB) and approved by the Myanmar government in February 2016.

The National Energy Efficiency and Conservation Policy document estimated that Myanmar can save about 25% of its annual electricity consumption through implementation of various energy efficiency and conservation measures in major consuming sectors. Among which, the residential sector was

[14] PEER Review on Energy Efficiency in Mexico, Final Report, APEC Energy Working Group (EWG), October 2017

estimated to have the greatest saving potential of 9.7% of the total electricity consumption. To achieve the energy efficiency target outlined in the policy, implementation of energy standards and labeling (S&L) programs for lighting and household appliances are recommended as one of the priority activities for the residential sector in Myanmar. The Energy Standards and Labeling Roadmap for Myanmar was also prepared as a part of the National Energy Efficiency and Conservation Policy. Electric motors are not yet considered as the priority product under the energy standards and labeling program in Myanmar.

Through participation in the ASEAN SHINE program, EECD has developed a National Roadmap on energy efficient RACs to implement the recommendations of the Regional Policy Roadmap to harmonize air conditioners standards in ASEAN economies by 2020 which aim at facilitating market transformation towards more energy efficient air conditioners. It targets all air conditioners (fixed speed and inverter) with the cooling capacity of and below 3.52 kW. The National Roadmap sets the following targets and goals:

1. Minimum Energy Performance Standards (MEPS)

- By 2020, adopt regionally harmonized technology neutral and mandatory MEPS at minimum EER 2.9W/W and CSPF 3.08 W/W for all air conditioners below 3.52kW by 2020; and Review of MEPS every 5 years.

2. Effective compliance mechanism

- Adoption of the testing and evaluation methods: Adopt ISO 5151-2010 as a uniform testing standard for air conditioners, and adjust import regulations accordingly; By 2020, adopt CSPF method of ISO 16358 as a uniform testing standard for all fixed speed and inverter units, and adjust import regulations accordingly.
- Recognition of the testing results from accredited laboratories in the third economies: Adopt provisions on recognizing testing results from laboratories certified and accredited based on ISO/IEC 17025; and Participate in development and adoption of the regional Mutual Recognition Agreement on recognition of energy performance testing standards and testing results reports for air conditioners from properly certified and accredited testing laboratories.

3. Monitoring, verification and enforcement (MVE)

- By 2020, establish and operationalize an efficient national system for MVE; Participate in establishing a coordinated regional monitoring, reporting and verification regime in ASEAN; and Participate in the establishment of a Regional Product Database as a tool to support exchange of product information and non-compliance alerts, and to coordinate verification activities.

2.16 NEW ZEALAND

2.16.1 Institutional Framework

New Zealand passed the Energy Efficiency and Conservation Act in 2000 (EEC Act). This act established the Energy Efficiency and Conservation Authority (EECA) as a government entity with the

responsibility of promoting energy efficiency, energy conservation, and renewable energy across all sectors of the economy. The act gives the EECA powers to promote energy efficiency standards and labeling for appliances as well as the disclosure of information to compile statistics on energy efficiency, energy conservation, and renewable energy. EECA in partnership with other government entities and the private sector, will develop programs to address the objectives outlined in the New Zealand Energy Efficiency and Conservation Strategy (NZEECS) 2017–2022. EECA partners with Standards New Zealand, a business unit within the Ministry of Business, Innovation and Employment, to promote energy efficiency in products/equipment. Standards New Zealand manages standards development and publishes and sells New Zealand, joint Australia-New Zealand, and international standards.

New Zealand works together with Australia through the E3 Program to share the cost of regulation and makes it easier and cheaper for businesses trading in both economies to comply with regulations. New Zealand participates in the E3 Program through a trans-Tasman Policy Framework and Funding Arrangement. New Zealand's party to this arrangement is the Minister of Energy and Resources.

2.16.2 Test Standards and MEPS

In New Zealand, the MEPS scheme for electric motors is part of the E3 Program, and the requirements for MEPS are set out in the Energy Efficiency (Energy Using Products) Regulations 2002 (the regulations), administered by the Ministry of Business, Innovation and Employment. The regulations are made under the EEC Act.

Schedule 1 of the Energy Efficiency (Energy Using Products) Regulations 2002, Reprint as at 21 October 2015, specifies that three-phase cage induction shall meet the MEPS requirements as stipulated in AS/NZS 1359.5:2004: Rotating electrical machines—General requirements—Three-phase cage induction motors—High efficiency and minimum energy performance standards requirements, and the MEPS levels is aligned with the IE2 levels of IEC 60034-30-1, as shown in Table 2-16. Energy efficiency test methods shall follow test method A or test method B in AS/NZS 1359.5:2004.

Box 4: AS/NZS 1359.5:2004 – Test Method A and B

AS/NZS standard 1359.5:2004 describes two internationally recognized test methods, complete with tables showing the motor efficiency levels. Both methods are valid for MEPS and are referred to as Test Method A and Test Method B.

Test Method A is identical to IEC 61972, which has been replaced by IEC 60034-2-1, and is technically equivalent to IEEE112-B. It involves precise and direct measurement of the additional load losses (or stray load losses).

Method B is equivalent to the old IEC 60034-2 standard, and assumes a fixed figure of 0.5 percent for additional load losses. Therefore, the required efficiency levels for Method B are higher than for the Method A.

Source: MEPS scheme for low-voltage motors in Australia and New Zealand, ABB Product Note, 2018

Table 2-16: MEPS Levels for Electric Motors in New Zealand (Test Method A)

Rated Power kW	Minimum Efficiency %			
	2 poles	4 poles	6 poles	8 poles
0.73	78.8	80.5	76.0	71.8
0.75	78.8	80.5	76.0	71.8
1.1	80.6	82.2	78.3	74.7
1.5	82.6	83.5	79.9	76.8
2.2	84.0	84.9	81.9	79.4
3	85.3	86.0	83.5	81.3
4	86.3	87.0	84.7	82.8
5.5	87.2	87.9	86.1	84.5
7.5	88.3	88.9	87.3	86.0
11	89.5	89.9	88.7	87.7
15	90.3	90.8	89.6	88.9
18.5	90.8	91.2	90.3	89.7
22	91.2	91.6	90.8	90.2
30	92.0	92.3	91.6	91.2
37	92.5	92.8	92.2	91.8
45	92.9	93.1	92.7	92.4
55	93.2	93.5	93.1	92.9
75	93.9	94.0	93.7	93.7
90	94.2	94.4	94.2	94.1
110	94.5	94.7	94.5	94.5
132	94.8	94.9	94.8	94.8
150	95.0	95.2	95.1	95.2
< 185	95.0	95.2	95.1	95.2

Source: MEPS scheme for low-voltage motors in Australia and New Zealand, ABB Product Note, 2018

The MEPS scheme applies to electric motors manufactured in or imported into New Zealand, either directly or in conjunction with other equipment - pumps, fans, conveyors, gearboxes, etc. It applies to two-, four- , six- and eight-pole, three-phase cage induction motors rated from 0.73 kW up to but not including 185 kW, for voltages up to 1,100 V. Explosion proof motors are also included.

The following types of motor are excluded: submersible motors, integral motor-gear systems (motor not separable from gearbox or compressor), variable or multispeed motors, and those rated only for short duty cycles (IEC 60034-1 duty rating S2). The MEPS scheme does not apply to rewound motors, except where the supplier claims that the rewound motor meets the requirements for one of the efficiency levels defined by Test Method A or Test Method B according to AS/NZS 1359.5:2004.

2.16.3 Labeling and Other Supporting Policies

2.16.3.1 Labeling

Similar to Australia, New Zealand does not specify requirement for the Energy Rating Label for three phase cage induction motors.

2.16.3.2 Other Supporting Policies

Manufacturers/importers can market their motors as high efficiency it the motors meet the efficiency levels shown in the table below.

Table 2-17: High Efficiency Levels for Electric Motors in New Zealand (Test Method A)

Rated Power kW	Minimum Efficiency %			
	2 poles	4 poles	6 poles	8 poles
0.73	81.4	82.9	78.8	75.0
0.75	81.4	82.9	78.8	75.0
1.1	83.0	84.5	80.9	77.6
1.5	84.8	85.6	82.4	79.6
2.2	86.2	86.9	84.2	81.9
3	87.2	87.8	85.6	83.6
4	88.1	88.7	86.7	85.0
5.5	88.9	89.5	87.9	86.5
7.5	89.9	90.4	89.0	87.8
11	90.9	91.3	90.2	89.3
15	91.6	92.1	91.0	90.4
18.5	92.1	92.4	91.6	91.1
22	92.4	92.8	92.1	91.5
30	93.1	93.4	92.8	92.4
37	93.6	93.8	93.3	92.9
45	93.9	94.1	93.7	93.5
55	94.2	94.4	94.1	93.9
75	94.8	94.9	94.6	94.6
90	95.0	95.2	95.0	94.9
110	95.3	95.5	95.3	95.3
132	95.5	95.6	95.5	95.5
150	95.7	95.9	95.8	95.9
< 185	95.7	95.9	95.8	95.9

Source: MEPS scheme for low-voltage motors in Australia and New Zealand, ABB Product Note, 2018

EECA also published a document entitled “Electric Motor Replacement Policy: A Development Guide” to assist managers in developing site-wide policies to simplify decision making regarding if and when to replace in-service three-phase electric motors. The site-wide motor replacement policy should contain a set of standard rules covering the majority of motors as well as recognizing and providing guidance for motors/applications identified as being “special”, due to unusual frame size or mountings, or a non-standard shaft diameter, or its application might have characteristics that a new motor will have difficulty coping with. Such special features may mean that replacement is not a feasible or economic option and this needs to be recognized in any replacement policy.

2.16.4 Monitoring, Verification and Enforcement

All electric motors that are subject to the MEPS scheme to New Zealand must be registered for importation with the Energy Rating website (www.energyrating.gov.au). The importers must ensure that the motors comply with the AS/NZS 1359.5:2004 standard, and be able to prove compliance by supplying a load test report based on one of the approved test methods outlined in the standard.

EECA monitors compliance with the regulations and helps importers, manufacturers and retailers to understand and fulfill their obligations under the regulations. EECA also collects sales data and information for compliance and enforcement purposes.

Under regulation 9 of the Energy Efficiency (Energy Using Products) Regulations 2002, persons who import or manufacture certain products in New Zealand are required to provide EECA with information as to the products they have sold, imported or exported. This information is then used to compile statistics on energy efficiency and conservation. According to the EEC Act, EECA cannot disclose that commercial related information to anyone else, except for the purposes of prosecution, and EECA may only publish statistical information if it is arranged in such a manner as to prevent that information from being identifiable as information relating to a particular person, save with that person's express consent.

EECA is also responsible for ensuring compliance with the Act and its associated regulations, including taking enforcement action where necessary. As part of this function, EECA may collect information from the following sources: surveys of product suppliers/outlets; monitoring of online trading; monitoring of online and print advertising and information; product check testing and onsite checks to determine compliance (as part of the E3 Program). Such information is collected for the purposes of establishing whether traders are complying with the EEC Act and regulations. In collecting information for compliance and enforcement purposes, EECA considers core principles including proportionality, consistency, transparency and fairness.

2.17 Papua New Guinea

PNG has participated in the the Pacific Appliance Labelling and Standards (PALS) Programme and the Energy Labelling and Minimum Energy Performance Standards for Appliances, Equipment and Lighting Products Regulation was drafted in August 2017 after the Climate Change (Management) Act was passed by the Parliament in 2015. The main objective of the Regulation, in accordance with Section 11 (1) (c) of the Act, is to reduce anthropogenic emissions of greenhouse gases in the electricity generation sector, which is a regulated sector under Section 53 (2) (b) of the Act, through increasing the energy efficiency of electrical appliances, equipment and lighting products imported into and sold in PNG.

2.18 Peru

2.18.1 Institutional Framework

In 2010, the Peruvian Government created the General Directorate Energy Efficiency (DGEE) as a part of the Ministry of Energy and Mines. DGEE is the regulatory technical body, responsible for proposing and evaluating the policy of energy efficiency and renewable energy, promoting efficient use of energy, and energy planning. Peruvian national standards (NTPs) approved by INDECOPI (National Standard Body) as voluntary implementation, however, NTPs become mandatory through approval of relevant technical regulations.

2.18.2 Test Standards and MEPS

The third edition of NTP 399.450 approved in 2018 (NTP 399.450: 2018) establishes MEPS values and specifications of the labeling for three-phase squirrel-cage induction motors for general purpose with closed and open enclosures, and nominal power from 0.746 kW to 149.2 kW (1HP to 200HP). The efficiency classifications are specified in NTP-IEC 60034-30-1: 2018 which are identical to IEC 60034-30-1 based on the test methods specified in IEC 60034-2-1.

2.18.3 Labeling and Other Supporting Policies

2.18.3.1 Labeling

In 2017, the Peruvian Government approved the Supreme Decree No. 009-2017-EM which approves the Technical Regulation on Energy Efficiency Labeling for Energy Equipment, with the objective of establishing the obligation of Energy Efficiency Labeling of Energy Equipment, as well as the technical requirements and ranges of energy efficiency for their classification, in order to protect the environment and safeguard the right to information of consumers and users. The Regulation focuses the following types of equipment and/or devices:

i) Lamps for domestic use and similar uses for general lighting;
ii) Ballasts for fluorescent lamps for domestic use and the like for general lighting;
iii) Refrigeration appliances for domestic use;
iv) Boilers;
v) Three-phase asynchronous or induction electric motors with squirrel cage rotor;
vi) Household washing machines;
vii) Household drum dryers
viii) Air conditioners; and
ix) Domestic water heaters.

The label design for electric motors in Peru is shown in Figure 2-12.

Source: Energy Efficiency Labeling Regulations A challenge, Ing. Raúl Del Rosario Q., March 2015

Figure 2-12: Energy Label Design for Electric Motors in Peru

2.19 THE PHILIPPINES

2.19.1 Institutional Framework

There are two (2) key government agencies responsible for safety, quality and energy performance of electric motors in the Philippines.

- **The Bureau of Philippine Standards (BPS)** under the Department of Trade and Industry (DTI) is a government agency mandated to develop, promulgate, implement, and promote standardization activities. BPS formulates Philippine National Standards (PNS) and adopts relevant international standards for promoting manufacturers to produce high-quality products and services and to increase productivity. These standards do not only protect the consumers but also facilitate trade in the global market.
- **The Department of Energy (DOE)** is responsible for preparing, integrating, coordinating, supervising and controlling all plans, programs, projects and activities of the Government related to energy exploration, development, utilization, distribution and conservation.

DOE issued Department Circular No. DC 2016-04-0005, entitle "Declaring the Compliance of Importers, Manufacturers, Distributors and Dealers of Electrical Appliances and other Energy-Consuming Products with the Philippine Energy Standards and Labeling Program (PESLP)" as the national energy standards and labeling program in 2016. The program covered air conditioners, refrigerators, TVs, washing machines, some lighting products and cars. Electric motors are not considered as the priority products under PESLP.

2.19.2 Test Standards and MEPS

The Philippines has set national standards aligned with IEC standards on energy efficiency. For electric motors, the technical committee No.58 of BPS adopted IEC 60034-30-1: Rotating electrical machines - Part 30-1: Efficiency classes of line operated AC motors (IE code) as PNS IEC 60034-30-1:2017[15] for electric motors in September 2017. PNS IEC TS 60034-2-3:2016 was also promulgated in August 2016 and it is identical with IEC TS 60034-2-3:2013, Rotating electrical machines – Part 2-3: Specific test methods for determining losses and efficiency of converter-fed AC induction motors.

2.19.3 Labeling and Other Supporting Policies

Although there is no MEPS and labeling program for electric motors in the Philippines, there are several other energy efficiency related plans and programs that contribute to the promotion of energy efficient motors in the economy, as described below.

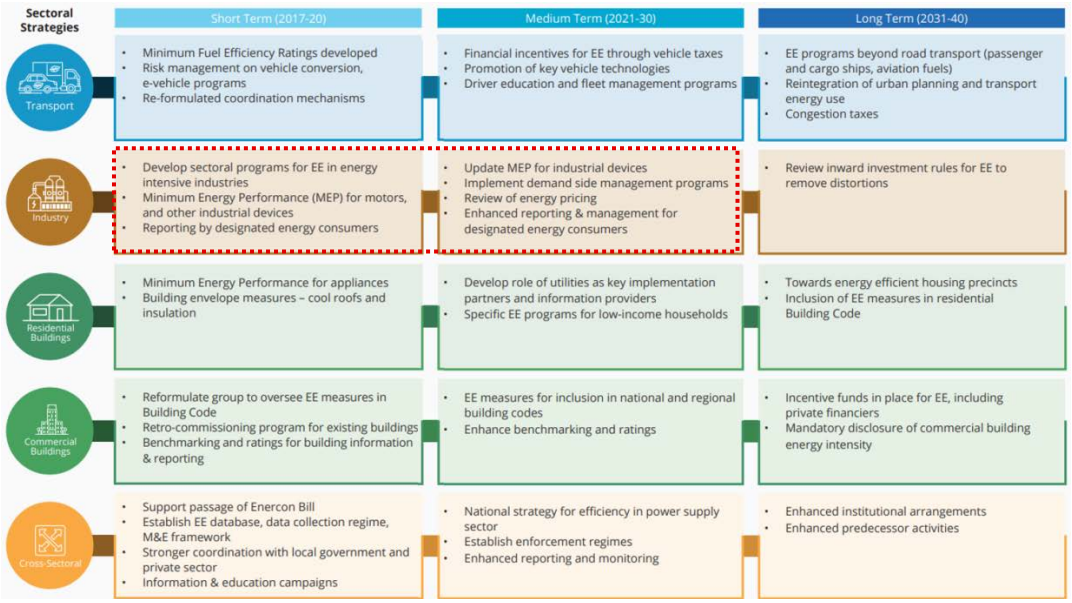
Energy Efficiency and Conservation Roadmap 2017-2040

DOE launched the National Energy Efficiency and Conservation Program (NEECP) in 2004. The primary goal of the program is to attain measurable target for the 2011-2030 which focuses on reducing the economy's final energy demand by 10%. In 2016, Energy Efficiency and Conservation Roadmap 2017-2040[16] has been updated to set the corresponding and complementing sector-based action plans and the detailed approach of implementing the recommendations of the roadmap, including allocating roles and responsibilities and financial resources. The objective of the roadmap is "to make energy efficiency and conservation (EE&C) a way of life" by the policy that focuses on judicious conservation and efficient utilization of energy resources through adoption of the cost-effective options toward the efficient use of energy to minimize environmental impact. Targets within this roadmap are set in a context of economy's economic development through efficiency gains and ensure energy security with a reduction in energy intensity across key economic sectors.

The figure below shows the framework of energy efficiency and conservation roadmap from 2017 to 2040. Development of MEPS for electric motors is one of the short-term plans to be implemented during 2017-2020 under the industrial sector. IE2 and IE3 were mentioned as international best practices for electric motors in the roadmap.

[15] http://www.bps.dti.gov.ph/index.php?option=com_content&view=article&id=482:dti-approves-the-adoption-of-an-international-standard-on-rotating-machinery-as-pns&catid=1:latest-news&Itemid=1

[16] https://www.doe.gov.ph/sites/default/files/pdf/energy_efficiency/ee_roadmap_book_2017-2040.pdf



Source: Energy Efficiency and Conservation Roadmap of the Philippines 2017-2040, 2016

Figure 2-13: Milestone of Energy Efficiency Roadmap 2017-2040

Guideline on Energy Conserving Designs of Buildings[17], 2007

This guideline aims to encourage and promote the energy conserving design of buildings and their services to reduce energy consumption and to prescribe guidelines and minimum requirements for energy efficiency and conservation. The guideline describes energy conserving design by applications in each section, such as lighting, electric power and distribution, air conditioning and ventilating system, etc, and electric motors are explained in the electric power and distribution section. The guideline covers any general-purpose with rated output from 1 to 200 hp drip-proof and totally enclosed fan-cooled enclosure, T-frame, single speed, foot-mounted, polyphase induction motor of design A and B configuration that is continuous rated and operating at 230/460 volts, 60 Hz.

Under the guideline, the motor performance shall equal or exceed the nominal full load efficiency levels as indicated in Table 2-18 below. Motors operating more than 750 hours a year should be of energy efficient types as shown in Table 2-19.

Table 2-18: Minimum Acceptable Full-Load Efficiency

Motor Size	Open Drip-Proof Motors			Totally Enclosed Fan Cooled Motors		
	revolutions per minute (rpm)			revolutions per minute (rpm)		
	1200	1800	3600	1200	1800	3600
0.8 kW (1 hp)	72.0	77.0	80.0	-	72.0	75.5
1.2 kW (1.5 hp)	82.5	82.5	82.5	82.5	81.5	78.5

17 https://www.doe.gov.ph/sites/default/files/pdf/energy_efficiency/guidelines_energy_conserving_design_buildings_v2008.pdf

Motor Size	Open Drip-Proof Motors			Totally Enclosed Fan Cooled Motors		
	revolutions per minute (rpm)			revolutions per minute (rpm)		
	1200	1800	3600	1200	1800	3600
1.6 kW (2 hp)	84.0	82.5	82.5	82.5	82.5	82.5
2.4 kW (3 hp)	85.5	86.5	82.5	84.0	84.0	82.5
4.0 kW (5 hp)	86.5	86.5	85.5	85.5	85.5	85.5
6.0 kW (7.5 hp)	88.5	88.5	85.5	87.5	87.5	85.5
8.0 kW (10 hp)	90.2	88.5	87.5	87.5	87.5	87.5
12.0 kW (15 hp)	89.5	90.2	89.5	89.5	88.5	87.5
16.0 kW (20 hp)	90.2	91.0	90.2	89.5	90.2	88.5
20.0 kW (25 hp)	91.0	91.7	91.0	90.2	91.0	89.5
24.0 kW (30 hp)	91.7	91.7	91.0	91.0	91.0	89.5
32.0 kW (40 hp)	91.7	92.4	91.7	91.7	91.7	90.2
40.0 kW (50 hp)	91.7	92.4	91.7	91.7	92.4	90.2
48 kW (60 hp)	92.4	93.0	93.0	91.7	93.0	91.7
60 kW (75 hp)	93.0	93.6	93.0	93.0	93.0	92.4
80 kW (100 hp)	93.0	93.6	93.0	93.0	93.6	93.0
100 kW (125 hp)	93.6	93.6	93.0	93.0	93.6	93.0
120 kW (150 hp)	93.6	94.1	93.6	94.1	94.1	93.6
160 kW (200 hp)	94.1	94.1	93.6	94.1	94.5	94.1

Source: Guidelines on Energy Conserving Design of Buildings, 2007

Table 2-19: Minimum Acceptable Full-Load Efficiency for High Efficiency Motors

Motor Size	Open Drip-Proof Motors			Totally Enclosed Fan Cooled Motors		
	revolutions per minute (rpm)			revolutions per minute (rpm)		
	1200	1800	3600	1200	1800	3600
0.8 kW (1hp)	74.0	80.0	82.5	74.0	80.0	82.5
1.2 kW (1.5hp)	84.0	84.0	82.5	85.5	84.0	82.5
1.6 kW (2 hp)	85.5	84.0	84.0	86.5	84.0	84.0
2.4 kW (3 hp)	86.5	86.5	84.0	87.5	87.5	85.5
4.0 kW (5hp)	87.5	87.5	85.5	87.5	87.5	87.5
6.0 kW (7.5 hp)	88.5	88.5	87.5	89.5	89.5	88.5
8.0 kW (10 hp)	90.2	89.5	88.5	89.5	89.5	89.5

Motor Size	Open Drip-Proof Motors			Totally Enclosed Fan Cooled Motors		
	revolutions per minute (rpm)			revolutions per minute (rpm)		
	1200	1800	3600	1200	1800	3600
12.0 kW (15 hp)	90.2	91.0	89.5	90.2	91.0	90.2
16.0 kW (20 hp)	91.0	91.0	90.2	90.2	91.0	90.2
20.0 kW (25 hp)	91.7	91.7	91.0	91.7	92.4	91.0
24.0 kW (30 hp)	92.4	92.4	91.0	91.7	92.4	91.0
32.0 kW (40 hp)	93.0	93.0	91.7	93.0	93.0	91.7
40.0 kW (50 hp)	93.0	93.0	92.4	93.0	93.0	92.4
48 kW (60 hp)	93.6	93.6	93.0	93.6	93.6	93.0
60 kW (75 hp)	93.6	9.4	93.0	93.6	94.1	93.0
80 kW (100 hp)	94.1	94.1	93.0	94.1	94.5	93.6
100 kW (125 hp)	94.1	94.5	93.6	94.1	94.5	94.5
120 kW (150 hp)	94.5	95.0	93.6	95.0	95.0	94.5
160 kW (200 hp)	94.5	95.0	94.5	95.0	95.0	95.0

Source: Guidelines on Energy Conserving Design of Buildings, 2007

Philippine Green Building Code[18], 2015

The Department of Public Works and Highways has approved the Philippine Green Building as a National Building Code (NBC) of the Philippines since June 22, 2015. The Code aims to improve the efficiency of building performance through a framework of acceptable set of standards to enhance sound environmental and resource management and the code is set of regulations setting minimum standards for compliance and not intended to rate buildings.

The code requires that:

- All motors for mechanical equipment over 5 kW shall be provided with variable speed drive and high efficiency motors in accordance with Table 2-20;
- All motors of cooling towers shall be provided with variable speed drive and high efficiency motors in accordance with Table 2-20; and
- All motors for domestic pumps shall have high efficiency motors in accordance with Table 2-20.

Table 2-20: High Efficiency Motors specified in the Philippine Green Building Code

Number of Poles	2	4	6	2	4	6

[18] http://www.dpwh.gov.ph/dpwh/sites/default/files/laws_codes_orders/PgbcBooklet23March.pdf

Synchronous Speed (rpm)		3600	1800	1200	3600	1800	1200
Motor Output		Open Motors			Enclosed Motors		
(hp)	(kW)						
1	0.75	77.0	85.5	82.5	77.0	85.5	82.5
1.5	1.1	84.0	86.5	86.5	84.0	86.5	87.5
2	1.5	85.5	86.5	87.5	85.5	86.5	88.5
3	2.2	85.5	89.5	88.5	86.5	89.5	89.5
5	4	86.5	89.5	89.5	88.5	89.5	89.5
7.5	5.5	88.5	91.0	90.2	89.5	91.7	91.0
10	7.5	89.5	91.7	91.7	90.2	91.7	91.0
15	11	90.2	93.0	91.7	91.0	92.4	91.7
20	15	91.0	93.0	92.4	91.0	93.0	91.7
25	18.5	91.7	93.6	93.0	91.7	93.6	93.0
30	22	91.7	94.1	93.6	91.7	93.6	93.0
40	30	92.4	94.1	94.1	92.4	94.1	94.1
50	37	92.0	94.5	94.1	93.0	94.5	94.1
60	45	93.6	95.0	94.5	93.6	95.0	94.5
75	55	93.6	95.0	94.5	93.6	95.4	94.5
100	75	93.6	95.4	95.0	94.1	95.4	95.0
125	90	94.1	95.4	95.0	95.0	95.4	95.0
150	110	94.1	95.8	95.4	95.0	95.8	95.8
200	150	95.0	95.8	95.4	95.4	96.2	95.8
250	185	95.0	95.8	95.4	95.8	95.6	95.8
300	225	95.4	95.8	95.4	95.8	96.2	95.8
350	260	95.4	95.8	95.4	95.8	96.2	95.8
400	300	95.8	95.8	95.8	95.8	96.2	95.8
450	335	95.8	96.2	96.2	95.8	96.2	95.8
500	375	95.8	96.2	96.2	95.8	96.2	95.8

Source: Philippine Green Building Code, 2015

2.19.4 Monitoring, Verification and Enforcement

In general, monitoring, verification and enforcement of mandatory energy efficiency requirements in the Philippines are jointly implemented by DOE and BPS. A memorandum of agreement between

DOE and BPS on how to carry out MVE activities for each electrical appliance/equipment will be prepared and signed by the department secretaries.

2.20 RUSSIA

2.20.1 Institutional Framework

Federal Law number 261-FZ "On Energy Conservation and Increase of Energy Efficiency" was enacted on 23 November 2009 to create legal, economical and administrative foundations to stimulate energy conservation and improve energy efficiency. Federal State Budget Authority "Russian Energy Agency" under the Ministry of Energy is the lead energy efficiency institution in Russia. In 2014, the Russian government approved the state program on "Energy efficiency and energy sector development" developed by the Ministry of Energy, and the key purpose of this program is to improve the energy efficiency of Russia's economic system.

Russia is a member of the Eurasian Economic Union (EAEU) which was started in January 2015. EAEU currently has five member economies, including Armenia, Belarus, Kazakhstan, the Kyrgyz Republic, and Russia. EAEU's objectives are to promote the free flow of goods, services, labor and capital among its members, i.e., a single market.

2.20.2 Test Standards and MEPS

According to the Decree No. 118, the draft decision on the EAEU technical regulation on the requirements for the energy efficiency of energy-consuming devices was adopted in July 2017. The list of energy-consuming devices applicable to this technical regulation covers various electrical appliances and equipment, including induction motors. The effective date of the technical regulation is subject to the final approval of the EAEU committee.

The Decree No. 118 specifies that three-phase induction motors with voltage input less than 1,000 V, 2 to 6 poles, 50/60 Hz, and rated output from 0.75kW to 375kW shall have minimum efficiency values of IE1 by 2020.

2.20.3 Labeling and Other Supporting Policies

The Federal Law No. 261-FZ established a mandatory energy labelling scheme in Russia.[19] The Law requires that, starting from January 1, 2011, household energy-consuming devices sold in Russia must contain information about the class of their energy efficiency in the technical documentation for those products, on the products themselves, and in product information documents. The Russian labelling scheme was designed on the basis of the existing European energy-efficiency labelling scheme. Energy classes of devices are just like in the EU marked by Latin characters from A to G. The most energy effective appliances correspond to the first "A" class, the most energy consuming correspond to the last "G" class. The provisions are applied to various household energy-

[19] https://www.iea.org/policiesandmeasures/pams/russia/name-43076-en.php

consuming appliances, and the Russian Government is to approve a list of other goods to be subject to these requirements. Electric motors are not included in this mandatory labeling scheme.

In September 2013, the Association of European Business (AEB) and the European Bank for Reconstruction and Development (EBRD) launched the Russia's first energy efficiency endorsement label which was designed to stimulate investment in energy efficient equipment in Russia. The label was developed in close cooperation with the Russian Sustainable Energy Efficiency Facility (RuSEFF), which provides credit lines to local financial institutions for financing energy efficiency projects in the industrial and residential sectors, also called "green loans"[20]. The first equipment type to be covered by the label is electric motors, a segment that is one of Russian industry's largest energy users.[21]

2.21 SINGAPORE

2.21.1 Institutional Framework

Mandatory MEPS and energy labeling programs for electrical appliances and equipment in Singapore are administered by the National Environment Agency (NEA), and currently regulated through the Energy Conservation (Prescribed Regulated Goods) Order 2017 and Energy Conservation (Regulated Goods and Registered Suppliers) Regulations 2017 under the Energy Conservation Act (Chapter 92C). Any importer and manufacturer that intends to supply any regulated goods in Singapore must apply to NEA to be a registered supplier. The registered supplier must also register the regulated goods before supplying the goods in Singapore.

2.21.2 Test Standards and MEPS

From 1 October 2018, all single speed, three-phase induction motors must have a minimum energy efficiency level of IE3 (as detailed in Table 2-21). Measurement of motor efficiency values shall be in accordance with Method 2-1-1B of IEC 60034-2-1 (2014) or Method B of IEEE 112 (2004). Single speed, three-phase induction motors covered by the Singaporean MEPS include:

- Rated voltage of up to 1,000 volts, 50 Hz or 50/60 Hz;
- 2 to 6 poles;
- Rated output power between 0.75kW and 375kW; and
- Rated duty type of S1, S3 (with cyclical duration factor of 80% or more), S6 or S9, in accordance to IEC 60034-1 (2017).

The following motors are excluded from the MEPS program:

- Designed to operate wholly immersed in a liquid;

[20] https://clasp.ngo/updates/2013/russia-launches-its-first-endorsement-label

[21] https://www.ebrd.com/news/2013/launch-of-energy-efficiency-label-in-russia.html

- Integral to its driven unit, where the motor shares common components (apart from connectors such as bolts) with the driven unit; and the separation of the motor from the driven unit will render the motor inoperative;
- Designed to operate exclusively, where ambient temperature air temperatures exceed 60°C; with a maximum operating temperature above 400°C; where ambient air temperature are less than -30°C in the case of any motor, or less than 0°C in the case of a motor with water cooling; where the water coolant temperature at the inlet to a product is less than 0°C or exceeding 32°C; or in an atmosphere that could become explosive due to local and operational conditions;
- Equipped with an electro-mechanical brake unit operating directly on the motor shaft without couplings;
- A high slip motor designed primarily to provide torque, often at or near 100% slip; or
- Supplied exclusively for export to another economy, or supplied exclusively for the incorporation of the motor into equipment that will be exported to another economy;

Table 2-21: Minimum Efficiency Requirements for Regulated Motors in Singapore

Rated Output (kW)	Minimum Efficiency (without tolerances), η
0.75 to 200	$\eta \geq A\times\left[\log_{10}\left(\frac{P}{1kW}\right)\right]^{-3}+B\times\left[\log_{10}\left(\frac{P}{1kW}\right)\right]^{-2}+C\times\left[\log_{10}\left(\frac{P}{1kW}\right)\right]+D$ where - (a) A is 0.3569 for a 2-pole motor, 0.0773 for a 4-pole motor and 0.1252 for a 6-pole motor; (b) B is -3.3076 for a 2-pole motor, -1.8951 for a 4-pole motor and -2.613 for a 6-pole motor; (c) C is 11.6108 for a 2-pole motor, 9.2984 for a 4-pole motor and 11.9963 for a 6-pole motor; (d) D is 82.2503 for a 2-pole motor, 83.7025 for a 4-pole motor and 80.4769 for a 6-pole motor; and (e) P is the rated power output of the motor.
> 200 to ≤ 375	(a) for 2-pole motors: η at rated output ≥ 95.8; (b) for 4-pole motors: η at rated output ≥ 96; and (c) for 6-pole motors: η at rated output ≥ 95.8.

Source: https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/energy-efficiency/household-sector/minimum-energy-performance-standards

2.21.3 Labeling and Other Supporting Policies

There is no energy labeling program for electric motors in Singapore, however, regulated motors supplied in Singapore must have the following product information marked durably in a visible manner on the rating plate of the regulated motor:

- Year of manufacture
- International Energy Efficiency or IE class, and
- Nominal efficiency at rated output power and, 75% and 50% of rated output power

If the size of the rating plate is insufficient to mark all the information, only the Nominal Efficiency at rated output power shall be marked.

2.21.4 Monitoring, Verification and Enforcement

Importers or manufacturers who intend to supply any regulated goods in the Singapore market must register themselves with NEA through the ELS Online Portal (https://e-services.nea.gov.sg/els/els.aspx). Every application must be accompanied by:

a) a test report in respect of the regulated goods issued by a specified laboratory, showing the energy efficiency of such goods and such other information as the Director-General may require;
b) such other documents and information as the Director-General may require; and
c) the appropriate fee specified in the Second Schedule, which is not refundable.

Upon the registration or renewal of the registration of any regulated goods, the Director-General must issue a certificate of registration to the registered supplier of those goods stating the validity period of the registration.

NEA will from time to time carry out verification testing on registered models. All verification testings for electric motors will be carried out in accordance with Method 2-1-1B of IEC 60034-2-1 (2014) or Method B of IEEE 112 (2004). Registered motor models are deemed to have passed the verification testing if the energy performance obtained through verification testing falls within the conformance limits specified below:

a) For motors with rated output power of up to 150kW - 100% - motor efficiency at rated output power from results of verification testing ≤ 1.15 times of 100% - Minimum Efficiency at the rated output power for the respective IE classes
b) For motors with rated output power of above 150kW - 100% - motor efficiency at rated output power) from results of verification testing ≤ 1.10 times of 100% - Minimum Efficiency at the rated output power for the respective IE classes

2.22 CHINESE TAIPEI

2.22.1 Institutional Framework

Bureau of Energy (BOE) under the Ministry of Economic Affairs (MOEA) is responsible for development and implementation of MEPS and labeling programs in Chinese Taipei. To date, Chinese Taipei has announced the MEPS requirements for 25 product categories, including low voltage single-phase and low voltage three-phase squirrel-cage induction motors (effective in 2002)[22]. The Bureau of Standards, Metrology and Inspection (BSMI) under MOEA is the authority responsible for the establishment and promotion of domestic standards in Chinese Taipei. In addition to standardization, the activities of the BSMI encompass verification of instruments, and inspection of commodities.

[22] https://www.moeaboe.gov.tw/ECW/english/content/Content.aspx?menu_id=1535

2.22.2 Test Standards and MEPS

The main testing standards and MEPS for electric motors in Chinese Taipei include:

- CNS 14400 Low-voltage three-phase squirrel-cage high-efficiency induction motors (for general purpose)
- CNS 1057 Low-voltage single-phase induction motors (for general purpose)

CNS 14400 covers three-phase induction motors rated output power from 0.75kW to 200kW (1 HP to 270 HP), and, from July 1st, 2016, three-phase induction motors under the scope of CNS 14400 shall have the full load efficiency meeting the IE3 requirements, as shown in Table 2-22.

Table 2-22: Energy Efficiency Requirements for Low-Voltage Three-Phase Squirrel-Cage Induction Motors in Chinese Taipei

Effective date		July. 1, 2016								
Rated output power		2pole			4pole			6pole		
		Synchronous speed (rpm)	Rated full- load efficiency η (%)		Synchronous speed (rpm)	Rated full- load efficiency η (%)		Synchronous speed (rpm)	Rated full- load efficiency η (%)	
kW	HP (reference)	60Hz	Totally enclosed (TE) type	Drip proof type	60Hz	Totally enclosed (TE) type	Drip proof type	60Hz	Totally enclosed (TE) type	Drip proof type
0.75	1	3600	77.0	77.0	1800	85.5	85.5	1200	82.5	82.5
1.1	1.5		84.0	84.0		86.5	86.5		87.5	86.5
1.5	2		85.5	85.5		86.5	86.5		88.5	87.5
2.2	3		86.5	85.5		89.5	89.5		89.5	88.5
3.7	5		88.5	86.5		89.5	89.5		89.5	89.5
5.5	7.5		89.5	88.5		91.7	91.0		91.0	90.2
7.5	10		90.2	89.5		91.7	91.7		91.0	91.7
11	15		91.0	90.2		92.4	93.0		91.7	91.7
15	20		91.0	91.0		93.0	93.0		91.7	92.4
18.5	25		91.7	91.7		93.6	93.6		93.0	93.0
22	30		91.7	91.7		93.6	94.1		93.0	93.6
30	40		92.4	92.4		94.1	94.1		94.1	94.1
37	50		93.0	93.0		94.5	94.5		94.1	94.1
45	60		93.6	93.6		95.0	95.0		94.5	94.5
55	75		93.6	93.6		95.4	95.0		94.5	94.5
75	100		94.1	93.6		95.4	95.4		95.0	95.0
90	125		95.0	94.1		95.4	95.4		95.0	95.0
110	150		95.0	94.1		95.8	95.8		95.8	95.4
150	200		95.4	95.0		96.2	95.8		95.8	95.4
185~200	250~270		95.8	95.4		96.2	96.0		95.8	95.8

Source: https://meps.energylabel.org.tw

Measurement of full load efficiencies specified in the above table shall be in accordance with IEC 60034-2-1 or IEEE 112B, and the test reports shall be issued by issued by certification authorities that are members of the mutual recognition agreement signed by the Taiwan Accreditation Foundation (TAF) and the International Laboratory Accreditation Cooperation (ILAC), laboratories certified by BSMI, BOE, or by Underwriters Laboratories Inc. (UL) and Technischer Überwachungs-Verein (TÜV).

2.22.3 Labeling and Other Supporting Policies

Electric motors shall be labeled (marked) on visible positions on the machine with full load efficiency values and efficiency classes (IE2 or IE3), and the following information: rated output power, number of poles, rated voltage, rated frequency, IP code, motor type, year of manufacture, and manufacturer's name or trade mark.

2.22.4 Monitoring, Verification and Enforcement

Before making or importing the induction motor, the supplier shall register with the Energy Efficiency Labeling Management System (EELMS) administered by the central competent authority (CCA). However, inspection of energy efficiency requirements for low-voltage single-phase induction motors and low-voltage three-phase squirrel-cage induction motors is not carried out at the entry points, due to various reasons, including the lack of performance testing laboratories for certain motor products, and the fact that the majority of these products are parts of other imported equipment and systems (such as pumps, fans and compressors). Safety is still the main consideration for BSMI's product certification[23].

CCA may conduct annual random energy efficiency check testing, and the supplier is required to deliver units of models specified by CCA to the given labs. In case the results do not conform to the energy efficiency requirements, CCA shall call the supplier for another test, and the supplier shall be responsible for the cost of the second test. The suppliers who decline to conduct the second test or fail the second test are subject Clause 21 and 24 of the Energy Administration Act.

2.23 THAILAND

2.23.1 Institutional Framework

Thailand has implemented energy efficiency standards and labelling (S&L) policies and regulations since the early 90s, and relevant S&L activities and programs for three-phase induction motors include Minimum Energy Performance Standard (MEPS), High Energy Performance Standard (HEPS), and energy labeling. There are key two (2) government agencies involving in promoting energy efficient electric motors in Thailand.

- **The Department of Alternative Energy Development and Efficiency (DEDE)** under Ministry of Energy is responsible for regulation, supervision, promotion, and assistance provision to the designated factories and buildings to comply with laws and regulations for efficient use of energy and savings. According the Energy Conservation and Promotion Act (ENCON Act), 2007, DEDE can develop and propose Minimum Energy Performance Standards (MEPS) for electric motors, however it has to collaborate with the Thai Industrial Standards Institute (TISI) for enforcement of enforce MEPS.
- **The Thai Industrial Standards Institute (TISI)** under Ministry of Industry has duty to carry out national standardization in order to promote, support and develop acceptable quality of domestic products and regulates the standards for industrial products. TISI has legal

[23] https://www.moeaboe.gov.tw/ECW/english/content/Content.aspx?menu_id=1535

authority to enforce compulsory standards including MEPS in Thailand. In 1989, TISI promulgated MEPS for electric motors which has been implemented on a voluntary basis.

2.23.2 Test Standards and MEPS

Thailand developed MEPS[24] for three-phase squirrel-cage induction motors with rated output of 0.73 kW to not exceeding 185 kW and the rated voltage not exceeding 1,000 V in 2007. The induction motor MEPS in Thailand was promulgated as TIS 867-2532 and upgraded as TIS 867-2550, however it is still recognized as a voluntary standard. According to the Barriers removal to the cost-effective development and implementation of energy efficiency standards and labeling (BRESL) project, TIS 867-2550 was drafted based on the Australian/New Zealand MEPS, AS/NZS 1359.5 (2004) Part 5: Three-phase cage induction motors – High efficiency and minimum energy performance standards requirements, and scope of the Thai MEPS covers the following three-phase squirrel cage induction motors:

- Rated voltage up to 1000 V
- Rated output between 0.73 kW and not exceeding 185 kW
- 2, 4, 6 or 8 poles

The MEPS levels specified in TIS 867-2550 reference table B1 (Level 2B): minimum efficiency – test method B[25] of the standard AS/NZS 1359.5:2004 as shown in Table 2-23 below.

Table 2-23: MEPS for three-phase induction motors (TIS 867-2550)

Rated Output (kW)	Minimum Efficiency (%)			
	2 poles	4 poles	6 poles	8 poles
0.73	74.0	74.4	72.4	68.4
0.75	74.0	74.4	72.4	68.4
1.1	76.2	76.2	75.2	71.5
1.5	78.5	78.5	77.3	74.6
2.2	81.0	81.0	79.6	77.6
3	82.6	82.6	81.4	79.7
4	84.2	84.2	83.0	81.5
5.5	85.7	85.7	84.6	83.3
7.5	87.0	87.0	86.0	85.0

[24] http://research.rid.go.th/vijais/moa/fulltext/TIS867-2550.pdf

[25] The method B of the AS/NZS 1359.5 (2004) is in accordance with AS 1359.102.1 or 60034-2. Thai MEPS indicates IEC 60034-2 as a test method to measure the efficiency of three-phase induction motors.

Rated Output (kW)	Minimum Efficiency (%)			
	2 poles	4 poles	6 poles	8 poles
11	88.4	88.4	87.6	86.8
15	89.4	89.4	88.8	88.2
18.5	90.0	90.0	89.6	89.0
22	90.5	90.5	90.1	89.7
30	91.4	91.4	91.1	90.8
37	92.0	92.0	91.7	91.5
45	92.5	92.5	92.3	92.0
55	93.0	93.0	92.8	92.6
75	93.6	93.6	93.5	93.4
90	93.9	93.9	93.9	93.7
110	94.4	94.4	94.3	94.1
132	94.8	94.7	94.7	94.4
150	95.0	95.0	94.9	94.7
<185	95.0	95.0	94.9	94.7

Based on the interview with TISI, Thailand has planned to withdraw the current MEPS and published a new MEPS for three-phase induction motors, referencing IE1 per IEC 60034-30-1:2014 Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE code). The new MEPS[26] is still in a draft form, and the target enforcement date has not yet been confirmed.

2.23.3 Labeling and Other Supporting Policies

In additional MEPS, DEDE has implemented a voluntary energy efficient labeling program for non-domestic appliances since 2009[27]. The motors with energy efficient labels appear in the market since 2016. DEDE's motor labeling program covers motors with rated output between 0.73 to 185 kW, 50-60 Hz and 380 V. The efficiency requirements of high efficiency motors under DEDE's energy labeling program (see Table 2-24) do not follow any international standards, and the requirements fall between IE3 and IE4 levels of IEC 60034-30-1: 2014. It should be noted that the Thai MEPS for three-phase induction motors reference IEC 60034-2 (1972), under Amendment 1 (1995) and Amendment 2 (1996) which has already been withdrawn by IEC and replaced by IEC 60034-2-1:2007.

[26] https://www.tisi.go.th/data/standard/pdf/a866_30_101_25XX.pdf

[27] http://www.2e-building.com/article.php?cat=knowledge&id=331, http://www.dede.go.th/download/files/en_sav5907.pdf

Figure 2-14: Energy Label for Three-Phase Induction Motors in Thailand

Table 2-24: Efficiency for three-phase induction motors under DEDE's Energy Labeling Program

Rated Power (kW)	Efficiency (%)			
	2 poles	4 poles	6 poles	8 poles
0.73	80.3	84.0	80.8	73.9
0.75	80.3	84.0	80.8	73.9
1.10	83.8	85.2	85.4	76.8
1.5	85.2	85.4	86.9	79.0
2.2	87.1	87.5	87.9	81.9
3.0	86.9	88.0	88.2	83.7
4.0	88.5	88.6	89.0	85.3
5.5	89.5	90.2	89.9	86.5
7.5	90.8	90.7	90.5	87.7
11	91.1	91.6	91.2	89.0
15	91.7	92.1	91.5	90.1
18.5	92.1	92.9	92.4	90.7
22	92.7	93.1	92.7	91.4
30	93.3	93.6	93.5	92.3
37	93.7	94.0	93.9	92.9
45	94.1	94.7	94.4	93.2

Rated Power (kW)	Efficiency (%)			
	2 poles	4 poles	6 poles	8 poles
55	94.5	95.0	94.7	94.2
75	95.2	95.4	95.3	94.2
90	95.5	95.5	95.7	94.3
110	95.6	95.7	95.8	95.0
132	95.8	95.6	95.9	95.3
150	95.9	96.0	96.1	95.5
185	95.7	95.8	96.1	95.7

Comparison of the Thai MEPS and efficiency requirements for the Thai energy labeling program for three-phase induction motors is illustrated in Figure 2-15.

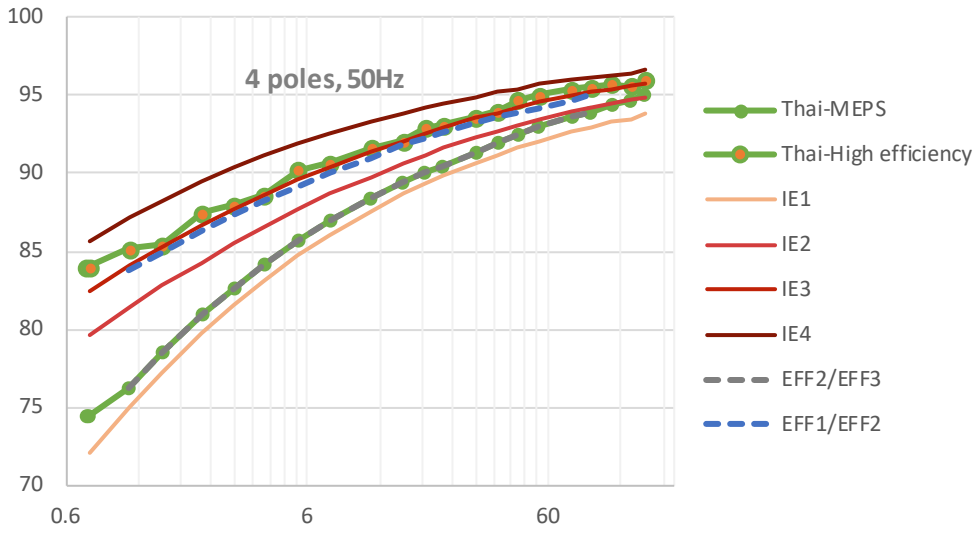


Figure 2-15: Efficiency Levels of Thailand and the international standards

2.23.4 Monitoring, Verification and Enforcement

DEDE is responsible for certification of the motor energy labeling in Thailand. However, the Thai MEPS for electric motors has not yet been made mandatory, and there are no registration required, and mo market surveillance activities implemented by TISI.

2.23.5 Financial Mechanisms

The Thai Ministry of Energy has implemented multiple financial incentive schemes to promote energy efficiency, and electric motors that pass the HEPS requirements are eligible to participate in the direct subsidy program which subsidizes 20% of equipment and installation costs.

2.24 THE UNITED STATES

2.24.1 Institutional Framework

The Office of Energy Efficiency and Renewable Energy under the United States Department of Energy (DOE) has a primary responsibility for programs to improve the energy efficiency of buildings, vehicles, and industry, and for setting minimum efficiency standards for key appliances and equipment. Landmark energy efficiency legislation enacted over the past twenty five years includes the National Appliance Energy Conservation Acts of 1987 and 1988 (NAECA); the Energy Policy Act of 1992 (EPAct 1992); the Energy Policy Act of 2005 (EPAct 2005); and the Energy Independence and Security Act of 2007 (EISA 2007).[28]

DOE, through its Building Technologies Office, sets minimum energy efficiency standards for approximately 60 categories of appliances and equipment used in homes, businesses, and other applications, as required by existing law. The United States Environmental Protection Agency (EPA) and DOE jointly administer the ENERGY STAR program, a voluntary energy efficiency labeling program for appliances and consumer electronics.

2.24.2 Test Standards and MEPS

Electric motors were first regulated in the United States through EPAct 1992. This was the first major energy law to require minimum, nominal, full-load motor efficiency ratings applying to the following motors: “general purpose, T-frame, single speed, squirrel cage, induction type; 230/460-V, National Electrical Manufacturers Association (NEMA) Designs A or B, continuous rated, 60 Hz, from 1 to 200 HP, 2-4-and 6-pole (3,600, 1,800and 1,200rpm), open and enclosed”. That definition represented the majority of electric motors commonly specified for industrial equipment, and they became known as “EPAct motors”. The nominal efficiencies of these motors are in accordance with NEMA MG-1 Table 12-11, and they are 1% to 4% higher than the standard motors they replaced.

EPAct 2005 required all federal motor purchases to attain NEMA Premium efficiency ratings. The NEMA Premium motor efficiency ratings are up to several percentage points higher than those of their EPAct predecessors (EPAct 1992). EISA 2007 updated efficiency regulations for motors covered under EPAct 1992 (called Subtype I motors), and extended coverage to several new categories of motors (called Subtype II motors) and established efficiency regulations for them. The extended scope of EISA 2007 includes motors that were previously exempted from MEPS. These motors incorporate design elements of Subtype I general-purpose motors but can be configured as U-frame motors, NEMA Design C motors, close-coupled pump motors, footless motors, vertical solid-shaft normal-thrust motors (as tested in a horizontal position), 8-pole (900 rpm) motors and polyphase motors with a voltage of not more than 600 V (other than 230 V or 460 V).

[28] Compendium Of Energy Efficiency Policies in APEC Economies, APEC Energy Working Group, October 2017

Under EISA 2007, the MEPS levels for motors from 1 HP to 200 HP and manufactured alone or as a component of another piece of equipment must meet the NEMA Premium efficiency ratings (NEMA MG-1-2006, Table 12.12 which is equivalent to IE3). For NEMA Design B motors between 201 hp and 500 hp and fire-pump motors classified as Subtype I motors, and Subtype II are required to meet the less stringent EPAct 1992 minimum nominal efficiencies. EISA 2007 MEPS requirements have become effective since December 2010.

In 2013, DOE issued the new Integral Horsepower Motor Rule which was published in the Federal Register on May 29th, 2014, and will take effect June 1st, 2016. The new Rule replaces EISA 2007, and almost all motors are covered at the NEMA Premium efficiency levels (NEMA MG 1, Table 12-12), as shown in the table below.

Table 2-25: Energy Conservation Standards for Electric Motors (Excluding Fire Pump Electric Motors) in the United States, after June 1st, 2016

Motor Horsepower/ Standard Kilowatt Equivalent	Nominal Full-Load Efficiency (%)							
	2 Pole		4 Pole		6 Pole		8 Pole	
	Enclosed	Open	Enclosed	Open	Enclosed	Open	Enclosed	Open
1/.75	77.0	77.0	85.5	85.5	82.5	82.5	75.5	75.5
1.5/1.1	84.0	84.0	86.5	86.5	87.5	86.5	78.5	77.0
2/1.5	85.5	85.5	86.5	86.5	88.5	87.5	84.0	86.5
3/2.2	86.5	85.5	89.5	89.5	89.5	88.5	85.5	87.5
5/3.7	88.5	86.5	89.5	89.5	89.5	89.5	86.5	88.5
7.5/5.5	89.5	88.5	91.7	91.0	91.0	90.2	86.5	89.5
10/7.5	90.2	89.5	91.7	91.7	91.0	91.7	89.5	90.2
15/11	91.0	90.2	92.4	93.0	91.7	91.7	89.5	90.2
20/15	91.0	91.0	93.0	93.0	91.7	92.4	90.2	91.0
25/18.5	91.7	91.7	93.6	93.6	93.0	93.0	90.2	91.0
30/22	91.7	91.7	93.6	94.1	93.0	93.6	91.7	91.7
40/30	92.4	92.4	94.1	94.1	94.1	94.1	91.7	91.7
50/37	93.0	93.0	94.5	94.5	94.1	94.1	92.4	92.4
60/45	93.6	93.6	95.0	95.0	94.5	94.5	92.4	93.0
75/55	93.6	93.6	95.4	95.0	94.5	94.5	93.6	94.1
100/75	94.1	93.6	95.4	95.4	95.0	95.0	93.6	94.1
125/90	95.0	94.1	95.4	95.4	95.0	95.0	94.1	94.1
150/110	95.0	94.1	95.8	95.8	95.8	95.4	94.1	94.1
200/150	95.4	95.0	96.2	95.8	95.8	95.4	94.5	94.1
250/186	95.8	95.0	96.2	95.8	95.8	95.8	95.0	95.0
300/224	95.8	95.4	96.2	95.8	95.8	95.8	--	--
350/261	95.8	95.4	96.2	95.8	95.8	95.8	--	--
400/298	95.8	95.8	96.2	95.8	--	--	--	--
450/336	95.8	96.2	96.2	96.2	--	--	--	--
500/373	95.8	96.2	96.2	96.2	--	--	--	--

Source: https://www.energy.gov/sites/prod/files/2014/05/f15/electric_motors_ecs_final_rule.pdf

The Rule also simplifies enforcement and compliance with improved definitions and testing guidelines. DOE defines characteristics of a motor regulated under the expanded scope as follow:

- Is a single-speed, induction motor;
- Is rated for continuous duty (MG 1) operation or for duty type S1 (IEC);
- Contains a squirrel-cage (MG 1) or cage (IEC) rotor;
- Operates on polyphase alternating current 60-hertz sinusoidal power;
- Is rated for 600 volts or less;
- Is built with a 2-, 4-, 6-, or 8-pole configuration;
- Is built in a three-digit or four-digit NEMA frame size (or IEC metric equivalent), including those designs between two consecutive NEMA frame sizes (or IEC metric equivalent), or an enclosed 56 NEMA frame size (or IEC metric equivalent);
- Produces at least 1 horsepower (0.746 kW) but not greater than 500 horsepower (373 kW) and;
- Meets all of the performance requirements of a NEMA Design A, B, or C motor or of an IEC Design N or H electric motor.

Table 2-26: Differences between EISA 2007 and New Integral Horsepower Motor Rule

Motor Type	EISA	New Integral HP Rule
1-200 HP Subtype I	Premium Efficient NEMA MG 1, Table 12-12	Premium Efficient NEMA MG 1, Table 12-12
1-200 HP Subtype II	Energy Efficient NEMA MG 1, Table 12-11	Premium Efficient NEMA MG 1, Table 12-12
201-500 HP	Energy Efficient NEMA MG 1, Table 12-11	Premium Efficient NEMA MG 1, Table 12-12 & 20-B
56 Frame Enclosed	Exempt	Premium Efficient NEMA MG 1, Table 12-12
Custom Configurations	Exempt	Premium Efficient NEMA MG 1, Table 12-12
1-200 HP Fire Pump Motors	Energy Efficient NEMA MG 1, Table 12-11	Energy Efficient NEMA MG 1, Table 12-11

Source: The Impact of the Integral Horsepower Amended Rule (1 – 500 HP Motor), NEMA, 2015

The United States currently recognizes in its legal requirements the national testing standard IEEE 112B, and the Canadian test standard CSA390. Although the differences are minimal, IEC 60034-2-1 has not yet been recognized in the United States.

2.24.3 Labeling and Other Supporting Policies

2.24.3.1 Labeling

NEMA has established a list of standardized efficiency values that manufacturers use when labeling their motors. The NEMA protocol for labeling efficiency on motor nameplates is described in NEMA MG 1-2011. This approach is required for NEMA designs A, B, and C polyphase single-speed induction motors ranging from 1 to 500 hp. The full-load motor nameplate efficiency is selected from a table of nominal efficiencies and represents a value that is "not greater than the average efficiency of a large population of motors of the same design," tested in accordance with IEEE 112. It must appear on the nameplate labeled "NEMA Nominal Efficiency" or "NEMA Nom. Eff."[29]

2.24.3.2 Other Supporting Policies

The Advanced Manufacturing Office (AMO) developed and maintains the MotorMaster+ software tool. MotorMaster+ is a free motor selection and management tool that supports energy management and motor system improvement planning by identifying the most efficient choice for a given repair or motor purchase decision. The tool includes a catalog of more than 20,000 low-voltage induction motors and features motor inventory management tools, maintenance log tracking, efficiency analysis, savings evaluation, energy accounting, and environmental reporting capabilities. All full- and part-load efficiency data is measured in accordance with the IEEE 112 Test Method B protocol to ensure consistency. The information is supplied by manufacturers in electronic format, and the database is updated periodically.

2.24.4 Monitoring, Verification and Enforcement

In the United States, manufacturers test and certify their own motors using IEEE/NEMA standards. DOE requires motor energy performance data to be certified in an accredited lab. To assure product quality, all motor efficiency labs follow either NVLAP (National Voluntary Lab Accreditation Program) or CSA guidelines. NAMA Premium nameplate motors that follow NVLAP accreditation use regulations as set forth in the US Federal Code (CFR 10 Part 431).

It should be noted that NVLAP has been recognized by the International Laboratory Accreditation Cooperation (ILAC) which maintains conformance with ISO/IEC 17011, and related ILAC guidance documents, including accredited laboratories compliance with ISO/IEC 17025.

Upon receiving information in writing, concerning the energy performance of a performance of an electric motor sold by a particular manufacturer or private labeler, which indicates that the electric motor may not be in compliance with the applicable energy efficiency standard, the regulatory commission may conduct testing of an electric motor by means of a test notice addressed to the manufacturer. If a manufacturer's basic model is determined to be in noncompliance with the applicable energy performance standard, the manufacturer may request additional testing at their own costs.

[29] Premium Efficiency Motor Selection and Application Guide, A Handbook for Industry, Advanced Manufacturing Office, DOE, February 2014

2.25 VIET NAM

2.25.1 Institutional Framework

The Vietnamese government passed a Decree on Energy Conservation and Energy Efficiency (102/2003/ND-CP) on 3 September 2003, which sets forth the roles and responsibilities for all actors in government and society with respect to energy efficiency (EE). The key government agencies involving in promoting energy efficient electric motors in Viet Nam are listed as follows:

- **The General Directorate of Energy (GDE)**[30], under the Ministry of Industry and Trade (MOIT), is the implementing agency for the standard and labeling program and it has responsibilities to provide guidelines, inspect and supervise the energy labeling implementation. According to the Vietnamese Government Decree No 98/2017/ND-CP[31] issued on August 18, 2017 on the functions, tasks, authorities and sector structure of MOIT, GDE has the following departments: the Electricity and Renewable Energy; Petroleum and Coal; and Energy Saving and Sustainable Development Departments.
- **The Directorate for Standards, Metrology and Quality of Viet Nam (STAMEQ)**, under the Ministry of Science and Technology (MOST), is the national standardization agency and mandated to issue national standards on EE, take charge and cooperate with relevant ministries and local authorities to set and promulgate technical regulations on EE and the minimum energy efficiency performance standards (MEPS).
- **The Viet Nam Standards and Quality Institute (VSQI)** is a subsidiary of STAMEQ and responsible for organizing national technical committee activities; developing and printing national standards, and providing other related services. It has established relationships with relevant domestic ministries/agencies, as well as international and national standardization organizations.
- **The Ministry of Finance (MOF)** is responsible for cooperating with the Ministry of Planning and Investment and MOIT in laying down the conditions to receive funds from the state budget for application of the energy labeling and MEPS. In addition, MOF takes charge and cooperate with relevant authorities to provide procedures guidance for import of the equipment and appliances regulated by the list.
- **Provincial People's Committees** are responsible for arrange their local institutions specializing in energy saving to work with relevant ministries so as to inspect and supervise the implementation of the energy labeling and MEPS in their areas.

2.25.2 Test Standards and MEPS

Energy standards and labels (ES&L) activities in Viet Nam started in 2006, following the Circular 08/2006/TT-BCT dated November 16, 2006 of MOIT on guidance of sequences and procedures for

[30] GDE was founded in accordance with the Prime Minister's Decision No 50/2011/QĐ-TTg at 05/9/2011, in which GED is assigned as an agency under MOIT having the function of advising and assisting MOIT in state managing and implementing the state management tasks on the energy industries (electricity, nuclear power, oil and gas, new and renewable energy, and energy saving), and managing implementation of the public services in the GDE scope of management.

[31] https://drive.google.com/file/d/0B3GpPjJihxF-UjhvQU1SbTZpNGM/view

labeling of energy efficiency equipment. A summary of legal documents that are relevant to ES&L is as follows:

- **Government Decree No. 102/2003/ND-CP** dated September 3, 2003 on energy efficiency and conservation.
- **Prime Minister Decision No. 80/2006/QD-TTg** dated April 14, 2006 on approval of national electricity saving program stage 2006-2010.
- **Ministry of Industry and Trade Circular No. 08/2006/TT-BCN**[32] dated November 16, 2006 on guidance of sequences and procedures for labeling of energy efficiency equipment. It provides details and guidance on: Testing procedures; testing methods; designated testing labs; and application, certification and labeling etc.
- **Law No. 50/2010/QH12 on Energy conservation and efficient use**, effective on June 28, 2010.
- **Government Decree No. 21/2011/ND-CP** dated March 29, 2011 on detailed regulations and implementation guidance of EE&C Law.
- **Ministry of Industry and Trade Circular No. Circular 07/2012/TT-BCT**[33] dated April 4, 2012 on the implementation of energy labeling
- **Government Decree No. 134/2013/NĐ-CP** dated October 17, 2013, Regulation on penalty in energy efficiency and conservation.
- **Ministry of Industry and Trade Circular No. 36/2016/TT-BCT**[34] dated December 28, 2016, comes into force from February 10, 2017 and replaces Circular No. 07/2012/TT-BCT dated April 4, 2012, regulates and guides to register for energy labeling of appliances and equipment.
- **Prime Minister Decision No. 78/2013/QĐ-TTg** dated December 25, 2013, stipulates the list of equipment and roadmap for rejecting lower than MEPS appliance/equipment
- **Prime Minister Decision No. 04/2017/QĐ-TTg**[35] dated March 9, 2017 supersede *Decision No. 51/2011/QĐ-TTg* dated September 12, 2011 & *Decision 03/2013/QĐ-TTg* dated January 14, 2013 stipulates the list of equipment and appliances subjected to mandatory energy labeling and MEPS and roadmap of implementation.
- **Prime Minister Decision No. 24/2018/QD-TTg** dated May 18, 2018 stipulates the list of equipment prohibited from being imported, manufactured and traded from July 10, 2018. It is prohibited to import; manufacture and trade in low-efficiency equipment that fails to satisfy MEPS specified in the national standards (TCVN). Motor is specified as TCVN 7540-1:2013

Relevant standards including MEPS for electric motors have been issued since 2005 on a voluntary basis. The testing standard for motors is based on TCVN 6627-2-1:2010, which is identical to IEC 60034-2-1:2007. The EE requirements for electric motors have become mandatory since 2015, and the relevant EE standards include:

[32] https://policy.asiapacificenergy.org/sites/default/files/Circular%20No.%2008%3A2006%3ATT-BCN%20on%20Guiding%20the%20Order%20of%2C%20Procedures%20for%20Energy-Saving%20Labelling%20for%20Energy%20Consumption%20Products.pdf

[33] http://vbqppl.mpi.gov.vn/en-us/Pages/default.aspx?itemId=1876ef5e-7c2e-47a8-90e6-0e3c5c5a0d25&list=documentDetail

[34] https://vanbanphapluat.co/circular-36-2016-tt-bct-energy-labeling-for-means-equipment-using-energy

[35] https://drive.google.com/file/d/0B3GpPjJihxF-UjhvQU1SbTZpNGM/view

- **TCVN 7540-1: 2013** (updated and replaced TCVN 7540-1: 2005) High Efficiency three-phase asynchronous squirrel cage electrical motors – Part 1: Minimum Energy performance[36]
- **TCVN 7540-2: 2013** (updated and replaced TCVN 7540-2: 2005) High Efficiency three-phase asynchronous squirrel cage electrical motors – Part 2: Methods for determination of performance

TCVN 7540-1: 2013 and TCVN 7540-2: 2013 are applied for 3-phase, asynchronous squirrel cage electric motors with a speed of 50 Hz and / or 60 Hz; voltage not exceed 1,000V, and rated power from 0.75-150kW. TCVN 7540-1:2013 specifies two EE classes, which are almost identical to IE1 (Standard efficiency) and IE3 (Premium efficiency) classes of IEC/EN 60034-30-1:2014.

Table 2-27 and Table 2-28 present minimum energy performance (MEP) values at 50 and 60 Hz as defined in TCVN 7540-1: 2013.

Table 2-27: MEP Values for Three-Phase Induction Motors, 50 Hz (TCVN 7540-1:2013)

Rated Output (kW)	Minimum Efficiency (%)		
	2 poles	4 poles	6 poles
0.75	72.1	72.1	70,0
1.1	75.0	75.0	72.9
1.5	77.2	77.2	75.2
2.2	79.7	79.7	77.7
3	81.5	81.5	79.7
4	83.1	83.1	81.4
5.5	84.7	84.7	83.1
7.5	86.0	86.0	84.7
11	87.6	87.6	86.4
15	88.7	88.7	87.7
18.5	89.3	89.3	88.6
22	89.9	89.9	89.2
30	90.7	90.7	90.2
37	91.2	91.2	90.8
45	91.7	91.7	91.4
55	92.1	92.1	91.9
75	92.7	92.7	92.6

[36]http://www.quatest3.com.vn/Content/UserImages/Hinh-anh-tin-tuc/ANF%20GA%20Meeting%202017/6.%20QUATEST3%20Presentation_Nov%2016%20(ANF%20GA%20meeting%20VN).pdf

Rated Output (kW)	Minimum Efficiency (%)		
	2 poles	4 poles	6 poles
90	93.0	93.0	92.9
110	93.3	93.3	93.3
132	93.5	93.5	93.5
150	93.8	93.8	93.8

Table 2-28: MEP Values for Three-Phase Induction Motors, 60 Hz (TCVN 7540-1:2013)

Rated Output (kW)	Minimum Efficiency (%)		
	2 poles	**4 poles**	**6 poles**
0.75	77.0	78,0	73.0
1.1	78 , 5	79.0	75,0
1.5	81,0	81.5	77.0
2.2	81.5	83.0	78.5
3.7	84.5	85,0	83.5
5.5	86.0	87.0	85,0
7.5	87.5	87.5	86.0
11	87.5	88.5	89.0
15	87.5	89.5	89.5
18.5	88.5	90.5	90.2
22	89.5	91,0	91,0
30	90.2	91.7	91.7
37	91.5	92.4	91.7
45	91.7	93.0	91.7
55	92.4	93.0	92.1
75	93.0	93.2	93.0
90	93.0	93.2	93.0
110	93.0	93.5	94.1
150	94.1	94.5	94.1

2.25.3 Labeling and Other Supporting Policies

2.25.3.1 Labeling

Endorsement energy labels (also known as Viet Energy Star) are affixed to electric motors distributed in the market describing the level of energy efficiency meeting or exceeding HEP values, as defined in TCVN 7540-1: 2013 (see Table 2-29 and Table 2-30 for HEP values for 50 and 60 Hz electric motors.

Figure 2-16: Viet Energy Star Label

Table 2-29: HEP Values for Three-Phase Induction Motors, 50 Hz (TCVN 7540-1:2013)

Rated Output (kW)	Efficiency (%)		
	2 poles	4 poles	6 poles
0.75	80.7	82.5	79.8
1.1	82.7	84.1	81,0
1.5	84.2	85.3	82.5
2.2	85.9	86.7	84.3
3	87.1	87.7	85.6
4	88.1	88.6	86.8
5.5	89.2	89.6	88.0
7.5	90.1	90.4	89.1
11	91.2	91.4	90.3
15	91.9	92.1	91.2
18.5	92.4	92.6	91.7
22	92.7	93.0	92.2
30	93.3	93.6	92.9
37	93.7	93.9	93.3
45	94.0	94.2	93.7
55	94.3	94.6	94.1

Rated Output (kW)	Efficiency (%)		
	2 poles	4 poles	6 poles
75	94.7	95.0	94.6
90	95.0	95.2	94.9
110	95.2	95.4	95.1
132	95.4	95.6	95.4
150	95.6	95.8	95.6

Table 2-30: HEP Values for Three-Phase Induction Motors, 60 Hz (TCVN 7540-1:2013)

Rated Output (kW)	Efficiency (%)		
	2 poles	4 poles	6 poles
0.75	77.0	85.5	82.5
1.1	84,0	86.5	87.5
1.5	85.5	86.5	88.5
2.2	86.5	89.5	89.5
3.7	88.5	89.5	89.5
5.5	89.5	91.7	91,0
7.5	90.2	91.7	91,0
11	91,0	92.4	91.7
15	91,0	93.0	91.7
18.5	91.7	93.6	93.0
22	91.7	93.6	93.0
30	92.4	94.1	94.1
37	93.0	94 , 5	94.1
45	93.6	95 , 0	94.5
55	93.6	95.4	94.5
75	94.1	95.4	95.0
90	95.0	95.4	95.0
110	95.0	95.8	95.8
150	95.4	96.2	95.8

Comparison of MEP and HEP requirements for Vietnamese energy standard and labeling program for 4-pole motors at 50 Hz with the international standards is illustrated in Figure 3.

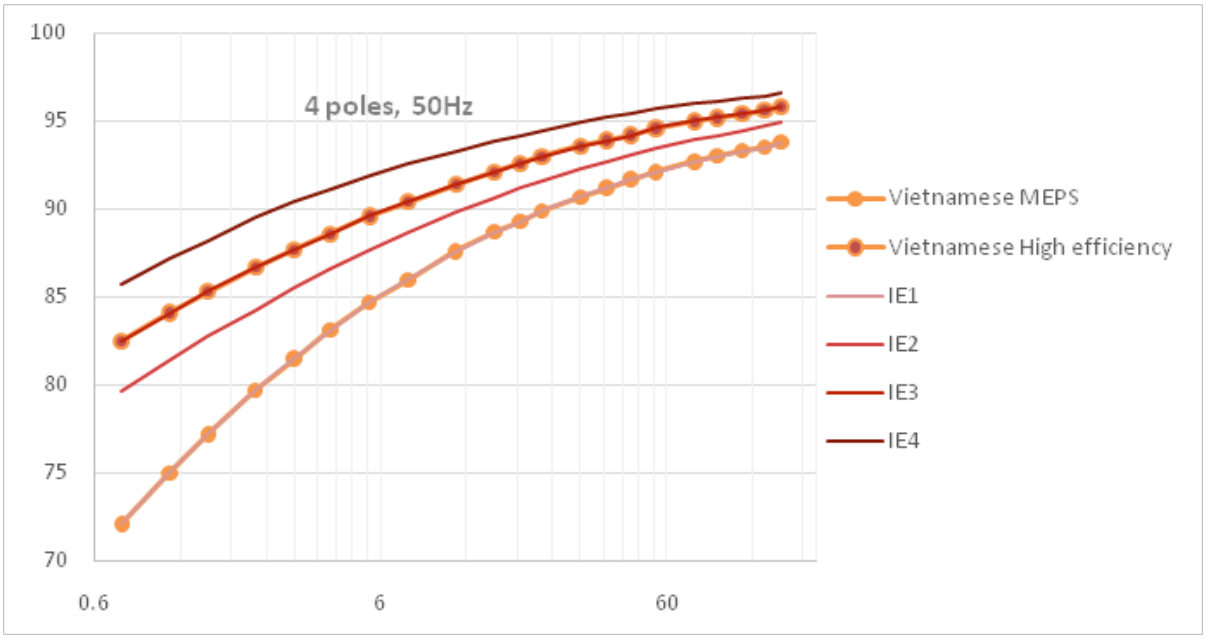


Figure 2-17: Motor Efficiency Levels in Viet Nam vs IE Codes

2.25.4 Monitoring, Verification and Enforcement

Monitoring, verification and enforcement for products regulated under mandatory standards in Viet Nam are responsible by the general department of market surveillance under MOIT. However implementation of monitoring, verification and enforcement activities for products under MEPS and labeling programs has been hampered by limited budget and human resources.

3 Energy Efficient Electric Motor Market Transformation

3.1 Regional Market Transformation Programs

3.1.1 ASEAN SHINE

The ASEAN SHINE[37] program is a public-private partnership between the United Nations Environment Programme (UN Environment) and the International Copper Association (ICA). The ASEAN SHINE program covers air conditioners, lighting, motors and transformers. In 2012, ICA and UN Environment successfully managed to secure funding from APEC and the European Union to implement a strategic harmonization framework for promotion of higher efficiency air conditioners (ACs) in eight ASEAN member economies (Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand and Vietnam).

Through support of the ASEAN SHINE program, ASEAN member states agreed to harmonize test methods for air conditioners to the international standard ISO 5151:2010, and adopt the "ASEAN Regional Policy Roadmap for Harmonization of Energy Performance Standards for Air Conditioners" which aims at setting a minimum EER (also refers to weighted EER) of 2.9W/W or CSPF of 3.08W/W by 2020 as mandatory MEPS for all fixed and variable drive ACs below 3.52kW capacities. In addition, a national policy roadmap for room air conditioners was developed for and adopted by each ASEAN member state to achieve their commitment toward the regional harmonization.

For electric motors, the ASEAN SHINE program conducted a scoping study in 2016, and the proposed strategic approaches for electric motors include:

- Harmonization of energy efficiency requirements with IEC standards (IE code);
- Adoption of regional and national policies to set MEPS at IE3 by 2025;
- Capacity building repair workshops to stop energy efficiency loss during repair (installed motors);
- Implementation of awareness programs for end-users by cooperating with manufacturers of higher efficiency motors.

Specific program activities for the above strategic approaches have not yet been developed.

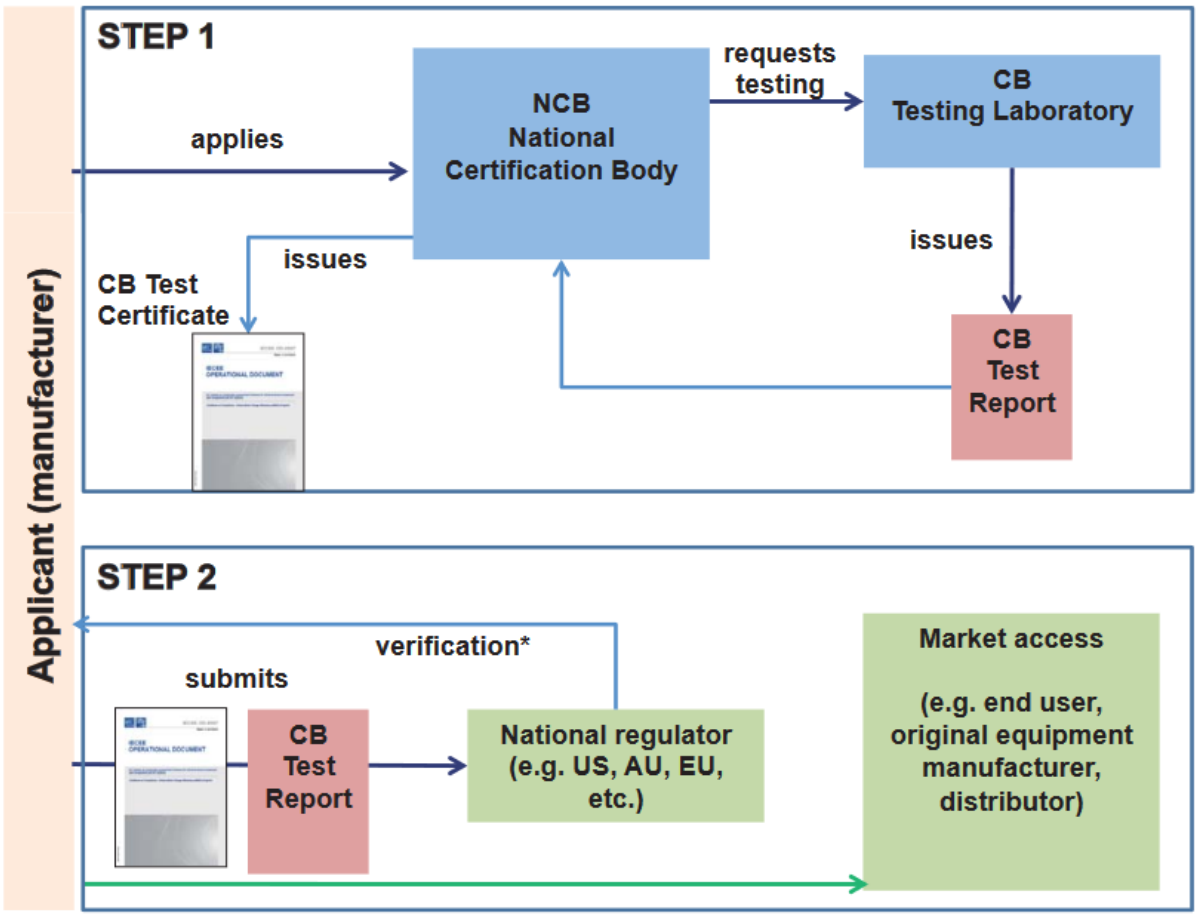
3.2 International Market Transformation Programs

3.2.1 GMEE

[37] ASEAN Standards Harmonization Initiative for Energy Efficiency (SHINE)

Major motor manufacturers produce and sell electric motors across many economies. Many economies around the world have adopted IEC standards or equivalent testing methods as the test standards for three-phase induction motors. However, efficiency levels and certification schemes still vary from economy to economy. Considering this, manufacturers initiated the IECEE Global Motor Energy Efficiency Programme (GMEE): www.iecee.org/about/gmee/. The goal of the programme is to have one recognized test method (IEC 60034-2-1), one test report format, one efficiency classification (IEC 60034-30-1), one certification process and one label for electric motors in all participating economies.

GMEE is based on the IECEE Certification Body (CB) Scheme which follows IEC International Standards. The main objective of the Scheme is to realize the concept of "one product, one test, one certificate" through promoting the harmonization of national standards with International Standards. Shown in the figure below is the process for obtaining GMEE certifications for market entry verification.



Source: IECEE Global Motor Energy Efficiency Programme Brochure, 2016

Figure 3-1: Process for Obtaining GMEE National Certification under the IECEE CB Scheme

The IECEE has more than 50 Member economies, nearly 80 participating National Certification Bodies (NCBs) and close to 500 CB Testing Laboratories (CBTLs). National Certification Bodies are assessed on site to verify their compliance against ISO/IEC 17065 and the IECEE Basic Rules, Rules of Procedures and Operational Documents. Fourteen APEC economies are members of the IECEE, as highlighted in Table 3-1.

Table 3-1: APEC Member Economies participating in the IECEE

Australia	Japan	The Philippines
Brunei Darussalam	Republic of Korea	Russia
Canada	Malaysia	Singapore
Chile	Mexico	Chinese Taipei
People's Republic of China	New Zealand	Thailand
Hong Kong, China	Papua New Guinea	The United States
Indonesia	Peru	Viet Nam

3.2.2 United for Efficiency

United for Efficiency (U4E) is a global initiative launched in 2015 to accelerate such a transition and unlock lasting economic, health, environmental, and climate benefits. UN Environment leads U4E, with funding from the Global Environment Facility (GEF) and support from global partners including ICA and participating manufacturers such as ABB, Arçelik, BSH Hausgeräte GmbH, Electrolux, MABE, MEGAMAN, Osram, Signify and Whirlpool Corporation.

In 2017, U4E issued a report entitled "Accelerating the Global Adoption of Energy-Efficient Electric Motors and Motor Systems" which is part of a series of U4E guides, which cover lighting, room air conditioners, residential refrigerators, and transformers. The objective of the report is to guide policymakers on how to promote energy efficient motors and motor systems in their national markets. It is based on U4E's Integrated Policy Approach[38], which has been applied around the world to bring about sustainable market transformations. The content was developed based on expert insights from over 20 organizations, ranging from motor manufacturers and industry associations to environmental groups, academia, and governments. This balanced approach offers credible guidance to address common questions.

[38] An Integrated Policy Approach to fully transform a market includes: Standards and Regulations; Supporting Policies; Finance and Financial Delivery Mechanisms; Monitoring, Verification and Enforcement (MVE); and Environmental Sustainability and Health considerations.

4 RECOMMENDED STRATEGY AND APPROACH

4.1 CONCLUSIONS

Analysis of MEPS and labeling programs for three-phase induction motors, and relevant energy efficiency policies and regulatory frameworks in APEC and ASEAN economies found that the recent developments of IEC standards for energy efficient motors, i.e., IEC 60034-2-1 and IEC 60034-30-1 have significantly reduced barriers to standard harmonization for energy efficiency programs for electric motors in APEC and ASEAN economies. The ongoing programs such as GMEE and ASEAN SHINE have further strengthened necessary infrastructures required to support effective implementation of energy efficiency programs for electric motors in APEC and ASEAN economies. Through these recent and ongoing developments, priorities of the core elements in aligning conformity assessment for energy efficiency programs for electric motors in APEC and ASEAN economies are discussed below:

Table 4-1: Summary of Findings from Situation Analysis

Core Element	Summary of Current Situation	Priority in Aligning Conformity Assessment Efforts	Remark
Scope and Product Type	• Rated power outputs are within a range of 0.73 kW to 375 kW (i.e., around 1hp to 500hp) • Minimum rated power outputs starting at 0.73kW and 0.75kW, while maximum rated power outputs include 7.5kW, 150kW, 185kW and 375kW • Special designed motors usually not included	**Low**	Flexibility should be given to small economies to adopt a scope of the energy efficiency program for electric motor that fits well with the local context.
Implementation Approach	• Mandatory implementation through the Acts and regulations developed specifically for energy efficient electric motors; • Mandatory implementation through relevant standard Acts	**Low to Medium**	Decision on the most effective legal framework for implementation of the mandatory energy efficiency program for electric motors shall be made by each

Core Element	Summary of Current Situation	Priority in Aligning Conformity Assessment Efforts	Remark
	• Efficiency info on nameplate rating, energy efficiency endorsement label, and comparative energy label requirements are common practices in APEC/ASEAN economies		respective APEC/ASEAN economy. Requirements for displaying efficiency information on motors' nameplates are the most common measures.
Testing and Efficiency Standard	• Test methods are generally identical to IEC 60034-2-1 Method 2-1-1B and/or IEEE 112 Method B. • In most economies, efficiency requirements are aligned with the IE classifications specified in IEC 60034-30-1 • Some APEC/ASEAN economies without active energy efficiency programs for electric motors reference previous editions of IEC standards	**High**	IEC standards for electric motors are common among APEC/ASEAN economies, and updating relevant IEC standards for electric motors should be immediately undertaken.
Conformity Assessment and Registration	• Virtually all economies recognize the results of testing conducted by accredited laboratories. • Product registration is prerequisite for product importation and/or distribution. • Not all APEC/ASEAN economies have online registration systems. • Most economies have developed procedures for market surveillance and verification testing, and details of enforcement actions.	**Medium**	Aligning test report format, and establishment of a central registration database for both 50/60Hz will reduce cost of conformity assessment for market entry. Sharing verification test results among APEC/ASEAN economies can improve effectiveness and also reduce implementation cost.

4.2 RECOMMENDATIONS ON HARMONIZATION ROADMAP

4.2.1 Recommended Actions

Aligning conformity assessment efforts for energy efficiency programs for electric motors in APEC and ASEAN economies are recommended through implementation of the following actions over the next 3 to 5 years:

Table 4-2: Recommended Actions and Indicative Timelines

Recommended Action	Indicative Timeline
Harmonize test methods and efficiency classifications with the latest editions of IEC 60034-2-1 and IEC 60034-30-1. This action can be carried out through a similar approach employed by the ASEAN SHINE program for room air conditioners, i.e., establishment of a regional policy and each APEC/ASEAN member economy will develop and adopt its national policy roadmap to achieve the long-term goals set out in the regional policy roadmap.	2020 - 2021
Require that all motors display efficiency information in accordance with the marking requirement specified in IEC 60034-30-1, i.e., the rated efficiency and the IE code shall be durably marked on the rating plate, for example "IE2 - 84.0%". Each APEC/ASEAN member economy may choose to implement an energy labeling and/or QR code scheme to supplement the mandatory marking.	2022
Adopt mandatory MEPS for general purpose, three-phase electric induction motors with two, four or six poles; rated output between 0.75 kW – 375 kW (i.e. 1 HP to 500 HP); rated voltage up to 1,000 Volts at 50 Hz or 60 Hz; and continuous duty operation. • **Level IE2 (defined by IEC 60034-30-1) is recommended as a starting point for APEC and ASEAN economies.** • **Each economy reserves the right to adopt a more stringent IE Level (defined by IEC 60034-30-1). .**	2022
Develop a plan to build awareness and capacity of stakeholders (testing laboratories, regulators and energy efficiency officials) for participating in the GMEE program to improve effectiveness of conformity assessment of motor energy efficiency for product registration and market entry checkpoints.	2021 - 2025

4.2.1 Implementation Arrangement

It is envisaged that implementation of the above recommended actions will be carried out under the existing frameworks of APEC and ASEAN. The first step is to establish the implementation framework for the regional policy harmonization roadmap which will outline program objectives, work plan and deliverables. The harmonization roadmap should be officially endorsed by the responsible units under APEC and/or ASEAN, and the regional steering committee should also be established to guide the implementation. Following the establishment of the implementation framework, policy working groups (for policy makers) and technical working groups (for standard bodies and testing labs) at the regional and national levels should be established. The responsibilities of the policy working groups would include development of policy recommendations, including but not limited to program scope, product type, conformity assessment approach, etc. The responsibility of the technical working groups would include adoption of the latest editions of IEC testing standards and efficiency classifications.

The regional policy harmonization roadmap will support and guide the development of the national policy roadmap which would include preparation of relevant policy documents and appropriate policy interventions at the national level. For some economies where market data is not adequate for making informed decisions, market assessments should be carried out.

Implementation of the national policy roadmap is generally follow the typical steps as illustrated in Figure 4-1, and the recommended actions shown in Table 4-2 are labeled as Step 1 to 4. Implementation of Step 5, 6 and 7 will enhance the implementation effectiveness at the national level once Step 1 to 4 are successfully carried out.

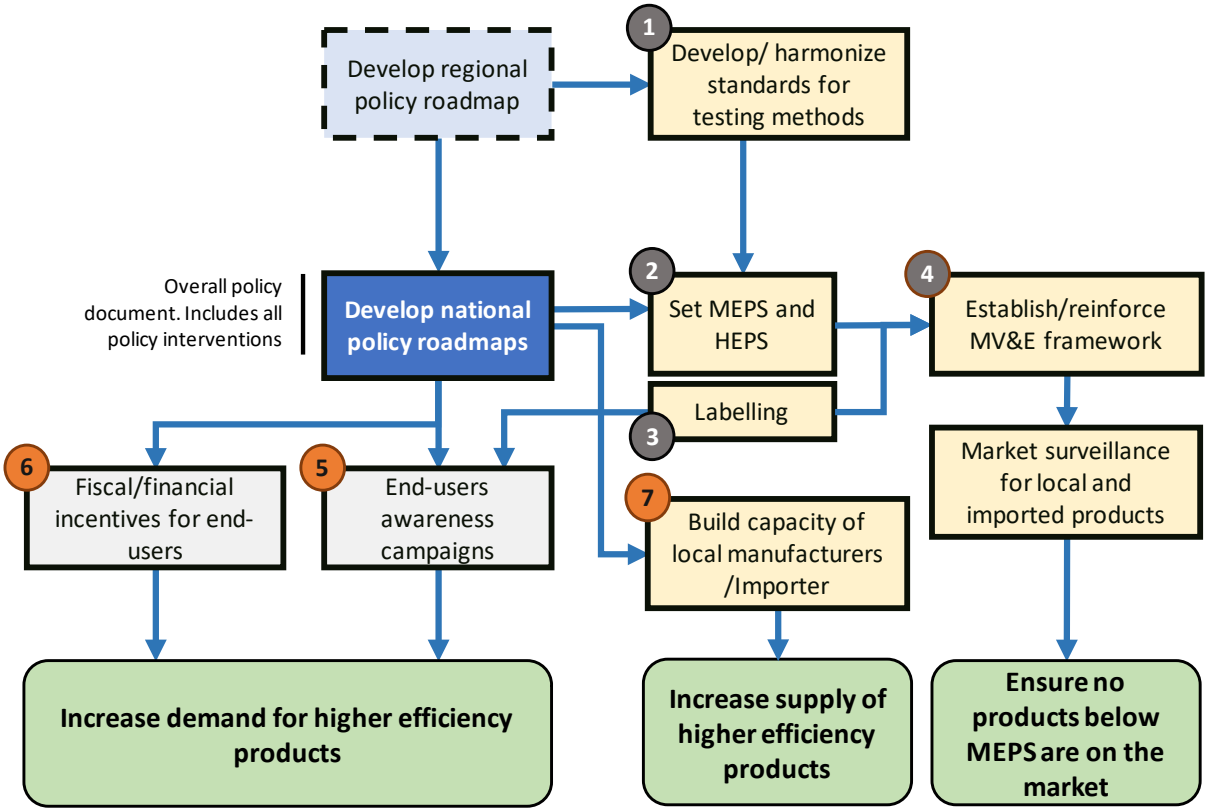


Figure 4-1: Proposed Implementation Arrangement

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