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Summary Report

APEC Workshop on Sharing Experiences in Developing Minimum Energy Performance Standards (MEPS) to Reduce Electricity Consumption in Industrial Production

APEC Energy Working Group

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APEC WORKSHOP ON SHARING EXPERIENCES IN DEVELOPING MINIMUM ENERGY PERFORMANCE STANDARDS (MEPS) TO REDUCE ELECTRICITY CONSUMPTION IN INDUSTRIAL PRODUCTION

29 – 30 June 2023

(A Hybrid Event)

Summary Report

I. INTRODUCTION

On 29 and 30 June 2023, the **APEC Workshop on Sharing Experiences In Developing Minimum Energy Performance Standards (MEPS) To Reduce Electricity Consumption In Industrial Production**, initiated by Viet Nam and co-sponsored by Australia; Hong Kong, China; Japan; Chinese Taipei; USA was held in a hybrid mode. Speakers and participants came from energy-related global organizations and research institutions and APEC member economies' relevant Ministries and government's agencies, companies and business associations.

The Workshop aimed to provide an opportunity for stakeholders to share information and experiences in developing Minimum Energy Performance Standards (MEPS) to reduce electricity consumption in industrial production.

II. BACKGROUND

Global power use increased more or less steadily until 2000, when it began seeing a more pronounced growth. The world's electricity consumption amounted to approximately 23,398 billion kilowatt hours in 2018, a huge portion of which is wasted due to outdated technologies. Using outdated and asynchronous equipment, which consumes a lot of electricity will cause overuse of electricity. Overuse of electricity will definitely result in a shortage of electricity, which causes a lot of severe consequences such as production interruptions, financial losses, etc. In other words, overuse of electricity is one kind of energy inefficiency. For that reason, the wise and effective usage of power is becoming increasingly important.

Overuse of electricity is not a new problem in APEC. Several methods have been applied to reduce electricity consumption. One of them is the minimum energy performance standard (MEPS). MEPS is a specification, containing a number of performance requirements for an energy-using device, that effectively limits the maximum amount of energy that may be consumed by a product in performing a specified task. A MEPS is usually made mandatory by a government energy efficiency body. It may include

requirements not directly related to energy; this is to ensure that general performance and user satisfaction are not adversely affected by increasing energy efficiency.

According to a report in 2017 of EWG on "Compendium of Energy Efficiency Policies in APEC Economies", MEPS has been applied in many APEC economies. In the USA, the State of California was a pioneer in the introduction of MEPS-related requirements, in order to reduce the growth in electricity use. It is mandatory for certain types of products manufactured in or imported into Australia Energy Commission (CEC) was given unique and strong authority to regulate the efficiency of appliances sold in the state. It started to adopt appliance efficiency regulations in 1978, and has updated the standards regularly over time, and expanded the list of covered appliances. MEPS programs are made mandatory in Australia by state government legislation and regulations which give force to the relevant Australian to meet the MEPS levels specified by the relevant Australian Standards. MEPS in China have been introduced since 1989 with subsequent amendments. China has MEPS for a broad variety of products, including residential, commercial, industrial, and transport equipment and appliances. In Viet Nam, realizing that many businesses use outdated technology resulting in driving up product prices and lowering product competitiveness, since 01 January 2015, according to domestic law, household appliances, industrial equipment and office equipment will not be allowed to be imported and manufactured if this equipment does not meet MEPS standards.

MEPS is an energy-saving policy option that is faster, larger, and more certain. It is aimed at promoting energy-saving activities in industry, supporting businesses to improve energy efficiency, reduce production costs, improve competitiveness, and meet requirements under the law. This Workshop is expected to help economies and stakeholders to share information and experiences on developing MEPS in order to improve the energy efficiency.

III. OPENING REMARKS

In the opening remarks, Mr Le Viet Cuong (Deputy Director **General, Institute of Energy, Viet Nam)** recalled that according to the International Energy Agency (IEA), in the published forecast scenarios, the global electricity demand will increase by about 5,900 billion kWh in the period from 2021 to 2030. Publications related to combating climate change have accelerated the energy transition, from other fossil fuels to the electricity use of vehicles and industrial equipment, leading to forecasting electricity demand will grow faster, increasing by about 7,000 billion kWh in the period 2021-2030, equivalent to nearly 70% of the current electricity demand in developed economies. The speaker observed that in the NZE scenario, with the trend of energy transition, the electricity demand is forecasted to even exceed 62 trillion kWh by 2050, 40% higher than the demand of the published forecast scenarios, with a level of growth is similar in both developed economies as well as in developing and emerging economies. Therefore, ensuring the energy security

of the world in general and the APEC region in particular in the energy transition roadmap and meeting the needs of economic growth recovering quickly after the COVID-19 pandemic is a big challenge for economies.

Mr Le Viet Cuong highlighted that studies on energy transition and experiences of some economies show that economical and efficient use of energy is the solution that plays an important role in ensuring energy security. Economical and efficient use of energy is also one of the most effective solutions to reduce investment pressure on energy supply, increase investment efficiency of the economy and contribute to minimizing the impacts of climate change.

The speaker shared that in Viet Nam, implementing the Law on Economical and Efficient Use of Energy, the Prime Minister issued Decision No. 78/2013/QD-TTg dated 25 December 2013. Accordingly, household appliances, industrial equipment and office equipment will not be allowed import and manufacture if the device does not meet MEPS. Regulations on MEPS are implemented with the coordination of participation in state management of the Ministry of Industry and Trade, the Ministry of Science and Technology and the General Department of Customs (Ministry of Finance).

Subject and scope of application MEPS are not the same across APEC economies. Therefore, Mr Le Viet Cuong stated that sharing information, good practices on experiences of building and applying MEPS from developed economies will help improve the efficiency of energy use in the manufacturing industry, thereby contributing to the joint efforts of the APEC regional community in responding to global climate change.

IV. KEY ISSUES

1. OVERVIEW ON MINIMUM ENERGY PERFORMANCE STANDARDS

There was one speaker in the Session: Mr. Terrence Surles, Consultant, Hawaii Natural Energy Institute, United States.

- Mr Terrence Surles started his presentation by giving an overview on average annual federal spending on clean energy. He said that in 2022, renewable resources for electricity generation moved past coal and nuclear, utility-scale solar is anticipated to add 54% of new generation in 2023, fossil-fired systems continue to be retired in 2023, solar and wind are competitive with natural gas and cheaper than coal. After that the speaker discussed energy efficiency, with a focus on commercial/industrial building system and energy use labelling for appliances and machinery. He talked briefly about the US Department of Energy which is the federal agency responsible for energy efficiency and renewable energy in the US. The federal government encourages industry to improve end-use energy efficiency. The more recent overriding concern is to improve de-carbonization practices in

industry. He emphasized that industrial energy efficiency is an important component of de-carbonization strategies. At the end of the presentation, Mr Terrence Surles concluded that: (i) Federal government needs to work closely with professional organizations to develop standards; (ii) Nature of US governance allows states to develop standards based on local regulatory and political considerations; (iii) Substantial funding is available from the federal government and, to a lesser degree, states such as California and New York.

2. COSTS AND BENEFITS OF EMPLOYING MEPS TO REDUCE ELECTRICITY CONSUMPTION IN INDUSTRIAL PRODUCTION

There were two speakers in the Session: Dr Supachai Sampao, Chief of Energy Efficiency Standard and Conservation Group, Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy, Thailand; Dr Ching-Yi Kuo, Researcher, Industrial Technology Research Institute, Chinese Taipei.

- Dr Suchachai Smpao divided his presentation into 6 parts: Energy Efficiency Standard and Labeling; Process of MEPS, High Energy Performance Standard (HEPS); MEPS in Thailand; Preliminary assessment of cost saving by MEPS in ASEAN; Current MEPS deployment; MEPS challenge, in the future. In the first part, he introduced some relevant organizations for MEPS/HEPS designation in Thailand and some international comparison of energy efficiency standard and labels. To the Process of MEPS and HEPS, he described the process of drafting MEPS from the beginning with 5 mandatory standards and 21 voluntary standards. The speaker shared that air-conditioners represent close to 50% of household electricity consumption in ASEAN. Assuming all ASEAN economies adopt a MEPS of 3.2, residential sector electricity consumption would be reduced by 5,373 GWh per annum, corresponding to a reduction of 2.7 million tons of CO2 emissions per annum. He also talked about the current status of testing method, evaluation method and MEPS for ACs (Alternating Current) in ASEAN economies. About MEPS challenge, in the future, Dr Supachai focused on mobile air conditioning (MAC) and how to improve its efficiency in Thailand.

- To begin the presentation, Dr Ching-Yi Kuo introduced briefly about electricity consumption in 2021 and the targets on energy-saving products. After that Dr Ching talked about measures to conduct energy efficiency management. She said that MEPS has been implemented for four industrial products. Energy efficiency rating labelling has not been implemented for industrial products but is currently under

planning. She also presented a timeline and efficiency benchmarks for implementing MEPS from 2015 to 2030. About costs for implementing MEPS, she talked from aspect of the manufacturing industry where investment is mainly focused on mold development and re-casting for volutes and impellers of water pumps. Many manufacturers in the economy invest in the construction of testing laboratories that utilize the ISO 9906 testing standard and obtaining ISO/IEC 17025 certification. For the economy's benefit, she said that it would help to increase industrial competitiveness by promoting manufacturers to invest in the development of high-efficiency products, end-users can spend less on electricity expenses.

3. BEST PRACTICES OF EMPLOYING MEPS TO REDUCE ELECTRICITY CONSUMPTION IN INDUSTRIAL PRODUCTION

There were two speakers in the Session: Mr Ma Nan, Vice Director, National Energy Administration, China; Mr Joachim Monkelbaan, Global Trade and Sustainable Development Advisor.

- Firstly, Mr Ma Nan introduced about the energy conservation and emission reduction goals in the 14th five-year plan with the objectives of the energy consumption per unit of GDP and the CO2 emissions per unit of GDP will be reduced by 13.5% and 18% respectively. He also talked briefly about the plan of a green, low-carbon, and circular economic system and a clean, low-carbon, safe and efficient energy system are established until 2060. About the framework of energy conservation standards system, he presented the idea of energy conservation standards system with almost 380 domestic standards on energy conservation, including nearly 50% of mandatory MEPS. He also listed out industries covered by 112 mandatory standards on energy consumption norm. About energy measurement, Mr Ma Nan said that it is a very important basic work of energy management, which is also the premise for energy savings management. At the end of the presentation, the speaker shared that up to now, 15 batches of product catalogs and corresponding implementing rules for 41 products covered by CEL (China Energy Label) have been released, covering 6 industrial equipment such as electric motors, power transformers, ventilators, and air compressors. 26,000+ manufacturers and 3,140,000+ product models in total were registered to the energy label database. In the year of 2022, 9,000+ manufacturers and 370,000+ product models in total were registered.

- Mr Joachim Monkelbaan started his presentation by giving a question on the necessity of MEPS. In general, he said that MEPS are regulations that establish the minimum level of energy efficiency for various appliances, equipment, and

systems. He then talked about benefits of employing MEPS in the APEC region which would cover: reduced energy consumption, cost savings, environmental impact, gender equality. He also drew attention to 4 main challenges when applying MEPS: Policy coordination, data availability, technology transfer and gender disparities. To conclude the presentation, he provided some recommendations for best practices and strategies for the APEC region: gender-responsive policies, stakeholder engagement, technology transfer and support, data collection and monitoring, and knowledge sharing.

4. MEPS AND MANDATORY ENERGY (EFFICIENCY) LABELLING SCHEME

There were 3 speakers in the Session: **Mr Marco Lui, Senior Engineer/Energy Efficiency, Electrical and Mechanical Services Department, Hong Kong, China; Mr Joachim Monkelbaan, Global Trade and Sustainable Development Advisor; Mr Hoang Hai, Managing Director, Viet Nam Technology Solutions Joint Stock Company**.

- To begin the Session, Mr Marco Lui shared some information about the Climate Action Plan 2050 of Hong Kong, China and background of MEELS (Mandatory Energy Efficiency Labelling Scheme) in Hong Kong, China. The objectives of MEELS are to increase public awareness of the importance of using energy efficient products, to facilitate consumers in choosing energy efficiency products, to encourage suppliers to make available more energy efficient products. Eight types of prescribed products account for 49% of residential household energy consumption. About the development of MEPS in Hong Kong, China which subject to prohibit the supply of low efficiency products by setting the minimum level of energy performance. Energy saving can be achieved by replacing products which cannot meet the MEPS standard with those meeting the standard. At the end of the presentation, the speaker concluded that legal authorization is required to prohibit the supply of energy using products which fail to meet certain criteria relating to energy efficiency.

- Mr Joachim Monkelbaan started his presentation by talking about the benefit of employing MEPS and MELS in industrial production. He showed the linkages between MEPS and MELS in the APEC region that includes: harmonization efforts for consistent standards and labelling requirements, information exchange on testing methodologies and evaluation procedures, mutual recognition of energy efficiency standards across APEC economies. The speaker emphasized the role of MEPS and MELS in driving market transformation that create demand for energy-efficient industrial products, encourage technology upgrades and innovation and save cost in long-term through reduced energy consumption. At the end of the

presentation, he recommended policy alignment and collaboration among APEC economies including: consistency in energy efficiency standards and labelling frameworks, facilitation of trade and market access for manufacturers, sharing of best practices and capacity building.

- Mr Hoang Hai divided his presentation into three main parts: Legal documents on Energy Labelling; Economy management system of Energy Labelling Program; Energy Labelling. Firstly, he talked briefly about the labelling energy stickers in the world since 1970s and labelling energy stickers in Viet Nam since the Ministry of Industry and Trade has implemented voluntary labelling since 2008 and made it mandatory starting from 1 July 2013. He listed out number of legal documents including public purchase category. He introduced some evaluation and testing agencies of Viet Nam for the vehicles and some quality standard of Viet Nam. In the third part, he talked about the energy labelling program with its objectives and preparation needed. At the end of the presentation, the speaker came up with some benefit of energy labelling program and concluded that along with the implementation of the Energy Efficiency and Conservation Law, Mandatory Energy Labelling Scheme (MELS), and Minimum Energy Performance Standards (MEPS), habits of consuming and purchasing high-performance and energy-efficient products have been established, contributing to environmental protection and raising public awareness. It is forecasted that the amount of electricity saved from labelled products could reach up to 30% by 2030. This reaffirms that the domestic energy efficiency program and the promotion of energy-efficient equipment by the Ministry of Industry and Trade are being effectively implemented, contributing to ensuring domestic energy security.

5. CASE STUDIES IN SOME APEC MEMBER ECONOMIES

There were three speakers in the session: Ms Fiona Ryan, Manager Standards and Regulation, Energy Efficiency and Conservation Authority (EECA), New Zealand; Mr Mark Ruth, Senior Researcher, National Renewable Energy Laboratory, United States; Dr Ching-Yi Kuo, Researcher, Industrial Technology Research Institute, Chinese Taipei.

- Ms Fiona Ryan started her presentation by introducing about EECA (Energy Efficiency and Conservation Authority) which is focused on mobilizing New Zealanders to be world leaders in clean and clever energy use. She then talked about the energy efficiency regulation since 2002 specify the MEPS, testing standards and MEPL that apply for certain products. The speaker also introduced about the developing MEPS - Trans-Tasman collaboration Equipment Energy Efficiency Program (E3) - Program is a cross jurisdictional collaborative initiative of the

Australian Government, states and territories and New Zealand Government. In the second part, she presented an overview on implementing MEPS & MEPL in New Zealand and detail on compliance monitoring challenges for industrial equipment. She mentioned about the role of EECA's changing operating context and future directions. EECA has commissioned New Zealand to develop a series of publicly available specifications focus on low carbon/emission technologies. At the end of the presentation, Ms Fiona Ryan introduced some technologies to support the integrated system such as: High Temperature Heat Pump PAS, GIDI's first industrial heat pump installation and Motor Systems.

- The presentation of Mr Mark Ruth focused on United States' industrial de-carbonization strategy and activities. To begin, the speaker introduced briefly about the National Renewable Energy Laboratory (NREL) and its main three critical research areas respond to today's energy challenges and provide tomorrow's solutions. Mr Mark Ruth shared that industry represents 30% of US primary energy-related CO2 emissions while consuming the most energy of any end-use sector. Decarbonizing the industrial sector can be more challenging than the buildings and transportation end-use sectors because emissions is not just from fuel for heat/power (68%) but also feedstock/processes. The speaker talked about the industrial de-carbonization pillars that includes: energy efficiency; industrial electrification; low-carbon fuels, feed stocks, and energy sources; carbon capture, utilization, and storage. Four pillar strategies to achieve net-zero industrial de-carbonization by 2050. At the end of the presentation, the speakers share some solution for energy efficiency technology: grid interactive steel with hydrogen, increasing copper tolerance in steel scrap, process heat opportunities, analysis of potential hybrid heat systems.
- In this session, Dr Ching-Yi Kuo shared some experiences in project management for MEPS execution and promotion. It is required to have efficiency standards & benchmarks, industry assistance and upgrading, construction of testing capability, compliance inspection, energy-saving consultation, promoting, MEPS policy and benefits. The speaker showed a process of products registration and compliance inspection before products are allowed to be sold in the market until ensuring products in the market meet MEPS requirement. She also mentioned about establishing test capabilities for verifying product compliance with MEPS, harmonization of test results across laboratories. Inspection of pre-market and post-market by non-profit testing laboratories. Conducting on-site energy consumption diagnosis and measurement to identify potential energy-saving practices for the industry. Establishing an open energy efficiency analysis platform that enables real-time and long-term monitoring to record power consumption during the load and

unload cycles of each air compressor, obtaining statistics of power consumption patterns, providing industry-wide references for energy-saving.

6. DISCUSSIONS

- A speaker shared that in the US once the manufacturing requirements are passed, that recommended standard is issued by the federal government but it is up to individual states to accept these standards or to impose stricter standards.
- Regarding MEPS development for the industrial and residential sectors, it is shared that in the history of the US, industrial policies or terms of industrial policies are mainly dependent the current political landscape. Since government policy is primarily driven by free market strategies, the government historically did not want to interfere with how companies run their business.
- However, recent legislation emphasizes the importance of information technology in the US, and procurement in relation with climate change responsibilities is driven by the redevelopment of some storage systems technology in the US. As an example, research and development funding has been applied to better develop new systems for the cement and concrete industry to make it more energy efficient and to reduce carbon emissions.
- There are several explicit codes and standards in the US in the residential sector. In residential and commercial buildings for California, new requirements for building codes for the zero net carbon emissions. Thus, all new buildings will have to be carbon neutral in the future. The appliance codes developed in California are the result of the California Energy Commission working with manufacturers to develop new standards applicable to evolving and new technologies for appliances such as air conditioning and the likes to become more energy efficient.
- Regarding the MEPS regulations, from the manufacturing standpoint, the codes have been developed and approved by the Department of Energy. They are generally developed by ASHRAE/ICC with input from other technical associations that are then implemented by related state agencies where they have enforcement responsibilities.
- In many economies, the MEPS is mandatory, but in the US, it is not compulsory on a federal level. As necessary, the Department of Energy can decide how to enforce requirements through negotiation or other enforcement actions.
- Related to the composition of the technical committee for MEPS implementation, the speaker from Thailand informed that in his economy experts from academies, government agencies and private companies could become members of the MEPS technical committee.

- To handle the product testing, Thailand set up laboratories for testing to issue the certificates at the EEI level for electricity consumption of other machines. The requirements to have a test result are not applied to MEPS products only, but also to APC products.
- Another speaker shared that in his project internal comparisons among laboratories are conducted and technical instructions are given in order to secure the accuracy of test results from the manufacturers' testing laboratories. Currently companies usually make sure that their test methods are correct by combining them with the testing back end. Guidance to apply suitable ISO certification for pre- and post-market verification is also given for these regulated products. The non-profit institutes' laboratories conduct these tests. Own testing by manufacturers' testing laboratories are only allowed during the first stage of registration.
- Besides, it is very expensive to test during implementation. Therefore, manufacturing companies should take into consideration those issues.
- When defining the efficiency benchmark, it is important to make sure that domestic manufacturers can meet it and if they have problems in doing so there will be a support for standardized drawings to make sure the basic requirements are met.
- For the entry level of the products, the entry-level policies are different. They mainly depend on the type of products. In order to encourage the MEPS application to products, it is suggested to make such enabling policies as tax reduction, which can be provided to international suppliers as well as domestic manufacturers to prioritize the use of the products.
- In the energy sector there is likely a problem of gender disparities, specifically in the MEPS area. There are different ways to resolve this problem.
- First of all, when looking at MEPS from the gender perspective, women might have less information and interest in MEPS. Therefore, it is necessary to take into account how information is channelled to both genders on MEPS so that they can access sufficient knowledge and information to consider joining these sectors.
- In addition, the overall quality of the industry will be improved with proper employment. Therefore, the topic of gender balance should be further considered.
- Women empowerment in the context of MEPS will hopefully allow proportional participation of women among MEPS implementers and developers and in a bigger picture will help improve the overall efficiency. Women empowerment involves many interventions, including, for example, access to financial services, financial literacy, micro-credit extension, which are popular in developing economies.
- In particular, the majority of small businesses are run by women. Businesses often have a lot of energy consuming equipment and machines, such as refrigerators or freezers, lights, ventilation systems, air conditioners, etc. It is very important for

the business owner and/ or manager to make a well-informed decision on what appliances they should buy and use. That would help women find appropriate suppliers and/ or contractors.

- Loans, financial services and support services are available at different levels. For example, services can be made available internationally through trade and investment. Therefore, investment facilitation is often a very important function of investment promotion agencies, whose key role is to attract foreign investments.
- For the harmonization of standards, as diverging standards can become a barrier to trade, mutual recognition agreements can also help overcome such barriers and improve the access to new technologies. One product may not be allowed because it does not comply to domestic standards at some levels, but non-tariff barriers can also be used as a contributing reason for this issue.
- Intellectual property is a very big part of production. It is indeed an essential actual property in renewable energy development. Additionally, technology and innovation play an important role in the renewable energy development and deployment process. In order to achieve this goal, special attention should be paid to education, especially for children and women and other disadvantaged people, from the first stage and ever after. Besides, the usage of social media, reading technologies and similar tools provides alternatives for information dissemination and education on renewable energy, energy efficiency and conservation.
- To assist manufacturers in developing modes for motors, a speaker shared an experience that they provided a standardized drawing of the bearings and then contacted manufacturers for standardization.
- Thank to that, all manufacturers have the same drawing of the same specifications. It is not prepared to be fixed and belongs to the government. It is used by manufacturers as a reference to make a standardized post to manufacture the product by themselves.
- For financial support, many years ago the manufacturers received some financial support only for the case of motors at the beginning stage of the project.
- In Thailand, at the registration stage of the product, manufacturers can use the reports from their own testing. However, later they have to get the product tested by a non-profit testing laboratory to verify the manufacturers' test report. In such cases, it is the statutory requirement that only non-profit institutes can do the test.
- To encourage the industry to produce high efficiency products, the government builds and operates a reward system. If consumers buy a product that performs better than the required efficiency benchmark, the consumers can be rewarded. This reward system also encourages manufacturers to produce higher efficiency products because the consumers will be more willing to buy and get a reward. Therefore, the rewarding system works with both the consumers, who will be more

eager for purchasing higher efficiency products, and the manufacturers, who will be more willing to produce such products to meet the demand.

- In addition, it is possible to identify the opportunities and challenges that go with every specific condition and then synergistic offers respectively. For example, Korea and Japan have similar challenges as both are not able to generate the adequate amount of energy their economies demand. Therefore, they have to search for alternatives and work out how they can possibly get new sources of energy to meet their economic needs and then look for opportunities of cooperating with the outsiders. New Zealand's cooperation with Australia represents another example at a smaller scale. New Zealand is engaged at the same time in a number of free trade agreements with Asian and Southeast Asian economies. Such agreements provide a framework for cooperation and collaboration and the signatory can make use of the agreement for further cooperation.

V. RECOMMENDATIONS

During the final session, there were 3 panelists in this Session: Mr. Terrence Surles, Consultant, Hawaii Natural Energy Institute, United States; Ms Mara Camille C. Galos, Science Research Specialist II, Department of Energy, Energy Utilization Management Bureau, the Philippines; Mr Hoang Hai, Managing Director, Viet Nam Technology Solutions Joint Stock Company.

- From the discussion and findings during the workshop, Mr Terrence Surles recommended that it is very helpful if economies share view of the importance of efficiency for reducing carbon emissions. While topic was industrial efficiency, focus on residential and commercial efficiency is part of improving overall efficiency. Public-private partnerships are critical in achieving improved energy efficiency; Broad educational activities are important for increasing overall understanding of energy efficiency. During the presentation, the speaker shared some major changes in the US in the governance and approach to the energy policies. He provided some experience sharing of California and Hawaii that have clear policies on energy efficiency and standards.

- To begin the presentation, Ms Mara Camille C. Galos talked about the Philippines' status on developing MEPS to reduce electricity consumption in industrial production. She shared that industries relied heavily on electricity and oil products, as both fuels represent two-thirds (60.5 percent) of the energy consumption of the

sector. After that she provided some information on the Philippines' status on developing MEPS to reduce electricity consumption in industrial production and the energy labelling program. At the end of the presentation, she made a short analyst on the challenges and opportunities of MEPS development. For the challenges, MEPS it would be at sub-industry level, data requirement, and the compliance. For the opportunities, it would be the link between government, industrial sector and other stakeholders, it helps to create energy consumption database and strengthen enforcement procedures.

- In this Session, Mr Hoang Hai said that in Viet Nam, using energy efficiency and conservation is a great issue of great concern. With the current economic growth rate, it is estimated that Viet Nam's electricity demand increases by approximately 8-10% each year. This puts significant pressure on the electricity sector as traditional energy sources have been exploited to their limits. The speaker thought the conference is an opportunity for us to learn from experiences in developing energy efficiency standards and applying them in practice. He concluded that the workshop has significant meaning, role, and effectiveness in the establishment of energy efficiency standards, as well as the promotion of energy efficiency and conservation. Therefore, similar conferences with relevant content should be organized, along with additional technical support activities to maximize the effectiveness of the program.

Participants also shared overall views and recommendations on (i) take-aways from the Workshop, (ii) what economies/ APEC should do in term of policies and actions.

Sharing on what the participants have achieved from the workshop sessions

- During the final group discussion, despite of significant differences among the member economies, their energy profiles and emissions profiles, the participants from different economies noticed more or less the same challenges across economies in terms of how to achieve greater energy efficiency in the domestic industrial sector, how to reduce greenhouse gas emissions and transit to advanced technology for better productivity and emission reduction.
- Besides, the participants shared and were shared with the best practices in implementation of MEPS in specific economies and received the updated information on new standards and technologies on MEPS.
- The participants wanted to learn more about the issues related to market communication, industrial production, specific models to improve energy

efficiency of high energy consuming equipment and devices such as electric motors, which are common in industrial production. Solutions for handling energy efficiency of such equipment and devices could be cited as typical models.

Brainstorm/ explore possible ways and suggest recommendations to APEC and member economies

- First, to improve implementation of MEPS, it is proposed to engage more participants from the private sector, and the consumers in discussions and dialogues related to the development and implementation of indices, standards and tools. Such stakeholders will be more aware of what is happening in the economies.
- Second, it is suggested to make information related to the on-going MEPS and related projects in the economies more accessible and open to the public. Currently, it is quite hard to find information on what is happening in other economies.
- Third, it is very useful to provide technical assistance on how to develop frameworks for MEPS development and implementation in industrial production and home consumption. There should be more capacity-building interventions, training workshops and dialogues. To be practical and attractive to participants the activities should focus on specific topics or areas of expertise, for example, home appliances, equipment and vehicles used in industrial production or in transportation, how to design and apply different standards, testing protocols, and frameworks in MEPS.
- Fourth, it is important to do a benchmark or comparative studies of the standards among member economies. By comparing how high the standards are in some economies and how low in others, and why they are set that way, learning can be enhanced and the adjustment can be initiated and implemented properly in each economy.
- Final, it is recommended to facilitate the process of standard harmonization. Based on the overall plan, economies with different capacities, resources and needs can then develop its own roadmap appropriately.

Application actions or requirements on necessary resources to implement such recommendations.

- First, the most important thing for each economy is to provide more funding and technical assistance on development of new standards for energy efficiency.
- Second, more stakeholders should be facilitated to participate in discussions on the standards being developed. This is very important because in various APEC member economies, people do not know what the standards are and how to interpret them.

- Third, it is important to invest in continuous capacity building of testing laboratories. Ensuring reliability of test results plays a key role in identifying the energy efficient products in terms of MEPS.
- Final, the developers and technical experts should disseminate more information on updated technology on MEPS to other industries and sectors through diverse channels, for example exhibitions, workshops, website and social media networks, etc.

VI. CONCLUSIONS

In her closing remarks, Ms Pham Quynh Mai (Viet Nam's Senior Official to APEC) recognized productive sessions were held on a number of important issues such as an overview on minimum energy performance standards (MEPS); costs and benefits of employing MEPS to reduce electricity consumption in industrial production; sharing best practices; MEPS and mandatory energy labelling scheme (MELS); case studies in APEC member economies; and so on.

From the presentations and discussions, the Senior Official also noted that MEPS is one of energy-saving policy options that contribute to promoting energy-saving in industry, supporting businesses to improve energy efficiency, reducing production costs, improving competitiveness, while still meeting requirements under the law. Through the sharing of information and lessons learnt, Ms Pham highlighted through various challenges remain, a number of recommendations have been suggested to best promote MEPS in industrial production in APEC member economies. Those might include, but not limited to:

- It is important to enhance awareness of the importance and contribution in implementing MEPS' in industrial production;
- The implementation of MEPS, on the other hand, would improve habits of consuming and purchasing high-performance and energy-efficient products, contributing to environmental protection and sustainability;
- It would be meaningful to conduct on-site energy consumption diagnosis and measurement to identify potential energy-saving practices for the industry;
- It is advised that the establishment of an open energy efficiency analysis platform that enables real-time and long-term monitoring to record power consumption, obtaining statistics of power consumption patterns would provide industry-wide references for energy-saving.
- MEPS could also contribute to promote women economic empowerment if gender perspectives were integrated into MEPS policies and programs, contributing to

equitable access to energy-efficient technologies, and creating gender-responsive employment opportunities.

- It is important to promote industrial producers/ buyers/ and consumers' awareness of mandatory energy labelling scheme (MELS) as well as promote mutual recognition in APEC member economies to further the implementation of MEPS.
- In APEC, policy alignment, harmonization and collaboration in implementing MEPS would definitely contribute to sustainable and inclusive growth and development in the region in the long term.
- In particular, collaboration between public institutions, private sector entities, and civil society organizations can drive successful MEPS implementation in the APEC region, including gender-responsive initiatives and targeted support.

The Senior Official suggested that it would significantly contribute to implementing the Leaders' commitments to a new type of urbanization featuring green, energy-efficient, low-carbon, and people-oriented development as well as encouraging ongoing efforts toward energy-efficient and low-carbon development. Through the sharing, each and every member economy's participants could have a more in-depth knowledge of the issues, hence promoting further efforts for sustainable and inclusive growth and development, subject to their specific domestic circumstances and long-term development policies.

By hosting this Workshop, Viet Nam wishes to join and strongly support APEC's common efforts to implement the Leaders' aspirational goals to reduce aggregate energy intensity by 45 percent by 2035.

VII. ANNEX 1: RESULTS OF THE PRE-WORKSHOP SURVEY

1. Does your economy apply Minimum Energy Performance Standards (MEPS) to reduce electricity consumption in industrial production? If Yes, please answer the next question.

Hong Kong, China

Currently a Mandatory Energy Efficiency Labelling Scheme (MEELS) is being implemented in Hong Kong, China, however, the Minimum Energy Performance Standards (MEPS) is **not** adopted. Apart from upgrading the grading standards of the MEELS, we are considering setting a MEPS requirements for the products regulated under the MEELS, with a view to further raising the energy efficiency performance of products. A study on the MEPS is being conducted to evaluate the feasibility and the mechanism of adopting MEPS to MEELS and assessment on the energy saving achievements.

Lao PDR: No

Malaysia

There is now no MEPS regulation have been made mandatory to reduce electricity consumption in industrial production. However, under the new proposed Energy Efficiency & Conservation Act (EECA) which is currently under deliberation, a similar MEPS program applied for electrical equipment will be adapted for buildings and infrastructures when EECA comes into enforcement.

Myanmar: No

The Philippines

Currently the Philippines applies MEPS through our Minimum Energy Performance for Products (MEPP) which is closely related to the Philippines Energy Labeling Program (PELP). The MEPP focuses on energy-consuming products such as lightning, refrigerators, air conditioner and television sets. Through these energy-efficient appliances, the electricity demand of the industrial sector for day-to-day operations may be reduced. The MEPP is also being expanded to cover other energy-consuming products (ECPs).

Further, the Philippines is planning to issue a MEPP for the Cold Chain sector with the assistance of a study conducted by the United Nations Industrial Development Organization (UNIDO).

Singapore: Yes

Chinese Taipei: Yes

Thailand: Yes

Viet Nam: Yes

2. Please share some policies and regulations your economy is applying on MEPS.

Malaysia

In Malaysia, policies and regulation on MEPS are regulated as per Electricity Supply Act 1990 – Part VA (Efficient use of electricity) Sec 23C – Equipment to meet the requirement for efficient use of electricity. Electricity Regulations 1994 and Amendment 2013 - Implementation and Enforcement of Minimum Energy Performance Standards (MEPS) for Domestic Electrical Equipment; [Regulation 97, Regulation 101A, 101B, 101C, 109A (1), 109 A(2)], which is currently in effect and covers refrigerators, air-conditioners, fans, lamps, televisions, washing machines, rice cookers, microwave ovens, freezers, and soon electric ovens.

The energy efficiency label displays the estimated energy consumption of electrical equipment using a star rating system, with 5 stars being the most efficient and 1 star representing the least efficient. Only equipment with a minimum of 2 stars is permitted in the Malaysia market. The ranking for lamps is based on the minimum lamp efficacy value.

The Philippines

Some of the policies and regulations related to the MEPP is as follows:

Issuance	**Title**	**Date Effective**

Department Circular No DC2020-06-0016	Prescribing the Minimum Energy Performance for Products (MEPP) covered by the Philippines Energy Labeling Program (PELP) for Compliance of importers, manufacturers, distributors, dealers and retailers of Energy-Consuming Products (ECPs)	11 July 2020
Department Circular No DC2020-11-0035	Expanding the coverage of the Philippines Energy Labelling Program (PELP) for the Compliance of importers, manufacturers, distributors, dealers and retailers of Energy Consuming Products (ECPs)	16 December 2022
Implementing Guidelines	Implementing Guidelines of the Philippines Energy Labelling Program for Lighting Product	18 June 2021
	Implementing Guidelines of the Philippines Energy Labelling Program for Television Sets	
	Implementing Guidelines of the Philippines Energy Labelling Program for Refrigerating Appliance	

Singapore

Minimum Energy Performance Standards (MEPS) for Motors and VRF air conditioners system.

Three-phase 50 Hz induction motors.

With effect from 1 October 2018, single speed, three-phase 50 Hz induction motors must have a minimum energy efficiency level of IE3.

Three-phase Variable Refrigerant Flow (VRF) air-conditioners

With effect from 1 April 2021, all three-phase VRF air-conditioners must comply with MELS and MEPS

Regulated Three-Phase VRF Air-Conditioners

Type of three-phase VRF Air-Conditioners	Minimum Integrated Energy Efficiency Ratio (IEER)
Base module/unit of three-phase VRF air-conditioner (unit efficiency) of all cooling capacities.	IEER ≥ 4.35

Three-Phase VRF Air-Conditioners

Type	Integrated Energy Efficiency Ratio (IEER)[11]				
	1 tick	2 ticks	3 ticks	4 ticks	5 ticks
Any base module/unit of Three-phase VRF air-conditioner	4.35 ≤ IEER < 4.80	4.80 ≤ IEER < 5.25	5.25 ≤ IEER < 5.70	5.70 ≤ IEER < 6.15	IEER ≥ 6.15

[11] Integrated Energy Efficiency Ratio (IEER) = 0.125*COP at 25% + 0.238*COP at 50% + 0.617*COP at 75% + 0.020*COP at 100%.
where

- Coefficient of Performance (COP) is ratio of cooling capacity to effective power consumption at T1 test conditions under ISO 15042(2017).
- Effective Power input is the average power input to the equipment obtained from operation of compressor(s), electric heating devices used only for defrosting, all control and safety devices and operations of all fans, whether provided with equipment or not.

Chinese Taipei

Minimum Energy Performance Standard (MEPS):

i. Air compressors efficiency standards
ii. Boiler efficiency standards
iii. Low-voltage single-phase inductive motor energy efficiency ratio standards

Thailand

The Thai Industrial Standard Institute (TISI), declared the Minimum Energy Performance Standard (MEPS) for the most of industrial products.

Viet Nam

- Energy Efficiency and Conservation Law on 17 May 2010;
- Decree No. 21/2011/ND-CP on 29 March 2011;
- Decree No. 134/2013/ND-CP and Decree No. 17/2022/ND-CP on 31 January 2022: stipulates administrative penalties for violations in the electricity sector, dam safety, and the use of energy efficiency and conservation.

- Decision No. 04/2017/QD-TTg: defines the list of vehicles and equipment that must bear energy labels, applies minimum energy efficiency levels, and establishes implementation timelines.
- Decision No. 24/2018/QD-TTg: issues the list and roadmap for the removal of vehicles and equipment using energy.
- Decision No. 68/2011/QD-TTg: issues the list of energy-saving vehicles and equipment to be purchased by government budget-funded agencies and units
- Circular No. 36/2016/TT-BCT: regulates energy labelling for vehicles and energy-using equipment under the management of the Ministry of Industry and Trade.
- Decision No. 2539/QD-BCT on 30 September 2020; provides guidelines for energy efficiency testing of labeled vehicles and equipment and applies minimum energy efficiency levels for circulation in the market.

3. If possible, can you list out implication(s) of those policies and regulations on developing and promoting MEPs?

Malaysia

MEPS was initially introduced on a voluntary basis for refrigerators through a domestic promotion campaign. Following a subsequent review, MEPS was gazetted in the Electricity Regulation (Amendments) 2013 and the rating and labelling were expanded to more appliances as described above. The regulation requires the said electrical appliances and lighting that enter the Malaysian market or sold to consumers to meet the minimum energy performance standards as stipulated in the regulation.

For example, promotion of efficient lighting through the EE Lighting Campaign has the potential to save 2,216GWh over a 10-year period. Furthermore, the development of MEPS for new equipment and appliances such as high efficiency motors is expected to result in a potential savings of 2,175GWh in 10 years.

The Philippines

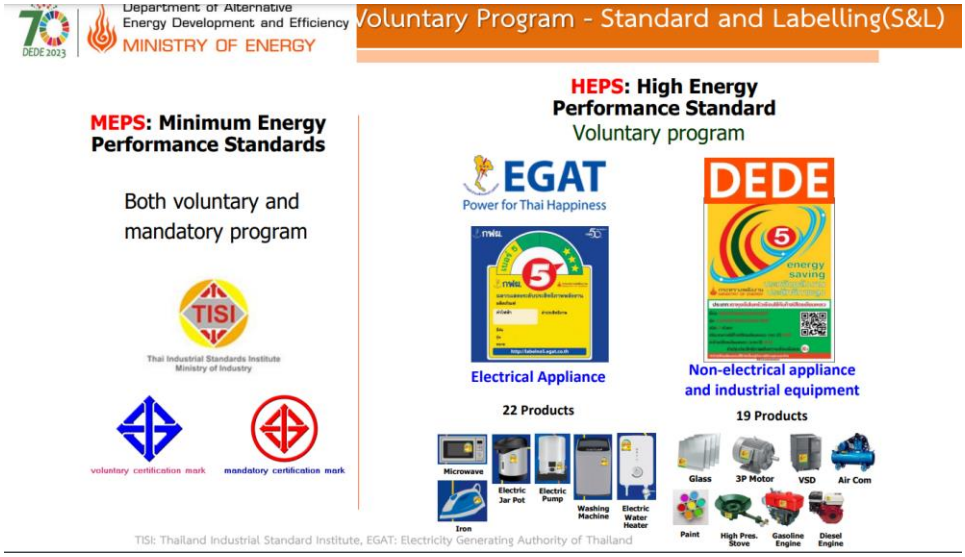
The policies imply that the currently existing MEPP is well developed and promoted to be implemented across all products covered under the PELP that enter the Philippines market. This restriction on energy efficiency performance decreases the overall energy consumption of not just the industrial sector, but also the residential commercial, and public sector as well.

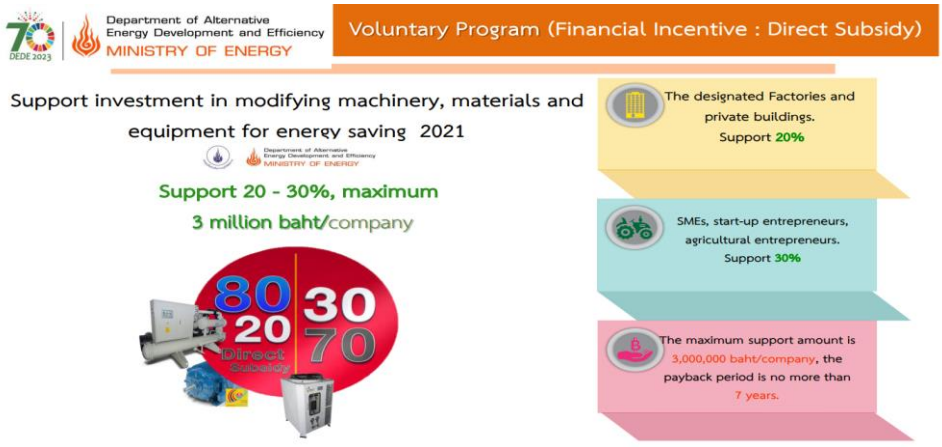
The further expansion of the MEPP also implies that there is a keen interest in the development and promotion of energy-efficient products.

Chinese Taipei

Main objectives and functions are prohibition of the importation or sale of products in Chinese Taipei with low energy efficiency or high energy requirements.

Thailand





Apart from MEPs, DEDE provide financial support to entrepreneurs to change the machineries via voluntary HEPS as well.

Viet Nam

Already mentioned in Question 2

4. Please share some good practices/ case studies of applying MEPs in reducing electricity in industrial production in your economy. (You may wish to provide links in English for this question)

Malaysia

Implementation of Efficient Management of Electrical Energy Regulations 2008, where any installation that consumes electricity above 3 Million kWh for 6 consecutive month require Registered Electrical Energy Manager.

Voluntary program such as energy audit per MS1525 Standard - Energy Efficiency and Use of Renewable Energy for Non-Residential Buildings.

https://www.st.gov.my/en/web/application/details/2/20

The Philippines

Among good practices in applying MEPS is to ensure that a good monitoring verification, and enforcement scheme is in place. Part of the activities of the Department of Energy is to conduct market surveillance to ensure that products on sale comply with their PELP and corresponding MEPP.

Chinese Taipei

Chinese Taipei's energy efficiency management systems (URL)

Thailand

There are many good practices/case studies of applying MEPS in reducing electricity in industrial production such as air conditioner, cooling and heating system in Thailand. The link as following:

https://deltathailand.com/en/blog-detail/4/78/Thai-companies-with-green-factory

https://weben.dede.go.th/webmax/sites/default/files/artall-eng%203.pdf