AC WEBINAR

CLEANER ENERGY FUTURE INITIATIVE FOR ASEAN (CEFIA) FLAGSHIP

15 February 2024

Online

INTRODUCTION

1. The AC Webinar under Cleaner Energy Future Initiative for ASEAN (CEFIA) Flagship on Healthy and Energy Efficient AC System was held online on 15 February 2024
2. The Webinar was co-organised by Ministry of Economy, Trade and Industry (METI) and ASEAN Centre for Energy (ACE) under new CEFIA Flagship Project on "Healthy and Energy Efficient AC System" which aims to promote the implementation of Energy Efficiency and Conservation (EE&C) best practices in air conditioning systems.
3. The Webinar was attended by representatives from eight (8) ASEAN Member States (AMS), namely Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. Representatives from various sectors in ASEAN and Japan were also in attendance, including government institutions, private companies, industries, academia, researchers, METI, and ACE. The list of participants is attached as **ANNEX 01**.

OPENING SESSION

4. **Ms. Haruna Yoshizawa**, METI, delivered his welcoming remarks and briefly introduced the CEFIA initiative and its objective, to provide capacity building for accelerating the deployment of cleaner energy and decarbonisation technologies in the ASEAN region. She mentioned that this Webinar is the first activity under the Healthy and Energy Efficient AC System Flagship. She hoped

that this Webinar could provide a deep understanding of how energy-efficient AC systems can benefit decarbonisation in ASEAN.

PRESENTATION SESSION

5. **Mr. Giannetti Niccolo,** Associate Professor of Waseda University, presented Energy Efficiency and Conservation for Mitigating Global Warming. The presentation material is available in **ANNEX 02**. The presentation noted the following items:
    a. Global warming is a result of ecosystem imbalance caused by human activities, therefore investing in technological development for carbon neutrality is one way to rebalance the ecosystem. For instance, from the supply side, the energy required for heating and cooling mostly relies on combustion technology that uses natural gas, coal, and oil, producing massive CO_2 emissions, and requiring replacement from renewable sources.
    b. In cooling technologies, there is a necessity to promote high efficiency variable speed inverter technology air conditioning system. While less efficient constant speed inverter technology may be cheaper at present, the speed inverter one could be more environmentally and operationally cost efficient in the far future. In addition, reintroducing natural refrigerants with lower Global warming potential (GWP) can reduce the greenhouse effect and depletion of the ozone layer.
    c. Although technological development is required to mitigate the impact of global warming, the use of human resources through education is one of the important keys in ensuring cooperation between different sectors and research fields, between academia and industry across various countries, can synergise well.

6. **Mr. Rio Jon Piter Silitonga,** Research Analyst of CEE Department of ACE, presented the Regional Context of AC MEPS and Initiatives in ASEAN. The presentation material is available in **ANNEX 03**. The presentation noted the following items:

a. Cooling appliances, particularly air conditioners, are projected to be one of the largest energy consumers in the residential sector by 2050, followed by an estimate that the number of AC units in ASEAN will reach 300 million in 2040. The deployment of energy-efficient AC in the region could provide significant savings potential by 2040, including savings in electricity consumption of 144 TWh and a reduction in CO_2 emissions of 101 million tons.
b. In terms of harmonisation of Minimum Energy Performance Standards (MEPS) for AC in ASEAN, ISO CSPF 3.08 for models with cooling capacity below 3.52 kW has been adopted as MEPS in most AMS. Meanwhile, for harmonisation of testing standards, most AMS have adopted ISO 5151 and ISO 16358 for AC. The future action plans will include net zero-carbon emissions, AC testing facilities and round-robin testing, signing a Mutual Recognition Agreement (MRA) to harmonise standards, and phasing out high GWP refrigerants.
c. Existing initiatives in ASEAN to promote higher energy-efficient AC systems consist of the ASEAN Cool Initiative, which aims to accelerate the implementation of MEPS on air conditioners in the region through an update of the regional roadmap, and the ASIA Low Carbon Building Transition, to enable the market-based mechanism for the adoption of higher energy-efficient AC in ASEAN.

7. **Mr. Koji Hatano,** General Manager of International-Affairs Department of Japan Refrigeration and Air Conditioning Industries Association (JRAIA), presented the Actual Situation and Challenges Regarding Air Conditioners in ASEAN from Industrial Perspective. The presentation material is available in **ANNEX 04**. The presentation noted the following items:
    a. Air conditioners are essential in tropical regions to improve the quality of life of the people in ASEAN, and AC penetration is expected to continue to increase. Some efforts to improve energy efficiency in cooling and reduce CO_2 emissions include reducing heat loss in buildings through building insulation and airtightness improvement, changing the mindset of overcooling habits, and developing technology that maintains comfort at high-temperature settings.

b. Using refrigerant in AC causes environmental issues due to its impact on ozone depletion. Accelerating movement to use lower GWP is highly recommended, including selecting alternative refrigerants by considering their characteristics, such as flammability, toxicity, operating pressure, and efficiency.
c. A multifaceted and comprehensive approach is necessary to grasp environmental issues broadly. Through S+3Es (Safety, Environment Performance, Energy Efficiency, and Economic Feasibility), JRAIA is committed to improving the well-being of the people in ASEAN while engaging in responsible activities to address global environmental issues.

8. **Mr. Hiroyuki Tanaka,** Sales Planning Department, Global Operations Division, Daikin, presented the Healthy and Energy-Efficient AC System for ASEAN market. The presentation material is available in **ANNEX 05**. The Workshop noted the following items:
    a. Introducing the Air Conditioning System with Excessive Cooling Protection (ECP) as CN Solution in the cooling system. AC-ECP promotes ventilation and AC that can simultaneously achieve energy saving and comfort, by replacing normal ventilation with Energy Recovery Ventilation (ERV) and reducing the load heat and humidity from the outside air to make it comfortable at a temperature setting of 26^{o}C.
    b. The CO_2 demand control feature is implemented using control software, which automatically switched the setting to low when fewer people are in the room, and high when more people in the room. By switching the settings to High and Low, savings are estimated to reach 8% of total energy consumption.
    c. The impact of using ERV and CO_2 demand control, provides savings in ASEAN market of 2,724 kt CO_2/year and 27.2 units of thermal power generator. Further action required is to understand the impact of natural ventilation or air tightness on energy and CO_2 saving.

PANEL DISCUSSION AND Q&A SESSION

The Webinar noted the following discussions during the panel and Q&A session as follows:

8. The meeting noted that while split AC units remain dominant in the ASEAN market, inverter technology shows promising growth. ASEAN nations recognise the potential for significant energy savings (up to 50%) through the adoption of inverter AC. However, raising awareness about the benefits of inverter AC remains crucial. To address this challenge, ACE will continue to collaborate with stakeholders to promote high-efficiency AC. This will involve promotional activities and advocacy efforts directed toward policymakers.
9. Current testing and monitoring methodologies for air conditioners may not fully capture the dynamic operation of inverter units. This can lead to underestimating the potential energy savings achievable with inverter technology. Numerical studies that simulate dynamic AC operation are valuable tools for:
    i. Understanding inverter AC characteristics: these studies can provide deeper insights into the performance of inverter units under varying conditions.
    ii. Developing performance monitoring techniques: by simulating dynamic operation, researchers can develop more effective real-time monitoring techniques that accurately assess inverter AC efficiency and identify potential operational issues.
10. Two key strategies can accelerate inverter AC adoption in ASEAN:
    i. Strengthened MEPS regulations: effective implementation of MEPS regulations can drive market transformation towards more energy-efficient AC units. Establishing clear evaluation indicators and implementation timelines will be crucial for government bodies.
    ii. Targeted incentives: financial incentives, such as purchase subsidies, can effectively encourage consumers to choose inverter ACs despite their initial higher cost.
11. To ensure product performance and eliminate substandard models, market verification measures are essential. This includes:

i. Mandatory product testing: a well-defined market verification system incorporating mandatory product pickup testing is necessary to identify and remove non-compliant products from circulation.
ii. Laboratory capacity building: investing in laboratory capacity building through training and infrastructure upgrades will enhance the accuracy and reliability of AC performance testing.

12. **Dr. Prapat Pongkiatkul,** professor from King Mongkut's university of technology Thonburi, Thailand, discussed the importance of inverter conversion after COVID19 and the actions needed in Thailand. The slide material is available in **ANNEX 06**. The discussion noted the following items:
    a. Air pollution in Thailand has become an issue, and there is a need to promote optimum ventilation, including ERV system technology. Based on the research conducted, increasing ventilation can reduce pollution concentration but requires more energy. ERV technology can reduce a significant amount of energy consumption, from 51% to 14%.
    b. Thailand is promoting the IAQ star initiative to give certificates to buildings that have good air quality and ventilation. This program aims to encourage the business operator to enhance IAQ management, as well as improve health and work efficiency within buildings.

13. **Dr. Ha Anh Tung**, professor from Ho Chi Minh City University of Technology, Vietnam, discussed the demonstration of AC-ECP in Vietnam and the expected outputs. The slide material is available in **ANNEX 07**. The discussion noted the following items:
    a. Currently, Vietnam and other ASEAN nations lack regulations governing AC operations. While the typical design standard in Vietnam specifies a temperature of 25°C and a relative humidity (RH) of 60 ± 5%, uneven air distribution frequently leads to excessive cooling, with temperatures dropping below 23°C. This situation highlights the importance of ERV technology.
    b. Daikin Industries Ltd. is at the forefront of improving air conditioning efficiency by adopting Excessive Cooling Protection (ECP) technologies. Following the completion of AC-ECP testing in Vietnam, Ho Chi Minh

City University of Technology will collaborate with Daikin to analyse the test results. These findings can then be disseminated to relevant government bodies, including the Ministry of Construction, the Ministry of Industry and Trade, and the Ministry of Natural Resources and Environment, to inform potential regulatory adjustments.

CLOSING SESSION

14. **Mr. Septia Buntara Supendi**, Acting Manager of the Conservation and Energy Efficiency (CEE) Department, on behalf of **Dr. Nuki Agya Utama**, Executive Director of ACE, delivered his closing remarks. He expressed his gratitude to all the webinar presenters and participants. Encouraging that the valuable insights and best practices shared in the Webinar will serve as a practical solution for government and private sector action towards carbon neutrality and a secure energy future for the ASEAN community. He also highlighted the urge to achieve the 32% reduction in energy intensity by 2025 which is in line with the ASEAN Plan of Action for Energy Cooperation (APAEC) Phase II 2021-2025 target, mainly in the Energy Efficiency and Conservation Program Area.

ACKNOWLEDGEMENT

15. The Workshop expressed its sincerest thanks and appreciation to ACE and METI, for the technical and secretariat assistance provided as well as excellent arrangements made for the Workshop.

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