22nd APEC Workshop on Energy Statistics: Tracking the progress of capacity built from the last workshops
23-26 July 2024
Tokyo, Japan

Summary proceedings

The **22nd APEC Workshop on Energy Statistics**, with the theme *Tracking the progress of capacity built from the last workshops*, was held in Tokyo, Japan, from 23-26 July 2024.

The workshop was participated in by 44 energy statisticians, experts and speakers from 14 member economies (Australia; Chile; China, Hong Kong, China; Indonesia; Japan; Korea; Malaysia; the Philippines; Singapore; Chinese Taipei; Thailand; United States and Viet Nam), international organisations [International Energy Agency (IEA), International Renewable Energy Agency (IRENA) and the Asia Pacific Energy Research Centre (APERC)]. Nine people from four economies and IEA participated online.

The following are the proceedings of the workshop.

Day 1 – 23 July 2024

Opening session, moderated by Mr Edito Barcelona, Senior Research Fellow, APERC and EGEDA Secretariat.

The workshop commenced with Welcome Remarks from **Mr Takehiko Saeki, Director for Natural Resources and Energy Research, International Affairs Division, Ministry of Economy, Trade Industry (METI), Japan.**

He welcomed all the in-person and online participants for the 22nd APEC Energy Statistics workshop and expressed his gratitude for the opportunity to hold it physically this year. Mr Saeki emphasised the workshop's objectives: following up on improvements in data collection for new and renewable energy, energy efficiency indicators, and new energy products and technologies. He anticipated that members would learn the methodologies for estimating the consumption of renewable energy sources, collecting data on new energy products and technologies, and developing energy efficiency indicators through energy consumption surveys, and this gained knowledge will help promote efficient energy use in each economy.

Dr Kazutomo Irie, APERC President, welcomed the participants and expressed his gratitude to the expert speakers for sparing their time to contribute to the workshop. He echoed the goal of the workshop: to stay updated with new or repurposed technologies, including hydrogen, district cooling systems, grid-scale electricity storage, electric vehicles, and more. From these learnings, members can better implement the data collection, reporting, and analysis procedures required to accurately measure the magnitude and effects of these technologies in the energy sector. He expected that this exchange of knowledge would provide valuable insights to enhance participants' energy statistics and help them address their respective issues.

Finally, he encouraged the participants to approach the workshop with open minds and a common goal: to gain insights, share knowledge, and build connections.

In his Opening Remarks**, Mr Glen Sweetnam, APERC Senior Vice President and EGEDA Chair,** likewise thanked the experts and speakers for their commitment to joining this workshop.

He quoted the famous economist Peter Ferdinand Drucker, saying, "*What gets measured gets done.*". He mentioned this renowned quote as the key to data collection. He highlighted the importance and difficulty of

collecting and reporting energy data. He strongly recommended active participation during every session and encouraged everyone to get to know each other during the networking dinner and breaks.

He concluded his speech by saying that this workshop is a great opportunity for EGEDA members to share knowledge of each economy and ponder the challenges we are facing.

Session 1– Setting the context: Deep diving into efforts in collecting new and renewable energy statistics and new energy products and technologies moderated by Mr Edito Barcelona of the EGEDA Secretariat.

The session commenced with a presentation by **Mr Mathew Horne, Senior Researcher, APERC,** on "*Assumptions on new and renewable energy and new energy products and technologies adopted for the 9th Outlook edition"*. He mentioned that while energy balances are a solid foundation for modelling energy systems, these balances may not yet be capturing the latest deployments of new energy products and technologies. Hence, modellers can cooperate with energy statisticians to best account for these new technologies (hydrogen, ammonia, e-fuels, storage and carbon capture technologies). He ended his presentation by mentioning that the preliminary results for the 9th Outlook are already reliant on capturing these new technologies, particularly in the Target scenario.

Mr Horne's presentation is attached as **Annex 1.1**.

During the Q&A session, the following were raised:

- Mr Barcelona inquired about the assumptions of new technologies for the ongoing 9th APEC Energy Demand and Supply Outlook, given that EGEDA is not yet able to capture the latest data on such technologies. Mr Horne responded that while energy balance tables are an important foundation for modelling Outlook, modellers use datasets from various sources as a basis to forecast.

This was followed by a presentation from **Ms Jungyoon Kim, Senior Researcher, APERC**, on **"***Korea's Carbon-Free Energy Initiative (CFE)".* She mentioned the importance of CFE, which was launched in 2023, in spearheading decarbonisation efforts in Korean companies to adhere to decarbonisation regulations of their export markets. She added that from a statistical point of view; the CFE would expect to see more private players taking on energy supply roles, hence possible diversification of the energy supply in Korea. This means that a methodology for collecting statistics on new energy technologies needs to be developed.

Ms Kim's presentation is attached as **Annex 1.2**

During the Q&A session, the following were raised:

- The Chair inquired whether there is sensitivity within the Korean government to transition into a carbon-free energy source without increasing the cost of electricity. Ms Kim responded that Korea is indeed sensitive to changes in the energy sources, as the transition will increase the electricity cost for the consumers.
- Malaysia would like to know if there are policies to regulate data centre deployment in Korea, given that data centres could influence Korea's overall energy consumption. Ms Kim responded that the industry sector could be the main driver of Korea's energy consumption in the future. In addition, she mentioned Korea's plans to build new nuclear reactors to supply uninterrupted electricity to the energy-intensive industry sector, given the intermittency of renewables.

Mr Barcelona delivered the following presentation on "*Developments in TT-SIEC Discussions"***.** He described the background of the Standard International Energy Classification (SIEC), which is used to harmonise the definitions

of energy products and flows contained in the UNSC's International Recommendations for Energy Statistics (IRES). He also shared about the progress of discussions on several issues within the SIEC, some of which are yet to be resolved and others which need final decisions. Such decisions will thus affect the current EGEDA's work on reporting statistics. Nevertheless, EGEDA will continue to participate in the discussions.

Mr Barcelona's presentation is attached as **Annex 1.3.**

During the Q&A session, the following were raised:

- Mr Prime emphasised that any decisions made on SIEC will directly affect the work of international organisations, including APERC, IEA, IRENA and others, in collecting energy data statistics.

Mr Julian Prime, Head of Statistics at IRENA, delivered his presentation on "*Renewable Energy Statistics for the Energy Transition"*. He shared about IRENA's Energy Taxonomy, which supports the ongoing international energy product revisions and gives more relevance to renewables. SIEC is the starting point for taxonomy, where the renewable classification takes priority. He also added that the next step would be the internal statistics implementation of taxonomy. Regarding IRENA's latest data collection, while the installation of renewables capacity in 2023 varied considerably within the APEC region, there has been an increase in renewable capacity and generation in the region between 2000 and 2023. He ended his presentation by mentioning that although global renewable capacity has grown substantially in 2023, more is needed to achieve the COP28 UAE goal of tripling renewables capacity by 2030.

Mr Prime's presentation is attached as **Annex 1.4**.

During the Q&A session, several issues were raised:

- Ms Gelindon of the EGEDA secretariat inquired about the baseline year of tripling renewables capacity by 2030. Mr Prime mentioned that IRENA, as a custodian for this goal, uses 2022 as the baseline year. In addition, IRENA will report the outcome of this goal by early 2031.
- Hong Kong, China asked if the target considers waste-to-energy facilities. Mr Prime responded that if renewable electricity is produced from such facilities, then IRENA will include it in the target.
- Mr Nabih of APERC asked if there is a possibility that the 2030 target could be reached earlier given China's significant solar PV installations in 2023. Mr Prime mentioned that while China's deployment may contribute to achieving the overall 2030 goal, the target is global-wide.
- Mr Barcelona inquired about the source of renewables' installed capacity data in 2022 used by IRENA. Mr Prime responded that most data were obtained from IRENA member economies from their submissions, as well as from reliable sources (official press releases, etc) through desktop research.

The economy presentations began with a presentation by **Ms Jean Tsoi, Analyst at the Energy Market Authority, Singapore,** on "*Sustainable Energy Data Collection" in Singapore*. She highlighted Singapore's "four switches" (natural gas, solar, regional power grids and low carbon alternatives) vital to achieving a net zero energy system. In addition, she explained the collection of solar data in Singapore, including its schematic, types of data collected, and challenges in processing and verifying solar data. She added that EMA collects other renewable energy data in district cooling systems and biofuels.

Ms Tsoi's presentation is attached in **Annex 1.5**.

During the Q&A session, several issues were raised:

- Dr Huy of APERC would like to know the details of Singapore's plans to store CO_2 in other economies. Ms Tsoi responded that the CCS is still in the research and development phase. Still, there have been discussions between the Singapore government and the industry players on the possibility of storing CO_2 in other economies (inland or offshore).
- Mr Munehisa Yamashiro, Vice President of APERC, inquired about the type of renewables used to generate 4 GW of electricity that Singapore would be importing. In response, the electricity procured would be generated from a mixture of renewable resources. Current electricity imports from Lao PDR are generated by hydro. Dr Huy shared that electricity imports from Viet Nam would come from offshore wind farms in the economy.
- Malaysia inquired i) if EMA imposes a minimum solar capacity requirement for monthly submission to EMA and (ii) How does EMA forecast Singapore's electricity demand based on these submissions and what is the accuracy of such forecast? Ms Tsoi mentioned that most solar PV owners are connected to the domestic grid, hence the owners are obliged to submit their installed capacity data to EMA. EMA would hire licensed electrical workers to measure the owners' capacities, and therefore accuracy would be guaranteed. In terms of demand forecast, the solar data would be utilised to help reduce the system peak load throughout the demand forecast.
- Chinese Taipei inquired why the need for verification when most of the installed capacities are connected to the grid. Ms Tsoi responded that this is internal verification between the EMA and licensed electrical workers.

The next presentation was by **Ms Nguyen Thi Hieu, Official at the Ministry of Industry and Trade in Viet Nam**, on "*Collecting New and Renewable Energy Data in Viet Nam*"**.** She presented Viet Nam's new Power Development Plan VIII, which emphasises the deployment of renewable energy sources for electricity production. In addition, she explained the various sources of data collected in Viet Nam.

Ms Nguyen's presentation is attached AS **Annex 1.6**.

Following the presentations, a roundtable discussion was held to hear updates on the members' experiences in estimating new and renewable energy statistics and the role of new energy products and technologies in their respective energy transition targets.

Economy	Update
Australia	Recently, Australia has been making efforts to estimate the electricity consumption in electric vehicles and place it in the transport sector.
Chile	Currently, Chile can disaggregate wood pellets from the total biomass in terms of data collection, through collaboration with relevant domestic players.
China	China obtains the following data: ○ New and renewable electricity generation (solar, wind and nuclear) from associations. These are also cross-checked with state power grids. ○ Consumption of renewables from associations.
Hong Kong, China	Annual data on renewable energy are obtained from power companies and the government. In addition, the accuracy of the data obtained is guaranteed. More large-scale PV systems are planning to be built (floating and land-based) as well as a new integrated waste management facility by next year that can treat up to 3 000 tonnes of waste each day. The facility is expected to produce about 480 million kWh of electricity.
Indonesia	Indonesia faces challenges in producing statistics on charcoal production/consumption.

Korea	Korea is now preparing hydrogen statistics which will be reflected in their overall domestic energy statistic.
Malaysia	Malaysia currently has data on installed renewable capacity published in National Energy Balance, which is used for forecasting. The current challenge is on ensuring the accuracy of the installed capacity data collected.
The Philippines	The Philippines is currently collecting data on renewable electricity generation from power operators. The economy is considering hydrogen and ammonia as indicative strategies for energy transition, but these need to be policy-driven. The economy is also considering including nuclear in the energy mix by 2032 and expects LNG to be the main energy source. In addition, it also plans to obtain data on the consumption of non-electricity renewables via the household energy consumption survey.
Chinese Taipei	Solar and wind power data are usually obtained directly from energy suppliers. The government also makes estimates of solar and wind power generation based on installed capacities in advance, based on the following: ○ For solar PV, every 1 kW of installed capacity generates 1 250 kWh of electricity. ○ For wind, every 1 kW of installed capacity generates 3 750 kWh of electricity. The government has set twelve key strategies to achieve the net zero goal by 2050, four of which focus on renewable energy.
Thailand	Thailand consistently collects renewable energy data from data owners but with a three-month lag time. Its energy transition considers enhancing energy security, reducing greenhouse gas emissions, and promoting sustainable growth.

Session 2: Report on Hydrogen/ammonia/e-fuels data collection moderated by Ms Elvira Gelindon, Research Fellow, APERC and EGEDA Secretariat. The objective of this session is to showcase the members' efforts in collecting hydrogen/ammonia/e-fuels data.

The session started with the presentation of **Mr Nobuhiro Sawamura, Senior Researcher, APERC and EGEDA Secretariat** on the pilot data collection on hydrogen/ammonia/e-fuels data in the APEC member economies. EGEDA is collecting data from APEC Non-OECD member economies as the IEA is already collecting from OECD members. He reported that even though 6 APEC member economies are already producing and/or consuming hydrogen and ammonia, only one economy reported data.

Mr Sawamura's presentation is attached as **Annex 2.1**.

During the Q&A session, the following were raised:

- China commented that ammonia is currently not treated as energy in the economy, as energy should provide heat and/or electricity. China also asked how ammonia is used as energy. In response, Mr Sawamura shared that Japan started co-firing ammonia with coal and natural gas in electricity power plants by about 20%. In the future, there is a plan to use 100% ammonia in power plants. Other examples include some shipbuilding companies that are designing ammonia-fuelled vessels to be used in the future.

Mr Prime delivered the second presentation of IRENA this time on hydrogen. The report mentioned that IRENA decided to drop the term green hydrogen but instead renamed it renewable hydrogen. Renewable hydrogen in IRENA is biohydrogen (biological hydrogen and biothermal hydrogen), renewable electrolytic hydrogen, renewable photolytic hydrogen, and renewable thermolytic hydrogen. Mr Prime also shared that the IEA was similarly not as successful as APEC in its pilot hydrogen data collection, of the two IEA members that filled the

hydrogen template, only one can report data, while the other cannot report on the production and consumption of hydrogen.

Mr Prime's presentation is attached as **Annex 2.2**.

During the Q&A, the following were raised:

- On Malaysia's question about the important things to consider when collecting hydrogen data, Mr Prime responded that high-level information like production and fuel used in production and the aggregated usage of hydrogen are the must-haves at the early stages of data collection and more detailed breakdown can come later.

Ms Nisha Dutta, Director of Energy Statistics and Analysis of the Department of Climate Change, Energy, the Environment and Water of Australia, presented on hydrogen data collection in the economy. She mentioned that Australia aims to become a major producer and exporter of hydrogen by 2030. As to data collection, she mentioned that the National Greenhouse and Energy Reporting Scheme (NGERS) of Australia would be the main data source, although there are ongoing challenges.

Ms Dutta's presentation is attached as **Annex 2.3**.

Mr Hector Ocampo Gonzalez of the Ministry of Energy of Chile presented on the development of the green hydrogen industry in Chile. He enumerated the action plan 2023-2030, key milestones, time frame, policies and strategies, strategic guidelines, and action plan.

Mr Ocampo's presentation is attached as **Annex 2.4.**

During the Q&A session, the following were raised:

- When asked how the green hydrogen plan works, Mr Ocampo confirmed that it will be reviewed regularly to update the industry's progress.

Mrs Herlina Yuanningrat of Center for Data and Information of the Ministry of Energy and Mineral Resources of Indonesia presented the development and utilisation of hydrogen energy in the economy. The goal of Indonesia's hydrogen program is to achieve a hydrogen economy that contributes to energy transition and plays a crucial role in decarbonising the global energy system. She gave an update on the policy and guidelines as well as the challenges and the efforts that are needed for green hydrogen development.

Mrs Yuanningrat's presentation is attached as **Annex 2.5.**

During the roundtable discussion, the participants were asked the following Issues:

1) The members' challenges in collecting hydrogen/ammonia/e-fuels data from their respective stakeholders.
2) Comments on the questionnaire for collecting hydrogen data.

The following table shows the responses of the participants:

Economy	Update
China	China's production data can be divided into different sources, such as hydrogen from coal, oil, gas, and electrolysis. The most challenging part is hydrogen produced from coal. Recently, a lot of effort was put into developing the coal chemical industry to reduce emissions and reach the net zero goal. In this industry, hydrogen is an intermediate product. China is still determining whether hydrogen production from coal is a non-energy use of coal.
Hong Kong, China	A strategy for hydrogen development in the economy was launched in June 2024. Double-deck buses and street-washing vehicles will be the first batch of consumers of hydrogen as energy fuel. To facilitate the data collection of this new energy consumption, HKC will liaise with the bus companies and government agencies operating street-washing vehicles to determine the available data to be collected.
Malaysia	Currently, the economy consumes hydrogen for pilot projects in Sarawak.
Philippines	The Philippines does not currently consume hydrogen, but the economy is considering using hydrogen and ammonia in the future.
Singapore	Singapore just launched the national hydrogen strategy, which targets 50% of the economy's power needs by 2050.
Chinese Taipei	Hydrogen is still in its early stages in the economy. The focus is on how to collect the data. The government will visit electricity and oil companies. Obtaining the data is still a big challenge. Dialogue will be done to address this.
Thailand	Thailand will launch alternative energy development in 2024 with a target of 5% hydrogen in 2030. For the electricity sector, the use of hydrogen is still in the pilot stage.
Viet Nam	Hydrogen technologies are still not available in Viet Nam, which is still in the phase of calling for investment to develop green hydrogen. Some challenges for developing hydrogen would be infrastructure, investment and managing the risk to the environment and security in case of leaks.

Session 3: Report on district cooling data collection moderated by Ms Yasmin Fouladi, Researcher, APERC. The objective of this session is to show the development since the district cooling system was introduced to the members, especially for members who can collect cooling data.

Ms Gelindon presented the EGEDA report on district cooling data collection. She highlighted the history of EGEDA's efforts to collect district cooling data and the status of each economy's district cooling data collection as reported in the *APEC Workshop on Energy Statistics in 2023*. After she explained how district cooling works, she took a closer look at the district cooling system (DCS), its advantages and limitations. She also touched upon the questionnaire revision and sample energy balance table.

Ms Gelindon's presentation is attached as **Annex 3.1**.

- The moderator asked for further information on the 5th generation of district cooling. Ms Gelindon responded that there is several information online regarding it however, she was not able to include it in the presentation. She suggested that it may probably be an improvement of the four generations of DCS.

Ms Nur Shakina Sharif, Assistant Director, Energy Commission of Malaysia, presented the data collection on district cooling systems in Malaysia. First, she explained the background of DCS in Malaysia and the Malaysian District Cooling Association. Then, she talked about Malaysia's data collection efforts and introduced its data format, template preparation and sample letter format. After explaining the trial run data collection format and data compilation, she pointed out the challenges for the data collection.

Malaysia's presentation is attached as **Annex 3.2**.

Ms Tsoi delivered the second presentation from Singapore, this time on "District *Cooling in Singapore*." After explaining the regulation of DCS and its role in demand response, she presented a closer look at the Marina Bay DCS and other DCS in Singapore.

Singapore's presentation is attached as **Annex 3.3**.

- Hong Kong, China, asked how the new DCS project supplies service for residential households, as home appliances such as air conditioners are generally used for residential households and whether the use of DCS is voluntary or mandatory in Singapore. Ms Tsoi agreed on this and further explained that, around 80% of Singapore's population lives in public housing where centralised air conditioners are used. She added that the use of DCS is voluntary in Singapore because people can stop subscribing to DCS service by their own decisions.

During the roundtable discussion, the members were asked to answer the following:

1) What efforts are made to collect cooling data?
2) What assistance do you need for collecting district cooling data?

A summary of the discussion is in the table below:

Economy	Update
Chile	Chile does not have an urban cooling system. To collect this data in the future, Chile needs the assistance of international experts and advanced technology.
China	China may not have district cooling data yet. China presumed that district cooling data is included in other data, such as heating.
Hong Kong, China	The current key district cooling plants are under EMSD operation, this facilitates the direct collection of relevant data. HKC is planning to build two more new district cooling plants and their data will be collected subsequently.
Indonesia	Currently, there is no district cooling system in Indonesia. However, once implemented, it will collect district cooling data.
Korea	District cooling is less common than district heating in Korea. Some institutions, such as the Korea Energy Agency, conduct surveys regarding cooling and heating.
Malaysia	Refer to its presentation on 23 July 2024.
The Philippines	Although the Philippines has district cooling systems, data is not being gathered yet. They may have to coordinate with the energy efficiency unit in DOE which has a collaboration with the DCS provider.
Singapore	Refer to its presentation on 23 July 2024.
Chinese Taipei	Chinese Taipei does not have district cooling facilities. However, some private companies use seawater for its own cooling use.
Thailand	District cooling facilities are at the international airport and offices in Thailand. Thailand is trying to collect district cooling system data using methods from other economies.
Viet Nam	Viet Nam does not have a district cooling system.

Session 4: Report on the collection of grid-scale electricity storage moderated by Mr Noriel Christopher Reyes, Researcher, APERC. The objective of this session is to show how grid-scale electricity storage data is collected.

Ms Konstantina Kalogianni from the International Energy Agency delivered an online presentation on "*Smart grid innovation"*. She mentioned that it is important to track it as electrification progressed, grids emerged as an increasingly crucial element of the energy system. The analysis showed that smart grid innovation increased in 2011 but declined towards 2016. However, in 2022 provisional data, there was an indication of more innovation in the power sector to get on track with the net zero scenario. She explained that specialization is not the same as patent production in smart grid innovation. Leading in patent production was seen in city hubs located mostly in East Asia-APEC, in particular Tokyo (Japan), Seoul (Korea), Beijing (China) and Nagoya (Japan). Specialization, which looked more into a specific country/economy for a given technology, was mostly in Europe but more recently, Australia and Korea were included.

Ms Kalogianni's presentation is attached as **Annex 4.1.**

During the Q&A, the following were raised:

- Ms Fouladi of APERC complimented IEA's report on smart grid innovation and asked if IEA has seen artificial intelligence (AI) and machine learning integrated with those smart grid innovation projects in the last two years. Ms Kalogianni acknowledged that it's a good question, but IEA did not look into this aspect more specifically. Doing this may entail more analysis in different categories and see the patents they have whether it's a component of smart grids and AI. IEA does not have the data yet and she further acknowledged that this will be an interesting analysis in the future when they can have enough data.
- In addition, Ms Fouladi asked if Ms Kalogianni could further explain the difference between "patent analysis" and "specialization analysis". Ms Kalogianni explained that in patent analysis IEA counts the specifically International Patent Families. It's a methodological decision to count for patents that were submitted to at least two patent offices. These are either the count of the number of International Patent Families in a specific year or a fractional count to understand the distribution for a specific country/economy. Regarding specialization or RTA (Revealed Technology Advantage), the analysis is different where IEA would like to understand the country's related specific specialization, that is, the specific country's patent for a specific technology related to the rest of the world. To represent it with a number, when it's higher than 1, means there's a specialization in a specific country/economy for a specific technology. Therefore, it means the higher the number, the better and hence, the presence of specialization.

Mr Barcelona delivered the presentation *EGEDA report on grid-scale electricity storage data collection*. He mentioned that energy storage is one of the solutions to address grid stability due to increasing variable renewables. He mentioned that 80 percent of the current grid-scale battery storage is installed in China and the US. At present, only two APEC Non-OECD member economies can report capacity data. There is known battery storage installed but it was not reported in the 2022 data collection. EGEDA looks forward to the report from all members in the future.

The EGEDA secretariat's report is attached as **Annex 4.2**.

During the Q&A session, the following were raised:

- The EGEDA Chair wondered why members have difficulty collecting these numbers for storage and asked if they are not available or if they are in another agency. It is understood that this is an important matter

that EGEDA members are doing here. The EGEDA secretariat replied, that it is probably because this will be the first time collecting the data, and hence the members are still not ready.

- China raised the issue of how to report the large-scale electricity storage in the energy balance table, especially the production, as it is huge. The EGEDA secretariat explained that reporting of the large-scale energy storage will be the same as pumped storage, where the electricity used for pumped storage is allocated for own use, but for the output, it would be separated from the hydro. Otherwise, it will be double counting the electricity. Hence, in grid electricity storage, while the output of the battery storage will be shown at the bottom of the electricity output table, only the amount of energy stored will appear in the energy balance table and the output will appear in the electricity generation data.
- The EGEDA Chair clarified if the energy stored will likely be a very small number at the end of the year and are not the accumulative number. The EGEDA secretariat clarified that it would be an accumulative number and affirmed that the amount would be from all the energy produced and stored. Likewise, it was clarified that produced may not be the same as stored energy in view of the losses; for hydropower, about 30% is lost but for battery storage, it is not yet known. Further clarification was made on produced/stored and input/output terms, the EGEDA secretariat finds it necessary that the definition of terms be developed accordingly in the international classification.
- IRENA agreed that it is important that the definition be raised to the SIEC task team to clarify the terms. It is important to note that there will be differences in the electricity that **flows to the battery** and **that flows back from the battery to be used** because of the small number of losses in the transfer of electricity from and to the battery.
- The moderator explained further that it needs to clarify how the batteries are utilised in the grid; for example, electricity is first drawn from the grid to charge the facility and then provides an output/ electricity for grid utilisation. It is important to clarify how to report these numbers in the template to avoid confusion in the numbers.

Mr Prime delivered another **IRENA** presentation on "*Electricity storage for the energy transition*". He complimented EGEDA's presentation on the basics of reporting electricity storage. The presentation included how IRENA is working closely with its members in tracking the tripling renewable electricity capacity goal by 2030 and that electricity storage is essential for the energy transition. The presentation mentioned that, to achieve the tripling renewable capacity goal it requires six to eight times growth in installed capacity by 2030. IRENA likewise mentioned among others, that robust, comparable data is needed to closely monitor the goal.

Mr Prime's presentation is attached as **Annex 4.3**.

During the Q&A session, the following were raised:

- The EGEDA Chair clarified why we only need 1 MW of electricity storage capacity for every 10 MW solar capacity, which is small. IRENA explained that they are already being used and it is just an addition to the already existing capacity. The EGEDA chair further asked how much total capacity is needed for solar. IRENA mentioned that the total required battery storage for solar capacity to meet the target would be 783 GW by 2030, assuming there is currently 86 GW and taking into consideration the variable solar and wind. The EGEDA chair further asked how much wind and solar capacity corresponds to that, and IRENA replied that solar is 5 457 GW and wind is around 3 500 GW. The EGEDA chair also asked if the height and the width or the duration of the storage or MWh/ GWh equivalent is also required in tracking the tripling goal. IRENA explained that it is not part of the goal, but it is also something to think about, something for the members to know, the flows to and from the batteries.

- The moderator asked IRENA if a long-duration storage system has already been collected by IRENA, for example how many hours those battery systems have within the unit. IRENA explained that this kind of analysis has not been done yet but agreed that it will be an interesting topic to think about, i.e. how long those electrons stay within the battery.
- The EGEDA secretariat explained that there are some other methods of storing electricity, such as chemical fuel storage, for example, producing hydrogen or ammonia using electrolysis is a kind of storing electricity, then using them later to produce electricity. But in EGEDA's data collection, these are not considered and as explained earlier, only pumped storage and battery electricity storage are included. However, hydrogen and ammonia can also be reported in other ways in the statistics such as inputs to electricity generation, and hopefully avoid double counting.
- The moderator further asked if the electricity storage collection and reporting method by IRENA is similar to what was introduced by APEC. IRENA affirmed that it is the same.

Mr John Christ Beraya, Science Research Specialist of the **Department of Energy (DOE), Philippines,** delivered the presentation "*Prescribing the Policy for Energy Storage System in the Electric Power Industry*". Recognising the increasing importance of energy storage systems as a component of the smart grid system in the Philippines, the government formulated policies supporting its implementation. One of the policies aims to introduce energy storage system (ESS) technologies to serve a variety of functions in the generation, transmission and distribution of electric energy. The directives will likewise accommodate the development of ESS for renewable energy integration and grid stability.

Mr Beraya's presentation is attached as **Annex 4.4**.

During the Q&A session, the following were raised:

- The secretariat verified if data on the amount of energy stored in ESS facilities can be collected from the provider, for example, the electricity used for pumped storage and the electricity stored in battery storage. The moderator explained on behalf of the Philippine presenter, that the pumped storage data is available in the system provider or plant operator. In terms of metering the quantity of the storage and utilised capacity by the pumped storage facility, these are being reported to DOE. As regards electricity on battery ESS, DOE requires the generation companies to report to DOE the monthly energy withdrawn from the grid as well as the electricity that is injected into the grid. These data are part of the power statistics in DOE that are published annually.
- The moderator further asked how the Philippines classified the ESS given that the facilities are functioning either as a load at times when withdrawing power and as a "generator" when injecting power to the grid. The Philippines replied that the economy will classify ESS as separate sector under Storage. The EGEDA chair clarified if the Philippines could report the duration of the storage or the capacity storage not just the peak amounts of megawatts produced but also the duration or the MWh. The Philippines will try to collect also the data mentioned. The moderator appreciated the Philippines' commitment to also provide the duration of the energy produced by the storage facilities as collecting these will provide a better analysis of the energy storage system.

Round table discussion

Economy	Update
Australia	Has numerous grid-scale storage options such as pumped hydro and big batteries. The two main grids and three smaller grids that can be considered large grid-scale systems and data are particularly good for the large grid. Australia has no problem

	with the collection but similarly to other economies, is facing the problem of how to allocate the data in the energy balance table. On the smaller grids, there may be existing capacity data but not on the production.
Chile	There is no operational grid battery storage yet, but numerous projects are underway. Chile has recently passed legislation to support large-scale energy storage and it plans to install multiple gigawatt capacity by 2026. Will try learning data collection of the system.
China	China is currently undergoing a huge expansion of renewables and battery storage. China is collecting data on pumped storage hydro and battery storage from private and government departments as well as electricity associations. As regards battery storage data, China is struggling with how to correctly account for the numbers to avoid double counting the production and how to segregate the input and output with the storage and generation.
Hong Kong, China	No existing grid-scale battery storage for renewable generation is already connected to the grid. Having said that, utility companies are exploring the potential of the battery energy storage system. In airports and other establishments, there are battery energy storage systems (BESS), but they are mainly used for emergency power supply and own use to flatten electricity consumption.
Indonesia	There are battery-energy solar systems that store electricity from solar power, but data are not yet collected as they are still on a small scale. Maybe in the future based on Roadmap 2031, data on grid-scale storage can be collected, as this can be an option to accelerate net zero emissions.
Korea	Not aware of the large-scale or grid-scale battery electricity storage system. Korea Electric Power Corporation manages the electricity data, but KEEI can request collaboration on the data anytime or as necessary.
Malaysia	BESS are in the pipeline and will be implemented in 2026.
The Philippines	Data is separated from the generation to avoid duplication.
Singapore	Has newly implemented BESS, data is yet to be collected.
Chinese Taipei	A new law will be issued that will allow grid battery electricity to participate in the trade system.
Thailand	Currently, only pumped storage exists in Thailand. There are three pilot studies in grid battery storage and if it is ever fully implemented, Thailand will surely collect the data.
Viet Nam	There is no existing energy storage yet but they will learn how to collect the data. In preparation for this, Viet Nam needs to review the existing energy regulations.

Session 5: Report on the collection of energy consumption of EVs, PHEVs and FCEVs, moderated by Mr Finbar Maunsell of APERC.

Session 5 began with a presentation by **Ms Risa Pancho, Researcher, APERC** on the *EGEDA report on collecting EVs, PHEVs and FCEVs' energy consumption*. She mentioned that electricity accounted for 0.4% of the total road transport energy consumption in 2021, while petroleum products still dominated fuel consumption at over 90%. Although most economies have adopted EV technologies, EGEDA is unsure if these economies report their electricity consumption under the road transport sector. She also shared the methodology for calculating EV consumption, which considers the number of EVs, average mileage (km/vehicle) and average consumption (kWh/km)

Ms Pancho's presentation is attached as **Annex 5.1.**

During the Q&A session, the following were raised:

- Mr Maunsell recognised the challenges in estimating the EV electricity consumption based on average mileage and average consumption per km travelled, given that different types of vehicles are being considered.
- China mentioned that the economy collects electricity consumption of its EVs from electricity associations that have electric vehicle chargers connected to commercial/public areas. Hence the data are being placed under the commercial/public sector instead of the road transport sector. Although it is difficult to separate the consumption from the commercial/public sector, China would like to estimate the consumption based on the equation presented earlier.
- Hong Kong, China briefly shared its process of conducting end-use energy surveys in its transport sector to estimate the energy consumption for different vehicle types.

The economy presentation began with a sharing by **Dr Melissa Lynes, Lead Technical Economist at the US Energy Information Agency** on "*EV electricity consumption data in the United States*". She shared EIA's recent cognitive studies to determine if EV consumption data could be collected using surveys on electricity providers and EV-owning households, as well as lessons learned from such studies. She concluded that it is not feasible to collect data at this time. She also shared EIA's three different models to estimate EV consumption in the economy (electric power monthly, residential energy consumption survey, and annual energy outlook).

Dr. Lynes's presentation is attached in **Annex 5.2**

During the Q&A session, the following were raised:

- The EGEDA Chair raised an issue of possible overloading of the nearby transformers given that fast chargers are the most common one. He would like to know if there has been a discussion with the utilities regarding the monitoring of the grid with respect to charging, as well as a permit for new charging infrastructure. Dr Lynes mentioned that, indeed, utilities are starting to pay close attention to the overloading issue. However, utilities have no capabilities to detect any incoming charging at real time and hence, EV owners are advised to inform the utilities of their EV ownership.
- Mr Yamashiro of APERC would like to know the following: 1) the influence of weather on electricity consumption of EVs, and 2) the kind of data collected at state- level. In response, Dr Lynes mentioned that there are several studies concerning the influence of weather on electricity consumption of EVs. For the US, extreme hot and cold weather events would degrade the fuel economy of EVs on average, thereby decreasing their efficiency. In terms of state-level information, there are data on EV stock levels even at ZIP code level which can be aggregated into state-level. In addition, weather data are also available based on the nearest airports' State-level.

This was followed by a presentation by **Ms Rosanna Y. Tejuco, Senior Science Research Specialist at the Department of Energy**, on the *Philippines' estimation of electric vehicle consumption*. She shared the Philippines' electric vehicle industry situationer and the economy's Comprehensive Road Map for the Electric Vehicle Industry (CREVI). She also explained the methodology of estimating the electricity consumption of electric vehicles and the corresponding displacement of oil consumption.

Ms Tejuco's presentation is attached in **Annex 5.3.**

Following the presentations was a roundtable discussion sharing the challenges encountered by the members in collecting and estimating the energy consumption of EVs, PHEVs and FCEVs.

Economy	Update
Australia	Research related to transportation was conducted within the Department of Infrastructure, Transport, Regional Development and Local Government. Australia collects data on EV electricity consumption but usually combines it with either residential or commercial electricity consumption.
Chile	Chile faces several challenges in collecting and estimating the electricity consumption of EVs, PHEVs and FCEVs. There are currently not enough charging stations for all types of EVs. Other challenges include consumer behaviour, different driving and charging habits, lack of local expertise, lack of robust policies, etc.
China	China collects data on EV charging from electricity associations, but it is still a challenge to separate electricity charged to EVs from residential sector consumption. The economy would be interested in using the US best practices in estimating regional electricity consumption of EVs.
Hong Kong, China	Hong Kong, China conducts end-use energy surveys in the transport sector for various kinds of vehicle types to estimate the energy consumption for each vehicle type. There is already a mechanism in place to disaggregate the electricity consumption of EVs from the commercial sector. For the residential sector, power companies are now encouraging households to apply for separate metering for their EV charging facilities.
Korea	In Korea, EV companies/sellers do not report the electric consumption of EVs sold. KEPCO reports the consumption of EVs, but it is still attached to the consumption of the public services sector. However, KEEI can estimate the consumption of EVs through a methodology similar to the one presented by the EGEDA secretariat.
Malaysia	Malaysia has a similar projection of EV consumption in the economy, based on the vehicle's average travel distance and average fuel economy. Linear regression analysis is used to project the forecast number of EVs using macroeconomic indicators. Among inputs are vehicle decay, EV price parity with ICE, tax reliefs and charging infrastructure. The current number of electric vehicles is about 17,150 units, including buses and motorcycles and vehicles in the commercial sector.
The Philippines	The Land Transportation Office (LTO) under the Department of Transportation currently manages the registration of all new vehicles, including EVs.
Singapore	The Ministry of Transport collects data from EV sellers. The Certificate of Entitlement issued for all vehicle types ensures all vehicles are recorded in the system. Singapore forecasts total electricity demand and peak electricity demand (day and evening peaks) of EVs based on the number of light EVs and public buses. Other indicators include travel patterns and charging time.
Chinese Taipei	Chinese Taipei estimates the electricity consumption of EVs based on the methodology presented by the EGEDA secretariat. EVs stock data are obtained from the Department of Transportation. Data on driving distance and vehicle efficiency are estimated through survey results, interviews with the Department of Transportation, and EV sellers. One challenge is that the surveys are voluntary and were conducted about three years ago, and hence the results may not reflect the current situation.

Thailand	Thailand collects data on public chargers from provincial and metropolitan electricity authorities. Private chargers are still embedded in the residential sector, and data are not yet being collected.
Viet Nam	The Ministry of Transport collects and estimates EVs' electricity consumption, which is then reported in the economy's greenhouse gas inventories.

After the roundtable discussion, the last presentation of this session was delivered by **Mr Riccardo Inverni and Mr Fabian Burkard, Energy Data Officers at IEA**, on *Energy consumption of electric road vehicles: methodological issues*. IEA shared the importance of EVs in electricity statistics, given that EVs continue to become increasingly important. IEA also shared the existing data collection in terms of activity data and energy data. The agency also stated that electricity consumption of road vehicles is to be reported in the transport sector. Issues and solutions that have been addressed for EV data collection from the survey were also shared. To end the presentation, it was mentioned that cross-validating EV consumption can be done via a bottom-up model which mainly considers mileage, fuel economy, and sales/vehicle stock as the main parameters.

Mr Iverni and Mr Burkard's presentation is attached in **Annex 5.4.**

During the Q&A session, the following were raised:

- Mr Barcelona of the EGEDA secretariat inquired whether IEA includes electric scooters and bicycles in the electric vehicles it collects. responded that they also include those vehicles, including smaller vehicles in the road transport sector, although estimating the consumption of these smaller vehicles Is challenging.
- Mr Maunsell sought advice from IEA if IEA can help check the estimated average mileage of each APEC economy, given that IEA has excellent quality mileage data at its disposal. IEA replied positively that APERC can get in touch with IEA's transport modellers to assist with the economies.

Session 6: Report on data collection on fugitive methane emissions moderated by Dr PHUNG Quoc Huy, Senior Researcher, APERC. The objective of this session is to show how members collect fugitive greenhouse gas emissions data.

Mr Nabih Matussin, Researcher, APERC, presented a report on collecting fugitive methane emissions. After mentioning the definition of fugitive emissions, he highlighted the status of the EGEDA Secretariat's efforts in collecting fugitive emissions data. He explained the reason for collecting fugitive emissions data and indicated the EGEDA Secretariat's next steps in collecting and calculating fugitive emissions data from APEC economies.

Mr Nabih's presentation is attached as **Annex 6.1**.

During the Q&A, the following were raised:

- The moderator asked how the Global Methane Initiative measures fugitive emissions data. Mr Nabih answered that it is measured by a combination of satellite data and estimated calculations.
- Malaysia also asked how the EGEDA Secretariat measure CCS and Enhanced Oil Recovery (EOR) activities data. Mr Matussin answered that the secretariat refers to the UNFCCC guidelines for calculating these data.

Mr Aloys Nghiem of the IEA presented IEA's real-time electricity + CO_2 tracker. He addressed the general context of energy data by using items outside and within the IEA and four targets for IEA 3.0. Regarding the development of the real-time electricity tracker, he mentioned that it is composed of a combination of manual work and

automation. He likewise showed live demonstrations by operating the real-time electricity map to show solar power generation and CO_2 emissions.

Mr Nghiem's presentation is attached as **Annex 6.2**.

- The EGEDA Chair asked what the black colour in Australia's real-time electricity map means. Mr Nghiem answered that it indicated Australia still uses a large amount of coal for electricity generation although solar PVs have been increasing.

Mr Barcelona presented *EGEDA's methodology in calculating fugitive emissions*. After highlighting the EGEDA Secretariat's efforts in collecting fugitive CO_2, methane and N_2O emissions data, he explained the additional data that the EGEDA Secretariat collects and does not collect. He also reported the status of GHG emissions data collection by the EGEDA Secretariat and introduced the templates to collect additional GHG emissions data such as CH_4 and N_2O. Finally, he reported on the issues that the EGEDA Secretariat faces in its data collection activities.

Mr Barcelona's presentation is attached as **Annex 6.3**.

Ms Tamara Curll, DCCEEW, Australia, presented Australia's fugitive methane emissions estimation approach. She introduced a mandatory government scheme for company-level emissions and energy reporting and information dissemination and the role of the National Greenhouse and Energy Reporting Scheme (NGERS) in Australia. She explained that Australia's fugitive methane emissions from coal, oil and gas sectors are estimated through the NGERS fugitive methane methods. Finally, she explained how emission estimation is quality-checked by showing the integrated and legislated estimation framework, and source of commercial activity data.

Ms Curll's presentation is attached as **Annex 6.4**.

During the roundtable discussion, the members discussed the challenges they encountered in estimating/collecting fugitive methane emissions.

A summary of the discussion is shown in the table below:

Economy	Update
Chile	Chile estimates fugitive methane emissions based on the IPCC guidelines and methodology.
China	China uses the IPCC methodologies to collect data on fugitive methane emissions. Many entities, such as the Department of Energy and oil and gas companies, collect the data in China. One of the data collection challenges is the emission factor because each organisation uses its own emission factors. Another challenge is the marginal emission factor and activity. There is no fugitive methane emissions data on China's website.
Hong Kong, China	Hong Kong, China, does not collect data on fugitive emissions at the moment. Nevertheless, there are two possible methane emissions cases. The first one is methane emissions from landfills. The government's system collects these methane emissions and converts them to energy. The second one is methane emissions from the town gas system. As the gas company has a close monitoring mechanism for the system pipework no serious leakage from town gas has been reported in recent years.
Indonesia	Indonesia routinely calculates GHG emissions, including CO_2 and CH_4, following the IPCC guidelines and reports the data to the EGEDA Secretariat. The new publication will include GHG emissions data.
Korea	Its research institute officially measures, monitors, and quantifies fugitive methane emissions and conducts various research projects. It also collects and analyses these data

	using advanced technologies. Collaboration with this institute is one option for obtaining these data.
Malaysia	Developing methodologies and collecting data to estimate GHG emission reductions for non-quantified initiatives, especially for reducing fugitive emissions by oil/gas operators. Efforts are being carried out to improve the completeness of activity data and emission factors for fugitive emissions from the oil and gas sector.
The Philippines	The Philippines follows the IPCC guidelines and methodologies for collecting GHG emissions data. It calculates GHG emissions and submits data to the Climate Commission for the economy's Nationally Determined Contributions.
Singapore	The National Environmental Agency of Singapore collects Singapore's GHG inventories. Since Singapore does not have mines, its methane emissions are pretty low.
Chinese Taipei	Monitoring and measuring are the main challenges in estimating and collecting fugitive methane emissions due to the dispersed nature of sources and the need for advanced technology, such as cameras and specialised equipment. As for data collection of fugitive methane emissions, Chinese Taipei refers to the IPCC guidelines.
Thailand	The Department of Climate Change and Environment, a newly established agency, currently collects fugitive emissions in Thailand.
Viet Nam	Viet Nam collects methane emissions. However, data collection on methane emissions is not under annual energy statistics but under the Department of Climate Change in Viet Nam.

Session 7: Importance of energy efficiency indicators moderated by Mr Sweetnam. This session discussed the importance of energy efficiency indicators by showing analyses of the collected indicators that help policymakers in developing energy efficiency policies.

Ms Gelindon of the EGEDA secretariat reported on their efforts in collecting the energy efficiency indicators template from member economies. She also reported on their efforts to assist non-OECD APEC member economies that are not able to fill in the template with the estimated end-use energy consumption data using their respective survey results and the end-use energy model prepared by a consultant. Her presentation also showed how energy efficiency indicators and disaggregated data can enrich the analysis of energy consumption trends.

Ms Gelindon's presentation is attached as **Annex 7.1**.

- The EGEDA secretariat asked Ms Gelindon what the next steps would be when she completes the EEI estimates for Brunei Darussalam; Malaysia; the Philippines and Thailand. Ms Gelindon responded that these will be sent to the mentioned economies for their analysis. On the question of whether the same estimation will be done for other economies like China and Indonesia, Ms Gelindon responded that it could probably be done and further explained that it is much better if the economies have energy consumption surveys like the four mentioned economies.
- In calculating EEI of the Philippines, the economy's representative suggested that Ms Gelindon should use the results of the Family Income and Expenditure Survey (FIES) instead of the Household Energy Consumption Survey (HECS), as the former is conducted regularly. Ms Gelindon responded that FIES data is already incorporated in the analysis, such as the household size and appliance ownership, among others but HECS results are particularly important as they describe energy consumption patterns. Therefore, when the results of the 2024 HECS become available, the model will be updated with this new information.

Mr Seiya Endo, Senior Economist of the Institute of Energy Economics, Japan reported on their compilation of energy efficiency indicators and focused the analysis on the drop in transport energy consumption in Japan during the COVID-19 pandemic. However, energy consumption did not rebound after the pandemic. He mentioned that based on his decomposition analysis, the change in behavior brought about by safety measures during the COVID-19 pandemic reduced road transport activity (reduced mileage) and the change in fuel economy did not result in a rebound of energy consumption after the pandemic.

Mr Endo's presentation is attached as **Annex 7.2**.

- Hong Kong, China asked about the coverage of the transport survey whether it is economy-wide or regional. Mr Endo responded that the survey's coverage is economy-wide.
- The EGEDA Chair noted that fuel economy's effect on road transport energy consumption decline is too large and inquired about the reason. Mr Endo responded that hybrid vehicles became extremely popular in Japan, which explains the big improvement in fuel economy.
- The EGEDA Chair appreciated the analysis made by Mr Endo and remarked that it is a particularly good example of the use of energy efficiency indicators.
- Ms Gelindon of the EGEDA secretariat asked whether IEEJ's energy efficiency analysis is used by the government in developing policies in the transportation sector. Mr Endo responded that he believes that the analysis can be used by the government.

Ms Fang-Ling Liao of Chinese Taipei reported on the economy's policies and strategies to enhance energy efficiency. Chinese Taipei initiated a policy on energy transition in 2016. The 2050 net-zero transition goal was declared in 2021. Chinese Taipei's goal for 2024 is to promote the second energy transition and prioritise energy conservation and diverse green energy options. They have 12 energy transition strategies including energy saving and efficiency.

Ms Liao's presentation is attached as **Annex 7.3**.

- On the EGEDA secretariat's question about whether the government uses the energy efficiency indicators data in energy policymaking, Ms Liao responded that the government uses the data.
- The EGEDA Chair noted the significant improvement in Chinese Taipei's energy intensity and asked whether this is because the GDP is growing rapidly, which does not always mean improvement in energy efficiency. Mr Yen-Po Liao responded that energy consumption and GDP are decoupling indicating that despite the rapidly growing GDP, energy consumption is growing at a slower rate.
- Ms Jung Yoo Kim of APERC asked how Chinese Taipei encourages large consumers to reduce energy consumption. Ms Liao responded that the government sets energy intensity reduction targets and provides subsidies for the replacement of old equipment. However, the industry replaces old equipment on its own, even without using subsidies.
- Mr Yamashiro of APERC, asked about the numbers shown in slide 14 because Chinese Taipei imports most of its coal, oil and gas supply. Ms Liao explained that the numbers show the number of energy suppliers where the data are collected from.
- On Singapore's question as to how the government determines compliance by the industry, Ms Liao responded that the industry is required to submit data to the government. In the setting of the targets, the industry sector is involved by the government to ensure that targets are achievable.

Mr Sansook Suwannasom of Thailand's Department of Alternative Energy Development and Efficiency, reported on the challenges in collecting data from industry. He mentioned that the industry is the second largest final energy consumer next to transportation. Data on natural gas consumption is obtained from the Petroleum Authority of Thailand. Consumption data on oil products are obtained from the Department of Energy Business (DEB) and electricity from the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA). Renewable energy consumption is based on data from energy management reports under the Energy Conservation Promotion Act.

Mr Suwannasom's presentation is attached as **Annex 7.4**.

- On the EGEDA Chair's question on how energy use is tracked by the government so that the industry can meet the energy efficiency targets, Mr Suwannasom responded that the industry is required to submit a report on energy consumption to the government.

Ms Nornadiah Hamrie, Assistant Director, Energy Commission of Malaysia presented the energy consumption survey in the manufacturing sector. The survey will cover 24 sub-sectors for manufacturing according to Malaysia Standard Industrial Classification. The number of samples is 2 000 covering all three regions (Peninsular Malaysia, Sabah and Sarawak).

Ms Nornadiah's presentation is attached as **Annex 7.5**.

- The EGEDA Chair asked about the surveys carried out from 2010 to 2013, whether they only covered energy consumption quantities or efficiency indicators as well. Ms Nornadiah responded that only energy quantities were collected, and other indicators are available in the economy's statistics authority.
- Ms Gelindon of the EGEDA Secretariat shared that she already completed estimating the end-use energy consumption for Malaysia using the 2014 survey. She also mentioned that she would share the estimates with Malaysia and requested that they fill out the questionnaire with available data from the statistical agency.

Mr Stewart Lee of the Electrical and Mechanical Services Department (EMSD) of Hong Kong, China reported on their end-use data collection through an end-use survey in the residential sector. The survey results are incorporated in the "Hong Kong Energy End-use Data" and published online annually. Mr Lee also reported on the measures for energy saving in the residential sector in the economy.

Mr Lee's presentation is attached as **Annex 7.6**.

- Malaysia asked whether Hong Kong, China collects the data annually. Mr Lee responded that annual territory-wide data are collected from energy suppliers while annual socio-economic data comes from the statistics office. Using these data and the results of energy surveys, end-use energy consumption is estimated. Surveys are carried out on average every five years for each sector or segment.
- Malaysia asked about the ideal frequency of surveys. Ms Gelindon responded that ideally, they should be conducted every five years, but it really depends on the situation in each economy. For example, the Philippines plans to carry out surveys every five years, but budgetary constraints make the conduct of surveys less regular than planned.
- Malaysia asked Hong Kong, China whether the report on the survey is available publicly. Mr Lee responded that individual responses are not made available, but the results are aggregated in the annual publication, Hong Kong Energy End-use Data which is available online for the public.

- Singapore asked about the sample size of the survey since the responses are voluntary and whether it would lead to selection bias. Mr Lee responded that the samples are selected randomly from a territory-wide sampling frame in the surveys.
- Ms Gelindon suggested that when conducting a survey, it is better to consult the government statistical agency as they are the experts in deciding the sample size of surveys.
- Singapore asked whether there is a scheme to encourage people to shift from town gas to electricity. Mr Lee responded that Hong Kong, China's government, does not have a scheme for this as the gas and electricity companies are private companies and the government would not influence the free market. Furthermore, there is no clear progress in reducing GHG emissions by choosing either of these two energy sources. Having said that, both gas and utility companies in HKC have their roadmap for lowering GHG emissions during energy generation by adjusting the fuel mix.

Mr Suwannasom reported on the challenges in collecting end-use data in the residential sector in Thailand. As in industry, electricity consumption data is obtained from MEA and PEA. LPG consumption data is obtained from the Department of Energy Business while traditional renewable energy data are obtained from DEDE research and from the National Statistics Office's (NSO) household expenditure survey.

Mr Suwannasom's presentation is attached as **Annex 7.7**.

- The EGEDA Chair noted that, based on the presentation, the use of traditional energy is declining and asked whether it is the intention of the government to replace traditional energy with electricity and LPG. Mr Suwannasom affirmed that there is a government plan to change from traditional energy to LPG and electricity.
- Ms Gelindon inquired if Thailand has a plan to conduct a survey on end-use energy consumption survey. Mr Suwannasom responded that there is a plan for the future.

Mr Ocampo, presented Chile's challenges in collecting/estimating energy efficiency indicators in the services sector. He reported that Chile is committed to reaching Net Zero by 2050 with energy efficiency as one of the pillars of the economy's net zero policy. As regards challenges in collecting/estimating data, an energy efficiency law that provides a legal framework mandating companies to report their final energy consumption and annual sales figures is helpful for the government's data collection.

Mr Ocampo's presentation is attached as **Annex 7.8**.

Ms Tejuco presented the Philippines' planned survey on establishment energy consumption, which would cover both the services and industrial sectors. The objective of the survey is to provide information on the economy's energy utilisation patterns of industries at its subsectors and national levels to generate data required to measure the demand for energy. The sample will be 30 000 establishments. The project will be implemented from 2024 to 2026.

Ms Tejuco's presentation is attached as **Annex 7.9**.

- Ms Gelindon asked when the report on the 2023 HECS will be released and whether the Philippines will be able to complete the energy efficiency indicators (EEI) template after the survey. Ms Tejuco responded that the 2023 HECS would be finished by December 2024 and believed that the Philippines would be able to complete the EEI template after the survey.

Mr Domenico Lattanzio of the International Energy Agency (IEA) presented a published guide in the preparation of an end-use data roadmap. The guide, entitled "*Demand-side data and energy efficiency indicators – a guide to designing a national roadmap*" can be downloaded from the IEA website. The guide was published as 1) it is important to have data and indicators informing policies and the need to support economies beyond methodologies, 2) past exchanges with economies evidenced that this is not a straightforward process and there are challenges everywhere, 3) the guide is developed by economies so that other economies can learn from each other's experiences and 4) a document that has objective to help countries and economies understand key steps and different options/possibilities to meet their goals.

Mr Lattanzio's presentation is attached as **Annex 7.10**.

- The EGEDA Chair appreciated Mr Lattanzio's presentation and noted that the roadmap presented is about building institutional capability to collect data and have the resources and commitment to do it. The roadmap can be downloaded from https://iea.blob.core.windows.net/assets/bcc21d9c-47df-4d5b-8e20-f9688d9f9279/Demand-sidedataandenergyefficiencyindicators.pdf.

Ms Gelindon of the EGEDA secretariat presented how to avail of the APEC project funding, highlighting a possible project on capacity building in conducting end-use energy consumption survey.

Ms Gelindon's presentation is attached as **Annex 7.11**.

- Mr Yamashiro mentioned that the APEC project funding guidelines entitled "APEC Funding Sources" were updated in July 2024. He mentioned that there are different funding sources but proposed that the most appropriate funding source is the Energy Efficiency, Low Carbon and Energy Resilience Measures (EELCER) sub-fund. He added that this sub-fund is contributed by the Japanese government to APEC through METI. He suggested that since the sub-fund is for energy efficiency and renewable energy, energy statisticians should make a statistical project related to energy efficiency and renewable energy development and make a concept note for submission for APEC funding.

In the roundtable discussion, the EGEDA Chair asked non-OECD APEC member economies whether they could fill in the energy efficiency indicators (EEI) template and what the challenges would be in collecting activity data. Some economies mentioned that they would try to fill out the template. The table below shows the responses:

Economy	Update
Chile	Chile hopes to have more information from the private sector as the government has no mandate to collect information from the sector
China	The government is also concerned with energy efficiency and putting a lot of effort into decreasing energy intensity, such as energy consumption per unit of production or value added, energy per passenger, and energy per person. Data collection is impeded by the fact that most data are not publicly available.
Hong Kong, China	Hong Kong, China will fill the templates as much as possible. In 2021, energy intensity has decreased by about 33% since 2005 and is still on track to meet the set target. The economy further explained that the reduction of energy intensity may be affected by other

	factors such as the local or global economic climate. The economy is also planning to conduct a survey to study the energy consumption of data centres.
Indonesia	In Indonesia, oil and gas data are already reported online. However, EEI data collection would need surveys with the assistance of the statistical agency.
Malaysia	As regards the EEI template, they will try to fill in the template in collaboration with other agencies such as the Department of Statistics.
The Philippines	The Philippines have tried to fill in the EEI template, but there are no end-use energy consumption data.
Singapore	Singapore will try to comply with the EEI template. The economy also has energy consumption surveys, but the challenge is getting people to respond to them.
Chinese Taipei	Chinese Taipei has no trouble collecting data as these are available in different agencies that might have conducted surveys to produce the data.
Thailand	Most of the data collected are primary data and collecting the data for the EEI template is difficult. However, the economy recognises the importance of EEI, so they must plan and discuss the best way to collect the data.
Viet Nam	Viet Nam statistics currently focus only on calculating indicators at the national level. It has not yet assessed the effective indicator for each industry that will contribute to improving efficiency. The economy is still identifying sectors with high energy consumption and low efficiency. Viet Nam requested EGEDA's advice on international data reporting.

Session 8: Energy consumption survey moderated by Mr Nabih Matussin, Researcher, APERC. This session discussed the importance of a survey on energy consumption in collecting energy efficiency indicators.

Dr Ian Mead, Energy Information Administration, USA, presented EIA's energy consumption survey programs. He described three benchmarks of energy consumption surveys, including the Commercial Energy Consumption Survey (CBECS), Manufacturing Energy Consumption Survey (MECS), and Residential Energy Consumption Survey (RECS), regarding execution, improvements and challenges. In his presentation, he reported that commercial buildings survey has challenges in the aspects of minimizing survey cost and declining response rate on the survey. In addition, capturing emerging technologies is a challenge in any sector. In particular, company confidentiality disturbs collecting data for some items (e.g., hydrogen) in the manufacturing sector.

Dr Mead's presentation is attached as **Annex 8.1**.

During the Q&A, the following were raised:

- In Hong Kong, China's question regarding how to ensure the survey samples are accurate. Dr Mead answered that they do not conduct any post-assessment and only collect data from survey forms. However,

they do verify the data using statistical methods (e.g., comparing household data in the same area and historical data to find the outliers)

- Malaysia asked about the best software that EIA is using, as their project is planning to introduce SPSS for processing the end-use data surveys. Dr Mead mentioned that they are using SAS, which has an advantage in calculating this kind of data in the US. He also expressed his opinion that SPSS is also good choice if it fits the statistical needs of your economy.
- The EGEDA secretariat asked if there is a legal framework for collecting end-use data. Dr Mead answered that collecting end-use data is not difficult since they can secure budgets for household and supplier surveys. In addition, they conduct surveys in cooperation with other statistical agencies.
- On the question about electricity consumption of EV charging and public charging stations raised by the EGEDA secretariat, Dr Mead answered that DOE has surveys on EV charging in household and commercial buildings. In addition, they collect data on public charging monthly and by the type of charger.
- IRENA raised a question regarding the use of satellite technology for commercial buildings, Dr Mead replied that EIA is using the satellite system just to identify the buildings. They determine the energy intensity inside those buildings through supplemental surveys such as sending out questionnaires (email, etc.).

Following EIA's presentation, **Ms Gelindon** presented a project concept for capacity building on the preparation of survey instruments and implementation of end-use energy consumption surveys in the APEC region. Her presentation explained the motivation for capacity building in conducting end-use energy consumption surveys and the current situation/challenges on end-use data surveys among non-OECD APEC members. She also provided an outline and some tips for preparing Project Concept Note for APEC funding. In closing her presentation, she emphasised that the EGEDA secretariat strongly recommends that the economies propose projects on capacity building for APEC funding.

Ms Gelindon's presentation is attached as **Annex 8.2**.

During the Q&A, the following were raised:

- Regarding the workshop funded by APEC, it should benefit all economies, especially developing economies.
- Ideally, each economy should fund the energy consumption surveys. Economies can use the APEC funding for capacity building and workshops to improve the survey quality by learning from the other economies' experience.
- As to the question of whether the proposed project can be used for the workshop to prepare the survey questionnaire. Ms Gelindon's response was that preparation of the survey questionnaire is just one of the activities in the workshop.
- The EGEDA secretariat asked whether IRENA collects biomass end-use consumption data and if it offers capability enhancement training on this topic. IRENA answered that it collects from over 100 countries and produces the energy balance table of renewables. They have online resources of best practices for biomass data and materials from the previous renewable energy statistics training courses available on their website. The standard for measuring biomass data is outlined in a publication issued in 2017.
- Dr Mead mentioned that economies must carefully consider base surveys because separate surveys need to be conducted in each economy. Regarding funding, it is significant to ensure that budget can be allocated and/or subsidies to statistics by emphasising their importance to the government, as statistics tend to be

overlooked. He also shared the current situation in the U.S. such that they have built infrastructure that encourages financial support for energy transition.

During the roundtable discussion, the members were asked to share the following:

1) Highlighting the member economies' respective needs in conducting energy consumption surveys.
2) Availing APEC funding

A summary of the discussion is in the table below:

Economy	Update
Australia	Australia recognises some gaps in end-use data across all sectors. In the residential and commercial sectors, they conduct infrequent baseline studies due to funding issues. This year, part of the National Energy Performance Strategy focuses on improving data analysis to support more effective demand management and planning and assisting energy policy to improve data access.
Hong Kong, China	Hong Kong, China conducts energy consumption surveys for sectors around every five years, with funding primarily provided by the government. However, they are facing a low response rate challenge. The economy is exploring to extend more end-use surveys such as covering data centres.
Indonesia	The economy recognises the need to conduct surveys and coordinate with the central statistical agency for the survey activities. For funding sample methodologies and standards, energy institutions and stakeholders (APEC, IEA, Ministries, and others) in Indonesia need to be informed.
Korea	Korea Energy Agency conducts surveys of the industry and transport sectors. Korea Energy Economics Institute handles other sectors such as the residential, commercial and public sectors. A survey on the residential sector is conducted annually, and the recent size of the sample is 140 000.
Malaysia	The Energy Commission has requested funds from the ministry to conduct this survey using a special fund named Malaysia Electric Supply Industries Trust Account (MESITA) Fund.
The Philippines	Surveys are dependent on locally funded projects and cover all the surveys in the Philippines. Survey proposals need approval from the Department of Budget and Management.
Singapore	The household energy consumption survey is conducted by the National Environmental Agency, other industrial players, and the Energy Market Authority (EMA), and funded by a combination of government sources. The petrochemical and oil/gas sector surveys are jointly conducted by EMA and the National Environmental Agency. They have already collected 80% of the total consumption of oil and gas, primarily from major oil and gas companies.

Chinese Taipei	Energy consumption surveys are conducted in five sectors (manufacturing, residential, commercial, transport and agriculture) every five years. Collecting accurate data in the agriculture sector is challenging. End-use consumption data is quite significant therefore, CT is thinking of applying for APEC funding. They also identified the gap between data collected from the suppliers and end-users. If there are gaps or some errors, these are discussed with suppliers and experts.
Thailand	Collecting energy consumption data for the residential and commercial sectors might be possible, but it might require cooperation from both governments and the public.
Viet Nam	Viet Nam has some issues with determining energy consumption data. Enterprise survey programs can support the calculation of energy consumption in industrial and non-energy sectors; however, they are still not reliable for the agriculture and services sectors. Household surveys are conducted by the General Statistics Office but not every year, and it does not support calculation. So, interpolation calculations are needed to combine with other data. There is also a challenge with biomass data in the household sector.

Wrap-up

During the wrap-up, the EGEDA Chair, Mr Glen Sweetnam highlighted the importance of the workshop and further stated that the workshop was very productive, as there was a lot of information exchanged among the participants. New technologies are being introduced that make data collection more difficult. There is still basic data collection that members need to work on. There's a wide variety of capabilities among the member economies and the new efforts that are required. In addition, there is a need to continue to improve what we are doing with traditional energy sources. Base surveys are still extremely important for data collection.

On hydrogen/ammonia/e-fuels, Mr Sweetnam mentioned that several economies are just starting pilot projects and/or developing hydrogen plants seems too early to collect data. However, as much as possible, he requested member economies to fill out the template developed by the EGEDA secretariat.

On district cooling data collection, he mentioned that it seems to be going well and would further improve especially if the UN agrees on the proposed accounting of cooling data that is under discussion.

Regarding battery electricity storage and the importance of avoiding double counting, we still need to keep track of energy stored and delivered to the grid from these facilities.

Fugitive emissions are another new data set being collected by the secretariat. They are difficult to track because they are fugitives. They aren't commercially sold so trying to estimate emissions that you did not intend to make is extremely challenging. Therefore, it is important to share all our experiences on that.

On energy efficiency indicators, he recognised that member economies are on different levels of being able to track that. He commended the secretariat for putting together the EEI template and encouraged everyone to fill it out although some economies have more data than others.

He also appreciated the excellent presentation from EIA and the presentation on a proposed project building that capacity. There is a whole range of capabilities among member economies and what is important is improving from the position where we are now. The workshop facilitated the sharing of experiences from experts and made resources available for everyone for the type of information that they need. He urged

members to not hesitate in approaching the experts and the EGEDA secretariat if they need to consult on matters related to data collection and surveys.

In closing, he mentioned that he is looking forward to seeing all EGEDA members in HKC for the 36th EGEDA meeting that will be held jointly with EGCFE, EGNRET and EGEEC.

End of the 4-day workshop