21st APEC Workshop on Energy Statistics: Data collection on new energy products and technologies
12-14 September 2023
Tokyo, Japan

Summary proceedings

The **21st APEC Workshop on Energy Statistics** with the theme ***Data collection on new energy products and technologies*** was held in Tokyo, Japan from 12 to 14 September 2023. This was the first workshop held physically after three workshops held online due to the COVID-19 pandemic. This was also the first collaboration of the Expert Group on Energy Data and Analysis (EGEDA) with the Expert Group on New and Renewable Energy Technologies (EGNRET) and the Expert Group on Clean Fossil Energy (EGCFE).

The workshop was participated in by 57 energy statisticians, experts and speakers from 14 member economies (Brunei Darussalam; Chile; China; Hong Kong, China; Indonesia; Japan; Malaysia; Papua New Guinea; Peru; the Philippines; Chinese Taipei; Thailand; United States and Viet Nam), international organisations [International Energy Agency (IEA), International Renewable Energy Agency (IRENA) and UN Environment Programme (UNEP)-Copenhagen] and APEC fora [APEC Transportation Working Group (TPTWG), EGNRET and the Asia Pacific Energy Research Centre (APERC)]. The workshop was co-chaired and co-moderated by the EGEDA Chair, EGCFE Chair and EGNRET Secretariat (on behalf of the EGNRET Chair). The following are the proceedings of the workshop.

Day 1 – 12 September 2023

Opening session, moderated by Mr Edito Barcelona, Senior Research Fellow, APERC/Energy Statistics and Training Office (ESTO) and EGEDA Secretariat. The opening session consisted of the remarks delivered by the three APEC expert groups, EGEDA, EGENRET and EGCFE.

The workshop commenced with Welcome Remarks from **Ms Reiko Eda, Director for Natural Resources and Energy Research, International Affairs Division, Ministry of Economy, Trade Industry (METI), Japan** and EGCFE Chair. She mentioned that the 21st APEC workshop on energy statistics was the first collaboration among EGEDA, EGCFE and EGNRET with the latter two working groups recommending expert speakers in the workshop.

Ms Eda emphasised that the international energy situation is drastically changing due to climate change and the measures to combat it with ambitious targets for carbon neutrality. Balanced energy transition is important while considering sustainable economic growth, climate change measures and energy security at the same time. It is very good timing to hold this workshop to assist APEC economies in improving the members' ability to collect data on new energy products and technologies such as hydrogen/ammonia, among others which are increasingly important in achieving a balanced energy transition.

She hopes that participants will be able to use the knowledge obtained from this workshop for their respective work.

Dr Kazutomo Irie, APERC President likewise delivered his Welcome Remarks. He welcomed the participants and expressed his gratitude to the expert speakers for sparing some of their time to contribute to the workshop. He echoed the goal of the workshop mentioned by Ms Eda which is to enhance EGEDA members' knowledge of new or re-purposed technologies that include hydrogen, district cooling systems, grid-scale electricity storage, electric

vehicles, CO_2 sequestration, etc. From these learnings, members can better deploy the data collection, reporting, and analysis procedures required to correctly measure the magnitude and effects of these technologies in the energy sector.

Finally, he encouraged the participants to approach the workshop with open minds and a shared goal: to glean insights, share knowledge, and forge connections.

EGEDA and EGNRET delivered their respective Opening Remarks. In his Opening Remarks**, Mr Glen Sweetnam, APERC Senior Vice President and EGEDA Chair** likewise thanked the experts and speakers for joining the workshop and emphasised the importance of the participation of the EGEDA members as the workshop is really intended for them. He mentioned that leaders are adopting policies to accelerate energy transition with unintended consequences that highlight the need for collecting data to know what is happening on the ground. EGEDA members are critical to the success of understanding the economies' energy flows, energy mix and carbon emissions. He mentioned that the workshop is an opportunity for EGEDA members to talk with each other and for the experts to really think through all the steps needed to be taken that are different from what was done before to accurately portray what is happening.

Finally, **Dr Hom-Ti Lee, Head of EGNRET secretariat** delivered the Opening Remarks on behalf of EGNRET Chair, Dr Kevin Liao and thanked EGEDA for inviting EGNRET to the workshop. He mentioned that energy statistics play a significant role in energy policy formulation in the process of energy transition. The need for a rapid transition to clean energy is enabling development in the RE sector. APEC members plan to adopt new energy products and technologies to accelerate the reduction of carbon emissions in the APEC region. Collecting and analysing data accurately became a very important need. It is therefore important that experts from EWG fora, international organisations and member economies exchange views on data collection on new energy products and technologies to enhance their knowledge of new energy technologies. He expressed that EGNRET is delighted to cooperate with APEC members, fora, international organisations and experts.

Session 1– Setting the context: The new data collection and reporting requirement of the energy transition moderated by Mr Glen Sweetnam. The objective of this workshop is to understand the growing need for new energy data requirements for the energy transition. Speakers include energy modelers, energy planners and energy statisticians in APERC, IRENA, the United States; Viet Nam; and Peru.

The session kicked off with a presentation from APERC on *New Energy Technologies and the Implications for Data Collection/Reporting* delivered by **Dr David Wogan, APERC Assistant Vice President and APEC Demand and Supply Outlook Lead.** In a nutshell, Dr Wogan emphasised that decision-making increasingly relies on quantitative analysis and that reliable data are fundamental inputs. Despite having more data available for collection and reporting now, infrastructure for collecting and dissemination is still lagging.

APERC's presentation is attached as **Annex A**.

This was followed by a presentation from **Ms Nazik Elhassan, Associate Programme Officer-Statistics, IRENA** on *The Role of renewables in energy transition*. The presentation emphasised that renewables play a major role in various areas, including decarbonisation, improving energy security, driving innovation in technology and energy infrastructure, and delivering significant socio-economic benefits for a just energy transition. In addition, accelerating energy transition and monitoring its progress shall be prioritised.

IRENA's presentation is attached as **Annex B.**

The economy presentation started with the *Energy Transition Plan of Viet Nam* from **Ms Dinh Thi Thanh Lan, Researcher, Institute of Energy, Viet Nam.** Her presentation briefly explained the *Energy Transition Plan of Viet Nam* and its specific targets, including power sector expansion. She noted that there are several challenges in making Viet Nam's existing coal-fired power plants cleaner and more efficient, as well as challenges and solutions in increasing deployments of renewables, battery electricity storage systems and hydrogen.

Viet Nam's presentation is attached as **Annex C**.

Ms Lucero Luciano De La Cruz, Renewable Energy Analyst, Ministry of Energy and Mines, delivered Peru's *Advances in Electric Mobility, Green Hydrogen and Storage*. She shared that Peru's journey towards electromobility, energy storage and green hydrogen aligns with the economy's Energy Efficiency Plan, Electricity Plan, and Integrated Energy Plan in 2050.

Peru's presentation is attached as **Annex D**.

A special economy presentation was delivered by **Mr Christopher Doleman, APERC Senior Researcher** on *Transitioning Canada to a net-zero electricity grid by 2035.* He explained that having a net-zero electricity sector is integral to Canada's climate ambitions. The government is working on a flexible policy approach, called the Clean Electricity Regulations (CER), that can respect the provincial resource variability and regulatory autonomy across the economy while achieving the core principles of maximising emission reductions and maintaining both electrical affordability and grid reliability. In addition, the Canada Energy Modelling Hub (EMH) is aiming to make modelling tools available for stakeholders for policy development.

The special economy presentation is attached as **Annex E**.

The following were raised during the Q&A:

- If CER's emissions performance standard allows for Steam Methane Reforming systems for hydrogen (SMRs), to which Mr Doleman responded they are allowed.
- There was an inquiry whether the emission performance standard of 30 tCO2e per GWh is also applicable for cogeneration systems. Mr Doleman responded that cogeneration systems are exempted from the standard if they are off grid.
- Whether the emissions performance standard is for the lifecycle emissions or just generation-based emissions. He was concerned that there would be risks of using grey hydrogen if the standard is only for generation-based emissions. Mr Doleman responded that it is indeed only for generation-based emissions, and assured that current policy and measures in Canada will ensure no emissions from grey hydrogen, etc.

Finally, **Mr Vikram Linga, Renewable Energy Analyst of U.S. Energy Information Administration (US EIA)** in his presentation titled "*Battery Storage, Electric Vehicle, and Hydrogen Developments in the United States"* provided an overview of EIA and current and planned developments of battery, electric vehicles, and hydrogen in the economy, along with their data needs.

The US presentation is attached as **Annex F**.

Round table discussion

During the roundtable discussion, other EGEDA members were given a chance to discuss the following:

1) What new technologies are likely to be employed in your economy?
2) What data challenges will your economy face?

A summary of the discussion for Session 1 is attached as **Appendix I.**

Session 2: Discussion on Hydrogen/ammonia/e-fuels production and consumption moderated by Ms Eda. The objective of this workshop is to understand the basic energy flow of hydrogen, ammonia and e-fuel from production to consumption. The research study from APERC and IEA's methodology will hopefully enlighten the members on this.

The session started with APERC's presentation from **Dr Manuel Heredia Muñoz, Senior Researcher of APERC**, entitled *"Hydrogen Technologies Prospectives"*. The presentation showed the supply side of hydrogen and that H_2 production is responsible for around 2.5% of global CO_2 emissions. He mentioned that almost all H_2 is used as feedstock in industry processes and produced using fossil fuels such as natural gas and coal. He also mentioned that H_2 is produced by gasification using biomass. On the demand side, he explained that H_2 is mainly used in the distribution and transport sectors. Finally, he highlighted the importance of H_2 as a way to store and transport green energy effectively.

APERC's presentation is attached as **Annex G**

Following APERC's special presentation, **Mr Luca Lorenzoni, Energy Data Manager of IEA**, presented IEA's hydrogen data collection. He mentioned that IEA's hydrogen data collection consists of two pillars. The first pillar is the key trend of hydrogen, emphasising the importance of hydrogen as a tool to support climate ambitions and enhance energy security. He also mentioned how IEA and Eurostat have cooperated to develop a new joint questionnaire for hydrogen. Given that hydrogen demand is growing, and the pipeline of production projects expands, he briefly mentioned that IEA sees hydrogen production and trade will increase dramatically by 2030. The second pillar highlighted the methodology of including hydrogen, ammonia and e-fuels in energy statistics. Lastly, he showed hydrogen's balance and flow, such as production, trade and transformation.

IEA's presentation is attached as **Annex H.**

Mr Nobuhiro Sawamura, Senior Researcher, APERC/EGEDA secretariat, delivered a presentation entitled *"Hydrogen production, storage, and consumption – data collection in APEC"*. The presentation included the definition of terms of hydrogen-related items, and the updated hydrogen data collection formats emphasising that *"with CCS"* and *"without CCS"* parts were newly added. He mentioned that the EGEDA Secretariat will make a hydrogen manual by referring to IEA/Eurostat's manuals. He also highlighted the discussion on hydrogen from the EGEDA33 meeting held in the Philippines in October 2022 and the last EGEDA34 meeting in Hawaii in April 2023 (a Joint Meeting with EGNRET 58). Finally, he concluded that the EGEDA Secretariat will send the data collection format by the end of 2023 (Data to be collected will be 2022 data).

The EGEDA secretariat's presentation is attached as **Annex I.**

During the Q&A, the following were raised:

- A suggestion that the EGEDA Secretariat should adopt net calorific value instead of gross calorific value in its energy balance table as it is more consistent with other units such as terajoule.
- Which unit will be used in the quantity of energy input of electrolytic processes?
- In response to all of these concerns, the EGEDA Secretariat assured that the secretariat will continue discussing with IEA and Eurostat on the acceptable calorific value and energy units, improve its template and report updates in the future.

In the economy presentation, **Ms Josefina Ramos, Statistical Analyst of the Ministry of Energy, Chile** started with "*Hydrogen development in Chile*". The presentation included Chile's economic background, stressing that its main industry is mining, such as copper and lithium although Chile depends on oil and natural gas imports. Chile has enormous potential for solar in the South and wind in the North and is expected to export green hydrogen produced from increased wind and solar PV generation in the future. In addition, she mentioned that Chile aims to be the top destination for green hydrogen investment in Latin America and provide the cheapest green hydrogen on the planet.

Chile's presentation is attached as **Annex J.**

Professor Yun Hau NG, School of Energy and Environment, City University of Hong Kong from Hong Kong, China, followed the economy presentation with the report on "*Green Hydrogen Development*". The presentation introduced "Hong Kong, China's Climate and Action Plan 2030+" released in 2017 and "Clean Air Plan for Hong Kong, China 2035" released in 2021. "Clean Air Plan for Hong Kong, China 2035" has six significant action areas which include among others, "Green Transport" such as EV roadmap and new energy ferries and "Clean Energy" such as power plant emissions reduction and green energy. He also mentioned that Town gas will use hydrogen energy in the future and the photocatalyst panel system, which turns water into a source of solar hydrogen.

Hong Kong, China's presentation is attached as **Annex K.**

During the Q&A, the following were raised:

- About the conversion efficiency of the photocatalyst panel, Professor Yun Hau NG mentioned that it is deficient and a single digit. He added that even though conversion efficiency is so low, the photocatalyst's durability is ten years, making it as competitive as other products.
- About the cost of FCV buses and EV buses and which is more competitive, Professor Yun Hau NG answered that EV buses are more competitive on flat roads, but FCV buses are more competitive on hills because they have more power.

The next economy presentation was from **Mr Tomohiko Adachi, Director, Hydrogen and Fuel Cells Strategy Office of METI, Japan** about "*Hydrogen and Ammonia Development in Japan*". He introduced Japan's policy and Hydrogen Basic Strategy, including its supply and demand volume target. He also explained Japan's hydrogen policy in production, maritime transport, the power sector, mobility and heat use at factories. Finally, he announced that the Hydrogen Energy Ministerial Meeting will be held on 25 September 2023.

Japan's presentation is attached as **Annex L.**

Japan delivered another presentation about *"E-fuels in Japan"* by **Ms Mai Yaguchi, Director, International Strategy on Energy Resources Office, ANRE, METI**. She mentioned that e-fuels have high volumetric and mass

density and can utilise existing fuel infrastructure even though their production cost must be reduced. She also addressed that e-fuels are essential for Japan to achieve GHG emission reduction by 46% by FY2030 from the level of FY2013 and carbon neutrality by 2050. She also introduced Japanese government-supported R&D projects such as e-fuels, e-methane, sustainable aviation fuels and green LP gas for "Carbon Recycling Fuels" in the Green Innovation Fund. Finally, she explained about Idemitsu Kosan's project with HIF Global to accelerate the production and diffusion of e-fuels in Japan.

Japan's presentation is attached as **Annex M.**

The final economy presentation was from **Mrs Aimi Hazwanie, Assistant Director, Energy Commission of Malaysia**, on "*Development of Hydrogen and Ammonia in the Energy Sector in Malaysia*". She mentioned that the production and consumption of hydrogen in Malaysia is still on a smaller scale and mostly pilot studies. The presentation introduced the Hydrogen Economy and Technology Roadmap (HETR) and National Energy Policy, 2022-2040 of Malaysia. The latter's initiatives include developing a hydrogen economy roadmap and long-term hydrogen roadmap, determining a national strategy to optimise hydrogen production locations and developing regulations. Finally, she mentioned Petronas hydrogen value chain project and Sarawak's hydrogen project.

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

Round table discussion

The roundtable discussion for Session 2 was deferred to the following day due to time constraints. The EGEDA members were requested to report the following:

1) What role are hydrogen/ammonia/e-fuels likely to play in your economy?
2) How and who will collect the data?

A summary of the discussion for Session 2 is attached as **Appendix II.**

Day 2 – 13 September 2023

Session 3: Understanding district cooling/district energy systems and the flow of energy from the plants moderated by Mr Jen-Yi Hou, EGEDA Vice-Chair. The objective of this session is to communicate the importance of district cooling in energy statistics in the same way as district heating.

Dr Zhuolun Chen, Senior Advisor for UN Environment Program-Copenhagen delivered a special presentation, entitled "*Implementing District Cooling to Cool Down Cities*". He presented the basics, background and recent trends of district cooling, system components, and recommendations. He recommended that filling the data gaps, integrating cooling mapping/planning into urban planning, and introducing Innovative technologies/financial supports are needed to develop the district cooling projects by showing some examples.

UNEP's special presentation is attached as **Annex O.**

- During the Q&A, a question was raised on how efficiency increases in using the DC. Dr Chen answered there are two factors the electric power source (power supply structure will be affected directly by the carbon emissions) and the cooling system's efficiency.

Ms Elvira Gelindon, Research Fellow, APERC/EGEDA secretariat reported on the *District cooling system in APEC*. She explained the district cooling data collection efforts by showing the revised questionnaire formats regarding chilled water production for 2016 data collection, district cooling study and global efforts including TT-SIEC

activities. At the end of her presentation, she concluded that the cooling system is as important as the district heating aspects of the energy systems, and a better understanding of the system is needed to identify inclusions/exclusions in reporting.

The EGEDA secretariat's presentation is attached as **Annex P.**

UNEP delivered another special presentation on the *Use of natural cooling resources for district cooling* by showing case studies. He showed the case study of seawater/chillers for cooling in El Alamein, Egypt and a Sewage/wastewater heat pump for district cooling in Zhengzhou, China. He explained that components like the location of end users, temperature of the natural cooling resources, environmental impacts assessment, etc. are significant sources of natural cooling for district cooling.

- On the question regarding the prospects of district cooling in APEC in 10 to 20 years, Dr Chen answered that APEC has large potential and cited China as an example, which projects about 700 to 1 million tons of district cooling capacity ready to be constructed.

UNEP's second presentation is attached as **Annex Q.**

The economy presentation started with **Ms Wun Lui, Engineer of EMSD** about the *District Cooling System in Hong Kong, China* highlighting Hong Kong, China's carbon neutrality policy, DCS implementation, and outline/energy optimisation/AI application in Kai Tak DCS. She also described technical systems and AI applications for energy optimisation in the example of Kai Tak DCS.

Hong Kong, China's presentation is not available for attachment.

- There was a question about whether there is any plan to apply the DC technologies for the existing buildings. Ms Lui answered that securing the space for a 1.2m diameter pipeline is challenging and Hong Kong, China has no plans.

Mrs Dini Anggreani, Statistician of MEMR provided the next economy presentation with *District Cooling in Indonesia* highlighting the economy's master plan for the new capital city on energy infrastructure and prospects of the district cooling system. She also introduced the partnership (MoU) between Jababeka, an industrial estate developer and Mitsubishi Heavy Industries (MHI) for a Net zero industrial cluster.

Indonesia's presentation is attached as **Annex R.**

- There was a question regarding a project in Jababeka and Ms Anggreani answered that the MoU already exists, and this project is under the Minister of Industry and Housing.

Finally, **Mr Zaharin Zulkifli, Deputy Director of Energy Commission, Malaysia** delivered the *District Cooling in Malaysia* providing the background and current/future data collection on district cooling. He explained that a trial run of data collection of DCS is in progress and will be shared with ESTO.

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

- There was a question about whether there are new plans for introducing DCs, Mr Zulkifli replied that Malaysia has a new DC project, but they are still not a regulated market, therefore they don't have the official information.

The following were also raised during the Q&A:

- Whether cooling from regasification should be included in district cooling reporting. Mr Lorenzoni mentioned that IEA does not have the position yet on the coolness that comes from the regasification of LNG. For now, only coolness as final consumption is included in the definition. The EGEDA secretariat shared that there has been an ongoing discussion by TT-SIEC on the inclusion/exclusion in reporting cooling and EGEDA will surely share the update on this matter. The secretariat also emphasised that legal frameworks that require mandatory data collection will be effective in collecting these data.
- UNEP explained further that the main consumer can be divided into two, one is to supply coolness to the warehouse nearby, and the other one is to cool the building nearby. UN developed a measurement reporting verification for the Paris Agreement, and cooling is one of the components. In the guidelines, the definition of cooling is only for active cooling.
- IRENA shared that coolness for cooling purposes should all be reported even if it is a byproduct.

Round table discussion

During the roundtable discussion for Session 3, the members were asked to answer the following:

1) What role do district cooling systems/district energy systems play in your economy?
2) Is your economy ready to collect and report the data?

A summary of the discussion is attached as **Appendix III.**

Session 4: Grid-scale electricity storage development in APEC moderated by Dr Hom-Ti Lee, EGNRET Secretariat. The objective of this session is to learn about the current development of large battery storage systems in APEC and highlight its importance in the energy transition.

The session started with an APERC presentation on *Energy battery storage* **by Mr Alexander Izhbuldin, Senior Researcher, APERC.** The presentation provided an informative overview of the history, types, and challenges associated with grid-scale electricity storage, with a specific focus on the importance of collecting accurate and detailed data for statistical analysis and modeling.

APERC's presentation is attached as **Annex T.**

During the Q&A, the following were raised:

- If there are any planned pumped hydro projects globally or in the APEC region, it was also mentioned the absence of new pumped hydro projects in the United States in recent decades. Mr Izhbuldin first highlighted the difference between pumped hydro and battery storage and mentioned that battery storage can be more easily procured and installed, while pumped hydro requires specific geological conditions and varies by country and location. He also confirmed that China has plans for more pumped hydro, currently constructing around 100 GW of pumped hydro capacity.
- The Chair of APEC TPTWG shared information about the Lake Onslow Battery Project in New Zealand, which is in the early project stages and could provide significant energy storage capacity in the future. He mentioned that the expected operation date is likely 8 to 9 years from now.
- About the methodology of reporting battery storage in the energy balance table, Mr Izhbuldin recommended following a consistent technique for collecting statistics on storage, irrespective of the technology used. He emphasised the importance of understanding the energy transformations between input and output points.

The next presentation was from EGNRET delivered by **Dr Chin-Chung Wu, TaiPower Vice President** on *Battery Energy Storage Systems (BESS) development within APEC* which provided an insightful overview of BESS development within APEC and specifically in Chinese Taipei. His presentation delved into several key aspects, including development targets, challenges, solutions, and operational aspects, shedding light on intriguing conclusions regarding the future of BESS applications.

EGNRET's presentation is attached as **Annex U.**

During the Q&A, the following were raised:

- A clarification regarding some of the observed data, battery simulations, and the need for larger batteries. Dr Wu explained the chart on the mentioned slide and the significance of system frequency in relation to battery energy storage. He also mentioned that the green line in the chart represents the simulation with a 120 MW battery response capacity.
- There were further inquiries about the differences between the batteries (59.61 Hz and 59.5 Hz) and whether a larger battery was necessary. Dr Wu confirmed that a larger battery capacity would be needed in specific situations.
- It was also reiterated the importance of BESS to meet the increasing demand for power, mentioning past power outages in Chinese Taipei and their consequences.

Mr Lorenzoni provided another comprehensive presentation on IEA's *Grid-scale Battery Storage Collection* explaining its definition and crucial role in advancing clean energy transitions. Regarding the data collection, he presented IEA's electricity and heat annual questionnaires, and how batteries are displayed in the generation and commodity balance. Furthermore, Mr Lorenzoni explained that this is the first cycle for IEA's collection of such data. Consequently, there is currently no historical data available on batteries, and IEA welcomes feedback from economies for this new technology and its data collection.

IEA's presentation is attached as **Annex V.**

During the Q&A, the following were raised:

- About how IEA plans to categorise and report battery storage data, especially for non-grid-connected uses and whether a new energy source category would be created for battery storage. Mr Lorenzoni responded that while data collection methods are in place, the methodology for integrating battery storage data into the energy balance has not been developed yet. He expressed that it might follow a similar approach to pumped hydro but acknowledged the unique nature of batteries.
- Whether the IEA has plans to collect data on power capacity (in megawatts) in addition to energy capacity (in megawatt-hours) and how the IEA plans to account for utility-scale battery storage that is charged from on-site renewable sources rather than the grid. Mr Lorenzoni confirmed that both energy capacity (MWh) and rated power capacity (MW) data are collected. However, he mentioned that the data collection currently focuses on grid-connected batteries, and there are no plans to account for on-site charging at this stage.
- Regarding the clarification on the predicted decrease in battery prices or if there were estimated percentages for this decrease, Mr Lorenzoni mentioned that while there has been a significant drop in battery costs in the past, predicting future reductions is challenging due to factors like supply chain constraints and rising mineral costs.

- Regarding the logic behind categorising batteries by size and the rationale for this approach and whether it was related to the intended use of the batteries, Mr Lorenzoni explained that the categorisation was advised by electrical analysts. It helps identify different applications and uses for batteries based on their size. He also agreed that there is a correlation between the ramp-up of battery storage with the ramp-up in wind and solar.
- There was also a mention of the correlation between the expansion of battery storage and the growth of wind and solar capacity, particularly in regions with high solar capacity, and that market dynamics and rules play a crucial role in battery deployment.

Mr Barcelona of the EGEDA secretariat presented its *Proposed data collection on grid-scale battery storage in APEC.* He showed a brief overview of pumped-storage hydro and grid-scale battery storage, along with an assessment of the current data collection practices employed by EGEDA for these storage technologies. The presentation's key takeaway is that, for the collection of 2022 annual data, the EGEDA secretariat will discuss with other organisations and member economies the revision of the annual electricity and heat questionnaire for collecting electricity storage data and capacity data effectively. The updated version shall be released by the end of the year.

The EGEDA secretariat presentation is attached as **Annex W.**

During the Q&A, the following were raised:

- About the meaning of "storage and run-of-river" in the context of hydropower, and Mr Barcelona explained that "storage hydro " refers to dams while “run-of-river” hydro facilities divert the flow of water from the river to the turbine.
- Mr Izhbuldin clarified that "conventional" includes both storage and run-of-river hydropower plants, while "mix hydro" refers to a hybrid of pumped storage and natural water flow. He emphasised that two categories, "conventional" and "pumped storage," should suffice.
- EGEDA further inquired whether the MWh or GWh capacity of pumped storage should be reported in addition to the megawatts. Mr Izhbuldin confirmed that both capacity and input/output data are needed for storage technologies, similar to how conventional generation data are reported. He suggested that the input related to electricity storage should be placed in the *transformation sector* of the energy balance table rather than under *own use*. He argued that this approach would align with how conventional generation power plants are reported, with separate indicators for generation and own use. Additionally, he emphasised the need for an additional indicator to represent input for storage technologies.
- On the reason for the inclusion of import capacity data in energy statistics in Singapore, the EGEDA secretariat explained that Singapore requested import capacity data to demonstrate sufficient capacity for peak demand situations.
- IRENA provided insights into how IRENA categorises pumped storage, considering it as non-renewable due to its use of grid electricity. She explained the categorisation of own use and output in energy balances for pumped storage.

- IEA discussed the breakdown categories for hydropower, including pure hydro, mixed hydro, and pure pumped storage. IEA emphasised the removal of energy generated by pumped hydro from energy balances to avoid double counting.
- Mr Izhbuldin supported the idea of introducing a negative input for storage technologies to maintain balance.

The economy presentation for the session started with China's presentation on the *Development of a New Power System and Power Storage in China* by **Dr Su Ming, Director, Energy Research Institute**. He outlined China's plans to develop a New Power System, offering insight into the current capacities of wind power and solar PV in the economy. He further highlighted the distinctions between traditional and New Power Systems and emphasised the growing challenges faced by new energy sources in the New Power Systems. China's presentation delved into the status, policies, and prospects associated with three types of power storage, namely pumped storage, new energy storage (primarily electrochemical energy storage), and green hydrogen. It also clarified the policies that have been formulated to support the development of new energy storage and provided details on key pilot demonstration projects.

China's presentation is attached as **Annex X.**

The second economy presentation was from the Philippines and delivered by **Mr Michael B. Coligado, Science Research Specialist, Department of Energy** entitled *"Powering Up: Battery Electrification Storage in the Philippines*." The presentation emphasised the critical need for battery electricity storage in the Philippines. Amid energy infrastructure challenges, including high costs and an unreliable power supply, battery storage proves itself as a dependable and cost-effective solution. The presentation provided valuable insights into the committed and indicative capacities of ESS (Energy Storage Systems), BESS (Battery Energy Storage Systems), and hybrid ESS projects. It also elaborated on the reporting methodology for data relating to grid-scale electricity storage.

The Philippines' presentation is attached as **Annex Y.**

Finally, Chinese Taipei's *Renewable Energy Strategy and Development* was delivered by **Mr Wei-Chih Huang Mr Wei-Chih Huang, Section Chief, Bureau of Energy.** The presentation illuminated the current energy landscape in Chinese Taipei, offering a comprehensive overview of the energy mix and the ambitious energy transition plan set for 2025. He underscored the nation's commitment to achieving net-zero emissions by 2050. The presentation also showed valuable insights into the current status of energy storage in Chinese Taipei, alongside the formidable challenges faced, including grid integration and maintaining a balance between supply and demand.

Chinese Taipei's presentation is attached as **Annex Z.**

During the Q&A the following were raised:

- About Chinese Taipei's plan to become nuclear-free by 2025 and whether this decision was driven by nuclear plants reaching the end of their life and the controversial issue of nuclear waste. It was confirmed that Chinese Taipei's decision to go nuclear-free by 2025 was influenced by two main factors: the natural retirement of nuclear power plants and the long-standing controversy surrounding nuclear waste disposal.

- About Chinese Taipei's energy transition plan and whether the plan, which aimed to achieve no nuclear power, increase renewable energy to 20%, and use LNG for 50% of energy generation by 2025 was realistic, especially given the potential increase in total generation.
- There was an information shared that Chinese Taipei's renewable energy target might be slightly delayed to 2026 due to unforeseen challenges, such as delays in offshore wind construction caused by the COVID-19 pandemic. He also mentioned that energy consumption in Chinese Taipei had varied due to the pandemic's economic effects but expressed optimism about reaching higher renewable energy percentages.

Round table discussion

During the roundtable discussion for Session 4, the members were asked to answer the following:

1) Electricity storage plans in your economy?
2) What are the data collection and storage challenges?
3) How and who will collect the data?

A summary of the discussion is attached as **Appendix IV.**

Day 3 – 14 September 2023

Session 5: Reporting the energy consumption of EVs, PHEVs and FCEVs moderated by Mr Glen Sweetnam. This session aims to communicate the proper reporting of fuel sources of EVs, PHEVs and FCEVs. Special presentations from the APEC Transportation Working Group (TPTWG) and APERC intended to help the members understand the flow of EVS, PHEVs and FCEVs while the EGEDA presentation showed the current status of the transportation sector in APEC.

Mr Morgan Watkins Chair of the Land Expert Group APEC TPTWG started the session with the topic "*Electric vehicles, sustainable mobility*". According to the presentation, transport accounts for about 25 percent of global GHG emissions. To achieve zero-emissions transport, the TPTWG believes that one of the most effective strategies for transport decarbonisation is vehicle electrification, including some use of plug-in hybrids and hydrogen fuel cell electric vehicles, and clean energy production to supply motive energy. It was also shown that if gasoline vehicles are replaced by electric vehicles using electricity from coal, energy use could be reduced by 31%. If electricity is from natural gas, the energy used reduction would be 48% and if electricity is from hydropower, reduction would be as high as 75%. It also reported that New Zealand's policy pathway to net-zero emissions considers increasing net-zero emissions vehicles.

APEC TPTWG's presentation is attached as **Annex AA.**

During the Q&A, the following were raised:

- Whether New Zealand's planned transition from traditional vehicles to electric vehicles considered the impact on job creation, as jobs in the oil and automotive industries will be affected. Mr Watkins responded that the economy has no significant oil and automotive industries but there are some work implications related to the retraining of the workforce that will be involved in the EVs.
- On the reduction in energy use if gasoline vehicles (ICE) are replaced by FCEVs. Mr Watkins responded that FCEV is more efficient than ICE by just 20-40% depending on the model of the fuel cell although FCEVs could be more powerful than EVs and it is faster to load hydrogen than to charge batteries.

Mr Finbar Maunsell, APERC researcher and transport modeler, presented *Electric Vehicle Technologies* and how to estimate their energy use. He showed a simple formula that energy consumption could be calculated using vehicle stock, average mileage, and fuel consumption per km. To calculate car battery charging in the residential sector, public charging data is needed. Total calculated consumption minus public charging would be equal to battery charging in the residential sector. For the consumption of hybrid and fuel cell vehicles, there is no need to calculate electricity consumption as the fuels to be reported are the oil and hydrogen that were used by these vehicles.

APERC's presentation is attached as **Annex AB.**

- On the question as to how the 1 charger per 10 EVs in public charging stations is assumed, Mr Maunsell replied that the number is just the average, and it would be different in each economy. Mr Watkins shared that New Zealand plans on charging hubs every 100 km of the highway, and one public charger could serve 20 to 40 vehicles.

Ms Risa Pancho, Researcher of ESTO/APERC, presented the *Electricity consumption in road transport* from the APEC energy statistics. She pointed out that there was a rapid increase in the number of EVs in recent years but there was no corresponding increase in electricity consumption. She suspected that the electricity consumption data of EVs are not fully captured by the reported electricity consumption data. She requested the EGEDA members to include the consumption of these new EVs in the road transport electricity consumption data reports.

The EGEDA secretariat's presentation is attached as **Annex AC**

The economy presentation started with Chinese Taipei by **Mr Jen-yi Hou, Vice President of Taiwan Research Institute and EGEDA Vice Chair.** Chinese Taipei's presentation on *Electricity consumption data collection of battery electric vehicles* showcased the economy's methodology and results which is similar to the methodology presented by Mr Maunsell. The calculation uses vehicle stock or registered BEVs, average mileage and average electricity consumption per kilometer. As regards reallocating electricity consumption of BEVs that are included in the industry, services and residential sectors, Chinese Taipei used the result of the survey that is conducted every five years. Mr Hou also showed the way forward such as conducting a survey on BEV charging behaviour, collecting electric bus data from the Ministry of Transportation, and collecting BEV data from Taiwan Power Company after the installation of advanced metering infrastructure.

Chinese Taipei's presentation is attached as **Annex AD.**

During Q&A, the following were raised:

- Regarding the lower sales targets for two-wheelers considering that these are faster to electrify than cars, Mr Hou responded those are the targets of international vehicle companies that Chinese Taipei adopted, as Chinese Taipei is just a vehicle importing and assembling economy.
- On the accuracy of electricity consumption per kilometre, Mr Hou responded that it is based on design efficiency which could be higher or lower depending on how the vehicles are used. Therefore, surveys are conducted to get better data.

- Finally, on the rule of thumb for losses, Mr Watkins shared that it is about 11% but could be as high as 18%. As to whether average mileage or the actual energy consumption is asked in the survey, Mr Hou mentioned that they ask for actual energy consumption.

The last economy presentation was from Thailand delivered by **Mrs Narumon Fromhold, Chief of Energy Information Development Group of the Energy Policy and Planning Office** who presented the *EV program of Thailand*. She showed the domestic sales and production target of the economy, charging stations and promotion of EV battery production. Thailand is also promoting smart grid technology to connect and manage integrated electric vehicle charging.

Thailand's presentation is attached as **Annex AE.**

During Q&A, the following were raised:

- Whether it is possible to monitor the EV charging in homes, Ms Fromhold responded that it is not yet possible at present. She hopes that the use of smart meters might be able to address that in the future. Electricity consumption of EVs is also not reflected yet in Thailand's energy balance table. Mr Watkins suggested that in plans to integrate electric vehicle charging, transport and energy planners should work together.

Round table discussion

During the roundtable discussion for Session 5, the members were asked to answer the following:

1) What are your economy's plans to electrify road transport?
2) How and who will collect the data?

A summary of the discussion is attached as **Appendix V.**

Session 6: Understanding fugitive methane emission and CO_2 sequestration moderated by Mr Barcelona. The objective of this session is to understand the sources of fugitive emissions and learn how they should be reported. This will also serve as a venue to learn if the member economies have any plans for CO_2 sequestration.

Mr Barcelona delivered the first presentation of Session 6 on *APEC GHG emissions data*. The presentation mentioned that the EGEDA Secretariat has been collecting data pertaining to fuel combustion-based CO_2 emissions while data on fugitive emissions and transport and storage of CO_2 are not collected. It was also mentioned that given the new APEC proposed goal of a 50% reduction in methane emissions, the EGEDA secretariat decided to revise the current data collection template to include methane, nitrous oxide emissions and transport and storage of CO_2. To conclude, the EGEDA secretariat requests economies to submit additional emissions data to the secretariat.

The EGEDA secretariat's presentation is attached as **Annex AF**

The next presentation was given by **Dr Phung Quoc Huy, Senior Researcher of APERC** on *Carbon Capture and Storage (CCS) technology perspective*, showcasing deployment across the globe and within the APEC region. The presentation laid out the possibility of reducing the overall cost of CCS through several measures, including scale-up, modularisation, learning by doing, low-cost energy supply, innovation in technology, and subsidies/innovation. To conclude, several opportunities and challenges of deploying CCS from the perspectives of policy, finance, and technology were presented.

APERC's presentation is attached as **Annex AG.**

Mr Nabih Matussin, Researcher of APERC, delivered a presentation on the C*ollection of fugitive emissions*, *and transport and storage of CO_2 data*. The presentation showed some methodology for collecting and calculating fugitive emissions, and transport and storage of CO_2 based on the Intergovernmental Panel on Climate Change (IPCC) guidelines. He also shared significant differences between fugitive methane emissions calculated via IPCC Tier 1 and fugitive emissions from submissions from selected APEC economies.

APERC's presentation is attached as **Annex AH.**

For the economy presentation, Japan delivered two presentations. The first presentation was from **Mr Makoto Shimouchi, Technical Director of the Methane Management Taskforce of JOGMEC**, about JOGMEC's initiatives and technology for methane emission management, which includes various top-down and bottom-up measurement techniques. Top-down measurements are via satellites and aircraft, while bottom-up measurements are through the usage of OGCI cameras and gas analysers. He also shared that JOGMEC currently has a testing facility in the JGC R&D Center to undertake various experimental activities (accuracy of quantification of methane with control release and methane detection performance).

Japan's presentation is attached as **Annex AI.**

The final presentation was delivered by **Mr Kenta Asahina of the CCS Policy Office of METI**. The presentation showed that Japan has been on the CCS road since 2000 when the first research was conducted at Nagaoka CCS Project. On Japan's Long-Term Roadmap, Japan aims to prepare and enforce CCS business model by 2030 and eventually deploy CCS at a full scale by 2050, with an annual storage capacity between 120 and 240 million tonnes. He also shared the locations of the selected advanced CCS projects and companies that will contribute to achieving the target annual storage capacity. In addition, it was mentioned that Japan is also aiming to demonstrate long-haul transportation of CO_2 by 2024. To conclude his presentation, he shared about the Asia CCUS Network (ACN) platform, which aims to share knowledge and develop a business environment for CCS utilisation throughout Asia.

Japan's presentation is attached as **Annex AJ**

Round table discussion

During the roundtable discussion for Session 5, the members were asked to answer the following:

1) Does the economy produce significant fugitive methane emissions?
2) Does the economy plan to sequester CO_2?
3) How and who will collect the data?

A summary of the discussion is attached as **Appendix VI.**

Closing session

The EGEDA Chair expressed his appreciation to all the participants, speakers and experts for contributing to the success of the workshop. He hoped that the workshop would provide the EGEDA members with the needed knowledge on how to address issues that come with the collection and reporting of new energy products and technologies.

To wrap up the 3-day workshop he addressed the following:

1) Points of Consensus
2) Open issues
3) Next steps

Among others, the following were identified:

Points of consensus

- New and emerging energy products and technologies will play an important role in the energy transition, energy efficiency and increasing share of renewables.
- Increasing penetration of new energy products and technologies will help accelerate in achieving low carbon/decarbonisation and/or a net-zero future.

Open issues

- Data may be existing but no available methodology for collecting (all technologies).
- Each economy may have different definitions and methods of collecting and reporting (all technologies), especially on energy units.

Next steps

- EGEDA will continue to collaborate with international organizations (especially IEA) on data collection methodology and harmonisation of definition and collection with international standards.
- EGEDA will update its members on the result of the global discussions on the definitions of new energy products and technologies (e.g., hydrogen, ammonia, e-fuels and district cooling).

End of the 3-day workshop