23rd APEC Workshop on Energy Statistics: Capacity Building in Conducting Household Energy Consumption Survey (Phase 1)

17-19 September 2025

Tokyo, Japan

Summary proceedings

The **23rd APEC Workshop on Energy Statistics**, with the theme *Capacity Building in Conducting Household Energy Consumption Survey (Phase 1)*, was held in Tokyo, Japan, from 17-19 September 2025.

The workshop was participated in by 43 energy statisticians, experts and speakers from 14 member economies (Australia; Chile; People's Republic of China; Hong Kong, China; Indonesia; Japan; Korea; Malaysia; Papua New Guinea; the Philippines; Chinese Taipei; Thailand; United States and Viet Nam), international organizations [International Energy Agency (IEA) and the Asia Pacific Energy Research Centre (APERC)]. Nine participants from five economies, and the IEA speakers, participated online.

The following are the workshop proceedings.

Day 1 – 17 September 2025

Session 1 - Opening session, moderated by Mr Nobuhiro Sawamura, Senior Researcher, APERC and EGEDA Secretariat.

The workshop commenced with a pre-recorded Welcome Remarks from **Ms Yuna Natsumi, Deputy Director for Natural Resources and Energy Research, International Affairs Division, Ministry of Economy, Trade and Industry (METI), Japan.**

Ms Natsumi welcomed the delegates and emphasized the vital role of accurate, timely energy data in achieving APEC's regional goals. She highlighted how the event—supported annually since 2002 by Japan's Ministry of Economy, Trade and Industry—has helped harmonize definitions and improve data quality across member economies. Reliable statistics, she noted, have been essential for tracking progress toward key targets, including a 45% reduction in energy intensity by 2035 and doubling the share of renewables by 2030. As APEC economies pursue decarbonization and net-zero ambitions, data collection has expanded to include emerging energy sources such as hydrogen, ammonia, and cooling. This year's focus on end-use energy consumption addresses persistent challenges faced by many economies, and the workshop aims to support data development and foster collaboration to strengthen energy efficiency efforts across the region.

Dr Kazutomo Irie, APERC Chairman and President, officially opened the 23rd APEC Workshop on Energy Statistics, highlighting this year's focus on building capacity for household energy consumption surveys. He emphasized the importance of sharing best practices among member economies to improve end-use data collection and develop effective survey instruments. Stressing that energy efficiency is the "first fuel," Dr Irie underscored its role in reducing emissions and supporting energy transitions. He linked this to APEC's goal of cutting energy intensity by 45% by 2035, noting that detailed data is essential for tracking progress. Despite challenges in gathering such data, APERC has worked closely with the IEA to advance energy efficiency indicators. He closed with the Japanese concept of "*mottainai*", urging

participants to value and use energy wisely, and encouraging collaboration throughout the workshop to drive meaningful progress.

Session 2– Setting the tone: This session provides an overview of the members' end-use data and how it was collected. This session was moderated by Mr Glen Sweetnam, APERC Senior Vice President and EGEDA Chair.

Ms Elvira Torres Gelindon, Research Fellow at APERC and the EGEDA Secretariat, presented an overview of APEC's current situation in end-use energy data collection, highlighting the region's ongoing efforts to improve household energy consumption statistics. She traced the development of the Energy Efficiency Indicators (EEI) template since 2014 and noted collaborative initiatives with the IEA, including joint workshops and shared templates. Despite progress, data completeness remains a challenge, especially among non-OECD economies, with only a few able to fully submit disaggregated residential energy data. Household consumption trends show varied patterns across economies, influenced by factors such as population, lifestyle, and climate. The presentation emphasized the importance of diverse data collection methods—from surveys to modelling—and stressed that better data leads to better analysis. Ms Gelindon concluded by encouraging continued learning and cooperation to strengthen energy statistics across the region.

Ms Gelindon's presentation is attached as **Annex 1.1**.

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

- Mr Sweetnam invited Ms Gelindon to provide an example demonstrating how household energy consumption surveys lead to deeper, more meaningful analysis—highlighting that the value of such surveys goes beyond data collection. Ms Gelindon cited Australia's residential energy data to illustrate this point. Between 2000 and 2021, total residential energy consumption in Australia rose by 24.5%. However, when examining specific end-uses, residential space cooling per dwelling actually declined by 25.3%. Without this improvement in cooling efficiency, the overall energy consumption would have increased even more. This kind of nuanced insight is only possible through detailed, end-use data—underscoring the importance and impact of comprehensive survey work.

This was followed by a presentation from **Mr Sean Lawson of the Department of Climate Change, Energy, the Environment and Water**, on **"***Australian residential consumption and end-use reporting".*

Mr Lawson's presentation provided a comprehensive overview of Australian residential energy consumption and end-use reporting. He outlined the geographical scope of electricity and gas networks, noting that residential consumption data is primarily sourced from state distributors, with limited detail on other fuels like LPG, solar hot water, and wood. Lawson highlighted that the residential sector accounts for 12% of Australia's total final energy consumption, with electricity and gas usage trends showing notable shifts—electricity use dipped post-2011 but rose during COVID-19, while gas use has declined recently, especially in Victoria. He emphasized regional variation in household energy patterns and detailed three key data sources: the Energy Use and Conservation Survey, the 2012 Household Energy Consumption Survey, and the Residential Baseline Study (RBS), which now serves as the primary model for estimating appliance-level energy use. The RBS combines product stock data with usage and efficiency metrics to generate aggregate demand estimates. Looking ahead, Lawson noted that future research will rely more heavily on administrative data and smart meter analytics, as traditional survey programs are unlikely to resume.

Mr Lawson's presentation is attached as **Annex 1.2**.

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

- Mr Sweetnam inquired whether there is interest in conducting a dedicated end-use energy consumption survey in Australia. Mr Lawson responded that while valuable, such a survey may not be a current priority for the Bureau of Statistics, which is focused on maximizing the use of administrative and alternative data sources.
- Mr Sweetnam also raised the potential role of Artificial Intelligence (AI) in reducing data collection costs. In response, Mr Lawson noted that technologies such as machine learning and smart meters could help make this approach more feasible.

Ms Yaxin CHAI of the Energy Development Research Institute of China Southern Power Grid presented a detailed analysis of China's electricity consumption and energy transition, highlighting the growing role of electrification in achieving low-carbon goals. It emphasized the shift from fossil fuels to electricity across sectors, the integration of renewables and smart grid technologies, and the rise of distributed energy and user-side participation. Regional disparities and industrial restructuring were explored, showing strong growth in high-tech and service sectors. The presenter also noted the rapid expansion of green electricity trading and China's active role in APEC energy cooperation. Looking ahead, the focus is on upgrading power systems, deepening market reforms, and fostering international collaboration to build a green and inclusive energy ecosystem.

Ms Chai's presentation is not attached due to data confidentiality.

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

- Participants sought clarification on terms used by Ms Chai, including "terminal power consumption," which she explained refers to energy consumed by end-use sectors, and "electric energy substitution," defined as the replacement of non-electric energy sources with electricity.
- Mr Sweetnam also asked whether there had been any analysis on the decoupling of economic activity from electricity consumption. Ms Chai responded that, at present, no centralized analysis has been conducted.

Dr Hiroaki Okamoto of Jyukankyo Research Institute presented an overview of Japan's Household CO_2 Emission Survey (HCES). He explained that residential energy consumption in Japan has declined since the mid-2000s, despite a growing number of households. To obtain foundational information for further advancing energy conservation within this trend, the HCES was developed to capture detailed data on household energy use, CO_2 emissions, and related behaviors. The survey, conducted annually since 2017 (except in 2024), covers 13,000 households economy-wide using both random sampling and online panels. It collects monthly data on energy consumption, payments, solar generation, and household attributes. Dr Okamoto highlighted challenges such as data inconsistencies and the shift from paper bills to online platforms, which have affected response rates. He also detailed the survey's rigorous data validation and imputation methods, emphasizing its role in supporting Japan's decarbonization policies.

Dr Okamoto's presentation is attached as **Annex 1.3**.

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

- Mr Sweetnam asked which method yields more accurate results: the Random Sampling Survey (RSS) or the Online Panel Survey (OPS). Dr. Okamoto explained that while OPS is significantly more cost-effective to implement, both methods have their advantages and limitations. For instance, OPS is not based on random sampling and therefore lacks statistical validity, whereas

RSS faced some refusals from participants unwilling to engage despite being based on random sampling. Given that both are voluntary, combining results from the two surveys offers a more balanced approach.

- An online participant from Korea asked about the response rates for RSS and OPS. Dr Okamoto noted that RSS generally achieves a higher response rate than OPS. He also clarified that RSS uses paper answer sheets, but the online response is also available .
- Dr Ismartini from Indonesia asked how the results from RSS and OPS were integrated. Dr Okamoto responded that the results were combined directly on a one-to-one basis, without any data adjustments.

Ms Jy-Ping Wu of the TRI, Chinese Taipei, presented an overview of the Energy Consumption Survey in the Residential Sector for the economy. The survey aims to supplement official energy statistics by capturing detailed end-use data not available from supplier reports. Residential energy consumption has remained stable, peaking during the COVID-19 pandemic and slightly rising again in 2024. Conducted every five years, the survey uses stratified random sampling and face-to-face interviews to gather data on household energy use, equipment, and building characteristics. Ms Wu highlighted discrepancies between survey results and official statistics, particularly in LPG consumption, and explained how survey feedback has led to improved data allocation. Future plans include increasing survey frequency to every three years, integrating cross-sector surveys, refining estimation parameters, and introducing thematic studies to better reflect emerging energy trends and support policy development.

Ms Wu's presentation is attached as **Annex 1.4**.

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

- In response to questions, Ms Wu shared that Chinese Taipei has just launched its latest residential household energy survey in 2025. The survey frequency, from every five years to every three years to improve the timeliness and relevance of "real lifetime" data, is being carefully evaluated.
- She also noted that all survey initiatives are voluntary, and there have been few respondent refusals—largely attributed to the effectiveness of the face-to-face interview approach.

Session 3: Household energy consumption surveys in selected APEC member economies moderated by Mr Edito Barcelona, Senior Research Fellow, APERC and EGEDA Secretariat.

The session started with the presentation of **Dr Pudji Ismartini from BPS–Statistics Indonesia** on capturing end-use energy consumption in the economy through the National Socioeconomic Survey (SUSENAS). She explained that household energy data is traditionally derived from supplier sales figures, but SUSENAS provides more accurate insights by directly surveying households. Conducted twice yearly, SUSENAS covers 345,000 households economy-wide and includes detailed modules on energy use, expenditure, and fuel types. The 2025 survey used stratified two-stage sampling and extensive questionnaires to gather data on electricity, LPG, and other fuels. LPG remains the dominant cooking fuel, used by over 87% of households, with average monthly spending around 55,000 rupiah. Challenges include long interview times, holiday-related consumption shifts, and respondent fatigue. Dr Ismartini emphasized that improving household energy data is vital for informed policymaking and achieving sustainable development goals.

Dr Ismartini's presentation is attached as **Annex 2.1**.

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

- When asked about the possibility of including energy efficiency questions in the survey, Dr Ismartini explained that conducting surveys is resource-intensive, and SUSENAS is already a large-scale effort focused primarily on social indicators. Adding more questions would increase complexity and make data cleaning more challenging.
- Regarding whether the survey captures different end-uses of electricity consumption, she clarified that only total household electricity consumption is collected.
- On the publication of results, Dr Ismartini noted that data are released only when the sampling error is below 25%.
- In response to a question about validating results with supply-side data and potential collaboration with the Ministry of Energy and Mineral Resources (ESDM), she shared that BPS already works with ESDM to ensure coherence between demand and supply figures.

Ms Diana Bunagan and Mr Kleffaine-J Viernes of the Philippine Department of Energy shared insights from the 2023 Household Energy Consumption Survey (HECS), an economy-wide effort covering 45,000 households. The survey aimed to capture detailed data on household energy sources, usage patterns, appliances, and attitudes toward energy issues. Using a two-stage cluster sampling design, the survey gathered information on electricity, petroleum products, and renewable energy use for lighting, cooking, and transportation. Key findings showed increased reliance on electricity and LPG, with electricity consumption rising from 108 kWh in 2011 to 267 kWh in 2023. The survey also explored fuel switching, conservation practices, and awareness of energy programs. Implementation involved extensive training, field supervision, and both paper-based and digital interviews. The HECS forms part of the broader Comprehensive Regional Energy Study, supporting evidence-based energy planning and policy development across the Philippines.

Ms Bunagan and Mr Viernes' presentation is attached as **Annex 2.2**.

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

- When asked how the Philippines achieves high response rates in its surveys, the presenters explained that surveyors are often trusted community members—such as local teachers—who are well-known and respected in the area.
- In response to a question about the underlying factors driving increased electricity use, the presenters noted that a detailed analysis will be included in the official report, expected to be released by the end of the year.

Mr Kevin Lee and Mr Raymond Yuen from Hong Kong, China's Electrical and Mechanical Services Department (EMSD) presented their economy's approach to residential energy consumption surveys. The surveys support the Hong Kong Energy End-use Database (HKEEUD) by collecting updated data on household energy use and appliance characteristics. Using a stratified sampling method based on housing types and districts, households self-report energy data via online questionnaires, which are then verified through follow-up visits or calls. The survey also includes data collection from common building areas. Enumerators receive technical training and conduct a pilot survey to refine tools and logistics. Key challenges include access restrictions, low response rates, and incomplete billing data. EMSD addressed these with official announcements, flexible participation options, and estimation techniques. The team emphasized the importance of careful planning, concise questionnaire design, and robust quality control to ensure reliable, actionable energy data for policy and planning.

Mr Lee and Mr Yuen's presentation is attached **as Annex 2.3.**

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

- When asked whether energy bills and usage records are obtained directly from utilities and if EMSD secures consent to access them, EMSD confirmed that both are done with the appropriate consent.

Dr Ian Mead from the U.S. Energy Information Administration (EIA) shared insights from his economy's Residential Energy Consumption Survey (RECS), focusing on lessons for contracting out survey work. He emphasized the importance of combining household-reported characteristics with utility billing data, noting that contractors often lack energy expertise and require close coordination. The RECS process spans multiple years, involving survey design, data collection, reconciliation, and end-use modeling. Dr Mead highlighted the need for pretesting, clear definitions (e.g., household space), and strategies for nonresponse, including monetary incentives. Reconciliation between household and utility data is key to validating responses, especially for estimating space heating. End-use modeling relies on billing data, housing characteristics, and weather information, using either statistical or engineering approaches. Dr Mead concluded that successful surveys require thoughtful planning, leveraging administrative data, and respecting the strengths of both survey specialists and energy analysts.

Dr Mead's presentation is attached as **Annex 2.4.**

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

- In addition to his presentation, Dr Mead shared his thoughts about AI. He noted the big push to use AI to find solutions to current data challenges. He shared that AI would need a benchmark survey. Currently, AI is used mostly for more efficient programming and data sorting . He believes that it will take a while before AI can truly solve a lot of problems, but it can make things more efficient and faster. Benchmark surveys are still necessary to determine how good the model results are.

Mr Mohamad Faiz bin Anuar of Malaysia's Energy Commission (ST) presented his agency's outsourcing approach to the economy's Energy Consumption Survey, covering residential, commercial, and manufacturing sectors. The 21-month project (May 2025–Jan 2027) aims to collect data from 12,000 samples economy-wide, including Sabah and Sarawak. ST appointed a contractor to manage fieldwork, allowing ST to focus on oversight, methodology, and integration into the economy's Energy Balance. The survey uses stratified sampling and CAPI tools via SurveyCTO (a secure data collection platform) for real-time tracking and data validation. Key milestones include pilot testing, enumerator training, and stakeholder workshops. Participation is encouraged through e-wallet incentives, awareness campaigns, and local engagement. The survey supports Malaysia's decarbonization goals and UNFCCC reporting, with funding from the Electricity Supply Industries Trust Account. ST emphasized future plans to retain internal control over design while outsourcing execution, and to collaborate closely with the Department of Statistics Malaysia for enhanced credibility and coverage.

Mr Mohamad Faiz's presentation is attached as **Annex 2.5.**

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

- Mr Faiz shared that the consulting company selected to implement the survey was chosen from among five candidates, with cost being one of the key selection criteria. The selected firm will be responsible for analysing the results and translating the data into clear, actionable findings.

Ms Agnieszka Koscielniak from the International Energy Agency (IEA) presented an overview of the IEA Energy End-uses and Efficiency Indicators Questionnaire, focusing on the residential module. She emphasized the importance of detailed end-use data—such as space heating, cooling, lighting, and appliance usage—for understanding energy consumption patterns and supporting policy development. The questionnaire collects data on dwelling characteristics, fuel types, appliance stocks, and macroeconomic indicators across 61 economies. Koscielniak highlighted the need for clear definitions, internal consistency checks, and plausibility testing to ensure data quality. She also discussed common challenges faced by OECD members, including difficulties in separating appliance and lighting data, limited appliance stock information, and inconsistent definitions. The presentation underscored the value of cross-checking with government statistics and energy balances and encouraged continued international collaboration to improve energy efficiency data collection and reporting.

Ms Koscielniak's presentation is attached as **Annex 2.6.**

Dr Thomas Elghozi from the IEA shared experiences from residential end-use energy consumption surveys across OECD members. He emphasized that surveys should be carefully planned, leveraging existing data sources and aligning economy statistical practices to ensure efficiency and accuracy. The presentation covered survey design principles, sampling strategies, and activity data collection, including household demographics, dwelling characteristics, and appliance usage. Dr Elghozi highlighted examples from Poland, the UK, Czechia, Slovenia, and Denmark, showcasing approaches like financial incentives, short surveys, and regular reviews to improve response rates and data quality. He stressed the importance of clear documentation, repeatability, and international comparability. The IEA offers tools such as manuals, guidebooks, and a practical modeling toolkit to support countries in designing and analyzing energy surveys. The key takeaway: while surveys are resource-intensive, they are essential for informed energy policy, and international collaboration can significantly enhance their effectiveness.

Dr Elghozi's presentation is attached as **Annex 2.6.**

After the two presentations from the IEA, a Q&A session followed:

- In response to a question about converting energy information into end-use categories, the IEA explained that they use various activity metrics—such as floor area, population, and number of households—and identify the relationships that best link energy consumption to these metrics.
- Regarding the ideal length and level of detail for a pilot survey compared to a full survey, the IEA noted that it depends on available resources. They emphasized that the key objectives of the survey should be defined first. While a pilot survey can be brief, it is beneficial to design it in a way that allows for trend analysis if repeated.
- On the minimum sample size for a pilot survey, one suggestion was to aim for approximately 0.01% of the population. However, one participant mentioned that since a pilot survey primarily tests the effectiveness of the questionnaire, a smaller sample size may be sufficient.

Session 4: Questionnaire workshop – This session intends to impart how the survey is designed and implemented, with the product being an energy consumption survey design that the members can implement. The questionnaire workshop will initially focus on indoor climate control systems and lighting technologies. This is moderated by Ms Elvira Gelindon of APERC.

Dr Wongkot Wongsapai of the Office of National Higher Education Science Research and Innovation Policy Council of Thailand presented the economy's extensive experience with household energy consumption surveys. The 2018 economy-wide survey, led by the Energy Policy and Planning

Office and Chiang Mai University, covered 7,000 households across all regions using a stratified multistage sampling method. The survey collected detailed data on household demographics, appliance usage, energy sources, and generation, including renewable energy and fuel types. It also assessed energy-saving potential by modeling electricity and fuel consumption across various appliances and regions. Key findings showed that air conditioners, lighting, and televisions were major electricity consumers, with significant savings possible through upgrades to energy-efficient technologies like LED lighting and inverter-type air conditioners. The survey also highlighted urban-rural differences in dwelling types and energy use. The results support Thailand's long-term energy demand modeling and policy planning, emphasizing the value of detailed, regionally representative data for identifying conservation opportunities and guiding energy efficiency programs.

Dr Wongkot's presentation is attached as **Annex 3.1**.

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

- In response to a question about conducting another survey following the 2018 edition, Dr. Wongkot confirmed that a new survey is planned for the coming year. This survey will place greater emphasis on electricity consumption related to electric appliances and lighting and will also include thermal energy use in households.
- Dr. Wongkot added that the upcoming survey will be a stand-alone effort, with an estimated interview duration of approximately 1.5 hours per respondent.

Ms Den Marie Joy Pe of the Philippine Statistics Authority (PSA) presented virtually the design and implementation of the 2023 Household Energy Consumption Survey (HECS), part of the broader Comprehensive Regional Energy Study (CRESP). Jointly conducted with the Department of Energy, this fifth HECS iteration aimed to collect detailed data on household energy sources, fuel mix, appliance efficiency, cooking fuel switching, conservation practices, and transportation energy use. Covering an economy-wide of approximately 45,000 households , the survey employed a two-stage cluster sampling design across 118 domains, using barangays (the smallest administrative division in the Philippines) and housing units as sampling units. The sampling frame was based on the 2020 Census, with stratification by geography, overseas worker presence, and wealth index. The questionnaire included sections on household demographics, energy sources, usage patterns, attitudes, and income. PSA emphasized the importance of rigorous sampling, replicates for reliable estimates, and clear questionnaire design to ensure high-quality, representative data for government energy planning and policy development.

Ms Pe's presentation is attached as **Annex 3.2**.

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

- In response to the question on the budget used in the survey, Ms Pe explained that the Department of Energy requests the allocation of the budget, and The Philippine Statistics Authority implements the survey. The Philippines' government funds the Statistic Authority as information it produces is fundamental for policy.
- Ms Pe also mentioned that the HECS is a stand-alone survey and not a rider of a regular survey, as it was expected that small households will take roughly 30 minutes to complete the survey while larger households can take over 1 hour to complete the questionnaire. In some special cases, the survey can take up to half a day (in especially large households).

After the two presentations, **Ms Elvira Torres Gelindon from APERC** outlined the mechanics of the breakout sessions and grouped participants by climate (warm vs. cold economies) and development status (emerging vs. developed economies) to tailor survey questions on indoor climate control, lighting, appliances, and household technologies. Sample questions focused on usage patterns, equipment types, and energy-saving behaviors. The final output of Phase I is a draft survey questionnaire, with Phase II involving pilot testing by two volunteer economies between 2025 and 2027. Phase III will present the pilot results at the 2027 workshop, with the long-term goal of expanding the pilot into a full-scale survey and encouraging broader adoption of energy efficiency reporting templates.

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

During the opening segment of the questionnaire workshop, participants agreed that general questions would be addressed in the plenary session. The key elements of this initial section of the questionnaire include:

Survey Objectives:

- Capture household energy profiles for cooling and lighting over one year.
- Establish baseline data on detailed household energy consumption.

General Household Information:

- Location: Urban or rural
- Household Head: Name, gender, age, education level, employment status
- Dwelling Characteristics: Type, number of rooms, floor area, height, construction materials, year built

Several considerations were raised:

- Questions about age and education may be perceived as sensitive if asked directly. Using ranges was recommended to reduce potential discomfort.
- Income-related questions were also flagged as sensitive. Positioning them at the end of the survey and framing them as ranges was seen as a way to improve response rates.
- One participant noted the difficulty of classifying buildings as strictly residential or commercial, especially in areas where informal businesses are common.
- Many participants cautioned against overly long questionnaires, citing increased costs, surveyor fatigue, and potential impacts on data quality. While no consensus was reached on an ideal length, there was strong agreement that each question should be clearly justified and practical to implement, in order to avoid budget overruns and respondent fatigue.

Workshops of two breakout groups

After discussing general questions that will form part of the section of the questionnaire, the group broke out into two groups: the warm and cold economies.

1. Cold economies (moderated by Mr Barcelona)

The participants in the cold economies' breakout group were Canada; Chile; China; Japan; Korea and the USA. Following are the results of the discussion:

Seasonal Coverage:

- A single questionnaire will be used to cover both winter and summer consumption to reduce costs and logistical complexity.
- Implementation during autumn or spring is preferred to avoid seasonal bias in responses.

Space Heating and Cooling:

- **District Systems:** Identify connection to district heating/cooling. If connected, gather billing details and payment structure.
- **Individual Devices:** For non-district systems, collect data on device types, fuel use, power ratings, quantity, age, and energy efficiency labels.
- **Usage Patterns:** Use checkboxes to record monthly usage, weekday/weekend patterns, and average daily hours.
- **Comfort Levels:** Ask respondents to rate perceived comfort (cold, mild, hot).
- **Future Plans:** Include questions on intentions and timelines for replacing devices with more efficient models.

Water Heating:

- Determine source of hot water (central system, solar).
- Collect data on consumption, billing, and usage habits (baths/showers, handwashing, kitchen use, laundry).
- Ask about energy-saving practices (e.g. turning off heating when not in use).
- Note potential high energy use from heating backyard pools.

Lighting:

- For each room (including outdoor areas), record number of fixtures and bulb types (e.g. LED, incandescent, solar).
- Use checkboxes to capture monthly usage, weekday/weekend patterns, and average daily hours.
- Flag need for further discussion on shared/common space lighting (e.g. corridors, motion sensors).

2. Warm economies (moderated by Ms Gelindon)

Cooling Activity:

- Record cooling devices by room type (e.g. living room, bedroom)
- For each device: type, number of units, brand, cooling capacity, hours and days of usage, and whether used exclusively within the household
- Device types include electric fans (ceiling, standing, desk, wall), air conditioners (window, split, centralised, floor-mounted), with inverter and non-inverter options

Lighting Activity:

- For each room: lighting type (e.g. incandescent, fluorescent, LED), number of units, wattage, smart app connectivity, hours and days of usage, and household-only use
- Include other sources such as kerosene or battery-powered lighting

Consumption and Savings Practices:

- Awareness of energy efficiency labelling
- Intentions to purchase labelled appliances
- Lighting maintenance habits
- Use of natural lighting
- Plans to upgrade to more efficient lighting
- Practice of switching off lights when not in use

Session 5: Questionnaire workshop – This session aims to impart how the survey is designed and implemented, with the end product being an energy consumption survey design that the members can implement in the future.

1. Developed economies (moderated by Ms Gelindon)

Appliance Categories Covered:

- **Cooking:** Microwave oven, oven, stove, rice cooker, toaster, coffee maker, kettle, blender, air fryer, BBQ/grill
- **Refrigeration:** Refrigerators (automatic/non-automatic), freezers (automatic/non-automatic)
- **Cleaning:** Dishwashers, clothes dryers, vacuum cleaners
- **Entertainment:** TVs (plasma, CRT, OLED, LCD), VHS, radio, CD players
- **PC/IT Devices:** PCs, chargers, Wi-Fi/modems, smart devices
- **Other Electric Tools:** Water pressure streamers, electric lawn mowers

Key Questions for Each Appliance:

- Frequency of use (times per week)
- Duration of use (hours per week)
- Appliance details:
    - Fuel type
    - Number of units
    - Usage patterns (times/day, days/week, average hours)
    - Capacity (wattage and size for entertainment devices)
    - Age of appliance
    - Presence and rating of energy label

Cooking Fuel Questions:

- Identify fuel types used: electricity, oil (kerosene, LPG), gas, biomass (fuel wood, charcoal, biogas)
- Monthly consumption: unit weight and average usage
- Purchase frequency: tick boxes for LPG (e.g. 12kg, 24kg) and biomass (e.g. 5kg+, 3–5kg)
- Time of use: AM/PM breakdown

Behaviour and Practice Questions:

- Do you unplug appliances when not in use?

- Do you plan to upgrade to more efficient appliances or adopt new tech within 5 years? If yes, do you have the financial means?
- Do you close blinds to reduce heat during afternoon hours?

Additional Notes:

- Smart devices need clear definition per economy
- EVs are excluded from this section but may be screened separately (e.g. EV ownership, charger presence, billing inclusion)
- Common fuel-related cooking questions may be placed after the main appliance table

2. Emerging economies (moderated by Dr Dumlao)

Purpose:

- Evaluate and compare kitchen appliances across multiple technical, functional, and user-oriented criteria.
- Supports informed decision-making for procurement, product reviews, or consumer guidance.

Core Specification Fields:

- **Basic Details:** Capacity (L), brand, model, fuel type, energy label
- **Vapor Functionality:**
  - Vapor type (impregnant or natural)
  - Vapor volume (compared to average)
- **Manufacturing Info:** Year of manufacture, manufacturer/distributor/importer, economy of origin
- **Dimensions and Appearance:** Height × Width × Depth, geometry, view colour

Functional Capabilities:

- Cooking modes: bake, broil, roast, toast, steam, microwave, convection, air fry, dehydrate, reheat, keep warm, proof, slow cook, grill, sear, sous vide, other
- Temperature range: specific to functions like dehydration, broiling, searing

Heating Types:

- Gas, electric, induction, microwave, halogen, other

Safety Features:

- Auto shutoff, cool-touch exterior, child lock, timer, overheat protection, other

Usability Features:

- Digital display, touch controls, preset programs, interior light, viewing window, other

Accessories Included:

- Wire rack, baking tray, crumb tray, steam tray, rotisserie spit, fry basket, other

Maintenance Technologies:

- Steam clean, catalytic clean, pyrolytic clean, other

Additional Evaluation Criteria:

- Price, warranty, store
- Quality parameters: taste, texture, quickness, consistency

Next Steps

Having identified the key questions for the residential sector across different types of economies, the EGEDA Secretariat will convert them into a formal survey questionnaire and circulate it to all participants for feedback. The questionnaire will be finalized following the review of submitted comments.

Member economies will be invited to conduct pilot surveys in 2026/2027 to assess the questionnaire's effectiveness. The results of these pilot surveys will be presented at the 25th workshop, scheduled for September 2027.

Wrap-up

Mr Glen Sweetnam, EGEDA Chair, commended the EGEDA Secretariat for organizing a highly substantive workshop. Unlike typical sessions dominated by presentations, this workshop fostered active collaboration, particularly through breakout groups that contributed to the development of a draft residential energy survey questionnaire. The Secretariat will now formalize this draft and circulate it to participants, encouraging continued engagement and feedback.

Mr Sweetnam then invited economies to reflect on their next steps in residential energy survey implementation. Economies with prior experience were asked to consider improvements or new insights gained, while those yet to begin were encouraged to leverage the group's collective work to inform their planning. Sharing these reflections was seen as beneficial for all, offering practical ideas, identifying challenges, and refining approaches.

Economy Reflections and Next Steps

Participants shared a wide range of insights and plans:

- **Viet Nam** aims to enhance residential energy data by engaging the National Statistics Office and exploring cost-effective survey integration, supported by university collaboration.
- **USA** plans to revisit its survey priorities, especially around EV electricity consumption, and explore alternative data methods to improve household energy analysis.
- **Thailand** is shifting toward qualitative research, focusing on behavioural change, energy labelling, and residential emissions tracking to support its NDC goals.
- **Chinese Taipei** is considering increasing survey frequency and integrating cross-sector data, while exploring thematic surveys on emerging topics like AI.

- **The Philippines** is forming a technical working group to support strategic survey design and implementation, emphasizing inter-agency collaboration.
- **Papua New Guinea** will refine its questionnaire and expand its survey to a second province, applying lessons learned from the workshop.
- **Malaysia** is preparing for a pilot survey in November and a full rollout in December, incorporating workshop insights to strengthen its approach.
- **Korea** shared its appliance-level tracking system and annual household survey model, highlighting the benefits of consistent data collection and efficiency labelling.
- **Indonesia** emphasized collaboration between the Ministry of Energy and NSO, with a focus on improving data quality and aligning with government account accounts.
- **China** plans to explore administrative data sources and university-led modelling to support future survey efforts, with enterprise-level insights from China Southern Power Grid.
- **Chile** will simplify its next residential survey to reduce respondent fatigue and plans to collaborate with utility companies to access billing data directly.

Closing Statements

Ms Gelindon stressed the importance of planning, training, and respectful engagement, especially in face-to-face surveys. She encouraged economies to consider small tokens of appreciation for respondents and to ensure knowledge transfer within teams to maintain continuity.

Mr Barcelona outlined the next phase: the Secretariat will finalize and circulate the draft questionnaire, inviting comments and refinement. Economies are encouraged to pilot test the survey between now and 2026, with results to be shared at the 2027 workshop.

Dr Dumlao highlighted the value of finding a common language across diverse economies to enable harmonized and comparable energy efficiency data. He emphasized the importance of collaboration in refining survey instruments.

Mr Sawamura expressed optimism about continued cooperation and the potential for pilot surveys to strengthen future workshops.

In closing, Mr Sweetnam acknowledged that while no economy is expected to commit immediately, the hope is that some will find it a logical next step to apply the questionnaire and collaborate with the Secretariat. He thanked all participants—both in person and online—for their contributions and engagement, marking the end of a productive and impactful three-day workshop.

End of the 3-day workshop