Conference Program

2025 6th International Conference on Power, Energy and Electrical Engineering (PEEE 2025)

2025 7th International Conference on Environment, Resources and Energy Engineering (EREE 2025)

July 25-27, 2025

TKP Tokyo Station Conference Center (TKP東京駅カンファレンスセンター)

Address: 〒103-0028 Tokyo, Chuo City, Yaesu, 1 Chome−8−16

〒103-0028 東京都中央区八重洲1-8-16 新槇町ビル1～3階・8階・10～12階（事務所：11階）

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Conference Venue

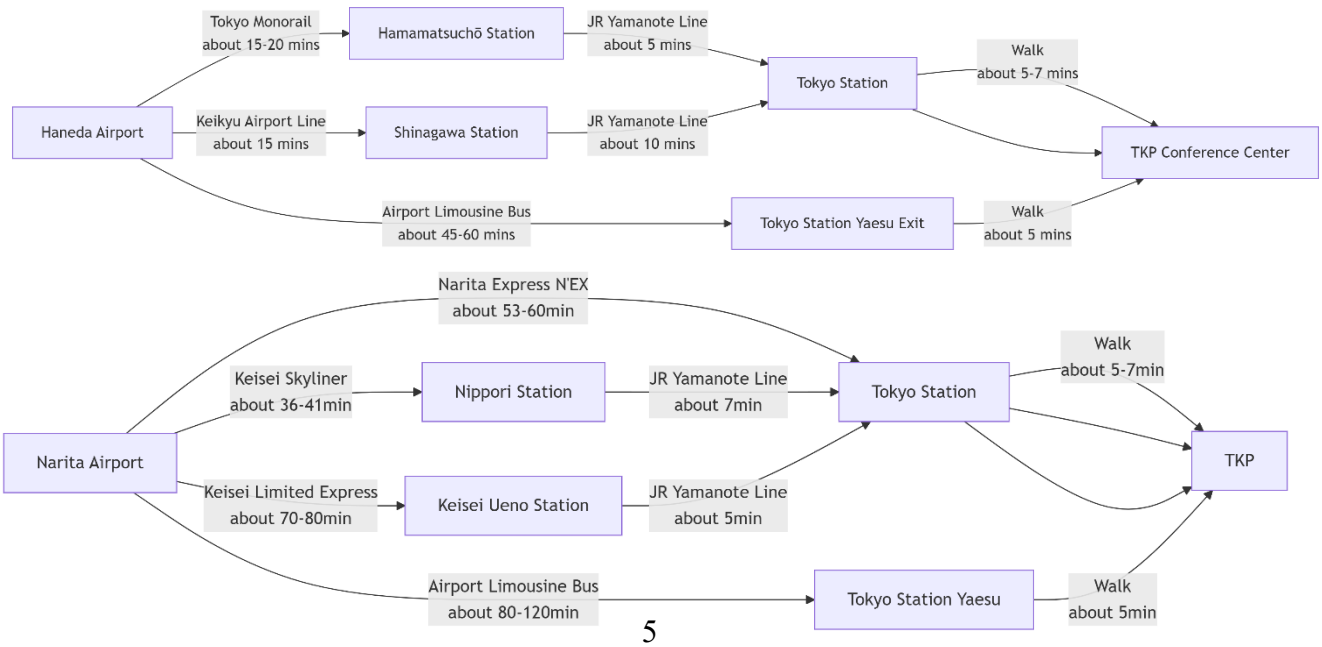
TKP Tokyo Station Conference Center

(TKP東京駅カンファレンスセンター)

Address: 〒103-0028 Tokyo, Chuo City, Yaesu, 1 Chome−8−16
〒103-0028 東京都中央区八重洲1-8-16 新槇町ビル1～3階・8階・10～12階（事務所：11階）

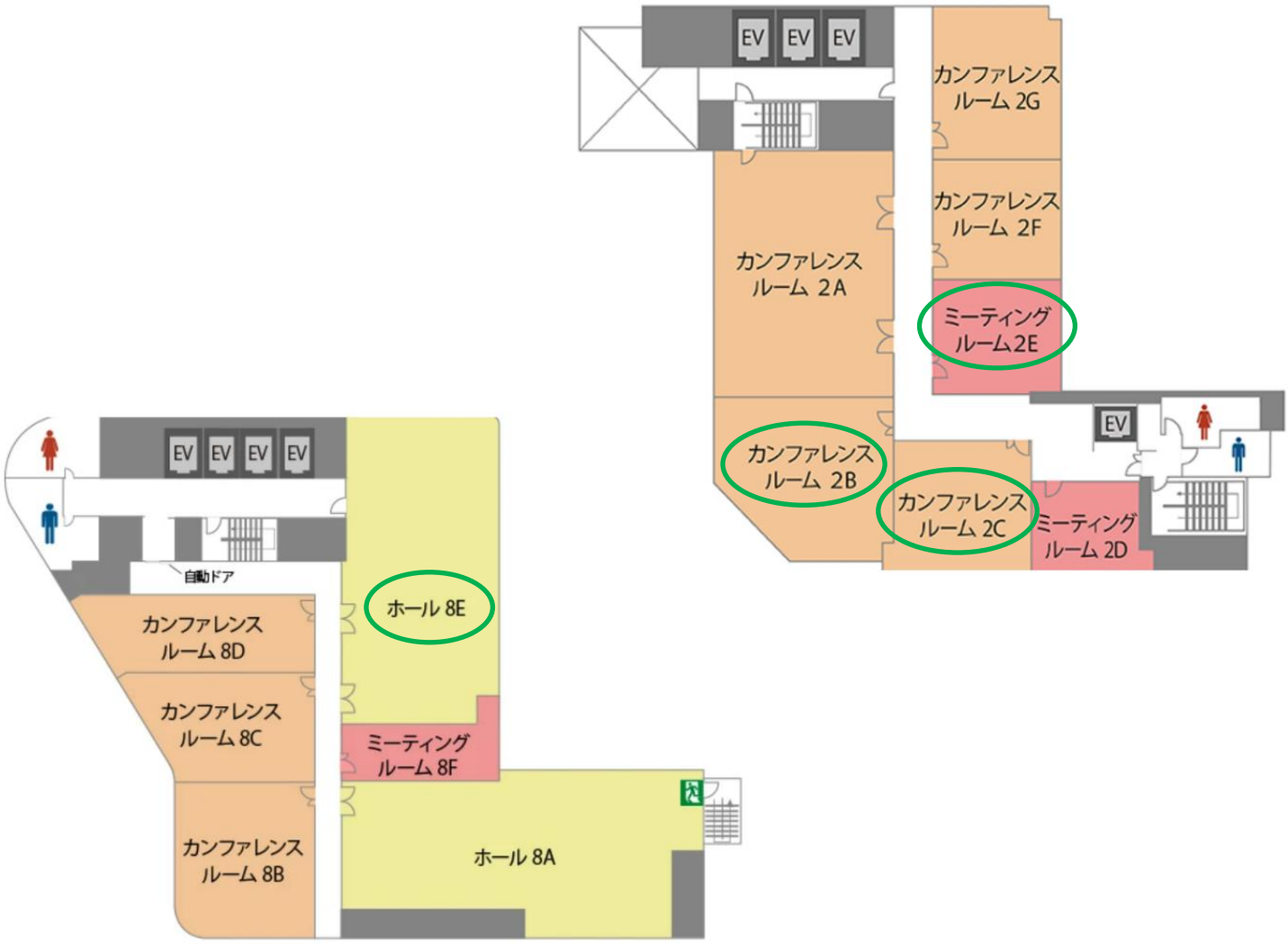
■ **Access:** https://www.kashikaigishitsu.net/facilitys/cc-tokyoeki-central/access/

■ **Transportation**



Conference Venue

Date	Activity	Level	Meeting Room
July 25th, 2025	Sign-in	2F	**2E**
July 26th, 2025	Opening Ceremony & Keynote Speech & Invited Speech	2F	**2B**
July 26th, 2025	Session 1 & 3	2F	**2C**
July 26th, 2025	Session 2 & Poster Session	2F	**2E**
July 26th, 2025	Dinner Banquet	8F	**8E**
July 27th, 2025	Free Day in Tokyo		



Attendance Instruction

■ Time Zone: UTC+9

■ Onsite Oral Presentation

1. Timing: a maximum of 15 minutes total, including speaking time and discussion. Please make sure your presentation is well timed. Please keep in mind that the program is full and that the speaker after you would like their allocated time available to them.
2. You can use USB flash drive (memory stick), make sure you scanned viruses in your own computer. Each speaker is required to meet her/his session chair in the corresponding session rooms 10 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.
3. It is suggested that you email a copy of your presentation to your personal inbox as a backup. If for some reason the files can't be accessed from your flash drive, you will be able to download them to the computer from your email.
4. Please note that each session room will be equipped with a LCD projector, screen, point device, microphone, and a laptop with general presentation software such as Microsoft PowerPoint and Adobe Reader. Please make sure that your files are compatible and readable with our operation system by using commonly used fronts and symbols. If you plan to use your own computer, please try the connection and make sure it works before your presentation.
5. Videos: If your PowerPoint files contain video clips please make sure that they are well formatted and connected to the main files.

■ Poster Presentation

1. Print poster (A1 size), content must be on 1 page. Please set the poster as vertical format, and bring it to paste onsite.
2. The content must include: the title of the article author, the logo of the unit in the upper left corner, the conference name + the ID of the article in the upper right corner, the key framework knowledge of the article, contact information and other necessary basic information, the rest of the information according to the importance of arrangement and design.
3. Other main content design, template format is not fixed, no template restrictions.
4. Prepare a 3-5 minutes presentation of the framework for on-site communication.

■ Dress Code

Please attend the conference in formal attire.

■ Safety Reminder: Secure Valuable Items at All Times

We remind you to secure your personal belongings at all times.
Please remember to:
* Wear your Conference Identification Badge at all times. Do not throw away Badge.
* If you are using a laptop computer, do not leave it unattended at any time.
* Keep your purse, wallet and other valuables with you at all times.
* The conference organizer will not be responsible for the loss or damage to any personal belongings.

■ Online Presentation

*** Zoom ID: 872 2679 1868 (Zoom Link: https://us02web.zoom.us/j/87226791868)**
*** Online Presentation Test Time: 14:00-16:00, July 25th, 2025 (UTC+9)**
(IE25-615, IE25-621, IE25-622)

Program Outline

Day 1 | July. 25th, 2025 (UTC+9)

Onsite Sign in and Conference Materials Collection

• **Time:** 14:00-17:00

• **Location:** 2nd Floor, **Meeting Room 2E**

• Tell your Paper ID to the staff.

• Sign your name in the attendance list and check meal information.

• Check your conference kit, which includes conference bag, name tag, meal voucher, conference program.

Program Outline

Day 2 | July. 26th, 2025 (UTC+9)

Time	Activity	Venue
Host: Jesús Toribio, University of Salamanca, Spain		**2nd Floor, Conference Room 2B**
Opening Ceremony | 09:00-09:05		
09:00-09:05	**Welcome Message from Conference Committee Chair:** **Saad Mekhilef,** Swinburne University of Technology, Australia & University of Malaya, Malaysia	
Keynote Speech & Invited Speech | 09:05-10:20		
09:05-09:50	**Saad Mekhilef** Swinburne University of Technology, Australia & University of Malaya, Malaysia *"Energy Storage Solutions for Renewable Energy Integration: Technologies and Grid Applications"*	
09:50-10:20	**Jozef Ritonja** University of Maribor, Slovenia *"Oscillatory Characteristics of Turbo-Type Synchronous Generators under Automatic Voltage Regulation"*	
Group Photo & Coffee Break | 10:20-10:50		
Invited Speech | 10:50-11:50		
10:50-11:20	**Firdaus Muhammad-Sukki** Edinburgh Napier University, United Kingdom *"Energy Feasibility Analysis of an Off-Grid Solar Wood Dryer in Scotland, UK"*	
11:20-11:50	**Jian Qiu** Zhejiang University, China *"AI and Digital Twin Model Fusion-based Smart Energy System Control and Optimization Techniques"*	
Lunch @ 2nd Floor, Conference Room 2B | 12:00-13:30		
Technical Sessions | 13:30-17:35		
13:30-15:30	**Session 1** – System Models and Energy Optimization Management in Electricity and Energy	**Conference Room 2C**
13:30-15:30	**Session 2** – Environmental Quality Monitoring and Control	**Meeting Room 2E**
Coffee Break | 15:30-15:50		
15:50-17:35	**Session 3** – Innovative Applications and Sustainable Development Based on Energy Optimization Configuration	**Conference Room 2C**
15:50-17:35	**Poster Session** – Modern Power Control System and Environmental Information Technology	**Meeting Room 2E**
Dinner @ 8th Floor, Hall 8E | 18:00-20:00		

Day 3 | July 27th, 2025 | One Free Day in Tokyo

Keynote Speaker

Prof. Saad Mekhilef

Swinburne University of Technology, Australia & University of Malaya, Malaysia

IEEE Fellow

Time: 09:05-09:50, July 26, 2025 (UTC+9)
Venue: 2nd Floor, Conference Room **2B**

Bio

Prof. Dr. Saad Mekhilef is an IEEE and IET Fellow. He is a Distinguished Professor at the School of Science, Computing and Engineering Technologies, Swinburne University of Technology, Melbourne, Australia, an Honorary Professor at the Department of Electrical Engineering, University of Malaya, and a distinguished visiting professor at the Institute of Sustainable Energy, Universiti Tenaga Nasional, Malaysia. He authored and co-authored more than 600 publications in academic journals and proceedings, five books with more than 47,000 citations, and more than 85 Ph.D. students who graduated under his supervision. He serves as an editorial board member for many top journals, such as IEEE Transactions on Power Electronics, IEEE Open Journal of Industrial Electronics, IET Renewable Power Generation, E-Prime, Journal of Power Electronics, and International Journal of Circuit Theory and Applications. His research interests include Power Conversion Techniques, Control of Power Converters, Maximum Power Point Tracking (MPPT), Renewable Energy, and Energy Efficiency.

Speech Information

Energy Storage Solutions for Renewable Energy Integration: Technologies and Grid Applications

Abstract: Energy storage plays a crucial role in modern electrical grids by enhancing reliability, improving efficiency, and facilitating the integration of renewable energy sources. Various energy storage technologies, including electrical, mechanical, electrochemical, thermal, and chemical systems, have been developed to address grid stability and fluctuations in energy demand. Advances in these technologies, coupled with declining costs, are making renewable energy sources, such as wind and solar, combined with storage, increasingly competitive with traditional fossil fuel-based power generation. This trend is expected to accelerate as both renewables and storage systems become more affordable and efficient. In this lecture, we will explore the fundamentals of power conversion and energy storage, examine key energy storage devices, and discuss their applications in modern grid systems.

Invited Speaker I

Prof. Jozef Ritonja

University of Maribor, Slovenia

Time: 09:50-10:20, July 26th, 2025 (UTC+9)

Venue: 2nd Floor, Conference Room **2B**

Bio

Prof. Jožef Ritonja is a Full Professor at the University of Maribor, Faculty of Electrical Engineering and Computer Science, where he serves as Head of the Institute of Electrical Power Engineering and Head of the Laboratory for Electrical Machines and Control. His research and teaching activities are focused on three main areas: the design, manufacturing, operation, and control of electrical machines; simulation, analysis, and control of power systems; and control theory, particularly the development of adaptive and robust control algorithms. He has been a member of the IEEE since 1992.

Prof. J. Ritonja has authored numerous scientific publications in peer-reviewed journals and is a co-author of two patents. He has held visiting positions at several European universities and collaborates actively with both academic institutions and industry. In addition, he serves on the editorial boards of multiple international scientific journals.

He leads and participates in various research and industrial projects, with a strong emphasis on the practical application of advanced control and power engineering concepts. He collaborates extensively with major Slovenian power companies, including the national transmission system operator and leading electricity producers. His work reflects a long-standing dedication to interdisciplinary cooperation and the integration of research into real-world solutions.

Speech Information

Oscillatory Characteristics of Turbo-Type Synchronous Generators under Automatic Voltage Regulation

Abstract: The behavior of synchronous generators under small disturbances is significantly shaped by their excitation systems, particularly the automatic voltage regulator (AVR). While numerous studies have investigated the influence of AVR dynamics on the electromechanical oscillations of hydro-type generators, the specific characteristics and responses of turbo-type synchronous machines remain less explored. This paper focuses exclusively on turbo-type generators, which differ notably from hydro units in terms of electromagnetic properties, inertia, damping, and operational context. Through modal analysis and dynamic simulations, the interaction between the AVR control loop and local oscillation modes is examined. The findings reveal how AVR parameters affect oscillatory performance and provide insight into stability margins for high-power turbo-generator units. This contributes to a more nuanced understanding of excitation control in large-scale thermal power systems.

Invited Speaker II

Assoc. Prof. Firdaus Muhammad-Sukki

Edinburgh Napier University, UK

Time: 10:50-11:20, July 26th, 2025 (UTC+9)
Venue: 2nd Floor, Conference Room **2B**

Bio

Associate Professor Dr. Muhammad-Sukki (PhD, CEng, MIET, ACGI) is a faculty member at the School of Engineering & the Built Environment, Edinburgh Napier University. With expertise in renewable energy technologies, policies, and sustainable resources, Dr. Muhammad-Sukki's research bridges innovation and practical implementation. He has secured funding from prominent UK and international agencies, including Innovate UK, the Scottish Institute for Remanufacturing (SIR), the British Council (Newton Fund), and Malaysia's Ministry of Higher Education. His interdisciplinary work includes market trend and financial analyses of renewable technologies across global contexts. Dr. Muhammad-Sukki has published in prestigious journals such as Nature and Applied Energy and is a recognized presenter at international conferences. Before academia, he worked as a communication engineer at Malaysia's largest telecommunications company, blending industry experience with academic expertise.

Speech Information

Energy Feasibility Analysis of an Off-Grid Solar Wood Dryer in Scotland, UK

Abstract: This study assesses the feasibility of powering an off-grid solar wood dryer at five locations across Scotland, UK. The energy requirements of the dryer are assumed to be consistent across all sites. Using PVsyst, a comprehensive solar energy simulation tool, we evaluate the solar potential and system performance at each location. The analysis considers site-specific solar irradiation, system sizing, and energy storage requirements to determine whether an off grid photovoltaic (PV) system can reliably meet the dryer's energy demands. The PVSyst simulation results confirm that each selected location can generate sufficient energy to meet the solar wood dryer's annual demand of 552.61 kWh, with excess energy ranging from a minimum of 272.5 kWh/year at Sutherland to a maximum of 439.81 kWh/year at the Isle of Mull. This demonstrates that the system is capable of not only meeting the energy demand but also generating surplus energy that can be stored or used as backup, thereby highlighting the viability and sustainability of solar-powered wood drying in these areas. The study highlights key considerations for optimising system configurations and ensuring reliable operation.

Invited Speaker III

Dr. Jian Qiu

Zhejiang University, China

Time: 11:20-11:50, July 26th, 2025 (UTC+9)

Venue: 2nd Floor, Conference Room **2B**

Bio

Qiu Jian is a researcher at the School of Electrical Engineering, Zhejiang University, PhD in Engineering, Visiting Scholar at Georgia Institute of Technology in the United States. He is also the director of the Power Artificial Intelligence Branch of the Energy Internet Research Center at Zhejiang University, a researcher at the Smart Power Energy Research Institute of State Grid Zhejiang University. In 2024, he will serve as a member of the Artificial Intelligence Expert Group of the State Grid Headquarters (responsible for scheduling direction).

Formerly served as the Technical Director of Energy Consumption Cloud at Alibaba Cloud, the R&D Director of Intelligent Power Energy at Alibaba Cloud, and the Algorithm Researcher at Huawei 2012 Laboratory. Mainly proficient in the application of cutting-edge technologies such as big data, artificial intelligence, knowledge graphs, and digital twins in the field of power energy. Participated in dozens of major national/corporate projects, published over 20 SCI/EI papers (two in the Nature journal), and obtained more than ten patents. Successfully developed and implemented intelligent products such as power knowledge graph platform, virtual dispatcher, virtual maintenance expert, energy consumption treasure, etc. Served as the vice chairman of the Carbon Neutralization Special Committee of China Energy Conservation Association, the vice chairman of the IEEE PES Power Information System and Data Technology Subcommittee, the member of the dual carbon subcommittee of the Industrial Internet Alliance of the Ministry of Industry and Information Technology, and participated in drafting a number of international, national and industrial standards for low carbon power. Has won the second prize of the 2023 China Electrotechnical Society Science and Technology Progress Award and the first prize of the 2024 Zhejiang Electric Power Science and Technology Progress Award.

Speech Information

AI and Digital Twin Model Fusion-based Smart Energy System Control and Optimization Techniques

Abstract: Modern smart distribution grids are based on four main goals: grid security, clean energy consumption, grid planning, and VPP user interaction. Based on cloud-edge synergistic digital twin technology, build the cloud brain and edge cerebellum. The edge side collects source network load and storage measurements, analyzes the cloud model and corrects it, and builds a virtual and real synergistic digital twin scene. The twin simulation is used to carry out real-time monitoring and trend calculation, analyze risks and provide early warning. Explore the optimal solution in the digital twin world through the twin control scheme and generate decision-making suggestions to build a collaborative and interactive application of source, grid, load and storage with twin perception, simulation, optimization, and assisted decision-making.

Session 1

July 26th, 2025 | 13:30 – 15:30
Venue: 2C
Zoom ID: **872 2679 1868** (https://us02web.zoom.us/j/87226791868)

- **Topic: System Models and Energy Optimization Management in Electricity and Energy**
- **Session Chair: Prof. Saad Mekhilef, Swinburne University of Technology, Australia & University of Malaya, Malaysia**

***Note: The schedule of each presentation is for reference only. Authors are required to attend the whole session, in case there may be some changes on conference day. Please join in the room 5-10 minutes earlier.**

13:30-13:45	(IE25-601) A Measurement of The Lighting Illumination and Uniformity Level at Self-Service Laundry **Mohd Nasrull Abdol Rahman** and Amirul Naim Zahari Universiti Tun Hussein Onn Malaysia (UTHM), Malaysia Abstract: Lighting in self-service laundry can pose several hazards, including tripping hazards due to poorly lit areas, eye strain and fatigue caused by poor lighting, poor visibility making it hard to locate items, fire hazards from improper lighting fixtures, and increased risk of accidents during power failures in poorly lit areas. Therefore, the main objectives this study was to evaluate the lighting illumination and uniformity level at self-service laundry. This study involves 15 self-service laundries in Malaysia. Lux meter has been used to analysis the suitable light sensitivity. The lux meter was used at each point to record and measure the illuminance level (Lux) in a certain area. The comparison of the value of self-service laundry shows that only 20% (306-313 lux) of the self-service laundries have been reaching the minimum lux level of lighting recommended and 80% (57-297 lux) of the self-service laundry did not reach the minimum lux level of lighting recommended. The comparison uniformity value of self-service laundry shows 73.3% (0.7-1.0 uniformity) of the self-service laundry has reached the minimum uniformity level of lighting recommended and 26.7% (0.2-0.5 uniformity) self-service laundry did not reach the minimum uniformity level of lighting recommended. Risks and hazards such as glare from laundry machines can lead to eye strain, headache, and reduced concentration. To reduce these effects, it is recommended to paint the ceiling and walls white or in a light colour, place lamps high for evenly distributed lighting, select the direction of light sources based on the task, clean lamps, skylights, windows, ceilings, walls, and partitions regularly, and replace any blown or dim light bulbs or tubes.
13:45-14:00	(IE25-606) Wide-Area Coordinated Voltage Control Based on Adaptive Dimension-Augmented Power Flow Considering Topology Reconfiguration **Guochao Lu**, Zhongguan Wang, Xialin Li, Li Guo, Chengshan Wang Tianjin University, China Abstract: The uncertainty of DG output further exacerbates the risk to the wide-area voltage security of power grids. Physics-based methods can address power flow (PF) security issues, but relying on accurate line parameters, which are difficult to obtain in ADNs. Although data driven methods can tackle this challenge, the trained PF models may be invalid in the event of topology reconfiguration triggered by extreme weather. This paper proposes an adaptive dimension-augmented PF method, which can establish a PF model under a new topology without historical data. On this basis, the paper implements coordinated

	voltage optimization using generalized Benders decomposition to address the different characteristics of TN and ADNs. Finally, the proposed method is validated on a system with high-penetration DG in ADNs. Simulation results demonstrate that the adaptive dimension-augmented PF method accurately calculate the actual voltage profiles in new topologies, and the proposed coordinated control makes full use of system flexible resources, maintaining global voltage security.
14:00-14:15	(IE25-609) Multi-factor Coupling Analysis and Optimization of Photovoltaic Efficiency Based on AHP-ISM Hybrid Model **Chuanjiang Zhou**, Xia Lei Xihua University, China Abstract: The technical shortcomings and deficiencies of traditional evaluation methods for factors affecting photovoltaic power generation efficiency are mainly reflected in the fact that traditional methods often focus on evaluating a single or a few factors, and fail to comprehensively consider all factors that may affect photovoltaic power generation efficiency; Accurately obtaining data on all relevant factors and effectively processing them can be a challenging task. Qualitative analysis methods may focus on qualitative analysis, which can be influenced by subjective factors and may not take into account the coupling between various influencing factors. This article first uses the Analytic Hierarchy Process (AHP) with the efficiency of photovoltaic power generation systems as the target layer. Through hierarchical analysis, the weights of various influencing factors on the target layer are obtained, and the validity of the questionnaire is verified through consistency testing; Then, using the Interpretive Structural Model (ISM) to decompose the hierarchical relationships of factors affecting the efficiency of photovoltaic power plant systems, the internal relationships of complex systems are analyzed. It divides the various influencing factors in the system into different levels and uses directed edges to connect the factors at different levels, forming a hierarchical model that can more clearly reveal the interactions and influencing relationships between various influencing factors. Then, a weight structure diagram of the factors affecting the efficiency of photovoltaic power generation was drawn, dividing the hierarchical structure into three categories: direct, indirect, and fundamental. This provided a deep and comprehensive understanding of the factors affecting the efficiency of photovoltaic power plant systems. These analysis results provided important data and theoretical support for the formulation of subsequent improvement strategies, laid a solid foundation for improving the system efficiency of photovoltaic power plants, and provided important support for the promotion and application of photovoltaic power generation technology, promoting energy transformation and sustainable development.
14:15-14:30	(IE25-608) Charactering Uncertainty of Frequency Regulation Capability: A Physics-Informed Unit Commitment Model Considering Time-Varying Dynamics **Wenlong Wu**, Zhongguan Wang, Xialin Li, Li Guo, Chengshan Wang Tianjin University, China Abstract: As the penetration of low-inertia wind power continues increasing, primary frequency regulation (PFR) capability of power systems faces severe risk of reserve shortage. Considering the complex interaction of wind turbines (WTs) and time-varying frequency dynamics, the PFR capability of wind power is significantly influenced by unit commitment (UC) scheme and uncertain wind speed. Therefore, it is essential to account for the uncertain PFR capability in UC stage to prevent frequency incidents. This paper proposes a physics informed UC model accounting for the probability distribution of wind power output and droop coefficient. The method employs the Koopman operator theory to establish a high-dimensional linear relationship between wind speed and the maximum droop coefficient, and obtains a probability distribution of PFR capability by predicting wind speed, which is incorporated as a constraint in the UC model. Simulation results demonstrate that this approach ensures sufficient PFR capability in UC stage while exhibiting promising real-time performance.

14:30-14:45	(IE25-611-A) Complementary Electrochromic Energy Storage Devices Enabled by Optimized PVDF-HFP-Based Gel Electrolytes **Pin-Yu Chen**, Yi Long The Chinese University of Hong Kong, Hong Kong, China Abstract: Electrochromic batteries offer significant promise for smart windows and dynamic displays by integrating energy storage and optical modulation. In this study, we present a multifunctional energy storage and electrochromic device (EESD) featuring lithium titanate ($Li_4Ti_5O_{12}$) as the anode and Prussian white as the cathode. The $Li_4Ti_5O_{12}$ film exhibits excellent lithium-ion storage with an approximate 80% transmittance change during ion insertion, while the Prussian white film provides a 70% modulation range. This complementary electrochromic behavior, combined with a suitable redox voltage gap and inherent electrochemical stability, yields remarkable device performance, including a 65% optical modulation at 660 nm, high coloration efficiency, and long-term stability. Furthermore, we investigated four gel electrolyte formulations based on a PVDFHFP/acetone matrix: without additives, with LiTFSI, with EMITFSI, and with both LiTFSI and EMITFSI. Electrochemical impedance spectroscopy (EIS) demonstrated that the membrane incorporating LiTFSI, when immersed in a 1 M LiTFSI/EMITFSI electrolyte, exhibited the lowest resistance. Because the combination of PVDFHFP and LiTFSI effectively reduces resistance, it enhances ionic conductivity, minimizes internal voltage drops, and ultimately improves battery performance by increasing power density and cycling stability.
14:45-15:00	(IE25-423) Assessing Energy Generation Technologies with Comprehensive Model based on SQuaRE Stan **Juan David Garcia-Racines**, Masahide Nakamura, Sinan Chen Kobe University, Japan Abstract: This study assesses energy generation technologies using a comprehensive model to support decision-making in energy project planning. We evaluated 11 energy generation technologies based on economic, environmental, and social metrics. Utilizing the SQuaRE standard as a reference, we defined five distinct objectives, each assigned a score for comparing the technologies. This approach provides a holistic perspective on each technology, enabling general and specific comparisons among them. Our results indicate that, in a general assessment, rooftop solar PV technology achieved the highest average score among the evaluated technologies, followed by small hydropower, offshore wind turbines, and utility-scale PV. Coal received the lowest score of all the sources evaluated. Overall, this assessment reveals that renewable energy sources are rated more favorably than non-renewable ones, reflecting a global shift towards renewable solutions and acknowledgment of their potential benefits.
15:00-15:15	(IE25-614-A) Almost exact matching for interpretable day-ahead electricity price forecasting **Fuyang Jiang**, Hussain Kazmi KU Leuven, Belgium Abstract: Reliable access to electricity underpins much of modern civilization. The day-ahead electricity market is the most actively traded market in Europe and provides price signals on an hourly basis. To make the most of price arbitrage on this market, traders and retailers typically need to forecast prices before scheduling their demand and generation. Recent years have seen an increasing shift towards more data-driven, machine-learning techniques to forecast electricity market prices. This is driven by greater availability of data and computational resources. Although these models often achieve state-of-the-art performance in terms of predictive accuracy, their industrial application is constrained by their black-box, non-interpretable nature. Unfortunately, existing explanation tools such as SHAP and LIME libraries provide only an incomplete view of the model's internal functioning, and suffer from their own shortcomings (e.g. tunable hyperparameters, multicollinearity). In this paper, we propose an interpretable-by-design matching-based method to forecast electricity prices and apply it to the case of day-ahead electricity markets. We also explore model sensitivity to different parametrizations, including

	the choice of input features and calibration window length. Preliminary results show that these methods can offer comparable forecast accuracy while remaining interpretable, thus effectively overcoming the issues introduced by post-hoc explanations of black-box methods.
15:15-15:30 	(IE25-622) Hydrokinetic Cross-Flow Turbine With NACA 00834 Hydrofoil for Small Scale Power Applications **Alexander Hamilton Atienza**, Prince Troy C. Delos Santos, Jan-Janette B. Edjan, Patrick G. Mosquera Mapua Malayan Colleges Laguna, Philippines Abstract: The study aimed towards the design, fabrication, and testing of a hydrokinetic energy extraction system that utilized the speed of irrigation water in existing water canals installed by the local government and helped optimize the use of water by extending the utilization of irrigation water. The innovation in this study utilized crossflow turbine type employing blade profile for the turbine runner patterned to a NACA 000834 hydrofoil. The performance of the turbine such as theoretical water power, turbine internal, mechanical, belt and generator efficiencies were assessed. The theoretical water power available for extraction was computed at a value of 6928.53 Watts. The turbine has had been found to run at 70.5 RPM with turbine internal and mechanical efficiencies are 44.57% and 71.57%, respectively. It was also observed belt efficiency of 69.74% and generator efficiency 74.45% of The system was able to produce 1152 watts of electrical power meant for small small-scale power applications.
Best Presentation Award & Session Group Photo	

Session 2

July 26th, 2025 | 13:30 – 15:30
Venue: **2E**

- **Topic: Environmental Quality Monitoring and Control**
- **Session Chair: Prof. Arwa Abdelahy, German Jordanian University, Jordan**

*Note: The schedule of each presentation is for reference only. Authors are required to attend the whole session, in case there may be some changes on conference day. Please join in the room 5-10 minutes earlier.

13:30-13:45	(IE25-408A) Natural heavy metal pollution: bioaccumulation and heavy metal exposure in traditional sulfur workers in the crater Ijen volcano **Septian Hadi Susetyo**, Azham Umar Abidin, Taiki Nagaya, Nobuyuki Kato, Emi Kawaguchi, Yasuto Matsui Kyoto University, Japan Abstract: Ijen Crater is a UNESCO-recognized biosphere reserve and is famous for its blue fire phenomenon and green crater with the highest acidity level in the world. In addition to being rich in sulfur, this area also contains heavy metals released with volcanic gas. Traditional sulfur mining by local communities increases the risk of heavy metal exposure for workers. This study aims to assess the health risks and impacts of the accumulation of heavy metal exposure to traditional sulfur miners in Ijen Crater. The research method includes measuring air quality at the work site using a High Volume Air Sampler (HVAS) and analyzing hair samples from 30 miners. The concentrations of heavy metals measured were arsenic (As), lead (Pb), cadmium (Cd), and chromium (Cr) which were measured using ICP-MS. The results showed heavy metal concentrations in the air of As (2.69 ppb), Pb (6.63 ppb), Cd (2.66 ppb), and Cr (9.9 ppb). Meanwhile, the levels of heavy metals in the hair of workers were on average As (100.3 ppb), Pb (35.2 ppb), Cd (2.9 ppb), and Cr (23.7 ppb). All levels of heavy metals detected exceeded the safe limits set by NIOSH, indicating potential health impacts for workers.
13:45-14:00	(IE25-436A) Nitrogen removal from high-saline municipal wastewater via anammox-based process driven by both nitritation and denitratation **Wenyu Li**, Yongzhen Peng Beijing University of Technology, China Abstract: Nitrogen removal from saline municipal wastewater has recently attracted attention; thus, developing energy-efficient technology such as anaerobic ammonium oxidation (anammox) for advanced nitrogen removal of hypersaline wastewater is significant. In this study, the long-term salt adaptation and evolution mechanisms of an anammox-based process driven by both nitritation ($NH_4^+ \rightarrow NO_2^-$, PN) and denitratation ($NO_3^- \rightarrow NO_2^-$, PD) were investigated under salinities ranging from 1.0%-3.0% (10-30 g NaCl/L). At 1.0% salinity, PN evolved into the major nitrite production pathway with thorough suppression of nitrite oxidation. At 1.5% salinity, nitrite reduction was inhibited along with suspended sludge loss due to poor sludge settleability. Under 2.0% salinity with only-biofilm, the highest nitrogen removal efficiency (81.2%) was observed with influent and effluent total inorganic nitrogen concentrations of 44.5 and 8.2 mg N/L, respectively. Notably, results showed that anammox bacteria occupied up to 1.07% of the microbial community (qPCR: 1.14×1011 copies/(g dry sludge)) and has strong adaptability to salinity. With salinity increases, anammox contribution kept over 85% and

	Ca. Kuenenia (0.57%→0.22%) was more tolerant than Ca. Brocadia (0.46%→0.02%). Metagenomic sequencing revealed that the multiple nitrite substrates production by Nitrosomonas (amoA-enriched), Denitratisoma and Denitromonas (narG-enriched) guaranteed the high anammox contribution. This study provides a multifaceted understanding of the anammox-based process, which can enable improved application in real saline wastewater treatment.
14:00-14:15	(IE25-402A) Sustainable Business Models for Carbon Sequestration **Natalia Maehle**, Pia Piroschka Otte Western Norway University of Applied Sciences, Norway Abstract: To secure environmental sustainability and biodiversity, there is a growing need for food system transformation. This transformation requires changes in the whole food production value chain, starting from its basis, namely the soil. In recent years, soil health has been declining due to increased use of synthetic fertilizers and overproduction. It has therefore been recognized as critical to achieving the United Nation's Sustainable Development Goals. A highly promising practice to improve soil health is carbon sequestration, which can increase soil productivity and reduce greenhouse gas emissions. However, carbon sequestration is costly for farmers within the current regulatory and market frameworks. To make carbon sequestration in soils economically viable, this study develops sustainable business models allowing companies to invest in carbon sequestration practices at local farms and reduce their climate footprint. We start by mapping existing carbon credit initiatives through desk research and follow up by secondary data collection (company records, websites, and press reports) and in-depth interviews with case representatives. Based on this, we design business model concepts by applying the adapted Sustainable Business Model Canvas framework. These concepts can serve as a basis for developing new solutions for financing carbon sequestration in agricultural soils to foster food system transformation.
14:15-14:30	(IE25-445A) Developing the extended theory of planned behaviour to investigate consumer circular economy behaviour in WEEE management **May Soe Oo**, Benjamin Steuer Hong Kong University of Science and Technology, Hong Kong, China Abstract: In circular economy concepts, extending the lifetime of an electronic product through repair will result in environmental gains and decrease the ecological burden of consumer electronics. Consumer consumption behavior plays a crucial role in promoting a circular economy by supporting repair, reuse, and recycling practices that reduce waste and extend the life of products. Since there is little empirical data from a consumer perspective on engaging circular repair behaviour for EEE in Hong Kong, this study aims to investigate the factors that underpin consumers' behavioural intention to circular repair practice. The extended theory of planned behaviour (TPB) was developed to explore the antecedents of consumers' behavioural intention for repairing EEE. The eight research hypotheses were examined using the Structural Equation Modelling technique from 609 respondents in Hong Kong. To acquire a stronger explanatory power, we extended the original TPB model such as attitude (ATT), subjective norm (SN) and perceived behavioural control (PBC) with three extra factors such as awareness of consequences (AC), environmental concern (EC) and policy concern (PRS). The study found that extending the TPB model resulted in higher explanatory power (54%) for behavioural intention. According to the hypothesized results, EC ($\beta = 0.473^{***}$,) showed the strongest influence on repair behaviour followed by PBC ($\beta = 0.224^{***}$), AC ($\beta = 0.195^{***}$), SN ($\beta = 0.175^{***}$) and finally ATT ($\beta = 0.164^{***}$). However, PRS ($\beta = 0.068$ns) was not statistically significant. The results of the analysis indicated that AC, EC, ATT, PBC, and SN are the major factors affecting the behavioral intention to repair behaviour. The study offers novel insights for researchers and policymakers to create a more consumer-centric CE framework to expand understanding about repair behaviour of EEE.

14:30-14:45	(IE25-448A) Rapid formation of denitrification granules for nitrite accumulation by increasing nitrogen loading rates **Jingwen Zhang**, Yongzhen Peng Beijing University of Technology, China Abstract: The nitrite accumulation in partial denitrification (PD) offers the possibility of widespread application of anammox process. Coupling PD with anammox process saves 80% carbon sources and 100% oxygen supply for aerobic ammonia oxidation. Thereby, this study aimed to investigate the rapid formation of PD granules with inoculation by increasing nitrogen loading rate (NLR) with shortening cycle time and increasing influent nitrate concentration. Results showed that the acetate-driven heterotrophic denitrification bioreactor by stepwise shortening the HRT and increasing NLR to obtain a satisfactory NTR as high as 87.0% within 18 days. To enhance NO2- accumulation, the reaction time stepwise decreased from 50 min to 20 min, and the influent NO3--N increased from 50.0 mg/L to 100.0 mg/L. Under this condition, with the NLR rising from 0.9 kg N/ (m3 • d) to 4.8 kg N/ (m3 • d), and organic loading rate (OLR) from 2.7 kg COD/ (m3 • d) to 9.6 kg COD/ (m3 • d), the NTR can be maintained above 70%. The microbial community succession elucidated the mechanism facilitated PD capability driven by the core bacteria. In this system, the Proteobacteria were known to consist of a large group of denitrifying bacteria with the relative abundance in the inoculated sludge was 33.9%, which increased to 81.5% (day 117). Growth evidence indicated that the functional genus Thauera was significantly enriched with abundance increasing from 12.5% to as high as 76.4% (P≤0.001), with electron transfer rates for NO3- reduction (SNO3) significantly improving by 5.4 times from 13.0±1.7 mg N/(g VSS h) to 70.7±1.7 mg N/(g VSS h), which much higher than that of NO2- reduction. Taken together, this study demonstrated the feasibility of the rapid formation of PD granules and provided a promising method for the stable and efficient NO3- containing wastewater treatment, which promotes the better coupling of PD and anammox to cooperatively and efficiently nitrogen removal, which matches the theme of the conference.
14:45-15:00	(IE25-404A) Adsorption behavior of carbamazepine and florfenicol on aged microplastics in seawater **Junjie Richard Li**, Huang Chuanjie, Ning Chenxu, Huada Daniel Ruan, Sabrina Yanan Jiang Beijing Normal University-Hong Kong Baptist University United International College, China Microplastics (MPs) and pharmaceuticals and personal care products (PPCPs) have been recognized as pervasive environmental contaminants. This study systematically elucidates the carrier-mediated transport behavior and interfacial interaction mechanisms between MPs and representative pharmaceuticals—florfenicol (FF) and carbamazepine (CBZ) under simulated seawater conditions. Polyethylene (PE) and polypropylene (PP) were exposed to ultraviolet to evaluate the adsorption and desorption behaviors before and after aging. Based on the results obtained from scanning electron microscopy (SEM), Fourier Transform Infrared Spectroscopy (FTIR), and Brunauer-Emmett-Teller (BET) surface area analysis, it was found that compared to the original microplastics, the specific surface area of the aged polyethylene (PE) increased by 17.9%, while that of polypropylene (PP) increased by 6.9%. Spectral identification of carbonyl (C=O) moieties and zeta potential measurements confirmed oxidative functionalization, with aged PP developing enhanced negative surface charge while PE displayed charge neutralization.The adsorption amount of aged PE for FF and CBZ increased by 110.0% and 80.2%, respectively, whereas aged PP exhibited increases of 50.4% and 65.3% for FF and CBZ, respectively. The fitting results of the pseudo-second-order kinetic model indicate that the adsorption processes of both microplastics on pharmaceuticals are predominantly chemical adsorption.Isotherm studies showed that the Freundlich model provided a better fit, suggesting the possibility of multilayer adsorption phenomena between microplastics and pharmaceuticals. The adsorption capacity of aged microplastics was significantly enhanced compared to pristine microplastics, particularly for PE. The distribution coefficient (Kd) values for pristine PE in simulated seawater ranged from 20.0 to 143.0 L/kg, which increased to 48.0 to 444.0 L/kg for aged PE. Additionally, the adsorption capacity of PE for FF and CBZ was higher than that of PP both before and after aging.This can be attributed to the increase in

	specific surface area during aging, which exposes more adsorption sites, the augmentation of oxygen-containing functional groups enhancing surface hydrophilicity, and changes in surface charge that enhance adsorption capacity and processes. Competitive adsorption results indicate that CBZ consistently dominated adsorption, achieving 2–3 times the accumulation compared to FF on both pristine and aged microplastics, with slight increases observed on aged microplastics. Salinity gradient experiments demonstrated that, in a high-salinity environment (3% salinity), the presence of Na+ ions inhibited FF adsorption on both PP and PE due to ionic competition, whereas CBZ adsorption was enhanced, potentially due to salting-out effects. This study reveals that under the equivalent pollutant concentrations, the aged microplastics have a significantly increased adsorption capacity for pollutants. Moreover, PE exhibits stronger adsorption and desorption capabilities compared to PP. Therefore, as a carrier of pollutants, PE may pose a greater potential environmental hazard.
15:00-15:15	(IE25-453A) Novel anammox granules formation from conventional activated sludge for municipal wastewater treatment through flocs management **Wanyi Feng**, Yongzhen Peng Beijing University of Technology, China Abstract: The direct integration of anammox process into municipal wastewater treatment has caused widespread concern, but the lack of anammox seeds limited its real application. This study applied a sequencing batch reactor and cultivated anammox granules (322.0 μ m) from conventional activated sludge treating municipal wastewater (Figure 1). After setting ultra-low floc sludge retention times of 8d, nitrifiers on flocs were eliminated and partial nitrification was realized. Furthermore, highly bacteria-enriched granules were initially formed, with Nitrosomonas and Ca. Competibacter 4-fold higher than that of flocs. Specific staining results revealed the microbial interaction with Ca. Brocadia, considering that Ca. Competibacter and Nitrosomonas correspondingly identified in the inner and outer layers of granules. The percentage of Ca. Brocadia present on the granules increased substantially from 0.0% to 3.0%, accompanied by a nitrogen removal rate of 0.3 kg·m-3·d-1. Our findings revealed a valuable reference for the anammox bacteria in-situ enrichment under mainstream conditions, which provides theoretical guidance for anammox-based processes practical application.
15:15-15:30	(IE25-449A) Green and Resilient Remediation of Arsenic-Contaminated Soils with Synergistic Use of Plant Microbial Fuel Cells and Biochar **Bo-Wen Wang**, Wei-Han Lin, Chia-Ling Kuo, Hung-En Lai, Chung-Yu Guan National Taiwan University, Taiwan Abstract: Environmental pollution, global warming, and energy shortage are critical issues nowadays. Plant Microbial Fuel Cells (PMFCs) have emerged as a novel technology. The functions of PMFCs include remediating soil contaminated with trivalent arsenic (As(III)) and pentavalent arsenic (As(V)), enhancing carbon sequestration through plant growth, and converting solar energy into electrical energy. In this study, Cyperus malaccensis Lam. ssp. monophyllus (Vahl）T. Koyama was used in the system to remediate pollution and generate electricity, measuring the output voltage and the soil pH values. The output voltage of the PMFCs without biochar increased from 39.55 ± 35.76 mV to 195.08 ± 37.52 mV, while the group with biochar increased from 189.63 ± 19.65 mV to 284.10 ± 8.92 mV. The results suggest that the addition of biochar increases the output voltage. The anode pH in PMFCs without biochar was 5.86 ± 0.10, and the cathode pH was 5.94 ± 0.06. On the contrary, the biochar condition elaborated an anode pH of 6.16 ± 0.03 and a cathode pH of 6.16 ± 0.04. The result indicates that both anode and cathode pH values were similar within each condition and that the utility of biochar makes the pH values closer to neutral. In summary, PMFCs with biochar improves the output voltage and maintain the soil pH values in neutral for sustainable remediation, net zero emissions, and green energy.
Best Presentation Award & Session Group Photo	

Session 3

July 26th, 2025 | 15:50 – 17:35
Venue: 2C
Zoom ID: **872 2679 1868** (https://us02web.zoom.us/j/87226791868)

- **Topic: Innovative Applications and Sustainable Development Based on Energy Optimization Configuration**
- **Session Chair: Assoc. Prof. Firdaus Muhammad-Sukki, Edinburgh Napier University, UK**

***Note: The schedule of each presentation is for reference only. Authors are required to attend the whole session, in case there may be some changes on conference day. Please join in the room 5-10 minutes earlier.**

15:50-16:05	(IE25-457) From Concept to Practice: Operationalizing the WEFE Nexus through a Low-Cost Solar Powered Hydroponic System **Arwa Abdelahy**, Serena Sandri, Munjed Al Sharif, Nooh Alshyab, Luay Jum'a, Ismail Abushaikha German Jordanian University, Jordan Abstract: Given the growing demand for food, limited natural resources, shrinking arable land, and rising energy costs, sustainable agricultural solutions are urgently needed. The Water-Energy-Food-Ecosystems (WEFE) Nexus offers an integrated framework to address these interconnected challenges by promoting synergies and minimizing trade-offs between sectors. This paper presents a community-led, solar-powered hydroponic system implemented in Wadi Al Wala, Jordan, as a practical and scalable example of the WEFE Nexus in action. The system was evaluated against soil-based agriculture across three cultivation cycles, focusing on water use, crop yield, land efficiency, and environmental performance. The environmental assessment used carbon dioxide emissions (kg CO_2 equivalent) as a key indicator to evaluate the system's sustainability. Findings showed that the hydroponic system reduced water consumption by 25 – 38% and boosted crop yields by 30 – 107% compared to traditional agriculture. Furthermore, solar-powered hydroponics significantly lowered carbon emissions by 66.7 kg and 13.2 kg CO_2 eq. and presented a benefit/cost ratio of 6.3 and 1.7 compared to diesel-powered and grid-powered hydroponic systems, respectively. These results underscore the environmental and resource-efficiency benefits of integrating renewable energy into innovative agricultural practices. To explore future potential, four hydroponic upscaling scenarios were developed using the REWEFE decision-support tool, offering pathways for replication. The results highlight the hydroponic greenhouse as a smart agricultural solution that conserves resources, improves productivity, and contributes to environmental sustainability. However, a rebound effect was observed in the form of increased energy demand, underscoring the need for further expansion of solar energy integration to ensure long-term resilience and sustainability.
16:05-16:20	(IE25-602-A) Capacity Optimization of Wind-PV-Storage Hybrid Power Systems Using Improved NSGA-II and Fuzzy TOPSIS **Daiyuan Huang**, Wenjun Yan Polytechnic Institute of Zhejiang University, China Abstract: With the large-scale integration of renewable energy into power systems, the challenges of volatility and intermittency faced by the grid are becoming increasingly prominent. A reasonable capacity ratio of wind, photovoltaic, and storage can harness the complementary characteristics of

	various power sources, thereby enhancing system stability. Optimizing the configuration of hybrid energy storage is one of the crucial measures to mitigate such strong intermittent fluctuations. To this end, this paper proposes a capacity optimization method for a combined wind-photovoltaic-storage-thermal power generation system based on an improved Non-dominated Sorting Genetic Algorithm II (NSGA-II) and the fuzzy Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) algorithm. This method establishes a multi-objective optimization model aiming to minimize total investment cost, load loss rate, and wind and photovoltaic curtailment rate. The constraints consider the charge-discharge efficiency of the energy storage system, the State of Charge (SOC) range, and limits on the load loss rate. By solving the model, a Pareto optimal solution set is obtained. Simulation analysis results indicate that the proposed method is effective in optimizing the capacity configuration of wind-photovoltaic-storage-thermal power generation systems, ensuring both stability and economic efficiency of the power system, and can be effectively applied to new energy power systems.
16:20-16:35	(IE25-415) Bioethanol Injection and Air Preheating on the Performance and Exhaust Emissions of a CRDI Diesel Engine **Pisak Chermprayong**, Ekkachai Sutheerasak, Worachest Pirompugd, Sathaporn Chuepeng Burapha University, Thailand Abstract: Renewable energy resources for diesel engine applications are continuously being studied to reduce fossil diesel consumption and exhaust emissions, which increase global warming and impacts on environment and human health. Bioethanol is a biofuel produced from biological resources by fermenting renewable biomass, being developed to replace the use of neat ethanol. Thus, this research aims to study the performance and exhaust emissions of common-rail direct injection (CRDI) diesel engine operated with dual-fuel diesel combined with bioethanol injection and air preheating. They were investigated at a constant speed and various loads and compared with a mode of only diesel. The injected bioethanol was increased from 10 to 50 ms and combined with preheated air at 60 oC. The best engine performance was found at 8.50 kW. Outstandingly, this work found that the reduction of carbon dioxide, carbon monoxide, black smoke, particulate matter, and nitrogen oxide emissions occurred from using the dual-fuel diesel combined with bioethanol injection at 10 ms. The dual-fuel modes were able to improve engine performance by increasing brake thermal efficiency and diesel saving.
16:35-16:50	(IE25-441A) Enhancing Zinc Ion Energy Devices with Solution-Processable Protection Layers for High-Performance Zn-Ion Capacitors **Ian Yi-yu Bu**, Kuan Hsun Chen, How-Wei Ke National University of Tainan, Taiwan Abstract: This study introduces a practical approach to enhance Zn-based energy storage devices using water-based electrolytes and Zinc foil. Despite their competitive energy density, high safety, and cost-efficiency, the progress of Zn-based storage devices is challenged by issues like dendrite growth and undesirable hydrogen evolution reactions (HRE). To address this, we propose an industrially compatible, spin-coated transition metal-based protection film that suppresses dendrite growth and facilitates Zn-ion transport. Under optimized conditions, this protective film enhances the specific capacitance by ~18% after 100 cycles, owing to Zn surface activation, which increases active sites for charge storage. Our findings show that the transition metal layer electrochemically converts between various forms of oxide, promoting Zn-ion desolvation and preventing HRE. This research offers a viable strategy for developing high-performance, stabilized, and dendrite-free Zn anodes for advanced Zn-based energy storage systems.
16:50-17:05 zoom	(IE25-621) Simultaneous Operation of Chilling and Warming Applications Using Thermoelectric Peltier Modules **Alexander Hamilton Atienza**, Dan Michael A. Tutanes,Pierre Hendrik Z. Ulita Mapua Malayan Colleges Laguna, Philippines

	Abstract: This study presents an analytical and experimental study on the integration of thermoelectric modules into the simultaneous operation of chilling and warming applications. The system involves a non-magnetic stainless steel, insulation materials, thermoelectric modules with its one side exposed to the heating section of the warming section and the other side attached to the cooling section of the chilling section. It was found out the maximum temperature reached for warming applications is 40ºC while chilling temperature is 12ºC. Both temperatures are within the standard general warming and chilling applications. The Peltier coefficient obtained was 0.25 V while the Seebeck coefficient was 0.37 V/K and Thomson coefficient was 0.0092 V/ K.
17:05-17:20	(IE25-460) Exploring the Drivers of Green Buying Behavior of Skincare Products in Indonesia’ s Major Cities: A Contribution to SDG 12 on Responsible Consumption **Audrey Pantoni**, Tengku Mohd. Khairal Abdullah, Suriani Sukri Bina Nusantara University, Indonesia Abstract: Research on sustainable consumption has been gaining ground for the last several years. Variables such as Atti-tudes, Environmental Concern, Peer Influence, Purchase Inten-tion & Green Buying Behavior although has been investigated in many contexts, still produced many inconsistencies. Researches on this field also still lacking the context of developing nation, as developing nation was argued to be not really into sustainable consumption. Therefore, this study focuses on the drivers of Green Buying Behavior of Green Skincare Products in Indone-sia’ s major cities as effort to contribute to the literature. Survey research was performed involving 250 respondents across Ja-karta, Bandung, Surabaya, Semarang and Medan. Hypotheses testing shows that Attitude, Environment Concern, Green Brand Evaluation, Peer Influence positively influence Purchase Inten-tion. Results also show that Attitude and Purchase Intention sig-nificantly produced mediating effects towards Green Buying Be-havior. This study hopes to contribute towards the literature of sustainable consumption in the context of Green Buying Behav-ior. The implication of this study towards the practical side of the business quite meaningful as it proposed the importance of brand image and peer influence as important determinants in the buying behavior of skincare products.
17:20-17:35 zoom	(IE25-615) Design and Analysis of Thermoacoustic Beta Type Stirling Engine with Piston Flywheel Energy Harvester Coupled with Dynamo Motor **Alexander Hamilton Atienza**, Mark Kennedy S. Molinar, Robin Cocoy M. Punongbayan Mapua Malayan Colleges Laguna, Philippines Abstract: One of the most promising types of energy to generate electricity is the vibrations of atoms by sound waves caused by thermal energy, known as thermoacoustic energy. A manner of recovering heat from a low-temperature source or solar energy can cause sound oscillations, which can be converted to electrical energy. This form of energy draws little attention compared to other energy sources that are highly explored nowadays. This study aimed to present an analytical and experimental study of a thermoacoustic Stirling engine system. The proposed system was formed to deliver more power than those systems that do not use moving parts, such as piezoelectric and thermoelectric devices, as harvesters. The prototype under study was made of pure aluminum heated by a heat source, a resonant tube with the stack, fibra wood to insulate hot and cold side gases, a piston-flywheel harvester, and a dynamo motor for electrical conversion. It used an alcohol lamp as the heat source. The maximum temperature difference of 71ºC was recorded. The maximum generated power from the system was 39.36 W.
Best Presentation Award & Session Group Photo	

Poster Session

July 26th, 2025 | 15:50 – 17:35
Venue: **2E**

■ Topic: Modern Power Control System and Environmental Information Technology

- **We will provide the tape and assist the author to stick it on the wall.**
- **Please ask the staff to help you take a photo if needed.**
- **The certificate will be prepared after the session.**

Poster 1	(IE25-613) Research on the Identification of Simulation Error Regions Based on Graph Information in Power Systems **Yanzhe Cheng**, Jule Zhao, Yibo Zhou, Mingzhi Chen, Qiyue Wang Northeast Electric Power University, China Abstract: Research on sustainable consumption has been gaining ground for the last several years. Variables such as Atti-tudes, Environmental Concern, Peer Influence, Purchase Inten-tion & Green Buying Behavior although has been investigated in many contexts, still produced many inconsistencies. Researches on this field also still lacking the context of developing nation, as developing nation was argued to be not really into sustainable consumption. Therefore, this study focuses on the drivers of Green Buying Behavior of Green Skincare Products in Indone-sia's major cities as effort to contribute to the literature. Survey research was performed involving 250 respondents across Ja-karta, Bandung, Surabaya, Semarang and Medan. Hypotheses testing shows that Attitude, Environment Concern, Green Brand Evaluation, Peer Influence positively influence Purchase Inten-tion. Results also show that Attitude and Purchase Intention sig-nificantly produced mediating effects towards Green Buying Be-havior. This study hopes to contribute towards the literature of sustainable consumption in the context of Green Buying Behav-ior. The implication of this study towards the practical side of the business quite meaningful as it proposed the importance of brand image and peer influence as important determinants in the buying behavior of skincare products.
Poster 2	(IE25-409A) The association of organophosphate flame retardants (OPFRs) exposure on omega-3 fatty acids metabolism: Evidence derived from the United States general population **Fu-Jen Cheng** Kaohsiung Chang Gung Memorial Hospital, Taiwan Abstract: **Background**: Previous studies have identified links between exposure to organo-phosphate flame retardants (OPFRs) and lipid metabolism. However, the relationship between OPFR exposure and omega-3 fatty acid levels, particularly in a large population-based dataset, remains unclear. This study aimed to explore these associations by analyzing the 2011–2014 NHANES dataset, extending findings from prior work that primarily focused on lipid profiles. **Methods:** We analyzed a representative sample of 1,350 adults (aged ≥ 20 years) from the NHANES 2011–2014 cohort. Urinary levels of five OPFR metabolites were measured and corre-

	lated with serum omega-3 fatty acids, including eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), and docosapentaenoic acid (DPA), after adjusting for potential confounders. **Results:** We found that a one-unit increase in the log-transformed diphenyl phosphate (DPhP) level was negatively associated with eicosapentaenoic acid (EPA) (regression coefficient = -7.915, p=0.015), docosahexaenoic acid (DHA) (regression coefficient = -18.096, p=0.004), and docosapentaenoic acid (DPA) (regression coefficient = -4.743, p=0.001) levels. One unit increase in the bis(1,3-dichloro-2-propyl) phosphate (BDCPP) level was negatively associated with EPA (regres-sion coefficient = -9.047, p=0.03), one-unit increase in the log bis-(1-chloro-2-propyl) phosphate (BCEP) level was negatively associated with DHA (regression coefficient = -7.112, p=0.035), and one-unit increase in the log dibutyl phosphate (DBUP) level was negatively associated with al-pha-linolenic acid (regression coefficient = -9.670, p = 0.04) and DPA (regression coefficient = -4.351, p=0.004) levels. Furthermore, the quartile increases in the levels of DPhP (p for trend=0.028) and BDCPP (p for trend=0.019) were negatively correlated with EPA, with differences of approxi-mately 18.2% and 18.4% between the upper and lower quartiles, respectively. Additionally, quartile increases in the levels of DPhP (p for trend<0.001) and sum of OPFRs (ΣOPFRs) (p for trend=0.024) were negatively correlated with DHA levels, with approximately 17.5% and 9.4% differences between the upper and lower quartiles. **Conclusions:** We found that a significant negative association between OPFRs and omega-3 fatty acid levels in the general U.S. population. These findings suggest that OPFR exposure may disrupt omega-3 fatty acid metabolism, which could have implications for human health. These results underscore the need for further research into the potential metabolic disruptions caused by OPFRs, particularly as exposure levels continue to rise.
Poster 3	(IE25-411A) Identification of Stable Low-Arsenic Rice Genotypes and Health Risk Assessment in Paddy Environments in Taiwan **Bo-Ching Chen**, Kai-Wei Juang Nanhua University, Taiwan Abstract: Arsenic (As) accumulation in rice poses a global health risk. This study assessed 12 rice genotypes grown across 18 As-rich environments in Taiwan. While 67% of the environments reflected soil As contamination, only 50% had brown rice As levels exceeding the maximum permissible concentration (MPC). Environmental factors significantly influenced grain As concentration. Using biplot and statistical analysis, five genotypes—TCS17, TCS10, TT30, KH139, and TC192—were identified as stable low-risk genotypes with low probabilities of exceeding the MPC. Health risk assessments based on these genotypes showed that the 75th percentile hazard quotient (HQ) values were below 1, indicating acceptable risk for most local residents. Among them, TCS17 was recommended as the safest genotype for immediate cultivation. The methodology can also be applied to identify low-As-risk rice in other regions.
Poster 4	(IE25-413A) Development of Modified Soil Drought Indices Using UAV Multispectral Imagery for Wheat Yield Prediction **Tung-Ching Su** National Quemoy University, Taiwan Abstract: In regions experiencing limited rainfall, agricultural productivity significantly depends on effective water management. This study aimed to accurately estimate soil moisture and predict wheat yields using UAV-based multispectral remote sensing combined with modified soil drought indices (SDIs). Specifically, the research developed an improved drought index, MPDI 2.0, to address limitations observed in previous models (PDI and MPDI), which occasionally exhibited illogical positive correlations with soil moisture due to vegetation effects. Multispectral images were acquired by UAV across multiple wheat growth stages at two experimental fields in Kinmen, Taiwan. The modified index (MPDI 2.0) was calculated, and its effectiveness was assessed through

	Gradient Boosting Regression (GBR) modeling, correlating the index with measured soil moisture and wheat yield data. Results demonstrated that MPDI 2.0 effectively corrected negative values produced by dense vegetation cover in the original MPDI. While MPDI 2.0 improved the logical consistency of soil moisture estimation, it provided limited improvements in correlation strength (R^2 values) compared to the original indices. Nevertheless, the spatial distribution maps of soil moisture generated using MPDI 2.0 provided reliable insights into field heterogeneity. Wheat yield predictions using MPDI 2.0 showed reasonable accuracy and practical applicability, highlighting its potential for precision agriculture in drought-prone regions.
Poster 5	(IE25-416A) Development of a CO_2-tolerant microalga for high-efficiency sustainable aviation fuel feedstock production Yu-Han Chang, **Chun-Yen Chen** National Cheng Kung University, Taiwan Abstract: In response to the global goal of achieving net-zero carbon emissions by 2050, industries worldwide are actively developing technologies to reduce carbon output. The aviation sector, which contributes approximately 2 – 3% of global carbon emissions, is urgently seeking alternative fuel sources. Sustainable aviation fuel (SAF) is currently considered the most promising replacement for fossil-based jet fuel, primarily because it is derived from renewable biomass rather than petroleum. According to projections by the International Air Transport Association (IATA), there will be a supply gap of approximately 325 million tons of SAF by 2050, highlighting the urgent global demand for SAF feedstocks and the significant commercial opportunities this presents. In light of this, our study successfully isolated a CO_2-tolerant, oil/lipid-producing microalga strain, CY1368, from southern Taiwan. Under simulated flue gas conditions with a controlled CO_2 concentration of 10%, the strain CY1368 achieved a CO_2 removal efficiency of over 82.7% and a oil/lipid accumulation rate of 44.6%. To further enhance oil/lipid productivity and carbon dioxide removal efficiency, immobilization materials were employed. The results showed improvements in both metrics, with CO_2 removal efficiency reaching 93.1% and oil/lipid accumulation increasing to 48.3%. Further analysis of the extracted algal oil/lipid confirmed its suitability as an SAF feedstock, with an acid value below 4.1 mg KOH/g and heavy metal contents all under 5.0 mg/kg, fully meeting SAF feedstock standards. These results demonstrate that microalgal strain CY1368 is a promising candidate for sustainable aviation fuel production using flue gas as a carbon source.
Poster 6	(IE25-420A) Effects of Hydraulic Retention Time and pH for Thermal Efficiency in Biogas Products from Food Waste via Anaerobic Digestion Method **Natthawat Wisaiprom, Thanyamai Samhirun, Apichart Thammajarn** King Mongkut's University of Technology Thonburi, Thailand Abstract: This study explores the influence of Hydraulic Retention Time (HRT) and pH on the efficiency of biogas production and methane (CH_4) concentration in anaerobic digestion systems. Findings indicate that extending HRT enhances biogas output and improves methane purity, while simultaneously reducing levels of carbon dioxide (CO_2), oxygen (O_2), and nitrogen (N_2), reflecting more effective methanogenic activity. As HRT increases from 10 to 30 days, biogas yield improves from 0.6 to 1.0 m^3/kg.VS, and CH_4 concentration rises from 54.71% to 65.92%. The decline in CO_2 content from 37.89% to 31.38% further supports the development of more stable anaerobic conditions. Despite these benefits, extended HRTs require larger digester capacities and raise operational expenses, underlining the necessity of identifying an economically viable operational window. At an HRT of 30 days, pH variation shows that methane levels grow from 63.78% at pH 6.0 to a peak of 73.46% at pH 9.0, with optimal methanogenesis observed between pH 7.0 and 8.5. The study also observes significant reductions in Chemical Oxygen Demand (COD) within the first 10 days, indicating rapid breakdown of organic substrates. Alkaline conditions appear to mitigate the inhibitory effects of volatile fatty acids, thereby enhancing methane quality, calorific value, and thermal efficiency. Overall, the results emphasize the critical role of fine-tuning both HRT and pH to maximize biogas yield, improve energy recovery, and promote more sustainable anaerobic digestion system performance.

Poster 7	(IE25-454A) Antibacterial Air Filter Using Cu-Grafted TiO_2 Nanotube **Seunghyun Weon** Korea University, Korea Abstract: Airborne transmission of pathogens has become an urgent public health concern amid recurring pandemics. While conventional air filters capture bioaerosols, they risk secondary contamination due to pathogen re-emission, underscoring the need for long-lasting air sterilization. We developed a photo-regenerable air filter based on copper cluster-grafted titanium dioxide nanotube mesh (CuxO/mTNT, $1 < x < 2$). The in-situ grown nanotubes on a mesh substrate offer high surface area, and the uniformly dispersed Cu clusters exhibit potent antimicrobial activity. The filter rapidly inactivated Gram-negative Escherichia coli (4.80 log reduction), Gram-positive Staphylococcus aureus (2.58 log reduction), and respiratory viruses including influenza A, influenza B, and RSV within minutes. Although Cu-based nanomaterials are effective antimicrobials, their activity diminishes as Cu(I) oxidizes to Cu(II). In our system, interfacial charge transfer (IFCT) between Cu clusters and TiO_2 enables visible-light absorption and promotes continuous Cu(I) regeneration under mild illumination, sustaining disinfection efficacy. When integrated into commercial air purifiers, the CuxO/mTNT filter provided efficient spatial disinfection, demonstrated stable photo-regeneration over 10 cycles, and maintained robust performance for over six months. Field tests revealed its superior sterilization capability compared to conventional filters, which left residual microbial contamination and potential health risks.
Poster 8	(IE25-461A) A Research on Sustainable Fashion in Indonesia: Drivers of Green Purchasing Behavior and Its Role in Achieving SDG 12 Flavia Priscilla Adisoethjahya, **Tengku Mohd. Khairal Abdullah**, Irina Safitri Zen Bina Nusantara University, Indonesia Abstract: Research on sustainability has gained tremendous footsteps for the past decades, especially in developed countries. However, such research has still been lacking in developing na-tion such as Indonesia, especially in the context of sustainable fashion. Studies on Green Purchase Intention and Green Buying Behavior, although has gained momentum, still produced lots of consistencies and gaps. This study focuses on the drivers of Green Buying Behavior, with antecedents such as Online Com-munities, Environmental Concern, Social Media Activities and Green Washing Concerns with Fashion Clothing Involvement & Purchase Intention as the mediating variables. Survey research was performed collecting 250 respondents from all over Indone-sia, with the focus of age group between 18 to 35. The data col-lected mostly from Females (67%) and mostly belong to middle class (41.7%). Results showed that Online Communities with En-vironmental Concerns, Social media Activities & Greenwashing Concern significantly influence Green Purchase Behavior, while Fashion Clothing Involvement & Purchase Intention signifi-cantly mediates the relationship. This study hopes to provide ad-ditional light in the literature of sustainability, especially in the field of sustainable fashion. The practical implication of the study hopes to emphasis the important role of social media, online communities as well as consideration for green washing towards the buying behavior of sustainable fashion.
Poster 9	(IE25-610-A) Development of Eco-Oriented Low-Fluorinated SPEEK/GPE Composite Membrane for Proton Exchange Membrane Fuel Cells **Mingming Ge**, Zhenshuo Guo, Jinhua Zhang, Chuanyu Sun Beijing Normal-Hong Kong Baptist University, China Abstract: This study takes the reduction of environmental pollution as starting point, developing and applying green, sustainable energy technologies to lessen dependence on fossil fuels. In view of the high cost, poor durability, and import dependence of conventional proton exchange membranes for hydrogen fuel cells, a low-fluorinated SPEEK/GPE composite membrane technology has been developed. By precisely controlling the sulfonation degree (58 – 65%) of the SPEEK membrane and the gradient distribution of fluorinated graphene, a synergistic enhancement of proton conductivity and mechanical strength has been achieved. These low-cost, high-performance proton exchange membrane fuel cells will provide dual benefits: firstly, by significantly reducing the fluorine content compared to traditional perfluorosulfonic acid membranes, they effectively lower the bioaccumulation risk of perfluorinated compounds

	(PFOA/PFOS); secondly, they support distributed hydrogen energy systems as alternatives to diesel generators, thereby reducing noise pollution in urban ecological corridors and rendering energy cleaner. Green hydrogen-driven proton exchange membrane fuel cells are used to power the observation station, with real-time CO_2 emission reduction data displayed in comparison to conventional energy sources to create a carbon footprint visualization educational scenario. Moreover, this composite membrane technology substantially improves fuel cell energy conversion efficiency and reduces operating costs while ensuring long-term system stability and safety.
Poster 10	(IE25-619) Regulation Methods for Rural New Energy Consumption Based on Photovoltaic-Storage-Charging Microgrid **Wen Peng Dai**, Liang Huang Wuhan University of Technology, China Abstract: Research on sustainability has gained tremendous footsteps for the past decades, especially in developed countries. However, such research has still been lacking in developing na-tion such as Indonesia, especially in the context of sustainable fashion. Studies on Green Purchase Intention and Green Buying Behavior, although has gained momentum, still produced lots of consistencies and gaps. This study focuses on the drivers of Green Buying Behavior, with antecedents such as Online Com-munities, Environmental Concern, Social Media Activities and Green Washing Concerns with Fashion Clothing Involvement & Purchase Intention as the mediating variables. Survey research was performed collecting 250 respondents from all over Indone-sia, with the focus of age group between 18 to 35. The data col-lected mostly from Females (67%) and mostly belong to middle class (41.7%). Results showed that Online Communities with En-vironmental Concerns, Social media Activities & Greenwashing Concern significantly influence Green Purchase Behavior, while Fashion Clothing Involvement & Purchase Intention signifi-cantly mediates the relationship. This study hopes to provide ad-ditional light in the literature of sustainability, especially in the field of sustainable fashion. The practical implication of the study hopes to emphasis the important role of social media, online communities as well as consideration for green washing towards the buying behavior of sustainable fashion.
Poster 11	(IE25-401) Applying Case-Based Reasoning (CBR) for Environmental Sustainability: Mitigating PM 2.5 Pollution in Chiang Mai, Thailand Thacha Lawanna, Zhai Fan, Jittima Wongwuttiwat Chiang Mai University, Thailand Abstract: Four approaches for managing crop residues and mitigating PM 2.5 pollution in Chiang Mai were studied: Crop Residue Management (CRM), Community-Led Awareness (CLA), Policy Enforcement and Incentives (PEI), and Case-Based Reasoning (CBR). The approaches are assessed based on five key metrics: Cost Efficiency, Adaptability to Local Context, Sustainability, Impact on PM 2.5 Pollution, and Flexibility & Continuous Improvement. Among the methods, CBR emerges as the most effective, outperforming others in all metrics, with scores of 85% for Cost Efficiency, 90% for Adaptability to Local Context, 85% for Sustainability, 90% for Impact on PM 2.5 Pollution, and 95% for Flexibility & Continuous Improvement. Unlike traditional models, CBR uses historical data and local context to provide adaptive, dynamic solutions that evolve. This adaptability allows for continuous improvement, reducing reliance on trial-and-error methods. While mechanized solutions, community awareness programs, and policy enforcement are valuable, they face challenges such as high costs, limited adoption, and weak enforcement. CBR, however, addresses these limitations by offering cost-effective, tailored strategies that enhance long-term sustainability and reduce PM 2.5 emissions from agricultural burning. The study suggests integrating CBR with real-time monitoring tools and exploring its application in other regions with similar challenges to further enhance its impact. Future research should focus on combining CBR with advanced technologies, like artificial intelligence and machine learning, to predict and mitigate PM 2.5 pollution more effectively, ensuring a more dynamic and responsive approach to air quality management.

Delegates

- Lin Lin, University of Science and Technology Beijing, China
- Lu-Yi Sun, University of Science and Technology Beijing, China
- Sabrina Yanan Jiang, Macau University of Science and Technology, China
- Chan Chee Chuen, Tan Tock Seng Hospital, Singapore
- Seok Dockko, Dankook University, Republic of Korea (South)
- Robertus Dermawan Pantoni, Indonesia

One Free Day in Tokyo

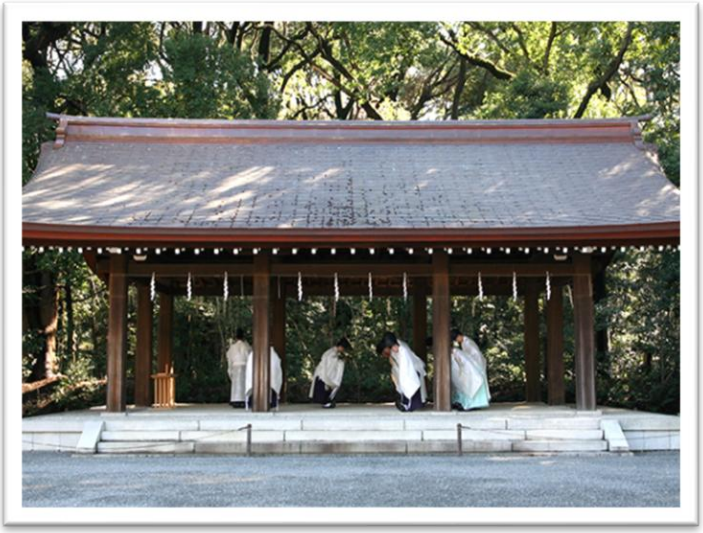
Time: Free Day - July 27th, 2025 (Time Zone:UTC+9)

Scheduling Recommendation:

➢ Meiji Jingu Shrine

Meiji Jingu is one of the Shinto shrines in Japan, with the vast land of the forest (70 ha.), located in the middle of the megacity, Tokyo. Once you step into this precinct, you will forget that you are in the hustle bustle city, and will find Japanese traditional scene amidst greenery nature. It was established in 1920, to commemorate the virtue of Emperor Meiji and Empress Shoken who took the initiative to make a foundation of modernized Japan.

- ✧ Web: https://www.meijijingu.or.jp/en/
- ✧ Ticket: Free
- ✧ Open hours: 5:00 -18:20
- ✧ Address: 1-1, Yoyogi Kamizono-cho, Shibuya-ku, Tokyo 151-8557, Japan



➢ Senso-ji Temple

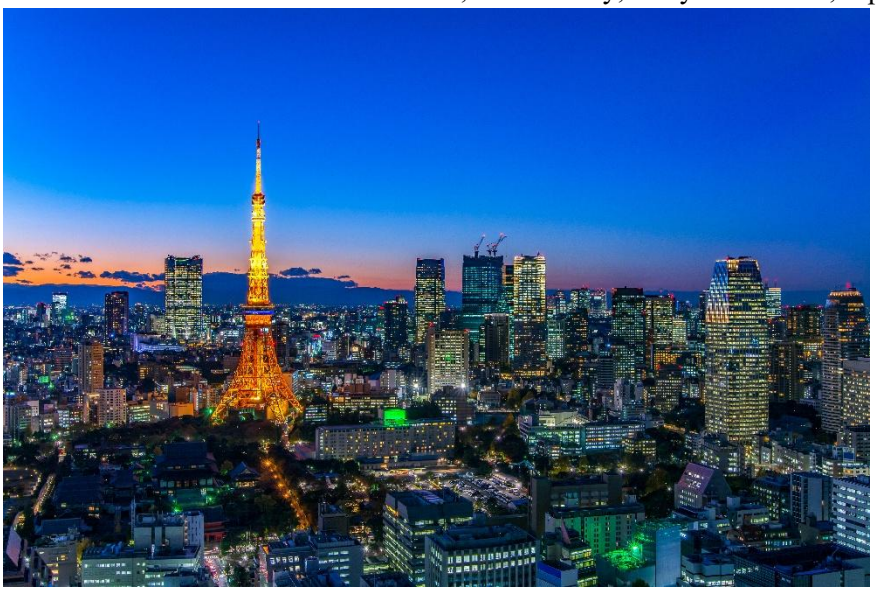
Senso-ji is the oldest temple in Tokyo. Known throughout Japan, it is the temple of Avalokitesvara Bodhisattva (Sho Kanzeon Bosatsu),who embodies the mercy of all Buddhas. This important center of religious faith draws 30 million worshippers every year.

- ✧ Web: https://www.senso-ji.jp/english/
- ✧ Ticket: Free
- ✧ Open hours: 6:00 – 17:00 (main hall)
- ✧ Address: 2-3-1 Asakusa, Taito-ku, Tokyo 111-0032, Japan

➢ Tokyo Tower

Tokyo Tower is a touristic spot that provides visitors with a magnificent 360° view of the surroundings, right from the center of Tokyo.

- ✧ Web: https://en.tokyotower.co.jp/
- ✧ Ticket: https://en.tokyotower.co.jp/ticket/
- ✧ Open hours: 9:00 – 23:00
- ✧ Address: 4 Chome-2-8 Shibakoen, Minato City, Tokyo 105-0011, Japan



➢ Tokyo Skytree

The Tokyo Skytree (東京スカイツリー) is a television broadcasting tower and landmark of Tokyo. It is the centerpiece of the Tokyo Skytree Town in the Sumida City Ward, not far away from Asakusa. With a height of 634 meters (634 can be read as "Musashi", a historic name of the Tokyo Region), it is the tallest structure in Japan and was the second tallest in the world at the time of its completion. A large shopping complex with an aquarium is located at its base.

- ✧ Web: https://www.tokyo-skytree.jp/en/
- ✧ Ticket: https://www.tokyo-skytree.jp/en/ticket/individual/
- ✧ Open hours: 10:00 to 22:00 (from 9:00 on Sundays and national holidays) Admission ends one hour before closing
- ✧ Address: 1 Chome-1-2 Oshiage, Sumida City, Tokyo 131-004, Japan

➢ Shibuya Crossing

Shibuya Crossing is one of Tokyo's most recognizable sights, pictured in countless films, magazines and blogs. During its busiest times, an estimated 1,000 to 2,500 people forge their way across this intersection every two minutes, enough to quickly fill up a football stadium.
The phenomenon gave rise to its nickname "scramble," as pedestrians cross from all directions. Shibuya Crossing walks the line between manic chaos and perfect synchronization. Your explorations of Tokyo will eventually bring you here to make your crossing and take advantage of Shibuya's wealth of shopping, dining and entertainment options.

- ✧ Ticket: Free (crossing); Shibuya Sky (book online)
- ✧ Open hours: Crossing always open; Shibuya Sky 10:00–22:30
- ✧ **How to get there**: Shibuya Crossing is located directly outside Shibuya Station's Hachiko exit.Take the major city loop, the JR Yamanote Line, and get off at Shibuya Station. The JR Saikyo and Shonan Shinjuku lines, The Keio Inokashira, Tokyu Den-en-toshi and Tokyu Toyoko lines all stop at Shibuya, as do the Tokyo Metro Ginza, Hanzomon and Fukutoshin subway lines.

NOTE