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Malaysia

International Conference

ENERGY TRANSITION & EXHIBITION 2024

5 - 7 SEPTEMBER 2024

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Edited by Fethma M. Nor, Kyaw Myo Aung, Nurul Amira Mohd Ramli, Ziad Bennour

1st International Conference on Energy Transition and Exhibition (ICETe24)
Miri, Malaysia
5 – 7 September 2024

Organised by:
Faculty of Engineering and Science, Curtin University, Malaysia

Pro Vice-Chancellor's Welcome

It is my pleasure to extend a warm welcome to all delegates attending the inaugural International Conference on Energy Transition & Exhibition 2024 (ICETe24). We are delighted to have such a distinguished gathering of experts, academics, and industry leaders from around the world as we come together to address some of the most critical issues shaping the future of energy.

This conference, focusing on Renewable and Sustainable Energy, Clean Transitional Energy, Waste Energy Recovery, Automation in Energy Systems, and Energy Policies, among other relevant areas, is a timely and significant platform. These topics resonate deeply with global efforts toward a cleaner and more sustainable energy landscape, and I am proud that Curtin Malaysia is taking a leading role in this important conversation.

We are also honoured to have the support of the Premier of Sarawak's Office, the Ministry of Energy and Environmental Sustainability Sarawak (MEEsty), the Institution of Chemical Engineers Malaysia Chapter (IChemE), American Chemical Society (ACS) Malaysia Chapter, and the Institution of Engineers Malaysia (IEM), Miri Branch, for this event. Their collaboration highlights the shared commitment to advancing Sarawak's energy transition, in alignment with the Post-COVID-19 Development Strategy 2030 (PCDS 2030), which envisions a 'prosperous, inclusive, and environmentally sustainable Sarawak.'

ICETe24 is more than just a conference. It is a milestone event for our region, and includes the launch of Curtin Malaysia's Hydrogen Testbed & Refueling Station and the establishment of the Centre of New and Sustainable Energy Research and Venture (CoNSERV). These initiatives demonstrate our dedication to driving innovation and research that supports Malaysia's and Sarawak's energy transition roadmap.

We are privileged to host keynote and invited speakers from renowned institutions across the Asia-Pacific region. Their insights, combined with the diverse perspectives of delegates from more than 10 countries, will undoubtedly enrich our discussions.

On behalf of Curtin University Malaysia, I extend my heartfelt thanks to our industry partners for their support and to all our sponsors for making this event possible. The industry exhibition accompanying the conference will further showcase the synergy between academic research and industry innovation.

Once again, welcome to ICETe24. I wish you a fruitful conference filled with productive exchanges, meaningful collaborations, and inspiring ideas as we work together towards a greener and more sustainable future.

Professor Simon Leunig
Pro Vice-Chancellor, President and Chief Executive
Curtin University Malaysia

Dean's Welcome

On behalf of the Faculty of Engineering and Science at Curtin University Malaysia, I would like to warmly welcome all attendees of the International Conference on Energy Transition and Exhibition 2024 (ICETe24). We are thrilled to host you on our beautiful campus in Miri, Sarawak.

This conference and exhibition will provide a platform to showcase the latest advancements and valuable lessons learned in research, development, policy, and implementation concerning future energy and energy transition. For the first time, we are bringing experts from academia, industry, and government to the northern region of Sarawak, Borneo.

The timing of this important forum in Sarawak is especially significant as it aligns with the Post-COVID-19 Development Strategy 2030 (PCDS 2030), which envisions a "prosperous, inclusive, and environmentally sustainable Sarawak."

The Faculty of Engineering and Science at Curtin Malaysia is dedicated to leading in education and research within the fields of energy, intelligent, and sustainable technologies. Beyond offering world-class higher education right here in Miri, we are also actively collaborating with regional and local industries and communities to tackle current challenges and work towards a brighter and more sustainable future.

We encourage you to actively participate in all the activities of this meaningful event, enjoy your time in Miri, and foster strong partnerships. Together, we can make a difference.

Thank you, and best wishes,

Prof. Dr. Tuong-Thuy Vu
Dean
Faculty of Engineering and Science
Curtin University, Malaysia

General Chair's Welcome

I am honoured to welcome you to the inaugural conference, the International Conference on Energy Transition and Exhibition 2024 (ICETe24), organised by the Faculty of Engineering & Science, Curtin University Malaysia. I am also pleased to receive support from the Premier Office, the Ministry of Energy and Environmental Sustainability Sarawak (MEEsty), the Institution of Chemical Engineers Malaysia Chapter (IChemE), American Chemistry Society (ACS) Malaysia Chapter and the Institution of Engineers Malaysia (IEM), Miri Branch to host the ICETe'24 conference on 5-7 September 2024 in Curtin University Malaysia. The organisation of ICETe'24 is also held in parallel with the launching of the first hydrogen testbed and refuelling station in the northern region of Miri as well as the establishment of the Centre of New and Sustainable Energy Research and Venture (CoNSERV) in Curtin University Malaysia. This marks the commitment of Curtin University Malaysia to supporting the national and state energy transition roadmap for a greener tomorrow.

ICETe24 is a paramount event dedicated to advancing the dialogue on one of the most pressing challenges of our time: The transition towards a sustainable and resilient energy future. This conference and exhibition aim to be a beacon of knowledge, collaboration and action in a world marked by increasing energy demands, environmental concerns and the need for innovative solutions. It is a prestigious gathering of experts, industry leaders, and stakeholders to discuss and shape the future of energy transition, showcasing ground-breaking innovations and fostering collaboration in renewable energy, sustainability, and environmental conservation.

I would like to take this opportunity to thank all our exhibitors and sponsors for your support and participation in our exhibition. Your contributions enhance the quality of our event and demonstrate your dedication to the energy sector. We are excited to showcase the remarkable innovations and opportunities that your presence brings to our delegates.

To everyone attending this event, I encourage you to take full advantage of the opportunities that lie ahead—engage with our exhibitors, participate in keynotes and parallel sessions, and connect with fellow attendees. Your involvement will undoubtedly enrich the experience for everyone. I look forward to seeing you at ICETe'24 and wish you a fruitful and memorable experience.

We hope you enjoy the conference and your stay in Miri, Malaysia.

Thank you, and best wishes,

Prof. Ir. Ts. Dr. Yen San CHAN
General Chairs

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Prof. Ramasamy Nagarajan
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Dr. Ziad Bennour

(Listed in alphabetical order)

GUEST SPEAKERS

Keynote Speakers

Prof. Dr. Reuy-An Doong
National Tsing Hua University, Taiwan

Prof. Dr. Saidur Rahman
Sunway University Malaysia, Malaysia

Acd. Prof. Dr. Alvin B. Culaba
National Academy of Science and Technology, Philippines

Prof. Ir. Dr. Yun Seng Lim
Universiti Tunku Abdul Rahman, Malaysia

Prof. Ir. Wahyudi Sutopo
Universitas Sebelas Maret, Indonesia

Prof. Dr. Prabhu Sethuramalingam
SRM Institute of Science and Technology, India

Ir. Ts. Dr. Harris A. Rahman Sabri
Petronas Carigali Sdn Bhd, Malaysia

(Listed in order of appearance during the conference)

Keynote Speaker 1

Prof. Dr. Reuy-An Doong
National Tsing Hua University, Taiwan

Professor Dr. Ruey-An Doong has received his Ph.D. in Environmental Engineering at National Taiwan University Taiwan in 1992. Currently he is working as full professor in Department of biomedical Engineering and Environmental Sciences National Tsing Hua University, Taiwan. He is serving as an editorial member of several reputed Journals like Journal of Environmental Engineering and Management and Global Journal of Environmental Science and Technology. He is authored more than 100 research articles/ books. He has honoured as fellow of Alexander von Humboldt Foundation, Germany.

Keynote Speaker 2

Prof. Dr. Saidur Rahman
Sunway University Malaysia, Malaysia

Professor Saidur Rahman is a Distinguished Research Professor and Head of the Research Centre for Nano-Materials and Energy Technology at Sunway University. He was Chair Professor in the Center of Research Excellence in Renewable Energy at King Fahd University of Petroleum & Minerals (KFUPM). Prior to joining KFUPM, he worked for 18 years at University of Malaya, a premier research university in Malaysia. Thomson Reuters awarded him as a highly-cited researcher for being among the top 1% of researchers with most cited documents in his research field from 2014 to 2016. Professor Rahman also won the highest accumulation citation award from University of Malaya for four consecutive years from 2011 to 2014. A number of his papers was listed among the top 25 articles in ScienceDirect published by Elsevier Limited. He has published more than 350 journal papers and a majority of them are in top-ranking journals. He has more than 16,000 citations with an h-index of 60 in Google Scholar. To-date, Professor Rahman has supervised more than 65 postgraduate students and has secured and managed more than RM10 million in research grants in Malaysia. He is currently working on improving the performance of solar thermal system with the application of nanofluids and phase change materials.

Keynote Speaker 3

Acd. Prof. Dr. Alvin B. Culaba
National Academy of Science and Technology, Philippines

Acd. Culaba is recognized for his pioneering and significant contributions in the area of Life Cycle Assessment (LCA) theory and applications, renewable energy systems and alternative energy and cleaner production and technology. He developed a diagnostic model for the assessment of green productivity of manufacturing processes and utilized the LCA methodology in the analysis of biofuels as alternative transportation fuel which helped in the formulation of the Philippine Biofuels Act of 2006. His studies with students and co-workers related to bio-energy, alternative energy fuels, and renewable energy and transport systems are highly significant in the light of current high energy costs and global climate change issues. In 2006, he established the Philippine LCA Clearinghouse (PhilCA) at DLSU-Manila to provide the link to the International LCA network and serve as the country's center for LCA research. He established the first and only PhD in Mechanical Engineering program in the country and has selflessly conducted training on research and education in many engineering schools around the country. Acd. Culaba is currently a member of Engineering Sciences and Technology Division.

Keynote Speaker 4

Prof. Ir. Dr. Yun Seng Lim
Universiti Tunku Abdul Rahman, Malaysia

Professor Ir. Dr. Lim Yun Seng has successfully developed the first utility scale, self-intelligent energy storage system (ESS) of 400kVA and 677kWh on the power grid in Malaysia using patented controllers to reduce maximum power demands for customers and utilities. The novel system enables utilities like TNB avoid adding new power plants and/or upgrading power networks, resulting in greenhouse emissions reduction and brings down the price of electricity which is essential to a developing country. The system also reduces commercial end-user electricity bills by reducing maximum demand charges. He has also developed another novel ESS that promotes renewable energy sources to mitigate climate change issues. His main contribution is the development of new controllers for ESS as all-round solutions for energy trilemma. Prof Lim is the founder and director of a spin-off company, IoT Energy S/B that designs ESS projects and setup energy system for utilities such as TNB R&D. Prof Lim set up ESS in Daikin factory in Sungai Buloh. Prof Lim has published 62 journal papers (5 journals are ranked in the top 5% in Clarivate Analysis) with 2222 citations at h-index of 22 in Google Scholar. He obtained RM7.9 million in research funding, consultancy projects worth RM67,900 and holds 3 granted patents (Malaysia and China) and 5 pending patents (3 in Malaysia and 2 in Indonesia). Prof Lim has successfully graduated 7 PhD and 15 Master students out of 28 postgraduate students. He was the lead author for the Intergovernmental Panel on Climate Change Sixth Assessment Report under Working Group 3. Prof Lim has been the recipient of 26 international and nation awards including National Outstanding Innovator Award 2017, Top Research Scientist Malaysia 2018, and 2020 MTSF Science & Technology Award.

Keynote Speaker 5

Prof. Ir. Wahyudi Sutopo
Universitas Sebelas Maret, Indonesia

Wahyudi Sutopo is Professor of Industrial Engineering and Head of the Industrial Engineering and Techno-Economics Group Research (GR-RITE) at the Faculty of Engineering of Universitas Sebelas Maret (UNS). His educational background is the profession of engineer (Ir) from the Professional Engineering Program UNS in 2018; Doctor (Dr) in Industrial Engineering & Management from Institut Teknologi Bandung (ITB) in 2011; Master of Management (M.Si.) from Universitas Indonesia in 2004, and Bachelor Of Industrial Engineering (S.T.) from ITB in 1999.

His research interests include logistics and supply chain engineering, engineering economic and cost analysis, and technology commercialization. GR-RITE's slogan is "Enhancing collaboration and innovating solutions to synthesize ASEAN market problems into industrial engineering knowledge acquisition" (https://youtu.be/xrGerbPWaxo). He is the owner and inventor of 17 intellectual property rights, author of 17 books and has 209 articles indexed on Scopus (H-Index-16). He was involved in the commercialization of the research results of the Center of Excellence for Electrical Energy Storage Technology (CE-FEEST) UNS as one of the start-up founders. He was honored as an Academy of IEOM Fellow (2019), received the Distinguished Service Award (2021) and the Distinguished Academic Leadership Award (2023). He has a particular focus on improving the quality of industrial engineering education (teaching and learning, assessment and evaluation, and accreditation and quality assurance). He is also a member of ISLI, IISE and IEOM. E-mail address: wahyudisutopo@staff.uns.ac.id..

Keynote Speaker 6

Prof. Dr. Prabhu Sethuramalingam
SRM Institute of Science and Technology, India

Prof. Prabhu Sethuramalingam received a BE in Mechanical Engineering from Bharathiar University, India in 1996, ME in Production engineering from Madurai Kamaraj University in 2000, and currently working as Professor in the Department of Mechanical Engineering, SRM Institute of Science and Technology, Chennai (India). He had an industrial experience of 3.5 years as Production Engineer and 22.4 years of teaching and research experience and 4.5 years as HOD in Mechanical department. He has won the Best teacher award and the Best project award. He is the author of 93 international journal papers, 41 International conferences and 20 National conference papers and 5 patents were published. His research interest includes nanotechnology, nanomachining, Expert system, Design of experiments, Nano materials and Robotics. Currently Guiding seven PhD research scholars and Three PhD scholar Completed in the field of Carbon nanotube-based applications in Cutting tool and Grinding tool and Silicon Machining, FGM Composite and Robotics with Machine Learning.

Keynote Speaker:7

Ir. Ts. Dr. Harris A. Rahman Sabri
Petronas Carigali Sdn Bhd, Malaysia

Ir. Ts. Dr. Harris A Rahman Sabri, P.Eng MIEM, PMP is an accomplished Professional Mechanical Engineer with 20 years of working experience in upstream and downstream of Oil & Gas industry with strong background in Design, Technical Evaluation, Vendor Data Incorporation, Project Management, Installation and Commissioning. Currently he is the team leader for PETRONAS Rotating Equipment Analytics (PROTEAN); an award winning in-house digital solution for rotating equipment predictive analytic. He has been involved in various major equipment namely Gas Turbine Compressor, Gas Turbine Generator, Acid Gas Removal System, Firewater Pump, Centrifugal Pump, Pedestal Crane, Waste Heat Recovery Unit, Centrifugal Compressor Bundle Retrofit & Submersible Pumps. He involved in Conceptual Study, FEED and Detailed Design for various Green Field projects; namely J4/D21, Sepat, Tangga Barat Cluster and CKX Booster Compression Platform; and Brown Field projects; D35 Host Tie in and Resak Platform. He is Corporate Member of Institute of Engineers Malaysia (IEM) Membership no 47092, Registered Professional Engineer with Board of Engineers Malaysia (BEM) Membership No 14995, Project Management Professional (PMP) ID No 1568664 and ASEAN Chartered Professional Engineer (ACPE) Reg No ACPE-00588/MY. He has been awarded Doctor of Philosophy from Universiti Teknologi Malaysia effective 18 Dec 2018.

Invited Speaker: 1

Prof. Dr. Vishnu Pareek
Curtin University Australia

Prof Vishnu Pareek is the Dean of Engineering at Curtin University and currently serves as President of the Australian Council of Engineering Deans. In 2022, he spearheaded a significant revision of Curtin's engineering curriculum to enhance graduate outcomes amid the energy transition, digital revolution, and evolving manufacturing practices. Previously, he was Head of School for the WA School of Mines: Minerals, Energy, and Chemical Engineering, which includes the renowned WA School of Mines in Kalgoorlie. Prior to this role, he led the School of Chemical and Petroleum Engineering (2015-2018) and the Department of Chemical Engineering (2012-2014). He holds a PhD from the University of New South Wales, an MTech from IIT Delhi, and a BE (Hons) from the University of Rajasthan Jaipur, all in Chemical Engineering with high distinctions. Prof Pareek's expertise lies in energy foundations, thermodynamics and fluid flow. In 2019, he was named a John Curtin Distinguished Professor for his excellence in research and academic leadership. He enjoys cricket, classical music and birdwatching in his spare time

Invited Speaker: 2

Prof. Dr. Mohammad Mansoob Khan
Universiti Brunei Darussalam

Mohammad Mansoob Khan is a Professor of Inorganic Chemistry at Chemical Sciences, Faculty of Science, Universiti Brunei Darussalam, Brunei Darussalam. He earned his PhD from Aligarh Muslim University, Aligarh, India, in 2002. He has worked in India, Ethiopia, Oman, and South Korea and has established excellence in teaching and novel research. He is teaching various courses at undergraduate and postgraduate levels. He has edited three books and authored two books. He has published about 210 research and review articles. He has addressed several conferences as a Plenary speaker (01 talk), Keynote speaker (09 talks) and delivered Invited talks (14 talks). Additionally, he is associated with several journals as editor, associate editor, reviewer, etc. His expertise is in the cutting-edge area of nanochemistry, nanotechnology, materials sciences, and materials chemistry, especially in the field of inorganic and nanohybrid materials such as the synthesis of noble metal nanoparticles, their nanocomposites, metal oxides (such as TiO2, ZnO, SnO2, CeO2, etc.), and chalcogenides (such as CdS, ZnS, MoS2, etc.), perovskites, MXenes, and their nanocomposites. He is also extensively working on the band gap engineering of semiconductors (such as metal oxides and chalcogenides). The synthesized nanostructured materials are used for heterogeneous photocatalysis, hydrogen production, photoelectrodes, solar cells, sensors, and biological applications such as antibacterial, antifungal, antibiofilm activities, etc.

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Industrial Speaker: 1

Nazrin Banu Shaikh S Ahmad
Petroleum Sarawak Berhad

Nazrin Banu is a Mirian who ventured into oil and gas and beyond, with experience spanning multiple roles and areas. She has made significant contributions in production chemistry, petroleum engineering, asset management, operations, and strategic planning. Her achievements include turning around non-economical fields, developing upstream international growth strategies, and contributing to organisational shaping initiatives. Currently, she plays a crucial role in resource development and management, focusing on revival of Sarawak onshore hydrocarbon opportunities and monetisation of CCUS. Nazrin is passionate in driving the success and the effective management of Sarawak valuable resources.

Industrial Speaker: 2

Michael Wong Shen Kai
Sarawak Energy Berhad

Michael is a seasoned professional with extensive experience in driving digital transformation initiatives at an organisational level. He has achieved success in delivering cybersecurity transformation roadmaps, cloud transformation strategies, and information technology/operational technology convergence strategies. Michael has 17 years of accumulated experience with competent skills and knowledge in the areas of digital transformation, cybersecurity, cloud technology, technical architecture, application development, enterprise integration, continuous improvement and project management.

Industrial Speaker: 3

Shuraj Subhamaniam
CETM Electrotest Sdn Bhd

Mr Shuraj hails from Klang,Selangor. He holds a Master in Electronics & System Engineering from Universiti Tenaga Nasional. He has vast experience on Power Quality in power plants and conducted various power quality and other test measurement training, seminar and workshop throughout Malaysia..He has also an invited lecturer for local universities in Malaysia to talk about topics related to power quality & renewable energy. He has also involved in commissioning of power plants. He is now the Application Engineer for CETM Malaysia and have a lot of experiences in conducting products and technological training in Malaysia. Mr Shuraj is also a trained certified thermographer.

Industrial Speaker: 4

Adelene Tie
Ultech Engineering Sdn Bhd

Adelene Tie is the Marketing and Business Development Manager at Ultech Engineering, where she plays a pivotal role in expanding the company's market presence across East Malaysia. With a background in marketing strategy and a passion for innovation, Adelene has been instrumental in developing unique branding and marketing experiences that resonate with both large corporations and individual professionals. Her expertise in digital marketing and business development has driven significant growth for Ultech Engineering, helping to position the company as a leader in integrated power management. Adelene's leadership and vision will continue to help shape the future of the company.

Industrial Speaker: 5

Muhammad Taufiq Salleh
Pantheleum Sdn Bhd, Malaysia

Mr. Muhammad Taufiq bin Salleh is an Instructor and Trainer at Pantheleum Sdn. Bhd. He holds a Master of Engineering in Gas and a Bachelor of Engineering in Petroleum from Universiti Teknologi Malaysia. With expertise in green and clean energy, fuel cells, and carbon capture, utilisation & storage, he has contributed significantly to the field, authoring four journal papers and holding two Malaysian patents. Beyond his professional achievements, Mr. Taufiq is an avid traveller and reader, constantly seeking to expand his horizons both personally and professionally.

Industrial Speaker: 6

Dr. Eldon Chua Chung Han
Solarvest Borneo Sdn Bhd

Dr. Eldon Chua Chung Han earned his PhD in Chemical Engineering and a Bachelor's degree in Petroleum Engineering from Curtin University Malaysia. His career encompasses subsurface operations at Petronas and extensive R&D focused on biofuel production, particularly biological hydrogen. While at Solarvest, in partnership with CENTEXS & HUAWEI, he played a key role in launching Sarawak's first Green Energy Program, leading efforts in renewable energy education and the development of testbeds involving green hydrogen, solar, battery, micro-cascading dams, and wind turbines. Dr. Chua's expertise spans the entire energy spectrum, from traditional oil and gas to cutting-edge renewable technologies

Industrial Speaker: 7

Yong Chee Soon
Treehouz Asia Sdn Bhd

Graduated with Bachelor (Hons) Business with Marketing from Sheffield Hallam University, United Kingdom. Yong has more than 12 years' experience in Biomass Pelleting industry and successfully developed 18 pellet projects. He is currently the Board Member in Expertise Resource Association (ERA) from 2021 – 2024, and the Committee Member in International Trade and Industry Working Committee of ACCCIM (The Associated Chinese Chambers of Commerce and Industry of Malaysia)

PROGRAMME OVERVIEW

Venue: Curtin University Malaysia

September 4 (Wednesday)
08:00 – 17:00 Exhibition Set Up
13:00 – 17:00 Registration

September 5 (Thursday)
08:00 – 16:30 Registration
09:00 – 09:15 Launch of Hydrogen Testbed & Refueling Station
09:15 – 10:00 Opening Ceremony
10:00 – 10:30 Group Photo, Exhibition Visit and Morning break
10:30 – 11:00 Keynote Speech 1
11:00 – 11:30 Keynote Speech 2
11:30 – 12:00 Keynote Speech 3
12:00 – 14:00 Lunch
14:00 – 14:30 Invited Speech 1
14:30 – 17:00 Parallel sessions 1

September 6 (Friday)
08:00 – 12:30 Registration
09:00 – 09:30 Keynote Speech 4
09:30 – 10:00 Keynote Speech 5
10:00 – 10:30 Morning break
10:30 – 11:00 Invited Speech 2
11:00 – 11:30 Invited Speech 3
11:30 – 12:00 Invited Speech 4
12:00 – 14:00 Lunch and Friday Prayers
14:00 – 17:00 Parallel sessions 2
18:30 – 22:30 Conference dinner

September 7 (Saturday)
08:00 – 09:00 Registration
09:00 – 09:30 Keynote Speech 6
09:30 – 10:00 Keynote Speech 7
10:00 – 11:00 Closing Ceremony & MOU Signing
11:10 Morning break Adjournment

VENUE MAP


REC HALL
Heron 4
Parallel Sessions (FOB)
Heron 1
Football Field
Tennis Court
Falcon 1
Falcon 3
Falcon 2
Hornbill 2
Hornbill 1
Falcon 5
Falcon 6
Auditorium
CARL
Legend
Staff, Student and Visitor Carpark
Staff Carpark
Bus Stop/ Drop-off Point
Curtin Entrance

LAUNCH OF HYDROGEN TESTBED & REFUELING STATION OVERVIEW

Venue: Curtin Aquaculture Research Laboratory (CARL)

September 5 (Thursday)

08:45 – 09:00 Arrival of GOH & VIPs
09:00 – 09:10 Welcoming remarks by Prof. Vincent Lee Chien Cheng (Acting Pro Vice-Chancellor, Curtin University Malaysia)
09:10 – 09:15 Officiation of Hydrogen Testbed & Refueling Station
09:15 – 09:20 Briefing on the operation of the Hydrogen Testbed & Refueling Station
09:20- 09:30 Adjournment and departure to Rec Hall

OPENING CEREMONY OVERVIEW

Venue: Rec Hall, Curtin University Malaysia

September 5 (Thursday)

09:30 – 09:45 Arrival of GOH & VIPs
National and State Anthem
Prayer Recitation
Safety Briefing
Welcome Performance
09:45 – 09:50 Welcoming remark by Prof. Tuong Thuy-Vu (Dean, Faculty of Engineering & Science, Curtin University Malaysia)
09:50 – 09:55 Welcoming remark by Prof. Vincent Lee Chien Cheng (Acting Pro Vice-Chancellor, Curtin University Malaysia)
09:55 – 10:00 Montage for Hydrogen Testbed & Refueling Station, launch of CONSERV, Energy Engineering and Mechatronics Engineering programs
Officiation of ICETe'2024
10:0 – 10:30 Featured talk byThe Right Honourable Datuk Patinggi Tan Sri (Dr) Abang Haji Abdul Rahman Zohari bin Tun Datuk Abang Haji Openg, Premier of Sarawak
Represented by Yang Berhormat Dato Sri Lee Kim Shin, Minister of Transport, Sarawak
10:30 - 11:00 Group Photo, Exhibition Visit & Tea break
11:00 Adjournment

GALA DINNER OVERVIEW

Venue: Imperial Palace Grand Ballroom

September 6 (Friday)

18:30 – 19:30 Registration
19:30 – 19:35 Safety Briefing
19:35 – 19:50 Welcoming speech
19:50 – 22:30 Dinner serves
Special performances of dance from Arts School
Presentation of Certificates to Sponsors
22:30 Adjournment

CLOSING CEREMONY OVERVIEW

Venue: Auditorium

September 7 (Saturday)

09:00 – 10:00 Keynote speeches
10:00 – 10:10 The arrival of Guest of Honour, YB Datuk Dr. Hazland Abang Hipni
Deputy Minister for Energy and Environmental Sustainability (MEESTy)
Negaraku & Ibu Pertiwiku
Doa Recital
10:10 – 10:20 Speech by Professor Dr Vincent Lee Chieng Chen, Acting Pro Vice Chancellor
Curtin University Malaysia
10:20 – 10:50 Closing Speech by YB Datuk Dr. Hazland Abang Hipni, Deputy Minister for Energy and Environmental Sustainability (MEESTy)
10:50 – 10:55 Best Presenter Award
10:55 – 11:10 MoU Signing witnessed by Guest of Honour
Souvenir Presentation from Curtin Malaysia to Guest of Honour
Photo Session
11:10 Morning tea and Adjournment

PROGRAMME

Wednesday, 4 September, 2024 Venue: Rec Hall	
13:00 – 17:00	Registration opens

DAY 1 Thursday, 5 September, 2024 Venue: Rec Hall		
08:00 – 16:30	Registration continues	
09:00 – 09:15	Launch of Hydrogen Testbed & Refueling Station at **CARL**	
09:15 – 10:00	Opening Ceremony	
10:00 – 10:30	Group Photo, Exhibition Visit and Morning break	
10:30 – 12:00	Keynote Speeches	
Speakers	**Prof. Dr. Reuy-An Doong** National Tsing Hua University, Taiwan	Metal-Free Nanocomposites as The Optoelectrodes for Hydrogen Evolution and Water-Energy Nexus
	Prof. Dr. Saidur Rahman Sunway University Malaysia	Advanced Green Materials for Energy Solutions
	Acd. Prof. Dr. Alvin B. Culaba De La Salle University Manila, Philippines	Energy transition strategy towards net zero emission
12:00 – 14:00	Lunch	
14:00 – 14:30	Invited Speech	
Speaker	**Tharshinye Soomaran** Institution of Chemical Engineers (IChemE), Malaysia	Introduction to IChemE

Parallel Session 1				
	Renewable & Sustainable Energy **Chair: A/Prof. Dr. Bridgid Chin Lai Fui** **Room: LTCL-4**	**Waste Energy Recovery** **Chair:Ir Dr. Henry Foo Chee Yew** **Room: LTCL-5**	**Advanced Green Materials for Energy Solutions** **Chair: Prof. Sujan Debnath** **Room: LTBS-I**	**Clean Transitional Energy** **Chair: A/Prof. Dr. Jundika Candra Kurnia** **Room: LTBS-II**
14:30-15:00	--Industry Talk— **Shuraj Subhamaniam CETM Electrotest Sdn Bhd** Driving Towards Renewable Energy	--Industry Talk— **Adelene Tie Ultech Engineering** Powering Tomorrow: Renewable Energy Solutions in Hybrid and Integrated Power Systems	--Invited Talk— **Mohammad Mansoob Khan** Photocatalysis: A sustainable approach to save energy and environment	**Muhammad Aziz** Enhancements of Three-Reactors Chemical Looping Technology for Efficient Clean-Hydrogen Production
15:00-15:20	**Tay Ai Chen, Erik Ngoi Yiew Tuang, Vera Loo Hui, Sung Aun Naa and Shariah Umar** A GIS-based Assessment of Agricultural Land Use Suitability for Local Crops: A Case Study at Kabuloh Region in Miri, Sarawak	**Jun Yan Low and Bridgid Fui Chin Lai** Kinetic Study of Co-Pyrolysis of Chlorella Vulgaris microalgae and Tetra Pak waste	**Ming Hui Hing, Mohd Hanif Mohd Pisal, Nur Atirah Afifah Sezali, Hui Lin Ong, and Ruey-An Doong** Physical and Tensile Properties of Industrial Wood Waste-Derived Cellulose Nanofibril Membranes	**Ashley Bernardette Simon and Augustine August Panggai** Developing Optimised Culture Conditions in Photobioreactor System for Enhanced Microalgae Growth
15:20-15:40	**Kushan Sandunil, Ziad Bennour, Saaveethya Sivakumar, Hisham Ben Mahmud and Ausama Giwelli** Application of Recently Developed Boosting Ensemble Machine Learning Algorithms in Carbon Capture and Storage Feasibility Assessment to Predict Subsurface Porosity	**Jaya Prasanth Rajakal, Foo Yuen Ng, Anna Zulkifli, Denny Ng, Jaka Sunarso, Bing Shen How, Viknesh Andiappana** Marginal Abatement Cost Curves for Decarbonisation Planning in Palm Oil Industry	**Amanda Anne Fui May Mu, Ai Ling Fong, Dominick Wong, Sujan Debnath, and Ke Khieng Tan** Hybrid Natural Fibre Polymer Composite for Lightweight Structural Applications	**Weng Hong Low, Yun Seng Lim, Jianhui Wong and Danny Pudjianto** Assessing the Whole Benefits of Energy Storage System on Maximum Demand Reductions Using Network-Based Modelling Approach
Tea break 15:40-16:00				
16:00-16:20	**Muhammad Taufiq Salleh and Mohamed Ayman Ibrahim Attia** Enhancing DMFC Performance: Addressing CO2 Bubble Formation and Methanol Delivery Issues	**Wen Da Oh** Integrated Pyrolysis System for Sustainable Conversion of Plastic Wastes into Pyrolysis Gas and Carbon Nanotubes	**Bashir Abubakar Abdulkadir, Lee Peng Teh, Nurul Ainirazali, Herma Dina Setiabudi** A Short Review on Recent Innovative Materials for Hydrogen Storage: Revolutionising Energy Storage	**M.C. Law and Emily W.T. Liew** Mathematical Modeling of Microwave-Assisted Heating of an Oil Palm Fresh Fruit Bunch

16:20-16:40	**Tiong Michelle, Chunkai, Qi Bao, Hang Ye and Qi Liu** Storage Capacity Potential Assessment for A CCUS Project: An In-Situ Carbon Mineralization Site	**Grace Xin Hui Kiu and Shiew Wei Lau** Feasibility Study of Synergistic Biohythane Production from Palm Oil Mill Effluent (POME) Sludge Co-Digested with Aquaculture Effluent	**Ai Ling Fong, Shiew Wei Lau, Sujan Debnath, Mahmood Anwar, Ian J.Davies, and Mahzan Johar, Nurizawaty Bolhie** Development of Hybrid Composite Using Simple Lab-Scale Vacuum-Assisted Resin Transfer Molding (VARTM) Technique	**Feri Adriyanto and Wahyudi Sutopo** Predicting Interoperability at Battery Swapping Stations for Electric Motorcycles in Indonesia: A Geographical, Demographic, and LSTM-Based Machine Learning Approach
16:40-17:00	**Asselah and A. Ben Amra** Sustainable Biodiesel Production via Transesterification of Waste Frying Oil		**Ke Ying Chin and Chye Ing Lim** A Comprehensive Feasibility Study Of Biomass Energy For Power Generation In Sarawak	**Nikhil Jayaraj, Subramaniam Ananthram, Anton Klarin** Bridging Stakeholder Perspectives - Transition Towards the Solar Energy Storage (SES)
End of DAY 1				

DAY 2 Friday, 6 September, 2024 Venue: Rec Hall		
08:00 – 12:30	Registration continues	
09:00 – 10:00	Keynote Speeches	
Speakers	**Prof. Ir. Dr. Yun Seng Lim** Universiti Tunku Abdul Rahman, Malaysia	Grid-Integrated Energy Storage System for Decarbonization of Electricity Supply
	Prof. Ir. Wahyudi Sutopo Universitas Sebele's Maret, Indonesia	Can Electrification of motorcycles support energy transition in Southeast Asia? Lessons Learned from Driving and Impeding Factors of Adoption in Indonesia
10:00 – 10:30	Morning break	
10:30 – 12:00	Invited Speech	
Speaker	**Nazrin Banu Shaikh S Ahmad** Petroleum Sarawak Berhad	CCUS as Energy Transition and Growth Enabler
	Michael Wong Shen Kai Sarawak Energy Berhad	Clean Energy Transition
	Prof. Vishnu Pareek Curtin University, Australia	Thermodynamics Foundations for Energy Transition
12:00 – 14:00	Lunch & Friday Prayers	

Parallel Session 2			
	Renewable & Sustainable Energy **Chair: Ir. Dr. Tan Inn Shi** **Room: LTCL-4**	**Advanced Green Materials for Energy Solutions** **Chair: Dr. Fethma M Nor** **Room: LTBS-I**	**Clean Transitional Energy** **Chair: A/Prof. Dr. Jobrun Nandong** **Room: LTBS-II**
14:00-14:30	--Industry Talk— **Muhammad Taufiq Salleh** **Pantheleum Sdn Bhd, Malaysia** Integrating Green and Clean Energy Solutions: The Role of Carbon Capture and Fuel Cells in the Energy Transition	--Industry Talk— **Eldon Chung Han Chua** **Solarvest** Building Sarawak's Workforce for the Energy Transition: A Hands-on Green Energy Training Initiative	--Industry Talk— **Chee Soon Yong** **Treehouz Asia Sdn Bhd** Biomass Pelleting: A Sustainable Solution for Renewable Energy and Waste Management

14:30 -14:50	**Ramanan C J, King Hann Lim, and Jundika Candra Kurnia** Development of Low-Cost Floating Platform for Solar PV Installation	**Cheng-Kuo Tsai and Jao-Jia Horng** Low-Energy Consumption Rapid Recovery of Valuable Metal Oxide Resource from Electric Arc Furnace Dust Waste with Wastewater Treatment Application	**Muhammad Hisjam, Silvi Istiqomah, and Wahyudi Sutopo** Sustainable Supply Chain Network Design of Electric Vehicle Battery Recycling
14:50 –15:10	**Yi Jie Liew and Sie Yon Lau** Exploring the Environmental Factors (Light and Air) on Biophotolysis of Microalgae on Biohydrogen Production	**Bukola Taiwo Atunwa and Yen San Chan** The Role of Watermelon Rinds in Sustainable Energy Solutions: Current Trends	**Zhi Xuan Lie and Yin Ling Tan** Mathematical Modelling for Enhanced Weathering-based Carbon Management Network
Tea break 15:10-16:00			
16:00-16:20	**Renny Rochani and Wahyudi Sutopo** The Eco-canvas of green business vehicle-electrification: A case study of electric motorcycle circular-economy business model in Indonesia	**Dominick Wong, Sujan Debnath, Yek Hao Yew, Natalie Juan, Mahmood Anwar, and Ian J.Davies** The Influence of Water Hyacinth Particle Size on the Tensile Strength and Microhardness Performance	**Fang Long Foo and Jundika C. Kurnia** The importance of metal hydride hydrogen storage systems in the automotive industry
16:20-16:40	**Zhe Ming Wong, Ing Ming Chew, Wei Kit Wong, Saveethya Sivakumar, Filbert H Juwono** Hybrid HVAC-HVDC Grid Fault Detection & Classification using ANN	**K. Prabhakar, M. Anwar, S. Debnath, and D. Wong** Thermal Influence on Mechanical Characteristics of Glass Fiber Reinforced Polymer Nanocomposites Towards Sustainable Curing Process	**Mohammad B Hossain** Investing in Green: Bilateral Investment Treaties (BITs) Role in Malaysia's Renewable Energy Sector
16:40-17:00	**Chai Lee Goi** Malaysia's Green Leap: Transforming Energy Policies for a Sustainable Future	**Haider Hamad Ghayeb and Kundai Peter Tichida** Seismic Performance of Precast Concrete Beam-to-Column Connections: Numerical Studies	**Zhia Jie Yong and Jobrun Nandong** Exploring the Potential of Chemical Looping Process for Sustainable Hydrogen Production
18:30 – 22:30 Conference Dinner			
End of DAY 2			

DAY 3 Saturday, 7 September, 2024 Venue: Auditorium		
08:00 – 09:00	Registration	
09:00 – 10:00	Keynote Speech	
Speakers	**Prof. Dr. Prabhu Sethuramalingam** SRM Institute of Science and Technology, India	Exploring Real-World Robot Applications and Future Research Avenues through a Machine Learning Framework
	Ir. Ts. Dr. Harris A. Rahman Sabri Petronas Carigali Sdn Bhd, Malaysia	Digitalization: How Automation is Driving Efficiency and Sustainability for Energy Sector
10:00 – 11:10	Closing Ceremony & MOU Signing	
11:10	Morning break	
End of ICETE 2024		

EXHIBITION

Venue: Rec Hall, Curtin University Malaysia

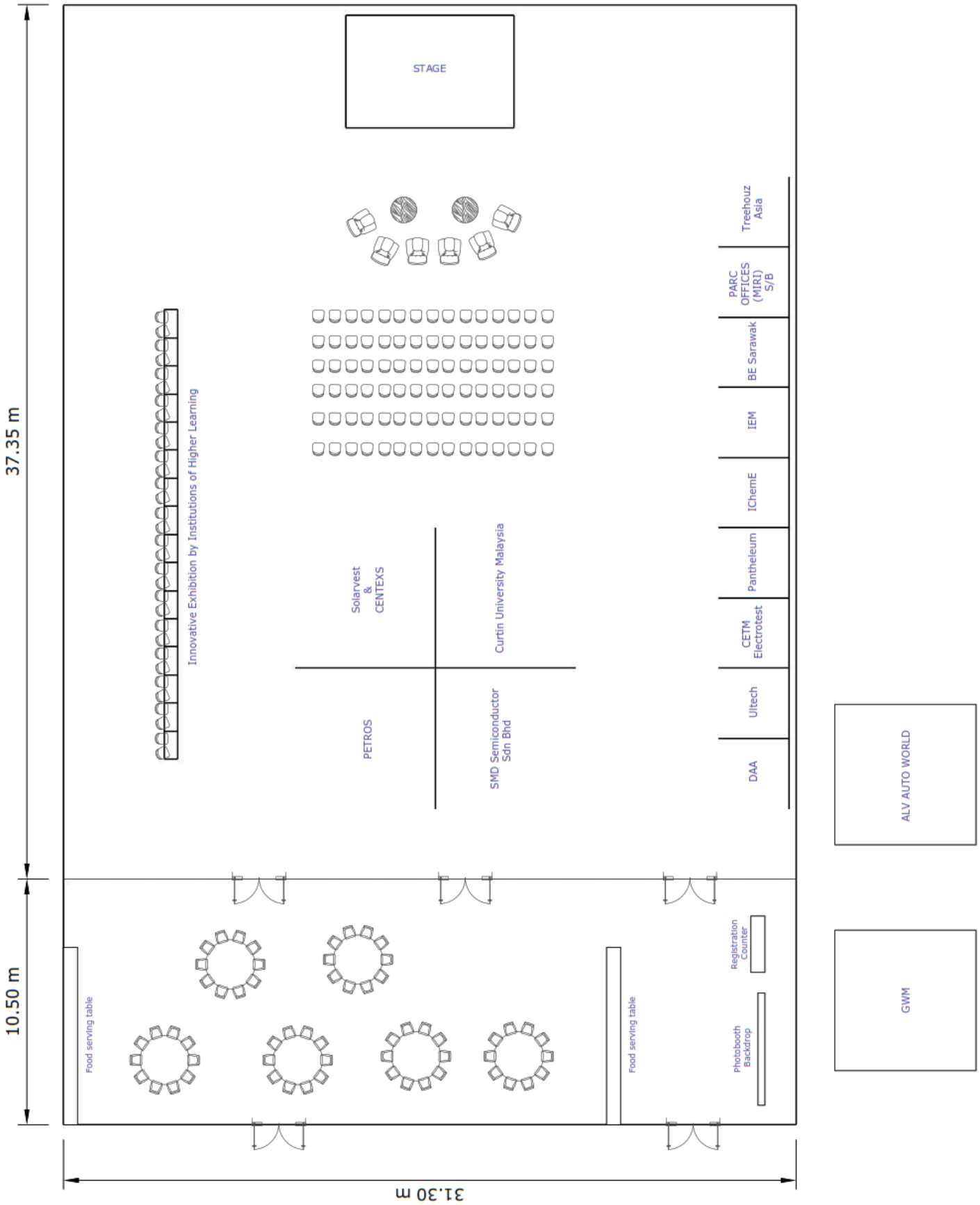
by Institutions of Higher Learning

1) i-CATS Miri
2) i-CATS Miri
3) Prof. Sujan Debnath's research group
4) A/P Dr. John Lau Sie Yon's research group
5) Seahorse Sculpt: The Evolution of Kinetic Art
6) Elegance in Motion: Designing the Swan Sculpture
7) Hornbill Kinetic Structure
8) Crafting the Perfect Cat Sculpture
9) Bujang Senang: The Legacy of a Legendary Crocodile in Sculpture
10) Teoh Yuan Ju & A/P Dr. Wong Wei Kitt
11) Ir. Ts. Dr. Tan Inn Shi's research group
12) A/P Dr. Bridgid Chin's research group
13) Ir. Ts. Dr. Henry Foo's research group
14) Prof. Garenth Lim's research group
15) A/P Dr. Lau Shiew Wei's research group
16) Ir. Dr. Christine Yeo's research group

by Industry

1) SMD Semiconductor Sdn Bhd
2) Solarvest & CENTEXS
3) Sarawak Energy Berhad (SEB)
4) Petroleum Sarawak Berhad (PETROS)
5) Drone Academy Asia
6) Ultech Engineering Sdn. Bhd.
7) CETM Electrotest Sdn Bhd
8) Pantheleum Sdn Bhd
9) The Institution of Chemical Engineers (IChemE)
10) The Institution of Engineers, Malaysia (IEM)
11) Curtin University Malaysia
12) Treehouz Asia Sdn Bhd
13) PARC Shared Offices (Miri) Sdn Bhd
14) ALV Auto World

Rec Hall Layout



1st International Conference on

Energy Transition and Exhibition

(ICETe24)

Miri, Malaysia

5 – 7 September 2024

ABSTRACTS

Keynote Speeches

Metal-Free Nanocomposites as The Optoelectrodes for Hydrogen Evolution and Water-Energy Nexus

Deblina Roy and Ruey-An Doong*

Institute of Analytical and Environmental Sciences, National Tsing Hua University, 101, Sec. 2, Kuang Fu Road, Hsinchu 300044, Taiwan.

Abstract

Hydrogen is one of the cleanest energies for net zero emission strategy. Water splitting to generate hydrogen and oxygen using solar energy has been explored as a potential means of clean and large-scale energy production. The photoelectrocatalytic process (PEC) is a promising process for water splitting to effectively generate H2 gas. It combines both photo- and electrocatalytic processes to give more yield without using any sacrificial agent as well as better separation of electron and hole pairs. However, a depletion layer will be formed on the surface of the electrode materials when applying an external voltage, which may reduce the recombination of charge carriers and enhance the hydrogen production rate in PEC system.

In this talk, a metal-free optoelectrode containing few-layer phosphorene/metal organic framework (FLP/NH2-MIL-125) heterostructure was fabricated by dip-coating method for enhanced hydrogen production. The visible-light responsive NH2 group of MOF will facilitate the electron transfer from the linker (NH2-BDC) to the metal center (Ti4+) by ligand-to-metal-charge-transfer (LMCT). The less stable Ti+3 can react with FLP through π back-bonding. The lone pair of electrons present in FLP will act as σ-donor as well as π-acceptor, resulting in the increase in electron density after receiving π-electron from FLP which can be confirmed by red-shift of the doublet Ti 2p peaks after the formation of heterojunction. The photocurrent efficiency of photoelectrodes is enhanced after the incorporation of FLP. The strong visible-light absorption capacity and mesoporous framework provide extra stability of MOF for photoelectrochemical water splitting. A 1.6-time improvement in the photocurrent density is observed after the incorporation of FLP. Photoelectrochemical (PEC) analysis indicates that the enhancement of MOF catalytic properties is mainly due to the decrease in the recombination rate of charge carriers by transferring the extra electron to FLP. From XPS analysis, the bond formation between Ti-P is confirmed. The synergistic effect of p-n heterojunction between MOF and FLP provides new insights to enhance the PEC hydrogen evolution rate of 960 μmol g-1.

Keywords: Metal organic framework (MOF); few-layer phosphorene (FLP); p-n heterojunction, π back-bonding; photoelectrochemical (PEC) hydrogen evolution.

Keynote Speeches

Advanced Green Materials for Energy Solutions

Saidur Rahman

Sunway University Malaysia

Abstract

Energy is among the top 10 global problems for the humanity for the next 50 years. Renewable sources of energies are intermittent and not available 24 years. Energy storage is also facing a lot of challenges. Overheating is a major problem in electronic devices, battery, solar panels, car radiators, energy storage and conversion devices. Overheating degrades the efficiency and performances of these and many other devices. Both thermal and electrochemical energy storage is also important research area as solar energy sources are intermittent. Energy storage devices are also facing challenges due to short storage duration, overheating and many other problems. Advanced nano-materials are potential candidates to overcome these challenges. MXene with chemical formula Ti3C2 is an emerging two-dimensional layered nano-materials has outstanding energy storage, electrical, optical, thermal, electrochemical, catalytic, photo-thermal conversion capabilities. MXenes are produced from the transition metal carbides, nitrides and carbonitrides by etching process from MAX phases. We are the first in Malaysia who successfully synthesized this new material using state of art lab equipment available in Research Centre for Nano-Materials and Energy Technology (RCNMET), Sunway University. MXene has excellent heat removal and energy storage capabilities which will be explored in this presentation in addition to MXene synthesis process

Keywords: MXene; energy storage; nano-materials

Keynote Speeches

Energy transition strategy towards net zero emission

Alvin B. Culaba

National Academy of Science & Technology, Philippines

Abstract

The pathway to sustainability has placed the energy sector at the forefront of transformative change. Achieving net zero emissions and transitioning to a low-carbon economy have become central not only to the Philippines but at the international agenda, driven by the urgent need to mitigate climate change and reduce greenhouse gas (GHG) emissions. The energy transition involves a fundamental shift from a reliance on fossil fuels to cleaner, renewable energy sources, coupled with innovations in technology and government policy. The Paris Agreement of 2015, which set a global target to limit warming to well below 2°C, and preferably to 1.5°C above pre-industrial levels, has intensified the focus on decarbonization efforts. Nations and regions worldwide are now crafting and implementing energy transition roadmaps to meet these ambitious goals. These are multifaceted strategies, involving the integration of renewable energy, the enhancement of energy efficiency, the development of low-carbon technologies, and the adaptation of energy systems to be resilient and sustainable. However, the journey towards a low-carbon economy is complex and is without challenges. These include technological hurdles, economic considerations, social acceptance, and policy frameworks that must align with long-term sustainability goals. This transition is influenced by local resources, economic structures, political will, and societal values. This keynote provides a comprehensive understanding of the energy transition landscape and the critical factors that will shape the future of global energy systems.

Keywords: Energy transition, low-carbon economy, net zero emission

Keynote Speeches

Grid-Integrated Energy Storage System for Decarbonization of Electricity Supply

Yun Seng Lim

Universiti Tunku Abdul Rahman, Malaysia

Abstract

The electricity generation and maximum demands in many countries are increasing rapidly in the past few decades in tandem with economic growth. A grid-integrated energy storage system (ESS) provides an attractive solution to mitigate the maximum demands. However, many entrepreneurs are not optimistic about the potential business opportunities for grid-integrated energy storage systems especially in developing countries like Malaysia because the technical, financial and environmental benefits of ESS technologies are not evident cur- rently. Therefore, a 400 kW and 667 kWh energy storage system was designed, set up and commissioned at a university building in Malaysia in order to demonstrate the multiple benefits of grid-integrated ESS. The system has proven to generate an annual saving of about USD 3,803.6 in electricity bills. At the same time, the utility company has also achieved the annual savings of USD 21,207.75 and 15.86 tons of CO_2 avoidance since the ESS reduces generation cost and helps cut significant cost through deferment of network reinforcements. With a storage cost of only USD 151,000, the customer and utility company can recover the cost within 6 years over the storage lifespan of 11 years. Hence, the grid-integrated ESS presents a good business opportunity for even small and medium-sized enterprises (SMEs) to enter the electricity industry by offering unique energy savings solutions to the customers and utility company which is particularly attractive in countries where there are only a few major electricity providers such as Malaysia to generate more savings to both the customers and utility companies.

Keywords: Grid-integrated energy storage system (ESS); decarbonization

Keynote Speeches

Can Electrification of motorcycles support energy transition in Southeast Asia? Lessons Learned from Driving and Impeding Factors of Adoption in Indonesia

Wahyudi Sutopo

Universitas Sebelas Maret, Indonesia

Abstract

Motorcycles with two-wheeled, gasoline-powered internal combustion engines (ICE) contribute significantly to CO2 pollution in Southeast Asia, including countries like Indonesia, Malaysia, and Vietnam. The adoption of technology innovation in electric motorcycles (EMs) can be utilized to achieve a target of the transport sector's zero emissions by 2050. The EM technology innovation provided transportation solutions that are environmentally friendly, energy-efficient, and lower operating and maintenance costs. However, the adoption rate of EMs in Southeast Asia still needs improvement and faces challenges of adoption-diffusion issues, such as, product, process, innovation, and business strategies. Early adopters often experience inconvenience and anxiety regarding their daily mobility needs over long distances.

Critical components in addressing these issues include charging infrastructure and battery capacities. First, users with high mobility who drive beyond the maximum mileage risk running out of power and must wait a long time for the battery to be fully recharged. Second, increasing the battery capacity to 2-3 times the usual amount could extend the vehicle's mileage without the need for recharging during a trip. These scenarios illustrate the dilemma in developing a business strategy. Will electric motorcycles fail to overtake two-wheeled gasoline-powered? Can we achieve a target for the transport sector's zero emissions by 2050?

The intervention instruments, such as early supply chain integration, have been used to address the challenges and problems associated with the adoption of electric motorcycles in Indonesia. This initiative was conducted by the University Centre of Excellence for Electrical Energy Storage Technology at Universitas Sebelas Maret. We investigated the driving and impeding factors of adoption in Indonesia and promoted the use of an equivalent annual cost (EAC) model to compare options between improving battery capacity and enhancing charging infrastructure, considering the long-term costs of owning, operating, and maintaining electric motorcycles. Comparing the scenarios in Indonesia and Malaysia is necessary to obtain comprehensive input for economies of scale in global market competition. We propose assessing the EM ecosystem in both countries.

The novelty expected from this research is the development of an EAC model suitable for the electric motorcycle market in Southeast Asia. The research results can provide strategic options for designing the global competitiveness of the electric motorcycle market and support the adoption of electric motorcycles over gasoline-powered two-wheelers in Southeast Asia. Ultimately, the electrification of motorcycles can significantly support the energy transition in Southeast Asia.

Keywords: battery capacity, driving and impeding factors of adoption, equivalent annual cost, energy transition, electric motorcycle

Keynote Speeches

Exploring Real-World Robot Applications and Future Research Avenues through a Machine Learning Framework

Prabhu Sethuramalingam

SRM Institute of Science and Technology, India

Abstract

This explores the pivotal role of machine learning (ML) and robotics in transforming the energy sector, emphasizing recent advancements and their impact on energy efficiency and sustainability. The presentation delves into how automation, AI, and digital technologies are reshaping energy systems by optimizing operations, management, and control. It begins with an overview of ML concepts and their applications in enhancing smart grids, improving grid security, and boosting production capabilities. The discussion includes a detailed examination of solar power forecasting using ML, showcasing how these technologies contribute to a sustainable energy future. Furthermore, the address covers the integration of surveillance robots in monitoring large storage tanks and their significant role in wind turbine blade manufacturing.

The presentation highlights various industrial and AI-driven robots, including innovations like CNT robot nanopaint and the optimization of IRB1410 industrial robot painting processes through Taguchi methods and fuzzy logic. Key research topics discussed include CNN-based deep learning for micro-crack detection in solar panels, heat transfer analysis of Functionally Graded Material (FGM) composites, and the impact of surface texturization on single crystal silicon. Additional areas of focus are the design of machine learning-based cooking robots, robot-assisted virtual health monitoring, and advancements in autonomous mobile robot navigation using RRT and K-nearest neighbors with fuzzy logic.

The address also covers gripping force analysis using IRB360 robots, surface defect detection on titanium alloys, ceramic tiles, and automotive surfaces, as well as machine learning-based defect detection in arecanut harvesting. Finally, it examines the accuracy and repeatability of the IRB1410 industrial robot and energy consumption predictions for smart buildings.

This comprehensive overview illustrates how ML and robotics are revolutionizing the energy sector, driving innovation, and improving operational efficiencies.

Keywords: Machine learning; Robotics; Energy sector; Nano Paint; Heat sink; FGM Composite; CNN.

Keynote Speeches

Digitalization: How Automation is Driving Efficiency and Sustainability for Energy Sector

Harris A. Rahman Sabri

Petronas Carigali Sdn Bhd

Abstract

In today's rapidly evolving global landscape, digitalization is reshaping the energy sector, driving unprecedented improvements in efficiency and sustainability. This keynote, titled "Digitalization: How Automation is Driving Efficiency and Sustainability for the Energy Sector," explores the transformative role of automation and digital technologies in addressing the sector's most pressing challenges. From optimizing energy production and distribution to reducing carbon footprints, automation enables smarter resource management, predictive maintenance, and real-time decision-making. By harnessing artificial intelligence, machine learning, and data analytics, the energy sector can achieve greater operational efficiency while advancing sustainability goals. This presentation will highlight some real life case studies on innovations and actionable insights on how automation is accelerating the transition to cleaner, more resilient energy systems. As the world moves towards a low-carbon future, digitalization will be key to unlocking the full potential of the energy industry, ensuring a more sustainable and efficient tomorrow.

Keywords: Artificial Intelligence; Carbon Footprint; Data Analytics; Digitalization; Efficiency; Machine Learning; Sustainability

Invited Speeches

CCUS as Energy Transition and Growth Enabler

Nazrin Banu Shaikh Sajjad Ahmad

Petroleum Sarawak Berhad

Abstract

The Carbon Capture Utilisation and Storage (CCUS) in Sarawak, aims to reduce greenhouse gas emissions and support a low-carbon economy. Key factors that make Sarawak ideal for CCS include its geological capacity, existing infrastructure, government support, integration with economic investments, skilled workforce, and a clear strategic plan. The state has developed a robust regulatory framework to facilitate CCS development, such as the Land Carbon Storage Rules 2022 and the Reduction of GHG Emission Ordinance 2023.

Beyond reducing emissions, Sarawak's CCUS initiatives focus on energy security and fostering local CCS expertise. By developing infrastructure for stranded sour gas reserves and positioning itself as the CCS Heartland of the Asia Pacific, Sarawak is committed to achieving net-zero emissions, creating sustainable jobs, and economic growth. PETROS, the resource manager, oversees the CCS process, ensuring a streamlined, investor-friendly environment through strategic planning and partnerships

Keywords: CCUS, low carbon economy, energy security

Invited Speeches

Thermodynamics Foundations for Energy Transition

Vishnu Pareek

Curtin University Australia

Abstract

The laws of thermodynamics have universal validity independent of even the concepts of fundamental particles (electrons, protons, neutrons). For example, the maximum achievable efficiency of an ideal engine (called Carnot engine) is independent of the fuel to be used. This makes thermodynamics an indispensable tool to study the unknowns of energy transition, also referred as decarbonisation. Although ensuring a net zero in the broad framework appears as a simple case of an accounting of the carbon atoms, it is necessary that the true energy needs of net zero within the bounds of the laws of thermodynamics is fully understood.

Keywords: thermodynamics; energy transition; decarbonization; net zero

Session 1 A

Driving Towards Renewable Energy

Shuraj Subhamaniam

CETM Electrotest Sdn Bhd

Abstract

Malaysia has just launched its New Energy Transition Roadmap (NETR). In NETR, Malaysia has targeted to achieve zero carbon emission by 2050. The roadmap aims to strike a balance between environmental targets, preserve affordability and economic benefits, and maintain system stability by mitigating the impact of variable renewable energy (VRE) sources, ultimately enabling the Malaysia power sector to deliver reliable and affordable green power to all. Therefore, transition towards renewable energy plays a crucial role in achieving this target. One of the crucial factors in ensuring efficiency in renewable energy daily operation is to optimize its output. The best approach to optimization is via maintenance. This talk will guide you on the importance of maintenance related to your renewable energy facilities.

Keywords: Variable renewable energy (VRE), New Energy Transition Roadmap (NETR)

Session 1 A

Sustainable Biodiesel Production via Transesterification of Waste Frying Oil

A. Asselah[a,b]* and A. Ben Amra[b]

[a.] Department of Engineering Process, Faculty of Technology, University of M'Hamed Bougara, Avenue de l'indépendance, 35000, Boumerdes, Algeria
[b.] Department of Organic Chemistry, Laboratory of Applied Organic Chemistry, Faculty of Chemistry, University of Sciences and Technology Houari Boumediene USTHB, BP 32 El Alia, Bab Ezzouar, 16000 Alger, Algeria

Abstract

Biofuel has attracted increasing attention worldwide as a clean energy for the future to substitute fuel, which their production derives from conventional ways that are so expensive and polluting using fossil fuels. The present study aims to valorize a potential agro-food waste, namely fried oil (80% soybean oil and 20% sunflower oil), whose use is widespread by its transformation into biofuel, which represents a renewable and non-polluting source of energy. The process allowing this transformation is based on the transesterification reaction of the oil using alcohol in basic homogeneous catalysis. Parametric study relating to temperature, time, stirring speed, type of catalyst and solvent influencing transesterification reaction was studied. To confirm that the biodiesel obtained is of good quality, this latter was analyzed by gas chromatography to determine its composition, and its physicochemical properties were studied. The results of this oil's esterification show that the biodiesel's quality is directly related to the temperature. The physicochemical characteristics in terms to density, viscosity, higher calorific value, pour point, cloud point, freezing point and acid number were determined and indicating that the physicochemical properties of the produced biodiesel are comparable to those of commercial diesel according to Algerian Oil Campany (Naftal) standards and EN14214 and ASTM D6751 international standards.

Keywords: Renewable energy, biodiesel, transesterification, vegetable oil.

Session 1 A

Application of Recently Developed Boosting Ensemble Machine Learning Algorithms in Carbon Capture and Storage Feasibility Assessment to Predict Subsurface Porosity

Kushan Sandunil[*1], Ziad Bennour[1], Saaveethya Sivakumar[1], Hisham Ben Mahmud[2] and Ausama Giwelli[3,4]

[1.] Curtin University Malaysia, 98009 Miri, Sarawak, Malaysia
[2.] Universiti Teknologi PETRONAS, 32610 Seri Iskandar, Perak Darul Ridzuan, Malaysia
[3.] INPEX, 100 St Georges Terrace, Perth 6000 WA, Australia
[4.] WASM, Curtin University, Kensington 6151 WA, Australia

Abstract

The excess emission of carbon dioxide (CO2) to the atmosphere has raised significate concerns about climate change. Consequently, industries with high CO2 emissions are under pressure to reduce their carbon footprint and explore solutions to minimise net CO2 output. One promising approach is carbon capture and storage (CCS), which involves storing liquefied CO2 underground. Assessing subsurface porosity is crucial for determining the feasibility of CCS projects as it helps to evaluate carbon storage capacity. In this study, we utilised three recently developed boosting algorithms—histogram-based boosting regression (HGBR), light gradient boosting machine regression (LGBR), and categorical boosting regression (CBR) to estimate subsurface porosity using well log data. We employed 5 well log data types: caliper log (CAL), gamma-ray log (GR), neutron porosity log (NPHI), photoelectric factor log (PE), and deep laterolog (LLD), as input features, while lab-corrected porosity served as the target variable. Model optimisation was conducted using grid search optimisation techniques. Our results indicated that HGBR outperformed the other models, achieving an impressive R2 value of 0.9756. However, both LGBR and CBR also yielded high- performing models, with R2 values of 0.9598 and 0.9700, respectively. Among the input features, GR had the most significant influence, while PE had the least influence on the output. In conclusion, our findings suggest that all three boosting algorithms—HGBR, LGBR, and CBR—show promise for predicting porosity in sandstone layers using well logs, making them valuable tools for CCS assessment programs.

Keywords: Carbon capture and storage; Machine learning; Boosting ensemble; Porosity; Histogram-based boosting regression; Light gradient boosting machine regression; Categorical boosting regression

Acknowledgement Authors would like to thank Curtin University Malaysia and Curtin Malaysia Postgraduate Research Scholarship (CMPRS) for hosting and allocating the research grant for the study. Moreover, a special thanks goes to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia for providing the Darling basin dataset and Dr. Lionel Esteban for mediating the process of acquiring the dataset.

Session 1 A

Enhancing DMFC Performance: Addressing CO2 Bubble Formation and Methanol Delivery Issues

Muhammad Taufiq Salleh[1] , Mohamed Ayman Ibrahim Attia[1,*]

[1.] Pantheleum Sdn. Bhd., 11-13A Wisma UOA 2, 21 Jalan Pinang, 50450 Kuala Lumpur, Malaysia

Abstract

Direct Methanol Fuel Cells (DMFCs) offer substantial promise for portable power applications due to their high energy density and operational simplicity. Despite their potential, optimizing DMFC performance remains a significant challenge, particularly concerning mass transport at the anode. CO2 bubble formation at the anode significantly impedes efficient mass transport and overall cell performance. Bubbles can block active catalytic sites, hinder methanol access, and increase the ohmic resistance of the cell. State-of-the-art computational and experimental techniques have been developed to study CO2 bubble dynamics. Advanced imaging techniques, such as high-resolution microscopy and synchrotron X-ray tomography, have provided detailed visualizations of bubble behaviour within the anode structure. Meanwhile, mechanical modelling and multi-scale simulations have offered deeper insights into the interactions between bubble dynamics and mass transport processes. This paper also highlights innovative strategies to mitigate the adverse effects of CO2 bubbles, including the optimization of flow field designs, development of novel catalyst supports, and the use of surface treatments to enhance bubble detachment and transport. Looking towards the future, we propose the development of a mist feed anode system as a promising direction to further improve methanol delivery and reduce CO2 bubble formation. The mist feed system aims to create a more uniform distribution of methanol at the anode, enhancing its availability while minimizing local oversaturation and subsequent bubble formation.

Keywords: direct methanol fuel cell, anode mass transport, CO2 bubble formation

Session 1 A

Storage Capacity Assessment Potential Assessment for A CCUS Project: An In-Situ Carbon Mineralization Site

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Abstract

Significant greenhouse gas emission, especially carbon dioxide (CO2) is the main cause of global warming. According to the International IEA report, carbon capture, utilization and sequestration (CCUS) is proposed as an effective mitigation strategy which accounts for about 15% of cumulative carbon emission reduction. The in-situ mineralization sequestration technology is based on the rapid CO2 mineralization mechanism, utilizing the formations of mafic rocks and ultramafic rocks (such as basalt and peridotite) as carbon storage sites. The mineralization reaction between CO2 and calcium- and magnesium-rich minerals is used to transform them into stable carbonates, achieving permanent and efficient CO2 sequestration. Pilot projects in Iceland and the United States have demonstrated the feasibility of this technology, but no demonstration project has been carried out in China yet. This paper presents the potential of this technology by first introducing its mechanism, current relevant projects and existing calculation methods for CO2 storage capacity. By categorizing CO2 storage into four levels: geological potential, technical capacity, technical-commercial capacity, and engineering reserves, this framework enables a systematic assessment of carbon dioxide storage potential through the processes of reservoir selection, potential grading, and capacity calculation. Lastly, based on the characterization profile of basaltic samples collected from site X, an innovative storage assessment calculation was established and compared to the existing ones. The key coefficient values which play a critical role in potential calculation formulas are also provided.

Keywords: CCUS, geological CO2 storage, in-situ carbon mineralization, storage capacity, basalt

Session 1 A

A Comprehensive Feasibility Study of Biomass Energy For Power Generation In Sarawak

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Abstract

Sarawak, a Borneo State of Malaysia is rich in natural resources that drive its diverse economy activities. It has a relatively green energy mix where the electricity is mainly generated from hydroelectric plants, supplemented by coal and gas thermal plants. However, the increasing demand of green energy for the development of green industries in recent years, has been putting pressure on the grid. To maintain the minimum 60% renewable energy in its power generation capacity mix, the state's renewable energy program targets a substantial increase in biomass energy capacity by 2030. Large-scale wood industry, palm oil plantations and agricultural activities in the state are producing substantial amounts of biomass waste, which is a promising energy source. However, the use of biomass waste for power generation is currently under-utilized. The purpose of this research is to explore the potential of biomass waste for power generation in Sarawak, to identify issues, challenges and opportunities in its implementation. Biomass wastes generated from palm oil and wood industry were considered in the study. Primary and secondary data were collected through literature review, online databases, on-site data collection from local industries and stakeholders' survey using questionnaires. The data collected was analysed to study the biomass energy potential, power generation capacity, and to investigate the technology and economic feasibility of biomass waste for power generation in each region of Sarawak. The preliminary results show that biomass waste from oil palm empty fruit bunches alone, could potentially generate 6.63*10^6 MWh (at 27% plant eff.) annually for the state if utilised fully.

Keywords: Green energy, renewable energy, Biomass waste

Session 1 A

A GIS-based Assessment of Agricultural Land Use Suitability for Local Crops: A Case Study at Kabuloh Region in Miri, Sarawak

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Abstract

The expansion of agricultural land use in Borneo, particularly in the Sarawak state of Malaysia, has brought several sustainability challenges, such as deforestation, peatland conversion and monoculture diversity. A quarter of the Sarawak state land consisting of primary forest was converted into agricultural land. Therefore, the study was aimed to assess the agricultural land use suitability on the Kabuloh region located in Miri, the Northern area of Sarawak, Malaysia. Kabuloh region was chosen as the study site because the region is an active agricultural land and approximately 40% of the total area are covered by oil palm plantation, which shall be planned for a long term sustainable agricultural development. The suitability assessment was conducted using Geographic Information System (GIS), and multiple criteria decision-making methods (MCDM) by assessing and interpreting data, such as soil type, slope gradient, agricultural land use capability, and distance to infrastructures. The criteria weightage was identified by applying the Fuzzy Analytic Hierarchy Process (FAHP) method. The analysis result showed that 5% of the land area is highly suitable for agricultural land use, 42% of the land is found to be moderately suitable, 33% of the land is marginally suitable, 19% of the land is currently not suitable, and 1% of the land is permanently not suitable. The significant shortcomings of the unsuitable land are steep slope and unfavourable soil type. The result proved that sago, paddy, and coconut could be alternative crops besides the existing active development in oil palm plantation in the study area.

Keywords: Agricultural Land Use, Suitability Assessment, Alternative Crops.

Session 1 B

Powering Tomorrow: Renewable Energy Solutions in Hybrid and Integrated Power Systems

Adelene Tie

Ultech Engineering

Abstract

This session will explore Ultech Engineering's latest innovations, including the Mini Hybrid Solar & Wind Turbine Project, which combines solar and wind energy as the first step towards net zero power generation in an offshore platform. Discover how DEIF hybrid and microgrid solutions revolutionize energy distribution and control, enabling efficient and reliable power management across diverse applications. Additionally, learn about Weidmüller's AC SMART EV charging boxes for home, which integrate renewable energy sources to provide sustainable and efficient charging solutions. The session will also cover Ultech Engineering's PV proposal for clients, simulated in a Net Zero IoT Remote Unmanned Platform for OGA 2024, where data collection in its SCADA systems will play a critical role in future proposals for energy-saving, efficiency, and performance solutions. Through these initiatives, Ultech Engineering is driving the shift towards cleaner, smarter, and more resilient energy systems. Don't miss this opportunity to gain valuable insights into the technologies shaping the future of renewable energy while exploring energy-saving solutions, energy management technology, and integrated power system control and management.

Keywords: Mini Hybrid Solar, Weidmüller's AC SMART EV,

Session 1 B

Analyzing Indonesia's Renewable Energy Potential from Palm Biomass and the Possibility of Utilizing Methanol and Hydrogen from Biomass

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Abstract

Climate change and rising global temperatures are pushing nations, including Indonesia, to transition to more ecologically friendly and sustainable energy sources. Indonesia has recognized biomass, particularly palm oil waste such as Empty Fruit Bunches (EFB) and Palm Oil Mill Waste (POME), as a possible source of new renewable energy in an endeavor to reach net zero emissions by 2060. Using Aspen Hysys V.14, this study intends to investigate the possibilities of EFB and POME in generating renewable energy and byproducts like hydrogen and methanol. According to simulation results, biomass may be thermochemically converted to generate syngas, which is utilized to make pure hydrogen and methanol. 64,700 tons of methanol and 15,600 tons of hydrogen are produced daily from this process. Furthermore, thermal integration with a 12 GW power production unit indicates the possibility of enhancing the energy efficiency and sustainability of the system. This study highlights how crucial it is to use biomass waste as a renewable energy source in order to meet Indonesia's energy mix objectives and lessen the country's reliance on fossil fuels.

Keywords: Palm Oil Biomass , New Renewable Energy (EBT), Empty Fruit Bunches (EPB), Palm Oil Mill Effluent (POME), Conversion Thermochemistry , Methanol Production , Production Hydrogen , Gasification Biomass , Net Zero Emission, Methanol Synthesis

Session 1 B

Marginal Abatement Cost Curves for Decarbonisation Planning in Palm Oil Industry

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Abstract

The twelfth Malaysia Plan published by the Ministry of Economy, Government of Malaysia has set a target to achieve net zero by 2050. This requires collective efforts of all sectors to develop and embrace sector-specific longterm low-carbon development strategies. Being one of the important Gross Domestic Product (GDP) contributors in Malaysia (accounts for about 5 - 7% of nation's GDP), the palm oil sector needs to be proactive in taking uo decarbonisation initiatives to achieve the net zero target. A typical palm oil mill generates huge amounts of byproducts such as palm mesocarp fibre (PMF), palm kernel shell (PKS), empty fruit bunch (EFB)), and palm oil mill effluent (POME). These by-products provide opportunities for the decarbonisation of the palm oil industry. For instance, PMF from mills can be used to generate power and steam for captive consumption, thereby offsetting emissions from fossil-based energy generation. This work presents a systematic approach known as the marginal abatement cost curve (MACC). MACC is used to analyse strategies in the utilisation of palm-based by-products for the decarbonisation of the palm oil industry. It characterises all decarbonisation pathways and allows a direct comparison between the options based on their economics relative to their environmental impact.

Keywords: Palm oil industry; Decarbonisation; Mathematical optimisation; Marginal abatement cost curve

Session 1 B

Integrated Pyrolysis System for Sustainable Conversion of Plastic Wastes into Pyrolysis Gas and Carbon Nanotubes

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Abstract

Plastic pollution is increasingly becoming a critical environmental issue due to its significant impact on ecosystems and human health. Pyrolysis technology is a promising method for addressing this problem as it can be used to convert plastic waste into pyrolysis gas. The pyrolysis gas can then be used either for energy applications or to produce valuable carbon nanomaterials. In this study, an integrated pyrolysis system was developed to generate high-quality pyrolysis gas from face mask waste. This gas was subsequently directed into a catalytic reactor for carbon nanotubes (CNTs) production. Several factors were found to influence the quality of CNTs, including the characteristics of face mask waste and the type of catalysts used in the catalytic reactor. Generally, polypropylene-based face masks can be pyrolyzed to produce an abundance of C_3 gases, which are beneficial for CNTs growth. Meanwhile, catalysts containing NiMoCa can be used in the catalytic reactor to produce high-quality CNTs. The results indicated that the carbon yield and morphology of the resultant CNTs were significantly affected by the Ca content in the NiMoCa catalyst (up to 6.4 wt.%). The NiMo-Ca catalyst may facilitate excellent carbon recovery, likely due to its creation of a low CO_2/CH_4 environment through CO_2 methanation. Further optimization studies revealed that increasing the pyrolysis temperature and duration led to reduced carbon yield. This study also provides valuable insights from the pyrolytic gas formation and carbon nucleation phases to the later CNTs growth phase. Overall, it is expected to enhance the understanding of the sustainable synthesis of valuable carbon nanomaterials from plastic waste.

Keywords: Plastic waste, pyrolysis, catalytic reactor

Session 1 B

Feasibility Study of Synergistic Biohythane Production from Palm Oil Mill Effluent (POME) Sludge Co-Digested with Aquaculture Effluent

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Abstract

In current practice, the generation of POME and aquaculture effluent was identified to be substantial owing to the increment in global demand, significantly exploiting freshwater resources and contributing to environmental pollution. This research project investigated the waste potential of palm oil mill effluent (POME) co-digested with aquaculture effluent for biohythane production, through a 2-stage anaerobic digestion process under dark fermentation conditions. Biohythane was perceived to be a superior bioenergy energy source substitution for pure biomethane and pure biohydrogen in fuel efficiency, gas productivity and energy storage. In this research, the experimental condition was set to conduct at thermophilic and mesophilic conditions for 2 days and 15 days, respectively. The POME: AW mixing ratios implemented in this research project were preset at 1:0, 1:0.25, 1:0.50, 1:0.75 and 1:1 in test tube scale and 1 set of jacketed reactor scale on digestion ratio of 1:0. Before commencing the anaerobic digestion, both inoculums for the acidogenesis and methanogenesis were prepared and mixed with digestate with the corresponding substrate-to-inoculum ratio of 20:1 and 2:1 in accordance with the digestion stage. The biogas productivity data was detected using a portable hydrogen meter in the acidogenesis stage and a multi-gas meter in the methanogenesis stage.

Keywords: Palm Oil Mill Effluent, Biohythane

Session 1 B

Kinetic Study of Co-Pyrolysis of Chlorella Vulgaris microalgae and Tetra Pak waste

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Abstract

This study explores the co-pyrolysis of Chlorella vulgaris microalgae and Tetra Pak waste mixtures, aiming to address the dual challenges of plastic pollution and increasing energy demands. Pyrolysis, a process of thermal decomposition in the absence of oxygen, is investigated as a method to convert these waste materials into valuable products like bio-oil. The research focuses on the kinetic and thermodynamic aspects of this process, employing models such as Starink, Friedman, and the Distributed Activation Energy Model (DAEM) to determine the activation energy, Arrhenius constant, and other key parameters. The study's findings include activation energy and Arrhenius constant, alongside thermodynamic parameters such as enthalpy, Gibbs free energy, and entropy changes. These results contribute to optimizing the pyrolysis process for enhanced yield and quality of bio-oil, demonstrating the potential for sustainable energy production from waste materials. Future work will focus on integrating machine learning techniques, particularly Artificial Neural Networks (ANN), to predict thermal degradation behavior and further improve process efficiency.

Keywords: Chlorella vulgaris microalgae, Pyrolysis, waste materials

Session 1 C

Photocatalysis: A sustainable approach to save energy and environment

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Abstract

Photocatalysis is a chemical reaction that takes place in the presence of a photocatalyst and suitable light. It is a favorable, green, and environmentally friendly method for the conversion of solar energy to chemical energy or chemical conversion using a suitable semiconductor such as metal oxide, chalcogenides, etc. Photocatalysis is a process in which the inexhaustible, abundant, clean, and safe energy of the sun can be harvested for sustainable, harmless, and economically feasible technologies. It is a unique process that can help resolve energy and environment-related issues. Photocatalysis is a rapidly emerging area with a high possibility of an extensive range of industrial applications, such as disinfection of water and air, mineralization of toxic organic pollutants, removal of organic or inorganic pollutants, production of renewable fuels, dye degradation, wastewater treatment, artificial wastewater treatment, chemicals synthesis, electrode materials, photoanodes, optoelectronic devices, etc. at ambient temperature and pressure without requiring any other energy inputs. Photocatalysis induces efficient and effective reactions at room temperature under sunlight irradiation and has been the focus of much attention for its potential to establish ideal and green technologies that can convert clean, safe, and abundant solar energy into electrical and/or chemical energy at ambient temperature and pressure without utilizing external energy inputs.

Keywords: Photocatalysis; Photocatalysts; Metal oxides; Chalcogenides; Semiconductors; Energy; Environment.

Session 1 C

Physical and Tensile Properties of Industrial Wood Waste-derived Cellulose Nanofibril Membranes

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Abstract

Abandoned wood wastes from industries have posed significant environmental challenges recently. Utilization of these industrial wood wastes in the production of nanocellulose, particularly cellulose nanofibrils (CNFs) can offer a promising solution to overcome this issue. CNFs can be derived from various plant materials, including industrial wood wastes, which are eco-friendly, making them an ideal candidate for sustainable material development, especially for energy storage applications. This study investigates the production of CNF membranes from industrial wood waste (IWW), focusing on their unique physical and tensile properties. CNF membranes with varying thicknesses (25, 30, 35, and 40 µm) were prepared using a solution casting method. Morphology, tensile properties, porosity, and electrolyte uptake ability of the membranes were determined. Notably, the CNF membrane with a thickness of 25 µm (CNF25) demonstrated promising tensile properties, including a tensile strength of 11.86 MPa, 4.59% of elongation at break and a tensile modulus of 410.13MPa. The prepared CNF25 membrane exhibited high porosity and electrolyte uptake of 52.14% and 219.52%, respectively. These findings are comparable to the commercially available cellulose membrane separator (NKK-TF4030 with thickness of 30 µm), highlighting the potential of CNF membranes derived from industrial wood waste as versatile and sustainable separators for energy storage devices.

Keywords: Industrial wood waste; Cellulose nanofibrils (CNFs); Separator; Porosity; Electrolyte uptake.

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Session 1 C

Thermal Effect On The Steam Turbine Cooling Process After Shutdown Using Parallel Convection in Salak Geothermal Power Plant

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Abstract

The shutdown process of a geothermal power plant involves a cooling process when the turbine reaches a speed of 3 rpm before it stops completely, to prevent damage to the turbine material. The current cooling process takes a long time, approximately 8 hours. Therefore, the research made innovations to accelerate the cooling process without causing damage to the turbine blade material and steam pipes. By accelerating the cooling process, it will result in energy efficiency by reducing the electrical energy consumption of one cooling pump. Based on analysis using CCT diagram, parallel convection research can be implemented without causing changes in material microstructure. The cooling time is only 5 hours, resulting in a reduction in electrical energy consumption of 3,561.00 kWh from the cooling pump. As for the steam pipe material leading to the turbine, no material stress occurs because the turbine steam valve is fully closed.

Keywords: Turbine, Shutdown, Forced Convection, Natural Convection, Heat Transfer

Session 1 C

A Short Review on Recent Innovative Materials for Hydrogen Storage: Revolutionising Energy Storage

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Setiabudi)

Abstract

Hydrogen storage technology is essential to the energy landscape, providing a clean and adequate substitute for current non-renewable fossil fuels. However, conventional storage methods, such as liquid hydrogen and high-pressure tanks, require substantial energy and pose significant challenges in handling due to safety issues. This article reviews recent innovative materials revolutionising hydrogen storage, focusing more on their potential to improve safety and efficiency. The article concisely discusses the fundamentals of hydrogen storage, including the performance and safety that guide the material development. Different materials in hydrogen storage technologies, including metal hydrides like magnesium hydrides, porous materials like metal-organic frameworks, carbon materials, and zeolites, are elucidated. Each material is studied in terms of its synthesis, characterisation, and performance. Challenges and limitations were discussed, and recommendations for upcoming research were provided. The prospects of using innovative hydrogen storage materials as an efficient energy source for the future have been adequately elucidated.

Keywords: Porous materials, hydrogen storage, metal hydrides, energy storage.

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Session 1 C

Development of hybrid composite using simple lab-scale vacuum-assisted resin transfer molding (VARTM) technique

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Abstract

This paper aims to develop and demonstrate a simple lab-scale vacuum-assisted resin transfer molding (VARTM) technique to fabricate a hybrid natural fibre-reinforced composite consisting of reinforcement from fibres and particulate forms. A study was conducted to investigate the effect of different filler sizes on the mechanical properties of the natural hybrid reinforced composite and showcase the effectiveness of the hybrid composite fabrication using the VARTM technique. The primary phase of the composites was epoxy resin, with reinforcement of oil palm empty fruit bunch (OPEFB) fibres and oil palm kernel shell (OPS) particulates were embedded into the resin as the secondary phase of the composites. The results indicate that incorporating smaller-sized Oil Palm Shell (OPS) particulates (≤75 µm) enhances the compressive properties of the hybrid composite. In contrast, larger particulates (150 µm - 300 µm) do not pass through intra-fiber spacing due to permeability issues, resulting in weaker bonding and reduced compressive strength.

Keywords-component; VARTM; hybrid composites; natural fibre; oil palm kernel particulates; oil palm empty fruit bunch fibres

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Session 1 C

Hybrid natural fibre polymer composite for lightweight structural applications

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Abstract

Hybrid natural fibre-reinforced polymer composite (NFRPC) materials can effectively address the demand for lightweight structural applications, offering improved strength-to-weight ratios, cost-effectiveness, and sustainable alternatives to traditional materials.The research experiment involved stages using different natural fibre materials: empty fruit bunch (EFB) fibres, palm kernel shells (PKS) microfibers, and carbon nanotubes (CNT) nanoparticles. The composition with the highest mechanical properties was then fabricated again with various ultrasonication parameters as the hand layup could not accommodate the agglomerated particles. The sample that possessed the highest tensile strength comprised of 4% EFB fibres and 96% epoxy resin – 43.43 MPa. Initially, it was hypothesised that the incorporation of hybrid microfibers would further improve the strength parameters. However, the hybrid microfibre composite did not meet expectations and degraded the strength of the composite. Meanwhile, the addition of CNT was found to be successful in improving both the tensile strength and microhardness of the hybrid microfiber. The highest sample combination in terms of microhardness had a composition of 0.5% nano-filler, 4% micro-filler, and 4% EFB fibres, ultrasonicated at an amplitude of 20 (16.33 HV). Overall, the tensile strength is comparable to that of conventional polymer materials such as low-density polyethylene (LDPE), high-density polyethylene (HDPE), polystyrene (PS), polypropylene (PP), and polyvinyl chloride (PVC).

Keywords: Hybrid composites; natural fibre; oil palm kernel particulates; oil palm empty fruit bunch fibres

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Session 1 D

Preliminary Study to assess Existing Coal-fired Power Plants, towards Nuclear Energy Transition through Coal to Nuclear (C2N) Conversion Mechanism to Support Indonesia Energy Transition

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Abstract

Indonesia has committed its contribution to achieving Net Zero Emission (NZE) by 2060 at the COP 26 Glasgow meeting. PLN as one of the largest energy companies in Indonesia has developed a greener Electricity Supply Business Plan (Green RUPTL) to support this commitment. One of the strategic initiatives in the RUPTL is to study the utilization of New Energy in the national electricity energy mix in the form of the use of Nuclear Power Plants (PLTN) in Indonesia. PLN considers the potential use of nuclear energy, especially when fossil energy reserves are depleted. Several countries have studied and implemented this nuclear energy transition strategy; one of which is through the conversion of coal-fired power plants to nuclear power plants with the Coal to Nuclear (C2N) mechanism, which is converting a steam power plant coal combustion system into a modular nuclear reactor equipped with a Steam Generator, but still maintaining the existing Steam Turbine & Generator system. PLN Nusantara Power (PLN NP) is the Generating Company (GenCo) of PLN, which currently manages more than 18GW of power generation capacity in Indonesia. This paper seeks to assess the feasibility of developing C2N scenarios and mechanisms ; in the form of selecting PLN NP coal-fired power plants that are feasible for C2N conversion. The assessment starts from the technical aspects of the existing coal-fired power plant, including the effective life of the existing plant & the need for extended-life/retrofit of the existing plant if C2N is carried out, the type and technology of nuclear reactors & steam generators that are suitable for the capacity output of the existing coal-fired power plant and the input of water & steam operational parameters of the existing coal-fired power plant, the history of the existing plant reliability conditions, as well as the Capacity Factor (CF) of the existing plant and its system peak load. Further assessment is carried out from the existing coal power plant site, including aspects of natural disaster, seismic and volcanic, peak ground acceleration, man-made hazard, urban density and emergency planning zone (EPZ). The assessment is carried out with a weighting and scoring system based on several sources of data and statistics issued by authorized institutions, including the Ministry of Energy and Mineral Resources (ESDM), the National Disaster Management Agency (BNPB), the Central Statistics Agency (BPS), and the State Electricity Company (PLN). The results of the overall assessment show that the candidate PLTU PLN NP coal unit is suitable and has the potential for the implementation of C2N conversion as part of the energy transition strategy through nuclear energy.

Keywords: net zero emission, nuclear power plants, coalfired power plants, coal to nuclear, C2N conversion.

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Session 1 D

Enhancements of Three-Reactors Chemical Looping Technology for Efficient Clean-Hydrogen Production

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Abstract

Hydrogen has been considered as a promising clean secondary energy source in the future, accompanying electricity. The production of hydrogen can be conducted via several routes, including thermochemical, electrochemical, and biological processes. Among thermochemical conversion technologies, chemical looping has a high potential to be adopted in the future due to its high energy efficiency and the capability to separate CO2 simultaneously during the conversion. In our works, chemical looping with three circulated reactors is adopted for clean hydrogen production. The system consists of a fuel reactor, a steam reactor, and an air reactor. Oxygen carriers are circulated among those reactors to facilitate the reaction, especially in terms of reduction and oxidation. However, to establish this technology, several challenges must be clarified and solved, especially some issues correlated to the performance of oxygen carriers, reaction mechanisms, reactor and particle fluidization, controllability, and process integration. Several of our works on those issues are described in order to improve the feasibility of three-reactor chemical looping technology.

Keywords: Chemical looping; hydrogen, reactor

Session 1 D

Assessing the Whole Benefits of Energy Storage System on Maximum Demand Reductions using a Network-Based Modelling Approach

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Abstract

Developing countries often witness a steady increase in maximum demand within their power systems. To maintain the reliability of power supply, utility operators must regularly plan and upgrade both existing power stations and transmission networks to ensure reliable electricity transmission to consumers. Substantial investments are necessary from the utility companies that will ultimately be passed on to consumers through increased electricity tariffs. Thus, the objective of this research work is to develop a methodology to model the distribution of energy storage systems across an electrical network such that a network- based modelling of ESS can be carried out to assess the financial and environmental benefits of maximum demand reductions by energy storage system. Such benefits are due to the reduced power generation costs and deferments of network upgrades and new peaking power plants. Several case studies are carried out by using the methodology based on the IEEE 24-bus transmission network with distributed ESS to perform maximum demand reductions. Results show that the optimum capacity of ESS is found to be 3700 MWh that brings the highest net financial saving of USD 402.54 million (RM 1900 million). In addition, 2679.1 ktons of CO2 emission is avoided with the reduction in maximum demands.

Keywords: Maximum demand reductions, Energy storage system, Network upgrade deferment, Carbon emission reductions, Optimum load flow, IEEE 24-bus network

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Session 1 D

Mathematical modeling of microwave-assisted heating of an oil palm fresh fruit bunch

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Abstract

Microwave heating has been used for small samples of oil palm fruit drying and sterilization at laboratory scale. To develop a pilot-scale microwave dryer/sterilizer for oil palm fruits, a computational model assisted in designing such a system. This work modelled microwave-assisted heating of a typical oil palm fresh fruit bunch (OPFFB) size. The drying kinetics of a single oil palm fruit was first modelled and validated with experimental data. Preliminary simulation shows that a microwave heating of 180 W is unable to heat up the inner part of an OPFFB sufficiently. Prolonged microwave heating will cause overheating which could degrade the palm oil quality.

Keywords: Microwave, oil palm fresh fruit bunch

Session 1D

Predicting Interoperability at Battery Swapping Stations for Electric Motorcycles in Indonesia: A Geographical, Demographic, and LSTM-Based Machine Learning Approach

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Abstract

Since electric bike are growing in popularity throughout Indonesia, the installation of efficient and interoperable stations battery-swapping has become imperative. The system extracts demographic and geographic information to use with machine learning in order to predict the interoperability of these stations. We built an LSTM memory cell neural network for ensemble learning. In this study, we looked at data from different areas, such as population density, the rate of urbanization, and the distribution of electric motorcycles. Then there are battery swapping points and as the entire process is automated, population density and proximity to major transport hubs come into play. Likewise, so are ages and income distribution. Conventional predictive models are typically accurate to only about 80%, while LSTM scored a higher average at a rate of around 92%. Cities statistically offer a better chance to integrate systems, as they have higher adoption of electric motorcycles and an enclave of relatively young people who are tech savvy. These findings give a good idea of how to deploy the location and operation strategy for battery swapping stations. By learning what challenges we are likely to face, all stakeholders can look forward to a powerful battery-swapping network that is reliable and convenient. Research contributes to strategic policy-making for electric vehicle infrastructure and promotes sustainable transportation in Indonesia. Through a long short-term memory (LSTM) neural network of China's national wide data: population density, urbanization and electric motorcycle distribution were applied to analysis. A crucial thing that matters is how the battery swapping stations interact and work together, On the one hand, we require measure of consumer density, i.e. population size, along with main transportation hubs at most distance, to evaluate no-market pricing and compare individual model fitness against yes-competitive pricing. Demographics such as age and income distribution are also relevant. This is much better than that of a traditional predictive model (92% for an LSTM). Factually, there are also higher likelihoods that electric motorcycle owners still reside in urban locations who will be able to use connected/current devices supported by lower costs of successful system integrations factoring age and early adopter/tech-savvy consumer statistics. This provides a reference for the optimal layout and operation of battery-swapping stations. It does certainly suggest some of the challenges in achieving that interoperability and establishing a vast battery-swapping ecosystem. Urban Research on urban sustainability to support future Urban Planning in Indonesia Development of EV infrastructure and sustainable transportation initiative.

Keywords: electric motorcycles; battery swapping stations; interoperability; machine learning; geographical and demographic.

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Session 1 D

Developing Optimised Culture Conditions in Photobioreactor System for Enhanced Microalgae Growth

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Abstract

In response to the global demand for sustainable energy sources and environmental solutions, microalgae have emerged as a promising focus of scientific research due to their unique characteristics and potential. Microalgae as autotrophic and photosynthetic organisms offer remarkable benefits, including carbon sequestration and biomass production rich in valuable compounds such as carbohydrates, proteins, and lipids. Their versatility allows for applications in renewable energy, particularly in biofuel production, carbon capture, and the generation of high-value bioproducts like vitamins, carotenoids, and omega-3 fatty acids. The study explores the optimisation of microalgae cultivation within photobioreactors, focusing on factors such as pH levels, light intensity, and growth media to enhance microalgae growth. The research addresses the existing gaps in understanding the interaction between these parameters in a unified system, aiming to design and test an innovative photobioreactor that maximizes the cultivation. With this study, we could contribute to sustainable development goals by improving biofuel production, advancing biotechnological innovations, and promoting environmental sustainability through efficient carbon capture and reduced environmental footprints

Keywords: Sustainable Energy; photobioreactor; optimization

Session 1 D

Bridging Stakeholder Perspectives – Transition towards the Solar Energy Storage (SES)

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Abstract

The current study identifies the key stakeholders who are of value to the transition of solar energy storage (SES) using a stakeholder analysis framework. The various stakeholders involved are identified and prioritised, enabling them to be grouped according to their significance, focusing on the adoption of SES and the level of interest or engagement in the residential solar and SES market based on a case study of Australia. The designated key stakeholders and their groups include market participants such as manufacturers, suppliers, retailers, and installers; participants from Australia's electricity network, utilities, and electricity retailers; state and federal government agencies and organisations; and the eventual consumers. Semi-structured interviews were conducted among 20 participants to identify the key stakeholders and their involvement in the transition. The study highlights the need for the stakeholders to share common goals and share collective responsibility for an effective transition towards SES. The study provides valuable insights into the complex landscape of SES adoption in Australia. The study indicates that despite the evident benefits, there are hurdles to the adoption of solar and storage systems remains, necessitating active participation from stakeholders across different sectors, such as industry, policymakers, local communities, and consumers. It underscores the interconnectedness of various stakeholder groups and the importance of their collaboration in achieving a sustainable energy future. This study aligns with United Nations Sustainable Development Goals 7, 9, 12, and 13.

Keywords: Stakeholder residential solar, solar energy storage, climate action; UN SDG

Session 2 A

Integrating Green and Clean Energy Solutions: The Role of Carbon Capture and Fuel Cells in the Energy Transition

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Abstract

As the global energy landscape shifts towards sustainability, integrating green and clean energy solutions has become a critical priority. This session will explore the intersection of carbon capture technologies and fuel cells, with a particular focus on their roles in driving the energy transition. We will delve into the latest advancements in carbon capture and storage (CCS) methods, examining how these technologies can be synergistically combined with fuel cells to reduce carbon emissions while enhancing energy efficiency. The session will highlight real-world applications and case studies that demonstrate the potential of these technologies to transform energy systems. By addressing the technical challenges and economic considerations involved in implementing these solutions, this session aims to provide a comprehensive overview of how carbon capture and fuel cells can contribute to a low-carbon future. Attendees will gain valuable insights into the strategies needed to accelerate the adoption of these technologies, ultimately paving the way for a more sustainable energy transition.

Keywords: Clean energy; Carbon Capture and Storage (CCS); Energy Efficiency

Session 2 A

Techno-Economic Evaluation of Developing a Solar-Wind Hybrid Power Plant on Komodo Island

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Abstract

This research focuses on the electrification of Komodo Island, a top tourist destination in Indonesia. To supply electricity to the island, three diesel generators with capacities of 2x80 kW and 60 kW are currently used. The study investigates the feasibility of using renewable energy to either complement or replace these diesel generators as part of Indonesia's de-dieselization programs. Proposed renewable energy options include a 10kW wind turbine, solar PV, a power conversion system, and batteries. The aim is to conduct a techno-economic analysis and optimize a hybrid system combining diesel generators with renewable energy (solar and wind) for Komodo Island. The Hybrid Optimization Model for Electric Renewable (HOMER) Pro software was employed for simulation and optimization. Calculations accounted for the current diesel price, including transport costs per liter. The study found that renewable energy could provide 74.4% of the energy needs in the most optimized system. The Net Present Cost (NPC) decreased from USD 2.83 million to USD 1.36 million, and the Cost of Energy (CoE) dropped from 0.505 USD/kWh to 0.243 USD/kWh. The Internal Rate of Return (IRR) for the optimized system is 33%, with a Return on Investment (ROI) of 28% and a simple payback period of 3.1 years. This research demonstrated that a solar-wind hybrid power generation system is both technically and economically viable, supporting previous studies that identified this hybrid configuration as the most optimal.

Keywords: Wind-solar hybrid; HOMER Pro; Techno-economic analysis, De-dieselization

Session 2 A

Multi-Criteria Financial Risk Analysis of the Solar PV Power Plant Project by Incorporating Uncertainty Using Monte Carlo Simulation

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Abstract

The government of Indonesia is concerned with accelerating the energy transition from fossil fuel to clean energy. PT. PLN (Persero) as the state-owned enterprise (SOE) in the electricity sector fully supports the government's intention by formulating the Accelerated Renewable Energy Development (ARED) with a coal phase-down scenario where the portion of the renewable energy power plant will increase to 75% of the total generation in 2040. However, the capital cost of green energy still tends to be expensive, therefore, with many renewable energy developments in the future, PLN needs to sharpen its financial modeling to prevent losses. The problem is that, in general, financial analysis only uses a deterministic approach where the parameters entered as input are only the “best estimate” value without considering the uncertainty in each input variable. Investment in the power generation sector is a long-term activity, so incorporating the uncertainty is very important and necessary. The Monte Carlo simulations were performed to incorporate the uncertainty and analyze the financial risk in more detail and realistic. One of the feasibility study reports of Solar PV Power Plant 13 MWp in Indonesia will be used as a case study. The result showed that Monte Carlo simulation can provide the confidence level (%) of each output parameter (NPV and IRR). It can show more realistic conditions compared to deterministic methods.

Keywords: Monte Carlo method, probability distribution, NPV, IRR, financial risk analysis

Session 2 A

The Eco-canvas of green business vehicle-electrification: A case study of electric motorcycle circular-economy business model in Indonesia

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Abstract

Eco-canvas is the latest tool of the business model canvas developed by Osterwalder & Pigneur, which incorporates the circular economy that considers environmental, social and innovation technology. The Eco-canvas creates a closed-loop business model to address the environmental and social damage caused by linear economy where Industries and societies generate unused waste products. The circular economy business concept is developed based on the principle of "closing the life cycles". The business which is generated from resource consumption to pollutant emissions as an end-life of products, becomes resources for other goods rather than wastes. It meets the sustainable development framework. Eco-canvas is a tool that can be used by researchers, private businesses and public sector, so that it can provide a better 17 understanding to develop sustainable businesses. This paper focused on the fundamental features of vehicle electrification related business which shows the model of circular economy green business using eco-canvas business model. It evaluates the electric motorcycle conversion workshop and the startup battery industry businesses. Current research explains the structure of green business models. We find that the models are trying to take a more consumer-centric perspective for creating environmental, economic, and social, values. They create different kinds of energy-related products and services for their customers. Successful business models mainly focus on the increasing revenue from new product development. This paper contributes to the development and application of the Eco-canvas that focuses on green businesses related industries. As a practical contribution, this study develops and provides information about the existing business models of green business vehicle electrification. Stakeholders may use this information as references to improve the green business become a circular economy business model through innovation and technology. Further research could explore the practicality of the Eco-canvas methodology through other sectors of activities and contexts which benefit creating more green business opportunities through innovation and technology.

Keywords: Eco-canvas, business model, circular economy, green business, electric motorcycle

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Session 2 A

Development of Low-Cost Floating Platform for Solar PV Installation

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Abstract

Floating photovoltaics is a prevailing technology in the energy sector, owing to its advantages over traditional solar photovoltaic systems. The rise and the rapid expansion of technology require persistent development activities to make it more affordable for widespread global adoption. In this regard, studies carrying out multidimensional floating photovoltaics investigations and their outcomes are frequently reported in the literature. However, the creation of the floating structure is not explored; rather, only the used elements are reported. This becomes a hurdle in creating the floating structure for photovoltaic systems, and therefore, this work aims to provide a comprehensive step-by-step formation of the floating structure for solar photovoltaics in water. The outcome shows the development of a simple floating photovoltaic structure that is welding-free, portable, modular, assembly-friendly, demountable, affordable, cost-efficient, and durable in harsh weather. This detailed guide on the floating structure formation de-escalates the difficulties in deploying photovoltaic panels in the waterbody.

Keywords: Floating photovoltaic, floating structure, cost efficiency, solar energy, renewable energy.

Session 2 A

Exploring the Environmental Factors (Light and Air) on Biophotolysis of Microalgae on Biohydrogen Production

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Abstract

As the world shifts toward cleaner energy sources, hydrogen is a promising solution due to its potential for zero-emission fuel production. Microalgae, particularly Chlorella sp., offer a novel approach to hydrogen production through biophotolysis, leveraging their ability to convert light energy into chemical energy. This research investigates how environmental factors—specifically light and air—affect biohydrogen production in microalgae using two experimental approaches: indirect biophotolysis and a two-phase process.Indirect biophotolysis involves cultivating microalgae under aerobic conditions with light to enhance biomass accumulation, followed by an anaerobic phase with light to drive hydrogen production. This process utilizes light energy to drive photosynthetic reactions even in the absence of oxygen, maximizing hydrogen yield. In contrast, the two-phase approach includes an initial aerobic growth phase under light, succeeded by an anaerobic phase in darkness. This method relies on dark fermentation processes, which may influence hydrogen production differently than continuous light exposure. By investigating these two experimental methods, the research seeks to identify optimal conditions for enhancing hydrogen yields and improving the overall efficiency of microalgae-based hydrogen production systems.

Keywords: Hydrogen, Microalgae, Chlorella, biophotolysis

Session 2 A

Malaysia's Green Leap: Transforming Energy Policies for a Sustainable Future

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Abstract

Malaysia's Green Leap initiative represents a bold vision for transforming the nation's energy policies toward a sustainable future. This strategic framework underscores Malaysia's commitment to reducing its carbon footprint and transitioning from fossil fuels to renewable energy sources, aligning with international environmental goals. This paper provides an objective review of Malaysia's current energy policies, identifies critical gaps, and offers recommendations to strengthen these policies, fostering a more robust green energy landscape. Malaysia's Green Leap encompasses various strategic policies aimed at promoting renewable energy, enhancing energy efficiency, and fostering technological innovation. Key initiatives include substantial investments in solar, wind, and hydroelectric power, as well as incentives for adopting energy-efficient practices across industries and households. Additionally, Malaysia has established regulatory frameworks to support the development and integration of renewable energy technologies, aiming to reduce greenhouse gas emissions and combat climate change. One of the noteworthy aspects of Malaysia's Green Leap is the emphasis on public-private partnerships and international collaborations. These partnerships are crucial for pooling resources, sharing expertise, and driving large-scale renewable energy projects. Furthermore, Malaysia's commitment to green energy is reflected in its national energy policies, which prioritise sustainability and long-term environmental health. Despite the promising outlook, several gaps and weaknesses in Malaysia's energy policies hinder the full realisation of its green energy potential. Firstly, the inconsistent implementation and enforcement of energy policies across different regions and sectors pose a significant challenge. While there are progressive regulations in place, the lack of uniformity in their application diminishes their overall effectiveness. This discrepancy is often due to varying levels of administrative capacity and political will among regional authorities. Secondly, Malaysia's energy infrastructure remains heavily reliant on non-renewable sources, such as coal and natural gas. The transition to renewable energy is hampered by the existing dependence on these traditional energy sources, which are deeply entrenched in the nation's energy mix. This dependency makes it challenging to integrate renewable energy systems seamlessly and sustainably. Another critical gap is the limited financial and technological resources available for renewable energy projects. Although there are investments in green energy, they are often insufficient to meet the growing demand for sustainable energy solutions. The high initial costs and technological barriers associated with renewable energy technologies further constrain their widespread adoption. To bridge these gaps and enhance Malaysia's green energy policies, several strategic recommendations are proposed. Firstly, it is essential to establish a centralised regulatory body to oversee and coordinate the implementation of energy policies across all regions. This centralized approach can ensure uniformity, compliance, and effective enforcement, thereby enhancing the overall impact of green energy initiatives.

Secondly, increasing investments in research and development (R&D) is crucial to drive innovation in renewable energy technologies. The government can provide incentives for private sector participation in R&D and collaborate with international research institutions to leverage global expertise. By fostering a culture of innovation, Malaysia can develop cutting-edge technologies that are both cost-effective and efficient. Financial mechanisms such as green bonds, subsidies, and tax incentives can also play a vital role in supporting the transition to renewable energy. These mechanisms can make green energy projects more economically viable for both consumers and producers, reducing the financial barriers to adoption. Additionally, establishing public-private partnerships can mobilise the necessary resources and expertise to scale up renewable energy initiatives. Public awareness and education campaigns are essential to garner support for green energy policies. By raising awareness about the benefits of renewable energy and sustainable practices, the government can encourage individuals and communities to adopt eco-friendly behaviours. These campaigns can also highlight the long-term economic and environmental benefits of transitioning to green energy, fostering a culture of sustainability. Lastly, integrating green energy goals into broader national development plans is critical to ensure that sustainability is a core component of Malaysia's growth strategy. By aligning economic and environmental objectives, the government can create a cohesive framework that supports sustainable development. This integration can also facilitate the allocation of resources and policy prioritisation necessary for achieving green energy targets. Malaysia's Green Leap represents a significant step toward a sustainable future, reflecting the nation's commitment to environmental stewardship and green energy transformation. However, to fully realise this vision, it is imperative to address the weaknesses and gaps in current policies. By implementing the proposed recommendations, Malaysia can strengthen its green energy policies, ensuring a resilient and sustainable energy future. This endeavour not only contributes to global environmental goals but also paves the way for economic resilience and social well-being, securing a sustainable legacy for future generations.

Keywords: Green, Energy policies, Renewable energy, Sustainability

Session 2 B

Building Sarawak's Workforce for the Energy Transition: A Hands-on Green Energy Training Initiative

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Abstract

Sarawak is at the forefront of preparing its workforce for the energy transition through a groundbreaking Green Energy Program. In partnership with CENTEXS, Solarvest, and HUAWEI, the program offers the region's first training and certification courses in smart solar PV, green mobility and storage, and green hydrogen. This program goes beyond traditional education by incorporating practical, hands-on experience through an advanced green energy testbed. Participants engage with real-world applications, including Southeast Asia's first solar-hydrogen hybrid solution for a 5G telco tower, Sarawak's first 392kWp rooftop solar system for commercial and industrial use, AC and DC charging for EVs, solar trackers with Huawei battery energy storage system and energy monitoring system, wind turbines, and a micro-cascading dam. This immersive approach ensures that graduates are not only knowledgeable but also ready to contribute effectively to Sarawak's energy transition, enhancing the region's workforce readiness for a sustainable future

Keywords: Solar-hydrogen hybrid solution; energy storage; energy transition

Session 2 B

Low-Energy Consumption Rapid Recovery of Valuable Metal Oxide Resource from Electric Arc Furnace Dust Waste with Wastewater Treatment Application

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Abstract

The metallurgical processes would generate a significant amount of Electric arc furnace dust (EAFD) as solid waste during colossal production. EAFD contains valuable metal material resources such as iron and zinc oxide. Today, high energy consumption, low conversion efficiency, and low purity of Fe3O4 and zinc oxide hamper the application of resource recovery. To overcome these drawbacks, we developed an optical fiber laser recovery technology for producing high-purity metal iron and zinc from EAFD and forming ZnFe2O4 composite catalyst material to degrade organic contaminants in an aqueous solution. The optical fiber laser, at a lower laser power of 600W and scanning rate of 2 mm/s, we could simultaneously recover 84.1% and 85.9% of high-purity granular iron and crude zinc oxide powders which were identified as Fe3O4 and ZnO crystal phase structures by XRD. Due to the high efficiency of little heat delivery and minimizing the potential hazards of heat damage, the optical fiber laser system had an energy consumption of around 0.72 GJ/ ton, 3-food better than using pyrometallurgical using Waelz kiln system. In addition, we produced ZnFe2O4 (ZFO) franklinite with homogeneous particles using hydrothermal alkaline activation. This ZFO had a magnetism and Fe3O4 crystal structure that could be a Fenton-like reaction to remove methylene blue (MB) at pH 3 with ten mM H2O2. MB dye has demonstrated excellent removal efficiency of 100% from high concentration (200 mg L-1) aqueous solution within 30 minutes and without producing sludgy. This innovative optical fiber laser and hydrothermal design enable efficient EAFD valorization recovery of valuable metal oxide without using a high energy consumption furnace.

Keywords: Electric arc furnace dust (EAFD), Wastewater, optical fiber laser

Session 2 B

The Role of Watermelon Rinds in Sustainable Energy Solutions: Current Trends

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Abstract

Watermelon, known for its ability to provide both refreshing and hydrating qualities, is gaining recognition for its potential use in cleaner and sustainable technologies. This concise review examines the utilization of discarded watermelon rinds as adsorbents, offering an environmentally acceptable waste management solution with versatile applications in areas such as biofuel production, catalysis, energy storage, supercapacitors and batteries. This study examines the production, characteristics, and various uses of watermelon rinds in the energy sector as of 2024, emphasizing the significance of watermelon rind biomass as a viable and renewable energy resource.

Keywords: Watermelon rinds, Energy, Biofuel, Catalysis, Battery, Adsorbent

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Session 2 B

The Influence of Water Hyacinth Particle Size on the Tensile Strength and Microhardness Performance

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Abstract

Water hyacinth, a water-dwelling plant known for its invasive nature, has garnered attention and notoriety due to the adverse economic and ecological effects it causes. The petiole of the water hyacinth plant has demonstrated potential as a reinforcing filler in the field of composite materials. However, limited studies have explored the dispersion of the WH particles. In this study, both qualitative and quantitative analyses were conducted, examining surface morphologies and conducting tensile and microhardness tests It was discovered that only particle size < 212 μm achieved homogenous dispersion within the polymer matrix. Additionally, it was found that particle size had no significant influence on microhardness. These findings would contribute to the development of effective WH-reinforced polymer composites.

Keywords: Natural Fiber, Water Hyacinth, Biomass Valorization, Particle Composite

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Session 2 B

Thermal Influence on Mechanical Characteristics of Glass Fiber Reinforced Polymer Nanocomposites Towards Sustainable Curing Process

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Abstract

Disrupting environmental challenges leads to sustainable development endeavor not only in renewable energy but also in resource materials such as polymer nanocomposite materials which are finding increased applications in various engineering fields. However, manufacturing of nanocomposites involved energy intensive curing process which hampers towards sustainability. Hence, to address such issue understanding of thermal influence on the curing process is crucial. Therefore, the aim of this research is to identify the effective curing temperature and its influence that address the interfacial bonding characteristics through mechanical characteristics i.e. surface hardness. Five different samples were prepared to analyse the thermal effect of curing process via varying five different curing temperature. The surface hardness and morphological properties of glass fiber reinforced epoxy nanocomposites were analysed through microhardness and micrography analysis. It is revealed that mechanical characteristics of the nanocomposite significantly depends on the curing temperature of the specimen and beyond an effective curing temperature, would lead to degradation in mechanical performance with severe damages to the glass fiber and the resin. It is expected such findings would pave the way towards sustainable composite manufacturing technology.

Keywords: GFRP composites; nanoclay; epoxy; green materials; interfacial bonding

Session 2 B

Seismic Performance of Precast Concrete Beam-to-Column Connections: Numerical Studies

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Abstract

Precast reinforced concrete (PC) structures are gaining popularity globally because of their improved quality control and decreased need for formwork, material waste, and construction time. Designing the PC beam-to-column connection to withstand seismic loads is crucial. Insufficient design of PC beam-to-column connections in the past earthquakes has led to the failure of many PC buildings due to poor design of the connections. Therefore, this study aims to numerically analyse the seismic behaviour of PC beam-to-column connections subjected to cyclic loading, thereby simulating the seismic behaviour. Therefore, two external PC beam-to-column connections were built using the finite element analysis (FEA) method and analysed using ABAQUS software to investigate their seismic behaviour. The FEA seismic analysis results for both models were very close to the experimental results regarding the mode of failure, the load-displacement curve, the loss of energy, the strength, the ductility, the stiffness degradation, and the yielding of the reinforcing bars. Hence, the FEA results were in good agreement with the experimental results. The FEA results could potentially predict and simulate the seismic behaviour of the PC beam-to-column connection. Therefore, using the FEA method to predict the seismic results of beam-to-column connections is a potentially sustainable method. It consumes less energy, saves time, reduces costs, and provides powerful prediction tools. Therefore, the results of this study would provide useful insights for improving the seismic design guidelines of PC beam-to-column connections, thereby enhancing structural integrity and seismic performance, guiding future developments in precast buildings, and well-probing seismic behaviour of PC buildings.

Keywords: Precast concrete, Finite element analysis

Session 2 B

Powering Up Transmission: Contingency of Indonesia's Smart Grid Policy

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Abstract

Electrical power has emerged as a more significant sector in Indonesia since it is used more frequently to advance its development. Some of the persistent challenges include reliability and access issues, especially in the transmission network, regular power outages, high transmission losses, and fluctuating RES production. This paper analyzes Indonesia's transmission system, identifying opportunities for smart investment and exploring the prospects of smart grid development. It further outlines key policy issues and corresponding solutions. New measures under the National Electricity Supply Business Plan (RUPTL) 2020-2024 demonstrate the government's efforts to ensure a 23% share of renewable energy in total electricity generation by 2025 through smart grid technologies. Several partnerships between the PT PLN (Persero), the Indonesian state electricity company that operates as a monopolistic entity in the country's power sector, and international energy companies have been vital in influencing the advancement of a smart grid. However, these partnerships are primarily aimed at the technology level and do not sufficiently cover the issues of financing problems and regulatory measures for deployment. The funds from initiatives like the Just Energy Transition Partnership (JETP) are insufficient, and banning Public-Private Partnerships (PPP) worsens the financial constraint. For the progression of smart grid technologies, one of the most important requirements is a strong policy framework. An implementation approach proposing market deregulation through the development of new innovative investment packages and the introduction of PPPs Can boost investors' attraction and distribute risk projects. For instance, more differentiated R & D strategies that focus on stakeholder involvement could be useful in enhancing innovation and paring operational costs. Public policies on changes in tariff structures and restructuring of the hybrid market may help improve competition in smart grid development without altering the traditional market structure.

Keywords: Smart grid, renewable energy, Indonesia

Session 2 C

Biomass Pelleting: A Sustainable Solution for Renewable Energy and Waste Management

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Abstract

Biomass pelleting is emerging as a pivotal technology in the pursuit of sustainable energy solutions and effective waste management. This presentation explores the role of biomass pelleting in converting agricultural and industrial waste into high-density, renewable energy sources. By compressing organic materials such as wood chips, agricultural residues, and sawdust into compact pellets, this process not only reduces the environmental burden of waste disposal but also creates a viable alternative to fossil fuels. The presentation will highlight the technological advancements in pellet production, the economic benefits of integrating biomass pelleting into energy systems, and the positive environmental impact of reducing greenhouse gas emissions. Additionally, it will address the challenges and opportunities in scaling up biomass pelleting for broader adoption. Through this exploration, the presentation aims to demonstrate how biomass pelleting can contribute to a more sustainable and circular economy, benefiting both energy security and waste management efforts.

Keywords: Biomass pelleting; sustainable energy solution; waste management

Session 2 C

Sustainable Supply Chain Network Design of Electric Vehicle Battery Recycling

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Abstract

The Republic of Indonesia Government has a plan for the Net Zero Emission in 2060, the electric vehicle market is starting to develop to help carry out these plans. One of the contributors to climate-damaging emissions is transportation, so the development of electric vehicles is quite important. As Lithium-Ion batteries fuel electric vehicles, a large number of them will soon reach the end of their life. This will be a significant waste if proper recycling handling and planning are not carried out. The issue of recycling to reduce environmental pollution and promote sustainable development of the electric vehicle market has become a pressing challenge today. Reusing used electric vehicle batteries is a valuable recycling strategy. However, there has not been much development of research into the design of electric vehicle battery recycling networks at the company level, thus hampering the sustainable development of electric vehicles. This research develops a set covering problem models by considering carbon emissions for battery recycling simulations. This model considers recycling options which will be influenced by costs to use. Ultimately, the main direction is developing models for more economical recycling technologies to reduce the total cost of the recycling process. This research will provide some perspectives of enterprises to develop the optimal infrastructure to support electric vehicle battery recycling activities at the enterprise level, and promote the economically and environmentally sustainable development of the electric vehicle battery industry. This model can provide input to local governments regarding optimal solutions in determining the location for building recycling plants in 5 different residencies. Then, from the model that has been created, 5 cities will be produced which are optimal areas to meet existing demand, namely Kudus, Semarang, Magelang, Purwokerto, and also the city of Tegal with the recycling process chosen for each city.

Keywords: Electric vehicle; Battery recycling; Carbon emission; Network design

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Session 2 C

Mathematical Modelling for Enhanced Weathering based Carbon Management Network

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Abstract

The escalating annual increase in greenhouse gas (GHG) emissions, particularly carbon dioxide (CO2), has exacerbated the global climate crisis, manifesting in rising sea levels, extreme weather events, and ocean acidification. To mitigate these impacts and prevent catastrophic temperature rises, the Paris Agreement was established, aiming for significant reductions in GHG emissions by 2050. Among various strategies, enhanced weathering (EW) has emerged as a promising negative emissions technology (NET) that accelerates the natural process of CO2 sequestration through the application of crushed silicate rocks. Carbonate compounds are formed when the silicate rocks react with the CO2 from the atmosphere and rainwater. The compounds are then carried by runoff into the ocean to achieve permanent carbon sequestration. However, all studies developed for this NET have been focusing on the optimal matching between sources (rock crushing plants), and sinks (mineral application sites), where the quarry sites are not incorporated into the optimization network. Therefore, to address this research gap, this study proposes a novel approach for optimizing the EW supply chain network by developing a mathematical model that minimizes costs and maximizes carbon dioxide removal (CDR). The model focuses on the optimal matches between quarry sites, sources and sinks, while considering factors such as CO2 sequestration potential, transportation costs, and environmental constraints. The model is illustrated with case studies to demonstrate the feasibility of the model. Keywords: Enhanced weathering, negative emission technology, optimization, carbon dioxide removal, mathematical modelling

Keywords: Enhanced weathering, negative emission technology, optimization, carbon dioxide removal, mathematical modelling

Session 2 C

The importance of metal hydride hydrogen storage systems in the automotive industry

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Abstract

To achieve the transition into renewable energies, efficient energy storage is of the utmost crucial, especially in the context of automotive transport. Hydrogen is an ideal energy carrier as it is clean, renewable and possesses a high gravimetric energy density. Nonetheless, determining the most efficient method for storing hydrogen remains an ongoing challenge. Current hydrogen storage methods such as storing hydrogen as high-pressure gas or liquified hydrogen are insufficient to meet future storage objectives. Storing hydrogen in solid-state compounds is most preferred since it is safer and more convenient compared to high-pressure compression and liquefaction technologies. Metal hydrides offer a promising solution due to their ability to absorb and release hydrogen at moderate temperatures and pressures, making them a safer and more practical alternative. Extensive research has been conducted to synthesize cost-effective metal hydrides with low absorption and desorption temperatures, high gravimetric and volumetric hydrogen storage capacities, strong resistance to oxidation, excellent reversibility and cycling stability, rapid kinetics and reactivity, and moderate thermodynamic stability. These advancements in metal hydride technology hold the potential to significantly advance hydrogen storage solutions, paving the way for more widespread adoption of hydrogen as a key component in the transition to renewable energy and sustainable transportation.

Keywords: Electric vehicle; Battery recycling; Carbon emission; Network design

Session 2 C

Investing in Green: Bilateral Investment Treaties (BITs) Role in Malaysia's Renewable Energy Sector

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Abstract

In Southeast Asia, Malaysia with its abundant natural resources and strategic geographic location, stands at the forefront of the renewable energy (RE) revolution. Malaysia's commitment to sustainable energy is evident through its ambitious targets, such as achieving 20% RE capacity by 2025. Central to this transformation is the role of Bilateral Investment Treaties (BITs) in attracting and securing foreign direct investment (FDI) crucial for the RE sector. In recent years, Malaysia has made significant efforts to attract FDI by implementing initiatives and regulations to establish a favorable business environment for international companies in the RE sector. As a part of its FDI policy, Malaysia has signed seventy BITs with various countries, sixty-nine of which were signed before 2011 and only one after 2011. These BITs have important implications for both investors and state parties. To regulate the RE sector, the Renewable Energy Act 2011 was enacted in 2011, however, the author's initial study/finding shows that none of the BITs include provisions specifically related to RE. Thus, if any dispute arises between the contracting parties, it may be challenging for the Malaysian government to protect its rights and prevail against foreign investors. Through qualitative research, this study attempts to fill this gap by conducting a thorough analysis of all Malaysian BITs and recommending clauses or provisions that could be inserted in new BITs or when existing BITs are renewed in the future.

Keywords: Bilateral Investment Treaties (BITs), foreign direct investment (FDI), renewable energy, regulatory framework, sustainable development.

Session 2 C

Exploring the Potential of Chemical Looping Process for Sustainable Hydrogen Production

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Abstract

Chemical looping process has received increasing attention due to its sustainability, carbonaceous fuel flexibility and capability for high-purity hydrogen production, inherent carbon capture and power generation. Oxidiser is a unit responsible for producing hydrogen from steam reaction with the reduced-state oxygen carriers. This process is complex because of the nonlinear interactions between the multi-phase reversible reactions and oxygen carriers limited by reaction thermodynamics and kinetics. To date, the dynamic behaviours of the oxidiser remain poorly understood and exploring all sets of possible operating and design conditions via experimental works is costly and time-consuming. In this work, the MATLAB simulation of the moving bed oxidiser based on the modified heterogeneous pellet-grain (HPG) model provides insights into several operational challenges, optimisation of operating conditions that yield an optimal hydrogen production, steam and oxygen carrier (OC) conversion. Based on the simulation result, 500°C was the optimal reaction temperature of oxidiser after optimisation, producing around 52.55 mol/s hydrogen and 70% hydrogen yield.

Keywords: Chemical Looping Process; Hydrogen Production; Heterogeneous Pellet-Grain Model; Oxidiser; Moving Bed Reactor; Simulation; MATLAB

Session 2 C

Hybrid HVAC-HVDC Grid Fault Detection & Classification using ANN

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Abstract

This paper presents an innovative approach to fault detection and diagnosis in hybrid grid systems by integrating Travelling Wave (TW) analysis, Discrete Wavelet Transform (DWT), and Artificial Neural Networks (ANNs). TW techniques are favored over traditional fault detection methods due to their heightened sensitivity to grid disturbances and their ability to provide essential spatial information for accurate fault localization. DWT is chosen as an additional analysis method for its ability to decompose fault signals into various frequency components, making it particularly effective for detecting transient faults in hybrid grid systems. The study focuses on a hybrid HVAC-HVDC grid system, incorporating a bipolar HVDC link and rectifying VSC stations. The use of ANNs is further enhanced by incorporating nested-validation techniques to optimize and generalize the model, ensuring robust performance in handling the non-linear and complex nature of hybrid grids. ANN models trained on TW and DWT fault data achieve high accuracy in fault detection and classification, with 96.75% and 96.12% accuracy, respectively. Given the close performance metrics, statistical validation techniques such as bootstrapping, stability analysis, out-of-sample validation, McNemar's test, and t-tests are applied to ensure robust model comparison and selection. The findings underscore the potential of these methods for enhancing fault detection and protection in hybrid power systems, contributing to improved stability and reliability in industrial applications.

Keywords: Travelling Wave, Discrete Wavelet Transform, Artificial Neural Networks, Hybrid HVAC-HVDC

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MIRI is a coastal city in Sarawak state, situated on the island of Borneo. Miri has diverse population, making it a small city with rich traditional ambiance and cosmopolitan whiff. The birthplace of Malaysia's petroleum industry, Miri is the location of Malaysia's first oil well. The city's economy is driven by petroleum industry, along with timber, oil palm, and tourism. The city has its own charm with a number of tourism spots (natural or man-made, traditional or contemporary, and leisure or adventurous alike). It also serves as hub for tourism destinations further deeper in the Borneo island.

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e-hailing apps such as Grab, maxim and AirasiaRide are available in Miri. You can use their online transportation services to get around Miri, including for airport transfers. Another way to get around is to rent a car from local people in Miri.

NOTES

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Department of Mechanical and Mechatronics Engineering, Faculty of Engineering and Science, Curtin University Malaysia

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For more info and to register: https://www.icheme.org/training-events/training/courses-a-z/layer- of-protection-analysis-lopa/

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The course functional pillars are knowledge and competence; engineering and design; systems and procedures; assurance; human factors; culture.
More information: https://www.icheme.org/training-events/training/courses-a-z/fundamentals-of-process-safety/

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For more information: https://www.icheme.org/training-events/training/courses-a-z/hazop-study-for-team-leaders-and-team-members/

Event

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Founded in 2008, Sarawak Oil Palm Plantation Owners Association (SOPPOA) is a non-profit organisation comprised of a majority of oil palm growers in Sarawak, with membership from plantation companies of various sizes including goverment land development agencies as well as independent smallholders.

SOPPOA fully support the State Goverment's initiatives in environmental sustainability, biodiversity conservation and wildlife preservation in Sarawak

Sarawak Oil Palm Plantation Owners Association
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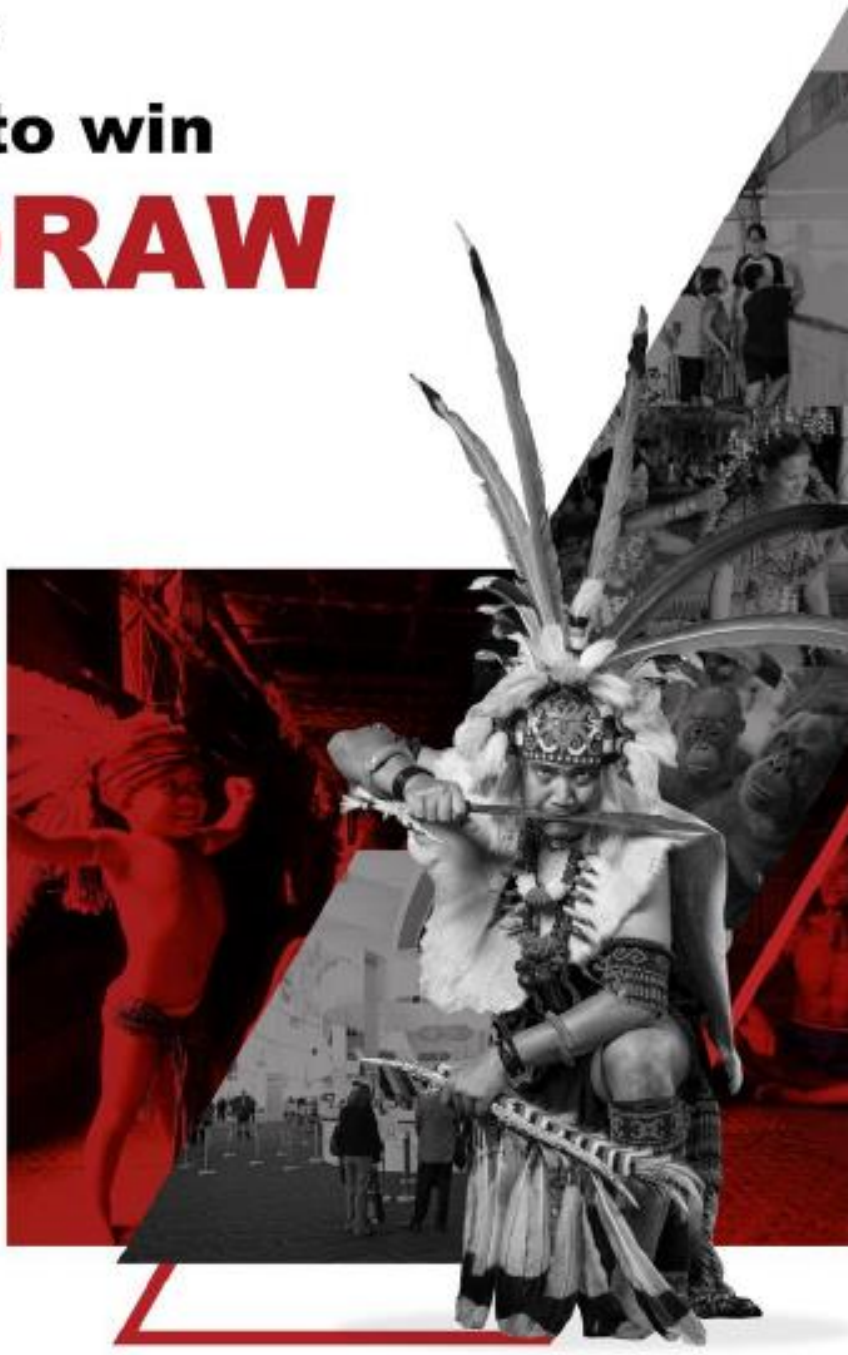

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