Conference Program

2024 5th International Conference on Power, Energy and Electrical Engineering (PEEE 2024)

2024 6th International Conference on Environment, Resources and Energy Engineering

"Environmental Solutions Towards Sustainable Society"

(EREE 2024)

2024 5th International Conference on Geology and Earth Sciences

(ICGES 2024)

2024 10th International Conference on Renewable Energy and Development (ICRED 2024)

Golden Tulip Jineng Resort Bali, Bali, Indonesia | November 7-9, 2024

Address: Ji. Sunset Road No. 98, 80361 Kuta, Indonesia

Co-organized by

Technically sponsored by

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Conference Venue

GOLDEN TULIP

Golden Tulip Jineng Resort Bali

Address: Ji. Sunset Road No. 98, 80361 Kuta, Indonesia

Tel: +62 811 3991249 | +62 (0)361 472 7488
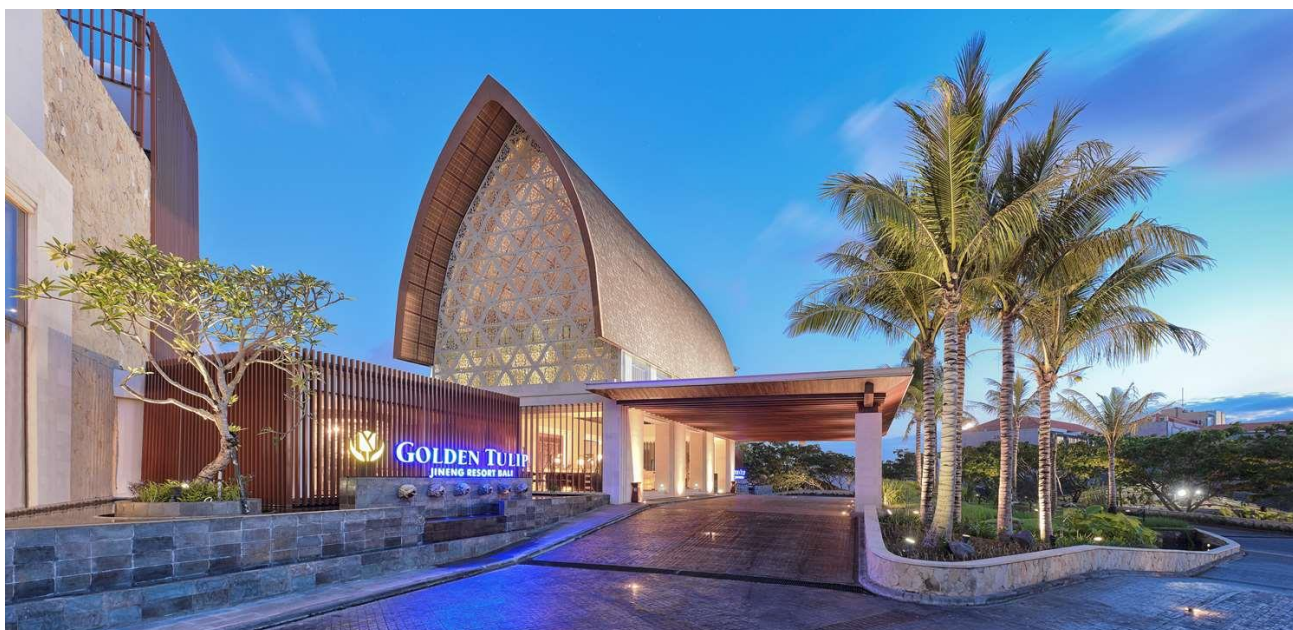
■ **Transportation**

| From Jl. Airport Ngurah Rai | 1) Bus: take bus K6B form Internasional Terminal Bandara Ngurah Rai – take off at Setiabudi station- walk to destination |
| | 2) Taxi: about 20 mins directly to the venue |

■ **Sign-in**

| Spot | Lobby, Golden Tulip Jineng Resort Bali |
| Time | 14:00-17:00 | Nov. 7, 2024 |

Onsite Instruction

■ Oral Presentation

1. Timing: a maximum of 15 minutes total, including speaking time and discussion. Please make sure your presentation is well timed. Please keep in mind that the program is full and that the speaker after you would like their allocated time available to them.

2. You can use USB flash drive (memory stick), make sure you scanned viruses in your own computer. Each speaker is required to meet her/his session chair in the corresponding session rooms 10 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.

3. It is suggested that you email a copy of your presentation to your personal inbox as a backup. If for some reason the files can't be accessed from your flash drive, you will be able to download them to the computer from your email.

4. Please note that each session room will be equipped with a LCD projector, screen, point device, microphone, and a laptop with general presentation software such as Microsoft PowerPoint and Adobe Reader. Please make sure that your files are compatible and readable with our operation system by using commonly used fronts and symbols. If you plan to use your own computer, please try the connection and make sure it works before your presentation.

5. Videos: If your PowerPoint files contain video clips please make sure that they are well formatted and connected to the main files.

■ Poster Presentation

1. Print poster (A1 size), content must be on 1 page. Please set the poster as vertical format, and bring it to paste onsite.

2. The content must include: the title of the article author, the logo of the unit in the upper left corner, the conference name + the ID of the article in the upper right corner, the key framework knowledge of the article, contact information and other necessary basic information, the rest of the information according to the importance of arrangement and design.

3. Other main content design, template format is not fixed, no template restrictions.

4. Prepare a 3-5 minutes presentation of the framework for on-site communication.

■ Dress Code

Please attend the conference in formal attire.

■ Safety Reminder: Secure Valuable Items at All Times

We remind you to secure your personal belongings at all times.

Please remember to:

* Wear your Conference Identification Badge at all times. Do not throw away Badge.

* If you are using a laptop computer, do not leave it unattended at any time.

* Keep your purse, wallet and other valuables with you at all times.

* The conference organizer will not be responsible for the loss or damage to any personal belongings.

Program Outline

Day 1 | Nov. 7, 2024

Onsite Sign in and Conference Materials Collection

• **Time:** 14:00-17:00

• **Location:** Lobby, Golden Tulip Jineng Resort Bali

• Tell your Paper ID to the staff.

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

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

program.

Program Outline

Day 2 | Nov. 8, 2024		
Time	**Activity**	**Venue**
Host: T M Indra Mahlia, University of Technology Sydney (UTS), Australia / University of Indonesia, Indonesia		
Zoom ID: 854 8411 4991 (Zoom link: https://us02web.zoom.us/j/85484114991)		
Opening Ceremony | 09:00-09:05		
09:00-09:05	**Welcome Message from Conference Committee Chair:** **Saad Mekhilef,** University of Malaya, Malaysia	
Keynote Speech | 09:05-10:35		
09:05-09:50	**Saad Mekhilef** University of Malaya, Malaysia *"The Role of Power Electronics in Achieving a Modern Carbon-Neutral Society"*	1st Floor, Sanjana Ballroom
09:50-10:35	**Danny Sutanto** University of Wollongong, Australia *"Vision of the Future Power Distribution Grid Infrastructure"* zoom	
Group Photo & Coffee Break | 10:35-11:00		
Invited Speech | 11:00-12:00		
11:00-11:30	**Dinh Thi Mai Thanh** University of Science and Technology of Ha Noi, Vietnam *"Research On Environmental Pollutants and The Synthesis of Materials Applied in Treatment"*	
11:30-12:00	**Lorant Andras Szolga** Technical University of Cluj-Napoca (TUCN), Romania *"Organic Photovoltaic Solar Cells: From Theory to Lab Testing and Manufacturing "* zoom	
Lunch @ 1st Floor, Dhanya Restaurant | 12:00-13:00		
Technical Sessions | 13:00-18:00		
13:00-15:00	Session 1 – GIS-Based Environmental Monitoring, Management and Sustainable Development	1st Floor, Sanjana Ballroom
Coffee Break | 15:00-15:15		
15:15-17:30	Session 2 – Clean Energy and Integrated Energy Systems	
17:30-18:00	Poster Session – Renewable Energy and Power Failure Monitoring	
Dinner @ 1st Floor, Dhanya Restaurant | 18:10-20:00		
Day 3 | Nov. 9, 2024 | One Day Tour in Bali		

Keynote Speaker I

Prof. Saad Mekhilef

University of Malaya, Malaysia

IEEE Fellow

Time: 09:05-09:50, Nov.8th, 2024 (UTC+8)
Venue: 1st Floor, Sanjana Ballroom

📚Bio

Prof. Dr. Saad Mekhilef is an IEEE and IET Fellow. He is a Distinguished Professor at the School of Science, Computing and Engineering Technologies, Swinburne University of Technology, Melbourne, Australia, an Honorary Professor at the Department of Electrical Engineering, University of Malaya, and a distinguished visiting professor at the Institute of Sustainable Energy, Universiti Tenaga Nasional, Malaysia. He authored and co-authored more than 700 publications in academic journals and proceedings, five books with more than 54,000 citations, and more than 85 Ph.D. students who graduated under his supervision. He serves as an editorial board member for many top journals, such as IEEE Transactions on Power Electronics, IEEE Open Journal of Industrial Electronics, IET Renewable Power Generation, E-Prime, Journal of Power Electronics, and International Journal of Circuit Theory and Applications.
Prof. Mekhilef has been listed by Thomson Reuters (Clarivate Analytics) as one of the world's Highly Cited (World's Top 1%) engineering researchers. He is actively involved in industrial consultancy for major corporations on power electronics and renewable energy projects.

🖥 Speech Information

The Role of Power Electronics in Achieving a Modern Carbon-Neutral Society

Abstract: The global energy system is transitioning significantly to become carbon neutral. The energy generation will be renewables, and electricity will carry more energy. Power electronics (PE) is an application-oriented and interdisciplinary area. It uses power semiconductor devices to perform switching actions to achieve the desired conversion strategy. The PE plays a crucial role in converting and controlling electrical power. The effective use of electrical energy is a vital technique for achieving energy efficiency, and power electronics technologies that can convert electric power into the optimum characteristics for each application are an essential part of this approach. Power electronics systems have attracted attention as critical components for building a sustainable energy supply. PE-based power converters are also widely used in conventional and renewable energy systems. The presentation will discuss the power electronics technology, where it is applied, and the main future challenges for the technology in creating a carbon-neutral society that is believed to be dominantly electrical-based.

Keynote Speaker II

Prof. Danny Sutanto

University of Wollongong, Australia

Time: 09:50-10:35, Nov. 8th, 2024 (UTC+8)
Venue: 1st Floor, Sanjana Ballroom
Zoom ID: 854 8411 4991 (Zoom link: https://us02web.zoom.us/j/85484114991)

Bio

Danny Sutanto received his B.Eng. and Ph.D. from the University of Western Australia in 1978 and 1981 respectively. Following his graduation he joined GEC Projects, Australia as a Power System Analyst. In 1982 he joined the School of Electrical Engineering at the University of New South Wales. In 1996 he joined the Hong Kong Polytechnic University as a Professor in Electrical Engineering. In 2006, he joined the School of Electrical, Computer and Telecommunications Engineering at the University of Wollongong as the Professor of Power Engineering. His main areas of research are power system analysis, power system economics, voltage stability, harmonics, power electronics and computer aided education. He has published numerous papers in the areas of electromagnetic transient analysis, power system analysis, voltage instability, design of harmonic filters, FACTS, Battery Energy Storage Systems, computer aided teaching systems, power system expansion planning, electrical machines and power electronics, in total over 170 papers. He was awarded the N. Svennson's Award for Teaching Excellence in the Faculty of Engineering in 1994. In 2000, he was awarded the HK Polytechnic University President's Award for Outstanding Performance in Teaching. He has extensive consultancy experience both in Australia and Hong Kong covering areas such as power system planning, fault analysis and harmonic filter design. While at the Hong Kong Polytechnic University, he received grants from the RGC, Learning and Teaching Development Committee (LTDC), British Council, various research studentship and grants from the Hong Kong Polytechnic University totalling more than HK$15 million. He was appointed as the Regional Representative of the Power Engineering Society of the Institute of Electrical and Electronics Engineers Electronic) for Region 10, Asia -Pacific from 2001-2004. He has been invited to be the members of International Advisory Board for several international conferences. He is also a member of the International Editorial Advisory panel of the International Journal "Electric Power Systems Research".

Speech Information

Vision of the Future Power Distribution Grid Infrastructure

Abstract: The current power grids are undergoing an unprecedented transformation from the original design, changing the way how energy has been produced, delivered, and consumed over the past century. The new power grid includes the integration of renewable sources such as wind and solar, supported by distributed or community energy storage, to power distribution grids through innovative high-frequency magnetic links and power electronic converters.   The use of emission-free transportation, such as electric vehicles, and energy-efficient technologies, such as superconducting generators and storage systems, are also rapidly emerging and will be integrated into the power grids in the foreseeable future.   As these connections evolve, it is necessary to reconsider the current paradigms of system analysis and planning with a focus on how to achieve the most flexible, efficient, and reliable power grid for the future – the one that enables operation in a domain that is very different than the current one to deliver the services to consumers at an affordable cost.

Furthermore, traditional transformers, that are the backbone of power distribution systems, do not have sufficiently flexible controls, integrated sensing, and communications to cope with the increasing penetration of intermittent renewable energy resources and the growing need for intelligence and monitoring in power systems. A solid-state transformer (SST) is a type of electric power converter that replaces a conventional transformer used in AC electric power distribution. It is more complex than a conventional transformer operating at the utility frequency, but it can be smaller and more efficient than a conventional transformer because it operates at a high frequency.   A solid-state transformer (SST) uses high-frequency power electronic switches that will have the flexibility to control the voltage, current, frequency, and power factor to enhance the power system performance.

The talk provides a vision of the future distribution grid infrastructure, where new and modern technologies will be integrated into the power distribution grid and will become the future building blocks for electricity distribution networks.

Invited Speaker I

Prof. Dinh Thi Mai Thanh

University of Science and Technology of Ha Noi, Vietnam

Time: 11:00-11:30, Nov. 8th, 2024 (UTC+8)
Venue: 1st Floor, Sanjana Ballroom

Bio

Professor Đinh Thi Mai Thanh is currently the Rector of University of Science and Technology of Hanoi. She got her PhD in Physical Chemistry - Analytical Chemistry from Paris VI University, France. She was appointed Associate Professor in 2011 and Professor in 2023 in the field of Chemistry. Her main research directions: including synthesizing materials and coatings that protect against corrosion for CT3 steel substrates in various environments; synthesizing materials for environmental treatment and biomedicine based on Hydroxyapatite. She has published over 200 scientific articles worldwide, holding of 2 patents, and published 3 specialized books and 2 reference books. Throughout her career, she has received numerous awards and certificate of merit, such as the UNESCO-L'OREAL Vietnam National Fellowship for Women in Science in 2010, as well as certificate of merit from the Ministry of Education and Training and the President of the Vietnam Academy of Science and Technology.

Speech Information

Research On Environmental Pollutants and The Synthesis of Materials Applied in Treatment

Abstract: Vietnam has a high economic growth rate that leading to many contaminants to be detected in the environment such as inorganic pollutants (heavy metals, nutrients⋯) and organic pollutants (antibiotics, pesticides⋯). Thus, we conducted several studies on the existance of these pollutants in the environment and their impacts to the organisms. These studied reported that pollutants have become a serious environmental problem in Vietnam and can cause a threat for organisms through the biological hierarchy, starting from the levels of molecular and cellular up to the individual level. In order to eliminate those pollutants, many methods, namely the electrochemical method, electrochemical Fenton, photocatalytic and adsorption methods, were studied by scientists. We have synthesized some materials, including hydroxyapatite (HAp), and their composite with superparamagnetic iron oxide nanoparticles (SPIONs), biochar, and $C_3N_4/Bi_2MoO_6/$Clinoptilolite to remove pollutants of heavy metals, fluoride, and dyes (methylene blue and congo red), and antibiotics (oxytetracycline and ciprofloxacin). Application of those materials through the mechanisms of adsorption and photocatalysis to eliminate tested pollutants from environment showed high removal and adsorption efficiency. In the future, our research group will synthesize the mixed matrix membranes containing HAp and biochar, biochar/SPION nanocomposite, which is a promise innovation to improve the efficiency in treating antibiotics residuals in the environment. We will also study to develop the films of copper benzene 1,3,5 tricarboxylate (CuBTC), zinc benzene 1,3,5 tricarboxylate (ZnBTC), and iron benzene 1,3,5 tricarboxylate (FeBTC) to create the colorimetric sensors, which will be applied in rapidly detecting NH_3 for security of public health.

Invited Speaker II

Assoc. Prof. Eng. Lorant Andras Szolga

Technical University of Cluj-Napoca (TUCN), Romania

Time: 11:30-12:00, Nov. 8th, 2024 (UTC+8)
Venue: 1st Floor, Sanjana Ballroom
Zoom ID:　854 8411 4991 (Zoom link: https://us02web.zoom.us/j/85484114991)

Bio

Lorant A. Szolga has been an IEEE member since 2018. He is Assoc. Prof. at the Faculty of Electronics, Telecommunications, and Information Technology (ETTI) from the Technical University of Cluj-Napoca (TUCN), Romania. He is a member of the Optoelectronics Group. He is responsible for the EMIMEO (Erasmus Master on Innovative Microwave Electronics and Optics) Erasmus Mundus program for TUCN.

Lorant received his BAc and MSc, both in Telecommunication and Electronics Engineering, from the Technical University of Cluj-Napoca, Romania, in 2005 and 2008. He obtained his PhD title in Electronics in 2013.

His main interests in the field of research are renewable energies (organic solar cells, dye-synthesized solar cells) and optoelectronic-based sensors and applications (medicine, agriculture, security systems).

Speech Information

Organic Photovoltaic Solar Cells: From Theory to Lab Testing and Manufacturing

Abstract: To quickly eliminate the major problems caused by the consumption of energy based on fossil fuels, solutions are being sought in the field of green energies, especially full green ones. Considering that solar energy is the largest energy that reaches the Earth ($1000W/m^2$), there is a desire to develop solar panels that produce a higher conversion of solar energy while also being environmentally friendly, meaning they fall into the category of full green energy sources. In the category of these photovoltaic panels, there are panels based on organic solar cells (OSC), dye-sensitized solar cells (DSSC), and perovskite cells. The advancement of research in these photovoltaic alternatives makes it possible for the limitations of classic silicon solar cells to be overcome in the near future. Among these alternative technologies, organic solar cells have the significant advantage of being able to be deposited on large and thin surfaces (such as PET films) using the roll-to-roll printing method, environmentally friendly organic compounds with simple syntheses and reduced costs, easy and quick recycling, easy installation and maintenance, as well as the deposition of thin layers that allow them to be mounted on windows with the property of letting some sunlight into the room. This presentation will outline all the essential points in the manufacturing, testing, and improvement process of these photovoltaic panels. This presentation is built on my 8 years of experience in this field, since the commissioning of the first and only research laboratory in this field in Romania.

Session 1

Nov. 8th | 13:00-15:00

Venue: 1st Floor, **Sanjana Ballroom**

- **Topic: GIS-Based Environmental Monitoring, Management and Sustainable Development**

- **Session Chair: Prof. Zhenqian Chen, Southeast University, China**

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

13:00-13:15	**(IE24-442A) Urban Emission Monitoring: A CFD-Based Approach for Environmental Health** **Amir Ali Feiz**, University of Evry Paris Saclay, France Abstract: This study introduces a methodology for urban monitoring networks to estimate unknown atmospheric emissions, addressing industrial and safety concerns by mitigating urban pollution. The design adapts to varying topography and meteorological conditions. It employs Computational Fluid Dynamics (CFD) for sensor sensitivity and probabilistic optimization for effectiveness. Validation in urban settings demonstrates the precise identification of emission sources, enhancing urban environmental health.
13:15-13:30	**(IE24-338) Remote Sensing of Nickel Laterite Deposits with Landsat – 8 in Indara Block, Halmahera Region** **Ludovicus Damardika Jasaputra**, PT. Halmahera Sukses Mineral, Indonesia Abstract: Exploration activities must be focused and efficient to optimize the use of available resources in identifying prospective areas. Remote sensing plays a crucial role in achieving this goal. Understanding the genesis of nickel laterite formation and utilizing Landsat-8 imagery are essential for exploration in the Indara Block. The band ratio method is used to process Landsat-8 imagery, and the results help assess the potential for laterization in the research area. Image interpretation guides field checks to validate our interpretation. This study evaluates the effectiveness and abilities of Landsat – 8 in nickel laterite exploration, aiming to provide breakthroughs in other regions and act as a reference for future research.
13:30-13:45	**(IE24-4009) Investigating Factors Affecting the Internal Erosion of Soils Used in Earthfill Dams and Embankments** **Mousa Fayiz Attom**, American University of Sharjah, UAE Abstract: One of the main causes of failures in earth dams and embankments is internal erosion. This process initiates when seepage forces exceed the internal frictional resistance within soils. This paper investigates the effect of physical properties of soils that control failure due to internal erosion of soils such as plastic limit, cohesion and initial dry density. Three types of clayey soils with different properties were used in this research. Specimens were prepared to perform direct shear test and hole erosion test at different initial dry densities to find cohesion and internal erosion characteristics of soils. An effort was made to identify the relationship between engineering properties and internal erosion parameters of soil like critical shear stress and erosion rate index. Results show that increase in initial dry density and liquid limit of soil makes them less susceptible to erosion and increase the critical shear value. Moreover, equations were developed to predict both erosion rate index and critical shear based on the initial physical properties of the soils. The findings of this research will contribute in selecting the soils for dams and embankments and predict their behavior from proposed equations using simple geotechnical properties.

13:45-14:00	(IE24-423A) Meteorological and Hydrological Time-series Analysis in the Gurupura River watershed of India using Statistical Techniques **Chetlapelly Vamshi Krishna**, National Institute of Technology Karnataka, India Abstract: Climate change is defined as large variations in climate averages that last for decades or more. Therefore, analysing changes in meteorological variables is an integral part of detecting climate change. Long-term trends in all climate variables are needed to assess the impact on the environment of the study area. The present study focuses on the long term trends of meteorological and hydrological variables like precipitation, temperature, and streamflow in the Gurupura River basin located in the Dakshina Kannada District of Karnataka, India. The monthly, seasonal and annual trends of hydro-meteorological variables were analysed for stations from the IMD data of 1970-2020. The non-parametric Mann-Kendall and Sen's slope estimator techniques were used to determine whether there was a positive or negative trend and the magnitude of the trend in hydrometeorological data at the 5% statistically significant level. The MK test revealed both increasing and decreasing trends in meteorological variables, suggesting that the study area is subject to significant climate variability. The Mann-Kendall and Sen's slope estimator statistical tests produced consistent results in detecting trends in the hydro-meteorological variables.
14:00-14:15	(IE24-429A) Antimony Retention by Schwertmannite in Acid Mine drainage: An X ray Absorption Spectroscopic Study **Mohammad Rastegari**, Southern Cross University, Australia Abstract: Schwertmannite is a commonly occurring poorly crystalline Fe(III) oxyhydroxysulfate mineral in acid mine drainage (AMD). In AMD-affected environments, schwertmannite's role in regulating the mobility of Sb(V) is critical. Nevertheless, the mechanisms governing the immobilization of aqueous Sb(V) by schwertmannite in such environments remain elusive. To address this gap, we examined the sorption of Sb(V) by schwertmannite at various environmentally relevant Sb(V) concentrations in an AMD-stimulated environment with a pH of 3 and high sulfate content. Schwertmannite was found to sorb Sb(V) at concentrations up to 48.5 mg g^{-1}, demonstrating a remarkable uptake efficiency of over 99% of the initially loaded Sb(V). Antimony K-edge extended X-ray absorption fine structure (EXAFS) spectroscopy indicated that at all loadings Sb(V) sorption occurred via edge-sharing and double-corner sharing complexes between $SbVO_6$ and $FeIIIO_6$ octahedra. Coordination numbers suggest that schwertmannite incorporated Sb(V) in its structure through heterovalent substitution of Sb(V) for Fe(III). The Sb(V) sorption also stabilized schwertmannite against dissolution, as indicated by changes in the dissolution rate of schwertmannite during extraction by acidic ammonium oxalate. Our findings provide new perspectives on the sorption of Sb(V) by schwertmannite in acid sulfate environments and underscore the potential of schwertmannite to immobilize Sb(V) within its crystal structure.
14:15-14:30	(IE24-436A) Analysis of the Impact of Seasonal Changes in Acid Rain pH on Polluted Soil Leachate and Water Body Pollution **Soo Min Kang**, Korea Environment Corporation, Republic of Korea Abstract: This study aims to analyze the impact of seasonal changes in the pH of acid rain on polluted soil leachate and the subsequent water body pollution. Acid rain, which occurs when acidic substances in the atmosphere are deposited with precipitation, affects the movement of pollutants and the chemical properties of soil. The study focuses on polluted soils around industrial areas, evaluating the chemical composition of soil leachate and its impact on water bodies in relation to seasonal and pH variations in acid rain The study follows Korean standard testing methods to assess soil pollution and utilizes leaching tests to analyze soil leachate, with pH and temperature as variables. Leachate analysis is conducted according to Korean waste process testing methods, focusing on variations in pH and temperature. The results indicate that variations in temperature and pH lead to differences in the chemical composition of the polluted soil leachate. Leachate collected under conditions of lower pH or higher temperatures showed increased concentrations of metal ions and other pollutants. This suggests that during hotter summer months or seasons with higher acid rain, management and preventive measures for pollutants are necessary. Future research should consider a broader range of locations and conditions for a more comprehensive analysis. In conclusion, South Korea is implementing various policies to address the issue of acid rain. Key policies include strengthening regulations on air pollutant emissions and introducing seasonal emission management systems. Efforts are particularly focused on developing and applying technologies to reduce emissions from industrial and power generation sectors, promoting the use of low-acidic fuels, and enhancing monitoring and response through real-time air pollution monitoring systems. These policies contribute to reducing environmental damage caused by acid rain and strengthening the management and prevention of pollutants.
14:30-14:45	(IE24-418A) Impact of incorporation of macrophytes in a vermifiltration based treatment system **Rajneesh Singh**, Indian Institute of Technology Roorkee, India

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Abstract: This study investigates the impact of incorporation of macrophytes on the performance, clogging and gaseous emission of a vermifilter (VF). Macrophytes named Carex Muskingmenis were incorporated to MaVF (Macrophyte assisted vermifilter) to compare against the conventional VF (without macrophytes), after application of untreated slaughterhouse wastewater. The average chemical oxygen demand (COD), total nitrogen (TN) and total phosphorous (TP) removals from MaVF were $68.3 \pm 1.3\%$, $61.2 \pm 1.4\%$, and $60.5 \pm 1.4\%$, respectively, while, in VF, COD, TN and TP removals were only $59.7 \pm 1.2\%$, $48.8 \pm 1.1\%$ and $51.8 \pm 0.9\%$, respectively. Higher removals from MaVF can be attributed to the increased activities due to the addition of macrophytes, such as plant uptake, root aeration, etc. Head loss from MaVF and VF were obtained as 0.84 cm and 0.86 cm after 90 days of operation, indicating that the incorporation of macrophyte in VF increases hydraulic conductivity due to the growth of the root system. Cumulative CO_2, CH_4, and N_2O emission from VF were obtained as 152.4 ± 10.7 mg C/m2, 81.7 ± 28.8 mg C/m2, and 478.2 ± 125.3 μg N/m2, respectively, which however was observed to be higher in the case of MaVF, as cumulative CO_2, CH_4, and N_2O emission from MaVF were 123.3 ± 14.5 mg C/m2, 74.8 ± 45.2 mg C/m2 and 328.4 ± 93.4 μg N/m2, respectively. Thus, the incorporation of macrophytes in vermifilters can be considered for improving the life-span and performance of vermifiltration based systems, with special attention to the minimization of gaseous emission.

14:45-15:00	**(IE24-324) Application of Gravimetry to Investigation of Volcanism – Examples from West Bohemian Massif and Greece** **Jan Mrlina**, Institute of Geophysics CAS, Czechia Abstract: Gravimetry as a geophysical technique can be applied in various fields of geosciences. Typically it is used in exploration for mineral resources, geoengineering, basic geological research, archaeology, etc. In this paper the focus is concentrated on discovering unknown maar structures and monitoring of volcanic activity in Greek volcanic islands of Nisyros and Santorini (Thira). Maar structures may not be simply visible in morphology and gravity surveys proved that they are characterized by striking negative gravity anomalies of about 2 to 5 mGal. Six till then unknown maars were discovered in the western Bohemian Massif in Central Europe. Mass changes in the intrusive system of volcanoes may be reflected in gravity monitoring data. The author performed such repeated observations of gravity field in the two Greek islands. It turned out that in both cases the data show certain unrest of the volcanic system, while especially in Thira an extensional process related to the new Kolumbo submarine volcano seems to continue.

Best Presentation Award & Session Group Photo

Session 2

Nov. 8th | 15:15-17:30
Venue: 1st Floor, **Sanjana Ballroom**

- **Topic: Clean Energy and Integrated Energy Systems**
- **Session Chair: Prof. Saad Mekhilef, University of Malaya, Malaysia**

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

15:15-15:30	(IE24-001) Balance Energy Savings with Indoor Comfort – An ANN Based Energy Management Controller for Flexible Loads **Xie Cherng Miow**, Universiti Tunku Abdul Rahman, Sungai Long, Malaysia Abstract: Flexible loads are common building demands that have gathered attention in demand-side management. However, further study is still required in applying machine learning-based methods on flexible loads to provide energy savings in practical studies. Thus, this article introduces an Artificial Neural Network (ANN)-based energy management controller for flexible loads, particularly VRV X AC and refrigerators. The controller balances energy savings and indoor comfort by controlling temperature set points for VRV X AC and duty cycles for refrigerators. Experimental data from the Daikin Research & Development building in Malaysia shows that the ANN-based controller can achieve energy savings of up to 27% while maintaining indoor comfort at an average temperature of 26.76°C with a Desired Energy Saving Coefficient (DESC) of 0.95. It is important to note that DESC represents the trade-off between energy savings and indoor comfort, with higher DESC values offering more significant savings at the potential cost of reduced comfort. Although maximum DESC settings have demonstrated up to 36% energy savings on-site, they have led to some compromise in comfort, evident from the higher average temperature of 27°C. This article highlights the fine balance between energy savings and indoor comfort during high building power demand.
15:30-15:45	(IE24-104) Investigation of Output Power Degradation in Solar PV: An Experimental Study on the Effect of Dry and Wet Dust **Talal Alharbi**, College of Engineering, Qassim University, Saudi Arabia Abstract: In the age of global warming, the conversion of electrical energy through solar cells has drawn great interest of the researchers. Solar Photovoltaic industry has grown rapidly and gone through a lot of development works in the recent years in which the performance of the photovoltaic has boosted up. On the other hand, the several factors have also been denoted that has great impact in the performance of the solar photovoltaic such as temperature, humidity, irradiance, tilt angle, ageing and dust. The accumulation of the dust on the surface of the solar cell has greatly affected the performance of the solar cell. In this paper, the impact of different kinds of dusts such as sand, soil, salt, coal, bird dropping, rock powder, wood powder, rice husk, brick powder, sea foam and cement in electrical performance of solar photovoltaics(PV) has been experimentally investigated under the irradiance of 1350 w/ -1400 w/ . The results indicate that the output power degradation rate/5g dust of white rock ,sea foam, red soil, sand, rice husk, wood powder, bird droppings, lime stone, brick powder, red rock, soil, ash, cement and coal are14.78%,18.65%,16.11%,13.31%,16.71%,20.05%,25.18%,21,76%,15.11%,12.88%,21.61%,33.28%, 19.26 %,51.91% respectively at weight condition and 20.91%, 20.68%, 18.96%, 10.06%, 20.46%, 33%, 28.70%, 20.08%, 10.95%, 11.36%, 16.63%, 30.20%, 22.80%,79.70% respectively at the dry condition.

15:45-16:00	**(IE24-107) Transforming Power System Operations: A Case Study of SCADA/EMS in Bhutan** **Ugyen Chophel**, Bhutan Power System Operator, Bhutan Abstract: Despite possessing a considerable quantity of hydropower resources, Bhutan has only utilized approximately 8% of its total potential. However, the presence of multiple international transmission lines to evacuate excess power to India, along with a significant increase in local electricity demand since 2007, has necessitated the development of a structured power sector and the adoption of advanced technology to ensure the reliable operation of the power system. In pursuit of centralized monitoring and control of Bhutan's power system, the country opted to implement state-of-the-art Supervisory Control and Data Acquisition System / Energy Management System (SCADA/EMS) technology in 2009. It has two regional control centers of respective regions reporting to the main control center in Thimphu. This paper articulates the experiences and lessons learned from operating the SCADA/EMS system, offering valuable insights to system operators, SCADA engineers, policymakers, regulatory authority, and power utilities alike.
16:00-16:15	**(IE24-118) Techno-Economic Analysis of an Extension of Renewable Energy Production on King Island, Australia** **T.M. Indra Mahlia**, University of Technology Sydney, Australia Abstract: This study investigates the possibility of improving electricity generation on King Island, Tasmania, to integrate a higher share of renewables into the island's energy portfolio. The study first presents the methodology adopted throughout the project, explaining the various meteorological, energy and economic data collected to produce a study that was as closely aligned as possible with the infrastructure already in place on the island. The results obtained during the project using HOMER Pro are then analysed. The optimisations calculated by the software evaluate new solutions for generating electricity on the island, incorporating new wind turbines, solar panels and batteries. To decide on the most viable option for HydroTasmania and the islanders who will be the consumers of this electricity, the various options are ranked according to their financial indicators, including Levelised Cost of Energy, Net Present cost, and Return on Investment. This study covers the economic and technical dimensions of the project while also considering the ecological dimension to create a project that aligns with the island's sustainable development.
16:15-16:30	**(IE24-114) Reliability Analysis of O&M Strategies for Power Generation Post 4MWp Solar Utility Integration: LNG Plant Case Study** **Muhamad Rais Bahtiar**, PT Badak NGL, Bontang, Indonesia Abstract: In response to declining feed gas, Badak LNG currently operates two process trains. The power demand has decreased to only one-third of the total 112.5 MW internal power generation capacity, indicating a significant opportunity to optimize generator usage for improved efficiency and cost reduction. However, reducing the number of active generators may decrease system inertia, making the system more vulnerable to disturbances, especially with the integration of a 4 MWp solar PV panel. Additionally, partial power migration to the public utility company (PLN) further reduces power consumption. This paper presents a comprehensive power system study and reliability analysis, including load flow, transient analysis, and a detailed reliability study. By employing the Loss of Load Expectation (LOLE) method and evaluating several jeopardy scenarios, the study recommends operating five power generators (PGs) for two-train mode. Although the calculated LOLE of 0.56 days/year is higher than the North American Electric Reliability Corporation (NERC) standard of 0.1 days/year for two-train mode, operating with fewer PGs can significantly benefit fuel efficiency. Additionally, considering that only non-critical loads would be affected in the event of load shedding, the proposed strategy is deemed viable. The paper also outlines a maintenance strategy for the power generators in the coming years to ensure sustained performance and reliability.

16:30-16:45	**(IE24-607-A) Numerical Analysis of Phase Change Material-Based Battery Thermal Management System Used in Electric Vehicles** **Bilal Kursuncu**, Bartin University, Turkey; Tohoku University, Japan Abstract: In recent years, the demand for electric vehicles has been increasing rapidly in line with environmental impacts and countries' net zero emission targets. High temperatures during the charging and use of energy storage batteries in electric vehicles adversely affect battery performance and safety. High temperatures may occur during high current power extraction from the electric vehicle battery or charging the battery. Due to the high temperature, vehicle performance decreases, and negative reactions such as explosion and ignition of the battery may occur. Battery thermal management systems (BTMS) are used to reduce high temperatures or keep a battery within the optimum operating temperature range of 15 to 35 ° C. While liquid or air-cooled systems can be used in these systems, BTMSs can also be created using phase change materials. In this study, a BTMS system containing phase change material (PCM) for an 18650 lithium-ion battery frequently used in electric vehicles was designed and thermally analyzed using ANSYS-Fluent software. PCM has recently been used in many areas, such as passive solar energy use, battery cooling, etc. Capric acid and Tetradecanoic acid were used as PCM materials. To prevent leakage of PCM material during use, which is one of the biggest problems in BTMSs with PCM, BTMS was designed to be made of a material that can be created in a 3D printer. As a result of the analyses, the temperature value in BTMSs containing PCM was determined to be lower than BTMS without PCM. BTMS formed with capric acid provided lower battery temperature during charging than BTMS formed with tetradecanoic acid. With this BTMS, which was designed and analyzed, the battery temperature was kept at lower levels during charging, and the leakage problem of PCM material, the biggest problem in BTMSs, was prevented.
16:45-17:00	**(IE24-419A) Application and Prospects of Groundwater Pollution Information Management in Taiwan** **Yu-Ting Chen**, Environmental Management Administration, Taiwan Abstract: In response to global challenges like water scarcity, climate change, and environmental sustainability, the importance of groundwater management in Taiwan has escalated. Various management entities address the quality, quantity, and geological aspects of groundwater based on operational needs. Data exchange and information integration, as well as how to combine the development and application of information technology, are the key to the development of environmental pollution management in recent years. Taiwan's groundwater, influenced by natural factors and geological structures, shows significant seasonal variations due to diverse contents and rainfall patterns. Additionally, economic activities and over-extraction have led to contamination and other environmental issues. To effectively manage these challenges, Taiwan's Ministry of Environment utilizes an intelligent monitoring platform that integrates data from various sources and employs Geographic Information Systems (GIS) to spatially analyze and display data. This supports decision-making by providing visualized data and real-time pollution alerts, facilitating proactive management strategies at national, regional, and local levels. Moreover, cross-departmental collaboration and resource sharing are crucial for sustaining groundwater quality management efforts, addressing specific pollution issues like arsenic and ammonia, and achieving comprehensive groundwater pollution oversight across Taiwan.
17:00-17:15	**(IE24-307) Unveiling the Talang Akar GRM Sedimentary Facies to Define Reservoir Distribution in North Musi, South Sumatra Basin** **Dwipaningtyas**, Pertamina Hulu Energi, Indonesia Abstract: Oil and Gas Exploration activities in North Musi Cluster, South Sumatra Basin at PERTAMINA EP Block had been inactive since Mambang Field stopped producing in 2005. However, in 2024, a recent hydrocarbon discovery was made in the area from the DPT wildcat

exploration well, which flowed & tested rate of 200 BOPD and 0.6 MMSCFD from drill stem test at Grid Sand Member (GRM) Talang Akar Formation. This recent discovery has opened new opportunities for exploitation and exploration activity. This well is a stratigraphic play opener in the area, shown through the TAF GRM geological model, built from well data and 3D seismic data. A robust depositional model of TAF GRM is created through integration of well data, such as Gamma Ray log Correlation, Borehole Image Interpretation, Biostratigraphy Analysis and seismic data such as Sweetness seismic attribute which in turn unveil the full stratigraphic play potential within the North Musi Cluster.

17:15-17:30	(IE24-608-A) Electrical and Thermal Investigation of Non-Imaging Concentrator Photovoltaic/Thermal Systems **Abid Ustaoğlu**, Bartin University, Turkey; Tohoku University, Japan Abstract: Concentrating photovoltaic thermal (CPVT) systems can generate electricity and thermal energy by concentrating solar radiation onto photovoltaic cells using lenses or mirrors. CPVT systems have important implications since they offer higher overall efficiency with dual-energy production and optimal energy harvesting in limited space, making them cost-effective and versatile for a large-scale solar energy project. Non-imaging concentrators are low-concentration systems and fall into the group of plane concentrators. They require no solar tracking system due to the larger acceptance angle. In this study, three different types of non-imaging concentrators were experimentally investigated in terms of the electrical and thermal performance of the systems. These are compound parabolic concentrators (CPC), V-trough, and compound hyperbolic concentrators (CHC). The systems were designed to have the same concentration ratio. CPC system can provide the highest possible concentration within the acceptance angle. Due to the same concentration, the system can generate similar power when the solar radiation comes around the normal incident angle. However, when the incident angle gets close to the acceptance angle, the power generation gradually decreases in V-trough and CHC systems. The CPC system requires about two times the reflector area of the CHC system. A larger area of the reflector increases the installment cost. Moreover, due to hot spot generation in the CPC system, the power generation decreased. On the other hand, the water circulation minimized the adverse effect of the higher temperature of PV cells. CHC may provide significant advantages with half reflector size and the same concentrators and higher power generation per unit reflector.

Best Presentation Award & Session Group Photo

Poster Session

Nov. 8th | 17:30-18:00
1st Floor, **Sanjana Ballroom**

■ **Topic: Renewable Energy and Power Failure Monitoring**

➕ **We will provide the tape and assist the author to stick it on the wall.**

➕ **Please ask the staff to help you take a photo if needed.**

➕ **The certificate will be prepared after the session.**

Poster 1	(IE24-111) Research on Anomaly Monitoring Method of Power Telecontrol Transmission Based on Feature Selection and M-LSTM **Kai Guo**, State Grid Liaoning Province Electric Power Co., Ltd. Huludao Power Supply Company,China Abstract: Power telecontrol transmission system is one of the key parts of power system, and its stable operation plays a key role in the safe operation of power system. Aiming at the redundancy of characteristic variables of power telecontrol transmission data, this paper proposes a set of typical characteristic variables by analyzing transmission network architecture and transmission protocol. A multi-time-short memory model (M-LSTM) is proposed to monitor the anomalies of power telecontrol data according to the sequence of each feature. The experimental results show that the method proposed in this paper has higher monitoring accuracy for the abnormal data in the power telecontrol transmission system.
Poster 2	(IE24-120) Regional Solar Power Potential Prediction Based on AI in Response to Climate Change **Changyong Jung**, Caramella Inc., Republic of Korea Abstract: This study analyzes the impact of climate change on regional solar power potential and proposes a method for predicting it using an AI model. Climate change can alter key factors such as solar radiation, temperature, and cloud cover, which significantly affect solar power generation. Accurate predictions of these changes are crucial for formulating strategiesto expand renewable energy. Using climate scenario data from the Korean Meteorological Administration, this study builds a deep learning model to analyze solar power potential in various regions. The results highlight notable regional differences in solar power potential due to climate change, providing valuable insights for selecting solar power plant locations and informing energy policy decisions. However, the model's current application is limited to a single region. Future research will extend testing to diverse geographical areas to enhance the model's generalizability and accuracy in reflecting varying climate conditions.
Poster 3	(IE24-610) Numerical Study of Heat Transfer Performance of Geothermal Pile-Foundation Heat Exchanger in Ground Source Heat Pump System **Zhenqian Chen**, Southeast University, China Abstract: In order to study the heat transfer performance of geothermal pile-foundation heat exchanger in ground source heat pump system (GSHP), the physical models of pile-foundation heat exchanger and heat exchanger group were established. The heat transfer processes of pile-foundation heat exchanger and heat transfer performance was analyzed both in cooling and heating mode. To carry out the simulation of heat transfer process for 3×3 energy piles, an office building located in Nanjing was introduced. The all-year dynamic building load was calculated with DeST, including the cooling period from June to September, the heating period from December to March

	and two recovery periods. After ten year's running, the average soil temperature increases in non-equilibrium condition. Study results are approximate to the actual situation and can be used as theoretical basis for the design and application of pile-foundation heat exchanger in GSHP system.
Poster 4	**(IE24-121) Solar Power Generation Prediction Based on Time Series Data Using AI** **Jongman Kim**, Dept. of Electricity and New&Renewable Energy, Damyang, Rep of KOREA Abstract: This study proposes a method for predicting power generation based on time series data using Artificial Intelligence. Power generation is influenced by various factors such as weather conditions, seasonal changes, and equipment performance, and accurately predicting these changes is crucial for enhancing power supply stability and efficiency. In this study, an LSTM (Long Short-Term Memory) model is employed to learn the time series data of power plants and predict future power generation fluctuations. Experimental results show that the AI model demonstrates superior accuracy in handling sudden power generation fluctuations compared to traditional prediction methods. This research is expected to contribute to the improved operational efficiency of power systems.
Poster 5	**(IE24-122-A) Commercial Area Value Analysis Method Based on Administrative Statistical Data** **Yeongmin Kim**, Jeonnam State University, Rep of KOREA Abstract: This study proposes a method for analyzing the value of commercial areas using administrative district-level statistical data. The value of a commercial area is influenced by factors such as population density, income levels, and traffic volume, making comprehensive analysis essential. This study employs an AI model to predict the value of commercial areas and quantitatively assess their potential for growth. By combining various statistical data, the current value and future growth potential of commercial areas are analyzed, showing higher prediction accuracy compared to traditional methods. The findings provide valuable infor-mation for commercial investment and policy decision-making.
Poster 6	**(IE24-117) A Changeable Frequency Control Strategy Coordinated with Black Start for Photovoltaic Station Integrated with Energy Storage** **Fei Liao**, Wuhan University, China Abstract: To enable Photovoltaic (PV) a controllable unit for frequency regulation and black start in power system, a grid-forming frequency control strategy is designed for PV station integrated with storage (ES). This paper proposed a frequency control strategy for PV and ES is developed based on virtual synchronous generator (VSG) control. Then, a small signal modeling of PV-ES control system is deduced with stability analysis. The simulation results reveal the feasibility and effectiveness of the proposed control method of PV and ES integration in frequency response.
Poster 7	**(IE24-305-A) Genesis and geodynamic setting of the granitoids at the giant Siahdik S1 porphyry Cu deposit, Chagai belt, Western Pakistan** **Xiaoyu Wang**, China University of Geosciences, China The Siahdik porphyry Cu deposit is a newly discovered giant Cu deposit (> 8 Mt Cu) in the western Chagai belt, Pakistan. The Chagai porphyry Cu belt of eastern Tethyan metallogenic domain is an arc structure curving southward, which extends for approximately 300 km and hosts numerous porphyry Cu deposits (PCDs) such as the word-class Reko Diq deposit, super-large Saindak deposit, and medium to small Dasht-e-Kain, Durban Chah, and Ziarat-Pir-Sultan deposits. The PCDs in the Chagai belt are widely accepted to be associated with the northward subduction of the oceanic slab of Arabian plate beneath the southern edge of the Eurasian plate during the Cenozoic. The giant Siahdik Cu deposit includes two separate mineralization centers: the western porphyry center (S1 deposit, 3.27 Mt Cu @0.32%) and the eastern porphyry center (S2 deposit, 4.84 Mt Cu @0.48%). Rocks of the Cretaceous Sinjrani Volcanic Group, Late Cretaceous Humai Formation, and the Plio-

Pleistocene Koh-e-Sultan Group crop out in the vicinity of the Siahdik ore district. Intermediate-acidic intrusions and minor basic intrusions, including granites, granodiorites, diorites, quartz diorites, gabbros, and diabases, occur in the neighborhood of the ore district. There are no bedrock outcrops in the ~2×3 km2 ore district hosting the S1 deposit and the ore bodies are buried. In the western porphyry center (S1 deposit) of the Siahdik deposit, there occur several groups of granitoids, including a pre-mineralization biotite granite (BG), an ore-bearing granodiorite (GD), and ore-forming quartz-diorite porphyry (QDP), and post-mineralization andesite porphyries (AP). LA–ICP–MS zircon U–Pb dating of the BG, GD, QDP, and AP gives weighted mean 206Pb/238U ages of 42.7 ± 0.4 Ma, 40.6 ± 0.5 Ma, 24.4 ± 0.2 Ma and 24.0 ± 0.3 Ma, respectively, reflecting two separate phases of magmatism in the Siahdik S1 deposit. The Middle Eocene BG and GD are high-K calc-alkaline series rocks, whereas the Late Oligocene QDP and AP are medium-K calc-alkaline series rocks with high Sr/Y ratios. These granitic rocks are enriched in large ion lithophile elements (LILE, e.g., Rb, Ba, and K) and light rare earth elements (LREE) and depleted in high rare earth elements (HREE) and high-field strength elements (HFSE, e.g., Nb, Ta, and Ti). They have uniform, relatively low (87Sr/86Sr)i values (0.70407–0.70575), positive εNd(t) (1.39 to 3.71) and εHf(t) values (+ 10.72 to + 21.41), and mantle-like zircon δ18O values (+ 4.09 to + 6.48), indicating that the magmas derive from a relatively enriched mantle source that was modified by components from the subducted slab. The composition of zircons from the granitoids of the Siahdik S1 deposit indicate the parental magmas – in particular the fertile QDP – were relatively oxidized. These geochemical and isotopic features, along with the occurrence of mafic microgranular enclaves, and the absence of ancient zircon grain suggest that the parental magmas of the Late Oligocene giant Siahdik S1 porphyry Cu deposit most probably were derived from mixing between mafic melts derived from the metasomatized mantle wedge and crust-derived felsic melts and then subsequently fractionated process. The giant Siahdik porphyry Cu deposit was formed in a continental arc setting during northward subduction of the Neo-Tethys oceanic crust. A high oxygen fugacity, a H2O-rich, volatile-rich magmatic system, and intense fluid-rock interaction maybe the key factors for the formation of the giant Siahdik S1 porphyry Cu deposit.

Poster 8

(IE24-119) Fault Analysis and Circuit Breakers Selection for Electrical Lines Protection: Case of Electrical Line from Lutchurukuru to Kindu (D.R. Congo)

Hikma Shabani, Papua New Guinea University of Technology (Unitech), Papua New Guinea

Abstract: Consumption of electrical energy has steadily increased due to industrial, commercial and demographic growth. In order to deliver constant power to consumers, reliability is an important factor that power companies must take into account. Common disturbances on transmission lines resulting from various faults such as line to line, single line to earth, double line to earth and faults between three lines affect the stability of the electric supply. This paper seeks to demonstrate the behavior of transmission line signals due to disturbances caused by different types of faults and to identify the effect of faults on transmission lines as well as on the bus assembly. Simscape Power tools available in MATLAB/Simulink environment was used to model the 33 kV, 105 km transmission line. After various fault analysis of the power line from Lutchurukuru to Kindu, the circuit breakers to be placed at the transmitter and receiver ends of this power line were selected with the aim of reinforcing the power line protection system. Hence, the circuit breakers at the sender end of the line must have a breaking capacity of 4.376 MVA, a voltage of 34.5 kV, a number of cycles for the fault interruption time of 5 and a subtransient fault current of 49.15 A, while the ones placed at the transmitter end of the line must have a breaking capacity of 497.15 A, a voltage of 34.5 kV, 5 number of cycles for fault interruption and a subtransient fault current of 5.6 A.

Delegates

- Yun Seng Lim, Universiti Tunku Abdul Rahman, Sungai Long, Malaysia
- Elton Daud Simbolon, PT. Wampu Electric Power, Indonesia
- Dinh Thi Mai Thanh, University of Science and Technology of Ha Noi, Vietnam
- Mai Huong, University of Science and Technology of Ha Noi, Vietnam
- Dong Oh Kim, Korea Environment Corporation, Republic of Korea
- Hye-Rim Kim, Korea Environment Corporation, Republic of Korea
- Shih-Kai Wu, Environmental & GeoInformatic Technology Company, Taiwan
- Arian S. Jenie, Pertamina Hulu Energi, Indonesia
- Sungjin Park, LoginSeogwang Inc., Republic of Korea

One Day Tour

Time   **06:20-17:30, Nov. 9, 2024** (Time Zone:UTC+8)

Scheduling

06:20 Start from - Pick up from Golden Tulip Jineng Resort Bali-Arrive at Sanur Port and going to Nusa Penida by using Speedboat → Arrive at Nusa Penida Port and start the tour → Visit Broken Beach → Visit Angel's Billabong → Visit Kelingking Beach → Lunch at Restaurant → Visit Crystal Bay → Back to Nusa Penida Port → Nusa Penida Port and going to Sanur Port by using Speedboat → Arrive at Sanur Port and back to Golden Tulip Jineng Resort Bali

Fee   **IDR 700,000 Per Person/ 45 USD**

Price Include :

- Private Transport with Fully Air-Conditioning Car in Bali and Nusa Penida Island
- Professional English Speaking Driver
- Return Transfer Speedboat Ticket to Nusa Penida (Sharing Boat)
- All Entrance Ticket
- Indonesian Set Menu Lunch and Mineral Water
- Petrol
- Parking Ticket
- 21% Government Tax and Service

Excluding All expenses required for activities outside the itinerary.

Service Language (Tour Guide)   **English**

Minimum Number of Tourist Required   **10 (Otherwise the one-day tour will be cancelled)**

Notice

1. Please be sure to bring your valid passport with you.
2. Please abide by the laws formulated by the government of the Indonesia, and those who violate them will bear the consequences.
3. The scenic spots, meals and other arrangements in this tour shall be subject to the arrangement of the tour guide.
4. Tourists are requested to arrive at Golden Tulip Jineng Resort Bali at least 10 minutes in advance. (The bus leaves at 06:20.)

Highlights of the Tour

> **BROKEN BEACH**

Broken Beach is one of the most popular Bali Places of Interest which is locally known as Pantai Pasih Uug is one of the top picturesque and most visited destinations on Nusa Penida Island. Uniqueness, a tranquil and incredible scene, which is a great spot for travel photographers and panoramic view seekers. Where there are reaches of cliffs 50-200 meters high. Cliff circular shape and the middle forming holes like caves or sea tunnels. The sea water as if caught in the middle of the cliff makes it seem like a big pond. Broken Beach (Pasih Uug) has a big natural pool, about a hundred

meters in diameter, created by sea abrasion and collapsed limestone hill millions of years ago. This hole is 98 meter in diameter and offers a unique and scenic view.

> **ANGEL'S BILLABONG**

Angel's Billabong is one of the most popular Bali Places of Interest with spectacular rock formation near Pasih Uug (Broken Beach), on the southwestern end of Nusa Penida Island. Both spots offer views of beautiful cliffs and pristine coastlines. There's a pathway leading to a naturally formed rock lagoon, offering a scenic seascape and pleasant swimming spot on the island. It's a good idea to explore Broken Beach first, where you can enjoy a view of natural limestone arches over the blue waters. A trail (with signposts) will lead you to Angel's Billabong from the beach. You can enjoy a dip in the rock pools or swim around the entire lagoon if you're feeling adventurous.

> **KELINGKING BEACH**

Kelingking Beach is one of the most popular Bali Places of Interest, Even if you don't want to go all the way down, take the small path that goes down along the ridge line, at least for a few meters. You will be much quieter and the photos will be much better. Another piece of advice, take your photos before going down, you will probably be less photogenic after climbing back. The first part of the trail, along the ridge line to the first turn is also quite easy. And you can check there if you have the courage to go all the way down to the beach.

> **Crystal Bay**

Crystal Bay is one of the most popular Bali Places of Interest, the name of a secluded cove with a 200-metre stretch of sand on the west coast of Nusa Penida. Despite its isolation, the bay is quite accessible thanks to well-developed roads. Besides its beautiful, palm-fringed beach, the bay is best known as one of Nusa Penida's famous snorkelling and dive sites. The sea is safe to swim close to the shore and during calmer tides, with crystal-clear waters (hence its name). Divers praise the superb visibility, sometimes down to 30 metres. Crystal Bay is a short drive west from the Coco Resort Penida. This is one of the very few resorts on the island's western region. Down at the dark-sand beach, you may find a couple of parasol-shaded sunbeds available for rent from locals.

NOTE