# CONFERENCE PROGRAM

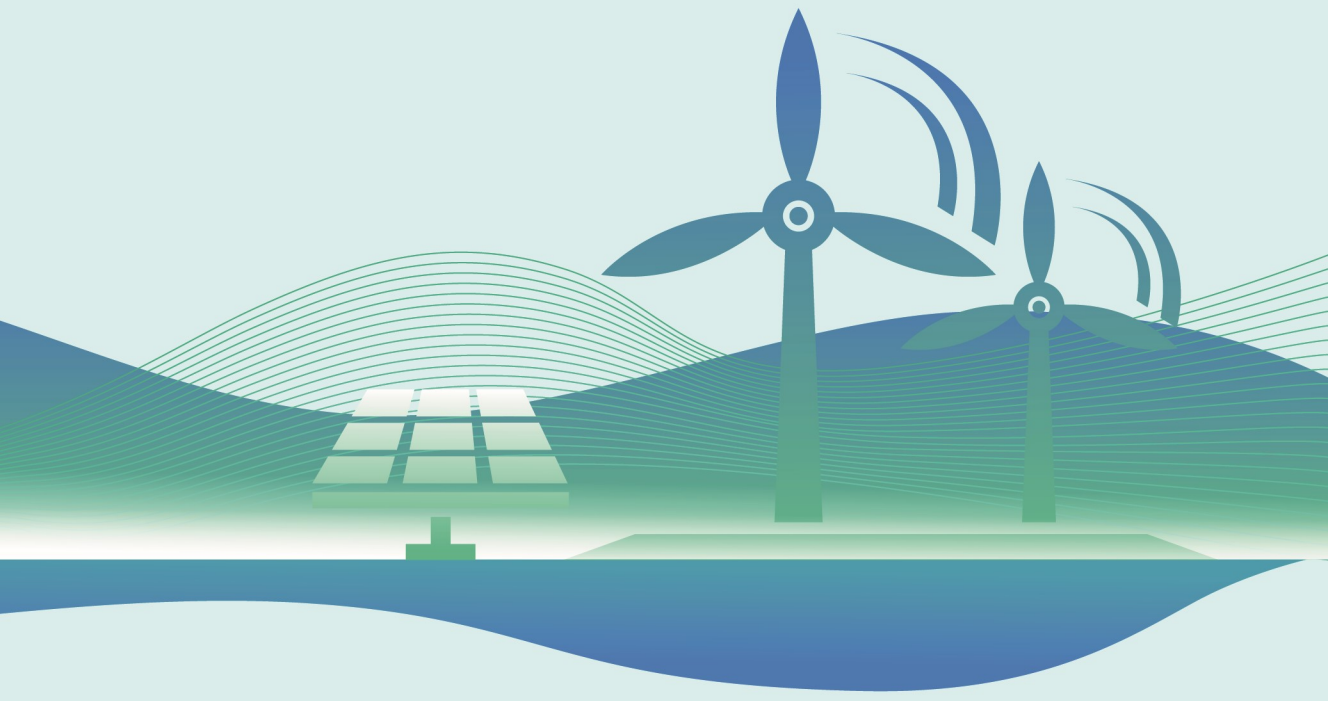
# ICPSE 2024

## 2024 13th International Conference on Power Science and Engineering

# ICREE 2024

## 2024 8th International Conference on Renewable Energy and Environment

September 27-29, 2024 Ankara, Turkey



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# WELCOME MESSAGE

Dear Distinguished Delegates,

On behalf of the organizing committee, it is an honor to extend a heartfelt welcome to all attendees of 2024 13th International Conference on Power Science and Engineering (ICPSE2024), and 2024 8th International Conference on Renewable Energy and Environment (ICREE2024), which taking place in Ankara, Turkey during September 27-29, 2024.

The conference provides a platform to share and get the latest insights from every area of power science and engineering, renewable energy and environment.

In this program, there are 2 keynote speeches, 5 invited speeches, 2 onsite sessions and 1 online session. A word of special welcome is given to our speakers who are pleased to make contributions to our conference and share their new research ideas with us.

Meanwhile, we'd like to express our sincere gratitude to our fellow members of the organizing committees composed by Honorary Chair, Conference Chair, Conference Co-Chair, Publication Chair, Technical Program Chairs, Finance Chair, Local Chair, Local Committees and Technical Committee for their excellent work in encouraging participation and securing a substantial input of papers from all around the world.

We truly believe all participants will find the discussion fruitfully and will enjoy the opportunity for setting up future collaborations. Wish all of you will have an unforgettable and prefect experience in this conference.

We hope you'll have a good time in Ankara, Turkey!

Your sincerely,
ICPSE 2024 & ICREE 2024 Conference Organizing Committees

# CONFERENCE COMMITTEES

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• Joao Paulo Catalao, University of Porto, Portugal
• Ummuhan Basaran Filik, Eskişehir Technical University, Eskişehir, Turkey
• Hulusi Bulent ERTAN, Atilim University, Ankara, Turkey

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**Local Chair**

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• Özge EROL, Eskişehir Technical University, Turkey
• Oğuzkaan ALIÇ, Eskişehir Technical University, Turkey

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• Sergei Kartavtcev, Nosov Magnitogorsk State Technical University, Russia
• Shadi Khan Baloch, Mehran UET Jamshoro, Pakistan
• Sreekanth. K. J., Kuwait Institute for Scientific Research, Kuwait
• Vannak Vai, Institute of Technology of Cambodia, Cambodia

# CONFERENCE HISTORY

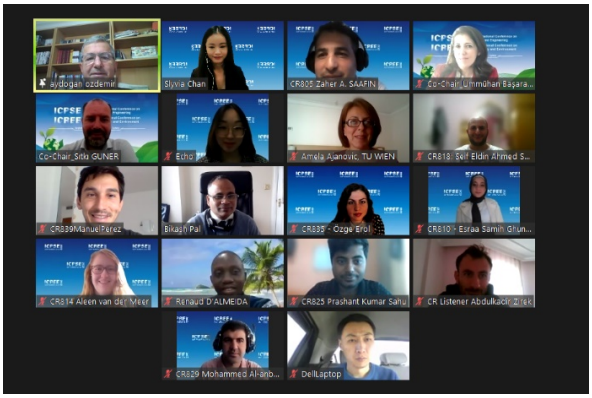
☺ Only display the last 5 years in this program

**ICPSE&ICREE 2023 | Eskişehir, Turkey | September 22-24, 2023**

ICPSE 2023 conference, was held in Eskişehir Technical University, Turkey on September 22-24, 2023 in hybrid with virtual style.

At the beginning of the conference, Conference Co-Chair: Prof. Ummuhan BasaranFilik, Eskişehir Technical University, Turkey delivered the opening remarks to welcome all participants to attend ICPSE 2023 onsite. For 2023 conference, we were so honored to invite Prof. Dr. João P. S. Catalão (IEEE Fellow) from University of Porto, Portugal, Prof. Dr. Fatih Onur Hocaoğlu from Afyon Kocatepe University, Turkey, Prof. Dr. Murat Fahrioglu, Middle East Technical University, Turkey to deliver the keynote speeches, respectively.

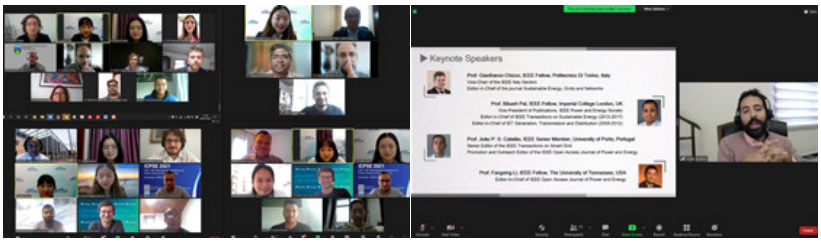
**ICPSE&ICREE 2022| Virtually | September 22-24, 2022**




Considering the uncertainty of COVID-19 and pervasive international travel restrictions, after counting the number of participants who prefer to attend the conference in the site, ICPSE&ICREE 2022 conference has to covert to full virtual style on September 22-24, 2022.

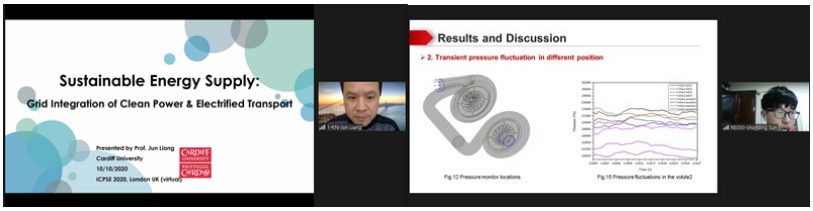
# CONFERENCE HISTORY

**ICPSE&ICREE 2021| Virtually | October 21-23, 2021**




Considering the uncertainty of COVID-19 and pervasive international travel restrictions, after counting the number of participants who prefer to attend the conference in the site, ICPSE&ICREE 2021 conference has to coverted to full virtual style on October 21-23, 2021 again.

**ICPSE&ICREE 2020| Virtually | October 23-25, 2020**




Considering the COVID-19 pandemic in UK and pervasive travel restrictions, ICPSE was planned to hold in London, UK on Oct. 23-25, has been coverted to full virtual style. In the conference, Prof. Jun Liang, Cardiff University, UK, Assoc. Prof. Zhenyuan Zhang, University of Electronic Science and Technology of China, China, and Dr. Amela Ajanovic, Vienna University of Technology, Austria delivered the keynote and invited speeches, respectively.

**ICPSE&ICREE 2019| Dublin, Ireland | December 2-4, 2019**

2019 3rd International Conference on Renewable Energy and Environment (ICREE 2019), the workshop of ICPSE 2019, which was held at University College Dublin, Dublin, Ireland during December 2-4, 2019. The conference is co-supported by UCD Energy Institute, Energy Economics Group, Institute of Energy Systems and Electric Drives, Vienna University of Technology (TU Wien).

# CONFERENCE VENUE

## Movenpick hotel


Website: https://movenpick.accor.com/

Address: Beştepe Mah. Yaşam Cad. No:1 Söğütözü / Yenimahalle | 06560 | Ankara | Turkey

Get the celebrity treatment with world-class service at Movenpick Hotel Ankara Situated in Ankara and with Anitkabir reachable within 4.5 km, Movenpick Hotel Ankara features concierge services, allergy-free rooms, a restaurant, free WiFithroughout the property and a fitness centre. This 5-star hotel offers a 24-hour front desk and room service. There is free private parking and the property provides paid airport shuttle service.

A buffet breakfast is available each morning at the hotel.

Movenpick Hotel Ankara offers guests a spa and wellness centre with a sauna, a hot tub and an indoor pool. Ankara Castle is 8.7 km from the accommodation, while National Library of Turkey is 1.9 km from the property. The nearest airport is Ankara Esenboga Airport, 31 km from Movenpick Hotel Ankara.

# ONSITE/ONLINE GUIDELINES

**Onsite Guideline**

- Oral presentation language: English
- Regular oral presentation: 15 minutes (including Q&A).
- Get your presentation PPT files prepared. Presentations MUST be copied in the conference laptop at least 10 minutes before session starts.
- Conference organizer will provide presentation laptop, USB, projector and screen, laser pointer. If you are using an IOS device, please bring your own converter.

### ◆ Important Notes

- Please enter the meeting room at least 10 minutes before your session. Your punctual arrival and active involvement will be highly appreciated.
- Please wear your name tag during the conference activities. Lending it to others is not allowed. If you have any companying person, please do inform our staff in advance.
- Please keep all your belongings (laptop and camera etc.) at any time. The conference organizer does not assume any responsibility for the loss of personal belongings.

**Online Guideline**

### ◆ Time Zone: Ankara Time (GMT/UTC+3)

Please attention the time difference.

### ◆ ZOOM Download link: https://zoom.us/download

### ◆ Equipment Needed

A computer with internet connection and camera
Stable internet connection
A quiet place and Proper background

### ◆ Test Your Presentation PPTX.

Date: September 27, 2024
Prior to the formal meeting, presenters shall join the test room to ensure everything is on the right track. Please check your test time in this program. All the online presenters must attend the test.

### ◆ Online Oral Presentation

Timing: a maximum of 15 minutes in total, including 2-3 minutes for Q&A. Please make sure your presentation is well timed.
Please join the meeting room 10 minutes in advance.

# AGENDA OVERVIEW

## Day 1 September 27 | Friday | GMT+3

➢ **Online participants only**

| Time | Activities | Meeting Room zoom |
|---|---|---|
| 10:00-12:00 | Equipment Test | Meeting ID: 889 7277 0198<br>Link:<br>https://us02web.zoom.us/j/88972770198 |

- Participants who are going to do an online presentation are required to join the Zoom pre-test.
- Please download the Zoom and prepare your presentation slides before you take the pre-test.
- Duration: 2~3 minutes apiece. Free to leave after your rehearsal is done.

**Name Setting before Entry!**

Keynote Speaker: Keynote-Name
Invited Speaker: IS-Name
Session Chair: SC-Name
Author's Presentation: Paper ID-Name
Delegate: Delegate-Name

➢ **Onsite participants only**

| Time | Activities | Location |
|---|---|---|
| 14:00-17:00 | Onsite Sign-up<br>Conference Materials Collections | Lobby of the hotel |

Movenpick hotel
Address: Beştepe Mah. Yaşam Cad. No:1 Söğütözü / Yenimahalle | 06560 | Ankara | Turkey

# AGENDA OVERVIEW

## Day 2 September 28 | Saturday | GMT+3

| Time | Activities | Morning Conference | Onsite Meeting Location: *Lausanne Hall-B2 Floor* Online Meeting ID: *889 7277 0198* |
|---|---|---|---|
| 09:35-09:40 | Opening Remark *(Online)* | **Prof. Ozan Erdinç**, Yildiz Technical University, Turkey (IEEE PES Turkey Chapter Chair, IEEE Senior Member) | |
| 09:40-10:20 | Keynote Speaker I | **Prof. Hulusi Bulent ERTAN**, Atilim University, Turkey *Speech Title: Real-Time Rotor Position Estimation from Induction Motor Current* | |
| 10:20-10:50 | Coffee Break and Group Photo | | |
| 10:50-11:30 | Keynote Speaker II *(Online)* | **Prof. João P. S. Catalão**, University of Porto, Portugal (IEEE Fellow) *Speech Title: Breakthroughs and Novel Insights into Demand Response Programs* | |
| 11:30-12:00 | Invited Speaker I *(Online)* | **Dr. Ashraf Mahmud**, University of the West of Scotland, UK *Speech Title: Effective Demand Response Modelling in the Smart Power Grid* | |
| 12:00-13:30 | Lunch | Teona Restaurant | |
| 13:30-14:00 | Invited Speaker II *(Online)* | **Dr. Hamed H. Aly**, Dalhousie University, Canada *Speech Title: Smart Grid Technologies and Renewables Integration* | |

| Time | Activities | Onsite Sessions (Onsite Only) | Location: *Lausanne Hall-B2 Floor* |
|---|---|---|---|
| 14:15-15:45 | Session I | **Topic:** "Optimization and Evaluation of Power and Energy Systems" **Session Chair:** Prof. IMARAZENE Khoukha, Power Equipment Characterization and Diagnosis Laboratory (of USTHB) Algiers, Algeria **Presenters**: PS032, PS609, PS604, PS605, PS055, PS623 | |
| 15:45-16:00 | Coffee Break | | |
| 16:00-18:00 | Session II | **Topic:** "Renewable Energy Technologies and Environmental Pollution Control" **Session Chair:** Prof. Mohammed Saleh Hussein Al Salameh, Jordan University of Science and Technology, Jordan **Presenters**:PS040, PS045, PS611, PS037-A, PS218, PS205, PS113, PS219 | |
| 18:00 | Dinner | Location: Teona Restaurant | |

# AGENDA OVERVIEW

## Day 3 September 29 | Sunday | GMT+3 | Online Conference

| Time | Activities | Morning Conference | Online Meeting ID: 889 7277 0198 |
|---|---|---|---|
| 09:00-09:30 | Invited Speaker III *(Online)* | Dr. NUR FADILAH AB AZIZ, Universiti Tenaga Nasional (UNITEN), Malaysia<br>*Speech Title: Geomagnetic Induced Currents: A Hidden Risk for Power Networks* | |
| 09:30-10:00 | Invited Speaker IV *(Online)* | Dr.-Ing. Mohd Zamri Che Wanik, HBKU, Qatar<br>*Speech Title: Active Distribution Network Management with Synchrophasor Technology* | |
| 10:00-10:30 | Invited Speaker V *(Online)* | Prof. Saadi Slami, Zian Achour University of Djelfa, Algeria<br>*Speech Title: Meta-heuristics for Intelligent Power Systems* | |
| 10:40-12:10 | Online Session | **Topic:** "Intelligent Prediction in Power System and Research on Energy Performance"<br>**Session Chair:** Gratitude Charis, Department of Chemical and Materials Engineering, University Of South Africa, South Africa<br>**Presenters**: PS039, PS049, PS302, PS206, PS050, PS220 | |
| 12:20-12:30 | **Online Closing Ceremony**<br>Host: Prof. Ozan Erdinç, Yildiz Technical University, Turkey | | |

# KEYNOTE SPEAKER

## Prof. Dr. Hulusi Bulent ERTAN

## Atilim University, Turkey

**Research Areas:** Electrical Machines, Smart Grids, Electric Vehicles, Electrical Drive Systems, Power Electronics, Renewable Energy

**Biography:** Dr. H. Bulent Ertan directed many industry-supported projects since 1977. He led the Intelligent Energy Conversion Group at TUBITAK (Turkish Scientific and Technological Research Council) Information Technologies and Electronics Research Institute (BILTEN) in Ankara Turkey, between 1999-2006. He was an executive committee member of the Center for Wind Energy, METU and also director of the Electromechanics laboratory between 2011-2017. Prof. Ertan was chairman of the Mustafa Parlar Education and Research Foundation in 2000 and he was a member of the executive board of this foundation until 2016.

He has published more than 150 journal and conference papers so far. He is co-editor of two books entitled "Modern Electrical Derives", Kluwer Academic Publishers, Netherlands, 2000 (NATO ASI series) and" Transformers: Analysis Design and Measurement" (CRC Press, 2013). Prof. Ertan is the holder of 5 national and international patents. He received the IEE Overseas Premium award in 1993 and an IEEE award in 2014, for his contributions to the IEEE standard "Trial-use guide for testing permanent magnet machines".

Professor Ertan is the founder of the Aegean International Conference on Electrical Machines and Power Electronics (ACEMP). Prof. Ertan is a member of the Turkish Chamber of Electrical Engineers and member of IET (UK) and a senior member of IEEE. He is currently the Mechatronics Engineering Department chair at Atilim University.

### Speech Title: Real-Time Rotor Position Estimation from Induction Motor Current

Speech Time: 09:40-10:20 | September 28, 2024 | GMT+3

**Abstract:** Field orientation is commonly used in modern electrical drives to obtain superior performance. Such motor drive applications often need instantaneous rotor position information. Rotor position may be detected by using a position sensor of some kind, such as incremental encoders. However, as it is well known this is costly and requires modification to apply existing installations. There are also sensorless vector control methods. Such methods measure the motor current and voltage and estimate the rotor position for field orientation. However, in this case, the drive performance is compromised especially at low speeds the accuracy of the drive is poor in producing the desired torque. Improving the performance of such drives has always been of interest.

There are two main approaches to detecting the rotor position without using a position sensor or modifying the motor. One approach is to inject a high-frequency signal and the other is to make use of existing saliencies of the motor. The focus of this paper is to use the most obvious saliency which exists in any induction motor; the slotting harmonics. Slotting harmonics are commonly used for fault detection purposes. However, the usual approach is to use spectral estimation techniques. this approach requires long sampling and computation periods, in the order of at least several milliseconds. For field orientation purposes it is desirable to detect the rotor position within a control cycle ie in several hundred microseconds.

This paper introduces a novel approach to the position detection problem by identifying the rotor slot harmonics (RHS) in an inverter-driven motor current. The RHS are treated as modulated onto the fundamental current and via demodulation, the RHS and its higher-order harmonics are obtained. The algorithm used for this purpose is fast and can be applied within a typical control cycle of a vector-controlled drive algorithm.

The proposed method is explained in this paper and implemented using higher-order RSH for position prediction. In this manner, the position estimation resolution increases and also possible effects of harmonics stemming from other sources are avoided. Implementation of this approach is described in the presentation and its position prediction performance is evaluated by comparing its predictions with the measured rotor position from an encoder via experiments on a vector-controlled drive.

# KEYNOTE SPEAKER

**Prof. João P. S. Catalão**
**IEEE Fellow**
**University of Porto, Portugal**

**Research Areas**: Power System Operations and Planning, Power System Economics and Electricity Markets, Distributed Renewable Generation, Demand Response and Smart Grid

**Biography**: João P. S. Catalão is an IEEE Fellow. He received the M.Sc. degree from the Instituto Superior Técnico (IST), Lisbon, Portugal, in 2003, and the Ph.D. degree and Habilitation for Full Professor ("Agregação") from the University of Beira Interior (UBI), Covilha, Portugal, in 2007 and 2013, respectively. Currently, he is a Professor at the Faculty of Engineering of the University of Porto (FEUP), Porto, Portugal. He was the Primary Coordinator of the EU-funded FP7 project SiNGULAR, a 5.2-million-euro project involving 11 industry partners. He has authored or coauthored more than 500 journal publications and 400 conference proceedings papers, with an h-index of 90 and more than 30,000 citations (according to Google Scholar), having supervised more than 120 post-docs, Ph.D. and M.Sc. students, and other students with project grants. He was the General Chair and General Co-Chair of SEST 2019 and SEST 2020, respectively, after being the inaugural Technical Chair and co-founder of SEST 2018. He is a Senior Editor of the IEEE Transactions on Neural Networks and Learning Systems. Furthermore, he is an Associate Editor of nine other IEEE Transactions/Journals. He was an IEEE Computational Intelligence Society (CIS) Fellows Committee Member in 2022 and 2023. He was recognized as one of the Outstanding Associate Editors 2020 of the IEEE Transactions on Smart Grid, and one of the Outstanding Associate Editors 2021 of the IEEE Transactions on Power Systems. He has multiple Highly Cited Papers in Web of Science. He has won 5 Best Paper Awards at IEEE Conferences. Furthermore, he was the recipient of the 2017-2022 (for the sixth consecutive year) FEUP Scientific Recognition Diplomas. His research interests include power system operations and planning, power system economics and electricity markets, distributed renewable generation, demand response, smart grid, and multi-energy carriers.

## (Online) Speech Title: Breakthroughs and Novel Insights into Demand Response Programs

(Online) Speech Time: 10:50-11:30 | September 28, 2024 | GMT+3

**Abstract**: The Clean Energy for all Europeans package and the European Green Deal both put the consumers at the centre of the European Union's energy system. Under the REPowerEU Plan, the European Commission reinforced the need to effectively allow consumers to become fully-fledged actors in the energy market. Digitalization could make it easier for consumers to invest in energy transition, also enabling consumers to actively participate in demand response programs. Demand response is becoming increasingly important to allow for a larger penetration of variable renewables, simultaneously ensuring more flexibility and more resilience. This keynote speech addresses breakthroughs and novel insights into demand response programs, from several theoretical breakthroughs to real-life cases, aiming to increase consumer empowerment.

# INVITED SPEAKER

## Dr. Ashraf Mahmud

## University of the West of Scotland, UK

**Research Areas**: Smart Grid, Micro Grids, Power Science, Data Science, Artificial Intelligence, Energy Management, Demand Response Modelling, Internet of Things, Green Energy

**Biography**: Ashraf Mahmud received a Master of Statistics from Dhaka University, Bangladesh, with first class in 1999, an MSc in Computer Science from the University of East London, UK, in 2006, and a PhD from the University of Bedfordshire, UK, in 2019.

He is currently working as the Data Science Programme Leader at the University of the West of Scotland, where he has been employed since 2022. He is involved with the DELTA research group, a multidisciplinary group that is part of the Artificial Intelligence, Virtual Communications, and Networks (AVCN) Institute at UWS.

Prior to this, he worked 10 years as an IT Manager and Head of Student services in the ICON College, London, UK since 2004. He worked part-time and full-time at the University of Bedfordshire since 2015. He also worked as a postdoctoral research associate at Heriot-Watt University on the UKRI-funded project ReFlex in Orkney in 2019-2020. When the pandemic started, he worked at both the University of Bedfordshire and York St John University. Afterward, he joined the University of Reading, where he worked until July 2022.

## (Online) Speech Title: Effective Demand Response Modelling in the Smart Power Grid

(Online) Speech Time: 11:30-12:00 | September 28, 2024 | GMT+3

**Abstract**: In the Smart Grid, demand response is a fundamental phenomenon due to the 70% energy wastage in the current power grid. This paper used Long Short-Term Memory (LSTM) and the Autoregressive Integrated Moving Average (ARIMA) models to predict electricity prices. The dataset was sourced from the open-source Victoria state of Australia. The study integrates seasonal energy variations in demand and electricity prices. The forecasting models were implemented and evaluated using three performance metrics: Mean Squared Error (MSE), Mean Absolute Error (MAE), and Root Mean Squared Error (RMSE), where LSTM demonstrated lower error compared to ARIMA. Several challenges were identified during the research, including unexpected negative Regional Reference Price (RRP), model limitations, and unpredictable price variations. In terms of accuracy, statistical models like Simultaneous Perturbation Stochastic Approximation (SPSA) were implemented, revealed significant prediction variations. Statistical model and machine learning approach used in prediction. However, there is potential for improved accuracy by implementing different techniques, such as alternative models, hybrid approaches, and dynamic hyperparameter tuning. This research has implications for future work in enhancing model accuracy, demand response modelling, and Smart Grid optimization.

# INVITED SPEAKER

## Dr. Hamed H. Aly

## Dalhousie University, Canada

**Research Areas**: micro grids, smart grid, distributed generation, power quality issues, applications of artificial intelligence in power systems, energy management, green energy, and optimization

**Biography**: Hamed H. Aly (S'09-M'12-SM'16) received the B.Eng. and MASc degrees in electrical engineering with distinction, in 1999 and 2005, respectively, from Zagazig University, Egypt, and the Ph.D. degree from Dalhousie University, Canada, in 2012. He worked as a postdoctoral research associate for one year and as an instructor for three years at Dalhousie University. He worked at Acadia University as an assistant professor for three years. Dr. Aly is currently working as an assistant professor at Dalhousie University and is the founder for Smart Grid and Green Power Research Laboratory. His research interests include micro grids, smart grid, distributed generation, power quality issues, applications of artificial intelligence in power systems, energy management, green energy, and optimization.

## (Online) Speech Title: Smart Grid Technologies and Renewables Integration

(Online) Speech Time: 13:30-14:00 | September 28, 2024 | GMT+3

**Abstract**: Challenges associated with climate changes motivate using renewable energy resources (RERs). The development of renewables generation, energy storage, and electric vehicles (EVs) are among the critical stages toward cleaner and more efficient power generation. Coordination and scheduling between RERs and the main grid are playing a crucial role for renewables integration as RERs are intermittent and uncontrollable and this presents several challenges like quality issues (stability of voltage and frequency), grid regulations, and inertia problems. For electricity companies and independent system operators (ISOs), it is important to ensure steady supply within a range, which is challenging in case of RERs due to its stochastic (uncertainty and variability). Due to nonlinearity, and fluctuation of RERs; prediction, control and management are very important factors to deal with renewables. Incorporating prediction model of intermittent resources in the optimization formulation is an approach which is actively uses the intermittent resources to follow the demand side variations. With the development of ML, there are opportunities to design and implement novel and cutting-edge decision support systems for real-time monitoring and performance optimization of renewables integration into smart grids. Their integration is vital for achieving energy sustainability among all clean energy sources, including wind, solar, and hydropower. This work presents some of the smart grid solutions to overcome renewables fluctuations and climate changes.

# INVITED SPEAKER

## Dr. NUR FADILAH AB AZIZ
## Universiti Tenaga Nasional (UNITEN), Malaysia

**Research Areas**: power system analysis, electric vehicle, and machine learning application in power system

**Biography**: Dr. NUR FADILAH AB AZIZ received the Master of Engineering degree (1st class Hons.) in Electrical Engineering from University of Southampton, UK in 2006 and Ph. D. degree from Universiti Teknologi Mara, Shah Alam in 2014. She is a member of Board of Engineers Malaysia (BEM) and IEEE since 2008 and has served as the Executive Committee in IEEE Power Energy Society (PES) Malaysia Chapter since 2021. She is currently at the Department of Electrical and Electronics Engineering, at Universiti Tenaga Nasional (UNITEN), Malaysia as the Head of Programme of Board of Engineers Malaysia Graduate Assessment Programme (BEM-GAP). She was the recipient of Teaching Excellence Award 2022 and Highest Number of Publication 2018 at College of Engineering, UNITEN. She has served as the External Examiner for several universities in Malaysia and she is also the Editorial Board Members for IEEE Access, Smart Grids (Frontiers in Energy Research), and Journal of Electrical & Electronic Systems Research. As a researcher, she has successfully led and completed several research grants in engineering focusing mainly on power system analysis, electric vehicle, and machine learning application in power system. She has published more than 60 publications in international journals and conferences, two books and several chapters in edited books. She has also co-authored several technical manuals for Tenaga Nasional Berhad (Malaysia's electric utility company) which are "A Guide For Distribution Protection Setting & Coordination", and "Testing & Commissioning Guidelines for Distribution Substation". She is also active in industry-based research. She has involved with several research and industry projects and supervised several graduated PhD and Master students.

## (Online) Speech Title: Geomagnetic Induced Currents: A Hidden Risk for Power Networks

(Online) Speech Time: 09:00-09:30 | September 29, 2024 | GMT+3

**Abstract:** For many decades, Geomagnetically Induced Current (GIC) has posed a significant risk over the electrical power grid infrastructures worldwide. The phenomenon occurs due to geomagnetic disturbance (GMD) and related space weather events arising from solar activity. It represents a potential hazard to the secure and safe operation of electrical power grids by causing half-cycle saturation of grounded High Voltage (HV) power transformers, relay misoperation, and increased reactive power demand in the power systems. Many power grid operators in various countries worldwide have begun to study and perform GIC measurements and many mitigation techniques have been proposed to mitigate its effects on the power grid infrastructures. Previous studies have shown that the occurrence of intense GIC is not limited to high and mid-latitude regions, but powerful space weather events can also result in intense GIC in power systems located in lower geographic latitudes. This talk will explore the potential impacts of GICs on power network, analyzing key vulnerabilities and risks. Using a combination of geomagnetic data and power grid simulations, this study evaluates the susceptibility of the power grid to GICs and discusses mitigation strategies to enhance the resilience of the power infrastructure. The findings contribute to understanding GICs in tropical regions and offer insights into protecting the integrity of the grid from space weather events.

# INVITED SPEAKER

## Dr.-Ing. Mohd Zamri Che Wanik
## HBKU, Qatar

**Research Areas**: Photovoltaic, Energy Storage and Electric Vehicle

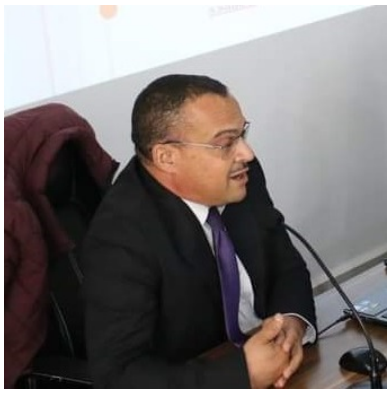
**Biography**: Dr.-Ing. Mohd Zamri Che Wanik is a Power & Renewable Systems Engineering and Research Specialist. He received his BSc. from the University of Evansville, U.S.A., MEngSc. from the Curtin University of Technology, Australia and Doktor der Ingenieurwissenschaften (equivalent to PhD) from Universität Duisburg-Essen, Germany in 1997, 2002 and 2011 respectively all in Electrical Engineering specialising in Electrical Power System. He was an academic staff at Malaysian National University where he teaches power system subjects and supervised theses. He is acknowledged as an expert and was constantly referred by Tenaga Nasional Berhad (TNB), the largest electric utility company in Malaysia. His works led to the amendment of Malaysia Grid Codes to accommodate large scale solar farm, improvement of Malaysian PV interconnection guidelines to medium voltage grid, pilot demonstration project on distributed generation management in TNB Distribution network, pilot demonstration of Microgrid operation at TNB, Malaysian Electric Vehicle charging infrastructure guidelines, the net metering policy with RE to name a few. Since 2016, he is with Qatar Environment and Energy Research Institute (QEERI) as Scientist/Project Lead – Advanced Power Systems-Smart Grids. At QEERI his R&D activities are focusing on intelligent management of distribution network to facilitate the integration of distributed energy resources such as Photovoltaic, Energy Storage and Electric Vehicle. He has successfully led many R&D, consultancy, pilot and demonstration projects in this domain. He is also frequently invited to give talks, conducting seminars and workshops for academia and industry on topics related to his expertise. He is active in voluntary work within technical society which he is currently a senior member of IEEE, a member of IEEE PES, and a member of CIGRE.

### (Online) Speech Title: Active Distribution Network Management with Synchrophasor Technology

(Online) Speech Time: 09:30-10:00 | September 29, 2024 | GMT+3

**Abstract**: The expected increase integration of distributed energy resources (DERs) especial solar PV into distribution system demands higher requirements in reliability, resiliency and power quality from electric user or customer. Active distribution network management is highlighted as a key tool for the efficient and secure integration of high level of distributed generation. Active distribution network management comprises of combine network development and operational solutions, structured and organized information exchange, increased monitoring, simulation, and control via telecommunication. One of the key technology that will enable the active management is phasor measurement unit. This talk in addition to the concept of active management will describe on the PMU technology, its application, and its benefits to distribution networks. The pilot-demonstration project on PMU based monitoring and management currently ongoing at one of the medium voltage level distribution systems in Qatar will be presented. The experience of planning, installing, and commissioning of the system will be shared. The functions and performance of the system will be presented. The R&D activities on this area at Qatar Environment and Energy Research Institute will also be shared with.

# INVITED SPEAKER



## Prof. Saadi Slami

## Zian Achour University of Djelfa, Algeria

**Research Areas**: Artificial Intelligence Applied to Signal Processing, Power Systems Quality Optimization, Smart Grids/Smart Cities, Hardware and Software Reconfigurable Implementation, Modern Control and Embedded Electronics

**Biography**: Pr. Slami SAADI, received his BSc degree in Electrical and Electronics Engineering from INELEC (1993), University of Boumerdes (Algeria) and MSc degree in Signal Processing from the University of Blida (2005). He got his PhD degree from SAAD DAHLAB university of Blida (Algeria) in 2012. His interests include artificial intelligence and meta-heuristics applied to signal processing, power systems quality optimization, smart grids/smart cities, hardware and software reconfigurable implementation, modern control and embedded electronics…etc. He worked as an engineer in industrial instrumentation for more than sixteen years in the Algerian power systems society (CDSE) and published many papers, conference presentations and scientific/text books in his domain. He is, currently, with the Department of Electronics, Faculty of Sciences and Technology, university Zian Achour of Djelfa, Algeria, as a full Professor.

## (Online) Speech Title: Meta-heuristics for Intelligent Power Systems

(Online) Speech Time: 10:00-10:30 | September 29, 2024 | GMT+3

**Abstract**: In this work, we present an optimal reduced order nonlinear dynamic model for proton exchange membrane fuel cell (PEMFC) using the minimization of error between original and reduced order models via (L1, H2, H∞) norms synergy optimized with biogeography based optimization (BBO) Algorithm. The data necessary to form the autoregressive exogenous(ARX) artificial neural network (ANN) model are generated by the simulationof the dynamic model of the nonlinear PEMFC500w differential equations to extract space state matrices values. This approach is compared with Balanced Truncation (BT) model reduction method and illustrated through simulation results.

# ONSITE SESSION I

**Topic**: Optimization and Evaluation of Power and Energy Systems
**Time**: 14:15-15:45 | September 28, 2024 | Saturday
**Session Chair**: Prof. IMARAZENE Khoukha, Power Equipment Characterization and Diagnosis Laboratory (of USTHB) Algiers, Algeria
**Onsite Meeting Room**: Lausanne Hall-B2 Floor

For each presenter, please copy your presentation PPT to the conference laptop before the session start, and stay onsite for the whole session.

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| PS032<br>14:15-14:30 | Optimization of double-circuit high-voltage transmission line configuration by Pareto-Particle Swarm Method<br>Mohammed Saleh Al Salameh<br><br>**Presenter**: Mohammed Saleh Hussein Al Salameh, Jordan University of Science and Technology, Jordan<br><br>**Abstract**: In this paper, the particle swarm optimization method, along with Pareto algorithm, is used to optimize the configuration of double-circuit high voltage transmission line. The global best of PSO is determined in each iteration using the weighted Euclidean distance. The global best solution should be nondominated in order to be included in the Pareto front. The best arrangement of transmission line conductors is determined based on the maximization of the power capacity and minimization of the electric and magnetic fields under the line, voltage gradient on each conductor surface, power losses in shield wires, and cost. The IEC-71 standards are adopted here for the clearance between conductors. MATLAB is used to realize the solution. Before finding the optimized results, the computed electric and magnetic fields were compared with measured data to ensure the validity of the solutions. The optimized and unoptimized results are compared where significant improvement is observed. New optimized configurations of double-circuit line conductors are obtained. |
| PS609<br>14:30-14:45 | Inductive Interference Between High Voltage Power Transmission Lines and Aerial Pipelines<br>M'hamed OUADAH, Omar TOUHAMI and Rachid IBTIOUEN<br><br>**Presenter**: M'hamed OUADAH, Ecole Nationale Supérieure des Technologies Avancées, Algeria<br><br>**Abstract**: This article explores the inductive coupling effects between a high-voltage power transmission line (HVPTL) and an aerial steel pipeline. The study uses the finite elements method to calculate the induced magnetic fields in the steel pipeline for a specific six-phase wire arrangement of the HVPTL. It includes measurements of the X70 steel's electrical resistivity using the four-point probe method and its magnetic properties through hysteresis analysis using VSM. The results show that the pipeline significantly impacts the magnetic field distribution, creating asymmetry near the pipeline. The arrangement of the phase wires is crucial in determining the induced magnetic field distribution in the pipeline. The research concludes that the Type (f) wire arrangement (ABC-C'B'A') is optimal for minimizing the magnetic field effects on the pipeline. |

# ONSITE SESSION I

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| PS604<br>14:45-15:00 | Incorporation of shunt capacitors in distribution system for techno-economic benefits<br>Ahmed Tidjani hachemi, Abdelhakim Saim, Hossam Abbou, Imen Ben Hamida and Mohamed Ebeed<br><br>**Presenter**: ABDELHAKIM SAIM, NANTES UNIVERSITE - IREENA UR 4642, FRANCE<br><br>**Abstract**: Effectively managing reactive power in distribution systems is crucial for their performance. Shunt capacitors (SCs) are commonly added to the grid to enhance its efficiency, but their placement must be carefully considered to avoid complications. This study presents a novel optimization approach known as the Modified Subtraction Average Based Optimizer (MSABO) to determine the optimal locations and sizes for shunt capacitors in radial systems. The primary objectives are cost reduction, voltage deviation minimization, active power loss reduction, and stability enhancement, especially when facing uncertain loads and pricing. Through simulations conducted on the IEEE 33 bus test distribution network, the effectiveness of the MSABO algorithm is showcased. The results demonstrate that MSABO surpasses other optimization techniques by efficiently identifying optimal solutions, resulting in significant cost savings, enhanced voltage stability, decreased voltage deviations, and lower active power losses. |
| PS605<br>15:00-15:15 | Effective Deep Learning-based Load Forecasting at Segregated and Aggregated Levels with Low Data Granularity<br>Aamir Maqbool, Attique Ur Rehman and Ammar Arshad<br><br>**Presenter**: Attique Ur Rehman, Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Pakistan<br><br>**Abstract**: Load forecasting is the first step towards energy management, an efficient way of resource allocation, and stability of the grid. Demand side management is widely used in distribution systems to meet the requirements of consumers along with maintaining the stability of the grid, all this cannot be done without forecasting the electricity demand of consumers. Many traditional machine learning and artificial intelligence models have been developed. However, these models have many issues such as high computational time, high complexity, and so on. This paper proposes a short-term load forecasting methodology for a household having 7 different appliances by employing optimized deep learning models namely, Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU). The presented methodology not only encompasses conventional load forecasting for aggregated loads but also elaborates on segregated load forecasting, leading to effective energy management strategies. Also, this paper incorporates an in-depth comparative analysis of the employed models in the realm of short-term load forecasting. The presented comparative analysis is twofold, i.e., it provides insights into models' performance as well as computational expense analysis of the employed models. Results show that the LSTM outperforms the GRU in terms of model performance for most of the loads under consideration. |

# ONSITE SESSION I

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| PS055<br>15:15-15:30 | State of Health Estimation of Battery pack with Passive Balancing Topology<br>Onur Şimşek, Hasan Bora Aydan, Cemalettin Kılıç and Sıtkı Güner<br><br>**Presenter**: Sıtkı Güner, Eskişehir Technical University, Türkiye<br><br>**Abstract**: The diversity and number of devices that operate directly on electricity are continuously increasing with technological advancements. The initiation of electric vehicle production in countries like Turkey has heightened the demand for battery management systems. For the safe use of electric vehicles and other large battery systems, the development of battery management systems is necessary. In this project, a battery management system is designed to determine the health status of lithium-ion batteries. This BMS measures the state of health (SoH) of the lithium-ion battery with internal resistance measurement method, state of charge (SoC) with open circuit voltage measurement method and parameters such as voltage, temperature, current are measured with the necessary sensors and processed in the microprocessor. The results are compared according to safe ranges and functions are performed accordingly. In this way, the battery is both protected and the necessary information about the health status is obtained. The design of the circuit board was made on Proteus. The production was done completely by ourselves and the necessary tests were carried out. |
| PS623<br>15:30-15:45 | IoT Integrated Rooftop Solar PV System for Performance Evaluation and Monitoring: A Prosumer and Utility Approach<br>Muhammad Ahad Rahman Miah and Runa Kabir<br><br>**Presenter**: Muhammad Ahad Rahman Miah, University of Asia Pacific (UAP), Bangladesh<br><br>**Abstract**: Fresh water production using solar energy via atmospheric water harvesting for green hydrogen production is proposed and investigated. Performance enhancement of the atmospheric water harvesting subsystem was experimentally investigated to assure the reliability and continuous operation of the overall green hydrogen hybrid system. It was investigated in summer and winter using different porous sheet metals with the silica gel bed. The Results showed that the productivity of the atmospheric water harvesting system can be increased by 20% with one mesh metal sheet and 33.4% with two meshes during. |

# ONSITE SESSION II

**Topic**: Renewable Energy Technologies and Environmental Pollution Control
**Time**: 16:00-18:00 | September 28, 2024 | Saturday
**Session Chair**: Prof. Mohammed Saleh Hussein Al Salameh, Jordan University of Science and Technology, Jordan
**Onsite Meeting Room**: Lausanne Hall-B2 Floor

For each presenter, please copy your presentation PPT to the conference laptop before the session start, and stay onsite for the whole session.

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| PS040<br>16:00-16:15 | Enhancing the Performance of Solar Air Heaters by Augmenting Emissivity of Absorber Plates<br>Bashar Khalil Hammad, Mohammad Khaled Al Shimi and Mohammad Al-Abed<br><br>**Presenter**: Bashar Khalil Hammad, German Jordanian University, Jordan<br><br>**Abstract**: Solar air heaters (SAHs) are a crucial and relatively inexpensive solution for trapping solar energy to warm air for various applications, especially in sun-rich regions. A previous experimental study tested two SAHs equipped with absorber plates purchased from local solar water heater suppliers in Jordan. One plate has a selective coating on one side, and the other is left untreated. The second plate has black paint on both sides. Contrary to what was expected, the experimental results showed that the absorber plate with black painting has a better thermal behavior than the plate with selective coating. The justification of this result was ascribed to the fact that the black-painted plate has high emissivity on the surface in contact with moving air compared to the low emissivity of the corresponding surface of the other plate. To investigate this justification further, the surface in contact with air in the selective-coated plate was coated with a black painting of the same properties of the paint used in the black-painted plate. An experiment to test the performance of the two plates was performed on a sunny day in outdoor conditions in Amman, Jordan. The results show that the daily thermal efficiency of the plate with selective coating on the upper side jumped from 42.2 % to 58.1 %, which is higher than the average daily efficiency of the plate with black painting on both sides (with a consistent result of 47.8 % in this work and 45.7 % in the previous work). The most significant difference in the instantaneous efficiencies between the two SAHs was calculated as 17.6 %, with the SAHs with selective-coated absorber plates being the most efficient. More importantly, these results confirmed that the large difference in emissivity (as justified in the previous work) between black-painted and untreated surfaces is a crucial reason behind the observation that the selective-coated absorber plate with the other side untreated has not performed well compared to the absorber plate with black paint on both sides. In addition, it was found that the useful gain for both SAHs is somewhat linear with the incident solar radiation. Still, the behavior of SAH with a black-painted plate is more linear compared to SAH with the selective-coated plate. More investigation is planned to explore the behavior of both SAHs further and reveal the most influential parameters for useful gain. |

# ONSITE SESSION II

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| PS045<br>16:15-16:30 | Experimental study of a new hybrid water solar collector<br>Khaled Touafek, Mohamed Lebbi, Lyes Boutina, Hafsia Haloui, Yehya Houam, Abdelkader SI Tayeb, Abdelkrim Khelifa and Rachid Hiba<br><br>**Presenter**: Khaled Touafek, Unit of Applied Research in Renewable Energy, Ghardaia, Algeria<br><br>**Abstract**: Hybrid photovoltaic thermal (PVT) collectors are systems that produce electricity and heat simultaneously. These are solutions for residential applications. Extracting heat from solar cells allows them to cool and consequently improve their electrical efficiency. In this paper, a new water hybrid collector was designed and studied. The new configuration is based on a new design which increases the thermal efficiency of the hybrid collector and hence its conversion efficiency. A detailed experimental study was carried out and good results were found. The performances of the new hybrid collector were compared to that of a control photovoltaic module placed on the same structure. |
| PS611<br>16:30-16:45 | Total Harmonic Distortion Optimization of Three-Level Neutral Point Clamped Inverter using Gravitational Search Algorithm<br>Yacine Bouali, Khoukha Imarazene and El Madjid Berkouk<br><br>**Presenter**: IMARAZENE Khoukha, Power equipment Characterization and Diagnosis Laboratory (of USTHB) Algiers, Algeria<br><br>**Abstract**: Harmonics are one of the most challenging issues in power electronics converters. Many techniques have been developed to reduce the percentage of harmonics at the output of the inverter. This study presents an optimization approach to reduce the total harmonic distortion of a three-level neutral point clamped inverter using the gravitational search algorithm. The optimization results obtained with gravitational search algorithm are presented and compared with those obtained using genetic algorithm. Both simulation and experimental results are pre-sented to validate the effectiveness of the proposed optimization approach. The study demonstrates that, the gravitational search algorithm-based optimization approach significantly reduces the total harmonic distortion in the three-level neutral point clamped inverter. |
| PS037-A<br>16:45-17:00 | Development of a small magnetic drive centrifugal pump using computational flow analysis<br>Jeong-Eui Yun, Jae-Min Kim, Joon-Young Sin, Harsito Cartur, Won-Sik Kim and Sang-Seon Lee<br><br>**Presenter**: Jeong-Eui Yun, Kangwon National University, South Korea<br><br>**Abstract**: Magnetic drive centrifugal pumps are mainly used in semiconductor, pharmaceutical, and petrochemical processing industries where the working fluid is highly corrosive and toxic, so sealing the fluid during operation is absolutely important. However, unlike conventional centrifugal pumps that drive the pump impeller directly from the motor through the shaft, magnetic drive pumps use a |

# ONSITE SESSION II

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| | method of remotely driving the internal impeller with an external rotating magnetic force, so they have an internal structure for magnetic drive. In addition, a complex internal cooling circuit must be additionally designed to remove heat generated during operation. In this study, an optimal design method based on computational flow analysis was used to design a magnetic drive impeller and volute that showed maximum efficiency at 68% at the design point (9m3/h, 35m, 3,450rpm). |
| PS218<br>17:00-17:15 | Energy analysis of PV surfaces in BIPV applications<br>Santiago Molina-Tamayo, Andrés Yesid Moreno, Felipe Mendoza, Gabriel Espitia Mesa and Gilberto Osorio- Gómez<br><br>**Presenter**: Santiago Molina-Tamayo, Universidad EAFIT, Colombia<br><br>**Abstract**: This paper studies the power generation performance of flexible solar panels at different radii of curvature for both concave and convex configurations. Its performance is evaluated horizontally and vertically to provide architects and designers with a reference of how power generation is impacted depending on the geometries selected for the design of facades or roofs. The study consisted of two phases, the first comprised a simulation to estimate the amount of energy a surface receives according to its geometry, orientation, location, and simulated period. The second phase corresponds to an experimental validation, in which five geometries were tested: two concave, two convex, and one flat as a baseline. The results indicate that, for horizontal configurations, curvature radii from 2.51 times the minimum radius allow adequate power generation to be maintained. In the concave configuration, 77.8% of the power generated by a flat PV module is achieved, while in the convex configuration, 80.21% is achieved. For vertical configurations, the convex geometry with minimum radius shows the best performance, exceeding the power of a flat module by 12.1%. The convex configuration with a radius of curvature of 2.51 times the minimum radius offers 81.14% of the flat reference power. |
| PS205<br>17:15-17:30 | Green synthesis, characterisation and photocatalytic activity of CdTe Quantum dots for the degradation of Fampridine<br>Harwin Sandhu, Sangeeta Garg, Amit D. Saran and Sandeep Singh<br><br>**Presenter**: Sangeeta, Dr B R Ambedkar Institute of Technology, India<br><br>**Abstract**: The reverse micelle microemulsion approach was used in the current investigation to synthesise CdTe quantum dots (QDs) at 80–100ºC utilising an AOT/H2O/n-heptane mixture. In order to avoid clumping together when dispersed in aqueous solution, the produced CdTe QDs were capped with thioglycolic acid (MAA) after extraction from microemulsion media. Utilising XRD, Photoluminiscence Spectroscopy and UV-Visible Spectroscopy methods, CdTe QDs were characterised. For CdTe QDs, the bandgap was determined to be 2.05 eV using Tauc's law. Using the Brus equation, the estimated particle sizes for CdTe QDs were 7.65 nm. Studies have been conducted on the impact of various parameters, including the dose of the photocatalyst and the initial concentration of pollutant on the Fampridine degradation process utilising QDs. The maximum Fampridine degradation efficiency onto CdTe QDs was reported to be 89.05% in 160 minutes under optimal conditions. The first order kinetic model showed a high valve of regression coefficient (R2- 0.96 to 0.99) which emphasized that the experimental data is best fitted. |

# ONSITE SESSION II

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| PS113<br>17:30-17:45 | Level of Deterioration Evident in Floating Plastic Bottles in Reducing Evaporation of Reservoirs<br>Vacharapoom Benjaoran and Laksamon Raksaksri<br><br>**Presenter**: Vacharapoom Benjaoran, Suranaree University of Technology, Thailand<br><br>**Abstract**: Significant water loss occurs due to reservoir evaporation. This research has proposed a novel, cost-effective alternative cover systems. The method utilizes floating, upcycled polyethylene terephthalate (PET) bottles, either empty or filled with opaque materials like laminated aluminum foil (LAF) and assorted plastic bags (APB), to create a cover for the wa-ter surface, thereby reducing evaporation. This ongoing experiment investigates the extent of physical deterioration ex-perienced by these PET bottles and their potential impact on water quality under simulated outdoor conditions. Eighteen samples, varying in filling materials and exposure periods (6, 12, and 18 months), were analyzed using Optical Micro-scope (OM). Results showed minimal surface degradation and no significant impact on water quality parameters (pH, DO, BOD, TCB, FCB), indicating the bottles' durability and safety. This method also addresses plastic waste manage-ment and could mitigate drought effects in arid regions, offering a dual benefit of environmental protection and water conservation. |
| PS219<br>17:45-18:00 | Aerodynamic Comparison of Conventional and Bio-inspired Turbines for Enhanced Wind Energy Applications in Low Wind Conditions<br>Luis Felipe Quesada Bedoya, David Lebrun Llano, Gabriel Jaime Espitia Mesa, Jorge Mario Tamayo Avendaño and Gilberto Osorio Gómez<br><br>**Presenter**: Luis Felipe Quesada Bedoya, Universidad EAFIT, Colombia<br><br>**Abstract**: Wind energy is projected to account for 35% of global production by 2050, with a significant contribution from large wind farms located in high-wind-speed areas. However, in low-wind regions, it is necessary to adapt turbines to maximize efficiency. This has led to the development of blades based on biomimetic principles, which improve performance in such conditions. To validate this approach, a comparative aerodynamic analysis is proposed between a conventional and a bio-inspired turbine. The proposed methodology involves using Computational Fluid Dynamics (CFD) simulations and Blade Element Momentum Theory (BEMT) to predict the behavior of both designs. Variables such as power coefficients (Cp), thrust (Ct), axial force, and torque are evaluated, comparing the performance of the rotors under identical conditions. The goal is to determine the feasibility of bio-inspired turbines and their adaptation to horizontal-axis wind turbines at low wind speeds, starting from 2.5 m/s. The results, validated in CFD and BEMT simulations, show that bio-inspired turbines have up to 33% higher performance compared to conventional rotors, highlighting their potential to improve wind energy efficiency under adverse environmental conditions, especially in regions where wind speeds are low or inconsistent. This demonstrates the viability of bio-inspired designs in enhancing renewable energy technologies. |

# ONLINE SESSION

**Topic**: Intelligent Prediction in Power System and Research on Energy Performance
**Time**: 10:40-12:10 | September 29, 2024 | Sunday
**Session Chair**: Gratitude Charis, Department of Chemical and Materials Engineering, University of South Africa, South Africa
**Online Meeting Room**: 889 7277 0198

For each presenter, please enter the meeting room 10 minutes before session start, and stay online during the session.

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| PS039<br>10:40-10:55 | Short-term Power Demand Prediction in Micro-Grid using AI Deep Learning<br>Dae-Won Chung<br><br>**Presenter**: Dae-Won Chung, Honam University, South Korea<br><br>**Abstract**: This study presents a deep learning model, verified for its accuracy in model prediction and diagnosis within the engineering field, to forecast short-term power demand. The model demonstrates excellent performance, particularly in the power demand sector. Short-term power demand forecasting is crucial but traditionally suffers from low accuracy, necessitating techniques with better performance. Our approach leverages AI deep learning (DL) to achieve higher applicability and more precise power demand management compared to existing methods. We applied our electricity demand prediction model using data on consumer electricity usage in a specific region and validated its accuracy by comparing the mean absolute percentage error (MAPE) of power demand. The results confirm the feasibility and future usability of our short-term power demand prediction model, highlighting its ability to manage power demand fluctuations effectively. This study's novelty lies in applying a verified AI deep learning technique to enhance the accuracy of short-term power demand forecasts, addressing a critical need in the energy sector for improved resource management and operational efficiency in Micro-Grid System. |
| PS049<br>10:55-11:10 | Prediction of Electrical Arcs in High-Voltage Transmission Lines Based on Magnetic Field Simulation and Optical Fiber<br>Raphael Dennys Medina, Kevin De La Cruz, Brandy Greybi Reyna and Camilo Juan Raymundo<br><br>**Presenter**: RAPHAEL DENNYS MEDINA, UNIVERSIDAD CONTINENTAL, Perú<br><br>**Abstract**: The phenomenon of electric arcs in medium and high voltage lines presents a critical challenge for electrical distribution companies and the quality of their supply. Repair and maintenance related to these arcs not only involve considerable economic losses but also significant risks for workers. Current solutions are limited in speed and effectiveness in preventing arc flashes. This study addresses the issue through a situational simulation with real data, using advanced mathematical models and magnetic field sensors based on optical fiber with lithium niobate. These sensors enable continuous and precise monitoring, offering early warnings crucial for preventing catastrophic failures. With these innovations, the response time to voltage increases would be reduced to optimal levels, improving both worker safety and the efficiency of the electrical supply. The implementation of these technologies would mitigate associated risks and costs, ensuring a more reliable service. |

# ONLINE SESSION

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| PS302<br>11:10-11:25 | Investigating the Effects of Hyperparameter Sensitivity on Machine Learning Algorithms for PV Forecasting<br>Muhammad Ehtsham, Marianna Rotilio, Federica Cucchiella, and Gianni Di Giovanni<br><br>**Presenter**: Muhammad Ehtsham, Department of Civil, Construction-Architectural and Environmental Engineering, University of L'Aquila, Italy<br><br>**Abstract**: Machine Learning (ML) models have been introduced in the past, and users have debated whether to tune the hyperparameters of the models. This study investigates the effects of tuning the hyperparameters of the ML models and summarizes the models that are most sensitive to hyperparameter tuning. This study leveraged the historic energy production data of two already operational PV plants. Four state-of-the-art ML models, namely Decision Trees (DT), Random Forest (RF), K-Nearest Neighbors (KNN), and Support Vector Regression (SVR) were investigated. All the ML models were trained with the same training features (meteorological estimates) obtained from the National Aeronautics and Space Administration's (NASA) Power project, with the daily PV energy production selected as the target variable. Models were developed and executed with default and tuned hyperparameters using an 85-15% train-test split. The results revealed that all the models showed improved performance with the tuned hyperparameters. However, the DT and SVR models depicted significantly improved RMSE after tuning of the hyperparameters. The RMSE of DT improved from 111 kWh/d to 75 kWh/d for one plant and from 442 kWh/d to 270 kWh/d for the second plant after tuning the hyperparameters. Similarly, the RMSE of SVR improved from 59 kWh/d to 50 kWh/d in the first case, and in the second case, the improvement of RMSE from 536 kWh/d to 294 kWh/d was observed. The efficiency of the RF and KNN models also improved to some extent after tuning, but the RMSE closely agreed with the default hyperparameters in one case study, making the RF and KNN less prone to hyperparameter sensitivity. This study concluded with the finding that it is necessary to tune the hyperparameters of the DT and SVR models, specifically for energy forecasting. Moreover, the results of this study also highlight the significance of meteorological estimates from NASA's Power project, as models successfully discerned the complex energy forecast patterns. The dataset is deemed suitable for energy forecasting for areas with sparse ground-based observatories and may serve as a baseline dataset for training the ML models. |
| PS206<br>11:25-11:40 | Operating regimes for intra-carbonisation of sawdust with low external fuel requirements<br>Charis Gratitude, Bilal Patel, Marko Chigondo, Morgen Rusere and Munashe Maposa<br><br>**Presenter**: Gratitude Charis, Department of Chemical And Materials Engineering, University Of South Africa, South Africa<br><br>**Abstract**: A comparative study of carbonized versus raw sawdust briquettes production using a banana waste based binder was conducted. The binder was formulated from banana pseudo stem, pith, ripe banana, green banana in the ratio 2:2:1:1. Sawdust was pyrolyzed at temperature ranges of 300-350℃, 370-470℃ and 600-700℃. Briquettes were produced using a gravity aided press (GAP). The |

# ONLINE SESSION

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| | mechanical and combustion properties of the briquettes were compared to assess binder effectiveness on both feedstocks as well as the extent of improvement introduced by carbonization. Comparable shatter indices of 0.96 and 0.95 and densities of 425 kg/m3 and 685 kg/m3 for carbonized and raw sawdust-based briquettes respectively indicated that the binder performs well with both feedstocks. Proximate analysis indicated that carbonization increased the solid fuel quality through a 39%, 16% and 41% decrease in moisture content, volatile matter and ash content respectively, and a 35% increase in fixed carbon. Carbonized briquettes demonstrated shorter ignition time, a steadier burn rate, shorter time to boil and higher calorific value by factors of 53%, 47%, 32% and 15% respectively compared to raw sawdust briquettes. Conclusively, banana waste-based binders can be used with carbonized sawdust to produce higher fuel quality briquettes for grilling and space heating. |
| PS050<br>11:40-11:55 | Introducing the Cybersecurity Toolbox: A Modeling Framework for Smart Grid Security<br>Simon Eschlberger, Dominik Vereno, Katharina Polanec and Christian Neureiter<br><br>**Presenter**: Simon Eschlberger, Salzburg University of Applied Sciences, Austria<br><br>**Abstract**: Recent cyber-attacks successfully launched on electricity infrastructure reveal the need to harden protection measures. Intelligent power grids, so-called smart grids, are highly distributed, and involve diverse stakeholders and devices. This makes the manageming their cybersecurity challenging, requiring a concisely defined, well-structured, and widely applicable strategy. The results of cybersecurity analysis must be consistently captured to enable seamless collaboration between stakeholders having common interest in enhancing the grid's resilience. In response, we present a model-based approach utilizing a domain-specific language, the Cybersecurity Toolbox. Its metamodel conforms to the Meta-Object Facility and is based on consolidated ontologies of widespread cybersecurity standards. The modeling language stands out by its ease of use grounded in a robust but extensible formal foundation. Furthermore, it is designed for broad interoperability with common cybersecurity analysis methodologies and tools, enabling it to function as a centralized hub for consolidating system-level cybersecurity findings. We demonstrate the toolbox's capabilities on a publicly available attack scenario. Ultimately, the Cybersecurity Toolbox can strengthen smart grids' resilience by holisitcally manageming security concerns in a security-by-design approach. |
| PS220<br>11:55-12:10 | Numerical study on a direct contact humidifier of a humidification-dehumidification desalination system: A heat and mass transfer review<br>Mohamed Ashraf Galal, Ehab M. Mina and Raouf N. Abdelmessih<br><br>**Presenter**: Mohamed Ashraf Galal, Ain Shams University, Egypt<br><br>**Abstract**: In a humidification-dehumidification (HDH) desalination system, the humidifier is a significant component that directly impacts the overall process of |

producing fresh water from saline or brackish sources. In this study, a heat-mass transfer numerical model between the hot sprayed seawater and air on a packing material direct contact humidifier was developed to investigate the effect of inlet seawater temperature, seawater mass flow rate, inlet air temperature and air mass flow rate on humidifier effectiveness and fresh water evaporation rate. The results illustrate the direct contact humidifier's performance in a humidification-dehumidification desalination system based on numerical analysis of heat and mass transfer. It shows that by increasing the mass flow rate ratio between seawater and air mass flow rates (MR) fresh water evaporation rate increases. and humidifier effectiveness decreases till a certain value, after which it increases slightly. The data displays that the maximum value for the humidifier effectiveness occurs at (MR=5). The maximum value of water evaporation is 341 kg/hr that occurs at operating conditions of (T_(sw,in)=90 ℃,T_(a,in)=30 ℃,ϕ_(a,in)=50 %,MR=5).

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