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ABSTRACT BOOK

CLEANENERGY2026

2nd International Connect on Clean & Traditional Energy

June 22-23, 2026 | Munich, Germany

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Table of Contents:

Message from the Conference Chair	pg.no 5
Organizing Committee	pg.no 6
Plenary Abstracts	pg.no 7
Ralph Kennel, Power Electronics in Renewable and Non-Renewable Energy Applications – More Manifold than People would Expect	pg.no 8
Philippe Tanguy, A Reality Check of the Low-Carbon Hydrogen Value Chain	pg.no 11
Richard Navarro, Poseidon Hydroelectric System	pg.no 12
Niclas Andersson, The Water–Energy–Food Nexus: Rethinking Resource Security for a Climate-Stressed World	pg.no 14
Keynote Abstracts	pg.no 15
Martin Meiller, Carbon-Negative Process Chains for Biofuel Production	pg.no 16
Antje Dittmer, The Research Wind Farm WiValdi and Advances in Wind Turbine and Farm Control	pg.no 18
Patrick G. Verdin, Development of a Novel J-Shaped Vertical Axis Wind Turbine	pg.no 19
Caroline Willich, Optimising Fuel Cell Systems for Aviation	pg.no 20
Jingsong Wang, Carbon-Hydrogen-Electricity Coupled Low-Carbon Blast-Furnace Ironmaking: China's Steel Decarbonization Solution	pg.no 21
Suzanna Elmassah, Advancing Environmental Sustainability in the UAE: The Interplay of Women's Empowerment, Financial Development, and Natural Resource Management	pg.no 23
Michael Finkel, Active Distribution Networks in the Age of Electrification	pg.no 24
Maximilian Millisterfer, Advantages of Optical Partial Discharge Measurement for Gas-Insulated Switchgear and Transformers	pg.no 25
Mina Oumam, Unconventional Energy Resources as Promising Reagents in Innovative Industrial Processes: The Role of Oil Shale and Biomass in the Conversion of Phosphogypsum into Elemental Sulfur and Sulfur Compounds	pg.no 26
Juho Mäkiö, Turning Heat and Power into a Strategic Advantage	pg.no 28
Antje Neve, Interdisciplinary and International Collaboration in the Age of AI	pg.no 30
C.E. Jiménez, Synchrotron Insights for Industrial Innovation in the Production of Sustainable Aviation Fuels	pg.no 31
Pieter Kapteijn, TriGen Energy – Integrated CCUS Value Chains for Clean Energy from Fossil Assets	pg.no 33
Komla A Folly, Bioenergy with Carbon Capture and Storage (BECCS) in Integrated Energy Systems: Technical Challenges and Regulatory Pathways	pg.no 35

Gurakuq Dajaku, Direct Drive Permanent Magnet Generator for Wind Power Industry: A Novel Solution with Reduced Rare Earth Materials	pg.no 36
Fred Schwartz, Retooling the Canadian Wood Biomass Industry	pg.no 38
David Smith, Status of e fuels in the GCC-MENA – 2026 Update	pg.no 39
Invited Abstracts	
Aditi Tulpule, From Policy to Profitability: Why Clean Energy Projects Struggle to Commercialise — and How Regulation Can Enable Scale	pg.no 41
Nedyalka Naneva Valcheva, Characterization of Isolated Strains of Microorganisms from Mineral, Mountain and Spring Waters from France, Italy, England, South Korea, Japan, Netherlands, Austria, Spain, Singapore, Germany, Switzerland, Dubai, Alanya and Bulgaria	pg.no 42
Robert Cooke, Community Engagement and Codevelopment of Capacity Building to Support the Clean Energy Transformation for Remote, Off-Grid Communities	pg.no 45
Ilknur Colak, AI-Powered Energy: Optimizing Converters for a Decarbonized Future	pg.no 47
Chro Ali Hamaradha, Advanced Passive Cooling and Heating Strategies in Hot-Dry Climates	pg.no 48
Houda Foulah, Thermochemical Reactivity of Kerogen in Acetic Acid- Pretreated Tarfaya Oil Shale: Impacts on Conversion Efficiency and by-Product Reduction	pg.no 49
Naoual Ouchitachne, Thermal Reactivity and Kinetic Modeling of Agro-Industrial Residues for Thermochemical Conversion	pg.no 51
Soumia Aboul-Hrouz, From Biomass to Sulfur Chemistry: Integrated Thermochemical Routes for Controlled SO^2 Generation	pg.no 53
Ruomei Li, For Energy Efficiency Promotion, Powering Progress with Empowering People	pg.no 55
Gabriel Murillo Morales, Opportunities and Challenges for the Catalytic Conversion of Lignin to Biofuels	pg.no 56
Poster Presentations	
Simon Ziegler, Adjustable Dead Time in Half Bridge Applications	pg.no 58
Round Table Discussion	
Ruggero Maria Santilli, Introduction to Clean Sustainable Hyperfusions without the Coulomb Barrier	pg.no 60
Emanuele Velardo, Introduction to Iso, Geno-, and Hyper-Mathematics and Their Applications in Physics, Chemistry and Biology	pg.no 62
Arun Muktibodh, Santilli's recovering of Einstein's determinism under strong interactions	pg.no 63
Simone Beghella Bartoli, Introduction to Magnegas and Its Combustion Properties	pg.no 64

Author Index	pg.no 67-69
Upcoming Conference - 3rd International Connect on Clean & Traditional Energy May 24-26, 2027 | Amsterdam, Netherlands	pg.no 70

Chair Welcome Message:

Dear colleagues, dear participants of the 2nd International Connect on Clean & Traditional Energy (CLEANENERGY-2026).

I am very happy to welcome you to this CLEANENERGY-2026 conference, which is going to take place a second time. Energy is and will be one of the most important issues of human society. Even when it seems there is spent more effort in information technology, it is obvious that at the end of any information processing there must be an action – and here we need energy. We have to make better use of renewable energy source, but we also have to deal reasonably with non-renewable energy source. These are the topics of CLEANENERGY-2026.

I am very proud to see the growth of energy engineering and the extension of areas for so-called renewable energies (of course, physically energy is not renewable). For me it is obvious, that energy and power – especially electrical energy and electrical power – will be decisive for our future. Yes, energy is the real challenge for us engineers, and it is the real challenge for mankind.

I conclude by wishing you all the best for the CLEANENERGY-2026 especially I wish ourselves a fruitful, exchange of ideas and results.

Best regards from Technical University of Munich

Prof. i.R. Dr.-Ing. Dr. h.c. Ralph M. Kennel

Technical University of Munich, Germany

Organization Community Members:	
Prof. Ralph Kennel	Technical University of Munich, Germany
Prof. Faisal Arain	AM Management Global (AMMG) Inc., Canada
Prof. Jinsong Wu	University of Chile, Chile
Prof. Guohe Huang	University of Regina, Canada
Prof. Chan Tung Sun	Macau University of Science and Technology, Macao
Prof. Martin Dornheim	University of Nottingham, UK
Prof. Ashok K. Das	SunMoksha, India
Prof. Lingai LUO	Nantes Thermal and Energy Laboratory, University of Nantes, France
Dr. Tomasz KISIELEWICZ	Warsaw University of Technology, Poland
Dr. Dou Zhang	Harbin Institute of Technology, China

PLENARY SPEAKERS

Prof. Ralph Kennel
Technical University of Munich, Germany

Power Electronics in Renewable and Non-Renewable Energy Applications – More Manifold than People would Expect

Abstract:

Voltage Source Inverters (e. g. frequency inverters) are mainly used in power conversion applications – the main reason for this is the fact, that this type of inverter is taught in respective lectures at Universities – it is, however not the best solution in all cases.

Voltage Source Inverters (VSI) are best when connecting current sources or inductive sources or loads. For electrical machines, this is proper, because these include large inductances by nature. On the grid side, however, we usually design these a voltage sources – hence, we have to integrate additional inductances to enable the VSI to work properly.

Connecting two grids with voltage source behavior (like in the case of connecting railway grids to public grids), a VSI is absolutely the wrong choice. There are different topologies which can do that job much better.

In the case of so-called renewable energy sources it depends on the intrinsic behavior of the source, whether a VSI or another topology would be best. Some sources (e. g. wind generators) have current source behavior – there a VSI is a good choice. Other sources (e. g. photovoltaics) provide voltage source behavior or even change their behavior – especially when they are operated with a maximum power tracking control (MPPT). In this case a VSI is not the best solution. Other topologies, however, demand more complex control strategies – conventional control is overstressed.

Recent research works have demonstrated that it is possible to use Predictive Control to control electrical energy with the use of power converters, without using modulators and linear controllers. This new approach will have a strong impact on control in power electronics in coming decades, because it has the potential to overcome the drawbacks of conventional control.

The main advantages of predictive control are:

- Concepts are very intuitive and easy to understand.
- The multivariable case can be easily considered.
- Easy inclusion of non-linearities in the model.
- Simple treatment of constraints.

Predictive Control enables engineers to apply the variety of possible power electronic topologies to make use of so-called renewable energy sources.

Biography:

Ralph M. Kennel was born in 1955 at Kaiserslautern (Germany). In 1979 he got his diploma degree and in 1984 his Dr.-Ing. (Ph.D.) degree from the University of Kaiserslautern.

From 1983 to 1999 he worked on several positions with Robert BOSCH GmbH (Germany). Until 1997 he was responsible for the development of servo drives. Dr. Kennel was one of the main supporters of VECON and SERCOS interface, two multi-company development projects for a microcontroller and a digital interface especially dedicated to servo drives. Furthermore he took actively part in the definition and release of new standards with respect to CE marking for servo drives.

Between 1997 and 1999 Dr. Kennel was responsible for "Advanced and Product Development of Fractional Horsepower Motors" in automotive applications. His main activity was preparing the introduction of brushless drive concepts to the automotive market.

From 1994 to 1999 Dr. Kennel was appointed Visiting Professor at the University of Newcastle-upon-Tyne (England, UK). From 1999 - 2008 he was Professor for Electrical Machines and Drives at Wuppertal University (Germany). From 2008 until his retirement in 2022 he was Professor for Electrical Drive systems and Power Electronics at Technische Universitaet Muenchen (Germany). His main interests are: Sensorless control of AC drives, predictive control of power electronics and contactless energy transmission.

Dr. Kennel is a Senior Member of IEEE, a Fellow of IET (former IEE) and a Chartered Engineer in the UK. Within IEEE he is Treasurer of the Germany Section – furthermore he has been Distinguished Lecturer of the Power Electronics Society (IEEE-PELS) as well as Vice President Meetings of the same society.

In 2018 Dr. Kennel received the Doctoral degree honoris causa from Universitatea Stefan cel Mare in Suceava (Romania).

Dr. Kennel has received in 2013 the Harry Owen Distinguished Service Award from IEEE-PELS, the EPE Association Distinguished Service Award in 2015 as well as the EPE Outstanding Achievement Award in 2019.

Dr. Kennel was appointed “Extraordinary Professor” by the University of Stellenbosch (South Africa) from 2016 to 2019 and as “Visiting Professor” at the Haixi Institute by the Chinese Academy of Sciences from 2016 to 2021. There he was appointed as "Jiaxi Lu Overseas Guest Professor" in 2017. In 2018 Dr. Kennel was appointed Guest Professor at Harbin Institute of Technology (HIT), Harbin, China. In 2019 Dr. Kennel was appointed “Honorary Chair Professor” ("distinguished visiting professor") at Shandong University in Jinan, China.

Philippe Tanguy
Hynergy Consulting Ltd. and Polytechnique Montreal, Canada

A Reality Check of the Low-Carbon Hydrogen Value Chain

Abstract:

A technical and economic assessment of the low-carbon hydrogen value chain is presented, with a focus on current capabilities and limitations from production to end use. The analysis reveals that the production of green hydrogen remains highly sensitive to the costs of the electrolysis system and electricity pricing, with its carbon footprint varying significantly depending on the carbon intensity of the grid. For blue hydrogen, key challenges include mitigating methane leakage, improving carbon capture efficiency, and ensuring the availability of reliable geological storage. While hydrogen from biomass could help address some of these challenges, it currently lacks the industrial maturity required for large-scale deployment, and feedstock availability is region-dependent. Beyond production, transportation - whether by compression, liquefaction, or chemical carriers - incurs substantial energy penalties, and storage requirements add both capital costs and operational complexity. The willingness to pay for low-carbon hydrogen is still limited to a small number of industrial applications, which are supported primarily by government policy. Achieving broader adoption of low-carbon hydrogen will require substantial reductions in capital costs, improvements in system efficiency, and the implementation of effective carbon pricing and incentive mechanisms.

Biography:

Professor Philippe Tanguy is a senior consultant in the hydrogen sector for Hynergy Consulting Ltd. and an adjunct professor at Polytechnique Montréal. Throughout his career, he has held several leadership positions, including Chief Strategy Officer at HTEC Inc., overseeing the development of green hydrogen in Quebec; President of Polytechnique Montreal Technology University; and Deputy Chief Technology Officer at TotalEnergies. He has also held two industrial research chairs and served as a professor at several Canadian universities.

Philippe Tanguy is one of the main contributors to Quebec's Green Hydrogen Strategy, was part of the founding team of the Hydrogen Council, and chaired the World Council of Chemical Engineering. He is a founding member of the Hassan II Academy of Science and Technology and a fellow of the Canadian Academy of Engineering. His academic background includes a Doctorate in Physics from Sorbonne University, a PhD in Chemical Engineering from Universite Laval, and executive management training at the MIT Sloan School of Management.

Richard Navarro, Ph.D.
Renewable Ocean Energy, Inc., United States of America

Poseidon Hydroelectric System

Abstract:

Statement of the Problem: Climate change impacts everyone while the need for more electricity is expanding exponentially with electric vehicles, artificial intelligence, and cryptocurrency. Low-cost, reliable electricity without sun, wind, waves, tides, currents, or batteries is needed. This report describes how Poseidon Hydroelectric System produces electricity on any water source without a dam to reduce climate change by eliminating carbon emissions, reducing transmission line costs, and expand the opportunity to provide electricity to people of the world.

Methodology & Theoretical Orientation: Three proven technologies used for hundreds of years have been blended in a new way using a siphon to lift water from any source, a hydraulic ram pump to capture the kinetic energy of flowing water and deliver pressurized water to an electric generator for less than .002 of a penny/kWh. Controlled operation provides efficiencies for minimizing water waste, eliminating fish kill, noise control, and dam hazards while allowing controlled 24/7 electricity production.

Conclusion & Significance: Renewable Ocean Energy, Inc.'s working prototype will be described with an operational video of the generator. Power may be generated on or offshore with an aesthetically pleasing modular generator without harm to fish, birds, marine life, or the environment. Vetted by the Texas Environmental Quality Board and the National Atmospheric Administration Agency.

Recent Publications:

1. Navarro, R. M., Poseidon Hydroelectric: Providing carbon-free renewable power. The Innovation Platform ISSUE 11 | www.innovationnewsnetwork.com.

Biography:

Dr. Richard Navarro, CEO of Renewable Ocean Energy, Inc, and inventor, has 14 inventions, 6 patents issued, 1 pending, 160 presentations, and authored Resurrection of the Blue Planet. He holds a Ph.D. from Vanderbilt University, School of Medicine, a Master of Arts and Bachelor of Science, cum laude from Western Michigan University, is a former professor, and serial entrepreneur with over 50 years of experience despite being severely hearing impaired. He has a passion for protecting the Earth and finding innovative solutions to common problems and leads a team of engineers and business people.

Niclas Andersson
Untap!, Sweden

The Water–Energy–Food Nexus: Rethinking Resource Security for a Climate-Stressed World

Abstract:

Water, energy, and food systems are deeply interconnected, yet they are often managed and developed in isolation. The concept of the Water–Energy–Food Nexus highlights how pressures on one system inevitably influence the others. Water is essential for energy production and agriculture; energy is required to extract, treat, and distribute water; and food production relies heavily on both resources. As climate change, population growth, and urbanization intensify global demand, these interdependencies become increasingly critical.

This presentation explores the importance of integrated thinking across water, energy, and food systems in order to address resource scarcity and improve resilience. It will discuss how emerging technologies, decentralized infrastructure, and cross-sector collaboration can help reshape how societies manage natural resources. By adopting a nexus-based perspective, policymakers, industries, and communities can develop more sustainable and adaptive solutions to ensure long-term resource security in a rapidly changing world.

Biography:

Niclas Andersson is an expert in sustainable infrastructure, resource systems, and climate resilience, with a particular focus on the interconnection to water, but also the links to energy, and food security. His work explores how emerging technologies and decentralized solutions can support more resilient and efficient resource management in the face of climate change and growing global demand.

With a background spanning engineering, and sustainable development, Mr. Andersson has been involved in international projects addressing water scarcity, energy efficiency, and environmental innovation. He regularly contributes to discussions on future resource strategies and the role of technological innovation in strengthening climate adaptation and infrastructure resilience.

Andersson is particularly interested in advancing integrated approaches that link water, energy, and food systems to support sustainable development and long-term resource security and is always willing to discuss this.

KEYNOTE SPEAKERS

Martin Meiller
Fraunhofer Institute for Environmental, Safety and Energy Technology, Germany

Carbon-Negative Process Chains for Biofuel Production

Abstract:

This presentation will show the development of an integrated process chain for the production of renewable fuels, with a strong emphasis on enabling negative emissions through advanced carbon management. A key innovation is the use of oxyfuel combustion to treat process residues and generate a concentrated CO_2 stream suitable for capture and storage.

Biogenic residues are thermochemically converted via Thermocatalytic Reforming (TCR) into a volatile gas phase, solid biochar, and TCR-oil. The biochar, rich in stable carbon, is either sequestered or applied in long-term uses, contributing to certified carbon removal. The volatile fraction is upgraded to high-quality syngas, from which hydrogen is extracted using Pressure Swing Adsorption (PSA). The remaining tail gas is combusted in an oxyfuel process, enabling efficient energy recovery and high-purity CO_2 capture.

The integration of oxyfuel combustion enhances system efficiency and supports climate mitigation by coupling renewable energy production with carbon capture. The modular and decentralized design allows flexible deployment in regions with access to biomass and CO_2 storage infrastructure, fostering regional value chains and contributing to climate-positive energy systems.

This presentation highlights contributions to system integration, process development, and environmental assessment, showcasing the potential of oxyfuel-based platforms for sustainable energy and carbon removal.

Biography:

Dr.-Ing. Martin Meiller is the Head of the Department Clean Combustion and Process Heat at the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT, Institute Branch Sulzbach-Rosenberg. Since joining Fraunhofer UMSICHT in 2011, he has advanced through multiple leadership roles, including heading the research group Energy from Biomass and Waste from 2016 and becoming department head in 2022. He holds a doctorate in engineering (Dr.-Ing.) from Friedrich-Alexander University Erlangen–Nürnberg, completed alongside his professional work.

His academic background also includes degrees in Environmental Engineering (M.Eng.) and Industrial Engineering (Dipl.-Wi.-Ing. (FH)). Dr. Meiller's research focuses on energy process engineering with an emphasis on solid fuel combustion, flue gas cleaning technologies, and the development of systems for NOx reduction and particulate removal. He is also active in the field of negative emission technologies—including BECCCS, BECCU, and pyrolysis-based carbon capture—and works on climate-neutral process heat, particularly the use of bioenergy in industrial high-temperature applications and high-temperature energy storage. He has contributed to major research projects such as NET-Fuels and BO2CCU, and has co-authored several scientific publications, including work on thermo-catalytic reforming and sensor technologies for biomass boiler operation.

Antje Dittmer
German Aerospace Center, Germany

The Research Wind Farm WiValdi and Advances in Wind Turbine and Farm Control

Abstract:

Wind energy generation has experienced rapid growth worldwide over the past few decades, positioning it alongside solar power as one of the most cost-effective energy sources. This expansion is largely driven by increased rotor swept areas. However, the necessity for larger structures, accompanied by more slender blades and towers, presents new challenges that make mechanical load reduction crucial. Additionally, the limited space available for onshore wind farms often results in turbines being placed closer together relative to their rotor diameters, which has heightened interest in cooperative wind farm control. The Krummendeich research wind farm, WiValdi, which commenced operation in 2023, serves as a unique test bed for wind energy research. The site comprises a meteorological mast, a three-mast array, and two multi-megawatt Enercon turbines, with a third turbine rated at 0.5 MW currently under construction. Researchers have access to blade pitch, generator torque, and yaw controls across all three turbines, facilitating control and systems studies that extend beyond what computer simulations can offer. This presentation will provide an overview of fundamental and advanced concepts in wind turbine control, addressing key aerodynamic principles and control objectives across the whole operating range. Current research efforts, including adaptive load reduction and the role of wind turbines in providing grid support services, will be examined. Simulation-based proof-of-concept results will be presented, concluding with an outlook on future research directions at WiValdi.

Biography:

Antje Dittmer is a Research Engineer at the German Aerospace Center (DLR), pursuing a PhD in the area of wind turbine and farm control at Hamburg University of Technology. She worked as a technical consultant for MathWorks, mainly on data analytics projects. Prior to that, she worked on online display advertisement algorithm optimizations at Yahoo! and AOL and on helicopter control at DLR. Antje holds a M. Sc. in Electrical Engineering from Hamburg University of Technology.

Patrick G. Verdin
Faculty of Engineering and Applied Sciences, Cranfield University, MK430AL, UK

Development of a Novel J-Shaped Vertical Axis Wind Turbine

Abstract:
Over the past decades, the application of computational fluid dynamics (CFD) has become increasingly prevalent in the design of fluid systems and the analysis of fluid flow and heat transfer phenomena. This presentation describes how CFD was used in the development of a novel J-shaped vertical axis wind turbine, engineered for implementation in urban settings, regions with low wind conditions, and remote areas. Preliminary experimental results are also presented along with considerations for future model development.

Biography:
Dr Patrick G. Verdin is a Reader in Energy Fluid Dynamics within the Faculty of Engineering and Applied Sciences at Cranfield University (UK), the former Director of the Energy & Sustainability Programme and the former Director of the Offshore Engineering MSc course. He has over two decades of experience in the field of Computational Fluid Dynamics (CFD) applied to single/multi-phase flow and heat transfer. He has developed expertise in model and numerical code development for industrial applications and has gained recognition through leading and delivering research and consultancy projects for the aerospace, oil & gas and renewable energy sectors. Patrick is the author of over 60 peer-reviewed journal publications and conference papers, and he owns two patents for inventions related to multiphase flow applications. He is a Chartered Energy Engineer (CEng), a Fellow of the Energy Institute (FEI) and a Fellow of the Higher Education Academy (FHEA).

Caroline Willich, Tobias Graf, Daniel Frank, Samara Brandao, Christian Kley, Roland Ademi, Christiane Bauer
Ulm University, Institute for Energy Conversion and Storage, Ulm, Germany
Albert-Einstein-Allee 47, 89081 Ulm

Optimising Fuel Cell Systems for Aviation

Abstract:

Fuel cell systems for automotive or stationary applications on ground are already available commercially. Fuel cells have also experienced a growing interest for use in aviation since they offer the potential to significantly reduce the climate impact of aviation. However, for aviation systems that are adapted to the conditions at high altitude, and comply with the strict weight and space restrictions as well as the high safety requirements, are still under development. This contribution explores the necessary modifications to state-of-the-art fuel cell systems for ground applications to enable their optimal adaptation for high altitudes. This includes modifications to hardware as well as software and operating strategies. The low ambient pressures at high altitudes decrease the performance of fuel cells, but they also reduce the outlet pressure and the maximal mass flow of a compressor which can be used for mitigating low pressures. It is shown how the compressor has to be designed for the target cruise altitude and a control strategy to operate safely despite changes in ambient conditions and provide the required mass flow to the fuel cell is presented. The optimal pressure ratio also depends on altitude, but also on the system output as the compression itself requires energy as well. If the fuel cell is operated with varying pressures the temperature should be adapted as well to reduce aging of the cells, which requires a sophisticated thermal and water management as a further optimization potential.

Biography:

Caroline Willich is a group leader and lecturer at the Institute for Energy Conversion and Storage at Ulm University. After studying mechanical engineering at TU Munich and ETSII in Madrid, she joined the German Aerospace Center (DLR), where she worked on local inhomogeneities in solid oxide fuel cells (SOFC) during her phd and on pressurized SOFC and a fuel cell - gas turbine - hybrid power plant as team lead afterwards. During a postdoc at Cambridge University, she worked on pumped thermal energy storage. At Ulm her main research focus is on fuel cell systems and their integration, as well as hybrid systems, for aviation and other mobile applications.

Jingsong WANG, Qingguo XUE, Haibin ZUO, Guang WANG, Xuefeng SHE, Zhancheng GUO
State Key Laboratory of Advanced Metallurgy, University of Science and Technology, Beijing (USTB)

Carbon-Hydrogen-Electricity Coupled Low-Carbon Blast-Furnace Ironmaking: China's Steel Decarbonization Solution

Abstract:

China's "30-60" dual-carbon pledge (peak emissions by 2030 and neutrality by 2060) places urgent decarbonisation pressure on energy-intensive industries. The steel sector, contributing 1.8 Gt CO_2 yr^{-1}—16 % of national emissions, well above the global sectoral share of 5 %—is the single largest industrial emitter. The core reason for massive carbon emissions is that China's steel production still primarily relies on the blast furnace-convertor process, which consumes iron ore and coal (coke). Consequently, reducing coke consumption in blast furnaces is critical. Substituting coke with low-carbon energy vectors such as green hydrogen and renewable electricity could deliver disproportionate sectoral emission reductions. This report first outlines the thermochemical principles governing blast-furnace decarbonisation and then parses viable pathways: increased metallic burden (DRI/HBI), low-carbon reductants, and CO_2-stripped top-gas recycling. CO2 removal and utilization technology, as essential supporting technologies, have become limiting factors for the economic feasibility of low-carbon ironmaking. We illustrate the implementation of these concepts via Baowu's HyCROF (Hydrogen-enriched Carbon Recycling Oxygen Furnace) project, which integrates oxygen blast, Hydrogen-rich gas injection, top-gas recycling and renewable power to achieve deep CO_2 cuts. Further studies confirm the technical viability of recycled-gas electric-resistance heating: gas temperatures above 1,100 °C can be achieved with an electro-thermal conversion efficiency exceeding 90%. Compared with conventional gas-heating methods, plasma heating can rapidly raise recycled gas temperatures above 2,000°C, offering marked advantages in both heating rate and peak temperature. Most critically, it enables near-term substitution of renewable electricity for fossil energy in reheating decarbonized recycle gas, substantially cutting ironmaking emissions and lessening the blast furnace's dependence on fossil fuels. Future directions and quantitative reduction targets for low-carbon blast-furnace ironmaking are discussed.

Biography:

Wang Jingsong, PhD., Professor and Doctoral Supervisor. Director of the Institute of Metallurgical Energy at the State Key Laboratory of Advanced Metallurgy, University of Science and Technology Beijing. His main research focuses on low-carbon metallurgy and the efficient utilization of resources and energy. He has carried out fundamental theoretical research and key technology development in areas such as HyCROF (Hydrogen-enriched Carbonic oxide Recycling Oxygenate Furnace) low carbon iron-making, efficient utilization of metallurgical energy, and full-scale resource utilization of solid wastes in the steel industry, achieving a series of research results. He has won 2 provincial and ministerial science and technology awards, obtained over 20 authorized invention patents, and published more than 200 papers indexed in SCI and EI.

Prof. Suzanna Elmassah
Zayed Univresity, UAE

Advancing Environmental Sustainability in the UAE: The Interplay of Women's Empowerment, Financial Development, and Natural Resource Management

Abstract:

The UAE's growth, still linked to hydrocarbons, raises a practical question: which levers—social, financial, or resource—actually move environmental outcomes? Using annual data for 1990–2021, we estimate ARDL models with the ecological footprint as the dependent variable. Women's empowerment is proxied by the World Bank's Women, Business and the Law (WBL) index; financial development by standard depth/market indicators; and resource pressure by natural-resource rents. We identify short- and long-run effects and test two interactions: WBL×finance and WBL×rents.

Higher WBL scores are associated with lower environmental pressure in both horizons. Finance is conditionally "green": on its own, the sign is mixed, but in combination with higher WBL, it supports better outcomes. Resource rents raise pressure in the short run; in the long run, the coefficient fades once controls are included. The WBL×rents term weakens the rents–pressure link. Among controls, urbanization improves outcomes in the long run, FDI worsens them, and GDP is not statistically significant.

The paper offers the first UAE evidence that links empowerment, finance, and resource intensity through interaction terms. Policy implications include scaling gender-responsive green finance, increasing women's roles in resource governance, and investing in education and skills so financial depth translates into environmental gains.

Keywords:

UAE; environmental sustainability; women's empowerment; financial development; natural-resource rents; ecological footprint; ARDL.

Michael Finkel

Augsburg Technical University of Applied Sciences, Germany

Active Distribution Networks in the Age of Electrification

Abstract:

- TI plan to address three topics in my introductory talk:
- The challenges of sector coupling for the distribution grid using the example of Munich.
- How AI can be used in the planning and expansion of the distribution grid and where the limits are.
- Grid-forming converters and their influence on island grid stability.

Biography:

Michael Finkel is a professor for high voltage engineering and electric power supply systems at Augsburg Technical University of Applied Sciences, Germany. After his PhD at the Technical University of Munich he worked for the Maschinenfabrik Reinhausen in Regensburg and for the SWM Infrastruktur GmbH, the grid operator in the city of Munich. His current research focus is on island power supply with distributed generation systems, power system stability, the integration of E-Mobility and heat pumps into the distribution grid and using AI for planning and operation of distribution grids. Michael is a member of IEEE, Cigre and the VDE.

Maximilian Millisterfer, Maximilian Vogl
Vogl electronic GmbH, Salching, Germany

Advantages of Optical Partial Discharge Measurement for Gas-Insulated Switchgear and Transformers

Abstract:

Purpose:
This presentation aims to highlight the advantages of optical partial discharge (PD) measurement for gas-insulated metal-enclosed switchgear (GIS) and power transformers compared with conventional electrical methods. To achieve this, PD patterns of typical operating defects are compared using both measurement techniques.

Methods:
The PD patterns are investigated in a laboratory setup filled with technical air, using a nearly uniform electrode arrangement that can be equipped with various typical defects, i.e., a protrusion on high-voltage or ground potential, surface roughness, hopping particles, an electrode at floating potential, and particles on the insulator surface. The pressure in the setup reaches up to 0.8 MPa. The electrode configurations are stressed with AC voltage, and the PD patterns are recorded phase-resolved using optical and electrical measurement techniques.

Results:
The comparison between optical and electrical PD detection methods shows that the optical approach is significantly more sensitive and less susceptible to interference. Optical measurements detect PD signals immediately after the PD inception voltage is exceeded for each defect type. In contrast, the electrical method registers PD activity only at higher voltages, and in the case of surface roughness, it may fail to detect any signals.

Conclusion:
Optical partial discharge measurement provides a highly sensitive and interference-resistant method for detecting typical defects in GIS and transformers. It enables early and reliable identification of PD activity that conventional electrical techniques may miss. Therefore, optical PD detection is a promising tool for improving condition monitoring and supporting predictive maintenance of high-voltage equipment.

Mina Oumam[1], Houda Foulah[1], Naoual Ouchitachne[1], Soumia Aboulhrouz[2].

1. Laboratory of Engineering and Materials - LIMAT - Hassan II University of Casablanca. Faculty of Sciences Ben M'Sick, BP.7955, Morocco.
2. Materials Science, Energy and Nano-Engineering Department (MSN), College of Chemical Sciences and Engineering (CCSE), Mohammed VI Polytechnic University (UM6P), Lot 660, Hay Moulay Rachid, Ben Guerir 43150, Morocco

Unconventional Energy Resources as Promising Reagents in Innovative Industrial Processes: The Role of Oil Shale and Biomass in the Conversion of Phosphogypsum into Elemental Sulfur and Sulfur Compounds

Abstract:

Lignocellulosic biomass is the most abundant and equitably distributed natural resource on the planet. Current research and trends in the valuation of the lignocellulosic products highlight the enormous potential for the industrial exploitation of these renewable resources that would certainly contribute to green economy growth and meet sustainable development challenges.

The thermal conversion of the biomass is one of the key areas to convert organic matter into useful energy and other value-added products. The use of lignocellulosic biomass to transform phosphogypsum into elemental sulfur is a novel approach to simultaneously valorize both resources. It's suggested that thermal and mechanical treatments are used to decompose biomass into usable forms, leading to intermediate products as reactants to transform sulfates into sulfur through reductive reactions. In this context, elemental sulfur S8 is produced by an innovative process based on the heat treatment of the precursors based on a lignocellulosic biomass (agricultural residues and agri-food by-products) combined with phosphogypsum. Indeed, lignocellulosic biomass is used as a source of carbon and hydrogen, whose thermal treatment under optimal operatory conditions leads to intermediate products serving as reactants for the reduction of sulfates to elemental sulfur. This process should be competitive since the conversion of phosphogypsum to elemental sulfur is carried out at temperatures ranging from 550°C to 800°C, which are much lower than conventional processes.

Converting phosphogypsum to elemental sulfur using this technology has many objectives, among other, i) production of sulfur using an eco-friendly process, ii) upcycling of agricultural and agri-food residues and iii) dressing the environmental and health negative impacts of the phosphogypsum.

Biography:

Ms. Mina OUMAM is a full professor at Hassan II University of Casablanca (UH2C). Holding a PhD in Process Engineering, her research focuses on the valorization of natural resources and industrial by-products, particularly in the development of bio-based materials, and graphite from the oil shales kerogen. Prof. Mina Oumam leads the Functional Materials research team at the Materials and Engineering Laboratory (LIMAT-UH2C). She has actively contributed to the design, implementation, and management of several research and training projects at Hassan II University of Casablanca, where she was head of the Department of Scientific Research, Cooperation, and Partnerships. She is currently coordinating the PHC Maghreb 25MAG37 (2025-2027) project, which aims to produce nanostructured carbon from bio-oils recovered by pyrolysis of lignocellulosic biomass.

Prof. Dr. Juho Mäkiö
Hochschule Emden / Leer, Constantiaplatz 4, 26723 Emden, Germany

Turning Heat and Power into a Strategic Advantage

Abstract:

High and volatile energy prices, together with continued dependence on imported fossil fuels, pose a fundamental challenge to energy security and economic resilience. While electricity systems have undergone rapid decarbonization in recent years, the heat sector—responsible for a substantial share of final energy demand—remains heavily reliant on oil and gas. This imbalance highlights the urgent need to rethink how heat and power systems are designed, coupled, and controlled.

This presentation explores how the electrification of heat and the large-scale integration of renewable thermal energy can jointly enable cost-effective decarbonization while strengthening energy independence. Rather than treating heat and power as separate domains, an integrated systems approach is proposed in which electricity and heat are coupled through flexible conversion and storage pathways. Renewable electricity from wind and photovoltaics can be converted into heat using power-to-heat technologies, while renewable heat sources, such as solar thermal, can directly supply thermal demand and charge storage systems.

Central to this approach is the deployment of thermal energy storage across multiple time horizons. Seasonal thermal storage enables the shifting of large volumes of renewable energy over months, while short-term solutions—such as gravel-based storage and containerized hot water systems—provide daily and weekly balancing capabilities. These storage layers create substantial system flexibility, allowing surplus electricity, including low-cost or reserve market energy, to be absorbed as heat rather than curtailed. Battery storage can be integrated to further support short-term electrical balancing, reinforcing the complementary roles of thermal and electrical storage.

Advanced control software based on machine learning and artificial intelligence is presented as a key enabler for coordinating these heterogeneous assets. By optimizing energy flows across heat and power domains in response to demand patterns, weather conditions, and market signals, such systems can minimize costs, reduce emissions, and enhance overall energy efficiency.

The presentation will demonstrate the applicability of this framework across a range of use cases, including district heating networks, industrial process heat, agriculture, andpublic infrastructure such as schools and hospitals. Together, these examples illustrate how flexible, digitally controlled combinations of renewable heat, electrified heat, and storage can be deployed at scale to reduce fossil fuel dependence, improve system resilience, and transform heat and power from a vulnerability into a strategic energy asset.

Biography:

J. Mäkiö, Professor.

Prof. Dr. Juho Mäkiö served as Department Manager of the Software Engineering Department at the Research Center for Information Technology (FZI), Karlsruhe Institute of Technology, from 2006 to 2010. From 2010 to 2012, he held a temporary professorship at Heilbronn University. Between 2012 and 2013, he worked as a lecturer at the Technical Trainers College (TTC) in Riyadh, Saudi Arabia. Since 2013, he has been a Full Professor of Computer Programming at the Faculty of Technology, University of Applied Sciences Emden/Leer.

Prof. Mäkiö has played a leading role in numerous industrial and research projects. His research interests include innovative teaching methods, digital education platforms, social and organizational aspects of IT professionals, approaches to teaching critical thinking and engineering ethics, as well as industrial cyber-physical systems and intelligent energy management systems. He has authored more than 100 scientific publications in international conferences and peer-reviewed journals. Prof. Mäkiö is regularly invited to serve as a keynote speaker at international academic and professional conferences.

Antje Neve
Universtität der Bundeswehr München, Germany

Interdisciplinary and International Collaboration in the Age of AI

Abstract:
The global transition to clean energy demands more than technological breakthroughs—it requires visionary cooperation across disciplines, institutions, and nations. Artificial intelligence (AI) is emerging as a transformative enabler in this endeavor, providing unprecedented tools for modeling complex energy systems, their states and optimizing efficiency, accelerating material discovery, and supporting evidence-based policymaking. Yet the true potential of AI lies not only in its computational power, but also in its ability to serve as a catalyst for interdisciplinary and international collaboration.

This keynote will explore how AI-driven research compiled with interdisciplinary views can bridge engineering, computer science and other disciplines while fostering global networks of research groups. It will show by example which factors led to successful research and collaboration in the field of batteries.

Biography:
Antje Neve, Professor of Internet of Things at Universität der Bundeswehr München.
Antje Neve received her diploma from the University of Applied Sciences in Rosenheim and continued with a Master of Science degree (2005) in Computer Science from TU Munich. She completed her Ph.D. focusing on developing object detection algorithms for driver assistant systems at TU Munich in cooperation with BMW Research and Development in 2009. Antje then continued her career as a satellite software engineer at Airbus Defence and Space working on Galileo Satellites and then returned to BMW as a project manager and software architect for the instrument cluster and driver camera. Passionate about teaching and guiding young people she has held the professorship for Internet of Things at the University of the Bundeswehr since 2020 teaching computer and data science, robotics and sensors and Internet of Things. Her research interests include applied data processing, cloud computing, didactics of computer science and anything that makes the world a better place in combining bringing out the best in people and using technology.

C.E. Jiménez[1], A. Skaltsogiannis[1], L. M. Toscani1, M. van der Merwe[1], P. Sakoglu[1], T. Zhong[1], F. Behrendt[1], A. Kunene[1], M.H. Raza[1], R. Garcia-Diez[1], I. Zizak[1], D.E. Starr[1], D. Wallacher[1], M. Osenberg[1], I. Manke[1], D. Amkreutz[1], D. Többens[1], M. Fadlalla[2], E. van Steen[2], M. Claeys[2], J. Potgieter[3], T. Botha[3], R. Schlatmann[1], R.G. Wilks[1], J.-D. Grunwaldt[4], A. Zimina[4], D.J. Moodley[3] and M. Bär[1],[5],[6]

1 Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Germany
2 University of Cape Town, Rondebosch, South Africa
3 Sasol Research and Technology Sasolburg, Sasolburg, South Africa
4 Karlsruhe Institute of Technology, Karlsruhe, Germany
5 Helmholtz Institute Erlangen-Nürnberg for Renewable Energy, Nürnberg, Germany
6 Friedrich-Alexander-Universität Erlangen-Nürnberg, Nürnberg, Germany

Synchrotron Insights for Industrial Innovation in the Production of Sustainable Aviation Fuels

Abstract:

In the CARE-O-SENE project major German and South African partners from industry and academia join forces for the development of the next generation cobalt-based catalysts to produce sustainable aviation fuels (SAF) via Fischer-Tropsch synthesis (FTS)[1,2]. In this context, Sasol recently achieved kerosene yields over 80% at demonstration/pre-commercial scale, an important step towards commercialisation of sustainable aviation fuels from renewable feedstocks[1].

Recent infrastructure advances at several BESSY II beamlines now enable integrated, multi-scale investigations of catalytic materials through imaging, scattering, and spectroscopy. Automated in-system, in-situ, and operando characterisation workflows allow detailed study of both model and commercial cobalt-based Fischer-Tropsch catalysts under realistic process conditions.With X-ray diffraction (XRD), ambient-pressure soft and hard X-ray photoelectron and absorption spectroscopies (AP-XPS, HAXPES, XAS), together with correlative synchrotron and focused ion beam (FIB) tomography, we obtain comprehensivestructural and chemical information. Machine-learning-assisted data analysis provides three-dimensional insight from the micro- to nanoscale.

These results identify key material features controlling activity and selectivity, supporting the optimisation of next-generation Co-based catalysts for efficient and sustainable fuels production.

References:

[1] https://care-o-sene.com (retrieved 02/01/2026); [2] D. J. Moodley, T. Botha, R. Crous, J. Potgieter, J. Visagie, R. Walmsley, C. Dwyer. Catalysis for a Sustainable Environment, Eds. A.J.L. Pombeiro, M. Sutradhar, E.C.B.A Alegria (Wiley, 2024), Chapter 6, 73–116.

Biography:

Dr Catalina E. Jimenez is a Research Group Leader at the Helmholtz-Zentrum Berlin responsible for applied catalysis research in the Energy Materials In-Situ Laboratory (EMIL). Catalina leads the Work Package 1 in the CARE-O-SENE project. She is a scientist with extensive experience in combining synchrotron-based X-ray spectroscopies, scattering, and imaging techniques to investigate energy materials. As part of the CARE-O-SENE project at HZB, she develops innovative thin-film catalysts using dedicated deposition and high-pressure reactors, enabling in-situ distinction between surface and bulk phenomena.

Dr. Jimenez holds a PhD in engineering science from TU Berlin, Germany, and previously studied physics and materials science in Buenos Aires, Argentina. She also organises the HZB Photon School yearly and contributes actively to the CARE-O-SENE mentoring programme.

Pieter Kapteijn
Co-Founder and CEO, Trigen Energy, Netherlands

TriGen Energy – Integrated CCUS Value Chains for Clean Energy from Fossil Assets

Abstract:

TriGen Energy presents an integrated Carbon Capture, Utilisation and Storage (CCUS) concept that transforms conventional oil and gas assets into producers of low-carbon energy vectors, rather than treating decarbonisation as a series technical point solutions. The approach combines pressurised oxy-fuel power generation with CO_2 utilisation for Enhanced Oil Recovery (CO2-EOR), followed by permanent geological storage in the hydrocarbon reservoirs.

The TriGen model is built around full value-chain integration: fuel production, power generation, CO_2 capture, utilisation, storage, and carbon credit generation are technically and commercially linked within one system. This enables coordinated optimisation of subsurface assets, surface facilities, and energy markets, creating bankable projects with multiple revenue streams: clean power, incremental hydrocarbon recovery, verified carbon credits and water.

Current oxy-fuel power cycles enable approximately 50% net CO_2 avoidance at competitive economics, with a development pathway targeting near-total carbon avoidance by 2038. The concept has been evaluated in more than twenty international case studies across mature hydrocarbon provinces, demonstrating broad applicability in countries seeking to balance energy security with decarbonisation.

The paper discusses the technical architecture of these integrated systems, including pressurised combustion, CO_2 handling, and reservoir management strategies, as well as the economic structuring required to align stakeholders across the energy and subsurface value chain. Policy and regulatory frameworks are examined in the context of enabling cross-sector CCUS developments at scale.

TriGen Energy's work illustrates how existing oil and gas infrastructure can be repurposed into long-term clean energy platforms, positioning CCUS not as an end-of-pipe mitigation tool, but as the backbone of an integrated, fossil fuel based low-carbon energy system.

Biography:

Ir. Pieter K.A. Kapteijn is Co-Founder and CEO of TriGen Energy and a technology entrepreneur with over four decades of international experience in oil, gas and energy innovation. His career spans Shell, Maersk Oil, and Sierra Oil, where he held senior roles in production technology, field development, and corporate innovation. He initiated and led major digital oilfield and oxy-fuel CCUS programs and has a strong track record in translating advanced technologies into commercial ventures. Pieter has founded multiple high-tech companies, including Marine Performance Systems, later acquired by Alfa Laval. He holds an MSc in Control and Systems Engineering from TU Delft and is author or co-author of several patents and publications related to smart fields, well technology, and CCUS.

Komla A Folly
Department of Electrical Engineering, University of Cape Town, South Africa

Bioenergy with Carbon Capture and Storage (BECCS) in Integrated Energy Systems: Technical Challenges and Regulatory Pathways

Abstract:

Bioenergy with Carbon Capture and Storage (BECCS) is often presented as one of the few scalable options capable of delivering net-negative carbon emissions, and it features prominently in many long-term decarbonisation scenarios. Yet its real-world deployment remains limited, raising important questions about feasibility, sustainability, and system value. This keynote examines BECCS through the lens of integrated energy systems, where electricity, heat, fuels, hydrogen, and carbon management infrastructures are increasingly interconnected. Rather than treating BECCS as a standalone climate solution, the presentation explores how its technical characteristics, operational constraints, and governance requirements interact with modern power systems dominated by variable renewable energy. Drawing on system-level insights and regional experience, the keynote highlights the practical challenges of sustainable biomass supply, operational flexibility, and carbon transport and storage, alongside the regulatory frameworks needed to ensure environmental integrity and public trust. Attention is given to the implications for emerging economies, with a focus on Southern Africa, where energy access, reliability, and development priorities must be balanced against long-term decarbonisation goals. The keynote argues that BECCS can play a constructive role only if deployed selectively and embedded within coherent system-level planning and policy frameworks.

Biography:

Komla Agbenyo Folly, Professor of Electrical Engineering at the University of Cape Town (UCT), South Africa

He obtained his PhD in Electrical Engineering from Hiroshima University, Japan, in 1997, and subsequently worked as a research scientist at the Central Research Institute of Electric Power Industry (CRIEPI) in Tokyo from 1997 to 2000. In 2009, he was awarded a Fulbright Scholarship and served as a Fulbright Scholar at the Missouri University of Science and Technology, USA. His research focuses on power system stability, control and optimisation, HVDC modelling, grid integration of renewable energy, computational intelligence applications in power systems, smart grids, and power system resilience. He is the Editor of the Journal of Energy in Southern Africa, a Senior Member of IEEE, and a Fellow of the South African Institute of Electrical Engineers (SAIEE).

Gurakuq Dajaku
FEAAM GmbH, Research Center for Electric Drives and Actuators Munich, Germany

Direct Drive Permanent Magnet Generator for Wind Power Industry: A Novel Solution with Reduced Rare Earth Materials

Abstract:

Permanent magnet synchronous generators (PMSG) are becoming increasingly important for direct drive (DD) wind turbine systems due to their ability to eliminate the gearbox and the associated maintenance requirements. In DD configuration, the turbine is directly connected to the generator, resulting in a low rational speed. Consequently, high-power applications require larger generators capable of producing higher torque. In order to reduce the generator size and weight, existing DD-systems typically use PMSG with expensive rare-earth magnets, with are characterized by high energy density. In addition, PMSGs offer several key advantages, including high reliability, high power density and increased efficiency. When combined with power electronic converters, they are well suited for variable-speed operation, allowing optimal energy conversation under fluctuating wind conditions. However, rare-earth materials are significantly more expensive than conventional materials such as laminated steel and copper, making magnet cost a substantial portion of the total generator cost. Furthermore, fluctuations in price and increased demand in rare-earth material have negatively impacted the overall costs and profit margins for wind turbine manufacturer.

Reducing dependence on these costly materials is therefore essential for improving the economic viability of wind generators. In this contexts, this work proposes a cost-effective DD-PMSG topology that significantly reduces the use of rare-earth materials. Compared to conventional designs, the proposed approach achieves an approximate 34% reduction in magnet mass for both small- and large-scale wind turbines. This reductionleads to as substantial decrease in generator costs, making the concept a promising solution for more economically competitive wind energy systems in the future.

Biography:

Gurakuq Dajaku is the CEO of FEAAM GmbH, the Research Center for Electrical Drives and Actuators Munich, Germany. He received the diploma degree in electrical engineering from the University of Prishtina, Kosova, in 1997, and the Ph.D. degree from the Universitaet der Bundeswehr Muenchen, Munich, Germany, in 2006. Since 2008 and 2010 he has been a Lecturer at the Universitaet der Bundeswehr Muenchen, Germany, and the University of Prishtina, Kosova, respectively. Since 2025 he is Associate Editor for IET Electric Power Applications (EPA). Dr. Dajaku has authored/co-authored numerous technical papers published in various IEEE conferences and journals and has several German and international patents and patent pending applications.

Fred Schwartz
York University, USA

Retooling the Canadian Wood Biomass Industry

Abstract:

The Canadian forest industry's historical reliance on a single-product commodity model (pulp and lumber) has left it dangerously exposed to global market volatility and trade tariffs. This paper advocates for a systemic "retooling" of the sector, transitioning from centralized commodity production to a decentralized, high-value biorefinery model. We propose a diversified output strategy that integrates advanced mass timber for housing, biomass for energy, and specialized dissolving pulps for textiles, biochemicals, and rigid insulation. By shifting production closer to the source, this model retains economic value within local and Indigenous communities rather than exporting profits to external stakeholders. Central to this transition is the application of a proprietary gPAI (generalized physical AI) platform designed to optimize multi-product streams and supply chain logistics. The authors demonstrate how this technology-driven, localized approach fosters economic sovereignty and industrial resilience in a fluctuating global landscape.

David Smith

Marubeni Middle-East and Africa Power Limited, UAE

Status of e fuels in the GCC-MENA – 2026 Update

Abstract:

Will review the most likely to occur SAF and methanol projects that have advanced in the GCC – Pre Feed Completed and Beyond.

Will share insights that allow these projects to move forward without government subsidy. Will highlight the smart incentives that may make a larger portfolio of projects daylighting in the 2032 period. Will review the procurement and commercial models that need to be adjusted and tweaked to accelerate the movement of projects from incubation to commercial operation.

Invited Speakers

Aditi Tulpule
Founder & Director, 4D Energy Advisory Services Limited, UK

From Policy to Profitability: Why Clean Energy Projects Struggle to Commercialise — and How Regulation Can Enable Scale

Abstract:

Despite unprecedented policy ambition and record levels of capital directed toward clean energy, many projects fail to achieve sustained commercial operation or scalable deployment. This paper examines the persistent gap between policy intent and project-level profitability, focusing on how regulatory frameworks, market readiness, and legal structuring directly influence the bankability and long-term scalability of clean energy assets.

Drawing on practitioner experience across distributed energy systems, private-wire networks, and embedded generation projects in the UK and comparable liberalised markets, the analysis identifies recurring structural barriers that constrain commercialisation. These include misalignment between policy incentives and durable revenue certainty; fragmented or restricted market access for decentralised assets; regulatory thresholds that inadvertently distort optimal project design; and legal frameworks that insufficiently address asset ownership, risk allocation, and long-term revenue durability. Together, these factors can transform technically viable projects into financially fragile investments.

Rather than advancing new technological solutions, the paper argues that many clean energy underperformance outcomes are fundamentally governance and market-design challenges. Technology maturity alone does not guarantee investability. Without stable revenue architecture and coherent regulatory integration, deployment remains constrained regardless of technical feasibility.

The paper proposes a set of practical regulatory and legal design principles aimed at strengthening investment confidence while preserving policy objectives. These principles emphasise revenue durability, regulatory clarity at asset level, and early integration of legal structuring into project development.

The findings are intended to support policymakers, regulators, researchers, developers, and investors seeking to transition clean energy from pilot-stage experimentation to durable, scalable infrastructure capable of attracting long-term capital.

Doctor of Sciences eng. tech. Nedyalka Naneva Valcheva
Teacher at Vocational High School, Prof. Dr. Asen Zlatarov", town Dimitrovgrad, Haskovo District, Bulgaria

Characterization of Isolated Strains of Microorganisms from Mineral, Mountain and Spring Waters from France, Italy, England, South Korea, Japan, Netherlands, Austria, Spain, Singapore, Germany, Switzerland, Dubai, Alanya and Bulgaria

Abstract:

The aim of the present work is to isolate, identify and investigate the species of bacteria from healing, mountain and spring waters in the area of Paris, France, Rome, Italy, London, England, Busan, South Korea, Tokyo, Japan, Amsterdam, Holland, Vienna,Switzerland, Dubai, Alanya and Bulgaria. 127 bacterial strains were isolated and their colonial and morphological characteristics were determined and the study strains were identified. The data show that the isolated 9 strains from the hypothermal healing spring waters in the Paris area, France were identified as N. Valcheva - Lisinibacillus pakistanensis, Serratia marcescens (four strains), Staphylococcus hominis, Staphylococcus haemoliticus, Bacillus pumilus and Bacillus cereus. The isolated strains from thermal healing springs in Saturnia, Tuscany region and Fontana di Trevi in Rome, Italy were identified as N. Valcheva - Tiobacillus Ferrooxidans, Staphylococcus cohnii, from a hypothermal spring in the London area as N. Valcheva - Aeromonas caviae, Pseudomonas chlororaphis, from a mountain spring in the area of Busan, South Korea, was identified as N. Valcheva - Bacillus safensis, Staphylococcus cohnii, Pseudomonas chlororaphis, Staphylococcus cohnii. From a mountain geothermal spring in the area of Tokyo, Japan, strains were identified as N. Valcheva - Bacillus safensis, Phellodendron chinense, Aeromonas caviae, Pseudomonas japonica. The strains identified in the Amsterdam, Netherlands area were identified as N.Valcheva&A.Atanasova - Aeromonas viridans, N.Valcheva&V.P.Panteleev - P. japonica, N.Valcheva&V.V. Panteleev - Aeromonas salmonicida, N.Valcheva&A.V Panteleev - Aeromonas caviae, N.Valcheva&L.A.V. Panteleeva - Phellodendrom chinense. Sulfur bacteria of the species N. Valcheva - Chlorobium chlorochromatii were identified from the healing springs in the region of Baden and Vienna, Austria. The strains from Bulgaria were identified from 100 hypothermal, thermal and common springs from 11 regions and belong to the following 14 genera: N. Valcheva - Bacillus, Brevibacillus, Geobacillus, Aeromonas, Klebsiella, Pseudomonas, Staphylococcus, Stenotrophomonas, Serratia, Nocardia, Trichosporon Azoarens , Lisinbacillus, Rhodococci. From the hypothermal salt source

in Barcelona, in the area to the Mediterranean Sea, 29 species of organisms were identified N.Valcheva §St.Mihailov - Pseudomonas shengduensis, N.Valcheva&V.Marinova- Bacillus cereus (3 strains), N.Valcheva&I.D.Valchev - Shevanella algae (3 strains), N.Valcheva&D.I.Valchev - Acinetobacter quillouiae, N. Valcheva&N.I.Valcheva - Pseudomonas pseudoalcaligenes, N.Valcheva&I.I.Valcheva - Pseudomonas korensis, N.Valcheva&P.N.Valcheva - Delftia acidovorans (2 strains), N.Valcheva&M.P.Pantelev - Citrobacter frendii, N. Valcheva&M.I.Panteleeva - Pseudomonas rhodesiae, N.Valcheva&D. Eschkenazy - Pseudomonas Chloraphis, N. Valcheva&H.Eschkenazy - Pseudomonas korecusis, N.Valcheva -M.Eschkenazy - Pseudomonas chlororaphis, N. Valcheva&G.Dimov - Strenotrophomonas sp., N.Valcheva&M.Naneva - Preudomonas rhodesiae, N.Valcheva& N.Nanev - Enterobacter Ludwigii, N. Valcheva&St.Stratiev - Aeromonas caviae (2 strains), N.Valcheva&P. Panteleev - Aeromonas mediae, N.Valcheva& E.Todorovska - Providencia retgerri, N.Valcheva - A.Stoyanova -Myroides odoratiminus, N.Valcheva&R.Moneva - Alcaligenes faecalis. N.Valcheva - Bacillus safensia is the only test that shows a significant reduction in the number of cells by 50% compared to cells in lung cancer A549. Concentration from 100 µg /mL. Metabolomic profiling of crude extracts from N.Valcheva - Bacillus safensis, isolated from a source in Tokyo and a source in Busan, South Korea, near the spring of South China Sea, reveals the presence of known antibacterial and/or anticancer agents such as licorin, angustin, krinamidin, Vaccinol and poulin.N. Valcheva - Acinetobacter guillouiae(born in Barcelona) degradates plasma. With probiotic action from N.Valcheva - Bacillus subtilis and N. Valcheva - Bacillus methylotrophius (Bulgaria). N.Valcheva&I.I.Valcheva - Pseudomonas korensis is used for vaccination. The identified strains from a source in the Singapore area are: N.Valcheva- Aeromonas caviae, Klebsiella oxytoca, Kurthia gibsoni, Roatella ornithinolitica, Kurthia gibsonii, Pseudomonas aeruginosa, Citrobacter cloacae, Klebsiella pneumoniae, Alcaligens fecalis, Aeromonas veronii, Serratia marcescens, Enterobacter hormchei, Enterobacter cloacae, Citrobacter frendii, Debaromyces hansenii, Pseudomonas putida, Pseudomonas sp.. The identified strains from a spring in the Berlin, Germany area are: N.Valcheva- Klebsiella, pneumoniae, N.Valcheva&A. Dechev, N.Valcheva&T. Bazaitova Serratia liquafaciens,N.Valcheva - Aerococcus oxytoca, Buttiauxella gaviniae, The identified microorganism from the healing spring in in the Bern area,Switzerland is yeast, which is discovered for the first time from healing springs and finds application in the food industry – N.Valcheva -Debaromyces hansenii. In Dubai, the identified microorganisms are N. Valcheva Citrobactere cloaca, N. Valcheva Roadella ornithinolitica. In Alanya, the identified microorganisms are N. Valcheva Serratia liquafaciens. All isolated strains have enzymatic, antifungal and antibacterial activity. Remediation is used to extract valuable metals such as gold, silver or to remove metals that are harmful to organisms. Many of them have the ability to degrade plastic, contributing to environmental protection. Antifungal activity is of great importance in agriculture, aquatic bacteria kill mold fungi and insecticides on plants.

Others are placed in animal feed as producers of enzymes and antibiotic action. This increases the weight and health of animals. Plant and animal bioproducts are obtained, which are important for human health. Probiotic producers are extremely important for medicine. Many of them are added to food products, thereby increasing the shelf life, since these are aquatic bacteria isolated from mineral springs. All strains have different biological activity. It is an indisputable fact that for the first time in the world, an anti-cancer strain has been discovered from mineral springs in Japan and South Korea - Bacillus saphenis, which destroys cancer cells in the lung and can be used to treat Covid, pneumonia, bronchitis and all respiratory diseases.

The difference in the type of strains identified can be explained by the influence of the composition of the water, the type of soil and rocks through which it passes, the temperature, pH of the environment and the different geographical location.

Biography:

1990 - Master's degree program of "Technology of vegetable, food and flavor products" in University of Food Technologies, town Plovdiv, Bulgaria

From 1990 to 2016 - Teacher at the Vocational High School of Chemical and Food Technologies "Prof. „Asen Zlatarov", PhD., town Dimitrovgrad, Bulgaria.

2014 - The dissertation on "Microflora of healing and spring waters in the Haskovo and Stara Zagora regions" at University of Food Technologies, town Plovdiv with a Ph.D degree.
Since 2016 - Senior expert, organizer in Department of Biochemistry, Microbiology and Physics in Trakia University, town Stara Zagora, Bulgaria.

2023 - The dissertation on " Physical, chemical, and microbiological characteristics of mineral, mountain, and spring waters from Bulgaria, and biological properties of identified microorganisms" at Institute of Cryobiology and Food Technologies, Agricultural Academy, town Sofia, Bulgaria with a DSc.

2024 - Teacher at the Vocational High School "Prof. Asen Zlatarov, PhD., town Dimitrovgrad, Bulgaria.

Robert Cooke

Yukon University Northern Energy Innovation, Canada

Community Engagement and Codevelopment of Capacity Building to Support the Clean Energy Transformation for Remote, Off-Grid Communities

Abstract:

Remote communities across the Arctic are facing an existential, yet growing threat. It is now no longer an argument that climate change is happening at a greater rate in the Arctic than anywhere else on the planet, it is a demonstrable fact. Not only is rapid climate change having a severe impact on the environment but in remote communities, particularly those reliant on subsistence lifestyles, it is impacting health and well-being; food supply and food security; housing; and probably most importantly culture and lifestyles. By far the majority of these communities are reliant on fossil fuels for energy generation, both heat and electricity. This not only adds to the climate change problems but has much more direct impacts on health and well-being through air and noise pollution, direct environmental damage through pollution of the land and food supplies, challenging supply logistics and very high costs of energy. Communities want to get away from fossil fuel exploitation, particularly indigenous communities that see a direct correlation between renewable energy and their cultures and heritages of living with the environment not fighting against it. The same logistics problems that create high prices for energy also impact integration of renewable energy into remote microgrids, making it even more important that the correct and appropriate solutions are pursued from the outset.

It is now widely accepted that for renewable energy projects to work in remote communities they must be wanted and owned by the communities; community members know what works best for their environment and locality, and they know what they need. By empowering community members with the skills, knowledge and networks to lead their own projects from concept through to in-service and beyond, we are seeing much stronger and more successful projects.

The Arctic Council Sustainable Development Working Group has been at the forefront of an international program called the Arctic Remote Energy Network Academy that for the last 8 years, and over three cohorts, has been working with energy champions from across the Arctic to give them the skills, knowledge and networks to develop their own clean energy projects.

Northern Energy Innovation, based out of the Yukon University Research Center in Whitehorse, Yukon, Canada has developed a more localized and direct approach codesigning, codeveloping and codelivering Community Energy Systems Courses with individual communities across the Canadian north to grow energy capacity and literacy that meets the very specific energy needs of those communities. Programs such as these, and the lessons they highlight, are making a difference to energy security across the Arctic and combating climate change. The lessons learnt also have much wider applicability than the Arctic. Remote communities from around the world, whether in Africa, South America or Asia are facing very similar challenges and lesson learning and knowledge sharing will help drive the international transition.

Same lessons apply to remote communities throughout the world

Lessons don't necessarily apply to just off grid

Criticisms of Net Zero – lack of understanding or buy in Nuclear and small modular reactors

Dr. Ilknur Colak
Schneider Electric, Germany

AI-Powered Energy: Optimizing Converters for a Decarbonized Future

Abstract:

The escalating global demand from high-power AI data centers and ultra-fast EV charging infrastructure is placing unprecedented stress on existing hybrid energy grids. Current traditional power conversion systems are fundamentally constrained in their ability to deliver the requisite efficiency, resilience, and stability necessary for a low-carbon energy future. This keynote will introduce a transformative AI-driven optimization framework specifically engineered for Medium-Voltage (MV) converters. Moving beyond static control methodologies, this framework is the result of a high-level iterative optimized design process and implements a dynamic system powered by the synergistic use of real-time data analytics, predictive algorithms, and digital twin technology.

Chro Ali Hamaradha
Sulaimani Polytechnic University, Iraq

Advanced Passive Cooling and Heating Strategies in Hot-Dry Climates

Abstract:

Hot-dry climates face increasing challenges related to thermal comfort, rising energy demand, and climate change impacts on the built environment. This presentation supports the CLEANENERGY-2026 vision by examining advanced passive cooling and heating strategies within the Passive and Thermo-Active Cluster (PTAC) framework. The presentation emphasizes climate-responsive architectural and urban design approaches that prioritize passive solutions while enabling integration with low-energy thermo-active systems. Key strategies include optimized building orientation, compact urban morphology, high thermal mass, adaptive shading, courtyard typologies, natural and night-time ventilation, evaporative cooling, and controlled solar heat gain for seasonal heating. Special attention is given to traditional windcatchers (badgir/malqaf) as an effective passive cooling technique for enhancing natural ventilation, reducing indoor temperatures, and improving thermal comfort in arid environments. Simulation-based performance assessments and selected case studies from hot-dry regions demonstrate how PTAC-oriented design can reduce reliance on mechanical systems, lower energy consumption, and support low-carbon, resilient built environments in line with workshop's objectives. The findings demonstrate that context-specific passive cooling and heating solutions are essential for sustainable energy transitions in arid and semi-arid regions.

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Thermochemical Reactivity of Kerogen in Acetic Acid-Pretreated Tarfaya Oil Shale: Impacts on Conversion Efficiency and by-Product Reduction

Abstract:

Faced with the depletion of conventional fossil fuels and the energy needs of industrial development, oil shale is emerging as an alternative resource for hydrocarbon production. These rocks, which are natural composites combining mineral compounds with bitumen and kerogen, are abundant worldwide and yield numerous chemical products we can extract by appropriate processes.

This study explores the thermochemical reactivity of kerogen by comparing the raw material (OSR) to its organic concentrate (OSRA) obtained by selectively removing carbonates via acetic acid treatment. This structural transformation, corroborated by several analyses (XRF, XRD, FTIR, CHNOS, SEM), reveals a marked enrichment in quartz. Multi-ramp thermogravimetric analysis (5 to 40 °C/min) demonstrates that decarbonation lowers the reactivity threshold to 260 °C and doubles the conversion efficiency, increasing it from 30% to 60%. These results are confirmed by comparative monitoring of pyrolysis, proving that excess calcite acts as an inhibitor in this process. Furthermore, the acetic acid pre-treatment not only improves hydrocarbon yield but also reduces mineral by-products, thus optimizing the quality of the solid residue for use as a raw material in naonsilica production.

The application of isoconversional kinetic models (Friedman, FWO, KAS) indicates a substantial reduction in energy barriers, with activation energies of 14.09 and 10.78 kJ•mol^{-1} for a conversion rate of 60%. Furthermore, examination of Criado and Coats-Redfern diagrams reveals a transition in the reaction mechanism from an Avrami-Erofeev A2 model to an A3-type complexity. These results highlight the crucial importance of mineral matrix management for optimizing the efficiency of thermal conversion processes and minimizing the environmental impact of residues.

Biography:

Houda FOULAH is a PhD student. She has been a researcher at the Laboratory of Engineering and Materials (LIMAT) at Hassan II University of Casablanca since 2020. Her research focuses on the valorization of Moroccan oil shale, at the intersection of thermal characterization, energy performance, kinetic modeling, and the valorization of residual products. She also teaches mathematics in addition to her academic career. She has expertise in project management, quality engineering, and simulation.

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Thermal Reactivity and Kinetic Modeling of Agro-Industrial Residues for Thermochemical Conversion

Abstract:

Agro-industrial residues represent an abundant yet underutilized resource for thermochemical biomass conversion. Their complex structural composition and heterogeneous organic content pose both environmental challenges and significant opportunities for sustainable energy production. This study aims to provide a comprehensive understanding of the thermal reactivity of industrial biomass waste through integrated thermogravimetric and advanced kinetic analysis. Thermogravimetric analysis (TGA) revealed a distinct multi-stage degradation behavior characterized by initial drying, intense devolatilization driven by structural carbohydrate decomposition, and a final stage associated with lignin transformation and progressive char formation. These results highlight the intrinsic heterogeneity of agro-industrial residues and their relevance for controlled thermochemical processing.

A multi-method kinetic framework was implemented combining isoconversional approaches (Friedman, KAS, FWO, and Vyazovkin), Arrhenius-based model-fitting techniques (e.g., Coats–Redfern), and distributed activation energy modeling (DAEM). This integrated strategy enabled a refined description of activation energy evolution and reaction mechanisms across conversion levels. The findings provide valuable insights for identifying key decomposition regimes, supporting process optimization, and reinforcing the role of industrial biomass waste as a strategic feedstock for next-generation biomass valorization and sustainable energy systems.

Biography:

Naoual Ouchitachne is a PhD candidate conducting her doctoral research jointly at the Engineering and Materials Laboratory (LIMAT), Faculty of Sciences Ben M'Sick, Hassan II University of Casablanca, Morocco, and at IATE (INRAE), Institut Agro Montpellier, France. Her research focuses on the thermochemical valorization of agro-industrial residues using thermal analysis and kinetic modeling approaches. She investigates sustainable pathways for converting industrial biomass waste into bioenergy and advanced materials, and integrated strategies supporting circular bioeconomy and sustainable energy systems.

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From Biomass to Sulfur Chemistry: Integrated Thermochemical Routes for Controlled SO_2 Generation

Abstract:

Thermochemical conversion of biomass is a promising route for energy valorization while generating reducing species (char, CO/H_2-rich pyrolysis gases, and reactive organic fragments) that can drive targeted chemical transformations. The use of biomass as a biosourced reducing agent is increasingly recognized as a credible alternative to fossil reductants in several thermochemical pathways. In this context, the present study investigates an integrated "energy-sulfur" concept aimed at converting sulfur-based material into SO_2 through a coupled pyrolysis/co-pyrolysis process, leveraging both recoverable energy and the reductive potential of biomass. Experiments were conducted under an inert N_2 atmosphere, assessing the effects of (i) process temperature and (ii) the biomass-to-material X ratio, key parameters governing conversion kinetics and the nature of residual solid phases. The resulting solids were thoroughly characterized to link structural/chemical transformations with SO_2 generation performance.

In addition, a multi-method kinetic framework was implemented by combining isoconversional approaches with Arrhenius-based model-fitting methods. This integrated strategy enabled a refined description of activation energy evolution and reaction mechanisms across conversion levels, thereby identifying key decomposition regimes relevant to SO_2 generation and solid-phase transformations. Overall, SO_2 formation was found to be strongly dependent on thermal conditions and on the availability of biomass-derived reducing agents (char and volatiles), highlighting clear levers for process optimization. In conclusion, the proposed energy-sulfur pathway confirms biomass as an effective biosourced reductant for controlled SO_2 generation from sulfur-bearing matrices, while the kinetic analysis provides actionable insights for process design and reinforces industrial biomass waste as a strategic feedstock for sustainable energy and next-generation biomass valorization.

Biography:

Soumia ABOUL-HROUZ, Senior Scientist in Materials and Energy Systems. She holds a PhD in Materials and Environmental Sciences and has extensive experience in thermochemical biomass conversion and sulfur chemistry. Her research focuses on biomass valorization, pyrolysis, and kinetic modeling, with particular emphasis on energy recovery pathways and sustainable process integration. She has actively contributed to research projects dedicated to the energy valorization of industrial biomass residues, developing integrated thermochemical strategies that couple energy production with chemical transformation. Her current work explores the use of biosourced reductants in sulfur conversion processes, aiming to bridge energy efficiency, circular resource management, and next-generation sustainable energy systems.

Ruomei Li
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For Energy Efficiency Promotion, Powering Progress with Empowering People

Abstract:
It emphasizes that energy efficiency enhancement is pivotal for global sustainable development, with people at its core. Sharing international practices, it explores how empowering communities, enterprises, and policymakers through inclusive technologies and awareness-building drives efficiency gains. Calling for cross-border collaboration, it advocates joint efforts to turn people's participation into a driving force, advancing green progress and forging an equitable, sustainable future.

Biography:
Dr. Ruomei Li, an expert in electrical engineering and a Senior Member of IEEE. She graduated from Hefei University of Technology in 1982 and earned her Ph.D. from the University of Bath, UK, in 2000. With a long-term career in the power system field, she previously served as the Chief Engineer of CEPRI and the Secretary-General of the Chinese Society for Electrical Engineering. She has been honored with awards including the National First Prize for Scientific and Technological Progress and the IEEE PES Wanda Reder Pioneer Award.

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Opportunities and Challenges for the Catalytic Conversion of Lignin to Biofuels

Abstract:
One of the main challenges in lignin's catalytic conversion is to achieve reliable sources and chemical strategies to convert them to techno-economically feasible biofuels. In the last ten years, remarkable achievements have been reported which serve as "selected cases" to highlight the opportunities of lignin as a biorefinery source for biofuels production and biofuel intermediates. This work discusses some of those cases in the economic and energetic context, and at the light of the estimated lignin production potential from the countries that have the capacity for lignin conversion, and emphasizes in the synthesis of lignin aviation biofuels (LJF) due to its strategic relevance for countries who are making significant investments in the production of bio jet fuel from triglycerides and alcohol sources. The vision and the roadmap for lignin biorefineries here presented is that lignin-based biofuels research must get a boost in order to implement promising pilot projects in the coming years and decades.

Keywords:
Lignin production potential, lignocellulose, lignin jet fuel, catalyst, hydrogenolysis, hydrodeoxygenation, chemical limitations, biorefineries.

Poster Presentations

Simon Ziegler, Prof. Dr. Michael Patt

University of Applied Sciences Kempten, Institute for Power Electronics (ILE), Germany

Adjustable Dead Time in Half Bridge Applications

Abstract:

Dead time in switching circuits, if not properly adjusted, causes significant losses, which can primarily be attributed to the MOSFETs' parasitic capacitances and body diode reverse recovery time. This paper discusses a logic circuit that automatically minimizes the dead time and its associated losses in any given half bridge application. The viability of this circuit is verified in combination with a half bridge LLC resonant tank with gallium nitride (GaN) FETs EPC2218 and gate driver LMG1210 featuring an independent input mode. The outputs of the logic circuit determine the new gate pulses in accordance with the rising and falling edges of the resonant tank's output voltage and zero voltage switching topology, thus minimizing losses.

Biography:

Simon Ziegler obtained his Bachelor of Engineering at the University of Applied Sciences Kempten in 2024, where he now works as a research engineer for the Institute for Power Electronics (ILE). The focus of his work lies in designing, testing, and optimizing converter solutions across various industries, including different types of electrical power converters and microprocessor-based control systems.

Round Table Discussion

Title:
Mathematical, Theoretical and Experimental Advances for the Possible Cleaning of Fossil Fuel Power Plants

Round Table Chair:
Ruggero Maria Santilli, The Institute for Basic Research, USA

Sir Prof. Ruggero Maria Santilli
www.i-b-r.org/Sir-Santilli-bionotes-05-15-21.pdf
Hadronic Technologies Corporation, Palm Harbor, FL, U.S.A

Introduction to Clean Sustainable Hyperfusions without the Coulomb Barrier

Abstract:
Following studies initiated at Harvard University in the early 1980's under DOE sup-port, we outline: 1) The irreversible, Lie-admissible and Jordan-admissible completion of quantum mechanics (hm) into hadronic mechanics with generalization of Heisenberg's equation $i(dA/dt) = (A, H) = A < H - H < A = ARH - HSA = (ATH - HTA) + \{AJH + JHA\}$, $R = T + J > 0$, $S = -T + J > 0$ for the consistent representation of nuclear fusions; 2) The experimentally confirmed new bonds of electrons and light natural nuclei called pseudo-nuclei; 3) The new HyperFusions without the Coulomb barrier $D + D\hat{} \rightarrow He + 2e-$ between natural positively charged Deuterons D(1, 2, 1) and negatively charged pseudo-Deuterons $D\hat{}(-1, 2, 1) = \{D(1, 2, 1) + (e- e-)\}$hm. We also show that pseudo-nuclei are prohibited by Heisenberg's uncertainty principle despite the extremely big Coulomb attraction between electrons and nuclei, but fully admitted by Einstein's isodeterminism of the covering hadronic mechanics and their experimen-tal verification. We finally review the independent certifications of the sustainable and controllable excess nuclear energy produced by the third Hadronic HyperFusion Reac-tor www.world-lecture-series.org/dragon-iii without the Coulomb barrier, without the emission of harmful radiations and without the release of radioactive waste.

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Introduction to Iso, Geno-, and Hyper-Mathematics and Their Applications in Physics, Chemistry and Biology

Abstract:

We review recent advances on isomathematics, genomathematics and hypermathematics for the invariant representation of reversible, irreversible and multi-valued systems of extended constituents in conditions of deep mutual entanglement, with conventional linear, local and potential interac-tions represented by the conventional Hamiltonian H plus non-linear, non-local and non-potential interactions represented by the operator S in the associativity-preserving iso-, geno- and hyper-completions $A\times\hat{}B = ASB$, $A\times\hat{}(B\times\hat{}C) = (A\times\hat{}B)\times\hat{}C$, of the millenary old associative product of opera-tors $A\times B = AB$, $A(BC) = (AB)C$. We then review advances in physics, chemistry and biology which are permitted by iso-, geno- and hyper- math-ematics, but impossible for 20th century applied mathematics [1] [2].

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Santilli's recovering of Einstein's determinism under strong interactions

Abstract:
Recent series of papers by the Italian-American physicist, Ruggero Maria Santilli based on the Lie-isotopic branch of hadronic mechanics, wherein a system of extended protons and neutrons in conditions of partial mutual penetration in a nuclear structure verifies the following properties: 1) Admits, for the first time, explicit and concrete realizations of Bohm's hidden variables. 2) Violates Bell's inequalities 3) Verifies the broadening of Heisenberg's indeterminacy principle for electromagnetic interactions of point-like particles in vacuum into the isouncertainty principle of hadronic mechanics, also called Einstein's isodeterminism for extended hadrons in conditions of partial mutual penetration. The new principle allows a progressive recovering of Einstein's determinism and there by weakening of the uncertainties proclaimed by quantum mechanics, in the transition from hadrons to nuclei and stars and its full recovering at the limit of Schwartzschild's horizon. Some far reaching advances are also indicated.

Keywords:
Bell's inequalities, Bohm's hidden variables, Einstein's determinism

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Introduction to Magnegas and Its Combustion Properties

Abstract:

The research conducted over decades by R. M. Santilli and colleagues has theoretically and experimentally shown that ordinary molecules exposed to intense magnetic fields generated by submerged DC electric arcs can undergo structural transformations leading to the formation of stable clusters known as magnecules [1-3]. Unlike conventional molecules bonded through valence interactions, magnecules can be described as aggregates formed by magnetic polarization of electron orbitals into toroidal configurations, resulting in non-valence magnetic bonds between atoms, radicals, and molecular species [2–4]. These structures are reported to exhibit enhanced chemical reactivity and improved combustion properties. [5,6,7,8].

Magnegas, a magnecular fuel produced through Plasma Arc Flow technology, is generated by gasification of liquid feedstocks such as sewage, waste oils, as well as other water- and oil-based liquids using submerged electric arcs [2, 5]. Experimental analyses based on GC–MS and infrared spectroscopy have identified clusters with high molecular weights lacking the infrared signatures expected from conventional molecular structures, supporting the hypothesis of magnecules [5,9].

Studies have reported that Magnegas combustion produces lower pollutants, reduced or non-detectable carbon monoxide and carcinogenic hydrocarbons, and a positive oxygen balance in exhaust gases compared with conventional fossil fuels [6, 7, 9]. In addition, Magnegas has demonstrated high flame temperatures and enhanced metal-cutting efficiency compared to acetylene [5, 6, 11, 12].

A hydrogen-rich derivative, MagneHydrogen (MH), can be separated from Magnegas using Pressure Swing Adsorption or Vacuum Swing Adsorption techniques [13]. Unlike conventional molecular hydrogen, MH is described as consisting of magnecular hydrogen clusters with higher apparent densities, potentially increasing the energy content per volume unit and eliminating hydrogen leakage [13-15]. These properties suggest interesting applications in hydrogen storage, space propulsion, internal combustion engines, and fuel-cell technologies. Moreover, the magnecular structure described by Hadronic Mechanics and Chemistry also opens the path to a new type of nuclear reactions called Intermediate Controlled Nuclear Fusions [16].

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