Dr Tony Lujia Chen

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Dr Tony Lujia Chen is a Senior Lecturer in High Voltage Engineering at The University of Manchester. He is currently the Secretary of Cigré Working Group B3/A3.59: Guidelines for SF_6 end-of-life treatment of transmission and distribution equipment in substations. Tony received his BEng degree in Electrical and Electronic Engineering and PhD degree in High Voltage Engineering from Cardiff University, UK, in 2012 and 2015, respectively. He worked for Western Power Distribution prior to joining The University of Manchester as a Lecturer in 2017. He was appointed as the Business Engagement Theme Lead for Transport in 2020 and the Associate Dean for Research Impact in 2023 for the Faculty of Science and Engineering.

EDUCATION

- PhD in High Voltage Engineering, Cardiff University, 2012-2015
- BEng in Electrical & Electronic Engineering, Cardiff University, 2009-2012

Qualification and Professional Membership

- Fellow of Higher Education Academy (FHEA)
- Member of the Institution of Engineering and Technology (MIET)
- Member of the Institute of Electrical and Electronics Engineers (MIEEE)

Employment History

- Department of Electrical & Electronic Engineering, The University of Manchester, 2017-
    - Associate Dean for Research Impact, 04/2023-
    - Senior Lecturer in High Voltage Engineering, 08/2022-
    - FSE Business Engagement Theme Lead in Transport, 07/2020 to 03/2023
    - Chair of EEE PGR Staff Student Liaison Committee, 09/2017 to 06/2020
    - Lecturer in High Voltage Engineering, 04/2017 to 05/2022
- Primary System Design, Western Power Distribution, 2016-2017

RESEARCH TRACK RECORD

Chen has an extensive track record working on environmentally friendlier alternatives to SF_6 alongside the power industry. He specialises in the electrical and material characterisation of gas and solid dielectrics, and condition-based monitoring of decomposition process and the generated by-products. A key feature of his research is the ability to upscale from fundamental research to application, catalysing the development of real-world solutions that can deliver environmental and economic saving to society. A prime example is his research demonstrated the technical viability of retrofill that gave National Grid the confidence to accelerate retrofill projects on their networks. Tangible benefits delivered to date are the world's first retrofilled SF6-free substation equipment in Richborough, having removed 755 kg of SF_6 from service with an alternative gas, delivering a 99% reduction in carbon equivalent.

This work received substantial recognition having won numerous external and internal innovation awards. The most notable being named the winner for the Best Innovation in Net Zero and Sustainability at the IET Engineering and Technology Annual Innovation Awards Ceremony 2022. Chen spent time working in Western Power Distribution after his PhD graduation. The time away from academia has given him unique insights on some of the practical challenges facing the energy sector. This is evidenced by Chen's direct income from industry is £2.35 million, in addition to significant in-kind contributions in the form of equipment endowment. His ongoing industry collaborators include National Grid, Rolls Royce, 3M, EDF, EPRI, JDR, HVPD and DILO. His pioneering work on SF_6-free retrofill solutions underpins the current collaboration with National Grid on non-invasive optical detection of decomposition by-products in transmission equipment, which will support the development of an overall strategy based on different replacement interventions to reach zero SF_6 by 2050 for NGET initially and eventually the wider UK SF_6 end-users.

Presentation 1

Title:
Application of Alternative Gases in Retrofilling SF_6-insulated High Voltage Equipment

Abstract:
Sulphur hexafluoride (SF_6) is widely used in electricity networks due to its outstanding dielectric insulation and arc interruption properties. There is a growing research interest into alternative gases with much lower environmental impact to SF_6. While a lot of current research focuses on developing state-of-the-art high voltage equipment specifically designed for alternative gases, this work investigates the feasibility of retro-filling existing SF_6-designed equipment. For the power industry, retrofilling the existing SF_6 equipment with an environmentally friendly solution would represent a more economical and time saving solution to phase out the usage of SF_6.

Presentation 2

Title:
Impact of Oscillatory Movement on Insulation Reliability of Dynamic Cables for Offshore Platforms

Abstract:
Floating wind turbine support structure (FWTSS) is a relatively new technology which allows expansion of offshore wind to deeper water sites. The offshore environment presents unique challenges, floating submarine cables connected to the FWTSS are subjected to constant mechanical flexure from tidal currents and waves. Hence, cables could suffer irreversible damage, leading to accelerated ageing via mechanisms such as electrical treeing; thereby shortening the assets' lifetime. There is little knowledge on the consequences of low frequency flexing, repeated compression, and extension of cable insulation because cables are typically installed in benign environments.

Presentation 3

Title:
Arc Tracking Hazards in Next Generation of Higher Voltage Aerospace Electrical Systems

Abstract:
Future hybrid aircrafts are expected to see an increase in the power demand up to 5 MW, which raises the operating system voltage to above 1 kV and to be operated in low ambient pressures. The proposed higher operating voltage for power generation will subsequently increases the likelihood of partial discharge and arc fault. An arcing event can lead to conductor erosion, insulation deterioration, and arc flash hazard to neighboring systems. The ambient conditions, voltage levels, types of power sources, vibrations, and space constraint in aircraft present technical challenges to model the unpredictable behavior of arcs.