Guest Editorial

This is a special issue of the SAIEE Africa Research Journal (ARJ) featuring selected best articles that were initially presented at the 26th Southern African Power Universities Engineering Conference (SAUPEC). The conference was hosted by the School of Electrical and Information Engineering at the University of the Witwatersrand, Johannesburg during the period 24-26 January 2018. Since its inception in 1990, SAUPEC has become an annual flagship conference for the power engineering community in Southern Africa.

Seven papers were selected from a total of 78 that had been accepted and presented as peer-reviewed papers at SAUPEC2018. The selected papers had to be further developed into journal quality scholarly articles after which they went through another peer review cycle. Each article was blind-reviewed by at least two experts. The ultimate outcome of the iterative process was six articles that are herein gladly presented in this special issue of the SAIEE ARJ.

Electric power systems research worldwide is currently driven by the need to address the challenges associated with the changes in the power network grids. The proliferation of distributed energy resources is a typical characteristic of contemporary evolving power systems. The article by Klein et al. presents results of studies on the possible South African power grid expansion scenarios characterized by increased demand side flexibility and high penetration of variable renewable energy sources. Development of improved energy storage and sector coupling capabilities are found to be imperative requirements.

Electric water heaters (EWHs) are important flexible energy storage devices that can play an important role in the demand side of power grids. The paper by Yen *et al*. is a detailed analysis of large-scale aggregated loads from EWHs, focusing on comparative maximum power demand of horizontally versus vertically orientated tanks.

Sustainability of the evolving power systems inherently imply more stringent reliability requirements of power system equipment. In that regard, the article by Kubelwa et al. contributes knowledge towards power line spacer damper sensitivity optimization that can be used in improving the existing and future designs.

Traditionally the transmission parts of power grids have been the focus of research and development efforts towards equipment system 'intelligence' capabilities. With the advent of distributed energy resources, the distribution grids have to be made up of equally intelligent equipment and systems. It is therefore now recognised that more effective equipment condition monitoring and diagnosis techniques for distribution equipment have to be developed. The paper by Haikali et al. presents results of an experimental study into how partial discharge characteristics of different defects, typically found in MV XLPE power cable terminations, evolve uniquely with time of voltage application. Such knowledge may lead to the development of more effective online condition monitoring of

As for overhead power lines, there exist safety risks associated with low-hanging power line conductors due to tilted wood poles. A tilted wood pole is an undesired condition that is not easily detected using the conventional power system protection techniques. The paper by Hardy et al. presents the design of magnetic field sensors that can be part of a distribution pole online condition monitoring system capable of detecting pole tilt conditions. The knowledge could be an important step towards implementing the concept of the Internet-of-Things (IoT) on distribution networks. Another safety concern on overhead power lines involves bird electrocution. The interaction of birds with overhead power lines has been an ongoing concern as it impacts on both power system reliability and risk to wildlife. The article by Beutel et al. presents a model developed to study the risks of bird electrocution on overhead power lines. The results show that only a few scenarios exist where birds may be at risk. The model can be a useful tool in formulating mitigation techniques for bird electrocutions.

The SAUPEC2018 Technical Committee comprising of Prof. Willie Cronje, Prof. Cuthbert Nyamupangedengu, Prof. Ken Nixon and Dr. Lesedi Masisi sincerely wish you an enjoyable engagement with this issue.

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C. Nyamupangedengu was born in Zimbabwe. He received his bachelor's degree with honours in electrical engineering from the University of Zimbabwe in 1994. He received his MSc (with distinction) and PhD at the University of the Witwatersrand in 2004 and 2011 respectively. His early work experience includes being an engineer at Zimbabwe Electricity Supply in power system planning and development. He is currently an Associate Professor of High Voltage Engineering at the University of the Witwatersrand. His passion and expertise is in the research on the diagnosis of high voltage insulation. He served as Cigre SC D1 (Materials and emerging test techniques) representative of Cigre Southern Africa. He is an active member of Cigre WG D1-50 (Atmospheric and altitude correction factors for air gaps and clean insulators) and D1-61 (Optical corona detection and measurement).