

Theme 1: Smart Grid & Advanced Power Electronics

The exploitation of renewable energy resources, the advancement of grid systems and the deployment of energy efficient technologies are urgently needed to mitigate impacts of climate change. This session articulates research, development, deployment and demonstration (RD³) of advanced power electronics hardware, firmware and software solutions to achieve the reliable smart grid system integration of renewables. These include converters and inverters using the latest power devices, high frequency applications, enhanced power density and topologies coupled with Information & Communication Technologies (ICT).

Energy Management System (EMS) which is dedicated to the operation and control optimisation of grids where the effective integration of renewable sources such as photovoltaic (PV) and wind with energy storage system is one of the focus areas. The integration of energy storage solutions is key to mitigating intermittency associated to grid instability. Distributed energy resource management system (DERMS) provides an enhance grid reliability at distribution level. Cyber physical system and blockchain technologies forms an integral part to enhance the security of smart grid.

Theme 2: Solid State Transformers (SST)

Solid state transformers have the potential to radically redesign the way utility power is distributed and utilized. In future, being a main component of energy grid, they will be enabler that directs power from any distributed generation source to any destination load point via the most efficient means. Advanced modelling methods and control implementation are critical in order to not only efficiently control the SST but also to enable higher functionalities such as reactive compensation, energy routing, interconnection with renewables and energy storage and management and control of overall system power. In cognizant with this, is the requirement and challenge to maintain reliability, adhering to existing to international standards and also, foresee potential standard requirements in such a consolidated but distributed energy generation and consumption environment. Silicon carbide has made leaps and strides in its capability to be adopted as an industrial high voltage and high power device offering to the user extensive benefits both in terms of reduced losses and in terms of operation under high temperature. In similar vein, another WBG device GaN is closely following behind in its capacity to enable operation in the Megahertz range of switching frequency. Coupled with the smartness of energy systems, it is more relevant now than ever, that the internet of energy and control is free from cyberattacks and secure in its delivery of power to the customer.

Theme 3: Microgrids

The pace of enabling electricity access in the Southeast Asia has risen remarkably in the past few years. According to IEA-World Energy Outlook 2018, the rate of access in Southeast Asia has exceeded 90%. This was possible with the advancement in micro-grid technologies and the pro-electrification policy pushed by the governments. The strong development trend has thus presented opportunities for researchers and industries to connect these independent off-grid micro-grids into higher reliable electrification systems in this region.

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The Renewable Energy Integration Demonstrator - Singapore ("REIDS") was initiated in 2014 to foster technology development and demonstration with industrial players in the renewable energy and micro-grid space. REIDS began with a modest aim to test and demonstrate integration of broad range of renewable energy generators, energy storage system and rational energy end-use technologies at a respectable scale, a largest in the tropics for hybrid micro-grid system. REIDS has since evolved into developing codes and technologies for multiple micro-grid systems to interoperate among themselves while at the same time sustaining a highly reliable, secured and resilient system against common threats faced by micro-grid operators and end-users.

This session will present the works performed by the researchers and industry partners working in the micro-grid and renewables in the tropics.