KINGS COLLEGE OF ENGINEERING
Recognised under 2(f) & 12(B) of UGC
Approved by AICTE, New Delhi.
Affiliated to Anna University, Chennai.

ISTE STAFF CHAPTER (TN 205)
ACADEMIC YEAR 2023-24(ODD SEMESTER)

Staff Seminar Report

A one day seminar titled "**Introduction to Hybrid AC/DC Micro-grid"** was organized by ISTE Staff Chapter [TN 205] on **9.11.2023** from 3.00p.m. to 3.45p.m. to the faculty members of Kings College of Engineering with an objective to offer a better understanding of AC/DC Microgrid. Welcome address was delivered by **Mrs.T. Gnanajeya**, Coordinator / ISTE Chapter. The session was handled by the resource person **Dr.S. Vasantharaj,** Assistant Professor / Department of Electrical and Electronics Engineering**.**

Today, conventional power systems are evolving to modern smart grids, where interconnected microgrids may dominate the distribution system with high penetration of renewable energy and energy storage systems. The hybrid AC/DC systems with DC and AC sources/loads are considered to be the most possible future distribution or even transmission structures. For such hybrid AC/DC microgrids, power management strategies are one of the most critical operation aspects. This seminar presents an overview of power management strategies for a hybrid AC/DC microgrid system, which includes different system structures (AC-coupled, DC-coupled, and ACDC-coupled hybrid microgrids), different operation modes, a thorough study of various power management and control schemes in both steady state and transient conditions, and examples of power management and control strategies. Finally, discussion and recommendations of power management strategies for the further research are presented.

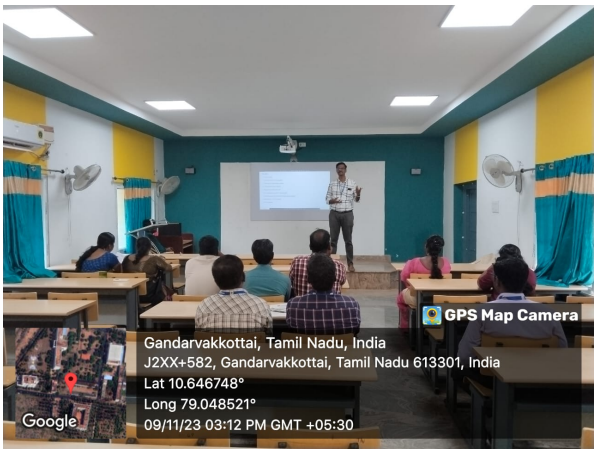
Smartgrids are being developed as the next generation power systems. These smart grids encompass interconnected microgrids, especially at the distribution level where distributed generations (DGs) are increasingly used. The DG technologies can be classified into power generation from renewable energy (RE) resources such as wind, photovoltaic, micro hydro, biomass, geothermal, ocean wave and tides, the clean alternative energy (AE) generation technologies such as fuel cells and micro-turbines, as well as the traditional rotational machine based technologies such as diesel generators. Due to several benefits of these sources such as cleanness and simple technologies, compounded with increasing demands for electrical energy and the exhaustible nature of fossil fuels, the RE and AE-based DGs play an important role in microgrids. The microgrids can work in grid-connected or stand-alone operation modes. Particularly the stand-alone operation, although may only for very limited period, can provide improved reliability to the smart grids. Some other systems, such as electric vehicles can be

considered as always operating in stand-alone mode. Due to the intermittent nature of renewable energy resources, other energy sources (such as diesel) and storage elements (SEs) are critical part to enable the stand-alone operation of microgrids or to smooth the microgrid power during grid connected operation. SEs can be classified into two categories: capacity-oriented energy storage and access-oriented energy storage. Capacity-oriented energy storage does not have fast response time and they are used for long-term energy balancing to buffer out low frequency power oscillation of DGs output power and compensate intermittency of renewable energy sources in microgrids. Batteries, pumped hydroelectric systems, compressed air energy storage (CAES), and hydrogen storage are types of capacity-oriented energy storage. Access-oriented storage devices have fast response time and they are responsible for short time disturbances in microgrids, by providing the high-frequency component of power. They can supply or absorb the high-power transients with high power density. Flywheels, super-capacitors, and superconducting magnetic energy storage (SMES) are considered as access oriented storage devices. Due to the presence of DC power sources in microgrids such as PV, fuel cell, and energy storages, and modern DC loads, and considering the existing century-long AC power systems, interests on hybrid AC/DC microgrids are growing rapidly. These hybrid AC/DC microgrids contain AC/DC loads and power sources, have advantages of both AC and DC power systems, and are considered to be the most possible future distribution and transmission systems. One critical aspect of the operation of such a hybrid AC/DC microgrid is the control strategy and power management scheme, which are essential for providing sound operation in both grid-connected and stand-alone operation modes. Factors like fuel costs, capital costs, maintenance costs, mission profiles, lifetimes, etc. are considered in energy management algorithms. In general, the energy management strategies include hourly prediction of renewable energy sources, management of controllable loads, providing appropriate level of power reserve capacity, etc.

On the other hand, the objective of short-term power management strategy is to affect the instantaneous operational conditions towards certain desired parameters such as voltage, current, power and frequency. The power management strategies include voltage and frequency regulations, and real-time power dispatching among different power sources in microgrids. As the short term power management is more relevant to the interface and control of power converters in the microgrid and is therefore the focus of this paper. While the control strategies and power management schemes for the traditional AC microgrid or DC microgrid are well understood with active research in recent years, the operation and power management of a hybrid AC/DC microgrid system has not been well studied so far. This

seminar presents an overview of control strategies and power management schemes for hybrid AC/DC microgrid. First, different hybrid AC/DC microgrid structures are discussed, including real world implement examples. Then, the control strategies and power management schemes of different types of hybrid AC/DC microgrid under different operation conditions are discussed. A few representative implementation examples of control strategies are also presented. Finally, recommendations for the future research on the control and power management of hybrid AC/DC microgrid are provided.

Totally 17 faculty members actively participated in this session and gained knowledge about AC/DC Microgrid. Vote of thanks was given by Mrs.T. Gnanajeya, Coordinator / ISTE Chapter.

	
Resource Person's Talk	***Audience listening the seminar***

10/11/23

Coordinator / ISTE Chapter

10/11/2023

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The ISTE Staff Chapter, Kings College of Engineering, organized a competition on **Mono Acting** on **9.11.2023** between 3.45pm and 4.20pm for the faculty members of the institution.

Prize Winners

POSITION	STAFF NAME WITH DESIGNATION
1	Dr.G. Suganya, AP/EEE Mrs.P. Thirumagal, AP/EEE
2	Mr.V. Aravind, AP/MECH Mr.K. Rajesh Kumar, AP/MECH

Staff members actively participating in Mono Acting Competition

10/11/23
Coordinator / ISTE Chapter

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