

Day 1 – 17.02.2020 - "RESEARCH PERSPECTIVES ON POWER CONVERTERS, CONTROLS AND HYBRID GRID INTEGRATION OF RENEWABLE ENERGY SOURCES" 17th Feb – 28th Feb 2020



(17.02.2020 to 28.02.2020) AICTE sponsored Faculty development program on **Research Perspectives on Power Converters, Controls and Hybrid Grid Integration of Renewable Energy Sources** was inaugurated on 17.02.2020. Dr.S.Ramkumar, HoD/EEE, New Horizon College of Engineering welcomed the participants and guests. He also emphasized the importance of Power Converters, Controls and Hybrid Grid Integration of Renewable Energy integration of Electrical Grid.



In his presidential address, Dr.Manjunatha, Principal, New Horizon College of Engineering emphasized the need for change in mindsets of the faculty members to learn new technologies in order to improve learning levels of students effectively in class room. He mentioned that attending the program like this is essential for the faculty members to understand the needs of industry and implement the strategies in teaching learning process. Further, he mentioned that this topic is emerging in the field of Electrical Engineering.



In his special address, Dr.C.S.R.Prashanth, Dean(Academics) mentioned the statistics of generation of renewable energy sources in India. He emphasized the importance of such sources keeping in mind the demand for power due to employing electric vehicles and other gadgets which require abundant electric power. He highlighted that there is lot of scope for research in this domain. Hence, he emphasized that this topic is appropriate in the current context.



Mr.G.Gobalakichenan, Project Manager, IBM Bangalore delivered a key note address on the Role of IoT In Renewable Energy Resources Integration to Electricity Grid. He explained how the development has taken place in Renewable Energy Resources and their Integration to Electricity Grid with the development of Power Converters and Control techniques. Further, he emphasized the role of IoT in grid integration. He highlighted that there is a lot of scope/potential for growth in this area. Hence, he explained the need of the faculty members to motivate the students for carrying out useful projects based on IoT and Energy Integration.



Mr.V.Sunil Kumar, Managing Director, VI Solution mentioned that Virtual instrumentation is possible with the current technology and data acquisition features. He came forward to help the faculty members pursuing any research on this emerging area by providing technical and infrastructural support and invited them for visiting their organization as and when required. He highlighted the need of graphical design for providing engineering solutions to the societal problems. He emphasized the role of virtual instrumentation



Mr.V.Jeejesh Kumar, Hardware Engineer, VI Solution gave a Hands-on experience to the participants on Model Based Controller Tuning & Deployment in RIO Platform. He trained the participants with examples using LabVIEW. He emphasized on adaptive control strategies. He also explained about Smart Grid system in India. He emphasized on measurement techniques used in smart grid. He also highlighted the use of various power tools employed for effective control of various parameters in a smart grid system.



Mr.Rajkumar, Hardware Engineer, VI Solution **Hands on Industrial Internet of Things – Interconnecting Things, Cloud & Dashboard** For the Internet of Things, or any control system, the **dashboard** or **IoT dashboard** is the key HMI (Human-Machine Interface) component that organizes and presents digital information from our physical world into a simply understood display on a computer or mobile device. With the help of IoT Dashboards, users and operators can (remotely) monitor and control specific assets and processes, and depending on safety requirements, access and control an environment from anywhere in the world.



Artificial Intelligence for Test Systems – Machine Learning Algorithms

Mr. Gobalakichenan. G, Project Manager, IBM Bangalore. Artificial intelligence – simply put, is the opposite to the natural intelligence shown/exercised by humans and animals. It is the study of agents those who perceive the world around them, form plans, and make decisions to achieve their goals. Its foundations include mathematics, logic, probability, linguistics, neuroscience, decision theory and even philosophy. Many fields fall under the umbrella of AI, such as computer vision, robotics, machine learning, and natural language processing.



Power Converter Design for Green Energy using Electronic Design Automation Tool

Dr.Dharmalingam, RTD GM, BHEL, Trichy

Electrical power converter allows grid to easily accept **power** from **renewable energy**. ... Engineering researchers have invented a novel **electrical power converter** system that simultaneously accepts **power** from a variety of **energy** sources and converts it for use in the **electrical** grid system



Power Converter Design for Green Energy using Electronic Design Automation Tool

Dr.Dharmalingam, RTD GM, BHEL, Trichy.

Electronic design automation (EDA), also referred to as **electronic computer-aided design (ECAD)** is a category of software tools for designing electronic systems such as integrated circuits and printed circuit boards. The tools work together in a design flow that chip designers use to design and analyze entire semiconductor chips.



Real Time Power Converter Signal Generations using RIO Hardware Mr.Rajkumar, Hardware Engineer, VI Solution.

A hardware in the loop (HIL) simulation is the implementation of a system model in embedded hardware, which represents part of a real system. The main requirement of HIL simulation is that it has to be in real-time. HIL simulation plays a significant role in the development of technology for many applications, presenting advantages such as the short time to market for new products; low cost of prototyping;



Real Time Power Converter Signal Generations using RIO Hardware Mr.Rajkumar, Hardware Engineer, VI Solution

Many examples of the use of this technology can be found in the literature, including simulating power electronics converters the simulation of a Voltage Source Converter (VSC), used in a High Voltage Direct Current (HVDC) system for distributed generation and power quality regulation,



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Smart Grid Monitoring (SMT) and Control using Electrical Power Toolkit

Mr.Jeejesh Kumar V, Hardware Engineer, VI Solution

Smart grid technology is enabling the effective management and distribution of **renewable energy sources** such as **solar, wind,** and hydrogen. ... By leveraging the **Internet of Things (IoT)** to collect data on the **smart grid**, utilities are able to quickly detect and resolve service issues through continuous self-assessments. The smart grid also delivers significant environmental benefits by conservation and renewable generation integration.



Real Time Demo – cDAQ Power Quality Monitoring (Road-Map to PMU)

Mr.Jeejesh Kumar V, Hardware Engineer, VI Solution to help measure voltage, measure current, and measure power with computer based instrumentation. The following material will cover common sensors found in the market, measurement hardware from National Instruments for voltage and current measurement, and software packages for power calculations. Combine the sensors, NI hardware, and software products referenced in this paper to assemble a complete, custom test measurement and control system for voltage, current and power measurements.



Discussions – Academic, Research & ISO Certifications related to energy scenerio and Smart Grid Mr.Jeejesh Kumar V, Hardware Engineer, VI Solution

Environmental sustainability remains a big trend; topics such as climate change and global warming are generating a lot of discussion. Growing world energy demand from fossil fuels plays a key role in the upward trend in CO₂ emissions and is the main source of human-induced climate changes. While energy systems around the world remain at vastly different stages of development, all countries share a common problem: they are far away from achieving sustainable energy systems.



Industrial Visit to TuVRheinland, Bangalore

Mr. Prashanth
Sr. Testing Engineer
TUV Rheinland, Bangalore



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Role of IoT in Renewable Energy Resources – Integrated to Smart Grid Dr.S.Sujitha NHCE, Bangalore

In recent years, a number of U.S. states have adopted or are considering smart grid related laws, regulations, and voluntary or mandatory requirements. At the same time, the number of smart grid pilot projects has been increasing rapidly. Recent activity includes the deployment of smart meters, distribution automation and demand response (DR) programs.



Importance and Recent Challenges on Renewable energy Integration Applications

This increased activity is supported by the disbursement of almost \$4.5 billion of American Recovery and Reinvestment Act funding targeted specifically to smart grid initiatives. Federal mandates are promoting smart grid projects, specifically Energy Independence and Security Act of 2007, Title XIII, which establishes a national policy for grid modernization and provides incentives for stakeholders to invest in smart grid initiatives.

Concept of Smart Grid in Renewable Energy Systems



Dr. K. Vijayakumar, Professor, IIITDM, Kanchepuram

With energy being a premium resource, ensuring security against theft, abuse, and malicious activities in a **smart grid** is of prime concern. The **challenges** of ensuring cybersecurity in a **smart grid** are diverse in nature due to the diversity of the components and the contexts where **smart grids** are deployed. Smart grid technology is the key for an efficient use of distributed energy resources. Noting the climate change becomes an important issue the whole world is currently facing the ever increasing price of petroleum products and the reduction in cost of renewable energy power systems

Smart Metering Technology & Policy and Regulation on Smart Grid



Dr. C. Ganesh NHCE, Bangalore

Smart grid (SG) is emerging as a new facet of power industry. It incorporates numerous advanced technologies to deal issues prevailing with conventional electric networks. Though capable to resolve many of these issues, SG is still facing challenges in deployment. These challenges are associated with adaption of emerging technologies, socio-economic issues, lack of policies and awareness.

Role of IoT and Smart Grid on Demand Side Management



Dr.A.Singaravelan NHCE, Bangalore

Demand side management techniques found in literature are reviewed and a novel electricity demand control technique using real-time pricing is proposed. Currently users have no means to change their power consumption to benefit the whole system. The proposed method consists of modern system identification and control that would enable user side load control. This would potentially balance demand side with supply side more effectively and would also reduce peak demand and make the whole system more efficient.

Challenges implementing Smart Grid Technology



Dr.K.Vinoth Kumar, Research Director, ABB Solutions, Chennai

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Challenges implementing Smart Grid Technology

Dr.K.Vinoth Kumar,,Research Director,ABB Solutions, Chennai

Smart grid technology is the key for an efficient use of distributed energy resources. Noting the climate change becomes an important issue the whole world is currently facing, the ever increasing price of petroleum products and the reduction in cost of renewable energy power systems, opportunities for renewable energy systems to address electricity generation seems to be increasing. However, to achieve commercialization and widespread use, an efficient energy management strategy of system needs to be addressed.



Challenges implementing Smart Grid Technology

Dr.K.Vinoth Kumar,,Research Director,ABB Solutions, Chennai

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**Industrial Visit to Festo Didactic, Bangalore
(Development for manufacturing and process automation)
Mr.Shameer Khan Sr. Engineer Festo Didactic, Bangalore**

Government of India (GoI) has initiated nationwide deployment of SG projects, the objective of this paper is to identify challenges and issues in SG implementation. In such situation, it is primarily essential to identify and discuss the barriers to overcome deployment concerns,



**Industrial Visit to Festo Didactic, Bangalore
(Development for manufacturing and process automation)**

**Mr.Shameer Khan
Sr. Engineer
Festo Didactic, Bangalore**



Cyber Security for Smart Grid

Dr. Yuvaraja Professor Anna Univeristy, Coimbatore

Cyber-Security in Smart Grid: Survey and Challenges. **Smart grid** uses the power of information technology to intelligently deliver energy to customers by using a two-way communication, and wisely meet the environmental requirements by facilitating the integration of green technologies.



Cyber Security for Smart Grid

Dr. Yuvaraja Professor Anna Univeristy, Coimbatore

Smart Grid being the vital national infrastructure, **smart grid cyber security** should not only address potential threats from disgruntled employees, terrorists, and espionage operations but also should take care of vulnerabilities arising from user errors, equipment failures, and natural disasters.



Role of Power Converters on Distribution Generation

Mr. K.Prabhu CDAC, Chennai

Power converters allow connection of independent equipment and components on a common system. **Distributed generation** technologies require specific **converters** and **power** electronic interfaces that are used to convert the generated energy to suitable **power** types directly supplied to a grid or to consumers



Role of Power Converters on Distribution Generation

Mr. K.Prabhu CDAC, Chennai

Power electronics technology has become the enabling technology for the integration of distributed power generation systems (DPGS) such as offshore wind turbine power systems and commercial photovoltaic power plants. Depending on the applications, a vast array of DPGS-based power converter topologies has been developed and more are coming into the market in order to achieve an efficient and reliable power conversion from the renewables



Research Perspectives on Power Converters of Renewable Energy Sources

Dr. Karthikeyan, Professor, National Institute of Technology, Suratkal

The rapid economic development is causing huge stresses in the existing generation, transmission and distribution systems as they are not able to keep pace with the increasing demand. Installation and incorporation of a large number of electrical power generation units with increased capacities to deal with the surging demand has an adverse impact on the environment therefore an efficient Energy Management is imperative..



Research Perspectives on Power Converters of Renewable Energy Sources

Dr. Karthikeyan, Professor, National Institute of Technology, Suratkal

Conventional instrumentation has proven inadequate for the purpose of managing the extensive and complex power systems. The electric grid to increase overall system efficiency and reliability. Much of the technology currently in use by the grid is outdated and in many cases unreliable The smart grid implements a two way communications and also facilitate the two way flow of energy.



Research Perspectives on Controls and Hybrid Integration of Renewable Energy Sources

Dr.S.Sujitha NHCE, Bangalore The Smart Energy Management System is developed with ability to record, store, and process power consumption data of every major appliance in the house and Industries. The power consumption data is accessible through the Web portal and on handheld devices. Homeowners and Industries can track their power usage by device, room, equipment, Plant or appliance, which helps better regulate power consumption



Importance and Recent Challenges on Power Converter for Power systems Applications

Dr. S. Ramkumar, NHCE, Bangalore

Facing the **Challenges** of the Current **Energy** Scenario: The **Power** Electronics Contribution. The current **energy** scenario has introduced several **challenges** to be solved such as the integration of clean **energy** generation and the use of efficient high-**power** and **energy** storage **systems**.



IoT and Energy Management in Smart Grid

Mr. Gobalakichenan. G, Project Manager, IBM Bangalore

The **Smart Grid** is part of an **IoT** framework, which can be used to remotely monitor and manage everything from lighting, traffic signs, traffic congestion, parking spaces, road warnings, and early detection of things like power influxes as the result of earthquakes and extreme weather



IoT and Energy Management in Smart Grid

Mr. Gobalakichenan. G, Project Manager, IBM Bangalore

Smart energy management is a way to understand **smart energy** and how the systems work most efficiently. Some **smart energy** systems are basic like **energy** saving air conditioners or using **smart** appliances. The **Smart Grid** is an automated, widely distributed energy delivery network characterized by a two-way flow of electricity and information, capable of monitoring and responding to changes in everything from power plants to customer preferences to individual appliances.



Solar PV Testing Methods and Technologies

Mr. Prashanth, Sr. Testing Engineer, TUV Rheinland, Bangalore

The ultra-high **efficiency** material called a tandem perovskite **solar cell** is being developed to help solve the world energy crisis. The most affordable, efficient way to harness the cleanest, most abundant renewable energy source in the world is one step closer to reality. To test solar panel voltage output, put your solar panel in direct sunlight, set your multi-meter to the "volts" setting and... ..To test solar panel amperage output, put your solar panel in direct sunlight, set your multi-meter to the "amps" setting and... ..



Solar PV Testing Methods and Technologies

Mr. Prashanth, Sr. Testing Engineer, TUV Rheinland, Bangalore

Photovoltaic Testers - try the Z200 **PV** Analyzer Faults in **PV** systems makes **testing** and certificating costly. Therefore EmaZys has developed an industry leading **technology**, which includes automatic fault finding in the **testing** **procedure**. The study considers five different **PV (Photovoltaic) technologies** (Mono, Multi, a-Si, CdTe, CIGS) based on their electrical parameters. It is observed that CIGS