ISO 9001:2008 CERTIFIED

PROCEEDINGS

NCPEES - 2022

NATIONAL CONFERENCE ON POWER ELECTRONICS & ENERGY SYSTEMS

23 -24 Sept., 2022

Organised by

Department of Electrical Engineering

(In association with ISTE, New Delhi)

GANDHI INSTITUTE FOR EDUCATION & TECHNOLOGY

WWW.GIETBBSR.COM

PROCEEDINGS

National Conference on Power Electronics & Energy Systems

NCPEES-2022

23 -24 September, 2022

Department of Electrical Engineering
(In association with ISTE, New Delhi)

Gandhi Institute for Education &Technology
Baniatangi, Bhubaneswar, Odisha, www.gietbbsr.com

NATIONAL CONFERENCE ON POWER ELECTRONICS & ENERGY SYSTEMS

(NCPEES-2022)

September 23-24, 2022

Editor:
Prof. Sushil Kumar Pati

Executive Editor:
Prof. Anshuman Bhuyan
Prof. (Dr.) Akshay Kumar Singh

Published by : **Gandhi Institute for Education & Technology**
Baniatangi, Bhubaneswar-752060
Ph. : 06755 243601 - 604,
e-mail : gietbbsr@aol.com, info@gietbbsr.com
Website : www.gietbbsr.com

ORGANISING COMMITTEE

Patrons

Dr. Satya Prakash Panda, Chairman

Prof. Jyoti Prakash Mishra, Vice Chairman

Mentors

Prof. Snigdha Rani Panda, Secretary

Chairman

Prof. (Dr.) Jibanananda Jena, Principal

Vice-Chairman

Prof. (Dr.) Animesh Chhotray, Dean (Academics)

Convener

Prof. Sushil Kumar Pati, H.O.D, E.E. Dept.

Co-Convener

Prof. Anshuman Bhuyan, Asst. Prof, E.E. Dept.

ADVISORY COMMITTEE

Dr. Ashutosh Kumar Singh, Curtin Univ., Malaysia
Prof. T.K. Basu, Ex-Professor, IIT Kharagpur
Dr. P.K.Hota, Principal, CET, BBSR
Dr. Arabinda Routray, IIT, Kharapur
Dr. B.K.Panigrahi, IIT, New Delhi
Dr. A.K.Pradhan, IIT, Kharagpur
Dr. Sidhartha Panda, Prof. & Head, VSSUT, Burla
Dr. Ranjan Kumar Behera, IIT, Patna
Dr. Gayadhara Panda, IGIT Sarang
Prof. Bimal Kumar Saragi, President, ISTE, Odisha
Prof. Debani Prasad Mishra (EEE), IIIT, BBSR
Prof. (Dr.) Amitarani Das, HOD (ECE)
Prof. (Dr.) Gangadhar Purohit, HOD (BSH)
Prof. (Dr.) Sambit Kumar Mishra, HOD (CSE)
Prof. (Dr.) L.K. Sahoo, HOD (ME)
Prof. B.K. Panigrahi, HOD (CE)

WORKING COMMITTEE

Prof. (Dr.) Pradyumna Ku. Sahoo
Prof. Abinash Pany
Prof. Abhishek Mohanty
Prof. (Dr.) Smruti Ranjan Nayak
Prof. Subhasish Mohanty
Prof. Mitali Samal

MEMBERS

All faculties from Dept. of Electrical Engg., Electronics & Communication Engineering of Gandhi Institute for Education & Technology, Baniatangi, Bhubaneswar.

Chairman's Message

It gives me immense pleasure to know that the Department of Electrical & Electronics Engineering, Gandhi Institute for Education & Technology, Bhubaneswar is organizing a two days National Conference on "Power Electronics & Energy Systems (NCPPES-2022)" during 23 -24 Sept., 2022.

I hope this Conference is aimed to focus the modern trends in Power Electronics and Energy Systems and would provide a platform to discuss innovative ideas and technologies which will help in realization of integrated and advanced Technologies in Power Electronics & Energy Systems.

I am pleased to note that 40 Technical papers related to the theme of the Conference have been accepted for presentation and some for publication and a good number of experts from reputed Institutes like IIT Kharagapur, NIT-Warangal, NIT-Rourkela, AU Visakhapatanam, Osmania University, Hyderabad, VSSUT, Burla, BPUT, Bhubaneswar, etc. are going to deliver keynote lectures and invited talks. It is a very good platform for all concerned to hope that the delegates and participants will be highly benefitted from the deliberations of the Conference.

I congratulate the faculty members and students of Electrical Engineering Department for their keen interest and commitment in the organization of this Conference. I wish that this Conference would be a great success.

Dr. S. P. Panda
Chairman
G.I.E.T., Bhubaneswar

Vice-Chairman's Message

The National Conference "Power Electronics & Energy Systems (NCPPES-2022)" offers an energetic environment for the exchange of information with emphasis on new developments, services and applications by bringing together Researchers, Scientists, Professionals, Academicians, Corporate & Industry Professionals, Technically sound Students and Entrepreneurs from various organizations all over the Nation. This Conference aims at facilitating the participants to exhibit, exchange and confabulate their pioneering works on their appropriate topics of interest in Advanced Engineering Research in the field of Power Electronics. Prospective authors shall be able to present all aspects pertaining to their findings in the innovations and challenges in their area of research. The mission of "Power Electronics & Energy Systems (NCPPES-2022)" is to create a podium for blending the best minds from the academia with the vogue of the industry and market and to buoy the fervor for pristine wisdom and the diligence to accomplish it.

I wish the Conference a grand success.

Prof. J.P. Mishra
Vice-Chairman
G.I.E.T., Bhubaneswar

Principal's Message

Warm and happy greetings to all. I am immensely happy that EE Department of our Institute is organizing a National Conference on "Power Electronics & Energy Systems (NCPPES-2022)" during 23 - 24 Sept.,2022 and is going to present a collection of various technical papers in the Proceedings.

Under the able guidance of our management, GIET continues to march on the way of success with confidence. The sharp, clear sighted vision and precise decision making powers of our management has benefitted our Institute to stay competitive.

The dedicated HOD's and staff members and disciplined students of GIET are the added features of our Institute. The role of students in building the nation cannot be undermined and students at GIET are trained in all aspects to become successful engineers and good citizens. On this occasion I would like the students all the very best.

I also congratulate HOD, staff members, students of EE Department, delegates from our Institute and other colleges for their participation in this Conference and wish the Conference all success.

Prof. (Dr.) Jibanananda Jena
Principal
G.I.E.T., Bhubaneswar

HOD's Message

I am indeed happy to place on record that the Department of Electrical Engineering of Gandhi Institute for Education and Technology (GIET), Baniatangi, Bhubaneswar is organizing the National Conference on "Power Electronics & Energy Systems" with the association of Indian Society for Technical Education, New Delhi (ISTE) during 23 -24 September,2022.

I am sure, the congregation of intellectuals, Electrical Engineers from industries, academic Institutions and allied fields would ponder over the modern Technological developments in the areas of Power Electronics and Energy Systems.

The idea nascent in the young adult mind of students and the matured thinking of the learned should reflect in the forum of this National Conference at GIET, Bhubaneswar.

The Department of Electrical Engineering and my colleagues have indeed worked hard to the best of their abilities to make the Conference a grand success. Furthermore, the management also has extended the required encouragement and help in form of providing all resources.

Moreover, we also express our deep sense of gratitude to the Indian Society for Technical Education, Bhubaneswar for being associated with the conduct of this Conference.

Prof. S.K. Pati
Head of the Department
Dept. of Electrical Engg.
GIET, Bhubaneswar

ABOUT GIET, BHUBANESWAR

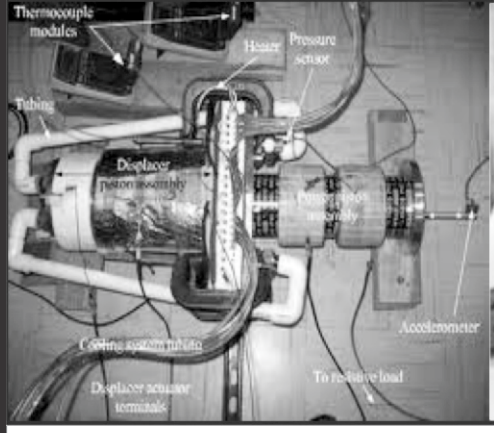
Gandhi Institute for Education and Technology (GIET) is situated in the City of Temples, Bhubaneswar. Established in the year 2009, with the approval of AICTE and affiliation from BPUT, the institute is committed to impart quality technical education. It has a mission to expand human knowledge and benefit the society through research integrated with education. It strives to investigate most challenging, fundamental problems in technology and science in a singularly collegial, interdisciplinary atmosphere, while educating students to become creatively contributing members of the society. Weekly tests are organized to check out the constant growth of learners, so that weak students can be identified and they can be improved. Extra classes are organized for average students. Personality Development Classes are organized for students to develop their professional life as well as personality which help them in building their career.

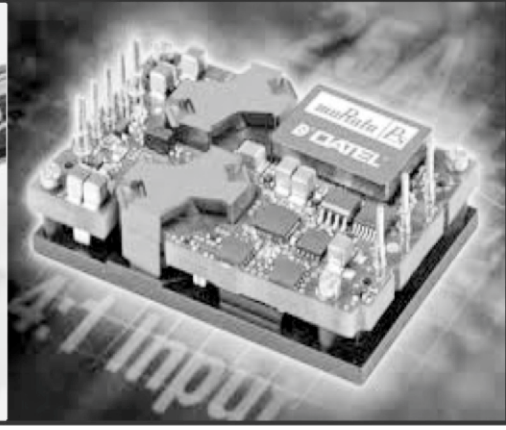
Thematic Solution with Practical Approach Special English spoken classes are organized for all students. It is mostly fruitful for those students who are weak in English. These classes make them able to grasp the ideas about engineering curriculum which is in English. The medium of instruction is English, but to make learning the easiest, we adopt BI-LINGUAL method, wherever it is necessary. Renowned Guest Faculties are invited to the Institute to put an ample light on various current issues of Engineering and Technology.

- **GIET : Best Engineering Institute in Eastern India 2011, 2012**
  - Dalal Street Journal, Mumbai

- **GIET : Amongst Top 10 : Emerging Institute in India 2012**
  - SILICON INDIA Magazine, Bangalore

DEPT. OF ELECTRICAL & ELECTRONICS ENGG.





The Department of ELECTRICAL AND ELECTRONICS ENGINEERING (EEE) has been established from the very inception of the Institute in 2009. Since its commencement, the primary objective of the Department has been to impart quality education, training and research at the undergraduate levels in various areas of Electrical and Electronics Engineering with broad emphasis on design aspects of electrical systems.

This programme aims at producing engineers with sound knowledge in electrical engineering and a strong background in electronics.

The faculty in the Department is a rich blend of personnel with industrial and professional experiences. The dedicated staff members have sound knowledge in emerging areas like embedded systems, power electronics applications in power systems, expert systems, etc.

The major areas of faculty expertise of the department include Biomedical Signal Processing, Communication Systems, Computer Networks, Control Systems, Digital Signal Processing, Image Processing & Computer Vision, Instrumentation, Multimedia Security, Power Electronics, Power Systems, Radar Signal Processing, RF and Microwaves, Speech Signal Processing, VLSI Systems and MEMS.

The EEE is an interdisciplinary branch of studies that naturally co-patterns with other disciplines to open a whole lot of new engineering avenues. Examples include Mecatronics with Mechanical Engineering, Bio-medical Sciences with Medicine and Avionics with Aeronautics. The EEE Department at GIET prepares students in this field using new age information and computer intensive technologies.

The Department pursues the academic programmes to achieve a balance between depth of knowledge acquired through specialization and breadth of knowledge gained through exploration. The Department provides a comprehensive foundation in the core topics of EEE coupled with an area of specialization relevant to emerging challenges.

The Department undertakes project works and consultancies from the industries in the infrastructural development under the dynamic involvement of a dedicated team of faculties. The Department is at par with any of the best in the country in giving industrial consultancies in the areas of power system and energy management.

Projects from leading industries in Odisha are also being handled by students under the guidance of our able staff members elevating the excellence in students.

Besides, value added courses like VLSI, Embedded Systems, Networking, Robotics, PLC, SCADA, etc. are being offered in addition to the regular academic programmes during every Semester.

CONTENTS

Sl #	Title	Author(s)	Page #
1	History and Development of Power Electronics Systems	Himanshu Shekhar Maharana and Pradyumna Kumar Sahoo	1
2	Some Practical Applications of Image Processing	Prakash Chandra Sahoo and Srinivas Mantha	2
3	Distributed Generations	Subhasish Mohanty	3
4	Modeling, Design Analysis and Simulation of Small Signal Control Strategies on a STATCOM for Reactive Power Compensation	Dhanurjaya Mahar	4
5	Design of a Gearless, Axial Flux Wind Power Generator	Sangate Pavan Kumar	5
6	Comparative Analysis of Different Optimization Techniques for Selective Harmonic Elimination of Cascaded Multilevel Inverter with equal DC Sources	Stita Prangna Mishra and Smruti Ranjan Nayak	6
7	Modeling, Design and Simulation of Current and Voltage Linear Controller of a STATCOM for Reactive Power Compensation	Mitali Samal	7
8	A Comparative study of Back-Propagation and RBF ANN Based Bearing Fault Detection of Induction Motor	Abinash Pany and , Anshuman Bhuyan	8
9	Modelling and Simulation of Induction Motor with Different Reference Frames	Srinivas Mantha	9
10	Energy Management in Power Sector Indian Prospective	Arul Kumar P	10
11	Power Quality Mitigation Using Dynamic Voltage Restoration (DVR)	Subhendu Shekhar Sahoo and Dhanurjaya Mahar	11
12	Ant Colony Search Based Minimum Losses Reconfiguration for Distribution Systems	Ajaya Kumar Swain	12
13	Intelligent Techniques for Optimization	Abhishek Mohanty and Satyajit Mohanty	13
14	Challenges of Implementing Smart Grids in India	Kommu Naveen	14
15	Hybrid Model of Linear Dynamic Systems using Eigen Spectrum Analysis	Sushil Kumar Pati and Smruti Ranjan Nayak	15
16	Modelling of Photovoltaic Cell Using Matlab/Simulink	Subhendu Shekhar Sahoo and Abhishek Mohanty	16
17	Enhancement of Power Quality by SVC with ANN and Fuzzy Logic Technique	Dhanurjaya Mahar and Akshay Kumar Singh	17
18	Electricity through Wireless Transmission Development and Possibility	Prakash Chandra Sahoo	18
19	High Voltage Direct Current Transmission Lines	Akshay Kumar Singh and Sushil Kumar Pati	19
20	Gas Insulated Substation	Abinash Pany	20
21	Flexible AC Transmission Systems (FACTS)	Dhanurjaya Mahar	21
22	Brushless DC Motor	Sushil Kumar Pati	22
23	Coordinated Design of PSS and TCSC using PSO Technique for Power System Stability Enhancement	Mitali Samal	23
24	Utilising Cutting Edge Power Electronics in Smart Grid Applications	Akshay Kumar Singh and Sushil Kumar Pati	24
25	Investigation on the function and use of cutting-edge power electronics in the development of smart grid	Himanshu Shekhar Maharana and Pradyumna Kumar Sahoo	25

CONTENTS

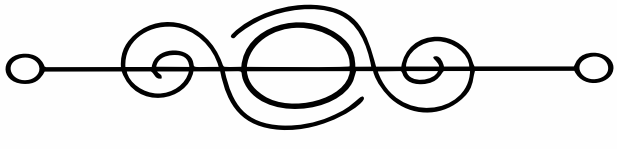
Sl #	Title	Author(s)	Page #
26	Advanced Interfaces for Power Electronics in Distributed Energy Systems	Abinash Pany and Anshuman Bhuyan	26
27	Control of smart grid power systems in distributed generation settings	Prakash Chandra Sahoo and Srinivas Mantha	27
28	Electronic Interfaces for Smart Grid Power	Arul Kumar P and Arabinda Pradhan	28
29	Electrical Power Systems for Dispersed Production	Rakesh Muthukuru and Subhasish Mohanty	29
30	An introduction to power electronics technology and its uses in the transmission and distribution of power	Subhendu Shekhar Sahoo and Dhanurjaya Mahar	30
31	Systems for Renewable Energy, Smart Grid, and Power Electronics	Sangate Pavan Kumar and Ajaya Kumar Swain	31
32	The Intelligent Power Grid: Present and Prospects	Stita Prangna Mishra and Smruti Ranjan Nayak	32
33	Smart Grid Management: An Overview	Abhishek Mohanty and Satyajit Mohanty	33
34	Control of smart grid power systems in distributed generation settings	Bijay Kumar Mohapatra and Kommu Naveen	34
35	An overview of power electronic systems as an essential component of the infrastructure of smart grids	Mitali Samal	35
36	In the Future Smart Microgrids, Advanced Control of Power Converters for Efficient Use of Distributed Energy Resources	Akshay Kumar Singh and Sushil Kumar Pati	36
37	Multi-frequency power system for smart grid integration of renewable energy sources	Himanshu Shekhar Maharana and Pradyumna Kumar Sahoo	37
38	Distributed Generation's Effects on the Smart Grid	Abinash Pany and Anshuman Bhuyan	38
39	An Intelligent Power Electronic Multi-Converter Designed for the Home	Prakash Chandra Sahoo and Srinivas Mantha	39
40	Grid modelling and simulation for a distributed generation system using renewable energy sources	Arul Kumar P and Arabinda Pradhan	40
41	Dispersed Generation's Impact on Electric Power Systems	Rakesh Muthukuru and Subhasish Mohanty	41
42	Examining the distributed Generation Idea: An Attempt at Unification	Subhendu Shekhar Sahoo and Dhanurjaya Mahar	42
43	Danish Electric Vehicle Charging Profiles for Planning and Design of Distribution Grids	Sangate Pavan Kumar and Ajaya Kumar Swain	43
44	An Examination of Scaling in a Multi-Energy System	Stita Prangna Mishra and Smruti Ranjan Nayak	44
45	Distributed generation with a significant proportion of renewable energy	Abhishek Mohanty and Satyajit Mohanty	45
46	Review of Integrated Renewable Energy Systems for Off-Grid Rural Applications	Bijay Kumar Mohapatra and Kommu Naveen	46
47	Modelling and performance evaluation of a microgrid coupled with a sustainable hydrogen energy storage system	Mitali Samal	47
48	Analysis of Integrated DC Microgrid System with PI Voltage Control Strategy	Sushil Kumar Pati and Smruti Ranjan Nayak	48

CONTENTS

Sl #	Title	Author(s)	Page #
49	Power Quality Improvement in a MicroGrid Integrated Hybrid Renewable Energy Source	Subhasish Mohanty and Satyajit Mohanty	49
50	Reconfiguration of Distribution System by Optimal Placement of Distributed Generator	Subhendu Shekhar Sahoo and Abhishek Mohanty	50
51	A holistic approach to a business case for smart grid technology	Dhanurjaya Mahar and Akshay Kumar Singh	51
52	Technological Developments in Distributed Generation	Arabinda Pradhan and Mitali Samal	52
53	An Innovative Cuckoo Optimisation Algorithm-Based Distributed Generation Planning in Distribution Network	Prakash Chandra Sahoo	53
54	Power control in distributed hybrid generation systems	Bijay Kumar Mohapatra	54
55	Current distributed generation situation in India: technologies, financial analysis, and problems with power quality	Subhasish Mohanty	55
56	Solutions for Distributed Generation and Alternatives for Distributed Generation	Anshuman Bhuyan	56
57	Genetic Algorithm-Based DG Distribution System Placement Optimisation	Subhendu Shekhar Sahoo	57
58	A Case Study on the Utilisation of Distributed Generation to Improve Distribution System Loadability	Abinash Pany	58
59	Problems with stability when varied distributed generation is present in a radial distribution network	Akshay Kumar Singh and Sushil Kumar Pati	59
60	Effect of Distributed Generation on Distribution Systems Losses and Voltage Profile	Abinash Pany and Anshuman Bhuyan	60
61	Grid-Connected and Independent Functioning of Dispersed Generation Modules Consolidated via Cascaded Boost Converters	Subhendu Shekhar Sahoo and Dhanurjaya Mahar	61
62	Regulation of Intelligent Distributed Generation Electricity Systems	Sushil Kumar Pati	62
63	Regarding the matter of evaluating distributed generation's effectiveness in low-voltage electric networks	Mitali Samal and Arabinda Pradhan	63
64	Including Electric Vehicle Charging and Discharging Strategies in Security-Constrained Optimal Power Flow to Promote High Renewable Penetration	Anshuman Bhuyan	64
65	A SVPWM for Multilevel Inverters to Remove Common-Mode Voltage	Arul Kumar P and Arabinda Pradhan	65
66	The configuration of circuits and systems for multilevel converters	Rakesh Muthukuru and Subhasish Mohanty	66
67	Power Electronics in Smart Systems	Mitali Samal and Anshuman Bhuyan	67
68	Using a Unified Power Quality Conditioner to Improve Power Quality in the Distribution System	Sangate Pavan Kumar and Ajaya Kumar Swain	68
69	Evaluation of Fuzzy Logic Controlled MPPT's Performance for Energy-Saving Solar Photovoltaic Systems	Akshay Kumar Singh	69
70	Utilising PID MPPT Controller for Incremental *Conductance* Algorithm-Based Photovoltaic Power Optimisation	Smruti Ranjan Nayak	70

CONTENTS

Sl #	Title	Author(s)	Page #
71	Power Electronics in Smart Grid and Renewable Energy Systems	Arabinda Pradhan and Ajaya Kumar Swain	71
72	Renewable Energy Systems and Smart Grids	Subhasish Mohanty and Subhendu Shekhar Sahoo	72
73	Regulation of Renewable Energy and Intelligent Systems	Anshuman Bhuyan and Ajaya Kumar Swain	73
74	A simple solution to reduce the amount of time that taps or capacitors change in distribution systems' reactive power control	Subhendu Shekhar Sahoo and Ajaya Kumar Swain	74
75	Distribution system reconfiguration with fuzzy multi-objective approach	Pradyumna Kumar Sahoo	75
76	Hybrid superconducting distribution system fault current limiter	Dhanurjaya Mahar and Akshay Kumar Singh	76
77	A novel multi-objective fuzzy-GA formulation for shunt FACTS controller placement and sizing optimisation	Abhishek Mohanty	77
78	Allocating capacitors and voltage regulators simultaneously at distribution networks with the use of genetic algorithms and optimal power flow	Sangate Pavan Kumar	78
79	Impact of wind farms equipped with ride-through frequency variations on power system frequency response	Akshay Kumar Singh and Himanshu Shekhar Maharana	79
80	Clustering-based node selection for optimal sizing in two stages of distributed generation	Himanshu Shekhar Maharana	80
81	Considering flexibility while planning a power system using renewable energy sources	Stita Prangna Mishra and Smruti Ranjan Nayak	81
82	A resilient control approach for a multi-bus microgrid connected to the grid in the event of imbalanced loads	Sangate Pavan Kumar and Mitali Samal	82
83	Energy storage systems: best use when combined with renewable energy sources	Rakesh Muthukuru and Stita Prangna Mishra	83
84	Using a dynamic voltage restorer to reduce voltage sag in an Indian distribution system	Abinash Pany and Dhanurjaya Mahar	84
85	Estimating the daily and peak profiles of substations in remote networks	Arul Kumar P and Anshuman Bhuyan	85
86	A precise piecewise approach for defect investigations in networked systems	Bijay Kumar Mohapatra and Kommu Naveen	86
87	System optimisation and simulation for renewable energy	Pradyumna Kumar Sahoo	87
88	Distributed reactive power production with Mult objective design in a deregulated electricity market	Rakesh Muthukuru	88



History and Development of Power Electronics Systems

Himanshu Shekhar Maharana,Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:hsmaharana@giet.edu.in

Pradyumna Kumar Sahoo, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email:pksahoo@giet.edu.in

Abstract: In the days of exponential growth of science and technology, the development of power electronics systems assumes a leading role in use, distribution and control of various energy resources including the renewable energies. Several electronic devices are being innovated for domestic as well as industrial requirements. The effective uses of all such devices depend significantly on how they are being designed and made use of. To this affect, power electronics acts as the smartest grid to harness them well. This paper deals with the history and development of power electronics systems in brief. The further growth and development of the subject are highlighted.

Some Practical Applications of Image Processing

Prakash Chandra Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:pcsahoo@giet.edu.in

Srinivas Mantha, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:smantha@giet.edu.in

Abstract: Modern digital technology has made it possible to manipulate multi-dimensional signals with systems that range from simple digital circuits to advanced parallel computers. As we all know, computer vision is the science and technology of machines that can see. As a scientific discipline, computer vision is concerned with the theory for building artificial systems that obtain information from images. The image data can take many forms, such as a video sequence, views from multiple cameras, or multi-dimensional data from a medical scanner. As a technology discipline, image processing is important to this and yes, it is beneficial. Image processing methods are extremely numerous and varied in terms of activities as in terms of size. To illustrate our statement, here is a non-exhaustive list of application domains: medical and biological purposes, security and surveillance, multimedia, photo and video, robotics, biometrics and remote sensing, etc. Moreover, in a situation of simultaneous existence of small and medium-sized businesses, including start-ups, many big companies can be easily identified by adoption of image processing technologies (like Philips, Canon, EADS, Thalès …). It is often seen that some great firms (for example, automobile or optical industries such as Renault, Essilor, etc.) also work with images for some of their products or services.

Distributed Generations

Subhasish Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering,Email:subhasishmohanty@giet.edu.in

Why Distributed Generations?

- Electric utility restructuring
- Public environmental policy
- Expanding power demand
- Small distributed generators are in great need tosatisfy on-site customer energy needs.
- Major improvements have been achieved throughdecades of intensive research

Obvious advantages

- Small-modular units
- Economic
- Operational
- Environmental
- Performance

DERs (Distributed Energy Resources)

- Micro-turbines
- Fuel Cells

Both of them are promising as they can operate onmultiple fuels with

- low emissions
- High efficiency
- High reliability

Micro-turbines

- Small
- Simple-cycle gas turbines
- Output (25 to 300KW)

Techniques incorporated into the larger machines to improve performance can be typically found in micro-turbines as well.

Techniques

- Recuperation
- Low NO_X technologies
- Potential use of advanced materials such asceramics for hot section parts

Types

- Single shaft
- Split shaft

Single-shaft

- High-speed single shaft unit with the compressor and turbine mounted on the same shaft as theelectrical alternator
- Speed: 50,000 to 120,000 rpm

Split-shaft

- Uses a power turbine rotating at 3600 rpm and a conventional generator connected via a gear box

Fuel Cell

- Produces power electrochemically by passing a hydrogen rich gas over an anode and air over a cathode & introducing an electrolyte in betweento enable exchange of ions
- The effectiveness is strongly dependent upon the electrolyte to create the chemical reactivity needed for ion transport

Features of Fuel Cells

- Efficiency: 35-60%
- Low to zero emissions
- Quiet operation
- High reliability due to limited number of moving parts

Types of Fuel Cells

- Polymer Electrolyte Fuel Cell (**PEFC**)
- Alkaline Fuel Cell (**AFC**)
- Phosphoric Acid Fuel Cell (**PAFC**)
- Molten Carbonate Fuel Cell (**MCFC**)
- Solid Oxide Fuel Cell (**SOFC**)

Developments of Fuel Cells

- PAFC:- Successfully commercialized, 200 KWPAFC first commercialized
- SOFC and MCFC are the second generation fuel cells (2002)
- PEFC:- still under development and testing phase

Modeling, Design Analysis and Simulation of SmallSignal Control Strategies on a STATCOM for Reactive Power Compensation

Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:dmahar@giet.edu.in

Abstract: The statcom (static synchronous compensator) is being increasingly popular in power system applications. in general, reactive power compensation for power factor and stability of the utility system can be improved. a simple dq transformation and steady state and transient analysis are achieved to characterize the open loop system. Two control schemes of the statcom are proposed without using independent dc voltage source. the small signal scheme controls the phase angle as well as modulation index of the switching pattern and with small perturbation of reference current (reactive current of load), the dc voltage nearly remains constant. the draou scheme controls only the phase angle. the two schemes provide fast response of the statcom compensation of the reactive power and becoming the stable of the system. the small signal control scheme is better than drauo scheme with respect to duration from transient to steady state operation of the statcm and voltage transient overshoot. all responses are obtained trough matlab simulink tool box.

Index Terms—STATCOM, small signal model, Jacobian matrix

Design of a Gearless, Axial Flux Wind Power Generator

Sangate Pavan Kumar, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:spkumar@giet.edu.in

Abstract: With rapid development of wind power technologies and significant growth of wind power capacity installed worldwide, various wind turbine concepts have been developed. The wind energy conversion system is demanded to be more cost-competitive, so that comparisons of different wind generator systems are necessary. The design aspects of an axial flux wind generator are described. A simple wind turbine is proposed to be developed with cost effective and technology effective methods, using materials like PVC tubes for blade design, Nylon shaft for Rotor assembly, an Axial flux excitation system that uses neodymium magnets in place of the regular rotor poles. Emf producing coils are proposed to be setup in the stator, for the same advantage as expected in a commercial alternator. The issue of gear box has been dispensed with in small power turbine design to further simplify the design.

Keywords Rotor assembly, Neodymium magnets, Charge controller, Wind direction sensor and Wind generator design.

Comparative Analysis of Different Optimization Techniques for Selective Harmonic Elimination of Cascaded Multilevel Inverter with equal DC Sources

Stita Prangna Mishra, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:spmishra@giet.edu.in

Smruti Ranjan Nayak, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:srnayak@giet.edu.in

Abstract: In this paper, elimination of lower order harmonics in a cascade multilevel inverter has been taken into account by using different optimization techniques. Each separate H-Bridge has been given equal dc sources. Switching anglesof each level of cascaded multilevel inverter has been optimized by solving non-linear transcendental equation.

Comparison of THD's has been made for different optimization techniques. Theoretical results are verified by simulation of a 7-level 3-phase cascade multilevel inverter. Experimental analysis has been shown for 5-level single phase cascade multilevel inverter. Results show that the proposed method effectively eliminates specific lower order harmonics, and the output voltage is resulted in low total harmonic distortion (THD).

Keywords

Multilevel inverter (MI), Newton Rapson Method (NRM), Mathematical Theory of Resultant, particle swarmoptimization (PSO), transcendental equations, selective harmonic elimination (SHE)

Modeling, Design and Simulation of Current andVoltage Linear Controller of a STATCOM for Reactive Power Compensation

Mitali Samal, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:msamal@giet.edu.in

Abstract: The STATCOM (STATic synchronous COMpensator) is a shunt connected voltage source converter using self-commutating device and can be effectively used for reactive power control. Its principle of operation is similar to that of a synchronous condenser. This paper describes the modeling of STATCOM along with design of current controller and voltage controller. The design of controllers for the converters can be realized in two ways. The first method is a non-linear realization, which results in simple control rules with faster dynamics. The second method is a linear method, which requires system modeling. The second approach is adopted and simulated waveforms are presented.

Index Terms-: Controller design, PI Controller, STATCOM,

A Comparative study of Back-Propagation and RBF ANN Based Bearing Fault Detection of Induction Motor

Abinash Pany, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:apany@giet.edu.in

Anshuman Bhuyan, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhuyan@giet.edu.in

Abstract: The paper investigates the effectiveness of different Artificial Neural Network structure like Feed Forward Back Propagation (FFBP) and Radial Basis Function (RBF) as a classifier for bearing faults detection in Induction Motor.

The steady state motor current with Park's Transformation has been used for discrimination of inner race and outer race bearing defects. The RBF neural networks shows very encouraging results for multi-class classification problems is hoped to set up a base for incipient fault detection of induction motor which will be simple, fast and overcome the limitations of traditional techniques.

Keywords— Induction Motor, Bearing Fault, Park's Transform, Back Propagation (FFBP), Radial BasisFunction (RBF).

Modelling and Simulation of Induction Motor withDifferent Reference Frames

Srinivas Mantha, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:smantha@ giet.edu.in

Abstract: In recent years the control of high-performance induction motor drives for general industry applications and production automation has received widespread research interests. Induction motor has varied modes of operation both under steady and dynamic states. Hence modelling of Induction motor is necessary. Here we have done 3 types of modelling. They are Synchronous frame of reference, Stator frame of reference, Rotor frame of reference. In all the three reference frames 3-phase parameters are converted to 2-phase parameters. In this project, MATLAB is used for simulation. It is been observed results like 2-phase stator currents, rotor currents, 3-phase stator currents, electric torque, mechanical speed, stator fluxes in all three reference frames.

Key Words- Induction motor, Parks' transformation, Rotor Frame of Reference, Stationary Frame of Reference, Stator Frame of Reference

Energy Management in Power SectorIndian Prospective

Arul Kumar P, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical and Computer Engineering, Email:arulkp@giet.edu.in

Abstract: The electricity industry in India continues to evolve due to regulatory changes and market forces. It has moved on from the vertically integrated system to open access market. Through overt public policy and an emergingindustry structure, the wholesale competitive marketplace has evolved. Regulatory changes are likely to be significant, particularly with regard to how the existing system and operated in the future. These ongoing changes in the structure and regulation of industry require changes in approach to resource planning. Given the potential for commodity markets (both natural gas and electric) to exhibit price swings, or volatility, alternative resources plans must be evaluated in terms of their exposure to this volatility, in addition to their long-run average costs. Furthermore, unpredictably in the future costs of new supply alternatives arising from fuel cost(primarily natural gas price) provides analysis leading to a comprehensive portfolio and strategy for supply acquisitions, transmission investments and demand side management along with the consideration of environmental issues. The purpose of IRP is to provide reliable, safe and least cost electric service to its customers. This paper pays emphasis on supply side management and its integrated resource planning.

Power Quality Mitigation Using DynamicVoltage Restoration (DVR)

Subhendu Shekhar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:sssahoo@giet.edu.in

Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:dmahar@giet.edu.in

Abstract: In present days Control of most of the industrial loads is mainly based on semiconductor devices, which causes such loads to be more sensitive against power system disturbances. Thus, the power quality problems have gained more interest recently. In this voltage sags and swells are vital power quality problems. Therefore, different solutions are examined to compensate these sags and swells to avoid production losses at sensitive loads. In this project Dynamic Voltage Restorer (DVR) is discussed for these problems. A sliding mode controller is designed and developed for single phase DVR by E. Rammohan Rao c. tal. [3] and an attempt is made to extended it to three phase DVR. Using sliding mode control to the DVR, additional sag/swell detection method is eliminated. This improves the dynamic response of the DVR and also DVR is able to compensate for any variation in source voltage. Usage of sliding mode control to DVR makes it multifunctional, such as compensation for voltage sag, swell, voltage flicker and voltage harmonics. The validation of sliding mode control is verified threw MATLAB/SIMULINK simulation results.

Keywords: Dynamic Voltage Restorer (DVR), voltage sag, swell, voltage flicker and voltage harmonics.

Ant Colony Search Based Minimum Losses Reconfigurationfor Distribution Systems

Ajaya Kumar Swain, Gandhi Institute for Education and Technology, Baniatangi,
Department of Electrical Engineering, Email: akswain@giet.edu.in

Abstract: According to the power system balancing equation the power generation can't reaches the load demand. So the only one choice for balancing that equation to reduce the transmission line losses by using different methods. This paper presents new application of the Ant Colony Search method to the minimum losses reconfiguration of distribution systems. The optimization problem is formulated by taking into account the operational constraints of the distribution systems. The results of the proposed approach are obtained from heuristic methods (iterative improvement, Tabu search and simulated annealing) and Dijkastra's algorithm on a single N-feeder distribution test system.

Intelligent Techniques for Optimization

Abhishek Mohanty, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhishekmohanty@giet.edu.in

Satyajit Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:smohanty@giet.edu.in

Abstract: Optimization techniques form an important part in many of the power system studies. They are used in planning operation and control, both in on-line and off line applications. Conventional optimization methods have been widely used and exploited. However they are associated with several drawbacks like for instance they are either time consuming or do not provide an optimal solution. New optimization techniques have been used which overcome the limitations of the conventional methods. These methods are termed 'intelligent' as they use heuristics to guide the search and arrive at an optimum solution. The theory of intelligent optimization techniques, namely, Evolutionary programming, Genetic Algorithms, Particle Swarm Optimization, Ant Colony Optimization and Fuzzy systems are introduced. Applications and case studies to Economic Dispatch and Optimal Power Flow are described and results presented.

Keywords: Optimization, Heuristics, Search Strategies, Population, Artificial Intelligence (AI), power systems, economic dispatch, optimal power flow.

Challenges of Implementing Smart Grids in India

Kommu Naveen, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:knaveen@giet.edu.in

Abstract: Smart Grids will play a vital role to help utilities in accomplishing this mission. So, the utilities will need to invest heavily in new hardware, software, business process development, and staff training. Further there would be high investment in home area networks and smart appliances by the customers. Achieving the broader view of Smart Grid will require complex task prioritization and right set of policies and regulations to be in place. Justifying its implementation however requires a full understanding of the long term benefits it would bring to the customers, utilities, societies in terms of minimizing the cost, fewer blackouts and improved customer service. In addition to these benefits it would play important role in addressing global issues like energy security and climate change.

Hybrid Model of Linear Dynamic Systems usingEigen Spectrum Analysis

Sushil Kumar Pati, Gandhi Institute for Education and Technology, Baniatangi,Departmentof Electrical Engineering, Email: skpati@giet.edu.in

Smruti Ranjan Nayak, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:srnayak@giet.edu.in

Abstract: This paper suggest a model reduction procedure for higher order continuous time systems. The proposed reduction method generates the reduced order denominator of model by using Eigen Spectrum analysis, where as the reduced order numerator polynomial is obtained by using Formal Approach analysis. This proposed method is used for the stability analysis and the design of the compensator for the higher order continuous tine systems.

Keywords- Eigen Spectrum analysis- Formal Approach analysis- Pole centroid- Tuning- PID Controller.

Modelling of Photovoltaic Cell Using Matlab/Simulink

Subhendu Shekhar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:sssahoo@giet.edu.in

Abhishek Mohanty, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: abhishekmohanty@giet.edu.in

Abstract: This paper presents the implementation of a generalized photovoltaic model using Matlab/Simulink software package, which can be representative of PV cell, module, and array for easy use on simulation platform. The proposed model is designed with a user-friendly icon and a dialog box like Simulink block libraries. This makes the generalized PV model easily simulated and analyzed in conjunction with power electronics for a maximum power point tracker. Taking the effect of sunlight irradiance and cell temperature into consideration, the output current and power characteristics of PV model are simulated and optimized using the proposed model. This enables the dynamics of PV power system to be easily simulated, analyzed, and optimized.

Keywords- Generalized model, photovoltaic module, Matlab / Simulink.

Enhancement of Power Quality by SVC with ANNand Fuzzy Logic Technique

Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:dmahar@giet.edu.in

Akshay Kumar Singh, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: sakshay@giet.edu.in

Abstract: Electrical distribution system suffers from various problems like reactive power burden, unbalanced loading, voltage regulation and harmonic distortion. Though DSTATCOMS are ideal solutions for such systems, they are not popular because of the cost and complexity of control involved. In this paper, Static Var Compensators (SVCs) remain ideal choice for such loads in practice due to low cost and simple control strategy. These SVCs, while correcting power factor, inject harmonics into the lines causing serious concerns about quality of the distribution line supplies at PCC. This paper proposes to minimize the harmonics injected into the distribution systems by the operation of TSC-TCR type SVC used in conjunction with fast changing loads at LV distribution level. Fuzzy logic system and ANN is used to solve this nonlinear problem, giving optimum triggering delay angles used to trigger switches in TCR. The scheme with Artificial Neural Network (ANN) and Fuzzy logic is attractive and can be used at distribution level where load harmonics are within limits. This project sets the quality of power that is to be provided at the point of common coupling (PCC). The interface between sources and loads is described as the point of common coupling; and observance of the design goals will minimize total harmonic distortion in the power system considered.

KeyWords:

Static Var Compensators(SVC), Artificial Neural Network (ANN), Fuzzy logic technique

Electricity through Wireless TransmissionDevelopment and Possibility

Prakash Chandra Sahoo, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:pcsahoo@giet.edu.in

Abstract: In the present paper the various technologies available so far for wireless transmission of electricity and the need for a Wireless System of Energy Transmission is being discussed to find its possibility in actual practices, their advantages, disadvantages and economical consideration. This paper is mainly concentrated on : i) The most popularconcept known as Tesla Theory, ii) The microwave power transmission (MPT) called Solar power satellite, and iii) The highly efficient fiber lasers for wireless power transmission. Many concepts, research papers, patents are available on wireless transmission of electricity but the commercial technologies are yet to be materialized. The paper also discusses the possible ways to get useful and practical results out of all research carried out so far elsewhere.

High Voltage Direct Current Transmission Lines

Akshay Kumar Singh, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: sakshay@giet.edu.in

Sushil Kumar Pati, Gandhi Institute for Education and Technology, Baniatangi,Department ofElectrical Engineering, Email: skpati@giet.edu.in

Abstract: Rapid developments in the field of power electronic devices with turn off capability like insulated gate bipolar transistors (IGBT) and gate turn off transistors (GTO), makes the voltage source converters (VSC) getting more and more attractive for High voltage direct current transmission (HVDC).This new innovative technology provides substantial technical and economical advantages for direct applications compared to conventional HVDC transmission systems based on thyristor technology. VSC Application for HVDC systems of high power rating (up to 200MW) which are currently in discussion for several projects are mentioned. The underlying technology of VSC based HVDC systems, its Characteristics and the working principle of VSC based HVDC system are also presented. This paper concludes with a brief set of guidelines for choosing VSC based HVDC systems in today's electricity system development.

Gas Insulated Substation

Abinash Pany, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:apany@giet.edu.in

Abstract: This paper presents about “Gas Insulated Substation”. Conventional substation requires large installation size, protection against atmospheric pollution and moisture, noiseless operation, non-explosive frame resistant, reduced maintenance, minimum radio interference, and totally enclosed substation. Gas insulated substations are particularly suitable for underground construction beneath public buildings. Gas insulated substation mainly used for a power transmission system or a sub- station system, of which outgoing bus bar is shortened to reduce consumption of the outgoing bus bar Sulfur Hexafluoride. SF6 acts as insulation between live parts & the earthed metal closure. Gas insulated switchgear is used in industrial areas to fulfil high-energy demands by space saving design with a minimum of cost.

Flexible AC Transmission Systems(FACTS)

Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical andComputer Engineering, Email:dmahar@giet.edu.in

Abstract: This paper presents about “Flexible AC transmission Systems”. Every power industry requires their power transmission system to be highly stable with maximum thermal limits. Flexible ac transmission system is a new integrated concept based on power electronic switching converters and dynamic controllers to enhance the system utilization and power transfer capacity as well as the stability, security, reliability and power quality of ac system interconnections.

Brushless DC Motor

Sushil Kumar Pati, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: skpati@giet.edu.in

Abstract: Permanent magnet (PM) brushless DC motors (BLDCM) are generated by virtually inverting the stator and rotor of PM DC motors. These motors are actually fed by rectangular AC waveform. The advantage is the removal of brushes, leading to the elimination of many problems associated with brushes. Another advantage is the ability to produce a larger torque because of the rectangular interaction between current and flux. The Simulation is done by widely used MATLAB SIMULINK software.

Coordinated Design of PSS and TCSC using PSO Technique for Power System Stability Enhancement

Mitali Samal, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:msamal@giet.edu.in

Abstract: Power system stability improvement by coordinated design of a Power System Stabilizers (PSS) and a Thyristor Controlled Series Compensator (TCSC) controller is addressed in this paper. Particle Swarm Optimisation (PSO) technique is employed for optimization of the parameter-constrained nonlinear optimization problem implemented in a simulation environment. The proposed controllers are tested on a weakly connected power system. The eigenvalue analysis and simulation results show the effectiveness and robustness of proposed controllers to improve the stability performance of power system by efficient damping of low frequency oscillations under severe disturbance.

KEYWORDS: power system stability, PSS, TCSC, co-ordinated design, particle swarm optimization.

Utilising Cutting Edge Power Electronics in Smart GridApplications

Akshay Kumar Singh, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:sakshay@giet.edu.in

Sushil Kumar Pati,Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: skpati@giet.edu.in

Abstract: The smart grid is advancing towards digitalization, automation, and information in tandem with society's ongoing development in the electricity system. The utilisation of cutting-edge power electronics technology is crucial to the smart grid and may significantly increase both operating efficiency and safety. In order to better understand the use of advanced power electronics technology in smart grid development, this article first examines the need for power electronics technology in the development of smart grids.

Investigation on the function and use of cutting-edge power electronics in the development of smart grid

Himanshu Shekhar Maharana,Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:hsmaharana@giet.edu.in

Pradyumna Kumar Sahoo, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:pksahoo@giet.edu.in

Abstract: One of the main obstacles to a country's development from the perspective of social progress is the strength of its power structure. Many nations have made the development of their intelligent power systems primarily focused on intellectualization. The study of the smart grid with Indian features, the application of BESS, andthe BESS model will be the main topics of this research. By encouraging the use of cutting-edge power electronics in the identification and enhancement of our nation's smart grid, it will also hasten the development of an intelligent, digitalized, and information-rich power system.

Advanced Interfaces for Power Electronics in Distributed EnergySystems

Abinash Pany, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email:apany@giet.edu.in
Anshuman Bhuyan, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhuyan@giet.edu.in

Abstract: Power electronics (PE) constitute essential constituents of distributed energy (DE) and renewable energy systems. For the Smart Grid to be implemented successfully, electricity consumers must have access to the cutting-edge technology tools and data necessary to compete in the market. The secret to a successful Smart Grid deployment is creating intelligent, interoperable technology devices, including cutting-edge PE technology, that will enhance and speed up the utilisation of distributed energy resource (DER) systems.

Control of smart grid power systems in distributed generationsettings

Prakash Chandra Sahoo, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:pcsahoo@giet.edu.in Srinivas Mantha, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:smantha@giet.edu.in

Abstract: The general aspects of smart grids are covered in this paper, with a focus onsome distribution level features, such as the integration of active distribution management and distributed generation, the use of automated metre reading (AMR) systems in network management and power quality monitoring, the use of power electronics in the distribution of electricity,the use of plug-in vehicles in smart grids, and frequency-based load control as examples of interactive customer gateway.

Electronic Interfaces for Smart Grid Power

Arul Kumar P, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:arulkp@giet.edu.inArabinda Pradhan, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:arabindapradhan@giet.edu.in

Abstract: The global trend in power generation and distribution is shifting towards renewable and sustainable energy sources, which is driving the evolution of traditional grid architecture into "smart grids." By fusing cutting-edge information and communication technologies with established electrical engineering concepts, smart grids have the potential to revolutionise the energy sector. A smart grid is essentially a contemporary electric grid infrastructure that strives for optimal power generation, distribution, and consumption in order to improve grid sustainability,efficiency, and dependability.Power electronics, which provide effective control and conversion of electric power, are an essential part of smart grids. Power electronics are used in many different sectors of smart grids, including energy storage systems, electric vehicles, renewable energy systems, and customer-side energy management systems.

Electrical Power Systems for Dispersed Production

Rakesh Muthukuru, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:rmuthukuru@giet.edu.inSubhasish Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:subhasishmohanty@giet.edu.in

Abstract: Power electronics is the combination of technologies that efficiently convert electrical energy for appropriate use in a variety of applications through sophisticated controls of semiconductor devices. A collection of power sources, such as wind power, solar systems, fuel cells, small hydropower, and micro turbines, that can be put in different locations within the power system or left isolated, is known as distributed generation (DG), and it is primarily composed of renewable energy. For distributed generation (DG) to be integrated into the contemporary sustainable power system, which includes micro grids and smart grid structures, power converters are an essential technology. They permit appropriate adoption while also allowing DG units to take full advantage of their potential advantages in a multitude of configurations.

An introduction to power electronics technology and its uses in thetransmission and distribution of power

Subhendu Shekhar Sahoo, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:sssahoo@giet.edu.in Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:dmahar@giet.edu.in

Abstract: This study aims to accomplish three key goals. Firstly, let me give a brief summary of the current state of power electronics technology, which is a major player in the new smart grid paradigm and allows for near-instantaneous control of voltages and currents in every link in the power system chain as well as maximum power throughputs. Secondly, to act as a mediator between the power systems and the power electronic communities, given theirdivergent perspectives on the functions of these gadgets when linked to the power grid. Third, we will talk about how power electronics technology can help future de-carbonised power systems achieve their goals.

Systems for Renewable Energy, Smart Grid, and Power Electronics

Sangate Pavan Kumar, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:spkumar@giet.edu.in Ajaya Kumar Swain, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:akswain@giet.edu.in

Abstract: The paper is basically an introduction of power electronics and its applications with emphasis on renewable energy systems and smart grid. The advent of modern power electronics has brought tremendous impact on power systems,besides the usual industrial applications to improve productivity. Power electronics is possibly the most important element in modern smart grid and renewable energy systems. The discussion in the paper will include modern power semiconductordevices and applications of power electronics in energy saving, electric vehicles, renewable energy systems, and grid energy storage. Finally, the basic elements of smart grid will be reviewed.

The Intelligent Power Grid: Present and Prospects

Stita Prangna Mishra, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:spmishra@giet.edu.in
Smruti Ranjan Nayak, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:srnayak@giet.edu.in

Abstract: The Smart Grid, which is seen as the power grid of the future, creates a network of widely dispersed automated and roboticized energy supply by utilizing bidirectional flows of information and power. Power is essential to the advancement of society, the economy, and industry. The built-up simplification, particularly in industrial and agricultural operations, has caused the energy consumption in developed countries to risequickly. The contemporary power system is constantly under pressure from the production and use of energy. Energy management is a challenging task in this case due to the dynamic nature of the load, over which we have no control. Renewable or non- depleted energy resources are quite useful and effective in the current electric power system conditions.

Smart Grid Management: An Overview

Abhishek Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:abhishekmohanty@giet.edu.in Satyajit Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:smohanty@giet.edu.in

Abstract: The electrical power infrastructure has undergone constant evolution over the past 100 years, but the last 20 or so years have seen some incredible advancements. Grid complexity is increasing due to the need for a constant, round-the-clock electricity supply as well as changes in people's and countries' socioeconomic standing. Furthermore, switching to renewable energy has revealed a whole new set of problems. Such complicated supply and demand requirements cannot be met by the traditional grid management method. The current study takes a different approach to handling different smart grid modalities, modes of operation, and management. Demand side management in both home and non-home contexts,as well as ICT and cyber security issues, are all included in this study.

Control of smart grid power systems in distributed generation settings

Bijay Kumar Mohapatra, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:bkmohapatra@giet.edu.in Kommu Naveen, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical and Computer Engineering, Email:knaveen@giet.edu.in

Abstract: The general aspects of smart grids are covered in this paper, along with some features specific to the distribution level, like the integration of active distribution management and distributed generation, the use of automated metre reading (AMR) systems for network management and power quality monitoring, the use of power electronics in the distribution of electricity, the use of plug-in vehicles in smart grids, and frequency-based load control as examples of interactive customer gateways.

An overview of power electronic systems as an essential component of the infrastructure of smart grids

Mitali Samal, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:msamal@giet.edu.in

Abstract: This paper provides a pedagogical overview of the key concerns surrounding the application of power electronic systems in power engineering, taking into account the pressing necessity to upgrade current grids in the direction of intelligent networks. This article outlines the primary issues and circumstances related to the development of smart grids, as well as the placement and operation of the most significant power electronic systems within them. There, particular focus is placed on the possible applications of V2G and V2H technologies as well as so-called "smart" transformers.

In the Future Smart Microgrids, Advanced Control of Power Converters forEfficient Use of Distributed Energy Resources

Akshay Kumar Singh, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email: sakshay@giet.edu.in
Sushil Kumar Pati,Gandhi Institute for Education and Technology, Baniatangi,Department ofElectrical Engineering, Email: skpati@giet.edu.in

Abstract: This study offers a vision for the expanding field of smart grids, in which the widespread use of distributed generators and creative power management techniques necessitates a thorough examination of the design of the power distribution network. The study is concentrated on low voltage micro grids since they are the most adaptable and open architectures to show the viability of the network renewal, notwithstanding the possible general benefit of the suggested strategy. Distributed Generators (DGs) have been heavily included into distribution networks in recent years. Until now, the network has been governed hierarchically, with utilities at the top of the hierarchy enforcing rules and maintaining control over the connections.

Multi-frequency power system for smart grid integration of renewable energy sources

Himanshu Shekhar Maharana,Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:hsmaharana@giet.edu.in Pradyumna Kumar Sahoo, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:pksahoo@giet.edu.in

Abstract: This work introduces a novel power system for the integration of renewable sources into microgrids, made possible by power-electronic technology. The micro-grid is divided into several separate power channels using decoupling. Any source to any load-independent power transfer across the common power transmission line is accomplished via these power channels. The superposition theorem and frequency-selective orthogonal power transfer theory underpin the operation of this system. A laboratory-scale prototype of a linked two-source, two-load system is created in order to illustrate the proposed power system. Using the shared power transmission line, the two sources separately deliver power to their respective loads at power transmission frequencies of 500 and 0 Hz (DC is also an acceptable frequency for power transmission), respectively. This decouples a two-source, two-load system into two separate power channels.

Distributed Generation's Effects on the Smart Grid

Abinash Pany, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:apany@giet.edu.in
Anshuman Bhuyan, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email:abhuyan@giet.edu.in

Abstract: The most crucial and significant concerns in the twenty-first century concerning the global climate change problem are renewable energy and smart grid technology. With the emergence of distributed generation and smart grids, the present centralised generation model offers a significant chance to address a number of problems related to energy security, energy efficiency, power quality, and the drawbacks of ageing power system infrastructures. To address the increasing demandfor electricity, improve service quality, and minimise pollution, the current power grid infrastructure ought to be transformed into a Smart Grid that can seamlessly integrate distributed generation. Dispersed generation integration with power systems, however, raises a number of technological problems, chief among them being system stability.

An Intelligent Power Electronic Multi-Converter Designed for theHome

Prakash Chandra Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:pcsahoo@giet.edu.in
Srinivas Mantha, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:smantha@giet.edu.in

Abstract: Smart grid technology and distributed power are part of the grid's future. Achieving high levels of robustness and dependability in power systems will also need the use of Demand Side Management (DSM) systems. Expanding the Energy Management Systems (EMS) and Advanced Metering Infrastructure (AMI) is required toachieve that. The development of hubs for energy resources, like the idea of a smart community, is the direction of trend. In this study, a smart multi-converter system with integrated local photovoltaic (PV) energy source integration and a hybrid energy storage system (HESS) including a supercapacitor and battery is presented for the residential/housing sector. Located in every community home, the device functions as a distributed energy unit that receives active power set-points from a smart community emergency management system.

Grid modelling and simulation for a distributed generation system usingrenewable energy sources

Arul Kumar P, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical and Computer Engineering, Email:arulkp@giet.edu.in
Arabinda Pradhan, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical and Computer Engineering, Email:arabindapradhan@giet.edu.in

Abstract: This research examines in depth the operating characteristics of distributed generation (DG) using renewable energy sources (RES). The intricate GRID simulation treats modular diesel and gas turbine units as conventional sources and considers wind and solar units as renewable energy sources. The transient modes for the Modular Diesel and Wind units are simulated. The study of these processes' results is shown at various power generation levels from solar and wind power plants.

Dispersed Generation's Impact on Electric Power Systems

Rakesh Muthukuru, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:rmuthukuru@giet.edu.inSubhasish Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:subhasishmohanty@giet.edu.in

Abstract: The consequences of distributed generation on electric power systems are discussed in this research. The production of electricity in close proximity to the point of consumption is referred to as distributed generation. Increased levels of short circuits, altered load losses, altered voltage profiles throughout the network, the appearance of voltage transients, the potential for system branch congestion, potential effects on power quality and reliability, and potential malfunctions with the network's protections are all consequences of distributed generation. An analysis of load flow is conducted for the IEEE14 system, considering the addition of an off-grid or distributed generator.

Examining the distributed Generation Idea: An Attempt at Unification

Subhendu Shekhar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:sssahoo@giet.edu.in Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:dmahar@giet.edu.in

Abstract: The many distributed generation concepts of the bibliography are reviewed in this work. It introduces the most well-known ideas of global and regional institutions and characterises each one to create a comprehensive idea that includes the findings and recommendations of this study.

Danish Electric Vehicle Charging Profiles for Planning and Design ofDistribution Grids

Sangate Pavan Kumar, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:spkumar@giet.edu.in Ajaya Kumar Swain, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:akswain@giet.edu.in

Abstract: In recent years, the use of electric vehicles, or EVs, has increased. It is anticipated that every low power electric vehicle charger (EVC) will be linked to the distribution network. Residential users' usage patterns will be significantly altered by EV charging. Distribution system operators must take these new consumption patterns into account when planning and designing the grid. This study offers a process for producing believable worst- case EVC profiles using a big dataset of actual charging information from 3, 547 EVCs. The obtained profiles demonstrate the seasonal and weekly patterns in EVC. A weekend-early- afternoon peak with a consumption of 2.5 kW per EVC replaces the night peak consumption of 3.5 kW per EVC that an aggregation of 100 EVCs has on a workday in the winter. The publicly available representative EVC profiles for various charger sizes, seasons, weekdays, and percentiles are among the primary contributions of this effort.

An Examination of Scaling in a Multi-Energy System

Stita Prangna Mishra, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email:spmishra@giet.edu.in
Smruti Ranjan Nayak, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:srnayak@giet.edu.in

Abstract: A scaling analysis of a multi-energy systems (MES) planning phase is presented in this research. MESs is becoming more and more common in the energy industry. The goal ofthe study is to better understand the relationships between and difficulties in scaling the various components of electrical and thermal systems. The relationship between these two domains is examined in this context, and the MES's distributed energy resources' sizes are scaled to look at how sizing affects the integrating networks and their regulating system. The study employs sensitivity analysis as well as a meta-modelling method, both of which are part of a scaling analysis toolbox, to accomplish this.

Distributed generation with a significant proportion of renewable energy

Abhishek Mohanty, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhishekmohanty@giet.edu.in
Satyajit Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:smohanty@giet.edu.in

Abstract: Numerous technological issues arise from the growing use of distributed generation (DG) and renewable energy sources (RES) in the European energy system. New efforts must bemade in the areas of energy network management, integration of RES and other decentralised units in distribution networks, load management and shaping, and the technical and socioeconomic aspects of decentralised energy markets in order to maintain a consistent and reasonably priced energy supply. The goal of the DISPOWER European project is to facilitate the modern energy supply's shift to a more decentralised and market-oriented supply structure.

Review of Integrated Renewable Energy Systems for Off-Grid RuralApplications

Bijay Kumar Mohapatra, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:bkmohapatra@giet.edu.in Kommu Naveen, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:knaveen@giet.edu.in

Abstract: Due to the low load density and uneven terrain, extending the electric grid to unconnected hills and rural locations is difficult and expensive. As a result, integrated renewable energy systems are emerging as a cost-effective solution for electrifying hilly and isolated places. This paper conducts a thorough investigation into many prospective off-grid uses. It also provides a detailed examination of the deployment of integrated renewable energy systems for off-grid applications. This study addresses the constraints and challenges that come with implementing integrated renewable energy systems.

Modelling and performance evaluation of a microgrid coupled with asustainable hydrogen energy storage system

Mitali Samal, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email:msamal@giet.edu.in

Abstract: In this study, an off-grid solar photovoltaic, wind turbine, lead-acid battery, andhydrogen tank-based hybrid system is created to generate renewable energy to meet the end-user load electricity requirements of northern Indian states. This study evaluates the ability of hydrogen systems to consume (in fuel cells) and store extra renewable energy produced. Four scenarios were investigated to establish the optimal combination ofenergy technologies for meeting the load demands of a microgrid in Lucknow, India. TheHOMER app simulates and models a hybrid energy system. This study looks at the efficiency of a hybrid renewable energy system with a household load demand of 52.00 kWh/day and a peak capacity of 11.04 kW. The ideal system consists of a 10-kWhydrogen tank, a 10-kW electrolyser, 13.9 kW solar PV, a 51-kWh lead-acid battery, a 9.93 kW converter, a 10-kW fuel cell, and a 9-kW wind turbine. A sensitivity study was carried out to determine the design's robustness to cost, fuel cell, and electrolyser uncertainties. The simulation results showed that a hydrogen battery-based microgrid lowered both the levelized energy cost and the total net present cost. With low energy generation costs and the possibility to contribute to carbon reduction efforts, the proposed hybrid power system can be implemented in a freestanding microgrid system that is totally reliant on renewable energy.

Analysis of Integrated DC Microgrid System with PI Voltage ControlStrategy

Sushil Kumar Pati,Gandhi Institute for Education and Technology, Baniatangi,Departmentof Electrical Engineering, Email: skpati@giet.edu.in
Smruti Ranjan Nayak, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:srnayak@giet.edu.in

Abstract: This research focuses on the integration of solar and wind energy in a direct current form. AC-DC converters and DC-DC buck converters are used in conjunction with a Proportional Integral (PI) control approach to keep voltage fluctuations at a desirable level. Batteries are used as an emergency source of supply to meet load demand, and household appliances are considered DC loads. MATLAB simulation models are utilised to apply the low voltage control method, and the expected outcomes are compared to the simulation results.

Power Quality Improvement in a MicroGrid Integrated Hybrid RenewableEnergy Source.

Subhasish Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email:subhasishmohanty@giet.edu.in
Satyajit Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical and Computer Engineering, Email:smohanty@giet.edu.in

Abstract: Today, air pollution is the dominant issue in power generation. Because of the use offossil fuels for generation, renewable energy sources (RES) have played an important role in clean generation of electricity. The hybrid combination of wind/solar systems has proved to bea reliable source to the utility. For extracting maximum power from RES battery, the RES is directly connected to the microgrid. Harmonics can reach the source side due to the non-linear load connected to the microgrid, so a shunt active power filter is employed to eliminate hormonics and keep the dc link voltage constant. In this case, RES is integrated with the microgrid utilising a shunt active power filter as a dual function.

Reconfiguration of Distribution System by Optimal Placement ofDistributed Generator

Subhendu Shekhar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:sssahoo@giet.edu.in
Abhishek Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email: abhishekmohanty@giet.edu.in

Abstract: Due to population growth and lifestyle changes, there is a significant increase in electricity consumption and generating shortages, creating a new platform for the expansion of distributed generator integration with power networks. The primary rationale for choosing a distributed generator is to reduce power loss and improve the voltage profile of the network. This paper focuses on reducing total power loss and improving the voltage profile of the power system network through the appropriate location of distributed generators. The fuzzy logic approach is utilised to identify candidate nodes for DG placement. Results have been validated. When compared to conventional methods, the fuzzy logic toolbox produces speedier results. The results are satisfactory.

A holistic approach to a business case for smart grid technology

Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical and Computer Engineering, Email:dmahar@giet.edu.in
Akshay Kumar Singh, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: sakshay@giet.edu.in

Abstract: The digitalization of the electrical grid makes it possible to package value-added services with the commodity of power and potentially move the business value of electricity services to align with sustainability, efficiency, and conservation principles. In this situation, market forces must to be stimulated while staying within the parameters of energy policy objectives in order to help finance the significant sums of money needed to realize the Smart Grid vision. In this work, we offer a systematic approach with the goal of creating technological and financial synergies that could strengthen the business cases of several Smart Grid technologies individually and help challenge the power industry's consumption-driven paradigm. Evidence from applications in the smart metre and electric car ecosystems supports our analysis. An EU (European Union) perspective is mostly taken into consideration throughout the article.

Technological Developments in Distributed Generation

Arabinda Pradhan, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:arabindapradhan@giet.edu.in
Mitali Samal, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:msamal@giet.edu.in

Abstract: Distributed generation is currently a popular area of study. The main distributed generation technologies as well as the development trend are presented in this study. A description of micro-grid technology, the main component of grid-connected distributed generation systems, is given. The primary focus of the suggested micro-grid technologies is operation control, which includes advanced energy management, micro-grid optimal operation, load classification principles and techniques during islanding, switching processes in micro-grid connection/isolation operating states, and control issues between multiple micro-sources. Additionally, the development trend of grid-connected distributed generation technologies is put forth, including the smart micro-grid and distributed hybrid energy system within the smart grid framework. We'll discuss the DCAC dual bus design of distributed hybrid energy systems, which allows for two-way energy flow and control between dispersed generation systems and major electrical networks. The smart micro-grid's power and information infrastructures will be described, along with a list of the main technical issues.

An Innovative Cuckoo Optimisation Algorithm-Based DistributedGeneration Planning in Distribution Network

Prakash Chandra Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:pcsahoo@giet.edu.in

Abstract: The ideal location and sizing of distributed generators have garnered a lot of attention lately. In this research, an evolutionary cuckoo optimization algorithm (COA) for distributed generation (DG) placement in a distribution system is proposed. The voltage profile, DG costs, and network losses are used to define the ideal DG location problem. The suggested technique is verified on a distribution system with thirteen buses. The findings demonstrate that a substantial shift in the weight of the parameter in the objective function affects the prediction of the DG's position and capacity.

Power control in distributed hybrid generation systems

Bijay Kumar Mohapatra, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:bkmohapatra@giet.edu.in

Abstract: This work proposes the design of a new power management tool that can control the power flow from various renewable energy sources. The system's main power sources are solar energy and wind power, with a fuel cell with an electrolyses and batteries serving as a backup. The intended controller's functions include managing power flows between the various energy systems and ensuring a steady supply of load. It is developed to model and simulate the several energy sources of distributed generation (DG) systems, such as batteries, fuel cell-electrolyser (FC), photovoltaic (PV), and wind turbines (WT). The coordination controller is built with the goal of meeting load demands. Any extra power is either stored in batteries or produced through an electrolyser for the fuel cell. The MATLAB/Simulink environment is used for the simulation, and the results demonstrate that the coordination method performs satisfactorily to meet the load requirements.

Current distributed generation situation in India: technologies, financialanalysis, and problems with power quality

Subhasish Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email:subhasishmohanty@giet.edu.in

Abstract: The Indian electrical grid is undergoing reforms to improve the system's dependability, efficiency, and quality of power. In addition to unbundling, Distributed Generation (DG) must be included into the power system network in order to produce green power and close the supply and demand gap. This study examines various distributed generation (DG) technologies, compares their installation costs with those of conventional power production technologies, and addresses some power quality concerns that may occur when integrating DG into an existing distribution network.

Solutions for Distributed Generation and Alternatives for DistributedGeneration

Anshuman Bhuyan, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhuyan@giet.edu.in

Abstract: We are looking for proposals in response to the Distributed Generation Solution ("DGS") Request for Proposals ("RFP") from owners and operators of distributed generation facilities. The goal of the RFP is to provide new generating capacity within the areas we have designated, as an alternative to building distribution upgrades to accommodate the system's anticipated growth in load. We are requesting informational proposals from interested parties, such as owners and operators of distributed generation facilities and/or load customers, in the Alternative Distributed Generation Solutions ("ADGS") Request for Information ("RFI") in order to provide alternatives to building distribution upgrades in order to accommodate forecasted load growth on the system.

Genetic Algorithm-Based DG Distribution System Placement Optimisation

Subhendu Shekhar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:sssahoo@giet.edu.in

Abstract: One of the key components of the distribution system is power loss minimization. The goal of this work is to minimize power loss in the distribution system by integrating distributed generators (DG). Using GA, the best place and size for DG to minimize power loss and DG costs is determined. There is a contradiction between these two goals: cost andpower loss. Furthermore, the decision-maker selects only one compromised answer that satisfies both objectives in this situation. These two objectives are solved using the Multi- objective Optimization Algorithm (NSGA-II), which yields a set of pareto optimum solutions. A 33-bus distribution system is used in the simulation study for various load scenarios.

A Case Study on the Utilization of Distributed Generation to ImproveDistribution System Loadability

Abinash Pany, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:apany@giet.edu.in

Abstract: In recent years, there has been a lot of interest in the integration of distributed generation (DG) units at the distribution level. DGs can offer more dependable, affordable, ecologically responsible, and high-quality energy solutions than traditional generating. It can be intimidating to comprehend the vast array of distributed generation (DG) options that are accessible, as well as their technical advantages, in the dynamic electric market of today. The technical advantages of distributed generation include decreased feeder loads and loss. Another advantage that DG can bring to the distribution system, if scaled and positioned correctly, is the improvement of loadability. In order to improve the loadability and voltage stability of the distribution system, this paper proposes a straightforwardmechanism for installing dispersed generating. It is shown that the suggested positioning approach is effective.

Problems with stability when varied distributed generation is present in aradial distribution network

Akshay Kumar Singh, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: sakshay@giet.edu.in
Sushil Kumar Pati,Gandhi Institute for Education and Technology, Baniatangi,Departmentof Electrical Engineering, Email: skpati@giet.edu.in

Abstract: The use of renewable energy is growing due to concerns about the environment raised by the use of conventional energy sources. Variations in voltage stability will undoubtedly be impacted by changes in the network's topology. This research examines the effects of stability following the penetration of distributed generation, which has very intermittent output. PSAT software that is simulation-based was evaluated on an IEEE 30 bus system. voltage deviation and SVSI-index measurements on a few load buses both before and after wind power integration. One important component influencing the bus voltage stability index is load condition. This has to do with the requirements for reactive and active electricity that DG penetration must supply.

Effect of Distributed Generation on Distribution Systems Losses and Voltage Profile

Abinash Pany, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:apany@giet.edu.in
Anshuman Bhuyan, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhuyan@giet.edu.in

Abstract: A new backward/forward algorithm for the analysis of radial distribution systems is introduced. It is based on the constant power demand model. Reactive and active power are used as flow variables in the suggested strategy. PQ, PV, and PQ(V) nodes are the mathematical representations of the various distributed generation (DG) types in the power flow programme. Calculations are made to determine the voltage profile and active power losses of DG units in various modes both before and after they are added to radial distribution systems. The results are obtained using the IEEE 33-bus test system. The simulation's findings show that the system voltages and losses can be greatly impacted by the modelsused, as well as by the position and capacity of the distributed generation.

Grid-Connected and Independent Functioning of Dispersed GenerationModules Consolidated via Cascaded Boost Converters

Subhendu Shekhar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:sssahoo@giet.edu.in Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:dmahar@giet.edu.in

Abstract: In order to facilitate grid-tied and stand-alone operations, this work offers the modelling, control, and simulation of an interconnection system (ICS) comprising cascaded distributed generation (DG) modules. The connectivity system's general configuration is provided. A DC/AC inverter and a series of cascaded DC/DC boost converters make up the connectivity system. Previousstudy has not taken into consideration the detailed modelling of the interconnection system that has a cascaded architecture. This research presents a detailed study and modelling of appropriate control systems for the cascaded design of power electronic converters in an interconnection system. A droop voltage controller serves as the foundation for a revolutionary DC/DC boost converter control system that is presented. Furthermore, a novel approach to controlling the aggregated DG modules in grid-tied and stand-alone modes is demonstrated for DC/AC inverters, based on the average big signal model. The efficiency of the suggested control mechanisms is demonstrated by the simulation results.

Regulation of Intelligent Distributed Generation Electricity Systems

Sushil Kumar Pati, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email: skpati@giet.edu.in

Abstract: The shift to an intelligent and decentralized distributed generation electrical system, where active customers play a pivotal role, is made easier by technological improvements. The power systems may become more affordable, secure, efficient, and clean as a result of this shift. However, in order to support dispersed generation, the relevant laws must be changed to reflect the current situation. In light of this, the Commission has proposed a new Directive on common regulations for the internal power market. This proposal demonstrates the Commission's support for distributed generation and centres on empowering electricity customers through smart metre technology, safe data management, and data security policies, as well as encouraging self-consumption rather than net metering. This suggestion is merely a fundamental beginning point, but it may serve as the impetus for the creation of a global legal framework that accommodates technological advancement in the electrical industry.

Regarding the matter of evaluating distributed generation's effectiveness inlow-voltage electric networks

Mitali Samal, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:msamal@giet.edu.in
Arabinda Pradhan, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:arabindapradhan@giet.edu.in

Abstract: The urgent need to use autonomous sources for small- and medium-sized industrial firms' power supply systems is discussed in this article. Diesel generators serve as an example of how effectively timing the moment of their switching-on during peak power system hours can lower the cost of electricity.

Including Electric Vehicle Charging and Discharging Strategies in Security-Constrained Optimal Power Flow to Promote High RenewablePenetration

Anshuman Bhuyan, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhuyan@giet.edu.in

Abstract: By taking advantage of the anticipated controllability or flexibility of electric vehicles (EVs), this research seeks to increase the operational efficiency and security of electric power systems at high renewable penetration. EVs interact with the grid through grid-to-vehicle (G2V) and vehicle-to-grid (V2G) services to ensure dependable and economical grid operation. A computational framework for this decision-making process is provided by this research. EV aggregators' charging and discharging techniques are integrated into a security-constrained optimal power flow (SCOPF) issue to minimize overall energy costs and guarantee functioning within reasonable reliability standards. In particular, Jeju Island in South Korea has been the focus of this SCOPF problem, which aims to reduce carbon emissions towards a zero-carbon island by integrating large-scale renewable energy and electric vehicles, among other things. To provide grid security at high renewable penetration, in addition to the standard limits on the generators and line flows, a unique constraint on the system inertia constant—interpreted as the minimum synchronous generation—is taken into consideration. Additionally investigated are the participating EV's available energy constraint related to the battery's state-of-charge (SOC) and the EV aggregators' market-responsive pricing behavior. Studies of cases for the Jeju electric power system in 2030 under different operating conditions show how the suggested approach works well and how controlled EVs increase operational flexibility.

A SVPWM for Multilevel Inverters to Remove Common-Mode Voltage

Arul Kumar P, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical and Computer Engineering, Email:arulkp@giet.edu.in
Arabinda Pradhan, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:arabindapradhan@giet.edu.in

Abstract: In order to reduce common-mode voltage (CMV) for multilevel inverters, a new space vector pulse width modulation (SVPWM) is presented in this study. The suggested SVPWM is carried out in a novel coordinate system where the absolute coordinate increase between neighboring vectors is equal to 1 and the converter voltage vectors only contain integer entries. Simple computations can be used to determine the reference vector's location, identify the closest three CMV vectors, and determine the duty cycles of those closest three CMV vectors. No lookup table is required, and the SVPWM operates quickly. The CMV of multilevel inverters is confined to zero with any modulation index, and the realization of the CMV vectors is simpler than with previous pulse width modulations (PWMs).

The configuration of circuits and systems for multilevel converters

Rakesh Muthukuru, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:rmuthukuru@giet.edu.inSubhasish Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:subhasishmohanty@giet.edu.in

Abstract: The modular multilevel cascade converter family is presented in this study after three-level, four-level, and three-level flying capacitor inverters, as well as three-level neutral-point-clamped and neutral-point-piloted inverters. It offers a thorough analysis of the systems and circuits of the next two grid-tied applications. The first is a back-to-back system based on another family member for an asynchronous inter-tie between two transmission power systems, and the other is a three-phase transformer less static synchronous compensator based on one family member for industrial and utility distribution systems. A broad description of a static synchronous compensator (STATCOM) based on single-star bridge cells (SSBCs) that uses phase-shifted carrier pulse width modulation (PWM) with an emphasis on capacitor-voltage balancing is also included in this chapter. It displays a phase-shifted-carrier PWM STATCOM that isbased on a downscaled SSBC.

Power Electronics in Smart Systems

Mitali Samal, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:msamal@giet.edu.in
Anshuman Bhuyan, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhuyan@giet.edu.in

Abstract: Electricity is produced using massive power plants that are fueled by nuclear, hydro, or fossil fuels (coal, natural gas, and oil) in conventional power systems. In orderto move energy from production to the end consumers, systems that are essentially unidirectional and passive are used to transmit and distribute the generated electric energy. However, smart grids (SGs) are a relatively new concept that can be broadly defined as "intelligent" electric power networks that integrate many conventional and unconventional power sources (such as energy storage systems and renewable energy sources, or RES) and "active" users, all of which are fully coordinated by an advanced management system.

Using a Unified Power Quality Conditioner to Improve Power Qualityin the Distribution System

Sangate Pavan Kumar, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:spkumar@giet.edu.in Ajaya Kumar Swain, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:akswain@giet.edu.in

Abstract: Voltage sag, voltage swell, and voltage harmonics in the distribution system are the main problems with power quality. Custom power conditioning devices like the Unified Power Quality Conditioner (UPQC), Distributed Static Compensator (DSTATCOM), and Dynamic Voltage Restorer (DVR) address these power quality problems. The capacity of the Unified Power Quality Conditioner to reduce voltage harmonics, sag, and swell in distribution systems is discussed in this study. UPQC is simulated using fuzzy logic (FL) and neural network (NN) controllers in the MATLAB_SIMULINK environment. A comparison is made between the twocontrollers' UPQC performances.

Evaluation of Fuzzy Logic Controlled MPPT's Performance for Energy-Saving Solar Photovoltaic Systems

Akshay Kumar Singh, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: sakshay@giet.edu.in

Abstract: This work examines the mathematical modelling of solar panels using formulas for determining the current flowing through the panels. Series and shunt resistances are taken as additional inputs in addition to the standard inputs. The implementation and efficiency testing of Maximum Power Point Tracking (MPPT) algorithms utilizing Perturb and Observe (P&O) and fuzzy logic approaches with the same voltage and currentvariables as inputs. To provide a steady DC output voltage, a conventional boost converter architecture using a MOSFET device as a switch is used. The MPPT algorithmsdetermine the duty cycle at which the switching device must receive gating pulses inorder for triggering to occur at the maximum power point and provide the load with the maximum amount of power. Based on the created electrical and mathematical models, simulation results are obtained in the MATLAB Simulink environment.

Utilising PID MPPT Controller for Incremental ConductanceAlgorithm-Based Photovoltaic Power Optimization

Smruti Ranjan Nayak, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:srnayak@giet.edu.in

Abstract: This work suggests a way for creating a proportional integral and derivative (PID) controller-based optimum controller based maximum powerpoint tracking (MPPT) control for a photovoltaic system (PV). To maximize the power output from a photovoltaic system, a two-stage controller employing an incremental conductance algorithm and PID is the suggested methodology. The boost converter's duty cycle is adjusted using the suggested PID controller. PV systems are evaluated in a variety of environmental settings here. With MATLAB SIMULINK, the suggested task is simulated. When the results of SIMULINK are compared to those of traditional techniques like P&O and the incremental conductance approach, it is evident that the PID MPPT controller requires the most amount of power extraction.

Power Electronics in Smart Grid and Renewable Energy Systems

Arabinda Pradhan, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:arabindapradhan@giet.edu.in

Ajaya Kumar Swain, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:akswain@giet.edu.in

Abstract: High-efficiency energy systems and contemporary industrial automation both heavily rely on power electronics. Power Electronics in Renewable Energy Systems and Smart Grid: Technology and Applications provides a thorough analysis of the technology and applications of power electronics in renewable energy systems and smart grids, including contributions from a global collection of renowned specialists. The writers provide information on a range of energy systems, such as bulk energy storage systems, fuel cell systems, wind, solar, ocean, and geothermal energy systems. They also look at AI applications, modelling, simulation, control, and smart grid components.

Renewable Energy Systems and Smart Grids

Subhasish Mohanty, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:subhasishmohanty@giet.edu.in

Subhendu Shekhar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:sssahoo@giet.edu.in

Abstract: More and more applications depend on electricity, which is driving up the usage of electrical energy. It is anticipated that in excess of 60% of total energy consumption will be transformed into electrical energy. As a result, it is required that electrical energy be produced, distributed, and used as efficiently as possible. Furthermore, there is a push for more sustainable energy generation methods in light of the current issues surrounding nuclear power plants. Out of all the possibilities, two key technologies will be crucial in helping to address some of those upcoming problems. One involves switching from traditional, fossil fuel-based energy sources to renewable energy sources for the production of electrical power. Utilizing highly efficient power electronics in power generation, transmission, and distribution, as well as end-user applications, is an additional option. This study discusses the rising renewable energy sources, wind energy and photovoltaics, as well as future grid infrastructure trends. The primary focus then shifts to the power electronics and control technology for wind turbines, which will likelyhave even more penetration into a Smart-Grid in the future due to their status as the greatest renewable power source.

Regulation of Renewable Energy and Intelligent Systems

Anshuman Bhuyan, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhuyan@giet.edu.in
Ajaya Kumar Swain, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:akswain@giet.edu.in

Abstract: Following the first major oil crisis in the late 1970s, there was a significant surge inthe usage of renewable energy. Since economic concerns dominated the scene at the time, a decline in oil prices led to a decline in interest in these procedures. Reducing the significant environmental impact of fossil-based energy systems is the driving force behind the present resurgence of interest in renewable energy. Unquestionably, one of the biggest problems of our day is large-scale energy harvesting. The next few decades will see significant progress insolving the renewable energy issue, which will determine future energy sustainability. While the primary energy source (fuel) in the majority of power-generating systems may be controlled, this is not the case for solar and wind energy. The primary issues with these energy sources are their cost and availability of solar and wind power aren't always there when and where they're needed. These renewable energy sources are not "dispatchable," meaning that the power output is not controllable, unlike conventional electric power sources. Intermittent generation is the product of daily, seasonal, and unpredictable factors. Along with other advantages, smart grids should make it easier to integrate renewable energy.

A simple solution to reduce the amount of time that taps or capacitorschange in distribution systems' reactive power control

Subhendu Shekhar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:sssahoo@giet.edu.in Ajaya Kumar Swain, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:akswain@giet.edu.in

Abstract: Transformers and capacitor regulators would be readily damaged during distribution system operation if their taps were regularly changed. Therefore, the tap- changing and capacitor regulator timings must be lowered. Because transformers have a greater influence on voltage levels than capacitors do, it is appropriate to modify transformer taps to maintain voltage within the designated range after first adjusting capacitor settings with the tap position fixed to significantly reduce the likelihood of voltage limit violations while minimizing losses. Reactive power and voltage control are two distinct problems. Since the objective function is solely dependent on capacitive susceptance and has nothing to do with changing transformer taps, it is possible to lower the objective function by adjusting the variables pertaining to capacitors alone and then change the taps of transformers to meet voltage limits. This research presents a distribution network-suitable two-phase based loss optimization technique. This technique can reduce tap-changing or capacitor regulator times while optimizing system losses. The suggested algorithm's validity, quick convergence, and computational efficiency are indicated by the IEEE 30-bus system.

Distribution system reconfiguration with fuzzy multi-objective approach

Pradyumna Kumar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:pksahoo@giet.edu.in

Abstract: An algorithm for network reconfiguration based on a fuzzy multi-objective approach is presented in this research. In order to minimize power loss and branch current constraint violation, load balancing among the feeders, minimum deviation of the node's voltage, and compliance with a radial network structure requiring all loads to be energized are all taken into consideration. Fuzzy sets are used to represent these objectives in order to assess their imprecise nature. Each objective can have its expected value entered by the individual. For each tie-switch operation, a fuzzy satisfaction goal function is created and maximized once these four objectives are initially fuzzified. The technique for minimizing the number of tie-switch operations also includes heuristic principles. An example is provided to illustrate the efficacy of the suggested approach.

Hybrid superconducting distribution system fault current limiter

Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:dmahar@giet.edu.in
Akshay Kumar Singh, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: sakshay@giet.edu.in

Abstract: For primary distribution systems, a novel hybrid fault current limiter is suggested in this research. Together with the other two branches, it includes a high temperature superconducting element in parallel. The fault current can be shared with an inductive impedance in the first place. A gate-turn-off thyristor switch with two operating modes is located in the second branch. In its primary mode, it regulates the superconducting element's temperature and guards against overheating damage. Rather, it maintains the gadget in the auxiliary functioning mode even in the absence of the superconducting element. The device's operation, control, and design are discussed. Its effectiveness in distribution networks with DG operating at 11 kV is examined. The variables influencing how the device behaves in various situations are investigated.

A novel multi-objective fuzzy-GA formulation for shunt FACTS controllerplacement and sizing optimisation

Abhishek Mohanty, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email: abhishekmohanty@giet.edu.in

Abstract: Practical power systems must take into account the placement and size of FACTS controllers for improving voltage stability. This research proposes a real coded genetic algorithm and fuzzy logic approach for the placement and sizing of a shunt FACTS controller. It is suggested to create a fuzzy performance index based on the voltage profile, capacity of theshunt FACTS controller, and distance to the saddle node bifurcation. The best position and sizefor the shunt FACTS devices can be determined using the suggested method. Test systems for IEEE 14-bus and IEEE 57-bus have been subjected to the suggested methodology. The application's outcomes seem encouraging.

Allocating capacitors and voltage regulators simultaneously at distributionnetworks with the use of genetic algorithms and optimal power flow

Sangate Pavan Kumar, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:spkumar@giet.edu.in

Abstract: Variations in the bus voltage magnitudes are introduced by the distribution systems' high demand for reactive power, as well as by the expansion of loads and ensuing increase in system losses. These factors jeopardize the quality of the supplied electric energy. Certain components, such capacitor banks (CBs) and voltage regulators (VRs), are installed to enable efficient regulation of voltage magnitude, reactive power, and power factor in order to ensure high quality. The current study suggests a strategy for allocating these devices concurrently that makes use of both optimal power flow (OPF) and genetic algorithms (GAs).The suggested approach calls for the use of GA for the distribution of CBs, with specifications for the kind of bank (fixed or automatic), thereactive power (kvar), and the distribution of VRs with secondary voltage adjustments. The OPF is in charge of solving the power balance equations, achieving the nominal current of the VRs allotted, and adjusting the taps on the VRs to ensure that the voltage level at their exits matches the voltage level that the GA has defined for the various loadcurves.

Impact of wind farms equipped with ride-through frequency variations on power systemfrequency response

Akshay Kumar Singh, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email: sakshay@giet.edu.in

Himanshu Shekhar Maharana,Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:hsmaharana@giet.edu.in

Abstract: Power system experts are currently concentrating on how wind power affects system frequency. The focus of research is on how wind farms can add active power to the grid and thereby mitigate frequency droop incidents. This study provides a thorough analysisof how a wind farm's connection to a particular electricity system affects the frequency response of the system. The majority of wind farm factors were taken into account, includingthe wind speeds themselves, wake effects inside the wind farm, various wind turbine configurations inside the wind farm, and pitch control mechanisms. Additionally, the key information of a hybrid power system was provided, including various traditional generating methods and the appropriate speed governors for each. Furthermore, instantaneous dynamic load fluctuations were used. This system was used for five case studies to test the system frequency attitude under regular operating conditions as well as in the event of abrupt and significant load fluctuations. The time required to reach the safe margin following a specific droop, the RMS value of frequency deviation following the fault initiation by a specified defined time period, and the highest frequency drop for each event are the three fundamental parameters utilised to quantify the impact mentioned. Based on actual wind speed data, MATLAB and Simulink simulations are used in all of the previously mentioned investigations.

Clustering-based node selection for optimal sizing in two stages ofdistributed generation

Himanshu Shekhar Maharana, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:hsmaharana@giet.edu.in

Abstract: Distributed generation (DG) is becoming a major component of modern electrical energy networks. While the introduction of distributed generation (DG) into electrical networks may enhance network performance, excessive DG deployment may result in system limits being violated. This study offers a novel approach that accounts for the time- dependent evolution of generation and load for determining the ideal size of distributed generation (DG) sources in electrical distribution networks. This approach uses a process that consists of two levels of nested calculations. Using a clustering-based method based on normalized node voltages and normalized loss sensitivity factors, a group of candidate nodesis chosen for the external stage. In order to locate upgraded DG sizes, an exhaustive search on a set of possible sizes at the candidate nodes is conducted during the internal stage. This search is fueled by the calculation of an objective function with energy losses and voltage profile components. The resultant technique finds pseudo-optimal DG sizing without breaking any system limitations under any operating situation and prevents the combinatorial explosion of the solutions to be evaluated. A 20 kV rural distribution network is used to evaluate the suggested approach, demonstrating its efficacy in attaining thepseudo-optimal solution with a comparatively small computing load.

Considering flexibility while planning a power system using renewableenergy sources

Stita Prangna Mishra, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:spmishra@giet.edu.in
Smruti Ranjan Nayak, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:srnayak@giet.edu.in

Abstract: The dispatchable generation units observe a lower and more volatile residual load profile as a result of the growing deployment of intermittent renewable energy sources. In light of technical operating limitations, a novel system planning model for power plants is presented in this work. This model's goal is to identify the ideal group of generating units that can meet a specific demand. Two preliminary solutions are derived: one from a mixed integer linear programming (MILP) model and the other from a classical screening curve model. To validate and enhance the solution, these preliminary solutions are coupled with an operational model and perturbed. With its high degree of information (power plant level and whole year – hourly time resolution) and quick computation time (<1 h), the created model enhances existing models from the literature. In a case study, the evolution of the ideal quantity of generation capacity in relation to installed wind capacity is investigated. Base load generation shifts to mid- and peak-load generation as the portfolio's proportion of wind power rises. The increased volatility and the declining demand both contribute to this change. This indicates that power plant operational restrictions, on an individual basis, have a significant influence on the ideal generator set layout and should be taken into account, particularly as the percentage of intermittent renewable energy sources increases.

A resilient control approach for a multi-bus micro-grid connected to thegrid in the event of imbalanced loads

Sangate Pavan Kumar, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical and Computer Engineering, Email:spkumar@giet.edu.in
Mitali Samal, Gandhi Institute for Education and Technology, Baniatangi, Department ofElectrical Engineering, Email:msamal@giet.edu.in

Abstract: The growing number of microgrid applications using inverter-based distributed generation (DG) units calls for control strategies that operate well both in balanced and unbalanced operating environments. Because of the distribution of imbalanced loads among the three microgrid phases, these situations may persist forever. In this research, a robust control technique for a grid-connected multi-bus microgrid with multiple inverter-based distributed generation units is proposed. Every DG unit has the capacity to serve both balanced and unbalanced local loads. The suggested control strategy makes use of a sliding mode-based control scheme to directly regulate the positive-sequence active and reactive power injected to the microgrid by DG units, as well as an adaptive Lyapunov function based control scheme to directly compensate the negative-sequence current components caused by unbalanced loads in some parts of the microgrid. Even in the presence of nonlinear and time-variantly unbalanced loads, the control strategy presented in this study is demonstrated to be resilient and stable in the face of load disruptions and uncertainty in microgrid parameters. Using the MATLAB/Simulink software environment, time-domain simulation studies are used to validate the efficacy of the given controller.

Energy storage systems: best use when combined with renewableenergy sources

Rakesh Muthukuru, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:rmuthukuru@giet.edu.inStita Prangna Mishra, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical Engineering, Email:spmishra@giet.edu.in

Abstract: In order to examine the technical and financial implications of placing and utilizing Energy Storage Systems (ESS) and Renewable Energy Sources (RES) in an electrical network, this paper suggests a multi-period optimization. The intrinsic variability of RESs has an impact on how much energy is actually deployed, how much they contribute to reducing greenhouse gas and pollutant emissions, and what overall welfare effects they may have when their

penetration grows. Furthermore, in order to effectively utilize renewable energy sources, new approaches and technologies must be implemented in order to mitigate the unpredictability and variability of these sources. Connecting to energy storage sources, either as specialized facilities on the supply side or assisting in the accommodation of loads to the availablegeneration on the demand side, could be one way to address the obstacles to the adoption of RES. In order to address some of the fundamental changes in the way the system is operated, this study proposes an algorithm for network dispatch and addresses analytical properties of theoptimal solution. We apply the suggested methodology to a case study. The welfare effects on the players in the wholesale market for a modified IEEE 30-bus network with wind energy as the RES at penetrations close to 15% are estimated for four scenarios that are analyzed in their dispatches. The findings have important policy implications because they demonstrate that, first, ESS can reduce the ramping required for load following while not always increasing the amount of wind energy used, and second, electrical network congestion patterns are critical to the overall effectiveness of RES and ESS. These provide significant new information in the current discussion about where to put money for renewable energy and storage in order to achieve a low-carbon economy.

Using a dynamic voltage restorer to reduce voltage sag in an Indian distribution system

Abinash Pany, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical Engineering, Email:apany@giet.edu.in
Dhanurjaya Mahar, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:dmahar@giet.edu.in

Abstract: Now a day's most power quality problems in distribution systems are related to voltage sags. Hence, diverse solutions have been tried to compensate these voltage sags to circumvent financial losses due to voltage sag at industries. Dynamic voltage restorers(DVRs) are now becoming more recognized in industries to diminish the impact of voltage sags to sensitive loads. The DVR, which is placed in series with a sensitive load, must beable to react speedily to a voltage sag if end users of sensitive equipment are to experienceno voltage sags. This paper discusses the use of series reactive injection as a voltage regulator. The proposed approach is to develop analytical aspects and to illustrate these by anexample of a real Indian distribution system. By continuously introducing a very modest voltage profile into the system, voltage sag can be completely removed. The plan blends sophisticated Fourier transform relations with the method of instantaneous symmetrical components. The suggested method, which uses half-cycle averaging, can lessen voltage sag in distribution networks at certain points. The suggested approach is used in both an actual Indian distribution system and a four-bus system.

Estimating the daily and peak profiles of substations in remotenetworks

Arul Kumar P, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:arulkp@giet.edu.in
Anshuman Bhuyan, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:abhuyan@giet.edu.in

Abstract: The diversity and conversion factors are estimated using the load of rural substations located in the northern region of Jordan. The peak and daily load profiles are estimated using these variables. The estimate is based on information gathered by SCADA system. The findings indicate that while the diversity factors change with the number of feeds, the conversion factor remains constant. Only a limited number of feeders are affected by the diversity factors' variance in number. Measured and estimated daily load profiles are contrasted.

A precise piecewise approach for defect investigations in networkedsystems

Bijay Kumar Mohapatra, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:bkmohapatra@giet.edu.in Kommu Naveen, Gandhi Institute for Education and Technology, Baniatangi, Departmentof Electrical and Computer Engineering, Email:knaveen@giet.edu.in

Abstract: New computational tools are needed to handle major difficulties such vast data processing, real-time analysis and control, security concerns, and information handling in light of the ever-growing scale and complexity of electrical networks. This work specifically attempts to address these issues in the fault studies field. Actually, the large change sensitivity (LCS) notion has been used to adopt a piecewise or diakoptical solutionprocess that corresponds to the decentralized nature of electrical networks. In order to accurately reflect the impact of the entire network in local studies conducted by individualutilities, it first alters the prefault voltage profile across utilities before modifying each utility's nodal Zbus. The suggested method's mathematical specifics and a numerical example will be shown. It has been practically implemented in an existing softwarepackage, and in the end, simulation results using this programme are shown for a typical network. In general, it can be applied to the least amount of computing resource investment for distributed modelling of large-scale electrical networks across computer networks.

System optimization and simulation for renewable energy

Pradyumna Kumar Sahoo, Gandhi Institute for Education and Technology, Baniatangi,Department of Electrical Engineering, Email:pksahoo@giet.edu.in

Abstract: The experience gained from using a renewable energy system simulator in both grid-connect and stand-alone modes is covered in this study. A model of a system including energy storage, wind, solar, and standby plants is created. Using the actual typical day loading, wind, and solar distributions in the western Sydney region, the simulator computes energy flows on an hourly basis. The model illustrates, in stand-alone mode, the connection between increased system availability, component rating, and system storage. It also demonstrates the quick "law of diminishing returns" effect, which states that without a stand-by plant, achieving total energy independence will be unaffordable in reality even though it is theoretically possible. The model was also used to show the possible benefits of optimizing stand-by plant schedulingor, in the case of grid connection, grid interaction through the use of predictive methods based on seasonal averages of wind, solar, and load.

Distributed reactive power production with Mult objective design ina deregulated electricity market

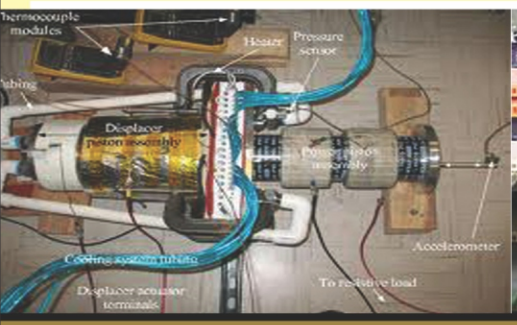
Rakesh Muthukuru, Gandhi Institute for Education and Technology, Baniatangi, Department of Electrical and Computer Engineering, Email:rmuthukuru@giet.edu.in

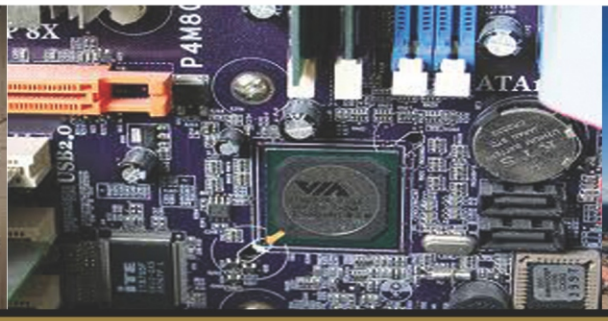
Abstract: A well-researched subject in the literature is reactive fluxes compensating optimal design for losses reduction in MV automated distribution systems. This study formulates the design challenge in light of the recently deregulated energy market. The MV grid operator is now able to view reactive energy generation as a service that can be offered to the transmission system above thanks to these new operating conditions. In this scenario, the transmission system would benefit in all operational scenarios when a robust reactive flow modulation via the HV/MV node is necessary. Therefore, the search for the configuration (number, location, and rated power of the capacitor banks) satisfying the following primary objectives is the MV grid operator's optimal design issue for the compensating system: (i) to reduce power outages; (ii) to increase the compensation system's return on investment. Since the parameter "economic value given to the reactive power," or RPEV, flowing from the MVnetwork to the HV node has a significant impact on the outcomes, the optimization issue has been parameterized for a range of RPEV values, and the total installed reactive power has been noted. This parameter has a determined threshold value. For values above the cutoff, thedistribution grid operator, or DGO, will profit financially from the proposed investment.

Each faculty, staff and student of GIET, Bhubaneswar is single-mindedly committed to the job of making India a world leader in technology and science, and nurtures this commitment with honesty, hard work and team spirit.

Courses Offered

- Civil Engineering
- Mechanical Engineering
- Automobile Engineering
- Computer Science & Engg.
- Electronics & Commn. Engg.
- Electrical & Electronics Engg.





GANDHI INSTITUTE FOR EDUCATION & TECHNOLOGY

CAMPUS : Baniatangi, Bhubaneswar, Khurda - 752060, Ph. : 06755-243600/601/602/603/604
OFFICE : HIG-33, Near PAL Heights, Jayadev Vihar, Bhubaneswar-751013 Ph. : 0674-2301562

Email : gietbbsr@aol.com, info@gietbbsr.com, WWW.GIETBBSR.COM