

## CURRICULUM VITAE

### **PRABODH BAJPAI**

Professor,  
Department of Sustainable Energy Engineering,  
Indian Institute of Technology Kanpur,  
Kanpur, U.P. - 208016, INDIA  
Tel: 0512-2592327, M: 09933363474  
Email: [pbajpai@iitk.ac.in](mailto:pbajpai@iitk.ac.in) , [bajpai.prabodh@gmail.com](mailto:bajpai.prabodh@gmail.com)



### **Educational Qualifications**

- Ph.D., Electrical Engineering. (Power Systems), 2008, Indian Institute of Technology Kanpur, U.P., India  
*Topic: Development of Market Monitoring System and Swarm Intelligence Based Bidding Strategies in Electricity Markets.*
- M. Tech., Energy Studies, 2001, Indian Institute of Technology Delhi, New Delhi, India  
*Topic: Automatic Reactive Power Control of an Isolated Hybrid Power System.*
- B. E., Electrical Engineering, 1997, Indian Institute of Technology Roorkee, Uttarakhand, India.

### **Professional Experience**

<i>Duration</i>	<i>Organization</i>	<i>Position</i>
Jan. 2023 till date	Department of Sustainable Energy Engineering, Indian Institute of Technology Kanpur	Professor
July 2022 to Dec. 2022	Department of Sustainable Energy Engineering, Indian Institute of Technology Kanpur	Associate Professor
July 2014 to June 2022	Electrical Engineering Department, Indian Institute of Technology Kharagpur, WB, India	Associate Professor
Sept. 2015 to March 04, 2021	School of Energy Sciences and Engineering, Indian Institute of Technology Kharagpur, WB, India	Joint faculty
June 2008 to July 2014	Electrical Engineering Department, Indian Institute of Technology Kharagpur, WB, India	Assistant Professor
July 2001 to July 2002	Electrical Engg. Department, Hercourt Butler Technology Institute, Kanpur, UP, India	Guest Lecturer

## Publications

- International Journals : 44
- International Conferences : 24
- National Conferences : 42
- Patent : 01 (Published), 02 (Filed)
- White Papers : 01
- Book Chapters : 05
- H-index : 24
- *i10*-index : 38

## Research Interests

- Renewable Energy Systems
- Power System Restructuring
- Smartgrid, Micro grid
- Power System Operation, Control and Analysis

## Awards

- Faculty Excellence Award 2021** for outstanding contribution towards Teaching, Research and Institutional Development by IIT Kharagpur
- The Institution of Engineers (India) Fellow**, Membership No: F-1265438, in Electrical Engineering Division since April 2020
- Bhaskara Advanced Solar Energy (BASE) Fellowship 2015** in School of Electrical Engineering and Computer Science, Washington State University (WSU) Pullman, USA, on the research theme of *Grid Interaction including Smart Grids*.
- Sr. Research Fellowship** in the Power Management Institute (PMI), National Thermal Power Corporation (NTPC), Noida, India from **July 2004 to July 2005** on the research theme of *Developing Power Trading Model for Indian Scenario*

## Work Experience

- **RESEARCH EXPERIENCE**

### A. Sponsored Research Projects

- 1) Solar PV Based Hybrid Microgrid System for Efficient Building Energy Management, (SPARC II, MoE, Govt. of India, Rs. 49.5 Lakhs), PI: Dr. Prabodh Bajpai, Co-PI: Dr. A. K. Pradhan, Dr. Ashish R. Hota, DOS:07-03-2024, DOE: 06-02-2026
- 2) Centre for Rechargeable Energy storage systems for Augmenting Transportation and Electrification (CREATE), (SERB India, Rs. 8.5 Cr), PI: Prof. Raju Kumar Gupta, Co-

PI: Dr. Shobit Omar, Dr. K. Singh Nalwa, Dr. Anand Singh, Dr. Ashish Garg, Dr. Jishnu Bhattacharya, Dr. Ankush Sharma, Dr. Suvendu Samanta, Dr. Prabodh Bajpai, DOS:14-03-2022, DOE: 10-03-2027

- 3) Development and Integration of an Efficient MPC in Intelligent HMG Energy Systems (SERB India, Rs. 102 Lakhs), PI: Dr. Ashish R. Hota, Co-PI: Dr. Prabodh Bajpai Co-PI: Dr. D. Kastha, DOS: Feb. 18, 2020, DOE: Feb, 2024
- 4) Transmission line protection in the presence of bulk solar photo voltaic power plants (PBV), (CPRI India, Rs. 48.4 Lakhs), PI: Dr. A.K. Pradhan, Co-PI: Dr. Prabodh Bajpai, DOS: July 23, 2019, DOE: Sept. 30, 2021
- 5) Grid complaint Direct matrix converter fed DFIG based Wind power generator (GFG), (DST India, Rs. 59.8 Lakhs), PI: Dr. D. Kastha, Co-PI: Dr. Prabodh Bajpai, DOS: July 17, 2019, DOE: July 16, 2022
- 6) UK India Clean Energy Research Institute (UKICERI), (DST India, Rs. 1247.83 Lakhs), PI: Dr. C. Chakarborthy, Co-PI: Dr. Prabodh Bajpai, DOS: April 5, 2017 DOE: Sept. 4, 2022
- 7) Socializing the micro-solar dome: empowering marginalized rural SC communities through solar illumination and solar electricity ((DST India, Rs. 472.94 Lakhs), PI: Dr. P.P. Chakrabarti, Joint PI: Dr. Priyadarshi Patnaik, Dr. A.K. Pradhan, Co-PI: DR. J.N. Roy, Dr. Pallab Dasgupta, Dr. Pulak Mishra, Dr. Prabodh Bajpai, DOS: March 29, 2019, DOE: March 28, 2022
- 8) Socializing the micro-solar dome: empowering marginalized rural ST and tribal communities through solar illumination and solar electricity, (DST India, Rs. 684.98 Lakhs), Pr: Dr. P.P. Chakrabarti, Joint PI: Dr. Priyadarshi Patnaik, Dr. A.K. Pradhan, Co-PI: Dr. J.N. Roy, Dr. Pallab Dasgupta, Dr. Pulak Mishra, Dr. Prabodh Bajpai, DOS: March 29, 2019, DOE: March 28, 2022
- 9) Reconfigurable Distribution Network (DST India, Rs. 452 Lakhs), PI: Dr. Prabodh Bajpai, Co-PI: Dr. A.K. Sinha, and Dr. D. Kastha, DOS: Sept. 29, 2014, DOE: March 28, 2019
- 10) Stability and performance analysis of photovoltaics (DST India, Rs. 168 Lakhs), PI: Dr. C. Chakarborthy, Co-PI: Dr. Prabodh Bajpai, Dr. A.K. Sinha, DOS: May 17, 2011, DOE: May 16, 2014
- 11) Renewable Hybrid Energy Power Plant for Telecom station in Isolated Sites (Vodafone Essar-IIT Kgp Center of Excellence in Telecommunications (VICET), Rs. 95.00 Lakhs) PI: Dr. Prabodh Bajpai ; Co-PI: Dr. N. K. Kishore, Co-PI: Dr. C. Chakarborthy, DOS: May, 1, 2009, DOE: March 31, 2013

## **B. Consultancy Projects**

- 1) Inspection and Assessment of Bio-Energy Projects in the State of Uttar Pradesh, Client: UPNEDA. UP Govt. Value: Rs. 49.93 Lakhs, PI: Dr. Prabodh Bajpai, Co-PI: Dr. Ankush Sharma, DOS:07-04-2024, DOE: 06-04-2025
- 2) Assessment of Abnormal Voltage Fluctuations in Panki-Chakeri section of Prayagraj Division of Indian Railway, Client: North Central Railway, MoR, Govt. of India, Value:5.9 Lakhs, DOS: June, 2024, DOE: Nov, 2024
- 3) Assessment of solar PV plant generation in WBSEDCL projects at Salboni, Patni, Dhaka, and Raniganj in West Bengal, Client: Vikram Solar Ltd., Value: 33.75 Lakhs; Period: 6 months, PI: Dr. P. Bajpai, Co-PI: Dr. Ashok K. Pradhan, DOS: July 15, 2022, DOE: Dec 15, 2024
- 4) Technical vetting of hydraulic and process design, electro-mechanical and instrumentation design-drawing for interception and diversion structures, lifting stations, main pumping station, effluent pumping station, and 35 MLD STP in Maheshtala municipality in the state of West Bengal, Client: Kolkata Metropolitan Development Authority, Value: 29.9 Lakhs; Period: 18 months, PI: Dr. Ashok K. Gupta, Co-PI: Dr. P. Bajpai, DOS: Sept. 17, 2021, DOE: Dec 31, 2023
- 5) Resiliency modeling and analysis with recommendations for overhead LV distribution network of CESC Ltd. In Kolkata region, (Client: CESC Ltd., Value: 26.08 Lakhs; Period: 12 months, PI: Dr. P. Bajpai, Co-PIs: Dr. A.K. Pradhan, Co-PIs: Dr. Neeraj K. Goyal), DOS: Jan. 15, 2021, DOE: Jan. 14, 2022.
- 6) Solar PV based DC Microgrid at NETRA (Client: NTPC Ltd., Value: 25.56 Lakhs; Period: 24 months, PI: Dr. P. Bajpai, Co-PIs: Dr. A.K. Pradhan), DOS: Jan. 5, 2017, DOE: Dec. 31, 2021.
- 7) Vetting of design and scheme of 50kW rooftop solar power plant at MES Bamrauli (Client: Agni Power & Electronics Pvt. Ltd. Kolkata, Value: 1.534 Lakhs; Period: 1 month, PI: Dr. P. Bajpai, Co-PIs: Dr. A. Shaw), DOS: Nov. 15, 2018, DOE: Dec.15, 2018.
- 8) Vetting of design and scheme of 1 MWp solar power plant at MES Barrackpore (Client: Agni Power & Electronics Pvt. Ltd. Kolkata, Value: 3.68 Lakhs; Period: 1 month, PI: Dr. P. Bajpai, Co-PIs: Dr. A. Shaw), DOS: Sept. 7, 2018, DOE: Oct.5, 2018.
- 9) Estimation of technical transmission and distribution losses for NESCO, (Client: NESCO, Odisha, Value: 5.50 Lakhs; Period: 6 months PI: Prof. A. K. Sinha; Co-PIs: Dr. P. Bajpai, Dr. N. K. Kishore, Dr. A.K. Pradhan, DOS: Aug., 6, 2012, DOE: Feb. 6, 2013
- 10) Inspection cum Survey and Evaluation of Solar PV HLS installed in West Bengal (Client: West Bengal Renewable Energy Development Agency

(WBREDA), Value: 5.50 Lakhs; Period: 3 months, PI: Prof. A. K. Sinha; Co-PIs: Dr. P. Bajpai, Dr. C. Chakraborty, Dr. A.K. Pradhan, DOS: May 15, 2009, DOE: Aug.,28, 2009.

### C. Research Guidance

Program	Guidance	Completed		In progress	
		IIT Kharagpur	IIT Kanpur	IIT Kharagpur	IIT Kanpur
Post-doctoral	Single	---	---	----	1
	Joint	---	---	----	1
Ph.D.	Single	3	--	--	--
	Joint	6	--	3	3
M. Tech.	Single	19	2	--	4
	Joint	1	--	--	--
M.S.	Single	2	--	--	--
	Joint	3	--	--	--
Program	Guidance	Completed		In progress	
		IIT Kharagpur	IIT Kanpur	IIT Kharagpur	IIT Kanpur
Post-doctoral	Single	---	---	----	1
	Joint	---	---	----	1
Ph.D.	Single	3	--	--	--
	Joint	6	--	3	3
M. Tech.	Single	19	1	--	5
	Joint	1	--	--	--
M.S.	Single	2	--	--	--
	Joint	3	--	--	--

#### • TEACHING EXPERIENCE

- Theory/lab subjects taught in the Department of Electrical Engineering, **IIT Kanpur** since June 2022.

- 1) SEE-603: Electrical Power Engineering (*Course revised and renamed*)
- 2) SEE 616- Renewables Integrated Smart Power Systems (*Course revised and renamed*)
- 3) SEE 611- Energy Systems: Modelling and Analysis
- 4) SEE-605: Introduction to Sustainable Energy Systems and Technologies

5) SEE-909: Energy Systems (e-Masters, Renewable energy and electric mobility)

- Theory/lab subjects taught in the Department of Electrical Engineering, **IIT Kharagpur** since June 2008.

- 1) Electrical Technology (EE11001)
- 2) Electrical Technology Lab (EE19001)
- 3) Measurements and Electronic Instruments (EE21004)
- 4) Measurements and Electronic Instruments Lab (EE29004)
- 5) Power System Lab (EE39002) (*New experiments included*)
- 6) Illumination and Electrical Utility Services (EE30024)
- 7) Energy Conversion Processes (EG30002)
- 8) Photovoltaic and Fuel Cells (EG31002)
- 9) Non-conventional Electrical Energy Systems (EE60049) (*New course developed*)
- 10) Renewable and Distributed Energy Systems (EE60005) (*New course developed*)
- 11) Smartgrid (EE60016) (*New course developed*)
- 12) Renewable Energy Sources (ES61007) (*New course developed*)
- 13) Energy systems modelling (ES61008)
- 14) Energy Systems Lab I (ES69007) & II (ES69008) (*New experiments included*)

- **ADMINISTRATIVE EXPERIENCE:**

**National Level Administrative Assignments: (at IIT Kanpur)**

- Member Electric and Hybrid Vehicles Sectional Committee (TED 27) of BIS
- Member IEEE India Council Awards Committee for the PGCIL Awards

**A) Institute Activity**

- 1) Evaluation Committee member of SIIC incubation program
- 2) Evaluation Committee member of SURGE internship program
- 3) Vice - Chairman, Career Development Centre (CDC) (Jan. 2021-June 2022)
- 4) Advisory Committee member of Institute Works (IW) section (Sept. 2019-2022)
- 5) Warden, B. R. Ambedkar hall of residence (July 2021-June 2022)
- 6) Assistant Warden, B. R. Ambedkar hall of residence (May 2017-June 2021)
- 7) Assistant Warden B. R. Ambedkar hall of residence (since May 2017)
- 8) Associate Professor-in-Charge, Electrical works (Jan 2014- Dec. 2018)
- 9) Assistant Warden Acharya J.C.Bose hall of residence (Oct. 2011- Oct.2013)
- 10)NSS Program officer (July 2011-June 2012)
- 11)Laboratory development in School of Energy Science & Engineering

**B) Professional Activities**

- 1) Secretary and Treasurer, 2011, IEEE Kharagpur Section
- 2) Vice Chair, 2012, IEEE Kharagpur Section
- 3) Chair, 2013, IEEE Kharagpur Section

**C) Seminar / Conference Organization**

- 1) Organizing Chair in 9th International Conference on Power Systems (ICPS 2021) at I.I.T. Kharagpur in Dec. 2021
- 2) Registration Chair in International Conference on 21<sup>st</sup> Century Energy Needs Materials, Systems and Applications (ICTFCEN), held at I.I.T. Kharagpur in Dec. 2016
- 3) Registration Chair in Third International Conference on Power Systems (ICPS 2009) held at I.I.T. Kharagpur in Dec. 2009
- 4) Registration Co-Chair in IEEE Region 10 Colloquium and Third International Conference on Industrial and Information Systems (ICIIS) held at I.I.T. Kharagpur, Dec. 2008.

- **Service rendered to other Institutes and Organizations:**

1. Guest Editor, IET Smart Grid Special Issue on Resilience
2. Solar System Consultant for Water resource Investigation and Development Department, Government of West Bengal
3. Building-Works-Committee (BWC) member of IIIT Kalyani
4. Invited Talks in various National Seminars, Technical sessions, Short term courses, Conferences and Workshop
5. Principal coordinator for organizing Annual Short Term Courses for Power utilities engineers of WBSEDCL, CESC and Tata Power at IIT Kharagpur Campus
6. Member of Research Degree Committee (Electrical Engineering Discipline), Dr. APJ Abdul Kalam Technical University, Lucknow (UP), India
7. Organizing International and National conferences and workshops in association with other Institutions
8. Technical paper review for various International and National publishing journals and conferences
9. Project proposal review and PhD and Master thesis review of research organization and academic Institutions
10. Mentorship and collaborative research activities with academic and R& D organizations

## List of Publications

### Papers in International Journal:

1. *Ishita Biswas, Debaprasad Kastha, **Prabodh Bajpai**, “A High Gain Switched Capacitor DC-DC Converter Suitable for Integration with Partially Isolated Multiport Converters”, **IEEE Journal of Emerging and Selected Topics in Industrial Electronics**, Accepted for publication*
2. *Arghya Mallick, Abhishek Mishra, Ashish R. Hota, **Prabodh Bajpai**, “Distributed Coordination of Multi-Microgrids in Active Distribution Networks for Provisioning Ancillary Services”, **IEEE Systems Journal**, 2024, Early Access, DOI:10.1109/JSYST.2024.3404600*
3. *Sheshadri Shekhar Rauth, Debaprasad Kastha, **Prabodh Bajpai**, “Jellyfish search algorithm-based optimum tuning of PI controller for a front-end converter in a DFIG-based wind energy conversion system” **Soft Computing, Springer**, Jan. 2024, <https://doi.org/10.1007/s00500-023-09534-6>*

4. *Sheshadri Shekhar Rauth, Debaprasad Kastha, Prabodh Bajpai*, "A Sensorless Control Strategy for Automatic Start-up and Grid-Synchronization of DFIG in Wind Energy Conversion System" *International Journal of Circuit Theory and Applications*, Nov. 2023, <https://doi.org/10.1002/cta.3843>
5. *Priyanka Mishra, Amlan Swain, Ashok Kumar Pradhan and Prabodh Bajpai*, "Sequence Current based Inrush Detection in High Permeability Core Transformers", *IEEE Transactions on Instrumentation & Measurement*, Vol. 72, 2023 DOI: [10.1109/TIM.2023.3318715](https://doi.org/10.1109/TIM.2023.3318715)
6. *Bonu Ramesh Naidu, Krishan Kumar Saini, Prabodh Bajpai, Chandan Chakraborty*, "A Novel Framework for Resilient Overhead Power Distribution Networks", *International Journal of Electrical Power and Energy Systems*, Elsevier, Vol. 147, May 2023, <https://doi.org/10.1016/j.ijepes.2022.108839> IF-4.62
7. *Bonu Ramesh Naidu, Prabodh Bajpai, Chandan Chakraborty, M. Malakondaiah, Kalyan Kumar Boddeti*, "Adaptive Dynamic Voltage Support Scheme for Fault Ride-Through Operation of a Microgrid", *IEEE Transactions on Sustainable Energy*, Vol. 14, Issue: 2, April 2023, pp .974-986, DOI: [10.1109/TSTE.2022.3231364](https://doi.org/10.1109/TSTE.2022.3231364) IF-7.65
8. *Kamlesh Narayan Tiwari, Mahesh Vinayak Hadole and Prabodh Bajpai*, "Solar Photovoltaic Pump-operated Micro-irrigation Systems: A Comprehensive Review", *Journal of Agricultural Engineering (India)*, Vol. 59 (4): October-December, 2022, DOI: 10.52151/jae2022594.1789
9. *Priyanka Mishra, Ashok Kumar Pradhan and Prabodh Bajpai*, "Time-Domain Directional Relaying Using Only Fault Current for Distribution System with PV Plant", *IEEE Transactions on Power Delivery*, Vol. 37, Issue: 4, August 2022, DOI: [10.1109/TPWRD.2021.3118712](https://doi.org/10.1109/TPWRD.2021.3118712) IF-4.42
10. *M.Malakondaiah, Kalyan Kumar Boddeti, Bonu Ramesh Naidu, Prabodh Bajpai*, "Second harmonic voltage injection-based self impedance estimation for effective decoupled droop control in a microgrid." *Energy Conversion and Economics, IET, Wiley*, July 2022, Vol.3, Issue-4, pp:227–243. DOI: 10.1049/enc2.12065 IF-0.5
11. *Mahesh V. Hadole, Prabodh Bajpai and Kamlesh N. Tiwari*, "Modeling and planning operation of directly coupled solar photovoltaic pump operated drip irrigation system with a case study", *Clean Technologies and Environmental Policy, Springer Nature*, July 2022, <https://doi.org/10.1007/s10098-022-02376-0>, IF-3.636
12. *Noel Richard Merritt, Chandan Chakraborty, Prabodh Bajpai*, "An E-STATCOM based solution for smoothing Photovoltaic and Wind Power fluctuations in a Microgrid under unbalanced conditions", *IEEE Transactions on Power Systems, IEEE Transactions on Power System*, Vol. 37, No. 2, pp. 1482-1494, March 2022, DOI: [10.1109/TPWRS.2021.3106859](https://doi.org/10.1109/TPWRS.2021.3106859) IF-4.42



13. Priyanka Mishra, Ashok Kumar Pradhan, Parul Singh and **Prabodh Bajpai**, “Protecting Distribution System with Inverter Interfaced PV Plant Using q-axis Components”, *IEEE Systems Journal*, Early Access, April 2021, DOI: [10.1109/JSYST.2021.3071627](https://doi.org/10.1109/JSYST.2021.3071627) IF-4.46
14. Kanishk Chawla, **Prabodh Bajpai** and Rajib Das, “Decision Support Tool for Enabling Resiliency in an Underground Power Distribution System”, *International Journal of Electric Power and Energy System*, Elsevier, Vol. 133, Dec. 2021, <https://doi.org/10.1016/j.ijepes.2021.107232> IF-3.588
15. Mahesh V. Hadole, Kamlesh N. Tiwari and **Prabodh Bajpai**, “Energy generation and flow rate prediction of photovoltaic water pumping system for irrigation”, *Environment, Development and Sustainability*, Elsevier, 23, pp 6722–6733, 2021, <https://doi.org/10.1007/s10668-020-00886-9>, IF-1.93
16. Priyanka Mishra, Ashok Kumar Pradhan and **Prabodh Bajpai**, “A Positive Sequence Relaying Method for Solar Photovoltaic Integrated Distribution System”, *IEEE Transactions on Power Delivery*, Early Access, Dec. 2020, DOI: [10.1109/TPWRD.2020.3044330](https://doi.org/10.1109/TPWRD.2020.3044330) IF-4.42
17. S. Sinha, S. Ghosh and **P. Bajpai**, “Power Sharing Through Interlinking Converters in Adaptive Droop Controlled Multiple Microgrid System”, *International Journal of Electric Power and Energy System*, Elsevier, Volume 128, June 2021, 106649, <https://doi.org/10.1016/j.ijepes.2020.106649> IF-4.62
18. Ishita Biswas, Debaprasad Kastha, **Prabodh Bajpai**, "Small Signal Modeling and Decoupled Controller Design for a Triple Active Bridge Multiport DC-DC Converter", *IEEE Transactions on Power Electronics*, Early Access, Vol. 36, Issue 2, pp.1856 – 1869, Feb. 2021, DOI: [10.1109/TPEL.2020.3006782](https://doi.org/10.1109/TPEL.2020.3006782), IF-7.224
19. S. Sinha and **P. Bajpai**, "Power Management of Hybrid Energy Storage System in a Standalone DC Microgrid" *Journal of Energy Storage*, Elsevier, Volume 30, August 2020, <https://doi.org/10.1016/j.est.2020.101523>, IF- 3.517
20. W. Shao, Ruizhu Wu, Li Ran, H. Jiang, P. A. Mawby, D. J. Rogers, Tim C. Green, T. Coombs, K. Yardley, **P. Bajpai**, D. Kastha, Lin Zhou, “A Power Module for Grid Inverter with in-built Short-Circuit Fault Current Capability”, *IEEE Transactions on Power Electronics*, Vol. 35, Issue 10, pp. 10567-10579, Oct. 2020, DOI: [10.1109/TPEL.2020.2978656](https://doi.org/10.1109/TPEL.2020.2978656), IF-7.224
21. Priyanka Mishra, Ashok K. Pradhan and **Prabodh Bajpai**, "Adaptive Distance Relaying for Distribution Lines Connecting Inverter-Interfaced Solar PV Plant", *IEEE Transactions on Industrial Electronics*, Early Access, Vol. 68, Issue 10, pp.2300-2309, March 2020, DOI: [10.1109/TIE.2020.2975462](https://doi.org/10.1109/TIE.2020.2975462), IF-8.7
22. Noel Richard Merritt, Chandan Chakraborty, **Prabodh Bajpai**, Bikash. C. Pal, “A Unified Control Structure for Grid Connected and Islanded Mode Operations of Voltage Source Converter based Distributed Generation Units under Unbalanced and Non-linear Conditions” *IEEE Transactions on Power Delivery*, Vol. 35, No. 4, Aug. 2020, DOI: [10.1109/TPWRD.2019.2952692](https://doi.org/10.1109/TPWRD.2019.2952692), IF-4.42

23. *M.Malakondaiah, Kalyan Kumar Boddeti, Bonu Ramesh Naidu, Prabodh Bajpai*, “Second Harmonic Impedance Drift based Islanding Detection Method” *IET Generation, Transmission & Distribution*, Vol. 13, Issue 23, pp. 5313 - 5324, Nov. 2019, DOI: [10.1049/iet-gtd.2018.6838](https://doi.org/10.1049/iet-gtd.2018.6838) IF-2.56
24. *Priyanka Mishra, Ashok Kumar Pradhan and Prabodh Bajpai*, “Voltage control of PV inverter connected to unbalanced distribution system”, *IET Renewable Power Generation*, Vol. 13, Issue 9, pp. 1587 – 1594, July 2019, DOI:[10.1049/iet-rpg.2018.6219](https://doi.org/10.1049/iet-rpg.2018.6219) IF-3.6.
25. *Dinesh Varma Tekumalla, Diptendu Pal, Prabodh Bajpai*, “Comprehensive Performance Evaluation of Various Solar PV System Configurations”, *IET Renewable Power Generation*, Volume 13, Issue 8, pp. 1261 – 1270, June 2019, DOI: [10.1049/iet-rpg.2018.5729](https://doi.org/10.1049/iet-rpg.2018.5729) IF-3.6.
26. *W. Shao, Li Ran, H. Jiang, P. Bajpai, D. Kastha, Ruizu Wu, P. A. Mawby, Zheng Zeng*, “Power module with large short-term current capability by using phase change material”, *IET, The Journal of Engineering*, Vol. 2019 Issue. 16, pp. 3225-3229, Jan. 2019, <https://doi.org/10.1049/joe.2018.8405> IF-0.3.
27. *Tanaya Datta, P. Bajpai*, "An Adaptive Limiter for Unbalanced Operation of Doubly Fed Induction Generator Based Wind Energy System" *International Journal of Renewable Energy Technology*, Inderscience, Vol. 9, No. 4, pp. 416-438, 2018, DOI: [10.1504/IJRET.2018.095797](https://doi.org/10.1504/IJRET.2018.095797) IF-0.12.
28. *P. Bajpai, Sayonsom Chanda and Anurag K. Srivastava*, “A Novel Metric to Quantify and Enable Resilient Distribution System using Graph Theory and Choquet Integral”, *IEEE Transactions on Smart Grid*, Vol. 9, No. 4, 2918–2929, July 2018, DOI: [10.1109/TSG.2016.2623818](https://doi.org/10.1109/TSG.2016.2623818) IF-10.49.
29. *Noel Merritt, Chandan Chakraborty and P. Bajpai*, “New Voltage Control Strategies for VSC based DG Units in an Unbalanced Microgrid”, *IEEE Transactions on Sustainable Energy*, Vol.8, no.3, pp.1127-1139, July 2017, DOI: [10.1109/TSTE.2017.2657660](https://doi.org/10.1109/TSTE.2017.2657660) IF-7.65.
30. *Paresh K. Nayak, A.K. Pradhan, and P. Bajpai*, "A Three-Terminal Line Protection Scheme Immune to Power Swing”, *IEEE Transactions on Power Delivery*, Vol. 31, No. 3, pp.999-1006, June 2016, DOI: [10.1109/TPWRD.2014.2387873](https://doi.org/10.1109/TPWRD.2014.2387873) IF-4.42.
31. *P. Bajpai, and Vaishalee Dash*, “Power Management Control Strategy for a Stand-alone Solar Photovoltaic-Fuel Cell-Battery Hybrid System” *Sustainable Energy Technologies and Assessments*, Vol.9, pp.68-80, 2015, <https://doi.org/10.1016/j.seta.2014.10.001> IF-3.46.
32. *Paresh K. Nayak, A.K. Pradhan, and P. Bajpai*, "Secured Zone 3 Protection During stressed Condition” *IEEE Transactions on Power Delivery*, Vol.30, no.1, pp: 89-96, 2015, DOI: [10.1109/TPWRD.2014.2348992](https://doi.org/10.1109/TPWRD.2014.2348992) IF-4.42.

33. *Paresh K. Nayak, A.K. Pradhan, and P. Bajpai*, "Wide-Area Measurement Based Backup Protection for Power Network with Series Compensation", *IEEE Transactions on Power Delivery*, Vol.29, no.4, pp: 1970 - 1977, 2014, DOI: [10.1109/TPWRD.2013.2294183](https://doi.org/10.1109/TPWRD.2013.2294183) IF-4.42.
34. *Ashish R. Hota, and P. Bajpai*, "Decentralized Operation of Residential Energy Resources in the Smart Grid", *International Journal of Renewable Energy Technology*, Vol. 5, No. 1, pp.55-76, 2014, DOI:[10.1504/IJRET.2014.059661](https://doi.org/10.1504/IJRET.2014.059661)
35. *Ashish Ranjan Hota, Mahesh Juvvanapudi and Prabodh Bajpai*, "Issues and Solution Approaches in PHEV Integration to Smart Grid", *Renewable & Sustainable Energy Reviews Elsevier*, Vol. 30, pp. 217-229, February 2014, <https://doi.org/10.1016/j.rser.2013.10.008> IF-10.56.
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- **Patent: Published**

1. **Inventors: Prabodh Bajpai**, N.K. Kishore, Anantha Baddam Reddy, Title “A hybrid energy power plant adapted to utilize multiple energy source” Indian Patent No. 422752, Dated 19.08.2013

- **White Paper(s)**

1. Efstratios Batzelis, Zakir H. Rather, John Barton, B. Ramesh Naidu, Billy Wu, Firdous Ul Nazir, Onyema S. Nduka, Wei He, Jerome Nsengiyaremye, Bandopant Pawar, Diane Palmer, Bikash Pal, Murray Thomson, Chandan Chakraborty, **Prabodh Bajpai**, Saikat Chakrabarti, Mark Dooner, Marcus King, Jihong Wang , “Solar integration in the UK and India: technical barriers and future directions”, Published by **Joint UK-India Clean Energy Centre (JVCEC)**, April 2021, DOI:10.17028/rd.lboro.14453133

- **Book Chapter(s)**

1. **Prabodh Bajpai**, Sayonsom Chanda and Anurag K. Srivastava, “Measuring Resiliency Using Integrated Decision Making Approach” in the book entitled “**Resiliency of power distribution systems**” published by **John Wiley & Sons, Ltd**, Jan 2024, Editor(s):Anurag K. Srivastava, Chen-Ching Liu, Sayonsom Chanda, <https://doi.org/10.1002/9781119418689.ch2>
2. T. Datta and **P. Bajpai**, “**Steady state modelling of DFIG based wind energy system for unbalance operation**” in the book “Handbook of Renewable Energy Technology and systems”, published by **World Scientific Publishing Co.**, UK, July 2021, *Edited By: Ramesh C. Bansal and Ahmed F. Zobaa*, ISBN 978-1-78634-902-6 <https://www.worldscientific.com/worldscibooks/10.1142/q0264>
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4. **Prabodh Bajpai** and Dinesh Varma, "IoT Driven Data Extraction Applications using Common Information Model in a Hybrid Microgrid System" in the book " **Design, analysis and Applications of Renewable Energy systems**" published by **Academic Press, Elsevier**, 2021, *Edited By: Ahmad Taher Azar, Nashwa Ahmad Kamal*, ISBN: 978-0-12-824555-2
5. **Prabodh Bajpai** and Dinesh Varma,"Techno-Economic Performance Evaluation among different Solar "Techno-Economic Performance Evaluation among different Solar Photovoltaic System Configurations" in the book " **Design, analysis and Applications of Renewable Energy systems**" published by **Academic Press, Elsevier**, Sept. 2021, *Edited By: Ahmad Taher Azar, Nashwa Ahmad Kamal*, ISBN: 978-0-12-824555-2

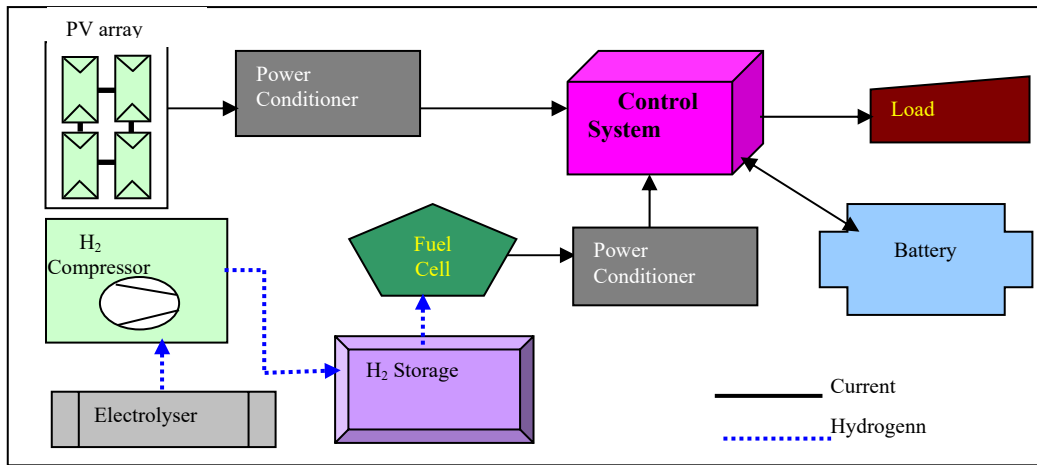
## **Technologies Developed**

Sl.	Title	Year	Supported by	Brief Detail
1.	Renewable hybrid energy power plant for stand-alone applications	2013	Sponsored research project funded by Vodafone Essar-IIT Kgp Center of Excellence in Telecommunications (VICET)	<p><b>Patent and Development of technology-</b> A Laboratory prototype of unified controller as for stand-alone Solar-fuel cell-Battery hybrid energy power plant is designed, developed and tested with Solar PV as primary source, battery as primary backup, FC as secondary backup to feed a DC load through changeover logic based on optimal energy management strategy.</p> <p><i>Indian Patent no. 422752, Dt. 19.08.2013</i></p>
2.	Hybrid AC-DC Microgrid test facility	2018	Sponsored research project funded by DST, India	<p><b>Development of technologies-</b> Unique Hybrid AC-DC microgrid system designed and developed with various sources, hybrid storage, AC/ DC loads, two level hierarchal controls. It is installed in and around a lab complex building as a test facility for various interface devices and control algorithms.</p>

*Technical details with photographs are provided below for both developed technologies.*

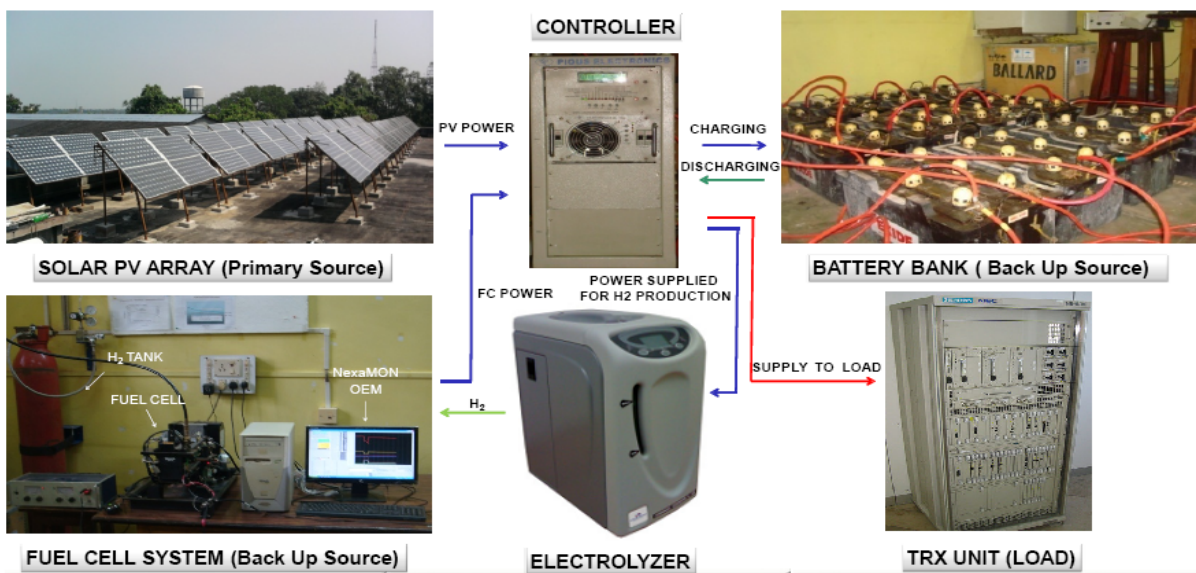
## Technical details and photographs of Renewable Hybrid Energy Power Plant for Stand-alone applications developed at IIT Kharagpur under the project Sponsored by Vodafone Essar-IIT Kgp Center of Excellence in Telecommunications (VICET)

Hybrid energy system using renewable power sources is a promising solution for Stand-alone applications like telecom stations in remote locations. Such arrangements could replace diesel generators in standalone installations, particularly placed far from the power grid. In isolated regions, intermittent renewable power system is integrated with adequate energy storage to provide a reliable supply of electricity to a load. The energy storage components (battery and/or Fuel Cell) can provide power to the load when the renewable sources are inadequate. Solar-fuel cell-Battery hybrid energy power plant schematic block diagram is shown in Fig. 1. The control system will direct power to a DC bus to supply the load, while the excess power is directed to the batteries first and an electrolyzer next, which is used to generate hydrogen for supplying the fuel cell. A unified controller for Solar-fuel cell-Battery hybrid energy power plant is designed, developed and tested with Solar PV as primary source, battery as primary backup, FC as secondary backup to feed a DC load.



*Fig. 1, Schematic block diagram of Solar-Fuel cell-Battery Hybrid Energy Power Plant*

### SPV-FC-BATTERY HYBRID ENERGY POWER PLANT



*Fig.2: Photo of Solar-Fuel cell-Battery hybrid Energy Power Plant*

## Technical details and photographs of the Hybrid AC/DC Microgrid test facility developed at IIT Kharagpur under project Sponsored by DST, Govt. of India

This hybrid AC/DC microgrid facility is unique in terms of kind of sources composed of solar PV, wind turbine-emulator & generator system, Fuel cell (FC) system, Diesel generator and hybrid storage of Battery and Supercapacitor (SC) and AC/DC loads. This is installed in and around a lab complex building in IIT Kharagpur campus to host and test new interface prototypes devices and the control algorithms. The two level control hierarchy and communication structure is developed using local control from NI CompactRIO and supervisory control from OPAL RT OP5600.

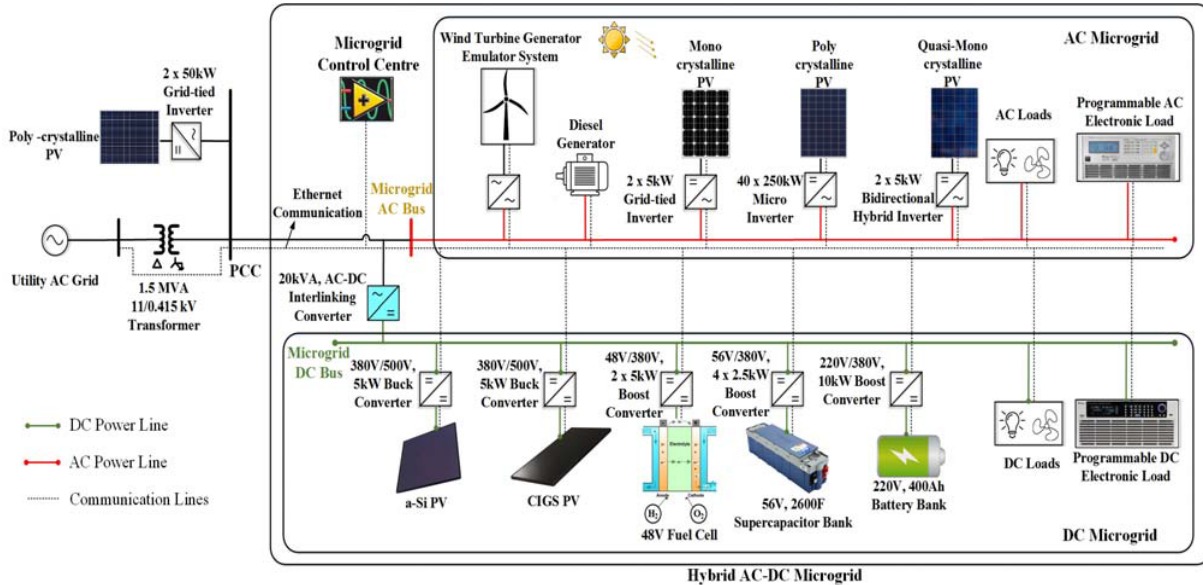


Fig.1: Schematic block diagram of the system architecture



Fig.2: Photo of 1)Control Center, 2)100kW PV plant, 3)ThinFilm PV array with Single axis tracker, 4) Crystalline PV array with Dual axis tracker, 5) Hybrid and Grid-tied PV inverters, 6) Wind turbine-emulator & generator system, 7) HMG Interface panel, 8) Converters for Battery, SC and FC, 9)FC system with Electrolyser and H<sub>2</sub> tank, 10)Battery Bank, 11) SC bank, 12) Diesel generator