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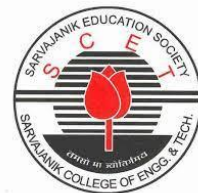


IEEE

SCET Student Branch



Power & Energy Society®



# REPORT

## ERTE - 2023

### Emerging Research Trends in Engineering (ERTE) on Smart Energy Systems

#### Event Date:

15<sup>th</sup> to 17<sup>th</sup> September, 2023

#### Organized by:

**Sarvajani College of Engineering and Technology**  
in association with IEEE PES GC & IEEE SCET SB

#### Team Behind the Event:

**General Chair:** Dr. Kiran Amin, Dr. Chirag Paunwala

**Program Co-chair:** Dr. Hitesh Mehta, Dr. Manisha Shah, Dr. Priyesh Chauhan

**Organizing CO-chair:** Dr. Ketki Pathak, Dr. Hardik Desai

**Committee Members:** Ashish Phophalia, Manisha Shukla, Rakesh Patel

**Student co-ordinators:** Mombasawala Aleemuddin, Tej Desai

# EVENT BANNER



INDUSTRIAL VISIT



## ERTE-2023

EMERGING RESEARCH TOPICS IN ENGINEERING

### Smart Energy Systems

Industry Experts



**Dr. Gopal Gajjar**  
Senior Research Scientist  
IIT, Bombay



**Mr. Himanshu Shah**  
Application Engineer (HUB APMEA),  
Power Transformers & Renewables,  
Hitachi Energy, Vadodara



**Ms. Manisha Sukla**  
Manager, Transformer Service  
Business, Hitachi Energy, Vadodara



**Mr. Nihar Raj**  
Sr. VP (O&M), Adani Transmission Ltd.,  
Ahmedabad

### Academicians



**Dr. Mahmdasraf A. Mulla**  
Associate Professor  
SVNIT, Surat



**Dr. A.K. Panchal**  
Professor  
SVNIT, Surat



**Dr. Hitesh Mehta**  
HOD, Electrical Engineering  
Department, SCET



**Dr. Pradyumn Chaturvedi**  
Associate Professor, Visvesvaraya  
National Institute of Technology, Nagpur



PANEL DISCUSSION



SEPT 15-16-17  
2023

### Registration:

For IEEE Members - ₹500/-

For Non IEEE members - ₹750/-

(including GST)

<https://forms.gle/ds5ZJfBqcNATIGfd7>

### Venue

SCET, Surat

Contact us at:

ketki.joshi@scet.ac.in,  
hardik.desai@scet.ac.in



### General Co-chairs

Kiran Amin  
Chirag Paunwala

### Program Co-chairs

Hitesh Mehta  
Manisha Shah  
Priyesh Chauhan

### Organizing Co-chairs

Hardik P. Desai  
Ketki C Pathak

### Program Committee

Ashish Phophalia  
Manisha Shukla  
Rakesh Patel

### Student Coordinator

Tej Desai  
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Mombasawala Aleemuddin  
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SCAN TO REGISTER



**Event Details:**

**Event Type:** Seminar, Panel Discussion and Industrial Visit

**Event Mode:** Hybrid

**Event Location/Platform:** Google Meet/SCET Campus

**Event Category:** Technical Event

**Event Date and Time:** 15<sup>th</sup> to 17<sup>th</sup> September 2023, Event

**Accessibility:** For registered participants

**Participation Details:**

Total numbers of participants - 45

## Day 1 – 15<sup>th</sup> September, 2023

### Inauguration:

The ERTE 2023 began on a very happy note with lamp lightening process followed by a prayer. All the program chairs, co-chairs and members of the organising committee were welcomed with warm wishes and their presence was acknowledged. Then, the Chair of IEEE Gujarat Section - Kiran Amin shared his wisdom on the activities performed by the IEEE under the banner of various societies.

Moreover, Deepak Mathur who was virtually present throughout the session praised the event and other tasks carried out by the IEEE GS, SPS and PES of the SCET SB in order to encourage the young generation of professionals to look out for some better and efficient ways of transforming or make some improvement in their domain of interest.



Then, the Principal of SCET College, Dr. Hiren Patel shared his memories of working with the control circuits and shared his insights about the current data of production and consumption of electricity in the subcontinent of India. He also acknowledged and encouraged the whole team behind the event setting the momentum for the three-day symposium on the topic of ‘Smart Energy Systems’.



All the participants coming from different parts of the Gujarat then connected with each other on tea and shared their travel stories of visiting SCET college. The eminent speakers also interacted with the faculties and program chairs of the college and event.



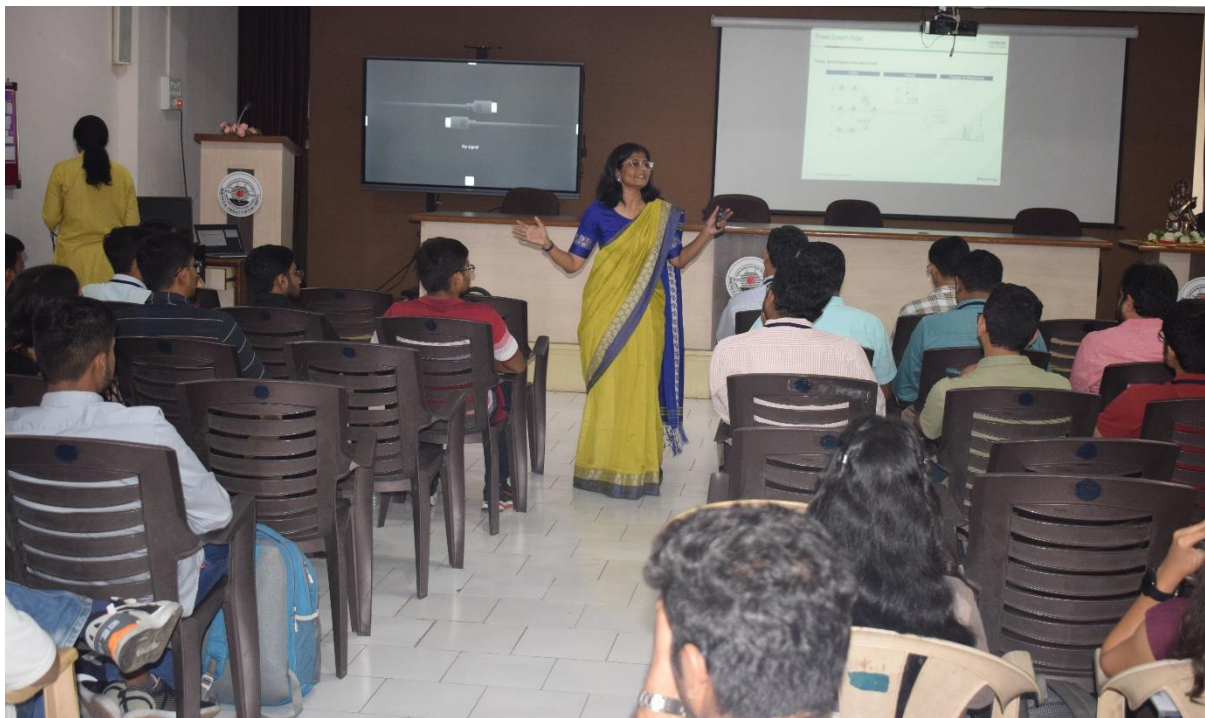
## Talk 1

### "Smart digital substation for smarter and greener grid " - Manisha Shukla

With 28 years of experience in business management, operations, sales, marketing, and engineering, Ms. Manisha Shukla is a techno-commercial leader who excels in various domains. Her proficiency encompasses business financial performance and control, operation excellence, product portfolio management, market segmentation, and product positioning. Additionally, she also serves as Professional Activity Head of IEEE Gujarat Section.



In her session, she shared her experience while working with Hitachi Energy, Vadodara where she not only explained the daily life problems of substations, but also emphasised on different techniques used by the Hitachi Energy Ltd. to curb the challenges faced by the society.



She kept the participants enthused with her practical questions, taking the students away from the ideal theories but providing an optimal solution to the daily life problems.

## Talk 2

### "Digitalization of transformers for optimum performance" - Mr. Himanshu Shah

0A Qualified Master of Engineering (M.E) in Electrical Power System with First Class and Bachelor of Engineering (B.E) in Electrical with Distinction and with more than Seventeen Years of experience in Sales & Marketing of Electrical Equipment (Transformers) along with the exposure to Design of Power and Distribution Transformers. Mr. Himanshu began his talk on a light tone of anecdotes of power and control units.

A colleague of Ms. Mnisha Shukla, he shared his experience working with her and helping out each other in their professional life. He first emphasized on the life of transformers and the need for some automated system in order to find out the life of a transformer and predict its usability.



He interacted with the participants where he talked not only about how companies can save crores by just deploying a small automated monitoring system which can not only help in reducing the maintenance cost by questioning whether it is the required to replace a transformer or can it run a few couple of months. One can look out for the average power consumption in a month and look out for peaks and crests. The maintenance task can be done in the period when demand is low and the peak season can be fully equipped with the best instruments available, in order to ensure efficiency and performance.

## Talk 3

### "Use of Data Analytics & AI in Utility Asset Management."

#### -Mr. Nihar Raj

Mr. Nihar Raj is a seasoned senior management professional with a strong track record in business and team management across diverse regions. Currently responsible for Asia's Consulting Business and P&L, he serves as the Head of O&M, overseeing a network of assets and driving strategic initiatives. With exceptional leadership skills, Mr. Raj effectively manages teams, fosters a culture of innovation, and prioritizes safety.

His specialties include managing complex high-value power system projects, building robust customer relationships, skilled negotiation, and seamless collaboration with global teams.

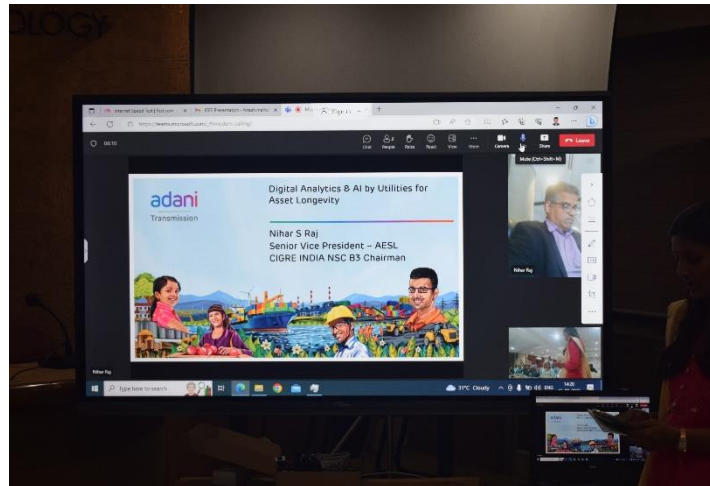
Under Mr. Raj's leadership, Adani Group has developed a number of innovative data analytics and AI-powered solutions for utility asset management. These solutions are helping Adani Group to:

Improve the efficiency and effectiveness of its asset maintenance operations.

Extend the life of its assets and reduce the need for costly emergency repairs.

Reduce costs and improve asset performance

Mr. Nihar Raj gave the talk in online mode but were able to project all the information necessary which expands our horizon in their respective topics and were able to add to our knowledge.





## Industry Visit.

### Surat Urban Observatory & Emergency Response Centre (SUOERC)



This Centre will not only deal with emergency situations but also monitors the civil management services & compiles the mammoth data for future planning.

Inside the SUOERC:-

3 War Rooms for emergency situations, strategy development & research.

Data centres, conference rooms, intelligent transit management systems , fare collection systems.

CCTV monitoring for waste management , safety vehicles, disease management, street amenities etc.

The project has been developed as part of Smart City Mission and it is based on the model of Integrated Command and Control Centre. The first floor will focus on emergency response while monitoring of civic services will be done from the second floor. Data compilation and analysis will be carried out on the third-floor of the building.





## Day 2 – 16<sup>th</sup> September, 2023

### Talk 1

#### "Photovoltaic Battery Charger with advance control algorithms"

– Dr. Ashish Panchal.

Dr. A.K. Panchal, a distinguished professor in the Department of Electrical Engineering, holds a rich academic background with qualifications including a B.E., M.Tech., and Ph.D. His subject expertise encompasses Si nanostructures, focusing on enhancing the efficiency of Si-based solar cell technology, as well as thin film optical structural and electrical characterization



Dr. Ashish Panchal, Professor and Head of Department of Electrical Engineering at SVNIT, Surat, is a leading expert in the field of photovoltaic (PV) technology. His research interests include silicon solar cells, thin film solar cells, and solar PV system design and optimization. He has published over 100 papers in international journals and conferences.

Dr. Panchal is also involved in a number of industry-funded research projects on PV technology. He is a member of the IEEE and the Indian Society of Renewable Energy. He has received several awards for his research, including the IEEE Senior Member Award (2023).

Dr. Panchal's research on advanced control algorithms for PV battery chargers is particularly relevant to the future of solar energy. As the cost of solar panels continues to decline, solar-powered battery systems are becoming increasingly popular. Advanced control algorithms can help to improve the performance and efficiency of these systems, and extend the lifespan of the batteries.

Dr. Panchal's work in this area is helping to make solar energy a more reliable and affordable source of renewable energy.

Here are some specific examples of Dr. Panchal's research on advanced control algorithms for PV battery chargers:

- He has developed a new MPPT algorithm that is more accurate and efficient than traditional algorithms, even under rapidly changing conditions.
- He has also developed a new algorithm for equalization charging, which can help to extend the lifespan of batteries in PV systems.

Dr. Panchal's research is helping to make PV battery chargers more intelligent and efficient, which is essential for the widespread adoption of solar energy.

## Talk 2

### "3 Point MPPT Algorithm For PV Systems" - Dr.Hitesh Mehta.

Dr. Hitesh Mehta is a Professor in the Department of Electrical Engineering at SVNIT, Surat. His research interests include power electronics, renewable energy, and electric vehicles. He has published over 50 papers in international journals and conferences. He is also a recipient of the prestigious IEEE Young Professional Award.



Dr. Mehta's research is helping to make PV battery chargers more intelligent and efficient, which is essential for the widespread adoption of solar energy.

#### Correlation with 3-Point MPPT Algorithm

The three-point MPPT algorithm is a more advanced MPPT algorithm than the traditional perturb and observe (P&O) and incremental conductance (IC) algorithms. It is more accurate and less susceptible to oscillation, but it is also more complex to implement.

Dr. Mehta's research on advanced control algorithms for PV battery chargers is relevant to the three-point MPPT algorithm in a number of ways. He is developing new algorithms that are more accurate and efficient than traditional algorithms, and that are less susceptible to oscillation. These algorithms could be used to improve the performance of the three-point MPPT algorithm. The three-point MPPT algorithm has a number of advantages over the P&O and IC algorithms, including:

- **Improved accuracy:** The three-point MPPT algorithm is more accurate at tracking the maximum power point of the PV array, even under rapidly changing conditions.
- **Reduced oscillation:** The three-point MPPT algorithm is less susceptible to oscillation than the P&O and IC algorithms.
- **Faster convergence:** The three-point MPPT algorithm can converge to the maximum power point more quickly than the P&O and IC algorithms.

Dr. Mehta is also working on developing new algorithms to improve the load shedding and battery monitoring capabilities of PV battery chargers. These algorithms could be used to make the three-point MPPT algorithm more robust and reliable.

Overall, Dr. Mehta's research is helping to make PV battery chargers more intelligent and efficient, which will make solar energy more reliable and affordable.

### Talk 3

#### **" Storage Technologies in Power Distribution Sector" - Dr.Gopal Gajjar.**

Dr. Gopal Gajjar (S'98–M'01–SM'16) received the MTech. and the Ph.D. degrees from IIT Bombay, Mumbai, India, in 2001 and 2015, respectively. He is currently a Research Scientist at IIT



Bombay. He is also a senior member of IEEE. Dr. Gopal Gajjar has a substantial body of work in the field of power systems, including a Ph.D. thesis titled "Mining Wide Area Frequency Measurements in Power Systems," accompanied by a comprehensive report and presentation.

On energy storage technologies, Dr. Gajjar's research contributes to efficiency and reliability, which is important for widespread adoption in distributed power.

Professor. Gajjar is developing new control algorithms for energy storage systems that can improve their performance for various applications such as frequency regulation, voltage support, etc. He is also working on developing new architectures for energy storage systems to mine their scalability and flexibility effectiveness. Dr. Gajjar's research also contributes to the integration of energy storage systems with renewable energy. For example, he is developing new control systems for energy storage systems to integrate with solar and wind power plants to maximize the use of renewable energy.

Professor Gajjar's research contributes to the efficiency, reliability and affordability of energy storage technologies, as well as to consumer and other stakeholders in the electricity distribution industry is very interested. Here are some specific examples of Dr. Gajjar's research on energy storage technologies: He is developing a new control algorithm for BESS that can optimize their performance for frequency regulation. He is also working on developing new systems for BESS that can improve their scalability and flexibility. Dr. Gajjar is also developing new operating systems for BESS to integrate their activities with solar and wind power plants to maximize the use of renewable energy Professor Gajjar's research is helping to make energy storage technologies more attractive to utilities and other stakeholders in the electricity distribution sector. This will help accelerate the adoption of energy storage and make the electricity system more sustainable & resilient



## **Panel Discussion.**

### **Panelist: Dr. Priyesh Chauhan:**

Dr. Priyesh Chauhan is an Assistant Professor in the Electrical Engineering Department at the Institute of Infrastructure Technology Research and Management (IITRAM) in Ahmedabad, India. His research interests include power electronics, microgrids, and distributed generation.

**Dr. Ganshyam Vaghasiya :** Dr. Ganshyam Vaghasiya is the co-founder of ACDTech. At ACDTech, Dr. Vaghasiya is responsible for leading the company's research and development efforts. He is also a passionate advocate for the use of technology to solve real-world problems. He is a frequent speaker at industry events, and he has published numerous papers in top academic journals.

**Dr. Jalpan Mehta:** Dr Jalpan Mehta has qualified Chartered Engineer with Project Management Professional coupled with Electrical Engineering, offering 11+ years of experience in the field of Service Operations, , Installation, Commissioning, operation & Maintenance, preparation of Estimates, Tendering & Contract management, Client Relationship, Team Management, Maintenance, Design Engineering & Men Management; currently spearheading functions as Assistant Engineer (Electrical)

**Dr. Gopal Gajjar:** Dr. Gopal Gajjar (S'98–M'01–SM'16) received the MTech. and the Ph.D. degrees from IIT Bombay, Mumbai, India, in 2001 and 2015, respectively. He is currently a Research Scientist at IIT Bombay. He is also a senior member of IEEE. Dr. Gopal Gajjar has a substantial body of work in the field of power systems, including a Ph.D. thesis titled "Mining Wide Area Frequency Measurements in Power Systems," accompanied by a comprehensive report and presentation.



**#Few thoughts and questions shared by the volunteers and the industrial experts and academicians gave most feasible solutions .**

**1)Question to Gajjar Sir, Being research scholar, what should be the approach and steps to go for startup about BESS?**

**A) Suggetion for BRTS system:-**

Could we install piezoelectric at the floor and seating chair to generate electricity which can power the lighting for bus stand Depo .

**2) Now a day's government is encouraging everyone to install rooftop PV at your home but i want to ask that how many government buildings have PV?**

If less then 100% then what's the reason not to install solar on government buildings like BRTS bus stand, police station, post office and many more buildings?

A)Revenue generation is there by providing electricity for charging ev to people at cheapest cost which smc is providing write now while production of it is costly as well as initial investment is more.

**3) For Jalpan Sir I have seen some brts bus stop their is no person need to exit from bus at stop but still but stop and door will open .As same case in their is no person is entering in bus at bus stop but stiil door is open.Can we manage smarty both case so we can save energy?**

**A) Case 1: No one needs to exit the bus at a stop**

One way to handle this case is to use sensor technology to detect if anyone is waiting to exit the bus at a stop. If no one is waiting, the doors can remain closed. This can be done using a variety of sensors, such as pressure sensors, infrared sensors, or ultrasonic sensors.

**4) Can we store the energy from lightning strikes with the help of connection of supercapacitor?**

A)Yes, it is possible to store the energy from lightning strikes with the help of a connection of supercapacitors. However, there are still some challenges that need to be addressed before this technology can be widely deployed, such as the cost and energy density of supercapacitors.

## Day 3 – 17<sup>th</sup> September, 2023

### Talk 1

#### **" Control of Voltage Source Inverters in Microgrids using TMS C2000 Microcontroller "** **- Dr.Ashraf Mulla , Dr.Rajan Vamja.**

Mahmadasraf A. Mulla (S'97-M'11-SM'21) received the B. E. degree in electrical engineering from the S. V. National Institute of Technology, Surat, India, in June 1995 and M. E. degree from the M. S. University, Vadodara, India, in June 1997 and Ph. D. degree from SVNIT, Surat, India in January 2015. He has more than 23 years of teaching experience. Dr. Ashraf Mulla is a Professor in the Electrical Engineering Department at SVNIT Surat. He has a research interest in



microgrids, power electronics, and renewable energy. He has published numerous papers in top journals and conferences in these areas.

Dr. Mulla's work on control of voltage source inverters (VSIs) in microgrids using TMS C2000 microcontroller is highly relevant to the topic of this article. He has developed a number of innovative control algorithms for VSIs in microgrids, which have been implemented using the TMS C2000 microcontroller. These algorithms have been shown to improve the performance and reliability of microgrids.

Dr. Mulla's research has helped to make microgrids more efficient, reliable, and affordable. His work has also helped to promote the adoption of microgrids in developing countries.

Here are some specific examples of Dr. Mulla's work on control of VSIs in microgrids using TMS C2000 microcontroller:

- He has developed a new control algorithm for VSIs in microgrids that improves the voltage and frequency regulation of the microgrid. This algorithm has been implemented using the TMS C2000 microcontroller and has been shown to improve the performance of microgrids under a variety of operating conditions.
- He has also developed a new control algorithm for VSIs in microgrids that improves the power quality of the microgrid. This algorithm has been implemented using the TMS C2000 microcontroller and has been shown to reduce the harmonic distortion of the microgrid voltage and current.

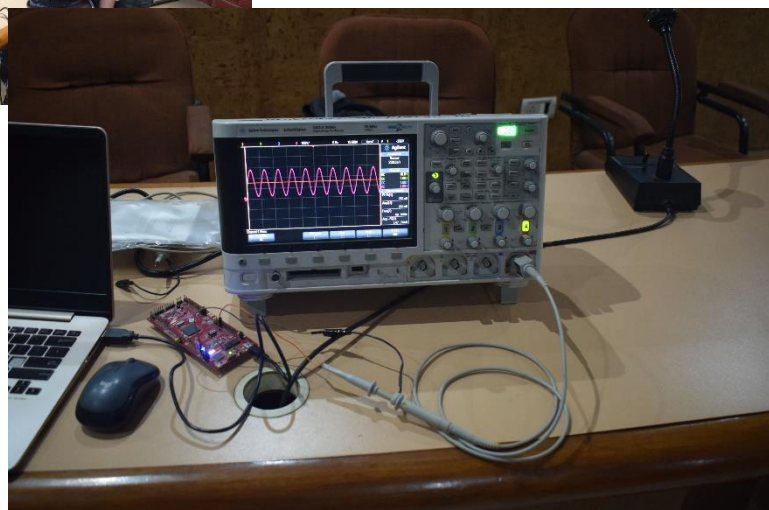
Dr. Mulla's work on control of VSIs in microgrids using TMS C2000 microcontroller is highly innovative and has had a significant impact on the field of microgrids. His work has helped to make microgrids more efficient, reliable, and affordable. It has also helped to promote the adoption of microgrids in developing countries.

Dr. Rajan Vamja is an Associate Professor at the Department of Electrical Engineering, National Institute of Technology, Surat (NITT Surat). His research interests include power electronics, renewable energy, and microgrids.

The TMS C2000 microcontroller is a powerful and flexible microcontroller that can be used to implement a variety of control algorithms for VSIs in microgrids. In this hands-on session, Dr. Rajan Vamja will teach you how to use the TMS C2000 microcontroller to implement a simple control algorithm for a VSI in a microgrid.

#### Objectives

- Understand the basics of microgrids and VSIs.
- Understand the role of the TMS C2000 microcontroller in controlling VSIs in microgrids.
- Implement a simple control algorithm for a VSI in a microgrid using the TMS C2000 microcontroller.
- Test the control algorithm using a simulation platform.





## Talk 2

### " Intelligent fault-tolerant operation of modern solid - state transformers. "

- Dr.Pradyumn Chaturvedi.

Dr.Pradyumn Chaturvedi is a prolific researcher with a notable track record, having authored over 90 research papers published in international and national journals and conferences. He's co-authored two books and holds one patent. Dr. Chaturvedi is an esteemed member of various technical societies, including IEEE, IET, and the International Association of Engineers. His extensive research portfolio includes three sponsored projects, and he's currently involved in four research projects



funded by prestigious organizations. Dr. Chaturvedi serves as an Associate Editor for IEEE IES Industrial Electronics Technology News and plays a significant role in IEEE committees.

Dr Chaturvedi's work on intelligent fault-tolerant operation of SSTs has made a significant contribution to the field of power electronics and has helped to improve the reliability, safety, and efficiency of modern solid-state transformers.

Here are some of the specific contributions of Dr Chaturvedi's work to the field of intelligent fault-tolerant operation of SSTs:

- His work on the development of new algorithms for fault detection, diagnosis, isolation, and system reconfiguration has helped to improve the reliability, safety, and efficiency of SSTs.
- He has also developed a number of innovative algorithms and techniques that have been shown to be more effective than traditional algorithms and techniques in detecting, diagnosing, isolating, and reconfiguring SSTs.
- His work has helped to make SSTs more reliable, safe, and efficient for use in a variety of applications, including microgrids, renewable energy systems, and smart grids.

Overall, Dr Chaturvedi's work on intelligent fault-tolerant operation of SSTs is highly significant and has had a major impact on the field of power electronics.

## Valedictory session.





## **Closing Ceremony**

The ERTE-2023 conference was a three-day event that was held from September 15-17, 2023 in Surat, India. The conference was a success, with over 50 attendees from Industry, Academia, and various colleges.

The conference featured a wide range of presentations, discussions, and networking opportunities. The presentations covered a variety of topics related to smart energy systems, including renewable energy, energy storage, energy efficiency, and many more.

The conference also featured a number of keynote speakers from leading companies and organizations in the smart energy sector. The keynote speakers provided their insights on the latest trends and developments in the industry.

In addition to the presentations, the conference also featured a number of panel discussions and workshops. The panel discussions allowed attendees to hear from experts on a variety of topics related to smart energy systems. The workshops provided attendees with the opportunity to learn more about specific technologies and applications.

The conference was a valuable opportunity for attendees to learn about the latest research and developments in smart energy systems. The conference also provided an opportunity for attendees to network with other professionals in the field.

The organizing committee would like to thank the industrial partners, academics, volunteers, mentors, student coordinators, and attendees for their support of the ERTE-2023 conference.

The committee is committed to continuing this conference series and providing a forum for the discussion of the latest research and developments in smart energy systems.



### **Feedback Forms :**

How do you rate our session on a scale of 1-5?

**Dr. Ashish Panchal** – Average Rating- **4.2**

**Dr. Hitesh Mehta** – Average Rating **-4.3**

**Dr. Gopal Gajjar**- Average Rating **-3.9**

**Ms. Manish Shukla**- Average Rating **-4.4**

**Mr. Nihar Raj**- Average Rating **-4.5**

**Mr. Himanshu Shukla** -Average Rating **-4.5**

**Dr. Asraf Mulla** -Average Rating **-4.2**

**Dr. Rajan Vamja** -Average Rating **-4.2**

**Dr, Pradyum Chaturvedi**– Average Rating **-4.3**

Members-**95%** of Volunteers are members .

Remaining **5%** are **interested** to become a member.



## **Volunteer credits:**

### **MoC:**

Shivangi Vyas  
Alok Mevawala  
Khushboo Jha  
Anirban Jana  
Gneya Chaudary  
Aarya Lokhandwala  
Chahi Tejani  
Dev Joshi

### **Food & Logistics:**

Niket Singla

### **Social Media:**

Hetasvi Bhimani

### **Photography:**

Tej Desai

### **Technical Support:**

Jeel Saliya

### **Report compiled by:**

Dev Joshi (ET21BTEC029) and Alok Mevawala (ET21BTEC037), student volunteers, IEEE SCET SB,