Report on Short-term course on "Digital Grid: Transforming Smart Energy Future"

A 5-day short-term course on "Digital Grid: Transforming Smart Energy Future" DGTSEF-2024 was organized by Electrical Engineering Department, NIT Jalandhar., was organized from 16-February-2024 to 20-February-2024 in online mode. Convener of the STC was Professor S. K. Pahuja, HOD, EE Department, NIT Jalandhar. Course Coordinators were Dr. K. C. Sharma, Dr. Monika Gaba, and Dr. Nandan Kumar Navin.

The event featured experts from Industry and academia who presented on various topics related to the digital grid and its impact on the future of smart energy. The details of the expert, their affiliation and their topic of presentation are as follows:

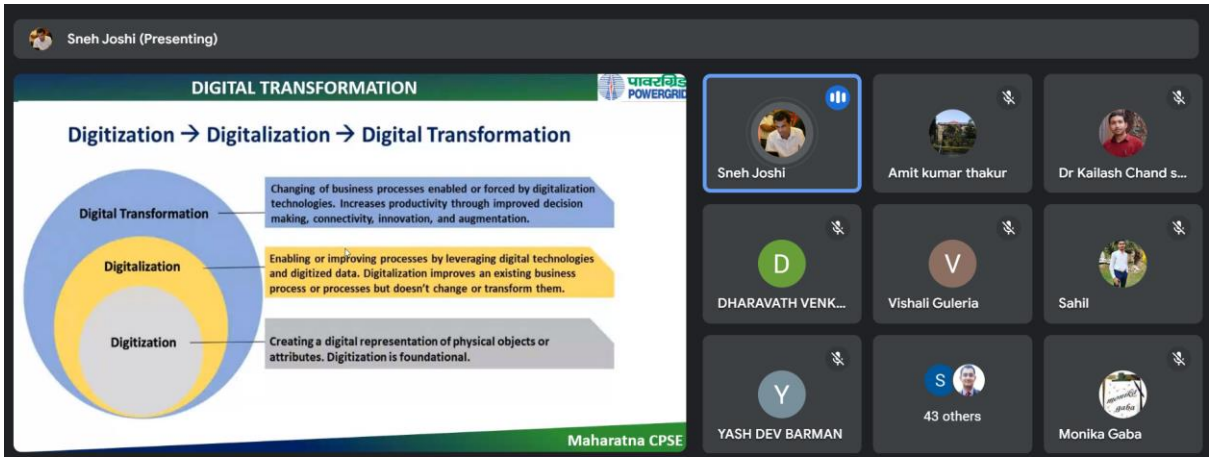
S.No	Name of Expert	Designation & Affiliation	Topic Covered
1.	Mr. Sneh Joshi	Manager, Power grid cooperation of India	Overview of Digital Grid: Transforming the Smart Energy Future "A New Way of Working"
2.	Dr. Saurabh Chanana	Associate Professor, NIT Kurukshetra	AI and its applications to Smart Grid
3.	Mr. Shashank Vyas	Consultant, Infosys	Smart Energy Utility: Innovations, Market trends and Enabling Policy & Regulatory Framework
4.	Dr. Batchu Rajasekhar	Lead Engineer, GE Vernova	Exploring Microgrids: Definition, Applications, and Operation Strategies Through the Lens of IEEE 2030.7 Standard, with a Focus on GE's Microgrid Solutions
5.	Dr. Priyanka	Application Engineer, Enerzinx India Pvt. Ltd	Powering the Future: Navigating Challenges and Opportunities in Net-Zero Power Systems
6.	Dr. V V S N Murthy	Manager, Engineers India Limited	Distributed Energy Sources integration in Grid Connected and Isolated Microgrid & Communication with electrical control system
7.	Dr. Sandeep Kakran	Assistant Professor, NIT Kurukshetra	A brief introduction to Smart Grid and energy management
8.	Dr. Pankaj Kumar	Assistant Professor, NIT Srinagar	Loss Allocation Methods in Distribution Network
9.	Dr. P. Vijay Babu	Assistant professor, Chaitanya Bharthi Institute of Technology, Hyderabad	Smart Integration: Strategies for Performance Enhancement in Distribution Systems with Distributed Energy Resources
10.	Mr. Pankaj Mehar	Co-founder, Nsemble AI	Data Analytics for Grid Optimization

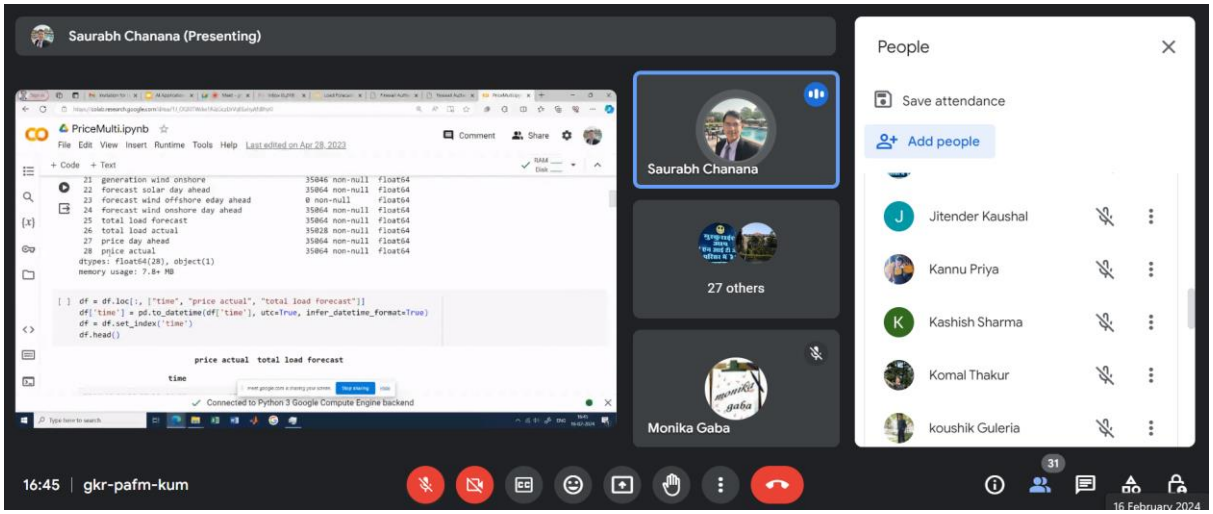
42 Participants comprising faculty, research scholars, postgraduate (PG), and undergraduate (UG) students from various academic institutes in India joined the Short-term course. List of Students and their transaction details are provided below:

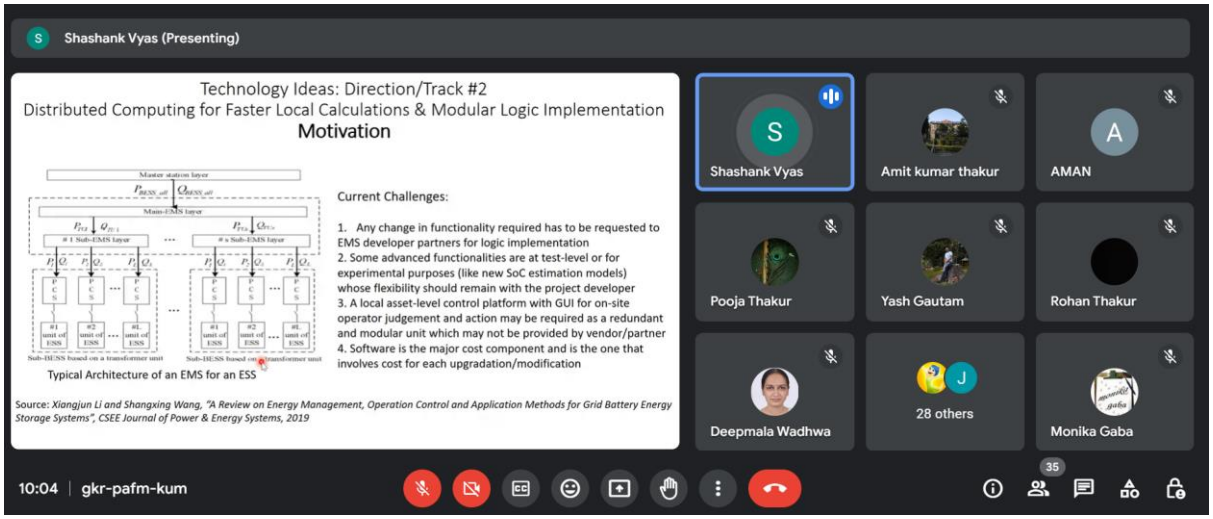
S. No.	Name	Amount (Including GST @ 18% for External Candidates)	Transaction ID	Fee Payment Date/Time
1.	Mr DHARAVATH VENKATESH	200.00	113169861004	06-Feb-2024 22:02:30
2.	Er YASHWANT SINGH MEENA	200.00	113169074346	06-Feb-2024 13:40:10
3.	Mr ANUPAM SAINI	200.00	113169087275	06-Feb-2024 13:48:57
4.	Mr DIPAK KUMAR PANDIT	236.00	113170887675	07-Feb-2024 17:58:49
5.	Mr AMIT KUMAR THAKUR	236.00	113170879280	07-Feb-2024 17:53:31
6.	Mr SHUBHAM KUMAR	236.00	113171863039	08-Feb-2024 14:27:08
7.	Er PANKAJ KUMAR SHARMA	236.00	113170896863	07-Feb-2024 18:04:39

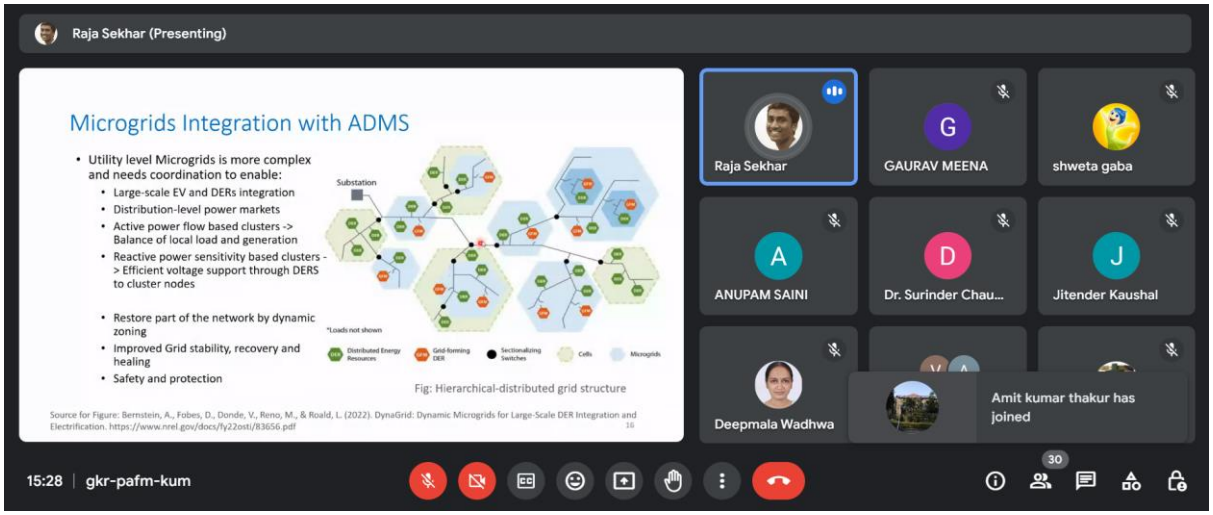
8.	Er CHANDRAVEER YADAV	236.00	113170864658	07-Feb-2024 17:44:09
9.	Ms ASTHA ANAND	236.00	113171071892	07-Feb-2024 20:03:14
10.	Mr SUSHIL KUMAR	236.00	113171866277	08-Feb-2024 14:29:36
11.	Mr ANSHU KUMAR	236.00	113171857145	08-Feb-2024 14:22:49
12.	Mr NAGMANI KUMAR	236.00	113170955941	07-Feb-2024 18:42:53
13.	Mr SHUBHAM KUMAR	236.00	113170871837	07-Feb-2024 17:48:49
14.	Er GAURAV MEENA	200.00	113180455038	15-Feb-2024 18:09:17
15.	Mr PAWAN CHAUDHARY	236.00	113175283427	11-Feb-2024 12:21:06
16.	Mr SAHIL	236.00	113175904014	12-Feb-2024 02:00:08
17.	Ms VISHALI	236.00	113177100447	12-Feb-2024 22:12:58
18.	Mr SARDAR VALLABH BHAI PATEL	236.00	113176324915	12-Feb-2024 12:57:10
19.	Ms KASHISH SHARMA	236.00	113176868682	12-Feb-2024 18:57:51
20.	Er KOMAL	236.00	113176888314	12-Feb-2024 19:11:41
21.	Mr KESHAV SINGLA	200.00	113177753404	13-Feb-2024 14:37:27
22.	Mr MANAN	200.00	113177754104	13-Feb-2024 14:37:56
23.	Mr KOUSHIK	236.00	113177786633	13-Feb-2024 15:01:25
24.	Mr ROHAN THAKUR	236.00	113179423264	14-Feb-2024 20:56:39
25.	Mr AMAN	236.00	113179643359	15-Feb-2024 08:42:48
26.	Mr YASH GAUTAM	236.00	113179659528	15-Feb-2024 09:04:56
27.	Ms KANNU PRIYA	236.00	113180214946	15-Feb-2024 15:28:50
28.	Ms POOJA	236.00	113180275040	15-Feb-2024 16:10:22
29.	Dr BHUPENDER SHARMA	590.00	113168478704	05-Feb-2024 22:28:36
30.	Dr PANDRY NARENDRA RAO	590.00	113170839901	07-Feb-2024 17:28:55
31.	Mr RAGHU N	590.00	113171452302	08-Feb-2024 09:53:26
32.	Ms VEDASHREE PRAKASH RAJDERKAR	590.00	113173150310	09-Feb-2024 13:29:04
33.	Dr DR PREMA DAIGAVANE	590.00	113173281847	09-Feb-2024 15:03:19
34.	Mr HUIDROM PREM KUMAR SINGH	590.00	113173361265	09-Feb-2024 16:00:17
35.	Mr WAYPHALE NILESH SHIVAJI	590.00	113174141084	10-Feb-2024 11:02:17
36.	Dr SURINDER CHAUHAN	590.00	113180464287	15-Feb-2024 18:13:43
37.	Dr JITENDER KAUSHAL	590.00	113180534390	15-Feb-2024 18:56:57
38.	Ms DEEPMALA	590.00	113179835645	15-Feb-2024 11:28:33
39.	Mr DEVEN VATSAL	500.00	113155559682	25-Jan-2024 16:40:02
40.	Ms SHWETA GABA	590.00	113168538777	06-Feb-2024 00:09:41
41.	Mr DHIRAJ KUMAR ARORA	590.00	113168789046	06-Feb-2024 10:46:48
42.	Mr NAVDEEP BATISH	500.00	113170210725	07-Feb-2024 10:49:45

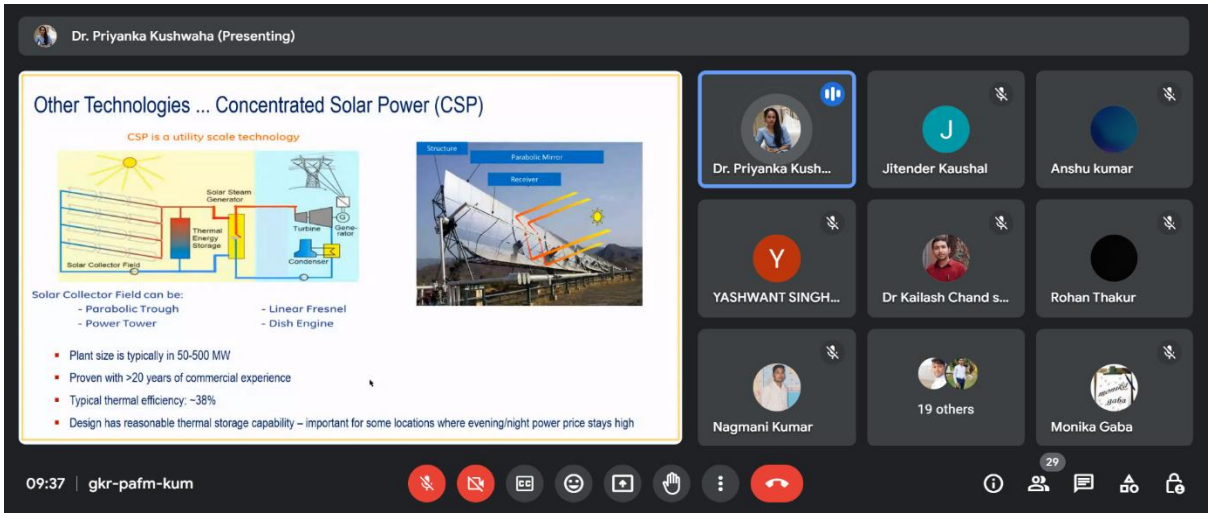
Following are few screenshots of the course that was conducted by various speakers.

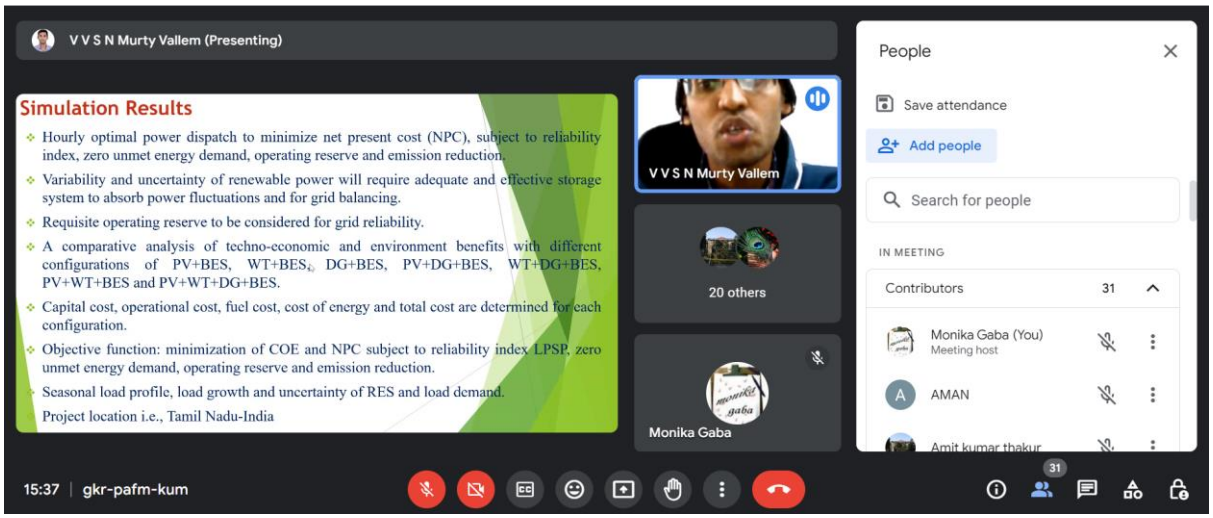

Sneh Joshi (Presenting)
DIGITAL TRANSFORMATION
Digitization → Digitalization → Digital Transformation
Digital Transformation
Changing of business processes enabled or forced by digitalization technologies. Increases productivity through improved decision making, connectivity, innovation, and augmentation.
Digitalization
Enabling or improving processes by leveraging digital technologies and digitized data. Digitalization improves an existing business process or processes but doesn't change or transform them.
Digitization
Creating a digital representation of physical objects or attributes. Digitization is foundational.
Maharatna CPSE
Sneh Joshi
Amit kumar thakur
Dr Kailash Chand s...
DHARAVATH VENK...
Vishali Guleria
Sahil
YASH DEV BARMAN
43 others
Monika Gaba


Saurabh Chanana (Presenting)
PriceMulti.ipynb
Saurabh Chanana
27 others
Monika Gaba
People
Save attendance
Add people
Jitender Kaushal
Kannu Priya
Kashish Sharma
Komal Thakur
koushik Guleria
16:45 | gkr-pafm-kum
16 February 2024


Shashank Vyas (Presenting)
Technology Ideas: Direction/Track #2
Distributed Computing for Faster Local Calculations & Modular Logic Implementation
Motivation
Current Challenges:
1. Any change in functionality required has to be requested to EMS developer partners for logic implementation
2. Some advanced functionalities are at test-level or for experimental purposes (like new SoC estimation models) whose flexibility should remain with the project developer
3. A local asset-level control platform with GUI for on-site operator judgement and action may be required as a redundant and modular unit which may not be provided by vendor/partner
4. Software is the major cost component and is the one that involves cost for each upgradation/modification
Typical Architecture of an EMS for an ESS
Source: Xiangjun Li and Shangxing Wang, "A Review on Energy Management, Operation Control and Application Methods for Grid Battery Energy Storage Systems", CSEE Journal of Power & Energy Systems, 2019
Shashank Vyas
Amit kumar thakur
AMAN
Pooja Thakur
Yash Gautam
Rohan Thakur
Deepmala Wadhwa
28 others
Monika Gaba
10:04 | gkr-pafm-kum


Raja Sekhar (Presenting)
Microgrids Integration with ADMS
• Utility level Microgrids is more complex and needs coordination to enable:
• Large-scale EV and DERs integration
• Distribution-level power markets
• Active power flow based clusters -> Balance of local load and generation
• Reactive power sensitivity based clusters -> Efficient voltage support through DERS to cluster nodes
• Restore part of the network by dynamic zoning
• Improved Grid stability, recovery and healing
• Safety and protection
Substation
*Loads not shown
Distributed Energy Resources
Grid-forming DER
Sectionalizing Switches
Cells
Microgrids
Fig: Hierarchical-distributed grid structure
Source for Figure: Bernstein, A., Fobes, D., Donde, V., Reno, M., & Roald, L. (2022). DynaGrid: Dynamic Microgrids for Large-Scale DER Integration and Electrification. https://www.nrel.gov/docs/fy22osti/83656.pdf
16
Raja Sekhar
GAURAV MEENA
shweta gaba
ANUPAM SAINI
Dr. Surinder Chau...
Jitender Kaushal
Deepmala Wadhwa
Amit kumar thakur has joined
15:28 | gkr-pafm-kum
30


Dr. Priyanka Kushwaha (Presenting)
Other Technologies ... Concentrated Solar Power (CSP)
CSP is a utility scale technology
Solar Steam Generator
Thermal Energy Storage
Turbine
Gene-rator
Condenser
Solar Collector Field
Structure
Parabolic Mirror
Receiver
Solar Collector Field can be:
- Parabolic Trough
- Power Tower
- Linear Fresnel
- Dish Engine
Plant size is typically in 50-500 MW
Proven with >20 years of commercial experience
Typical thermal efficiency: ~38%
Design has reasonable thermal storage capability – important for some locations where evening/night power price stays high
Dr. Priyanka Kush...
Jitender Kaushal
Anshu kumar
YASHWANT SINGH...
Dr Kailash Chand s...
Rohan Thakur
Nagmani Kumar
19 others
Monika Gaba
09:37 | gkr-pafm-kum
29


V V S N Murty Vallem (Presenting)
Simulation Results
Hourly optimal power dispatch to minimize net present cost (NPC), subject to reliability index, zero unmet energy demand, operating reserve and emission reduction.
Variability and uncertainty of renewable power will require adequate and effective storage system to absorb power fluctuations and for grid balancing.
Requisite operating reserve to be considered for grid reliability.
A comparative analysis of techno-economic and environment benefits with different configurations of PV+BES, WT+BES, DG+BES, PV+DG+BES, WT+DG+BES, PV+WT+BES and PV+WT+DG+BES.
Capital cost, operational cost, fuel cost, cost of energy and total cost are determined for each configuration.
Objective function: minimization of COE and NPC subject to reliability index LPSP, zero unmet energy demand, operating reserve and emission reduction.
Seasonal load profile, load growth and uncertainty of RES and load demand.
Project location i.e., Tamil Nadu-India
V V S N Murty Vallem
20 others
Monika Gaba
People
Save attendance
Add people
Search for people
IN MEETING
Contributors 31
Monika Gaba (You)
Meeting host
AMAN
Amit kumar thakur
15:37 | gkr-pafm-kum
31

Sandeep Kakran (Presenting)

Smart Grid Classification (continue….)

2) Smart management system
i. Energy efficiency improvement
ii. Supply and demand balance
iii. Emission control
iv. Operation cost reduction
v. Utility maximization

Sandeep Kakran | Amit kumar thakur | DHARAVATH VENK... | Abhigya Gangwar | SARDAR PATEL | Shubham kumar | YASHWANT SINGH... | 25 others | Monika Gaba

10:40 | gkr-pafm-kum

PANKAJ KUMAR (Presenting)

Result and discussion

Table 2 b Power generation and siting of DGs

Particular	DG1	DG2	DG3
Node	6	25	32
Active power (kW)	2058.71	738.39	499.55
Reactive power (kVAr)	997.10	457.60	0.00

Table 3. Comparison of remuneration allocation

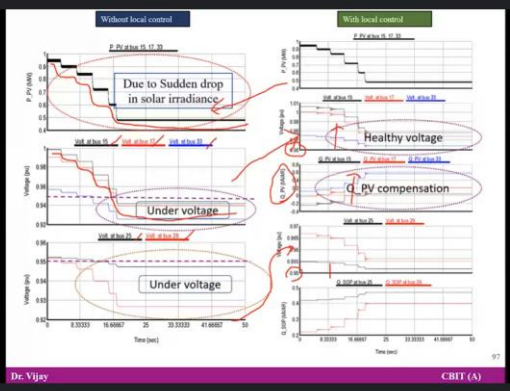
Indices	BCDLA [9]	BCDM [12]	PSMLA [11]	Method [5]	CTDM [13]	ECTDM [14]
RDG1	-0.04	-105.11	-71.9	-56.28	-118.09	-118.84
RDG2	-0.05	-24.27	-20.05	-8.37	-21.14	-20.89
RDG3	0.04	-29.85	-32.34	-12.87	-20.01	-19.49
NRU	43.44	43.44	43.44	43.44	43.44	43.44
TRDG	-0.05	-159.23	-124.29	-77.52	-159.23	-159.23

RDG=Remuneration to DG owners, NRU= Net revenue to utility, TRDG= Total revenue to DGO.

PANKAJ KUMAR | Amit kumar thakur | Raghu N | koushik Guleria | vedashree rajderkar | Deepmala Wadhwa | AMAN | 23 others | Monika Gaba

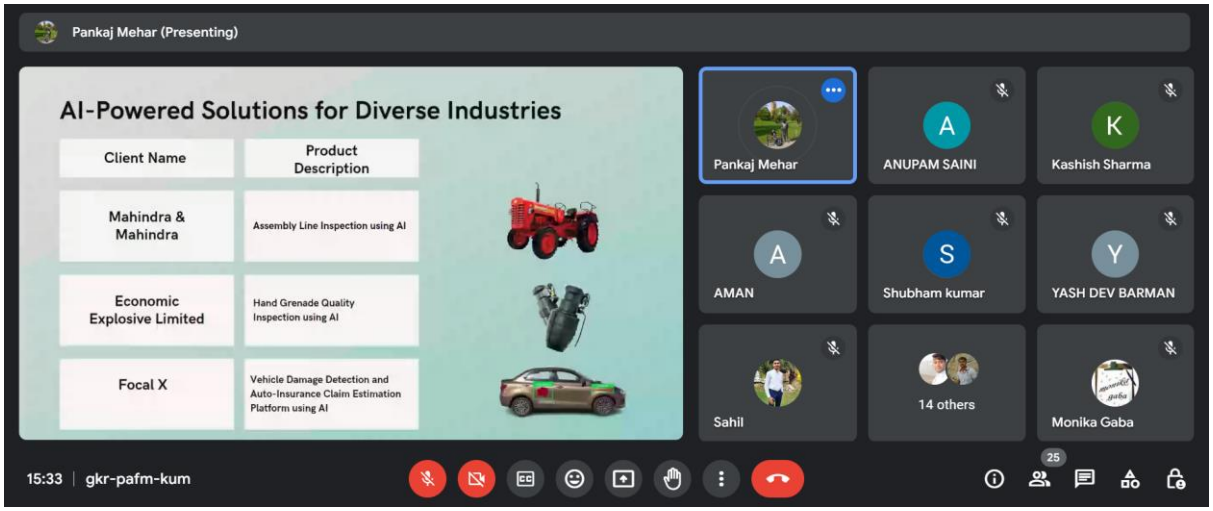
16:02 | gkr-pafm-kum

Vijay Babu (Presenting)



Vijay Babu | Amit kumar thakur | Vishali Guleria | Sahil | Shubham kumar | MANAN | Komal Thakur | 16 others | Monika Gaba

11:03 | gkr-pafm-kum


Pankaj Mehar (Presenting)
AI-Powered Solutions for Diverse Industries
Client Name
Product Description
Mahindra & Mahindra
Assembly Line Inspection using AI
Economic Explosive Limited
Hand Grenade Quality Inspection using AI
Focal X
Vehicle Damage Detection and Auto-Insurance Claim Estimation Platform using AI
Pankaj Mehar
ANUPAM SAINI
Kashish Sharma
AMAN
Shubham kumar
YASH DEV BARMAN
Sahil
14 others
Monika Gaba
15:33 | gkr-pafm-kum
25