

2019 8th International Conference on Power Systems (ICPS)

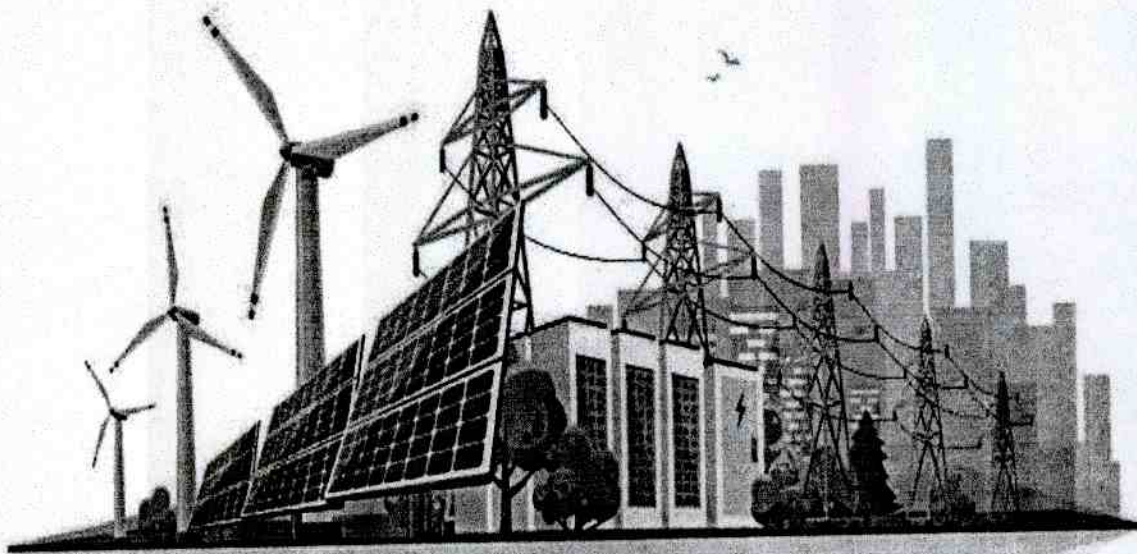
20th - 22nd Dec. 2019

“Transition Towards Sustainable, Smart & Flexible Grids”



*Venue: Vivekananda Lecture Theatre Complex,
MNIT Jaipur*

*Organized By-
Malaviya National Institute of Technology Jaipur
Jawahar Lal Nehru Marg, Malviya Nagar, Jaipur, Rajasthan
302017*



2019 8th International Conference on Power Systems (ICPS)
List of Papers

Paper No.	Authors	Article Title
ICPS001	B. Lokeshgupta and S. Sivasubramani	Multi-objective residential demand side management with solar and wind energy integration
ICPS002	Prashant Jain, Vivek Agarwal, Bishnu Prasad Muni, S. Eswara Rao, Shoubhik Mukherjee and Keerthi Mukund	CAN-based architecture for MSC-GCCI with Maximum Power Point Tracking in large PV installations
ICPS003	Sanjoy Debbarma, Chhandashree Hazarika, Siddhartha Deb Roy	SPC based approach for Frequency Control of Power Systems Penetrated with Fast Acting Reserve
ICPS004	Divyarajsinh Zala, Shubhanga Kn and Krishna Rao	Modal Analysis of Multi-Machine Power System for Load Perturbation
ICPS005	Rajesh M Pindoriya, B.S. Rajpurohit and A. Monti	An Investigative Study of the PMSG Based Wind Turbine Using Real Time Simulation
ICPS006	Nikhil Kunnuthottiyil and Shanti Swarup	Optimal utilization of Transmission Capacity in Indian Grid by placement of Phase Shifting Transformer using Combinational Algorithm
ICPS007	Vishnuvardhan Telukunta, Basavaraj, Praveen, Chowdareddy, Krishna V and Debabrata Rout	Technical Loss Evaluation and Reduction for Agricultural Distribution Feeder
ICPS008	Abhineet Prakash and S.K. Parida	LFC of Interconnected Power System with TCSC using Salp Swarm Algorithm
ICPS009	Megha Gupta and A. R. Abhyankar	Transmission Contingency Selection Considering Impact of Uncertain Distributed Generation
ICPS010	Smriti Jain and Neeraj Kanwar	Day ahead optimal scheduling of generators using Dynamic Programming method
ICPS011	Noha Eissa Morsy, Mahmoud A. Attia, Almoataz Y. Abdelaziz and Neeraj Kanwar	Optimization of the PI controller to improve the dynamic performance of grid-connected photovoltaic system
ICPS012	Kapil Chauhan and Ranjana Sodhi	A Comparative Analysis of μ PMU Placement for Active Distribution Network's Observability
ICPS013	Soniya Sherkar, Srikanth Pamu and Arghya Mitra	Assessing the impacts of integration of Solar PV on transient stability of the power system using a sensitivity based index
ICPS014	Suresh D Varwandkar	Frequency Separation in Mixed Inertia Power Systems Using Modular Approach
ICPS015	Anil Annamraju and Srikanth Nandiraju	Load Frequency Control of an Autonomous Microgrid Using Robust Fuzzy PI Controller
ICPS016	S. D. Varwandkar and Jeremy Lin	Power Displacement Analysis for Power Systems - A Commodity Model
ICPS017	G.V.N. Yatendra Babu and Vaskar Sarkar	A Case Study on Clustering Methods Applied to Identification of Generator Coherency for Controlled Islanding
ICPS018	U. Rajendra Prasad, C. Vyjayanthi and Jaison K.	Modelling and Detection of Interturn Faults in Distribution Transformer
ICPS019	Upasana Sarma, Sanjib Ganguly and Arunima Dutta	Determination of component sizes and analysis of the operational cost of PEM Fuel-Cell-Battery Hybrid Energy System to Retrofit the Diesel Locomotives of Indian Railway

ICPS020	N.A. Rathod, H.H. Patel and S.R. Joshi	Distributed Hybrid State Estimation with Ill Conditioning of Sub Area
ICPS021	Arkadipta Chandra and Ashok Kumar Pradhan	Online Voltage Stability Assessment using Wide Area Measurements
ICPS022	Harish Kumar Varma Gadiraju, Venugopal Reddy Barry and Israyelu Maraka	Dynamic Photovoltaic Array Reconfiguration for Standalone PV Water Pumping System
ICPS023	Priyatosh Mahish and Ashok Kumar Pradhan	Synchrophasor Data Based Distributed Droop Control in Grid Integrated Wind Farms to Improve Primary Frequency Response
ICPS024	Arindam Sadhukhan, S. Sivasubramani and Md Samar Ahmad	Optimal Placement of Electric Vehicle Charging Stations in a Distribution network
ICPS025	Satabdy Jena, Narayana Padhy, Suresh C Srivastava and Noel N. Schulz	A hybrid RC-droop control strategy for power sharing and voltage restoration in islanded DC microgrids
ICPS026	Benoit Couraud, Partik Kumar, Valentin Robu, David Jenkins, Sonam Norbu, David Flynn and A R Abhyankar	Assessment of Decentralized Reactive Power Control Strategies for Low Voltage PV Inverter
ICPS027	Subho Paul, Narayana Padhy, Santanu K Mishra and Anurag K Srivastava	UUCA: Utility-User Cooperative Algorithm for Flexible Load Scheduling in Distribution System
ICPS028	Kundan Kumar, S K Parida and Pabitra Kumar Biswas	Comparative Analysis of PSS and IPFC based Damping Controller for SMIB System
ICPS029	K Raghavendra Naik, Bhooshan Rajpathak, Arghya Mitra and Mohan Kolhe	Voltage stability of Small Hydro Generator Based DC Microgrid
ICPS030	Ancha Satish Kumar and Bibhu Prasad Padhy	A Novel Adaptive Droop Control Strategy for Improved Power Sharing and DC Voltage Control in MTDC grids
ICPS031	Bhimavarapu Gayathri and Chandrasekhar Yammani	Multi-Attacking Strategy on Smart Grid with Incomplete Network Information
ICPS032	Yashasvi Bansal and Ranjana Sodhi	An Adaptive IIR Notch Filter based Half-Cycle P-Class Phasor Measurement Estimation Scheme
ICPS033	Shrinath Kannan and Jan Meyer	Recent Developments in Harmonic Resonance Detection in Low Voltage Networks using Impedance Measurement Techniques
ICPS034	Suraj Kumar Gadari, Praveen Kumar, Komal Mishra, Arup Ratan Bhowmik and Ajoy Kumar Chakraborty	Detailed analysis of Fuzzy Logic Controller for Second order DC-DC Converters
ICPS035	Aqsa Shaikh and Ruchi Harchandani	Implementation of Ultra-Wide Band Marx Generator with Improved PFN Topology for Antenna Load
ICPS036	P Naga Yasasvi, A Mohapatra and S C Srivastava	An Exact Second Order Conic Programming Formulation with McCormick based Relaxation for OPF Solution
ICPS037	Amulya and K. S. Swarup	Analysis of False Data Injection Attacks on Multiarea Load Frequency Control
ICPS038	Akshita Sharma and Anup Shukla	SSB-CPSO Based Multi-Objective Security Constrained Unit Commitment Solution Using NBI
ICPS039	Sagar Bhutada, Saurabh Barot and Dr Satish Chetwani	Analysis of Higher Partial Discharge Values in 36 kV Resin Cast Epoxy Bushings: A Case Study
ICPS040	Abhiram V P, A B Shyam, Soumya Ranjan Sahoo and Sandeep Anand	Stability of DC Microgrid for Different Reduced Communication Topologies

ICPS041	Bryan Paul Robert, P. Arun Babu, Navin Kashyap and Gurunath Gurralla	Practical Approaches Towards Securing Edge Devices in Smart Grid
ICPS042	Amit R Kulkarni, Makrand S Ballal and Aman Gautam	Operational Experience and Performance Evaluation of Prime System Integrity and Protection Schemes (SIPS) in India
ICPS043	Arunima Dutta, Sanjib Ganguly and Chandan Kumar	Voltage Control in Active Distribution Networks and an Approach based on Model Predictive Control
ICPS044	Partik Kumar, Shri Ram Vaishya and Abhijit R. Abhyankar	A Linearized Optimal Power Flow Framework for a Balanced Active Distribution Network
ICPS045	Nihar Karmakar, Ankit Gupta and Biplab Bhattacharyya	Loss Sensitivity based Reactive Power Planning using Hybrid Intelligence Technique
ICPS046	Megha Fatnani and Arghya Mitra	Small signal stability analysis of wind farm integrated multi-machine power system with distributed load
ICPS047	Shaziya Rasheed and A. R. Abhyankar	Development of Nash Equilibrium for Profit Maximization Equilibrium Problem in Electricity Market
ICPS048	Shruti Ranjan and A. R. Abhyankar	Network Constraint Compliant Choice of Renewable Energy Source Siting
ICPS049	Arti Vivek Tare, Prashant Patil and Dr. Vijay Pande	Design of Fractional-order Power System Stabilizer
ICPS050	Jignesh P. Shah and Shefali Talati	Modeling and Analysis of Very Fast Transient Overvoltages in 400 kV GIS
ICPS051	Phani Teja Bankupalli, Subhojit Ghosh, Lalit Kumar Sahu and Atul Kumar Dwivedi	Parameter estimation of PEM Fuel Cell Electrical Equivalent Model using Hybrid Optimization
ICPS052	Mithu Sarkar, Bidyadhar Subudhi and Prema Daigavane	Robust PI Damping Controller design using Wide-Area Signal for Inter-area Oscillation in Power System
ICPS053	Harshvardhan C. Kamble, Trupti P. Hinge, Sanjay Dambhare	Improved Integrated Impedance Scheme for Series Compensated Transmission Line
ICPS054	Kaustav Dey and A. M. Kulkarni	Investigation of Passivity Behavior of Synchronous Generators Connected to Passive Network
ICPS055	Neethu George, Surajath P, O.D. naidu and Preetham Yalla	Machine Learning Based Setting-free Reach Element For Zone-1 Distance Protection
ICPS056	S. Venkata Hareesh and K. Shanti Swarup	Dynamic State Estimation of Synchronous Generator based Distributed Energy Resource in Autonomous Microgrid
ICPS057	Prashant Gawande and Sanjay Dambhare	Pilot Scheme for System Integrity Protection during Stressed Conditions
ICPS058	Shitikantha Dash, Ranjana Sodhi and Balwinder Sodhi	A Semi-Intrusive Load Monitoring Approach for Demand Response Applications
ICPS059	Sumbul Hasan and Himanshu J Bahirat	Impact of BESS Operating Methods on Reliability of Renewable Energy sources.
ICPS060	Akhil G Augustine and Od Naidu	A Novel Fault Section Identification Algorithm for a Series-Compensated Transmission Line
ICPS061	Kirti Gupta, Saumendra Sarangi and Suraj Kumar Gadari	Adaptive Voltage Based Relay Setting for PV Connected Distribution System
ICPS062	Surendra Kumar Joshi, Biswajit Sahoo and S.R. Samantaray	A New Approach to Supervise Vulnerable Third Zone Relay Operation for Power Transmission System

ICPS063	Smrutirekha Samal, S.R. Samantaray and M. S Manikandan	A DNN based Intelligent Protective Relaying Scheme for Microgrids
ICPS064	V Suresh, Rajib Sutradhar, Mintu Mandal, Sunil Singha and Adarsh Jaiswal	Demand Side Management Through Hydro URS in North-Eastern Region
ICPS065	O.D. Naidu, A.K. Pradhan and Neethu George	Accelerated Zone-2 Protection Scheme for Transmission Lines using Traveling Waves
ICPS066	Richa Priyadarshi, Tripta Thakur and Anoop Arya	Performance Evaluation of Rural Electrification sector of India
ICPS067	Astik Dhandhia and Vivek Pandya	Multi Classification of Static Security Assessment using Teaching Learning based Optimization enhanced Support Vector Machine
ICPS068	Ankit Uniyal, Saumendra Sarangi and Himani Kala	Droop based DG allocation in weakly meshed autonomous microgrid
ICPS069	Srikanth Reddy K, Ameena Saad Al-Sumaiti, Vishu Gupta, Rajesh Kumar and Akash Saxena	An Improved Binary Grey Wolf Optimizer (IBGWO) for Unit Commitment Problem in Thermal Generation
ICPS070	Naga Chaitanya Munukutla, Dr. Venkata Siva Krishna Rao Gadi and Dr Ramamoorthy Mylavarapu	A Simplified Approach to Controlled Islanding of Power System
ICPS071	Sagar Sandeepan Indalkar and Anupa Sabnis	An OFF Board Electric Vehicle Charger Based On ZVS Interleaved AC-DC Boost PFC Converter
ICPS072	Suman Sharma, Purna Jain, Rohit Bhakar and Archana Mishra	Grid-to-Vehicle Smart Charging Strategies for Electric Vehicles Aggregator: A Review and Outlook
ICPS073	Brijendra Kumar Verma, Sachin Devassy, Subhash Kumar Ram, Anand Abhishek and Ajeet Dhakkar	Control of a Multi-functional Solar PV-Battery System for Operation in a Microgrid Environment
ICPS074	Diptanu Dey, Arup Ratan Bhowmik, and S Mukherjee	Fabrication and Performance Analysis of TiO ₂ based Photo Electro Chemical Cell
ICPS075	Lokesh Vankudoth and Dr Altaf Q.H. Badar	Distribution Network Optimization through Siting and Sizing of BESS
ICPS076	Urmila Solanki, Ganesh P. Prajapat and Prabhat Jha	Unscented Kalman Filter based Mechanical Parameter Estimation of Wind Turbine Systems
ICPS077	Amit Kumar and Pradeep Kumar	Sliding Mode Control of DSTATCOM for Power Quality Improvement
ICPS078	Ram Krishan, Neshwin Rodrigues and Shashank Vyas	Battery Energy Storage System Operational Control for Distribution Transformer Overload Management
ICPS079	S R Narasimhan, S S Barpanda, Prabal Adhikari, Dirghayu Kumar Shrestha, Suresh Bahadur Bhattarai, Debasis De, N Nallarasan, G Chakraborty, Samir C Saxena and K V N Pawan Kumar	Success Story of India-Nepal Power System Operation
ICPS080	Jagriti Dey, Saurabh Dutta, Arijit Baral and Sivaji Chakravorti	Leakage Current Based Analysis of Suspension Insulator for Effective Determination of ESDD
ICPS081	Amita Sharma, Rohit Bhakar, H P Tiwari and Purna Jain	Distribution Network Pricing to Mitigate Uncertain Load Scenario
ICPS082	Vijeta Singh, Deepak Mishra, Arijit Baral and Sivaji Chakravorti	A Method to Predict Degree of Polymerization Value of Oil-paper Insulation Using Interfacial charge

ICPS083	Pawan Kumar, Gagandeep Singh Brar and Lovepreet Singh	Energy efficiency evaluation in commercial and residential buildings with demand side management: A review
ICPS084	Vaibhav Garg and Bajrang Agarwal	Survey of Literature on Machine Intelligence and Deep learning for Smart Grid Applications
ICPS085	Nagasekhara Reddy Naguru and Yatendra Babu G V N	Reduced-Scale Wide Area Control System Design Based Upon the Dominancy Index Analysis
ICPS086	Shraddha Jadhav, Swati Lavand and Gopal Gajjar	Wide Area Measurement System based Frequency Data Mining for Event Detection in Power System
ICPS087	Himadri Sekhar Bhattacharyya, Amalendu Bikash Choudhury and Chandan Kumar Chanda	Performance Analysis of a Lithium-ion Battery Pack in EV Application Using an Auto-Upgraded Neural Network Model
ICPS088	Upma Sahu and Anamika Yadav	Fault detection in MTDC network utilising one end measurements
ICPS089	Neeraj Kumar Singh and Vasundhara Mahajan	Cyber Attack Detection In Smart Grid Substation Using Virtual Range Increment And Trust Weight
ICPS090	Phanindra Kumar G and Premalata Jena	A Study On Effect of Different Control Strategies on Q-f Droop Based Islanding Detection Technique
ICPS091	Tripta Thakur	A Cost Frontier Model for Indian Electricity Generating Utilities: A Stochastic Approach
ICPS092	Adil Khan, Saikat Chakrabarti, Ankush Sharma and Mahamad Nabab Alam	Parameter and Topology Estimation for Electrical Power Distribution System
ICPS093	Jiwan Kumar Mallik, Satish Gautam, Surendra Mathema, Binod Koirala, Hitendra Dev Shakya and Madhusudhan Adhikari	Micro Hydropower in Nepal: A Journey from Stand-alone System to Distributed Generation
ICPS094	Soumya Mudgal, Atul Kumar Yadav and Vasundhara Mahajan	Reliability Evaluation Of Power System Network With Solar Energy
ICPS095	Pushpendra Singh, Shree Krishna Bishnoi, Nand K. Meena and Jin Yang	Simultaneous Integration of Renewable Power Generation and Battery Energy Storage in Distribution Networks
ICPS096	Ramesh Devarapalli and Bipalab Bhattacharyya	Application of Modified Harris Hawks Optimization in Power System Oscillations Damping Controller Design
ICPS097	Parama Das and Arijit Baral	Effect of Tower Footing Resistance on Back Flashover for a Double Circuit Line
ICPS098	Ankit Uniyal, Saumendra Sarangi and Himani Kala	Optimal dump load allocation to regulate voltage and frequency in microgrid
ICPS099	Preeti Gupta and Dr. Yajvender Verma	Role of Residential Demand Response in Optimizing Utility Cost in PV integrated System under Frequency Linked Pricing Environment
ICPS100	Félix Dubuisson, Ambrish Chandra, Miloud Rezkallah, Hussein Ibrahim and Bhim Singh	Predictive Based Control Algorithm for Hybrid Diesel-Battery Standalone Power Generation System
ICPS101	Harsh Vardhan, Neal M Sarkar and Himanshu Neema	Modeling and Optimization of a Longitudinally-Distributed Global Solar Grid
ICPS102	Madhusudan Kumar and Mala De	Optimal Load Scheduling for Industrial Load - Analysis for a Generalized Industrial Load Model
ICPS103	Soumitri Jena and Bhavesh R. Bhalja	A New Differential Protection Scheme for Busbar using Teager Energy Operator

ICPS104	Anukram Mishra, Bajrang Agarwal, Rajeev Kk and Dhruv Minocha	Assessment of Features in Smart Meters to Enhance Consumers Safety
ICPS105	Jyotsna Singh and Rajive Tiwari	Hierarchical Coordinated Control of Electric Vehicle Parking Lot in Distribution System
ICPS106	Vishal Kumar Gaur and Bhavesh R. Bhalja	Wavelet Transform Modulus Maxima-based Fault Location Method for Three-Terminal Transmission Line
ICPS107	Sunaina Singh, Seema, Bhim Singh and Bijaya Ketan Panigrahi	MRZA-LMM with IMTOGI Control for Grid Tied PV System
ICPS108	Pawan Kumar Pathak, Anil Kumar Yadav and P. A. Alvi	Maximum Power Operation of SPV System using Advanced FL based Control Strategy
ICPS109	Sangeeta Das, Debapriya Das and Amit Patra	Distribution Network Operation with Dispatchable Distributed Generation considering Load Variations
ICPS110	Sreenu Sreekumar, Kailash Chand Sharma, Rohit Bhakar, Sandeep Chawda, Falti Teotia and Vivek Prakash	Deviation Charge Reduction of Aggregated Wind Power Generation using Intelligently Tuned Support Vector Regression
ICPS111	Nishant Kothari, Bhavesh Bhalja, Vivek Pandya, Pushkar Tripathi and Soumitri Jena	A Faulty Section Identification Scheme in Thyristor Controlled Series Compensated Transmission Lines using Superimposed Currents
ICPS112	Priyesh Pandey and Prashant Agnihotri	An Efficient LLC Resonant Converter Design for Photovoltaic Application
ICPS113	Bonu Ramesh Naidu, Prabodh Bajpai and Chandan Chakraborty	Voltage Fault Ride-Through Operation of Solar PV Units: A Review and Way Forward
ICPS114	Pramod Singh, S.K. Jain, Devender Kumar, PK Agarwal	Successful Mitigation of Week Roll Over Issue of Global Positioning System in Indian Power System ζ A Case Study
ICPS115	Vijay P. Singh, Raj Kumar Patel, Naveen K Pandey, S P Singh and Kamlesh Bharti	Impact of Demand Response in Integartion of Renewable Energy Resources in Smart Grid
ICPS116	Abhisek Mishra and Premalata Jena	Restoration in Microgrid using System Stability Criteria
ICPS117	Shubham Gupta, Kanwardeep Singh and Vinod Kumar Yadav	Transmission Expansion Planning in Deregulated Electricity Markets using Multi-Criteria Data Envelopment Analysis (MCDEA)
ICPS118	Muazzam Phansopkar, Mahendra Rane and Sushil Thale	Analysis and Control of Quasi Z-source Inverter with Digital Current Control for Energy Storage
ICPS119	Prashant Malik, Mamta Awasthi and Sunanda Sinha	Analysis of sensitive parameters influencing a SPV/WT/Biomass/Battery based hybrid system
ICPS120	Mukesh Kumar, Shashank Vyas and Alekhya Datta	A Review on Integration of Electric Vehicles into a Smart Power Grid and Vehicle-to-Grid Impacts
ICPS121	Alamanda Sudheer Kumar and Boddeti Kalyan Kumar	A Non-iterative Three Phase Distribution System Power Flow Analysis
ICPS122	Tanuj Rawat, Khaleequr Rehman Niazi, Nikhil Gupta and Sachin Sharma	Joint Allocation and Operation Management of DG and BESS in Distribution System in Presence of Demand Response
ICPS123	Ram Kumar Agrawal, M.P. Sharma Neeraj Kumar Kumawat, Bhavesh Vyas	High Voltage Mitigation Of EHV System by Shunt Reactor Vs Shunt Capacitor
ICPS124	Sandeep D Hanwate, Yogesh V Hote and Shivam Jain	Relative Stability Analysis of Load Frequency Control with QRAWCP-PID controller
ICPS125	Gautam Raina and Sunanda Sinha	Study of PV Systems using Fin Augmentation in real outdoor condition

ICPS126	Shivam Kumar Srivastva, Rakesh Kumar Panda, Sai Sowmya Nagam and Abhejeet Mohapatra	Current Derivative based schemes for Fault Location in DC Microgrid
ICPS127	Ashish Laddha, Neeli Satyanarayana and Vijayakumar K	State Frame of Multi-port DC-DC Converter
ICPS128	Atul Yadav, Soumya Mudgal and Vasundhara Mahajan	Reliability Test of Restructured Power System with Capacity Expansion and Transmission Switching
ICPS129	Akash Gautam, Arun Kumar Verma and Manaswi Srivastava	A Novel Algorithm for Scheduling of Electric Vehicle Using Adaptive Load Forecasting with Vehicle-to-Grid Integration
ICPS130	G.Kesava Rao, Premalata Jena and Saumendra Sarangi	Adaptive Fault Location Algorithm for Series Compensated Line Using Relay data
ICPS131	Murli Manohar, Ebha Koley and Subhojit Ghosh	A wavelet and ANFIS based reliable protection technique for Microgrid
ICPS132	K. K. Gajjar and A. M. Kulkarni	Selective Eigenvalue Analysis for Wide-Area Measurement and Control Applications - A Review
ICPS133	Madhukar Rao A, V Srinivas and B Srividya	Multilevel Inverter Topology with Symmetrical and Asymmetrical Sources for Distributed Energy Resources
ICPS134	C. Purushotham Reddy and Ravikumar Bhimasingu	Synchronized Measurements Based Fault Location Algorithm For Three Terminal Homogeneous Transmission Lines
ICPS135	Ashish Sharma, Abhinav Jain, Neshwin Rodrigues, Alekhya Datta and Shashank Vyas	Evaluating the the Smoothing Application of BESS for Large Solar Photovoltaic Parks
ICPS136	Nilesh Hadiya, Falti Teotia, Rohit Bhakar, Parul Mathuria and Shashank Vyas	Identifying the Potential for Peer-to-Peer Trading of Rooftop Solar Power for Indian Scenario
ICPS137	Archee Gupta, Kailash Chand Sharma, Archita Vijayvargia and Rohit Bhakar	Very Short term Wind Power Prediction Using Hybrid Univariate ARIMA-GARCH Model
ICPS138	Sumanth Yamujala, Anjali Jain, Rohit Bhakar, Jyotirmay Mathur and Priyanka Kushwaha	Operational Flexibility Enhancement through Flexible Ramp Products from Energy Storage
ICPS139	D R Karthik and Shashidhara Mecha Kotian	Initialization of Doubly-fed Induction Generator Wind Turbines Using Noniterative Method
ICPS140	Chandra Prakash Barala, Parul Mathuria and Rohit Bhakar	Optimal Scheduling for Residential Building Based on Virtual Energy Storage System
ICPS141	Priyanka Kushwaha, Vivek Prakash, Rohit Bhakar, Udaykumar R Yaragatti, Sumanth Yamujala and Anjali Jain	Primary Frequency Response Constrained Energy Storage Scheduling Under Photovoltaic Generation
ICPS142	Gayathri Nair and Nilanjan Senroy	Coordinated control of HESS in Wind power systems
ICPS143	Anil Kumar Kesavarapu, Priyanka Kushwaha, Vivek Prakash, Rohit Bhakar, Harpal Tiwari and Krishan Gopal Sharma	Inertia Emulation Trends in Low Carbon Power Systems
ICPS144	Satyendra Singh and Manoj Fozdar	Double Sided Bidding Strategy in a Day-Ahead Electricity Market
ICPS145	Jay Prakash Keshri and Harpal Tiwari	Fault Classification in VSC-HVDC using Machine Learning Approach
ICPS146	Nikhil Garwa and Khaleequr Rehman Niazi	Impact of EV on Integration with Grid System - A Review

ICPS147	Vipin Chandra Pandey, Nikhil Gupta, Khaleequr Rehman Niazi and Anil Swarnkar	A Scenario-based Stochastic Dynamic Economic Load Dispatch Considering Wind Uncertainty
ICPS148	Bhuvan Sharma, Nikhil Gupta, K.R. Niazi, Anil Swarnkar and Shakti Vashisth	Demand Response in the Global Arena: Challenges and Future Trends
ICPS149	Sonam Parashar, Anil Swarnkar, K.R. Niazi and Nikhil Gupta	Operational Management of Grid Connected Microgrid with Responsive Loads
ICPS150	Soumesh Chatterjee	Identification of Faults During Power Swing: A PMU Based Scheme
ICPS151	Shubham Nagar, Vishu Gupta, Rajesh Kumar, Akhilesh Mathur and Vinay Pratap Singh	Optimizing Billing Cost and Revenue in PV - BES Integrated Residential Society
ICPS152	Sangeeta Kumari, Sandeep N, Arun Kumar Verma, Udaykumar R. Yaragatti	An Improved Unipolar SPWM for Transformerless PV Grid Connected Inverter
ICPS153	Sagar Rastogi, Mandeep Singh Rana, and Santanu Kumar Mishra	A Dual-DC Output Unity Power Factor Rectifier for Smart Home
ICPS154	Vivek Patel, Dipayan Guha and Shubhi Purwar	Frequency regulation of an islanded microgrid using integral sliding mode control
ICPS155	Rohit Vijay, J.S Dhillon and Parul Mathuria	Economic Emission Load Dispatch using Fuzzy Decision based Whale Algorithm
ICPS156	M Vetri Selvi and Prof. Sukumar Mishra	Investigation of Influence of Derived Weather Variables using two different Approaches for Modeling Day-Ahead Hourly Electric Load Power Demand Forecasting Framework with Standard Long Short-Term Memory Networks
ICPS157	Diksha Jain, Sandeep N, Arun Kumar Verma and Udaykumar R. Yaragatti	A Simple Methodolgy for Sizing of Stand-Alone PV-Battery System
ICPS158	Arup Ratan Bhowmik, Ajoy Kumar Chakraborty and Siddhartha Mukherjee	Gauss/Mouse Map based Chaotic Lightning Search Algorithm for Sizing and Allocation of DG and DSTATCOM Considering Probabilistic Load Flow
ICPS159	Sunil Bagudai, Olive Ray and Subhransu Samantaray	Evaluation of Control Strategies within Hybrid DC/AC Microgrids using Typhoon HIL
ICPS160	Navonita Sharma and Ajoy Kumar Chakraborty	Development of Feed-In-Tariff using Unbundle Smart Meters for Small Scale Wind Power Generating Plant and Small Scale Roof-Top Solar Plant
ICPS161	Arnab Pal, Aniruddha Bhattacharya and Ajoy Kumar Chakraborty	Allocation of EV Fast Charging Station with V2G Facility in Distribution Network
ICPS162	Karun Kokkonda and P S Kulkarni	PV Fed Active clamped ZVS High Voltage Gain DC-DC Converter for Grid-Tied Photovoltaic applications
ICPS163	Phanendra Babu N V and Suresh Babu P	Optimal Identification and selection of Phasor Measurement Units- A Methodology
ICPS164	Anoop Singh, T Bharath Kumar, Gaurav Yadav and Rahul Karna	Security Constrained Economic Despatch - India: A Rolling Block Implementation Framework
ICPS165	Narayan Bhusal, Michael Abdelmalak and Mohammed Benidris	Optimum Locations of Utility-Scale Shared Energy Storage Systems

An Improved Binary Grey Wolf Optimizer (IBGWO) for Unit Commitment Problem in Thermal Generation

Srikanth Reddy K¹, Ameena Saad Al-Sumaiti¹, Vishu Gupta², Rajesh Kumar², and Akash Saxena³

¹ Advanced Power & Energy Center, Electrical Engineering & Computer Science, Khalifa University, Abu Dhabi, UAE

² Department of Electrical Engineering, MNIT Jaipur, Rajasthan, India

³ Department of Electrical Engineering, SKIT, Management and Gramothan, Jaipur, India

ameena.alsumaiti@ku.ac.ae, vishu.gupta0607@gmail.com, rkumar.ee@gmail.com, aakash.saxena@hotmail.com

Abstract— Generation scheduling and unit commitment procedures in a power system constitute a key operational planning feature of any power system. The complex, constrained unit commitment problem presents a computational challenge, and improving the solution quality can make a substantial impact in the long run. This paper presents an improved binary grey wolf optimization (IBGWO) to solve the unit commitment problem in power system operational planning. The IBGWO enhances the balance between exploration and exploitation properties of the grey wolf search. This would improve both the local as well as the global search properties of the classical grey wolf algorithm. In order to execute and implement the improved grey wolf optimization to unit commitment with binary decision variables, binary transformation of the real valued variant is employed. The IBGWO is tested using test system with different sizes ranging from 10 thermal units to 100 thermal units. The solution quality indices along with convergence characteristics are presented and compared to the existing approaches. The same demonstrates the improved solution quality in the form of reduced operational cost.

Index Terms—Unit Commitment, Demand Response, Dynamic Penalty Cost Models (DPCM), Binary Grey Wolf Optimizer (BGWO), Static Mean Adjustment Cost model (SMACM)

I. INTRODUCTION

The unit commitment (UC) formulation is constrained by various operating conditions and presents an operation scheduling problem [1]. The main objective is to minimize the cost of operation which is a sum of fuel cost and the start up cost. However, the constraints of the system operating conditions and the constraints over the generation unit operation make the problem a complex and computationally demanding problem. The UC problem is categorized as a NP-hard problem that is a combinational optimization problem with mixed integer formulation that contains binary variables in the form of commitment status bits of the generation stations. The complexity of the problem intensifies exponentially with an increase in the dimension of the problem i.e., number of generation units and the hours of scheduling horizon. The UC problem is one of the more widely investigated problems in the power system operation landscape. For solving the UC problem, various optimization algorithms and techniques have been proposed in the last two decades. However, each of these approaches have attracted some sort of criticism with respect

to various performance indices and characteristics. A few of the deterministic approaches that have been used from early years include mixed integer programming, second-order cone programming, dynamic programming, priority list, branch and bound programming. The other class of optimization approaches that have been successfully used to solve the UC problem are stochastic processes. These include evolutionary programming (EP) [2], particle swarm optimization (PSO) [3], genetic algorithm (GA) [4], simulated annealing (SA) [5], quantum based evolutionary algorithm (QEA) [6], grey wolf optimization (GWO) [7], whale optimization algorithm (WOA) [8], fireworks algorithm (FWA) [9], sine-cosine algorithm (SCA) [10]. The ever increasing complexity of the system requires up to date computational approaches to deliver improved solution quality and computational time. The application of all the algorithms are not tailor made for all the problems. Therefore, investigation of solution quality of a particular problem with a particular algorithm is subjected to its suitability for that problem.

The non-smooth and non linear equality and inequality constraints makes the UC problem highly complex and a highly difficult task for the traditional approaches to find a solution. Since the algorithms based on stochastic processes are non-deterministic and approximative in their nature, the resultant solution may fall under local or global minimum. The grey wolf optimizer is a meta-heuristic algorithm that is inspired by the hunting behaviour and social dominance in the grey wolf pack. The application of GWO for different types of problems across different domains has been fairly successful in the past few years. The application of GWO and its variants in power system planning and operation domain has been promising in comparison to the existing approaches. In [11], an oppositional GWO variant is proposed to solve the optimal allocation of generation among power generation units in economic load dispatch (ELD) problem. The application of GWO was also performed for siting and sizing of active filters in the distribution system with distributed generation [12]. The multi-objective version of GWO is used to schedule generation stations in a combined hydro-thermal electric generation scenario [13]. In another application [14], GWO is used for PID controller design, which is used for frequency control in power system operation. On a similar note, another variant of GWO has also been developed for interconnected power systems' load frequency control [15]. Further, the combined scheduling