Training Program on "Renewable Energy Grid Integration"

August 26 – 31, 2019

Power Systems Training Institute,

Subramanyapura Road, Banashankari II Stage, Bengaluru - 560070

Day – 1| Monday, August 26, 2019	
09.30 – 10.00 AM	Registration and Program Overview
10.00 – 11.00 AM	Inaugural Ceremony*
11.00 – 11.30 AM	Group Photo, Tea / Coffee Break
11.30 – 12.30 PM	Introduction to wind and solar power generation technologies - Dr Hans Peter Waldl, MD, Overspeed GmbH, Germany
12.30 – 01.15 PM	Energy Meteorology and Forecasting - Dr Hans Peter Waldl
01.15 – 02.00 PM	Lunch Break
02.00 – 03.30 PM	Role of Weather Data in Power Generation Forecasting - Dr Hans Peter Waldl
03.30 – 03.45 PM	Tea / Coffee Break
03.45 – 04.30 PM	Practical Exercise on Forecasting
04.30 – 05.15 PM	Concept of Wind and Solar Power Forecasting - Dr Hans Peter Waldl
05.15 – 05.30 PM	Wrap Up and Feedback

***Inaugural Ceremony**	
10.00 – 10.05 AM	Welcome address and Introduction to the training program - Mr Markus Wypior
10.05 – 10.15 AM	RE Grid Integration: MNRE's Views - Mr Dilip Nigam, MNRE
10.15 – 10.25 AM	Special Address - Mrs C. Shikha, MD, BESCOM
10.25 – 10.35 AM	RE Grid Integration: Perspective on Grid Operator's Training - Mr KVS Baba, CMD, POSOCO
10.35 – 10.45 AM	Fraunhofer India Perspective - Ms. Anandi Iyer, Director, Fraunhofer Office India
10.45 – 10.55 AM	Key Note Address - Dr RK Pandey, Director General, NPTI
10.55 – 11.05 AM	Address from Guest of Honour - Mr. Karl Philipp Ehlerding, German Consulate, Bengaluru
11.05 – 11.10 AM	Vote of Thanks - Mr Sunil Sharma / Mr V Vidyasagar
11.10 – 11.30 AM	Lamp lighting followed by Tea / Coffee Break

Day – 2| Tuesday, August 27, 2019	
09.30 – 11.00 AM	Concepts of Wind and Solar Power Forecasting - Dr Hans Peter Waldl, MD, Overspeed GmbH, Germany
11.00 – 11.15 AM	Tea / Coffee Break
11.15 – 12.00 PM	International cases of RE Generation Forecasting - Dr Hans Peter Waldl
12.00 – 01.00 PM	Applications of RE Generation Forecasting - Dr Bernhard Ernst, Fraunhofer IEE, Germany
01.00 – 02.00 PM	Lunch Break
02.00 – 02.45 PM	Applications of Forecasting in RE Grid Integration - Dr Bernhard Ernst
02.45 – 03.45 PM	Forecasting regulations in India and current trends - Dr Zakir H Rather, IIT Mumbai
03.45 – 04.00 PM	Tea/ Coffee Break
04.00 – 04.30 PM	Practical Exercise on Forecasting
04.30 – 05.15 PM	Introduction to the concept of grid balancing - Dr Bernhard Ernst
05.15 – 05.30 PM	Wrap Up and Feedback

Day – 3| Wednesday, August 28, 2019	
09.30 – 11.00 AM	Concepts of Grid Balancing and Flexibility in Power Generation - Dr Bernhard Ernst, Fraunhofer IEE, Germany
11.00 – 11.15 AM	Tea / Coffee Break
11.15 – 12.00 PM	Concept of Ancillary Services in India - Dr Zakir H Rather, IIT Mumbai
12.00 – 01.00 PM	Electricity market and power exchange in India - Dr Zakir H Rather
01.00 – 02.00 PM	Lunch Break
02.00 – 02.45 PM	Discussion Session on practical issues in balancing in India moderated by Dr Bernhard Ernst and Dr Zakir H Rather
02.45 – 03.30 PM	Ancillary services and reserve types: International Perspective - Dr Bernhard Ernst
03.30 – 03.45 PM	Tea/ Coffee Break
03.45 – 04.30 PM	Flexibility in Demand / Flexible Load - Dr Bernhard Ernst
04.30 – 05.15 PM	Indian Electricity Grid Code and Technical Standards: Grid Integration perspective - Dr Zakir H Rather
05.15 – 05.30 PM	Wrap Up, take home exercise on balancing and Feedback

Day – 4| Thursday, August 29, 2019	
09.30 – 11.00 AM	Discussion on assignment exercise Introduction into the principals of Electricity Markets and Case Study: The German electricity market - Dr Bernhard Ernst, Fraunhofer IEE, Germany
11.00 – 11.15 AM	Tea / Coffee Break
11.15 – 01.00 PM	Building blocks of Visualisation and Control of RE Generation - Dr Hans Peter Waldl
01.00 – 02.00 PM	Lunch Break
02.00 – 03.30 PM	International Case Studies • Scheduling and Imbalance Settlement mechanism in Europe

	• Markets for ancillary services - Dr Bernhard Ernst
03.30 – 03.45 PM	Tea/ Coffee Break
03.45 – 04.30 PM	Costs related to RE Grid Integration - Dr Bernhard Ernst
04.30 – 05.15 PM	Exercise on Markets / Control Reserves - Dr Bernhard Ernst
05.15 – 05.30 PM	Wrap Up and Feedback

Day – 5| Friday, August 30, 2019	
09.30 – 10.15 AM	RE Grid Integration: Role of Grid Codes (General structure, steady-state requirement, transient requirements, grid connection procedure) - Dr Gunter Arnold, Fraunhofer IEE, Germany
10.15 – 11.00 AM	Technical standards: power quality characteristics, compliance test procedure, rooftop solar integration - Dr Gunter Arnold, Fraunhofer IEE, Germany
11.00 – 11.15 AM	Tea / Coffee Break
11.15 – 01.00 PM	Reactive power: dependency between reactive power and voltage, steady-state voltage control, dynamic voltage support by DER plants; Review of IEGC and compliance procedure - Dr Gunter Arnold
01.00 – 02.00 PM	Lunch Break
02.00 – 03.00 PM	Grid and System Integration Studies Overview and introduction to relevant international studies - Dr Thomas Ackermann, CEO, Energynautics GmbH, Germany
03.00 – 03.15 PM	Tea/ Coffee Break
03.15 – 04.30 PM	Grid and System Integration Studies: System Adequacy, Security, Operation Studies - Dr Thomas Ackermann
04.30 – 05.15 PM	Grid and System Integration Studies: Application to distribution networks - Dr Thomas Ackermann
05.15 – 05.30 PM	Wrap Up and Feedback

Day – 6| Saturday, August 31, 2019	
09.30 – 10.45 AM	Grid and System Integration Studies: Application to transmission networks - Dr Thomas Ackermann, CEO, Energynautics GmbH, Germany
10.45 – 11.15 AM	Grid and System Integration Studies (exercise) - Dr Thomas Ackermann
11.30 – 12.10 PM	Classroom Quiz
12.10 – 12.30 PM	Tea / Coffee Break
12.30 – 01.30 PM	Closing, feedback and certification ceremony
01.30 PM	Lunch Break