

18th Wind Integration Workshop

International Workshop on Large-Scale Integration of Wind Power into Power Systems as well as on Transmission Networks for Offshore Wind Power Plants

16 - 18 Oct 2019

Dublin, Ireland



PRELIMINARY PROGRAM AS OF 13 SEPTEMBER 2019

Important: This preliminary program is subject to changes. It is strongly recommended to check back regularly.

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WEDNESDAY 16 OCTOBER 2019				THURSDAY 17 OCTOBER 2019				FRIDAY 18 OCTOBER 2019					
Wind Workshop Day 1				Wind Workshop Day 2				Wind Workshop Day 3					
				09:00 – 10:40		REDWOOD A	REDWOOD B	REDWOOD C	09:00 – 10:40		REDWOOD A	REDWOOD B	REDWOOD C
						SESSION 3A: FREQUENCY ASPECTS	SESSION 3B: WINDEUROPE SESSION	SESSION 3C: MODELLING			SESSION 7A: GRID FORMING II	SESSION 7B: OFFSHORE WIND POWER	SESSION 7C: FORECASTING II
				COFFEE BREAK (30MIN)				COFFEE BREAK (30MIN)					
9:00 – 14:00				11:10 – 13:00		REDWOOD A	REDWOOD B	REDWOOD C	11:10 – 13:00		REDWOOD A	REDWOOD B	REDWOOD C
FOYER						SESSION 4A: GRID FORMING I	SESSION 4B: EIRGRID-SESSION	SESSION 4C: FORECASTING I			SESSION 8A: VIRTUAL SYNCHRONOUS MACHINES	SESSION 8B: TECHNO-ECONOMIC ASSESSMENT	SESSION 8C: HARMONICS II
REGISTRATION													
LUNCH 12:00 – 14:00				LUNCH 13:00 – 14:00				LUNCH 13:00 – 14:00					
14:00 – 15:50				14:00 – 15:40		REDWOOD A	REDWOOD B	REDWOOD C	14:00 – 15:40		REDWOOD A	REDWOOD B	REDWOOD C
WELCOME & SESSION 1: KEYNOTE SESSION						SESSION 5A: MIGRATE PROJECT	SESSION 5B: IEC TC 88 STANDARD	SESSION 5C: HARMONICS I			SESSION 9A: BLACK-START	SESSION 9B: HYBRID POWER PLANTS	SESSION 9C: GRID INTEGRATION SOLUTIONS
COFFEE BREAK (30MIN)				COFFEE BREAK (30 MIN)				SHORT BREAK (20 MIN)					
16:20 – 18:20				16:10 – 18:15		REDWOOD A	REDWOOD B	REDWOOD C	16:00 – 17:00		REDWOOD A/B/C		
SESSION 2A: ENTSO-E ON NETWORK CODES		SESSION 2B: COUNTRY STUDIES		SESSION 2C: CONVERTER RELATED ASPECTS		SESSION 6A: COMPLIANCE TESTING		SESSION 6B: POWER SYSTEM ISSUES		SESSION 6C: IEA WIND TASK 36 OPENSOURCE DISCUSSIONS		SESSION 10: CLOSING SESSION – PODIUM DISCUSSION	
19:00				18:20				POSTER RECEPTION & NETWORKING					
NETWORKING EVENT/CASUAL DINNER (to be booked separately)													

WEDNESDAY, 16 OCTOBER 2019

09:00 – 14:00 **Registration**

14:00 – 14:15 **Welcome**

14:15 – 15:50 **SESSION 1 – KEYNOTE SESSION**

> **Session Chair** **T. Ackermann (Energynautics, Germany)**

14:15 – 15:30 **Presentations (20 min. each)**

- **What the World has to Learn from the Ireland and Northern Ireland Experience**
J. O’Sullivan (EirGrid, Ireland)
- **Title TBA**
Mark O’Malley (NREL, USA)
- **Title TBA**
Babak Badrzadeh (AEMO, Australia)
- **Title TBA**
Graham Stein (National Grid, United Kingdom)

15:35 – 15:50 **Discussions**

15:50 – 16:20 **COFFEE BREAK**

16:20 – 18:20 **SESSION 2A: ENTSO-E WORKING GROUP ON CONNECTION NETWORK CODES (WG CNC)**

> **Session Chair** **Helge Urdal (UrdalPowerSolutions, United Kingdom)**

16:20 – 17:50 **Presentations (30 min. each)**

- **The New EU Legislative Framework (Clean Energy Package – CEP) and Its Impact on Connection Network Codes in the Light of Future System Challenges**
R. Pfeiffer (Amprion, Germany), E. Milin (RTE, France), K. Johansen (energinet.dk, Denmark), O. Rychly (CEPS, Czech Republic), J. Sprooten (elia, Belgium), I. Theologitis (ENTSO-E, Belgium)
(Submission-ID WIW19-46)
- **Monitoring of Connection Network Codes Implementation in EU Member States**
O. Rychlý (CEPS, Czech Republic), A. Johnson (National Grid, United Kingdom), D. Ilisiu (Transelectrica, Romania), G. Levacic (HOPS, Croatia), I. T. Theologitis (ENTSO-E, Belgium) (Submission-ID WIW19-53)
- **Connection Network Codes Assessment: The Outcomes of the First Three Expert Groups Established under the Grid Connection European Stakeholder Committee**
I. T. Theologitis (ENTSO-E, Belgium), R. Pfeiffer (Amprion, Germany), E. Milin (RTE, France), R. Wilson (National Grid ESO, United Kingdom) (Submission-ID WIW19-43)

17:50– 18:20 **Discussions**

16:20 – 18:08 Presentations (18 min. each)

- **Operating Experiences with High Penetrations of Variable Renewable Energy**
D. Lew (GE Energy Consulting, United States), D. Bartlett (Xcel Energy, United States), A. Groom (Australian Energy Market Operator, Australia), P. Jorgensen (Energinet, Denmark), J. O'Sullivan (EirGrid, Ireland), R. Quint (North American Electric Reliability Corporation, United States), B. Rew (Southwest Power Pool, United States), B. Rockwell (Kauai Island Utility Cooperative, United States), S. Sharma (Electric Reliability Council of Texas, United States), D. Stenlik (Telos Energy, United States) ([Submission-ID WIW19-149](#))
- **Technical and Regulatory Challenges and Solutions in Operating Low Inertia Power Systems**
A. Tuohy (EPRI, United States), A. Kelly (EPRI International, Ireland), E. Farantatos (EPRI, United States), P. Dattaray, E. Lannoye (EPRI International, Ireland) ([Submission-ID WIW19-171](#))
- **Non-Synchronous Penetration: Conflict between Wind Generation and HVDC Interconnection**
R. Davison-Kernan (System Operator Northern Ireland (SONI), United Kingdom), **B. Fox**, S. McLoone (Queen's University Belfast, United Kingdom) ([Submission-ID WIW19-27](#))
- **Common Mode Oscillations on the All Island System and Wind Generations Role in their Mitigation**
P. Wall (EirGrid, Ireland), A. Bowen (University College Cork, Ireland), C. Geaney, B. O'Connell, N. Cunniffe, R. Doyle, D. Gillespie, J. O'Sullivan (EirGrid, Ireland) ([Submission-ID WIW19-87](#))
- **Sector Coupling in Denmark – Entering the Next Phase of the Green Transition**
A. Orths, A. Bavnhøj Hansen (Energinet, Denmark) ([Submission-ID WIW19-160](#))
- **ESCRA-SA: 30MW Grid Forming BESS Boosting Reliability in South Australia and Providing Market Services on the National Electricity Market**
S. Cherevatskiy (ABB Australia Pty, Australia) ([Submission-ID WIW19-237](#))
- **Research and Practice on Energy System Coupling for Achieving High Penetration of Wind Power in Northeast China Power Grid**
S. Yu, L. Jiaqing (Northeast Power Dispatching Center of SGCC, China) ([Submission-ID WIW19-69](#))

18:08– 18:20 Discussions

16:20 – 18:20	SESSION 2C: CONVERTER RELATED ASPECTS
> Session Chair	TBA
16:20 – 18:08	Presentations (18 min. each)
	<ul style="list-style-type: none"> • Overview, Status and Outline of the New CIGRE Working Group on Converter Stability in Power Systems Ł. Kocewiak (Ørsted Wind Power, Denmark), C. Buchhagen (TenneT, Germany), Y. Sun (DNV GL, Netherlands), X. Wang (Aalborg University, Denmark), G. Lietz (DlGSILENT, Germany), M. Larsson (ABB, Switzerland), J. C. Garcia Alonso (Manitoba Hydro, Canada) (Submission-ID WIW19-146) • Need for Grid-Forming Converter-Control in Future System-Split Scenarios C. Heising, D. Meyer (Avasition, Germany), J. Weidner, S. Kuechler (50Hertz, Germany), T. Hennig, K. Vennemann (Amprion, Germany), W. Winter, G. Deiml (Tennet, Germany), J. Lehner, S. Wenig (TransetBW, Germany), J. Fortmann (HTW – University of Applied Sciences Berlin, Germany), H. Wrede (University of Applied Sciences Düsseldorf, Germany) (Submission-ID WIW19-99) • Impact of Converter-Interfaced Generation to the Frequency Response of the European Power System R. Musca (University of Palermo, Italy), L. Busarello (NEPLAN AG, Switzerland) (Submission-ID WIW19-223) • A Positive Sequence Screening Tool to Identify Areas of Potential Inverter Instability in Inverter Dominated Systems J. Ruddy, D. Ramasubramanian, P. Dattaray, E. Farantatos, A. Gaikwad (EPRI, Ireland) (Submission-ID WIW19-101) • Analysis of AC-Side Grid Interaction of MMC-Based HVDC Systems Utilizing a Laboratory Demonstrator C. Heising, D. Meyer, R. Bartelt (Avasition, Germany), T. Stoetzel, V. Staudt (Ruhr-University Bochum, Germany), K. Vennemann (Amprion, Germany) (Submission-ID WIW19-97) • Analysis of HVDC and FACTS Operation Strategies for Transient Stability Improvement in High Penetration of Inverter-Based Resources H. Noh (Korea University, Korea, Republic of South Korea), Y. Cho (Daegu Catholic University, Republic of South Korea), K. Lee, E. Kwak (Korea Electric Power Corporation, Republic of South Korea), B. Lee (Korea University, Republic of South Korea) (Submission-ID WIW19-154) • A VSM Converter Controller Implemented for RMS Simulation Studies of Electrical Power Systems R. Heydari (Aalborg University, Denmark ABB Corporate Research, Sweden), N. Johansson, L. Harnefors (ABB Corporate Research, Sweden), F. Blaabjerg (Aalborg University, Denmark) (Submission-ID WIW19-91)
18:08– 18:20	Discussions

19:00 **NETWORKING EVENT/CASUAL DINNER**
<http://windintegrationworkshop.org/dinner/>
(to be booked separately)

09:00 – 10:40	SESSION 3A: FREQUENCY ASPECTS
> Session Chair	TBA
09:00 – 10:30	Presentations (15 min. each)
	<ul style="list-style-type: none">• Ensuring Future Frequency Stability in the Nordic Synchronous Area R. Eriksson, N. Modig (Svenska kraftnät – Swedish National Grid, Sweden), M. Kuivaniemi (Fingrid Oyj, Finland) (Submission-ID WIW19-143)• Probabilistic Estimation of the aFRR Requirement in the Future European Power System with High RES Penetration J. Morin, G. Prime, Y. Wang (EDF R&D, France) (Submission-ID WIW19-22)• Power System Reliability Impact of Advanced Frequency Control in Wind Power Generation J. Steinkohl, X. Wang, P. Davari, F. Blaabjerg (Aalborg University, Denmark) (Submission-ID WIW19-141)• Ultra-Fast Frequency Response of Inverter-Dominant Grids Through PMU Measurements V. Gevorgian (NREL – National Research Laboratory, United States) (Submission-ID WIW19-280)• Coordinated Frequency Control of Inertial Response by Wind Power and Electrolyzer in Japanese Power System Model J. Qi, T. Tsuji (Yokohama National University, Japan) (Submission-ID WIW19-186)• Energy Management Philosophy for Enhanced Frequency Response Using Dead Band Theory L. Shobayo, N. Schofield, Y. Hu, N. Zhao (University of Huddersfield, United Kingdom) (Submission-ID WIW19-251)
10:30 – 10:40	Discussions

09:00 – 10:40	SESSION 3B: WINDEUROPE SESSION
> Session Chair	TBA
09:00 – 10:20	Presentations (20 min. each)
	<ul style="list-style-type: none">• Presentation 1 (TBA) TBA• Presentation 2 (TBA) TBA• Presentation 3 (TBA) TBA• Presentation 4 (TBA) TBA
10:20 – 10:40	Discussions

09:00 – 10:40	SESSION 3C: MODELLING
> Session Chair	TBA
09:00 – 10:25	Presentations (17 min. each)
<ul style="list-style-type: none"> • Call for Adequate RMS Approach for Grid Stability Assessment with a Significant Share of Converter-Interfaced Units V. Akhmatov, C. F. Flytkær (Energinet, Denmark) (Submission-ID WIW19-56) • Enhancing Quality of Vendor-Specific Dynamic Models Representing Wind Turbine Generators and Other New Power System Components in Interconnection Studies M. Borodulin (KIIP Consulting, United States) (Submission-ID WIW19-25) • High-Resolution Real-Time Analysis of HVDC-Connected Wind Farm with 100 Wind-Energy Plants Utilizing a High-Performance Calculation Cluster C. Heising, R. Bartelt, M. Kleine Jäger, D. Meyer (Avasition, Germany), T. Jersch, P. Thomas, S. Khan (Fraunhofer IWES, Germany) (Submission-ID WIW19-102) • Large-Scale Wind Generation Simulations: Estimating Missing Technical Parameters Using Random Forest M. Koivisto, K. Plakas, P. Sørensen (DTU Wind Energy, Denmark) (Submission-ID WIW19-107) • The Next-Generation Modelling Platform for Energy Systems Integration M. McPherson (University of Victoria, Canada) (Submission-ID WIW19-79) 	
10:25 – 10:40	Discussions

10:40 – 11:10 COFFEE BREAK

11:10 – 13:00	SESSION 4A : GRID FORMING I
> Session Chair	TBA
11:10 – 12:30	Presentations (20 min. each)
<ul style="list-style-type: none"> • Will Grid Forming Inverters Be the Key for High Renewable Penetration? J. Matevosyana (ERCOT, United States) (Submission-ID WIW19-273) • Progress statement from ENTSO's Pan-European Technical Group on High Penetration of Power Electronic Interfaced Power Sources Focused on Performance Aspects of Grid Forming Converters H. Urdal (ENTSO-E, Belgium) (Submission-ID WIW19-74) • Experience with a Grid Forming Wind Farm P. Brogan, D. Elliott, T. Kneuppel, A. Roscoe (Siemens Gamesa Renewable Energy, United Kingdom), I. Gutierrez (Scottish Power Renewables, United Kingdom) (Submission-ID WIW19-26) • Comparison of Selected Grid-Forming Converter Control Strategies for Use in Power Electronic Dominated Power Systems B. Weise, A. Korai, A. Constantin (DgSILENT, Germany) (Submission-ID WIW19-145) 	
12:30 – 13:00	Discussions

11:10 – 13:00	SESSION 4B: EIRGRID SESSION
> Session Chair	TBA
11:10 – 12:30	Presentations (20 min. each)
• Presentation 1 (TBA)	TBA
• Presentation 2 (TBA)	TBA
• Presentation 3 (TBA)	TBA
• Presentation 4 (TBA)	TBA
12:30 – 13:00	Discussions

11:10 – 13:00	SESSION 4C: FORECASTING I
> Session Chair	TBA
11:10 – 12:40	Presentations (18 min. each)
• Probabilistic Forecasting Tools for High Wind penetration Areas: An Irish Case Study	C. Möhrten (WEPROG, Denmark), J. Ryan, K. Conway (EIRGRID., Ireland) (Submission-ID WIW19-60)
• Forecasting of Wind Power Curtailment Events	J. Koch , S. Vogt, A. Braun, D. Jost, J. Dobschinski (Fraunhofer IEE, Germany) (Submission-ID WIW19-117)
• Forecasts for the Vertical Grid Load	O. Steinert, J. Kuehnert, E. Arndt , J. Rosenkranz, U. Focken, M. Lange (energy & meteo systems, Germany) (Submission-ID WIW19-148)
• Forecasting Vertical Loads for Grid Nodes at the Transition from Medium to High Voltage: A Concept, a Realization and First Results	A. Wessel , K. Brauns (Fraunhofer IEE, Germany) (Submission-ID WIW19-72)
• Forecasting Vertical Power Flows at Transmission Grid Nodes Characterized by High Penetration of Renewable Generation and Consumption	D. Jost , A. Braun, K. Brauns, J. Dobschinski (Fraunhofer IEE, Germany) (Submission-ID WIW19-89)
12:40 – 13:00	Discussions

13:00 – 14:00 LUNCH BREAK

14:00 – 15:40	SESSION 5A: CHALLENGES AND SOLUTIONS FOR FUTURE TRANSMISSION NETWORKS – RESULTS FROM HORIZON PROJECT MIGRATE
> Session Chair	Jako Kilter (Elering / TalTech, Estonia)
14:00 – 15:20	Presentations
	<ul style="list-style-type: none"> • MIGRATE Project Outcomes and Future Challenges J. Kilter (Elering / TalTech, Estonia) • Massive Integration of Power Electronic Devices (MIGRATE) – Results and Future Challenges J. Kilter (Tallinn University of Technology, Estonia), S. Rüberg (TenneT, Germany), B. Heimisson (Landsnet, Iceland), T. Prevost (RTE, France), D. Lopez (Red Electrica, Spain), M. Val Escudero (Eirgrid, Ireland) (Submission-ID WIW19-255) • Power System Stability Issues Arising from Increasing Levels of Power Electronics Interfaced Generation V. Sewdien (TenneT / TU Delft, The Netherlands) (Submission-ID WIW19-287) • Wide Area Controls for Improved System Stability in Low Inertia System – Experience from Iceland B. Heimisson (Landsnet, Iceland) (Submission-ID WIW19-288) • From Grid-Forming Definition to Experimental Validation with a VSC C. Cardozo (RTE, France) (Submission-ID WIW19-285) • Power System Protection Solutions for Future Transmission Networks R. Andrino Gallego (REE, Spain) (Submission-ID WIW19-289) • Control of Wind Energy Converters in Power Systems with Very High Share of Renewables K. Almunem (TU Berlin, Germany) (Submission-ID WIW19-290)
15:20 – 15:40	Discussions

14:00 – 15:40	SESSION 5B: LATEST DEVELOPMENTS OF IEC TC 88 WIND POWER GENERATION STANDARDS IN RELATION TO GRID CONNECTION REQUIREMENTS
> Session Chair	Frank Martin (Siemens Gamesa Renewable Energy, Denmark)
14:00 – 15:20	Presentations (20 min. each)
	<ul style="list-style-type: none"> • IEC 61400-21 series – Measurement, Test and Assessment of Electrical Capabilities of Wind Generations Systems and Their Relation to Grid Code Requirements B. Andresen (Aarhus University, Denmark) (Submission-ID WIW19-211) • IEC 61400-27 Series – Electrical Simulation Models of Wind Generation Systems P. Sørensen (Technical University of Denmark, Denmark) (Submission-ID WIW19-217) • Application of IEC 61400-21 and -27 for Grid Compliance Measurements, Model Development and its Validation – Manufacturer Experience and Perspective F. Martin, P. Mahat (Siemens Gamesa Renewable Energy, Denmark), T. Dreyer (Siemens Gamesa Renewable Energy, Germany), K. Ntovolos(Siemens Gamesa Renewable Energy, Denmark) (Submission-ID WIW19-214) • Application of IEC 61400-21 and -27 for Grid Compliance Measurements, Model Development and Its Validation – Developer’s Experience and Perspective ł. Kocewiak (Ørsted Wind Power, Denmark) (Submission-ID WIW19-241)
15:20 – 15:40	Discussions

14:00 – 15:40 **SESSION 5C: HARMONICS I**
> Session Chair TBA

- 14:00 – 15:30** **Presentations (18 min. each)**
- **High-Frequency Resonance in HVDC and Wind Systems: Root Cause and Solutions**
J. Sun, I. Vieto (Rensselaer Polytechnic Institute, United States), E. Larsen (eLarsen Power System Consulting, Denmark), C. Buchhagen (TenneT Offshore, Germany) (Submission-ID WIW19-275)
 - **Improved Procedures for Determining Harmonics – Findings of the German Research Project NetzHarmonie**
J. Rauch, L. Ziemann, M. Muehlberg (FGW e.V., Germany) (Submission-ID WIW19-208)
 - **A New Type of Sub-Synchronous Resonance in the AC Connected Offshore Wind Farm**
Y. Sun, A. Fabian, Y. Yang (DNVGL, Netherlands) (Submission-ID EMOB19-177)
 - **Automation of Impedance-Based Harmonic Stability Assessment for MMC-HVDC Systems**
D. Yang, X. Wang (Aalborg University, Denmark), M. Ndreko, W. Winter (TenneT TSO, Germany) (Submission-ID WIW19-126)
 - **Passivity-Based Harmonic Stability Analysis of Offshore Wind Farm Connected to MMC-HVDC**
H. Wu, X. Wang (Aalborg University, Denmark), Ł. Kocewiak, J. Hjerrild (Ørsted Wind Power, Denmark) (Submission-ID WIW19-47)
- 15:30 – 15:40** **Discussions**

15:40 – 16:10 **COFFEE BREAK**

16:10 – 18:15 **SESSION 6A: COMPLIANCE TESTING**
> Session Chair TBA

- 16:10 – 17:55** **Presentations (15 min. each)**
- **National RfG-Implementations – An Update to Grid Codes and Compliance Schemes**
B. Schowe-von der Brelie (FGH Zertifizierungsgesellschaft, Germany | European Federation of Associations of Certification Bodies, United Kingdom), J. Döll, M. Meuser, S. M. Ali (FGH, Germany) (Submission-ID WIW19-262)
 - **Compliance Testing in Ireland and Northern Ireland**
F. Kalverkamp, J. Rauber, S. M. Ali, E. Makki, B. Schowe von der Brelie (FGH, Germany) (Submission-ID WIW19-221)
 - **Ensuring Grid Code Compliance in the New and Changing RfG Landscape**
L. Ulvgard (DNV GL, Germany) (Submission-ID WIW19-174)
 - **Compliance Testing, Type Testing on Simulator Combined with Performance Testing on Site**
L. S. Christensen, T. Lund, B. Andersen, F. R. Londono (Vestas Wind Systems, Denmark), N. Ryan, M. Hughes (ESB O&M Renewables Wind, Ireland) R. R. Bekker (Vestas Wind Systems, Denmark) (Submission-ID WIW19-95)
 - **Comparison of Fault-Ride-Through Measurements between Field Tests and DyNaLab Grid Simulator Tests of the Siemens Gamesa D8 Variable-Speed Direct-Drive Wind Turbine Platform**
T. Siepker (Siemens Gamesa Renewable Energy, Germany), B. Nedjar, P. Ghimire, F. Martin (Siemens Gamesa Renewable Energy, Denmark), S. Azarian, G. Quistorf, S. Khan, T. Jersch (Fraunhofer IWES, Germany) (Submission-ID WIW19-135)
 - **Identified Challenges in the Grid Code Compliance Process – Extensive Experience with Fingrid VJV2013**
M. Jantunen, S. Uski (Ampner Oy, Finland) (Submission-ID WIW19-259)
 - **Transformer Based FRT Test Unit Becomes Common**
R. Klosse (delta energieloesungen technischer anwendungen, Germany), F. Loh (GE Renewables Energy, Germany), M. Brand (windtest grevenbroich, Germany), L. Undevall (INNIO Jenbacher, rmany) (Submission-ID WIW19-231)
- 17:55 – 18:15** **Discussions**

16:10 – 18:15 **SESSION 6B: POWER SYSTEM ISSUES**
> Session Chair TBA

16:10 – 17:50 Presentations (20 min. each)

- **Modeling of Wind Power Plant Dynamics in Power System Planning and Operation Studies: Lessons to Learn from the 2016 South Australian Blackout**
M. Borodulin (KIIP Consulting, United States) ([Submission-ID WIW19-23](#))
- **System Analysis 2019 of German TSOs on Demand for Reserve Generation Capacity**
F. Jahns (50Hertz Transmission, Germany), U. Janischka (TransnetBW, Germany), **R. Pfeiffer**, C. Spieker (Amprion, Germany), S. Spieker (50Hertz Transmission, Germany), G. Weidhas (Tennet TSO, Germany), ([Submission-ID WIW19-35](#))
- **Impact on Power System Protection by a Large Penetration of Renewable Energy Sources**
A. Boricic, J. Wang, Y.Y. Li (ABB Corporate Research Center, Sweden), S. Zubic (ABB Substation Automation Products, Sweden), **N. Johansson** (ABB Corporate Research Center, Sweden) ([Submission-ID WIW19-54](#))
- **Controlling Power Generation and Ancillary Services from Variable Renewable Energies (Wind and Solar)**
E. Tröster, D. Masendorf (Energynautics, Germany) ([Submission-ID WIW19-286](#))
- **Probabilistic Security Limits of Power Grids with Large Integration of Wind Generating Resources**
S. Kim (Sangmyung University, Republic of South Korea), S. Jung, J. Lee, S. Park (Korea Electrical Power Corporation, Republic of South Korea), Y. Cho (Daegu Catholic University, Republic of South Korea), J. Hur (Sangmyung University, Republic of South Korea) ([Submission-ID WIW19-50](#))

17:50 – 18:15 Discussions

16:10 – 18:15	SESSION 6C: IEA WIND TASK 36 OPENSOURCE DISCUSSIONS
> Session Chair	Corinna Möhrten (WEPROG, Denmark)
16:10 – 17:58	Presentations (18 min. each)
	<ul style="list-style-type: none"> IEA Task 36 Open Space Session on Wind Power Forecasting and System integration Issues C. Möhrten (WEPROG, Denmark), J. Zack (UL - AWS Truepower, United States), W. Shaw (PNNL, United States), T. Göçmen (DTU, Denmark), C. Draxl (NREL, United States), R. Bessa (INESC TEC, Portugal), G. Giebel (DTU, Denmark) (Submission-ID WIW19-127) Work group Topic 1: Standards and Industry Guidelines for Data Exchange and IT Solutions in Power Industry: Where Do We Need Them? C. Möhrten (WEPROG, Denmark), J. Zack (UL AWS Truepower, United States), W. Shaw (Pacific Northwest National Laboratory, United States), T. Göçmen, G. Giebel, P. Pinson (Danish Technical University, Denmark), C. Draxl (National Renewable Energy Laboratory, United States), R. Bessa (INESC TEC, Portugal) (Submission-ID WIW19-200) Work group Topic 2: Meteorological Measurements and Instrumentation Standardization for Integration into Grid Codes: What Can We Learn from the WMO? W. Shaw (Pacific Northwest National Laboratory, United States), C. Möhrten (WEPROG, Denmark) (Submission-ID WIW19-201) Work group Topic 3: Application of Probabilistic Forecasts in Grid Operation and Marketing: What Should a Guideline Contain? R. Bessa (INESC TEC, Portugal), C. Möhrten (WEPROG, Denmark), P. Pinson (Danish Technical University, Denmark) (Submission-ID WIW19-202) Work group Topic 4: Recommended Practices on Forecast Solution Selection: Which Areas Are Not Covered Sufficiently? J. Zack (UL AWS Truepower, Denmark), C. Draxl (National Renewable Energy Laboratory, United States), C. Möhrten (WEPROG, Denmark) (Submission-ID WIW19-203) Work group Topic 5: Uncovering Uncertainty Origins through the Entire Modelling Chain: Which Applications Can Benefit from That Knowledge? T. Göçmen, G. Giebel (Danish Technical University, Denmark), C. Möhrten (WEPROG, Denmark), J. Zack (UL AWS Truepower, United States), C. Draxl (National Renewable Energy Laboratory, United States) (Submission-ID WIW19-204)
17:50 – 18:15	Discussions

18:20 Poster Reception & Networking

09:00 – 10:40	SESSION 7A: GRID FORMING II
> Session Chair	TBA
09:00 – 10:30	Presentations (18 min. each)
	<ul style="list-style-type: none"> Experiences and Perspectives on Grid-Forming Systems S. Achilles, D. Howard (General Electric (GE) Energy Consulting, United States) (Submission-ID WIW19-246) A Proposed Grid-Forming System for 100% Inverter-Based Generation P. Marinakis (Huddersfield University, United Kingdom HVDC Technologies, United Kingdom) N. Schofield (Huddersfield University, United Kingdom) (Submission-ID WIW19-234) Modified Grid Forming Converter Controller with Fault Ride through Capability without PLL or Current Loop A. Abdelrahim (University of Strathclyde, Glasgow, United Kingdom), M. Smailes (ORE Catapult, National Renewable Energy Centre, Blyth, United Kingdom), K. Ahmed, A. Egea (University of Strathclyde, United Kingdom) (Submission-ID WIW19-256) Influence of Grid-Forming Inverter Control on Short-Term Voltage Stability in Distribution Grids M. Coumont, B. Braun, J. Hanson (TU Darmstadt, Germany) (Submission-ID WIW19-66) Grid-Forming Converters in Weak Grids – The Case of a Mediterranean Island R. Musca, G. Zizzo (University of Palermo, Italy), M. Bongiorno (Chalmers University of Technology, Sweden) (Submission-ID WIW19-224)
10:30 – 10:40	Discussions

09:00 – 10:40	SESSION 7B: OFFSHORE WIND POWER
> Session Chair	TBA
09:00 – 10:20	Presentations (20 min. each)
	<ul style="list-style-type: none"> Integration of AC Connected Offshore Wind Power Plants with Long Export Circuit Cable A. Atallah (Siemens, Germany), A. Shafiu (Siemens, United Kingdom) (Submission-ID WIW19-232) Kriegers Flak Combined Grid Solution – Real Time Power Transmission Control and Method for Transmission Capacity Calculation for Meshed Offshore Grids V. Akhmatov, T. Bentzon Sørensen (Energinet, Denmark), A.-K. Marten, R. Stornowski (50Hertz Transmission, Germany) (Submission-ID WIW19-15) Sequence Current Controllability Analysis of Offshore MMC-HVDC during Asymmetrical Faults H. Wu, X. Wang (Aalborg University, Denmark), J. Hjerrild, Ł. Kocewiak, L. Zeni (Ørsted Wind Power, Denmark) (Submission-ID WIW19-48) Control of Diode-Rectifier-Connected Offshore Wind Power Plant Using a Common Frequency Reference A. Arasteh, A. Bidadfar, O. Saborío-Romano, J. Naidu Sakamuri, P. Ejnar Sørensen, N. A. Cutululis (Technical University of Denmark, Denmark) (Submission-ID WIW19-263)
10:20 – 10:40	Discussions

09:00 – 10:40	SESSION 7C: FORECASTING II
> Session Chair	TBA
09:00 – 10:30	Presentations (18 min. each)
<ul style="list-style-type: none"> • The Value of Short-Term Wind Power Forecasting in Single Imbalance Price Markets G. Goretti, A. Duffy (Technological University Dublin, Ireland) (Submission-ID WIW19-207) • Wind Power Forecasting Based on Deep Artificial Neural Networks and Multi-Task Learning S. Vogt, A. Braun, J. Dobschinski (Fraunhofer IEE, Germany), B. Sick (University of Kassel, Germany) (Submission-ID WIW19-121) • Reduced Cost and Increased Wind and Solar Prediction Quality by a Generic Platform for Forecast Handling, Optimisation and Benchmarking H.-P. Waldl, F. Dierich (Overspeed, Germany) (Submission-ID WIW19-170) • Prediction of Power Flow in Electrical Networks I. Vdovichenko, M. Bengfort, D. Syga, B. Jordan, J. Rosenkranz, M. Lange, U. Focken (energy & meteo systems, Germany) (Submission-ID WIW19-161) 	
10:30 – 10:40	Discussions

10:40 – 11:10 COFFEE BREAK

11:10 – 13:00	SESSION 8A: VIRTUAL SYNCHRONOUS MACHINES
> Session Chair	TBA
11:10 – 12:40	Presentations (18 min. each)
<ul style="list-style-type: none"> • Dispatching Parameters, Strategies and Associated Algorithm for VSM (Virtual Synchronous Machines) and Hybrid Grid Forming Converters R. Ierna, C. Li (National Grid Electricity System Operator (ESO), Warwick, United Kingdom), M. Sumner, S. Pholboon (University of Nottingham, United Kingdom), M. Yu, A. Egea-Álvarez (University of Strathclyde, United Kingdom), H. Urdal (Urdal Power Solutions, United Kingdom) (Submission-ID WIW19-193) • Enhanced Virtual Synchronous Machine (VSM) Control Algorithm for Hybrid Grid Forming Converters M. Yu, A. Egea-Álvarez, A. Avras, A. Dyško, C. Booth (University of Strathclyde, Glasgow, United Kingdom), R. Ierna, C. Li (National Grid Electricity System Operator (ESO), Warwick, United Kingdom), H. Urdal (Urdal Power Solution, United Kingdom) (Submission-ID WIW19-192) • VSM (Virtual Synchronous Machine) Power Quality, Harmonic and Imbalance Performance, Design and Service Prioritisation M. Sumner, S. Pholboon (University of Nottingham, UK, United Kingdom), R. Ierna, C. Li (National Grid ESO, United Kingdom, United Kingdom), H. Urdal (Urdal Power Solutions, United Kingdom) (Submission-ID WIW19-93) • VSM (Virtual Synchronous Machine) Control System Design, Implementation and Comparison of Performance (Hardware Versus RMS Model) M. Sumner, S. Pholboon (University of Nottingham, United Kingdom), R. Ierna, C. Li (National Grid ESO, United Kingdom), H. Urdal (Urdal power Solutions, United Kingdom) (Submission-ID WIW19-92) • Small-Signal Stability Analysis of A Grid-Forming Inverter Based on A VSM Control Scheme L. Lu, N. A. Cutululis (Technical University of Denmark, Denmark) (Submission-ID WIW19-175) 	
12:40 – 13:00	Discussions

11:10 – 13:00	SESSION 8B: TECHNO-ECONOMIC ASSESSMENT
> Session Chair	TBA
11:10 – 12:30	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Impact of Flexibility Service Requirements on Investment Decisions and Costs C. O'Dwyer, D. Flynn (University College Dublin, Ireland) (Submission-ID WIW19-76) • Review and Techno-Economic Assessment of Low Frequency AC Transmission for the North Sea Energy Hub J. G. Møller, S. Chatzivasileiadis, J. Østergaard (DTU Denmark, Denmark) (Submission-ID WIW19-270) • Optimization of the Electricity and Heating Sectors Development in the North Sea Region towards 2050 J. Gea-Bermúdez, M. Koivisto, M. Münster (Technical University of Denmark, Denmark) (Submission-ID WIW19-109) • A Study of Hydrogen as the Main Transporter of Future Renewable Energies J. Zaba (University of Huddersfield, United Kingdom) (Submission-ID WIW19-236)
12:30 – 13:00	Discussions

11:10 – 13:00	SESSION 8C: HARMONICS II
> Session Chair	TBA
11:10 – 12:30	Presentations (20 min. each)
	<ul style="list-style-type: none"> • Analysis of Harmonic Resonance Behavior in Power System with Large Wind Power Plants L. Cai (University of Rostock, Germany), X. Meng, K. Hou (Shanghai Electric, SEWIND, China) (Submission-ID WIW19-206) • Control of Type-III Turbines to Avoid Subsynchronous Resonance with Different Types of Transmission Systems J. Sun, I. Vieto (Rensselaer Polytechnic Institute, United States) (Submission-ID WIW19-49) • Impact of Wind Turbine Voltage Source Converters on the Harmonic Emission Levels and Harmonic Stability of HVAC Connected Offshore Wind Farms L. Depla (InnoEnergy, Germany), E. Prieto Araujo, M. Cheah (CITCEA-UPC, Spain) , R. Cremers, K. Velistitakis (DNV-GL, Netherlands) (Submission-ID WIW19-281) • Updated Harmonic and Interharmonic Current Summation Rule in Wind Power Plants with Type III Wind Turbines H. Ghanavati (University of Science and Technology, Iran), Ł Kocewiak (Ørsted Wind Power, Denmark), A. Jalilian (University of Science and Technology, Iran) (Submission-ID WIW19-151)
12:30 – 13:00	Discussions

13:00 – 14:00 LUNCH BREAK

14:00 – 15:40	SESSION 9A: BLACK-START
> Session Chair	TBA
14:00 – 15:00	Presentations (20 min. each)
<ul style="list-style-type: none"> • “Greenstart” – Incorporating Wind Plants into the Restoration Process S. McGuinness, J. Ruddy, A. Kelly, E. Lannoye (EPRI, Ireland) (Submission-ID WIW19-120) • Dynamic Simulations of a Black Starting Offshore Wind Farm Using Grid Forming Converters M. Aten (Uniper, United Kingdom), R. Shanahan (Carbon Trust, United Kingdom), F. Mosallat (Manitoba Hydro International, Canada) (Submission-ID WIW19-28) • Co-Simulation Hardware in the Loop Testbench for a Wind Turbine: Validation of a Wind Turbine Black Start Capability A. Fabian (DNV GL Group Technology and Research, Netherlands), A. Harson (DNV GL Energy, United Kingdom), Y. Sun (DNV GL Group Technology and Research, Netherlands), B. Tang (Ming Yang Smart Energy Group Limited, China) (Submission-ID WIW19-115) 	
15:00 – 15:40	Discussions

14:00 – 15:40	SESSION 9B: : HYBRID POWER PLANTS
> Session Chair	TBA
14:00 – 15:30	Presentations (18 min. each)
<ul style="list-style-type: none"> • Dynamic Modelling of Wind-Solar-Storage Based Hybrid Power Plant K. Das, A. D. Hansen, J. Sakamuri, P. Adamou, X. Giagkou, J. García Carretero, S. Majumder, F. Rigas (Technical University of Denmark, Denmark), M. Altin (Izmir Institute of Technology, Turkey), E. Nuno (Suzlon Energy, Germany), P. Sørensen (Technical University of Denmark, Denmark) (Submission-ID WIW19-248) • Performance of Hybrid Power Park Technologies in Future OFTO Networks with the Aim to Achieve Grid-Forming Capability M. Yu, A. Egea-Álvarez, A. Dysko, A. Avras, C. Booth (University of Strathclyde, Glasgow, United Kingdom), R. Ierna, C. Li, M. Horley (National Grid Electricity System Operator (ESO), United Kingdom), H. Urdal (Urdal Power Solution, United Kingdom) (Submission-ID WIW19-191) • Assessment of Power Electronic Controlled BESS for Grid System Frequency Response Service R. Guo (University College Dublin, Ireland), Y. Hu (University of Huddersfield, United Kingdom), N. Zhao (University College Dublin, Ireland), N. Schofield (University of Huddersfield, United Kingdom) (Submission-ID WIW19-239) • Impedance Characterization of Utility-Scale Renewable Energy and Storage Systems V. Gevorgian (NREL – National Research Laboratory, United States) (Submission-ID WIW19-277) • Challenges in Integration of MMC STATCOM with Battery Energy Storage for Wind Power Plants S. Chaudhary, R. Teodorescu (Aalborg University, Denmark), Ł. Kocewiak (Ørsted Offshore Wind, Denmark), P. Johnson (Ørsted Offshore Wind, United Kingdom), C. Y. Chen, B. Berggren, L. Harnefors (ABB, Sweden) (Submission-ID WIW19-183) 	
15:30 – 15:40	Discussions

14:00 – 15:40	SESSION 9C: GRID INTEGRATION SOLUTIONS
> Session Chair	TBA
14:00 – 15:30	Presentations (18 min. each)
•	Applying modular FACTS Devices to Relieve Transmission Constraints and Accelerate Wind Integration on a Global Scale R. Fenlon, B. Kelly (Smart Wires, Ireland) (Submission-ID WIW19-233)
•	Dynamic Line Rating and Hotspot Analysis for Electric Utilities T. Speet, B. Faerber, J. Rosenkranz, U. Focken, M. Lange (energy & meteo systems, Germany) (Submission-ID WIW19-139)
•	Case Study Results of Wind Power Integration with Dynamic Line Rating R. Kuwahata (Ampacimon, Belgium) (Submission-ID WIW19-199)
•	Back-Casting Analysis How Dynamic Load Rating Would Increase Usage Ratio of European Interconnection R. Kuwahata (Ampacimon, Belgium), A. Michiorri (MINES ParisTech, France), Y. Yasuda (Kyoto University, Japan) (Submission-ID WIW19-32)
•	Processes and Systems for Using Flexibility from Distribution Grid to Integrate a High Share of RES in a Resilient, Stable and Efficient Operated Energy Supply System M. Staudt (Mitteldeutsche Netzgesellschaft Strom mbH, Germany), S. Wende-von Berg (Fraunhofer IEE, Germany University of Kassel, Germany), W. Albers, C. Calpe (innogy SE, Germany), B. Silva (INESC TEC, Portugal) (Submission-ID WIW19-57)
15:30 – 15:40	Discussions

15:40 – 16:00 SHORT BREAK

16:00 – 17:00	SESSION 10 – CLOSING SESSION – PANEL DISCUSSION
> Session Chair	TBA
16:00 – 16:50	
	Title TBA
	Panelists: - TBA
16:50– 17:00	Closure

POSTER PRESENTATIONS

- **Making Use of Analytical Wake Models for Large Scale Power System Models by Generation of Generic Efficiency Fields**
G. Erichsen, O. Schülting, A. Kather (Hamburg University of Technology, Germany) (Submission-ID WIW19-19)
- **Multi-Objective Optimization of Cable Sizes of an Offshore Wind Power Plant Collector System**
C. Kaufmann (Hamburg University of Applied Sciences, Germany), J. Dakic, O. Gomis-Bellmunt (CITCEA-UPC, Polytechnical University of Catalonia, Spain) (Submission-ID WIW19-31)
- **Dynamic Stability Assessment of the Large Offshore Wind Power Plant at Kriegers Flak**
R. B. Glasdam, V. Akhmatov, L. Dall, H. Abildgaard (Energinet, Denmark), H. Jóhansson (Technical University of Denmark (DTU), Denmark) (Submission-ID WIW19-36)
- **Dynamic Model of Current Source Converter Based Wind Power Plant Composed of Series-Connected Wind Turbine Generators and Synchronous-Compensator-Commutated Thyristor Inverter**
S. Nishikata (Tokyo Denki University, Japan), K.-i. Yamashita (Salesian Polytechnic, Japan) (Submission-ID WIW19-37)
- **A Current-Source Converter Based Wind Power Plant Capable of Controlling Power Factor and Its Basic Characteristics**
S. Nishikata, F. Tatsuta (Tokyo Denki University, Japan) (Submission-ID WIW19-39)
- **Modelling Wind Speeds Using CorRES: Combination of Mesoscale Reanalysis Data and Stochastic Simulations**
G. M. Jónsdóttir (University College Dublin, Ireland), M. Koivisto, P. E. Sørensen (Technical University of Denmark, Roskilde, Denmark), F. Milano (University College Dublin, Ireland) (Submission-ID WIW19-58)
- **Development of Practical Allocation Method About Reactive Power Reference for Wind Farms Through Inner-Voltage Restriction**
S. Jung (Hanbat National University, Republic of South Korea), Y. Yoo, G. Jang (Korea University, Republic of South Korea) (Submission-ID WIW19-65)
- **Optimal Sizing and Location of Reactive Power Compensation in Offshore HVAC Transmission Systems for Loss Minimization**
J. Dakic, M. Cheah, E. Prieto Araujo, O. Gomis-Bellmunt (CITCEA-UPC – Politechnical University of Catalonia, Spain) (Submission-ID WIW19-73)
- **Comparison of European Union Network Codes for HVDC and AC Connected Wind Power Plants**
B. Nouri, Ö. Göksu, N. Sakamuri, E. Sørensen (Department of Wind Energy, Technical University of Denmark, Denmark) (Submission-ID WIW19-86)
- **Experimental Studies Using 1.5kW DFIG on Power Control for Wind Power Generation and Transmission Line Impedance effect**
H. Nakamura, Y. Ota, T. Nakajima (Tokyo City University, Japan) (Submission-ID WIW19-110)
- **Study on the Review and Establishment of Grid Code Criteria in South Korea According to the Expansion of Renewable Power Sources**
J. Han, H. Kwon, Y. Jo, J. Jung, M. Lee, Y. Cho (Daegu Catholic University, Republic of South Korea)
B. Kang, J. Myong, H. Yi (Korea Power Exchange(KPX), Republic of South Korea), J. Hur (Sangmyung University, Republic of South Korea) (Submission-ID WIW19-131)
- **A Study on the Optimal Methodology for Power System Development Plan to Expand Renewable Energy in South Korea**
H.-I. Kwon, Y.-S. Cho (Daegu Catholic University, Republic of South Korea), J. Hur (Sangmyung University, Republic of South Korea), H.-J. Noh, B.-J. Lee (Korean University, Republic of South Korea), K.-S. Lee, E.-S. Kwak (KEPCO, Republic of South Korea) (Submission-ID WIW19-132)
- **A Single-Loop Offshore Voltage Control for VSC-HVDC Systems in AC Meshed Offshore Grids with Various HVDC Technologies**
C. Neumann, H.-G. Eckel (University of Rostock, Germany), S. Achenbach (Siemens, Germany) (Submission-ID WIW19-136)
- **Small-Signal Analysis of Grid-Supporting Droop-Based Converter Control for Wind Power Application**
M. Gierschner (University of Rostock, Germany) (Submission-ID WIW19-153)
- **Grid Current Observer for Wind Energy Systems with LCL-Filter**
A. Schöley, M. Gierschner, T. Jeinsch (University of Rostock, Germany) (Submission-ID WIW19-155)

- **Influence of Inverter-Based Generation on Minimum and Maximum Short-Circuit Currents in Distribution Grids**
B. Niersbach, J. Hanson (TU Darmstadt, Germany), I. Ghourabi (Netze BW, Germany) ([Submission-ID WIW19-198](#))
- **WT Type 4 Benchmarks for IEC 61400-27-1**
R. Musca (University of Palermo, Italy), G. Cott (NEPLAN AG, Switzerland) ([Submission-ID WIW19-222](#))
- **Thermal Modelling Characteristics of Sodium-Nickel Chloride Battery for Transient Energy Storage Systems**
Y. Hu (University of Huddersfield, United Kingdom), N. Zhao (University College Dublin, Ireland), L. O. Shobayo, N. Schofield (University of Huddersfield, United Kingdom) ([Submission-ID WIW19-240](#))
- **Modelling the Intra-Hour Power System Balancing of the Danish Power System for 2020, 2030 and 2050**
P. Kanellas, J. Gea-Bermudez, K. Das, P. E. Sørensen (Technical University of Denmark (DTU), Denmark) ([Submission-ID WIW19-242](#))
- **Comparison of Compliance Verification Methods of Wind Farm Controllers in Germany and Ireland**
M. Ali, B. Schowe-von der Brelie, P. Tavasolli (FGH, Germany) ([Submission-ID WIW19-249](#))
- **Impact of Different Load Types on Voltage Stability of Power System Considering Wind Power Support**
M. Sarkar, P. Sørensen, A. Hansen (DTU Wind Energy, Technical University of Denmark, Denmark) ([Submission-ID WIW19-258](#))
- **A Global Atlas of 600,000 Pumped Hydro Energy Storage Sites**
M. Stocks, R. Stocks, B. Lu, C. Cheng, A. Nadolny, A. Blakers (Australian National University, Australia) ([Submission-ID WIW19-265](#))
- **Design of a High Fault Current Synchronous Machine for a Grid Forming System**
N. Schofield, P. Marinakis (University of Huddersfield, United Kingdom) ([Submission-ID WIW19-266](#))