NIWeek
May 22–25, 2017 | Austin, Texas

Digital Energy Summit at NIWeek 2017

The 2017 Digital Energy Summit at NIWeek 2017 builds on the highly successful Energy Summit of previous years. The focus this year is on the simulation, design, test and deployment of power electronics-enabled systems. The sessions will cover topics such as grid-tied systems development, simulation of wind turbines, silicon carbide (SiC) inverters, active front-ends, isolated DC-DC conversion for safe fast chargers with energy storage, FPGA-based controls with floating point IP, why and how to apply hardware-in-the-loop to speed time-to-market.

The Summit is honored to have two industry-leading co-sponsors: SEMIKRON, the world-leader in power electronics stacks solutions and OPAL-RT, the world-leader in hardware-in-the-loop (HIL) solutions for power-electronics. NI has collaborated with SEMIKRON and OPAL-RT to help customers accelerate the simulation, design, test and successful deployment of these complex systems.

Find out more at: www.ni.com/niweek

Co-Sponsored By:

OPAL-RT TECHNOLOGIES

SEMIKRON innovation+service

Opening Keynote By:

Dr Qing-Chang Zhong, IEEE Fellow and Max McGraw Endowed Chair Professor of Energy and Power Engineering and Management

ILLINOIS INSTITUTE OF TECHNOLOGY

Technical Sessions by Presenters from:

C-PED CENTER FOR POWER ELECTRONICS AND DRIVES

NextEra

OAK RIDGE National Laboratory

PERM NATIONAL RESEARCH POLYTECHNIC UNIVERSITY

Siemens

VIEWPOINT SYSTEMS

Schedule of Digital Energy Summit Events

Tuesday, 23 May, Room 17A

Time	Session #	Presentation By	Session Title
1:00-2:00 pm (13:00-14:00)	950	Dr Qing-Chang Zhong	Next-Generation Smart Grids: Power Electronics-enabled Autonomous Power Systems
2:15-3:15 pm (14:15-15:15)	951	SEMIKRON, OPAL-RT and NI	Live Demo: Design, Test and Deploy a Grid Tied Inverter in Sixty Minutes
3:30-4:30 pm (15:30-16:30)	617	Center for Power Electronics and Drives	LabVIEW RT and FPGA for Power Electronics and Drives Control Apps
4:45-5:45 pm (16:45-17:45)	655	Viewpoint Systems	Active Front End Power Conversion! What? When? How?

Wednesday, 24 May, Room 17A

Time	Session #	Presentation By	Session Title
9:15-10:15 am	639	SEMIKRON	A Primer on Silicon Carbide in Power Converters
10:30-11:30 am	729	National Instruments	Isolated Battery Charging Through Dual Active Bridges
1:00-2:00 pm (13:00-14:00)	945	OPAL-RT	A Smarter Grid Needs Smarter Test
2:15-3:15 pm (14:15-15:15)	947	Oak Ridge National Lab, NextEra	Wind Turbine Control: When can you trust your simulation model?
3:30-4:30 pm (15:30-16:30)	661	Siemens	Accelerating HVDC Test With NI and The MathWorks
4:45-5:45 pm (16:45-17:45)	794	Perm National Research Polytechnic University	Developing an Energy Manager for MicroGrids based on LabVIEW

NIWeek Exhibition:

Tuesday, May 23, 9:00 a.m.–7:00 p.m. (Beer With Engineers, 5:45–7:00 p.m.)

Wednesday , May 24, 9:00 a.m.–4:30 p.m.

SEMIKRON Booth 115

Semikron will be showing their 100kW power conversion development/evaluation cabinet whose power electronics and cabinet controls are done with the NI General Purpose Inverter Controller (NI GPIC).

OPAL-RT Booth 932

Opal-RT will be showing their eHS solver running on NI CompactRIO and PXI hardware platforms.

Viewpoint Systems Booth 829

Viewpoint will be showing a MIL-STD-704 Ground Power Unit (GPU) Accessory LRU converter from McGregor & Associates, Inc. developed using the NI GPIC.

Embedded Pavilion - Center for Power Electronics and Drives (C-PED)

The C-PED will be showing the NI toolchain for power electronics and drives control. The embedded control target is the PED-Board from NI Alliance Partner, E.D. Elettronica Dedicata.

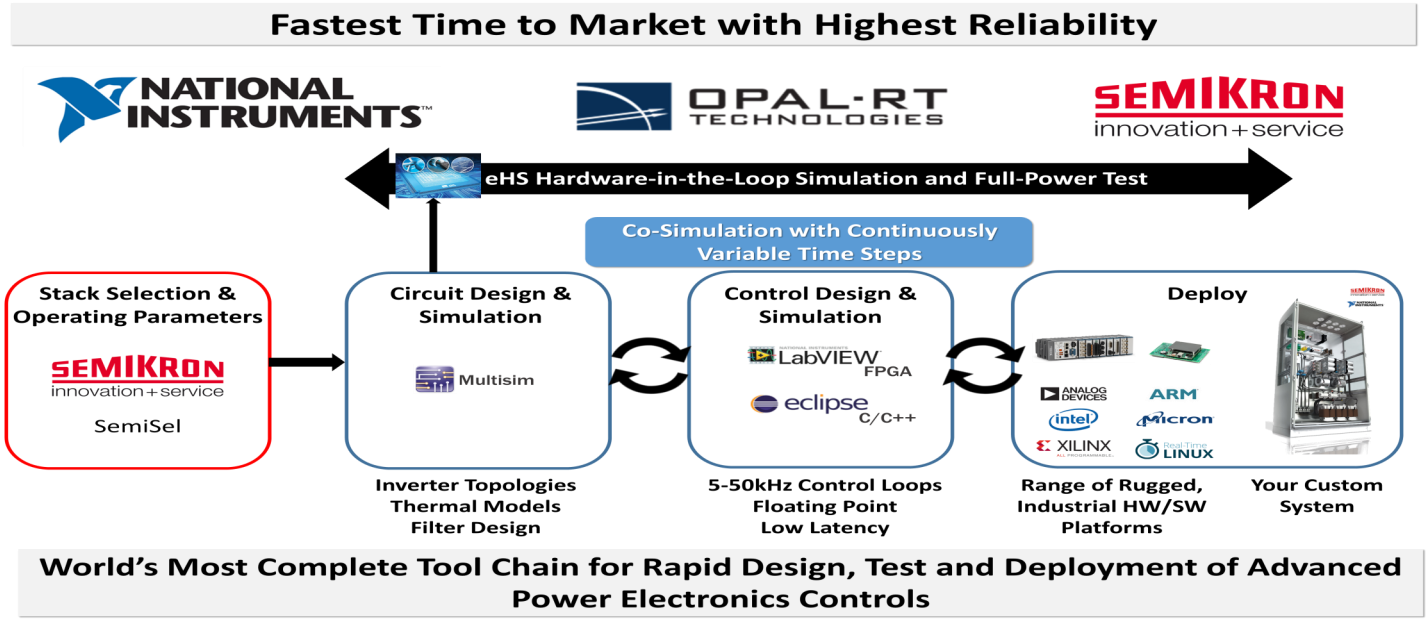
NI IIoT Lab

The NI IIoT Lab, which is a demonstration, development, collaboration, research, and commercially available platform will be showing the active stabilization of power grids using sync inverters. This is based on work between Dr. Zhong, Oak Ridge National Labs, Semikron, Viewpoint Systems, NI and others.

Summary of Sessions

Title	Abstract
Next-Generation Smart Grid: Power Electronics-based Power Systems	Power systems are going through a paradigm change. A lateral system architecture and two technical routes will be presented to empower the power electronic converters existing in non-synchronous distributed generators and flexible loads to behave like virtual synchronous machines so that they can all actively regulate system frequency and voltage.
Live Demo: Design, Test and Deploy a Grid Tied Inverter in Sixty Minutes	In this action packed session, you'll be a live witness to the entire development process for a grid tied inverter. We'll take Dr. Qing-Chang Zhong's latest IP from IEEE paper to working Semikron grid tied inverter. Learn to master the NI power electronics tool chain from co-simulation, to rapid prototype, to deployment & HIL test using Opal -RT.
LabVIEW RT and FPGA for Power Electronics and Drives Control Apps	Discover how to combine the benefits of the graphical programming approach, software portability, and the LabVIEW Real-Time and LabVIEW FPGA modules to
Active Front End Power Conversion! What? When? How?	Active Front End (AFE) power conversion can be a mystical technology. It promises lower harmonics, better DC bus regulation, and higher efficiency. But what is it really? Explore this technology and how you can use the NI Single-Board RIO General-Purpose Inverter Controller (GPIC) to control these devices.
A Primer on Silicon Carbide in Power Converters	Silicon carbide (SiC) is a buzzword in power electronics. Explore the basics of SiC: production, implementation, and the advantages and disadvantages for anyone interested in implementing high-speed switching in power converters. View a design example and available products for fast converter implementation.
Isolated Battery Charging Through Dual Active Bridges	Grid-tied energy storage systems are rapidly becoming popular due to the rise of distributed power generation such as photovoltaic arrays. A dual active bridge topology provides for bidirectional power transfer and isolation between the grid and the battery. This presentation will investigate controlling a DAB using the NI GPIC platform.
A Smarter Grid Needs Smarter Test	As digital control systems on the grid become more prevalent and more intelligent, more thorough test is required to insure the safety and compliance of the devices being deployed. A physical test bench or a few deployed test systems is no longer enough to guarantee product stability. Real-world use cases are used to illustrate this.
Wind Turbine Control: When can you trust your simulation model?	Do control engineers put too much trust in the Park and Clarke transforms? The vector relationships between balanced three phase power are the basis for traditional control algorithms and models of wind turbine generators. Can they be trusted? Under what conditions? We compared experimental results and FPGA simulation models to find out.
Accelerating HVDC Test With NI and The MathWorks	High voltage, direct current (HVDC) is key for long-distance electric power transmission. Learn how engineers used the NI platform to implement a proof of concept for a revolutionary HVDC test circuit at record speed. Discover how to integrate a high-speed The MathWorks, Inc. MATLAB® and Simulink® model into LabVIEW Real-Time and LabVIEW FPGA.
Developing an Energy Manager for MicroGrids based on LabVIEW	The project focuses research in the field of simulation-based optimizations and software-integrated solutions for automated electrical power monitoring and consumption control. Structurally Uni's MicroGrid Lab consists of power sources, electrical transmission lines, power source controllers, protection controllers, and loads.

Showcasing at NIWeek



Semikron 100kW Development/Evaluation Cabinet

Includes NI General Purpose Inverter Controller
Supports most inverter topologies, including back-to-back, active front ends for:

- Energy Storage Systems, Fast Chargers with/ without storage
- Wind turbine retrofit including DFIG
- Solar
- Regenerative, Variable-Frequency Drives

OPAL-RT eHS Power Electronics Simulation Solver

eHS is a Real-Time Power Electronics Simulation solver providing the most intuitive FPGA real-time simulation in the industry. A convenient circuit schematic graphical user interface means, FPGA code is automatically generated and ported, making FPGA-based simulation accessible, powerful and easy.

Viewpoint Systems—NI IIoT Lab Cabinets

- NI CompactRIO cRIO-9039
- Semikron SKiiP3 Inverters
- Current and Voltage Sensors
- Grid POCC
- Solar, Wind, Storage Inverters
- Loads
- Custom Configurations, HW and SW Development Services

Center for Power Electronics and Drives / E.D. Elettronica Dedicata (www.ped-board.com)

Expertise in control development with FPGAs and floating point

- NI System-on-Module (NI SOM) based power electronics / conversion system controllers
- 30x PWM Channels
- 16x 14-bit ADC Channels
- 8x 10-bit ADC, 4x 12-bit DAC, 36 Digital IO, Resolver, RS485, USB, CAN, Ethernet

NI Industrial IoT Lab—Active Stabilization of Power Grids with Sync Inverters—www.ni.com/iiot-lab

NI collaborated with Oak Ridge National Laboratory (ORNL) to demonstrate how the latest in standard Ethernet Time Sensitive Networking (TSN) can be utilized to operate inverters as grid forming voltage source inverters with voltage and frequency

regulation enabling 100% renewable energy microgrids. The voltage/frequency regulation can be operated with +/- 100ns time synchronization using TSN, additionally supporting seamless transition between grid tied and islanded modes. The lab has also demonstrated that other techniques, such as the Advanced Droop Controller research from Dr. Qing-Chang Zhong could be deployed from concept to working prototype in hours.