

EEI-KOLLOQUIUM

Grid Applications for Power Electronic Systems – Challenges and Opportunities

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Cauerstraße 9, Raum A2.16

Diskussionsleitung: Prof. Dr.-Ing. B. Piepenbreier

The availability of low cost power electronics is fundamentally changing the manner in which electric power is being generated, transmitted and consumed. For generation, power electronics allow cost effective exploitation of renewable energy sources, such as wind and solar. For transmission, it enables long distance high power transmission via underground and submarine cables and facilitates the control of power flows within ac network via FACTS controllers. At the consumer level UPS systems, dynamic voltage restorers and electric drives make up merely a few of the power electronic components that enhance the efficiency and reliability of the overall network.

To date each of these power electronic components has been predominantly designed, analyzed and operated as if it were in isolation – a sole power electronic converter within an otherwise linear, converter free, network. The structure of the future grid looks very different from such simplified system models. Many major challenges now faced by utilities relate to the interaction between power electronic systems – either at low frequencies via control loop interactions (these include limitations imposed by energy sources as well) or at high frequencies via harmonic interactions. Fortunately, along with these challenges come exciting opportunities for engineers to re-examine, at a systems level, how power electronics might be more effectively utilized within the network by more tightly integrating generation, transmission and distribution functions.

The presentation provides an overview of recent research results on emerging power system architectures, control systems techniques and harmonic analysis tools that will facilitate cost effective deployment of power electronics within the grid. Integrating HVDC transmission with power collector systems for off-shore wind farms or integrating HVDC transmission systems within distribution systems are possibilities that will be explored. Emerging control systems that are able to address problematic low order uncharacteristic harmonics associated with unbalanced operation of converter systems will be presented. The presentation will conclude with an outline of future challenges and research opportunities in the area of power electronic systems for grid applications.