

Session title: Smart and Secure Transmission Grids To Realize US and EU Renewable Energy Potentials

When? Friday, February 19, 2010: 8:30 AM-10:00 AM
Where? Room 10 (San Diego Convention Center)

A Smart U.S. Power Grid for a Reliable and Sustainable Service
Pei Zhang , Electric Power Research Institute (EPRI), Palo Alto, CA

To provide reliable and sustainable service and realize U.S. and E.U. renewable energy potentials, a smart US power grid should modernize both the transmission and distribution grids, ensure an interoperable, secure, and open energy infrastructure that will enable all electric resources, including renewables, demand-side resources, to contribute to an efficient, reliable electricity network. The North American electric power grid is critical to US economy and our way of life. Although it has historically been one of the most reliable power grids in the world, relatively little investment has been made in R&D to assure continued surety in light of increasing energy demands, dependence on fossil energy sources, transmission congestion, and terrorist threats. The drivers, challenges, requirements, standards and possible conceptual models of US smart grid need to be analyzed and developed to facilitate a more secure, reliable and sustainable power grid, which enables penetration of intermittent persistent (e.g., wind, solar) and distributed energy sources, helps alleviate transmission congestion, provides an understanding of security issues and interdependencies, and enables more resistance to catastrophic outages and natural disasters including faster and more efficient reconstitution after such events.

This talk will first provide understanding as to what we consider to be the "Smart Grid". It also gives insight into associated drivers and opportunities for the reliable and sustainable service. Then the talk will analyze the procedural and technical challenges that the Smart Grid poses as we migrate from the current grid with its one-way power flows from central generation to dispersed loads, toward a new grid with two-way power flows, two-way and peer to peer customer interactions, and distributed generation. Finally, it will develop a strategic vision on the roadmap of technological and architectural paths and destinations, and how best to deploy secure, efficient and reliable smart grid technologies.

Climate Change Drivers for a Single and Smart E.U. Grid
Keith Bell , University of Strathclyde, Glasgow, Scotland

Concerns about the climate effects of, in particular, carbon dioxide have led governments across Europe to introduce incentives to the development of renewable electricity generation. However, the best locations for wind, solar, tidal or wave resource are not uniformly distributed across the continent, and are often in places where connections to the electricity network are weak. If these resources are to be fully utilised, the power grid must be enhanced to allow the energy to be transported to the main centres of demand for electricity. This, in turn, presents some major technical challenges as well as raising commercial and regulatory issues. Very large, integrated electric power systems are highly complex and will become even more so with high penetrations of variable and uncertain power resources such as wind farms. If climate change targets are to be met, electricity users are to continue to experience a reliable supply of electricity and its costs are not to become excessive, renewables must be utilised whenever possible and the complexities of operation of the system must be well managed. This presentation outlines the background to developments in Europe to date of different technologies to accommodate increasing amounts of renewable electricity. It discusses the degree to which the grid can already be said to be 'smart' and how much smarter it must become with higher and more uncertain continent-wide transfers of power.

U.S. and E.U. Power Grids: Comparable Challenges and Solutions
Michele de Nigris , IEA Implementing Agreement on networks (ENARD), Milan, Italy

The presentations from the US and EU experts, earlier in the session, will describe the main drivers and barriers for the development of the transmission networks in the respective continents. Based on the outcomes of these talks, the presentation will focus on a comparative analysis of these situations highlighting similarities and differences and pointing out the area of possible enlarged cooperation. Although with intrinsic differences, due to different system history, market development conditions, policy, regulation, standards, financing rules, country topologies, etc. we will show that the essence of both systems are similar in their characteristics of being fit for developed economies which have grown during times characterized by low costs of energy. We will point out the inadequacy of some of the present system characteristics in the energy changing world, with carbon constraints and financial restrictions. The discussion will be broadened towards a more worldwide approach to smart transmission grids developments, including for reference, the latest projects and approach in China, India, Brazil: most of these countries are nowadays developing their transmission infrastructure and much can still be done to build up systems that will be fit not only for the current needs but will also be prone to evolution towards smarter and more sustainable situations. The talk will address the main aspects of the transmission networks developments, with special reference to the system planning, operation and management and looking at innovative power technologies, highlighting the approach and the results adopted in the ongoing IEA ENARD – Annex IV (Transmission network) working body and the European funded project REALISEGRID. Attention will be given to technological and integration gaps and to the imperative necessity of the setting up of enlarged cooperation, participative fundamental research and large scale demonstration, to dramatically shorten the time-to-market of key technologies and solutions, to avoid costly repetitions and waste of resources. The problem of human resources and necessary multidisciplinary skills will also be addressed.