TUTORIAL: Renewables demand a fundamental reassessment of the way we approach the design, construction and operation of grids

Author & Presenter: **Mario Campo, ABB**

Initially, there was a belief that renewables were simply an extension of the existing energy mix that we could integrate seamlessly without fundamental changes. Nothing could be further from the truth.

Renewables have become one of the largest power sources in many countries, with further, accelerated growth expected as the costs of these technologies fall, even in increasing competitive markets, where past economic incentives to renewable are being modified or just eliminated. As a result, we are experiencing substantial challenges in maintaining the stability and reliability of grids. It is becoming clear that the main task is not simply to connect wind farms into existing systems, but to develop new, effective systems capable of incorporating ever-larger amounts of renewable energy.

In most of the developed world, transmission and distribution grids were built based on the concept of large, centralized generation plants based on fossil fuels or nuclear energy, connected through synchronous generators. And it is a job they have performed very well and served reliably the end users. Furthermore, the network was developed to connect the population and industrial centers with the sites these plants were placed.

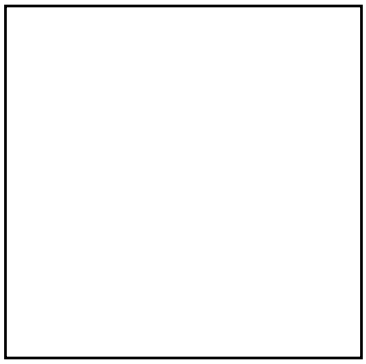
That is changing, because renewable energy is usually connected to grid through non-synchronous technology (power converters) and wind turbines need to be installed where the wind blows — in remote countryside or far out to sea — which means production is often distant from the point of consumption, in places not linked with the existing networks. In addition, the volatility and relatively unpredictable nature of wind and solar sources shows a strong contrast in comparison with the classical predictable baseload generation, for which grid were designed.

There is also major growth in distributed generation, mainly solar, and combined heat and power, so distribution grids need the flexibility and smart capability to handle large numbers of small-embedded generation units.

The new role of renewables in the electrical systems poses, therefore, a number of new challenges, with technical (voltage, frequency and network stability), logistic (new transmission links needed), market (new energy market design, including international interchanges and ancillary services, distributed energy and load management) and operational (forecast, network congestions, international coordination, new dispatching rules) implications.

The presentation describes some outstanding aspects of new electrical networks. This includes how different technologies can help to integrate increasing amounts of renewable (battery storage, FACTS, VSC based DC links). How to keep or even decrease the Levelized Cost of Energy (more digital and smart installations, advanced asset management). And how the technical and marketing regulations are evolving to adapt to the new situation (generation grid codes and new requirements for compliance).

Bio



Name: **Mario Campo**

Title: Global Product Manager Renewables

Company: ABB

Contact details:

13, San Romualdo, Street
28037, Madrid,SPAIN
Mobile: +34 666 570 421
email: mario.campo@es.abb.com

About:

Mario Campo has a Global Position in ABB as Global Product Manager for Renewable´s - System Integration. He is a frequent speaker at renewables events focusing in the integration of the Renewables in to the grid. Previously, he held a business development position in ABB for Energy Storage and was specialist in FACTS (Flexible AC transmission systems). Mario has spent more than 12 years working on the Renewable field. He obtained a MSc at the Carlos III in Madrid, MBA at the IE business school and a Wind Power Master at the Gotland University in Sweden. He is based in Spain where he is heading the center of competence for wind power in ABB´s System Integration group.