Monday 7th May – 02:00 pm - Aula B7 Edificio didattica

The Conventional and Non-conventional Electric Power Generation Systems

SITKI GUNER
Department of Electrical&Electronics Engineering,
Istanbul Arel University

Abstract:

Fossil fuels have the biggest part of electricity generation in the world. Coal-fired power plants, also known as power stations, provide over 42% of global electricity supply. With a clearer understanding of power plant efficiency and how to benchmark this performance measure, policy makers would be in a better position to encourage improvements in power plant performance. An essential part of sound policy development is the rigorous analysis of information which should be internally consistent and verifiable. Reliable power plant operating information is not easy to obtain, whether for an individual unit or for a number of units comprising a power plant, particularly efficiency-related information such as coal quality, coal consumption and electricity output.

In this lecture, briefly information about fossil fuel power plants which are coal power plants, fuel oil power plants and nature gas power plants is given. Also each part of these power plants is explained. Then, wind turbine system and solar power plant is presented. Last, some simulations about these power plants are shown.

Wednesday 9th May – 11:30 am - Aula B6 Edificio didattica

Wednesday 9th May – 02:00 pm - Aula A2 Edificio didattica

Smart Grid Environment and Electric Vehicle Parking Lots

SITKI GUNER
Department of Electrical&Electronics Engineering,
Istanbul Arel University

Abstract:

Smart grid is a new type power grid describes the integration of hardware, software, monitoring and control technologies, and modern communication networks. It is the evolution of power networks. In today's world, electric power networks have been so much loaded that such a case has never been observed before, and there are many actors from generators to customers. Furthermore, renewable energy sources must be easily integrated the power system. Under these circumstances, management of transmission congestion is a crucial task for successful operation of power systems. Main objective of smart grid is to constitute a more efficient, secure, reliable, flexible, green, and economic power system. Smart grid is not created all at once. It will evolve over many years from the existing infrastructure through the development and integration of intelligent systems. There are two main infrastructures which are electrical infrastructure and intelligent infrastructure. Generation, transmission and distribution parts of power system are upgraded and developed, at the same time, smart metering equipment are widely deployed all parts.

One of the main challenges of the smart grids was to strengthen the grid enabling smaller scale distributed generations (DGs) to operate harmoniously with the total system and capturing the benefits of DG and storage. In the new constituting structure, DGs which have low investment costs in addition to their green and highly flexible operating flexibilities become an attractive generation type. Also, DG simplified the integration of renewable energy sources to the grid. Moreover, smart grids were thought to be efficient means of accommodating the supply needs of electric vehicles (EVs). EV consumption will be of great importance due to its mobile and highly dispersed character and possible massive deployment in the future. On the other hand, EVs are expected to be an effective distributed generating capacity for future power systems and EV's main impact will be on local distribution system to which they connect. Therefore, smart metering equipment and communication tools were important for this power system evolution.

EVs operate either at charging mode or discharging mode. Charging mode is named as grid-to-vehicle (G2V) mode. Discharging mode comprises both the transportation of an EV where the stored energy is converted to mechanical energy and supply the electric network through appropriate devices as a distributed energy resource, DER. The second one is named as vehicle-to-grid (V2G) mode. Finally, EVs can be at an idle phase where they do not perform any charging or discharging work. Private vehicles are averagely driven only one hour in a day and charged for a couple of hours; hence, they are parked at an idle phase during most of the day time. Since EVs are parked most of the time during a day, it is always probable to operate at G2V and V2G modes in accordance with the power needs of the grid. However, the latter operation

mode requires the installation of V2G technology. Vehicle-to- grid and vehicle-to-infrastructure operation requires the aggregation of individual EV capacities. At this point, parking lots (PLs) play a crucial role in aggregating the EVs to reach high distributed energy storage capacity for longer periods. Modern electric power systems will face new challenges due to integration of EVs and EV operational management will be of great importance for distribution system operation due to their mobile and highly dispersed character.

EV parking lots (PLs) are natural aggregators of large number of EVs to assess considerable amount of energy storage facilities for the electric grid for longer periods. This stored energy can be used to supply the distribution network during the peak-load durations. Total peak-load duration is around thousand hours in a year, which is almost one eighth of the total duration. Due to high population density of the metropolitan cities like Istanbul, there are several challenging grid management tasks for the peak-load periods of a day. Distributed energy storage capacity of PLs can be utilised as cost-effective storage sources instead of installing new generation plants with high installation costs. Furthermore, several urbanisation and environmental restrictions against the installation of large-scale distributed generations at metropolitan areas as well as lack of distributed renewable sources have increased the feasibility of utilising EV PLs as effective storage assets.

Distributed storage capacity of existing EV PLs can be used both for techno-economic benefits of the utilities (smoothing the daily load curve by peak shaving and valley filling) as well as for the improvement of end users' supply reliability and power quality. This presentation is devoted to the improvement of the model that will include the impacts of several probabilistic parameters, future behavioural changes and urban planning on the storage capacity.

<u>Biography:</u>

Sitki Guner was born in Antalya, Turkey. He received his B. Sc. and M. Sc. degree from the Department of Electrical & Electronics Engineering at the Bahcesehir University in 2006 and 2009 respectively and he continues his PhD education and almost it will be finished June 2018. In 2011 he joined the Electrical & Electronics Engineering Department of Istanbul Arel University, where he is currently an instructor. His current research interests include smart grid, power systems analysis, distributed energy resources, distribution system reliability, electric vehicles and electric vehicles parking lots.