Power Electronics for Renewable Energy

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Abstract:

Renewable energy (RE) is a growing component in electricity grids around the world due to its contributions to (1) energy system decarbonization, (2) long-term energy security, and (3) expansion of energy access to new energy consumers in the developing world. The amount of electricity produced with renewable energy, especially wind and solar power, is growing rapidly throughout the world.

Producing the power is one thing; getting it onto the electric grid and to consumers is another matter. Large amounts of power from renewable energy must be moved from the (often remote) locations where they are produced to the cities and towns that need power. Moving this much power will require more efficient use of existing high power transmission lines and the development of new transmission lines. Apart from new transmission infrastructure, many of the grid rules governing how to plan for, interconnect, and operate power on the grid also need to change to accommodate these power. Renewable energy, like the customer demand it serves, is often variable, meaning that it fluctuates up and down based on factors like weather and the time of day. Some of the current grid rules have been in place since the 1930s – well before renewable energy generation became available in significant amounts.

Therefore integrating renewable energy into the utility grid is very challenging. Steps must be taken in order to prevent the grid from becoming instable. Challenges and possible solutions must be identified and analyzed in order to maintain the stability and security of the grid. These foreseen challenges motivates this research to study the power quality problems that may arise from large penetration of renewable energy sources into the utility grid. On top of that, renewable energy scenario in Malaysia and other Asian countries will be discussed as well as power quality problems and solutions.