EM-Power Europe
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EM-POWER EUROPE TREND PAPER: SECURE SUPPLY WITH RENEWABLE ENERGY: A DECENTRALIZED SUPPLY FOR GREATER STABILITY

Munich/Pforzheim, May – in Europe, this frequency is exactly 50 hertz. This requires the quantity of electricity fed into the grid to always correspond exactly to demand. Minimal fluctuations within a narrow tolerance range occur frequently and are automatically balanced by the system within milliseconds. By global standards, Germany is among the countries with the most reliable power supply. Decentralization is becoming a major strength in this regard. Heterogeneous energy sources and storage technologies are capable of offsetting frequency fluctuations on a small scale – even in the event of major disruptions to the European grid.

Virtual synchronous machines for grid stabilization

But with an increasing share of renewable energies, how does the power supply react to any short-term disruptions caused by issues such as major load variations, power plant failures or short circuits? When it comes to dynamic grid stability, synchronous machines play a crucial role. Take, for example, generators at large conventional power plants, which provide power system inertia as part of their remit. The focus here is the ability to use inertia to cover fluctuations. In the event of frequency deviations, these energy reserves are instantly available within milliseconds. In the near future, though, these generators at large-scale power plants will be partially – and, in the long term, completely – removed from the system.

As a result, the new energy industry has developed innovative approaches, such as virtual synchronous machines, advanced power electronics and large-scale storage systems.

Virtual synchronous machines imitate the characteristics of real machines. They can re-establish and maintain the grid voltage in the event of a drop in frequency or power outage, which enables a so- called black start in the grid. In the event of a potential large-scale grid outage, stand-alone power systems can be started up independently from the overall power grid. Until now, the concept of a black start has relied upon large synchronous machines. This, however, needs to change quickly, in line with the increasing development of renewable sources of energy.

Grid stability through battery storage systems and power electronics

Another key factor when it comes to the future safeguarding of grid stability is the fact that modern power electronics can simulate the characteristics of synchronous generators at large-scale power plants. Inverters at photovoltaic and wind power plants, as well as storage technologies, are increasingly capable of carrying out these tasks. Energy storage systems are becoming an important part of ensuring dynamic frequency stability, as they can use their inverters to provide services to maintain frequency at any time of the day or night.

Large battery storage systems are particularly advantageous as, in contrast to other storage technologies or power plants (such as gas-fired power plants that only run on an intermittent basis), they are always ready for use at maximum capacity

in a matter of milliseconds. This means that battery storage systems can provide both dynamic stability and traditional operating reserve with sufficient power. Large-scale storage systems can even supply all types of operating reserve themselves, provided that storage capacities are high enough.

Grid stability at EM-Power Europe

EM-Power Europe from June 14-16 in Munich offers extensive information on the topic of secure supply with renewable energies. With numerous exhibitors as well as sessions at the EM-Power Europe Conference and the EM-Power Forum exhibition visitors will gain comprehensive insights into new market concepts, innovations and solutions for a decentralized, renewable and stable power supply. Click here for the complete exhibitor list of EM-Power Europe.

For further information, please visit:
www.em-power.eu
www.TheSmarterE.de