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Fact Sheet

STATCOMs: stable voltage for future-proof networks

Facts about SVC PLUS in the Kusenhorst substation; September 2020

Due to the volatile feed-in, the connection and disconnection of electricity-intensive industrial plants and the increasing distance between power generation and consumption, the grid is more susceptible to voltage fluctuations. Voltage collapses can lead to major disruptions. Often large power plants have provided the reactive power necessary for stabilization. In the course of global decarbonization, however, many of these power plants are going offline. Network operators such as Amprion therefore set up **STATCOM** (Static Synchronous Compensator) systems at important network nodes. **These Flexible AC Transmission Solutions (FACTS) based on power electronics compensate voltage fluctuations by absorbing or feeding in reactive power as required for the network to remain stable.**

At the important Kusenhorst grid node in Haltern am See (North Rhine-Westphalia, Germany), Amprion is now relying on an SVC PLUS system from Siemens Energy. This is an advanced STATCOM with which Amprion can adapt the voltage flexibly and quickly enough to ensure a stable power supply for the entire region.
With a comparatively short overall project duration of 32 months (from signing the contract to hand over), Siemens Energy planned and built the turnkey STATCOM system and put it into commercial operation on schedule in June 2020.

Further details on the STATCOM system at the Kusenhorst grid node:

- The SVC PLUS system in Kusenhorst is designed for a **reactive power range of +300 MVAr/- 300 MVAr** and will regulate and secure the voltage in the grid as required.
- The heart of the system is the modular multilevel converter (MMC) technology. It ensures that the voltage waveform is almost sinusoidal.
- Powerful **4.5kV "power modules"** are built into the MMC. Compared to previous modules, they can provide the same output with fewer modules for the specified control range.
- In addition, the system in Kusenhorst has a new **active harmonic filter** that significantly improves the voltage quality in the network. It complements the functions of the STATCOM: It eliminates disruptive harmonics in the network by first measuring them, then superimposing a counter voltage from the SVC PLUS and thus eliminating the network-side distortions. Siemens Energy installed the "Active Filter" for the first time in Germany in the Kusenhorst plant. The company's innovative technology can also be retrofitted in installations using the 4.5kV module technology.
- The entire STATCOM system is designed for **environmental and maintenance friendliness and a high level of occupational safety**.
    - Components installed at a great height are only accessible via secure platforms.
    - The system has been checked for its electromagnetic compatibility. The step down transformer is connected with medium-voltage cables that were laid underground instead of the usual above-ground busbars.
    - The noises of the system should not exceed the normal daily background noise. All components, including the decoupling chokes typical of a STATCOM, are housed in a kind of "protective cover" made of metal.
- The STATCOM system includes a hall with three rooms for the converter, the control & protection technology and the chokes. The hall is around 10 meters high and covers around 1,000 m^2. The transformer and external cooler are located next to the hall.
- The STATCOM system itself is unmanned and can also be controlled by remote access.
- Despite difficult conditions during the complete lockdown caused by the pandemic, the customer put the plant into commercial operation on June 23, 2020.

STATCOM von Siemens Energy

- Siemens Energy received the order for three more identical STATCOM systems for Amprion: at the Kriftel node in the Frankfurt (South Hesse) area, Dauersberg (Rhineland-Palatinate) and Gersteinwerk (North Rhine-Westphalia). The reactive power compensation system in Kriftel has been in operation since 2018.
- Siemens Energy installed the hundredth STATCOM worldwide for the Kusenhorst substation in mid-2019. In 2008 the SVC PLUS technology was presented for the first time with the grid connection of what was then the largest offshore wind farm in the world in Thanet (Great Britain).
- Siemens Energy has developed further **innovative solutions** such as the Frequency Stabilizer SVC PLUS FS or the mobile STATCOM, which stabilize the network and close gaps in energy networks worldwide. Pre-installed in containers, the mobile unit can provide temporary support after emergencies such as earthquakes or other acute threats.
- **Two thirds of the STATCOM systems installed worldwide come from Siemens Energy.**
- In the future, Siemens Energy will continue moving toward digitalization in the area of grid stabilization. The goal is to provide grid operators with a load flow management solution.

A press feature on grid stabilization can be found at
www.siemens-energy.com/press/grid-stabilization
For more information about Siemens Energy, please see:
www.siemens-energy.com