Use Cases for PSS®NETOMAC with Customer Amprion

Siemens PTI in Germany has recently received very positive feedback on two specific use cases of PSS®NETOMAC at Amprion by their head of network analysis, Mr. Martin Loesing.

Rotating Synchronous Condenser in BUEGRSTADT/BIBLIS
Regulation of Networks at the Highest Level

A rotating synchronous condenser – the largest synchronous motor of its type worldwide – has been stabilizing the voltage in the region Frankfurt am Main since mid-February.

Biblis Nuclear Power Plant is located in southern Hesse, Germany and consists of two pressured water reactor blocks referred to as Biblis A and Biblis B. After the nuclear power plant blocks Biblis A and B were disconnected the voltage control in the area of Frankfurt became more difficult. Therefore the federal net agency agreed to project a rotating synchronous condenser for Biblis A, which was realized in an initiative by Amprion and RWE Power.

Generator becomes engine

After the disconnection of both blocks in Biblis, the infeed of reactive power in the Frankfurt area has been too low. What was missing was the essential “network lubricant for the transport of electric energy” as the federal net agency appropriately characterizes the reactive power. With the rebuilding of the synchronous generator of Biblis A into a synchronous motor the missing feed of the "lubricant" is largely compensated. Martin Loesing, manager of network analysis at Amprion, explains: “The rotating synchronous condenser allows for the adaptable and automatically adjustable support of voltage in this important network area.”
Technological Masterstroke

During low voltage the synchronous condenser automatically delivers inductive reactive power into the network. If the voltage is high, the condenser "sucks" reactive power – comparable with an inductance. RWE Power has managed the retrofit in close cooperation with Siemens within only five months. First the generator was decoupled from the turbine, and then a start-up converter was connected to the generator, which was used as a synchronous motor. The converter boots up the motor to the speed required for coupling. For converter protection a special short-circuit stream limiter was installed. The synchronous condenser remains in operation in the network and constantly produces reactive power.

New territory for software

Not only with regard to hardware, but also software, the experts entered new territory. Many simulations with PSS®NETOMAC software were conducted prior to the project. Martin Loesing recalls, "The regulation of protection and voltage of the former generator was adapted to the new motor in the network." Finally, after the first booting in the middle of February, the synchronous condenser was connected to the 380-kV-transformer arrangement in Buergstadt by a special synchronization process. Now the findings of this pilot project are also available for other future synchronous condensers.

Use case two: Stability simulations for power plants (Author: Martin Lösing)

In February 2012, Martin Loesing was invited to speak in front of the nuclear safety commission about the stability of the current nuclear power plants.

Beforehand, he gave technical details regarding stability such as voltage transients in auxiliary systems, motor starts, auxiliary systems and switch over. Martin Loesing based his presentation on simulations conducted with the expert software PSS®NETOMAC – which was anticipated by the commission very well.

Many details were discussed and the main finding was the importance of the dynamic simulation of the interface of the power plant to the network – i.e. the coordination of block and network protection.

Martin Loesing particularly mentioned the conduction of all simulations with PSS®NETOMAC and also referred to the first simulations performed for nuclear power plant connections in Germany, which have also been conducted with PSS®NETOMAC.