Static VAr Compensator (SVC)

Wind Farm

OPERATION PRINCIPLE

A Static VAr Compensator (or SVC) is an electrical device for providing fast-acting reactive power on electricity transmission networks. SVCs are part of the Flexible AC transmission system device family (FACTS), regulating voltage and stabilizing the system.

The SVC can also be considered as an automated impedance matching device, designed to bring the system closer to unity power factor.

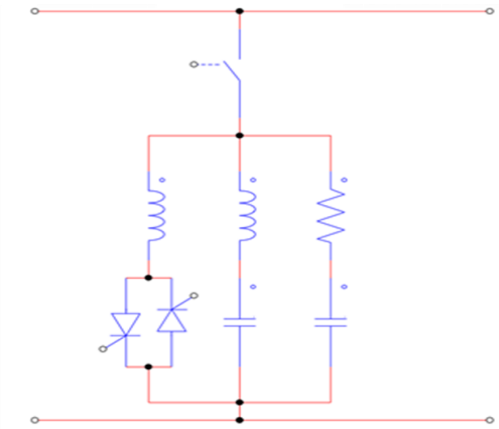
The regulated reactive power is obtained by paralleling a fixed capacitive load (Capacitor Banks) and an adjustable inductive load (Thyristor Controlled Reactor, or TCR).

Depending on the firing angle of the Thyristors, injected reactive power can be controlled and the grid voltage can be regulated. The effect of voltage control through capacitance can be understood in terms of a reduction in the line voltage drop as a result of reactive power injection. The SVC provides capacitive reactance, meaning that it injects reactive power into the grid in order to boost the local voltage level.

The SVC circuit also contains tuned filters to suppress the harmonic currents originated by the Thyristors.

The simplicity of the SVC concept and the robustness of the main components (Thyristors, Air Core Reactors, HV Capacitors), allow for outstanding performance and reliability.

The SVC can be connected directly to the grid up to 36kV and no transformers are needed, reducing power losses and installation space.



Single Line Diagram of SVC

Jema can provide a complete turnkey delivery of the project including civil works.

Jema can also provide consultancy support for the assessment of the SVC specification.

APPLICATIONS & BENEFITS

Due to increase of wind energy, the Transmission System Operators (TSO) put grid code requirements on the wind parks to ensure grid stability such as reactive power control and ride-through capability. A centrally placed SVC at the Point of Common Coupling (PCC) can be used to solve these issues in wind farms and have the following benefits:

1. *Voltage Stabilization*

One important issue is voltage stability, reactive power consumption of the connecting lines and loads may lead to voltage collapse in a weak and heavily loaded system. This is quite typical for wind generation as they are often located in remote areas and connected with long lines to the grid. The SVC compensates the voltage drop due to the reactance in the connection line, the transformer and wind turbines.

2. *Fault Ride Through (FRT)*

For some wind turbines (SCIG and DFIG) it is difficult to comply with the grid code requirement to stay connected to the grid during a grid fault. Induction generators need to be magnetized quickly after the fault to avoid over-speed of the generator rotor. The SVC compensates the reactive power demand of the turbines during the fault and also improves quick recovery after the fault.

3. *Reactive Power Balance*

Some TSO require that the wind farm when not operating is still capable of controlling the reactive power.
The SVC can dynamically control the reactive power, to make sure that the grid code requirements are still met during voltage sag.

4. *Flicker Reduction*

Flicker due to variation in wind speed will be reduced by the SVC as it has the potential to absorb changes in reactive power.