Session 3

Mitigation possibilities for power quality and operational issues in relation to RE integration in distribution networks

Agenda for Session 3

- Grid codes
- Examples of operational issues faced by ESKOM
- Solutions
- Grid code requirement in relation to operational issues

Eskom Danish Energy Agency COWI

Reactive power capabilities and voltage control

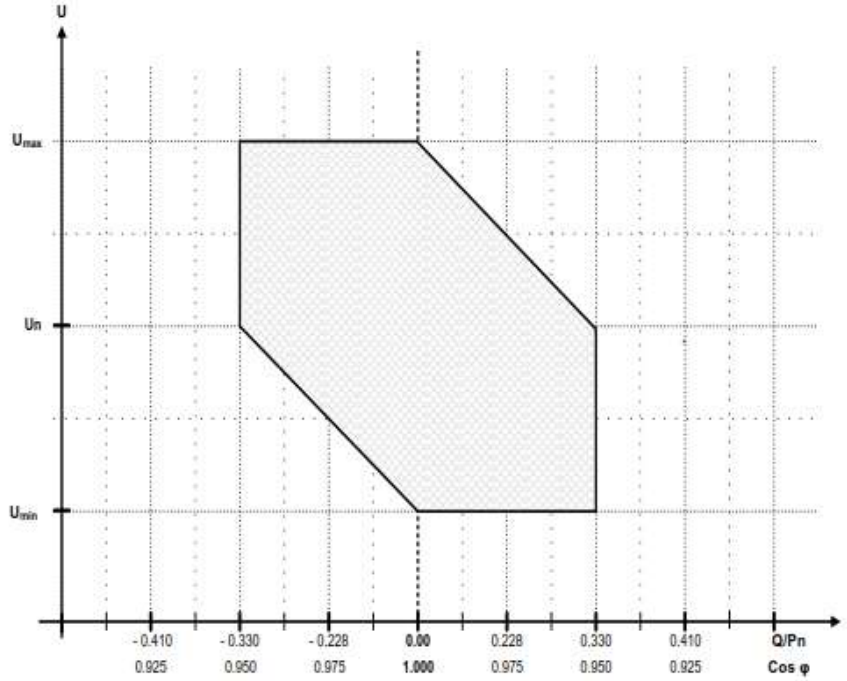

Figure 11: Requirements for reactive power and voltage control range for *RPPs* of category C

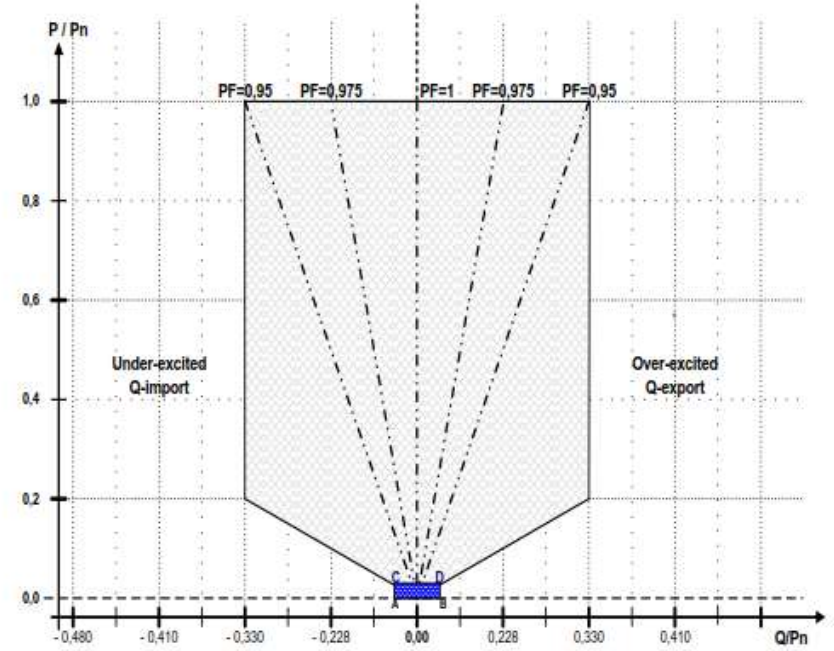

Figure 10b: Reactive power requirements for RPPs of category C (at nominal voltage at POC)

Static var compensation, SVC

- Reactive power compensation
- Combines conventional capacitors and inductors with fast switching capability
- Both absorption and generation of reactive power

The benefits of SVC to power transmission:

- Stabilized voltages in weak systems
- Reduced transmission losses
- Increased transmission capacity, to reduce, defer or eliminate the need for new lines
- Higher transient stability limit
- Increased damping of minor disturbances
- Greater voltage control and stability
- Power oscillation damping

The benefits of SVC to power distribution:

- Stabilized voltage at the receiving end of long lines
- Increased productivity as stabilized voltage means better utilized capacity
- Reduced reactive power consumption, which gives lower losses and improved tariffs
- Balanced asymmetrical loads reduce system losses and enable lower stresses in rotating machinery
- Enables better use of equipment (particularly transformers and cables)
- Reduced voltage fluctuations and light flicker
- Decreased harmonic distortion

Static var compensation, SVC for wind power

- Steady-state and dynamic voltage stabilization
- Continuous power factor control
- Enabling fault ride-through of the wind farm
- Power quality control by mitigation of flicker

Static synchronous compensator, STATCOM

- Solid-state shunt device
- Both absorption and generation of reactive power
- Uses power electronics to synthesize the reactive power output

Reactive power control

- Induction generators – fix reactive absorption
- Static capacitors – fix reactive generation
- Solid-state power electronics – controllable reactive compensation
- Distributed resources, RE, can contribute to voltage control

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Exercise

Consider the following questions till the Q&A session

- Are you familiar with the SA grid code for RPPs?
- Can the discussed issues be seen in other parts of the power grid?
- What mitigation solutions have been considered?