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Microsystems
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Remote Controlled Fast-Response Brushless Rotating Exciters for Improved Performance of Hydrogenerators

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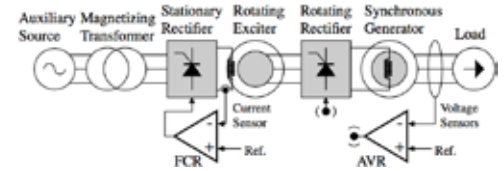
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Background

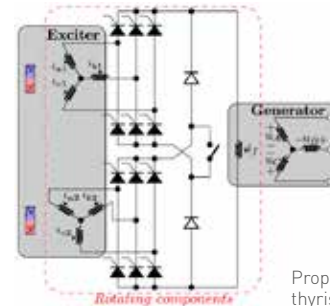
The grid code, FIKS, from the Norwegian Transmission System Operator (TSO), Statnett, states that synchronous generators ≥ 25 MVA, must have a static excitation system. However, an improved brushless excitation system is in operation on some commercial power plants (36MVA, 93.75rpm & 52 MVA, 167.67rpm) with grid-assisting performance beyond the conventional static system.

Preliminary outcomes of the project

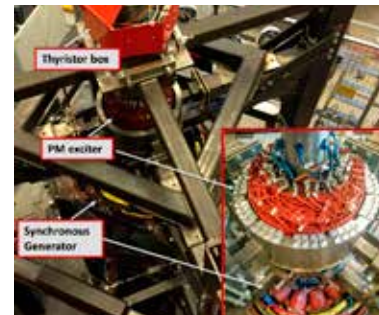
- A new era for large brushless hydro-generators is expected. If remote control is not allowed, a control signal through brushes should be employed instead.
- A six-phase exciter design with a hybrid-mode thyristor interface leads to improved redundancy, better controllability, minimized torque pulsations and reduced armature currents for the exciter.
- Proposed brushless system leads to reduced regular maintenance due to lack of slip rings and reduced unscheduled maintenance due to redundancy; both causing a reduced cost-of-energy.
- Permanent magnets on test rig is equivalent to constant field current control (FCR) of exciter in the commercial system.
- Excitation boosting (EB) is included in the brushless system without additional components or circuitry, leading to improved FRT-capability and PSS-actions.



Schematics of commercial brushless system (Voith)



Proposed hybrid-mode
thyristor based interface



State-of-the-art experimental test rig (Uppsala)

Objectives of the future work

Extensive measurements and verification of the system on large-scale power plants.