

HIL Synchronous Condenser

RTDS European UGM Genk 2018

Agenda

RTDS European UGM Genk 2018

- 1. Scope of the project
- 2. Synchronous Condenser
- 3. Components of the Synchronous Condenser
- 4. How to control reactive power of Synchronous Condenser
- 5. Generator Model
- 6. SIL model of controller
- 7. HIL model of controller
- 8. Validation of step response SIL & HIL
- 9. Validation SIL & HIL 1-phase-fault

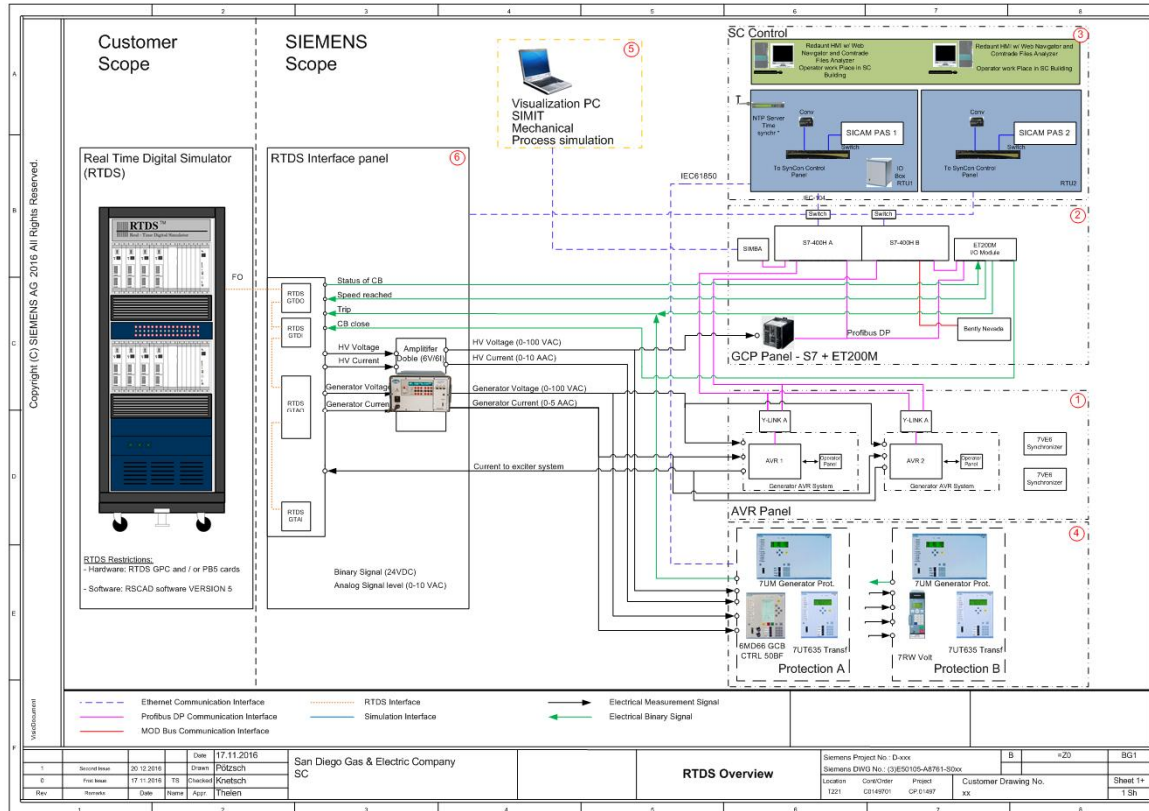
Scope of the Project

RTDS European UGM Genk 2018

- A project, containing 7 SYNC CON substations is awarded to Siemens
- 6 SS are already commissioned
- 1 SS commissioning is in progress
- Customer would like to study dynamical behavior of all Synchronous condensers in a dynamic network in their laboratory
- Protection studies will be performed with HIL too

Scope of the Project

RTDS European UGM Genk 2018

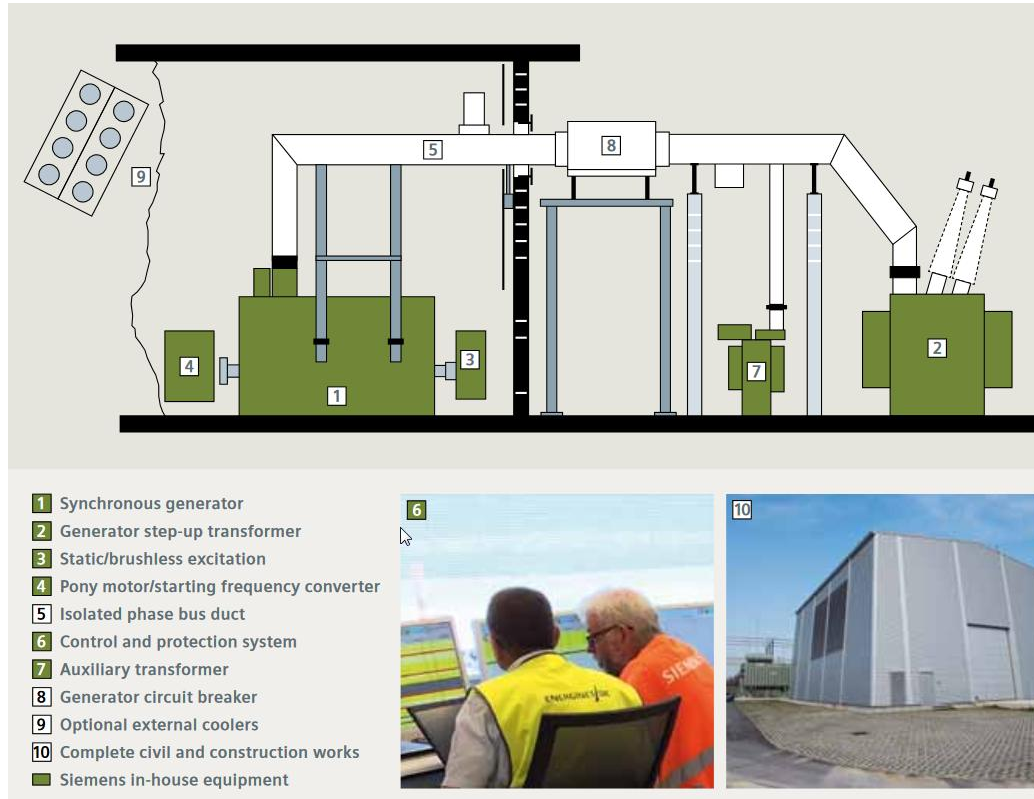


Synchronous Condenser RTDS European UGM Genk 2018

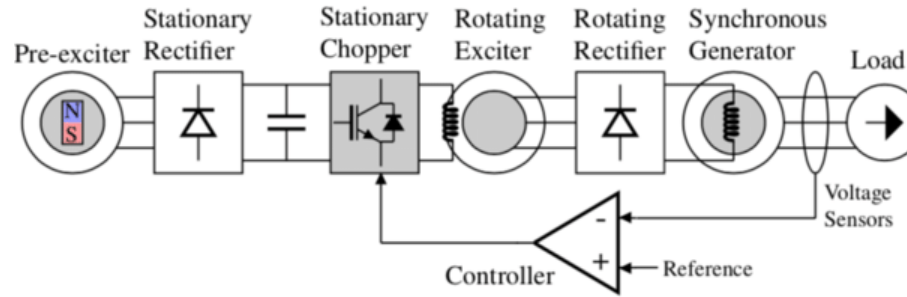
SIEMENS
Ingenuity for life



Components of the Synchronous Condenser RTDS European UGM Genk 2018



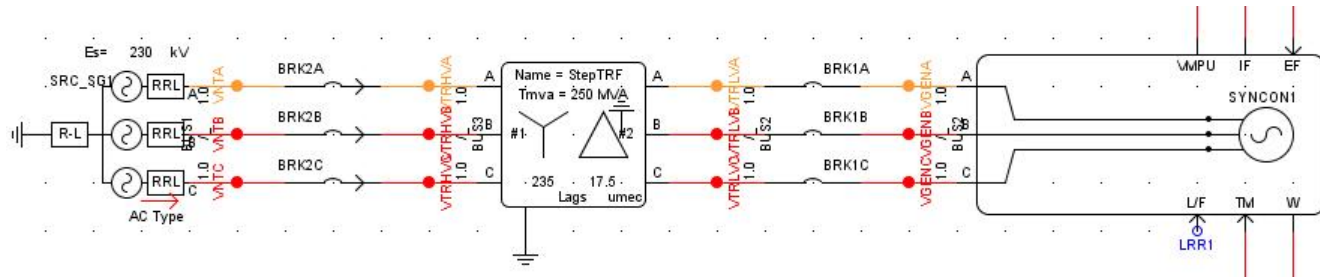
How to control reactive power of Synchronous Condenser RTDS European UGM Genk 2018



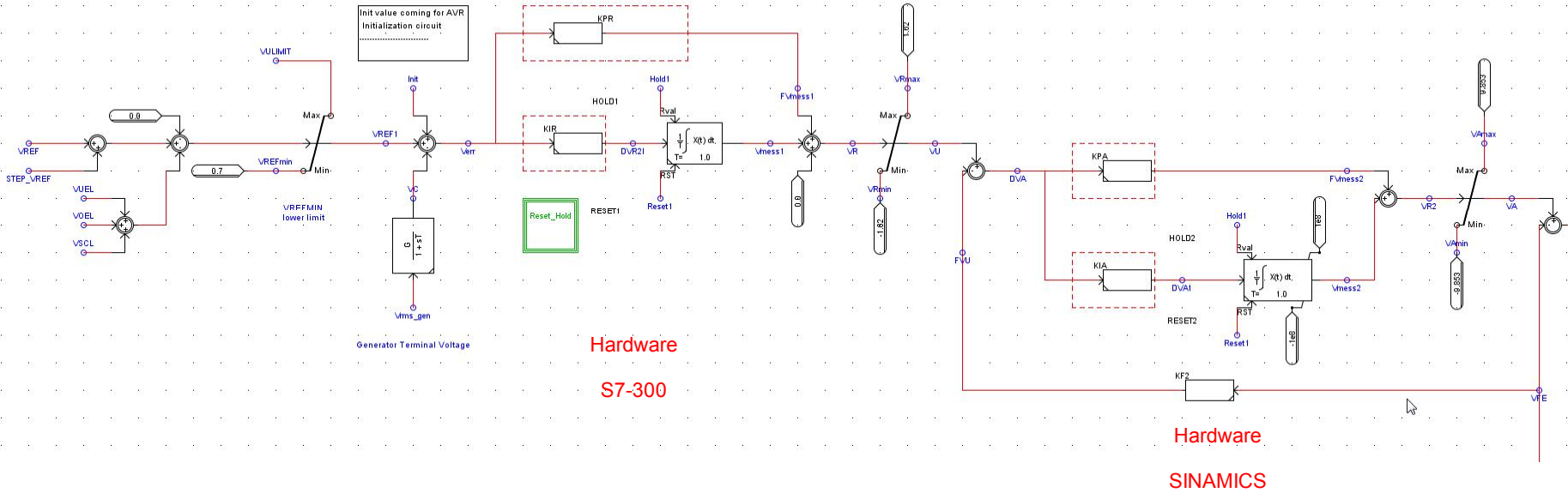
https://www.researchgate.net/figure/Different-excitation-system-topologies-A-Static-conventional-B-Brushless_fig1_305676232

Generator Model

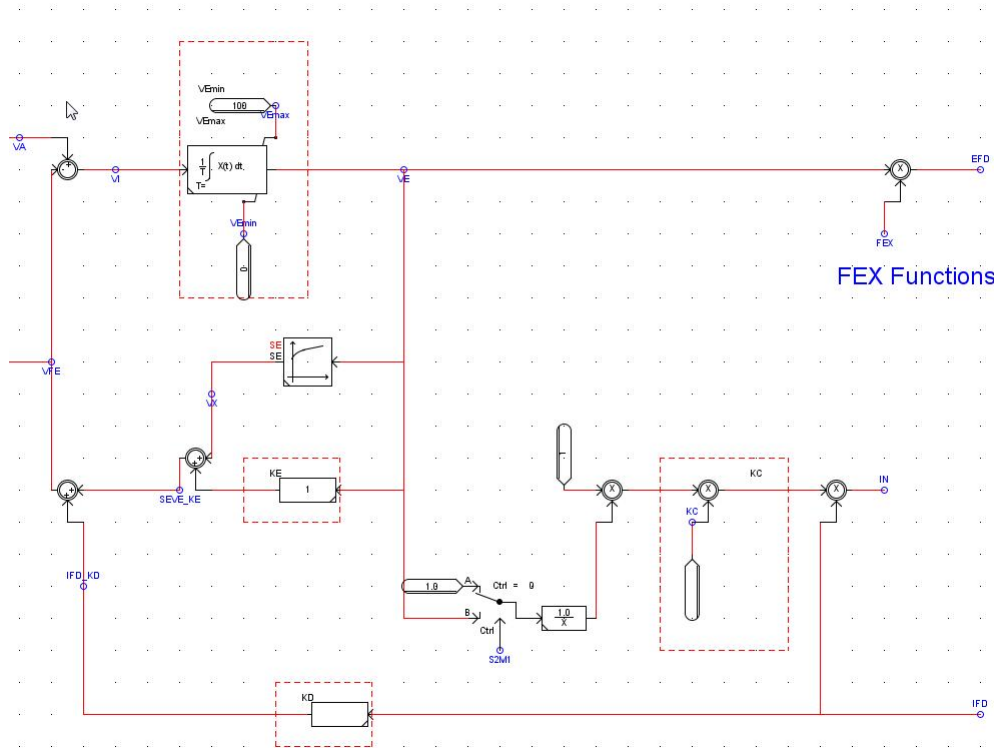
RTDS European UGM Genk 2018



AVR Model according to AC7B (2 cascading PI controllers) RTDS European UGM Genk 2018



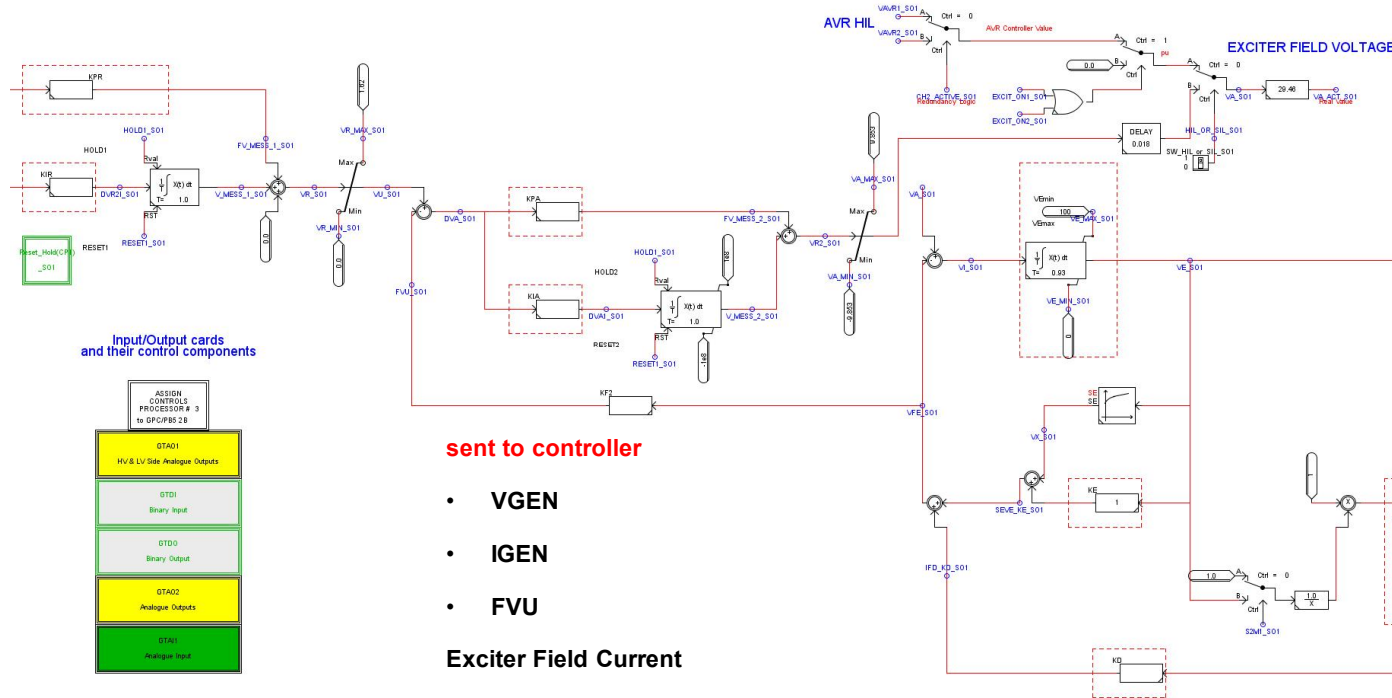
Exciter Machine Model according to AC7B RTDS European UGM Genk 2018



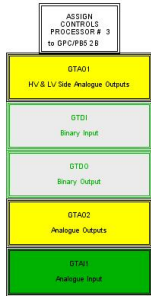
FEX Functions

This part is representing excitation machine, and the same for SIL and HIL models

HIL model RTDS European UGM Genk 2018



Input/Output cards and their control components



sent to controller

- VGEN
- IGEN
- FVU

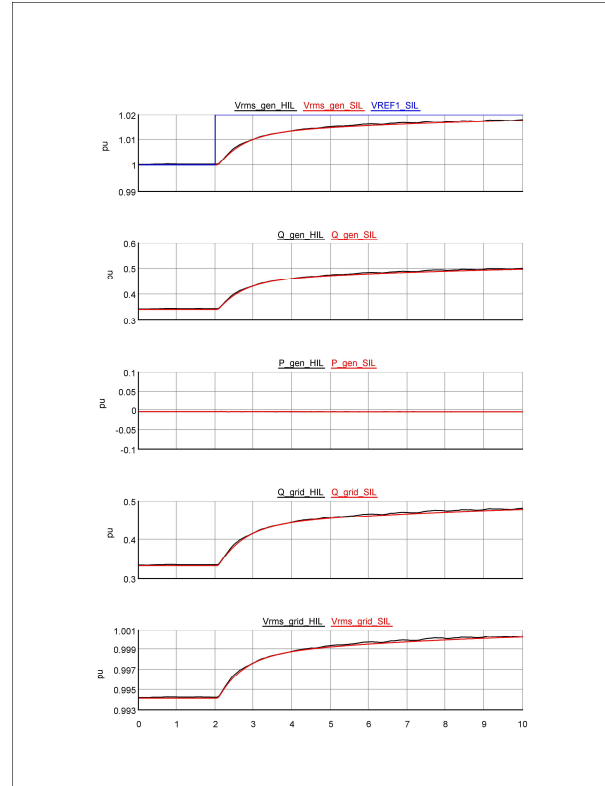
Exciter Field Current

received from controller

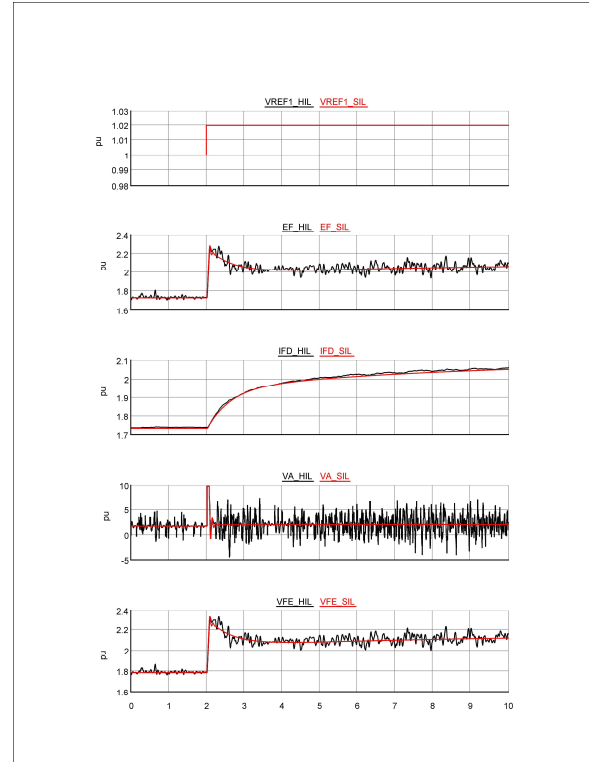
- VA

Exciter Field Voltage

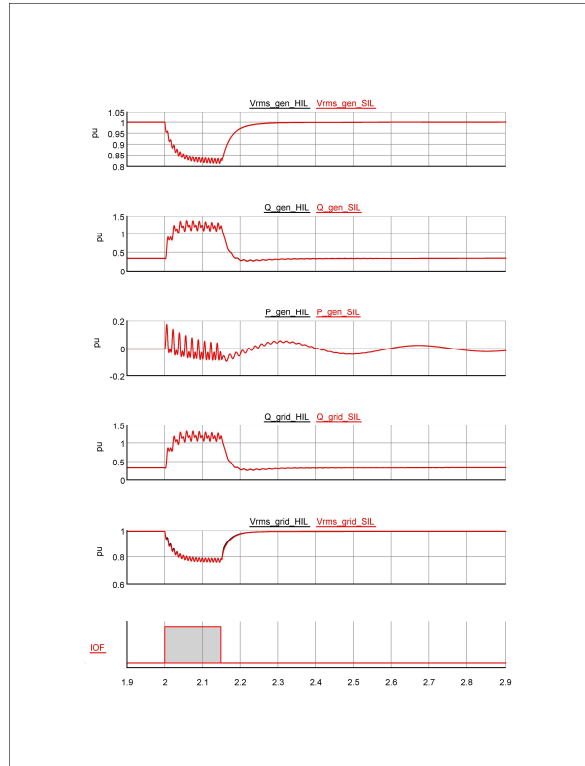
Validation of step response on grid SIL & HIL RTDS European UGM Genk 2018



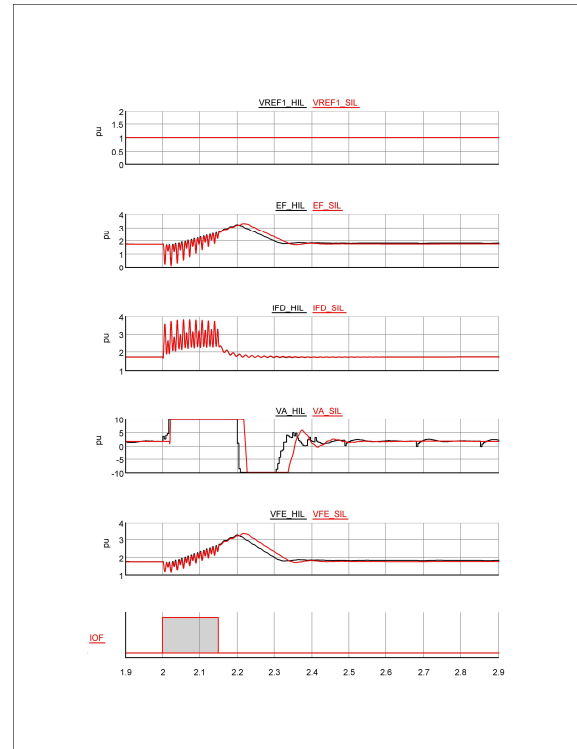
Validation of step response on grid SIL & HIL RTDS European UGM Genk 2018



Validation SIL & HIL 1-phase-fault RTDS European UGM Genk 2018



Validation SIL & HIL 1-phase-fault RTDS European UGM Genk 2018



Abstract

RTDS European UGM Genk 2018

SIEMENS
Ingenuity for life



Murat SEZER

System Engineer
EM TS EA EN C&P-P

Freyeslebenstraße 1
91058 Erlangen

Phone: +49 172 8131992

E-mail: murat.sezer@siemens.com

siemens.com