PERSONAL SAFETY PRECAUTIONS:

NOTE: we follow a zero harm philosophy, safety precautions must be considered!

- Wear personal safety equipment!
- The system to be accessed and assessed has to be isolated and taken out of service!
- Before opening any cubicle doors, make sure the system is isolated!
- In case of dangerous materials used, like Asbestos, make sure use caution to protect personal safety!
- Make sure cubicle doors are able to open for survey!

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REQUEST AN OFFER
To request an offer for modernizing your Excitation system please complete and return the plant survey sheet to Nicolai Wißler nicolai.wissler@siemens.com
General technical information of application

**Application Data (existing)**

**General Application:**
- [ ] Hydro
- [ ] Pumped Storage
- [ ] Steam
- [ ] Gas
- [ ] Synchronous Condenser

**Existing System:**
- [ ] THYRIPOL
- [ ] SFC / SEE compact
- [ ] SFC stand alone
- [ ] RG3
- [ ] THYRIPART
- [ ] SEMIPOL
- [ ] Others

Manufacturer others: __________________________

**Retrofit case**

**Retrofit objects:**
- [ ] Control- / regulator unit only
- [ ] SFC equipment only
- [ ] SFC / SES compact design ( retrofit case 2 and 3 )
- [ ] Full / complete retrofit (incl. power section)
- [ ] Excitation equipment only ( SES )

**DCS modification planned / DCS Type planned:**

**Generator protection modification planned / Protection Type planned:** __________________________

Cubicle location close to sea side (sea water - air conditions)

Air conditioned equipment room

Seismic Rating Required

Cubicle location ambient temperature: _____________ °C

Cubicle location humidity rating: ______________ %

Cubicle location altitude: ________________ m (measured from sea level = 0 m)

Cubicle location distance to generator / motor: : _______ m
Typical Retrofit Overview

**NOTE:** Compact units will combine SES and SFC into one compact unit (retrofit case 2 and 3)
### Generator- / Motor- Data of existing system

| OEM: __________________________________ | Year of manufacturing: ______________________________ |
| Machine number: ______________________ | |
| Rated Power SN: __________________________ MVA | cos φN: __________________________ |
| Frequency f: ____________________________ Hz | Speed: ____________________________ rpm |
| Nominal Voltage UGN: ______________________ kV | Nominal Current IGN: _________________ kA |
| Nominal Field Voltage UfN: __________________ V | Nominal Field Current IfN: _____________ A |
| Ceiling Field Voltage UfP: __________________ V | Ceiling Field Current IfP: _____________ A |
| No Load Field Voltage Uf0: __________________ V | No Load Field Current If0: _____________ A |
| Stator winding connection: _________________ (example: YYY) |

( NOTE: All photographs taken of generator name plate to be with no flash light reflection, min. 12 Meg. pixel )

### Excitation- / Exciter Machine- / PMG- Data of existing system (if applicable)

#### EXCITATION SYSTEM (if applicable):

| No-load Excitation Voltage: _______________________ V (Uf0 resp. UE0) |
| No-load Excitation Current: _______________________ A (If0 resp. IE0) |
| Nominal Excitation Voltage: _______________________ V (UfN resp. UEN) |
| Nominal Excitation Current: _______________________ A (IfN resp. IEN) |
| Max. Continuous Excitation Current: ________________ A (Ifmax resp. IEmax) |
| Ceiling Voltage: ________________________________ V (UfP resp. UEP) |
| Ceiling Current, time limit: ______________________ A (IfP resp. IEP) for _________ sec |

#### EXCITER MACHINE / EM (if applicable / RG3 only):

- [ ] DC - Exciter Machine
- [ ] 3-phase - Exciter Machine

| Nominal EM Field Voltage: _______________________ V (UEN) |
| Nominal EM Field Current: _______________________ A (IEN) |
| Nominal EM Output Voltage: _______________________ V (UEMN) |
| Nominal EM Output Current: _______________________ A (IEMN) |
| Nominal EM App. Power: __________________________ kVA (SEN) |
| Ceiling Voltage: ________________________________ V (UEP) |
| Ceiling Current, time limit: ______________________ A (IEP) for _________ sec |
PILOT EXCITER / PMG (if applicable / RG3 only):

- Permanent Magnetic Generator
- 3-phase
- 1-phase

Nominal PMG Output Voltage: ________________________ V (UNPMG)
Nominal PMG Output Current: ________________________ A (INPMG)
Nominal PMG App. Power: ___________________________ kVA (SNPMG)
PMG Power Factor: ________________________________
Nominal PMG Frequency: __________________________ Hz (fNPMG)
Nominal PMG speed: ______________________________ rpm

PILOT EXCITER / PMG (if applicable / RG3 only):

- AC Voltage 1
- DC Voltage 1

Nominal Voltage: ________________________________ V
Nominal Frequency: ______________________________ Hz
Nominal Power: ________________________________ kVA / kW

AC Voltage 1
DC Voltage 1
Nominal Voltage: ________________________________ V
Nominal Frequency: ______________________________ Hz
Nominal Power: ________________________________ kVA / kW

Excitation- / SFC- Transformer (if applicable)

(technical data, see sections “Retrofit cases 1, 2 or 3”)

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### Technical information, pending on retrofit case

#### Retrofit case 1 -- “EXCITATION Control- / regulator unit only”

Documents from existing system to be collected from client, if possible:

1. Photo of name plates (original Excitation system)
2. Photo of name plates (Excitation transformers)
3. Photo of name plates (Generator, Exciter Machine, PMG)
4. Single Line Diagram of unit setup
5. Capability curve of generator / motor
6. No load characteristics of generator / motor (open circuit + short circuit)
7. Thermal capability characteristics of generator / motor (thermal curves)
8. Electrical data sheet of generator / motor (Xd / Xq / inertia, etc.)
9. Excitation performance characteristics (set point steps, regulator and channel transfers, limiter tests, PSS tests)
10. VT- & CT- configuration (locations, how many of each, etc.)
11. Excitation Interface documentation / configuration interfacing to power plant
12. Excitation circuit diagrams and dimensional drawings of existing system

**NOTE:** All photographs taken, to be free of flash light reflection with high resolution, min. 12 Meg. pixel

- ☐ System cubicle color planned ______________________________ (RAL No.; example RAL 7035)
- ☐ Redundant Controls
- ☐ Power Factor Controller
- ☐ Hardwired interface to power plant
- ☐ Excitation Fault Recorder
- ☐ Reactive Power Controller
- ☐ BUS interface to power plant
- ☐ IEC 61850 interface
- ☐ MODBUS interface
- ☐ PROFIBUS interface
- ☐ PROFINET interface
- ☐ TCPIP interface
- ☐ Other interface to power plant

- ☐ PSS 2B
- ☐ AVR AUTO mode with PID
- ☐ AVR REMOTE Control from power plant
- ☐ TIME synch. via NTP
- ☐ TIME synch. via DCF77
- ☐ Electrical braking
- ☐ Redundant cooling fan
- ☐ Redundant air condition unit
- ☐ No. of RCT (static only)
- ☐ Excitation with AC CB
- ☐ “supply from bus duct” (static only)
- ☐ SES “back to back” application (pump storage only)

- ☐ Analog outputs of excitation system
- ☐ AVR LOCAL Control via Touch Panel / HMI
- Type: ____________

- ☐ PSS 3B
- ☐ “AUX supply” (static only)
- Total No: ____________

- ☐ Cubicle Cable Entry: ☐ Top ☐ Bottom ☐ Others:

---

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Excitation Transformer

☐ is existing  ☐ will remain  ☐ will be exchanged

Nominal PMG Output Voltage:
Transformer Type: ___________________________
Vector Group: _________________________________
Cooling System: _____________________________
Ratio: _______________ kV / _____________ V
Impedance voltage (Uk): _______________ %
Rated Power: _______________ kVA

AUX supply voltage-levels

AC Volt.  ❑ 400 V  ❑ 380 V  ❑ 230 V 110 V  ❑ others:
AC Freq.  ❑ 400 Hz  ❑ 60 Hz  ❑ 50 Hz
DC Volt.  ❑ 220 V  ❑ 125 V  ❑ 110 V  ❑ 24 V

RCT spare conditions onsite:

_____ No. of spare RCT parts (onsite)  _____ No. of spare RCT cooling fans (onsite)
_____ Years of RCT operation (existing)

Type of RCT spare parts onsite: ____________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
Others: ______________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
Retrofit case 2 -- “EXCITATION including power section” / (compact design if applicable)

Documents from existing system to be collected from client, if possible:

1.) Photo of name plates (original Excitation system)
2.) Photo of name plates (Excitation transformers)
3.) Photo of name plates (Generator, Exciter Machine, PMG)
4.) Single Line Diagram of unit setup
5.) Capability curve of generator / motor
6.) No load characteristics of generator / motor (open circuit + short circuit)
7.) Thermal capability characteristics of generator / motor (thermal curves)
8.) Electrical data sheet of generator / motor (Xd / Xq / inertia, etc.)
9.) Excitation performance characteristics (set point steps, regulator and channel transfers, limiter tests, PSS tests)
10.) VT- & CT- configuration (locations, how many of each, etc.)
11.) Excitation Interface documentation / configuration interfacing to power plant
12.) Excitation circuit diagrams and dimensional drawings of existing system

(Note: All photographs taken, to be free of flash light reflection with high resolution, min. 12 Meg. pixel)

- System cubicle color planned ______________________________ (RAL No.; example RAL 7035)
- Redundant Controls
- Power Factor Controller
- Hardwired interface to power plant
- Excitation Fault Recorder
- Reactive Power Controller
- BUS interface to power plant
- IEC 61850 interface
- MODBUS interface
- PROFINET interface
- TCP/IP interface
- Other interface to power plant

Type: ______________

- PSS 2B
- AVR AUTO mode with PID
- AVR REMOTE Control from power plant
- TIME synch. via NTP
- TIME synch. via DCF77
- Electrical braking
- Redundant cooling fan
- Redundant air condition unit

- No. of RCT (static only)
- No. of total cubicles

- Excitation with AC CB
- “supply from bus duct” (static only)
- “AUX supply” (static only)
- SES “back to back” application (pump storage only)

Cubicle Cable Entry:
- Top
- Bottom
- Others:
Excitation Transformer

☐ is existing     ☐ will remain     ☐ will be exchanged

Nominal PMG Output Voltage:
Transformer Type: ___________________________
Vector Group: _________________________________
Cooling System: _____________________________
Ratio: ____________ kV / _____________ V
Impedance voltage (Uk): ________________ %
Rated Power: ____________ kVA

AUX supply voltage-levels

<table>
<thead>
<tr>
<th>AC Volt.</th>
<th>400 V</th>
<th>380 V</th>
<th>230 V</th>
<th>110 V</th>
<th>others:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>AC Freq.</th>
<th>400 Hz</th>
<th>60 Hz</th>
<th>50 Hz</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>DC Volt.</th>
<th>220 V</th>
<th>125 V</th>
<th>110 V</th>
<th>24 V</th>
</tr>
</thead>
</table>

Others: ____________________________________________________________________________________________________
______________________________________________________________________________________________________________
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### Retrofit case 3 -- “STARTUP FREQUENCY CONVERTER / SFC” / ( compact design if applicable )

Documents from existing system to be collected from client, if possible:

1. Photo of name plates (original SFC- system)
2. Photo of name plates (SFC transformer)
3. Photo of name plates (Generator)
4. Single Line Diagram of unit setup
5. Capability curve of generator / motor
6. No load characteristics of generator / motor (open circuit + short circuit)
7. Thermal capability characteristics of generator / motor (thermal curves)
8. Electrical data sheet of generator / motor (Xd / Xq / inertia, etc.)
9. SFC start up characteristics (start up curves, etc.)
10. VT- & CT- configuration (locations, how many of each, etc.)
11. SFC Interface documentation / configuration interfacing to power plant

**NOTE:** All photographs taken, to be free of flash light reflection with high resolution, min. 12 Meg. pixel

| Type of turbine: ____________________________ | OEM: ____________________________________________ |
| SFC DC-link-Power: __________ MW |

**SFC Operating Modes:**

- [ ] Washing
- [ ] Purging
- [ ] Turning
- [ ] Black Star
- [ ] Electrical braking

- [ ] One SFC for 1 turbine
- [ ] One SFC for 2 turbines
- [ ] One SFC for 3 turbine
- [ ] One SFC for 4 turbines

**System cubicle color planned __________________________ ( RAL No.; example RAL 7035 )**

**Fault Recorder**

- [ ] Startup Excitation existing
- [ ] Startup Excitation required

**Hardwired interface to power plant**

- [ ] BUS interface to power plant
- [ ] IEC 61850 interface
- [ ] MODBUS interface
- [ ] PROFIBUS interface
- [ ] PROFINET interface
- [ ] TCP/IP interface
- [ ] Other interface to power plant

**Type:** __________

**Total No:** __________

**SFC REMOTE Control from power plant**

- [ ] SFC LOCAL Control via Touch Panel / HMI
- [ ] TIME synch. via NTP
- [ ] TIME synch. via DCF77
- [ ] Redundant cooling fan
- [ ] Redundant air condition unit
- [ ] Hardwired interface to SES
- [ ] PROFIBUS interface to SES

**No. of power stack**: __________

**No. of total cubicles**: __________
☐ SFC “crossover” application (for more than 1 unit only)

Cubicle Cable Entry: ☐ Top ☐ Bottom ☐ Others:

**SFC Transformer**

☐ is existing ☐ will remain ☐ will be exchanged

Transformer Type: ____________________________
Vector Group: _________________________________

Cooling System: ____________________________
Ratio: ___________ kV / ___________ V

Impedance voltage (Uk): ___________ %
Rated Power: ___________ kVA

Trip- / Switching time of existing CB in front of SFC: ___________ ms

**AUX supply voltage-levels**

AC Volt. ☐ 400 V ☐ 380 V ☐ 230 V 110 V ☐ others:

AC Freq. ☐ 400 Hz ☐ 60 Hz ☐ 50 Hz

DC Volt. ☐ 220 V ☐ 125 V ☐ 110 V ☐ 24 V

Others: _____________________________________________________________________________________________
_____________________________________________________________________________________________________
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MEASUREMENTS / ON SITE CONDITIONS

Equipment room dimensions (LxWxH):

Length______ m x With______ m x Height______ m

( take photographs and measurement of critical areas, all the way through from truck off-loading point to power plant / equipment room installation point, to be free of flash light reflection with high resolution, min. 12 Meg. Pixel, sketch of floor and room layout )

Existing equipment dimensions of Excit.-, SFC- and transformer cubicles ( foot print, sketch of layout )

EXAMPLE:

Existing equipment cable routing of Excit.-, SFC- and transformer- cubicles ( foot print, sketch of cable routing )

EXAMPLE:
Cubicle transport way (descriptions example):

The cubicle off-loading point from truck is approx. 100 m away from the equipment installation point, inside the equipment room. The way through has got 3 critical areas with the following dimensions

Point 1: Length______ m x With______ m x Height______ m
Point 2: Length______ m x With______ m x Height______ m
Point 3: Length______ m x With______ m x Height______ m

etc.

Cable routing (descriptions example):

Cubicle “CONTROLS”
- interface cable to plant DCS system, cable no.: "xxxx", cubicle entry: BOTTOM-LEFT, spare cable loop: approx.. 2 m
- interface cable to plant protection system, cable no.: "xxxx", cubicle entry: BOTTOM-FRONT, spare cable loop: approx.. 3 m
- interface cable to plant "xxx", cable no.: "xxxx", cubicle entry: BOTTOM-BACK, spare cable loop: approx.. 4 m
- power cable to plant "xxx", cable no.: "xxxx", cubicle entry: TOP-RIGHT, spare cable loop: approx.. 2 m
- Cable entrance BOTTOM of cubicle is closed with fire seal

Cubicle “RCT 1”
- interface cable to "CONTROL cubicle", cable no.: "xxxx", cubicle entry: BOTTOM-LEFT, spare cable loop: approx.. 2 m
- Cable entrance BOTTOM of cubicle is closed with fire seal

Cubicle “RCT 2”
- interface cable to "CONTROL cubicle", cable no.: "xxxx", cubicle entry: BOTTOM-LEFT, spare cable loop: approx.. 2 m
- Cable entrance BOTTOM of cubicle is closed with fire seal

Cubicle “DC CB”
- power cable to plant "xxx", cable no.: "xxxx", cubicle entry: BOTTOM-FRONT, spare cable loop: approx.. 2 m
- power cable to plant "xxx", cable no.: "xxxx", cubicle entry: BOTTOM-FRONT, spare cable loop: approx.. 1 m
- power cable to plant "xxx", cable no.: "xxxx", cubicle entry: BOTTOM-FRONT, spare cable loop: approx.. 3 m
- Cable entrance BOTTOM of cubicle is not closed with fire seal

etc.

etc.
ON SITE PHOTOGRAPHS

On site photograph example to be taken from each and every cubicle involved in retrofit activities, also transformers.

EXAMPLE cub. 1:  
- C1_1_F  
- C1_1_R  
- C1_2_F  
- C1_2_R  
- C1_3_F  
- C1_3_R  
- C1_4_F  
- C1_4_R  
- C1_5_F  
- C1_5_R

EXAMPLE cub. 2:  
- C2_1_F  
- C2_1_R  
- C2_2_F  
- C2_2_R  
- C2_3_F  
- C2_3_R  
- C2_4_F  
- C2_4_R  
- C2_5_F  
- C2_5_R

- Each and every section / cubicle of the SFC / SES will have at least 5 topological photographs from the top to the bottom.
- Photographs shall be taken free of flash light reflection with high resolution, min. 12 Meg. Pixel.
- Photograph shall be readable and good to see, even minor details by zooming into the photograph.
- If the cubicle has got a back and a front door installation inside, conclusively 10 pics / cubicle must be taken.
- Make notes also about the cable routing inside the cable tunnels / on top of the cable trays, see descriptions of cable routing examples above.
- Take photographs of all side equipment, near the SFC / SES cubicles as well.
- Take photographs or screenshots of ECS control screens on the DCS side / control room as well.
- Take photographs of cubicle cable entries from inside cubicles (cable glanding, fire sealing, etc.).
- Take photographs of control cubicle front door if there are control items (lamps, button, etc.) installed.
NAME CODING of photography’s taken:

**General view** (all cubicles, line up, doors closed)
- GEN_1_F (Front)
- GEN_2_F (Front)
- ... ...
- GEN_n_F (Front)
- GEN_1_R (Rear)
- GEN_2_R (Rear)
- ...
- GEN_n_R (Rear)

**Cable floor / cable tray view** (all cable entries to cubicles)
- Cable_1_F  Cable_1_R
- Cable_2_F  Cable_2_R
- Cable_3_F  Cable_3_R
( ... Note: make comment to each and every photograph ... )

**Cubicle 1** (from Top to Bottom / Front and Rear)
- C1_1_F (Front)
- C1_2_F (Front)
- C1_3_F (Front)
- C1_4_F (Front)
- C1_5_F (Front)
- C1_1_R (Rear)
- C1_2_R (Rear)
- C1_3_R (Rear)
- C1_4_R (Rear)
- C1_5_R (Rear)

**Cubicle 2** (from Top to Bottom / Front and Rear)
- C2_1_F (Front)
- C2_2_F (Front)
- C2_3_F (Front)
- C2_4_F (Front)
- C2_5_F (Front)
- C2_1_R (Rear)
- C2_2_R (Rear)
- C2_3_R (Rear)
- C2_4_R (Rear)
- C2_5_R (Rear)

**Cubicle n** (from Top to Bottom / Front and Rear)
- Cn_1_F (Front)
- Cn_2_F (Front)
- Cn_3_F (Front)
- Cn_4_F (Front)
- Cn_5_F (Front)
- Cn_1_R (Rear)
- Cn_2_R (Rear)
- Cn_3_R (Rear)
- Cn_4_R (Rear)
- Cn_5_R (Rear)

**Comments**

___________________________________________________________________________________________________________
___________________________________________________________________________________________________________
___________________________________________________________________________________________________________
___________________________________________________________________________________________________________
___________________________________________________________________________________________________________
___________________________________________________________________________________________________________
___________________________________________________________________________________________________________
PHOTOGRAPHS:

EXAMPLE -- General view

GEN_1_F
Comment: Example, example, example

GEN_1_R
Comment: Example, example, example

GEN_2_F
Comment: Example, example, example

GEN_2_R
Comment: Example, example, example
EXAMPLE -- Cable Floor

Cable_1_F
Comment: cubicle no., type of cables, cable no., spare loops in meter on cable tray

Cable_2_F
Comment: cubicle no., type of cables, cable no., spare loops in meter on cable tray
EXAMPLE -- Transport / Clearance

T_1
Comment: crane available, truck access

T_2
Comment: crane available, truck access

EXAMPLE -- Cubicle 1
Cubicle 2

C2_1_F
Comment: xxxxxxxxx

C2_1_R
Comment: xxxxxxxxx

C2_2_F
Comment: xxxxxxxxx

C2_2_R
Comment: xxxxxxxxx
C2_3_F
Comment: xxxxxxxxx

C2_3_R
Comment: xxxxxxxxx

C2_4_F
Comment: xxxxxxxxx
Contact Information

Power Plant / Survey Conducted

SITE / PLANT:

Address: ____________________________________________________________

City: ________________________________________________________________

Country: _____________________________________________________________

Phone: ______________________________________________________________

Contact person: ______________________________________________________

mailto: ______________________________________________________________

Unit No.: _____________________________________________________________

SURVEY CONDUCTED:

Name: _______________________________________________________________

Department: __________________________________________________________

Phone: ______________________________________________________________

mailto: ______________________________________________________________

Participants: _________________________________________________________

Participants: _________________________________________________________

Participants: _________________________________________________________

Participants: _________________________________________________________

Participants: _________________________________________________________

Participants: _________________________________________________________