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1 PURPOSE

To address the safety regarding connections involving high-voltage equipment.

2 SCOPE

This instruction applies to all operations involving connections or disconnections of high-voltage equipment for which Skagerak Kraft AS (SK) or Statkraft Energi AS (SE) has operational responsibility. This is regulated through the applicable connection agreements and safety cards.

3 RESPONSIBILITY


The person nominated as the Switching Supervisor shall be responsible for ensuring that this instruction is followed. The Operations Manager HV (high voltage) shall ensure that activities regulated by this instruction are carried out appropriately. The Operations Manager HV is responsible for the making and updating of this instruction.

Only the Operations Manager HV has the authority to give deviation permit.

4 PROCEDURE

The nominated Switching Supervisor shall ensure that connections are carried out in accordance with the requirements in the "Forskrift om sikkerhet ved arbeid i og drift av elektriske anlegg" (FSE 2006) and this instruction.

Skagerak Kraft AS and Statkraft Energi AS do not carry out Work on Live Equipment (LW) under their own direction for their own high-voltage equipment (§ 16).

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The sections (§) refer to Safety regulations related to the maintenance and operation of electrical installations, "Forskrift om sikkerhet ved arbeid i og drift av elektriske anlegg" (FSE 2006)¹.

The Switching Supervisor shall be familiar with the use of the various installations/switches, but shall assess his own level of competence with respect to performing the function at any one time and for any particular installation. In the event of any doubt, this shall be clarified with the Operations Manager for the installation concerned.

Manually voltage testing and earthing with moveable earthing device demands for special attention and a minimum of 2 persons present.

4.1 Permanently appointed Switching Supervisors.

The Duty Officer at Statkraft Energi AS' Operations Centres shall act as permanently appointed Switching Supervisor for all high-voltage equipment in the region and shall have connection authority for this equipment.

The Operations Centre in Southern Region is also assigned the function of Switching Supervisor with connection authority for high-voltage equipment where Skagerak Kraft AS is Operations Manager HV.

The Duty Officer at the Operations Centre shall be the person who at any one time plans and manages/executes all operational connections in a safe manner for Skagerak Kraft AS' and Statkraft Energi AS' high-voltage equipment.

The person nominated as the permanent Switching Supervisor may nominate his own Switching Supervisor for special connection assignments from among the personnel prequalified Switching Supervisors. Such nominations may be made verbally, but must be recorded in such a way that the restrictions associated with the nomination are clearly specified. Furthermore, it shall be recorded when the connection task has been completed and the nomination withdrawn.

4.2 Emergency preparedness and locally connection authority for high-voltage equipment.

In an extraordinary emergency situation, where a Power Plant Group (KG) cannot contact the Dispatch Centre after repeated attempts/tests, the Administrative Manager, who is preapproved as Switching Supervisor, has authority to supervise switching locally in their own plants, including catchment areas and production lines.


This applies to installations within their respective operating areas (groups of power plants or maintenance groups) when contact is not achieved with the Switching Supervisor at the Dispatch Centre after repeated attempts, and it is obvious that communication is not operational.

Administrative manager in the Power Plant Group may start and stop the unit when needed to maintain the supply of its own facilities within the Plant, including station supply and lines in regulation area. Energizing of other owners installations is not allowed unless necessary contact with the external owner's Switching Supervisor is established. See 4.3 for details.

NB! When starting the generator in some plants, automatically energizing of other owners plants may occur.

The purpose of local delegated switching authority is primarily to salvage own equipment and ensure safety. When communication is restored, the switching authority is transferred back to the Switching Supervisor at the Dispatch Centre through direct contact between local delegated authority and the Switching Supervisor at the respectively Dispatch Centre.

¹ See reference list at bottom of document, 5.3.1.

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4.3 Connections, general

The Switching Supervisor shall be responsible for ensuring that connections are carried out in a way which poses no risk to life, health and material assets (§ 11). When connections cannot be made from the Operations Centre, the Switching Supervisor must use a Switching Assistant at the local switching point. The Switching Assistant shall note the switching sequence and repeat this to the Switching Supervisor. The Switching Supervisor provides switching order, which is performed and verified by The Switching Assistant.

Connection orders shall be issued in writing or dictated by telephone or by radio. The notice shall be written down by the recipient and repeated to the Switching Supervisor. An operations list shall be used for all complex connections involving high-voltage equipment. The Switching Supervisor shall maintain a record of all connections.

The Switching Assistant has to be an instructed person, and possess sufficient knowledge to perform the connection appropriately.

The Switching Supervisor shall document his connection orders.

The Switching Supervisor shall check the connection plan and safety measures in relation to the applicable connection agreements and single line diagrams.

Manually voltage testing at disconnecting location, manually endpoint earthing and local operation of switches, including circuit breakers, shall only take place following a risk assessment. This also includes manually synchronization of circuit breaker. The Switching Supervisor shall have a confirmation from the Safety Supervisor that risk assessment is performed before any activity can take place.


Local operation of fuses in high voltage installations implies a connection. The operation shall be directed by the Switching Supervisor.

In the case of electrical reconnection or the connection of loads, it shall be clarified that the disconnecter is designed for this and that its arrangement is in good technical condition.

4.4 Coordination of connections.

When connections could/will affect equipment belonging to other parties, the connections shall be coordinated between the respective Switching Supervisors in advance. All connections and contact between the Switching Supervisors and affected parties shall be documented. The details are addressed in connection agreements.

The coordination doesn't generally apply to production-related connections. Where production-related connections must be notified, this is stated in the connection agreement.

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4.5 Connections relating to work and Safety Supervisor nomination.

The Switching Supervisor shall plan any necessary connections together with the person nominated as Safety Supervisor. The Switching Supervisor is responsible for ensuring that all required connections, for the work to be performed, are carried out.

The Switching Supervisor is responsible for any necessary disconnection, marking and safeguarding measures against reconnection, cf. §§ 11, 14 and 17.

The Switching Supervisor may use a person, The Switching Assistant, to carry out these connections locally:

- The Switching Supervisor shall order a visual check and confirmation in order to ascertain that the isolation has been performed.
 - When inspecting DCB switches² and other GIS³- systems, The Switching Supervisor should order The Switching Assistant to check that gas pressure is normal for all three switch poles. In case of too low a pressure in some of the switch poles, the switch cannot be considered disconnected.
- All connectors (normally disconnectors) that could make the workplace energized must be prevented from being operated by disconnecting motor fuses, shutting off compressed air or locking control panels.
- Blocking/Disconnection of remote controls for the disconnector.
- Marker signs shall be used which clearly state what has been isolated, the fact that work is taking place and that reconnections must not be made. Marker signs must be placed at all locations where connections may be made.
- If LOTO system is installed, it is mandatory to use it.
- The Switching Supervisor is responsible for ensuring that voltage checks are performed, the connection of end point earthing including locking of earthing switches and visual checks thereof. Voltage checks using voltage indicators and earthing using mobile earthing equipment (end point earthing) shall be carried out with at least two people present and in accordance with the instruction and training provided; cf. § 14 and the User Guide⁴. Marker signs shall be used on control panels for earthing connectors.
- The Switching Supervisor shall notify the Safety Supervisor of the safety measures.
- The Switching Supervisor shall keep a record of the safety measures, stating the time and name of the person who received and implemented the safety order. The Switching Supervisor shall receive confirmation from the person carrying out a connection locally, The Switching Assistant, stating that the signs and safety measures to prevent reconnection have been implemented.

The Switching Supervisor is responsible for securing any component that prevents the system from being energized. The Switching Assistant performs safety measures only on direct order from Switching Supervisor. To be able to establish a lock for Switching Supervisor, it is a requirement to be approved as a Switching Assistant.


All operational safety measures must have their own locks.

Establishment of safety measures with other plant owner is confirmed to Switching Supervisor in accordance with mutual reporting obligation regulated by connection agreement.

² Disconnecting Circuit Breaker

³ Gas Insulated Switchgear

⁴ User Guide for FSE and NEK EN 50110-1:2005 High Voltage

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Separate marker signs/locks shall be used for each work team in cases where several work teams are using common safety measures⁵. This is also relevant for other parallel activities, i.e. inside waterways.

A Safety Supervisor shall be appointed for individual work assignments from among the persons holding such approval in accordance with the control list for safety cards.

The person appointed as Safety Supervisor shall confirm that the planning and risk assessment for the work (SJA) has been carried out. Appointing shall not be done before the SJA is confirmed.

The Switching Supervisor appoints a Safety Supervisor for work to be performed on or in the vicinity of high-voltage equipment.

Appointing may take place verbally.

Appointings must be unambiguous, and the appointed person must confirm the work assignment for which he or she has been appointed. The Switching Supervisor shall record the appointing.

The Switching Supervisor must have an overview of all work teams sharing common safety measures in order to safeguard against the removal of safety measures before all work teams have completed their work.

Following completion of the work, the Switching Supervisor shall receive notification directly from the Safety Supervisor stating that the work has been concluded and that the safety measures implemented at the workplace have been removed (§ 15). The appointment shall then be withdrawn, and a record shall be made of this.

The Switching Supervisor is responsible for removing the safety measures implemented at the isolation point. The Switching Supervisor shall record the removal order, specifying the safety measures that are to be removed and the name of the person who received and implemented the removal order. The Switching Supervisor shall ensure that the removal has been carried out. This also involves visual inspection of earthing switches and disconnector switches.

Following the removal of all safety measures, the Switching Supervisor shall ensure that the installation is reconnected appropriately.

4.6 Connections relating to faults or alterations.


Before any test connections following operating disruption, an assessment must be carried out of what could have caused the disconnection, and eventually inspect the equipment (§ 11).

Regarding troubleshooting, the Switching Supervisor shall inform the personnel involved in the troubleshooting of any connections that will be made.

Before test reconnection following a fault or alteration to the installation, reconnections shall only be made following a risk assessment. The reconnection must be made using a fuse load breaker/circuit breaker. At least two people shall be present if the connection is to be made locally (at a local control point) (§ 11), unless Operations Manager HV has approved that it can be operated by one person

The test reconnection of transformers, following a trip triggered by gas or differential relay, shall not be carried out until the installation has been inspected.

In case of failure in automatic synchronization of circuit breaker, an eventual manual synchronization shall not take place until the failure is examined and a risk assessment is performed.

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4.7 Internal references, Skagerak Kraft AS

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| 4.7.1 | Losen, Kraft, HMS, Elsikkerhet | Instruks for el-sikkerhet. |
| 4.7.2 | Losen, Kraft, HMS, Elsikkerhet | Instruks for Leder for Sikkerhet (LFS). |
| 4.7.3 | Losen, Kraft, HMS, Elsikkerhet | Instruks for kobler |
| 4.7.4 | Losen, Kraft, HMS, Elsikkerhet | Instruks for overvåker i høyspenningsanlegg. |
| 4.7.5 | Losen, Kraft, HMS, Elsikkerhet | Skjema for utpeking av overvåker |
| 4.7.6 | Losen, Kraft, HMS, Elsikkerhet AS | Leder for Sikkerhet, ved skogrydding, Skagerak Kraft AS |
| 4.7.7 | Losen, Kraft, HMS, Sikkert arbeid | Bruk av personlig verneutstyr. |
| 4.7.8 | Vedlikeholdssystem JobTech, | Skagerak Kraft AS. |

4.8 Internal references, Statkraft Energi AS

- 4.8.1 Governing document P-23. Supervision – operation and maintenance of electrical installations
- 4.8.2 Governing document P-23/120. Instructions for electrical safety.
- 4.8.3 Governing document P-23/145. Instructions for Safety Supervisor HV.
- 4.8.4 Governing document P-23/146. Instructions for high-voltage installations Temporary Safety Substitute.
- 4.8.5 Governing document P-23/147. Form for nomination of Temporary Safety Substitute.
- 4.8.6 Governing document P-23/141. Instructions for Switcher Assistant.
- 4.8.7 Maintenance system in Statkraft
- 4.8.8 Governing document Doc-no 18-91 Process for Working Permit in Norway
- 4.8.9 Governing document Doc-no 20-2 Isolation of energy sources with LOTO

4.9 External references

- 4.9.1 FSE 2006. Regulation on safety in connection with work in and operation of electrical installations
- 4.9.2 FEF 2006. Regulation on electrical supply installations

⁵ Use id no./serial number for disconnection. I.e. it becomes a new number, even if not physically performed disconnection.
