



FATAL ACCIDENT IN CONTACTOR SWITCHGEAR PANEL



QSE alert

Associated non-conformity code: NC201708308

This document contains public information and it is intended to share the lessons learnt from incidents and risk situations that could be of interest to others in the same sector as Acciona Energía.

This document may undergo updates due to the collection and analysis of better information, because of technical advances and the proposed measures etc. For this reason, it is very important to check with Acciona Energía for the latest versions of the issued alerts.

SCOPE

- Worldwide Local. Country:
 All Businesses Construction Production
 All Technologies Wind Power Hydraulic Thermo-electric
 Photovoltaic High voltage
 Others. Specify

FACTS

General information about the accident

- Acciona Energía wind farm.
- October 2017. Sunday at 09:10
- During corrective maintenance tasks due to turbine shutdown with an inverter error.

Description of what happened

At the start of the workday, after verifying the SCADA application for the shutdown machines on the farm, the two technicians removed the spare part, deemed necessary for resolving the problem, from the storage facility (a contactor power supply) and then went to the corresponding turbine.

According to the declarations of the victim's companion, who, at the time, was in the vehicle checking the machine engineering, the victim was inside the wind turbine carrying out switchgear panel de-energisation (thus failing to comply with the obligation of always performing this type of work in pairs).

At a given moment, this witness suddenly heard a loud cry and, when he entered the wind turbine, he found his companion lying unconscious on the floor. He automatically activated the farm emergency plan. At the hospital, the victim was declared dead due to "cardio-respiratory arrest produced by a high-voltage burn" (the electric current entered by his left thumb and exited by his right knee, 12 kV).

It is pointed out that the machine had been shut down for several days and, four days earlier, an unsuccessful attempt had been made to repair it. There is no record in the turbine maintenance log as to how the turbine had been left after the last intervention, if the contactor enclosure or other cabinet enclosures were open or with power connected.

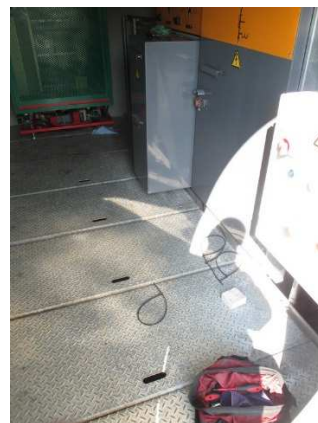


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Evidence found during the investigation

The evidence subsequently found during the accident investigation was as follows:

- The contactor enclosure door was open and with power applied inside (this indicates that the line switchgear panel isolation switch was not opened).
- The isolation switch for the turbine transformer protection switchgear panel was open: without power applied to the circuit.
- The front panel on the switchgear panel was partially unscrewed.
- No personal protection equipment (PPE) for working with electric shock hazards was found in the work area.
- Correct operation of the switchgear panel interlocks.



Close-up of the ratchet handle and the screws from the front panel of the switchgear found on the actual panel. It can be seen that the front panel is partially unscrewed. Inside the wind turbine with the tool bag on the floor.



Leds que muestran que las 3 fases tienen tensión

Interruptor del línea posición cerrado

Sin tornillos

Tornillos flojos

Interruptor del trafo en posición abierto

Close-up showing the condition in which the switchgear panel was found.



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Close-up of the contactor switchgear panel door. The interlock keys (B and C) are correctly inserted into their locks.

Accident causes.

- The discovered evidence indicates that the switchgear panel had been intentionally manipulated in order to extract the interlock key that protects the line switchgear panel. The investigation showed that by loosening the front panel on the switchgear panel and removing some of the screws, it becomes possible to force this panel to enable the lock barrel to be rotated and extract the keys without performing the isolation switch operation because when the panel and associated lock barrel are forced, the internal lock mechanism is freed and can be rotated.
- Non-compliance of the five golden rules: the power supplies were not opened, the lack of power was not verified and the installation was not earthed.
- None of the PPE required when working with electric shock hazards, which could have reduced the consequences of the accident, was employed during the operation.



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LESSONS LEARNT

Apart from the obvious need to reinforce personnel training and awareness in order to ensure that they employ all the established electric hazard protection equipment and follow the corresponding work procedures:

- Improve the switchgear panel interlock system by installing an "additional special screw" in the front panel. This screw must require the use of a special tool to remove it and this special tool must be in the care of the Wind Farm Manager.
- All switchgear panel modules must be clearly and precisely identified: line switchgear panel, protection switchgear panel and contactor switchgear panel. This must be applied to all switchgear panels regardless of make and model.
- Establish a work procedure that defines how to transfer a turbine in those cases in which a work team is unable to repair a machine before their shift ends: in what conditions a turbine should be left, the minimum information that must be recorded about the operations carried out, where this information should be kept so that it is available to the next pair of technicians that comes to work on the machine etc.