

Upgrade to High Voltage Switchgear Control & Indication

By Christian Howells

Introduction

High Voltage Switchgear plays a crucial role in electrical distribution networks. They ensure the protection, safe operation & reliability of the network.

An upgrade to the remote switching & indication of HV Vacuum Circuit Breakers in Concast South Substation in the Port Talbot Steelworks had become essential. The original control system from the 1970s had become nonfunctional due to the deterioration of control cabling running over long distances. Replacing this cable would have been extremely costly.

Aim

Identify and implement a modern control method, incorporating real time monitoring, automated fault detection, improved flexibility and ease of expansion.

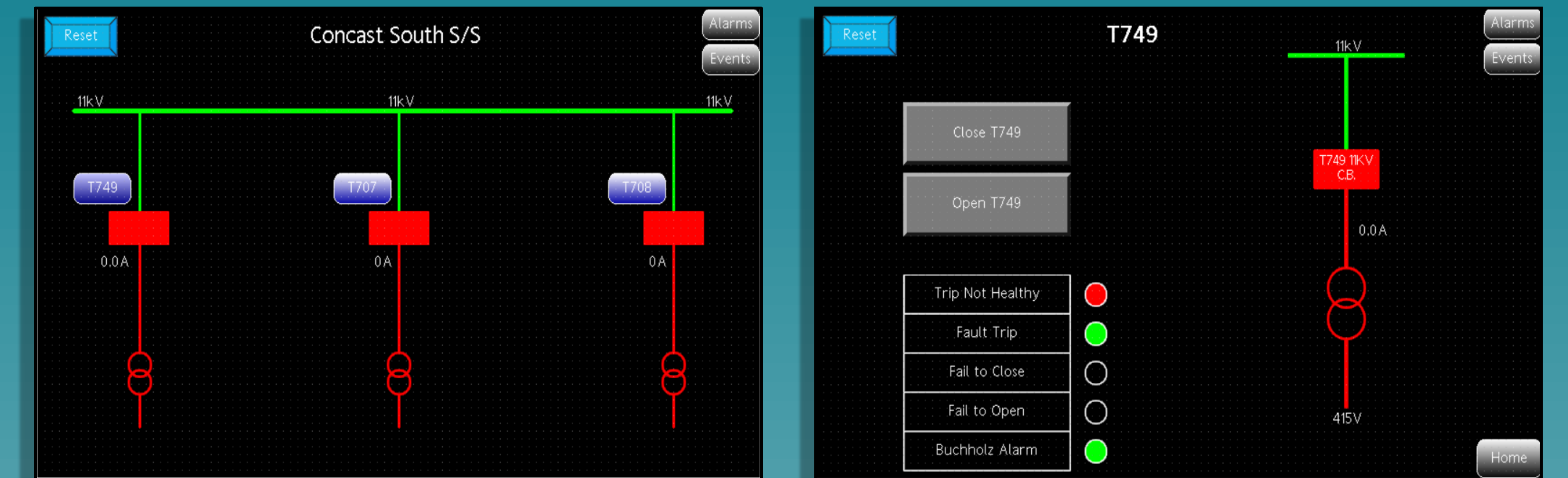
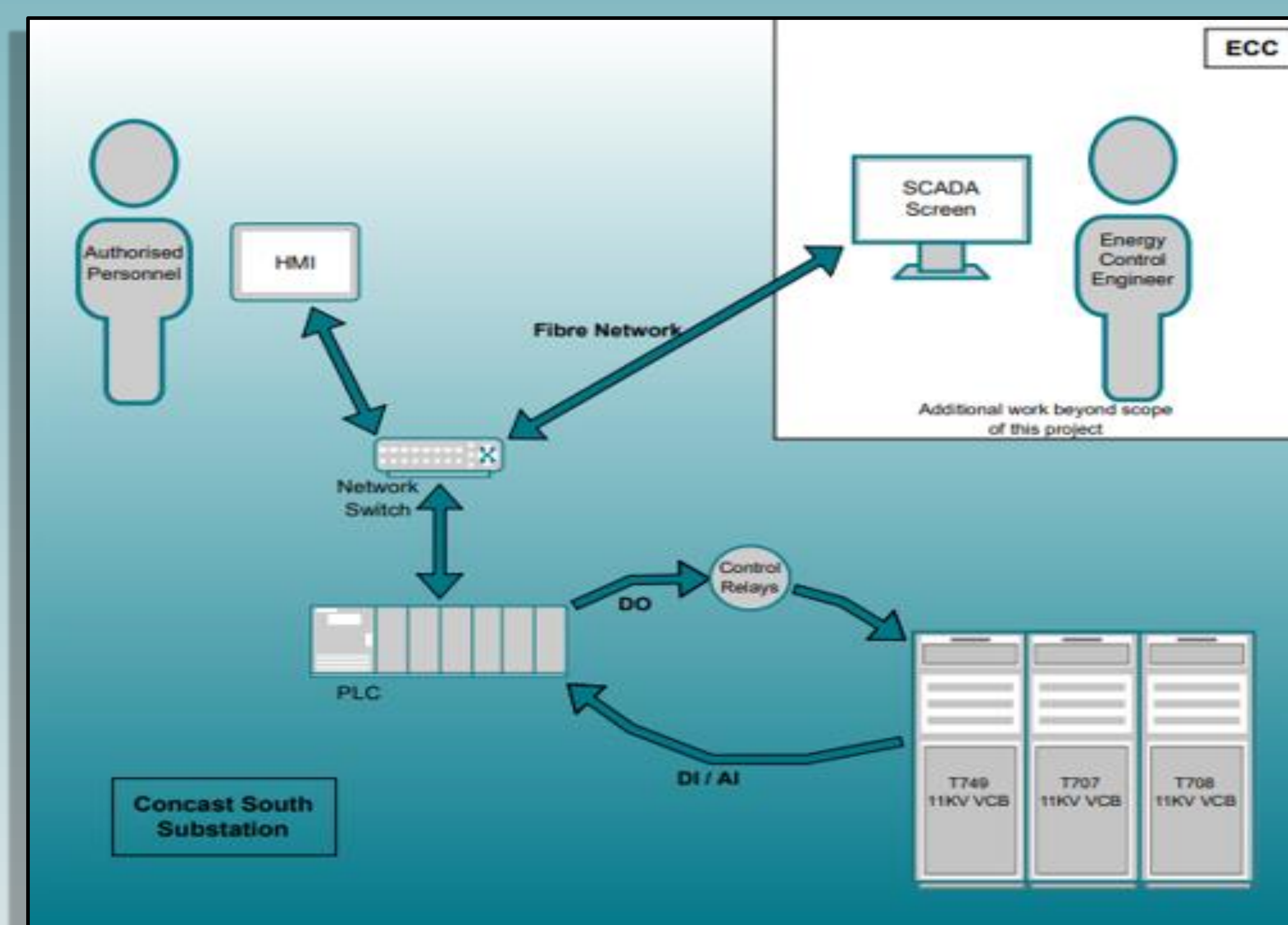
Objectives

The new installation will provide authorized electricians the facility to open & close 11KV VCBs from a safe, remote location within the substation.

Provide the user with up-to-date indications and alarms.

Design & Implementation

- I Utilized an existing PLC (Allen Bradley Compact Logix) and a network switch already installed in the substation by relocating both and expanding PLC. I programmed the PLC using Studio 5000 Logix designer.
- A list of I/O requirements was developed.
- The new control panel was installed inside the existing control cubicle, this offered easier integration with the control wiring arriving from the switchgear and the control relays
- An HMI was incorporated into the upgrade, allowing the user to perform switching operations, monitor circuit statuses, alarms, warnings and circuit amps. The HMI was programmed using Crimson 3.1 software.



Operational Requirements

- The HMI has a home screen which acts as an overview of the 11KV VCBs to be controlled at Concast South Substation. T749, T707 & T708.
- The required circuit breaker can be selected from the home screen, taking the user to a control & operations page.
- The user can open & close the circuit breakers, the mimic will update to represent its status (Green-closed, Grey-open, Red-position unknown).
- If a circuit breaker opened under fault, a fault trip alarm will indicate and sound from the HMI.
- If a VCBs trip circuit becomes unhealthy, a TNH warning will indicate on HMI.
- If a close or open command is unsuccessful, it is displayed on screen.
- The circuit current (Amps) is shown on HMI.
- Transformer Buchholz alarms have been integrated onto the HMI.

Conclusions

Initial tests have proven successful. The transformer circuits T749 and T707 were isolated, and function testing from HMI carried out on both 11KV VCBs. The aim was to have 3 VCBs upgraded to the new controls, I completed 2, achieving my objectives on both. Providing a safer, more reliable and efficient installation.