



## **SLIDE ONE (Title slide)**

The move to LAN based systems has created a plethora of new challenges in the design, operation and maintenance of the protection and control system.

These challenges demand a new way of thinking, which means having an open mind to new solutions

This contribution summarises the new techniques identified in the CIGRE SC B5 2017 papers #102 and #103

## **SLIDE TWO**

In wire-based systems, a lot of effort goes into validation, checking of all the drawings and wiring schedules to the design stage in order to identify as many as possible of the wiring errors that may have crept in.

In GOOSE based systems, the infamous EXCEL spreadsheet is the equivalent design tool for many systems.

Even if more advanced System Configuration Tools are used, it is still difficult to validate the publish-subscribe relationships represented in the SCL files.

Interactive visualisation tools can provide invaluable mechanisms to see the configuration in a different way. These allow drill down to help validate and identify any configuration inconsistencies.

## **SLIDE THREE**

Once the physical system is then created, our test environment needs to be suited to the often hybrid system of wires and LANs

In many instances this also involves catering with the limitations of the old test sets which don't have IEC 61850 interfaces.

In fact we may need to use an interface box to help trigger message capture as well as to stop the test set when certain GOOSE are received.

## **SLIDE FOUR**

Wireshark is an extremely useful tool in capturing messages. However more advanced "multimeter" type tools are needed to identify the meaning of the messages and indeed the performance of the system overall

## **SLIDE FIVE**

Finally we need an auditing tool that can validate

- Has the intended SCL files been loaded into the actual system
- Has the contractor delivered truly as operating configuration files
- Has anything changed since the last time we sniffed the network