Question 2.4: How one deals with large number of relays (hundreds and potentially thousands) if failure monitoring and setting coordination are to be managed through remote access?

The fundamental principle objective of Smart Grids is to improve **overall reliability and availability** of supply to the consumer at reduced capital and operating cost.

The standardised mechanisms and procedures that are established by the asset owner and required to be included in the Substation Automation System built by the (internal or external) Systems Integrated significantly affect the response times to equipment failures.
This significantly affects CAIDI and SAIDI.

Availability is given by

$$A = \frac{MTBF}{MTBF + MTTR}$$

$\qquad$ Mean Time Between Failures
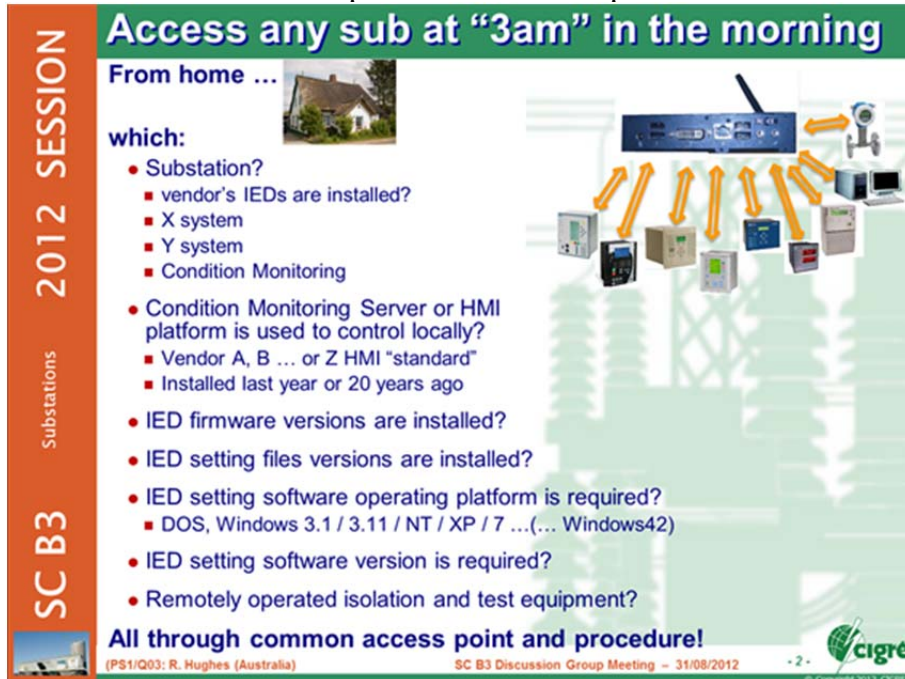$\qquad$ Mean Time To <u>Restore</u>

Assuming procurement processes maximise the use of long MTBF equipment, it is also possible to **increase Availability by reducing the MTTR**.

This can be achieved through the use of appropriate systems for technicians and the use IEC 61850 systems

This can be considered in the "**3am in the morning**" scenario for how to respond and fix equipment failures. This is when utility efficiency is most evident.

The first step and priority is for the technician asleep at home or at a friend's party needs to gain remote access to the substation to analyse the situation.

Several difficulties arise in this which prevent effective response:

In the worst scenario, the technician doesn't even have any of the required IED operating software on the PC they are using.

The technician therefore needs to be able to use some form of access that guarantees not only security but also that they have full access to the right tools and information specific to the equipment installed at the location in question.

This is best achieved by providing authenticated access to a central server via the corporate LAN/WAN, their PC at home, their Smart Phone or Tablet.

Once logged in to the Central Distributed Control Unit (as for example the DCU provided by 7com Ltd and distributed Rod Hughes Consulting Pty Ltd), this can provide the operator through Windows Remote Desktop (*avoiding need for any special software on their PC) selection and access to the remote site through secure VPN by any variety of communication networks- including Mobile 3G in order to retain segregated or alternative comms to the corporate WAN.

Once connected to the site DCU, the technician can now access the specific IEDs using the IED-specific software installed on the substation DCU. This ensures the right software is available at all times. The DCU can even run Virtual Machine in order to cater for different software operating platform or version requirements.

The substation DCU also acts as a general file server itself providing direct access to documentation and IED configuration files specific to that site.

Using Remote Desktop, the technician operates all these software tools, even accessing other PCs for disturbance records, condition monitoring or even the substation HMI, in order to diagnose the issue and undertake any tasks able to be carried out remotely that may speed up the overall restoration of the equipment.

Availability (CAIDI, SAIDI) is affected by Utility defined Restoration facilities and procedures

Remote access must provide mechanisms to use
- Right tools specific to the
- Right devices, with the
- Right documentation, and the
- Right configuration files