STEP OUT OF THE ARC FLASH HAZARD ZONE

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How remote is your switchgear

Step out of the "Zone". The Arc Flash Zone! Advance protection can make it safer for equipment and people working in the Arc Flash hazard zone, but not having to be in the hazard zone is obviously the preferred option. Advances in trip units and communications along with tried and true remote buttons and switches have helped to remove employees from arc flash associated hazards but let's take a look at what GE's Entellisys Switchgear will allow an operator or electrician to do without being in front of the switchgear lineup. The system administrator assigns users to groups and defines what permissions that group is allowed. This allows only individuals with proper training to have access to control functions and provides a history of each operators input.

Entellisys offers a Near Gear HMI which will provide all the functionality that will be described here. The HMI can be wall mounted,(figure 1a) put in a standard 19" relay rack or ordered as a control stack (figure 1b) with the HMI, the systems redundant CPU's and UPS's and the optional I/O. The HMI can be located anywhere within a 300ft range and requires only control power & a cat 5 cable to operate.

Figure 1a

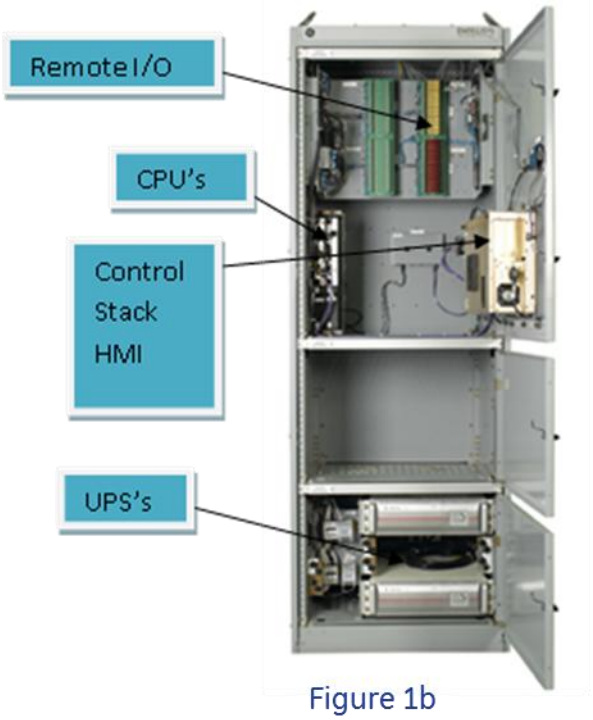


Figure 1b

Let's see what information and functionality are available to you without being in the Arc Flash Zone. A quick look at the oneline (figure 2) provides status of all the breakers (Open, Close, Trip), load on each breaker (Amps) and system voltages. If you need to operate a breaker, you select that breaker (touch screen) from the oneline or the Elevation view. (figure 3)

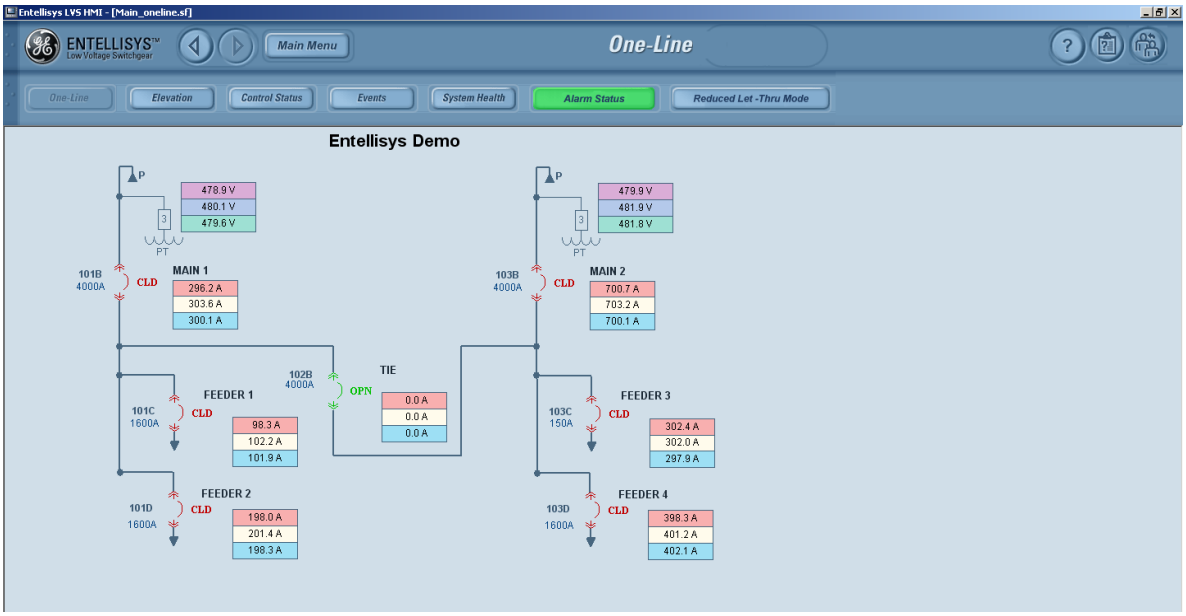


Figure 2

Figure 3

Selecting a breaker opens the breaker status screen.(figure 4) This provides detailed info such as breaker contact, rack and secondary disconnect position; protection functions that are active and relay status as well as per phase current and voltage.

From this screen you will select control (available to an operator with correct password)

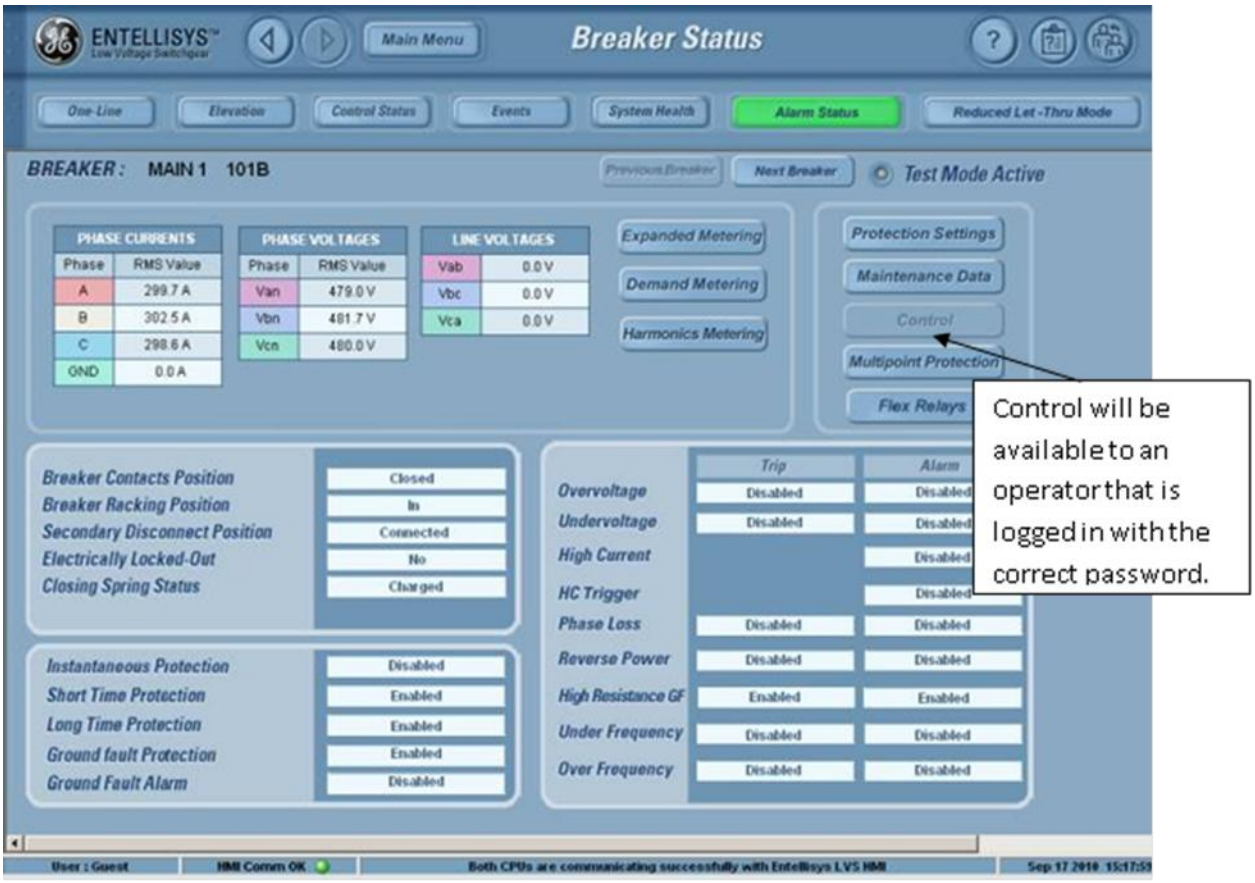


Figure 4

Figure 5

Once the control box opens (figure 5) you want to verify that you are about to operate the correct breaker. You push the locator LED on and you can look at the front of the switchgear to verify the flashing blue LED is at the breaker you want to control.

You can now operate the breaker.

You want to do required maintenance but downtime is extremely difficult to schedule and costly. You select maintenance data (figure 6) from the breaker status screen and it says you have only used 5% load life and .53% mechanical life. You decide to wait until a more opportune time for maintenance. You better check each breaker.

Figure 5

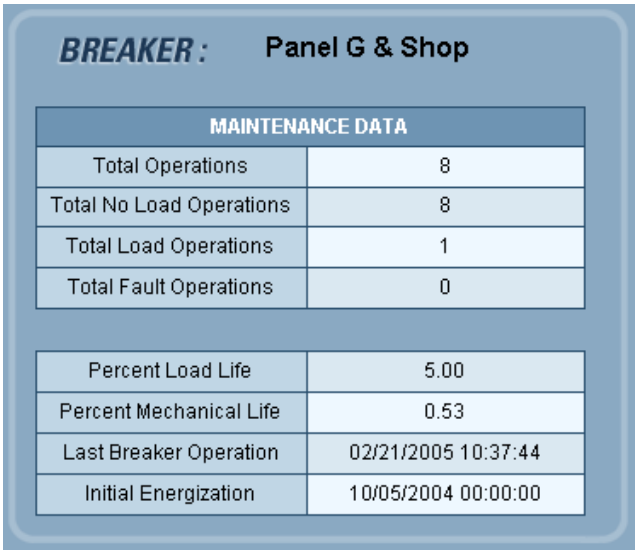


Figure 6

One breaker has already used 50% load life so you go to the alarm screen and enter your email address to be notified if any breakers reach 90% load life. But are there any problems with this lineup? Under the "System Health" tab (figure 7) you can look into detail on the status of each breaker. The self-test

has passed, the configuration and hardware are ok, the protection settings are in range and both communication loops and both control power sources are ok.

Figure 7

You were told the chiller on feeder 1 seems a little erratic, you decide to check the protection settings. (figure 8)

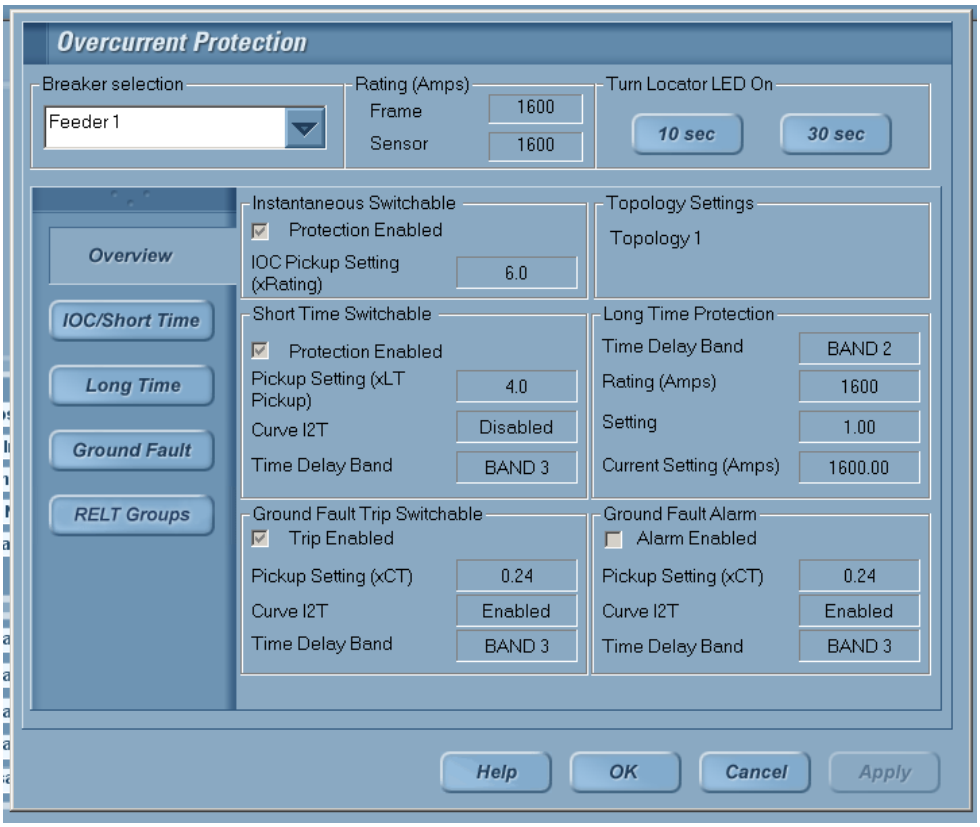
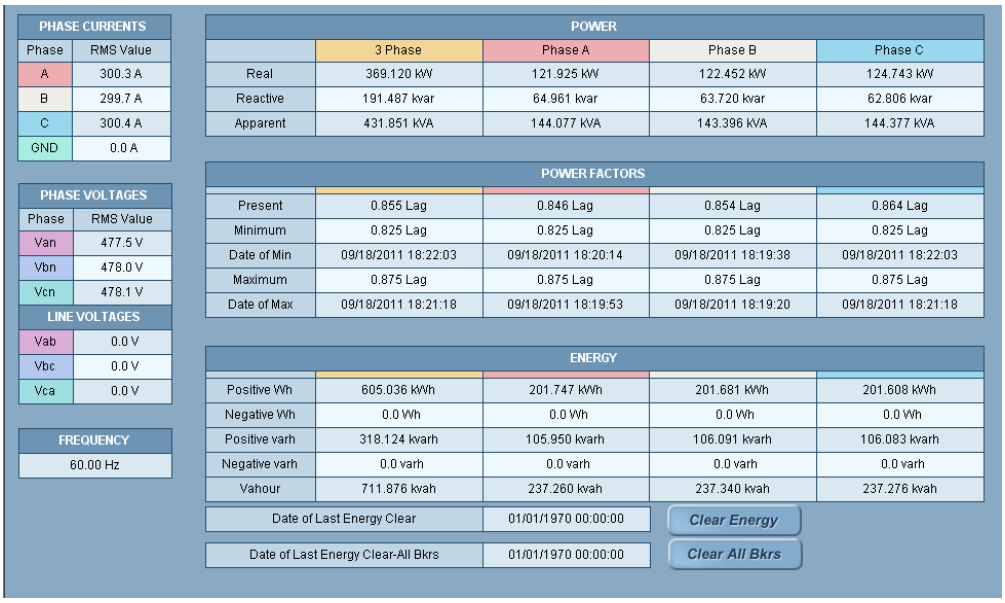


Figure 8

The breaker settings look good, after checking the more detailed metering(figure 9) you write a work order to have the chiller checked out.



PHASE CURRENTS

Phase	RMS Value
A	300.3 A
B	299.7 A
C	300.4 A
GND	0.0 A

PHASE VOLTAGES

Phase	RMS Value
Van	477.5 V
Vbn	478.0 V
Vcn	478.1 V

LINE VOLTAGES

Vab	0.0 V
Vbc	0.0 V
Vca	0.0 V

FREQUENCY

60.00 Hz

POWER

	3 Phase	Phase A	Phase B	Phase C
Real	369.120 kW	121.925 kW	122.452 kW	124.743 kW
Reactive	191.487 kvar	64.961 kvar	63.720 kvar	62.806 kvar
Apparent	431.851 kVA	144.077 kVA	143.396 kVA	144.377 kVA

POWER FACTORS

Present	0.855 Lag	0.846 Lag	0.854 Lag	0.864 Lag
Minimum	0.825 Lag	0.825 Lag	0.825 Lag	0.825 Lag
Date of Min	09/18/2011 18:22:03	09/18/2011 18:20:14	09/18/2011 18:19:38	09/18/2011 18:22:03
Maximum	0.875 Lag	0.875 Lag	0.875 Lag	0.875 Lag
Date of Max	09/18/2011 18:21:18	09/18/2011 18:19:53	09/18/2011 18:19:20	09/18/2011 18:21:18

ENERGY

Positive Wh	605.036 kWh	201.747 kWh	201.681 kWh	201.608 kWh
Negative Wh	0.0 Wh	0.0 Wh	0.0 Wh	0.0 Wh
Positive varh	318.124 kvarh	105.950 kvarh	106.091 kvarh	106.083 kvarh
Negative varh	0.0 varh	0.0 varh	0.0 varh	0.0 varh
Vahour	711.876 kvah	237.260 kvah	237.340 kvah	237.276 kvah

Date of Last Energy Clear	01/01/1970 00:00:00	Clear Energy
Date of Last Energy Clear-All Bkrs	01/01/1970 00:00:00	Clear All Bkrs

Figure 9

The next morning on the way in to work you get an email, it looks like your maintance man was right, feeder 1 has tripped. Did it trip on an overload or if was there a fault? A look at the eventlog(figure 10)

shows feeder 1 tripped on Instantaneous Overcurrent, how big a fault? You highlight the event shown here in red and click view fault data.(figure 11)

Figure10

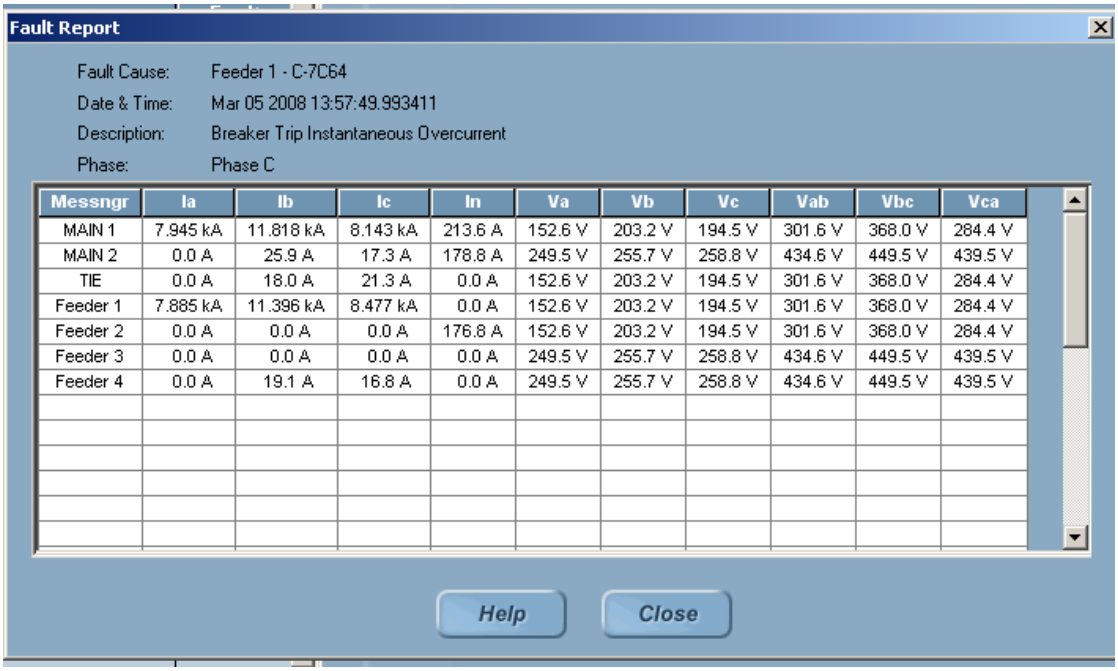


Figure11

Three phase fault current, looks like you'll need to do testing before you try to reenergize. Maybe the waveform(figures 12 & 13) will be useful for trouble shooting. This waveform may help locate the trouble, you save it to a USB zip drive and send that to the chiller maintenance team.

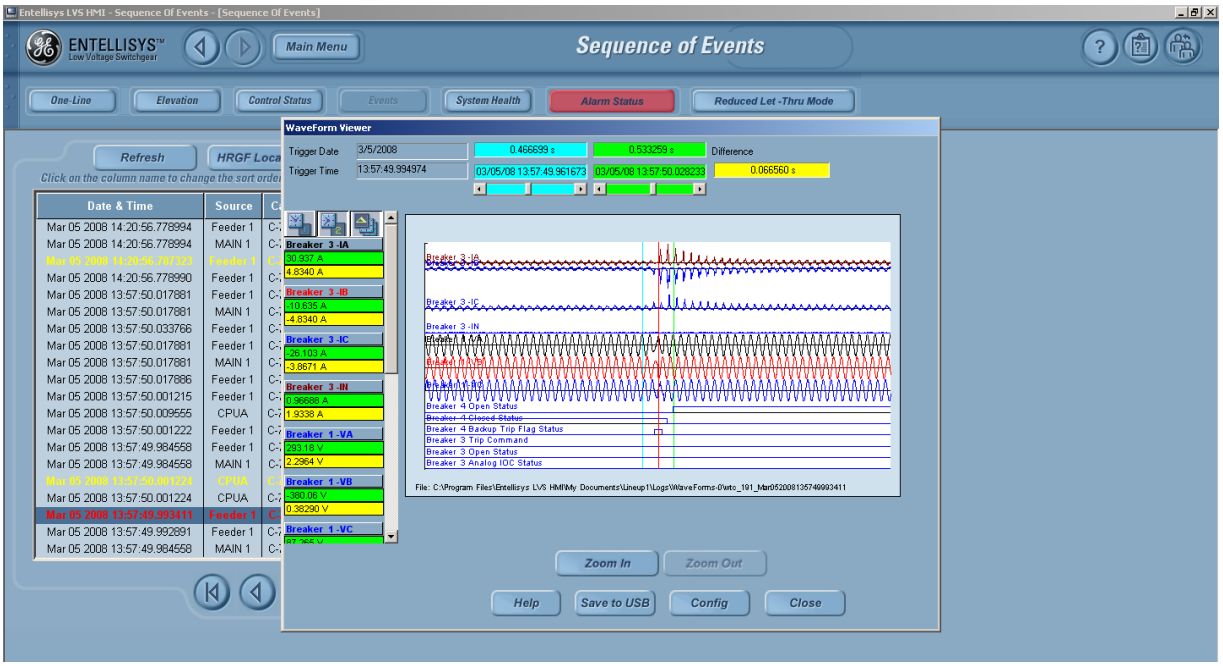


Figure12

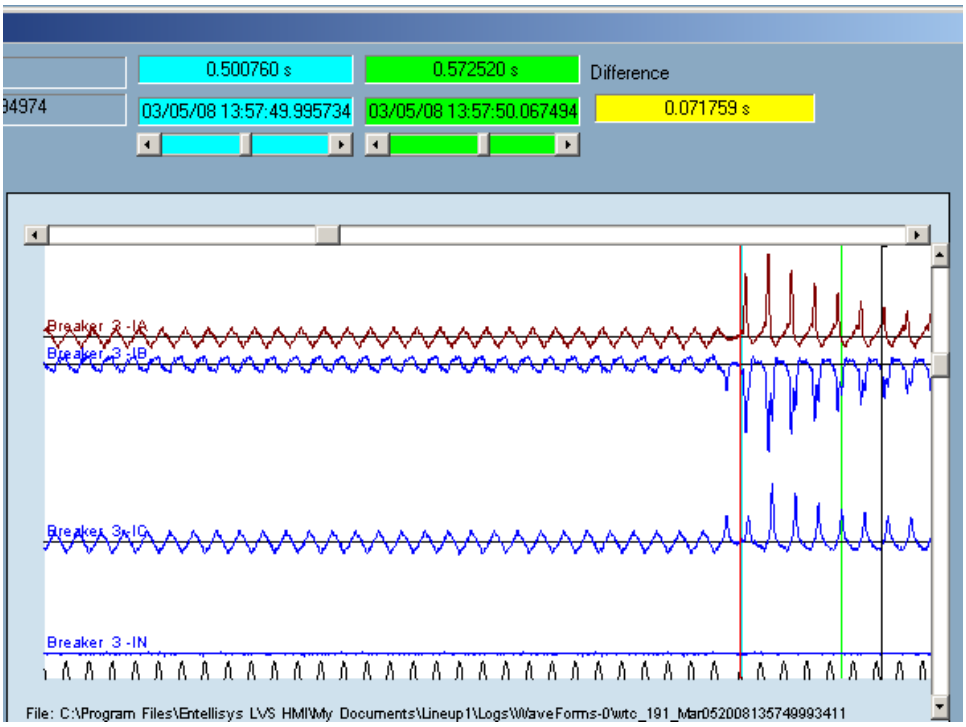


Figure13

Maintanance has repaired a failed variable frequency drive on the chiller. They are ready to reenergize but you want to provide some increase protection for the initial startup. You put the system in RELT (Reduced Energy Let-Thru). This will provide faster overcurrent protection that has been selected to provide a lower HRC (Hazard Risk Category) for Feeder 1 and the down stream load, the chiller. Breakers in RELT are indicated in yellow on the oneline and the elevation. (figure 14) If RELT is not removed in a present time (By the person or persons that applied it), an alarm will be emailed.

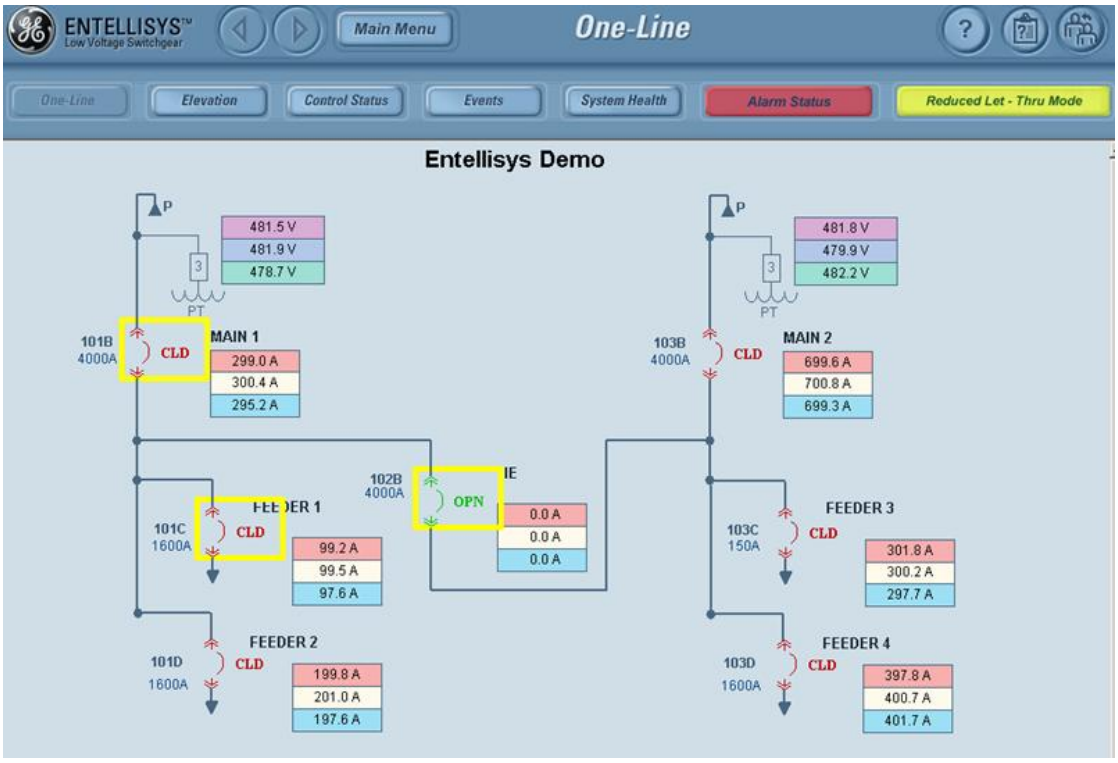


Figure14

Please remember that all of the above was done a safe distance from the actual switchgear. As described the Near Gear HMI is located within 300ft of the Switchgear Lineup. GE offers software that can provide an additional workstation anywhere in the world that has Ethernet access. The additional HMI's can be view only or full control, based on customer preference.

This of course describes only some of the remote functionality of Entellisys. Remote racking is also available that allows the breaker to be moved to the test or withdrawn position while the switchgear door is closed and the operator is outside of the arc flash hazard zone.

For a system with 2 mains a control screen allows control of the automatic throwover. (ATO) This screen allows ATO control to be adjusted in the field to meet site requirements.

Entellisys can provide advance protection like, multi-source ground fault, high resistance ground fault (HRGF), bus differential and zone selective interlocking, all of which work together to provide increased safety, selectivity and reliability. The HRGF is available with location function which will indicate which

feeder has the ground fault, of course without having to open the cable compartment to attach test equipment. How remote is your switchgear?

For more information on Entellisys contact your GE account manager or visit our website:

www.geindustrial.com

Under “Product” select “Switchgear” and choose Entellisys 4.5.

References:

DET-738 (07/10) Entellisys™ 4.5 Low-Voltage Switchgear Application Guide

DEA-427A (08/07) Entellisys™ 4.0 Low-Voltage Switchgear, 17 ways to save money during design, installation, operation and maintenance

DEA-383 (10/06) Entellisys™ Low-Voltage Switchgear Safety, reliability & flexibility