# DNP3.0 Migration Project Distributed Network Protocol 3 By Todd Peckett





#### Transpower?

- Responsible for monitoring and controlling the transmission network – substations and lines
- Responsible for system security and stability ensuring that the power is provided to where it is needed without overloading lines and equipment





# SCADA System

- SCADA (Supervisory Control and Data Acquisition)
- Around 190 substations
- Equipment installed in substations to monitor and control equipment in the sub called RTUs (Remote Terminal Units)
- Information sent to SCADA Master Station via two communications hubs – Hamilton and Christchurch
- 4 Control Centers
  - 2 National Grid Operation Centers (NGOCs) Auckland and Christchurch responsible for network switching and operation
  - 2 Coordination Centers Hamilton and Wellington responsible for network security and electricity dispatch
- SCADA is a critical component in keeping the lights on!





# SCADA System







# **DNP3** Migration Project

- Communications protocol between SCADA front end processors and the RTUs is being migrated from Harris to DNP3
- Harris is a legacy, proprietary protocol not well supported
- DNP3 is an industry standard protocol, well supported





# Why DNP3 Protocol?

- The Electrical Industry Standard
- More robust, efficient, compatible and more secure than Harris 6000
- Dramatically Improved bandwidth due to its efficiency
- SOE events returned quickly
- Increase in Analogue accuracy
- Pre-requisite for SMS
- Most commonly used in Asia Pacific





# **DNP3 Migration Steps**

Three step process

- 1. Convert SCADA and RTU databases
- 2. Comprehensive In-house testing of the converted databases on the Test Environment
- 3. Testing and commissioning of the converted databases once they have been installed on the Production SCADA system





## Stage 1 - Conversion

- Export the SCADA database for the site to be converted from the SCADA Master Station Modeller server (e-terraModeler)
- Obtain the current RTU configuration information from Master configuration database
- Run the ReadPro Conversion tool on the extracted databases
- Check the outputs of the conversion tool for any discrepancies
- Especially review and check analogue scaling
- Prepare standardised Master Station Inputs and Outputs (MSIO) spreadsheets





# Stage 2 – In House Testing

- Prepare a test plan
- Load the converted SCADA and RTU databases into the test environment
- Test every SCADA point
- Use simSCADA to simulate IEDs attached to the RTU





#### **Test Environment**







#### **Test Environment**







## **Test Environment Layout**

- Three cabinets in our test area
- Middle cabinet (Cab 2) contains the test environment computers
- Cabinets 1 and 3 have the test RTUs D20ME in Cab 1 and D200 in Cab 3
- Patch panels in Cabs 1 and 3 are used to patch serial circuits between devices. Master and Slave. A Master must always be connected to a Slave.





# Stage 3 – Site Commissioning

- Prepare a Commissioning Plan
- Send RTU config files to site contractor along with commissioning plan
- On commissioning day update the SCADA database (done by others)
- Along with site contractor, check that the data is being reported correctly, especially analogs
- Maybe spot check a few controls





#### **Protocol Converter**

- Some sites have older RTUs (D20M++) which do not fully support DNP3
- At these sites we install a temporary Protocol Converter which is installed between the comms equipment and the RTU
- The Protocol Converter accepts DNP3 from the Master Station and converts it to Harris 6000 for the RTU





#### **Protocol Converter**



Note 1. The Protocol Converter can be connected directly on the back of the RTU or at the RS232 to RS485 Data Isolators.

DB9 to RJ45 plug details											
	Deb	1 1		Detail 2				Detail 3			
DB9 Male to RJ45				D89 Female to RJ45				D89 Female to RJ45			
Data Type	089 Pin	Colour	RJ45 Pin	Data Type	DB9 Pin	Colour	RJ45 Pin	Data Type	089 Pin	Colour	RJ45 Pin
Red	2	GN	5	Red	2	GN	5	Red	3	GN	5
Ted	3	YE	6	Ted	3	ΥE	6	Ted	2	YE	6
CND	5	RD	4	CND	5	RD	4	CND	5	RD	4





## **Current Position**

- Pilot Project Completed KIN & TMK:
- Other sites successfully completed:

17 sites have been converted to DNP3 and then had SMS upgrades.

97 sites have been converted.





#### Questions?











