HIGH RELIABILITY COMMUNICATIONS FOR RELAYING AND SCADA

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WMU 115 kV Loop

Figure 1
WMU Fiber Loop Topology

Figure 2
**New networking concepts**

**FiberLoop II** – Designed for SCADA – a head end controller manages the connection of all remote slave transceivers to the network and only master slave communications is supported.

**FiberLoop III** – Masterless design – each transceiver manages its connection to one or more transceivers anywhere on the network.
H&L Model 570 Fiberoptic Transceiver

100 MHz Packet Switch Engine
Ethernet 10/100BaseT
128 RS-232 serial channels
1310 nm lasers
Fiberoptic power monitoring
Alphanumeric display
IEEE C37.90 / -40 to +85C
Network Management System
Network Management System
Paired Peer-to-Peer Virtual Channels
Serial Port Properties Screen

[Image of the Serial Port Properties Screen]

- Channel: 001
- Baud: 9600
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Master
- Slave
- Enable RS-485
- P2P (Point-to-Point)
- Turn-On mSec: 0
- Turn-Off mSec: 0
- Port Tag: Power RTU 101A
- Apply these properties to:
  - Port 1
  - Port 2
  - Port 3
  - Port 4

Buttons:
- Refresh
- Select all
- Default
- OK
- Apply
- Clear all
- All Default
- Exit
WMU West Substation
Substation with Relays, RTU, H&L 570

Figure 3
WMU West Substation Panels
Relaying Considerations for Short Lines

- Standard Distance relays can overreach

- Piloted relaying prevents over-tripping, but requires communications channel

- For security, different communications channels for primary and secondary relay
Relay communications on the fiber Loop

- Primary relays point-to-point (SEL-311L) current differential
- Secondary relays POTT (SEL-311C) using mirrored bits via Fiber Loop – H&L
- H&L loop heals in 10mS or less
- Secondary relaying survives failure of one fiber segment
Avoided use of fiber

- Alternative – backwards around the loop
- Significant cost, modems terminations
- Limits future use of installed fiber optic cable
Conclusions

- Loss of a single section of cable would compromise only the primary relaying between two terminals rather than the primary relaying between those terminals and the backup relaying for all the other line segments.

- The additional channels provide a simple, reliable path for data sharing between the utilities in town.

- The available Ethernet capability to each substation will be of use to the owner.

- A reasonable number of dark fibers remained for future projects.

- The original schedule and budget were not changed.