REAL-TIME TRANSMISSION LINE MONITORING SYSTEM
The demand for electric power continues to grow faster than the transmission industry can deliver reliably. The result: the transmission grid is overburdened. System bottlenecks and congestion, blackouts, equipment, and system disturbances are occurring with alarming frequency. In fact, power-related issues cost U.S. businesses over $100 billion per year.

Promethean’s real-time monitoring system improves transmission reliability, relieves power line congestion, and safely permits 15 to 25% more power to be moved over existing circuits. And unlike similar systems, transmission outage(s) are not required for installation and calibration, which equals faster installation and lower costs.

With Promethean RT-TLM, you can:

- Safely and reliably increase loading of existing transmission lines
- Improve control, visualization, and power transfer capability
- Relieve congestion; increase asset utilization and operating lifetime
- Intelligently defer the costs of planned upgrades and new construction
- Enhance operational safety and reliability
- Ensure and verify compliance
Promethean™ Devices is a state-of-the-art “Smart Grid” solution that enables utilities to operate transmission lines at higher power flows by providing real-time information. Through Promethean, you have access to conductor sag of conductors above ground, the phase currents and conductor temperature – all in real-time! This allows you to load power lines to much higher values than the simple summer and winter ratings currently allow.

Promethean Takes the Guesswork Out of Risk Assessment

Need to buy or sell a certain amount of power over a line? Now you can know with certainty how to gauge the risk of the transaction.

Chart 2: Risk Assessment
Promethean can enable risk assessment through providing real-time information. The green area shown is the amount of power that can be transmitted with Promethean.

- Increase transmission transfer capability
- Fully utilize available thermal capacity
- Decrease transmission congestion
- Increase economic efficiency
- Increase utilization of existing assets
- Extend the operational lifetime of existing assets
- Defer new construction and/or upgrade costs
- Improve and verify accuracy of PLS-CADD models
- Enhance ATC/TTC calculations
- Money Saved and Earned!
Promethean™ Devices provides both a non-contact, real-time Transmission Line Monitoring System (Non-Contact RT-TLMS) and Transfer Capability Optimization Solution (Non-Contact RT-TCOS). Ground-based and deployed in existing ROWs—the RT-TLMS determines phase currents, conductor temperature, clearance or sag, and ampacity—and wirelessly transmits this information to secure servers. The RT-TCOS consists of monitoring systems methodically distributed under key sections of a transmission line. This determines the actual thermal capacity of the target line and reports this information to system operators as the real-time dynamic ampacity.

Non-Contact RT-TLMS (Real-Time Transmission Line Monitoring System)

- Monitor and verify individual phase currents, including taps
- Measure conductor sag or clearance; prevent clearance violations; verify or anchor
- PLS-CADD models and line surveys
- Compute conductor temperature; avoid, detect, monitor, and track conductor annealing (loss of strength)
- Estimate real-time ampacity; quantify available thermal capacity

Non-Contact RT-TCOS (Real-Time Transfer Capability Optimization Solution)

- Monitor and quantify actual thermal capacity of existing transmission lines
- Safely and reliably optimize power transfer capability
- Improve operational reliability and safety
- Relieve congestion and Improve ATC and TTC
- Optimize asset utilization and extend lifespan of existing infrastructure
- Defer the costs of upgrades and new construction
- Inform/Improve Optimum Dispatch; optimize generation mix

For more information, contact Alcan Cable at (800) 347-0571.
Using a base station, Promethean RT-TLM senses power line status, performs analysis and provides real-time, web-based information. The system, Promethean RT-TLM, uses three passive AC magnetic field sensors positioned at or below the right-of-way near the phase conductors. These sensors are linked to an above ground systems electronics package that accurately and reliably measures the AC magnetic fields, sending data reduction and transmission to the base station. Solar panels with battery back-up provide power to the system.

Installation Options: Above Ground or Below Ground

**Above Ground**
- 2x135W 12 VDC (260 Watt Nominal)
- 2D B-Field Sensor Phase (B/Y/2) (20 ma nom)
- 3x100 Ahr batteries 12 VDC (330 Ahr nom)

**Below Ground**
- 3x100 Ahr batteries 12 VDC (330 Ahr nom)
- 2x135W 12 VDC (260 Watt Nominal)

- System Power Controller and Monitor
- Analog Electronics
- Single Board Computer
- Solar Charge Controller
- Cell Modem & Router
- Digital Electronics Package

Encrypted field data is wirelessly linked via VPN to secure servers. This data is analyzed and displayed on a password-protected, real-time, web-based Graphical User Interface (GUI). All data is written to a secure SQL database that is accessible only to authorized users/applications.

Once installed in the Transmission ROW, the system is calibrated to report phase currents, conductor clearance, maximum conductor temperature, and instantaneous ampacity (maximum current carrying capability). System operation and accuracy is not adversely affected by wind, rain, ice, snow, dust, smoke, hail, sleet, or fog.
### Installation Advantages

- Totally non-contact, ground-based installation, and operation
- Utility field crews and equipment are not required
- No line outage(s) required for installation
- No line outage(s) required for calibration, recalibration, or data validation
- No line outage(s) required for service, upgrades, or physical maintenance
- Equipment located in existing ROWs under overhead phase conductors
- Above-ground, surface or below-surface sensors
- Rapid, straightforward field deployment, installation, and calibration
- Rugged, reliable, field-proven solar/battery power supply
- Designed for Field-and-Forget operation

### Passive, Ground-Based Installation & Calibration in the Transmission ROW

- Near-surface, surface, or sub-surface sensors
- No transmission line outage(s) required
- No utility field crew, labor, or equipment required
- Utilizes rugged, readily available hardware
- Field-proven solar battery power supply

### Renewable Energy Applications

- Maximize renewable generation utilization
- Avoid unnecessary generation dispatch/mix changes
- Safely and reliably access and utilize renewable energy generation sources with existing transmission assets
- Prevent unnecessary wind power curtailments
Continuous Autonomous Operation — Long Lasting Calibration

- Reliable, Field-and-Forget installation, calibration and operation
- Accuracy and operation not affected by weather, ice, wind, snow, rain, smoke, etc.
- Phase currents measured to within ± 0.5% (calibrated to Utility CTs)
- Conductor temperature reported to ± 3.5°C (calibrated to High Accuracy IR Images)
- Ampacity consistent with IEEE-738; reported w/r/t utility static rating
- Calibration is easily performed and verified in the field with no system down-time

Wireless Data Communication & Secure Storage

- Secure/encrypted data (via VPN)
- SQL database readily serves all reporting and web applications
- Web-based GUI and reporting via dedicated, secure servers

Communication to PI Server — Critical Infrastructure Protection

810 MZ Cellular
CIP (FERC Order 706)
Compliant Option

Electronics Package

Sensor A

Sensor B

Sensor C

Phase A

Phase B

Phase C

810 MZ Cellular
CIP (FERC Order 706)
Compliant Option

Internet

PI Server

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