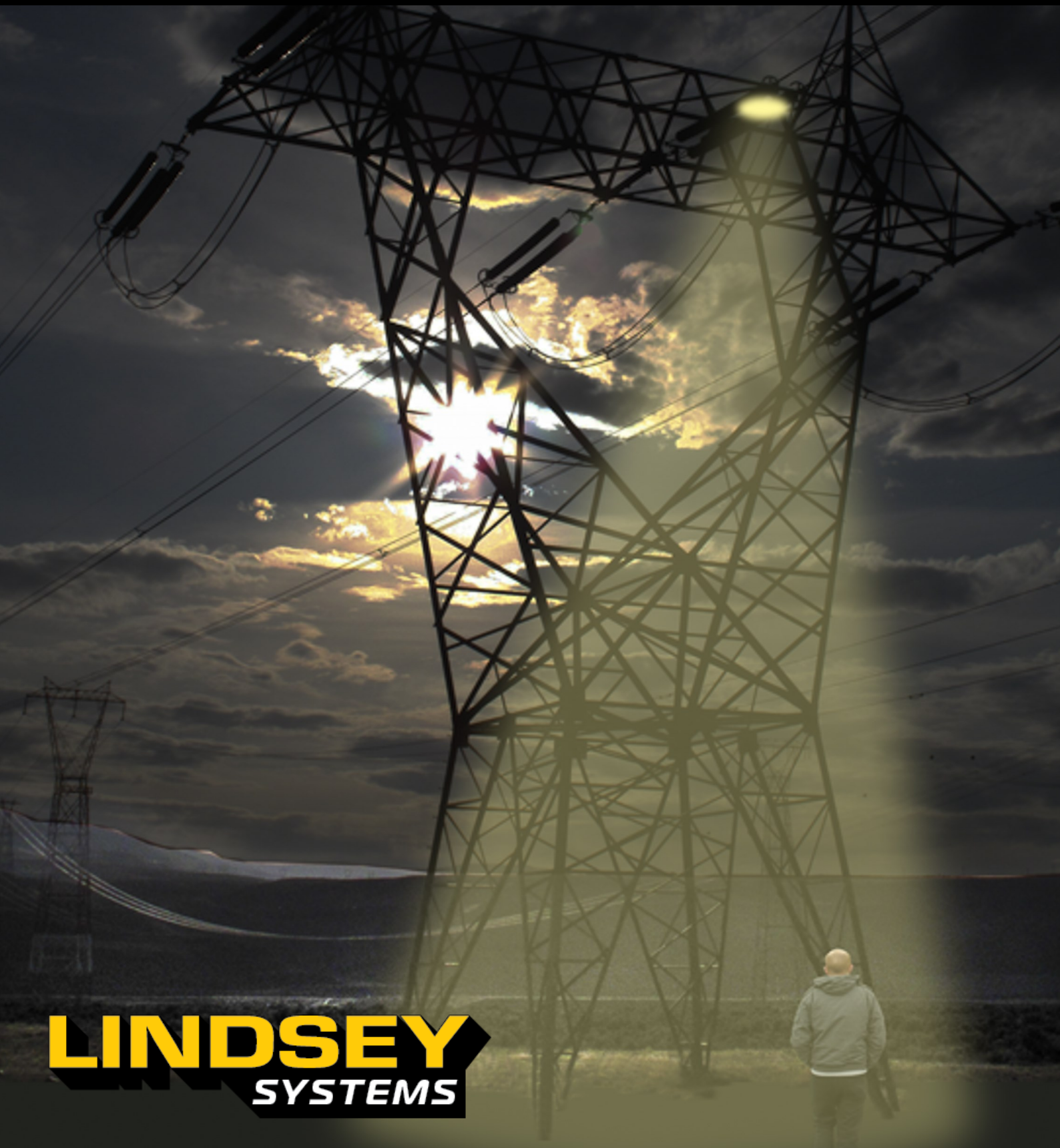


SMARTLINE-TAMPERTM

Tower Security Monitoring System



LINDSEY
SYSTEMS



Intrusion detection for transmission tower installations.

The Lindsey SMARTLINE-TAMPER™ Tower Security Monitoring System provides for detection of intrusion around the base of lattice transmission tower installations and subsequent tampering with the structure. The system combines advanced tower tampering sensor technology with convenient web-based reporting and activity logging software. Infrared sensors detect human presence at the tower base while accelerometers and advanced algorithms monitor conductor vibration patterns associated with tower tampering.

The SMARTLINE-TAMPER™ consists of Lindsey TLSM™ tower security sensors installed on each tower to be monitored, and web-based SMARTLINE-TAMPER software to provide for data collection and reporting.

TLSM™ Self-Powered Intrusion Detection Monitor

Human Intrusion Detection

When installed on the energized (hot) end of an insulator string, the Lindsey TLSM security monitor's onboard infrared (IR) sensor detects and reports the presence of a human heat signature in the area at the base of the tower.

Tower Tamper Detection

Three-axis MEMS accelerometer and built-in Fast Fourier Transform (FFT) processing monitors the vibration frequency patterns on the conductor. Built-in algorithms developed by the U.S. Department of Energy's Idaho National Laboratory analyze these patterns to detect and report tower vibrations indicative of tower tampering, such as cutting or unbolting tower steel.

Smart Alarms with Activity Level

When both the IR and vibration algorithms sense activity, an intrusion alarm is issued. By monitoring the level of both types of activity, the TLSM also reports an activity level with the alarm. This Smart Alarm provides additional confidence in determining how, and how quickly, to respond.

Optional Sub-Conductor Break Detection

The TLSM monitor detects and alarms on possible sub-conductor breakage for the span on which it is installed.

SMARTLINE-TAMPER

SMARTLINE-TAMPER is a secure, cloud-based application providing encrypted access to all TLSM security monitors installed on your system. Accessible from any web browser, SMARTLINE-TAMPER provides secure, two-factor authorization security. Any detected tower tampering activity can trigger email or SMS message notification of one or more users.

System Dashboard: Provides status overview of all TLSM monitors including all key indicators (alarm status, monitor health, etc.).

Map View: Provides a map-based overview of the entire grid, highlighting monitored lines. Color-coded line status allows for rapid identification of problem areas.

Line View: Zoom in on any line to observe the status of all TLSM monitors on that line.

Tower History: The tower history view provides complete information on all monitored TLSM activity at any given tower. Data includes alarms received with alarm activity levels, alarm acknowledgements and resets, operator notes, and TLSM mode changes (active, maintenance, etc.). All activity is logged with time, date, and user stamps for audit tracking.

TLSM Monitors are designed for easy field deployment

80A

Self-powered by line current as low as 80A.

Note: If used on lines with bundled conductors, the current on each sub-conductor must be at least 80A.

Global

Iridium satellite radio provides reliable communications in any location.

Tamper-Proof

Directly installed on the HV line, utilizing satellite communications, and completely self-powered, TLSM monitors make interference with their operation almost impossible.

Why SMARTLINE-TAMPER™?

SMARTLINE-TAMPER provides for early warning and detection of critical external issues associated with transmission tower integrity; **Vandalism, Sabotage, and Broken Sub-conductors.**

Vandalism

Tampering (i.e., vandalizing) of transmission towers commonly involves the theft of steel sections from the tower to be sold as scrap. While the goal of this activity is rarely to cause the tower to collapse, the result is a weakened tower that may collapse under lower loading conditions than originally designed to withstand.

Sabotage

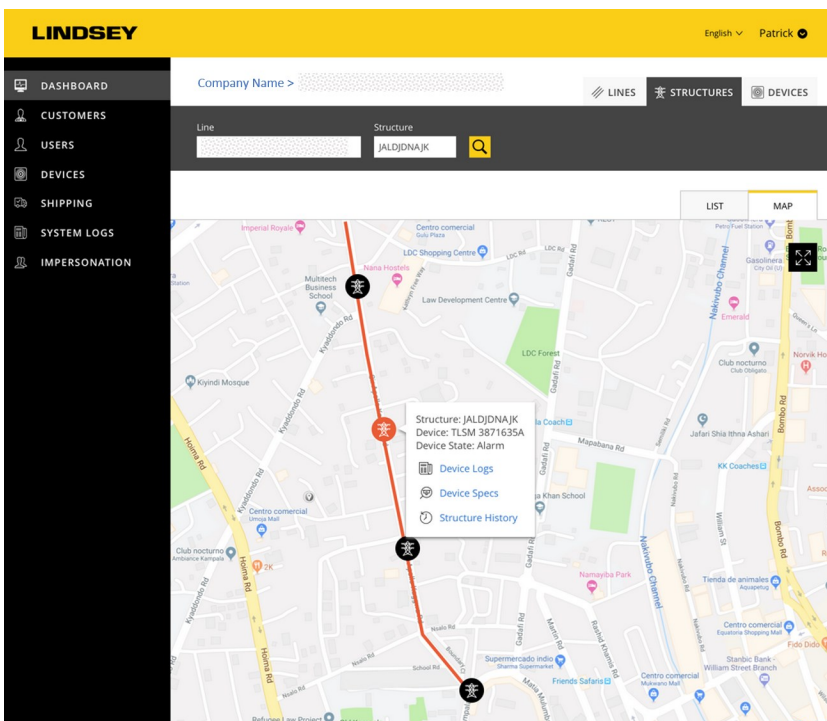
Removal of extensive amounts of tower steel is often associated with willful sabotage. The goal of such activity is the deliberate collapse of a tower.

Early notification of vandalism or sabotage allows for preventative repairs to be made on your schedule and in advance of bad weather when the effect of tampering is most likely to reveal itself. Early notification may even make it possible to interrupt such activity in progress. The result is to avoid catastrophic line failures, power outages, and expensive, time-consuming repairs.



Collapse of a 132kV tower after bolts and crossmembers were removed to sell as scrap.

SMARTLINE-TAMPER Line View provides an overview of the monitors installed on a line.



Broken sub-conductor Detection

Breakage of a sub-conductor produces increased longitudinal loads which can lead to insulator breakage and increased structural loading on the tower. SMARTLINE-TAMPER can detect changes in conductor behavior associated with sub-conductor breakage on the span and phase on which the TLSM monitor is installed. This feature is especially useful when TLSM monitors are installed on every tower.

SMARTLINE-TAMPER

Simple Sensor Installation

No line outages are needed. TLSM sensors can be quickly installed on energized lines using hot stick or bare hand practices through system voltages up to 765kV L-L.

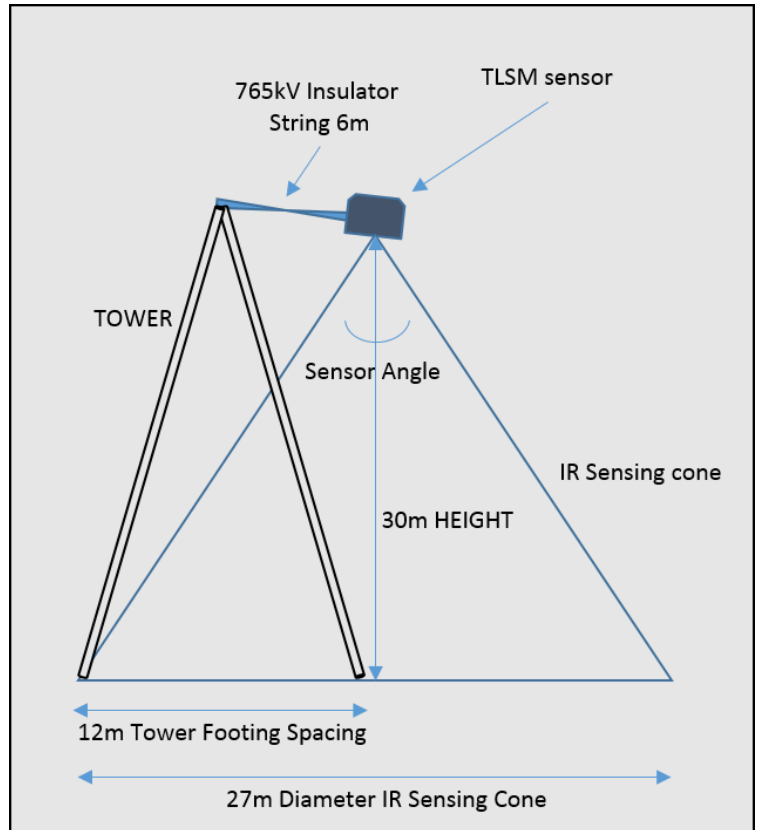
TLSM sensors are available with Iridium satellite communications. Satellite radio ensures coverage in even the most remote locations without the need for any existing communication infrastructure.

TLSM Installation Assistant

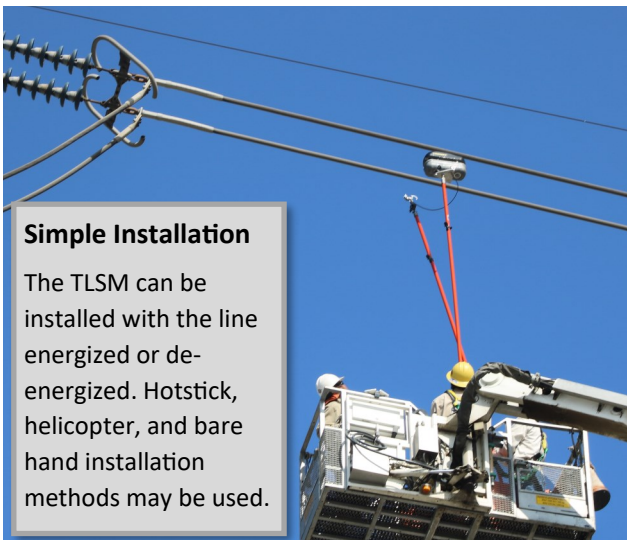
To assist in field installation SMARTLINE-TAMPER integrates with the TLSM Installation Assistant app compatible with all Android smartphones or tablets.

The Installation Assistant provides:

- Confirmation of proper installation.
- Automatic tower Identification and registration in the SMARTLINE-TAMPER abase.
- Confirmation the TLSM can properly see all four tower legs and can properly sense tamper events.



The wide sensing angle of the TLSM means only one TLSM is required for most towers.



Simple Installation

The TLSM can be installed with the line energized or de-energized. Hotstick, helicopter, and bare hand installation methods may be used.

SPECIFICATIONS

Parameter	Specification
Conductor operating current	80A min - 1500A, 80A turn on
Conductor voltage	765kV L-L max
AC voltage frequency	50Hz - 60Hz
Conductor temperature	356°F (180°C) max
Conductor size	Up to 1.8" (46mm)
Conductor type	Aluminum or copper
Infrared sensor lens angle	50°
Effective installation height	35m maximum
Power	Self-powered
Communications	Iridium satellite radio (built-in)
Operating ambient temperature	158°F (70°C) max
Dimensions	16.5" (L) x 6.75" (W) x 8.75" (H) (420mm x 170mm x 220mm)
Weight	17 lbs (7.7kg)

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Thoughtful Solutions in Transmission