



# PJM Emerging Technologies Forum

November 13, 2020

# Lindsey Manufacturing Company

*is now*



Founded by L.E. Lindsey in 1947

Initial products were pole line hardware and labor-saving devices for use by SCE

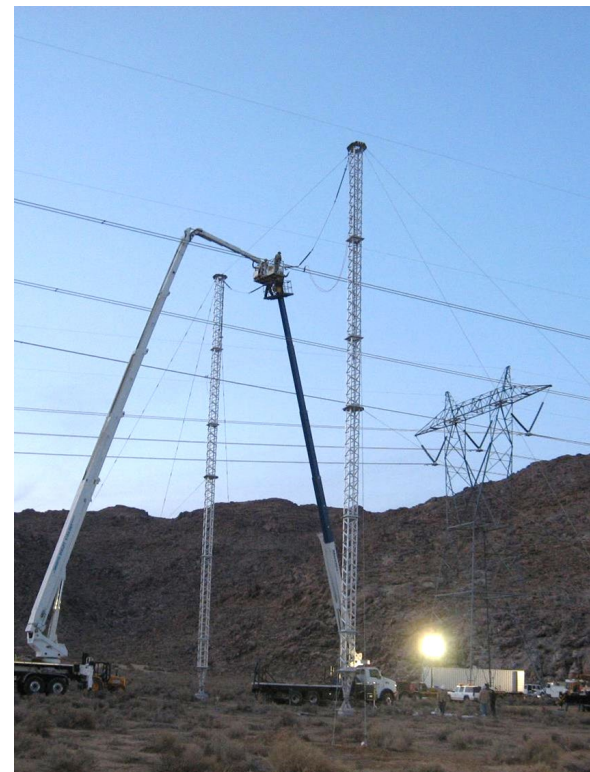
Over the next 20 years, production expanded to cover a wide range of distribution hardware



# Expansion

The next decades saw Lindsey moving to address ongoing industry concerns, introducing:

- Innovative HV and EHV hardware solutions
  - Emergency Restoration System Structures to address tower collapse
- Easy to install Line sensors to provide accurate measurements



# Lindsey Systems Today



Industry challenges have changed, and so has Lindsey Systems

Lindsey Systems' **Hybrid Solutions** combine advanced sensors and analytic software to address:

- Grid congestion
- Transmission Asset Monitoring
- Transmission Tower Security



# SMARTLINE- TCF

DLR and Capacity Forecasting  
System

**LINDSEY**  
SYSTEMS

# Summary

Line-mounted sensors directly measure critical parameters

Direct measurement methodology assures:

- Clearance-to-ground limits are not violated
- Thermal limits of the conductor are not violated

Provides real-time (instantaneous) DLR

Provides forecasts of line capacity capability

Cloud-based software (SaaS) provides

- Web-portal viewer
- Connection to EMS system



# Quick, Easy Line Sensor Installation



Live Helicopter Installation

Barehand Installation

Hotstick Installation



# Cyber Security Aspects



Span mounted line sensors are not accessible for physical attack

- Compare to RTUs, ground-based sensors, tower mounted radios

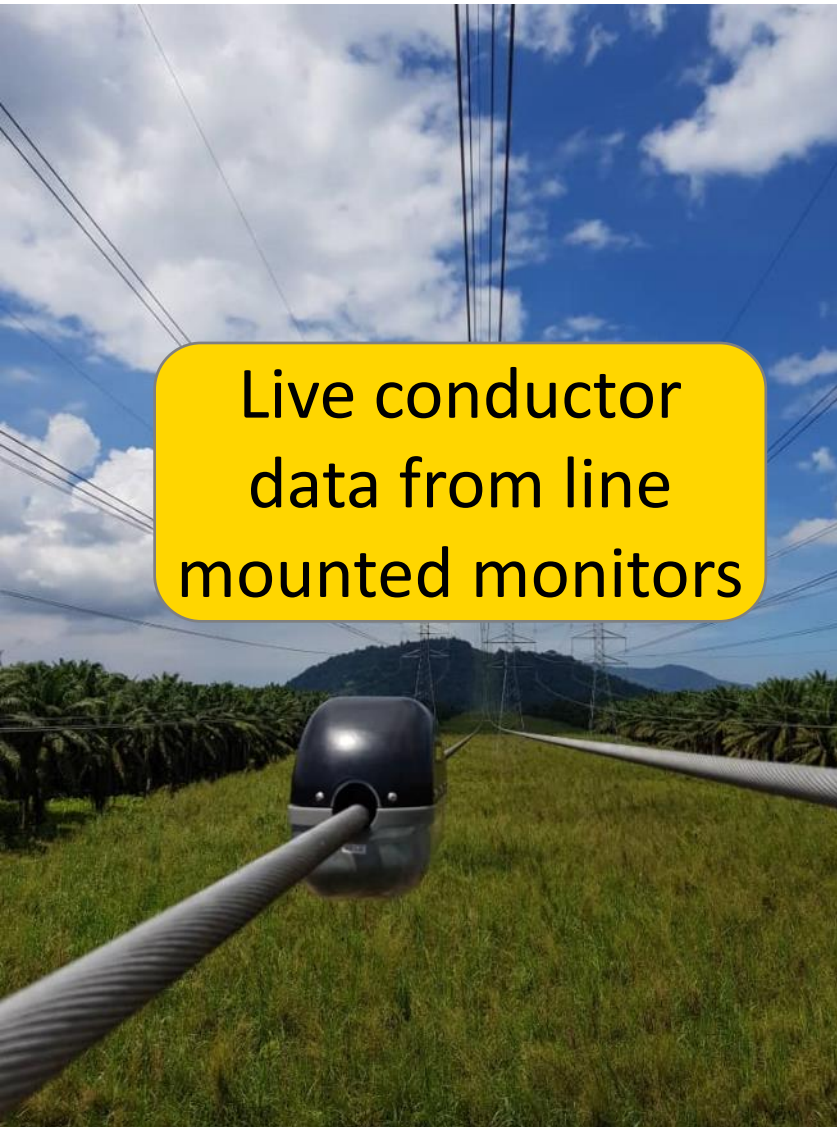
Satellite radio has no on-board comm port, no SIM card, and is inherently secure

SMARTLINE-TCF web-server features:

- Regular penetration testing
- Two-factor authentication
- Full redundant backup
- Isolated databases



# Overview of SMARTLINE-TCF



Live weather data



Develop Learned Conductor Behavior Model



Weather forecast data

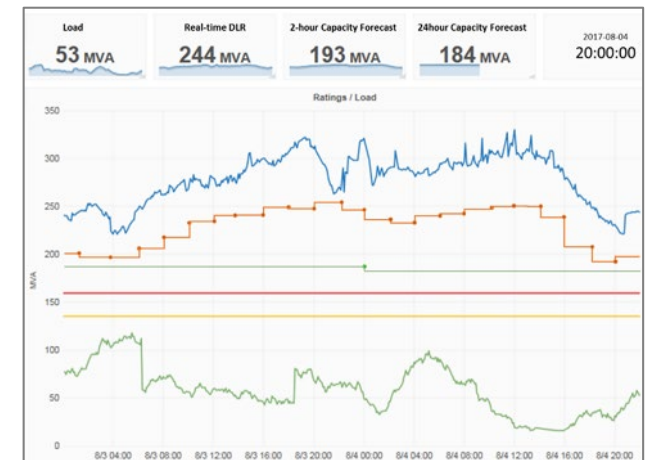


Line Power Capacity Forecast

Compute Instantaneous DLR

Based on:

- Clearance
- Conductor temperature



# Forecasting



## Customizable Confidence factors

- 98% default

Forecasts available in hourly and daily increments to 1 week

Complex forecast “packages” can be prepared

Overlay display with normal line ratings

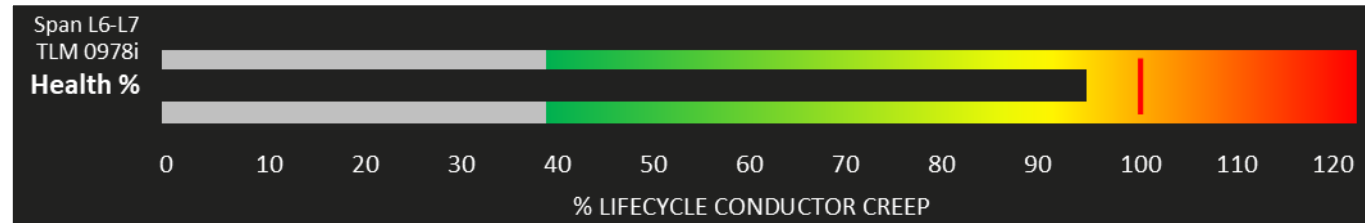
# Transmission Line Asset Monitoring

Conductors lose strength as they age from:

- Electrical load
- Wind events
- Fires
- Severe ice loading

SMARTLINE-TCF monitors loss of strength from these events

Provides conductor aging indicator



*Thoughtful Solutions in Transmission Line Monitoring*

# SMARTLINE-TCF



Simple Implementation

Line mounted sensors

- No need to de-energize lines
- Self-contained
- Self-powered
- Built in communications

No need for external weather stations

Definable forecast packages

90-day time from Decision to Operation



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