SMARTLINE-DLR™

Next Generation Dynamic Line Rating System

SMARTLINE-DLR identifies transmission line power carrying capacity in real-time.

SMARTLINE-DLR is a next generation transmission line dynamic rating system using real-time weather and measured conductor data -including mid-span clearance-to-ground - to determine power capacity.

How are Transmission Lines Rated?

Transmission line rating is dependent on several environmental variables, including:

- Heat generated in the line (resistance and current);
- Heat being added to the line (solar radiation);
- Heat being removed from the line (convective and radiated cooling) due to wind and precipitation.

Traditional operational limits of a transmission line are established through "static" transmission line rating methodologies. Common practice is to select very conservative values for the environmental operating conditions of the line. The result is both a low probability that conductor sag will exceed operational or regulatory limits for even a very short duration, and a very conservative rating of the line.

What is Dynamic Line Rating?

Seasonally adjusted ratings (SAR) and ambient adjusted ratings (AAR) are commonly used today to increase a line's static rating by acknowledging different environmental conditions exist at different times of the year. Dynamic Line Rating, or DLR, is a transmission line's actual, real-time, power carrying capacity based on the conductor's actual operating temperature using real-time line behavior data and weather conditions. DLR is the natural and logical extension of seasonal and ambient adjusted ratings.

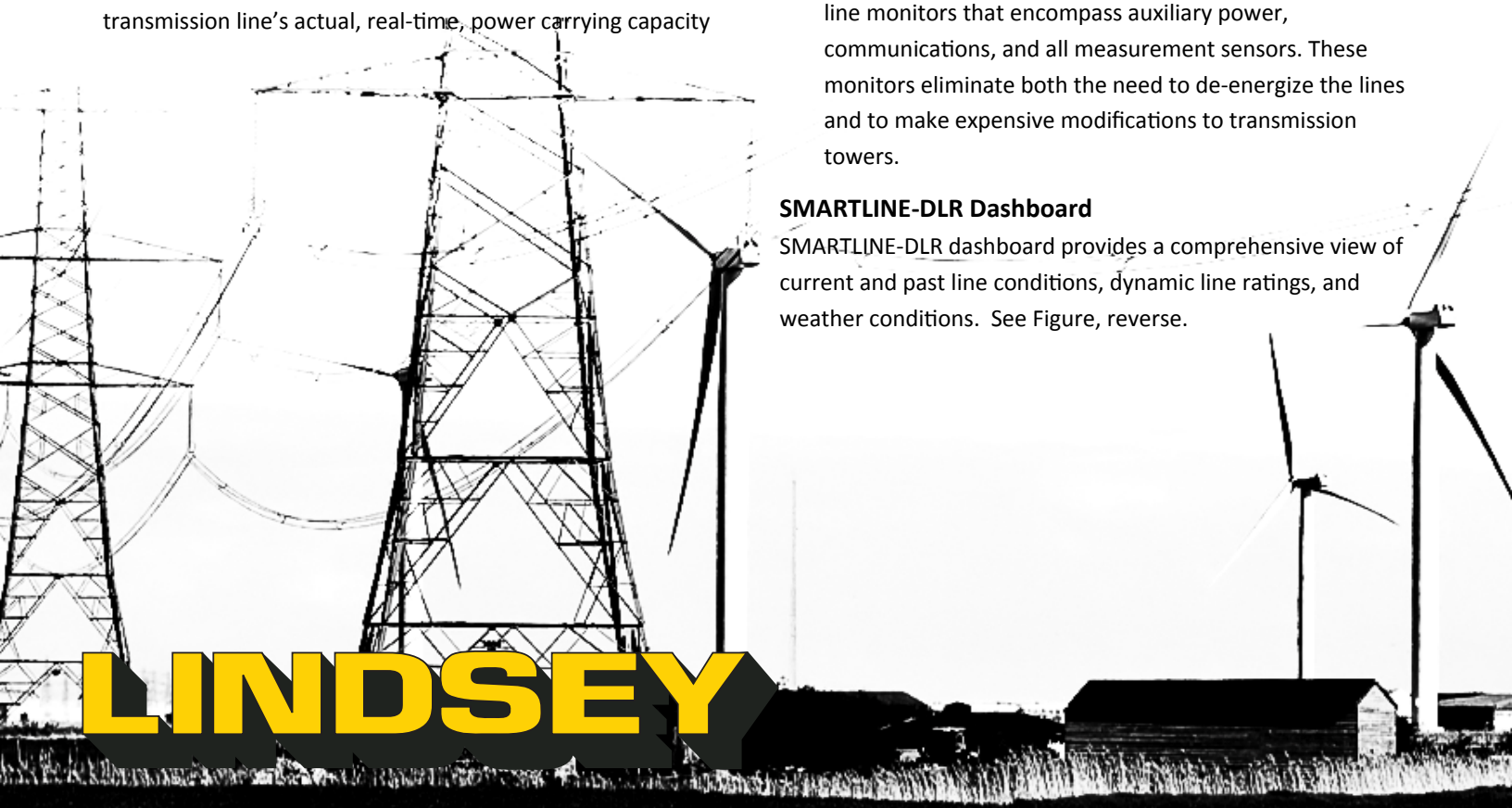
What is SMARTLINE-DLR

SMARTLINE-DLR is the next generation of DLR. Compared with traditional DLR systems, SMARTLINE-DLR:

- Ensures clearance-to-ground limits are not exceeded by using real-time direct clearance-to-ground measurements of the conductor provided by Lindsey TLM™ conductor monitors.
- Eliminates the dependence on look-up tables and "as designed" line data. Learning-based algorithms actively learn line behavior, resulting in much more accurate ratings than look-up table based methods. This method also properly reflects "as-built" line conditions as compared to using "as-designed" assumptions.
- SMARTLINE-DLR use completely self-contained conductor line monitors that encompass auxiliary power, communications, and all measurement sensors. These monitors eliminate both the need to de-energize the lines and to make expensive modifications to transmission towers.

SMARTLINE-DLR Dashboard

SMARTLINE-DLR dashboard provides a comprehensive view of current and past line conditions, dynamic line ratings, and weather conditions. See Figure, reverse.



Cost Effective Alternative to Reconductoring

SMARTLINE–DLR can quickly document 10-25% additional capacity availability on existing lines, allowing for deferral or elimination of reconductoring projects.

Recognize Extreme Events

Extreme events, such as severe ice loading or emergency loading conditions, are recognized. Resulting changes in conductor behavior are automatically incorporated in SMARTLINE-DLR ratings.

Clearance Critical Span Measurements

The SMARTLINE-DLR system uses data from Lindsey TLM conductor monitors which may be placed on all clearance critical spans on a transmission line. The measurement of actual critical span clearance makes obsolete the need to use data from several spans away to infer critical span clearance.

Clearance Monitoring

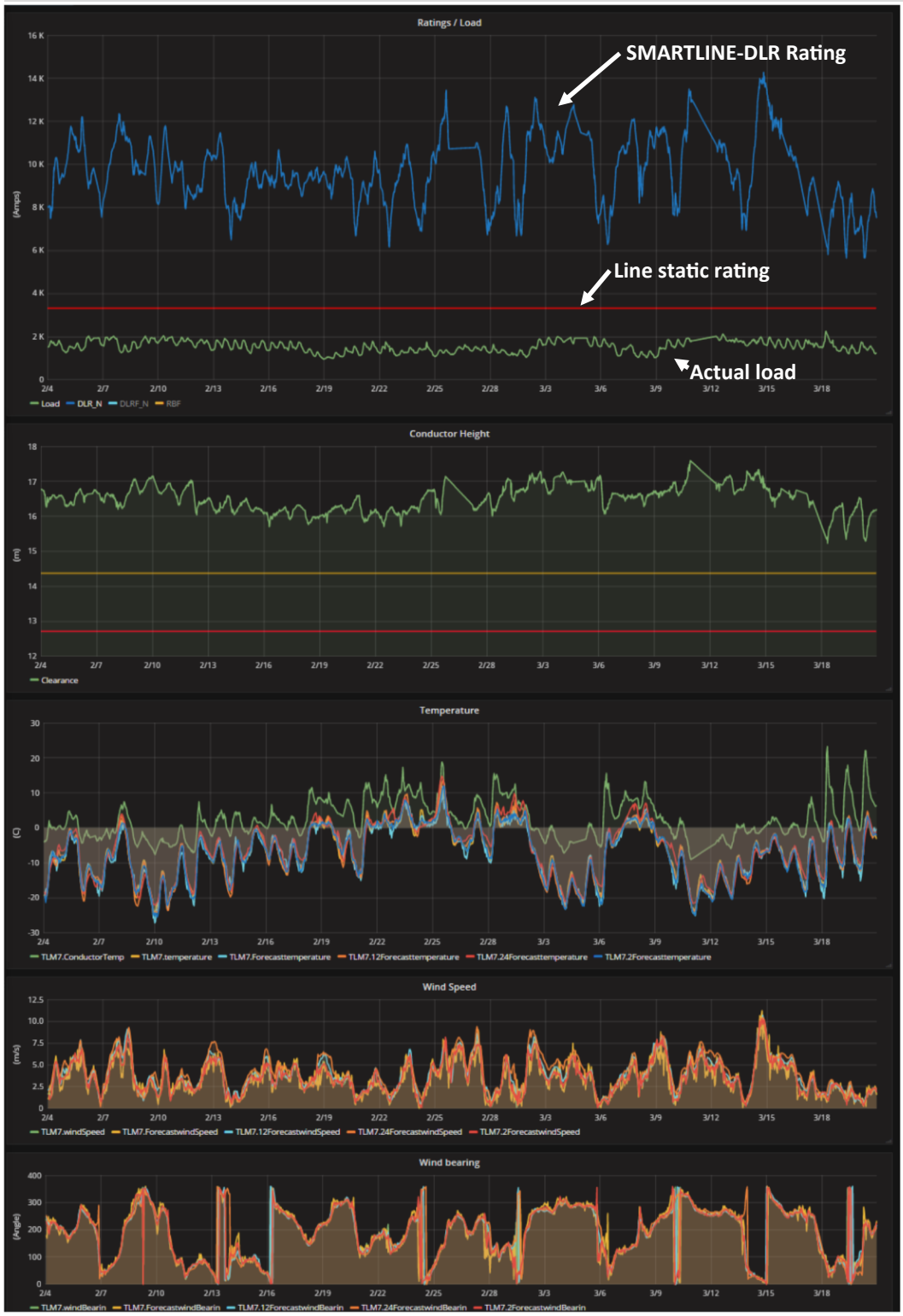
SMARTLINE-DLR ratings are based on continuous geospatial clearances; a requirement of legal and safety standards. Clearance compliance to standards is directly monitored and conductor behavior is learned and understood.

Forecast Capacity Ratings

SMARTLINE-DLR forms the basis for line capacity forecasts provided by Lindsey's SMARTLINE-TCF transmission capacity forecasting system. SMARTLINE-TCF provides high accuracy capacity forecasts in 1– to 48-hour increments. SMARTLINE-TCF may be added at any time.

SMARTLINE-DLR Dashboard

Comprehensive display of measured line and weather parameters SMARTLINE-DLR rating. Partial display shown.



Lindsey Manufacturing Co.
760 N Georgia Avenue
Azusa, CA 91702 USA

Publication Number 11F-002 SMARTLINE-DLR • March 2017

LINDSEY

Touching High Voltage Every Day™

www.lindsey-usa.com