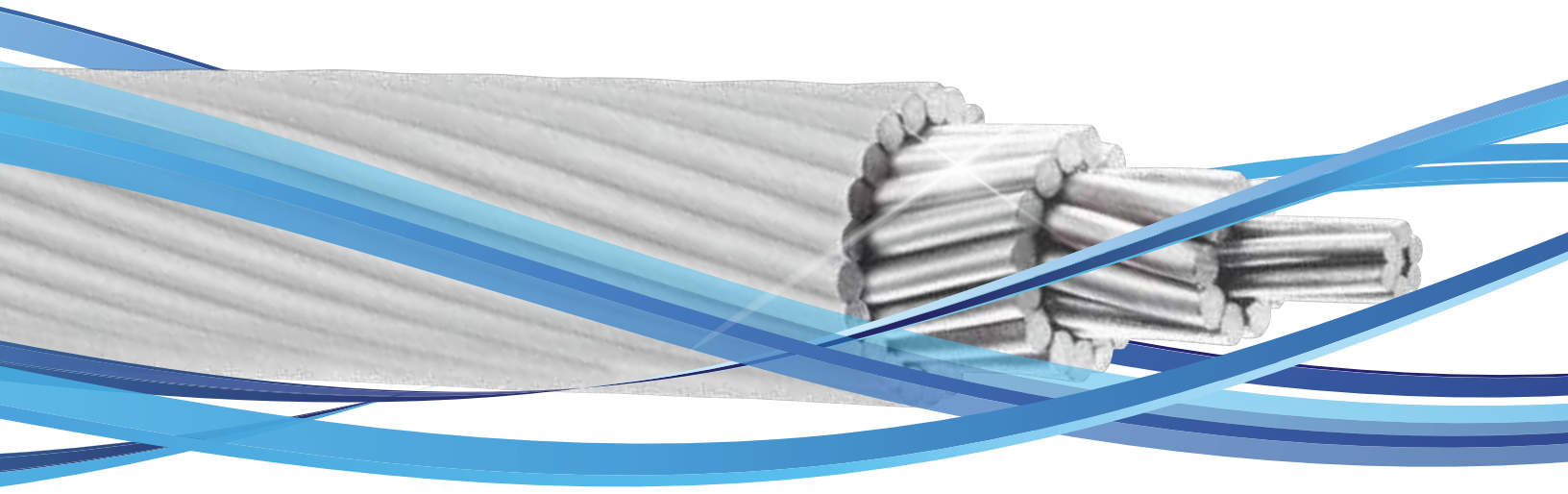
THE UTILITY INDUSTRY'S FIRST HEAT-DISSIPATING OVERHEAD CONDUCTOR

TransPowr® with E3X™ TECHNOLOGY

More Power. Less Cost.



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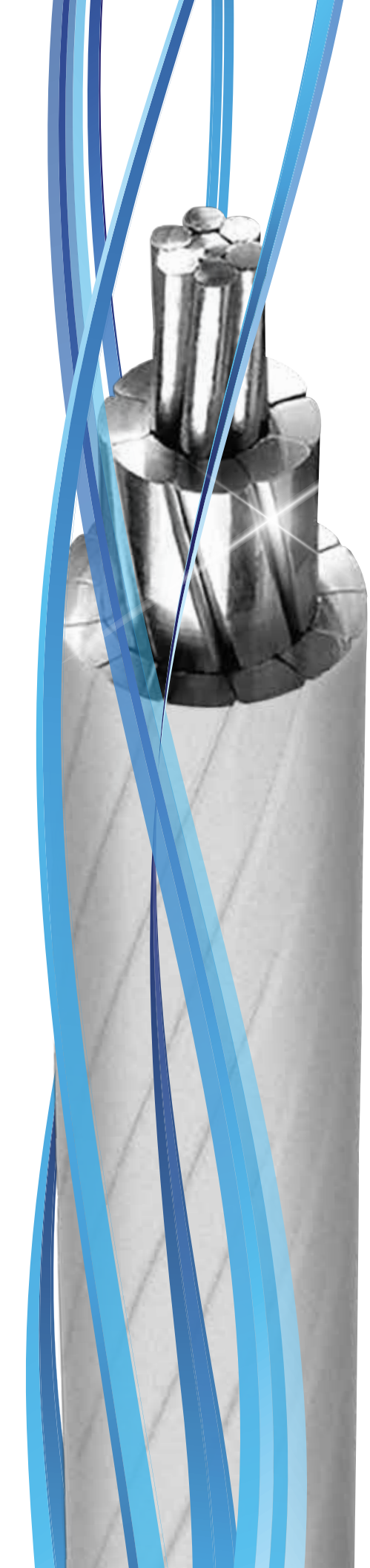

Reduce Your Costs and Increase Your Power

Groundbreaking E3X™ Technology allows utilities to optimize the power grid by adding more capacity and controlling losses with significant first-cost and long-term operational savings.

TransPowr® with E3X Technology features a thin, durable coating that is applied to the surface of any TransPowr overhead conductor. This heat-dissipating coating increases ***emissivity*** and reduces absorptivity, improving ***energy effectiveness and efficiency*** by allowing for a higher ampacity rating, reduced operating temperature and lower losses for a given conductor size, or reduced conductor size for a given ampacity rating—transforming power grid sustainability, reliability, resilience and cost of ownership.

Less than 2 Years on Average Payback Period*

Savings from lower first project cost or line loss will result in an accelerated return on conductor investment.

Up to 20% Reduced Project Costs*

A reduced conductor sag or size enables optimized structures, hardware and labor for new lines.

Up to 25% Increased Ampacity*

Lowers reconductoring cost by increasing conductor ampacity without upgrading existing infrastructure.

Up to 25% Lower Line Loss*

Reduces conductor line losses via lower operating temperature, resulting in significant lifetime savings.

AND

Up to 30% Reduced Operating Temperature*

Lower operating temperature reduces power losses and increases power-carrying capacity, for efficiency and lower total system costs.

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* Dependent on operating conditions

CASE STUDY

Cross Texas Transmission CREZ Project

TransPowr® with E3X™ TECHNOLOGY

BACKGROUND

Cross Texas Transmission (CTT), an affiliate of LS Power, was designated by the Public Utility Commission of Texas (PUCT) to construct, operate and maintain 238 miles of transmission lines as part of PUCT's commitment to deliver renewable energy from Competitive Renewable-Energy Zones (CREZ). These zones, located in West Texas and the Texas Panhandle, are resource-rich, high-wind areas. The CREZ projects were ultimately constructed by 8 different utilities to transmit 18,456 MW of wind power over more than 2,300 miles of transmission lines from the zones to approximately five million homes and businesses. The CTT portion of the CREZ initiative consisted of approximately 1,300 structures that included lattice and monopole steel towers ranging from 80 to 200 feet tall. The 238 miles of Falcon/ACSS/MA2 transmission lines consisted of double-circuit, double-bundle 345 kV AC lines running in three segments, totaling 2,820 conductor miles.

PRIMARY OBJECTIVE

With assistance from Burns & McDonnell and LS Power, estimate the potential first-cost savings for the CTT CREZ project if an equivalent ampacity Pheasant/ACSS/MA2 with E3X™ Technology had been implemented. First project cost savings are calculated based on reduced mechanical loading due to the change in conductor size in both round wire and trapezoidal constructions.

SECONDARY OBJECTIVE

Estimate the potential energy savings associated with conductor losses for the CTT CREZ project if a Falcon/ACSS/MA2 with E3X Technology had been implemented. Energy savings are based on a conservative 20% reduction in operating temperature due to application of the high emissivity, low absorptivity E3X Technology.

FIRST-COST SAVINGS WITH E3X

$11MM to $13MM Savings[1]

Original Conductor Design & E3X Technology Options	Ampacity @ 200°C [2]	Conductor Weight (lb/kft)	Material Cost Savings ($/mile)
1590 kcmil 54/19 Falcon/ACSS/MA2	2372	2039	Original Base Design
1272 kcmil 54/19 Pheasant/ACSS/MA2/E3X	2360	1631	**$45,743/mile**
1272 kcmil 59/19 Pheasant/ACSS/TW/MA2/E3X	2357	1636	**$55,382/mile**

[1] Neglected potential cost savings associated with smaller conductor diameter hardware, structure erection costs, foundation rock excavation and casings.

[2] Ampacities calculated per IEEE 738 and the following conditions: 40°C ambient temperature, 2 ft/s wind velocity (90° to conductor), 35° northern latitude, 3500 ft elevation, 90° azimuth of line (East-West), clear atmosphere, and a date and time of 12:00 PM on June 21 (resulting in 106.3 W/ft² of solar and sky radiated heat). Standard conductor calculated with an emissivity of 0.5 and an absorptivity of 0.5; E3X conductor calculated with values of 0.9 and 0.2 respectively.

ENERGY SAVINGS WITH E3X

Net Present Value of Savings — $150MM[1]

Parameter	1590 kcmil Falcon/ACSS/MA2 100°C - 1452 Amps [2]	1590 kcmil Falcon/ACSS/MA2/E3X 80°C - 1452 Amps [2]	NPV of Savings Per Conductor	NPV of Savings for Transmission Line
Power Losses (kW/mile)	165	157	8	98
Annual Energy Losses (kWh/mile)	470,982	447,620	23,362	280,344
Annual Energy Cost ($/mile)	$36,307	$34,506	$1,801	$21,612
Annual Demand Cost ($/mile)	$33,748	$32,074	$1,674	$20,088
NPV of Energy Savings ($/mile)	-	-	**$53,419**	**$641,027**

[1] Economic Analysis calculated per Aluminum Association Publication No. 54 with the following parameters: transmission application, 1452 ampacity, $1000/kW cost of installed generating capacity, 17% fixed charge rate on generating capacity, 50% load factor, $0.060/kW present cost of energy, 30-year service life of conductor, and 5% interest rate. Additional significant savings potentially available from carbon credits.

[2] Ampacities calculated per IEEE 738 and the following conditions: 40°C ambient temperature, 2 ft/s wind velocity (90° to conductor), 35° northern latitude, 3500 ft elevation, 90° azimuth of line (East-West), clear atmosphere, and a date and time of 12:00 PM on June 21 (resulting in 106.3 W/ft² of solar and sky radiated heat). Standard conductor calculated with an emissivity of 0.5 and an absorptivity of 0.5. E3X conductor calculated with values of 0.9 and 0.2 respectively.

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INDEPENDENT VERIFICATION AND VALIDATION OF E3X™ TECHNOLOGY

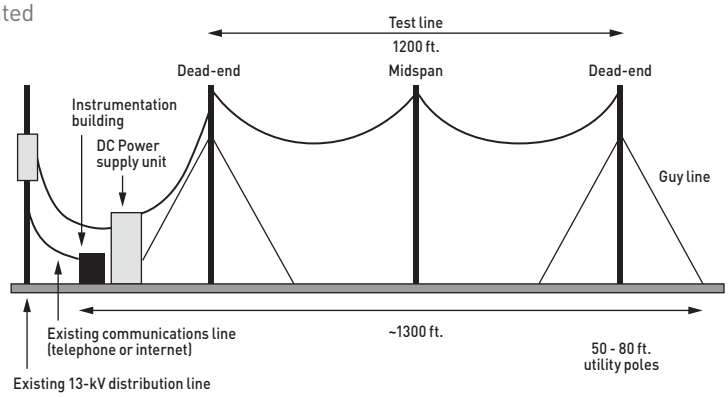
Oak Ridge National Laboratory (ORNL) Powerline Conductor Accelerated Testing (PCAT)

ORNL PCAT FACILITY

PCAT in Oak Ridge, Tennessee was developed by ORNL and the U.S. Department of Energy in 2003 as a test facility to evaluate the performance and reliability of overhead conductor designs in a real-world environment either before or in conjunction with field trials. PCAT accommodates 2,400 ft of overhead test conductor in a loop arrangement across five 161 kV-rated steel transmission poles, with two poles at each of the two dead-ends and one in the center with a cross-arm. The facility uniquely provides a high-power, heavily instrumented and controlled platform for conducting accelerated performance testing and collecting all the necessary information for overhead conductor characterization.

ORNL PCAT OBJECTIVE

A test plan was designed to evaluate the sag/tension, current-carrying and temperature characteristics of Drake/ACSS/MA2 with E3X Technology against standard Drake/ACSS/MA2 utilizing constant current tests and current thermal/mechanical cycling tests. The charts on Temperature and Sag versus Ampacity are based on test data generated at the ORNL PCAT facility.

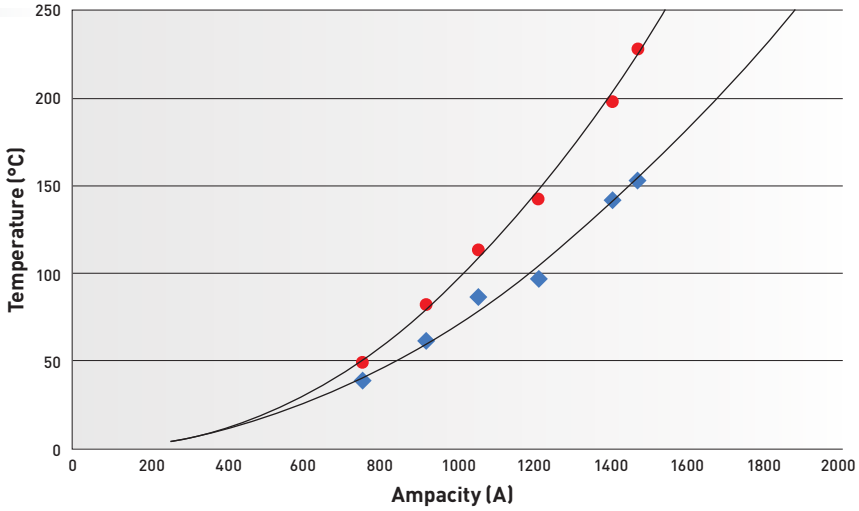


OAK RIDGE NATIONAL LABORATORY:

Temperature vs. Ampacity

Drake/ACSS/MA2

Drake/ACSS/MA2/E3X

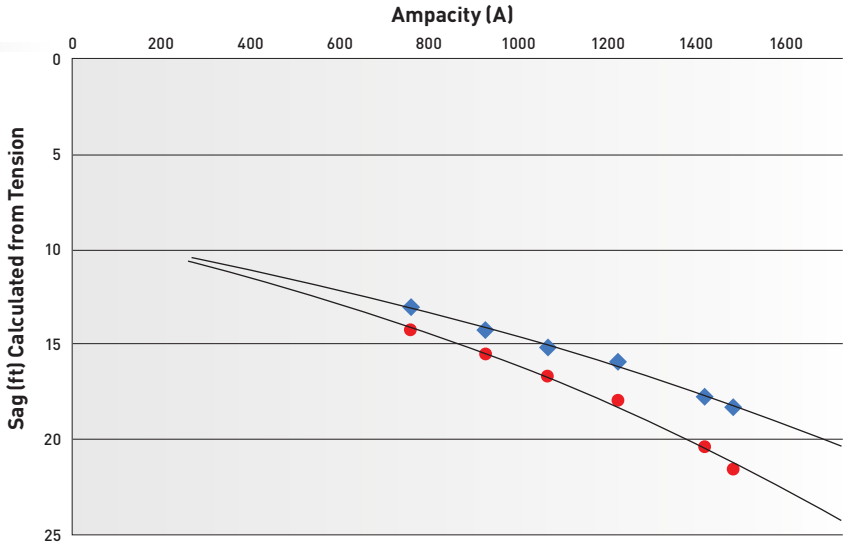


OAK RIDGE NATIONAL LABORATORY:

Sag vs. Ampacity

Drake/ACSS/MA2

Drake/ACSS/MA2/E3X



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