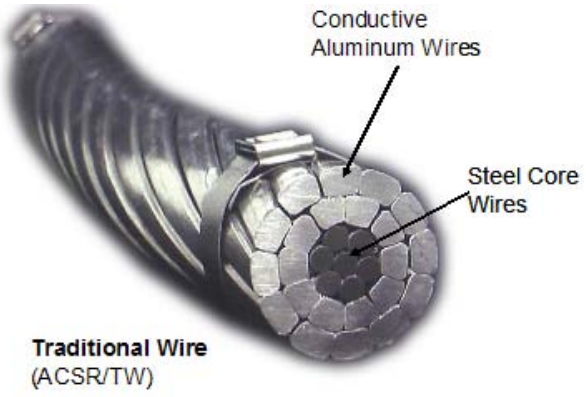
Transmission Efficiency Initiative: Host Demonstration Project

Application of ACSR/TW Conductor for a 765-kV Line



Aluminum-conductor, steel-reinforced trapezoidal wire

- Evaluate selected TW conductor for a new 765-kV line.
- Monitor before and after energy losses and utilization and document the results.
- Benefits include reduced losses and reduced carbon footprint.

Project Scope

As part of EPRI's Transmission Efficiency Initiative, American Electric Power is evaluating a possible demonstration of the advantages of using trapezoidal wire (TW) conductors on new transmission lines over conventional aluminum-conductor, steel-reinforced (ACSR) round wire conductors.

American Electric Power selected ACSR/TW conductor for a new 275-mile, 765-kV transmission line. System studies conducted during the line design and engineering process show that TW conductor saves more than 8 MW of demand losses and 36 GWh per year relative to the round wire counterpart of the same diameter.

The objective of this project is to assess, through a consistent measurement and verification (M&V) process, the actual savings achieved by selecting the TW conductor. In addition, the lessons learned during the design process and the installation and operation of the TW will be documented.

Technology Description

A TW conductor consists of a stranded steel central core with one or more layers of trapezoid-shaped aluminum wires. Although this conductor is limited to operation at moderate temperatures, a 765-kV line commonly operates at near-ambient temperatures, even under heavy loading conditions. The use of compact trapezoidal strands results in a resistance reduction of 15–20% for the same-diameter round wire conductor. If some increase in conductor diameter over the original is possible with limited structural reinforcement, the resistance reduction can be in excess of 20% and the increase in thermal rating can be 20% or more. The 765-kV line for which TW conductor was selected is a relatively long, heavily loaded transmission corridor in the region. Therefore, considerable savings in line losses are realized for the entire system.

Expected Benefits

One or more of the following benefits may be realized through the application of this technology:

- Reduce transmission system losses by reducing the resistance of the 275-mile, 765-kV transmission line.
- Reduce carbon footprint by reducing the energy lost in the transmission wires.

Approach for Measurement and Verification

A key objective of EPRI's Transmission Efficiency Initiative is to verify and validate the "actual" benefits realized by the application of the technology using a consistent M&V methodology that will be developed as part of EPRI's transmission efficiency research portfolio.

The detailed methodology of M&V will be developed during the course of the project using the following general approach:

- Demand, energy, and CO_2 savings will be determined based on simulations for the studied line for both conductor options—ACSR and ACSR/TW.
- Losses will be evaluated over a one-year period based on observed loading patterns and compared to the estimated savings. This will lead to an industry-accepted methodology for projecting savings from ACSR/TW applications.
- A life cycle carbon footprint methodology will be developed.

Project Schedule

The schedule of the project tasks is as follows:

1. Data collection. American Electric Power will provide EPRI with all the information required for the study, which will include:
   - Detailed data of the 765-kV line to be studied
   - Power flow model and selected scenario
   - Current and/or MVA power flow over the line and line availability over the study period
2. Evaluation of losses based on the monitored power flows for both the actual ACSR/TW conductor and the conventional ACSR conductor.
3. Evaluation of CO_2 savings.
4. Documentation of results using the EPRI demonstration protocol.
5. Final project report, December 2011.

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