Southwire HS285® Cable

Project Profile Western Area Power Administration

High-Temperature, Low-Sag Conductors Ease Ecologically Sensitive Line Upgrade

When the Western Area Power Administration (Western) wanted to upgrade the ampacity of a 230 kV transmission line near the lower Colorado River, they knew the existing ACSR conductors were approaching the end of their life span. Conductor selection became a design challenge.

The Davis-Mead line is part of the Parker-Davis Project, which includes 1,541 circuit-miles of high-voltage transmission lines in Arizona, southern Nevada and California. Power generated from the Parker-Davis Project is marketed to customers in Nevada, Arizona and California. "The existing 61 miles of 230 kV line had a capacity of 170 MVA.

By mid-2004, growing demands on the grid were requiring more power down that route. The goal was a rating of 450 MVA, a 164% increase in capacity," says Allen Turner, electrical engineer, Western Area Power Administration, Design Group.

Project Title: Davis–Mead 230 kV Transmission Line Re-conductor Project

Location: Southwestern Nevada

Project Owner: Western Area Power Adminstration

Electrical Contractor: IDelpro A/S

Product Used: Southwire ACSS/TW HS285

In Service Date: May 2008

Ecosystem Presents Design Challenges

About 50 miles of the line cross arid desert land near Lake Mohave in southern Nevada. This land is managed by the federal government and is home to several protected species of animals – including mountain goats and desert tortoises. This fragile area is slow to recover from construction disturbances, so great care would have to be taken to not disrupt the ecosystem.

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Western wanted to use existing sites and structures if possible to hold down project costs. In addition, adding access roads to accommodate new tower sites or to bring heavy construction equipment to existing sites might have detrimental effects to the mountain goat or tortoise population that would trigger a lengthy environmental review. "Besides the obvious budget benefits, using existing sites and structures could shorten the project by two to three years," Turner says. The design challenge was to find a conductor that gave the needed capacity gains while minimizing structural work.

Conductor Evaluation Started with Sag and Tension Studies
The team modeled portions of the line in PLS-CADD using existing drawings. They carried out sag and tension studies in April 2005. The rated steady-state capacity of the existing ACSR conductor was 170 MVA at an operating temperature of 176˚F (80˚C), with an assumption of a four foot-per-second ambient wind.

High-Temperature, Low-Sag Conductors Made the Short List
The design team looked at several conductor options for the line, both with and without tower modifications. Only two delivered the required increase in capacity without significant tower modifications: Southwire "Rook" ACSS/TW HS285 conductor and 3M "Drake" ACCR.

Southwire ACSS/TW (Aluminum Conductor Steel Supported, Trapezoidal Wire) HS285 uses an engineered ultra-high-strength steel core to support the entire conductor, thus controlling sag by the core's lower rate of thermal expansion. The 3M ACCR (Aluminum Conductor Composite-core Reinforced) has a core made from aluminum oxide fibers embedded in high-purity aluminum. While the two conductors had similar ampacity ratings, the WAPA design team's choice for the majority of the line work was Southwire's "Rook" ACSS/TW HS285 based on the comparative expense of the two conductor options.

Southwire HS285® Met Design Goals at Lower Cost
By May 2007, the Western design team had selected Southwire HS285 cable for the reconductor project. Southwire's pre-construction support began immediately. Southwire hosted the Western team at the Flora, Illinois plant in November 2007 to observe the conductor manufacturing process and held a pre-construction training session on-site. Cable reels arrived on-site in February 2008, and the line was in service by May 2008. Total installed cost for the project came in around $5.7 million—within the budget set for the project.

The reconductored line using Southwire HS285 cable has a steady-state rating of 450 MVA at an operating temperature of 270˚F (132˚C), again with an assumption of a four foot-per-second ambient wind. The line can also handle a 30-minute overload of 500 MVA at an operating temperature of 305˚F (152˚C), thus achieving Western's goals while saving significant time and budget dollars in this ecologicallysensitive line upgrade.

High Temperatures with Low Sag

In ACSS conductors, the weight of the wire is taken almost entirely by the steel core. Sag is determined by the low expansion rate of steel, rather than the high expansion rate of aluminum. That allows higher operating temperatures – and more capacity. ACSS can operate continuously at temperatures up to 250°C without loss of strength. For the same conductor size and weight, an ACSS solution can give substantial increases over ACSR without significant changes in structure or line design, sometimes exceeding 100 percent more power than ACSR with the same sag.

Strength Comparison of Steel Cores

- A typical steel core in a standard ACSR cable has a tensile strength of about 210 ksi.
- A traditional "high-strength" core delivers a tensile strength of about 235 ksi.
- HS285 cable's steel core can stand up to 285 ksi before failure, 21 percent stronger than the usual "high-strength" core, and 36 percent stronger than a standard core.

If you need increased capacity in a new line, Southwire HS285® conductor is the multi-purpose tool you need.

Call your Southwirerepresentative or visit www.southwire.com today to learn more.