## Conductor field testing

DSW is involved in testing both technologies. In January, crews installed two spans of 3M ACCR on Western's Liberty-Parker No. 2 circuit, just northeast of Liberty Substation, near Phoenix. DSW plans to have six spans of CTC's ACCC conductor installed on the same circuit later this fall.

These field tests will help Western understand the characteristics of this new technology and its potential benefit to Western's transmission system. Both conductors cost more to manufacture than conventional cable and require careful handling to prevent breaks to the composite conductor materials.

Industry experts see composite conductors as a cost effective way to uprate a transmission line's capacity when reconductoring an existing line. Because a smaller diameter composite wire can carry more electricity and the conductor physically sags less when under high loads, a utility wouldn't have to modify its structures or acquire additional right of way to increase the line's capacity. Eliminating these costs could make the equation cost effective. Composite conductor technology is also expected to be useful for long span applications such as river crossings and other specialized purposes.

For more information on these projects, contact Mark DePoe at 602-352-2687.

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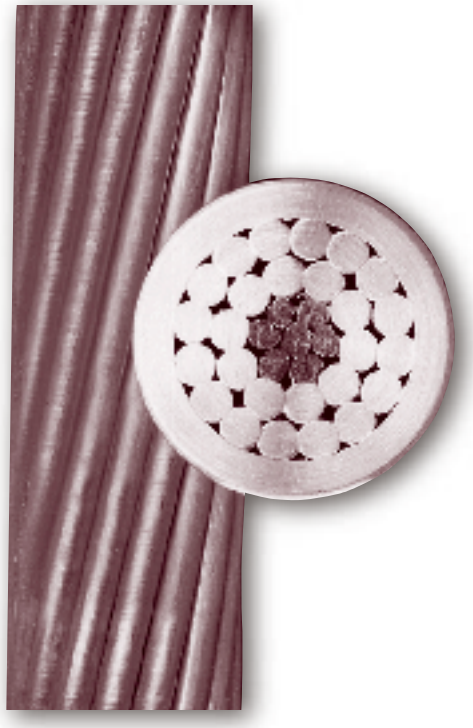
Western
AREA POWER
ADMINISTRATION

8-04

# COMPOSITE CONDUCTOR TESTING



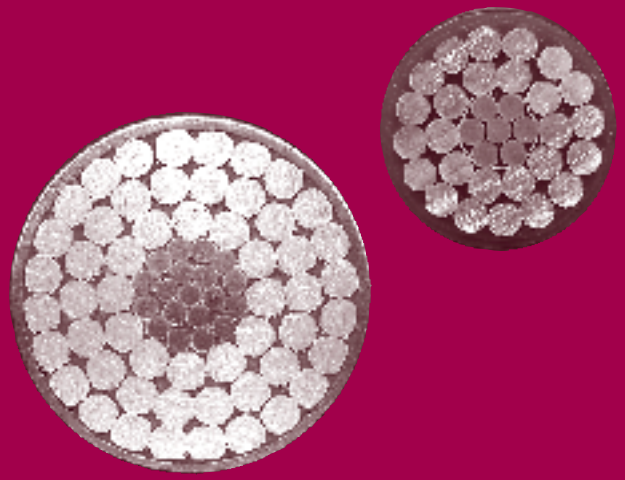
## Desert Southwest Region

# Customer Meeting

September 14, 2004

Western's Desert Southwest Region is actively investigating new technologies that promise to increase transmission capacity, ease strain on the electrical grid, and ensure system reliability so that our customers' needs for energy are met.

Acquiring new rights of way, adding new towers and stringing larger conductor are expensive and difficult. Composite conductor technology promises significant performance and economic benefits in the effort to increase power line capacity.



## Composite technology options

Today, DSW operates 3,100 miles of high-voltage power lines that are constructed either out of aluminum conductor steel reinforced—ACSR—or copper. Two new conductor options are now in manufacturers' testing and DSW is providing field testing sites to help identify how the new technologies stand up in harsh desert conditions. Aluminum conductor composite reinforced, or ACCR, is manufactured by the 3M Company. Aluminum conductor composite core, or ACCC, was developed by Composite Technology Corp.

These new technologies have the potential to help ease transmission grid constraints in many parts of the nation. The U.S. Department of Energy's National Transmission Grid Study reported "new transmission conductors with composite cores, as opposed to steel cores, are both lighter and have greater current carrying capacity, allowing more power to flow in existing rights-of-way."

## ACCR by 3M

The 3M conductor uses a core of aluminum composite wires surrounded by temperature-resistant aluminum-zirconium strands, which permit operation at 210° C. ACCR expands less than conventional steel-reinforced conductor under high loading and in hot weather. It's stronger than conventional conductor and can carry up to three times the amount of electrical capacity. Testing at Oak Ridge National Laboratory shows the core has the strength and stiffness of steel but with half the weight and higher conductivity.

3M is working with hardware manufacturers to adapt and test connectors that will complement the new conductor.

## ACCC by Composite Technology

CTC's conductor incorporates a core made of continuous glass and carbon fibers with a polymer resin. Aluminum wires are then wrapped over the core. ACCC conductor can transmit up to twice electric power of conventional steel-reinforced power lines, has up to 28 percent lower line losses and can be used on existing towers without structural modification.

It is also predicted to lower electromagnetic fields by up to 50 percent for a given power level since it doesn't have the ferromagnetic core of conventional conductor cable. ACCC expands at about half the rate of conventional cable and has 25 percent greater tensile strength. This permits more aluminum so that power lines can carry more electrical power without sagging.

The dead-end hardware being developed and tested by CTC uses a wedge type assembly to grip the center core. The outer conductor sleeve is a conventional compression type assembly.

**CTC's aluminum conductor composite core. 1020 kcmil ACCC/TW cable. Cable outside diameter 1.108 inch.**