

Raising capacity, reducing line sag

New material lets APS use existing poles, towers, line location

The manufacturer's claims sound like something from a television infomercial: *It carries more than twice the electrical power of conventional lines the same size and does it at higher operating temperatures with minimal conductor sag.*

Turns out 3M's Aluminum Conductor Composite Reinforced (ACCR) transmission line is living up to its hype. Recently APS used it to increase a transmission line's capacity without disrupting the surrounding community.

The six-mile 230-kilovolt (kV) transmission line, originally built in the 1970s, runs from the West Phoenix Power Plant north of Sun City West to the Lincoln Street Substation in downtown Phoenix. Although the line's capacity was increased in 2002 (a process known as reconductoring), Transmission Planning forecasts in 2004 showed the line would be maxed out by this year or next, according to **Paul Richards**, construction project planner, Transmission Construction Projects – Administration.

"Reconductoring is like buying a bigger diameter garden hose," Richards said. "You're still moving water but you're moving more in the same amount of time. We used a higher capacity conductor. It still carried 230-kV electricity, just more of it. Unfortunately it wasn't enough to keep up with the area's growth."

Aluminum conductor steel supported (ACSS) replaced the original aluminum conductor steel reinforced, or ACSR. Reconductoring with larger ACSS was not the answer, though. Its increased weight would be too much for the power poles and towers, Richards said.

"The line is adjacent to two schools and some of the poles

are in customers' yards," he said. "Taking out the old structures and putting in larger ones would have been very disruptive to the community. We wanted to avoid that if we could."

One option was to find conductor material weighing about the same as ACSS but able to carry significantly more electricity.



APS linemen thread the new transmission line through pulleys.

Three products seemed promising but they were new to the utility industry. That meant there were no industry standards in place to determine not only that a product performed as claimed, but more importantly, that the products were manufactured properly. The responsibility for putting together the tests necessary to evaluate this type of conductor fell to **Brian Booker** and **Juan Gutierrez Jr.**, senior engineers, T&D Engineering and Standards.

"APS has a responsibility for the public's safety as well as that of our employees," said **Bill Hanna**, manager, Transmission Construction Projects. "We had to be sure the product met our public safety requirements as well as perfor-

mance standards before we moved forward with the project."

In the end, 3M's ACCR came out on top. Construction began March 15 and wrapped up April 16.

"During that time, we didn't get a single complaint," Richards said. "**Kendra (Cea**, technical account rep, Technical Account Management) and **Maria (Arellano**, consultant, External Communications) made sure everyone knew what we'd be doing and when."

The team also got support from the Arizona Department of Transportation (ADOT).

"The line crosses Interstate 17. Normally ADOT doesn't let you do work over a freeway except on weekends," Hanna said. "But they worked with us and let us do a mid-week freeway crossing."

The May 1 in-service date was just in time. There have been times this summer when the line's load exceeded the previous line's capacity.

"The Transmission Construction department always is studying new technology and work methods to ensure a cost effective, reliable system," Hanna said. "There are other opportunities on the horizon and APS wants to be involved in the early phases of development to ensure the transmission system's demands can be met in a structured time frame."

New technology will be the driver in meeting these demands in the future, according to Richards.

"The composite conductor is one of many technologies under development," Richards said. "Understanding its abilities has contributed to our being able to meet the transmission system growth with minimal disruption."

— Colleen Hawk