High-tech conductor could help Southern California in wake of SONGS closure

Conductor carries more current, has lower line losses

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The manufacturer of a high-tech transmission conductor says its product could help Southern California offset the effects of the loss of the San Onofre nuclear generating station (SONGS) by making it possible to import more power without constructing new transmission pathways.

The company, CTC Global, manufactures an aluminum conductor, composite core (ACCC) product that can carry significantly more current than standard conductors of equal diameter and weight, Dave Bryant, the company's director of technology, told *TransmissionHub*.

“We use about 28% more aluminum for any given conductor size ... which not only helps with increased current flow, it also reduces line losses by as much as 40% compared to other conductors,” Bryant said.

That means two things, he said: more capacity to import power, and the need to inject less power at the source to get an equivalent amount delivered to the sink. Those features are important when considering ways to replace the 2,200 MW lost by the SONGS closure.

“Because of line losses and the distance associated with importing other power, we're going to have to replace the lost megawatts” with approximately 10% to 15% more generation to have the same amount of power delivered to load, Bryant said. Reducing line losses enables generators to save on their capacity investment.

Additional capacity over a conductor with similar diameter and weight would give area utilities the ability to upgrade existing pathways without the need for a complete rebuild. That appealed to Nevada's **NV Energy** (NYSE:NVE), which selected ACCC in 2009 to upgrade an existing line that extended through a well-established, higher-end neighborhood of Reno, Nev.

“We had an old, copper 120-kV transmission line that needed to be reconductored for a higher ampacity,” Jim Lehan, senior engineer with NV Energy, told *TransmissionHub.*

However, the existing wooden pole structures had neither the strength nor the ground clearance to support larger conductors, so the utility was facing the potential of a full rebuild, complete with taller towers, to get the additional capacity needed.

“We modeled the line with [aluminum conductor, steel-supported] ACSS conductor and we would have [needed to make] about three-quarters of all the structures taller,” he said. In an effort to avoid complete rebuild, the company evaluated other options including ACCC, which had only been on the market about four years at the time.

“We analyzed the line using ACCC and were able to reconductor almost 18 miles of line without having to tear the whole line down,” Lehan said. “It was about half the cost of what we estimated it would cost to tear the whole line down and redo it, and that doesn't include [the cost of] permitting.” The upgrade more than tripled the line's ampacity, from 280 amps to over 900 amps, he said.

To date, NV Energy has used the ACCC in four projects and has more in the planning stages.

American Electric Power (NYSE:AEP) has also successfully deployed ACCC conductor, primarily for reconductoring existing circuits.

“Our biggest project right now is the reconductoring of two 345-kV lines in Texas, where we need to increase the import capability to the Rio Grande Valley,” Scott Moore, AEP's VP of transmission engineering and project services, told *TransmissionHub*. “We're using ACCC there so we don't have to replace the towers.” That project uses a total of 216 miles of bundled 345-kV conductor.

Although it varies by jurisdiction, AEP's reconductoring project in Texas does not require additional permits because they are using the existing towers, Moore said, saving additional time and money over more conventional rebuild projects.

“We're gaining a 75% increase in ampacity” by replacing more conventional conductor with ACCC, he said. “We have also considered it in new construction where we needed to have some higher capacities on those lines and were trying to reduce the weight of the structures, which drives up costs.”

The aluminum strands in the ACCC conductor are trapezoidal rather than round as in other conductors, such as ACSS and aluminum conductor, steel-reinforced (ACSR). That maximizes the ACCC's current-carrying capacity by providing more surface area. In addition, the conductor core uses a carbon fiber technology derived from the aerospace industry, which helps mitigate thermal sag.

“This allows us to run more power through the conductor and to tension the lines tighter so they don't sag as much, either in winter conditions or summer conditions,” Moore said. Thermal sag contributed to the 2003 Northeast blackout, so limiting sag can result in enhanced system reliability.

One of the challenges to deployment of ACCC is that, in the utility world's frame of reference, it is still a fairly new product, first made commercially available in 2005.

“A lot of utilities are hesitant to try new things that don't have 10 or more years of experience,” Bryant said. “ACSS conductor that was introduced in 1970 really didn't gain any traction for the first 20 years.”

Some of Its early adopters, however, say the product has a promising future.

“It is going to become increasingly popular,” Moore predicted. “It's getting used a lot worldwide. I think the U.S. may actually be a little bit slower on the uptake, but it is definitely another tool in the toolbox, and I think a lot more folks will be utilizing it.”

The federal government has provided some financial incentives, according to Bryant, who said the Energy Policy Act of 2005 offered increased returns on equity, accelerated depreciation, and other incentives intended to inspire utilities to make the jump to the new conductor. Even without such incentives, however, the company expects to see use of its product increase in the near future.

“There is growing acceptance of the technology, and I think before the end of the year, we're going to start seeing more ACCC installations in California,” Bryant said.

ABOUT THE AUTHOR

Carl Dombek

Carl Dombek, senior editor for TransmissionHub, is an award-winning journalist with nearly two decades of experience

as a broadcast journalist on radio and TV, and as a writer for newspapers, magazines, and the Web.

Prior to joining TransmissionHub, Carl spent five years in the U.S. power industry, including positions at the North American Electric Reliability Corporation and the Midwest ISO.

Contact Carl Dombek at CarlD@PennWell.com.