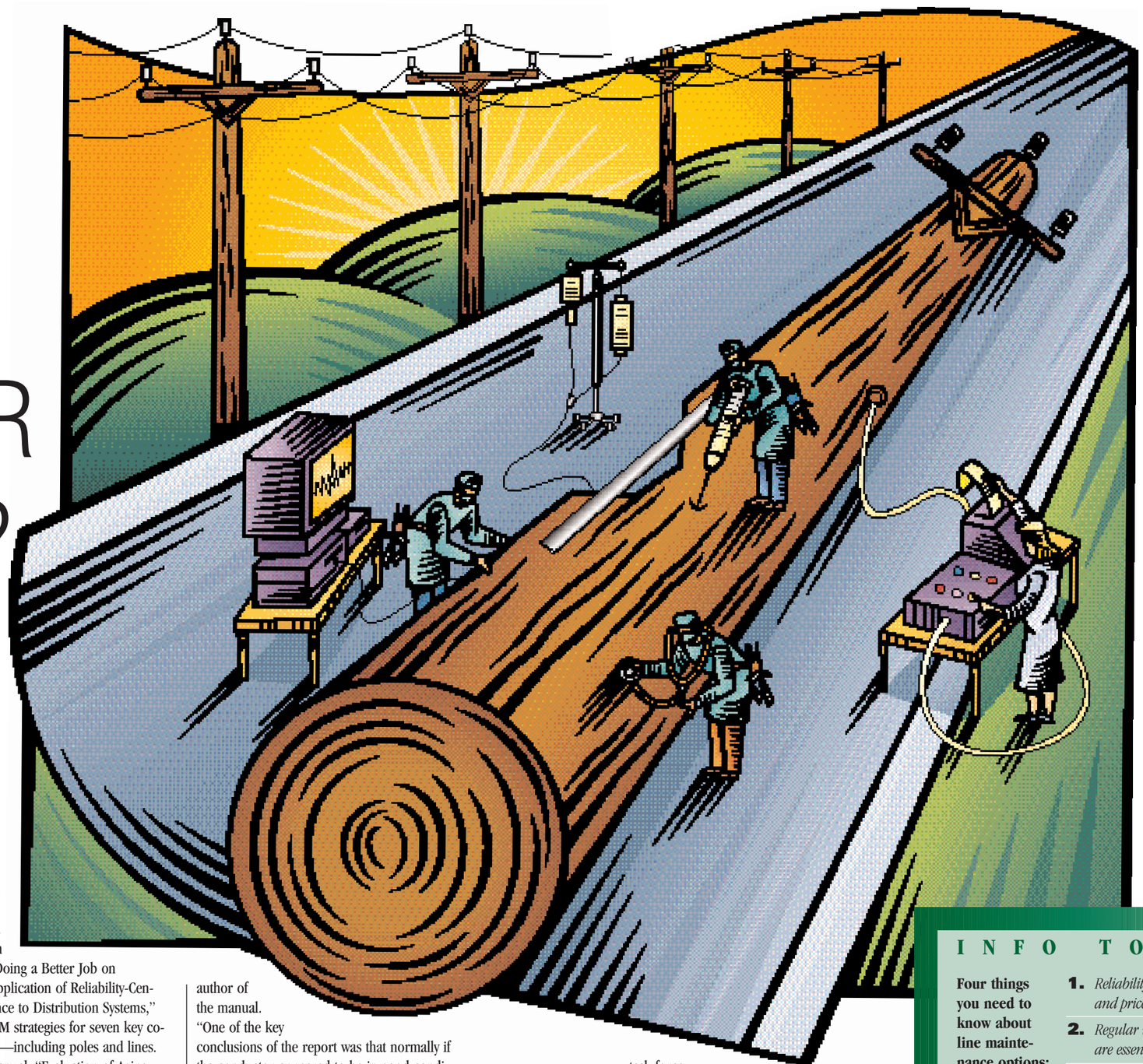
# REPAIR OR REPLACE?

*With aging distribution lines to maintain, co-ops must weigh a lot of factors*

By **John Lowrey**



TIM WEBB

Wood poles and copper wires are the backbone of co-op distribution systems. But lines strung in the 1930s, 1940s and 1950s are reaching the end of their expected life, and a host of new approaches to maintenance can both complicate and help co-ops decide when to repair and when to replace their single largest asset.

Maintenance philosophies also come into play, and they range from fixing just what is broken to zealous preventive maintenance that calls for gold-plating everything. A happier medium can be found in reliability-centered maintenance, or RCM, developed by the airline industry to keep jumbo jets in the air without breaking the budget.

NRECA's Cooperative Research Network (CRN) reviewed this approach in a guide titled "Doing a Better Job on Maintenance: Application of Reliability-Centered Maintenance to Distribution Systems," which offers RCM strategies for seven key co-op components—including poles and lines. Another CRN manual, "Evaluation of Aging Conductors," takes an even deeper look.

"By and large, conductor will last 50 to 60 years," says Dale Douglass, principal engineer for Power Delivery Consultants and the author of the manual. "One of the key conclusions of the report was that normally if the conductor appeared to be in good condition, it probably was."

Randy Poulson, vice president of engineering for Dakota Electric Association in Farmington, Minn., was on the CRN project's task force.

"We were looking to see if there was some kind of nondestructive test that could quickly determine when to replace overhead line," Poulson says. Instead, he adds, the project confirmed that no device can substitute for visual inspection, expensive and time-consuming as it may be. "The study reemphasized what we knew. There isn't any gizmo."

Before you can decide what needs replacing and what can be repaired, Poulson says, you have to really know your system.

"Over many years you retire stuff, you add stuff—and your inventory can get off," he explains. "We actually had our staking folks survey the system, using pole brands to identify vintage."

Any co-op, large or small, can also set up conductor failure records to quantify the economics of replacing a line. Corrosion of the galvanized steel strand in an aluminum conductor steel reinforced (ACSR) line can be hard to detect, but most problems are easier to spot. And line crews can keep an eye out for ACSR corrosion while making repairs and splices.

Tracking and reporting conductor status is the next step. A visual inspection tour every five years, Douglass says, is one easy way to catch most overhead conductor problems. "You can start counting splices per span. I saw one line in Ohio that was still in use that had six splices in a 200-foot span."

He also points out that a poor right-of-way program is a major cause of conductor failure. Tree contact with old Copperweld conductor usually leaves burn marks and visible corrosion.

Although CRN's aging conductor manual contains several rules of thumb, formulas and checklists, Douglass cautions that conductor replacement plans must vary from co-op to co-op. "Each co-op is different. And to some extent, how well things have held up is a function of the initial engineering and design decisions."

## INFO TO GO

**Four things you need to know about line maintenance options:**

1. *Reliability-centered maintenance balances performance and price.*
2. *Regular visual inspections, augmented by outage data, are essential.*
3. *Lines and poles must be monitored in tandem—and non-wood poles should be considered.*
4. *Many utilities outsource line inspection.*

Load growth is the driving factor for most co-op decisions to replace conductor, Douglass adds, especially as consumer power quality demands increase.

"The worst part isn't fixing things and replacing lines—the worst part is dealing with adverse publicity," he observes, adding that no engineering manual can put a figure on that. "Simple formulas you can put in a spreadsheet were included in the manual. But there are noneconomic factors like safety, injuries and property damage that should be considered, too."

Ron Jones, director of power operations, central region for Henkels & McCoy (www.henkels.com), says the replacement decision starts by tracking outages.

"Most co-ops are trying to replace the old Copperweld on their system with ACSR," Jones says. "Copperweld was put up back in the 30s and 40s. Its condition depends on how much exposure it's had to lightning and ice. A lot of the co-ops are pretty proactive, but some just let it fall."

Henkels & McCoy is replacing 50 miles of single-phase service for Southwestern Electric Cooperative in Greenville, Ill., and Jones says the company also works extensively with Tri-County Electric Cooperative in Mount Vernon, Ill. "They spend some money every year instead of just letting it fall apart," he says.

Gary Chesney, Tri-County's operations superintendent, says pole replacement is factored into the process.

"If we have 30 to 50 percent of the poles on a particular line that are failing and it's an 8-A Copperweld line, it's almost a no-brainer," Chesney says. "We're going to go ahead and rebuild that line."

The co-op maintains an outage history to identify sections that need to be replaced, but Chesney also counts on the human database. "We use our servicemen and linemen. We try to draw from all the information we have out there, both our people and our outage reporting."

Board and management support, Chesney says, is essential to a quality replacement program.

"It's a pride thing. If you're happy just keeping it patched up, the money won't be allocated. Today's members demand power quality. They dislike blinks almost as much as an outage. To them it is an outage. All of our people take a lot of pride in keeping this system up and keeping it from having problems."

Tri-County contracts with O&M Services which provides line and pole inspection, inventorying and mapping. The co-op is on an eight-year cycle and now has O&M gather geographic data on each pole it inspects. This information combines with outage data to support long-range improvement planning.

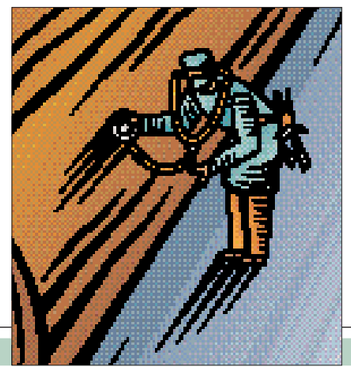
Another replacement question centers around the difference between steel and wood poles. Henkels & McCoy is building four miles of new 69-kV transmission line for Tri-County, using a dozen steel poles in areas where guying was a problem. "We're also getting ready to build a single-phase line with steel poles in some bottoms where water stands," Chesney says. "It's thickly wooded and we've had some woodpecker problems there. We're looking at steel for many applications.

"We like a number of things about steel," he continues. "The strength, it's lighter, it's constant and uniform. The framing of steel poles can go quicker. And with steel there would actually be some salvage value instead of a disposal problem."

The co-op also experimented with Shakespeare fiberglass cross arms on a narrow construction project. "Those arms were put up in the 80s and they've been bulletproof," Chesney says. "We've had no failures."

Wood poles are likely to remain the workhorse for co-op distribution systems, but a CRN survey found that 61 percent of co-ops use substitutes for special situations.

Jim Carter, executive vice president of the NRECA subsidiary Wood Quality Control, says he occasionally sees co-ops experimenting with steel poles and fiberglass cross arms. "I'm pro wood," Carter says. "But steel has its place."



Wood poles, however, still represent the largest single asset of most co-ops, and Carter says a good pole inspection program, completed on a regular cycle, is essential. Determining the proper cycle depends on the type of wood and environmental factors. "Most co-ops are trying to get at least a 10-year cycle," Carter says. "Some are already on their fourth cycle."

Accurate data is another key to answering questions about an aging infrastructure, according to Bob Butera, vice president of sales and marketing for Osmose (www.osmose.com), a pole inspection company that has expanded its business to include data gathering.

"It's critical," Butera says, "to have a combination of good old-fashioned maintenance with really intelligent strategies and knowledge of system performance—and having that knowledge at the hands of decision makers.

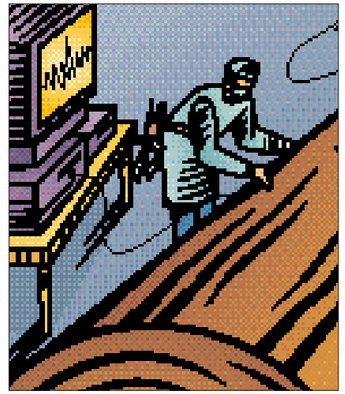
"Reliance on routine maintenance is just no longer adequate," he adds. "Geographic information systems [GIS], operation support systems like outage management, customer information systems, work management systems, all help solve these problems of 'When do I replace rather than maintain? When do I upgrade rather than just stay the course?' The real struggle is very few organizations currently have a real accurate asset database. That's what we're helping them create."

McLean Electric Cooperative in Garrison, North Dakota, started a pole inspection subsidiary called MEC Services (www.mecservices.net) five years ago, and now provides global positioning and GIS services as well.

"We have worked for six co-ops in North Dakota, Montana and Wyoming," says Darrin Sand, project manager. "Being part of the co-op family does help us get in the door at other co-ops. They know that they can trust the work will get done on time and on budget."

To help stay on budget, Sand says, MEC Services uses a pole testing device called Polux from POLE + Management (www.poleplus.com). "We've been using the Polux system for two years. One crew is able to test between 125 and 150 poles in the course of a day, where before two crews were averaging about 70 poles a day."

The system is accurate as well as fast, Sand says. "I was a little skeptical at first, but our first client allowed us to come back and cut up the poles that had been rejected. After seeing what the poles looked like, I was a believer."



A handheld computer integrates five variables that contribute to pole strength, including type of wood, circumference, height, knots, age and mechanical damage. "I do think the software is set a little on the high side for rejection criteria," Sand says. "For example, the Polux software shows a pole with a remaining strength level at 40 percent or lower as a rejected pole, whereas the RUS standard is 33 percent." However, Polux gives a less subjective measurement of remaining pole strength than traditional visual or sound and bore methods.

Kevin Mara, principal engineer for HiLine Engineering, a division of GDS Associates (www.gdsassoc.com), helps co-ops with system planning studies. Although he hasn't seen a lot of co-op movement toward reliability-centered maintenance, he says all co-ops are doing a better job of recording detailed data.

"We're seeing a lot of GIS data gathering," Mara says. "The big advantage of GIS mapping is to be able to say, 'I've got old stuff and here is where it is. This is where I've got to concentrate my work.' If 80 percent of your poles are more than 30 years old, you'd better get ready."

The new tools on the market, he says, can be a big help in refurbishing and testing. Polux is one of them. "With that you can determine what kind of fiber strength is left in the material. They have tested lots of poles to see whether or not they get a correlation between test results and actual breaking tests."

For repairing underground lines, Mara recommends CableCURE from Wire DynamiX (www.wiredynamix.com).

"With CableCURE you're going to spend $8 a foot to refurbish your underground cable," he says. "The question is, how much longer are you going to get out of the cable and should you just bite the bullet and spend $20 a foot to replace it?"

Wire DynamiX has helped some co-ops answer that question with a 20-year, full-replacement guarantee. "They'll test the cable," Mara explains, "and typically about 80 percent of the cable can be refurbished and the other 20 percent has to be replaced."

Replacing transmission conductor is the most expensive—and sometimes impossible—project. Yet the demand for more transmission capacity pushes all utilities to look for new answers, especially where bottlenecks choke the grid.

Power Technology (www.pti-us.com) has a new thermal rating monitor for keeping track of weather conditions, allowing dispatchers to transport more power without crossing the heat limits of the conductor. Without accurate information, dispatchers have to keep power levels within the line's worst-case thermal rating limits, but Power Technology's monitor allows them to take advantage of wind and rain cooling the conductor.

"It just permits you to use your transmission line better," says Jose Daconti, executive consultant for Power Technology. "Now you have a more accurate idea about your weather cooling effect."

The monitor can determine line rating for heavy and light loads, and can be viewed through existing SCADA systems. Best of all, it doesn't require any capital investment in the transmission line itself.

From weather monitors to pole inspection routines, the experts agree, thorough planning and data gathering are the keys to shaping maintenance and repair plans for any co-op's most vital asset.

"Asset management is all about making sure you only have to spend capital money to create new revenue, to build new lines, to serve new customers," concludes Osmose's Bob Butera. "Spending capital money to continually replace the legacy system is just financial suicide. It's not fair to consumers. Rates are going to go up.

"When you can use maintenance to eliminate having to replace what you already own, it makes sense." ■