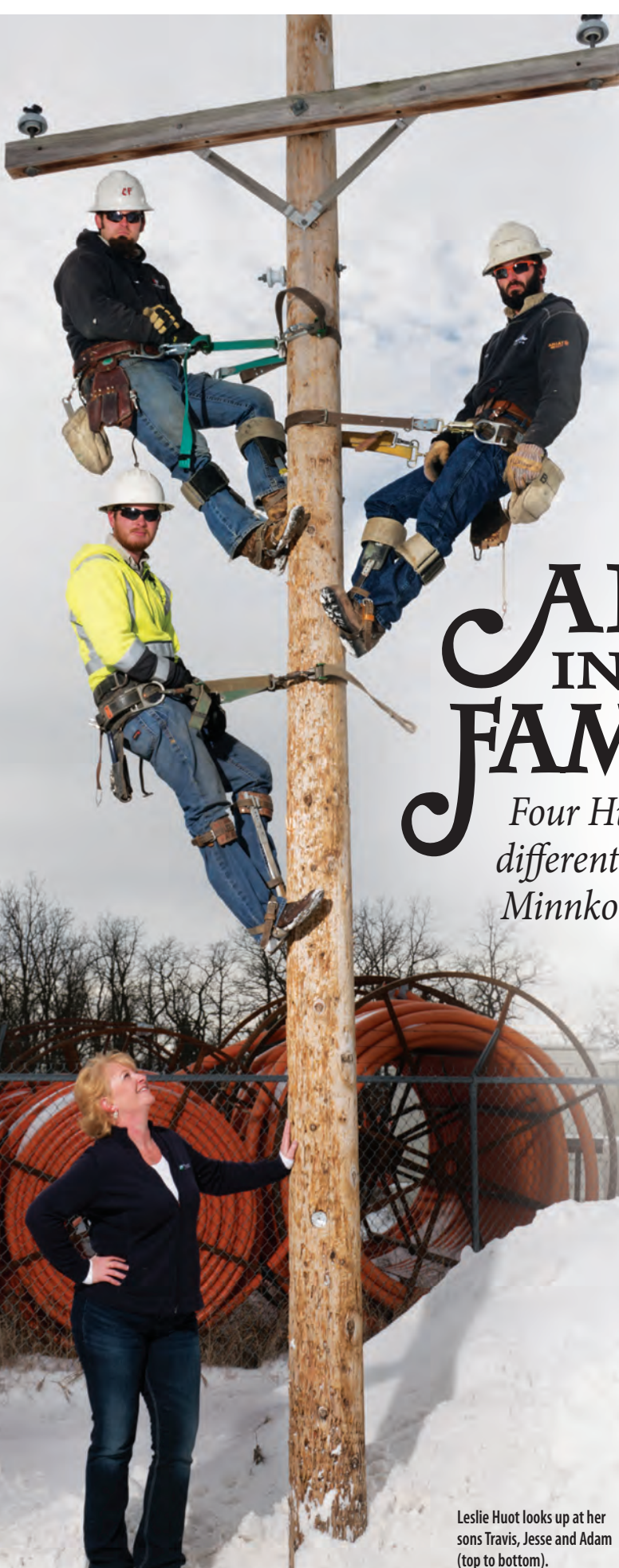


Minnkota Messenger

November-December 2017



**ALL
IN THE
FAMILY**
Story page 2



ALL IN THE FAMILY

*Four Huots, four
different co-ops in
Minnkota system*

Leslie Huot looks up at her sons Travis, Jesse and Adam (top to bottom).

In the middle of the night when storms rage through northwest Minnesota, Leslie Huot can't help but worry.

Her three sons – Travis, Jesse and Adam – are electric cooperative line workers in the region. If the lights go out, working day and night in treacherous conditions is just part of the job.

"I'm very proud as a parent to have linemen," Leslie said. "It's a dangerous profession, but it's a good profession."

Leslie knows firsthand the importance of what her sons do for a living. She's worked the phone lines at Beltrami Electric Cooperative in Bemidji, Minn., for the last 17 years. Having line workers as sons helps her answer questions and relay information out to the membership.

"I feel I have a better understanding of the linemen I work with," Leslie said. "When they get called out on storm jobs, I know what they're going to be doing, because my boys do the same thing."

While it is rare to have four immediate family members working for electric cooperatives, it is even more rare that each works for a cooperative in the Minnkota system. Travis is the line foreman at Clearwater-Polk Electric Cooperative in Bagley, Minn.; Jesse is a journeyman lineman at North Star Electric Cooperative in Baudette, Minn.; and Adam is an apprentice lineman based out of Red River Valley Cooperative Power Association's outpost office in Moorhead, Minn.

The Huots were initially drawn to cooperatives because of the rural setting and their reputation of having a family atmosphere. They haven't been disappointed.

"When I got hired, the one thing that was said to me was, 'You don't quit Beltrami Electric; you retire from Beltrami Electric,'" Leslie said. "That's just the kind of company it is. And I think our sons' co-ops are the same way."

Growing up

Leslie and her husband, Mark, say there were no clear-cut signs that they were raising three future line workers. But when the family moved to Bemidji from western North

Dakota in 1994, the tall trees in the area provided a perfect training ground for pole climbing. In fact, on their first day in town, Jesse climbed so high he needed a ladder to get down.

"They were always climbing trees," Leslie said. "They couldn't stand to stay inside. So we knew they probably weren't going to like sitting in an office someday."

Even electrician work included too much time inside for Jesse, 30, who was the first in the family to enter the line trade. After sharing stories of a typical day on the job, his brothers followed the same career path.

As much as Jesse enjoys the fresh air and open spaces, the camaraderie on his crew may be his favorite part.

"You pretty much live with each other," Jesse said. "A lot of other jobs, people come and go. When you get into a cooperative, people don't leave too often."

With a younger line crew at North Star Electric, he believes there is chance for his guys to be together for many years to come. Working on power lines in remote areas means everyone has to trust each other, he said.

"A guy might get ticked off here or there, but at the end of the day you gotta be buddies," Jesse said.

Camaraderie is something Adam, 21, noticed right away, too. He's had six months on the job at his co-op and is starting to become comfortable with the processes and systems.

"I really like it so far," Adam said. "The guys are really good to me. They take the time to teach me their way of doing things."

Adrenaline rush

From one brother to the next, the Huots admit they are drawn to the adrenaline rush of line work and the satisfaction of doing something that makes a difference in people's lives. One of the career highlights for the brothers is working together on a storm project near Bagley. Each of the Minnkota cooperatives routinely reach out to help each other when Mother Nature strikes.

"We'll have outages when we're working nonstop for days on end," said Travis, 31. "When you turn the power back on and they're appreciative, it makes a guy feel pretty good."

Travis chased that feeling all the way to

New York, where in 2012 he helped restore power after Hurricane Sandy. But with three young children at home, he's happy sticking close to the area. He says the kids are getting used to the 24-hour demands of the job.

"If it's suppertime and I gotta go to work, my kids will say, 'Daddy, you gotta go fix power?' I say, 'Yeah, daddy has to go fix power.'"

If the crews are in a safe area close to home, his wife, Kate, will drive near the job site so his 4-year-old daughter, Peyton, and 3-year-old son, Judson, can watch their dad work.

"There's probably going to be another line-man in the family," Leslie said with a smile. □



Brothers Travis (Clearwater-Polk Electric), Adam (Red River Valley Co-op Power) and Jesse (North Star Electric) are line workers for cooperatives in the Minnkota system.

"They were always climbing trees. They couldn't stand to stay inside. So we knew they probably weren't going to like sitting in an office someday."

— LESLIE HUOT





From left to right, David Lopez, Mike Howard and Joe Leddige make some leads to hook up equipment at the Ulrich substation near Audubon, Minn.

Preserving a legacy system

Minnkota replacing demand response injectors

When Minnkota electrical engineer Nick Gellerman, just fresh out of college, tried to research information on the Minnkota demand response system equipment he had to go the extra mile.

“I went into the library, dug up old German documents and tried to Google translate some of those,” Gellerman said.

That’s because Minnkota’s ripple control injector system was purchased from

Landis & Gyr, a company from Zug, Switzerland, which is close to the German border, in 1977.

“The first few months were pretty much a nightmare,” Gellerman said. “We have one tech in the shop, Gerry Lichter, who was around when they originally put them up. So I talked with him a lot. I checked out

the documents just to see how the system worked because none of the engineers who worked on the project before are still around.”

“I needed background to design our stuff and fit it into Landis & Gyr’s new system.”

Gellerman and a few other Minnkota employees know a lot about the system now.

Personnel from Landis & Gyr worked



Franz Tataruch, right, and Patrick Rickenbacher from Landis & Gyr, a company based in Switzerland, work alongside Minnkota employees in November to commission new demand response system equipment at the Ulrich substation.



Gerry Lichter, right, and Jason Bjerke take voltage measurements while wiring injector alarms at the Ulrich substation.

with Minnkota engineers to design the equipment and then worked alongside Minnkota employees in November to commission new demand response system equipment.

In the first year of the replacement project, Landis & Gyr helped Minnkota crews install the new ripple injectors and associated equipment at the Ulrich substation near Audubon, Minn., and the Lake Park substation near Lake Park, Minn., as part of a multiyear effort to replace demand response equipment across the entire system.

The ripple injector system includes computers that can produce electronic signals and equipment at the substations that injects these signals into the power transmission and distribution lines. Receivers at homes and businesses can “read” the signals, and when the appropriate message is sent, the receiver interrupts the electric power flowing to a water heater, electric heating system or other controlled loads.

In exchange for allowing Minnkota to temporarily control these systems, the consumer receives a discounted retail electric rate. This capability enables Minnkota to more effectively manage its existing power resources and its interaction in the wholesale energy marketplace.

While crews replaced the Ulrich injector system, Lake Park is a new substation so it also received a new load control transmitter.

Minnkota hopes to install new injector systems at 14 other substations over the next several years. The target will be to replace two injector systems a year.

“Nothing changes for our distribution cooperatives,” said Kasey Borboa, electrical engineering supervisor. “We researched the possibility of replacing everything with a whole new program, but there was overwhelming support to keep our existing system operating.”

“All we did was purchase new injector hardware to replicate the same signals that the co-ops were getting in the past.”

As part of the injector system project, Landis & Gyr will build Minnkota a system

model that will allow the cooperative to study signal strength of the ripple control and determine where it’s the weakest, or where more injection is needed.

“We’re going to use that to target the next site that we are going to visit,” Borboa said. “But what we want to use the tool for ultimately is to study outages real-time. So if this substation is going to be out, what’s our signal level going to be in our system – to give us an idea where we will have signal issues.”

Minnkota might actually do three ripple injector replacements in 2018, with Moranville and Littlefork substations being completed in the spring and the Pickert substation scheduled in the fall.

Minnkota also plans to retire its Yukon master system – the brains of the entire load management system – in the spring. Landis & Gyr is providing a server software called SGC Controller to replace it. When Minnkota commissions that, it will need to replace the Local Control Units at all 16 substations.

“For about a month’s time we will have every single load management site offline while we go replace these units in the field,” Borboa said.

Also in the contract with Landis & Gyr? A mandate that documentation for all the equipment and systems be in English.

“Really all we’re doing is extending the life of a legacy system so on the marketing side it continues to give them a resource that’s equivalent to 300 megawatts of generation,” Borboa said. “It continues that legacy.” □



Outside ripple injector equipment at the Ulrich substation.

A RARE OPPORTUNITY

ND is a new frontier in vital rare earth element research

North Dakota is sitting atop enough lignite coal to generate electricity for the next 800 years.

Researchers in the state see even more potential.

Lignite contains high concentrations of rare earth elements – ingredients that are essential to bringing most of today’s modern technology to life. Each coal seam could produce the key components needed to manufacture smartphones, wind turbines, electric vehicles and computer hard drives, among other things.


Dr. Steve Benson, president of Microbeam Technologies (MTI) in Grand Forks, N.D., and Dr. Dan Laudal, major projects manager with the Institute for Energy Studies at the University of North Dakota, are leading research to find economical methods to extract rare earth elements from lignite.

“Rare earth elements are basically thought of as a vitamin for materials development,” Benson said. “They’re used in multiple applications that are essential to our everyday life and there are challenges associated with the resources that are available.”

Benson said the United States imports 100 percent of the rare earth elements it needs. China controls 85 percent of the world’s mining, as well as the entire value chain to refine and process the elements. Benson said North Dakota lignite has an opportunity to reduce the country’s dependence on importing the elements, which have become vital in many military applications.

“This is really an issue of national security,” Benson said.

Lignite coal can produce all 16 rare earth



Dr. Dan Laudal, major projects manager with the UND Institute for Energy Studies, and Dr. Steve Benson, president of Microbeam Technologies, show core samples they are studying as part of a project to extract rare earth elements from North Dakota lignite.

elements, including europium, dysprosium, erbium, terbium, neodymium, holmium, scandium, lutetium and yttrium, among others. Research has shown that most of the elements accumulate in top and bottom of the coal seam.

“Certain parts of the lignite coal have some of the highest levels of rare earth elements we’ve seen in the United States,” Benson said.

Energy experts

UND’s Institute for Energy Studies is leading the project in collaboration with MTI, Barr Engineering, Pacific Northwest National Laboratory and MLJ Consulting. Industry partners, including Minnkota Power Cooperative, have also stepped up to sponsor the research.

Benson and Laudal bring a tremendous amount of knowledge specific to the project. Benson has 40 years of energy research experience, including projects in the 1980s identifying rare earth elements in lignite. Laudal has been completing energy research for the last decade, and recently earned his Ph.D. focusing on rare earth elements.

Through Phase 1 of the project, high percentages of the elements were demonstrated in lignite and extracted in a usable form using laboratory beakers. In August, the U.S. Department of Energy (DOE) provided \$2.75 million to UND for the second phase, which will scale up extraction to 55-gallon drum tanks. It is one of four projects in the nation to receive federal funding for rare earth element recovery from coal and coal-related byproducts.

The research process includes continuously applying a solvent to extract and concentrate the rare earth elements. A detailed economic analysis is also a significant focus. If successful, Benson and Laudal believe the next step is a pilot project, potentially at Valley City State University’s new steam plant.

While there are still several steps before large-scale commercial application, Laudal believes there is great potential in North Dakota.

“Our resource assessments, based on the concentrations that we’ve found in certain seams and how much lignite coal we have here



Research has shown that the rare earth elements are concentrated at the top and bottom of the coal seam.

in North Dakota, show that we can make a significant dent if not completely offset all foreign imports,” Laudal said.

Analyzing coal

The Minnkota-operated Milton R. Young Station may prove to be a valuable resource because both generating units are equipped with full-stream elemental coal analyzers, which provide real-time ash composition, moisture and ash content for all coal delivered into the plant.

The long-term vision would be to use the analyzers to separate the coal with high rare earth element content and divert it to a processing unit for extraction. Following the process, the coal could then be delivered back into the plant and used for electricity generation.

“It would actually result in a better quality coal than what you started with,” Laudal explained. “It’s going to have lower ash content and remove a lot of the inorganic content that can cause problems in the boiler.”

The combination of rare earth element scarcity and growing demand for products like wind turbines and electric vehicles could turn lignite into an even more precious resource. Laudal said it’s a matter of optimizing the chemistry and gaining a better understanding of the economics.

“From a process standpoint, this is brand new research,” Laudal said. “Nobody has done this before.” □

“Our resource assessments, based on the concentrations that we’ve found in certain seams and how much lignite coal we have here in North Dakota, show that we can make a significant dent if not completely offset all foreign imports.”

– DAN LAUDAL, major projects manager
Institute for Energy Studies at the University of North Dakota



HOPES FOR HEMP

*Five farms in
Minnkota service
area participate
in pilot program*

When Tracy Foy and Gary Warner were approved for North Dakota's industrial hemp pilot program, the couple initially decided to keep their plans a secret.

They didn't tell friends. They didn't tell neighboring farmers. And they planted the crop in a secluded corner of their 15,000-acre farm near Pembina, N.D.

"We didn't know what the response would be," Foy said. "We wanted to make sure we educated ourselves before we started talking about it."

Industrial hemp fights the stigma of being a cousin plant to marijuana. Although hemp contains no psychoactive properties and cannot be used as a drug, federal law classifies it as a Schedule 1 controlled substance and bans its production.

North Dakota is one of 15 states to enact legislation to grow the crop under strict oversight from the federal Drug Enforcement Administration and the state Department of Agriculture.

Despite stringent rules, the enthusiasm for hemp grew on Warner Farms almost as quickly as the crop itself. Soon after planting, the 22.25-acre plot became a hub for all things hemp. The state held its annual Industrial Hemp Day on-site. The crop has even gained a following on Foy's social media, where the reaction has been overwhelmingly positive.

"Once we started telling people, they thought it was cool," Foy said. "People wanted to know more about what we were doing and why we were doing it."

After five generations of farming in the Red River Valley, the decision to grow hemp at Warner Farms came down to trying something different. As people begin to see the benefits and applications, Foy believes the crop has the potential to take off in North Dakota. Both the seed and fiber can be processed into a wide variety of mate-



Warner Farms is harvesting hemp for the seed, which has a variety of applications, including oils and nutritional supplements.

“This crop is amazing. It’s good for your body, it’s good for the environment, it’s good for construction materials.”

– TRACY FOY

rials, including textiles, paper, nutritional supplements, oils and even a concrete additive.

“This crop is amazing,” Foy said. “It’s good for your body, it’s good for the environment, it’s good for construction materials.”

Growing the crop

Foy refers to the farm as an “old school operation,” which grows sugar beets, soybeans, pinto beans, black beans, wheat and durum wheat. Hemp fit right into the mix. After receiving approval from the state Department of Agriculture early in the year, homework began on how to grow the crop in North Dakota.

“It was exciting, but it was also nerve-racking,” Foy said. “There aren’t a lot of people out there right now if you have questions. No matter how many photos or videos you see, it’s always different when it comes to your farm.”

The farm purchased their seed from Legacy Hemp. Planting was completed June 1 using an air seeder. No pesticides are applied on the crop, which grows quickly, sprouting leaves and leaving little sunlight for weeds to grow.

“The plant grows so fast. It grew 2 feet in one week,” Foy said.

Harvest occurred on Oct. 7 as the crop reached heights of 5 to 7 feet. The process was similar to combining wheat.



Tracy Foy inspects a hemp plant as harvest begins near Pembina, N.D.

Due to regulations, anyone who works with hemp must go through a background check and be approved. Of the nearly 50 employees Warner Farms has at peak times, the farm selected only a handful to go through the permitting process.

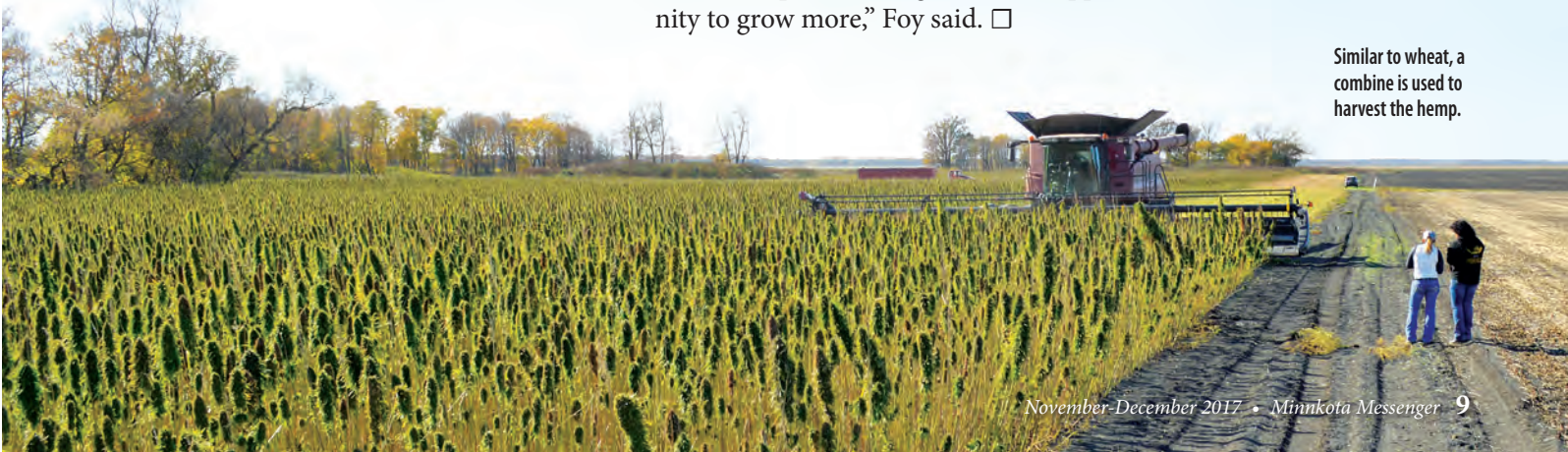
Future in ND

In 2017, North Dakota accepted 37 applications to grow industrial hemp across 3,064 acres. Five farms in Nodak Electric Cooperative’s service area, including Warner Farms, participated during the second year of the program. Nodak is a member distribution cooperative in the Minnkota Power Cooperative system.

At Warner Farms, the plan for 2018 is set: apply for more acres of hemp.

“We hope the state gives us the opportunity to grow more,” Foy said. □

Similar to wheat, a combine is used to harvest the hemp.





2018

JAN. 23, 24

DoubleTree Inn

825 E Beaton Dr
West Fargo, N.D.

JAN. 30

Eagles Club

1270 Neilson Ave SE
Bemidji, Minn.

JAN. 31

*Bigwood
Event Center*

925 Western Avenue
Fergus Falls, Minn.

FEB. 6, 7

*Minnkota Power
Cooperative Headquarters*

5301 32nd Ave. South
Grand Forks, N.D.

Electrical contractor continuing education sessions scheduled

Minnkota Power Cooperative and the associated systems will again provide an opportunity for area electricians to obtain credits for license renewal by attending one of the six continuing education classes being offered throughout Minnkota's service area.

This marks the 30th year of the successful program, which is aimed at providing area trade allies with the latest information on electrical code and practices.

This informative class, instructed by master electrician Dean Hunter, will cover the significant changes of the 2017 National Electrical Code with an emphasis on calculations, using the 2018 Midwestern Electrical Seminars Book. The seminars are approved in Minnesota, North Dakota and South Dakota for eight hours of continuing education credit necessary for renewing electrical licenses.

The electrical workshops will be held Jan. 23 and Jan. 24 at the DoubleTree Inn in West Fargo. The training then moves to the Eagles Club in Bemidji, Jan. 30, and at the Bigwood Event Center in Fergus Falls on Jan. 31. The workshops conclude with classes Feb. 6 and Feb. 7 at Minnkota Power Cooperative's headquarters in Grand Forks.

The registration fee is \$75 for eight code credits. Taking the class on multiple days will not qualify for 16 code credits. Registration must be done online at www.minnkota.com. Registration should be completed at least seven days prior to the start of the course.

For residential building contractor continuing education workshops, contact your local home builders association.

For more information about the program, call (701) 795-4292 or email questions to contractortraining@minnkota.com. □

Rate stability highlights 2018 budget



The Minnkota Power Cooperative board of directors voted to approve the 2018 budget and rates at its November meeting.

No increase in the wholesale rate components is included as part of the capital and operating budgets. A five-year forecast projects stable rates for the 11 member distribution cooperatives in the Minnkota system.

“Minnkota remains in solid financial condition,” said Mac McLennan, Minnkota president & CEO. “Our long-term focus is on maintaining competitive rates, while continuing to enhance the value we provide to the membership.”

Minnkota’s revenue requirement in 2018 is budgeted at \$416.7 million, a \$2.0 million increase from the 2017 budget. Expenses are budgeted at \$408.6 million, a \$3.2 million increase from the previous year’s budget.

The net margin is projected to be \$8.1 million before the recognition of \$2.1 million of deferred revenue to reach the cooperative’s target margin level of \$10.2 million. At the end of 2017, it is estimated that Minnkota will have \$16.8 million available as part of its Rural Utility Service (RUS)-approved revenue deferral plan.

“We are anticipating that energy sales

will rebound after consecutive years of mild weather, particularly in the winter,” McLennan said.

The 2018 capital budget is \$68.2 million, three-quarters of which will be invested in the power delivery system. That includes the upgrade of the 69-kilovolt (kV) transmission system to 115-kV to accommodate continued load growth in the Fargo area. The cooperative is also investing in its 69-kV system through projects to rebuild and reconductor line, along with continued efforts to install blink outage mitigation equipment.

As for power production, a major outage is scheduled during the fall on Unit 1 of the Milton R. Young Station. Located near Center, N.D., the Young Station is a two-unit coal-based facility that serves as the primary generation resource for the Minnkota members.

“Our long-term forecast shows that there are opportunities to make needed investments in our generation and transmission assets without impacting rates,” McLennan said. “Our mission remains to provide our members with the best energy value in the region.” □

Minnkota line crews work to reconductor a stretch of 69-kV transmission line between Warsaw, N.D., and Argyle, Minn. Improvements to the 69-kV system are a focus in the 2018 budget.



Dahl receives Pioneer award

Stacey Dahl, Minnkota external affairs and communications manager, is the first female recipient of the Pioneer Award from the Plains CO₂ Reduction (PCOR) Partnership. Dahl received the award, which recognizes pioneering efforts in carbon (CO₂) capture, utilization and storage, during PCOR's annual meeting Oct. 24 in Plano, Texas. Dahl was specifically recognized for her "invaluable contributions to the PCOR Partnership Technical Advisory Board and her efforts as co-leader of Project Tundra."

Project Tundra is being pursued by Minnkota and ALLETE of Dulu-

th, Minn. Modeled after the successful Petra Nova initiative in Texas, the vision for the project is to retrofit Unit 2 at the lignite coal-based Milton R. Young Station, located near Center, N.D., with technology that could capture up to 90 percent of its CO₂ emissions. The CO₂ would then be utilized for enhanced oil recovery (EOR) or permanent geologic storage.

Other Pioneer Award winners in 2017 were Scott Wehner, chief scientist at the Technical Center at Denbury Resources; and Bill Sawyer, manager of Clean Energy Solutions, Allete Clean Energy. □

Minnkota Messenger

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November-December 2017

Minnkota Messenger is published bimonthly to communicate Minnkota Power Cooperative's perspectives and concerns to its members, elected officials, employees and other business audiences.

For subscription or editorial inquiries, call (701) 795-4282 or send email to bfladhammer@minnkota.com.

Minnkota is a generation and transmission cooperative supplying wholesale electricity to 11 member-owner distribution cooperatives, three in eastern North Dakota and eight in northwestern Minnesota. Minnkota also serves as operating agent for the Northern Municipal Power Agency, an association of 12 municipal utilities in the same service region. Together, the Joint System serves more than 150,000 customers.

Visit Minnkota's website at www.minnkota.com.



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On the cover: Brothers Travis, Jesse and Adam Huot (top to bottom), along with their mother, Leslie, all work for different cooperatives in the Minnkota system.

Story on pages 2-3.