Red River Valley Cooperative Power Association
SPARKS
May/June 2019
Your Touchstone Energy® Cooperative

Project Tundra forges ahead

Project Partners:

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Carbon capture research moves forward at Milton R. Young Station

Jason Laumb admits it was a bit of a pipe dream when he and his colleagues started talking more seriously about carbon capture and storage technology for North Dakota power plants.

That was about eight years ago at a conference table inside the Energy and Environmental Research Center on the University of North Dakota campus. Laumb is a principal engineer and advanced energy systems group lead at EERC.

"It was like, my goodness, what's it going to take?" Laumb said. "We drew out on the board the different parts we would need to make it happen – capture, oil fields, storage availability. After that meeting we went our separate ways and started developing those parts we had identified during that meeting."

A few years later in 2016, bingo – Minnkota set its sights high by beginning the evaluation of a post-combustion carbon capture project at the Milton R. Young Station near Center, N.D. Known as Project Tundra, the venture is still in the research and feasibility stages, but it shows promise as a real-world solution to operating in a carbon-constrained world.

Building partnerships with players such as EERC and working to prioritize funding for advanced energy technologies, Minnkota hopes to bring Project Tundra to the finish line.

"It is feasible to operate," Laumb said of carbon capture and storage. "What it comes down to is dollars and cents. What's it going to cost to operate? What's it going to cost to build the capture facility?

"Everything has to pencil out. Everyone has to win along that value chain. And it has to make economic sense. The preliminary indications are that, so far, it's still making sense."

Preliminary numbers put the Tun-

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SPARKS

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Halstad, Minnesota (USPS 509-300)

Scheduled Board Meeting

Board meetings are held in Halstad at the cooperative office starting at 8:30 a.m. on the next-to-last Monday of each month.

Outages: 800-788-7784

Rich Whitcomb
CEO

The CEO's Report

Construction season under way

The construction season has certainly started off busy for your cooperative.

Among other areas, line crews are spending significant time in Hendrum converting three-phase overhead power line to underground line in preparation of the town's Highway 75 renovation and beautification project. Additionally, a section of the line feeding the town will be buried to maintain strong reliability.

The Minnesota Department of Transportation plans to begin work in Hendrum sometime in early June. Plans are for the project to be completed sometime this fall.

Change is sometimes necessary but usually hard. Your employees have handled these changes professionally and with a positive attitude. Their efforts are appreciated immensely.

Pole testing beginning soon

Some time ago, Red River Valley Co-op Power began a process of testing every pole within the service territory that is 15 years or older as a way of maintaining a strong distribution system.

This year, the final four townships will be inspected, bringing this phase of testing to completion. The process has been well worth it. There are about 26,000 poles in our territory; of those about 1,000 will have been replaced or removed for underground line when the final round of testing is completed later this year.

I know this isn't necessarily exciting stuff, but it is a very important process – one that has improved reliability to you. A side benefit to this project is all the poles are entered in GPS, which will help as we start digitally mapping the system for future engineering and outage management services.

Software conversion continues

In five short months, employees have started using modules of the new internal software system, including member care and billing, accounting, mobile workforce and SmartHub. The next planned software implementations include mapping/staking and outage management. As I've said before, these internal changes will really transform how we operate behind the scenes.

Change is sometimes necessary but usually hard. Your employees have handled these changes professionally and with a positive attitude. Their efforts are appreciated immensely. All employees, directors and members are part of something larger than each individual part – a cooperative that is not-for-profit and exists to serve its members.

As the convenience of electricity becomes an afterthought, I am reminded of the hard work it took to get the co-op to where it is today. That especially comes to mind every time a lineman is called out of a warm bed in the middle of the night to restore power during a storm.

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Wall units **lack efficiency**, as they only provide spot cooling and air can leak through window seals. Central air units are comparable to ASHPs in summer	IS IT EFFICIENT?	**Super energy efficient,** as the unit moves both cooled and heated air throughout the home
• Smaller upfront cost, but does not offer heating • No installation rebates offered	CAN I SAVE MONEY?	• **Large rebates** available for unit installation • **Sustained savings** through energy efficiency

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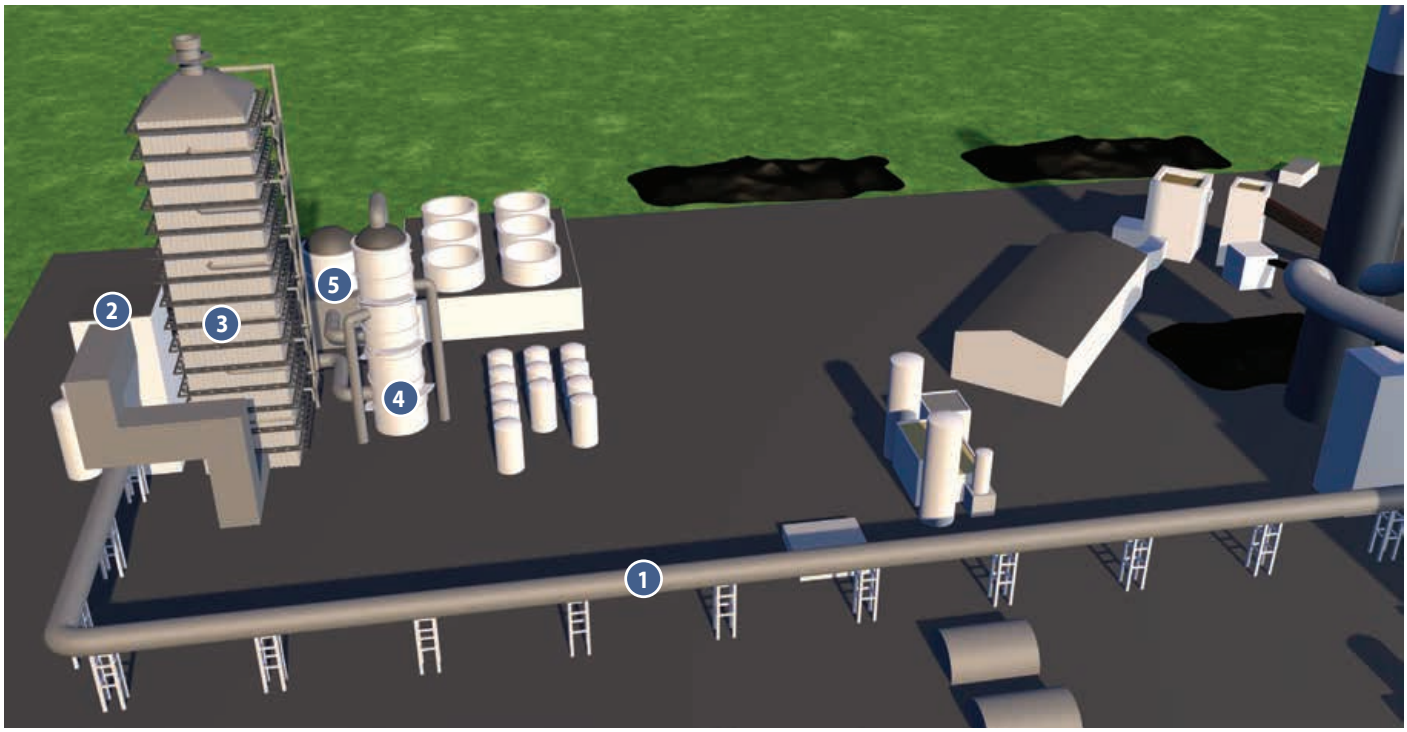

The carbon capture process

1) The flue gas is diverted from the power plant.
2) A scrubber cools the gas and removes impurities.
3) The gas flows into the bottom of a large absorber unit, which is filled with stainless steel structural packing. As the gas rises through the packing, an amine-based liquid solvent is released. The amine bonds with the CO_2 and removes it from the flue gas.
4) The solvent is sent to a regeneration unit. There, heat is used to separate the CO_2 from the liquid solvent, bringing the CO_2 back to a gaseous state.
5) The CO_2 is finally delivered to a compressor where it is compacted and prepared for transport via pipeline. The solvent, meanwhile, is routed back to the absorber unit where it is used again.

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dra price tag at more than $1 billion. Various tax credits from the state and the federal governments would help offset the steep cost. Laumb, who is leading the research in some of the Pre-FEED (front-ending engineering and design) work on the capture side of Project Tundra, says a better cost estimate will come later this year after the Pre-FEED work is done.

Jason Laumb, a principal engineer and advanced energy systems group lead at the Energy and Environmental Research Center at UND, says adding carbon capture to Unit 2 of Minnkota's Milton R. Young Station is technically feasible.

In addition to the EERC, other Minnkota partners on the project are the state of North Dakota Industrial Commission, the U.S. Department of Energy, engineers Burns and McDonnell, BNI Energy and Eagle Energy Partners.

Laumb is also the project manager for the $12.7 million Project Carbon initiative. Those research efforts involve Tundra and other carbon projects in the state.

"We are focusing on barriers," he said. "What are the final barriers that we need to overcome to implement CO_2 capture in the state of North Dakota on a plant that uses North Dakota lignite?"

Building the pilot

A pilot-scale test unit has been installed on Unit 2 at the Young Station. Testing will run during the summer. The pilot will include a sulfur dioxide scrubber, a CO_2 absorber and a regenerator. The test system, made of stainless steel components, will capture the equivalent of a ton of CO_2 per day.

With the project gaining traction, Minnkota hired one of the world's foremost experts in CO_2 technology and development in 2018. David Greeson joined the project team in October after previously serving as the vice president of development at Texas-based NRG Energy. In that role, he led the development of the Petra Nova initiative, which is currently the world's largest post-combustion CO_2 capture and enhanced oil recovery (EOR) project.

Petra Nova, located in Texas, is the

only post-combustion carbon capture facility operating in the United States. Petra Nova became operational Dec. 29, 2016, on budget and on schedule.

Project Tundra is modeled after Petra Nova, which is capturing about 90% of the CO_2 emitted from a 240-megawatt (MW) flue gas slipstream. The captured CO_2 is then injected into mature reservoirs to release more oil.

Project Tundra aims to build on the success of Petra Nova by applying a similar, but much larger, set of technologies to Unit 2 of the Young Station. Unit 2 is a 455-MW generation facility, which has previously been retrofitted with emissions control equipment that meets or exceeds all current air quality standards.

Storage or oil recovery?

Minnkota and the EERC are researching the possibility of both carbon capture plus storage and carbon capture plus EOR. The Young Station has enough space and the right geology near the plant underground to handle straight CO_2 storage.

The North Dakota CarbonSAFE initiative (Carbon Storage Assurance Facility Enterprise) is a research project investigating the feasibility of taking captured CO_2 emissions from coal-fired plants, compressing it and injecting it a mile deep underground into the Broom Creek Formation in Oliver and Mercer counties, preventing the CO_2 from being emitted into the atmosphere.

"If things look right and Project Tundra gets built, it will have an impact to the power industry, it will have an impact to all the power consumers Minnkota's cooperatives have and it will have an impact to Oliver County in North Dakota."

– Jason Laumb

"The only time they would use the Unit 2 chimney once carbon capture is installed is during startup and maybe some during shutdown, where there's an upset condition in the carbon capture. Basically, there wouldn't be a lot of flue gas coming out of Unit 2," Laumb said.

While Greeson heads the business development side of Project Tundra, other key players include Minnkota's Stacey Dahl (legislative affairs), Gerry Pfau (technical manager) and Shannon Mikula (legal).

"I'm just excited to be part of this," Laumb said. "If things look right and Project Tundra gets built, it will have an impact to the power industry, it will have an impact to all the power consumers Minnkota's cooperatives have and it will have an impact to Oliver County in North Dakota. There will be a regional impact during construction and then when it's done. If an EOR entity starts to come in and take CO_2, that will impact another part of North Dakota within that region."

Laumb said Project Tundra would be a major industry development if it moves forward after the FEED portion of the project. The earliest Tundra construction could start would be late 2021. If it happens, Project Tundra could add more than 2,000 jobs to the area.

"There are a lot of folks in the state of North Dakota who are looking at the lead that Minnkota Power is taking on Project Tundra, and it could be a template for other folks out there with power stations to replicate," he said.

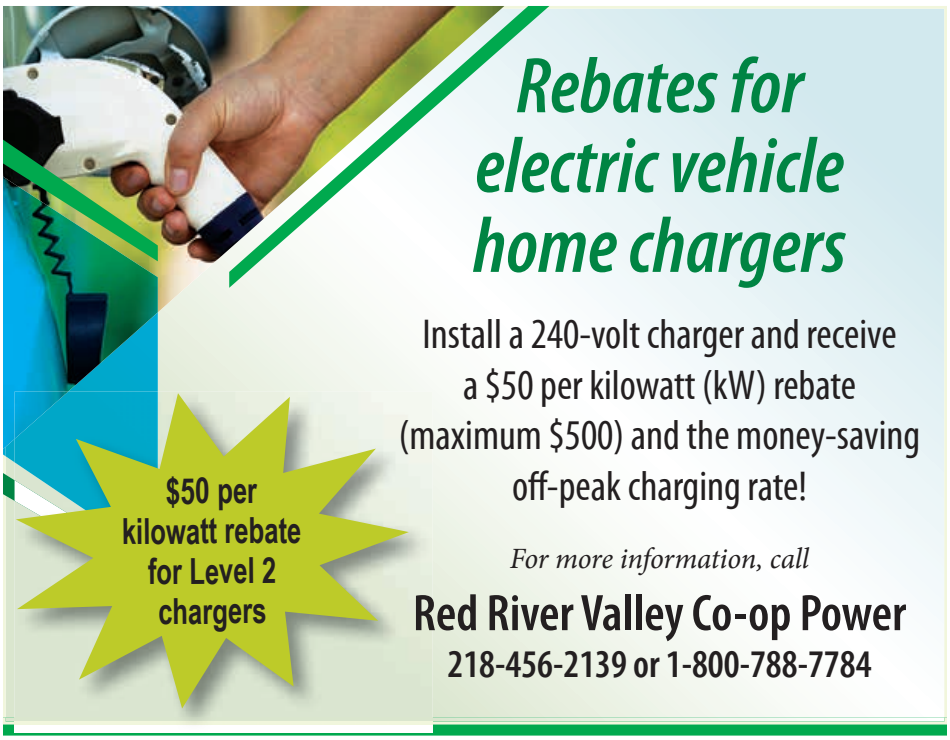
"You're not going to be able to do it everywhere. Not everyone has the geology. In North Dakota, we are very fortunate to have the geology for the storage side and also the oil fields for the enhanced oil recovery side. Those are two very important parts to have. You need to be able to do something with the CO_2 and it has to have some value to it."

Reprinted with permission from the March-April Minnkota Messenger

Summer ENERGY TIPS

It might be hot outside, but keep your cool with these simple energy-saving tips!

- If you use air conditioning, set your thermostat to as high as comfortable. The less the difference between the indoor and outdoor temperatures, the lower your cooling bill will be.
- Make sure your air conditioner or heat pump is in good working order. A tune-up by a professional can often lead to energy savings and extend the life of the system.
- Switch out incandescents to LEDs.
- Close shades and drapes during the day to help keep heat out during the summer.
- Run ceiling paddle fans on medium, blowing down in summer when you are in the room. The fans will help spread the cooled air more evenly throughout the home, allowing you to raise the temperature on the thermostat. The feeling of air moving across skin also helps cool.
- Make sure to clean and change HVAC filters per manufacturer's instructions.
- Air dry dishes instead of using the dishwasher's drying cycle.
- Use a microwave rather than a conventional oven when possible.
- If you have an older central air conditioner, consider switching to a new, more efficient model or a versatile air-source heat pump when the unit breaks down. Going from a SEER 10 model to a SEER 16 model can save about $65 per year in cooling costs. That's a savings of $325 in five short years. Great rebates are available for heat pumps that work like an AC in the summer but provide very efficient heating in the fall, winter and spring as well.



Myth vs Fact

When it comes to electricity, you have to know the facts. It might save your life one day. Here are some common electrical myths:

Once a line is down, it is dead.

1

The electric current does not always turn off when a power line is down. Even if lines do not show signs of life (arcing, smoking, popping), they can still hold dangerous electrical current. Always treat a downed wire as energized because there is no way for you to know by looking whether it is hot or not. Just always stay away, and keep others away.

All power lines are insulated.

2

Most power lines are actually not insulated. The coating on the lines is actually for weatherproofing and will not offer any protection from the electrical current. Even if a power line is insulated, it can crack due to weather, reducing its safety. No matter the case, it is never safe to touch a power line.

There is no need to worry about power lines when digging a hole.

3

Always call 811 before you dig to have a professional come to your home and locate buried public utility lines free of charge. No matter the size of a digging project, if you come into contact with a buried power line, you could be electrocuted or seriously injured. *

It is safe to work around a power line at home as long as direct contact is not made.

4

Always keep yourself and equipment at least 10 feet from power lines. This goes for ladders, pool skimmers, pruning poles and any other equipment. Always be aware of where power lines are so you do not risk electric shock. If you are trimming trees or attempting any do-it-yourself project near power lines, always call professionals for the job.

It is safe to remove the third prong from a plug.

5

The third prong is a safety feature designed to reduce the risk of shock or electrocution. That prong grounds the electrical current. If the outlet is only fit for a two prong plug, replace the outlet with a three-prong or a GFCI outlet.

Tires insulate my car from electrical dangers.

6

If a wire falls on your car while you are in it, the tires do not keep you from being injured by the electricity. The vehicle is the path to ground for the electrical current, so while you remain in the car, you are safe. The moment you step out of the car, you are the path to ground and in danger. If you find yourself in a situation where your car has hit a utility pole or power lines have fallen, stay in the car. Wait for a utility crew to cut the power. Only exit the car if it is on fire. Make sure to not touch the ground and the car at the same time. Jump from the car, keeping your feet together, and hop away from the scene.

* Calling 811 before every digging job gets underground utility power lines marked for free, up to your main meter. Underground power lines from the main meter inward, however, are the responsibility of the member. Homeowners need to call their local electrician or ask the contracted locating company to have their private lines marked.

RED RIVER VALLEY
CO-OP POWER

FREE RedHawks tickets!

Red River Valley Co-op Power is giving away 300 tickets to members to see the FM RedHawks battle the St. Paul Saints on Saturday, July 20.

RedHawks Tickets Entry Form

***Saturday, July 20, 2019* – 6 p.m.**

Newman Outdoor Field – Fargo, ND

Name_____ Account #_____

Address _____

Phone _____ No. of Tickets Requested* (4 max.)_____

Entries must be received by 4:30 p.m. Monday, July 8, to be entered in the drawing for tickets.

Please only request the number of tickets needed up to a maximum of four.

Mail form to: Red River Valley Co-op Power, P.O. Box 358, Halstad, MN 56548-0358
or email complete request to info@rrvcoop.com with "RedHawks" in the subject line.

To enter the drawing, fill out and mail the form, or go to **www.rrvcoop.com** to send us an email with "RedHawks" in the subject line.