Wiring up the Wild Wild West

Basin Electric builds up transmission system in oil country

By Erin Huntimer

It's the Wild West all over again, only this time instead of cowboys, horses and stage coaches, it's oil field workers, tanker trucks and drilling rigs. Western North Dakota and eastern Montana are home to a 21st century gold rush of sorts. More than 200 drilling rigs are scrambling in North Dakota alone to sink wells and fracture the rock, coaxing the Bakken to give up some of her black gold.

The influx of activity requires electricity – lots of electricity. Having power plants ready to generate the much-needed power is important, but equally so is a reliable transmission system to get the power where it needs to go.

Basin Electric is stepping in to build up the transmission system in oil country and working closely with member cooperatives and transmission partners to get it done efficiently.

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Basin Electric

A moving target

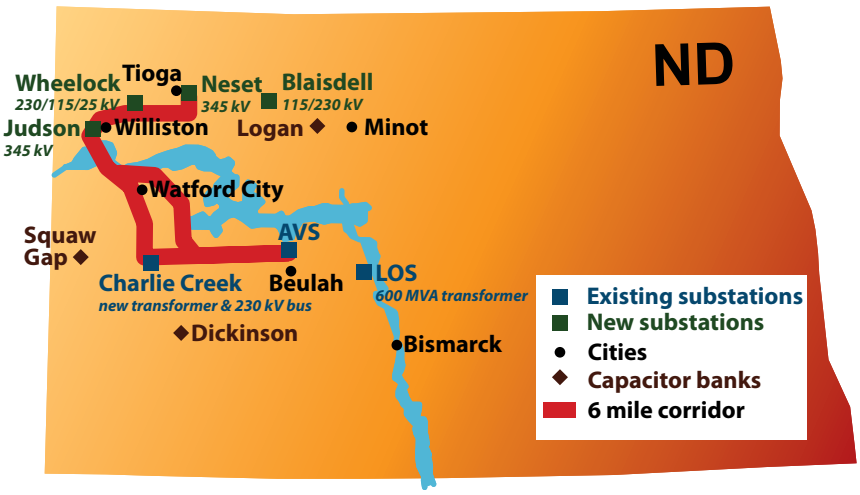
Mike Risan, Basin Electric senior vice president of Transmission, says Basin Electric and its partners in the Integrated System have been following the load growth in the area for several years. "One of the challenges is projecting the growth and identifying what transmission additions Basin Electric needs to make to provide power to our member cooperatives in that part of the system."

Basin Electric has already placed in service several projects, including the new Rhame Substation, the Rhame-to-Belfield 230-kilovolt (kV) line in southwest North Dakota in 2010, the Culbertson Generation Station in eastern Montana in 2011, the new Neset Substation and the Williston-to-Tioga 230-kV line in 2011. The Western Area Power Administration (Western), a partner in the Integrated System, is upgrading their Williston-to-Charlie Creek line from 115 kV to 230 kV. That project will be complete in the spring of 2012. With

Basin Electric's and Western's projects in place, the Integrated System will have both a 115- and a 230-kV loop around Lake Sakakawea.

The loop was a significant step forward in beefing up the system's reliability and load-serving capability, but it quickly became apparent it wouldn't be enough. Early in 2011, Basin Electric's marketing division released a new load study for the region and confirmed the load projections had increased significantly.

"Unfortunately, it's been a moving target, trending mostly up and at an increased rate," Risan says. "We now expect the loads in the area to double from current levels by 2021."



That outpaces even the newly enhanced system's ability to serve that load through the planning horizon. To get a handle on the next steps, Basin Electric conducted a new load-serving planning study. The study identified several more projects necessary to serve oil country, including the first 345-kV transmission line built by the cooperative in nearly three decades.

Big plans, tight schedules

Matthew Stoltz, Basin Electric manager of transmission services, says member cooperatives and neighboring utilities have about 800 megawatts of load in the area. "By 2021, we're anticipating 1,600 megawatts. That outpaces our ability to serve that load from a transmission perspective," he says.

Stoltz says the cooperative's long-term plan to meet that increment of growth is to construct a 345-kV line from the Antelope Valley Station, to Williston, to Tioga and have it in service by 2016. "That'll give us a large increase in our load-serving capacity," he says.

In the meantime, Basin Electric is working on several substation projects, and several member cooperatives are installing infrastructure, all designed to support load-service capability and voltage on the system. These projects don't require the extensive permitting that the 345-kV line does and can be completed in a much shorter time frame.

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All of the projects identified in the load-serving study are to be completed in a short time frame – by 2016 if all goes according to plan. The next four years will be intense for cooperative staff, and require careful planning and close coordination with member cooperatives and transmission neighbors.

A generation project has also been identified to help boost the reliability of the grid in the region. The cooperative is planning a 45-megawatt combustion turbine generator, the Pioneer Generation Station, near Williston. (See page 6 for more on this project.) It'll be equipped with a synchronous condenser that'll uncouple the turbine and generator, and allow the generator to support voltage on the grid without running the turbine. Construction is slated to begin in 2012, with commercial operation planned for 2013.

Antelope Valley Station-to-Neset 345-kV line

It's the biggest transmission line Basin Electric has built in decades. The planned 190-mile Antelope Valley-to-Neset line would be the first 345-kV line built by Basin Electric since the Antelope Valley-to-Charlie Creek line was completed in 1983.

Duey Marthaller, Basin Electric manager of civil engineering, says permitting, right-of-way and preliminary engineering and design are all under way.

Cris Miller, Basin Electric senior environmental project administrator, says an Environmental Impact Statement (EIS) is being conducted. The Rural Utilities Service (RUS) is the lead federal agency in preparing the EIS, with Western as a cooperating agency. In November, RUS held public scoping meetings in Williston and Killdeer to share information and receive comments and suggestions on the scope of the EIS in areas near and affected by the proposed project.

Charlie Creek's new transformer is loaded from the rail onto a truck at Belfield.

Basin Electric will need Certificates of Corridor and Route from the North Dakota Public Service Commission (PSC), Miller says. Basin Electric has filed two Letters of Intent with them.

Mountrail-Williams Electric Cooperative of Williston, ND, is currently in the permitting and engineering and design phase for their 115-kV Stateline Transmission Project. The line will go to a new natural gas processing plant adjacent to the planned Pioneer Generation Station. Both the Antelope Valley Station-to-Neset 345-kV and the Stateline 115-kV line connect with Western's Williston Substation.

Due to the congested land use in the area and both projects having common route locations, the 115-kV line will be double circuited on single-pole structures with Basin Electric's lines for the first three miles from the Williston Substation. "This effort will minimize the impacts to the landowners and to the environment. Both projects will see significant savings with this combined effort," Miller says.

"Mountrail-Williams needs that line in service by the end of 2012, so the three-mile double-circuited portion of the overall 190-mile project was carved out," Marthaller says. The PSC siting process began in November for the three-mile segment, with the filing of a Letter of Intent. The siting application is anticipated to be filed with the PSC in January 2012. Engineering for the steel poles to be used in the double-circuit line is complete, and bids for the structures will be awarded in February 2012.

According to Miller, the Antelope Valley Station-to-Neset 345-kV Transmission Project's siting permit application is anticipated to be submitted to the PSC in early 2013. County planning and zoning permits are also required, in addition to permits from the U.S. Forest Service, the U.S. Army Corps of Engineers and the North Dakota Department of Health.

Marthaller says staff is concentrating on preliminary routing, so right-of-way agents can conduct title searches. "They're contacting these landowners to request permission for us to do our surveys on the ground. That's well on its way."

Marthaller says the cooperative is working closely with the U.S. Forest Service, the U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service during the permitting process to make sure any environmental sensitivities are addressed.

Preliminary design work is also being done to specify the structures, foundation design and conductor type to be used on the 190-mile line. "They will be single-pole, steel structures similar to what we used on Rhame-Belfield and Williston-Tioga, only a little bigger for the higher voltage," he says. "We also anticipate using steel H-frame structures in the Badlands, an area where we can't get concrete trucks in. We have to direct-embed them in the ground."

Basin Electric's previous 345-kV lines had been constructed with steel lattice structures. While that structure design is still the most efficient use of steel, the single pole structures have a smaller footprint and are easier to install. "That technology has allowed us to have a lot less impact on the land we cross. That's huge. It's nice to work with the landowners where we don't impact what they're doing."

Basin Electric hopes to begin construction on the line in 2014 and have it in service in 2016.

The structures on the new 345-kilovolt (kV) line will be like the ones on the Williston-to-Tioga 230-kV line, shown here, only bigger.

Substation projects

The Charlie Creek Substation near Killdeer is getting a new transformer and a 230-kilovolt bus. The additions support Western's upgrade of their line that heads north out of the substation.

Pius Fischer and his staff of electrical engineers are deeply involved in the 345-kV project as well. Any time the line interfaces with an existing substation, or requires a new substation, the electrical and civil engineers are there to see it through from start to finish.

The starting point for the 345-kV line will be the terminal, where the line will leave the Antelope Valley Station. Next, the existing Charlie Creek Substation to the west will require two new 345-kV terminals to carry the power through. Fischer says this project will involve moving an existing microwave tower.

When the line reaches Williston, it'll pass through the planned Judson Substation. Lastly, a new 345-kV substation will need to be built near the existing 230-kV Neset Substation near Tioga.

In addition to the projects directly related to the 345-kV line, many others with shorter lead times are either already on the drawing boards or under construction. Those include:

- An addition to the Neset Substation. A breaker was added to provide Mountrail-Williams more reliable access to the grid. It was energized on Dec. 1, 2011.
- A new 230/115-kV substation near Blaisdell, ND, which is under construction. It's a joint project with Mountrail-Williams. The project will include two 115-kV capacitor banks. It's about 50-percent complete.
- A new 230/115/25-kV substation near Wheelock, ND. It's also a joint project with Mountrail-Williams. They'll own the 115/25-kV section of the substation, and Basin Electric will own and operate the 230-kV section. The ground is graded and ready for foundation work to begin.
- A new 600 megavolt-ampere (MVA) 345/230-kV transformer at the Leland Olds Station switchyard. It will replace an existing 250-MVA transformer and prevent overloading in the event an existing 500-MVA transformer fails. The project is slated for completion next fall.
- A new transformer and a 230-kV bus at Charlie Creek Substation. The new transformer will support Western's transmission line upgrade when it is energized in the summer of 2012.
- Capacitor banks to be added to the Squaw Gap, Dickinson and Logan substations in 2013. They help maintain voltage on the system.

Three other projects identified by the transmission study will be completed by member cooperatives.

- Central Power Electric Cooperative of Minot, ND: A new Minot Southwest 115/42-kV substation on the 115-kV Logan-to-Kenmare transmission line immediately southwest of Minot, ND.
- Central Power: An expansion of the existing Berthold Tap on the Logan-to-Kenmare 115-kV line near Berthold, ND.
- Burke-Divide Electric Cooperative of Columbus, ND: A new Kenaston Tap Station with two 115-kV capacitor banks added on the Logan-to-Kenmare line near Kenaston, ND.

Basin Electric Engineering and Construction will design and install all the interfaces to these member projects. This includes connection to Basin Electric's 115-kV transmission line and microwave radio system expansion for communications.

Fischer says Basin Electric's substation projects are in addition to his staff's responsibility to support new power plant construction and existing facility projects. "We don't just do substations. We do a lot of other work to support the power plants," he says.

For example, Fischer says they're supporting the commissioning of the Deer Creek Station near Elkton, SD, right now as well as supporting the western North Dakota transmission build-out.

When faced with conflicting demands, Fischer consults with Stoltz in the Transmission Department: Can any of the substation project schedules shift and still meet member needs? If schedules must stay in place, consultants may be brought in to help get the projects completed on schedule.

"Sometimes it's a real balancing act," he says. "Keeping up with the rapidly increasing member load growth, it does feel like the wild, wild west at times."