



# POWERING THROUGH

## *Neither Weather, Nor Terrain, Nor Bears Can Thwart New Northwest Transmission Line*

### BACKGROUND

Burns & McDonnell partnered with Valard Construction to design and build the Northwest Transmission Line (NTL). It's a 213-mile, 287-kV transmission project for BC Hydro to deliver electricity to an area in northwestern British Columbia, Canada, that had not been connected to the utility's grid. Extending from the Skeena Substation near Terrace to Bob Quinn Lake, the project was completed in July 2014 and was built to provide power to mining facilities and to promote development of clean, renewable energy generation projects in the region.

### CHALLENGES

The project involved installing the line in a remote location, through rough terrain and often in difficult weather conditions. The majority of the route lacked cellphone service, making communications a challenge. Rugged terrain and harsh weather conditions spurred safety concerns and required modification of construction plans. An intricate procurement effort involved close coordination of deliveries from across the globe. Mountain goats, bears and toad migrations raised environmental concerns. Special design and construction considerations were made at multiple river crossings and in avalanche zones.

Along the route, workers dealt with visibility issues brought on by rain and fog. Due to the rugged terrain and access issues, much of the equipment was installed using helicopters that were frequently unable to operate due to adverse weather conditions.

"This area is a temperate rainforest, so it was always drizzly and foggy," says Todd Hunt, Burns & McDonnell's construction manager for the project. "We had to adjust the schedule to accommodate visibility for the helicopters installing the towers."

Heavy rains and significant snowfall brought the threat of landslides and avalanches. A landslide early in the project closed the only highway leading to the job site for several weeks.

## SOLUTIONS

Harsh weather conditions meant adding time to delivery schedules. Some days were dedicated to clearing snow off roads to allow access to the route.

Due to the route's remote location, work camps were established to accommodate more than 400 field personnel. The camps included dorm-style rooms, a cafeteria and an entertainment area.

"Living in a camp has its challenges," says Andy Jarvis, vice president in Burns & McDonnell's Transmission & Distribution Group, who led the project's design efforts. "But the nearest hotels required six- to seven-hour drives to the job sites each day, so alternative lodging options were necessary."

A 21-day work schedule, with seven days off between stints, provided workers some downtime away from the camps.

With cell service unavailable along most of the route, satellite telephones were used for project support and emergency situations. Limited Internet access was also satellite-based.

The team used tablets to transmit updated drawings to the field, providing significant costs savings compared with printing and shipping to remote locations.

Items that had to be brought in — construction materials such as towers from India, hardware from Italy, conductor from the U.S., and fiber-optic wire from South Korea — were delivered initially to a central material yard in Terrace, where they could be sorted for distribution. Laydown yards along the route allowed for further receiving, sorting and transferring of materials to sites, according to a detailed and coordinated plans.

"It took a lot of effort by our procurement and expediting team to make it all happen without any adverse impacts to the construction schedule," Jarvis says.

Because the project required long spans to make major river crossings, the team coordinated closely with multiple permitting agencies to meet required clearances and other crossing

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requirements. Because the area is a popular for heli-skiing, red and white aerial marker balls were placed on some major crossings and long spans to help prevent aircraft from colliding with the lines.

Special design considerations were made to fortify equipment in areas susceptible to high winds and avalanches. Avalanche diversion berms were built around towers, and conductors were designed to break away from towers when loads from avalanches become too heavy.

"In those cases, it makes sense to sacrifice the conductor as it takes less time and cost to reinstall the conductor than to rebuild the towers," Jarvis says.

Designers also followed the most stringent earthquake guidelines during design, calling for use of alternate foundations where necessary to avoid damage to the structures due to shifts in the earth.



The project schedule was adapted to account for several environmental concerns along the route. Construction was restricted for months in mountain goat ranges. Bridges were built over fish-bearing streams. Tower locations were modified to avoid disrupting the Western toad migration. Disturbances to wetland areas were mitigated. Surveys of bear dens were conducted to assess the presence of grizzly bears. Workers carried bear repellent and "bear bangers" — firecracker-like noise makers — that helped repel the beasts.

As the construction schedule was limited due to weather conditions and environmental concerns, the project team increased the workforce during periods when construction was more favorable to maximize production.

"There were nearly 18 months of delays that we mitigated back to four and a half months by using more crews, more helicopters, more staff and creative procurement strategies to help move the project through quicker," says Todd Hunt, Burns & McDonnell's construction manager for the project.

Because the project crossed eight First Nations territories and sovereign land of Nisga'a Nation, the project team met with their representatives early in the project development process to receive feedback on the project and to help identify opportunities for their members to become involved. Members handled much of the work clearing right-of-way, building access roads and conducting environmental monitoring.

## OUTCOME

This first major international undertaking by Burns & McDonnell's Transmission & Distribution Group has led to additional opportunities in Canada. The firm has established a regional office in Calgary, Alberta, to accommodate the growth.

"Through the Northwest Transmission Line project, we've shown we have the capabilities to take on a project of this size and with this level of difficulty, which has led to opportunities we may not have had without it," Jarvis says.

For BC Hydro, the project has opened the door to growth in the northern region of the province. The project delivers power that supports the area's growing mining industries, and has led to projects now under development. The mining industry has estimated the project has the potential to attract \$15 billion in new investment and create more than 10,000 new jobs in the next few decades.

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