

PROJECT PROFILE / **PUMPED STORAGE HYDRO ELECTRICAL AND CONTROLS UPGRADE**

# WHEN OLD MEETS NEW: MODERNIZING A COLORADO HYDROELECTRIC PLANT

When Xcel Energy's Cabin Creek Generating Station came online more than 50 years ago, the hydroelectric plant was a marvel of engineering nestled in the Rocky Mountains more than 10,000 feet above sea level. The facility remains critical to Colorado's electric grid today, driving an innovative face-lift to allow operations to continue reliably for decades to come.



# INNOVATIVE THINKING REDUCES TIME AND IMPROVES EFFICIENCY

A modernization project overcomes a unique alpine location to deliver 21st century renovation.

## PROJECT STATS

### CLIENT

Xcel Energy

### LOCATION

Georgetown, Colorado

### COMPLETION DATE

2022

# 300

**MW PUMPED STORAGE  
HYDROELECTRIC  
PLANT UPGRADE**

A SITE

# 10,018

**FEET ABOVE SEA LEVEL**

**TYPICAL TRANSFORMER  
DELIVERY LEAD TIME  
REDUCED BY**

# 26

**WEEKS**

For more than 50 years, Xcel Energy's Cabin Creek Generating Station has played a critical role in Colorado's electric grid. The 300-megawatt (MW) pumped storage hydroelectric plant — built into the Rocky Mountains at 10,018 feet above sea level — can act similarly to battery storage, reacting quickly to situations on the grid. This makes Cabin Creek particularly vital to the overall grid's operation. However, many of the plant's components and protective devices were out-of-date and incapable of integrating with modern technology.

As Xcel Energy embarked on an extensive modernizing renovation, including replacing the plant's two giant turbines, our team was tasked with upgrading the electrical infrastructure within the plant, including the generator, transformer and switchgear protective relays, as well as the generator step-up (GSU) transformers, auxiliary transformer and exciters.

We also designed a complete overhaul and upgrade to the existing outdated control system, including the conversion of over 300 electromechanical logic relays to digital logic via the new Allen Bradley ControlLogix PLC platform. An entirely new control network architecture was developed for the plant that also included more robust networking equipment and replacement of the plant's governor and balance of plant (BOP) PLCs. The new system provides better feedback and troubleshooting capabilities, greatly enhancing the ability of Xcel Energy to operate the facility reliably.

The site itself also presented some unique challenges. The repairs and upgrades would have to be integrated within the plant's existing facility and space constraints, while also managing the site's unique alpine location and logistics planning for delivery of the 60-ton transformers along the narrow mountain pass.





To fit the new transformers within the plant's existing space, our team relied on an innovative strategy using laser scanners to create a highly accurate 3D model of the site. By working closely with the manufacturer, our team was able to precisely determine that the new transformers would fit into the tight confines of the existing transformer yard before the units were constructed, eliminating significant project risk for the client. The timeline was reduced even further by expediting the delivery of the transformers, which arrived on-site about 26 weeks after the contract was awarded, through design collaboration with the transformer manufacturer, significantly reducing the typical 52-week lead time.

Our project planning process identified key electrical and control systems for replacement during the common outage, creating a clear and detailed scope of work that kept construction moving efficiently.

We also conducted electrical system studies, including short circuit, protective device coordination and arc flash studies, and provided on-site construction and technical support during planned outages for the major equipment replacements.

During the modernization project, Xcel Energy also focused on enhancing the facility's safety. While the existing medium voltage switchgear was kept,

it was equipped with an arc flash detection system designed to quickly trip offline and protect personnel during an electrical event.

While the project is still underway — the final turbine replacement won't be complete until 2022— many of the electrical infrastructure upgrades are already up and running. Through innovative thinking, our team was able to enhance the existing facility to not only meet today's electrical standards, but also to be ready for another 50 years of reliable service to the ratepayers of Colorado.



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