

CASE STUDY

Strategic Solutions Drive Enhanced Power Reliability at Mississippi River Crossing

To boost power supply reliability for one of its utility co-ops in Missouri, Wabash Valley Power Alliance constructed several substations and transmission lines, including a complex river crossing. Through meticulous planning and collaboration, the project team addressed environmental challenges, coordinated with large industrial clients and enhanced infrastructure while minimizing impact.



Challenge

The Limestone Ridge project was a significant endeavor to enhance electrical infrastructure reliability for Citizens Electric Corporation, a member of the Wabash Valley Power Alliance (WVPA). This project involved constructing two greenfield substations, one brownfield substation and several transmission lines, including a transmission line crossing the Mississippi River.

The primary objective of the Limestone Ridge project was to provide a more reliable power supply. The project faced challenges, especially with supply chain procurement, permitting and environmental compliance, and electrical system supply constraints, all of which required meticulous planning and execution to achieve successful outcomes.

Project Stats

Client

Wabash Valley Power Alliance

Location

Perry and Cape Girardeau counties, Missouri

7

miles of transmission line

12

days of helicopter operations

3

new or upgraded substations

The project required multiple federal and state permits, especially for the greenfield substations located in environmentally sensitive areas. The construction of new transmission lines, including a river crossing, further complicated the permitting process. Adherence to stringent environmental regulations and mitigation of potential ecological impacts were paramount.

The project team obtained the necessary permits for the Wittenberg Substation and the Grand Tower-to-Wittenberg transmission line — both of which involved greenfield sites that required bat clearance. The remote location involved substantial civil work, including removing a hilltop and constructing an access road. Additionally, the project required coordination with various regulatory bodies to facilitate compliance with environmental standards.

Installing transmission lines across the Mississippi River required coordination with the Coast Guard and adherence to strict safety protocols.

Solution

The project team successfully implemented a series of strategic solutions, including the design and construction of both greenfield and brownfield substations. At the Trail of Tears Expansion Substation, innovative transmission structures were used to manage 161-kV transmission lines within a restricted space, allowing for both horizontal and vertical entries to the substation. The Wittenberg Substation was upgraded with a 138-kV four-breaker ring bus, creating an additional transmission path for customers in the Jackson, Missouri area, thereby enhancing reliability and operational flexibility.

To strengthen the region's electrical infrastructure, the Trail of Tears Expansion Substation was completed in October 2023, featuring a 161-kV three-bay breaker-and-a-half configuration. The project team also managed the relocation of a 1-mile segment of 69-kV transmission line with distribution underbuild, along with the phased completion of two 161-kV transmission lines.

In March 2024, a third substation was completed, exemplifying WVPA's commitment to enhancing reliability. Initially configured as a single 161-kV line position straight bus, the substation was upgraded to a two 161-kV line position, four-breaker straight bus.

The final phase, completed in March 2024, significantly improves power supply reliability for the area's homes, businesses and industrial facilities while providing robust power supply to support utility operations. Supply chain management strategies were essential to maintaining the project schedule, using alternative sourcing measures to address long lead times.

The project also involved a complex 138-kV transmission line crossing over the Mississippi River, which required stringent environmental and

safety measures. The use of concrete poles in the flood plain provided the necessary stability while reducing the environmental footprint. Helicopter operations were crucial for line installations, requiring close coordination with the Coast Guard to halt river traffic and implement safety protocols during construction.

Throughout the project, safety was a top priority. The team conducted thorough pre-task analysis, particularly during helicopter operations. Planning from start to finish focused on reducing site congestion, managing access to work locations and coordinating highway crossings, even on a small two-lane state highway. Unique safety challenges included traffic control during line crossings over roads and railroads, conducting helicopter operations, working with energized lines to maintain power to customers, and navigating congested areas.

Environmental compliance was another critical focus. The project began with the creation of a permit matrix, outlining all potential permits and regulations, including time frames for obtaining permits and conducting agency consultations. This matrix was regularly updated at major project milestones. Comprehensive environmental studies were conducted to identify potential impacts and develop effective mitigation strategies. The civil work at the Wittenberg Substation, located within a 5-mile radius of Indiana bat habitat, involved removing a hilltop to create a stable foundation and constructing an access road. WVPA purchased mitigation credits to meet regulatory requirements and minimize environmental impact for the federally endangered species.

All necessary environmental permits, including those for the river crossing and substation work, were obtained ahead of schedule. Coordination with regulatory agencies prioritized compliance with National Pollutant Discharge Elimination System stormwater permit conditions. The project also required compliance with the Endangered Species Act Section 7, leading to a biological assessment conducted by Burns & McDonnell. The U.S. Fish and Wildlife Service (USFWS) issued a biological opinion to evaluate potential effects on several impacted species, including Indiana bats. The expedited review by the USFWS and the U.S. Army Corps of Engineers allowed for timely tree clearing, preventing project delays.

Early and frequent engagement with regulatory agencies and other interested parties was essential to the project's success. This collaborative approach facilitated a smoother permitting process and allowed the project team to proactively address concerns, incorporating feedback into the planning and execution phases.

Results

The WVPA Limestone Ridge project achieved enhanced electrical infrastructure reliability while adhering to stringent environmental regulations. The construction of the substations and transmission lines, including the complex Mississippi River crossing, was completed efficiently and with minimal environmental disruptions.



The project successfully balanced infrastructure development with environmental stewardship. Effective communication and a collaborative approach by the project team facilitated smoother permitting processes, minimized delays, and facilitated compliance with all regulatory requirements.

There were no injuries throughout construction. Strict adherence to safety protocols, particularly during the helicopter operations for the river crossing, helped prioritize the well-being of all personnel involved. The Limestone Ridge project highlighted the importance of careful planning and collaboration to overcome complex challenges. These efforts minimized the impact on utility clients while enhancing grid reliability for the future.

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