



## Project Summary

### Organization:

PowerChina Huadong Engineering Corporation

### Solution:

Power Generation

### Location:

Dali Prefecture, Yunnan, China

### Project Objectives:

- Provide preliminary and detailed design, construction, and handover of China's 1,800-megawatt Longkaikou Hydropower Station.
- Create a 3D digital environment fully customized for PHEC.
- Implement a collaborative BIM approach to streamline workflows and improve design coordination among the more than 20 project disciplines.

### Products Used:

AECOsim Building Designer, AssetWise, Bentley Raceway and Cable Management, ContextCapture, Descartes, MicroStation, Navigator, OpenRoads, ProjectWise, Bentley Map

## Fast Facts

- The Longkaikou Hydropower Station consists of a 116-meter-high concrete dam and five turbine generators and includes irrigation, water supply, and flood control structures.
- PHEC generated and analyzed geotechnical, civil, and structural plant models to optimize design and construction with Bentley applications.

## ROI

- Using a BIM solution saved USD 300 million and enabled the project to be delivered 10 months ahead of schedule.
- Performing clash analysis lowered equipment collision rates by 95 percent and reduced on-site design changes by 80 percent.

# Comprehensive 3D Digital Design on a China Hydropower Project Saves USD 300 Million

Using Bentley BIM Technology Delivered Project 10 Months Ahead of Schedule

## A BIM Initiative

With hydropower at the forefront of China's current aggressive targets to establish green energy consumption, Longkaikou Hydropower Co. Ltd. of China Huaneng Group commissioned the development of the Longkaikou Hydropower Station in China's Yunnan Province. The sixth power station located along the Jinsha River, the Longkaikou plant is a 116-meter-high concrete gravity dam with five 360-megawatt turbine generators and a maximum installed capacity of 1,800 megawatts. Mainly functioning as a power generation station, it also includes structures for irrigation, water supply, and flood control. PowerChina Huadong Engineering Corporation (PHEC) was retained to design, build, and deliver the CNY 8.9 billion project.

Specializing predominantly in hydropower and new energy projects, PHEC is committed to development, research, and technology innovation for lifecycle management. Consistent with that vision, PHEC worked with Bentley to create a 3D collaborative design environment as part of the Longkaikou project. This environment is fully customized to meet the needs of the organization and was implemented to deliver the hydropower station. Faced with complex topography challenges and a project requiring more than 20 different engineering disciplines, PHEC pioneered a digital BIM solution from preliminary design through construction and operation to deliver the hydropower plant, integrating civil, and plant design and analysis processes.

## Integrated Technology Delivers Benefits

The complex topography and dam foundation with deep grooves posed rare engineering challenges with no design precedent in the hydropower industry and required a collaborative, innovative approach to keep construction on schedule. PHEC modeled and compared numerous design and construction scenarios from surveyed terrain data to find a viable solution and avoid changes and delays during the construction phase. Using Bentley Map and Descartes, the team simulated terrain, riverbed, and physical geology conditions, and analyzed different options to determine the optimal location and routing of the dam. PHEC used MicroStation and

OpenRoads to design the dam foundation's excavation surface and deep groove imperfections and generated geological models with AECOsim Building Designer to save CNY 194 million in engineering costs. With Navigator, the construction team had onsite access to these geological designs to effectively guide construction work, eliminate errors, and streamline delivery costs.

In addition to the dam layout, AECOsim satisfied multiple system designs, including infrastructure for flood discharge and energy dissipation and plant water inlet. Using Bentley's integrated 3D design applications, the team conducted clash analysis, which improved design quality, lowered the rate of equipment collisions by 95 percent, and reduced onsite design changes by 80 percent. With parametric and finite element modeling capabilities, the technology enabled the team to avoid repetition and rework, reducing design time for some equipment drawings by 50 percent. The interoperability of MicroStation and Bentley's applications facilitated a collaborative universal modeling approach. PHEC delivered the hydropower plant 10 months in advance, with economic benefits reaching USD 300 million, by implementing Bentley's comprehensive, integrated 3D digital design solution.



PowerChina Huadong Engineering Corporation used Bentley Raceway and Cable Management for layout, routing, and material estimating.

*“The three-dimensional digital design solution of Longkaikou Hydropower Station is the result of personalized customization on Bentley’s software platform formed by ECADI in accordance with local specifications and the actual situation in China”*

*– Wang Jinfeng,  
IT Director, East China Design  
& Research Institute Co., Ltd.  
of China Power Construction  
Group Corporation*

**Find out about Bentley  
at: [www.bentley.com](http://www.bentley.com)**

**Contact Bentley**  
1-800-BENTLEY (1-800-236-8539)  
Outside the US +1 610-458-5000

**Global Office Listings**  
[www.bentley.com/contact](http://www.bentley.com/contact)

### **ProjectWise® Provides Uniform Management Standard**

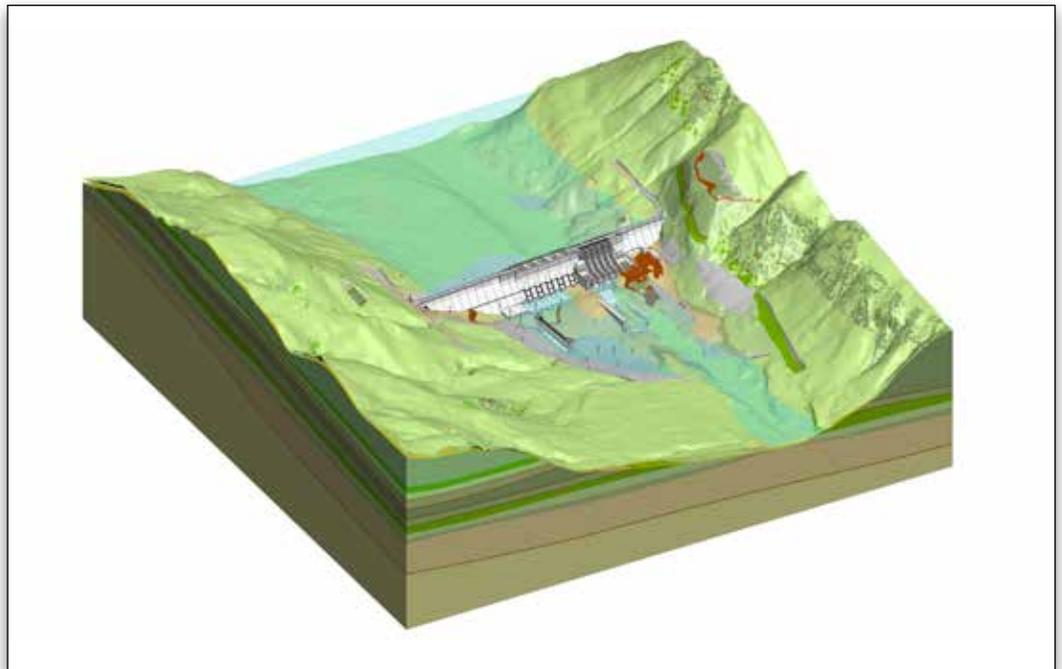
With numerous engineering disciplines working simultaneously, ranging from geological to structural and electrical, PHEC required a common platform to share and access accurate data and information throughout the entire project lifecycle. Based on ProjectWise, the company built a remote synergetic design interface, safely accessible by all project participants. This interface facilitated efficient information management and provided a collaborative environment, enabling a mutual view of engineering models and optimizing design reviews and approvals. In the past, it took more than one month to get countersignatures to approve plant layout drawings; however, PHEC streamlined workflows and improved information mobility among the different disciplines by working in a single platform, which enhanced design efficiency by more than 40 percent.

Furthermore, based on the management environment created for this project, PHEC built its own standard for future

projects. Using ProjectWise, the company managed configuration based on similarity of projects to automatically align workflows, optimizing and accelerating real-time information sharing, for successful collaborative BIM standards.

### **Success Drives BIM in China’s Hydropower Industry**

With a complete set of 3D digital design technical standards, future hydropower projects now have a reference for implementing integrated 3D modeling using Bentley applications and driving collaborative BIM as an industry standard. The concept of lifecycle management and digital transfer of project information through 3D models provides a new management strategy for digital operation and maintenance of hydropower stations in China. According to Wang Jinfeng, IT Director of East China Design and Research Institute Co., Ltd. of China Power Construction Group Corporation, “Bentley provides a strong impetus for whole lifecycle operation of hydropower plants.”



*Bentley design applications were used to create a 3D digital design from conceptual design through construction.*