Utilities

Reality Modeling for Going Digital Strategy
Reality modeling provides accurate, affordable, real-world digital context to utilities

Stakeholders in utilities require the most up-to-date site information throughout their assets’ lifecycles allowing them to make informed decisions. With reality modeling technologies and solutions, utilities owners/operators can monitor onsite asset conditions while reducing costs, saving time, and lowering risks of injuries to workers.

Reality modeling is the process of capturing existing site conditions using photographs and point clouds to create high-fidelity, georeferenced, 3D models. Assets can be easily documented and 3D-registered infrastructure can be linked to operations and engineering data. These capabilities provide a complete, up-to-date representation of the asset as a single, digital source, which can be easily shared and streamed in other software applications for better asset management. All involved parties—from remotely located stakeholders, to engineers in the office, to workers in the field—can be connected and assist in the asset design, construction, operation, and inspection workflows.

Reality modeling enables users to design in digital context
- Understand existing conditions
- Save design time and shorten project schedules
- Carry out construction simulations to evaluate potential impacts
- Uncover financial implications early
- Optimize information sharing
- Improve collaborative design workflow

Reality modeling offers continuous survey capabilities during construction
- Ease collaboration between stakeholders
- Give accurate global perspectives of the job site
- Provide up-to-date construction documentation
- Allow the calculation of cut/fill quantities as often as necessary
- Improve safety
- Lower cost of as-built survey

Reality modeling helps utilities optimize maintenance and service
- Ensure workers have access to real-world digital context of their assets
- Improve safety
- Ease collaboration between stakeholders
- Lower cost of asset inspection
- Develop more repeatable inspection processes
- Provide easier access to hard-to-inspect locations

Reality modeling is going mainstream and has been used in the following utilities projects.
Pacific Gas and Electric Company
San Francisco, California, United States

Reality Modeling in Bentley Substation

Pacific Gas and Electric Company (PG&E) owns and operates more than 1,000 transmission and distribution substations, spanning two-thirds of California. With 95 percent of its USD 1 billion substation budget spent on brownfield locations, PG&E had been manually converting existing 2D drawings to 3D models for use on retrofit projects. That time-consuming process has been replaced by reality modeling based on image capture and processing.

The Substation Engineering Department has reduced the cost of substation modeling by 50 percent with the use of UAV imagery and processing with ContextCapture. Taking one-third less time than previously used methods to create, the highly accurate 3D reality models are referenced into Bentley Substation to model the existing substation in 3D for use in substation design. Using ProjectWise to share the models among design teams, PG&E now has one source of information in a centralized location.

Project Playbook: Descartes, Bentley Substation, ContextCapture, MicroStation, ProjectWise

"Having a complete 3D model at the time of constructability review allows us to measure electrical and physical clearance in real time, which helps eliminate costly conflicts during construction phases. With today’s increasing substation complexity and decreasing substation footprint, having a 3D model is a must."

— Ralph Hansen, Construction Supervisor, Pacific Gas and Electric Company
Bentley’s digital solution has been fully applied across disciplines and stages of the Miaoshan 220-kilovolt Secondary Transformer Substation project, bringing both social and economic benefits. The solution is a significant improvement to design efficiency and quality, and provides strong technical support for construction, operation, and maintenance.

— Wang Wei, Digital Center Team Leader, Hubei Electric Engineering Corporation

Hubei Electric Engineering Corporation (HEEC), a subsidiary of POWERCHINA Limited, designed a CNY 172 million indoor secondary transformer station to meet Year 2030 energy demands in excess of 400,000 kilovolts (kV) in the Wuhan East Lake High Tech Zone, Hubei province, China. The scope of the work involved the layout and design of a three-story facility housing three sets of 240-megavolt ampere transformers and providing 220kV, 110kV, and 10kV outgoing lines that consider the constraints of the dense urban location.

HEEC designed the substation and facilitated project collaboration using Bentley Substation, AECOsim Building Designer, Bentley Raceway and Cable Management, ContextCapture, ProStructures, and ProjectWise. ProjectWise allowed the multi-discipline team to work in a unified model space, increasing efficiency and helping to solve clashes in the complex indoor layout. Avoiding rework in at least 10 instances saved CNY 2 million. When completed, this substation will optimize the High Tech Zone’s power grid and improve the quality of life for more than 400,000 people.

**Project Playbook:** ContextCapture, Bentley Substation, AECOsim Building Designer, Bentley Raceway and Cable Management, ProStructures, and ProjectWise
Hubei Electric Power Survey and Design Institute
Macheng, Hubei, China

Macheng Caijiazhai Wind Farm Project

The CNY 435 million Macheng Caijiazhai Wind Farm Project in China’s Hubei province is generating 49.5 of the planned 80 megawatt capacity for supplying power to Macheng City. As the general contractor, Hubei Electric Power Survey and Design Institute was responsible for designing and constructing the wind generating sets, pylons and bases, booster station, and associated equipment.

Low mountain ridges and steep slopes posed a challenge for locating the wind generating sets, designing the booster station access road, and transporting large-scale equipment. The institute used Bentley technology to create a landform reality model to resolve locations and routes. Hybrid models combining the reality model and 3D design models of the project informed construction, saving more than CNY 200,000 and shortening the construction period by 20 days.

Project Playbook: AECOsim Building Designer, Bentley Substation, ContextCapture, AssetWise ALIM, LumenRT, OpenRoads, ProjectWise, ProStructures

We used the hybrid model consisting of landform reality model and 3D models of booster station and fan to demonstrate the final panorama. In conjunction with the decomposition of the model’s details and simulation of construction and transportation, we enabled the management team to have a full understanding of the whole project’s construction process before starting the project’s construction.

– Hubei Electric Power Survey and Design Institute
About Bentley Systems
Bentley Systems is a global leader in providing engineers, architects, geospatial professionals, constructors, and owner-operators with comprehensive software solutions for advancing the design, construction, and operations of infrastructure. Bentley users leverage information mobility across disciplines and throughout the infrastructure lifecycle to deliver better-performing projects and assets. Bentley solutions encompass MicroStation applications for information modeling, ProjectWise collaboration services to deliver integrated projects, and AssetWise operations services to achieve intelligent infrastructure – complemented by comprehensive managed services offered through customized Success Plans.

Founded in 1984, Bentley has more than 3,500 colleagues in over 50 countries, and is on track to surpass an annual revenue run rate of $700 million during 2018. Since 2012, Bentley has invested more than $1 billion in research, development, and acquisitions.

For additional information, visit [www.bentley.com](http://www.bentley.com).

About ContextCapture
ContextCapture is Bentley’s reality modeling software that can quickly produce 3D models of existing conditions for infrastructure projects of all types, derived from simple photographs and/or point cloud. Without the need for expensive or specialized equipment, ContextCapture enables users to quickly create and use these highly detailed 3D engineering-ready reality meshes to provide precise real-world context for design, construction, and operations decisions throughout the lifecycle of projects. Project teams can easily and consistently share reality modeling information, consumable and accessible, on desktop and mobile devices, in many formats, including native use within MicroStation for any engineering, operations, maintenance, or GIS workflow.

For additional information, visit [www.bentley.com/ContextCapture](http://www.bentley.com/ContextCapture).