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Top 10 Design Practices to Accelerate Energy Project Delivery

Introduction

In transitioning from fossil fuel consumption to clean energy, infrastructure projects are accelerating to move toward a net-zero future. Infrastructure projects are becoming more complex as teams face rising costs, challenging site locations, unique equipment, specialized building systems, multifaceted programs, multiple shareholders, and accelerated schedules.

The acceleration also requires completing these projects on time, if not sooner, and as safely as possible. However, it is difficult to do with fewer resources, less time, and a backlog of existing work. Organizations are trying to do more against a backdrop of ever-changing regulations, environmental concerns, worker welfare, and health and safety. Projects are stalled due to a lack of documentation, data held in silos, the move to digital deliverables, and a remote workforce.

Working longer hours was once a way to speed up infrastructure project delivery. Now, the design phase is where these challenges are resolved. The design phase is where the foundation is laid for a seamless transition to construction and operations. Bentley Systems' applications help design and engineering professionals build innovative infrastructure around the world.

Here are some of the core design functionalities and practices that help control project outcomes and accelerate energy project delivery.

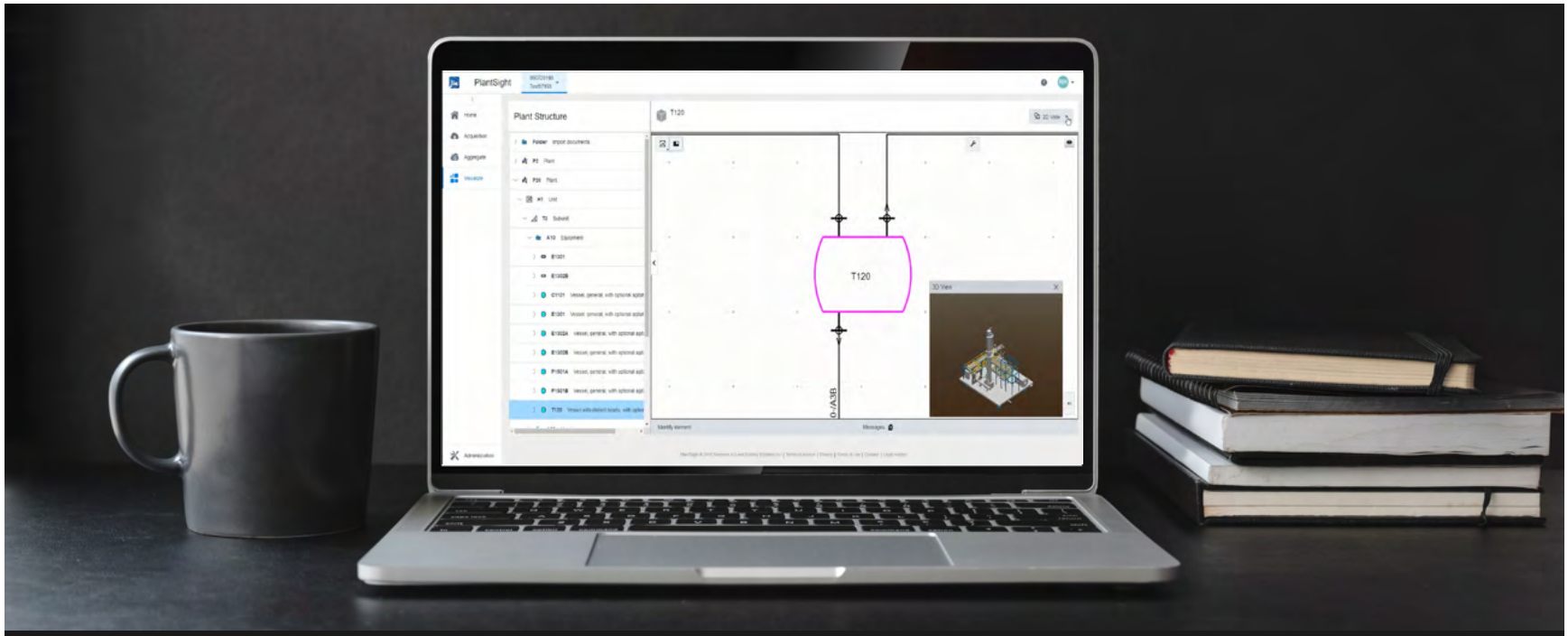
1 Keep Data Evergreen

Within any project, engineering data quickly becomes outdated when new model information is produced or generated. It can happen multiple times as designs mature from the ground up.

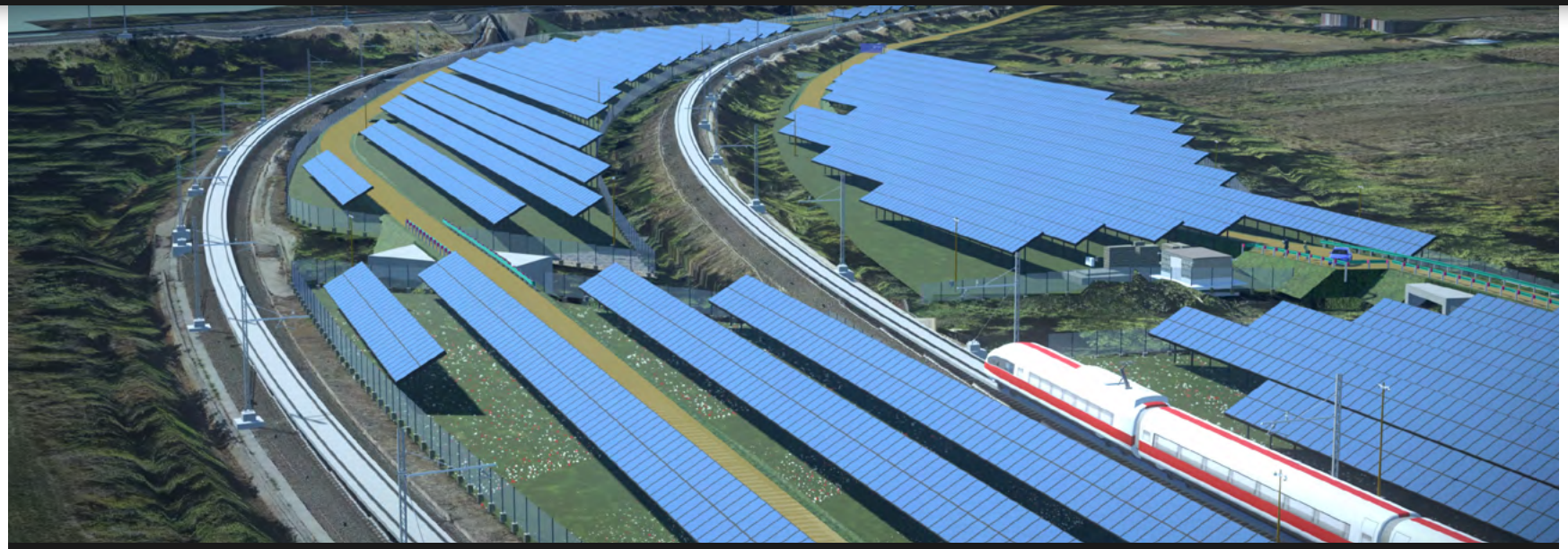
But older data is still useful to track any changes, check version history, and audit why the changes were made. A designer's data management must integrate with a digital twin so that the history is accessible, and to ensure the right information is being used at the right time. Such a management system helps to avoid repeating work, overwrites, and using outdated information.

Value for Business

Avoid liability due to relying on outdated information for design and construction.



Bentley's iTwin® Platform allows for the aggregation, interrogation, and visualization of engineering data from Bentley and third-party design applications. All information lives in the iModel®, a distributed relational database that provides an accurate record of who-changed-what-when and a complete timeline of change.



Italferr S.p.A's recent energy project involved installing power generation plants using photovoltaic panels. It was not only at one location, but at 26 locations across Italy. For this large-scale project, they had to manage 60 terrain models, one hydraulic maintenance hole, 20 models of yards, 20 models of fences, nine models of roadways, 26 models of photovoltaic panels, 26 models of telecommunication networks, and 32 models of conduits. It was crucial for the project's success to have a system that was scalable and could manage the amount of data by leveraging Bentley's iTwin Platform and interoperable applications. Image courtesy of Italferr S.p.A.

2 Ensure Scalability

Scalability is the systems' ability to handle sudden changes in the workload without negatively impacting performance. Scalability can be broken down into three areas:

1. Availability to all with no downtime
2. Performance under heavy loads
3. Reliability when storing, retrieving, and editing data under stress

Scalability is essential as a project grows. Any design software or digital twin solution must be able to cope with expansion throughout the lifecycle.

Value for Business

The design process can continue across the project lifecycle for reduced costs and consistent digital deliverables.

3 Have the Right Software

The cost of using a design application that is too complex and takes time to learn how to use properly means that mistakes will be made. These mistakes could result in costly rework during the design phase or, even worse, financial expenses if they are not caught until the construction or operational phase.

Having a design application that is easy to use will reduce rework, allow users to carry out their tasks more efficiently, and limit risk. Additionally, if that application can easily integrate with other third-party applications, it means that you can leverage existing data regardless of the source for seamless delivery.

Value for Business

Increase user satisfaction and efficiency, reduce errors and costs, and provide a competitive advantage.

For the massive Hangjinqi Yihe Wusu wind farm project, POWERCHINA's engineering team needed an integrated digital technology solution. Using OpenPlant® and other Bentley software for dynamic visual design, they created a 3D site layout, allowing for optimal site utilization. Working in an integrated modeling environment facilitated clash detection, reducing rework to improve overall construction efficiency by 18%. Image courtesy of POWERCHINA SEPCO1 Electric Power Construction Co., Ltd.

For the reconstruction of the Wangjialing coal preparation plant of China Coal Huajin Group, the China Coal Tianjin team established a digital twin, leveraging OpenPlant, ProjectWise®, and other Bentley Open applications. Using Bentley's integrated design applications saved six months of on-site survey time and reduced BIM modeling time by 90 days. The team improved model data integration by 60% and saved 180 days of work. Image courtesy of China Coal Tianjin Design and Engineering Co., Ltd.

4 Keep It Open and Interoperable

All project information should be stored and maintained in one location that may be accessed by various disciplines.

An open application allows the gathering, sharing, and processing of data via a common set of exchange formats, especially within a cloud and digital twin environment that needs to access multiple engineering design files. Failure to have interoperability in your design software will lead to less collaboration, the inability to access critical information, and time wasted moving between different applications, impacting productivity.

Value for Business

Ensure that systems talk to each other intelligently so that the right data reaches the right place at the right time.

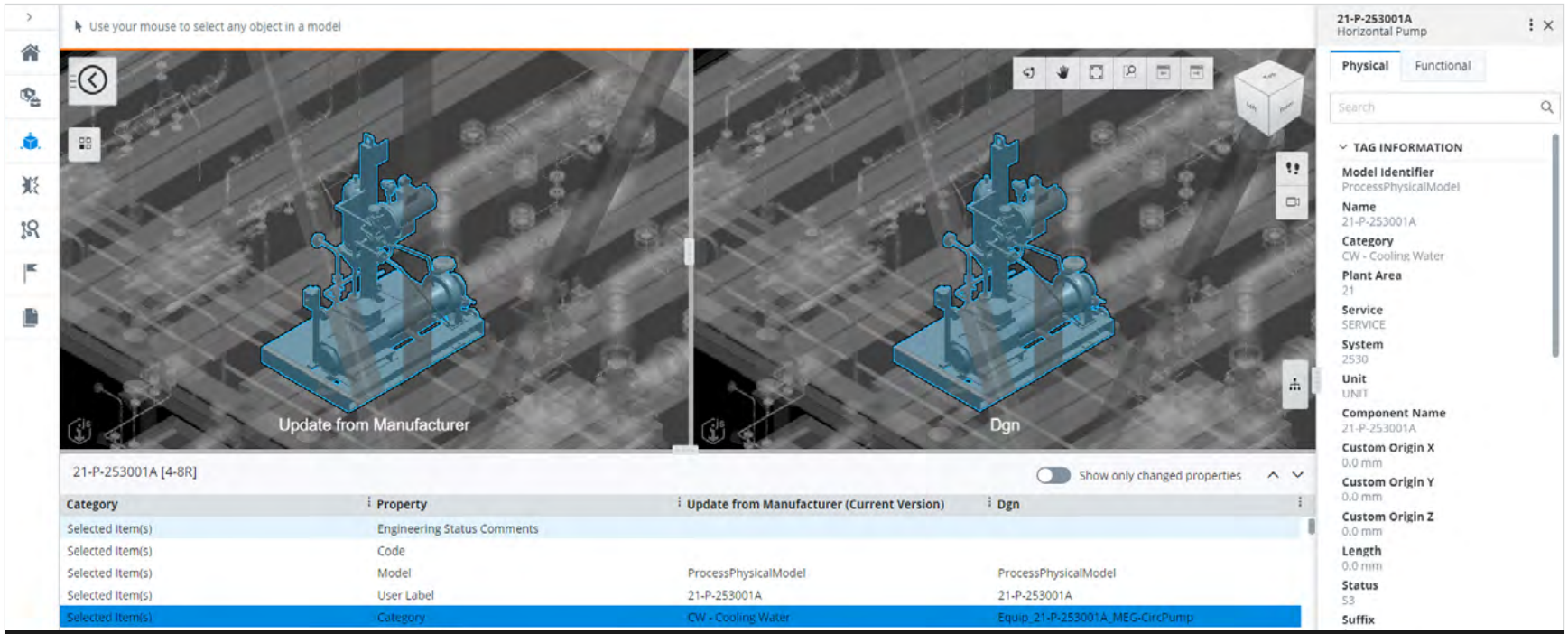
5 Track and Manage Change

Tracking and managing changes is crucial if multiple engineers are working on the same project. New features or bug fixes can be worked on at the same time, and there is no risk of engineers overriding someone else's work.

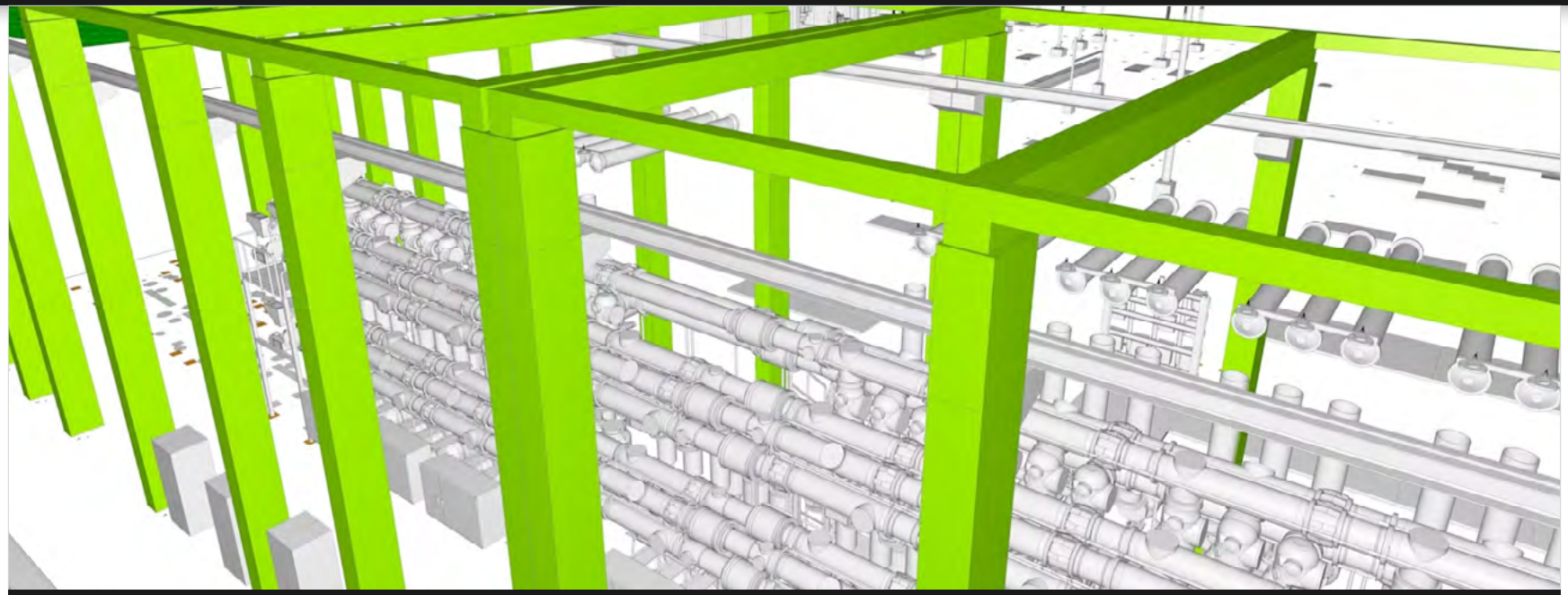
While multiple engineers are working in teams and are continually creating and updating models, having a full audit trail of version history brings back the control of having a safety net to always protect all files.

Value for Business

Protect design files from both catastrophe and the casual degradation of human error and unintended consequences.



The ability to compare different versions of models side-by-side in applications—such as OpenPlant, iTwin Experience, and PlantSight—means that users view changes over time and manage all changes via cloud services.



High-voltage electrical work requires safety distances between different phase lines. Using ProjectWise, powered by iTwin, Elia used the clash and safety clearance functionality to anticipate arcs and sparks, saving signficant cost caused by construction clashes and safety on operation. Image courtesy of Elia.

6 Automate Issue Identification

It is common for design elements to clash between the different disciplines, resulting in time delays, lack of progress, and problems further down the line.

By allowing asset clash detection and reporting in a digital twin environment, designers can easily detect clashes before proceeding to the construction phase. Engineering data (1D, 2D, and 3D) from multiple formats and disciplines can be aggregated, interrogated, and visualized in a distributed cloud environment. Avoiding clashes early on results in significantly reduced risk and liability due to mistakes.

Value for Business

Avoiding clashes results in significantly reduced risk and liability due to mistakes.

7 Extend Digital Twin Life

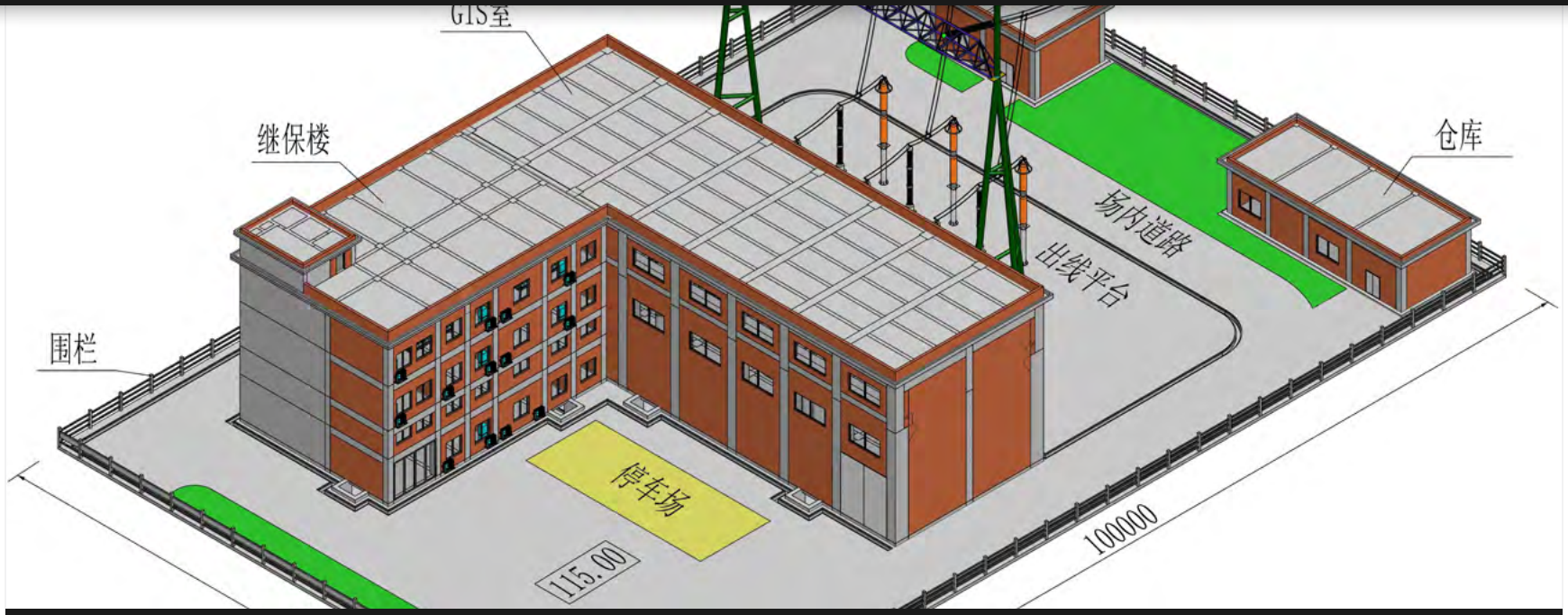
Digital twins are used more during the planning and engineering design phases of many projects; however, data is sometimes not efficiently utilized after design review and construction.

Organizations need to consider operations and maintenance data requirements to ensure the continuity of the digital twin over the asset's life. This process would ensure that the digital twin is easily and regularly updated so that decision makers have access to all information, including original designs and real-time operational data. This workflow makes it easier for teams to track information and processes on the site, with templates in place to ensure that best practices and standards are followed correctly, preventing the build-up of data silos post-design review.

Value for Business

Extend the life of a digital twin and prevent the build-up of silos post-design review.

For an FPSO offshore facility in the South China Sea, CNOOC needed to create a reality mesh and generate a digital twin that integrated indoor and outdoor data. CNOOC selected OpenPlant and other Bentley software for intelligent information management. They plan to connect the model to the iTwin Platform and establish an intelligent digital twin, automating control of the offshore oil platform over its lifetime. Image courtesy of CNOOC Energy Development Design and R&D Center.



POWERCHINA designed the Wuyue pumped storage power station using Bentley's integrated applications, including OpenPlant. The team performed collaborative multidiscipline 3D modeling in a connected data platform. Through coordinated workflows, they shortened construction time and achieved full project lifecycle digitization. Image courtesy of POWERCHINA ZhongNan Engineering Corporation Limited.

8 Collaborate Efficiently

With more people involved in projects, as well as more applications, a dedicated project management or delivery system improves design and collaboration within a connected environment.

This environment keeps the entire team on schedule through a common set of standards and workflows, streamlines access to project information to coordinate design work among stakeholders, and drives better project outcomes that enable timely data-driven decisions based on project insights.

Value for Business

Move beyond engineering work-in-progress to digital delivery for more efficient, collaborative, and sustainable infrastructure design.

9 Connect Remotely

In some cases, projects are in remote locations, or are hard to access due to geography or terrain. However, if the site or asset has photogrammetry of some form, these projects can have a digital twin to reflect the as-is state or different stages of design, construction, and operations.

Using both the visualization and information contained in it, stakeholders can inspect an asset at any time and in any location with minimal documentation as the digital twin forms a record of all events. This workflow avoids costly site visits.

Value for Business

Avoid costly site visits by qualified personnel to perform inspection when required.

For collaborative 3D modeling of two giant hydropower plants, SIDRI chose OpenPlant and Bentley Open™ applications. They saved 200 days in modeling time and shortened construction time by 5%. With industrial automation and digital engineering, the team established a comprehensive digital asset management and control system for the entire lifecycle. Image courtesy of Shanghai Investigation, Design & Research Institute Co., Ltd.

With the use of OpenPlant and other Bentley software in developing its Wind Power and Photovoltaic Power Integration project, CITIC Heavy Industries leveraged BIM, a digital twin, and IoT technology. CITIC expects design costs to be reduced by 8% and construction time cut by 20%. The integrated digital solution will save more than CNY 25 million in material and labor costs and 3% in operation and maintenance costs. Image courtesy of CITIC Heavy Industries Co., Ltd.

10 Do More with Less

Many infrastructure assets are affected by factors that slow down productivity and delivery, such as:

- The evolution of working remotely/globally and the knowledge gap
- Client demands for digital deliverables, tight schedules, and security
- Business demands for digital integration and complex supply chains

Technology can help by digitally automating processes and workflows to remove manual-intensive tasks. Having a design application or a solution (such as a digital twin) that is interoperable and can multitask ensures visibility of all information and to all parties involved.

Value for Business

Save time, costs, and effort by swapping less often between different applications.

Choose Bentley Design Software

Bentley software helps you address your critical energy business issues. Collaborate across disciplines, ensure safe and reliable designs, and optimize the designs and deliverables required for each project to ensure that delivery is reliable and on time.

Bentley's range of infrastructure design software helps users to design and build models and digital twins in an open, intuitive, and collaborative environment.

See for yourself how you can deliver compliant, reliable designs on time while overcoming your unique energy project challenges.

Learn More or Chat with a Design Expert