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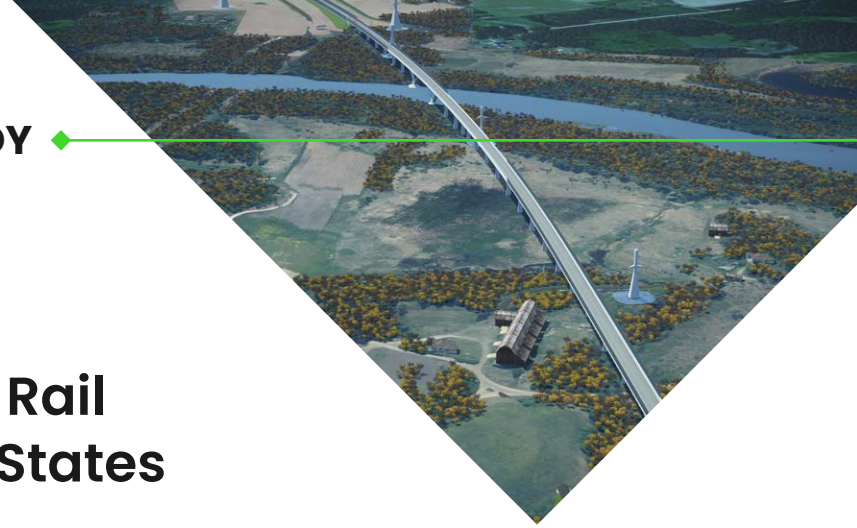
CASE STUDY



INECO Designs Electrified Rail to Seamlessly Link Baltic States to the European Union

A Digital Twin Created with Bentley Applications Helped Them Optimize Designs for Complicated Terrain

DIFFERENT CULTURES, DIFFERENT RAIL SIZES

For well over a century, Europe has depended on rail travel. Individual countries began by building their own rail systems, but these quickly became linked into a multinational system vital for transporting people and goods across the continent. Since the beginning of the 20th century, Europe has featured one of the densest, most comprehensive rail networks in the world. However, the political divisions that began during the second World War also resulted in rail design divisions that disrupted travel far more than political restrictions and passport checks.

Western Europe moved to rail tracks that are 1,435 millimeters wide, while Eastern Europe used the Russian standard of rails that are 1,520 millimeters wide. As a result, travel between the two types of rails was difficult and costly. Since the end of the Cold War, more and more countries have switched to the 1,435-millimeter standard, ensuring seamless travel between countries. By the 2020s, Estonia, Latvia, and Lithuania were among the last European countries still using the Russian standards, and people and freight originating from all three countries faced a bottleneck when connecting to the rest of the European Union via Poland.

A MASSIVE AND COMPLEX PROJECT

The Rail Baltica project is developing a single high-speed rail line connecting the three countries with Poland, all based on western European standards. The ambitious project has been split into 11 sections, with transportation infrastructure engineering firm INECO (a member of INA JV) assuming design duties for the 94-kilometer Latvian North section, which runs from the border of Latvia and Estonia to the Latvian town of Vangazi. The section includes 41 overpasses, and 17 viaducts, one of which is a unique, 1,480-meter span over the Gauja River. "From a geotechnical point of view, the most challenging aspect is the presence of peatland, which completely conditions the design of the railway platform and the foundations of the structures," said Francisco Luque Rodriguez, BIM manager at INECO.

INECO anticipated that the project would generate an enormous amount of data, as they had to create an appropriate level of detail for all assets and coordinate all contributions. "More than 200 professionals have been involved in the design of the solutions located in different countries such as Spain, Latvia, U.K., Colombia, and Venezuela," added Luque Rodriguez. Each of these assets would need to be adjusted for its environment for maximum stability and resiliency. Finally, all assets needed to be combined into a single model to ensure consistency and help plan the construction process.

INCREASED CLARITY WITH A DIGITAL TWIN

The organization determined that creating a digital twin with Bentley applications would help them overcome all challenges of the project and deliver a high-quality rail system. They began by using ProjectWise to establish a connected data environment. Not only did it enable all team members to contribute, no matter their physical location, it gave INECO confidence that all information was correct and up to date. Next, they used OpenGround and Leapfrog to model the site environment, helping them to determine the optimal designs for the terrain.

Within the reality mesh, they used OpenRail, OpenRoads, and OpenBuildings to model the main rail and all associated assets. In the process, they

PROJECT SUMMARY

ORGANIZATION
INECO

SOLUTION
Rail and Transit

LOCATION
Estonia and Latvia

PROJECT OBJECTIVES
- To develop 94 kilometers of electrified rail line and associated assets.
- To create a digital twin of both rail assets and site geography.

PROJECT PLAYBOOK
Bentley LumenRT™, iTwin®, iTwin Capture, Leapfrog®, MicroStation®, OpenBridge®, OpenBuildings®, OpenGround®, OpenRail™, OpenRoads™, PLAXIS®, ProjectWise®, SYNCHRO™

FAST FACTS

- When complete, Rail Baltica will help link the Baltic states to the European Union for the first time.
- INECO is designing the Latvian North section, which runs from the border of Latvia and Estonia to the Latvian town of Vangazi.
- They faced challenges with managing an enormous amount of data and determining how to build within peatland.

ROI

- Digital design also helped minimize environmental impact, potentially saving EUR 7.1 billion in climate change costs.
- Though Rail Baltica has a total cost of EUR 5.8 billion, it is expected to bring socioeconomic benefits of up to EUR 16.2 billion.

"From a civil BIM perspective, Bentley's open software is unbeatable, due to their capacities to generate its own models with enough flexibility to generate and integrate associated data."

– Francisco Luque Rodriguez, BIM Manager, INECO

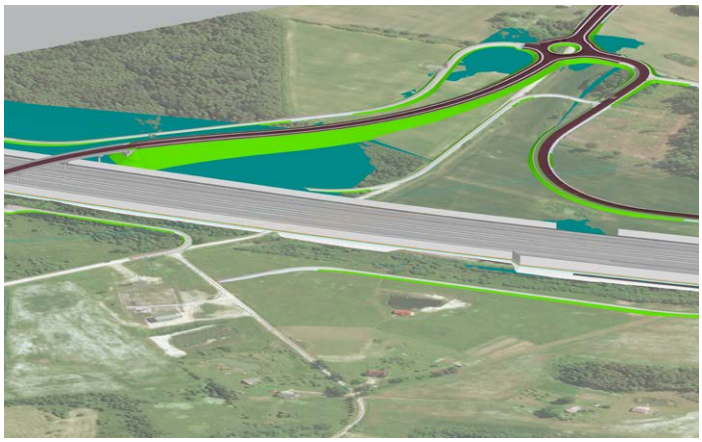
incorporated detailed data for individual models, ensuring the digital twin would contain all needed information. Then INECO ensured all individual models fit together properly. "[We federated] different software solutions under [iTwin] to study clashes," said Luque Rodriguez. Finally, they used SYNCHRO and Bentley LumenRT to intuitively plan the construction timeline and determine phases of development.

MINIMIZING ENVIRONMENTAL IMPACT

By using Bentley applications, INECO was able to model their entire part of the project using a single suite of software. "OpenRail and OpenRoads' capabilities to add detail to solutions cannot be overcome by other civil software, also the MicroStation shared platform allows an easy sharing of solutions for different disciplines," said Luque Rodriguez. OpenGround and Leapfrog helped them fully understand the geography of the project area and determine how much earthworks are needed.

Digital design also helped minimize environmental impact, potentially saving EUR 7.1 billion in climate change costs. "Rail Baltica will be fully electrified so that any emissions will be avoided," explained Luque Rodriguez. Full geographical knowledge of the project area helped them avoid building in environmentally sensitive areas. Additionally, they installed noise protection barriers where necessary, and incorporated special animal passages throughout. When complete, Rail Baltica will usher the Baltic states into the European Union, greatly improving commerce and quality of life. Though Rail Baltica has a total cost of EUR 5.8 billion, it is expected to bring socioeconomic benefits of up to EUR 16.2 billion.

INECO used ProjectWise to manage the vast amount of data for the project.



OpenRail and OpenRoads helped model hundreds of kilometers of the roads and railways.

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