Nashville Electric Service

Customer Success Story

Autodesk® Inventor®

The Inventor model isn't just a drawing. It's like having a digital prototype of a substation on your desktop. You can walk through a project with other engineers or even the construction crew to find options that contribute to better real-world performance.

—Vaughan Charles
Engineering Supervisor
Nashville Electric Service

Adding intelligence to substation design.

Nashville Electric Service goes beyond 3D and accelerates its substation design process by as much as 50 percent.

Project Summary

Taking advantage of the efficient, hydroelectric power provided by the Tennessee Valley Authority, Nashville Electric Service (NES) began delivering power—and exceptional service—to 52,000 customers in 1939. Today, NES serves more than 355,000 customers in a 700-square-mile service area. As NES has grown, its commitment to providing reliable power and value to customers hasn't changed. The publicly owned, nonprofit company strives continually to enhance operational efficiencies by helping employees increase their productivity. As part of that effort, NES recently transformed its substation design process, accelerating many tasks by as much as 50 percent while improving design accuracy.

NES helps to drive its new substation design process with Autodesk® Inventor® software, which allows design engineers to create intelligent, digital models of substations assembled from a library of 3D parts. Vaughan Charles, engineering supervisor for NES's substation group, explains how having digital models has enhanced the design process: "For us, 3D is just the beginning. We create designs that serve as digital models of actual substations, with parts, calculations, and bills of materials (BOMs) coming together quickly and more automatically."

The Challenge

The substation engineering department at NES relied on AutoCAD® software for many years. Whether for new substations or retrofits to existing facilities, the NES team used 3D part designs, or blocks, to create substation assemblies. As designers encountered new parts, they drafted a 3D block and added it to an ever-growing library of parts. The 3D process allowed the designers to work quickly and easily visualize designs.

Inefficiencies in other aspects of the process slowed substation projects. Substation designers relied on manual processes and disconnected tools for many tasks. For example, to generate BOMs, they had two options: to count individual parts and enter the results in a spreadsheet manually, or to extract parts lists using a cumbersome multistep process. Both options were equally time-consuming and required frequent double-checking for accuracy.

"We liked designing with 3D because it enhanced our ability to visualize assemblies and communicate design intent," says Terri Humel, principal associate engineer in the NES substation design group. "But we wanted to go beyond 3D to work with designs that included more embedded intelligence. Looking at our overall design process, we saw a number of opportunities to accelerate tasks and improve productivity."

Autodesk®

Improving the real-world performance of substations with digital prototypes.

The Solution

Believing it had maximized the advantages of 3D, the company decided to explore other alternatives for enhancing the substation design process. Working with an outside consultant, NES evaluated several technology options. In the end, the consultant made a recommendation that enabled NES to build on their existing AutoCAD expertise: Autodesk Inventor software. Autodesk Inventor software enhances 3D mechanical design by allowing designers to work with digital models and a rules-based design process.

"Inventor stood out for a number of reasons," notes Charles. "It allowed us to build the insights we've gained through the years into every design—automatically. On a more practical level, compatibilities with AutoCAD software would allow us to leverage the huge library of 3D parts we developed, helping to speed up the implementation."

From 3D to Intelligent Models

To implement the new substation design process, NES began by bringing its 3D parts library into the new solution, enhancing the blocks with additional specification and material information supported by the model-based process. NES also redrew steel structural pieces used in substations to ensure a higher degree of precision. At the same time, NES embedded its engineering standards within the solution.

After a brief trial and training period, NES launched the new substation design process. "Whether we're designing a new substation or retrofitting an existing one, we begin by bringing together 3D parts into subassemblies," says Denise Jackson-Holder, senior associate engineer with NES. "The goal is to create an accurate, digital model of the substation as a whole. Embedded standards and automated calculations facilitate parts selection. With Inventor, it's as though another experienced designer is helping to guide the process and perform calculations as the design evolves."

"Working from a model enables greater efficiencies," says Charles. "That's why it's our goal to have an accurate digital model of every one of the more than 230 substations in the system. We'll be able to respond to operational needs faster and more proactively. So will the maintenance and construction crews we support. It adds up to more value and reliability for our customers."

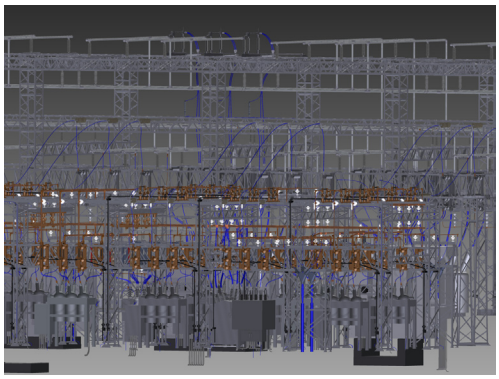
Accelerating Tasks

While the new model-based process has increased the pace of many design tasks, designers are particularly pleased with improvements to BOM generation. Autodesk Inventor software automatically tracks part types and material quantities during design. Using a single command, designers can export more accurate BOMs directly into their spreadsheet-based workflow. When designs change, they simply repeat the process to generate an up-to-date parts list. Business rules within the application help prevent over- and under-ordering of materials.

"Compared to the prior process, we're able to generate BOMs as much as 80 percent faster," says Humel. "It's also much easier to create more accurate BOMs. Before, we wasted quite a bit of time on multiple rounds of quality checks to ensure the correct materials made it to job sites."

The Result

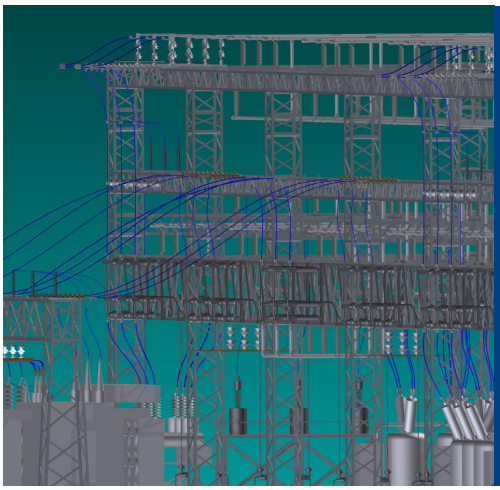
NES expects to study the overall impact of adding Autodesk Inventor to its workflow in the future, but individual designers are already realizing significant productivity gains. "We recently compared the time-to-completion for a project from before our Inventor implementation with a recent, similar project," says Humel. "The newer design was done in three weeks, and the earlier project took six weeks. No two projects are ever exactly the same, but the time savings reflects the productivity gains we're enjoying with help from Inventor."



Charles reports that the faster design process is also helping to support better decisions. "Today, we have more time to explore 'what if' scenarios. This helps us to see how choices might impact constructability or long-term maintenance," he says. "The Inventor model isn't just a drawing. It's like having a digital prototype of a substation on your desktop. You can walk through a project with other engineers or even the construction crew to find options that contribute to better real-world performance."

For More Information

Take your substation designs beyond 3D using Autodesk Inventor software. Visit **www.autodesk.com/inventor** to find out how to apply Digital Prototyping to your design process.



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—Terri Humel
Principal Associate Engineer
Nashville Electric Service

Images courtesy of Nashville Electric Service

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