

# 21<sup>st</sup> century substation design

RICHARD ZAMBUNI explains the need for substation re-design to support the grid.

There have been so many innovations in the engineering software that supports power generation, and transmission and distribution that energy utilities have been able to become far more efficient in how they manage the lifecycle of this complex and valuable infrastructure. However, one class of energy utility infrastructure has lagged behind, and that is substations. Substations are important to energy utilities because as you will read below, there are lots of them, and in developed economies a substantial proportion of them are reaching the end of their useful operating life – in the US this is estimated to be 40 percent of all substations. In developing economies, the demand for new electric transmission and distribution infrastructure means that thousands of new substations are being designed and built. For these reasons alone, it is time for mould-breaking innovation in the way that substations are designed and engineered. Substations need to take a front seat in the changes and improvements in efficiency planned by energy utility engineering team managers.



## The status quo

In many utilities, the majority of the substation engineering documentation is not even in intelligent digital form. It's in standard CAD, or drawings organised in books. In other cases, some of the engineering documentation is maintained in a digital format, but it is split down the middle between the electrical design for protection and control systems and the physical design of the substation. This means that workflows are problematic because data is in silos, and even creating accurate bills of material can be onerous because the process is mostly manual and therefore subject to error. This is unsurprising because until now, there has been no engineering tool for substation design that can unify the electrical and physical design environments.

It is time for a new paradigm in substation design. It was precisely this state of affairs that led to Bentley developing Bentley Substation V8i. This is the first and only product to allow engineers to execute both the electrical systems and the physical design in a single environment. The net outcome is that substations can be designed 30 percent faster, bills of materials can be produced more than 60 percent faster, and the information model can be used to support the substation across its lifecycle from design, construction, energising, to operation and ultimately decommissioning.

Bentley's solution for substations includes interoperable products for site/civil design, structural analysis and detailing for steel and concrete structures, and document conversion and image management. This is a solution that is being adopted now by forward-looking utilities around the world, including Iberdrola Engineering and Construction, a major Canadian utility, and others. This solution is not only useful for energy utility owner-operators, but also for EPCs and rail owner-operators that design and manage substation infrastructure. Substations will no longer be the neglected class of infrastructure for utilities; they will be designed and operated using 21st century technology. ■

Richard Zambuni is the Global Marketing Director of Bentley Systems. He has spent all of his career in marketing and the last 15 years in hi-tech marketing, living and working in the US and Europe. Zambuni has covered a broad range of technology, from network hardware to telecommunications inventory and provisioning software, to geospatial and infrastructure engineering software.

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## *“It is time for a new paradigm in substation design”*

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Substations are coming to the fore of the smart grid. We have reached a point where substations are being replaced or built from scratch, but those aren't the only vectors for change. There is a lot of talk about the smart grid and what this means for energy utilities. One thing is for sure, and that is that substations will be critical in achieving the kind of intelligent infrastructure that the smart grid demands. Transformers will be fitted or retro-fitted with intelligent electronic devices that will constantly monitor performance and allow the substation to be operated optimally. And in a grid that has to be monitored actively from the point of power generation to the point of service, one thing we can be sure of is that there will be no smart grid without smart infrastructure data. To a large extent, this already exists for much of the power generation and transmission and distribution infrastructure, but for substations it barely exists at all.