

Unique virtual design and technology targeting saved millions of dollars in flawless eight-day control-system upgrade

15

year-old gas turbine controls
upgraded to latest Mark™ VIe

8

days to complete in parallel
with scheduled maintenance

25%

lower cost than conventional
panel replacement

Challenge

Sakhalin Energy is developing the Piltun-Astokhskoye oil field and the Lunskoye gas field off the northeast coast of Sakhalin Island in eastern Russia. The LNG plant has two parallel process trains with a combined production capacity of 9.6 million tonnes of LNG per year. BHGE was asked to update the gas turbine generator control system as part of Sakhalin's regular obsolescence-management regimen.

Knowing precisely how valuable time is for LNG operations, our Chief Project Engineer issued an ambitious challenge to our design team: find a way to complete the upgrade within eight days, so it could take place during an already scheduled maintenance outage. We also wanted to minimize impact on the plant operating team by enabling a seamless transition with no re-training.

Solution

We upgraded the plant's 15-year-old gas turbine controls to our latest Mark VIe system by designing a customized modular migration kit that kept most of the existing panel structure, and only injected the new technologies that were absolutely necessary to achieve full modernization. From a practical perspective, a lot of panel elements don't need to be replaced to achieve this objective. In this case, for example, most of the existing electronics were sufficient, and the customer had a large supply of spare parts for them. So, we set out to retain the inherent value of those resources, while avoiding any compatibility issues between old and new technologies.

To ensure that no gaps would emerge between installation and restart, we completed a comprehensive Technical Risk Reduction program. This evaluated every possible process impact, mechanical and electrical issues, space constraints, and field-crew requirements — and executed all necessary remedial actions.

We designed and simulated everything with advanced 3D modeling processes and a customized virtual-reality environment that replicated the entire LNG gas turbine generator and controls configuration. This let the Sakhalin team see exactly what they were getting — complete with performance testing in a wide range of operating situations.

Like any application of this type, the Sakhalin control panel had hundreds of subsystems and components. With our digitally enabled migration approach, we precisely designed and pre-assembled just 40 discrete modules — tailored building blocks that slid easily into the old panel for an exact fit. This took all the stress out of the on-site installation, and made it a fast, predictable process.

“With this kind of custom upgrade, there's no such thing as a product prototype. So we created a unique virtual environment that bridged the gap between design and installation. It brought the invisible to life — the customer could see exactly what they'd get and how it would improve their operation.”

Paolo Fini, Senior Controls Engineer, BHGE

Results

The upgrade took just eight days instead of the three or more weeks typically needed to replace a full panel. All work was done in parallel with a planned maintenance outage — so our customer incurred no other downtime. Considering CAPEX/product costs alone, the migration was 20-25% less expensive than a conventional full-panel upgrade. On top of that, with downtime costs in the multi-millions per day for an LNG operation of this size, the savings realized through our streamlined migration approach were simply enormous.

Sakhalin now runs the latest Mark VIe control system with advanced features for cyber security, intuitive interfaces, and significantly higher overall reliability than the plant's original control system. It also includes the latest GE Predix™ software tools for monitoring and diagnostics, predictive condition-based maintenance planning, performance analysis, and optimization — and the flexibility for future expansion.

The solution by far surpasses the idea of obsolescence management. Rather, it injects longevity — adding at least one complete technology cycle that will go a long way in meeting productivity goals over this plant's 30+ year life.

Enabling Technology



The Mark VIe control system is robust, scalable, and secure. It's designed for extreme conditions in a wide range of applications. The migration kit changes only the parts of your existing control panel that need upgrading, and inserts modular Mark VIe components to bring your system up to date.

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