

Honeywell Process Solutions



Successful Offline Experion PKS R310 Migration

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Introduction

Luminant Power is a Texas-based electric utility. A subsidiary of Energy Future Holdings Corp. of Dallas (the former TXU Corporation), its operations include electricity generation and wholesaling, mining, construction and development.

Luminant Power has an electric generation capacity of 18,300 MW at 18 power plants. This includes 2,300 MW from the Comanche Peak Nuclear Power Plant in Glen Rose, Texas, and 8,000 MW from various coal-fired power plants. The remainder of its generation capacity comes from natural gas-fired plants.

Luminant's predecessor, Dallas Electric Lighting Company, provided the first electric service for lighting to illuminate Dallas in 1882. The company's Trinidad Unit 1 came online in 1926 as the only lignite plant in Texas, and the biggest plant in the U.S. using lignite exclusively. In 1950, Luminant initiated rural contract and home lighting programs and in 1965 it began providing electricity to NorthPark Mall, the world's largest climate-controlled shopping center.

Luminant's Big Brown Unit 1 in Fairfield, Texas, came online in 1971 as the first modern lignite unit, and its Comanche Peak Unit 1 began commercial operation in 1990.

Luminant Power received an unprecedented fifth Director's Award from the U.S. Department of the Interior's Office of Surface Mining in 2009 for advancing the science of reclamation.

Background

Reliable power is a major concern in Texas and other growing states. Electric utilities are under pressure to modernize their operations for greater efficiency and output, while at the same time minimizing their generation downtime.

Upgrading legacy control systems enables power plants to protect unit reliability, improve heat rate, reduce unit startup time and leverage investments in current hardware, engineering and tuning.

For Luminant and other major power producers, migrating combustion control, turbine control and burner management systems to the latest automation technology provides a number of operational and economic benefits. These include improvements in data acquisition, alarm monitoring and report management, and more data available for fleet-wide analysis and remote system/component diagnostics.

History of Modernization

The Monticello steam electric station, located near Mt. Pleasant, Texas (120 miles northeast of Dallas), is one of Luminant's top performing plants. The facility's fuel source is lignite, which is supplemented by Powder River Basin coal. Water for the steam plant is supplied from Lake Monticello. The Monticello station has an operating capacity of 1,880 MW, and is comprised of three units: Unit 1 (1974), Unit 2 (1975) and Unit 3 (1978).



Luminant Power's Monticello steam electric station, located near Mt. Pleasant, Texas.

Monticello 1 and 2 are twin 565 MW units commissioned in 1974 and 1975. In 1983-84 their original GE 40-10 Data Acquisition System (DAS) was replaced with a Honeywell 4500 process computer and Process Interface Units (PIUs). In 1990-91, the units' original L&N analog electronic Boiler Control Systems (BCS) were replaced with Honeywell TDC 3000 Process Managers (PMs) and Universal Stations (USs), while retaining the DAS PIUs. At the same time, the 4500 computers were replaced with Application Modules (AMs) and Hiway Gateways (HGs).

In 2003, Unit 2's original Westinghouse Turbine Control System (TCS) was updated to a GE Mark VI with a single Human-Machine Interface (HMI) DCS interface via Enhanced PLC Gateway (EPLCGs) and redundant serial I/O Processors (IOPs) into PMs upgraded to High Performance Process Managers (HPMs).

The Unit 1 upgrade in 2006 included replacement of the original Westinghouse TCS with a MK VI with two HMIs, DCS interface via redundant OPC Mark servers, redundant Experion Servers Total Plant Solution (ESVTs), and two additional Experion Station TPS (ESTs).

In 2007, the PIU-based DAS on Unit 2 was replaced with two non-redundant C200 controllers and HPM type I/O. The DAS, BCS and Balance of Plant (BOP) USs (and graphics) were also replaced with Experion EST stations with ASM style graphics. IOPs and EPLCGs interfacing with the Mark VI TCS were switched in favor of redundant OPC Mark servers and redundant ESVTs. Additional work included adding a second GE HMI, upgrading the Plant Historian (PHD) collectors and server, upgrading PMs to HPMs, implementing an e-Server, and adding an ACE-T node and EST desktop.

During the 2007 Unit 2 hardware assembly stage, it was determined that an eight-zone network firewall with the associated routers, switches and servers would be implemented for all three Monticello units. Honeywell provided the hardware and the network consultant for this work.

Monticello #3 is a 750 MW Babcock & Wilcox unit commissioned in 1978. The unit's original L&N scrubber controls were replaced with TDC 3000 PMs and Universal Stations in 1995. Fly ash controls were also replaced with Allen-Bradley PLC 5s and Honeywell EPLCGs.

In 1997, the original Honeywell 4500 DAS was replaced with TDC 3000 Advanced Process Managers (APMs) and USs, and the original Bailey Burner Management System was replaced with Allen Bradley PLC 5s and EPLCGs.

In 2000, Unit 3's original Bailey analog electronic BCS was switched with TDC 3000 HPMS and USs, and in 2004, the original GE Mark II turbine controls were also exchanged for a GE Mark VI with two GE HMIs with two dedicated Experion EST Icon stations and redundant ESVTs with beta software release licenses.

Latest Technology Upgrades

Luminant Power's Monticello electric station is currently in the process of implementing the latest Honeywell process control system solutions, including the Experion Process Knowledge System (PKS) and HMIWeb technology.

Experion PKS is a next-generation plant automation platform combining state-of-the-art DCS capabilities with business management, advanced control and optimization, operations management, process management and field management under one unified, collaborative architecture.

HMIWeb technology integrates plant data delivery using standard Internet technologies such as HTML and XML. Its user interface includes a comprehensive set of ASM style displays, supporting navigation and operation of the entire system. Plant personnel now have a simplified solution for building SCADA points and connecting PLCs and other subsystems.



With Honeywell HMIWeb technology, Luminant's plant personnel now have simplified solution for building SCADA points and connecting PLCs and other subsystems.

The Experion PKS solution utilizes a Fault Tolerant Ethernet (FTE) control network, which provides not only fault tolerance, but also fast response, determinism and security. FTE leverages commercial Ethernet technology to lower the costs of the network infrastructure, connections to IT networks and third-party Ethernet devices, and ongoing maintenance and support.

The current project on Monticello Unit 1 includes installation of redundant C300s with C type I/O. Legacy USs have been replaced by Experion Stations with Unit 2 ASM style graphics modified for Unit 1. Legacy PMs have also been converted to HPMs.

Additionally, the current Unit 1 project has involved replacing ESVTs with faster computers providing R310 functionality and reloading existing Experion Stations, Uniformance PHD collectors and the PHD shadow server with the latest software. The unit's e-Server was upgraded to a premium version that now communicates with all three units, and a new ACE-T node and Experion PKS desktop were also added.

Project Challenges

Luminant's first experience with Experion PKS started with a beta software version for the Unit 3 turbine controls project in 2004. There were numerous challenges in implementing the system. For example, the Experion OPC interface did not operate reliably, requiring frequent reboots after frozen displays were observed. Since the Mark VI TCS was purchased with two dedicated GE HMIs, the Icon stations sat unused for an entire year. Fortunately, further revisions of the Honeywell system software, increased interaction with GE and intensive Honeywell site support finally eliminated these problems.

Luminant's second Experion PKS project was the Unit 1 turbine controls replacement with the inclusion of an Experion HMI interface. The third Experion project was an upgrade of the Unit 2 PIU system with C200 in 2008. Luminant determined that the common-ended 4-20 mA TPS analog input I/O modules Honeywell initially proposed were not a suitable replacement due to the existing field wiring and devices connected to the PIU I/O. Instead, the C200 upgrade required 4-20 mA modules with the capability of being powered either by the module, or powered externally, like the PM-style I/O, on a point-by-point basis, which the C200 TPS I/O modules did not provide.

Honeywell recognized the problem and provided HPM I/O in lieu of the C200 I/O. This I/O, along with the C200 processors, ESVTs and ESTs, all performed as expected.

In addition, Honeywell was unable to directly support the US to Experion graphics rewrite for this project. Many difficulties were encountered, but ultimately overcome by a third-party graphics contractor. At that point, Honeywell was also unable to provide the ASM object library, and the third-party contractor was obliged to render their interpretation of the ASM graphics.

When the Monticello plant embarked on the 2010 Unit 1 DAS and US replacement, the difficulties experienced with the Unit 2 C200 I/O were fresh on the minds of all project participants. This prompted Luminant to research the C300 I/O closely, and observe the accommodations made for the externally powered 4-20 mA inputs with the C300 modules.

Unfortunately, in an effort to maintain continuity between the PIU terminology in the I/O database, the designation of externally powered and I/O-powered 4-20 mA became ambiguous, and two months before FAT, the project team discovered that 90 externally powered 4-20 mA inputs were required—not 40 inputs as originally planned. Honeywell responded immediately and corrected the problem with minimal added cost.

Luminant also expected to modify the Unit 2 Experion PKS graphics to fit Unit 1 with little difficulty, test run them on Unit 1 R210 stations and then have Honeywell perform a batch conversion to R310. This approach worked to some extent, but it was discovered at the FAT that many of the Unit 1 graphics had built-in configuration problems arising from the Unit 2 third-party work, which resulted in slow call-ups and some aspects not working at all.

Honeywell subsequently identified the deficiencies in the graphics and rebuilt them in a format to allow for trouble-free software revisions in the future. Luminant intends to have its in-house staff correct the defects remaining in the Unit 2 graphics as time permits during the coming year.

Conclusion

Honeywell has demonstrated personal and corporate integrity to Luminant Power; from the first TDC 2000 project with Basic Controllers through several TDC 3000 systems with Multifunction Controllers, PMs, APMs and HPMS, and now Experion R310. It has continuously supported its products and technology evolution over the years at Luminant plants, with all matters successfully resolved.

More Information

For more information about Experion migration, visit www.honeywell.com/ps or contact your Honeywell account manager.

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WP-10-10-ENG
August 2010
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