Designing and Delivering a Nationwide SCADA Network for the Iraqi Ministry of Electricity

Industry: Electrical Utility

Application Area: IT/SCADA Portals

The Challenge
Implementing, in a very compressed time-frame, a secure, distributed supervisory control and data acquisition (SCADA) system for Iraqi power plants using a cost-effective and time-efficient method

The Solution
Designing and deploying reusable IT/SCADA nodes to monitor and control combustion turbine units while protected in blast-resistant, ballistic up-armored modules

Improving Electricity Generation and Distribution in Iraq
The United States Army Corps of Engineers (USACE) is one of the world's largest public agencies delivering engineering, design and construction services to customers in more than 130 countries worldwide. As part of an ongoing effort to assist with the rebuilding of Iraq, the USACE helped the Iraqi Ministry of Electricity (MOE) to improve the reliability and availability of power plants around the country. Like most of the world, the MOE previously relied on more manual management techniques, such as using telephone communication from a plant to the MOE headquarters in Baghdad to relay status updates and receive plant operation instructions. Therefore, the plan was to install a Central Monitoring Center to more effectively manage a selected number of combustion turbine units that would in turn positively impact the power generation levels within Iraq. However, remote nodes in a nationwide SCADA system are particularly vulnerable to disruption by natural events – such as earthquakes and fires – and terrorism. Determining how best to secure these nodes is a major challenge.

The USACE turned to a team of specialists, including Kline Technical Consulting (KTC), to provide protected SCADA interactivity in a distributed, nationwide network both quickly and cost effectively with maximum use of identical electronic units. As a service-disabled veteran-owned technical firm with extensive knowledge in force protection, IT security, and structural/civil engineering, KTC was chosen for its thorough proposal to develop easily integrated IT subsystems and implement these in secure IT/SCADA nodes. The fact that the team had specialists who already have actual experience with extensive rebuilding and repair of turbines for various plants in the region was a plus.

Figure 1.The USACE chose KTC and their partner [Wintara](#) to design and install a nationwide SCADA system for Iraq to improve the management of and supply from power plants with combustion turbines.

Designing and Executing a Comprehensive Plan for the SCADA Network

The team's scope of work included the design, supply, installation, testing and commissioning of the complete central monitoring system in the Central Monitoring Center in Baghdad, as well as all the monitoring equipment necessary at power plants for interfacing with the Very Small Aperture Terminal (VSAT) communications system. KTC also designed, built, and delivered the training and control subsystems. The scope of supply included:

- Hardware and software for the workstations and power plant interfaces
- Networking equipment and servers for data storage and handling
- VSAT communications system for the Central Monitoring Center
- A comprehensive set of operational and consumable spares for two years of operation
- Operator training and all applicable operation and maintenance documentation
- Training simulators for combustion turbine power plant operators and their instructors

Monitoring Multiple Power Plants with the Central Monitoring Center

The main purpose of the Central Monitoring Center is to increase the dependability and accessibility of 13 selected power plants with combustion turbine units by providing specialized technical monitoring and support from a central location in the Baghdad area. This includes monitoring combustion turbine operating conditions, developing predictive maintenance plans and programs, troubleshooting operational issues, and identifying potential causes of machine shutdowns or failures. A standardized control architecture based on MODBUS programmable logic controllers (PLCs) was selected for the collection, transmission and display of about 800 signals per unit time for each separate SCADA unit. Typical sampling rate is every 10 seconds, resulting in the collection of approximately 8000 signals per minute per installation.

The central monitoring system itself includes a set of monitoring stations, administration workstations and supervisor workstations. The software provides a hierarchy of monitoring that displays both high and low-level data in an efficient manner. To ensure a high level of reliability, system redundancy was designed to prevent loss of communication to any device or equipment and to backup all data storage and handling facilities.

Housing the Equipment in Blast Resistant, Ballistically Up-Armored Modules

As part of a system-wide upgrade, to protect the individual SCADA nodes at each power plant from environmental elements and terrorist attacks, KTC partnered with [ABox4U](#) to deliver blast-resistant

modules with ballistic up-armoring. The modules are then outfitted with KTC's standard racks, power storage units, and power conditioners. The successful deployment of these secure structures led to the new KTC Blast Resistant/Ballistically Up-armored Pre-kitted Control Room platform.

Figure 2. Blast-resistant modules with ballistic up-armoring are used to secure the SCADA nodes at each power plant from the harsh environment and terrorist attacks.

Upgrading the Satellite Communication Network
In order to improve communication between the Central Monitoring System and power generation and related transmission facilities, the MOE is upgrading the existing VSAT satellite communications system. KTC is providing the complete VSAT communications system for the Central Monitoring Center, as well as dual redundant, open process control (OPC) servers for each power plant that communicates with the VSAT systems using reporting by exception and signal filtering for optimized bandwidth usage.

The MOE is also planning the future installation of a fiber-optic-based communication network as part of the national SCADA system. Therefore, the central monitoring system was designed so that the equipment can be readily interfaced with these future improvements, ensuring redundancy.

Instructing Personnel with State of the Art Training Simulators
In addition to the central monitoring system, KTC also supplied, installed, commissioned and tested a set of combustion turbine training simulators for the new Central Training Facility. The simulators consist of instructor and operator workstations with stand-alone hardware and software packages designed to replicate the combustion turbine controllers. The objective of the training is to instruct power plant personnel in combustion turbine operation procedures such as overall set-up, operation, troubleshooting and maintenance. The simulators are capable of simulating complete start-up and shutdown sequences, as well as normal and adverse operating situations.

Deploying A Successful SCADA System with a National Impact
The new SCADA system for Iraq has been very beneficial to both the MOE and the USACE. The country has a nationwide SCADA network that will enable it to generate more electricity – which also results in increased oil production and exports – to support its population and industry. USACE was able to provide this much-needed infrastructure rehabilitation for the MOE in short order, while introducing them to U.S.-derived technology, companies and ideas. As the USACE left Iraq, the system transitioned

to MOE entirely. KTC and Wintara remain in charge of updating and extending the system as new plants are brought online.

KTC continues to build upon its reputation for delivering reliable, viable solutions that customers can count on. In this project, they were able to create a standard module design for IT/SCADA nodes and replicate them to multiple units or larger units – all using the same plans and building techniques. This reusable template provides customers rapidly deployable units that save both time and money, allowing KTC to focus on other areas such as increasing data security. For more information on how KTC can help you with your physical security systems, IT security and critical infrastructure protection needs, contact us today.