



SCADA & Automation Service

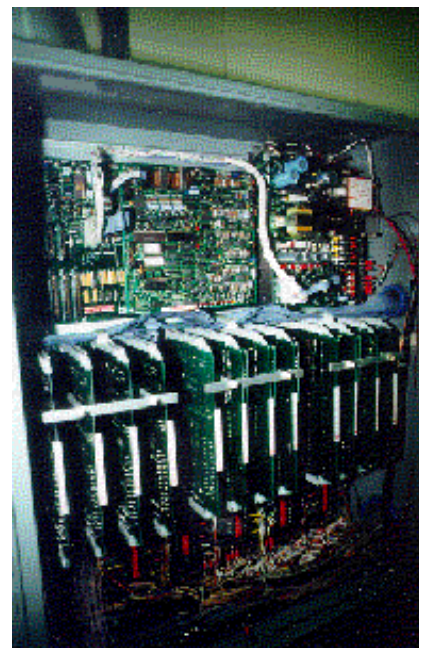
INTRODUCTION

Burns & McDonnell designs state-of-the-art supervisory control and data acquisition system (SCADA) and automation systems for utilities and industry. We offer a full range of automation engineering services, including studies, designs, and turnkey systems. Related services include system integration services, process engineering, communications system engineering, and control center design.

Your project's special challenges will be met by professionals in a wide range of fields. To develop your most efficient solution, our automation specialists consult with in-house experts in utility operations; power generation, transmission, and distribution; water/sewer collection, distribution and treatment; system protection; industrial processes; geographical information systems; and long range planning.

Our experience includes electric and water utility SCADA, energy management systems (EMS), substation automation, and industrial automation systems.

Projects range in size from small PC-based SCADA, to full EMS function including automatic generation control (AGC), economic dispatch, and network analysis and security applications. Burns & McDonnell is also a leader in the design, implementation, and programming of programmable logic control (PLC)-based automation for utility and industrial applications.



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RECENT SCADA CLIENTS

CITY OF BENTONVILLE ARKANSAS PUBLIC WORKS DEPARTMENT

Burns & McDonnell designed a SCADA and substation automation system for this client, which included integration of programmable logic controllers (PLCs) and intelligent electronic devices (IEDs). IEDs included ABB TPU 2000R Transformer Protection Relays, Basler BE-851 Overcurrent Relays, and Bitronics Power Plex RT electronic transducers. NovaNet Orion data concentrators were used to integrate the IEDs with Square D PLCs and ModBus protocol providing a complete substation automation network for three of the City's electrical substations. Radio communications are used to communicate between the substation networks and an open-architecture PC-based SCADA master station.

AMES MUNICIPAL ELECTRIC SYSTEM (AMES)

This SCADA/EMS system consists of a dual-redundant Open Systems International (OSI) masters station and fifteen Telegyr 5310 and 5520 remote terminal units. The masters station utilizes an open architecture platform which includes Dell PowerEdge servers, five operator stations in a client/server configuration, corporate LAN interface, and fiber optic communications. The feature's of this system includes sequence-of-events (SOE) reporting and NOAA satellite time synchronization, and an Internet Server for remote web-based access to designated information. The EMS capabilities include automatic generation control (AGC) of one 65 megawatt coal fired unit, one 30 megawatt refuse-derived fuel (RDF) fired unit and one 16 megawatt combustion turbine with economic dispatch, interchange transaction scheduler, and cost of interchange analysis.



Burns & McDonnell provided the design engineering services for AMES original Landis & Gyr 6800 system in 1990, and was then retained by the client to design the master station upgrade to open architecture in 2000. Burns & McDonnell performed the initial feasibility and planning studies and then provided design services including system specifications, bid evaluation and contract administration for the original system plus the upgrade. Burns & McDonnell also provided substation integration design including remote terminal unit (RTU) I/O point wiring, transducers and interposing relays and the installation contract.

COLORADO RIVER COMMISSION OF NEVADA

Integrated technology. That is the key to Burns & McDonnell's design of a complete SCADA and communications system for the Colorado River Commission of Nevada (CRC). This system combines computers and programmable logic controller (PLC) technology with microwave and fiber optic communications to provide an integrated high-tech SCADA/substation automation system.



CRC undertook a project to provide electrical power to serve pumping facilities used to transport water from Lake Mead to the southern Nevada region. Burns & McDonnell was hired to provide complete design services for this extensive project, which includes two 230/69-kV transmission substations, four 69/4-kV distribution substations, five miles of underground 69-kV ductbank, and associated communications and SCADA systems.

The SCADA system will consist of PLCs distributed throughout the transmission and distribution substations. These PLCs are networked together with fiber optic cable within the transmission substations and between the transmission and distribution substations. A common protocol, MODBUS Plus, is used for communications among the PLCs. A protocol converter/multiplexer, the Novatech Bridgemux, is employed to integrate the MODBUS architecture with the proprietary ABB protocol of the relays, presenting all data to a local substation-hardened personal computer in the transmission substations that serves as a local man-machine interface (MMI).

The SCADA master station is located at CRC's headquarters in Las Vegas. The substation integration networks are tied into the master station via a wide area digital network (WAN). The WAN consists of spread-spectrum digital microwave radio and fiber optics in the form of optical ground wire (OPGW). The fiber portion of the WAN utilizes intelligent SONET OC-1 (55 Mbps) multiplexers with automatic rerouting capability.

HOLLAND BOARD OF PUBLIC WORKS

Burns & McDonnell designed and specified a SCADA system for Holland Board of Public Works.

This SCADA system consists of a central computer system (master station), a remote operators console and 8 remote terminal units (RTUs). These RTUs provide monitoring and control of 8 electrical substations and interchange points. The RTUs communicate digitally

to various intelligent electronic devices (IEDs) in the substation utilizing a common protocol via fiber optics.

The master station consists of work station class reduced instruction set computers (RISC) in a dual-redundant configuration running a Unix operating system and X-windows as the man-machine interface (MMI). A distributed-processor local area network (LAN) is employed. The network's open-architecture platform allows for integration with existing hardware and software such as BPW's Arcinfo geographical information system (GIS) as well as allowing for necessary upgrades to support future applications such as customer information systems (CIS) and outage reporting.

The SCADA system is configured with two operator workstations at BPW's headquarters and a remote operator's station located at the power plant's control center. Master station-to-RTU and remote operator's console is via BPW's fiber optics system.

Burns & McDonnell provided complete engineering and design services. We provided installation and wiring drawings for the RTUs including updating existing BPW drawings and conversion of manual drawings to an AutoCADD format as needed. We also provided specifications and contract documents for the procurement of the system, bid evaluation, database development, contract administration, integration, and inspection.

CITY OF INDEPENDENCE, MISSOURI

This system is performing the City's control area functions. The economic dispatch and interchange transaction programs allow the dispatcher to quickly evaluate buy/sell arrangements with adjacent utilities. The system is controlling the City's coal and gas-fired generation to optimal loading levels. Six strip chart recorders were furnished with the system.

Burns & McDonnell performed a feasibility study that resulted in a recommendation that the City establish a control area and that a SCADA/EMS system be implemented. Burns & McDonnell then provided the system design and specifications and participated in bid evaluation and contract award. Other services included contract administration for the project and participation in system factory tests, installation and acceptance tests.

MIDWEST RESOURCES

Burns & McDonnell provided complete electrical design services for the addition of ten SCADA remote terminal units (RTUs) in existing 12-kV distribution substations for Midwest Power. Our design included modification of AC and DC schematics and I/O point wiring. We modified the client's existing substation drawings and created new drawings as needed.

In the performance of these services, Burns & McDonnell assigned a substation engineer to work in the client's offices for 12 months as an extension of their staff.

NORWICH UTILITIES

This SCADA system consists of a dual HP-9000 open architecture master station and nine 7050A remote terminal units. The system was furnished by Advanced Controls Systems. The features of this system include an X-Windows graphical interface, remote workstations and an interface to a guest computer at the Connecticut Municipal Electric Energy Cooperative (CMEEC) for retrieval of hourly load information.

Burns & McDonnell provided the SCADA study and design for the City of Norwich. The planning study identified the best approach to the replacement of the City's obsolete Westinghouse Visicode supervisory system with a modern SCADA system. The study included definitions of both technical and functional requirements of the equipment, telecommunications options, and estimated capital budget and schedule.

Design services included preparation of technical specifications and contract documents, vendor prequalification, bid evaluation, and contract supervision.

PEDERNALES ELECTRIC COOPERATIVE

This SCADA system consists of a Leeds & Northrup LN700 fully distributed master station and forty-three (43) C300 RTUs. System features include SOE reporting, automatic voltage reduction and an ethernet LAN interface for data transfer to the Cooperative's DEC mainframe computer.

Burns & McDonnell provided the initial feasibility and planning study for the project, then provided design services including system specifications, bid evaluation, factory acceptance testing and contract administration. Burns & McDonnell also provided design of an extensive telecommunications network including two hops of 6 GHz

digital (DS3) microwave with an interface to Lower Colorado River Authorities' (LCRA's) microwave system, and seven 928/952 MHz multiple address radio systems (7 masters, 43 remotes).

PLATTE-CLAY ELECTRIC COOPERATIVE

Platte-Clay Electric Cooperative retained Burns & McDonnell to perform a SCADA and Load Management Feasibility Study. The study was used to provide justification for REA financing of the system.

Burns & McDonnell designed the Ilex 9000 SCADA system for Platte-Clay Electric Cooperative. The system includes thirteen RTUs and two master station sites. Our services included design of both the SCADA system and the communications network, which includes two multiple-address radio systems. We provided system specifications, bid evaluation, factory acceptance testing, and contract administration. Burns & McDonnell also designed the wiring and telemetry interface for one of the Cooperative's substations. The Cooperative then adapted our design for their other substations.

ROLLA MUNICIPAL UTILITIES

Rolla, Missouri, is a growing community of approximately 15,000 people located in the Ozark Hills of south central Missouri. Rolla's flourishing economy centers around a state university and several large industries. With a steadily growing electrical load, modernization of local utilities became a priority.

In 1994, Rolla Municipal Utilities decided to move toward the future with the implementation of a modern SCADA system that would provide remote monitoring and control of electric and water utility facilities. Burns & McDonnell was hired to provide complete design of the new system, including the master station, remote terminal units and a radio communications system.

This SCADA system consists of a central computer system (master station) and 48 remote terminal units (RTUs).

These RTUs provide monitoring and control of 15 electrical substations and metering points, 12 34.5-kV sectionalizing switches, 15 water wells, two pump stations and four water towers. The system also provides control of distributed capacitors for VAR control. The RTUs communicate digitally to various intelligent

electronic devices (IEDs) in the substation utilizing a common protocol via fiber optics.

The master station consists of reduced instruction set computer (RISC) computers in a dual-redundant configuration, running a UNIX operating system. A distributed-processor local area network (LAN)-based arrangement is employed. This open-architecture platform provides for orderly expansion in support of future applications including geographic information systems (GIS), and future integration with customer information systems (CIS) and outage reporting. Two operator workstations are provided at RMU's operations center, and an off-premise development and administration workstation is provided at RMU's engineering center.

Master station-to-RTU communications are provided via 928/952 MHz multiple-address radio (MAS). A point-to-point 960 MHz digital radio link is used to connect the off-premise workstation to the master station local area network. Capacitor control is accomplished with VHF radio communications.

Burns & McDonnell provided the initial engineering study for this system, then provided complete design services. We provided detailed installation and wiring drawings for the RTUs, including updating RMU's existing substation drawings as needed and converting them to an AutoCAD format. We also provided specifications and contract documents for the furnishing and installation of the system, FCC licensing of the radio systems, bid evaluation, contract administration, inspection and testing.

RUSHMORE ELECTIC POWER COOPERATIVE

Burns & McDonnell is providing a mid-life assessment study and upgrade plan for REPC's SCADA and related communications system.

In 1987 REPC installed a Valmet Series VII SCADA system, along with a hybrid communications system consisting of 2 GHz and 960 MHz microwave, 928/952 MHz multiple-address (MAS) radio and C-band very small aperture satellite (VSAT) terminals. As usage of the system expanded, certain capacity and functional limitations became apparent. REPC retained Burns & McDonnell to provide a short-range and long-range strategy to upgrade the system.

Our recommendations include migration to an open architecture distributed SCADA system, which will provide a higher degree of

flexibility, reliability and functionality, along with numerous improvements in the communications system.

SIKESTON (MISSOURI) LIGHT AND WATER

This SCADA system consists of an Ilex 9000 master station and seven 8200 RTUs. The 9000 master is configured in a distributed architecture with dual IBM PS/2 Model 70 servers and two IBM PS/2 Model 30 operator stations connected on an ethernet local area network (LAN) and one additional Model 30 operator station located at a remote site. RTUs were installed in seven substations. The system features SOE reporting and a digital interface to Schweitzer Engineering Laboratories multifunction transmission relays.

Burns & McDonnell provided design services including system specifications, bid evaluation, factory acceptance testing and contract administration. We also provided design of the telecommunication system employed by the SCADA system, which consists of both digital fiberoptics and 928/952 MHz multiple-address radio.

SOUTH TEXAS ELECTRIC COOPERATIVE, INC.

In 1995 South Texas Electric Cooperative (STEC) hired Burns & McDonnell to assist them in the procurement of a modern integrated energy management system (EMS). The system contract was awarded to Advanced Control Systems (ACS).

The new system is based on dual Hewlett-Packard J200 RISC computers in a distributed configuration. Each operator position includes three 20-inch high-resolution monitors. A rear-projection graphics wall was also included consisting of a 2x3 matrix of retro-type projectors yielding a 7-foot tall by 13-foot wide full-graphics display. Software applications include SCADA, AGC, Economic Dispatch, Interchange Scheduling, Interchange Transaction Evaluation, State Estimator and Operator Load Flow.

Prior to 1996, the STEC control center had no advanced energy management capabilities.

The SCADA system was an early 1980s vintage Advanced Controls Systems 3040 SCADA master computer with an 8-bit CPU, used solely for monitoring and control of substations. The AGC system was a C-based program, written by in-house personnel, running on a personal computer under UNIX. The SCADA system was completely separate from the AGC. Tie line flows and generator control pulses were telemetered in and out of the AGC computer via

Leeds & Northrup tone transmitters and receivers.

A Digital Equipment Corporation Alpha workstation was installed in 1995 to extract operating data from the AGC and forward it to the ERCOT Security Center in Austin, Texas, through an implementation of EEPRI's Inter-Control Center Protocol. STEC decided that it was time to integrate all of these functions into a single open-architecture SCADA/EMS.

Burns & McDonnell developed the specifications for the new system, assisted in the prequalification of bidders and evaluated competitive proposals. Bidding was followed by a short-listing process including vendor demonstrations and negotiations.

TRANSWORLD AIRLINES, GROUND OPERATIONS CENTER

This Landis 6800 SCADA system consists of a single CPU master and fifteen remote terminal units. The system is used to monitor and control TWA's 12-kV substations and 480 volt load centers at their 747/SST Overhaul Base and Ground Operations Center at Kansas City International Airport. The system also controls 3,750 kVA of emergency generation at the facility. The system features a digital interface to Westinghouse Digitrip low voltage breaker trip units at the RTU level. This interface was developed under contract with Landis & Gyr and was the first of its kind. The interface will allow the SCADA system to retrieve breaker status and analog telemetry values from more than 200 secondary feeder breakers without the need for analog transducers or additional wiring.

Burns & McDonnell performed all design-related functions including development of system specifications, bid evaluation, factory acceptance testing and contract administration. We provided database programming as well as special programs to start up and shut down emergency diesel generators in the event of a power interruption. We also provided RTU integration design including I/O point wiring, interposing relays and the installation contract.

U.S. ARMY CORPS OF ENGINEERS

Burns & McDonnell is designing a Supervisory Control and Data Acquisition (SCADA) system to allow the plant operating contractor to monitor and control the 12.47-kV electrical distribution system and to monitor the emergency power generators at the Lake City Army Ammunition Plant in Independence. The design includes the SCADA master station, approximately 40 remote terminal units, a

radio communications system, and dispatch center with system mapboard in an existing room remodeled for this function.

WISCONSIN PUBLIC POWER, INC.

This SCADA/EMS system was furnished by Ilex Systems and is based upon their Ilex 9000 distributed architecture. The master station consists of dual IBM PS/2 Model 90 computers, two IBM PS/2 Model 70 operator station and one remotely located Model 30 operator station. Forty-eight (48) 8110 RTUs and four (4) 8200 RTUs were provided. Twenty-three of these RTUs are quiescent RTUs with dial-up communications for retrieval of load information. EMS features include interchange transaction scheduling and short term load forecasting. A guest computer interface automatically transfers hourly load schedules to Wisconsin Electric Power Company's (WEPCO's) Control Data Corporation EMS system. The system will be used for power dispatch for WPPI's member municipal utilities in four separate control areas throughout Wisconsin. Burns & McDonnell provided design services including system specifications, bid evaluation, factory acceptance testing and contract administration. Burns & McDonnell also provided design and FCC licensing of the associated multiple-address radio systems.