



University of Mississippi Wins Big with On-Site Generation & Load Curtailment



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Like many universities, the University of Mississippi is always interested in maintaining its quality of education without increasing costs. The University wanted to increase funds available for educational programs without raising fees, so when it learned of a load curtailment initiative introduced by the Tennessee Valley Authority (TVA) that would allow it to reduce its electricity costs, it was eager to participate.

TVA's load curtailment plan is simple. In exchange for granting TVA the right to cut off power to the University during peak demand times for up to 72 hours per year, the University gains significantly-reduced kW and kWh rates on its overall power usage. According to Darrell Russell, Physical Plant Engineer at the University, the reduced rates add up to over \$1 million in annual savings, cutting the University's electrical energy costs by 25 to 30 percent.

Load Curtailment Initiative Details

The Tennessee Valley Authority is a large power producer with a power-service region covering 80,000 square miles. TVA sells its power to 158 distributors and 62 large industrial and federal direct-serve customers. TVA introduced the load curtailment plan to reduce its costs and better manage its resources. The plan allows TVA to curtail customer demand rather than invest in more generation facilities or pay higher market prices for excess power during peak demand periods. Russell explains, "The University qualified for this program because its overall electric load was over 5,000 kW and it was willing to make its entire electric load interruptible." The University also agreed to as little as one hour's notice for curtailment, although TVA tries to provide advanced notice whenever possible.

The University is the largest customer of its energy supplier, the North East Mississippi Electric Power Association (NEMEPA), a distributor of TVA electricity. Because NEMEPA is a not-for-profit cooperative concerned only with keeping its revenue neutral, it was happy to help the University set up a load curtailment agreement. "While under this curtailment program, the University purchases its utility power at a reduced rate. This new rate causes a reduction in the revenue margin that NEMEPA previously collected from the University for its energy consumption. NEMEPA has been contracted by the University to manage the generation facility. NEMEPA also added a small facilities charge to the University's utility bill for equipment needed for the generation project, which helps keep our revenue neutral," clarifies Bob Collier, Manager of NEMEPA.



Covering Curtailment

The load curtailment plan gave the University a great way to save on its electrical bills. But it created a new challenge: providing reliable power to the entire campus for the up to 72 hours a year while TVA curtailed its power supply.

The University called in experts to help craft a solution. Fisher & Arnold, Inc., an architectural and engineering firm from Memphis, Tennessee, was contracted to design, build and project-manage an on-campus generation facility.

At a cost just under \$7 million, the new facility houses 10 diesel generators with a maximum generation capacity of 20 MW. The facility also has two empty bays allowing for future capacity growth up to 24 MW. According to Chet Puckett, Project Manager of Energy Services for Fisher & Arnold, Inc., the new generation facility can power the entire campus for up to 3 or 4 days without refueling, if necessary.

Information and System Control

The system can function in several strategic modes. These modes include “Island Mode”, where it provides all the power necessary for the campus while the campus is completely off-line from the utility; “Baseload Mode” where it provides power supply in conjunction with the utility; and “Import/Export Mode” where it can provide power back to the utility’s electrical grid.

A unique combination of equipment and technologies were used to provide the control and functionality needed to operate the generators in these different modes. Each generator unit has its own control/monitoring system that allows it to be individually controlled and monitored at the generator unit by an Advanced Power Technologies (APT) power module and switchgear.

A PowerLogic® ION Enterprise® energy and power management system from Square D/Schneider Electric is another crucial control element within the facility. The system is comprised of three full-featured ION power and energy meters located on a relay panel in the switchgear and a Server PC running PowerLogic® ION Enterprise® software. The meters each fulfill a different function: measuring the overall load requirement of the campus, monitoring the generated power produced by the generators, and tracking the incoming power from the utility at the service entrance of the university’s substation.

“The PowerLogic® ION meters are a small but key part in the system”, notes Puckett. “The information they provide allows the whole system to react quickly to any interruption in power from the utility, whether or not it is scheduled.” The overall effectiveness of the system was clearly demonstrated not long after installation, when a bird flew into the utility’s transmission line system and dropped service to the University. The generators picked up the entire campus load in about 30 seconds from the time of the outage, ensuring no significant impact on any functions or activities occurring at the institution.





The meters send collected data to PowerLogic® ION Enterprise® software where it is aggregated and analyzed. The software sends the information on to the APT Master module that controls the operation of all generator units. The Master module receives information via Ethernet using Modbus protocols from each of the 10 generators, each medium voltage breaker, all protective relays, and the step-up transformers as well as from PowerLogic ION Enterprise software.

All operational and control data is displayed on specially designed PowerLogic® ION Enterprise® Vista screens on the Server PC workstation inside the building, providing full Supervisory Control and Data Acquisition (SCADA) for the entire facility, including a 45,000 gallon diesel generator fuel reserve.

System information and control functions are available locally to users within the generation facility, as well as remotely to users with permission to call in to the system's modem connection or log in via a Virtual Private Network (VPN) Internet connection. Remote access permissions are held by staff at the University, at NEMEPA, at Fisher & Arnold, Inc., and at Thompson Power (the Caterpillar distributor who supplied the generation equipment). Both local and dial-in access is monitored and controlled with 3 levels of security, both physical and virtual, and for safety and control reasons, only the utility is authorized to dispatch the generators remotely.

Reporting & Billing

PowerLogic ION Enterprise software data is also used to confirm the data on the University's bills from TVA, and to prepare operational reports for the system, particularly the operating costs of the generators. More specifically, data is drawn into a custom Excel-based decision model developed by Fisher & Arnold, Inc. This innovative program is installed on the Server PC and operates in the background to help determine the generators' operating costs on a real-time basis and limit the maximum price the University will pay for utility power at any given time, thus capturing additional benefit for the University by avoiding the cost of higher priced energy.

Increased Learning Opportunities

The facility will be used for teaching purposes as well as operations, doubling as a learning tool for students enrolled in the University's electrical engineering programs. By offering hands-on energy management experience, the University gains a practical advantage over other institutions that offer only theory. The University can also teach thermodynamics, acoustics, and instrumentation concepts. The Business College will also benefit, using the facility to teach "real-world" energy trading concepts through a "real-time" energy trading computer service. The generation plant will likely create increased enrollment in both the School of Engineering and the Business College, by offering students 'hands-on' experience in electrical and mechanical engineering and in the electrical power marketing field, a real benefit in today's competitive job markets.





Future Revenue Possibilities

The generation facility has excess capacity (up to 8 MW, depending on potential expansion and campus demand) that could be sold back to TVA or other entities when price conditions justify. When needed, the University and Fisher & Arnold will initiate the proper agreements with NEMEPA, TVA and any other entities to allow power to be exported back to the grid and sold, generating revenue for the University. Russell points out that all necessary protective, switchgear and metering equipment is already in place. “The system is ready to go when the price is right”, he says. “In fact, the entire 20 MW of generated power has been exported back on to the grid on a test basis, to verify that the system functions properly.”

The Best of Both Worlds

A final, perfect illustration of why the new system is such a success: prior to the construction of the generation facilities, the University did not have a full campus backup protection. With only small generators spotted throughout the campus for the most critical loads, a loss of utility power meant most of the campus stayed in the dark. Now full power can be restored in less than a minute through an automated and reliable system. Not only is the new system saving the University of Mississippi a million dollars a year, it has vastly improved services for the entire campus as well. For Ole Miss, it truly is the best of both worlds.

Schneider Electric - North American Operating Division
295 Tech Park Drive
LaVergne, TN 37086
Tel: 866-466-7627 Toll Free
PowerLogic.com



by Schneider Electric

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