



A Venetian Bind

What was The Venetian Resort to do if it wanted to provide a first-class vacation experience in the middle of the desert and at the same time not worry about the power needed to generate such an experience? The Venetian Resort took the road to electrical power independence by installing GE Power Management Systems and InTouch HMI.

LAS VEGAS IS THE GLITTERING OASIS IN THE NEVADA DESERT, FAMOUS FOR ITS WORLD-RENOWNED CASINOS AND RESORT HOTELS THAT PROVIDE A UNIQUE, 24-HOUR-A-DAY EXPERIENCE FOR ENTHUSIASTIC VISITORS. Perhaps the brightest star in today's Las Vegas skyline is The Venetian Resort/Hotel/Casino, which combines the best the city has to offer in modern conveniences with the Old World character and charm of Renaissance-era Venice.

The Venetian has gone to extraordinary lengths to recreate the Renaissance artworks, the graceful arched bridges, the flowing canals and the lovely piazzas that capture the color and spirit of the original Venice in faithful detail. The Venetian also hasn't forgotten the elements that make Las Vegas what it is, including a vibrant casino, an incredible array of outstanding restaurants, today's biggest names in retail shops and boutiques and more than 3,000 luxurious hotel suites.

This magical mix of the old and the new has made The Venetian one of the most successful resort launches in Las Vegas history. But what makes it truly unique is the behind-the-scenes technology that guarantees The Venetian will always be able to offer its guests a top-of-the-line recreational experience. Combining the latest in power management control systems (PMCS) from General Electric Industrial Systems and the InTouch® human-machine interface software from the Wonderware® FactorySuite™, The Venetian has created a world-class electrical power distribution and management system. It not only gives The Venetian complete freedom from the vagaries of the new century's energy issues, but also ensures that the resort is an efficient and low-cost power user.

A Power Distributor and Consumer

CUSTOM-DESIGNED BY GE'S INDUSTRIAL SYSTEMS GROUP AND ELECTRICAL SYSTEMS CONSULTANTS (ESC) INC., BASED IN FORT COLLINS, COLO., THE HOTEL SYSTEM COMBINES MULTIPLE ENERGY MANAGEMENT APPLICATIONS THAT ALLOW THE VENETIAN TO OPERATE AS A POWER DISTRIBUTION COMPANY, NOT JUST A POWER CONSUMER. The GE Energy Management system provides both short- and long-term cost efficiencies, increased facilities uptime, good power quality and effective cost allocation and usage monitoring through the deployment of multiple software applications and a broad array of hardware components. ESC, a GE Industrial Systems partner and Wonderware Systems Integrator, provided the system design, programming, integration and eventually all of the start-up and commissioning of the system.

Networks of devices, including programmable logic controllers (PLCs), data concentrators, Ethernet network gear, meters, protective relays, controllers, monitors and trip units, are managed by GE software applications that include the PMCS system, a cost allocation module and power quality analysis systems. The Wonderware InTouch HMI system provides the graphical interfaces used by Venetian facilities staff to monitor operation of the entire system and take action whenever necessary. They can better manage demand projections, meter all usage and monitor power quality so equipment runs properly, more effectively manage power load shedding when necessary and generate their own backup electrical power in emergencies.

Electricity arrives from Nevada Power via two substations. What happens at this point is uniquely different from other Las Vegas power users.

The Venetian isn't just a retail customer. Using transformers that look like something right out of the movie "Frankenstein," the hotel takes the electricity that arrives at 138,000 volts and steps it down to 25,000 volts for internal distribution. The Venetian does this through its own power system that feeds the hotel, casino, restaurants, shops and soon the adjacent Sands Expo and Convention Center. Most other hotels and casinos require the utility to step it down to more manageable voltage for their retail use, but The Venetian has 20 electrical power substations of its own, spread throughout its campus of buildings.

"In our early meetings with GE and ESC, they convinced us that we could save a lot more money on our power bills if we did it this way," says Mike Helbert, project manager for The Venetian's power management systems. "The power company can bill us at a transmission rate instead of a distribution rate because they're not doing anything to it. We actually step down the voltage, just tapping off their supply. The transmission rate is a lot less than the distribution rate, and since we're a big user, we qualify for the better rate."

This unusual difference in power management not only means The Venetian's power bill is reduced tremendously, but that the hotel is also self-reliant when it comes to power sourcing. The hotel typically draws utility power at a 12 megawatt rate for all its operations. The Venetian has its own bank of five backup generators that can produce up to 10 megawatts of power—enough to run facilities with minimal load shedding should there be a complete loss of utility power. Both systems are managed from the same PMCS consoles, and the hotel has the ultimate flexibility to respond to constantly changing energy needs.

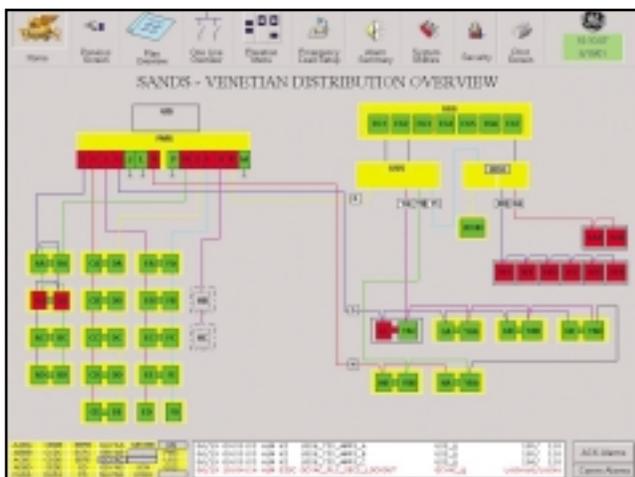
In addition, the hotel's power systems are designed to use "double-ended" or parallel substations. This means that if electrical

repairs have to be made to any piece of equipment, staff can shut down one side of a substation to do the work, and hotel and casino services will still function normally using the other side. In addition, should any piece of equipment fail for any reason, the redundancy would provide an instant switchover to the parallel unit to keep everything running.

"It should be obvious that since we're in a service business it's important for us to have all our facilities running all the time in order for us to keep generating revenues," Helbert says. "No matter what happens to the rest of the world out there, customers standing in our casino or dining in our restaurants or shopping in our stores will never know it if there's a power problem. The most anyone would see is a blip of a few seconds if power goes off, as we switch to backup circuits and everything pops back on. We've conducted extensive testing of this capability and it works just fine—although I'm happy to say we've never had to use it."

Extensive Power Management

MANAGING ALL THIS FLEXIBILITY, HOWEVER, MEANS THE HOTEL ENGINEERING STAFF MUST HAVE PRECISE CONTROL OVER ALL POWER EQUIPMENT AND BE ABLE TO RESPOND TO EVER-CHANGING CONDITIONS FROM A CENTRAL SITE. That's what the GE power management system gives them—with high visibility into their systems via the InTouch HMI software. The graphical screens give management a "one-line" diagram of their entire power management system. Just by clicking on the graphical representation of any substation, power line, breaker or panel, engineers can see what's happening and take appropriate actions. All critical real-time control requirements are handled through protective relaying devices and approximately 32 PLCs. The InTouch HMI station also allows the staff to interact



THE GE/INTOUCH OPERATOR SCREEN SHOWS A COMPLETE "ONE-LINE" DIAGRAM OF THE HOTEL'S ENTIRE ELECTRICAL POWER MANAGEMENT SYSTEM. NOTICE THE DOUBLE-ENDED, REDUNDANT SUBSTATIONS AT THE LEFT, WHICH PERMIT MAINTENANCE OR REPAIR OPERATIONS WHILE STILL PROVIDING POWER TO FACILITIES.

with these devices when manual control is required. ESC designed numerous one-line diagrams and on-screen control panels that exactly mimic the real control panels in the power system so the system can be run as if the staff was actually on the plant floor.

"We have used InTouch for many years for various types of applications, including utility and industrial power monitoring applications," says Kevin Hartig, ESC project manager. "The addition of the GE PMCS application set to InTouch added a great deal of power and flexibility to the system design. It allowed us to efficiently and cost-effectively integrate an enormous amount of information for the system so that we could concentrate on the real-time control portions of the emergency systems."

The major benefits provided by the system include:

- cost allocation, which defines cost centers to determine actual energy usage by operating departments or groups to evaluate efficiency and to determine where energy-reducing strategies, such as moving in-peak usage into off-peak periods or shifting from one rate schedule to another, could help improve power costs;
- demand prediction, which identifies costly variations in load profiles by monitoring peak demand usage in all facilities and enabling implementation of control strategies to avoid unforeseen peak demands that can incur additional power surcharges;
- load shedding management, which facilitates the orderly cycle-down of operations during any electrical disturbance;
- system metering, which provides an accurate picture of energy use so that problems often can be identified and alarmed before damage occurs, so that maintenance and replacements costs are reduced;
- power quality monitoring, which tracks power data such as voltage or current waveforms and harmonic content so that the mix of different power needs—from lighting to computers and slot machines—is handled efficiently;
- protection and management of generators, which can reduce downtime and maintenance or repair costs as well as make the most efficient use of backup generation capabilities;
- trending, which provides a historical look at electrical operating characteristics and facilitates load and capacity studies so that the system can be maintained and expanded over time.

The whole system operates automatically and is monitored 24 hours a day from both the project manager's office and the hotel's Fire Control Room. Helbert could even dial in from home if a problem arose at night, when he's off-duty. If an InTouch alarm is triggered, the hotel staff can swing into action immediately. If there were a utility power loss, for example, the system would automatically shed power or allow management to selectively shed power to less critical functions so that the most important needs are fully up and running. "The system was designed to make the most efficient use of staff," Hartig explains. "The facility is extremely large, and it's not easy to get to many of the substation locations quickly. Remote monitoring and control of the system were a necessity to allow staff to quickly diagnose and respond to problems should they arise."



VENETIAN POWER MANAGEMENT STAFF PERFORM PERIODIC CHECKS OF BACKUP DIESEL ELECTRIC GENERATORS, WHICH CAN PROVIDE UP TO 10 MEGAWATTS OF POWER FOR THE HOTEL.

This remote control capability has implications for both response times and costs related to potential emergencies, Hartig notes. At a potential cost that could range up to \$500,000 per hour, dependent on the location on the property, downtime situations could be very expensive.

"The total PMCS system, with the control scenarios that are in place, helps to avoid or at least minimize downtime," Hartig says. "If there were a feeder equipment failure on one circuit, the system is designed to automatically switch sources and restore power, keeping systems online. If the system were not designed to operate in this manner, it could take up to 15 minutes just for facilities staff to get to a specific location and identify the problem. Just three circuit faults in a year could cost upwards of \$375,000 under those conditions. This is in addition to the emergency standby systems that are in place to prevent total power loss in the event that Nevada Power experienced delivery problems to the property. Without the standby systems, the loss could be astronomical."

"The way this system is designed, we have motor-operated circuit breakers so that in case we have a problem with our power source or any of our generators, we can prioritize our load shedding," Helbert explains. "In addition, most equipment is programmed so that if one of the generators drops out, that circuit's load will be shunted automatically. The breakers will open in sequential order, right down the line."

"If everything else went down, the PMCS system would take us right down to the point where the only thing left on, with one generator, would be the emergency power and life-saving systems," Helbert says. "The PLCs throughout the system control these real-time functions and run on their own dedicated communications network, independently of the networks used for data acquisition."

"But believe me, we would not let it get that low," he emphasizes. "We'll keep these going. In the worst-case scenario, our basic draw would be 3.4 megawatts, which we could feed with two



ELECTRICITY ARRIVES FROM NEVADA POWER AT 138,000 VOLTS AND IS STEPPED DOWN AT THE VENETIAN TO 25,000 VOLTS FOR DISTRIBUTION TO THE HOTEL'S OWN SUBSTATIONS. THE TRANSFORMER GEAR LOOKS LIKE SOMETHING FROM THE MOVIE "FRANKENSTEIN."

generators if we had to. Since we have five generators, we have the potential to keep running through most anything."

Given the electrical power supply problems that have been encountered in the western United States over the past year, it's important to The Venetian that they partner closely with Nevada Power. In addition, the hotel is planning large expansions of its facilities over the next few years, which will add more power requirements.

"Right now, the Sands Convention Center, which is among the facilities we own, is on a separate power system. We'd like to integrate that with these operations because it would save us thousands of dollars a year in our electric rates," Helbert notes. "In addition, we're in the process of constructing another 1,000 hotel suites atop our parking garage, and we have another expansion phase that calls for the addition of another 3,000 hotel suites over the next five years."

"We're looking at running in parallel with Nevada Power so that we might have greater visibility into power conditions in the outside world and could respond with them to support the situation here in Las Vegas," Helbert says. "If the worst happened and they couldn't fully supply the public in an emergency, we would be able to reduce our load and handle most of our needs internally—which would be a big help to the power company."

"While we want to be a good corporate citizen in this regard, we still have to be careful because we obviously must take care of our own needs," he adds. "We can't afford to have our capacity reduced by outside demands, but it would be very nice if we could monitor trends in outside power usage to see what potential emergencies might be facing the region so that we could respond accordingly where possible."

GE Industrial Systems, Wonderware and ESC are helping to power The Venetian to be a highly efficient resort that keeps its customers happy at all times—without those vacationers or conventioners even realizing the safeguards that have been put in place to make their visits so enjoyable. And that helps contribute to The Venetian's bottom line in more ways than one. **THE END**