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Sarajevo's economic growth gets a boost with Siemens technology

The city of Sarajevo, capital of Bosnia and Herzegovina, has re-established itself as one of Southeastern Europe's most sought-after cultural places. It's becoming renowned for its music, film and arts programs, museums, and outdoor recreation opportunities. The provision of reliable, quality power to the city's industrial zones is critical to sustain Sarajevo's growth which impacts the nation's economy. This was made possible by building a redundant, fiber-based data communication network supported by managed Ethernet switches with a successful track record to ensure reliable power substation performance.

The modern city straddles the Miljacka River, fed by streams draining the surrounding Dinaric Alps. Its metro area houses a diversified population of more than a half million residents. After emerging from the shadows of war in the 1990s, Sarajevo has become the fastest growing city in the region. Tourism and manufacturing dominate the city's economy, which accounts for one-quarter of the nation's gross domestic product. Numerous industrial zones provide a foundation for manufacturing and commerce, which strengthens the local economy.

The provision of reliable, quality power to the city's industrial zones is critical to sustain Sarajevo's growth which impacts the nation's economy. This fact is well-illustrated by the Industrial Zone Rajlovac in western Sarajevo, near the A1 Motorway, the city's arterial highway. This industrial zone hosts more than

60 companies across industries, such as food processing, automotive, transportation, manufacturing and retail, providing employment to over 2,000 people.

Industrial Zone Rajlovac is served by Elektroprijenos BiH's bulk power transmission system and the Sarajevo 10 substation, one of the most important substations in the 400 kilovolt (kV) network serving the entire country. In the post-war years, substations were upgraded with then standard supervisory control and data acquisition (SCADA) systems.

After 15 years, these technology upgrades had reached the end of their useful life. Not only did maintenance costs grow, but the substations' reliability had become an issue. Unplanned power outages were disruptive and costly for manufacturing facilities whose processes rely on uninterrupted, quality power.



To address these issues and ensure the reliability of the Sarajevo 10 substation, the transmission system owner, Elektroprijenos BiH contracted with the leading local systems integrator, CET Energy Ltd. to perform an ambitious slew of upgrades. CET Energy, founded in 2009 in Sarajevo, specializes in designing and upgrading transmission and distribution substations and the underlying communication networks they rely on.

“The main idea behind the refurbishment of this substation was that it had outdated equipment that had to be renewed for voltage stability and service reliability,” said Sanjin Čekić, system integrator with CET Energy. “There were too many malfunctions and there was constant demand for more energy by tenants of the industrial zone.”

The challenge:

Maintain operation of a critical transmission substation while refurbishing protection and control gear by upgrading an underlying data communication network for reliable power delivery.

CET Energy’s work included upgrading and integrating existing protection and control devices with a new, redundant SCADA system, and the installation of two new power transformers and new switchgear. The substation had to comply with the global IEC 61850 standard to ensure that all legacy and new substation devices from different vendors would interoperate.

This meant making the substation digital with Ethernet based communication network that would give it a robust foundation. This would give the grid operators full visibility into the substation’s performance, and provide state-of-the-art protection and control functionality, while ensuring reliable power for Industrial Zone Rajlovac.

“This is one of the most important commercial zones in the city,” Čekić said. “It offers an opportunity for Sarajevo to grow. So, it’s really, really important to have reliable power, as further investment and expansion is being planned.”

Two of Elektroprijenos BiH’s project requirements posed a challenge for CET Energy. “The main requirement of the client was to keep the original substation running the whole time we were rebuilding it, until a new system was up and functioning,” Čekić said. “Also, CET Energy had to ensure the upgrade would result in power reliability for Industrial Zone Rajlovac.

The solution:

Build a redundant, fiber-based data communication network supported by managed Ethernet switches with a successful track record to ensure reliable power substation performance.

The installation of new power transformers and switchgear was relatively straightforward for CET Energy’s experts. The project also required tying together all protection and control devices within the substation using a reliable, standards-based, data communication network, then connecting the substation data network to Elektroprijenos BiH’s operations center.

Maintaining the substation’s power in the industrial zone while upgrading its protection and control devices required a well-considered strategy. This was accomplished by designing a redundant network with fiber optic cables laid in underground tunnels below the substation, connected with managed Ethernet switches that could support capacities for current as well as future needs.

From experience, CET Energy already knew that a reliable standards-based data communication network could be supported by the Ethernet switches from the RUGGEDCOM family of network components from Siemens.

“RUGGEDCOM products were definitely our No. 1 choice,” Čekić said. “We have used RUGGEDCOM for ten years, since CET Energy was founded. This was also our client’s choice.”

CET Energy created two parallel data networks in the Sarajevo 10 substation using the RUGGEDCOM RSG2100 and RUGGEDCOM RS900 Layer 2 Ethernet switches. On the 400 kV transmission side, a series of RSG2100 and RS900 switches were used to connect the legacy and new protection and control equipment. On the 110 kV distribution sides that feed power to Industrial Zone Rajlovac, CET Energy installed another series of RSG2100 and RS900 switches to integrate protection and control gear.

The parallel data communication networks run through a pair of RUGGEDCOM RSG2100 switches, which monitor and transfer data to an onsite, redundant, human-machine



Sarajevo's substation of Elektroprijenos BiH "Copyright: CET Energy d.o.o"

interface, and to servers, connected to a wide area network (WAN). The same network transmits data to Elektroprijenos BiH's offsite operations center.

The RUGGEDCOM RSG2100 is a rugged, fully managed, modular 19-port Ethernet switch specifically designed to operate reliably in electrically harsh and climatically demanding utility substation environments. This highly versatile switch supports various fiber optic or copper Ethernet connections with up to Gigabit port speeds that allowed CET Energy to accommodate legacy as well as new protection and control gear in the Sarajevo 10 substation. The RUGGEDCOM RS900 is 9 -port utility-grade compact switch used for tight spaces with different fiber optic and copper Ethernet ports.

Both switches not only meet but exceed international standards for electrical substation operations, including the European IEC 61850 standard which guarantees interoperability and communication between substation protection, control devices and other equipment. The switches are designed for passive cooling without fans or other moving parts that can fail in harsh substation environments. Their robust design enables them to withstand electromagnetic interference (EMI) that is endemic to power substations, as well as operate comfortably in temperature extremes of -40 degrees Celsius (-40 degrees Fahrenheit) to up to +85 degrees Celsius (185 degrees F.).

"The RUGGEDCOM product line from Siemens has proven itself the most reliable solution and therefore we have total confidence in its performance," Čekić said. "This is especially important in a transmission substation, where conditions are quite harsh. In fact, we have never experienced any trouble with RUGGEDCOM switches and we've never had to change one out."

Results:

The project of design and deployment ran from October 2016 to October 2017. Since then the refurbished substation serving an industrial zone critical to sustaining Sarajevo's economic growth has been running reliably, with significantly reduced operational expenditure.

"We have had no outages since the project was completed a year ago," Čekić said. "There have been no problems regarding the communication network. It is stable and reliable. The lack of outages obviously lowers operations

and maintenance costs because no manpower is devoted to reliability, freeing field crews to do other work."

As to the specific role of the RUGGEDCOM product line from Siemens, Čekić said, "If you do not have a reliable communication network, then all the data on substation functionality is lost and you have a reliability issue, a performance issue. So, the reliability of the communication network is crucial."

"The communication network is definitely the backbone of this substation system," Čekić added. "Without it, your protection and control scheme cannot work as designed and reliability suffers as a result."

Timely completion of the refurbishment and upgrading of the Sarajevo 10 substation and the return of reliable power for Industrial Zone Rajlovac has increased the number of investors, companies and job opportunities available. This ultimately enables Sarajevo's continued economic growth and its significant contribution to Bosnia and Herzegovina's economy. These accomplishments were duly recognized by CET Energy's client, Elektroprijenos BiH.

"When we finished, our client was very pleased that we completed the project on time, that we had kept the old substation functioning while we completed our work and that the new substation was stable and reliable," Čekić concluded. "Our approach will probably be duplicated in other, similar substations across our client's transmission network."

Conclusion:

Leading local systems integrator CET Energy Ltd. was contracted by Elektroprijenos BiH to perform an ambitious slew of upgrades in the critical Sarajevo 10 substation while ensuring that the original substation continued to operate the whole time until the new system was up and running smoothly. To accomplish this project and build a highly robust network tolerant to chronic outages, a redundant, fiber-based data communication network supported by managed Ethernet switches with a successful track record from RUGGEDCOM, the Siemens line of rugged network components, was built and has been running reliably since October 2017, with significantly reduced operational and maintenance costs. More importantly, the reliable power for Industrial Zone Rajlovac in Western Sarajevo has brought new investors, companies and job opportunities that support Sarajevo's economic growth.



RUGGEDCOM RS900



RUGGEDCOM RSG2100

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