USAID
FROM THE AMERICAN PEOPLE

SERBIA DISTRICT HEATING CASE STUDY

SCHEDULING FOR SUCCESS IN ČAČAK

USAID is improving energy efficiency and diversifying energy generation options in Serbia's district heating sector to decrease gas consumption.

With support from the United States Agency for International Development (USAID), pilot projects at district heating companies in Pančevo, Niš, and Čačak are exploring how advanced technologies, modernized equipment, improved data collection, and **enhanced energy management systems derived from U.S. best practices can save energy and cut costs.**

ČAČAK SCADA PILOT PROJECT

In Čačak, 21 percent of the population relies on the municipal district heating network for warmth in the winter. Over the past ten years, Čačak's district heating company (JKP Preduzeće za grejanje Čačak) experienced very high water and thermal losses, which negatively impact network efficiency.

JKP Čačak invested in system upgrades, including reconstruction of all 4,200 meters of its main line network, and automation of heat supply to better manage operations. However, to fully enhance energy efficiency by reducing system thermal losses, JKP Čačak needed equipment to measure, communicate, and control each thermal substation, as well as a central digital system for remote monitoring and control of heat distribution throughout the network.

USAID worked with JKP Čačak management to improve energy efficiency and operations by installing a supervisory control and data acquisition (SCADA) system in 25 of its most inefficient substations, which enabled JKP Čačak to automate an operations schedule and adjust the delivery of heat to consumers in real time based on consumers' needs, the energy available in the system, and the outdoor temperature.

Controlling the times that substations come online and how much heat is delivered allows JKP Čačak to reduce thermal losses in the system while providing consistent supply to customers.

DURING THE 2019-2020 HEATING SEASON, ČAČAK REPORTED A

33% REDUCTION
IN NATURAL GAS CONSUMPTION

With the SCADA system, JKP Čačak implemented a schedule for a substation that serves a local school building. At that substation, heat is reduced automatically during nights, weekends and holidays, and turned back on one hour before the school opens.

This scheduled program is **saving money by reducing gas consumption** during unoccupied periods to minimum levels required to maintain building conditions in compliance with local codes.

JKP ČAČAK DISTRICT HEATING TECHNICAL CHARACTERISTICS

Substations	**285**	Total Heating Area, Public Buildings	**90,199 m²**
Number of Flats Connected to DH System	**8,500**	Total Heating Area, Residential	**416,174 m²**
Percentage of Flats Connected to DH System	**29.5%**	Total Heating Object, Public Buildings	**65.51 MW**
Total Heating Area	**506,373 m²**	Total Heating Object, Residential	**2,170 MW**

HOW IT WORKS

Prior to the installation of the SCADA systems, substations were controlled manually by local operators based on ambient temperatures and verbal instructions from the central dispatcher. This manual control resulted in routine underheating or overheating in buildings, especially during the transition periods in late fall and early spring, leading to customer complaints about JKP Čačak service quality.

The pilot project – **implemented by JKP Čačak with Serbian engineers and suppliers,** in collaboration with USAID and the U.S. companies Tetra Tech and E3 International – included the design and implementation of a SCADA system in 25 of JKP Čačak's least-efficient thermal substations.

On-site data was collected for each substation on the operating parameters and installed equipment, and included within-tender specifications for the installation of the following equipment at each substation:

- Direct digital control (DDC) controller with 3-point PI (D) control for a minimum of three independent control circuits;
- Valve electromotor drives 24V AC/DC with return spring and 3-point control;
- Calorimeters installed on primary supply;
- Outdoor temperature sensor; and
- Temperature sensors on supply and return lines and related communications equipment.

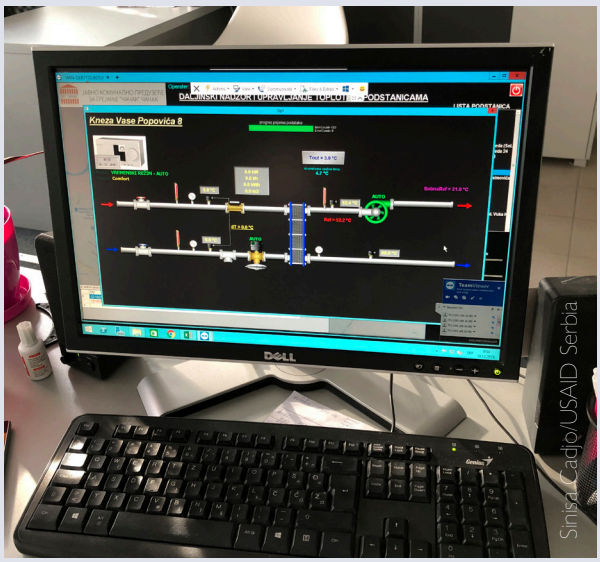
In addition to this individual substation equipment, all retrofitted substations can be connected to a central server via the internet using a standard internet browser from any personal computer, as well as from the JKP Čačak network.

Based on the installed SCADA systems, control of all automated substations is now coordinated from a central server using SCADA system algorithms that enable each substation to deliver an optimal amount of heat in accordance with real-time outdoor conditions.

In regular operation, the substation is controlled by the algorithm installed in the local DDC controller and receives, via the SCADA system, key settings and information about the distribution network condition. The substation sends status information to the central system periodically (typically every five minutes). The substation can also be controlled manually via the SCADA system.

JKP Čačak SCADA Control Panel

JKP Čačak SCADA Temperature Sensors



JKP Čačak SCADA Central Server

COSTS AND SAVINGS

At an installed cost per substation of approximately €5,200, **investment in the SCADA system for 25 substations has been extremely cost-effective** for JKP Čačak, allowing management to improve system performance, reduce operating costs through lower gas consumption, and increase customer satisfaction.

€130,000 INVESTMENT → **ONE HEATING SEASON** SIMPLE PAYBACK

IN THEIR OWN WORDS

The impact of the substation automation and central monitoring and control system is an **increase in energy efficiency** by reducing heat losses previously caused by inaccurate human operation. In addition, automation provides **better reliability and availability** of the system, helps JKP Čačak implement planned and predictive maintenance, improves the ability to implement building heat schedules, and monitors plant energy efficiency.

JKP Čačak management is so impressed with the impact of the SCADA system that they implemented optimal scheduling programs for public buildings that are unoccupied during part of the day (schools, administrative buildings, etc.) that are connected to the 25 substations. The company also **initiated SCADA projects at five additional substations,** with installation of temperature control units as the first step, at their own cost.

> "We are thankful for the USAID district heating project in Čačak. It enabled our company to remotely monitor and control the 25 thermal substations consuming the most energy across our distribution system. We were able to ensure the reliability and efficient operation of these substations, and thus the entire heat distribution system, with much greater certainty. This has resulted in reduced costs for overall maintenance and the distribution of energy for heating."
>
> MILJAN ŠTRBAC, DIRECTOR OF TECHNICAL SERVICES SECTOR
> SONJA JEVTOVIČ, HEAD OF TECHNICAL PREPARATION & PPZ SERVICE
> MILAN NIĆIFOROVIĆ, INFORMATION SYSTEM ADMINISTRATOR

ABOUT THE USAID SERBIA ENERGY EFFICIENCY ACTIVITY

The USAID Serbia Energy Efficiency Activity (SEEA) is intended to reduce gas fuel consumption and dependency on imported fuel through improved energy efficiency in the provision of heating at the local level. SEEA is implemented by Tetra Tech ES, Inc., in cooperation with E3 International.

USAID regional projects also support Serbia's energy sector by improving generation, distribution, oversight, and security. These regional projects work with Serbia's Ministry of Mining and Energy, the Energy Agency of the Republic of Serbia, the state-owned electric power company (EPS), the national transmission operator (EMS), and government officials.

FOR MORE INFORMATION

Steven Burns
Chief, Energy & Infrastructure
USAID Europe & Eurasia Bureau
sburns@usaid.gov

Sinisa Cadjo
Project Management Specialist
USAID Serbia
scadjo@usaid.gov