



SERBIA DISTRICT HEATING CASE STUDY

SWITCHING TO SOLAR IN PANČEVO

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.**

PANČEVO SOLAR THERMAL SYSTEM FOR HOT WATER

The municipal district heating company in Pančevo, JKP Grejanje, has implemented several energy efficiency projects over the past 15 years, including modernizing more than 260 substations with automated control systems, replacing aging boiler houses with more effective thermal plants, and installing new burners with frequency regulation and combustion control to maximize combustion efficiency based on maintaining optimal air-to-fuel ratios.

In 2019, JKP Grejanje sought to improve the company’s ability to supply sanitary hot water to customers using the most efficient and cost-effective means, and identified an opportunity to expand the capacity of an existing municipal solar thermal system, which could further reduce natural gas consumption.

USAID worked with JKP Grejanje to implement a roof-mounted solar thermal system that expands plant capacity by 50 percent while reducing gas consumption. The new system boosts the capacity of a solar thermal plant built in Pančevo in 2016 with grant funding from the Instrument for Pre-Accession Assistance (IPA), which is composed of 360 ground-mounted flat plate solar collectors with a total area of 906 m². With a thermal capacity of approximately 700 kWt, the original plant generated approximately 600 MWh of sanitary hot water for residential consumers annually.



The JKP Grejanje roof-mounted solar thermal system on the Kotež boiler house.

JKP GREJANJE PANČEVO DISTRICT HEATING TECHNICAL CHARACTERISTICS

Number of Flats Connected to DH System	11,683	Total Heated Area, Public Buildings	159,390 m²
Percentage of Flats Connected to DH System	47%	Total Heated Area, Residential	642,427 m²
Total Heated Area	801,817 m²	Total Heating Demand, Public Buildings	20 MW
Number of Heat Sources	2	Total Heating Demand, Residential	85 MW
Total Installed Capacity	114 MW	Total Connected Capacity	105 MW

HOW IT WORKS

The JKP Grejanje solar thermal system uses 200 collectors (solar panels) and has a design production capacity of 335 MWh of heat energy annually, making it the largest solar thermal system constructed in the Western Balkans to date.

USAID funded the design and installation of the system, which was conducted and permitted by local contractors under the supervision of a USAID-led engineering team and the equipment vendor.

Conceptual Design Parameters:

- Minimum active collector area: 450m²
- Collector field orientation: 223°
- Azimuth angle: 43° SW
- Collector inclination angle: 22°-30°
- Clearance between rows: 3.9m-4.65m
- Design temperature: 65°C
- Buffer tank: 115 m³
- Boiler output: 1,000 kW
- Standby tank dimensions: 25 x 4m³
- DHW temperature: 50°C
- Average daily consumption, DHW: 200 m³
- Cold water temperature, February: 10°C
- Cold water temperature, August: 15°C
- Temperature of working fluid leaving the collector's field: 65°C



The JKP Grejanje roof-mounted solar thermal system on the Kotež boiler house.

Roof-mounted installation was chosen to avoid using available land at the plant and in accordance with European Union (EU) Directive that prefers using roof areas instead of land. To accommodate the panels, the installation team made structural modifications to the roof.

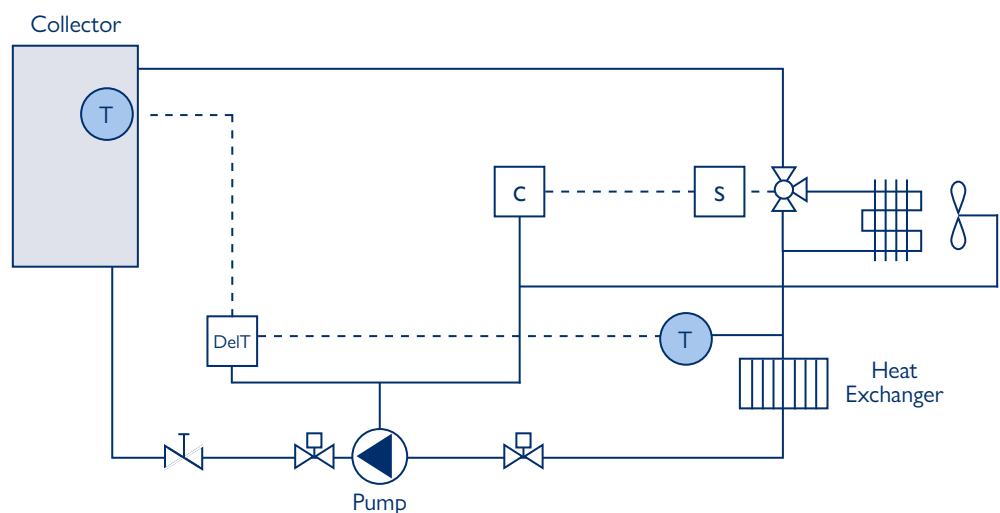
For example, the solar collectors were mounted on a supporting lattice structure tied into the building's frame along the entire 15-meter length of the roof. The lattice structure was designed to resist "dead" and "live" loads and their combination. Such loads include the weight of collectors, pipelines and valves, quantity of fluid in the collectors and pipelines, as well as weather factors like snow and wind loading.

Additional solar thermal capacity enables JKP Grejanje to meet approximately 20 percent of its sanitary hot water demand with renewable energy, significantly reducing natural gas consumption.



CONCEPTUAL DESIGN FOR THE JKP GREJANJE ROOF-MOUNTED SOLAR THERMAL SYSTEM

Source: E3 International



COSTS AND SAVINGS

At an installed cost of approximately €130,000, **investment in the solar thermal system has been extremely cost-effective** for JKP Grejanje. Since commissioning the solar plant in March 2020, all systems are operating as designed and JKP Grejanje averaged 300 m³ in reduced gas consumption daily during the first month of operation, which translates to roughly €120 per day in heating season months. Based on design estimates, JKP Grejanje can expect an annual gas consumption reduction of approximately 41,000 m³, saving roughly €15,000 per year and resulting in simple payback on the investment in nine years.

€130,000
INVESTMENT  **9 YEARS**
SIMPLE PAYBACK

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

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