Energy sector coupling in the Western Balkans

Opportunities and risks for renewable integration



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Cover photo: Decarbonising district heating with pit thermal energy storage in Meldorf, Germany, via Solmax

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Executive summary

The Western Balkans are entering a decisive phase of the energy transition, with renewable energy deployment accelerating alongside ambitious plans to modernise the region's energy systems. Between 2016 and 2025, renewable energy capacity in the region increased by more than 70%, from 7.6 gigawatts (GW) to 13.2 GW, driven by growing investments in solar and wind power.[1]

As renewable generation grows, greater system flexibility will be required to balance supply and demand and integrate an increasing share of renewable electricity. Coupling electricity and heat more closely, including through thermal energy storage, offers a way to absorb surplus renewable generation, store energy as heat and release it when demand arises.

Governments, utilities and international financial institutions increasingly promote thermal storage, power-to-heat and sector coupling as key technologies for addressing these challenges. The EU recognises thermal storage as an important flexibility option and encourages the use of surplus renewable electricity to decarbonise heating and cooling. The European Bank for Reconstruction and Development (EBRD) has emerged as a leading financier of such projects in the Western Balkans, with projects in Novi Sad,[2] Skopje and Pljevlja and discussions on further replication in Serbia.

Thermal storage can help integrate renewable energy, reducing renewable curtailment, improve system balancing and support the replacement of heat from fossil fuels. In a region where hydropower currently provides most balancing services, thermal storage can become an important source of flexibility alongside large-scale battery storage.

However, thermal storage does not automatically align with climate and energy transition objectives. Its impact depends on the energy sources that charge the storage and the infrastructure it supports. Projects and plans in Novi Sad, Skopje and Pljevlja demonstrate both opportunities and risks. Some could help reduce fossil fuel use and integrate more renewable energy. Others risk improving the economics of coal, gas or other combustion-based heat sources, creating new forms of infrastructure lock-in.

As public financiers increase their support for thermal storage in the region, they should assess investments based on their contribution to phasing out fossil fuels. Storage projects should support the replacement of coal and gas, not improve the conditions for their continued operation.

[1] International Renewable Energy Agency, Renewable Capacity Statistics 2026, 4, March 2026.

[2] European Bank for Reconstruction and Development, EBRD lends up to €105 million to Serbia to decarbonise district heating, 27 December 2024.

Key messages

For the EU and international financial institutions

- Projects linked to coal or gas infrastructure, and companies dependent on fossil fuels, should not receive support from international financial institutions. Financing that prolongs reliance on fossil fuels is incompatible with the Paris Agreement, the EU's decarbonisation objectives and these institutions' commitments to a clean energy transition.
- Thermal storage financing should be conditional on measurable reductions in fossil fuel use.
- Fossil fuel lock-in assessments should become a standard part of project appraisal for storage and district heating investments.
- Public funding should prioritise thermal storage and battery storage alongside heat pumps, renewable electricity integration, solar and geothermal energy, and genuinely residual waste heat.

For national governments

- Thermal storage should be integrated into renewable energy and coal phase-out strategies, not developed as a stand-alone technology measure.
- District heating modernisation should reduce dependence on coal, gas and other combustion-based heat sources rather than replacing one dependency with another.
- Governments should prioritise renewable heat, thermal storage, battery storage, demand-side flexibility and system integration measures that support the long-term phase-out of fossil fuels.
- New district heating investments should avoid creating infrastructure that depends on the continued operation of fossil fuel assets.

Why the Western Balkans need flexibility and storage

The Western Balkans have some of the most carbon-intensive energy systems in Europe. Coal accounts for close to 50% of electricity generation across the region and still dominates in Kosovo, Serbia, and Bosnia and Herzegovina,[3] although its share is declining in the latter two.[4] Meanwhile, district heating systems continue to rely mainly on gas and lignite.[5]

At the same time, the need for flexibility is becoming increasingly urgent as renewable energy deployment accelerates across the region. The 2030 renewable energy targets adopted by the Energy Community range from 32% of gross final energy consumption in Kosovo to 52% in Albania.[6]

Investors have already started building large solar and wind power plants in some countries, and much more capacity is planned. Serbia's first renewable energy auction in 2023 allocated 400 megawatts (MW) of wind power and 25.2 MW of solar capacity, while the second auction in 2024 offered an additional 300 MW of wind and 124.8 MW of solar capacity.[7] Montenegro's first renewable energy auction, launched in July 2025, offered market premiums for 250 MW of solar capacity.[8] Kosovo has received bids in its first wind auction, for up to 100 MW,[9] and has started preparing a second, for up to 200 MW.[10]

Governments, utilities and international financial institutions increasingly promote thermal storage, power-to-heat and other sector-coupling technologies as solutions for integrating renewable energy and modernising district heating. However, their contribution to decarbonisation depends on how they are designed, what energy sources they are connected to, and whether they accelerate or delay the phase-out of fossil fuels.

This briefing examines the role that thermal storage can play in the region's energy transition, assesses the risks of fossil fuel and infrastructure lock-in, and analyses emerging projects in Serbia, North Macedonia and Montenegro to identify the conditions under which public investment in thermal storage can support a genuine transition away from coal and gas.

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[3] Organisation for Economic Co-operation and Development, Energy Prices and Subsidies in the Western Balkans: Reforms for a Fair and Green Future, 44, 95, 14 May 2025.

[4] CEE Bankwatch Network, Comply or Close: Eight years of deadly legal breaches by Western Balkan coal plants, 7, 23 June 2026.

[5] Energy Community Secretariat, Energy Community Secretariat's CBAM-Readiness Tracker, 22, 5 July 2023.

[6] Energy Community Secretariat, The Clean Energy Package targets, accessed 12 November 2026.

[7] Organisation for Economic Co-operation and Development, Western Balkans Competitiveness Outlook 2024: Regional Profile, 209, 26 June 2024; European Bank for Reconstruction and Development, Serbia launches second renewables auction with EBRD support, 27 November 2024.

[8] Ministry of Energy and Mining of Montenegro, Crna Gora pokreće prvi aukcijski proces za obnovljive izvore energije, 11 July 2025.

[9] Igor Todorović, Three official bids submitted for first wind auction in Kosovo*, Balkan Green Energy News, 15 September 2026.

[10] Igor Todorović, Kosovo* kickstarts preparations for second wind power auction, Balkan Green Energy News, updated 10 November 2026.

Existing flexibility is not enough

Hydropower already plays the biggest role in balancing electricity systems in the region, as plants can adjust their output to changes in demand. However, it cannot be regarded as an unlimited balancing resource. Reservoir operations are constrained by extreme droughts,[11] environmental requirements and competing water uses.

Beyond hydropower, battery storage projects are starting to emerge in the region, such as in Kosovo,[12] but much of the planned capacity is not yet operational. Despite the rapid growth of renewable self-consumers in some countries in the region, the infrastructure, regulatory and market arrangements needed to enable consumers to provide demand-side flexibility are still being developed, including smart, well-developed distribution grids, access to smart-meter data, dynamic pricing and appropriate market participation rules.[13]

Other potential flexibility options, such as smart charging and vehicle-to-grid services, are still in the early stage of deployment in the region and are not yet significant sources of system flexibility.

District heating as a flexibility resource

District heating systems offer an important opportunity for coupling the electricity and heat sectors. Large-scale heat pumps and electric boilers can convert electricity into heat, while thermal storage can decouple the timing of electricity consumption from the timing of heat demand.

This is especially relevant for solar and wind power. When renewable electricity production is high and demand or electricity prices are low, power-to-heat can use the surplus instead of renewable generation being curtailed. The resulting heat can be stored in large hot-water tanks or pits, or in other media such as molten salt or sand, and supplied to the district heating network later, including during times when renewable electricity production is lower.

Thermal storage can therefore perform a function similar to electricity storage, but at a different point in the energy system. Instead of storing electricity directly, it shifts the timing of heat production. This time-shifting can provide flexibility over hours, days and, where sufficiently large seasonal storage is available, across the heating season.

[11] Igor Todorović, Data confirm European river flows at poorest levels in modern history, Balkan Green Energy News, updated 5 October 2026.

[12] Igor Todorović, Two bids received for 340 MWh of battery storage in Kosovo*, Balkan Green Energy News, updated 2 October 2026.

[13] Energy Community Regulatory Board, Active customers' participation in the electricity market: Main obstacles and how to remove them, 4, 13, 28–30, 46, 12 June 2026.

Growing policy support for storage

The importance of storage was reinforced through the EU's 2024 reform of its electricity market design, which requires EU Member States to assess flexibility needs when planning electricity systems and strengthens the role of non-fossil flexibility resources, including storage and demand response, in electricity markets.[14]

In the Western Balkans, the Energy Community's Electricity Integration Package, adopted in December 2022, aims to prepare electricity markets for a cost-efficient clean energy transition and enables their full integration into the EU's internal energy market.[15] The Energy Community Secretariat has also advised Contracting Parties to assess whether district heating could provide flexibility to the electricity sector and enable sector coupling, pointing to Member States that treat thermal storage as a flexibility option.[16]

The European Commission's Recommendation on Energy Storage identifies thermal storage, especially in district heating systems, as a cost-effective solution for integrating variable renewable electricity by absorbing surplus generation and providing balancing services to the power system.[17] It also highlights the role of thermal storage in increasing the share of renewable heating and cooling by enabling greater use of sources such as solar thermal, geothermal and ambient heat. The Recommendation asks Member States to reflect these considerations in their updated national energy and climate plans, including through policies and measures aimed at increasing system flexibility and supporting storage deployment.

A Commission study on energy storage similarly concludes that storage technologies, including thermal storage, will be essential for accommodating high shares of renewable energy, providing flexibility and balancing services, reducing renewable curtailment, and enabling stronger coupling between the electricity and heating sectors.[18]

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[14] European Parliament, Council of the European Union, Regulation (EU) 2024/1747 of the European Parliament and of the Council of 13 June 2024 amending Regulations (EU) 2019/942 and (EU) 2019/943 as regards improving the Union's electricity market design, 13 June 2024; Directive (EU) 2024/1711 of the European Parliament and of the Council of 13 June 2024 amending Directives (EU) 2018/2001 and (EU) 2019/944 as regards improving the Union's electricity market design, 13 June 2024.

[15] Energy Community, Electricity Integration Package Roadmaps, accessed 19 November 2026.

[16] Energy Community Secretariat, How would heating and cooling sector contribute to EU 2030 decarbonisation goal – NECPs measures, 4, 11, 15, 11 October 2021.

[17] European Commission, Commission Recommendation of 14 March 2023 on Energy Storage – Underpinning a decarbonised and secure EU energy system, 1–3, 20 March 2023.

[18] Onne Hoogland, Verena Fluri, Christoph Kost et al., Energy Transition Expertise Centre: Study on Energy Storage, Fraunhofer Institute for Systems and Innovation Research ISI, Guidehouse, McKinsey & Company et al., 13, 14 March 2023.

Thermal storage technologies and benefits of energy coupling

The basic principle of sector coupling is connecting electricity, heating and cooling systems so that energy can be converted between them and used where and when it has the greatest value. In a system with increasing amounts of variable wind and solar generation, sector coupling can reduce the need to match electricity production and consumption at every moment. Instead, surplus electricity can be converted into heat, stored and used later for district heating.

The distinction between electricity storage and thermal storage is important. A battery stores electricity and can return it to the grid. A thermal store normally stores and returns heat. Its value therefore heavily depends on the availability of a heat network and on the ability to convert electricity into heat when needed. Thermal storage can hold very large amounts of energy at a relatively low cost, but it is not a direct substitute for batteries or other electricity storage technologies.

Thermal storage can operate over very different time periods. Short-term systems can shift heat production by several hours or days, while large seasonal stores can retain heat for months.

Seasonal thermal storage is especially relevant to district heating because heat demand is highly seasonal. Solar energy, for example, is most abundant in spring and summer, when district heating demand is relatively low. A sufficiently large thermal store can capture part of this heat and make it available during the winter heating season. One of the main technologies for this purpose is pit thermal energy storage.

A pit store is essentially a large, excavated reservoir lined and insulated to reduce heat losses. The reservoir is filled with water, which acts as the storage medium. Hot water can be added when heat is available and extracted when the district heating system requires it. For applications where energy needs to be stored for many hours, days or months, large thermal stores can provide storage capacity that would be technically and economically difficult to achieve with batteries.

Thermal storage is not necessarily limited to seasonal applications. The same principle can be used for daily storage, allowing heat to be produced during periods of low electricity prices or high renewable generation and delivered to the network during morning and evening peaks in demand.

Power-to-heat refers to technologies that use electricity to produce heat. The simplest example is an electric boiler, in which electricity heats water directly. Electric boilers can respond rapidly to electricity system conditions and can therefore increase consumption when there is surplus renewable generation. Electric boilers are a relatively simple technology, and almost all the electricity they consume is converted into heat. Their limitation is that they do not multiply the amount of useful heat available from electricity.

Power-to-heat-to-power refers to technologies that store surplus electricity as heat and later release it either as heat or, converted back, as electricity. Although still at an early stage of development, it could eventually replace combustion-based combined heat and power (CHP) plants.

Large heat pumps use electricity to move heat from a low-temperature source to a higher temperature suitable for district heating. Depending on the system, the heat source can be river water, wastewater, groundwater, ambient air or industrial waste heat. During the non-heating season, heat can be extracted from the most suitable source and transferred into the thermal store for later supply to the district heating network.

Heat pumps can also make use of heat that would otherwise be wasted. Wastewater treatment plants, industrial facilities and data centres, for example, can produce relatively low-temperature waste heat. This creates a further form of sector coupling: not only electricity and heat, but also waste heat and district heating can be connected through a heat pump.

Solar thermal collectors convert sunlight into heat rather than electricity. The heat can be transferred to the seasonal thermal store and subsequently supplied to the district heating system. Solar thermal is especially well suited to being combined with seasonal storage because its production profile is complementary to heating demand: the strongest solar resource occurs outside the main heating season, while district heating demand peaks during winter.

How sector coupling works in practice

A coupled district heating system can bring together solar thermal collectors, heat pumps, electric boilers and thermal storage, allowing heat production to respond to both energy availability and consumer demand. Heat can be generated when renewable electricity, solar energy or ambient heat is available, retained in storage, and delivered later when demand is higher. This links the electricity and heating sectors, making it easier to use variable energy resources while reducing the need for fossil-based heat production.

The main benefits include:

- **Supporting renewable energy integration and reducing curtailment:** When combined with power-to-heat, thermal storage can absorb surplus electricity during periods of high wind and solar generation and convert it into heat for later use. This creates an additional source of flexibility in the energy system, reduces renewable energy curtailment and helps integrate larger shares of variable renewable energy.
- **Providing flexibility and reducing reliance on conventional balancing resources:** Thermal storage decouples the timing of heat production from heat consumption, allowing electric boilers and heat pumps to adjust electricity demand in response to power system conditions. This can support system balancing and reduce reliance on hydropower and fossil-based balancing resources.
- **Accelerating the decarbonisation of district heating:** Thermal storage can facilitate the replacement of heat from fossil fuels with renewable electricity, renewable heat and ambient heat sources. It is highly valuable where renewable heat resources are variable or seasonal, enabling their use when heat demand is highest rather than when energy is produced.

- **Improving the efficiency of district heating systems:** By separating the timing of heat production from heat demand, thermal storage allows heat sources to operate under more stable and efficient conditions. It can reduce reliance on peak-load boilers, minimise start–stop operation of generation units and increase the utilisation of renewable and waste heat resources that would otherwise be unavailable when needed.

Limitations and conditions

Thermal storage should not, however, be treated as a universally applicable substitute for other flexibility technologies. Until power-to-heat-to-power technologies are rolled out at scale, its usefulness depends on sufficient heat demand and a district heating network capable of receiving the stored heat. Large seasonal storage facilities also require suitable and available land, geological and hydrological conditions, connections to the heating network and, where power-to-heat is included, adequate grid capacity. Land availability can be a particularly important constraint for pit thermal energy storage, especially in dense urban areas where district heating systems are located and land is scarce or expensive.

Most importantly, the climate benefit depends on what the storage system replaces and what is used to charge it. A heat store charged by solar thermal energy, renewable-powered heat pumps or otherwise curtailed renewable electricity can help displace fossil fuels. A store that primarily enables a coal- or gas-fired CHP plant to operate for longer can have a very different effect.

This distinction is crucial for the Western Balkans. Thermal storage and sector coupling are technologies, not outcomes in themselves. Their contribution to the energy transition depends on the sources of heat and electricity connected to them, how they are operated, and whether they reduce or prolong dependence on fossil fuel infrastructure. Similar considerations apply to cooling, where the benefits depend on how storage is integrated into the wider energy system and whether it supports decarbonisation.

Fossil fuel and other lock-in risks

Lock-in risks arise when thermal storage is integrated into a heating system that remains dependent on a coal- or gas-fired CHP plant, supporting the plant rather than helping to replace it. CHP plants are frequently treated as must-run units because their primary function is to meet the heat demand of an interconnected district heating network.

Thermal storage can relax this constraint by decoupling heat production from heat demand, allowing the CHP unit to produce electricity and heat at more economically favourable times while storing heat for later use. This flexibility may also enable fossil fuel CHP plants to operate during periods of low heat demand, including in summer, when electricity generation is economically attractive. Research on CHP district

heating systems explicitly identifies thermal storage as a means of enabling more flexible CHP operation and grid support services.[19]

Such flexibility can create an economic rationale for the continued operation of the fossil asset instead of replacing it with renewable sources. The risk is greatest where new storage infrastructure is planned alongside an existing or planned fossil CHP plant: rather than creating a pathway to retirement, storage can become an enabling asset that increases the flexibility and revenue opportunities of the fossil plant.

Infrastructure lock-in

District heating networks, pipelines, CHP units, boilers and storage are long-lived, interconnected assets. Once a network is designed around a specific heat source, replacing it can require changes to network configuration, substations, heat exchangers, controls and replacement generation capacity. These switching costs can make the existing source difficult to replace and create infrastructure lock-in.[20]

Lock-in is especially likely where new networks or storage are developed around high-temperature sources such as coal, gas, biomass or waste incineration, which can make future conversion to more efficient low-temperature systems more difficult. Diversifying heat sources, through heat pumps, geothermal energy and genuinely residual waste heat, can reduce reliance on a single heat source and improve the long-term flexibility of district heating systems.[21]

Industrial excess heat presents a similar risk. It can reduce fuel use when it is genuinely residual, but a district heating system should not become dependent on the continued operation of an emissions-intensive industrial process. If that process stops, the system must replace the heat source or maintain alternative generation capacity.

For publicly financed storage and heating infrastructure, the key question is therefore whether the investment enables progressive replacement of combustion with renewable heat and electricity, or creates new technical and economic dependence that makes continued operation of fossil or high-emitting sources – such as gas CHP, unsustainable biomass and waste incineration plants or emissions-intensive industrial facilities – harder to avoid.

[19] Jelle Garcet, Roeland De Meulenaere, Julien Blondeau, Enabling flexible CHP operation for grid support by exploiting the DHN thermal inertia, Applied Energy, 316, 119056, 15 June 2022.

[20] See Leon Clarke, Yi-Ming Wei, Angel De La Vega Navarro et al., Energy Systems, Intergovernmental Panel on Climate Change, 696–697, 4 April 2022.

[21] Shangwei Liu, Yang Guo, Fabian Wagner et al., Diversifying heat sources in China's urban district heating systems will reduce risk of carbon lock-in, Nature Energy, 9(8), 1021–1031, 1 July 2024.

Case studies: Potential thermal storage sites

The following case studies show how thermal storage and sector coupling can improve heating system efficiency, integrate renewable energy and reduce fossil fuel use, while highlighting the possible risks of reinforcing existing dependencies.

Novi Sad, Serbia

One of the most advanced large-scale seasonal thermal storage projects in south-eastern Europe is being developed in Novi Sad. It combines approximately 38,600 square metres (m^2) of solar thermal collectors, pit storage of up to 870,000 cubic metres (m^3), a 17-MW heat pump and two 30-MW electric boilers.[22] The project is financed by an EBRD sovereign loan of up to EUR 105 million and EU grants of up to EUR 24 million through the Western Balkans Investment Framework for capital investment and technical assistance, and is expected to produce around 120 gigawatt hours (GWh) of heat annually. Procurement was due to begin in November 2025, and the project is expected to be completed by the end of 2028.[23] The project would reduce reliance on gas-based heat production in three interconnected district heating areas.

It also shows how large-scale thermal storage can help balance power systems with growing shares of variable renewable energy. According to the EBRD, seasonal storage and power-to-heat will help balance excess electricity generation from wind and solar,[24] and the electric boilers will provide up to 60 MW of balancing reserve to the power system.[25] These services could also generate operational cost savings by reducing reliance on hydropower and thermal power plants for balancing services, while increasing the system's capacity to integrate future wind and solar projects.

However, the new solar thermal plant, pit storage, heat pump and electric boilers will be integrated into a wider heating system of seven gas-fired heating plants, including the Novi Sad CHP plant, rather than replacing it.[26] According to the Serbian government, the CHP plant is expected to supply approximately 363 GWh of heat annually: 230 GWh directly to the network and 133 GWh through the seasonal store. By comparison, the EBRD expects about 29 GWh of solar heat, almost 40 GWh from the electric boilers and 50

[22] European Bank for Reconstruction and Development, Novi Sad Solar - Thermal Plant, updated 21 February 2025; Government of Serbia, Предлог закона о потврђивању Уговора о зајму (Пројекат соларно-термалне електране у Новом Саду) између Републике Србије и Европске банке за обнову и развој, 30, January 2025.

[23] European Bank for Reconstruction and Development, EBRD lends up to €105 million to Serbia to decarbonise district heating; Government of Serbia, Предлог закона о потврђивању Уговора о зајму (Пројекат соларно-термалне електране у Новом Саду) између Републике Србије и Европске банке за обнову и развој, 14; Serbia Energy, Serbia: Novi Sad launches €110 million solar-thermal upgrade of district heating system, 15 November 2025.

[24] European Bank for Reconstruction and Development, Novi Sad Solar - Thermal Plant.

[25] Government of Serbia, Предлог закона о потврђивању Уговора о зајму (Пројекат соларно-термалне електране у Новом Саду) између Републике Србије и Европске банке за обнову и развој, 31.

[26] European Bank for Reconstruction and Development, GrCF3 W2 - Novi Sad Solar-Thermal Plant Board Report, 16, 22, 4 December 2024.

GWh from the heat pump.[27] These figures indicate that gas-fired CHP will remain the dominant heat source, while renewable heat and power-to-heat technologies will play a considerably smaller role. Rather than driving a substantial shift away from fossil fuels, the investment risks reinforcing the role of existing gas infrastructure by improving its operational flexibility and economic viability.

A possible waste incineration CHP plant, for which the city's district heating company invited bids for a pre-feasibility study in November 2025,[28] adds a further lock-in risk. By making better use of its heat, thermal storage could reinforce the long-term role of waste incineration in the district heating system. The risk is serious because incinerators rely on long-term waste delivery contracts and can create incentives to maintain waste streams that should instead be prevented, reused or recycled in line with circular economy objectives.

Skopje, North Macedonia

An EU-funded feasibility study prepared for the United Nations Office for Project Services, completed in January 2026, proposes large-scale thermal storage for Skopje's district heating system. Such storage could provide flexibility but also risks extending the role of fossil-based heat and power. The study envisages a first phase involving 400,000 m^3 of water-filled pit storage, combined with a 35-MW electric boiler and a 50-MW absorption heat pump, with an estimated investment of between EUR 40 and 60 million. The first phase could provide approximately 40,000 megawatt hours (MWh) per cycle, while the wider site has potential for more than 1.2 million m^3 of storage, equivalent to roughly 120,000 MWh per cycle under similar operating conditions.[29]

The study sees the main benefit as the storage's ability to absorb surplus renewable electricity and reduce curtailment, while providing multi-hour and multi-day flexibility and better use of existing assets such as the gas-fired CHP plants run by the Skopje-based company Kogel. It also points to potential benefits from reducing the must-run operation of the Kogel and other CHP facilities, improving hydropower optimisation and reducing fossil fuel use.

It identifies the site as potentially suitable for a new high-efficiency CHP plant, because the thermal storage could allow the CHP plant to operate outside the heating season and store its heat for later use. The prospect of a new CHP plant is an important red flag, as storage can improve the utilisation and economics of a CHP plant, potentially making continued or new fossil generation more viable.

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[27] Government of Serbia, Предлог закона о потврђивању Уговора о зајму (Пројекат соларно-термалне електране у Новом Саду) између Републике Србије и Европске банке за обнову и развој, 31; European Bank for Reconstruction and Development, GrCF3 W2 - Novi Sad Solar-Thermal Plant Board Report, 22.

[28] Vladimir Berbatović, Novi Sad plans to build waste-to-energy cogeneration plant, Balkan Green Energy News, updated 2 June 2026.

[29] NIRAS, Feasibility study for the expansion of Skopje's district heating system, prepared for the United Nations Office for Project Services under the EU for Clean Air project, January 2026 (unpublished). For a summary, see: NIRAS, Decarbonising urban heating: A roadmap for expanding Skopje's district heating system, accessed 19 November 2026.

The potential climate benefit will largely depend on the energy sources used to charge the storage. If charging is predominantly based on surplus renewable electricity and genuinely residual industrial waste heat, the project can support decarbonisation. If paired with a new gas CHP plant or continued use of fossil-intensive industrial heat, the same infrastructure would contribute to long-term fossil fuel lock-in.

Surplus heat from chemical, hydrogen, ammonia or e-methanol production could also be integrated.30 Such integration could be beneficial where the heat is genuinely a by-product that would otherwise be wasted. However, it should not create an incentive to maintain or develop new inefficient or fossil-dependent industrial production simply to provide a heat source. Skopje therefore shows both the value and the limits of thermal storage: its climate impact depends on the generation and industrial assets it enables or preserves.

Pljevlja, Montenegro

In October 2026, the EBRD, Montenegro's state power utility Elektroprivreda Crne Gore, and the Pljevlja coal mine signed a memorandum of understanding on the town's energy transition, covering a solar power plant with battery storage on the former mine site and solutions for district heating and thermal energy storage.[31] Large-scale thermal storage could help integrate solar thermal energy and power-to-heat, absorb surplus renewable electricity and provide additional flexibility to the power system.

At the same time, a new district heating system, under construction since 2024, will take heat from the 225-MW Pljevlja coal-fired power plant.32 The first 2.3 kilometres (km) of the primary pipeline to the town is complete, and work on the remaining 4.4 km is underway, with a contractual deadline of April 2027. The back-up heat source is two 16-MW boilers running on heavy fuel oil.[33]

Meanwhile, the Montenegrin government is preparing a post-coal heating solution under the World-Bank-supported Montenegro Just Energy Transition programme. In September 2026, it announced the preparation of an approximately EUR 50 million investment programme for Pljevlja focused on sustainable heating, district heating expansion and cleaner household heating as part of the transition away from coal.[34]

Pre-feasibility study data presented at a World Bank consultation workshop on the programme in October 2026 assessed a 36-MW biomass district heating plant intended to replace heat currently supplied from the thermal power plant. The project would require approximately 36,900 m^3 of wood biomass annually. Such demand raises concerns about the availability of sufficient and genuinely sustainable biomass resources

[30] Ibid.

[31] Vladimir Spasić, Montenegro's EPCG seals new partnerships for renewables, BESS, decarbonization, Balkan Green Energy News, updated 25 October 2026.

[32] Balkan Green Energy News, EPCG starts ecological reconstruction of TPP Pljevlja, 29 April 2022; Ecoportal, Počela izgradnja toplovoda od Termoelektrane do Pljevalja, 30 July 2024.

[33] Goran Malidžan, Kotlovi odlaze u istoriju: Projekat toplifikacije Pljevalja u završnoj fazi realizacije, Vijesti, 9 June 2026.

[34] Bankar.me, Novi plan za grijanje Pljevalja vrijedan 50 miliona eura: Vlada priprema projekat sa Svjetskom bankom, 3 September 2026.

for long-term operation, while potentially increasing pressure on forests and contributing to air pollution in a region that already experiences severe air-quality problems.

Thermal storage could improve the use of renewable electricity and facilitate future solar thermal integration. However, its overall environmental performance will depend on whether future heat supply is based on genuinely sustainable sources rather than continued dependence on coal, heavy fuel oil or unsustainable forest biomass.

Conclusions

Thermal storage is one of the most promising flexibility technologies available, and it can be used very efficiently in the Western Balkans. It can facilitate renewable energy integration, improve system balancing, optimise hydropower operation and support the decarbonisation of district heating.

However, it only contributes to decarbonisation when coupled with renewable electricity, heat pumps and solar thermal energy, enabling greater use of clean energy and reducing reliance on fossil fuels. When integrated into coal- or gas-dependent systems, it can prolong the lifetime of fossil fuel assets and delay their phase-out. Public funding and policy support should therefore prioritise projects that replace coal- and gas-based heat generation with renewable energy and accelerate decarbonisation of the entire energy system.