

## Kazakhstan energy storage industry

Pokazat` bol`she

Kazakhstan (population 19.6 million) is Central Asia's largest economy and exhibits all the characteristics of carbon lock-in. It is dependent on exports of oil and gas, while its abundant and inexpensive coal is the main fuel for the power generation sector, with a share of some 70 per cent. Coal is also essential for residential heating (in many regions, winter temperatures routinely plummet to -20°C) and is indispensable for Kazakhstan's heavy industry. Natural gas is widely seen as a promising transition fuel and there are plans to convert some thermal power plants from coal to gas. Energy prices are subsidised, weakening incentives to invest in energy efficiency and other green technologies. As a result, Kazakhstan is among the most carbon-intensive economies worldwide.

And yet, despite its strong dependence on fossil fuels, Kazakhstan has scored many energy transition firsts in the region. It was the first to launch a national emissions trading system, set renewable energy targets, introduce a functioning support mechanism for renewables, develop utility-scale solar and wind projects, and to set a carbon neutrality target (by 2060). Today, Kazakhstan boasts 957 MW of installed wind power capacity and 1.149 MW of solar, with many more projects under development. By 2035, the country plans to deploy as much as 11.7 GW of new wind and solar capacity.

There is a strongly held view in Kazakhstan that any further development of renewable energy should go hand in hand with an increase in balancing capacity and/or the deployment of expensive storage systems. However, as experience from European countries shows, much higher shares of renewable energy can be successfully integrated through a combination of different mechanisms, including increased regional trade, demand response, grid capacity improvement, better forecasting and so forth.

Another controversial issue is the potential role of nuclear power in Kazakhstan's energy mix. The Central Asian republic is the world's largest producer of uranium but has no nuclear capacity in operation. The possible construction of a large nuclear power plant has been the subject of longstanding public debate, with a national referendum scheduled for autumn 2024. While the idea is supported by the government (and welcomed by Russia, whose state nuclear corporation Rosatom would likely build the plant), Kazakh society remains highly polarised on the issue.

In the geopolitics of the global energy transformation, Kazakhstan's enormous wind and solar potential - coupled with land availability and rich reserves of critical raw materials - represent a strong strategic advantage. Renewables can supply low-cost power to the growing population, bolster energy security and reduce power imports, help decarbonise industry and transport, and attract foreign investment. For a fossil-dependent economy like Kazakhstan, harnessing these benefits is essential for adapting to the decarbonising global economy and contributing to global climate action.

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Energy storage technologies emerged as a critical component in efficient, flexible, reliable use of energy worldwide. They help smoothing out supply of various forms of renewable energy

In terms of economic benefit, energy storage systems are cost-effective since they provide for lower operational costs in powering the grid and potentially reduce the amount customers pay for demand charges due to decrease in consumption by a customer in peak times.<sup>1</sup>

Environmental impact of energy storage systems shall not be ignored, as several studies show its potential to support decarbonisation. For example, as part of the Green Deal, EU sets an ambitious goal of decarbonisation until 2030 and 2050 with the help of energy storage solutions.<sup>2</sup>

It is also crucial to highlight the importance of the role of energy storage as a new energy infrastructure that shall be integrated into renewable energy system and also integrate autonomous, distributed and centralized systems together with renewable energy sources.<sup>3</sup>

Kazakhstan is not an exception, due to the country's geography and climate, the most promising sources of renewable energy are solar and wind. According to estimates in the Concept for the Development of the Fuel and Energy Complex until 2030", the total potential of renewable energy sources for energy production is 1,885 billion kWh; the thermal potential is 4.3 GW (Government Decree of the Republic of Kazakhstan No. 724, 2014)<sup>4</sup>. However, with the current structure of generation mainly from the stations fired by coal and gas and the lack of balancing and reserve capacities, the intermittent nature of wind and solar plants puts even more pressure on the reliability and stability of the overall power system in Kazakhstan.

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