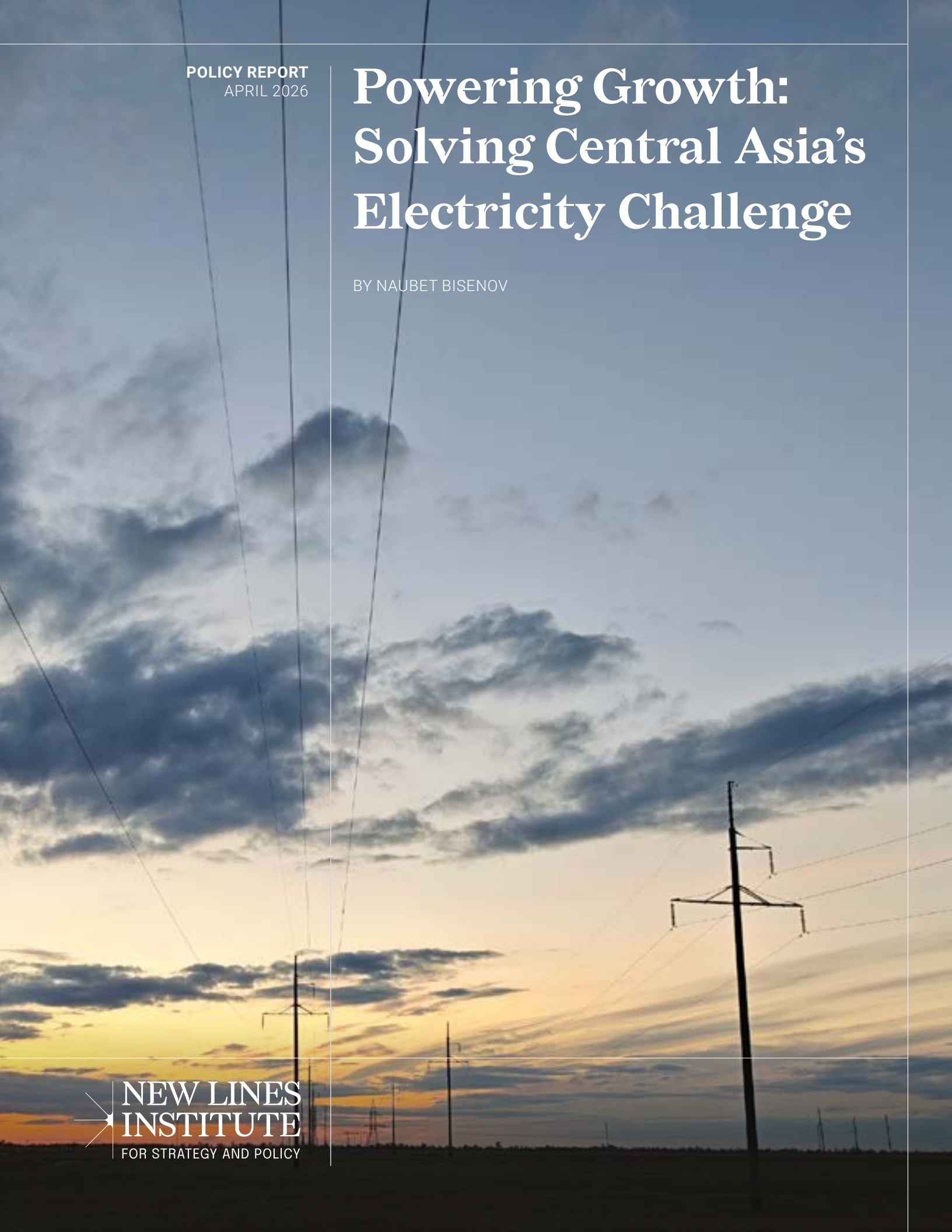

POLICY REPORT
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Powering Growth: Solving Central Asia's Electricity Challenge

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Power lines point toward a sunset in Kazakhstan. (Murat Kuzhakhmetov / Getty Images)

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EXECUTIVE SUMMARY

Central Asia is grappling with a power generation challenge. Four of the region's five states have adopted economic growth programs requiring considerably more electricity than they currently produce. States are even contending with electricity deficits right now. Thus, a pivotal challenge facing regional leaders is whether they can develop enough new power sources – including hydro-driven, solar, wind, and nuclear – fast enough to fulfill their economic ambitions. The chances of success would be greatly enhanced by the operation of a more effective regional entity to coordinate the efficient generation and distribution of electricity. A unified regional electricity grid existed prior to the collapse of the Soviet Union and could be fully reestablished relatively quickly, given sufficient political will. This report illuminates the flaws in the current system and existing plans to add generating capacity, while evaluating the capacity for regional cooperation. Ultimately, a well-coordinated management system is needed to unlock the region's economic potential. The effective functioning of such a system could also build trust that catalyzes the formation of a Central Asian economic union.

Recommendations

For Central Asian States:

- Expand the Central Asian Power System (CAPS) to connect the grids of all five Central Asian states.
- Empower an interstate power commission or executive body, comprising representatives of all five Central Asian states, with the ability to enforce its decisions.
- Explore joint projects to develop renewables, maximize available financial and natural resources, and promote efficiencies in the generation and distribution of electricity.
- Reduce hydropower's share of electricity production and implement measures to reduce reservoir evaporation.
- Bring tariff rates for electricity usage by both businesses and households into closer alignment with the actual cost of power production.
- Develop public awareness campaigns aimed at conserving electricity with the deterioration of the water-energy nexus.
- Expand small-scale renewable initiatives.

For the International Community:

- The United States, European Union, United Kingdom, multilateral development banks, and other interested parties can provide assistance to refurbish antiquated infrastructure, digitalize distribution systems, and finance new projects that help expand CAPS.
- Assist Central Asian states in the development of strategies for IT/AI/data center development that keep demand for electricity and water to a minimum, ensuring adequate supplies for household needs.
- The United States, EU, U.K., and multilateral development banks should encourage the modification of Central Asian states' nuclear strategies to better meet nearer-term needs.

Introduction

Soviet communism inflicted immeasurable harm on the peoples of Central Asia, upending cultural traditions, disrupting traditional economic patterns, and causing enduring environmental damage. But electrification and the establishment of a reliable distribution network can arguably be counted as a positive legacy of the Soviet system.

During the Soviet era, power shortages were not a systemic problem. A regional framework called the Central Asian Power System (CAPS) managed power generation and ensured equitable distribution to all five of what were then union republics: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

The collapse of the Soviet Union in 1991 meant that Moscow no longer could act as the distribution manager of electricity. More importantly, Moscow lost its status as arbiter of the region's water-energy nexus, balancing the competing needs of the mountainous republics Kyrgyzstan and Tajikistan, which required water to generate electricity in the winter, against those of lowland republics Kazakhstan, Turkmenistan, and Uzbekistan, which could generate electricity with coal and gas in winter, but needed large volumes of water to irrigate agricultural lands.[1]

"Not surprisingly, electricity shortages became increasingly common as the 21st century progressed. The water–energy nexus became a source of regional tension that, at one point, threatened to provoke armed conflict among regional states."

The divergent needs and interests of Soviet Central Asian republics led to disputes that Moscow would mediate or, perhaps more aptly, dictate solutions to. But once the Soviet Union was no more, the newly independent Central Asian states were left to themselves to resolve their disputes over water and electricity allocation. Problems proved difficult to resolve, resulting in disruptions with power generation and distribution. Ultimately, CAPS suffered a breakdown as regional states proved incapable of developing an effective replacement conflict-resolution mechanism.[2]

Not surprisingly, electricity shortages became increasingly common as the 21st century progressed. The water-energy nexus became a source of regional tension that, at one point, threatened to provoke armed conflict among regional states.[3,4] A pivot point occurred in 2016, when Uzbekistan's longtime leader, Islam Karimov, died. His successor, Shavkat Mirziyoyev, rejected Karimov's antagonistic approach toward the country's Central Asian neighbors and started reengaging with the region.[5]

Over the past decade, Central Asian states have demonstrated an increasing willingness to trade with each other and cooperate on some issues, including water-resource management and electricity distribution, but such cooperation has largely been limited to the bilateral level.[6] Although a few regional mechanisms exist, such as the Interstate Commission for Water Management,[7] they have proven incapable of creating and implementing effective joint policies. Systematic cooperation on electricity production and distribution, meanwhile, has been inefficient.

These days, Central Asian states are struggling to keep up with growing de-

1 E. A. Borisova, "История развития конфликтов по поводу водных ресурсов в Центральной Азии в постсоветский период" [History of the development of conflicts over water resources in Central Asia in the post-Soviet period], *Oriens*, no. 2 (2014), https://www.cawater-info.net/bk/water_law/pdf/borisova.pdf.

2 Salauat Rakhmetov, "Передай энергию по кругу" [Pass the energy around], *Expert-Kazakhstan*, October 20, 2008, https://eabr.org/press/releases/zhurnal-ekspert-kazakhstan-pereday-energiyu-po-krugu/.

3 "*Энергетические проблемы Центральной Азии*" [Central Asia's Energy Risks], International Crisis Group, May 24, 2007, https://www.crisisgroup.org/sites/default/files/133-central-asia-s-energy-risks.pdf.

4 "Нехватка воды в Центральной Азии может в будущем вызвать войны, считает глава Узбекистана" [Water scarcity in Central Asia could cause wars in the future, believes the head of Uzbekistan], *KazTAG*, September 7, 2012, https://kaztag.kz/ru/news/nekhvatka-vody-v-tsentralnoy-azii-mozhet-v-budushchem-vyzvat-voyny-schitaet-glava-uzbekistana.

5 "Uzbekistan: Mirziyoyev Flirting with Regional Reset?," *Eurasianet*, September 20, 2017, https://eurasianet.org/uzbekistan-mirziyoyev-flirting-regional-reset.

6 "Су-энергетикалық ресурстарды тиімді пайдалану саласындағы Орталық Азия елдерімен ынтымақтастық" [Cooperation with Central Asian countries in the field of efficient use of water and energy resources], Ministry of Foreign Affairs of the Republic of Kazakhstan, accessed April 12, 2026, https://www.gov.kz/memleket/entities/mfa/press/article/details/596.

7 Interstate Commission for Water Coordination of Central Asia, accessed April 12, 2026, http://www.icwc-aral.uz/index.htm

mand for electricity. And the challenge of ensuring adequate supplies seems set to deepen as states, such as Kazakhstan, Tajikistan, and Uzbekistan, have all embarked on electricity-intensive economic development programs to develop AI capacity, build data centers, and become cryptocurrency hubs.

Fortunately, there is a growing realization among Central Asian leaders that electricity and water issues require holistic solutions rooted in regional cooperation. However, whether they can form a cooperation framework fast enough to meet the challenges posed by ambitious economic development agendas and rapid population growth remains an open question.

If Central Asian states hope to meet their ambitious economic expansion goals and provide sufficient power for their growing populations, regional cooperation on energy production and distribution is crucial. Many of the existing challenges in adding sufficient generating capacity and ensuring baseload levels of electricity supply are too great for any one state in the region to handle alone.

Part I: Critical Context

Brief History of Electrification in Central Asia

In the 1950s and 1960s, the Soviet Union created regional power grid systems, including one linking western and northern Kazakhstan to western and central Siberia and another comprising the rest of Central Asia.[8,9] The all-union grid network was designed to use generation capacities in different markets and time zones more efficiently by transmitting power from areas with an excess of power to areas where demand was higher at any given time.[10]

Given Kazakhstan's geography, with its vast and sparsely populated territory, it made economic sense to link the republic's northern and western regions to grids in the Russian Soviet Federative Socialist Republic (RSFSR). The southern part of the country, meanwhile, linked up to the grids of other Central Asian republics. At that time, Central Asian republics mostly relied on hydropower (Tajikistan and Kyrgyzstan), coal (Uzbekistan and Kazakhstan), and natural gas (Uzbekistan) for power generation. As of 1961, the grid's installed power generation capacity stood at 1,157 megawatts (MW), 30% of which came from hydropower and 70% of which came from fossil fuels, with a maximum load of 951 MW and a total annual output of 6.5 billion kilowatt-hours (kWh), linked with 110 kilovolt (kV) and 220 kV power lines.[11]

In the 1970s, the grid was linked by 500 kV power lines, and in 1991, at the time of the breakup of the Soviet Union, the grid linked 83 power plants with a combined capacity of 25,000 MW.[12]

With its coordination and dispatching center in Tashkent, CAPS aimed to regulate generation and ensure stable power supply throughout the region. Electricity generation was intertwined with water supply, as all Central Asian countries were involved to a differing extent in water-thirsty cotton production, with the region's two main river basins – the Amu Darya and the Syr Darya – feeding the cotton fields while also having to produce hydropower. Water was accumulated in the upper reaches of the rivers in winter for release downstream to Uzbekistan, Kazakhstan, and Turkmenistan for irrigation during the growing

BASELOAD VS. VARIABLE POWER

As Central Asian states diversify power generation sources to include renewables, authorities must keep in mind baseload considerations. The U.S. Energy Information Administration defines baseload as "the minimum amount of electric power delivered or required over a given period of time at a steady rate."

Electricity output from coal, natural gas, and nuclear plants tends to be constant and is well-suited to ensuring baseload supply for any given grid. Wind and solar generation output, however, is variable, depending on time of day and weather conditions. Accordingly, boosting the share of renewables in the power generation mix would require energy storage capacity that can be used to maintain a steady flow of electricity when renewable output dips. Grids also must have added flexibility in transmission capabilities to accommodate fluctuations in renewable-generated power.

8 "Энергетика СССР" [Energy Sector of the USSR], *EES EAEC*, December 22, 2025, https://www.eeseaec.org/energetika-evrazii/energetika-sssr.

9 Ulugbek Akbarov, "Эксперт рассказал, как работает единая энергосистема Центральной Азии" [An expert explained how the unified energy system of Central Asia works], *Kun.uz*, January 29, 2022, https://kun.uz/ru/30786736.

10 "Единая электроэнергетическая система" [Unified Energy System], Great Soviet Encyclopedia, 3rd ed. 1969-1978, accessed April 12, 2026, https://www.booksite.ru/fulltext/1/001/008/036/764.htm.

11 "Что такое единая энергосистема Центральной Азии?" [What is the Unified Energy System of Central Asia?], *Yuz.uz*, February 10, 2022, https://yuz.uz/ru/news/chto-takoe-edinaya-energosistema-tsentralnoy-azii.

12 "Страны Центральной Азии могут снова объединиться в общую энергосистему" [Central Asian countries may unite again in a common energy system]. *Podrobno.uz*, May 16, 2017. https://podrobno.uz/cat/economic/strany-tsentralnoy-azii-mogut-snova-obedinitsya-v-obshchuyu-energosistemu-/.

season and power generation in spring and summer. In turn, the three downstream republics supplied coal, natural gas and power to upstream Kyrgyzstan and Tajikistan during autumn and winter. This exchange of resources became known as the water-energy nexus.

The system worked well during the Soviet era because it was easy to coordinate exchange of power between the countries centrally from Moscow. The key tradeoff involved Kazakh and Uzbek thermal power plants supplying power into the system in winter to free up Kyrgyz and Tajik hydropower stations to accumulate water in reservoirs for release during the summer growing season, rather than using resources for wintertime power generation. The downstream countries depended on water coming from upstream Kyrgyz and Tajik reservoirs in spring and summer.[13] Soviet central planners in Moscow also made all decisions on locating and building power plants and hydropower stations, as well as regulating water flows. At the time, central planners paid little attention to regional boundaries or the individual concerns of union republics. Instead, they looked at Central Asia as a whole. Administrative boundaries were treated as a formality. CAPS was entirely coordinated from Moscow and was funded by the Soviet Energy and Electricity Ministry.[14]

The Impact of the Soviet Union's Collapse

The Soviet Union's collapse in 1991 led to the slow demise of CAPS. Each newly independent state in Central Asia was suddenly responsible for managing its own power generation and distribution. Regional states at first tried to preserve a unified system. Central Asian countries signed an agreement covering the parallel work of power grids in Ashgabat in November 1991 and established a unified dispatcher directorate with ostensible parity financing.[15] The re-established system was managed by an entity called the Council of the Unified Power Grid of Central Asia, comprising the respective heads of the national power grids. The council met quarterly in each country and adopted decisions collegially.[16]

Initially, the Soviet Union's demise helped conceal problems with electricity generation and distribution as the precipitous decline of economic activity caused demand for electricity to plummet. In Kazakhstan, for example, the country's economy contracted by 38.6% in 1995 compared to 1990. Power generation in 1997 was sufficient to meet the country's needs despite a 40.5% decrease in supply compared to 1990.[17] As late as the early 2000s, the region did not face a need to add generating capacity as the system could still supply enough power for regional economies that were only starting to recover from the shock of the Soviet collapse.[18]

Even though the system functioned, it began to suffer due to deteriorating infrastructure and funding shortages. Differences over the allocation of resources also started to disrupt operations. In June 1999, the governments of all Central Asian countries except Turkmenistan signed an agreement to regulate the parallel work of their power grids and interstate supplies of power. The

13 Igor Tomberg, "Энергетика Центральной Азии: проблемы и перспективы" [Energy of Central Asia: problems and prospects], Russian International Affairs Council, April 18, 2012, https://russiancouncil.ru/analytics-and-comments/analytics/energetika-tsentralnoy-azii-problemy-i-perspektivy/.

14 E. Vinokurov et al., "Инвестиции в водно-энергетический комплекс Центральной Азии" [Investment in the water and energy complex of Central Asia], Eurasian Development Bank, 2021, https://eabr.org/upload/EDB-WEC-CA-Report_RU_web.cleaned.pdf.

15 "Разорвать нельзя оставить" [Break it, you can't leave it], *24.kg*, November 1, 2012, https://24.kg/archive/ru/news-stall/140742-razorvat-nelzya-ostavit.html/.

16 "Что такое единая энергосистема Центральной Азии? Почему ее называют 'энергетическим кольцом'?" [What is the unified energy system of Central Asia? Why is it called the 'energy ring'?], *UzReport*, January 29, 2022, https://uzreport.news/economy/chto-takoe-edinaya-obedinennaya-energosistema-tsentralnoy-azii-pochemu-ee-nazivayut-energe.

17 Казахстан: реформы и развитие 1991–2007 [Kazakhstan: reforms and development 1991–2007], Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic Of Kazakhstan, 2008, https://stat.gov.kz/upload/iblock/0e3/zob3n4rq862csw2db7qxz6flv3zx4zxb/%D0%9A%D0%B0%D0%B7_%D0%B2_%D1%80%D0%B5%D1%84%D0%BE%D1%80%D0%BC_%D1%80%D1%83%D1%81.pdf

18 "Энергетический профиль Казахстана" [Energy profile of Kazakhstan], *EES EAEC*, accessed April 12, 2026, https://www.eeseaec.org/energetika-evrazii/energeticeskij-profil-kazahstana.

agreement also led to the establishment in 2005 of a new entity to regulate distribution, the Coordination Power Grid Council of Central Asia.[19]

Turkmenistan withdrew from the system completely in 2003, instead connecting its system to that of Iran.[20]

At this time, Uzbekistan and Kazakhstan were the main sources of coal, natural gas, and power supply to Kyrgyzstan and Tajikistan, especially in winter, but disputes over the price of fuel and subsequent payment arrears for fuel led to frequent cutoffs of supplies, especially in winter. This in turn prompted Tajikistan and Kyrgyzstan to drain reservoirs for generating hydropower. The mechanism to resolve payment disputes and the unauthorized use of electricity and water proved ineffective, leading to periods of paralysis and severe shortages.[21]

More broadly, interstate relations at this time were hampered by Karimov, who used the country's central position, demographic dominance, and relative self-sufficiency to bully smaller neighbors and weaponize energy supplies.[22] Geographically isolated, energy-scarce, economically poor Kyrgyzstan and Tajikistan saw a solution in capitalizing on their water resources to resolve their energy problems, but Karimov considered this a threat to Uzbekistan's agricultural sector, especially its cotton industry. The Uzbek leader at one point warned that disputes over water-related issues might spark armed conflict.[23]

Tension kept building as the first decade of the 2000s progressed. Uzbekistan repeatedly suspended electricity supplies to Tajikistan as punitive measures over payment delays and water usage disputes.[24] The severe winters of 2007-2009 caused widespread electricity shortages across Central Asia. Amid the crisis, Uzbek and Kazakh officials accused Tajikistan of improperly siphoning electricity from the common grid.[25]

As a result, Uzbekistan opted to leave the unified system entirely in 2009,[26] leaving Tajikistan cut off from the grid.[27] After Tashkent's withdrawal, Tajikistan tried to source power directly from Turkmenistan[28] and Kyrgyzstan and intensified its efforts to build hydropower capacity with a renewed emphasis on completing the long-planned 3,600 MW Rogun Dam.[29]

19 "Международное сотрудничество" [International cooperation], Kazakhstan Electricity Grid Operating Company, accessed April 12, 2026. https://www.kegoc.kz/ru/electric-power/mezhdunarodnoe-sotrudnichestvo/.

20 Aziz Abdraimov, "Центральноазиатское энергокольцо: будущее региона приходит из прошлого" [Central Asian energy ring: the future of the region comes from the past], *Rhythm of Eurasia*, August 22, 2023, https://www.ritmeurasia.ru/news--2023-08-22--centralnoaziatskoe-energokolco-buduschee-regiona-prihodit-iz-proshlogo-68261.

21 Adil Urmanov, "Казахстан нуждается в поливной воде" [Kazakhstan needs irrigation water], *Business & Power Weekly*, May 21, 2008, https://prg.kz/document/?doc_id=30181673.

22 Doston Akhrorov, "Каримов и Рахмон: история конфликта и его первопричины" [Karimov and Rahmon: the history of the conflict and its root causes], *Kun.uz*, September 9, 2025, https://kun.uz/ru/news/2025/09/09/karimov-i-raxmon-istoriya-konflikta-i-yego-pervoprichiny.

23 Konur Alp Kocak, "Water Disputes in Central Asia: Rising Tension Threatens Regional Stability," Briefing, European Parliamentary Research Service, October 2015, https://www.europarl.europa.eu/RegData/etudes/BRIE/2015/571303/EPRS_BRI(2015)571303_EN.pdf.

24 "Узбекистан в очередной раз прекратил экспорт электричества в Таджикистан" [Uzbekistan once again stopped exporting electricity to Tajikistan], *Asia-Plus*, February 25, 2008, https://asiaplus.news/2008/02/25/uzbekistan-v-ocherednoj-raz-prekratil-eksport-elektrichestva-v-tadzhikistan/.

25 "Из-за отключения линии электропередачи между энергосистемами Узбекистана и Таджикистана произошло нарушение работы северной и южной частей ЕЭС Казахстана" [Due to the disconnection of the power transmission line between the energy systems of Uzbekistan and Tajikistan, a disruption occurred in the operation of the northern and southern parts of the Unified Energy System of Kazakhstan], *Kazakhstan Today*, May 25, 2009, https://www.kt.kz/rus/society/izza_otkljuchenija_linii_elektroperedachi_mezhdu_energosistemami_uzbekistana_i_tadzhikistana_proizoshlo_narushenie_raboti_severnoj_i_juzhnoj_chastej_ees_kazahstana_1153416416.html.

26 "Uzbekistan Withdrawing From Regional Power Grid," *RFE/RL*, December 01, 2009, https://www.rferl.org/a/Uzbekistan_Withdrawing_From_Regional_Power_Grid/1892220.html.

27 Anora Sarkorova, "Таджикистан с приходом холодов остался без тепла" [Tajikistan left without heat as cold weather sets in], *BBC News Russian*, November 9, 2009, https://www.bbc.com/russian/lg/business/2009/11/091109_tajik_energy_cuts.

28 A. Berdiyeva and A. Dubnov, "Таджикистан без туркменской электроэнергии" [Tajikistan without Turkmen electricity], *Deutsche Welle*, January 6, 2009, https://www.dw.com/ru/tadzhikistan-bez-turkmenskoj-jelektrojenergii/a-3925633.

29 "Rogun hydroelectric plant," Ministry of Energy and Water Resources of the Republic of Tajikistan, accessed April 12, 2026, https://www.mewr.tj/?page_id=618.

"The region subsequently experienced widespread shortages throughout the especially harsh winter of 2022–2023, and in late 2025, authorities in Kyrgyzstan, Tajikistan and Uzbekistan introduced emergency conservation measures to limit expected supply shortages during the winter heating season."

Uzbekistan's departure was in part motivated by Tajikistan's decision to build Rogun, which faced problems with international funding due to Tashkent's opposition. Karimov feared that Rogun's completion would leave Uzbekistan with insufficient water supplies for its agricultural sector. At the time, Tashkent denied the pullout was politically motivated.[30]

After Karimov's death in 2016, Mirziyoyev took quick steps to repair relations with the country's Central Asian neighbors. Over the past decade, Mirziyoyev has promoted the expansion of regional connectivity and trade.[31] Uzbekistan's about-face on regional relations has enabled closer cooperation on the water aspect of the water-energy nexus. Uzbekistan, for example, now supports the construction of large-scale hydropower stations in Kyrgyzstan and Tajikistan, including Rogun.[32]

Power Generation in the Post-Soviet Era

Following the breakup of the Soviet Union, Kazakhstan, Uzbekistan, and Turkmenistan added power generation capacities, mostly powered by coal and natural gas, while Kyrgyzstan and Tajikistan focused on hydropower. Nevertheless, aging infrastructure and disputes over water allocation have meant that most countries have struggled to generate enough power to meet surging demand in recent years.

In late January 2022, for example, the southern regions of Kazakhstan, along with portions of Uzbekistan and Kyrgyzstan, experienced a major blackout caused by a short circuit that shut down six power units totaling 1,500 MW at Uzbekistan's Syrdarya thermal power plant. This blackout was resolved relatively quickly after plants in Kazakhstan supplied power to Uzbekistan and Kyrgyzstan.[33] The incident, however, had a silver lining in that it demonstrated an increasing willingness among regional states to cooperate in addressing emergencies.

That blackout was not an isolated incident. The region subsequently experienced widespread shortages throughout the especially harsh winter of 2022-2023,[34,35] and in late 2025, authorities in Kyrgyzstan, Tajikistan, and Uzbekistan[36] introduced emergency conservation measures to limit expected supply shortages during the winter heating season.

Expanding Generating Capacity

In recent years, Kazakhstan and Uzbekistan have expanded power generation into renewables, including solar, wind, and small-scale hydropower, along with plans to build nuclear power plants.

Kazakhstan

Over the past two decades, Kazakhstan has modernized existing coal-fired power plants and built gas-fired and small-scale hydropower stations, increas-

30 Aldiyar Kosenov, "Ташкент опроверг влияние политики на выход из энергосистемы ЦА" [Tashkent denied the influence of politics on the decision to exit the CA energy system], *Tengrinews*, November 24, 2009, https://tengrinews.kz/unsort/taskent-oproverg-vliianie-politiki-vyxod-energosistemy-ca-32275/.

31 "Центральная Азия – главный приоритет внешней политики Узбекистана" [Central Asia is the main priority of Uzbekistan's foreign policy], *UzDaily*, August 11, 2017, https://www.uzdaily.uz/ru/tsentralnaia-aziia-glavnyi-prioritet-vneshnei-politiki-uzbekistana/.

32 Peter Leonard, "Tajikistan, Uzbekistan Taking Cautious Steps to End Dam Impasse," *Eurasianet*, November 10, 2016, https://eurasianet.org/tajikistan-uzbekistan-taking-cautious-steps-to-end-dam-impasse.

33 Nadezhda Lykova, "Блэкаут на юге Казахстана не связан с деятельностью майнеров - KEGOC" [Blackout in southern Kazakhstan is not related to the activities of miners - KEGOC], *Tengrinews*, January 28, 2022, https://tengrinews.kz/kazakhstan_news/blekaut-yuge-kazahstana-ne-svyazan-deyatelnostyu-maynerov-460411/.

34 Zhanbolat Mamyshev, "На юге Казахстана введены ограничения по электроэнергии" [Electricity restrictions have been introduced in southern Kazakhstan], *Kursiv Media*, February 13, 2023, https://kz.kursiv.media/2023-02-13/zhnb-electroblackaut/.

35 "Минэнерго объяснило причину отключений электричества в Узбекистане" [The Ministry of Energy explained the cause of power outages in Uzbekistan], *Spot.uz*, August 3, 2023, https://www.spot.uz/ru/2023/08/03/blackout-causes/.

36 Stephen M. Bland, "Uzbekistan Announces New Electricity Rationing Amid Power Shortages," The Times of Central Asia, December 11, 2025, https://timesca.com/uzbekistan-announces-new-electricity-rationing-amid-power-shortages/.

ing its generation capacity from 18.6 GW[37] to 26.8 GW at the beginning of 2026.[38]

Despite the added capacity, Kazakhstan still finds itself having to play catch-up to ensure power generation keeps pace with growing demand. One of the country's largest coal-fired district thermal power stations, known as Ekibastuz-1, has been modernized.[39] The country also built the 300 MW Moynak hydropower station to ease power shortages in areas around its largest city, Almaty.[40] Other power stations have been added to ensure smooth operations at oil fields at Kashagan,[41] Kalamkas,[42] and Karabatan.[43]

Uzbekistan

During the Soviet era, Uzbekistan relied on generating power mainly from fossil fuels and hydropower, with capacities standing at 9.4 GW and 1.7 GW in 1992,[44] respectively. Since gaining independence, it has modernized existing thermal power plants and commissioned three major new gas-powered plants: Talimarjan (1.7 GW),[45] Syrdarya (1.5 GW)[46] and Turakurgan (920 MW).[47] The country has also built smaller gas-fired thermal power plants and small-scale hydropower stations.[48]

Like Kazakhstan, Uzbekistan's long recovery from the economic shock of the Soviet collapse kept power consumption flat for the first decades of independence. The country's power generation was stagnant at about 50 billion kWh annually from 1991 to 2009.[49] Over the past 16 years, consumption and generation have risen steadily: In 2025, the country generated 86.7 billion kWh.[50] Even so, Uzbekistan in 2025 faced a persistent challenge[51] in meeting demand for power.

Kyrgyzstan and Tajikistan

Central Asia's two upstream states have experienced the most difficulty in meeting power generation requirements and thus have suffered the most from shortages during the post-Soviet era.

Both countries lack meaningful reserves of fossil fuels and are relatively poor, meaning they are hard-pressed to pay for fuel imports. With large but rapidly

37 Kazanina, I. V. *Энергосбережение* [Energy conservation]. *Almaty University of Energy and Communications*, 2011, https://libr.aues.kz/facultet/eef/kaf_epp/45/umm/epp_1.htm.

38 "Электроэнергетика Казахстана" [Electric Power Industry of Kazakhstan]. Kazakhstan Electricity Grid Operating Company, accessed April 12, 2026, https://www.kegoc.kz/ru/electric-power/elektroenergetika-kazakhstana/.

39 "Экибастузской ГРЭС-1 введен в эксплуатацию энергоблок №1" ["Ekibastuz GRES-1 Energy Unit No. 1 Commissioned for Operation]. *Tengrinews* (Tengrinews.kz), accessed April 12, 2026, https://tengrinews.kz/kazakhstan_news/ekibastuzskoy-gres-1-vveden-ekspluatatsiyu-energoblok-1-558080/.

40 Aldyar Kosenov, "Президент Казахстана принял участие в запуске второго этапа проекта 'Модернизация Национальной электрической сети'" [The President of Kazakhstan took part in the launch of the second stage of the 'Modernization of the National Electric Grid' project], *Tengrinews*, May 26, 2012, https://tengrinews.kz/kazakhstan_news/prezident-kazaxstana-prinial-ucastie-zapuske-vtorogo-214809/.

41 Saule Tasbulatova, "Kashagan power grows by 240 MWt," *Ak Zhaik*, May 2 2013, https://azh.kz/en/news/view/1429.

42 Olga Zolotykh, "Нефтяники Прикаспия ввели в эксплуатацию газотурбинную электростанцию" [Caspian oil workers commissioned a gas turbine power plant], *Kazakhstanskaya Pravda*, October 11, 2014, https://kazpravda.kz/n/neftyaniki-prikaspiya-vveli-v-ekspluatatsiyu-gazoturbinnuyu-elektrostantsiyu/.

43 "Строительство Парогазотурбинной электростанции 310МВт " [Construction of a 310 MW combined-cycle power plant], Karabatan Utility Solutions, accessed April 16, 2026, https://kus.com.kz/ru/projects/realizovannye-proekty/3.

44 "Энергетический профиль Узбекистана" [Energy profile of Uzbekistan], *EES EAEC*, accessed April 12, 2026, https://www.eeseaec.org/energetika-evrazii/energeticeskij-profil-uzbekistana.

45 "Company today," JSC Talimarjon TPP, accessed April 12, 2026. https://taltes.uz/ru/jamiyat-bugun/.

46 "В Узбекистане возможны перебои со светом из-за неисправности на Сырдарьинской ТЭС от ACWA Power" [Power outages possible in Uzbekistan due to malfunction at Sirdaryo TPP by ACWA Power], *Gazeta.uz*, December 10, 2025, https://www.gazeta.uz/ru/2025/12/10/sirdaryo-ies/.

47 Elena Kim, "Туракурганская ТЭС вновь заработала на полную мощность" [Turakurgan TPP has returned to full capacity], *Kursiv Media*, February 3, 2023, https://uz.kursiv.media/2023-02-03/turakurganskaya-tes-vnov-zarabotala-na-polnuyu-moshhnost/.

48 "В 2025 году Узбекистан удвоил производство электроэнергии за счёт солнца и ветра — Минэнерго" [In 2025, Uzbekistan doubled its electricity generation from solar and wind sources — Ministry of Energy], *Gazeta.uz*, January 5, 2026, https://www.gazeta.uz/ru/2026/01/05/energy/.

49 "Энергетический профиль Узбекистана" [Energy profile of Uzbekistan], EES EAEC, accessed April 12, 2026, https://www.eeseaec.org/energetika-evrazii/energeticeskij-profil-uzbekistana.

50 " Министерство энергетики: Показатели выработки электроэнергии в стране за 2016-2025 гг" [Ministry of Energy: National electricity generation figures, 2016–2025], National Electric Grid of Uzbekistan, January 7, 2026, https://www.uzbekistonmet.uz/ru/lists/view/7956.

51 "Uzbek officials adapting quickly to growing water deficit," *Eurasianet*, January 6, 2026, https://eurasianet.org/uzbek-officials-adapting-quickly-to-growing-water-deficit.

dwindling supplies of water, they have continued to focus on developing hydropower, but troubles attracting financing and questions about the technology's regional viability amid climate change have slowed such projects in recent years and raised questions about their eventual ability to meet power-generating expectations.[52]

Turkmenistan

Thanks largely to its abundance of natural gas, Turkmenistan boosted its power generation capacity from 3.9 GW in 1992[53] to 6.5 GW in 2025[54] with the construction of new gas-fired thermal stations. Its generation increased from 12.1 billion kWh in 1992 to 30.1 billion kWh in 2022, with exports standing at 9 billion kWh in 2022.[55] Top electricity export destinations for Turkmen power are Afghanistan, Iran, and its Central Asian neighbors. Ashgabat also has plans to build a 1.6 GW combined-cycle plant,[56] the output from which is envisioned for export via a planned trans-Caspian power line destined for Türkiye and points farther West.[57]

Part II: Looming Challenges

Central Asia's economic resurgence over the past two decades has not been even: Kazakhstan has benefited greatly from revenue generated by its energy sector, Uzbekistan's economy started picking up after Mirziyoyev's economic reforms began to take hold.[58] The economies of Tajikistan and Kyrgyzstan, meanwhile, have lagged, although Bishkek has reaped a windfall from the significant expansion of trade with Russia since the start of the Russia-Ukraine war in 2022.[59] Turkmenistan, like Kazakhstan, has relied on energy-sector revenue to keep its economy afloat.

In the past year, regional leaders from all five states have articulated a desire to diversify their economies and take advantage of emerging trade routes such as the Middle Corridor, which would connect Central Asia to European markets.[60] Some states have also pursued closer ties with Pakistan, aiming to establish regular access to a seaport.[61]

In addition, Kazakhstan,[62] Tajikistan,[63] and Uzbekistan[64] have unveiled ambitious economic modernization programs that emphasize the development of cryptocurrency capacity and the creation of IT and AI hubs backed by the

52 Alexander Thompson, S. Frederick Starr, "When Water Becomes Glue: Solving Central Asia's Water Dilemma through Collaboration," *New Lines Institute*, February 2, 2026, https://newlinesinstitute.org/central-asia-center/when-water-becomes-glue-solving-central-asias-water-dilemma-through-collaboration/.

53 "Энергетический профиль Туркменистана" [Energy profile of Turkmenistan], *EES EAEC*, accessed April 12, 2026, https://www.eeseaec.org/energetika-evrazii/energeticeskij-profil-turkmenistana.

54 "State Power Corporation Turkmenenergo," Ministry of Energy of Turkmenistan, accessed April 12, 2026, https://minenergo.gov.tm/karhanalar/turkmenenergo.

55 "Энергетика Туркменистана: настоящее и будущее" [Energy of Turkmenistan: present and future]. *InfoAbad*, September 5, 2022, https://www.infoabad.com/1479-energetika-turkmenistana-nastojaschee-i-buduschee.html.

56 Zhanna Nurmaganbetova, "Turkmenistan to increase electricity production in 2026," *Kazinform*, March 8, 2026, https://qazinform.com/news/turkmenistan-to-increase-electricity-production-in-2026-5389f4.

57 "Turkmenistan reveals electricity export aspirations," *Eurasianet*, November 4, 2025, https://eurasianet.org/turkmenistan-reveals-electricity-export-aspirations.

58 "Helping Uzbekistan Undertake a Historic Social and Economic Transformation," World Bank Group, July 16, 2024, https://www.worldbank.org/en/results/2024/07/16/helping-uzbekistan-undertake-a-historic-social-and-economic-transformation.

59 Svyatoslav Antonov, " Как Кыргызстан стал одним из самых быстрорастущих рынков Центральной Азии" [How Kyrgyzstan became one of Central Asia's fastest-growing markets], *Kursiv Media*, March 13, 2026, https://kz.kursiv.media/2026-03-13/svan-pochemu-kyrgyzstan-operedil-vse-strany-centralnoj-azii-po-rostu-ekonomiki/.

60 "Central Asian states registering impressive trade gains," *Eurasianet*, Oct 21, 2025, https://eurasianet.org/central-asian-states-registering-impressive-trade-gains.

61 "Pakistan Seeks To Link Ports To Central Asia Via China," Afghanistan International, Feb 4, 2026, https://www.afintl.com/en/202602047442.

62 Azamatkhan Akhmadov, "В Казахстане начинают строить 'долину дата-центров' за 30 миллиардов долларов" [Construction of a $30 billion 'data center valley' begins in Kazakhstan], *Tengrinews.kz*, January 30, 2026, https://tengrinews.kz/kazakhstan_news/kazahstane-nachinayut-stroit-dolinu-data-tsentrov-30-591575/.

63 "В Дарвазе построят первый зелёный дата-центр на гидроэнергии" [First green data center powered by hydropower to be built in Darvoz], *Khovar*, October 28, 2025, https://khovar.tj/rus/2025/10/v-darvaze-postroyat-pervyj-zelyonyj-data-tsentr-na-gidroenergii/.

64 "DataVolt инвестирует $6,5 млрд в создание дата-центров в Узбекистане — Минцифры" [DataVolt to invest $6.5 billion in data centers in Uzbekistan — Ministry of Digital Technologies], *Gazeta.uz*, June 13, 2025, https://www.gazeta.uz/ru/2025/06/13/it-ai/.

An electric substation in Kazakhstan. (Hlopotov/ Getty Images)

construction of data centers. All these areas of planned development are electricity intensive and are sure to add to the challenges regional states face in overcoming the present power deficit.[65] The need to rapidly add generating capacity to meet growing demand is spurring interest among regional states in developing renewable power sources. Also, Kazakhstan, Kyrgyzstan, and Uzbekistan are pursuing nuclear energy options.

While wind and solar capacity can be developed relatively quickly, there are questions over whether nuclear power plants can come online fast enough to meet medium-term needs. All three Central Asian states have engaged Russia's nuclear energy agency, Rosatom, to build the first plants in the country,[66,67] but Western sanctions against Rosatom entities appear to be creating financing complications, threatening to cause delays in construction timelines.[68] Kazakhstan has hedged its nuclear bet by engaging China to build at least one of its three planned nuclear power plants.[69]

Diversifying Power Generation

Kazakhstan

Kazakhstan's total generating capacity stood at 26.8 GW as of early 2026.[70] Of this, coal-powered power plants account for 13.8 GW, gas-powered plants 6.8 GW, hydro 2.5 GW and renewables 3.5 GW.[71] In 2025, Kazakhstan had a slight electricity deficit, producing 123.1 billion kWh of power and consuming 124.6 billion kWh.[72] The shortfall was covered mostly by imports from Russia. Renewables accounted for 6% of total generation, and their share is set to grow.

By 2035, the government aims to double generating capacity, with the added power coming from modernizing existing facilities (5 GW), conventional-fossil (10.5 GW), renewables (8.4 GW), and nuclear (2.4 GW).[73]

Kazakhstan is embracing nuclear energy, having contracted with Russia and China to build three large-scale nuclear power plants by the mid-2030s.[74] The first plant, to be built by Rosatom, will feature two large-scale reactors with an annual generating capacity of 1.2 GW each. The target completion date is in the mid-2030s.[75]

Over 31% of new capacity is designed to ensure base load and at least 3 gigawatt hours (GWh) of storage capacity should be built to accumulate excess power from renewables to release when demand is high.

65 "Kazakhstan to cover electricity deficit in autumn-winter with imports from Russia, Uzbekistan - KEGOC," *Interfax*, October 16, 2025, https://interfax.com/newsroom/top-stories/114349/.

66 Tatiana Panchenko, "Узбекистан и Россия подписали соглашение о строительстве АЭС большой мощности" [Uzbekistan and Russia signed an agreement on the construction of a large-capacity nuclear power plant], *Forbes Kazakhstan*, June 21, 2025, https://forbes.kz/articles/uzbekistan-i-rossiya-podpisali-soglashenie-o-stroitelstve-aes-bolshoy-moshnosti-32bf5b.

67 "АЭС в Кыргызстане вынесут на референдум — переговоры с "Росатомом" продолжаются" [Nuclear power plant in Kyrgyzstan to be put to referendum — negotiations with Rosatom continue], *24.kg*, April 3, 2026, https://24.kg/obschestvo/368884_aes_vnbspkyirgyizstane_vyinesut_nanbspreferendumnbspmdash_peregovoryi_snbsplaquorosatomomraquo_prodoljayutsya/.

68 "Проект АЭС в Казахстане под угрозой? В "Росатоме" отреагировали на новые санкции ЕС" [Is the nuclear power plant project in Kazakhstan under threat? Rosatom reacts to new EU sanctions], *Orda.kz*, February 26, 2026, https://orda.kz/proekt-ajes-v-kazahstane-pod-ugrozoj-v-rosatome-otreagirovali-na-novye-sankcii-es-412140/.

69 "Nuclear Power Plant Construction in Kazakhstan as a Test of Strength: Can Rosatom Withstand Competition from China?" Bellona, November 14, 2025, https://etc.bellona.org/2025/11/14/kazakhstan-npp-test/.

70 "Электроэнергетика Казахстана" [Electric Power Industry of Kazakhstan]. Kazakhstan Electricity Grid Operating Company, accessed April 12, 2026, https://www.kegoc.kz/ru/electric-power/elektroenergetika-kazakhstana/.

71 ""Чистая" энергетика на взлёте: мощность таких станций увеличилась в 14 раз в Казахстане" [Clean energy is on the rise: the capacity of such stations has increased 14-fold in Kazakhstan], *Qazaq Green*, January 16, 2026, https://qazaqgreen.com/news/kazakhstan/3303/.

72 "Национальная энергосистема" [National power system], Kazakhstan Electricity Grid Operating Company, accessed April 12, 2026, https://www.kegoc.kz/ru/electric-power/natsionalnaya-energosistema/.

73 "Реализация поручений Президента: новая генерация и инвестиции меняют энергосистему Казахстана" [Implementation of President's instructions: New generation and investments are changing Kazakhstan's energy system], Press Service of the Prime Minister of the Republic of Kazakhstan, February 5, 2026, https://primeminister.kz/ru/news/reviews/realizaciia-porucenii-prezidenta-novaia-generaciia-i-investicii-meniaiut-energosistemu-kazaxstana-31061.

74 "Uzbekistan, Kazakhstan expanding nuclear energy programs," *Eurasianet*, Sep 30, 2025, https://eurasianet.org/uzbekistan-kazakhstan-expanding-nuclear-energy-programs.

75 Alexander Thompson, S. Frederick Starr, "When Water Becomes Glue: Solving Central Asia's Water Dilemma through Collaboration," *New Lines Institute*, February 2, 2026, https://newlinesinstitute.org/central-asia-center/when-water-becomes-glue-solving-central-asias-water-dilemma-through-collaboration/.

Uzbekistan

Uzbekistan is embracing green energy in a big way. The country has adopted a program for the development of the power sector between 2025 and 2035, under which it aims to increase the share of renewables in total power generation to 54% by 2030.[76] Tashkent also has plans to build nuclear power plants that could provide more than 2 GW of power by 2035.[77]

The country possesses 25.8 GW of installed capacity, including 17.6 GW of thermal power stations, 2.4 GW of hydro, almost 4 GW of solar and 1.7 GW of wind power generation.[78]

Kyrgyzstan

Kyrgyzstan has had modest success in boosting generating capacity, but those efforts have not translated into an actual increase in electricity production, leading to a widening power deficit. Generating capacity has risen only marginally since 2024's level of 4.02 GW.[79] Perhaps the most significant project to increase capacity was an upgrade to the Toktogul hydropower stations,[80] increasing their potential output by 240 MW.

In 2020, power generation stood at 15.3 billion kWh. Over the past five years, generation has remained relatively level: Kyrgyzstan produced 15.4 billion kWh in 2025,[81] of which 12.9 billion kWh came from hydropower, 2 billion kWh from thermal power and 450 million kWh from small-scale hydropower and other renewables.[82]

The country claims to have signed investment contracts to build five solar and one wind farm with a combined capacity of 3.2 GW.[83] Bishkek is also exploring the feasibility of building a nuclear power plant with the help of Rosatom.[84]

Kyrgyzstan has struggled to construct the Kambarata-1 hydropower station with a designed capacity of 1.9 GW, due mainly to financing problems. In 2024, Kyrgyzstan agreed with Kazakhstan and Uzbekistan to set up a joint company to build and operate the hydropower station. Each participating state was seeking loans worth $500 million from the World Bank.[85]

76 "Выступление Президента Республики Узбекистан Шавката Мирзиёева на первом саммите "Центральная Азия + Япония"" [Address by the President of the Republic of Uzbekistan, Shavkat Mirziyoyev, at the First "Central Asia + Japan" Summit], Official Website of the President of the Republic of Uzbekistan, December 12, 2025, https://president.uz/ru/lists/view/8812.

77 "Uzbekistan, Kazakhstan expanding nuclear energy programs," *Eurasianet*, Sep 30, 2025, https://eurasianet.org/uzbekistan-kazakhstan-expanding-nuclear-energy-programs.

78 "В 2025 году Узбекистан удвоил производство электроэнергии за счёт солнца и ветра — Минэнерго" [In 2025, Uzbekistan doubled its electricity generation from solar and wind sources — Ministry of Energy.], *Gazeta.uz*, January 5, 2026, https://www.gazeta.uz/ru/2026/01/05/energy/.

79 "Электроэнергетика государств-участников СНГ: Основные показатели работы энергосистем за I квартал 2024 года" [Electric power industry of the CIS member states: Key performance indicators of energy systems for the 1st quarter of 2024], Executive Committee of the CIS Electric Power Council, accessed April 12, 2026, http://energo-cis.ru/wyswyg/file/Gertzen/Sborniki_kvartal/Бюллетень%201%20кв%202023%20год.pdf.

80 "Гидроагрегат №1 Токтогульской ГЭС введен в эксплуатацию" [Hydraulic unit No. 1 of the Toktogul HPP put into operation], EITR, November 19, 2024, https://eltr.kg/ru/gidroagregat-№1-toktogulskoj-ges-vveden-v-ekspluatacziyu/.

81 "Кыргызстан потребляет 19.3 млрд кВт·ч, но производит только 15.4 млрд" [Kyrgyzstan consumes 19.3 billion kWh, but produces only 15.4 billion], *Economist.kg*, January 26, 2026, https://economist.kg/enierghietika/2026/01/26/kyrghyzstan-potriebliaiet-19-3-mlrd-kvt-ch-no-proizvodit-tolko-15-4-mlrd/.

82 Ayzada Kutuyeva, "КР экспортировала в 2025 году 3.886 миллиарда киловатт-часов электроэнергии" [Kyrgyz Republic exported 3.886 billion kilowatt-hours of electricity in 2025], *24.kg*, February 24, 2026, https://24.kg/obschestvo/363281_kreksportirovala_v2025_godu_3886_milliarda_kilovatt-chasov_elektroenergii/.

83 Aybek Sultanov, "Годовой дефицит электричества в Кыргызстане достиг 3,9 миллиарда киловатт-часов" [Annual electricity deficit in Kyrgyzstan reached 3.9 billion kilowatt-hours], *24.kg*, January 26, 2026, https://24.kg/ekonomika/359070_godovoy_defitsit_elektrichestva_vkyirgyizstane_dostig_39_milliarda_kilovatt-chasov_/.

84 Sergey Sukhankin, "Russia's offer to build a small nuclear reactor in Kyrgyzstan and its implications," *Eurasianet*, February 18, 2026, https://eurasianet.org/russias-offer-to-build-a-small-nuclear-reactor-in-kyrgyzstan-and-its-implications.

85 "Рамочная стратегия партнёрства Группы Всемирного банка с Республикой Казахстан" [World Bank Group country partnership framework with the Republic of Kazakhstan], World Bank Group, January 2026, https://thedocs.worldbank.org/en/doc/90643194a397505d39405056a53814ea-0080012026/original/Information-for-CPF-Consultations-January-2026-ru.pdf.

Electricity consumption jumped by 25% over the past five years, from 15.4 billion kWh in 2020 to 19.3 billion kWh last year.[86] Over the same period, Kyrgyzstan's imports of electricity increased from 353 million kWh in 2020 to 3.8 billion kWh last year.[87]

Tajikistan

Tajikistan has encountered persistent problems with wintertime electricity shortages over the past 20 years, even though production has risen. At the same time, government has earned revenue by exporting power primarily during the summer months.[88]

Power generation capacity stood at 5.8 GW in 2024, of which 88% was hydropower and 12% generated via thermal power.[89] The country has virtually no solar or wind power generation capacity at present, but in early 2026, the government signed a relatively small deal to build solar farms.[90]

The country produced 20 billion kWh of power in 2025 (up 6.5% on the previous year), of which 5.4 billion kWh was exported to Afghanistan, Uzbekistan, and Kyrgyzstan in summer, while 2.7 billion kWh was imported from Uzbekistan and Kyrgyzstan in winter.[91]

Turkmenistan

Turkmenistan has 12 thermal power plants, mostly powered by natural gas (70%), with a total capacity of 6.5 GW.[92] The country has virtually no generating capacity via renewables, but it has plans to add some within the next five years or so, including a 100 MW solar farm.[93]

The country's domestic consumption stands at 3 GW, and it is capable of exporting 3.5 GW. Kyrgyzstan reportedly has imported power from Turkmenistan in recent years, including about 5 billion kWh in 2025.[94]

The Role of Renewables

Solar and wind power represent the fastest way Central Asian states can add generating capacity without complicating efforts to achieve greenhouse gas emission reduction goals. Kazakhstan, for example, has set a goal of reducing emissions by 15% by 2030, a target that puts pressure on authorities to reduce reliance on coal- and gas-fired power plants.[95] Solar and wind power are also widely seen as cheaper to generate than nuclear energy.[96] They also do not threaten the region's critical water-energy nexus.

86 "В Кыргызстане потребление электроэнергии выросло на 25% за пять лет" [Electricity consumption in Kyrgyzstan has grown by 25% over five years], *Kaktus.media*, January 24, 2026, https://kaktus.media/doc/539283_v_kyrgyzstane_potreblenie_elektroenergii_vyroslo_na_25_za_piat_let.html.

87 "Импорт электроэнергии в Кыргызстан вырос более чем в 10 раз с 2020 по 2025 год" [Electricity imports to Kyrgyzstan increased more than 10 times from 2020 to 2025], CIS Electric Power Council, February 9, 2026, http://energo-cis.ru/news/infografika__import/.

88 "Таджикистан увеличил экспорт электроэнергии на 37% в 2025 году" [Tajikistan increased electricity exports by 37% in 2025], *Central Asian Light*, January 30, 2026, https://centralasianlight.org/ru/news/tadzhikistan-uvelichil-eksport-elektroenergii-na-37-v-2025-godu/.

89 "Энергетика" [Energy sector], Ministry of Energy and Water Resources of the Republic of Tajikistan, accessed April 12, 2026, https://www.mewr.tj/?page_id=552.

90 "Tajikistan hedging its Rogun bet, exploring solar options," *Eurasianet*, January 15, 2026, https://eurasianet.org/tajikistan-hedging-its-rogun-bet-exploring-solar-options.

91 "Таджикистан увеличил экспорт электроэнергии на 37% в 2025 году" [Tajikistan increased electricity exports by 37% in 2025], *Central Asian Light*, January 30, 2026, https://centralasianlight.org/ru/news/tadzhikistan-uvelichil-eksport-elektroenergii-na-37-v-2025-godu/.

92 "State Power Corporation Turkmenenergo," Ministry of Energy of Turkmenistan, accessed April 12, 2026, https://minenergo.gov.tm/karhanalar/turkmenenergo.

93 Vladimir Sidorovich, "Masdar построит солнечную электростанцию мощностью 100 МВт в Туркменистане" [Masdar to build a 100 MW solar power plant in Turkmenistan], *RenEn*, November 23, 2022, https://renen.ru/masdar-postroit-solnechnuyu-elektrostantsiyu-moshhnostyu-100-mvt-v-turkmenistane/.

94 Baktygul Osmonalieva, "Сколько электроэнергии импортирует Кыргызстан из Туркменистана, рассказал Ибраев" [Ibraev shared how much electricity Kyrgyzstan imports from Turkmenistan], *24.kg*, December 15, 2025, https://24.kg/ekonomika/354545_skolko_elektroenergii_importiruet_kyirgyizstan_izturkmenistana_rasskazal_ibraev/.

95 Helena Garkava, "Kazakhstan's Climate Policy Will Change," *Climate Action Network Eastern Europe, Caucasus and Central Asia (CAN EECCA)*, November 18, 2025, https://caneecca.org/en/kazakhstans-climate-policy-will-change/.

96 Dianne Plummer, "Power Play: The Economics Of Nuclear Vs. Renewables," *Forbes*, February 12, 2025, https://www.forbes.com/sites/dianneplummer/2025/02/12/power-play-the-economics-of-nuclear-vs-renewables/.

Along with expanding power generation capacities from renewables, Kazakhstan and Uzbekistan are also working to build energy storage systems. Uzbekistan plans to build 4.5 GW of such systems by 2030.[97] It built 1.2 GW of storage capacity in 2025.[98] A planned 1 GW solar farm in Samarkand also envisages 750 MW of storage.[99] According to Kazakh government estimates, the country needs 3 GW of storage capacity by 2030.[100] New projects all feature the construction of storage components. For example, France's TotalEnergies plans to build a 1 GW wind farm with a storage capacity of 600 MW,[101] and Chinese investors will build a 1 GW wind farm with a storage capacity of 300 MW.[102] Kazakhstan also plans to produce storage systems with a U.S. firm, Clearbrook Energy Solutions.[103]

Uzbekistan is leading the charge to embrace solar and wind power. In December 2025, Mirziyoyev announced that the country was implementing 42 green energy projects at a cost of $11 billion, including power generation sites, electricity storage facilities, and transmission lines.[104] In February 2026, solar- and wind-generated electricity totaled 815 million kWh,[105] a more than 200% increase over the total for the same month the previous year. Tashkent is leaning on Saudi Arabia[106] and China[107] to assist in its green transition.

Uzbekistan additionally launched a program to encourage households, public facilities, and businesses to install rooftop solar panels, with the ability to sell excess power. As of late 2025, the country has installed solar panels on 141,221 rooftops, with a total potential capacity of almost 2 GW.[108]

Despite its abundance of oil and gas reserves, Kazakhstan has likewise embraced solar and wind options. For example, the massive Mirny wind farm in western Kazakhstan with a 1 GW annual generating capacity is projected to be commissioned in 2028.[109] Within the context of its goal of achieving carbon neutrality by 2060, Kazakhstan plans to generate 15% of power using renewables by 2030 and at least 50% by 2050.[110]

97 "Узбекистан активно развивает системы накопления энергии" [Uzbekistan is actively developing energy storage systems], *UzDaily*, March 17, 2026, https://www.uzdaily.uz/ru/uzbekistan-aktivno-razvivaet-sistemy-nakopleniia-energii/.

98 Rushanabonu Aliakbarova, "Узбекистан запускает проекты в области чистой энергетики стоимостью 9,46 млрд евро" [Uzbekistan launches clean energy projects worth €9.46 billion], *Euronews*, December 5, 2025, https://ru.euronews.com/business/2025/12/05/uzbekistan-zapuskaet-proekty-v-oblasti-chistoj-energetiki-stoimostyu-9-mlrd-evro.

99 "В Самаркандской области строят солнечную электростанцию мощностью 1 ГВт и систему накопления энергии" [A 1 GW solar power plant and energy storage system are being built in the Samarkand region], *UzDaily*, March 4, 2026, https://www.uzdaily.uz/ru/v-samarkandskaia-oblasti-stroiat-solnechnuiu-elektrostantsiiu-moshchnostiu-1-gvt-i-sistemu-nakopleniia-energii/.

100 Zhanbolat Mamyshev, "В Казахстане мощность систем накопления энергии может достичь 3 ГВт" [In Kazakhstan, the capacity of energy storage systems could reach 3 GW.], *Kursiv Media*, May 28, 2025, https://kz.kursiv.media/2025-05-28/zhnb-batterykz/.

101 "Mirny: A Giant Onshore Wind Project in Kazakhstan," TotalEnergies, accessed April 16, 2026, https://totalenergies.com/company/projects/wind/mirny-kazakhstan.

102 "Самрук-Энерго начал строительство еще одного крупнейшего ветропарка в СНГ" [Samruk-Energy has commenced construction of another major wind farm in the CIS], *Zakon.kz*, March 31, 2026, https://www.zakon.kz/sobytiia/6512778-samrukenergo-nachal-stroitelstvo-eshche-odnogo-krupneyshego-vetroparka-v-sng.html

103 Daniil Devyatkin, "Devy инвестирует $350 млн в энергетическую инфраструктуру Казахстана" [Devy to invest $350 million in Kazakhstan's energy infrastructure], *Kursiv Media*, November 8, 2025, https://kz.kursiv.media/2025-11-08/devy-350-mln-investiruyut-v-energeticheskuyu-infrastrukturu-kazakhstana/.

104 "Введены в строй крупные мощности и дан старт строительству ряда новых объектов энергетики в Узбекистане" [Major power generation capacities have been commissioned, and construction has commenced on a number of new energy facilities in Uzbekistan.], Cabinet of Ministers of the Republic of Uzbekistan, December 5, 2025, https://gov.uz/ru/news/view/108357.

105 "В Узбекистане выработка электроэнергии на солнечных и ветряных станциях выросла более чем в три раза" [In Uzbekistan, electricity generation at solar and wind power plants has more than tripled], *Yuz.uz*, March 11, 2026, https://yuz.uz/ru/news/140353.

106 "IFC Partners with ACWA Power to Support Uzbekistan's Renewable Energy Transition," International Finance Corporation, October 29, 2024, https://www.ifc.org/en/pressroom/2024/ifc-partners-with-acwa-power-to-support-uzbekistan-s-renewable-energy-transition.

107 Yunis Sharifli, "Green New Wave: How China Adapts to Central Asia's Renewable Energy Landscape," Carnegie Endowment for International Peace, Apr 19, 2024, https://carnegieendowment.org/posts/2024/07/green-new-wave-how-china-adapts-to-central-asias-renewable-energy-landscape.

108 "В Узбекистане установлено свыше 14,1 тысячи солнечных панелей общей мощностью почти 2 ГВт" [Over 14.1 thousand solar panels with a total capacity of almost 2 GW installed in Uzbekistan], *Yuz.uz*, December 2, 2025, https://yuz.uz/index.php/ru/news/v-uzbekistane-ustanovleno-svshe-141-tsyachi-solnechnx-paneley-obey-monostyu-pochti-2-gvt?strict=1.

109 "Mirny: A Giant Onshore Wind Project in Kazakhstan," TotalEnergies, accessed April 16, 2026, https://totalenergies.com/company/projects/wind/mirny-kazakhstan.

110 "Казахстан планирует довести долю ВИЭ до 50% к 2050 году" [Kazakhstan plans to increase the share of renewable energy sources to 50% by 2050], *Kazinform*, June 16, 2025, https://www.inform.kz/ru/kazahstan-planiruet-dovesti-dolyu-vie-do50-k2050-godu-f4ec48.

The region's other states, Kyrgyzstan, Tajikistan, and Turkmenistan, are only starting to awaken to solar and wind possibilities.[111] These states also have carbon reduction targets. Kyrgyzstan, for example, aims to reduce its carbon emissions by up to 39% by 2035.[112] In a sign of faith that some regional leaders have in renewables, in 2024, Azerbaijan, Kazakhstan, and Uzbekistan signed an ambitious agreement to build an underwater power cable across the Caspian Sea intended to export solar- and wind-generated power from Central Asia to the Caucasus and Europe.[113] A feasibility study is expected to be completed this year.[114] Experts believe the earliest Europe-bound electricity transmissions could start is the early 2030s.

The Race to Meet Growing Power Needs

"All Central Asian countries have adopted strategic plans to develop power generation capacity capable of meeting their medium-term economic development goals."

All Central Asian countries have adopted strategic plans to develop power generation capacity capable of meeting their medium-term economic development goals. At the same time, meeting the production targets specified in those plans is far from assured, given questions surrounding financing, as well as technological and logistical challenges. For example, Kazakhstan awarded contracts to Russian companies to build three thermal power plants and upgrade another one, but the companies' financial woes caused delays, prompting Kazakh authorities to cancel the contracts in 2025 and eventually re-award the jobs.[115] Similarly, Uzbekistan,[116] and Kazakhstan[117] have encountered delays in finalizing agreements with Rosatom to build nuclear power plants.

Kazakh officials express confidence that 2026 will be the last year the country experiences an electricity deficit.[118] Starting in 2027, production is projected to surpass consumption – 134.1 billion kWh versus 132.8 billion kWh. And by 2032, officials say there will be an 18.4 billion kWh annual surplus.[119]

Uzbekistan's energy strategy projects annual electricity production reaching 163 billion kWh in 2040, up from 86.7 billion kWh in 2025.[120] Such production growth would leave roughly 13 billion kWh annually of excess electricity. By 2030, renewables are expected to account for 54% of the country's overall power production.[121]

Kyrgyzstan grappled with a substantial electricity deficit during the winter of 2025-2026. Even so, according to Kyrgyzstan's national energy program that

111 "Kyrgyz Republic," UNDP Climate Promise, accessed April 12, 2026, https://climatepromise.undp.org/what-we-do/where-we-work/kyrgyz-republic.

112 "Кыргызстан представил свой обновлённый национальный климатический план — ОНУВ30" [Kyrgyzstan presented its updated national climate plan — NDC30], *United Nations Kyrgyzstan*, November 25, 2024, https://kyrgyzstan.un.org/ru/303222-кыргызстан-представил-свой-обновлённый-национальный-климатический-план-—-онув30.

113 Arsen Askarov, "Кабель по дну Каспия: ратифицировано соглашение Казахстана с Азербайджаном и Узбекистаном" [Cable along the bottom of the Caspian: Kazakhstan's agreement with Azerbaijan and Uzbekistan ratified], *Kapital.kz*, March 3, 2026, https://kapital.kz/economic/145809/kabel-po-dnu-kaspiya-ratificirovano-soglashenie-kazahstana-s-azerbajdzhanom-i-uzbekistanom.html.

114 "Feasibility study for trans-Caspian power line to be ready in 2026 – report," *Eurasianet*, October 7, 2025, https://eurasianet.org/feasibility-study-for-trans-caspian-power-line-to-be-ready-in-2026-report.

115 "Russian power entities appear plagued by financing troubles in Central Asia," *Eurasianet*, March 13, 2026, https://eurasianet.org/russian-power-entities-appear-plagued-by-financing-troubles-in-central-asia.

116 "Rosatom appears to hit speed bump in Uzbekistan," *Eurasianet*, January 27, 2026, https://eurasianet.org/rosatom-appears-to-hit-speed-bump-in-uzbekistan.

117 "Rosatom may whiff on Kazakh nuclear project due to financing yips," *Eurasianet*, August 1, 2025, https://eurasianet.org/rosatom-may-whiff-on-kazakh-nuclear-project-due-to-financing-yips.

118 Alexey Afonskiy, "Казахстан избавится от энергодефицита через год — обещает Минэнерго" [Kazakhstan will get rid of energy shortages in a year — Ministry of Energy promises], *Orda.kz*, February 16, 2026, https://orda.kz/kazahstan-izbavitsja-ot-jenergodeficita-cherez-god-obeschaet-minjenergo-411837/.

119 "Об утверждении прогнозных балансов электрической энергии и мощности в единой электроэнергетической системе Республики Казахстан на период с 2026 по 2032 годы" [On approval of the forecast balances of electric energy and power in the unified power system of the Republic of Kazakhstan for the period from 2026 to 2032], Ministry of Energy of the Republic of Kazakhstan, January 5, 2026, https://www.kegoc.kz/upload/iblock/ebf/40fc28zsn9os5asep5wv231rq6leyizg.pdf.

120 "Uzbekistan doubles solar and wind power production in 2025," *Tashkent Times*, January 6, 2026, https://tashkenttimes.uz/national/16737-uzbekistan-doubles-solar-and-wind-power-production-in-2025.

121 "Выступление Президента Республики Узбекистан Шавката Мирзиёева на первом саммите "Центральная Азия + Япония"" [Address by the President of the Republic of Uzbekistan, Shavkat Mirziyoyev, at the First "Central Asia + Japan" Summit], Official Website of the President of the Republic of Uzbekistan, December 12, 2025, https://president.uz/ru/lists/view/8812.

The Eco-Technological Waste Incineration and Energy Production Facility in Bishkek, Kyrgyzstan, shown in this December 2025 photo, generates electricity from recycled household waste. (Nazir Aliyev Tayfur / Anadolu via Getty Images)

runs until 2035,[122] officials project electricity surpluses starting in 2027, largely by relying on hydropower at a time when water volume[123] in the region appears to be rapidly dwindling due to climate change and drought. Government plans to develop solar- and wind-power generating capacity are already behind schedule.

Tajikistan's development program for 2026-2030[124] envisages almost 2.7 GW of new hydropower generation capacity. It also plans for upgrades of existing hydropower facilities to generate an additional 695 MW of power, along with the development of solar plants capable of producing 1.5 GW of power. Demand for electricity is expected to reach 25.6 billion kWh by 2030, an increase of 31% over last year's level. Dushanbe also expects to export up to 5 billion kWh of electricity per year.[125] Failing to meet its production targets could leave Tajikistan, like Kyrgyzstan, with persistent shortages over the medium term.

As Turkmenistan exports over 50% of the electricity it currently generates, its plans to add capacity are driven by a desire to develop new export markets.

AI, Crypto, and Electricity

The development of the AI sector is in an embryonic state in Central Asia. Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan have all unveiled concepts to transform their countries into digital hubs, but development plans remain vague and hinge on the potential arrival of foreign investors. Little thought has yet been given, publicly at least, to how the countries will provide enough electricity and water to fulfill their respective AI visions. Plans to add production capacity do not expressly provide estimates for IT, AI, and data center needs.

Kazakh President Kassym-Jomart Tokayev proclaimed 2026 as the "year of digitalization and AI."[126] The government has a $30 billion plan to build a cluster of data centers in the northern Pavlodar region with the help of foreign investment, aiming to attract major global IT companies.[127] The region boasts substantial coal-fired power stations, including the 4 GW Ekibastuz-1. But reliance on coal-fired plants potentially runs up against the country's 2060 carbon neutrality target.

In early 2025, the government also pondered locating cryptocurrency mining centers in the Pavlodar region, but the idea fell through because loosely regulated crypto mining in the country previously led to power shortages.[128] The regulatory framework has been tightened since then and at present, 72 crypto miners are officially authorized to operate in the country.[129]

Uzbekistan also plans to develop up to 20 new data centers.[130] A Saudi firm,

122 "Национальная энергетическая программа КР до 2035 года" [National Energy Program of the Kyrgyz Republic until 2035], Ministry of Energy of the Kyrgyz Republic, April 12, 2024, https://esep.energo.kg/wp-content/uploads/2025/02/Национальная-энергетическая-программа-КР-до-2035-года.pdf.

123 Ayzada Kutuyeva, "К 1 апреля объем воды в Токтогульской ГЭС составит 6,8 миллиарда кубометров" [By April 1, the volume of water in the Toktogul HPP will be 6.8 billion cubic meters], *24.kg*, February 24, 2026, https://24.kg/vlast/363290_k1aprelya_obyem_vodyi_vtoktogulskoy_ges_sostavit_68_milliarda_kubometrov/.

124 "Правительство Таджикистана утвердило Программу развития электроэнергетики на 2026-2030 годы" [Government of Tajikistan approved the Electric Power Development Program for 2026-2030], *Avesta*, November 26, 2025, https://avesta.tj/2025/11/26/pravitelstvo-tadzhikistana-utverdilo-programmu-razvitiya-elektroenergetiki-na-2026-2030-gody/.

125 Pairav Chorshanbiyev, "Властям Таджикистана в ближайшие пять лет нужно $6,5 млрд на развитие энергетики" [Tajikistan's authorities need $6.5 billion for energy development over the next five years], *Asia-Plus*, December 29, 2025, https://asiaplus.news/2025/12/29/vlastyam-tadzhikistana-v-blizhajshie-pyat-let-nuzhno-65-mlrd-na-razvitie-energetiki/.

126 "President proclaims Kazakhstan's year of AI off to good start," *Eurasianet*, January 9, 2026, https://eurasianet.org/president-proclaims-kazakhstans-year-of-ai-off-to-good-start.

127 Azamatkhan Akhmadov, "В Казахстане начинают строить 'Долину дата-центров' за $30 млрд" [Kazakhstan begins construction of a $30 billion 'Data Center Valley'], *Tengrinews.kz*, January 30, 2026, https://tengrinews.kz/kazakhstan_news/kazahstane-nachinayut-stroit-dolinu-data-tsentrov-30-591575/.

128 Joanna Lillis, "Kazakhstan slaps crypto miners with higher energy bills," *Eurasianet*, January 12, 2023, https://eurasianet.org/kazakhstan-slaps-crypto-miners-with-higher-energy-bills.

129 "Список лицензированных цифровых майнеров на 16 марта 2026 года" [List of licensed digital miners as of March 16, 2026], Ministry of Artificial Intelligence and Digital Development of the Republic of Kazakhstan, accessed April 12, 2026, https://www.gov.kz/memleket/entities/maidd/documents/details/985607?lang=ru.

130 "Узбекистан строит "суверенное облако": что известно о масштабных планах развития ЦОДов" [Uzbekistan is building a 'sovereign cloud': what is known about large-scale development plans for data centers], *Frank.uz*, September 24, 2025, https://frank.uz/news/uzbekistan-stroit-suverennoe-oblako-chto-izvestno-o-masshtabnyh-planah-razvitiya-czodov/.

DataVolt, was slated to build the first AI-powered data center at Tashkent's IT Park, with a completion date set for late 2026.[131] The country issued its first license to a crypto miner in early 2026.[132]

Kyrgyzstan and Tajikistan have entered the race to develop data centers. In February 2026, Kyrgyzstan adopted regulations for their operations,[133] while Tajikistan signed an agreement in 2025 with India's Yotta to build a data center.[134]

Low Water and Aging Infrastructure

As they strive to meet electricity production targets, Central Asian states not only have to add generating capacity but also must confront environmental and infrastructure challenges that threaten to impede power generation and distribution.

The melting of Central Asian glaciers has intensified low-water cycles in mountainous regions.[135] During the winter of 2025-2026, low water in rivers resulted in critically low levels in the region's reservoirs, leading to a crisis in the water-energy nexus. The crisis hit upstream states particularly hard.[136] Low reservoir levels also imperiled the 2026 agricultural growing season.[137]

In late 2025, Kyrgyzstan and Tajikistan, which depend heavily on hydropower generation, introduced emergency electricity conservation measures in anticipation of wintertime shortages. Tajik authorities announced they would switch off power to consumers when they hit a limit of 5 kWh per day. Meanwhile, businesses and public-service facilities, such as schools and local government offices, were required to keep lights turned off from 6 p.m. until the start of the next school/business day.[138] Kyrgyzstan established similar rules.[139]

Beyond the issue of water availability, a significant challenge is replacing and upgrading antiquated infrastructure. Key existing hydropower plants, such as the Nurek facility in Tajikistan, date to the 1970s and are in need of modernization.[140]

The problems associated with aging infrastructure are regionwide. For example, outdated transmission equipment results in the loss of almost 18% of the electricity moving on Uzbekistan's grid, more than twice the average in developed economies. According to local media reports, over 33,000 transformers and 122,000 kilometers of transmission lines needed upgrade or replacement as of early 2026.[141]

131 "DataVolt to Build Central Asia's First AI-Powered Data Center in Uzbekistan," *Mosaic Financial*, October 27, 2025, https://mosaic-financial.uz/news/datavolt_to_build_central_asias_first_ai_powered_data_center_in_uzbekistan.html.

132 "Uzbekistan issues the first cryptocurrency mining license," *Binance News*, February 21, 2026, https://www.binance.com/en/square/post/02-22-2026-294219830208562.

133 Turdubek Aigyrov, "Кабмин утвердил единые требования к госдата-центрам и облачным вычислениям" [Cabinet of Ministers approved unified requirements for state data centers and cloud computing], *24.kg*, January 13, 2026, https://24.kg/tehnoblog/357613_kabmin_utverdil_edinyie_trebovaniya_kgosdata-tsentram_ioblachnyim_vyichisleniyam/.

134 "В Дарвазе построят первый "зелёный" дата-центр на гидроэнергии" [First green data center powered by hydropower to be built in Darvoz], *Khovar*, October 28, 2025, https://khovar.tj/rus/2025/10/v-darvaze-postroyat-pervyj-zelyonyj-data-tsentr-na-gidroenergii/.

135 Amir Ismailov, "Central Asia, a region of high priority," *The UNESCO Courier*, February 28, 2025, https://courier.unesco.org/en/articles/central-asia-region-high-priority.

136 Alexander Thompson, "Low reservoir water levels mean tough winter for hydro-dependent Kyrgyzstan," *Eurasianet*, October 3, 2025, https://eurasianet.org/low-reservoir-water-levels-mean-tough-winter-for-hydro-dependent-kyrgyzstan.

137 Bruce Pannier, "Central Asia's Water Crisis Is Reaching Its Breaking Point," Yorktown Institute, January 22, 2026, https://yorktowninstitute.org/central-asias-water-crisis-is-reaching-its-breaking-point/.

138 "В Таджикистане ввели новые ограничения на подачу электроэнергии" [New restrictions on electricity supply introduced in Tajikistan], *Asia-Plus*, November 29, 2025, https://asiaplus.news/2025/11/29/v-tadzhikistane-vveli-novye-ogranicheniya-na-podachu-elektroenergii/.

139 Gulmira Abdrakhmanova, "Кыргызстан вводит режим ЧС в энергетической отрасли на три года: причины и последствия" [Kyrgyzstan introduces emergency state in the energy sector for three years: causes and consequences], *Kazinform*, August 1, 2023, https://www.inform.kz/ru/kyrgyzstan-vvodit-rezhim-chs-v-energeticheskoy-otrasli-na-tri-goda-prichiny-i-posledstviya_a4095879.

140 "Энергетический фундамент Центральной Азии: как модернизация Нурекской ГЭС усилит экономику региона" [Energy foundation of Central Asia: how the modernization of the Nurek HPP will strengthen the regional economy], *Economist.kg*, March 30, 2026, https://economist.kg/enierghietika/2026/03/30/enierghietichieskii-fundamient-tsientralnoi-azii-kak-modiernizatsiia-nuriekskoi-ges-usilit-ekonomiku-rieghiona/.

141 "Uzbekistan advances energy transition and power modernization," *UzDaily.uz*, March 20, 2026, https://www.uzdaily.uz/en/uzbekistan-advances-energy-transition-and-power-modernization/.

Renewed Cooperation

In recent years, Central Asian states have shown increasing willingness to cooperate on the production and distribution of electricity, providing some momentum for the expansion of a CAPS-like regional system. Cooperation, however, has proven far from systematic to date.

Tajikistan's southwestern regions were reconnected to the power grids of southern Uzbekistan in 2024, and northern Tajik regions were expected to be linked up in the first half of 2026.[142] To address a brewing crisis in the water-energy nexus, specifically aiming to alleviate pressure created by the current low-water cycle, Kazakhstan, Uzbekistan, and Kyrgyzstan signed trilateral agreements under which Astana and Tashkent supply Bishkek with electricity in winter; in return, Kyrgyzstan has agreed to accumulate and release water in spring and summer for the growing season. The latest agreement was signed in November 2025.[143]

The involvement of Kazakhstan and Uzbekistan in the construction of the Kambarata-1 hydropower project in Kyrgyzstan raises the chances it will be completed.[144] If it is finished to current specifications, it stands to improve connectivity, baseload reliability, and the use of water resources accumulated in reservoirs. The plant would work in conjunction with the Toktogul reservoir to maximize the use of water resources. Kambarata-1 would use water for power generation in winter, and the water released would be accumulated in the downriver Toktogul reservoir without significant loss.[145] The reservoir would then release water for additional power generation and irrigation during the growing season.

Should Turkmenistan fully reintegrate into the Central Asian power grid system, a big if, this would ease risks of power shortages even during low-water periods. Turkmenistan has a long tradition of isolationism and has not been part of the regional grid for over two decades. At the same time, Ashgabat recently has signaled greater interest in participating in regional trade development. Rejoining CAPS would enable the country to expand electricity generation and exports to neighboring states. Even if Turkmenistan rejoins the unified grid, however, antiquated infrastructure,[146] including outdated power lines linking countries, remains a significant barrier.

Kazakhstan is working on its own to clear the way for the potential reestablishment of a unified Central Asian grid. Officials are working to unify the country's electricity supply system, linking western areas of the country to the rest of the national grid.[147] The project is expected to require 6,600 kilometers of new transmission lines and extensive reconstruction of existing infrastructure over the next decade.[148]

142 Madibek Janibekov, "Таджикистан присоединится к Объединенной энергосистеме Центральной Азии в 2026 году" [Tajikistan will join the Integrated Power System of Central Asia in 2026], *Kazinform*, November 21, 2025, https://www.inform.kz/ru/tadzhikistan-prisoedinitsya-k-obedinennoy-energosisteme-tsentralnoy-azii-v-2026-godu-c29121.

143 "Три страны Центральной Азии договорились об обмене электроэнергией и водой" [Three Central Asian countries have agreed to exchange electricity and water], *Forbes Kazakhstan*, November 23, 2025, https://forbes.kz/articles/tri-strany-tsentralnoy-azii-dogovorilis-ob-obmene-elektroenergiey-i-vodoy-25956b.

144 Gulmira Abdrakhmanova, "Как идет реализация проекта строительства Камбаратинской ГЭС-1 в Кыргызстане" [How the Kambarata HPP-1 construction project is progressing in Kyrgyzstan], *Kazinform*, January 23, 2026, https://www.inform.kz/ru/kak-idet-realizatsiya-proekta-stroitelstva-kambaratinskoy-ges-1-v-kirgizstane-48875f.

145 Kirill Stepanyuk, "'Камбарата-1" превзойдет по мощности Токтогульскую ГЭС и станет локомотивом экономики" ['Kambarata-1' will surpass the Toktogul HPP in capacity and become a locomotive for the economy], *Kabar*, January 10, 2023, https://ru.archive.kabar.kg/news/kambarata-1-prevzoidet-po-moshchnosti-toktogul-skuiu-ges-i-stanet-lokomotivom-ekonomiki/.

146 "Износ энергосетей в Центральной Азии достигает 80%" [Power grid deterioration in Central Asia reaches 80%], *Akchabar.kg*, March 19, 2026, https://www.akchabar.kg/news/iznos-energosetej-v-tsentralnoj-azii-dostigaet-80-fiyupzselilvnagz.

147 "Запад Казахстана подключат к Единой энергосистеме к 2027 году" [Western Kazakhstan will be connected to the Unified Energy System by 2027], *KazTAG*, March 3, 2026, https://kaztag.kz/ru/news/zapad-kazakhstana-podklyuchat-k-edinoy-energosisteme-k-2027-godu.

148 Nagima Abuova, "Kazakhstan to Link Western Regions to National Grid in Major Network Upgrade by 2027," *The Astana Times*, March 7, 2026, https://astanatimes.com/2026/03/kazakhstan-to-link-western-regions-to-national-grid-in-major-network-upgrade-by-2027/.

RECOMMENDATIONS

1 EXPAND A CENTRAL ASIAN POWER SYSTEM (CAPS) CONNECTING THE GRIDS OF ALL FIVE CENTRAL ASIAN STATES

2 EMPOWER AN INTERSTATE POWER COMMISSION OR EXECUTIVE BODY COMPRISING REPRESENTATIVES OF ALL FIVE CENTRAL ASIAN STATES

3 EXPLORE JOINT PROJECTS TO DEVELOP RENEWABLES, MAXIMIZE AVAILABLE FINANCIAL AND NATURAL RESOURCES, AND PROMOTE EFFICIENCIES IN THE GENERATION AND DISTRIBUTION OF ELECTRICITY

4 REDUCE HYDROPOWER'S SHARE OF ELECTRICITY PRODUCTION AND IMPLEMENT MEASURES TO REDUCE RESERVOIR EVAPORATION

5 BRING TARIFF RATES FOR ELECTRICITY USAGE BY BOTH BUSINESSES AND HOUSEHOLDS INTO CLOSER ALIGNMENT WITH THE ACTUAL COST OF POWER PRODUCTION.

For Central Asian States

The expansion of a unified, regional grid would go a long way toward enabling dependable supplies of electricity needed to meet the economic growth agendas of respective states. Meeting those growth goals, in turn, would encourage the expansion of trade and a greater degree of regional prosperity. A well-functioning CAPS system can additionally reinforce mutual trust among states and create critical momentum for regional cooperation in other spheres. Ultimately, CAPS could become a cornerstone of a regional trade bloc, a Central Asian economic union.

The commission would be empowered to make decisions about distributing electricity in an equitable manner, balancing the competing interests of upstream and downstream states within the context of the water-energy nexus. A central role of the commission would be to manage disputes among participating states in matters concerning power generation and distribution. The power commission responsibilities could potentially be merged with a regional water-resources-management body to more efficiently manage the region's water-energy nexus. Critically, any such regional authority would need to be imbued with powers to enforce its decisions.

Kyrgyzstan, Kazakhstan, and Uzbekistan have already demonstrated an interest in building the Kambarata-1 hydropower station in a way that ensures water used for power generation can be recaptured downriver for later use by downstream states for irrigation. Such a cooperative model can also be applied to other renewable power generation. Kazakhstan and Uzbekistan have more financial resources to build solar and wind power stations in their countries, but labor, installation and maintenance costs tend to be lower in Kyrgyzstan and Tajikistan. As a result, the same amount of investment could lead to higher production capacity with a joint approach. The distribution of power generated under collaborative agreements could be established by treaty or binding agreement, with operations overseen by a regional power commission.

Central Asian water reserves are declining at a rapid rate. Regional states can join in a unified initiative to conserve water used to generate electricity and redirect resources for household use, irrigation, and economic development. One way to pursue this is to explore the feasibility of installing floating solar panels (as practiced in China) over reservoirs. Such use could reduce evaporation and reduce demand for hydropower.

Rates paid by consumers across Central Asia are heavily subsidized by regional governments. This enables overconsumption and wastage. Central Asian governments should develop plans to gradually reduce subsidization so that the cost of power production is better reflected by the rates corporations and individuals pay for electricity.[149]

149 Charles Cormier, "Powering the energy future of Europe and Central Asia," *World Bank Blogs*, July 01, 2025, https://blogs.worldbank.org/en/energy/powering-the-energy-future-of-europe-and-central-asia-.

6 **DEVELOP PUBLIC AWARENESS CAMPAIGNS AIMED AT CONSERVING ELECTRICITY**

Governments should encourage citizens to reduce their electricity usage with public service messaging aimed at combating wastage, as well as raising awareness among citizens about the potentially harmful consequences connected with the deterioration of the water-energy nexus.

7 **EXPAND SMALL-SCALE RENEWABLE INITIATIVES**

An Uzbek-modeled program to encourage the installation of rooftop solar panels to cut withdrawals of power from the grid at daytime (sunshine) can be expanded across Central Asia. Solar panels on only 141,000 homes and buildings in Uzbekistan produced nearly 3% of the country's total power and saved nearly 600 million cubic meters of gas in 2025, cutting greenhouse gas emissions by about 500,000 metric tons. A regionwide program could save nearly 3 billion cubic meters of gas and reduce greenhouse emissions by nearly 2.5 million metric tons. A similar program to install Turkish-modeled rooftop water-heating systems could reduce fuel use for heating water.

For the International Community

8 **THE UNITED STATES, EUROPEAN UNION, UNITED KINGDOM, MULTILATERAL DEVELOPMENT BANKS, AND OTHER INTERESTED PARTIES CAN PROVIDE ASSISTANCE TO REFURBISH ANTIQUATED INFRASTRUCTURE, DIGITALIZE DISTRIBUTION SYSTEMS AND FINANCE NEW PROJECTS THAT HELP EXPAND CAPS**

Donor states and institutions can expand assistance efforts in a variety of ways. For example, supporting the deployment of shade balls in reservoirs. They can also help Central Asian countries improve power connectivity by installing high-voltage (500 kV and higher) power lines to transmit power quickly and efficiently.

9 **ASSIST CENTRAL ASIAN STATES IN THE DEVELOPMENT OF STRATEGIES FOR IT/AI/ DATA CENTER DEVELOPMENT THAT KEEP DEMAND FOR ELECTRICITY AND WATER TO A MINIMUM, ENSURING ADEQUATE SUPPLIES FOR HOUSEHOLD NEEDS**

As Central Asian states develop their respective power-intensive AI/data center strategies, the international community, including corporate players, can provide assistance in promoting sustainable development within the context of the region's water-energy nexus. Governments can enable the use of new technologies that reduce demand for water for data center operations.[150] Adiabatic cooling systems, for example, are shown to reduce water usage and electricity demand in the operations of data centers.[151]

10 **THE UNITED STATES, EU, AND U.K., ALONG WITH MULTILATERAL DEVELOPMENT BANKS, SHOULD ENCOURAGE THE MODIFICATION OF CENTRAL ASIAN STATES' NUCLEAR STRATEGIES TO BETTER MEET NEARER-TERM NEEDS**

Kazakhstan, Kyrgyzstan, and Uzbekistan all plan to add nuclear energy to their respective power generation mixes. But existing plans indicate that nuclear energy will not come online until the mid-2030s at the earliest due to an emphasis on the construction of large-scale reactors by Russia and China. The United States is a leader in the area of small modular reactor (SMR) technology. Such SMRs can be built faster and at a more efficient cost than larger ones. SMRs are generally seen as safer to operate and can be deployed in areas unsuitable for large reactors and thus are better suited for operation in Central Asia and would be able to meet the region's growing near- and medium-term power needs. SMRs, for example, could be deployed near AI clusters to meet

150 Mara Pusic, "AI's Cooling Problem: How Data Centers Are Transforming Water Use," *Vibrant Environment Blog* , Environmental Law Institute, October 23, 2025, https://www.eli.org/vibrant-environment-blog/ais-cooling-problem-how-data-centers-are-transforming-water-use.

151 Alissa, H., Nick, T., Raniwala, A. *et al.* Using life cycle assessment to drive innovation for sustainable cool clouds. *Nature* 641, 331–338 (2025). https://doi.org/10.1038/s41586-025-08832-3.

intensive power needs without stressing transmission networks. Kazakhstan is currently working with the United States on the feasibility of deploying SMRs in the country.[152] The United States should strive to accelerate this process and engage other regional states in exploring the possibilities of SMRs.

AUTHOR

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152 "The U.S. and Kazakhstan Expand Civil Nuclear Energy Partnership with Launch of Small Modular Reactor Feasibility Study, Regional Training Hub, and Holtec Classroom Simulator for Workforce Development under the FIRST Program," U.S. Embassy and Consulate in Kazakhstan, December 22, 2025, https://kz.usembassy.gov/the-u-s-and-kazakhstan-expand-civil-nuclear-energy-partnership/.

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