Load shifting kyrgyzstan

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Kyrgyzstan"s high dependence on hydropower exposes it to the risk of electricity shortages during periods of water scarcity. These risks are magnified by the growing fragility of the power system, which is in urgent need of generation and network investment to improve its operational reliability and to ensure that it has sufficient capacity to meet demand over time. The challenge is further amplified by rapidly growing electricity demand, fuelled by unsustainably low regulated electricity prices, which threatens to quickly outstrip domestic production capacity. Maintaining access to reliable electricity services is likely to become increasingly problematic in these circumstances, especially during periods of water shortage.

Kyrgyzstan"s power sector is relatively small with total generating capacity of around 3.9gigawatts, producing around 15.4terawatt-hours (TWh) in 2020. Hydroelectric plants dominate the sector, representing 78% of total generating capacity. The remaining generating capacity is largely provided by thermal CHP plants serving the main population centres. The sector"s heavy dependence on hydroelectric plants is reflected in domestic power production levels, with hydropower typically representing around 90% of Kyrgyzstan"s annual power output during normal hydrological periods. The figure below shows current generating capacity and recent trends in power production in Kyrgyzstan.

High dependence on hydropower raises concerns about maintaining the reliability of electricity supply and power system resilience during periods of water shortage. For instance, the power production trends presented in the figure below reflect the impact of water shortages on hydropower production during the last major water scarcity event in 2015 and 2016. During this period, average hydropower production fell to around 11300gigawatt-hours (GWh) per year, representing a fall of nearly 1800GWh (13.6%) compared with the ten-year average, with most of the production loss experienced during the winter months of 2015 and 2016.1

As a result, Kyrgyzstan experienced significant power shortfalls and rolling blackouts during the winter peak heating seasons in 2015 and 2016. Power shortages also led to substantial increases in relatively expensive power imports and increasing power production from Bishkek"s CHP plant during the winter period for the duration of this event, placing additional financial pressure on an already cash-strapped sector.2

Reliability and resilience risks are magnified by the age and relative fragility of Kyrgyzstan"s electricity infrastructure, as shown in the figure below. The vast majority of the hydroelectric fleet is well over 30years old, with a weighted average age of over 40years and nearly 80% of its capital depreciated. Network infrastructure is also relatively old, with over one-third of all transmission lines depreciated and nearly 70% of the substations depreciated. Distribution assets are in similar condition, with depreciation of distribution lines and substations averaging around 60% and 80% respectively.3

High levels of depreciation are typically reflected in higher operating costs, higher rates of unplanned outages and higher network losses. The government reported that over 4600supply disruptions were recorded in the distribution system in 2019.4 The World Bank also notes evidence of unplanned infrastructure outages resulting from operating old and under-maintained assets, which served to exacerbate power system security challenges arising from water shortages experienced during the 2015 and 2016 winter peak seasons.5 And the International Monetary Fund recently observed that old and unreliable power infrastructure had added considerable cost for private-sector power consumers in Kyrgyzstan, with economic losses representing around 4% of annual sales.6

The combination of hydro dependence and ageing electricity infrastructure greatly increases Kyrgyzstan"s exposure to potential power supply shortages and power system failures, especially when the power system is under additional stress during periods of water scarcity.

These risks are compounded by rapidly increasing demand for electricity, especially in the residential sector, which is a key driver of growing power demand during the peak winter season. The figure below shows that in 2020, the residential sector dominated power use, accounting for 76% of total final electricity consumption. The industrial sector was the next-largest electricity consumer in 2019, accounting for around 12% of total final electricity consumption. In 2020, around two-thirds of annual electricity consumption occurred during the winter period for all consumer classes except the agricultural sector, reflecting growing use of electricity for space heating, especially among residential consumers.10

Total final consumption of electricity grew by 72% between 2010 and 2020, to around 12260GWh. The figure below confirms that rapid growth in residential electricity consumption was the primary contributor to growing power consumption over the period. Residential electricity consumption grew by nearly 170% between 2010 and 2020, to 9320GWh. By contrast, trends in electricity demand among the other consuming sectors were variable and subdued, exhibiting little or no growth over the period.

These trends have implications for pursuing power sector reliability and resilience. Residential power consumption is the key driver of growing power demand during the peak winter season, which is also the most likely period for water shortages to jeopardise the reliability of hydropower production. This suggests some potential priorities for power system security policies, in particular, for demand-side management programmes seeking to reduce power use during future power shortages.

However, electricity prices for the majority of consumption are currently set at levels well below the cost of production, as shown in the figure below. In particular, residential tariffs for the "up to 700kWh" consumption block have remained unchanged since 2015, despite several policy announcements incorporating tariff increases for this consumption block over recent years.12 The International Monetary Fund has concluded that the current subsidy regime is highly inefficient and poorly targeted, with nearly half of the electricity, district heating and hot water subsidies going to the richest 30% of households, while the bottom 30% receive barely 20% of the subsidies.13

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