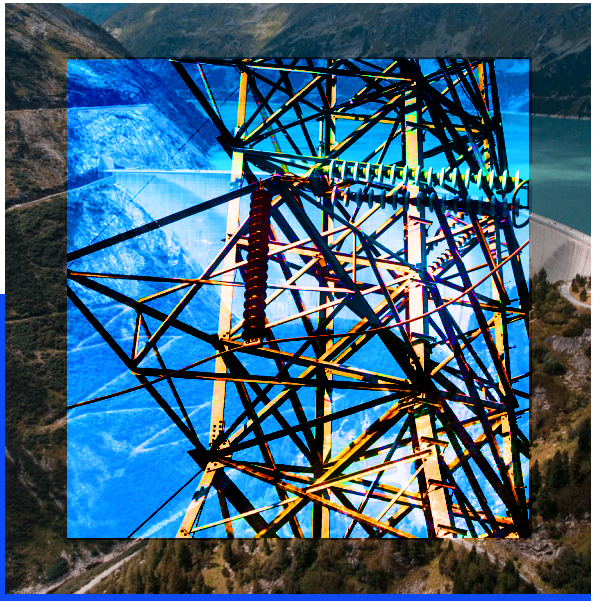
Co-Funded by the European Union

Strengthening Power System Security in Kyrgyzstan: A Roadmap



Explore how Kyrgyzstan could implement a range of policies to strengthen power system security to increase reliability and meet current resiliency challenges.

Experience the full roadmap at iea.org/programmes/eu4energy

Power System Security Context

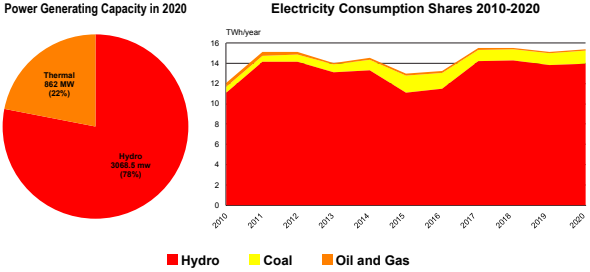
Defining Power System Security

Power system security refers to the capability of a power system using its **existing resources** to maintain **reliable power supplies** in the face of **real-time unexpected shocks and sudden disruption**, such as the unanticipated loss of key generation or network components, loss of fuel, or rapid and unanticipated changes in demand. Maintaining power system security is a critical precondition for delivering **reliable and resilient power services**.

Key Trends and Challenges

Kyrgyzstan's **power sector is relatively** small with total generating capacity of around 3.9 GW, producing around 15.4 TWh in 2020. **Hydroelectric plants** dominate the sector, representing **78% of total generating capacity**. This is reflected in domestic power production levels, with hydropower typically representing around **90% of Kyrgyzstan's annual power output.**

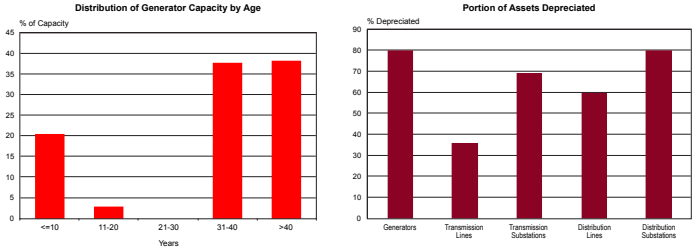
Power Generating Capacity and Production Trends, Kyrgyzstan, 2010-2020



Notes: MW=megawatts. Thermal production shares for 2020 are estimates.
Sources: IEA (2022), World Energy Statistics and Balances (database),https://www.iea.org/data-and-statistics; and State Committee for Industry, Energy and Subsoil Use (2020), Kyrgyzstan's Energy Sector 2020.

Kyrgyzstan's electricity infrastructure is aging and **increasingly fragile**. The vast majority of the hydroelectric fleet is well over 30 years old, with nearly **80% of its capital depreciated**. Network infrastructure is also relatively old, with most of its capital substantially depreciated.

Power Sector Infrastructure Status, Kyrgyzstan, 2020



Notes: Generation depreciation figures apply to Joint Stock Company (JSC) Power Plants generators only. Distribution depreciation figures represent an average across the four distribution companies.
Source: Adapted from State Committee for Industry, Energy and Subsoil Use (2020), Kyrgyzstan's Energy Sector 2020.

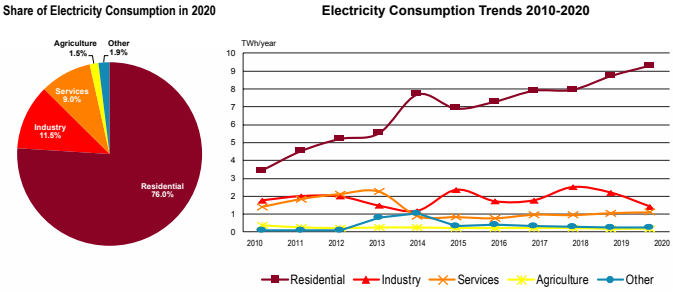
The combination of hydro dependence and aging electricity infrastructure exposes Kyrgyzstan to potential power supply shortages and power system failures, especially when the power system is under additional stress during periods of water scarcity.

The Power Security Challenge

Energy Demand

The power security challenge is further magnified by **rapidly growing electricity demand**. The residential sector dominates power use, representing around **76% of total final electricity consumption** in 2020, with around two-thirds of annual electricity consumption occurring during the winter period reflecting growing use of electricity for space heating.

Electricity Consumption Shares and Trends by Customer Class, Kyrgyzstan, 2010-2020



Notes: Other category includes energy sector, transport and unspecified consumption.
Source: IEA (2022), World Energy Statistics and Balances (database).

Rapid growth in residential electricity consumption over the last decade has been driven by **unsustainably low regulated electricity prices**, with demand now threatening to outstrip domestic production capacity. Maintaining access to reliable electricity services is likely to become increasingly problematic, especially during periods of water shortage.

Opportunities

Policy responses to date have focused on addressing the **longer-term investment dimensions** of this challenge, while relatively little attention has been given to addressing the more **immediate operational reliability challenges** facing the Kyrgyz power system.

Opportunities exist to implement a range of policies that could help to **strengthen power system security in the shorter term**, especially during periods of water shortage, when operational reliability and resilience is likely to be under greatest stress.

Roadmap Goal and Priorities

The proposed roadmap provides a comprehensive and integrated approach to help strengthen power system security in a **timely, efficient**, and **cost-effective** manner. The key goal of the roadmap is to **improve power sector reliability and resilience** in Kyrgyzstan in the short-term by quickly **strengthening power system security**, especially during periods of water scarcity.

This outcome will be delivered by deploying an interrelated set of internationally proven and effective policy measures over the next decade to achieve three strategic priorities:

1

Improve power system operation and management, especially in response to sustained hydrological events.

2

Broaden and deepen supply-side capability to respond to sustained hydrological events.

3

Develop complementary demand-side capability that can be deployed quickly and effectively during sustained hydrological events.

Key Measures

Improving Power System Operation and Management

Key measures include upgrading or developing:

- Power system monitoring, analysis, and real-time management tools and capabilities;
- System operating practices;
- Coordination and communication;
- Training and capacity building; and
- An integrated emergency management plan for responding to sustained water shortages.

Supply-side Measures

Supply-side measures represent the **backbone of the roadmap**, providing the **primary response** and **main resources** for managing sustained power system security events.

Key measures include developing and implementing:

- A dedicated contingency reserve that provides sufficient back-up generation capacity to cover credible hydropower deficits resulting from infrastructure outages and seasonal water shortages;
- Scenario-based methodology to support power system security planning and managing contingency reserve procurement; and
- More robust and reliable regional power system security arrangements over the longer-term.

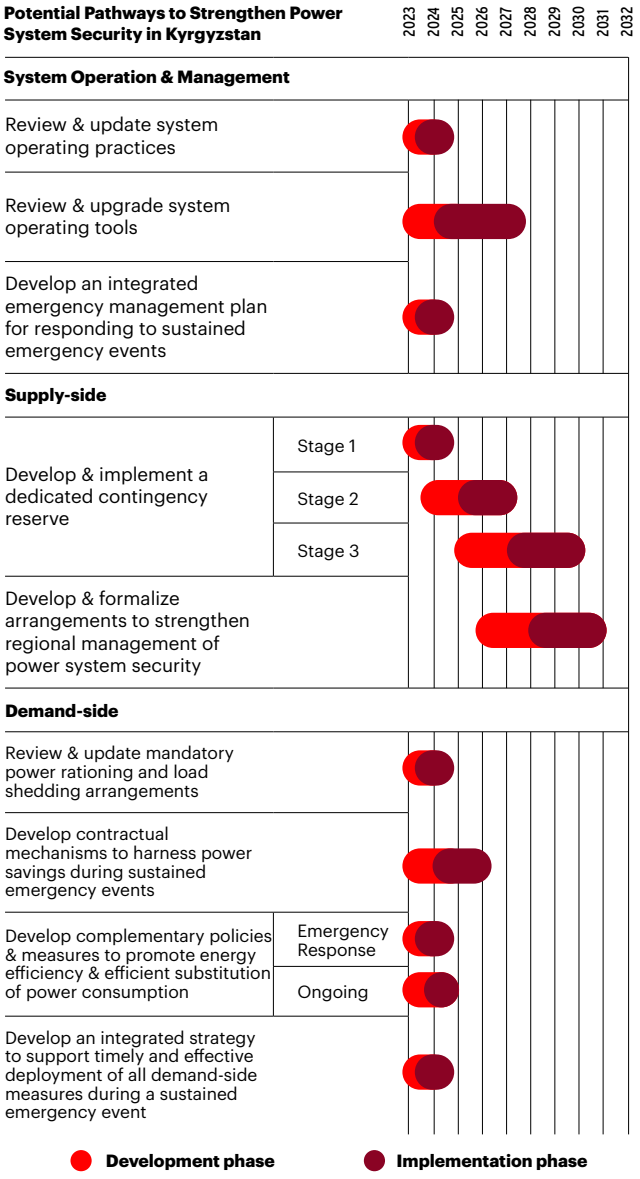
Demand-side Measures

Targeted demand-side measures can **complement and reinforce traditional supply-side** responses during sustained **water shortage events.**

Key measures include developing and refining:

- Emergency power rationing arrangements;
- Strategies to harness voluntary power savings during water shortage events;
- Contractual mechanisms to harness power savings from larger power users;
- Energy efficiency and power substitution measures to deliver substantial power savings over the longer-term; and
- An integrated strategy for deploying demand-side measures during sustained water shortages.

Attaining the Vision



An extended set of policy recommendations is included in the full roadmap

Co-Funded by the European Union

This publication has been produced with the financial assistance of the European Union and is part of the EU4Energy programme. This publication reflects the views of the International Energy Agency (IEA) Secretariat but does not necessarily reflect those of individual IEA member countries or the European Union. The IEA makes no representation or warranty, express or implied, in respect to the publication's contents (including its completeness or accuracy) and shall not be responsible for any use of, or reliance on, the publication. EU4Energy is a collaboration between the IEA, the European Union, Focus Countries and other implementing parties, designed to support the aspirations of Focus Countries to implement sustainable energy policies and foster co-operative energy sector development at the regional level.