

ENERGY WITHOUT BORDERS

The Architecture of Power Connectivity in Central Asia

KEY TAKEAWAYS

ANALYTICAL REPORT '26

POTENTIAL IMPACT OF A DEVELOPED ARCHITECTURE



Up to **640**
USD million/year
gross effect



Up to **120**
USD million/year
net effect



2.8–4.5
billion kWh/year
lower RES curtailment

4 BENEFIT CHANNELS

Trade arbitrage

Shared reserves

Less RES curtailment

Lower emergency costs

CHALLENGES

Why existing interconnection is not fully used



GRID AT ITS LIMIT

102–123%

overloads on key lines at the 2024 peak

GRID



CAPACITY ≠ AVAILABILITY

6.6 GW

unavailable/restricted + 0.85 GW under repair

AVAILABILITY



RES OUTPACE THE SYSTEM

3.5 billion kWh

RE curtailment in Uzbekistan in 2028

FLEXIBILITY



POORLY CONTROLLABLE GRID

Outages 2022–2026

cascading trips ·
manual coordination · conservative limits

CONTROLLABILITY

ROOT CAUSES

Five structural constraints explain the four system-level challenges



GRID
BOTTLENECKS

- Both within countries and at interfaces
- Physical link ≠ available transfer capacity



GENERATION
AVAILABILITY

- 6.6 GW was unavailable at the 2024 peak for various reasons



FLEXIBILITY
& RESERVES

- Limited maneuverability of existing generation
- Shortage of fast-acting reserves and storage
- Limited joint use of reserves



OBSERVABILITY
& AUTOMATION

- Incomplete picture of grid state
- Fragmented data and models
- Manual coordination



INSTITUTIONS
& RULES

- Differing rules and areas of responsibility
- Immature balancing and ancillary services mechanisms
- Allocation of benefits and costs

SOLUTIONS

Three dimensions of integration



PHYSICAL

- Strengthening internal corridors and cross-border interfaces
- Development of BESS and flexible capacity
- Substations, transformers + reactive power compensation



TECHNOLOGICAL /
DIGITAL

- Unified digital loop: SCADA/EMS · AGC · WAMS/WACS · AMI · verified models
- Secure data exchange + settlement infrastructure
- Automatic control + emergency control
- RES and load forecasting + ATC/NTC calculation



INSTITUTIONAL

- Allocation of powers and functions among system operators, national regulators, CDC and market participants
- Launch of pilot markets: day-ahead, balancing, ancillary services
- Hydro-flexibility payment mechanism + allocation of benefits and costs

National dispatch control is retained; regional functions develop as integration matures.

PHYSICAL CONNECTIVITY + CONTROLLABILITY = REGIONAL SYSTEM EFFECT



Eurasian
Development Bank

Full version of
the analytical
report

