

The Impact of Power Outages on Network Performance & Availability



ZICTA

A Connected and Inclusive Digital Zambia

How energy dependency is reshaping QoS in Sub-Saharan Africa

May 2026

CONTEXT: ZAMBIA'S HYDRO-DEPENDENT GRID

Over 80% of electricity comes from hydro—making telecoms highly vulnerable to climate shocks.

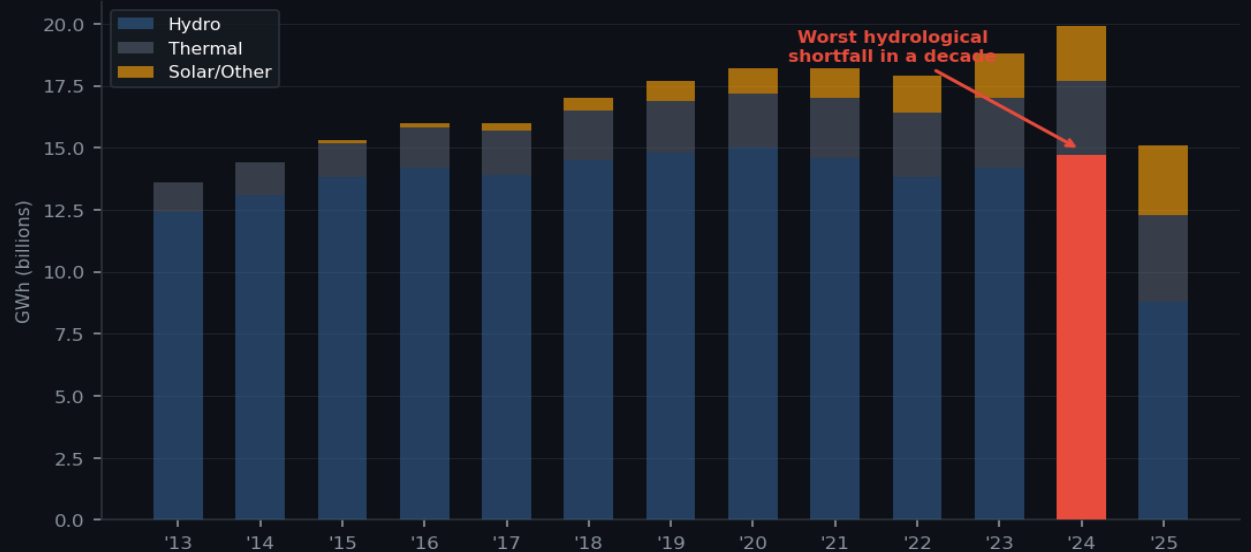
80%+

Hydro generation share
(average 2013–2023)

-37%

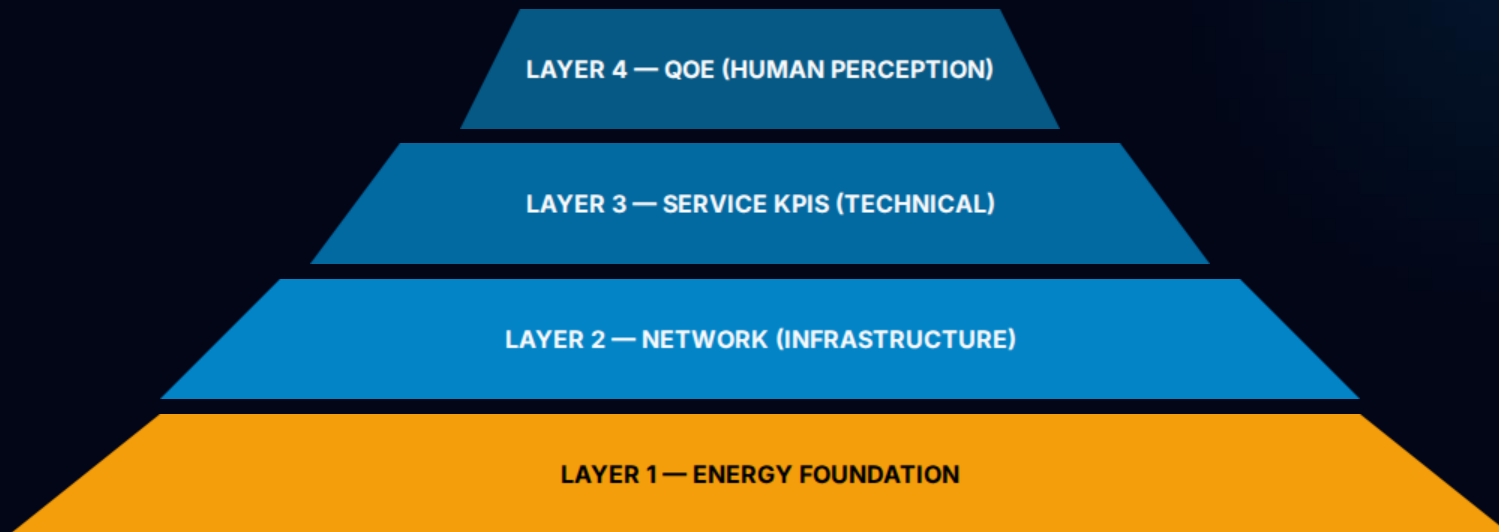
Hydro generation decline
in 2024 drought year

NATIONAL GENERATION MIX 2013-2025



Zambia's hydro-dependent grid left the telecoms sector uniquely exposed to the 2023–2024 ENSO drought event

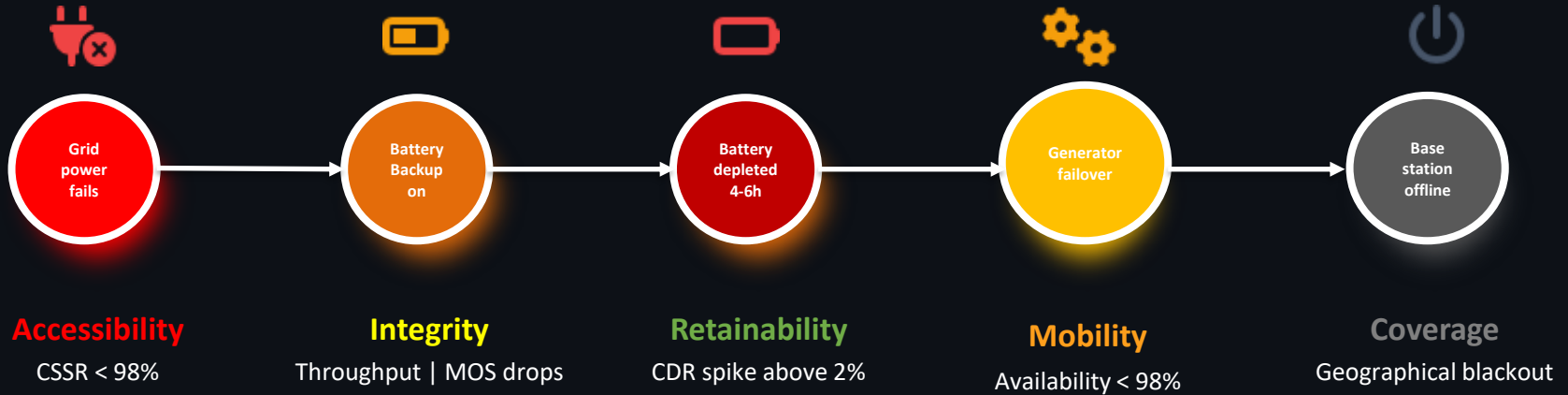
THE 4-LAYER ARCHITECTURE



"Energy is the foundational layer. Without reliable energy, every performance metric above it collapses."

HOW POWER STRESS PROPAGATES

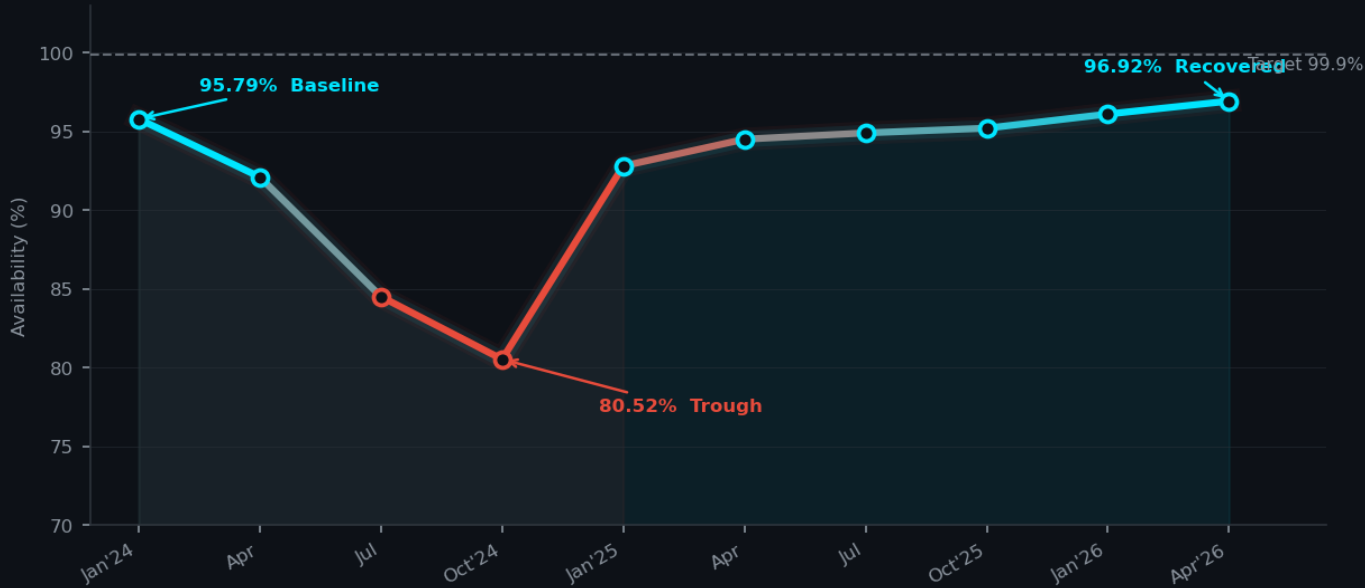
A sustained power shortfall triggers a rapid, cascading sequence of failures across the network.



LTE NETWORK AVAILABILITY (2024–2026)

Backup systems exceeded design limits — availability collapsed system-wide.

LTE NETWORK AVAILABILITY 2024–2026



95.79%

Jan 2024 Baseline

80.52%

Oct 2024 Trough

96.92%

Apr 2026 Recovery

NETWORK RESILIENCE — INVESTMENT DETERMINED OUTCOMES

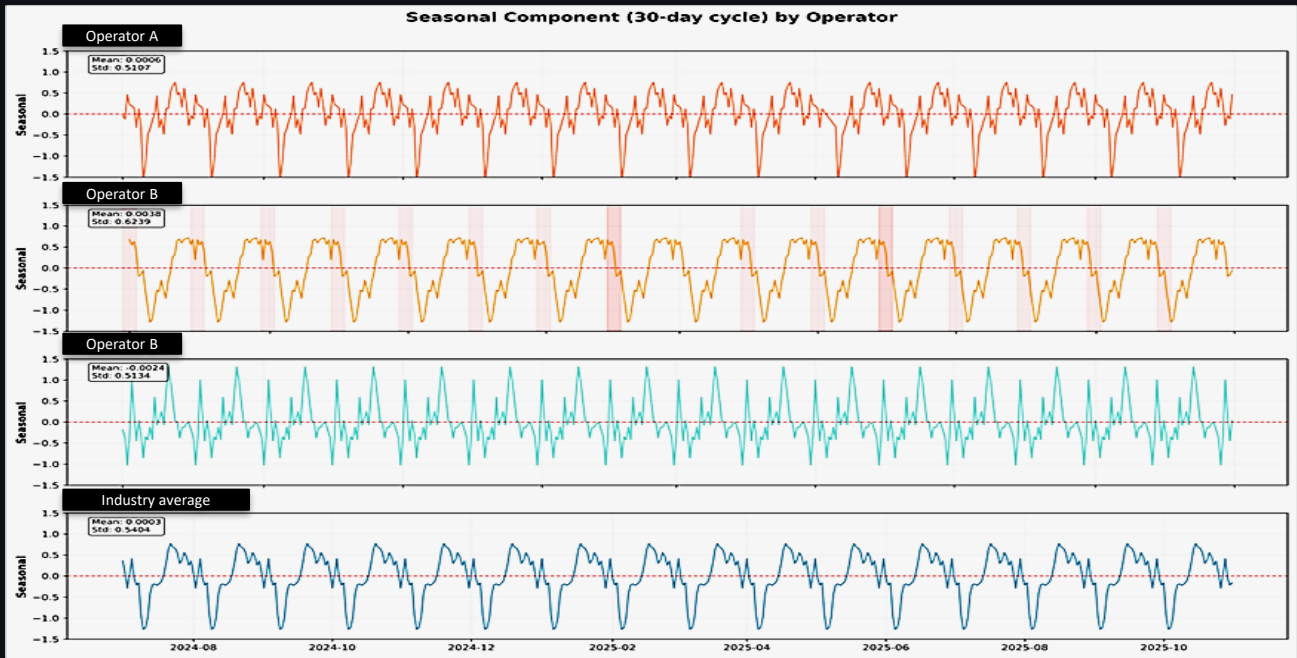
Backup investment levels translated directly into QoS performance under sustained power stress.

Metric	Operator A	Operator B	Operator C
Battery Backup	8 hours	6 hours	4 hours
Generator Coverage	92%	78%	61%
LTE Avail. (Oct '24)	88.1%	80.5%	73.2%
CSSR (Oct '24)	97.8%	96.9%	95.3%
Penalty Cells (peak)	3,210	8,540	11,925
Recovery (Apr '26)	97.8%	96.4%	95.9%
Trend	Strongest	Moderate	Most impacted

Operator identities anonymised — all three are licensed under ZICTA QoS licence obligations

THE 30-DAY CYCLICAL SIGNATURE OF POWER STRESS

Seasonal decomposition of LTE availability reveals synchronised 30-day degradation troughs across all operators



30-Day Cycle

Troughs repeat monthly aligned to billing periods

Month-End Dips

QoS falls each month-end as fuel procurement resets

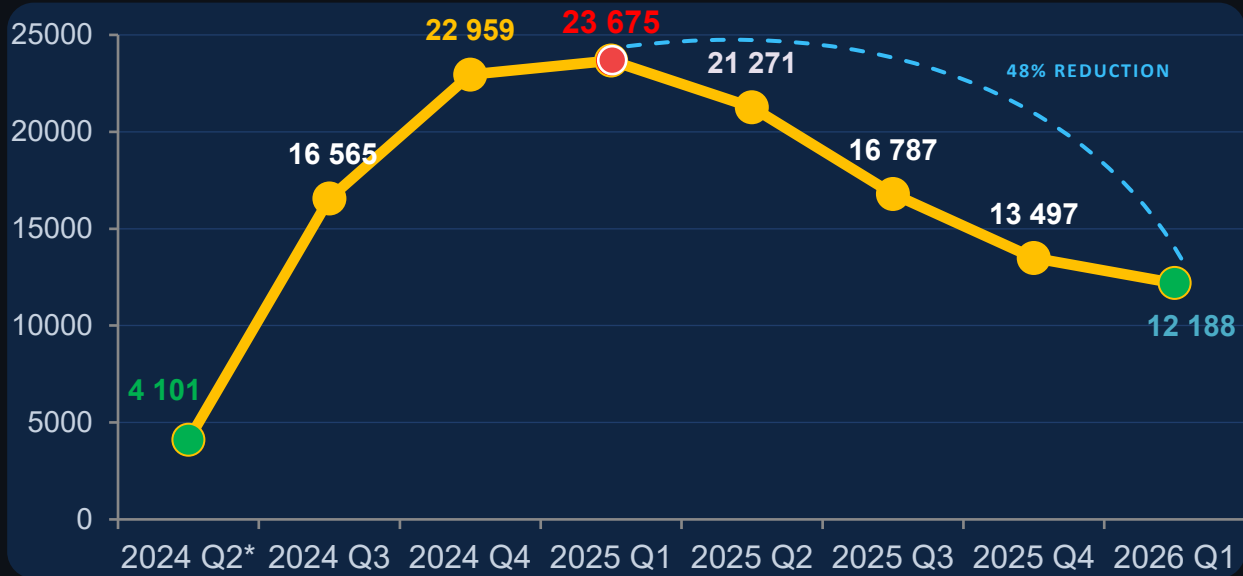
Cross-Operator Synchrony

All operators dip simultaneously — a systemic signal

Time-series decomposition proves degradation dips synchronise every 30 days — directly aligning with fuel replenishment cycles at tower sites

THE SCALE OF THE CHALLENGE — AND THE INDUSTRY'S RECOVERY

Penalty cell count — base stations failing QoS thresholds for 3+ consecutive months — peaked at 23,675 before a 48% decline.



23,675

Peak penalty cells
Q1 2025

12,188

Penalty cells by
Q1 2026

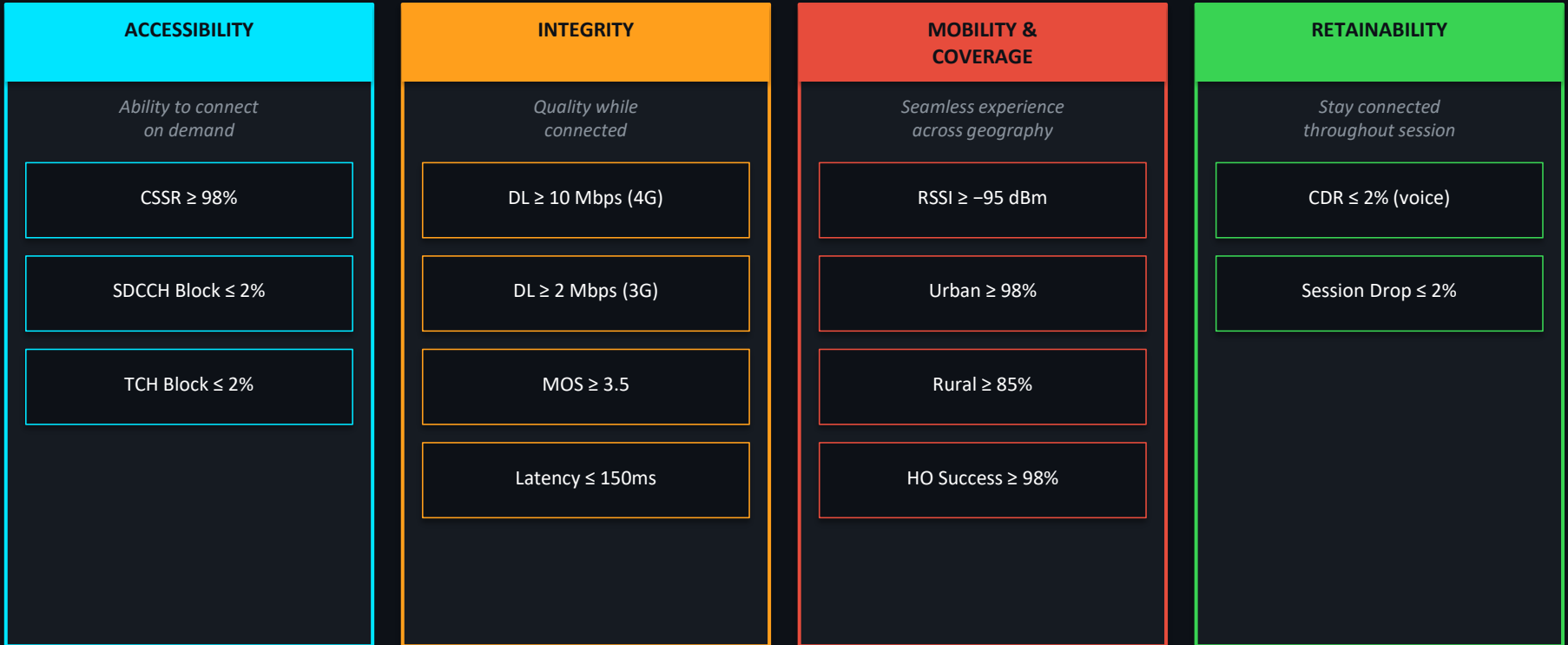
48%

Reduction from peak

Industry-wide investment in backup power and fuel contracts drove the 48% penalty cell reduction — Q2 2025 to Q1 2026

ZICTA'S QoS MONITORING FRAMEWORK

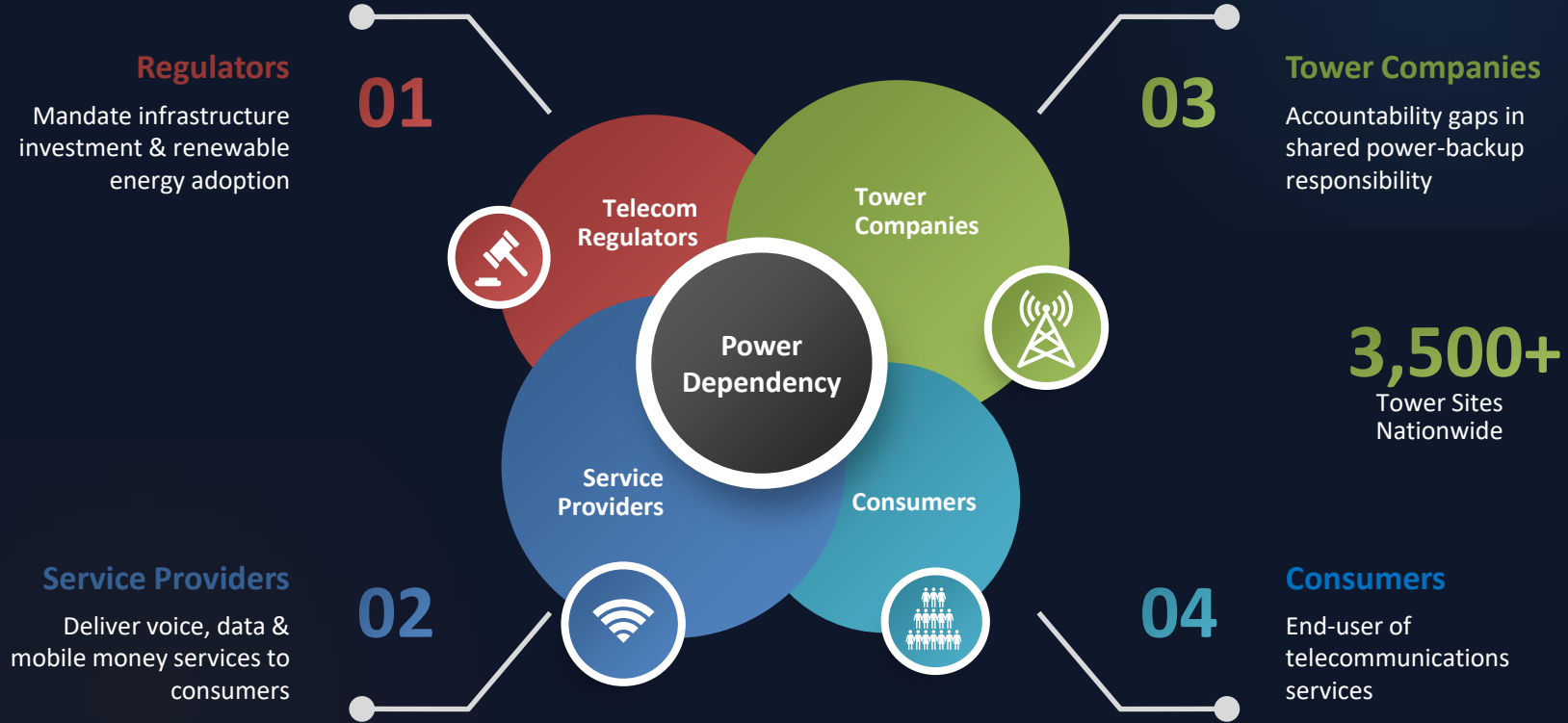
A four-dimension model aligned to ITU-T E.805 / E.806 captures the full performance spectrum.



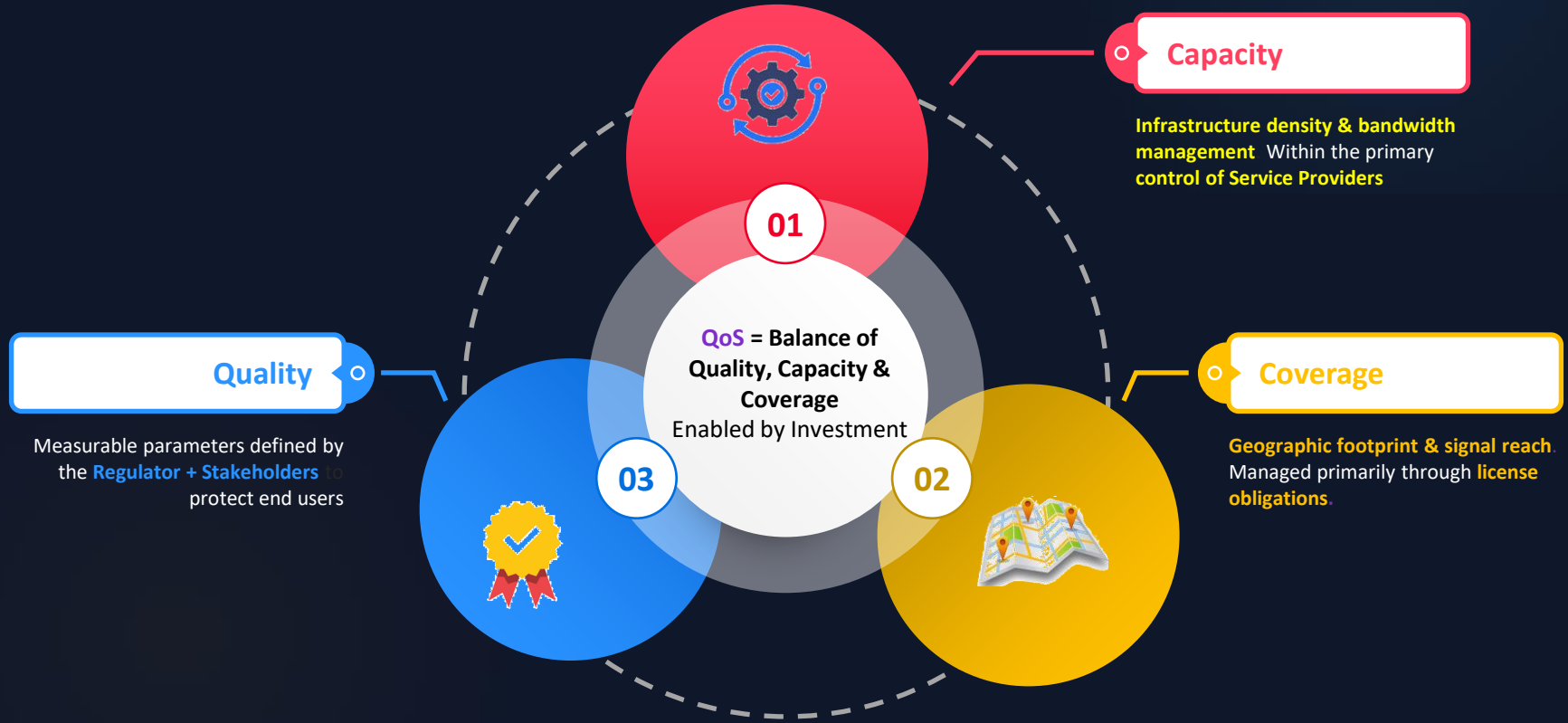
Energy resilience now tracked as a cross-cutting fifth dimension — the prerequisite for all four pillars

A SHARED DEPENDENCY — THE ECOSYSTEM CHALLENGE

Every party in the telecoms ecosystem depends on the same power infrastructure — making this a challenge that can only be solved together.



QoS Compliance is a Collaborative Framework





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