RENEWABLES FIRST

PAKISTAN ELECTRICITY REVIEW 2026

Authors:

Huma Naveed
Nabiya Imran

Acknowledgement:

We would like to thank Ummamah Shah for her contribution to a section of this report. We are also grateful to Zeeshan Ashfaq, Muhammad Mustafa Amjad, Sohaib Malik and Rabia Babar for their valuable inputs during review process.

Tara We would like to express our appreciation to Tara Climate Foundation for supporting the publication of this report.

Designer:

Talha Ahmad

Disclaimer:

All the data, information and analysis provided in this document are accurate and to the best of our knowledge and understanding, in case you identify any error, feel free to reach out to us at: info@renewablesfirst.org

Pakistan's power sector is at a crossroads. The centralized power system has struggled to deliver reliable and affordable electricity. Households, farms, and businesses have resorted to distributed solar PV systems to reduce their reliance on the grid, which is becoming a secondary source of power during the day while retaining its primacy when the sun doesn't shine.

Policymakers are starting to recognize the challenges facing the centralized model of power generation and supply. The State of Industry Report 2025 described the country's power sector as being at an "inflection point". This edition of the Pakistan Electricity Review 2026 (PER26) suggests, however, that the full extent of the shift is yet to be appreciated by most stakeholders, largely because of the incomplete and imprecise datasets available to them.

PER26 offers the most comprehensive picture of Pakistan's rapidly evolving electric power market to date. It presents our updated estimates for distributed solar capacity, which stood at 38 GW as of FY24-25 equivalent to 93% of the country's utility-scale installed capacity. Annual solar power generation is modelled at 51 TWh in FY24-25, or 46% of the grid-supplied electricity of 111 TWh.

These findings have two notable implications. First, they position solar energy as a major source of power generation and consumption in Pakistan. Second, they underline a critical gap in the country's official energy statistics. It follows that regulatory, policy, planning, operational, or financial decisions for the power sector will remain sub-optimal unless they account for the dynamics of the distributed solar market over the coming years and decades.

The report's authors, Huma Naveed and Nabiya Imran, are to be commended for ensuring that PER26 not only offers a rigorous sectoral analysis but also makes a significant contribution to the country's energy policy debate by plugging critical data gaps. The challenge now is for policymakers, the regulator, utilities, and development partners to align their decisions with the sector's new reality.

We look forward to continued dialogue with stakeholders across the public and private sectors, and welcome feedback that helps keep this debate grounded in accurate and comprehensive data.

Sohaib Malik
Senior Fellow - Energy Transitions
Renewables First

Foreword

Contents

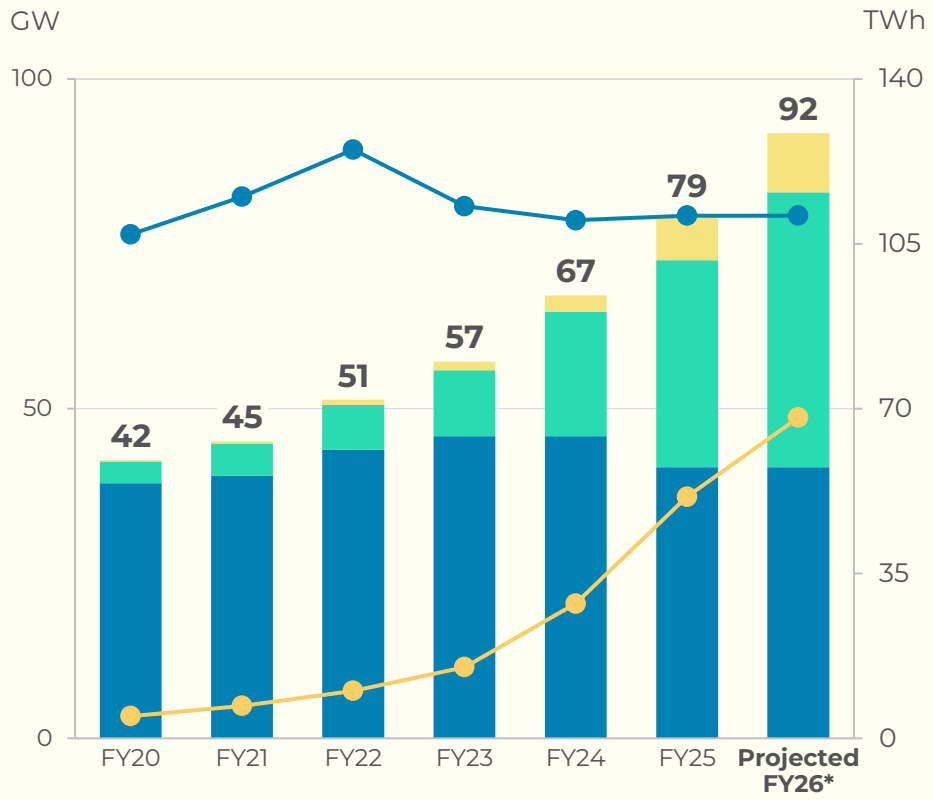
Pakistan’s power sector reaches an inflection point: solarization is rising, but the grid is not keeping up

Pakistan’s power sector is undergoing a structural transition where electrification is accelerating through distributed solar, even as grid-based indicators suggest stagnation. In FY25, grid electricity demand grew just 1.7% YoY despite 5.3% consumer growth, reflecting a clear shift toward decentralized energy adoption. Distributed solar, equivalent to nearly 46% of grid electricity in FY25, has begun reshaping demand patterns, shifting peak loads and reducing reliance on centralized generation. However, legacy system design hasn’t adapted: transmission bottlenecks, underutilized capacity, and a volumetric revenue model continue to drive inefficiencies and rising costs. As a result, Pakistan’s power system is no longer generation-constrained, but structurally misaligned, requiring a transition toward flexibility, grid enhancement, and planning frameworks that account for a bi-directional, decentralized energy system.

Executive Summary

Pakistan's energy transition is already underway, consumer energy resources (CERs) prove it while official data falls behind

In FY25, CERs generated about 51 TWh, nearly half of 111 TWh grid sales, signaling a major shift toward distributed generation. Utility-scale capacity, at 41 GW, reflects only the visible grid, while the broader system rises to nearly 79 GW when 38 GW of distributed solar and behind-the-meter (BTM) / off-grid additions are included, which are not captured in official data.



Pakistan utility-level installed capacity vs. solar uptake, FY20–FY25 and FY26 (Projected)

- **Grid sales fell** from 125 TWh in FY22 to 111 TWh in FY25, an 11% drop, driven by demand displacement from distributed solar rather than reduced end-use consumption.
- **BTM and off-grid deployment** rose from 7 GW in FY22 to 31 GW in FY25, forming the largest yet least visible part of the transition in official statistics.
- **Net-metering capacity** across CPPA-G and K-Electric, surged from 0.7 GW to 6.8 GW over the same period, more than tenfold, fueled by falling panel costs.
- **Total CERs electricity output** reached 51 TWh by FY25, equivalent to 46% of grid sales. Following the same trajectory, CERs generation is forecast to reach around 68 TWh in 9MFY26, representing 61% of FY25's total grid sales.
- CERs signal an inflection point in Pakistan's power sector where it is starting to decouple from the conventional grid**, and rapidly expanding distributed solar, largely unregistered, is reshaping system economics, planning, and operational control.**

Note: For FY26 projection, utility-level installed capacity and grid sales are held at FY25 levels, *9M-FY26 solar imports, reflecting continued stagnation driven by accelerating CERs displacement.

Data source: NEPRA State of Industry Report 2025, CORE Finance Mapping, Ember-energy, & RF's calculations

FY25 power sector at a glance

Installed capacity
fell **10.5%** YoY to **41** GW
at utility scale

Electricity generation
dropped **2%** YoY to **135** TWh
at utility scale

Distributed solar generation
amounted to **51** TWh
(**46%** of grid sales)

Transmission constrained
with **77%** transformers not optimally loaded,
limiting renewable integration

Distribution
grid sales grew just **1.7%** YoY
against **5.3%** consumer growth

Thermal capacity utilization
at **43%** increased costs as fixed
payments spread over fewer units

K-Electric
greater reliance on national grid
imports, up **20%** YoY to **10.2** TWh

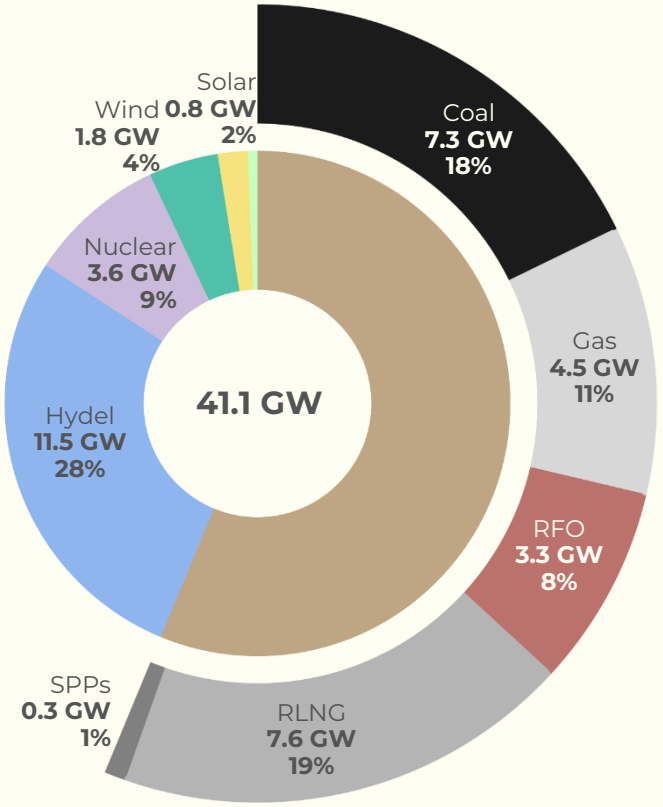
Circular debt
declined to PKR **1.6** trillion (T) due to one-off stock
clearances, amidst future accumulation risks

Note: FY25 refers to the period from July 2024 to June 2025. YoY reflects a comparison between FY24 and FY25.

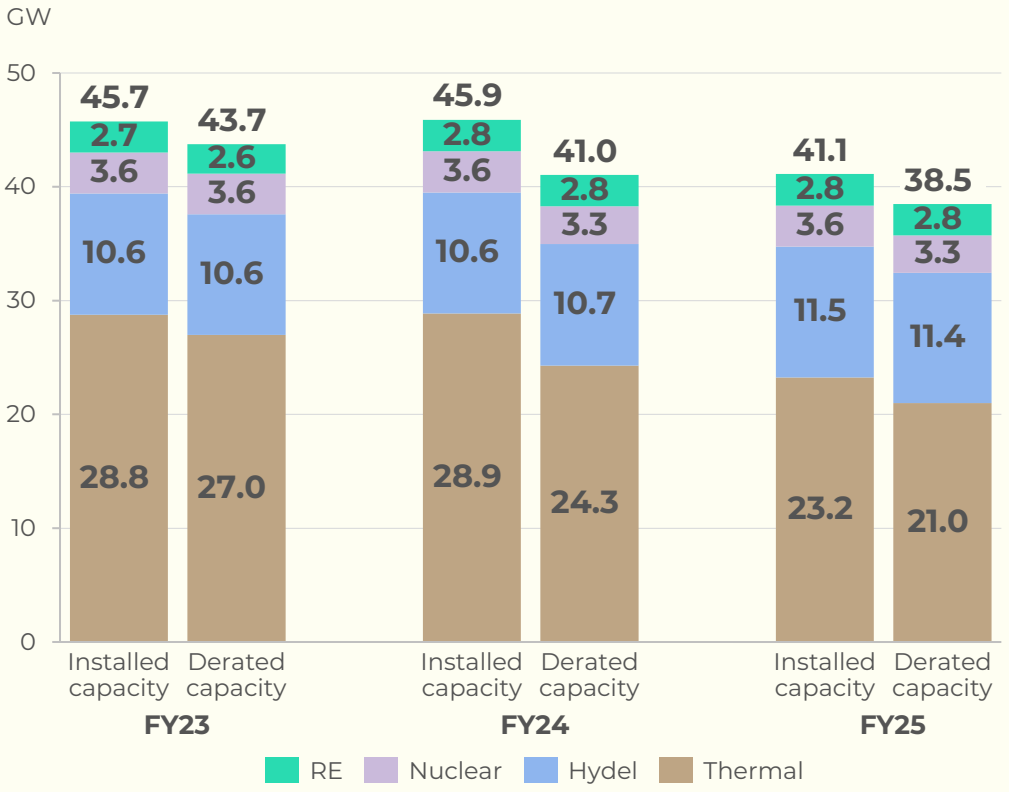
Generation

In FY25, the thermal phase-out drove installed generation capacity down to 41 GW

During FY25, thermal generation capacity fell to 23 GW, down 19.5% YoY, as power purchase agreement (PPAs) terminations and independent power producers (IPPs) retirement removed 5.7 GW from the system. Despite the decline, thermal fleet still accounts for 57% of installed capacity. Hydel capacity rose to 11.5 GW with new plant addition*, while utility-scale renewables+, remained flat YoY, underscoring the need to accelerate grid-connected renewable expansion to reduce thermal reliance and advance the clean energy transition.



Energy source-wise installed generation capacity, FY25

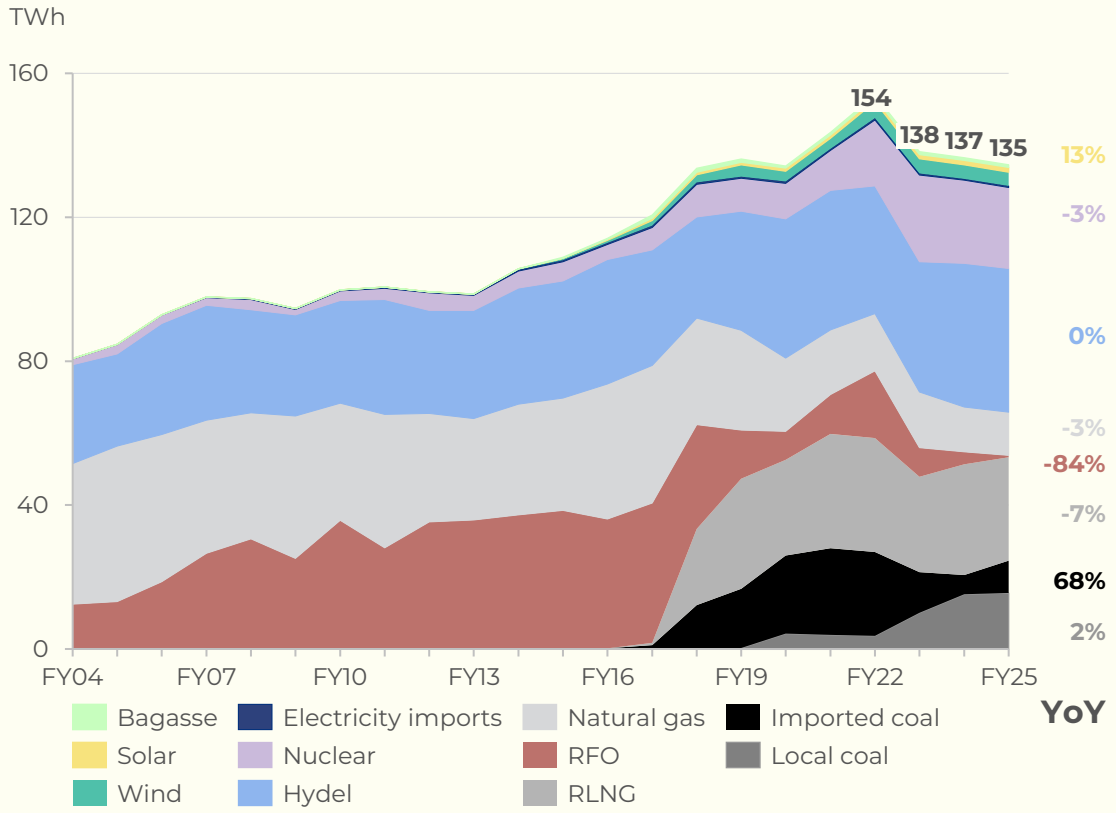


Installed and derated capacity, FY23 – FY25

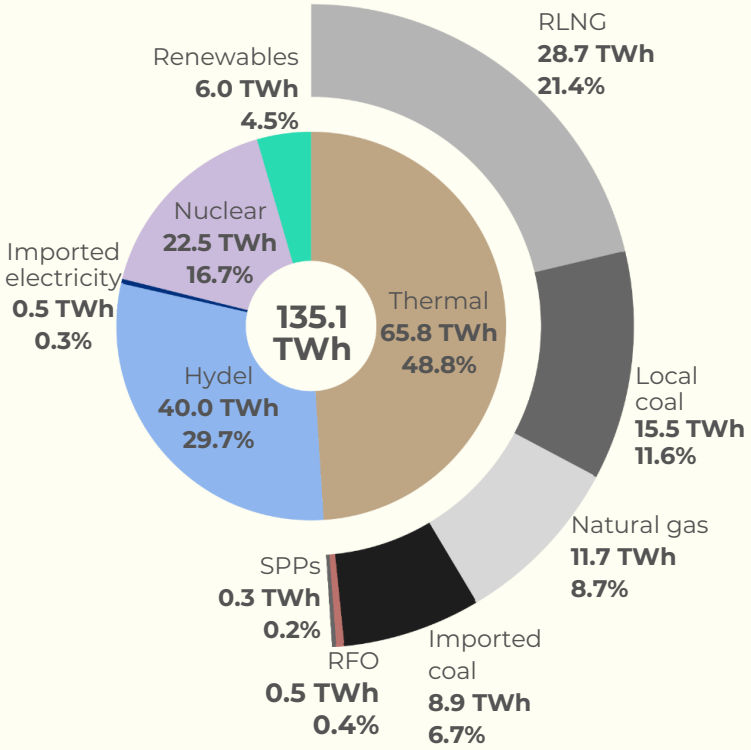
*Suki Kinari hydro limited: 884 MW, COD: Nov.24
+Utility-scale renewable capacity excludes distributed solar installations (net-metered and BTM systems)

Reliance on utility-scale electricity generation fell 2% YoY in FY25, the third straight year of decline

During FY25, hydel remained the largest contributor with a 30% share, reflecting reliance on seasonal water variability. Coal generation surged 19.5% YoY to 24.5 TWh amid declining oil-based generation, while RLNG-based generation fell from 30.8 TWh in FY24 to 28.7 TWh in FY25 under cost-based economic dispatch. Overall, electricity generation declined from 154 TWh in FY22 to 135 TWh in FY25, driven by rising decentralized clean energy, particularly rooftop solar and BTM generation, reshaping grid demand patterns.



Electricity generation by energy source, FY04 - FY25

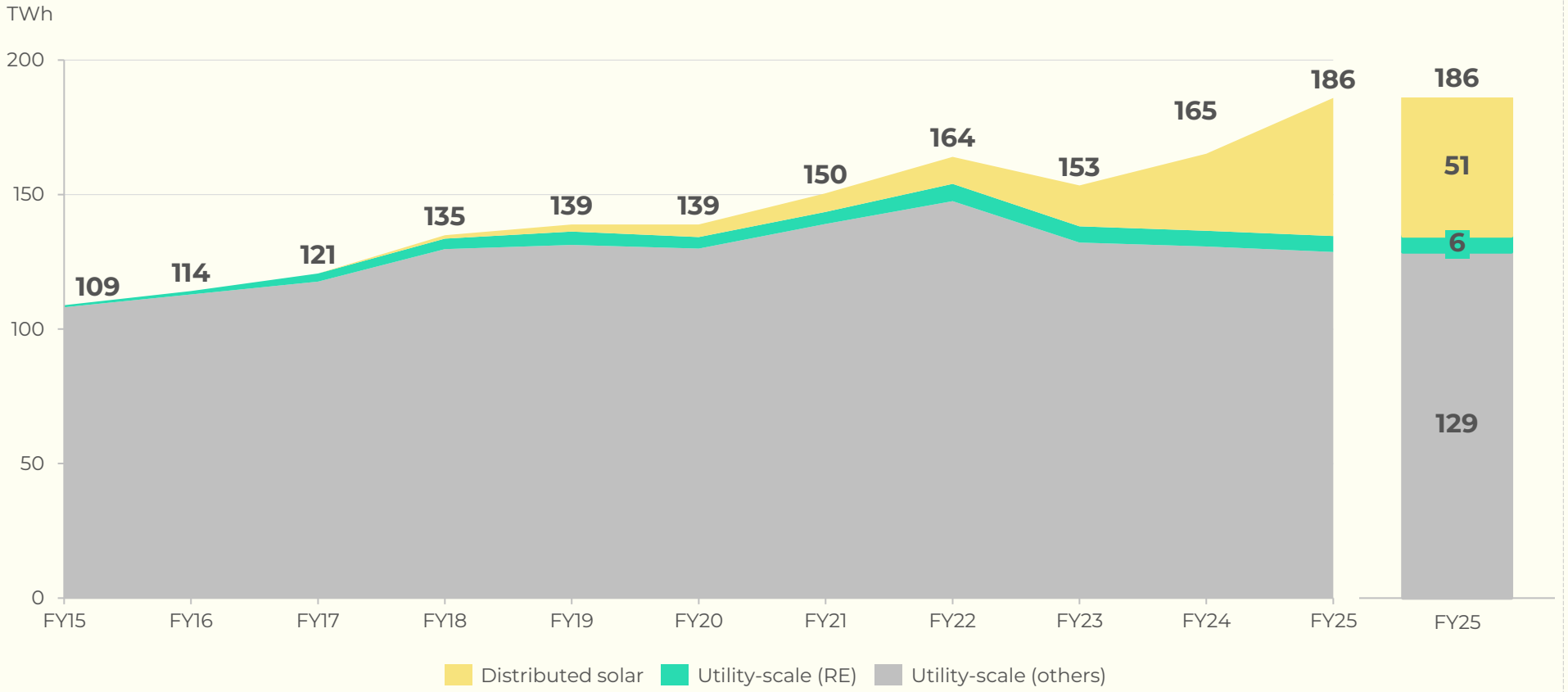


Electricity generation by energy source, FY25

Data source: NEPRA State of Industry Reports & RF's calculations

Distributed solar adds 51 TWh in FY25, quietly reshaping the generation mix

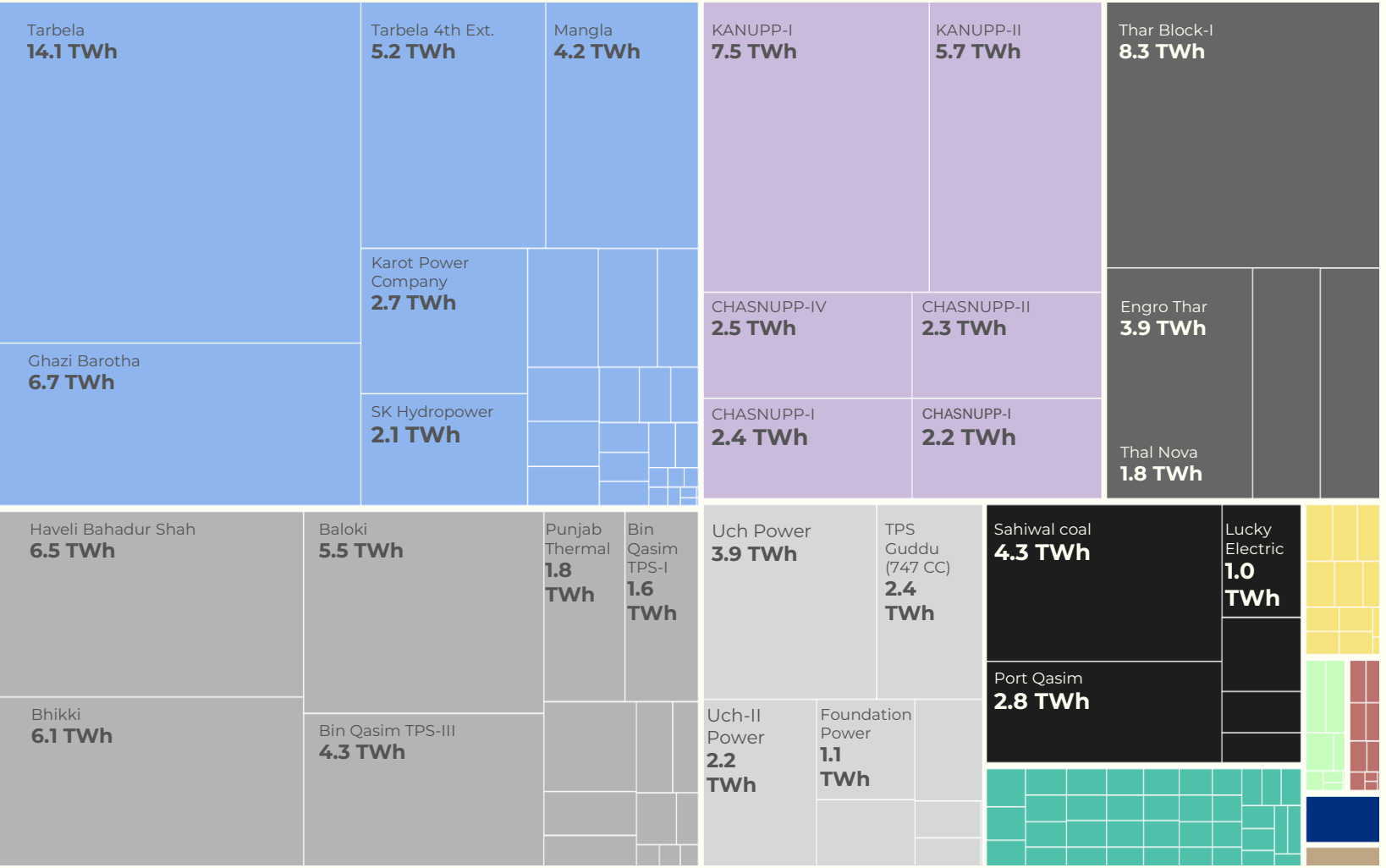
Since the advent of solar PV imports in the country, there has been shift in the generation mix which official numbers do not fully account for. In FY25 alone, generation from net-metering, BTM and off-grid solar deployment reached 51 TWh bringing total generation for the year to 186 TWh.



Electricity generation by energy source, FY15 - FY25

Data source: NEPRA State of Industry Reports & RF's calculations

A snapshot of utility-scale electricity generation by source and its share in FY25

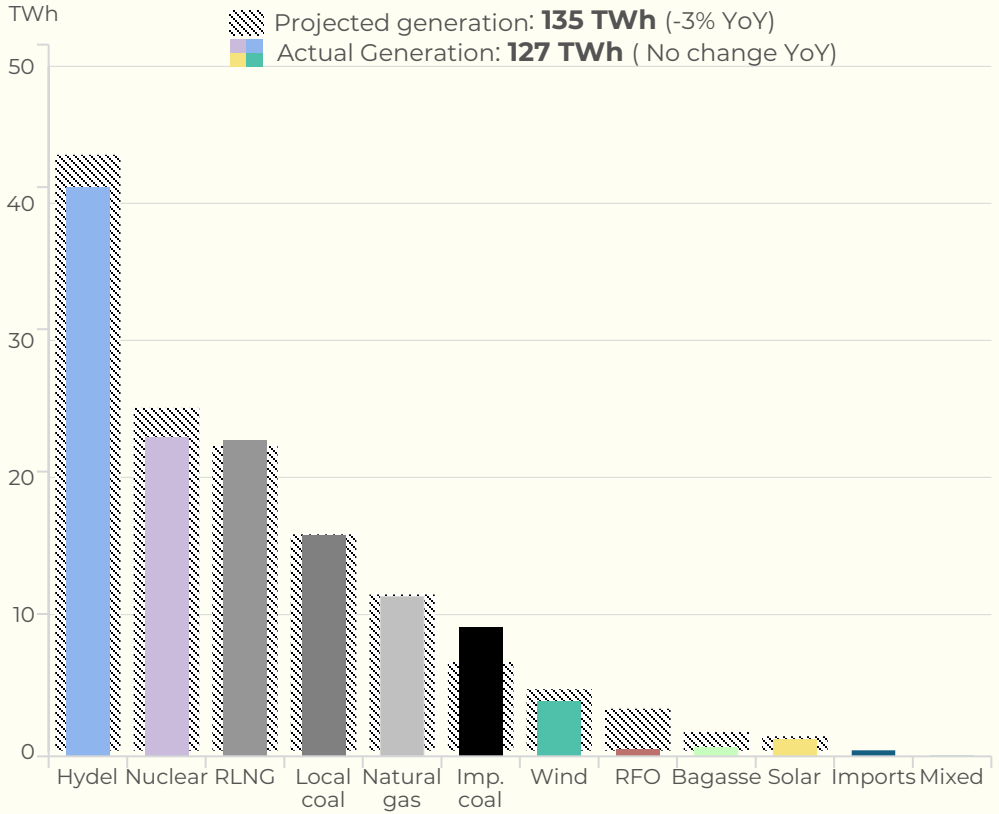


Sources	Electricity Generated TWh	% Share
Hydel	40.0	29.7%
RLNG	28.7	21.4%
Nuclear	22.5	16.7%
Local coal	15.5	11.6%
Natural gas	11.7	8.7%
Imported coal	8.9	6.7%
Wind	3.8	2.9%
Solar	1.4	1.0%
Bagasse	0.7	0.5%
RFO	0.5	0.4%
Electricity imports	0.5	0.3%
SPPs/CPPs	0.3	0.2%

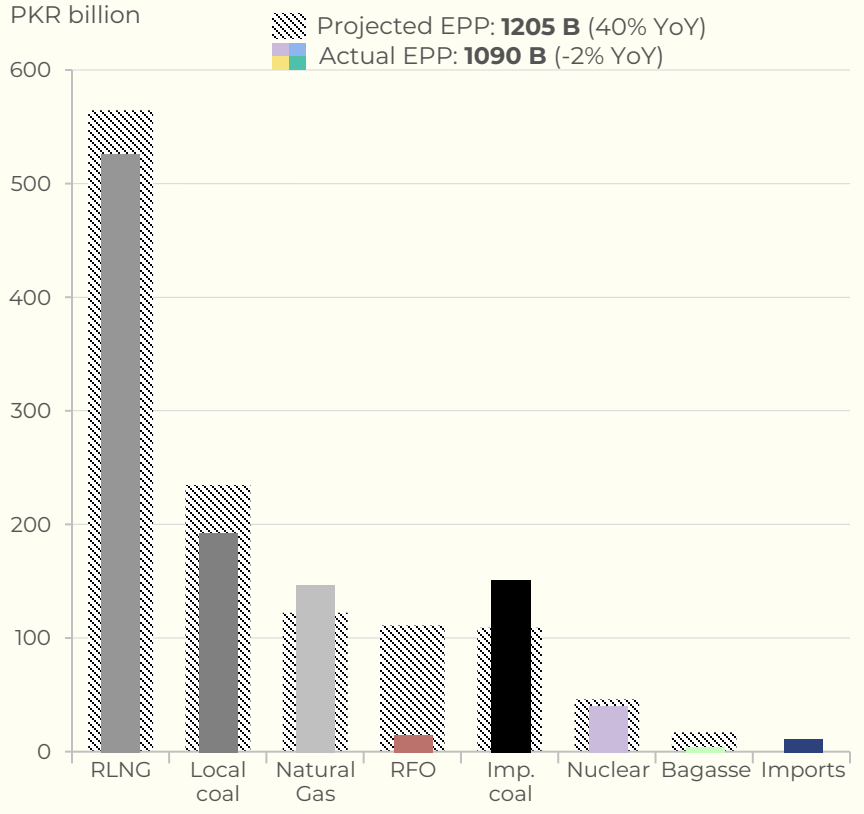
Data source: NEPRA State of Industry Report 2025 & RF's calculations

Demand-driven generation shortfall kept utility-scale payments below FY25 projections

During FY25, operational reliance on imported coal rose from a projected 6.5 TWh to 9.0 TWh to ensure stable supply amid low seasonal water inflows limiting hydel generation and forced outages constraining nuclear output, raising costs to PKR 151 billion (B), 39% above projections, and increasing energy bills. Over the same period, reduced RLNG dispatch priority kept energy purchase price (EPP) below projections, saving approximately PKR 38 B.



Energy source-wise projected and actual electricity generation, FY25

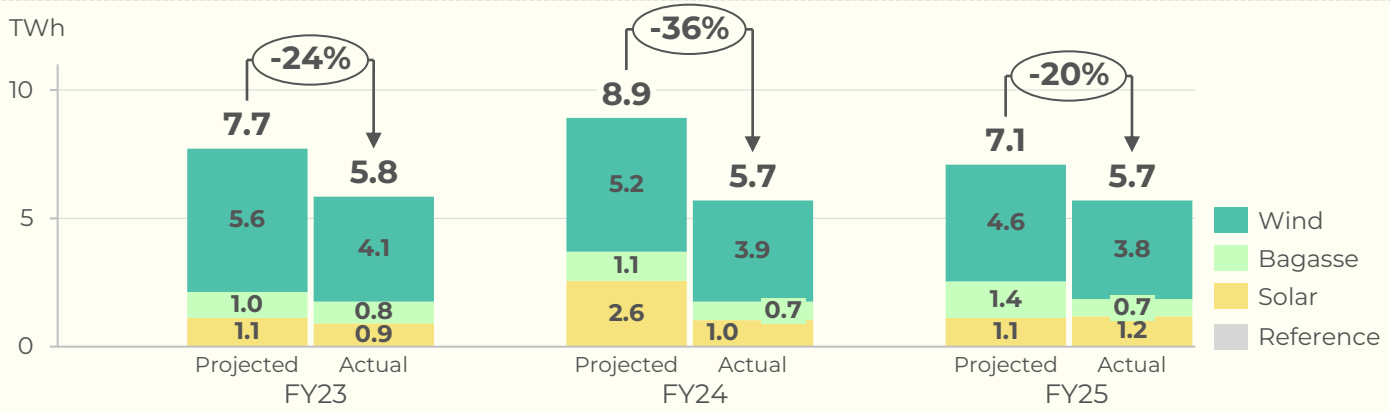


Energy source-wise projected and actual EPP, FY25

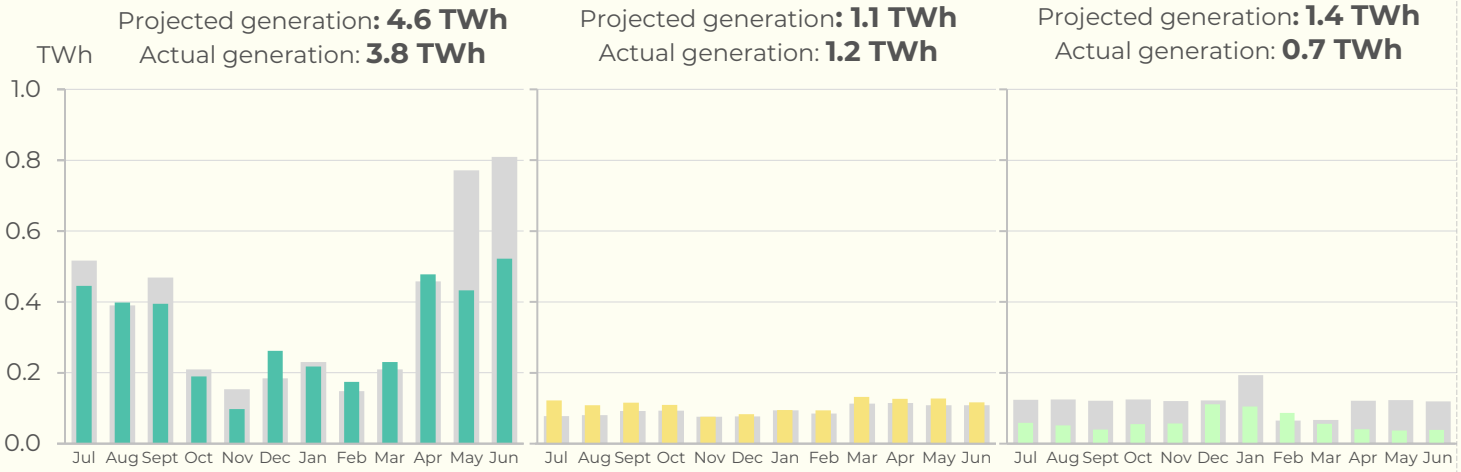
Note: K-Electric numbers are not included in the above graphs

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Transmission bottlenecks and dispatch constraints limit utility-scale renewable generation output against projections



Electricity generation from renewables, actual vs projected FY23 - FY25



Electricity generation from RES, actual vs projected, FY25

Renewable generation has missed annual targets for three consecutive years as grid constraints limit south-to-north dispatch of wind and solar generation, while thermal take-or-pay contracts retain dispatch priority. Meanwhile, bagasse generation remains confined to the crushing season, with internal process energy prioritized over grid export.

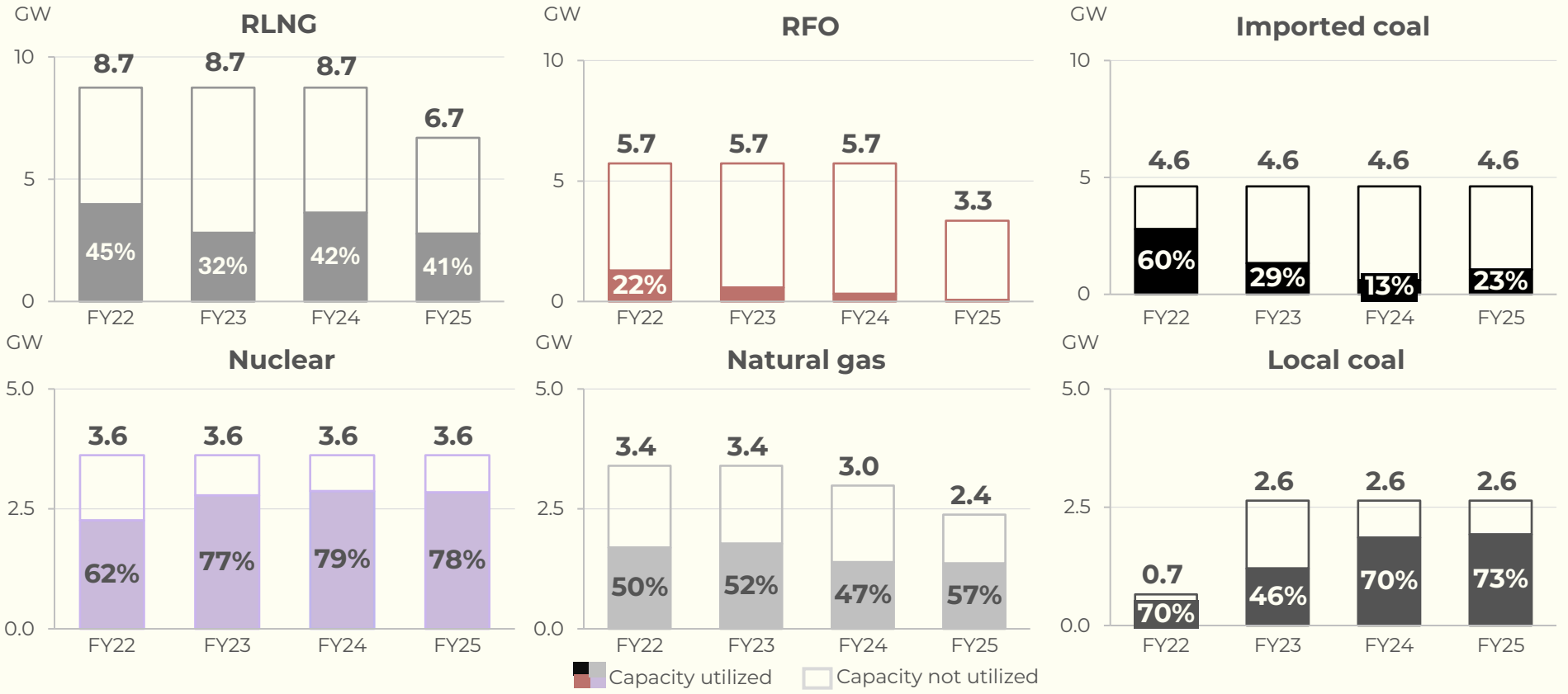
In FY25, wind generation fell 16% below projections as curtailment (Ref. slide 47) and transmission bottlenecks left available capacity underutilized. Solar generation exceeded projections by 7%, reaching 1.2 TWh, as FY24 commissioned plants* operated at full capacity. Meanwhile, bagasse usage shifted toward paper industry, generating only 0.7 TWh of electricity.

*Note: Three new solar plants: HNDS (50 MW), Meridian Energy (50 MW), and Helios (50 MW), all commissioned in Feb 24

Data source: NEPRA State of Industry Report 2025 & RF's calculations

High tariffs and the solar surge constrained thermal capacity utilization to 43% in FY25

During FY25, nuclear and local coal led thermal utilization at 78% and 73%, driven by merit order priority and lower generation costs, whereas 11.3 GW of RLNG and imported coal capacity remained underutilized due to higher fuel costs. Underutilized generation capacity continues to raise electricity costs, reduce grid demand, and accelerate the shift toward solar.

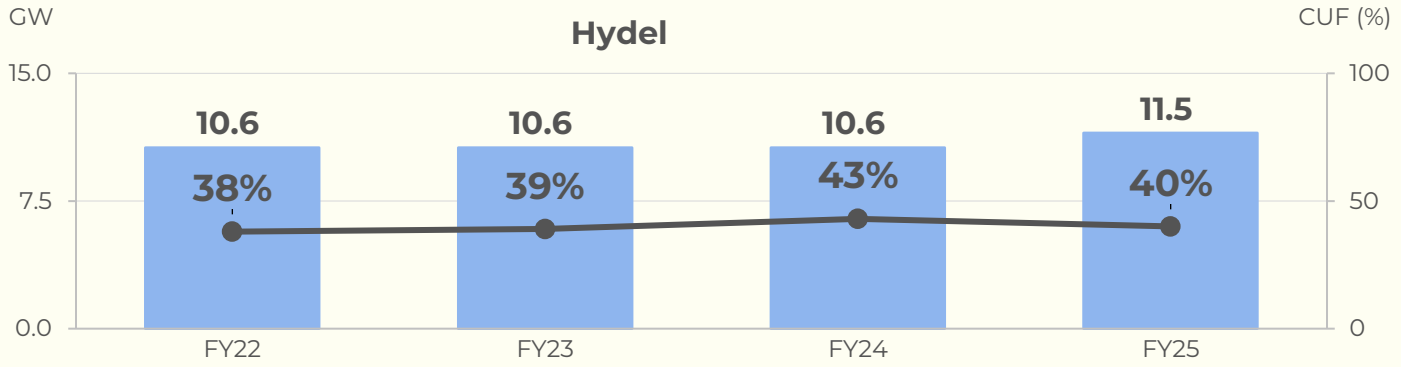


Thermal source-wise installed capacity and plant utilization factor, FY22 - FY25

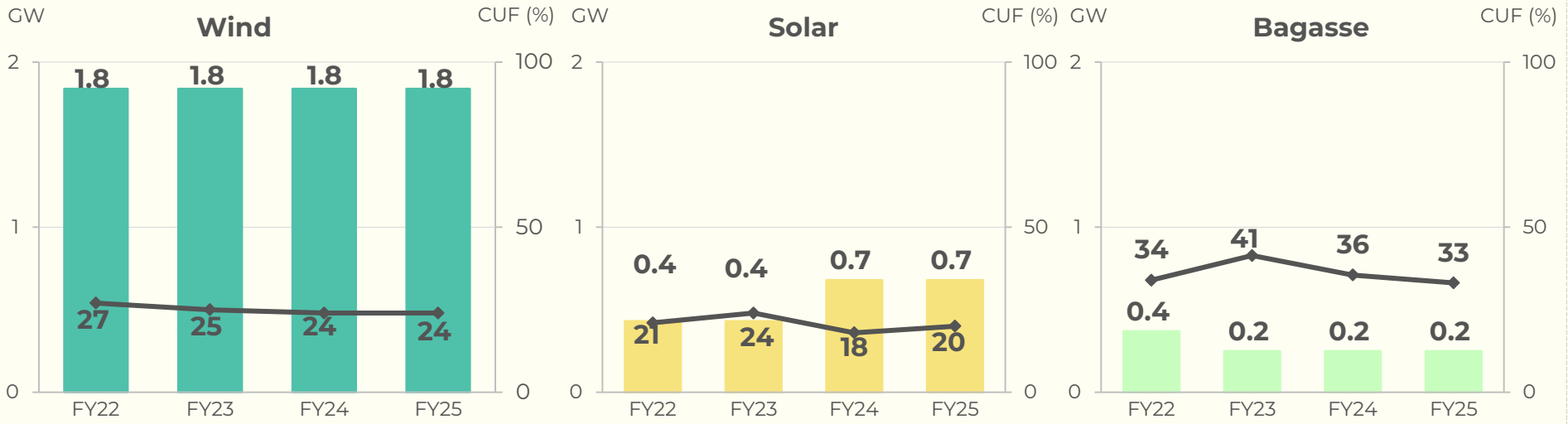
Note: Colored bars represents capacity utilized while empty represents capacity not utilized
Note: K-Electric numbers are not included in the above graphs

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Hydel and renewable capacity utilization factors (CUFs) remain bound by seasonal and resource availability



In FY25, hydel capacity utilization declined to 40% from 43% in FY24 despite capacity addition, reflecting weaker monsoon and snowmelt conditions. Bagasse recorded the highest CUF at 67%, concentrated within the sugarcane crushing season. Wind and solar CUFs remain resource-driven, bounded by wind speeds and solar irradiance.



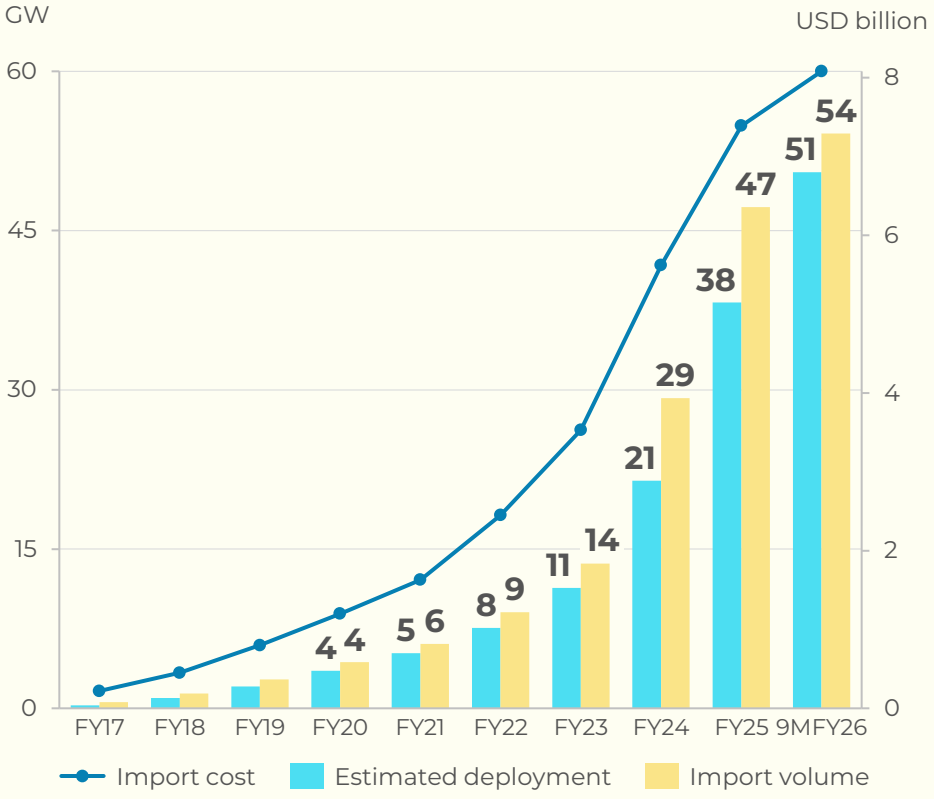
Energy source-wise installed capacity and capacity utilization factor, FY22 - FY25

Note: K-Electric numbers are not included in the above graphs

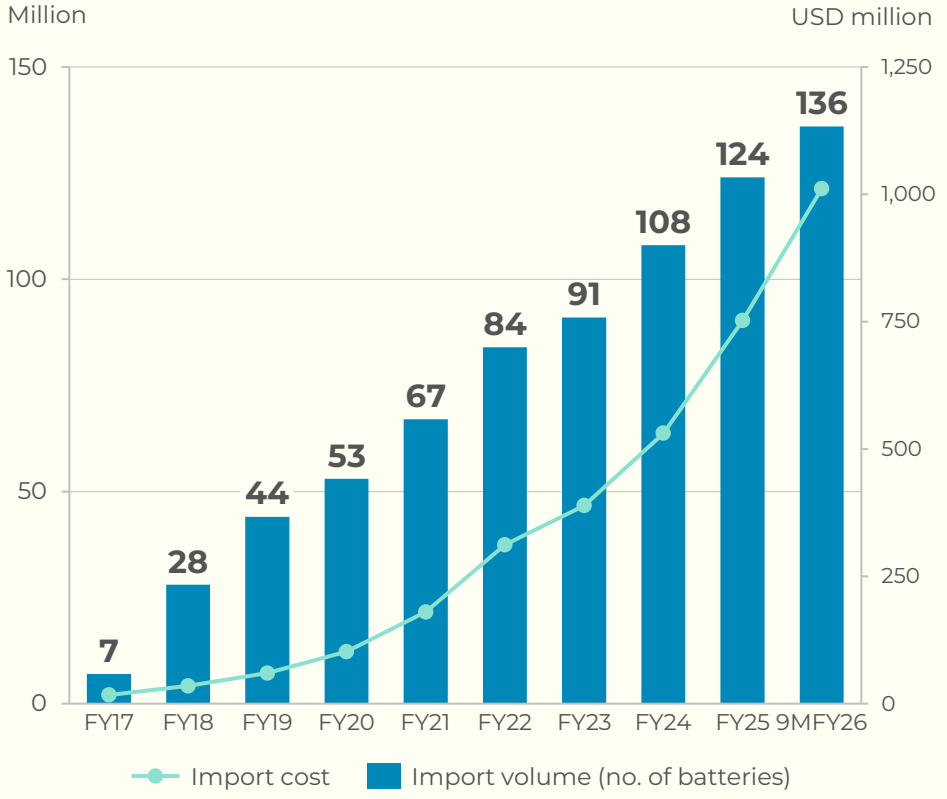
Data source: NEPRA State of Industry Report 2025 & RF's calculations

Distributed solar and battery storage are scaling rapidly outside the grid's accounting framework

Pakistan has imported nearly 54 GW of solar PV modules as of Mar 26, underscoring the scale of citizen-led solarization occurring beyond conventional grid frameworks. At the same time, lithium-ion battery imports have reached USD 1 B since FY17, with annual inflows increasing by 56% YoY in FY25 alone. Together, these trends indicate a shift in how electricity is produced, consumed, and increasingly stored.



Cumulative volume, cost and deployment of Chinese solar PV modules imported by Pakistan, FY17 - 9MFY26



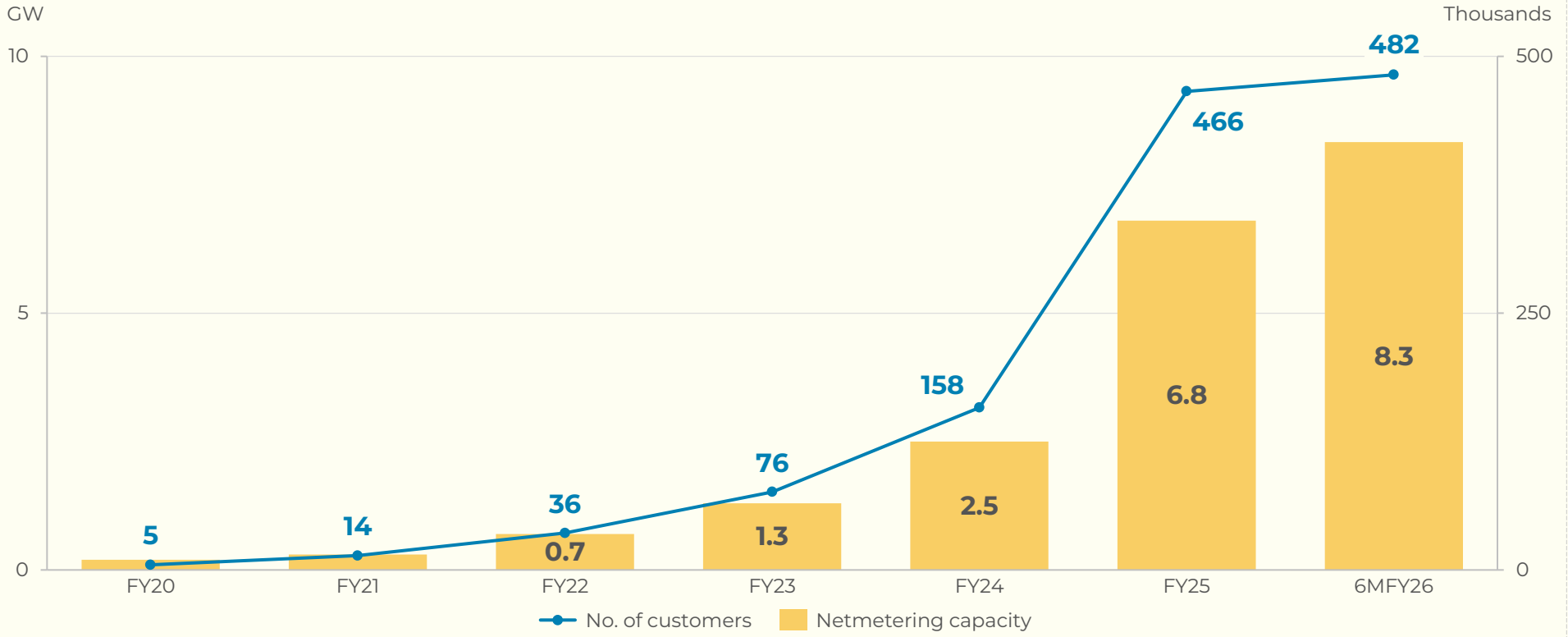
Cumulative quantity and cost of Chinese Li-ion batteries imported by Pakistan, FY17 - 9MFY26

Note: Li-ion battery imports data represents units imported from China against HS Code 850760

Data source: Ember-energy, Chinese customs, CORE Finance Mapping & RF's calculations

Net-metered capacity has reached 8.3 GW in Dec 25, but it reflects only a fraction of solar deployment

Total net-metering capacity has reached 6.8 GW at the end of FY25 dominated by domestic consumers, reflecting rapid formal integration of distributed solar into the grid. However, official data captures only grid-connected systems, overlooking widespread off-grid and BTM deployment. With total solar deployment estimated at almost 38 GW as of Jun 25, Pakistan's solarization trajectory is materially larger than conventional grid statistics indicate.

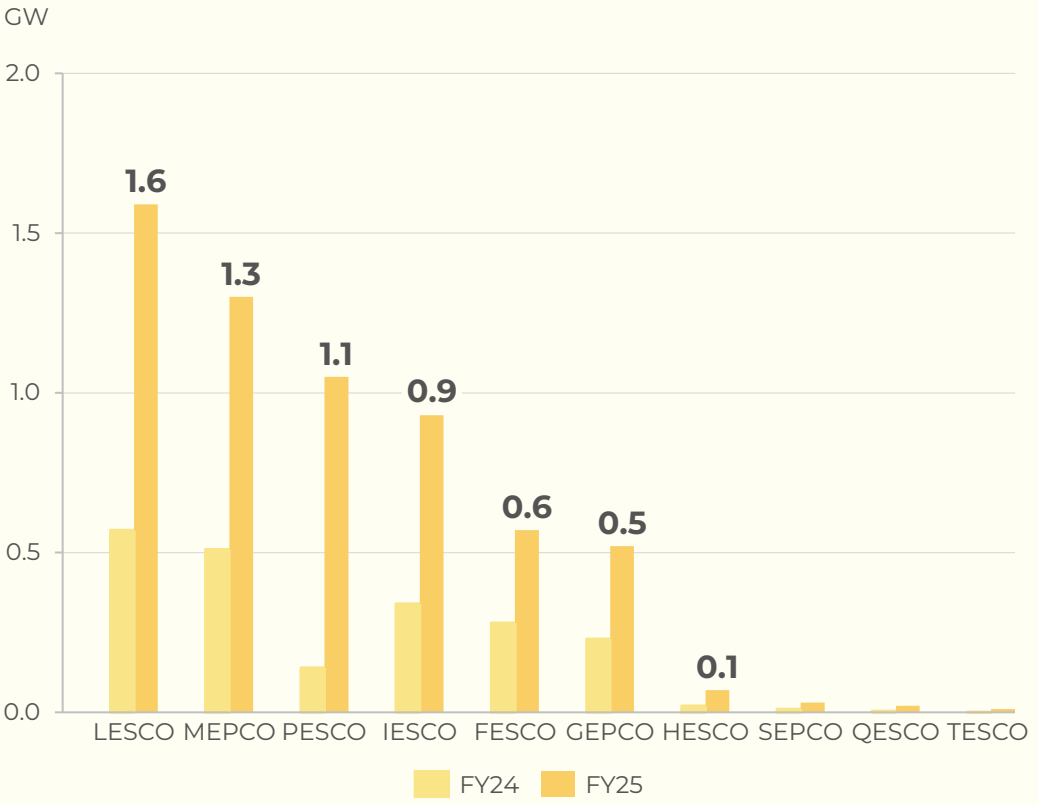


Total DISCOs and KE net-metering capacity (cumulative by year), FY20 - 6MFY26

Note: 6MFY26 numbers are provisional.
Data source: NEPRA & RF's calculations

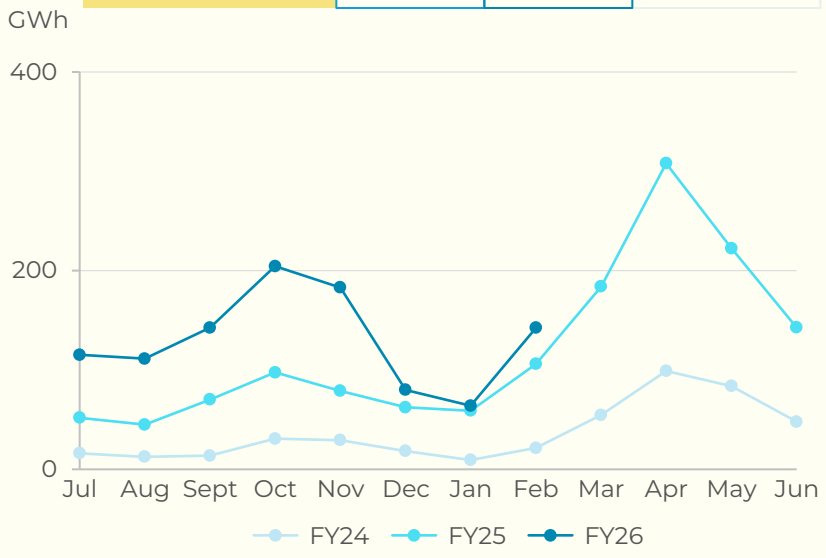
Net-metering remains marginal at 1% of DISCOs procurement despite rapid growth

Net-metering is geographically concentrated, with the DISCOs in Punjab leading additions and small-scale (<25 kW) systems dominating deployment. Despite a 227% YoY increase in net-metering units procured by DISCOs in FY25, these volumes represent only 1% of total procurement. The scale mismatch reinforces that much of Pakistan's solar expansion is unfolding beyond the formal grid network.



DISCO wise cumulative net-metering capacity addition, FY24 - FY25

	FY24	FY25	YoY Change
Total Units Procured by DISCOs (TWh)	115.2	114.4	-1%
Net-Metering Units (TWh)	0.4	1.43	227%

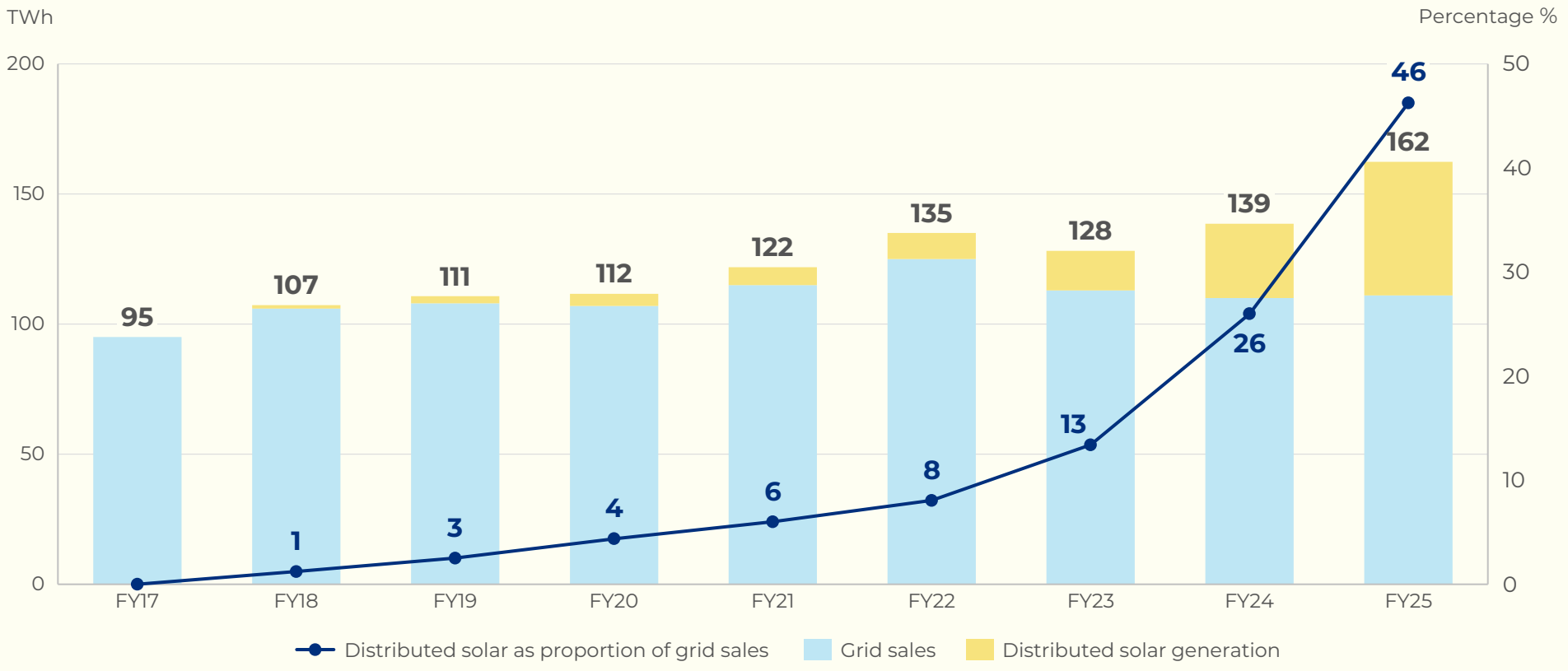


Comparison of DISCOs net-metering units procured, FY24 - FY26

Data source: NEPRA & RF's calculations

Distributed solar generation is equivalent to almost half of grid sales as of FY25

Distributed solar is estimated to have generated 51 TWh in FY25, equivalent to roughly 46% of grid-supplied electricity. While grid sales have declined from their FY22 peak, this does not reflect falling electricity demand. Instead, a growing share of consumption is being met through distributed solar, indicating that underlying electricity use continues to rise but is increasingly bypassing the grid.

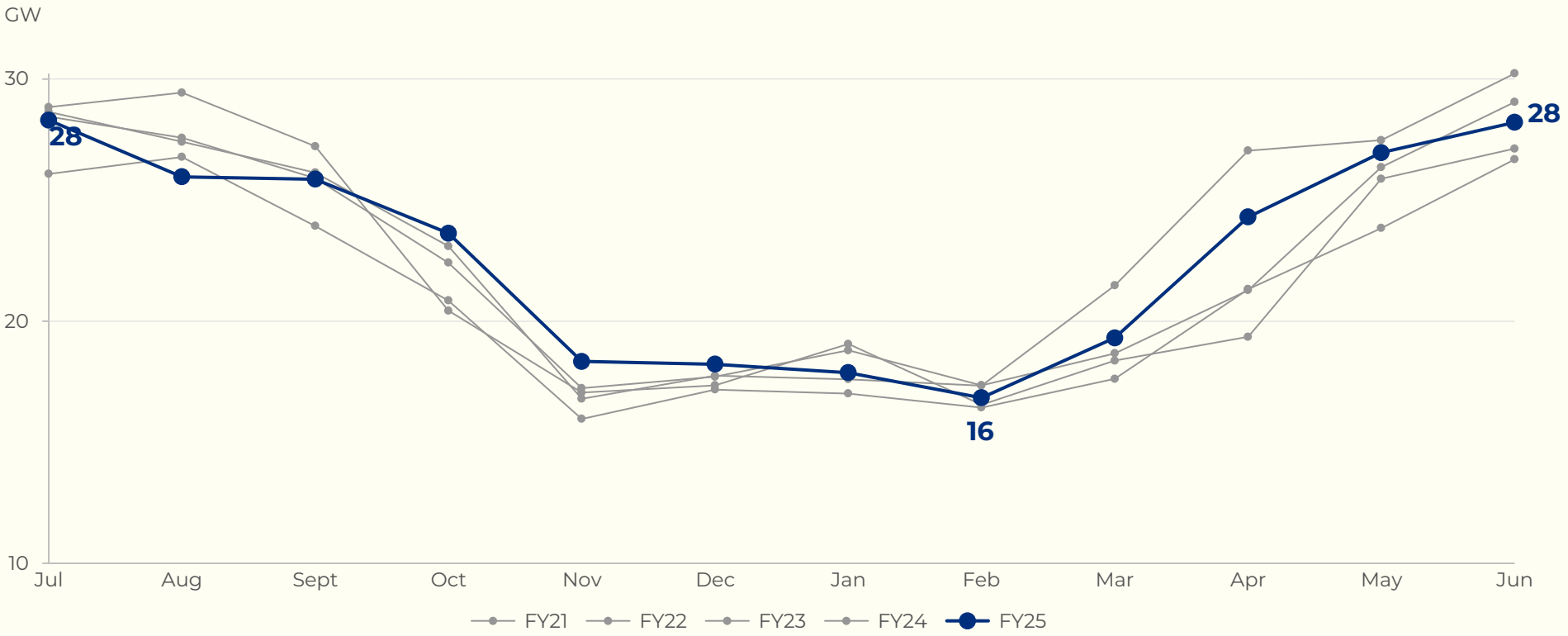


Grid sales vs. distributed solar generation, FY17 - FY25

Data source: NEPRA, & RF's calculations (adapted from The Many Dividends of the Solar Rush in Pakistan and Electrons In, Hydrocarbons Out)

Plateau in grid peak system demand highlights emerging decentralized load patterns

As distributed solar deployment has accelerated, system peak demand has plateaued relative to earlier growth trends in grid sales observed until FY22. This suggests that part of incremental demand growth is increasingly being absorbed outside the grid. As a result, conventional indicators such as peak system demand and grid sales may understate the pace of solarized electrification, with implications for transmission planning, capacity payments, and distribution revenue models.



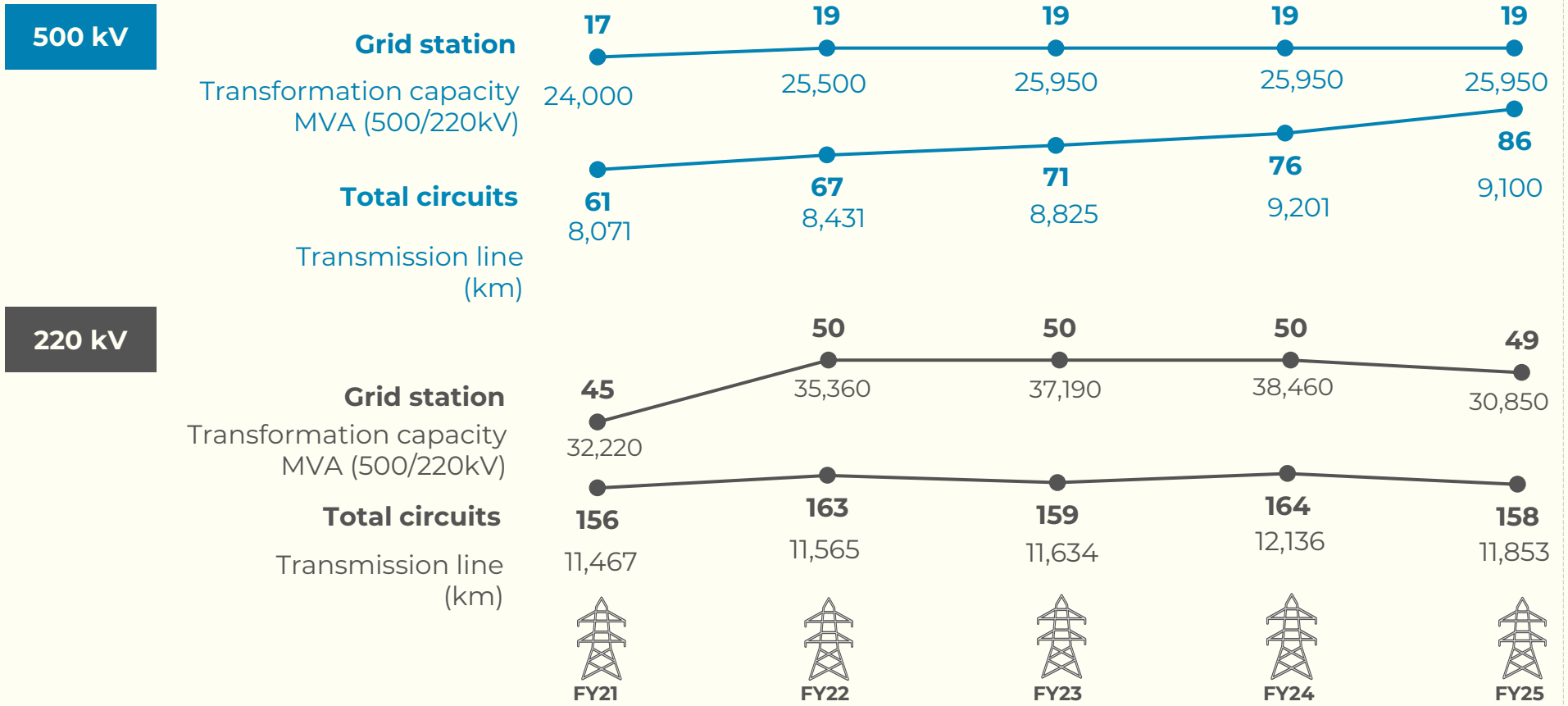
Monthly system peak demand, FY21 - FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Transmission

Pakistan's transmission network expansion lags behind system needs

In FY25, transmission expansion remained limited, with no new grid stations and a reduction in 500 kV and 220 kV transmission lines. The gap between system growth and grid capacity has persistently widened, constraining power flows and resulting in bottlenecks and underutilized assets, leaving the system transmission-constrained rather than generation-constrained.



Year-wise expansion of National Grid Company (NGC) network, FY21 - FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Transmission bottlenecks are a primary driver of reliance on expensive thermal generation

Pakistan's transmission network continued to experience operational stress at 500 kV and 220 kV marked by persistent congestion, uneven load distribution, and rising reliance on costly generation.

		FY24	FY25	
500 kV power transformer	Overloaded	32	30	**64%**
	Under-utilized	12	9	**19%**
	Optimally loaded	3	8	**17%**
	Total	**47**	**47**	

		FY24	FY25	
220 kV power transformer	Overloaded	88	86	**59%**
	Under-utilized	18	22	**15%**
	Optimally loaded	77	37	**26%**
	Total	**183**	**145**	

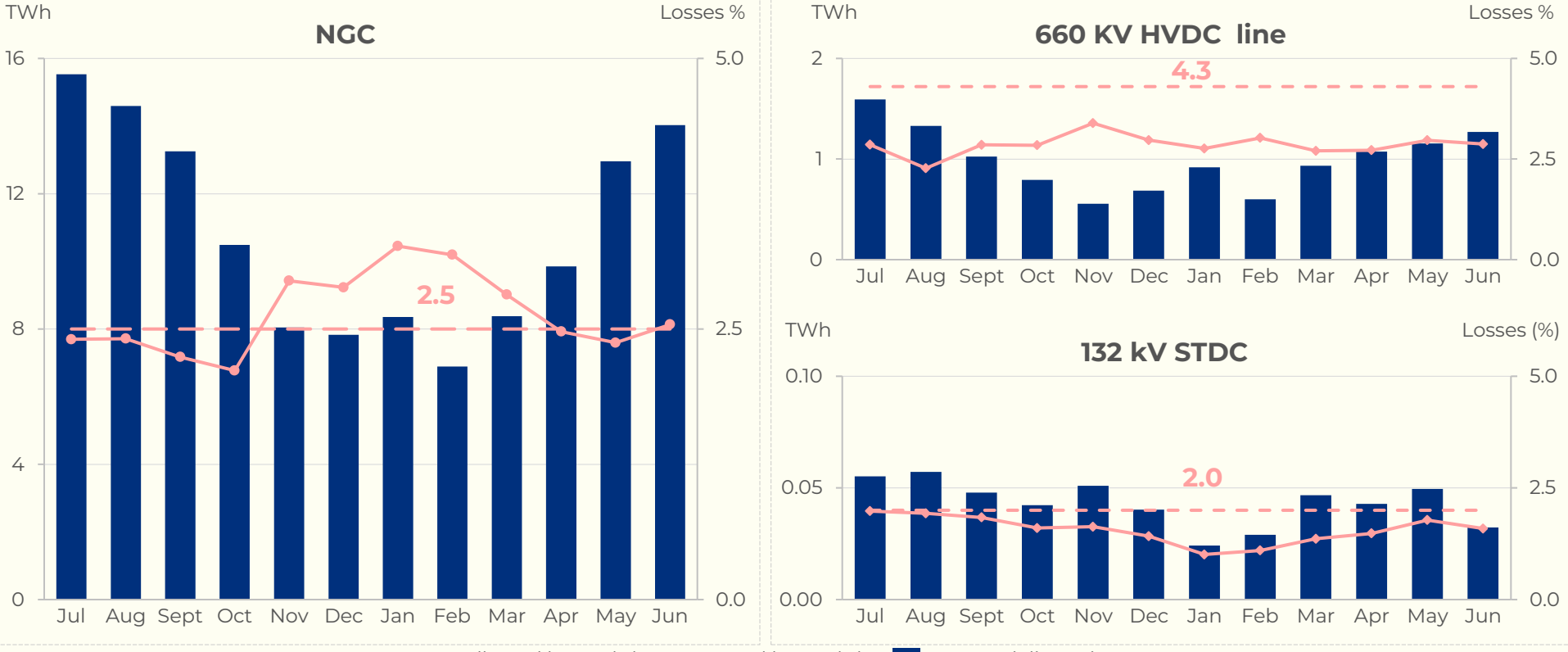
Overloaded and under-utilized power transformers, FY24 - FY25

- In FY25, 64% of 500 kV and 59% of 220 kV transformers ran above 80% capacity, limiting evacuation of low-cost power and forcing reliance on costly RFO and RLNG generation in northern and central load centers.
- In FY25, 16% of 192 total 500kV and 220 kV transformers were underutilized, highlighting gaps in system planning and leaving significant transmission capacity idle.
- Transformer utilization showed a slight improvement from FY24, driven by better load distribution.
- Uneven transformer utilization distorts dispatch efficiency and raises costs, while constraining peak demand and driving load shedding

Note: Overloaded means 80% load on transmission line while under-utilized means less than 30% load on transmission line
Data source: NEPRA State of Industry Report 2025 & RF's calculations

NGC transmission and transformation (T&T) losses in FY25 reflect seasonal variations and grid constraints

During FY25, NGC T&T losses rose in winter due to reduced northern hydel generation, requiring long-distance power transfers from the southern region to meet northern load centers' demand. Meanwhile, in summer, T&T losses were driven by grid bottlenecks, increasing system costs and consumer tariffs. T&T losses for Pak Matiari-Lahore Transmission Line Company (PMTLC) HVDC line (high voltage direct current) and Sindh Transmission & Dispatch Company (STDC) remained within permissible limits, ensuring reliable power transfers across the network in FY25.

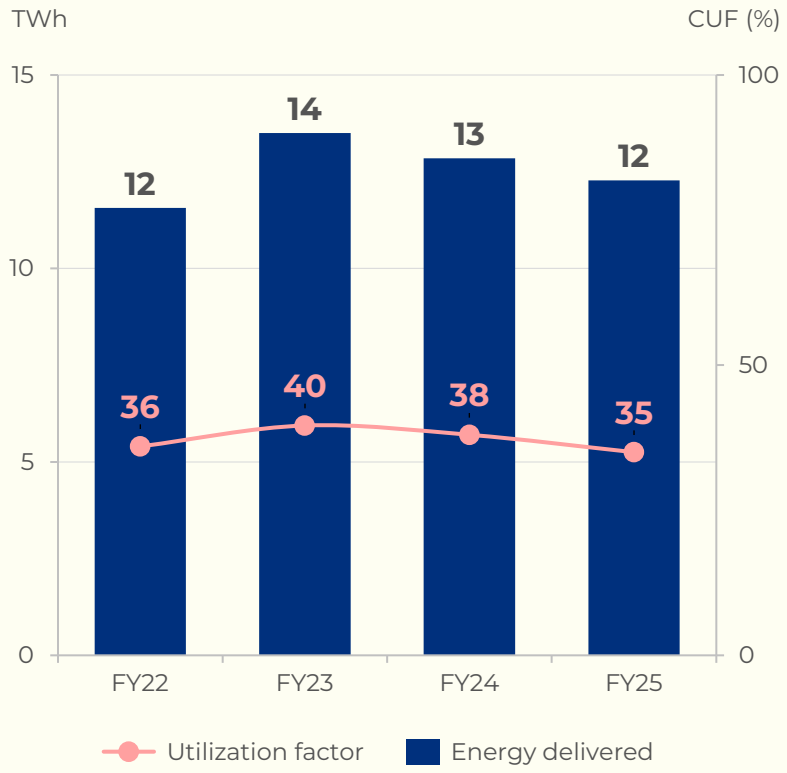


Energy delivered and T&T losses in FY25 - NGC, PMTLC and STDC

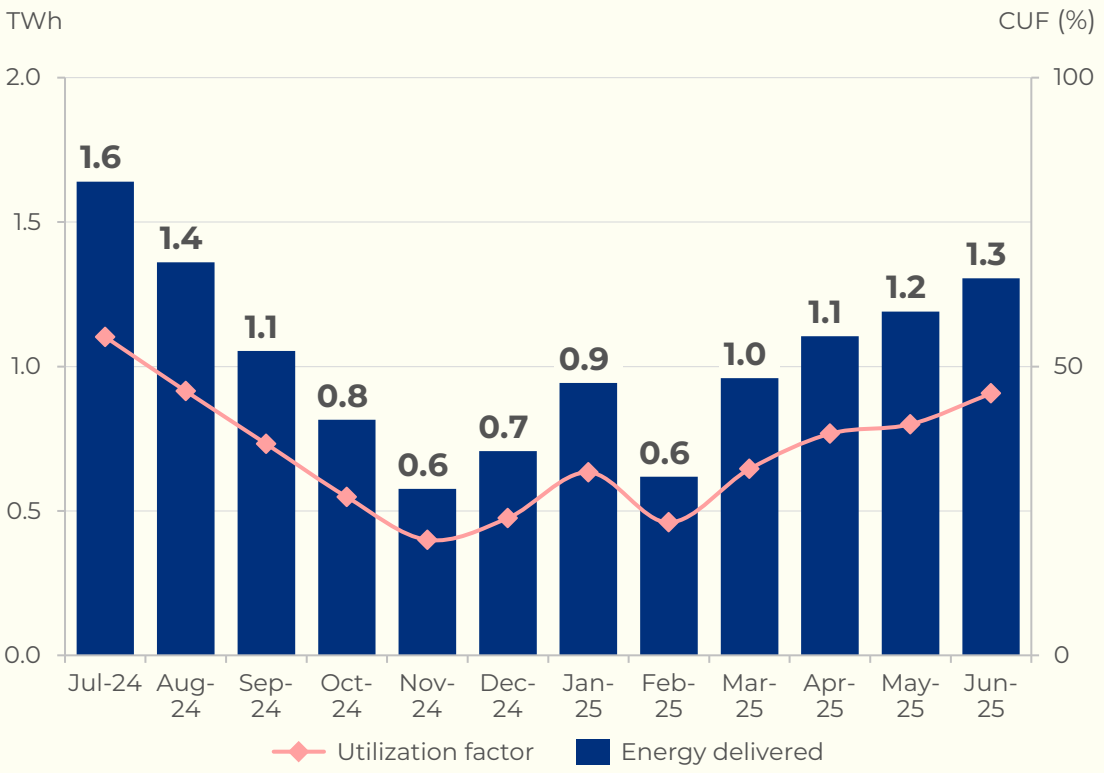
Data source: NEPRA State of Industry Report 2025 & RF's calculations

Grid infrastructure bottlenecks limit Matiari-Lahore HVDC utilization to 35% in FY25

The 500 kV HVAC double-circuit runs the south-to-north corridor, upstream at Matiari feeding downstream Lahore North, parallel to the HVDC bipole. Power flows remain constrained by downstream HVAC limitations, despite dedicated HVDC capacity. Underutilization of the Matiari-Lahore HVDC line since FY22 reflects delays in commissioning the 500 kV Lahore North substation (commissioned Dec 25) and associated infrastructure. The 500 kV Jamshoro-Rahim Yar Khan corridor is limited to a transfer capacity of 1,800 MW due to infrastructure constraints, restricting low-cost southern power and increasing reliance on costly northern plants, raising tariffs.



Energy delivered and capacity utilization factor of 660kV HVDC line, FY22 - FY25



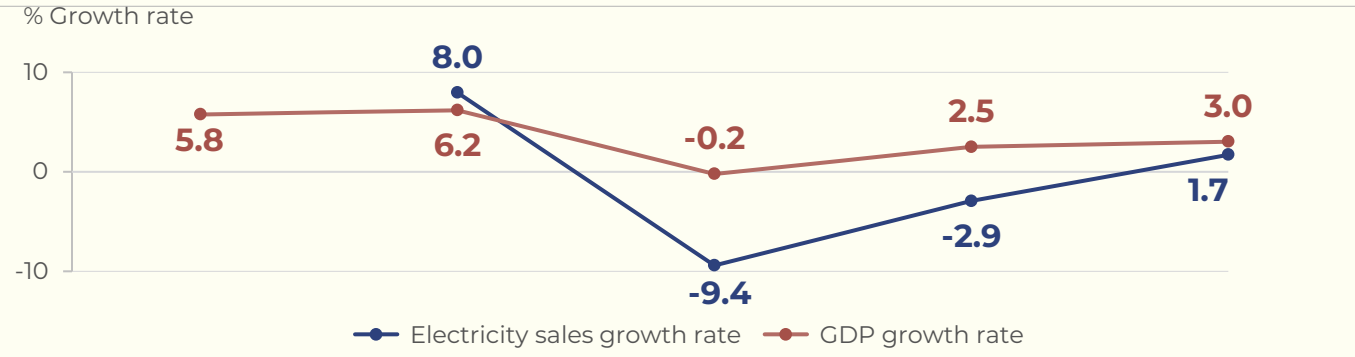
Energy delivered and capacity utilization factor of 660kV HVDC line, FY25

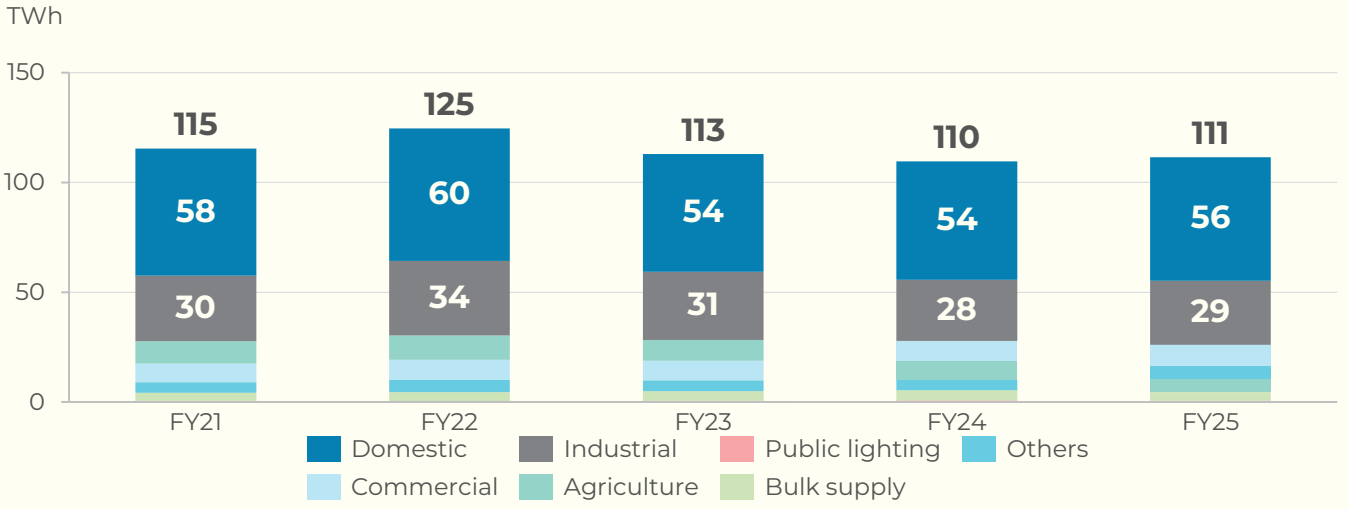
Data source: NEPRA State of Industry Report 2025 & RF's calculations

Distribution

National electricity demand is increasingly being met outside the grid

In FY25, grid sales reached 111 TWh, up just 1.7% YoY despite 5.3% consumer growth. A five-year CAGR comparison shows real GDP growth of 3% and population growth of 2% per annum contrasted with a 1% annual contraction in grid electricity sales. This indicates that incremental demand growth is increasingly being met outside the grid.





Category-wise electricity units sold, FY21 - FY25

Domestic: Sales rose by 4% YoY in FY25, but consumers grew by 6%, implying declining per-household consumption, predominantly due to rooftop solar adoption.

Industrial: Sales increased 5% YoY from 27.7 TWh to 29.1 TWh, largely reflecting increased captive load on the grid rather than broad-based industrial expansion.

Commercial: Sales rose about 6% YoY in FY25, driven mainly by higher usage intensity rather than new connections. A 1.1°C warmer summer likely boosted cooling demand, with improved macro-economic stability providing a supportive backdrop.

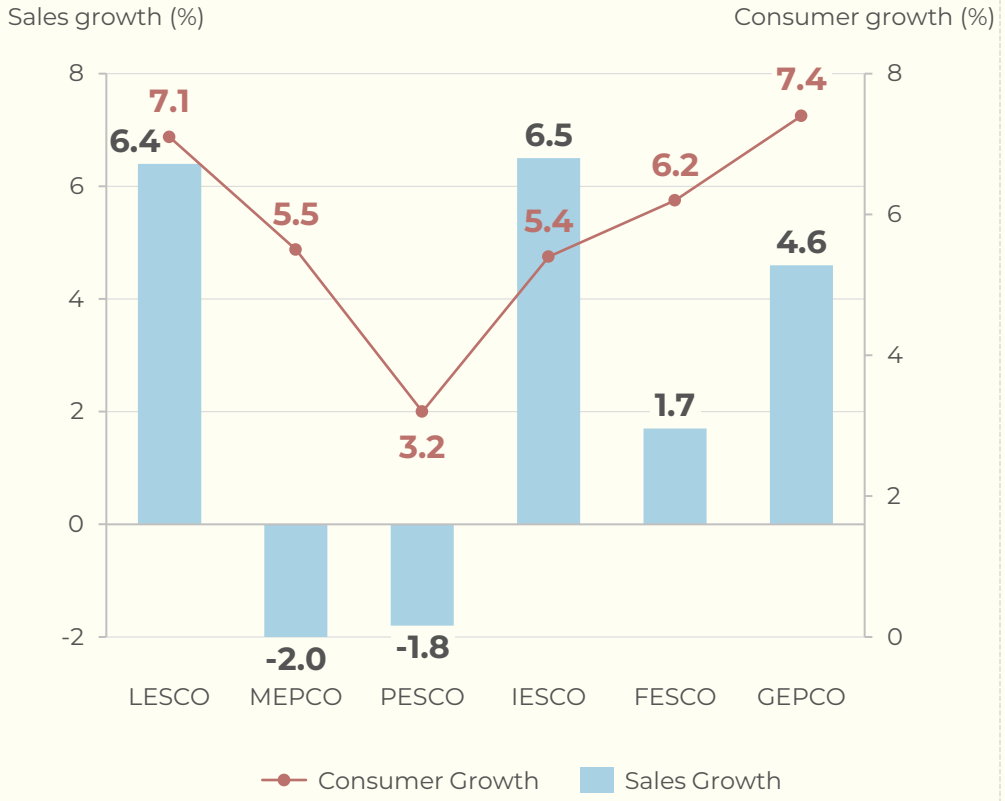
Agricultural: Agricultural sales bucked the sectoral trend, contracting 47% between FY22 (11 TWh) and FY25 (5.8 TWh) even as all other major categories grew, a direct consequence of accelerating solar adoption.

Note: Sales numbers cover K-Electric and DISCOs

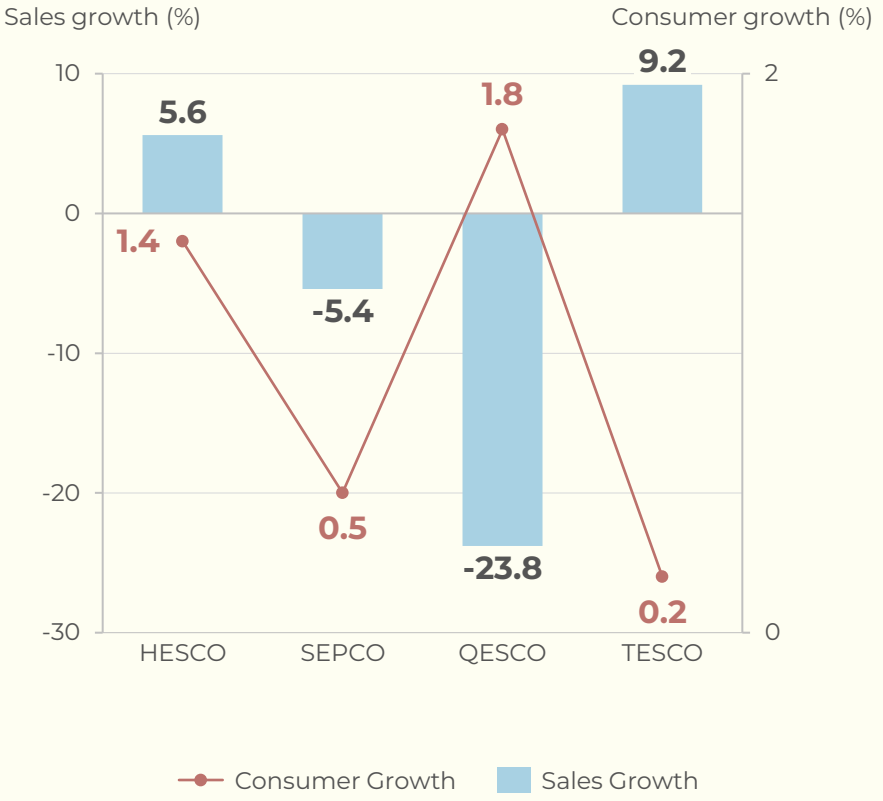
Data source: NEPRA State of Industry Report 2025, State Bank of Pakistan, Pakistan Bureau of Statistics, Pakistan Meteorological Department & RF's calculations

Consumer growth is no longer translating into grid electricity demand for most DISCOs

For most DISCOs, consumer growth has increased YoY to varying degrees. However, this growth has not translated to proportionate growth in electricity sales especially for high net-metering DISCOs. For MEPCO, which ranks second in net-metering penetration, consumers grew by 5.5% YoY, but sales declined by 2% over the same time period.



Growth in consumers and electricity sales: high net-metering DISCOs, FY24 - FY25

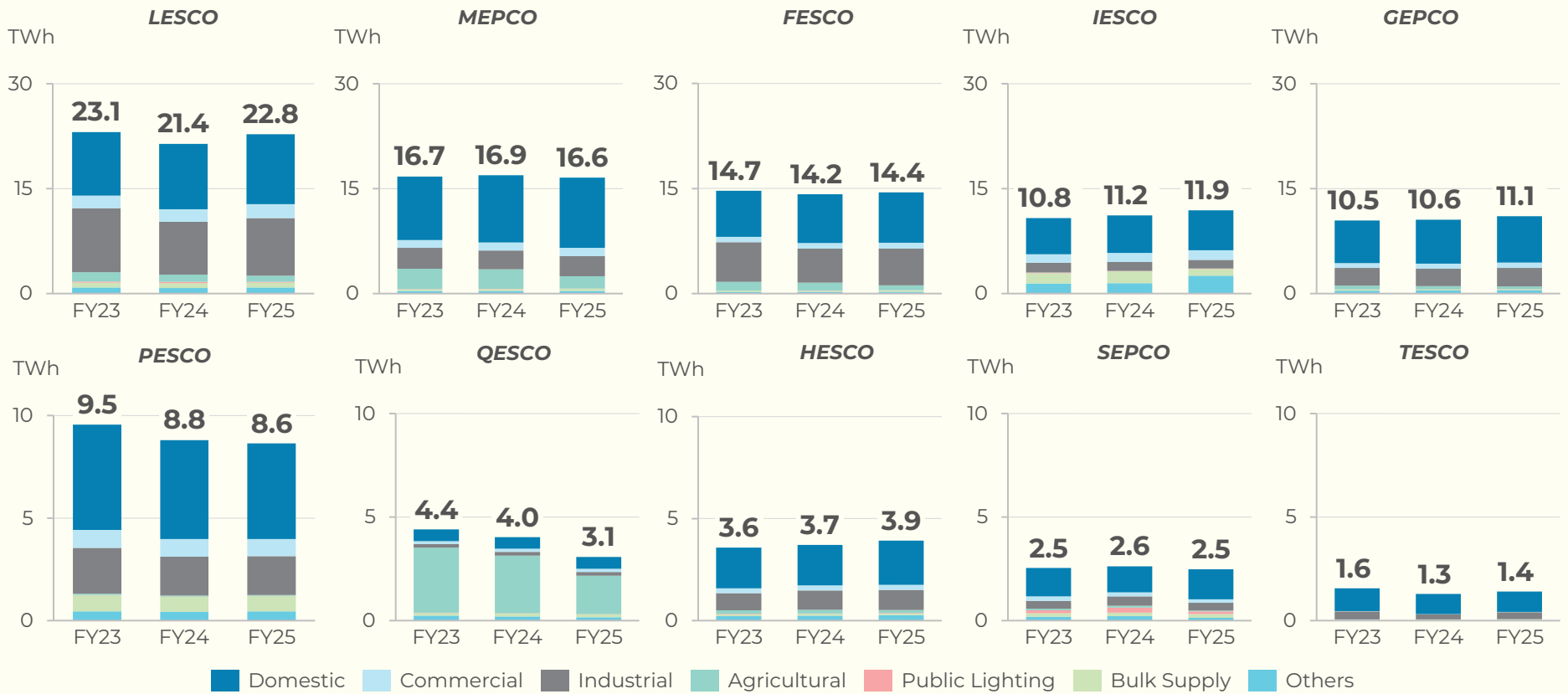


Growth in consumers and electricity sales: low net-metering DISCOs, FY24 - FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Volumetric growth plateaus as solar absorbs incremental demand across DISCOs

Sales across major DISCOs show modest growth or stagnation between FY23 - FY25, with clear divergence across service territories. LESCO and MEPCO remain the primary volume anchors, while smaller DISCOs such as QESCO and TESCO continue to exhibit declining or volatile offtake. Despite rising consumer numbers, volumetric expansion remains muted, indicating rapid solar adoption. .

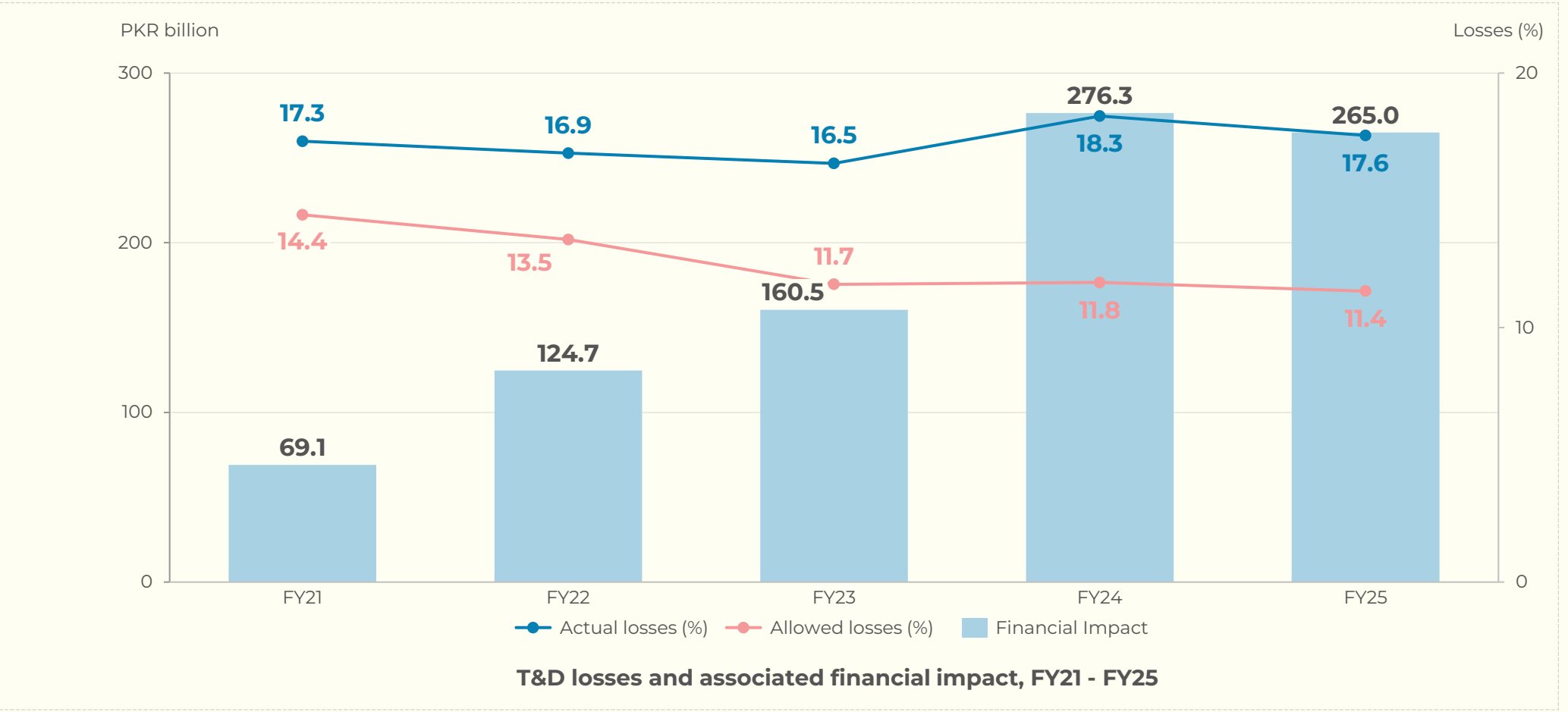


DISCO-wise segment-based electricity sales, FY23 - FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Financial burden from transmission and distribution (T&D) losses reaches 4 times FY21 levels in FY25

In FY25, T&D losses in the CCPA-G system were 17.55%, well above the allowed 11.43%, despite a slight improvement from FY24 (18.31%). The financial impact remained substantial at PKR 265 B, nearly 4× FY21 levels, and ultimately borne by consumers through tariffs. The surge in financial losses reflects both persistently high loss rates and rising system costs, with planned reforms yet to deliver sustained system-wide efficiency gains.

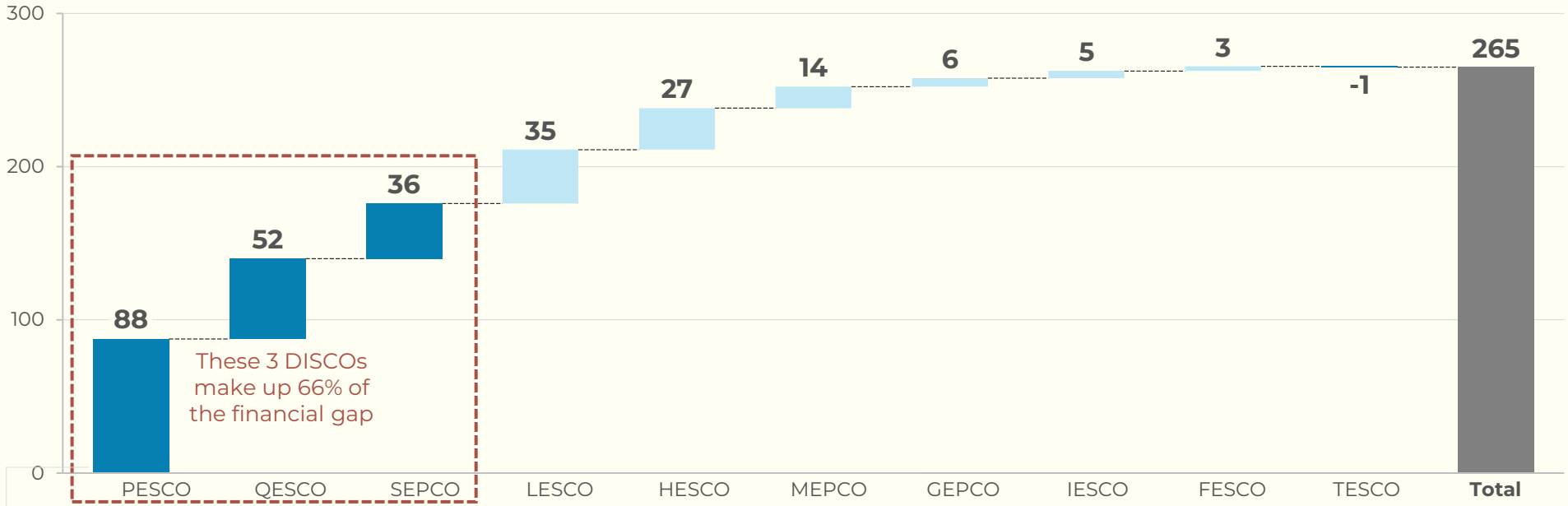


T&D losses and associated financial impact, FY21 - FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Uneven DISCO-wide losses make the case for differentiated reforms

In FY25, the PKR 265 B loss impact was heavily concentrated in a few DISCOs. PESCO, QESCO and SEPCO alone account for the bulk of the financial gap, reflecting large deviations from allowed loss targets, while several other DISCOs remain close to or below benchmark levels. This highlights that the T&D loss challenge is not system-wide in equal measure, but geographically and operationally concentrated requiring targeted reforms.



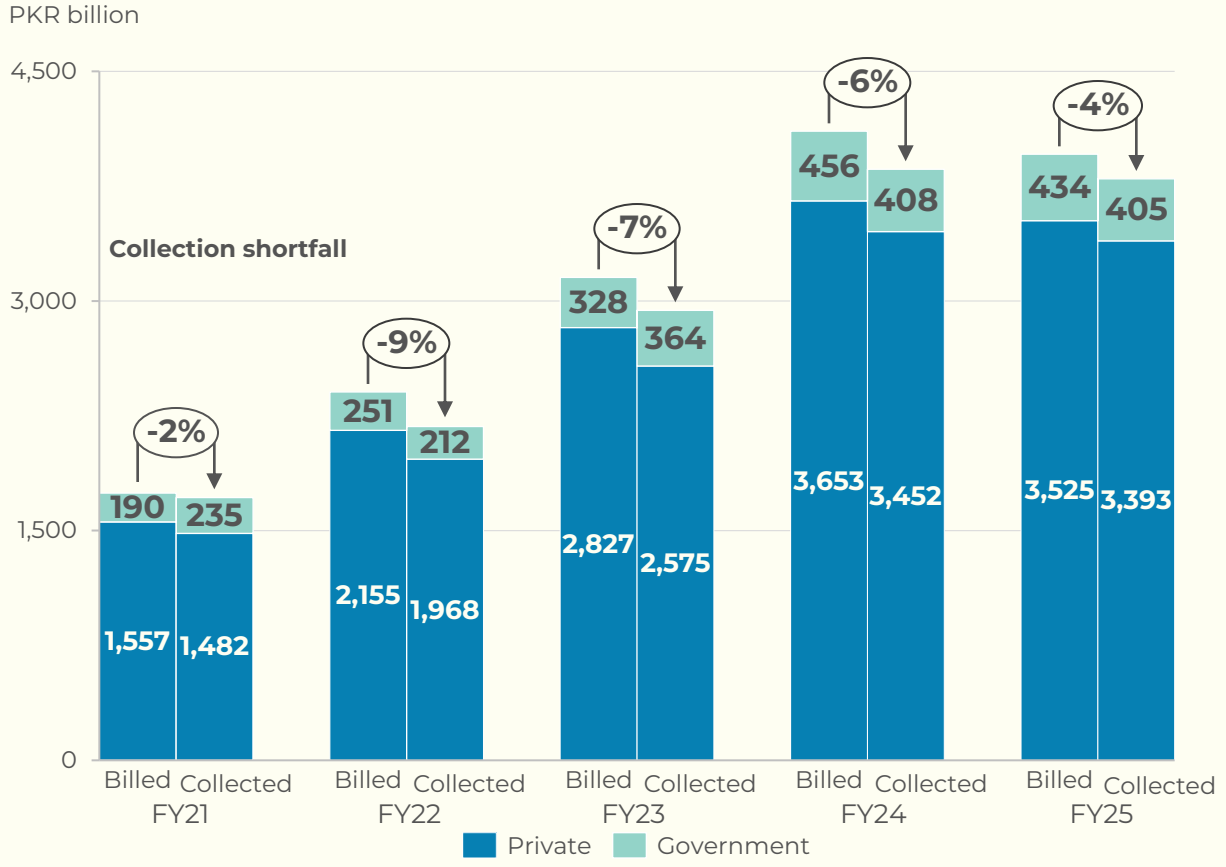
	PESCO	QESCO	SEPCO	LESCO	HESCO	MEPCO	GEPCO	IESCO	FESCO	TESCO
Actual Losses (%)	37.15	38.44	39.18	13.7	27.89	13.81	10.6	8.61	9.02	8.3
Allowed Losses (%)	19.26	13.81	16.31	9.46	17.55	11.34	8.9	7.31	8.38	8.89
Difference	17.89	24.63	22.87	4.24	10.34	2.47	1.7	1.3	0.64	-0.59

DISCO-wise T&D losses and associated financial impact, FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Collection shortfall reflects underlying recovery inefficiencies , not solar uptake

In FY25, collection shortfall declined to PKR 160 B (-4%) from PKR 249 B (-6%) in FY24 but remains a significant contributor to circular debt. Shortfalls are geographically concentrated, with QESCO, HESCO, and SEPCO accounting for the bulk of the gap. Notably, high-solar DISCOs such as LESCO and IESCO maintained >100% collection, indicating that under-recovery reflects inefficiency problems rather than distributed solar uptake.



Billing and collection trends, FY21 - FY25

DISCO	Collection shortfall (PKR B)	Collection rate %
QESCO	85.3	38.75
HESCO	40.5	74.26
SEPCO	29.3	70.16
PESCO	26.3	92.38
TESCO	3.9	91.89
GEPCO	-1.9	100.43
FESCO	-2.2	100.37
MEPCO	-3.2	100.51
IESCO	-4.9	100.97
LESCO	-12.9	101.3

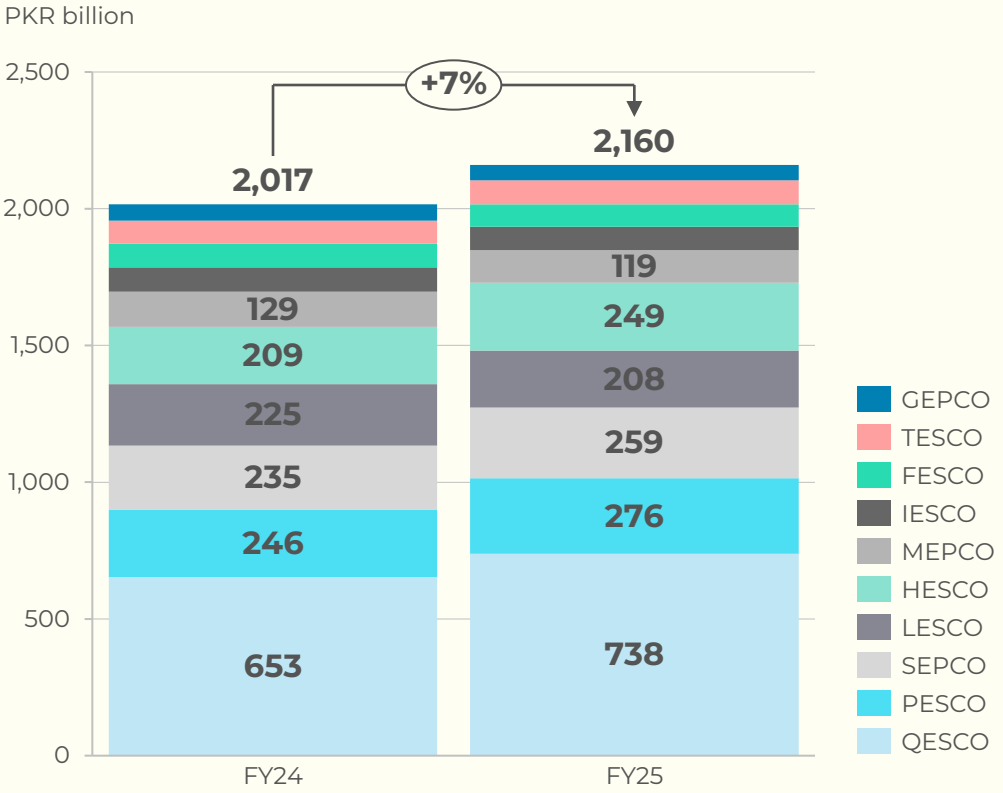
Collection shortfall = billing – collection
Collection rate = collection/billing

DISCO-wise collection shortfall, FY25

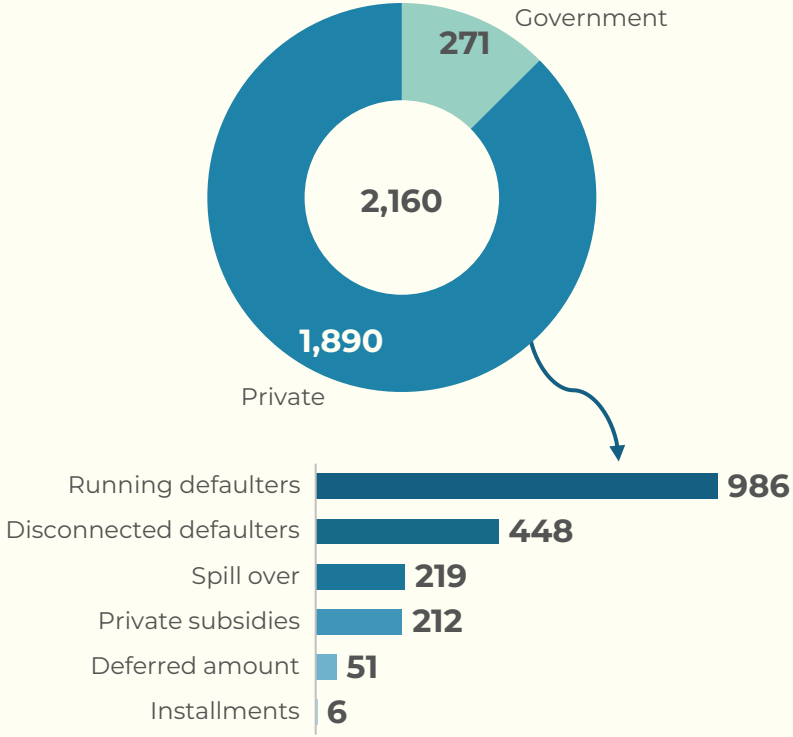
Data source: NEPRA State of Industry Report 2025 & RF's calculations

DISCO receivables increased to PKR 2.1 T with concentration in aged private defaults

By June 2025, net DISCO receivables had risen to PKR 2.1 T. Over 60% of this stock is concentrated in private sector defaults (aged 6 months or more), with QESCO, SEPCO, and HESCO accounting for most of the outstanding amount. In these three DISCOs, a significant portion of receivables has remained overdue for more than three years, effectively locking up more than one year of annual revenue in some DISCOs and intensifying liquidity stress.



Net receivables of DISCOs, FY24 - FY25

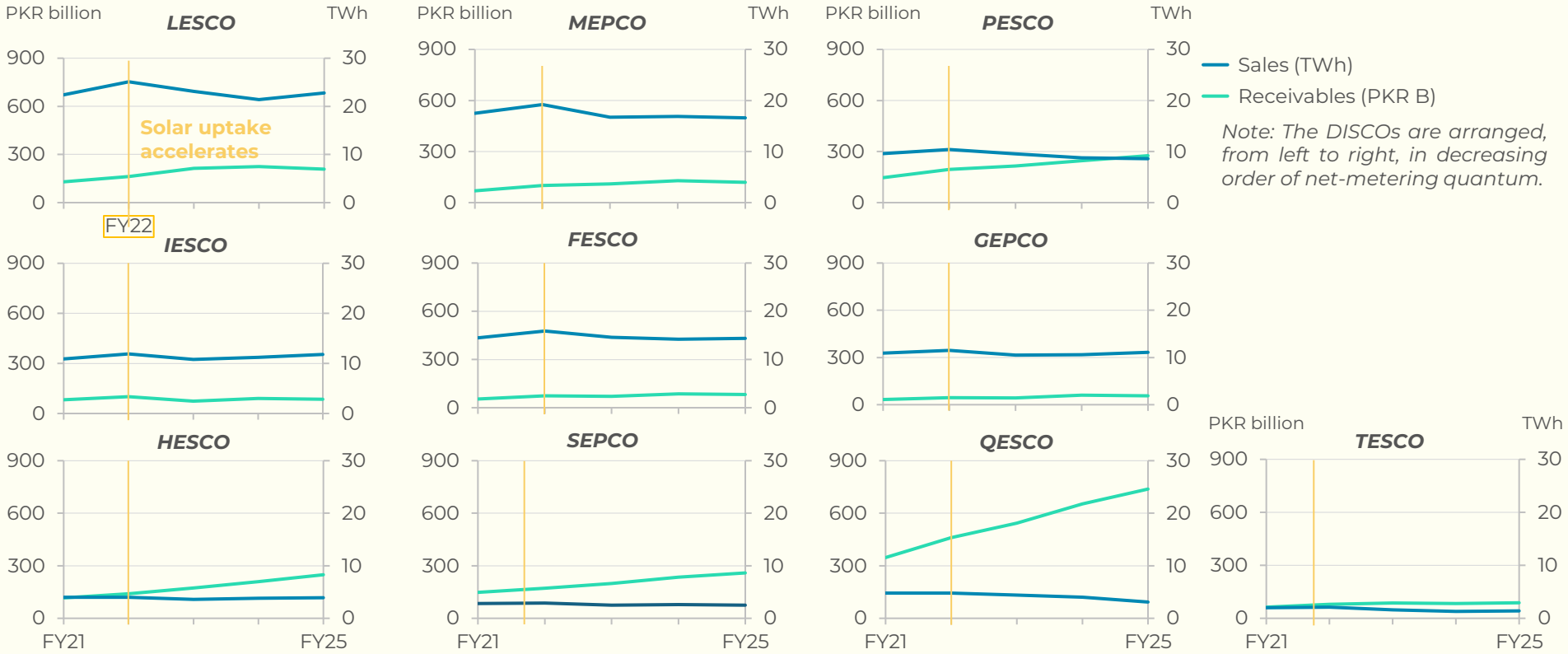


Breakdown of FY25 receivables (PKR billion)

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Volumetric revenue model is increasingly misaligned with the emerging power demand patterns

Pakistan's distribution framework was structured around assumptions of sustained growth in volumetric sales to recover fixed costs. As distributed solar expands and grid sales growth moderates (through decline or stagnation), this cost-recovery model is being tested, exposing pre-existing vulnerabilities within the system. However, financial stress remains concentrated in historically weak recovery jurisdictions, indicating operational challenges alongside evolving demand patterns are central to current receivables pressures.



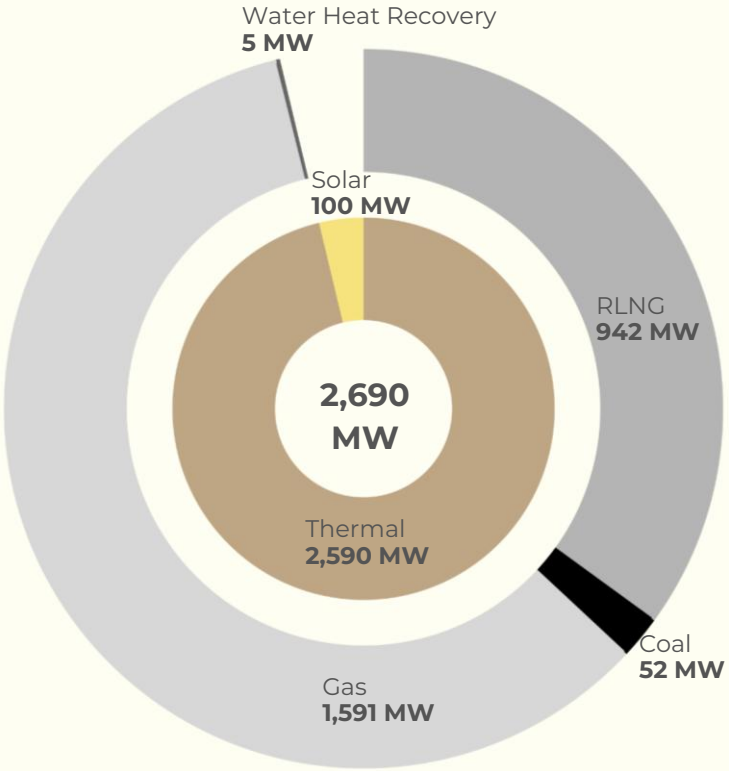
DISCO-wise trends in grid sales (TWh) and net receivables (PKR B), FY21 - FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

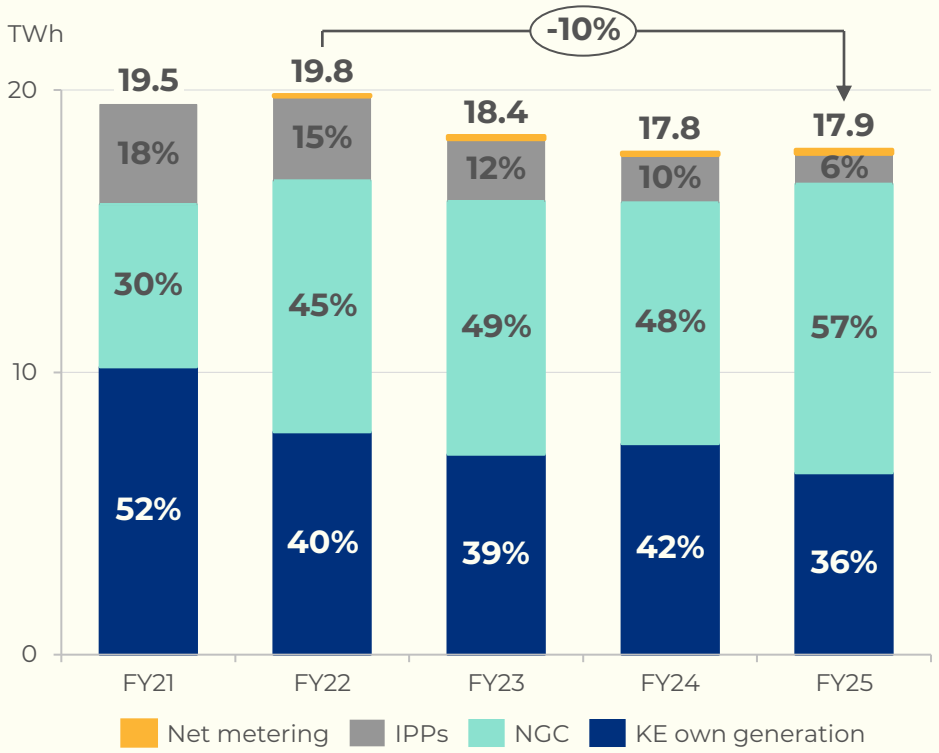
K-Electric

K-Electric increased reliance on the national grid amid generation capacity decline in FY25

During FY25, K-Electric's installed generation capacity declined 20% YoY, from 3.4 GW to 2.7 GW, following the expiry of RFO-based IPPs' contracts and the retirement of Bin Qasim Thermal Power Station-I (BQTPS) units 1 and 2 (2×210 MW). In FY25, generation from K-Electric-owned plants and IPPs fell 18% YoY to 7.5 TWh due to reduced dispatch, while the Karachi-Keti Bandar Interconnection (KKI) enabled K-Electric to draw 10.2 TWh of lower-cost power from national grid, offsetting shortfalls.



Energy source-wise K-Electric installed capacity, FY25



K-Electric's generation mix, FY21 - FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

In FY25, the energization of the 500/220 kV KKI grid station strengthened K-Electric's interconnection with the national grid

During FY25, K-Electric commissioned its first 500/220 kV grid station, along with one 220 kV and two 132 kV grid stations, and increased the power transformation capacity by 1,801 MVA.

	Grid stations		Transmission lines (km)		Transmission Capacity (MVA)		Power transformers		Transformers loaded >80%	
	FY24	FY25	FY24	FY25	FY24	FY25	FY24	FY25	FY24	FY25
500 kV	0	**1**	0	7	0	1,800	0	0	0	0
220 kV	11	12	436	467	5,500	5,500	0	0	0	0
132 kV	60	62	805	805	7,116	7,117	180	180	37	62
66 kV	3	3	153	153	79	79	4	4	2	2
	74	**78**	**1,394**	**1,432**	**12,695**	**14,496**	**184**	**184**	**39**	**64**

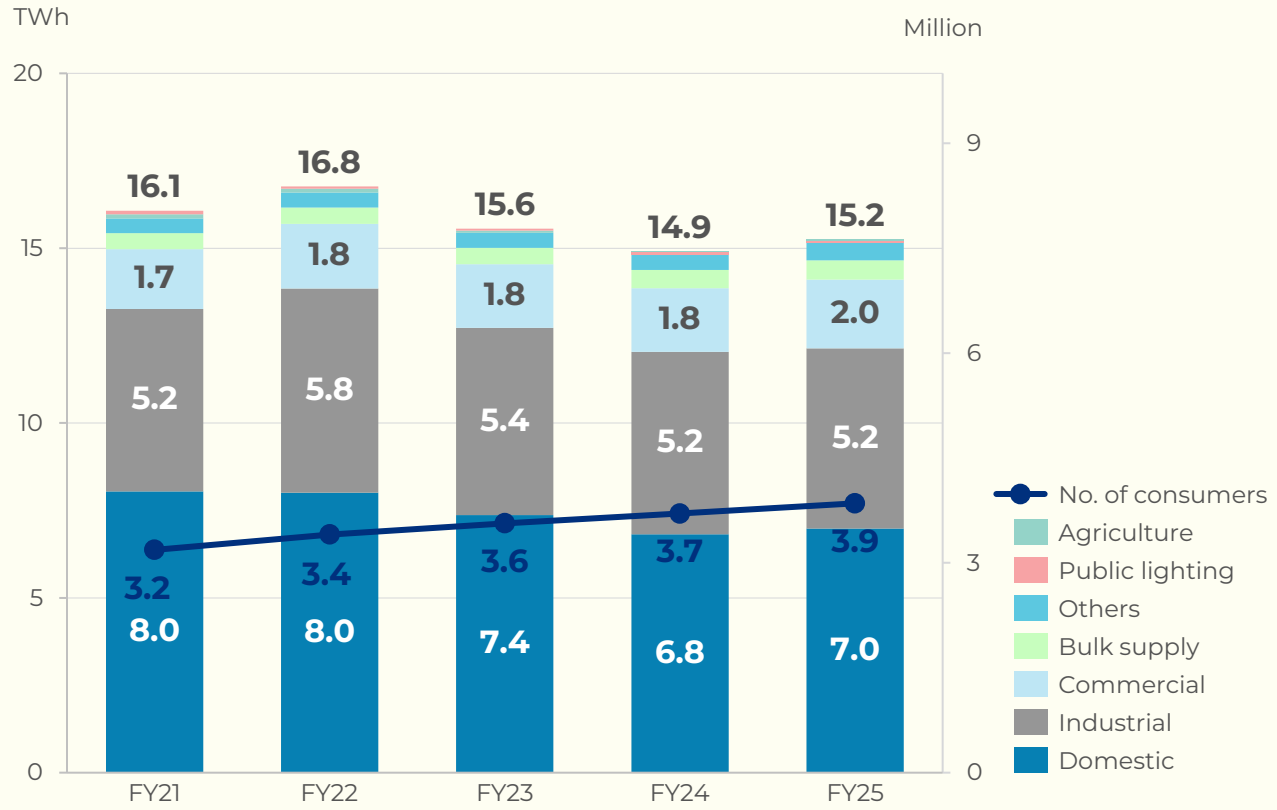
K-Electric's transmission infrastructure, FY24 - FY25

- In FY25, the 500/220 kV KKI grid station was provisionally commissioned with a 1,600 MW import limit, enabling KE to draw power via the KKI–K2/K3 and KKI–Jamshoro lines. KKI strengthened transmission to Karachi, allowing bulk imports of low-cost nuclear power from K-2 and K-3, reducing stress on local generation, mitigating bottlenecks, and enhancing system reliability
- At the 132/66/11 kV level, nearly one-third of transformers operated above 80% capacity in FY25, a 68% YoY increase from 37 in FY24, signaling rising network stress and reduced flexibility during peak demand and system disturbances.

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Electricity sales in K-Electric rose 2.3% YoY after two years of consecutive decline

In FY25, K-Electric's sales rose to 15.24 TWh from 14.9 TWh, supported by targeted demand-revival measures, including winter relief packages and tariff concessions. The recovery remains fragile amid high electricity tariffs and rising BTM and rooftop solar adoption.



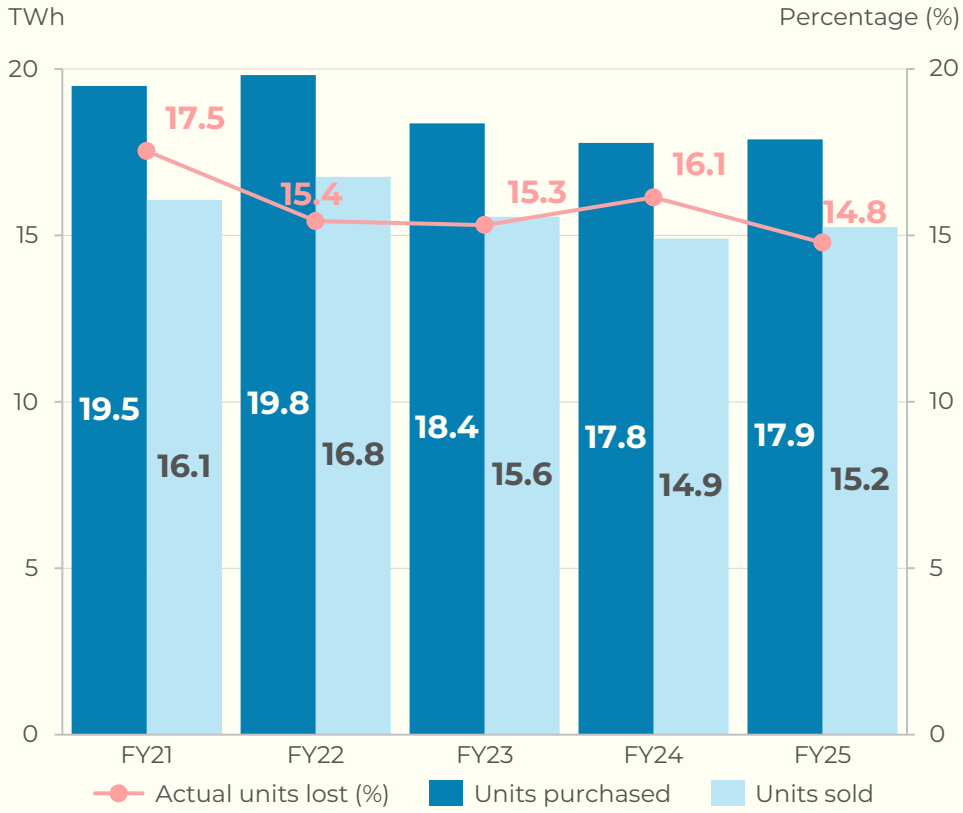
Electricity units sold and consumer growth in K-Electric, FY21 - FY25

- **Domestic** consumers rose 4.3% YoY to 3.3 M in FY25, accounting for 85% of the total consumer base, while electricity sales increased just 2.5% YoY to 7 TWh, as solar adoption and tariff sensitivity limited per-household grid consumption despite higher connections.
- **Commercial** sales rose from 1.8 TWh to 2.0 TWh, supported by higher business activity.
- **Industrial** sales declined to 5.15 TWh, with consumers falling 1.5% YoY, as weak industrial output and a shift to solar generation limited grid usage despite short-term incentives.

Data source: NEPRA State of Industry Report 2025 & RF's calculations

In FY25, K-Electric T&D losses stood at 14.8%, resulting in the financial burden of PKR 1.1 B

During FY25, T&D losses improved by 1.36 percentage points YoY, declining from 16.14% in FY24, resulting in an estimated loss of 2.6 TWh of electricity. Meanwhile, K-Electric's losses remained lower than FESCO and IESCO among the high-performing DISCOs (Ref: Slide 31) T&D losses are reflected in consumer bills, highlighting the need for improved monitoring and theft control measures.



Units purchased, units sold and unit losses, FY21 - FY25

Actual losses (%) | **Allowed losses %** | **Point difference**

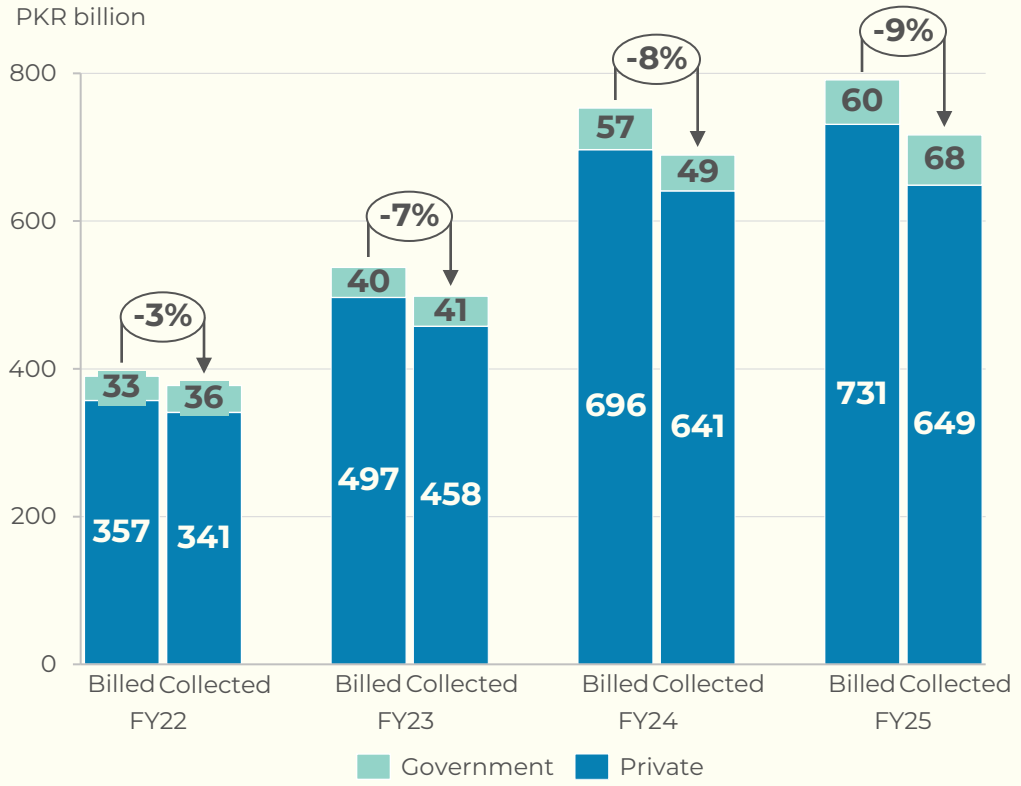
	FY21	FY22	FY23	FY24	FY25
Actual losses (%)	17.5	15.4	15.3	16.1	14.8
Allowed losses (%)	16.8	16.0	15.4	14.6	14.6
Point difference	**0.74**	**-0.53**	**-0.05**	**1.56**	**0.20**

Actual vs projected T&D losses, FY21 - FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Persistent recovery shortfalls are increasing the financing burden on K-Electric

K-Electric's collections continued to lag billing, widening the recovery gap to around PKR 80 B in FY25 and straining cash flows. Domestic consumers, nearly 85% of the customer base, recovered only 78% of billed revenue, making households the primary driver of the utility's recovery shortfall. Meanwhile, industry provided only limited offset to the recovery gap, reinforcing the need for targeted loss-reduction and improved billing enforcement.



Sector-wise amount billed vs collected, FY22 - FY25

	No. of consumers (thousands K)	Units Sold (TWh)	Amount billed (PKR billion)	Collection ratio (%)
Domestic	3,259	7.0	330	**78.2**
Agriculture	2	0.04	0.6	**47.2**
Commercial	545	2.0	145	**93.0**
Bulk power	0	0.6	30	**101.0**
Industry	23	5.2	249	**102.0**
Others	23	0.5	32	**104.7**
Public lighting	0.2	0.1	3	**135.9**
	3,852	**15**	**791**	**90.5**

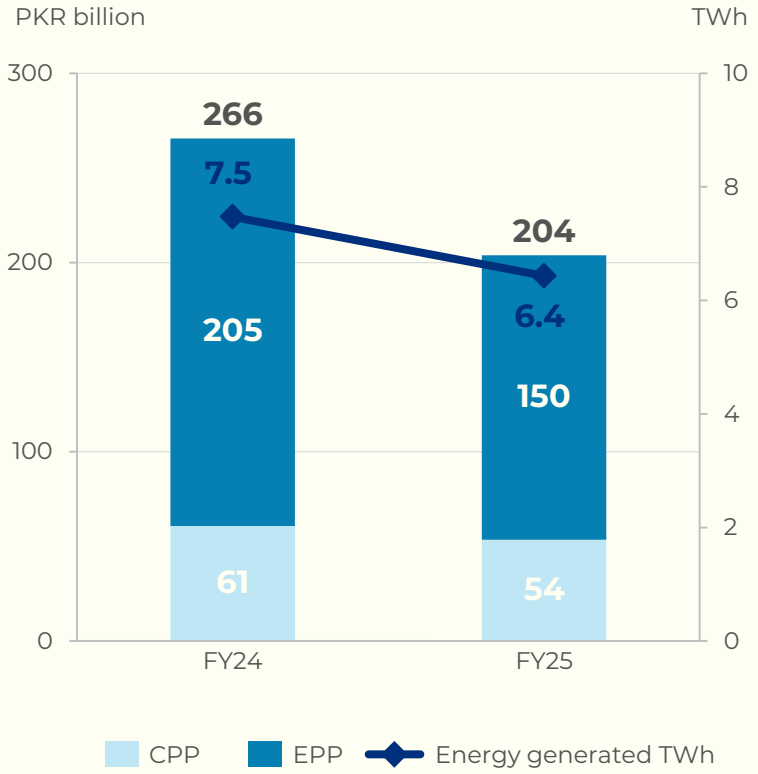
Category-wise collection shortfall, FY25

Note: A collection ratio above 100% may include adjustments for previous years' arrears or settlements

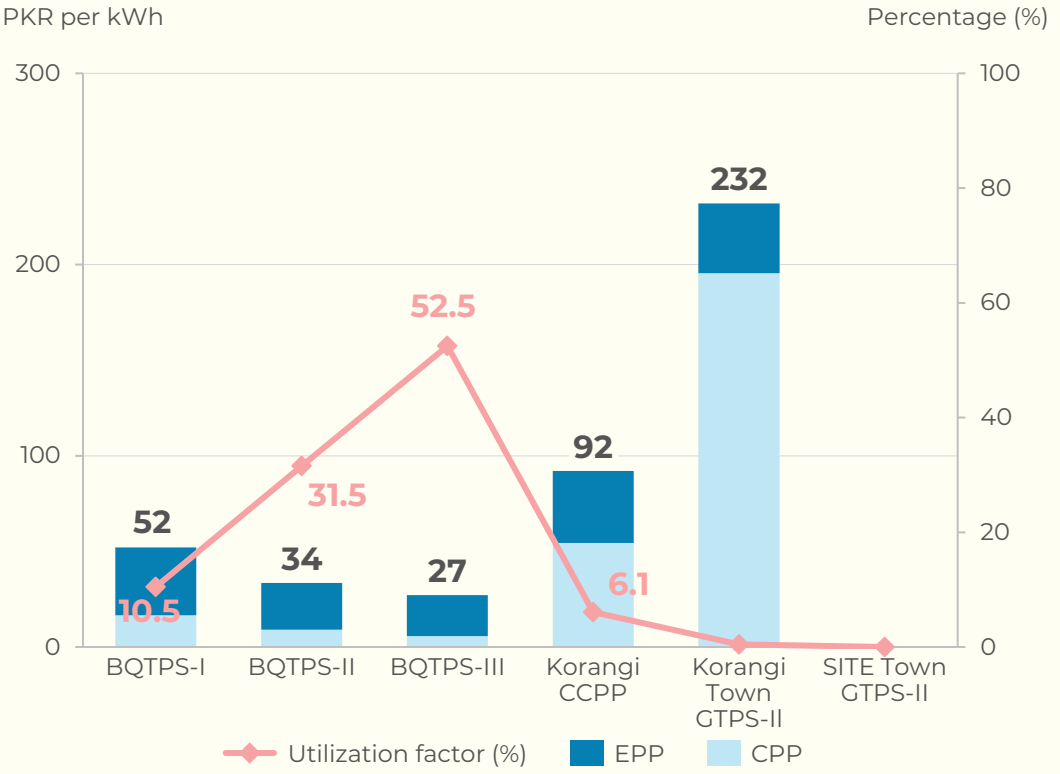
Data source: NEPRA State of Industry Report 2025 & RF's calculations

K-Electric's in-house power plants' generation tariff fell 11% YoY amid reduced reliance on expensive thermal generation

K-Electric's own power plants' generation cost declined from PKR 36 per kWh in FY24 to PKR 32 per kWh in FY25, driven by greater reliance on cheaper grid electricity i.e., PKR 27 per kWh. Energy payments dropped 27% YoY as K-Electric reduced dispatch from its thermal fleet, while capacity payments declined 12% YoY following the retirement of older units. Thermal plants' utilization remained low at 26%, with BQTPS-III providing the largest output amid selective dispatch, while Korangi GTPS's 0.6% utilization due to low gas and RLNG supply pushed costs to 232 PKR per kWh.



K-Electric own power plants: EPP, CPP and electricity generated (FY24 - FY25)



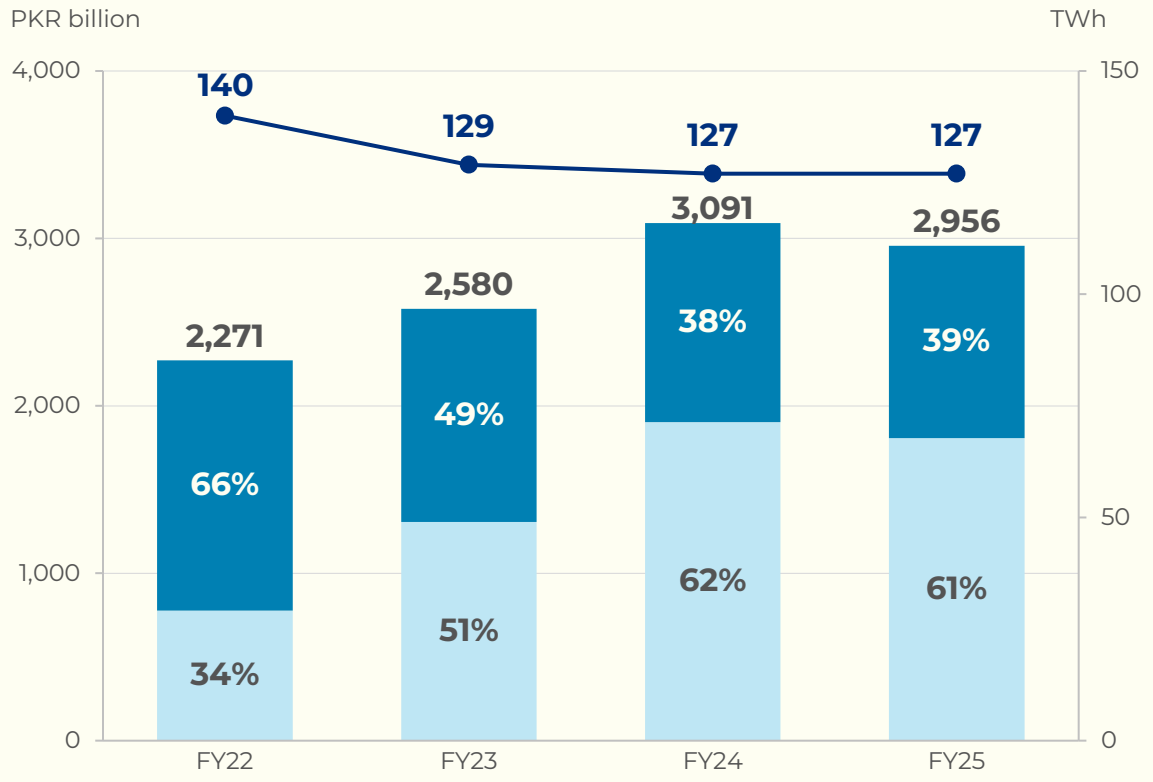
K-Electric own power plants: EPP, CPP, and utilization factor, FY25

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Grid economics

Capacity rationalization cuts Pakistan's power purchase cost by 4.4% YoY in FY25

During FY25, the exit of 4.6 GW of generation capacity helped to reduce capacity payment obligations, leading to a decline in power purchase costs to PKR 2.9 T from PKR 3.1 T in FY24.



EPP, CPP and energy generated, FY22 - FY25

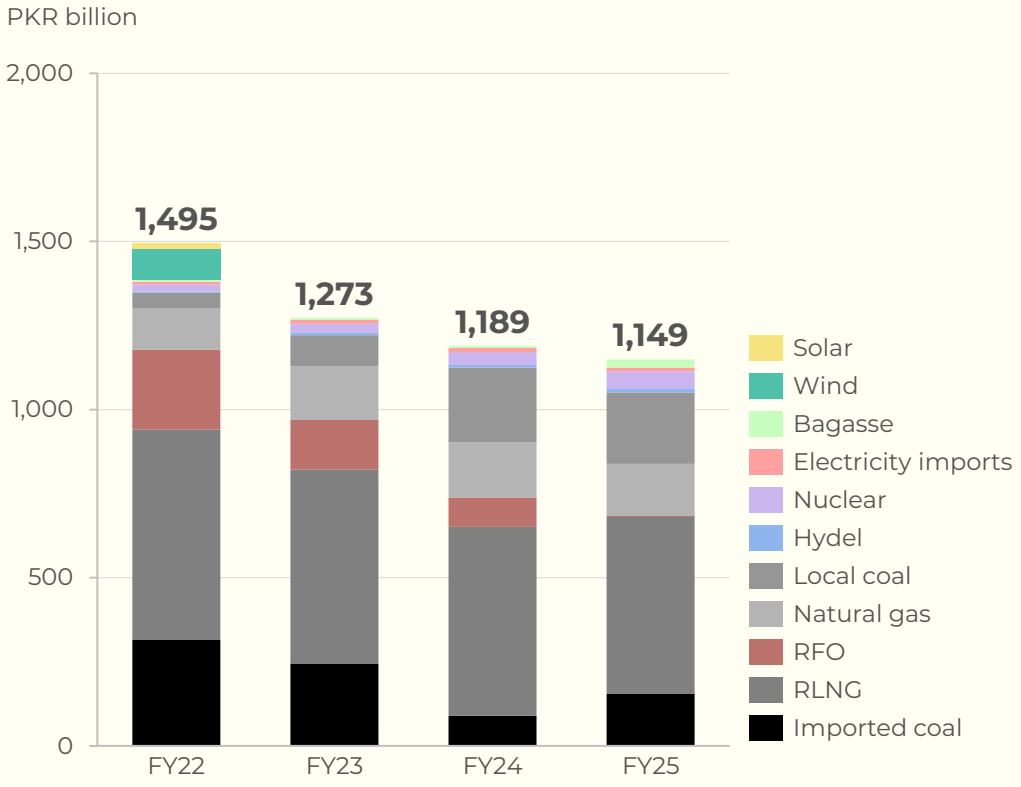
- During FY23 - FY25, CPP surged by 38%, driven by RLNG, coal, and hydel additions, with debt repayments intensifying financial pressure on the power sector.
- Total generation cost stood at PKR 23.3 per kWh in FY25. During FY23 to FY25, EPP fell from PKR 9.85 per kWh to PKR 9.04 per kWh, about 8% decline, due to merit order shift away from expensive fuels, meanwhile CPP rose from PKR 10.11 per kWh to PKR 14.21 per kWh, nearly 40% increase, during same period, showing rising dominance of fixed capacity charges in overall generation cost.
- Between FY22 and FY25, electricity generation fell 9%, while CPP alone accounted for 61% of total power purchase cost in FY25, highlighting a system paying more for less output and the need to improve capacity utilization.

Note: K-Electric numbers are not included in the above graphs

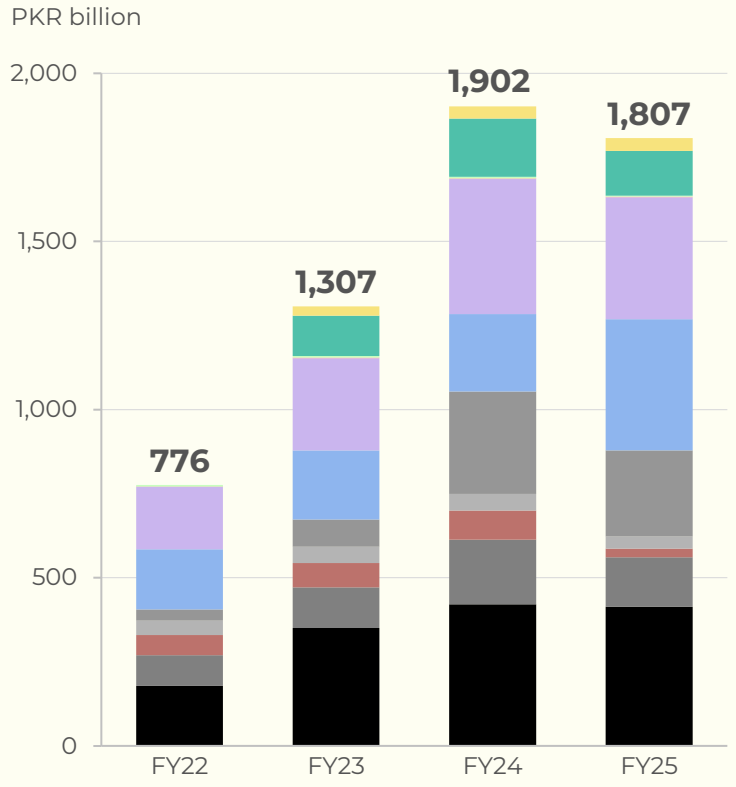
Data source: NEPRA State of Industry Report 2025 & RF's calculations

Increased imported coal generation raised its share in EPP, while hydel capacity addition drove higher CPP in FY25

During FY25, hydel CPP rose by 70% YoY as new capacity additions kept fixed payments for capital recovery and debt servicing elevated despite moderate generation. Meanwhile, higher generation from imported coal increased its EPP by 72% YoY, off-setting the impact of IPPs' retirements and renegotiations. EPP from bagasse-fired plants rose despite lower generation, reflecting higher fuel cost components and tariff indexation.



Energy source-wise EPP, FY22 - FY25



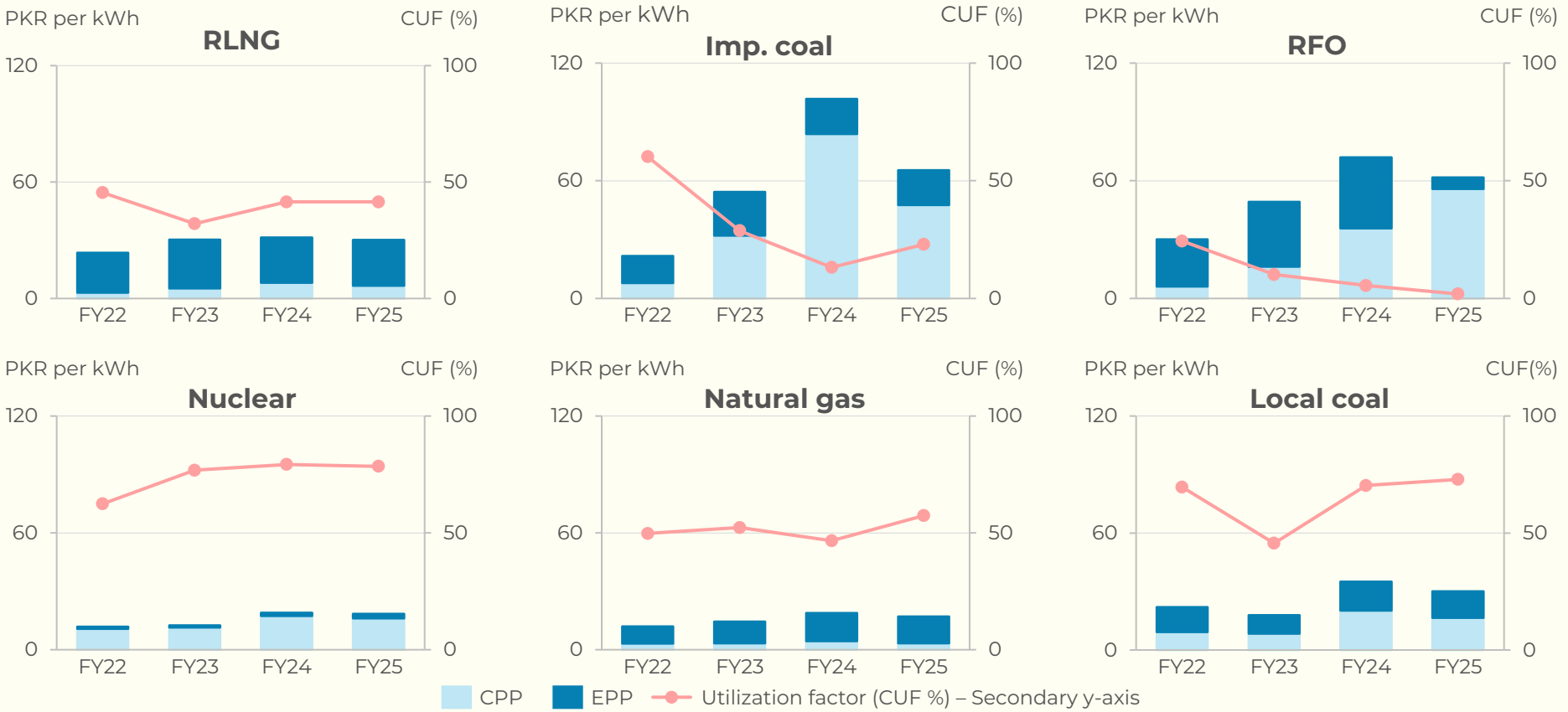
Energy source-wise CPP, FY22 - FY25

Note: K-Electric numbers are not included in the above graphs

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Soaring costs and collapsing utilization turn imported fuels into a system burden

Imported coal costs tripled from FY22 to FY25, reaching PKR 65 per kWh, while utilization fell from 60% to 23%, as higher costs pushed it down the merit order and curtailed its dispatch. RLNG operates at a 41% utilization factor, mainly during peak demand or gas shortfalls, keeping system costs elevated, while RFO, at just 2% utilization, still incurs costs of PKR 62 per kWh, adding to overall system inefficiencies.



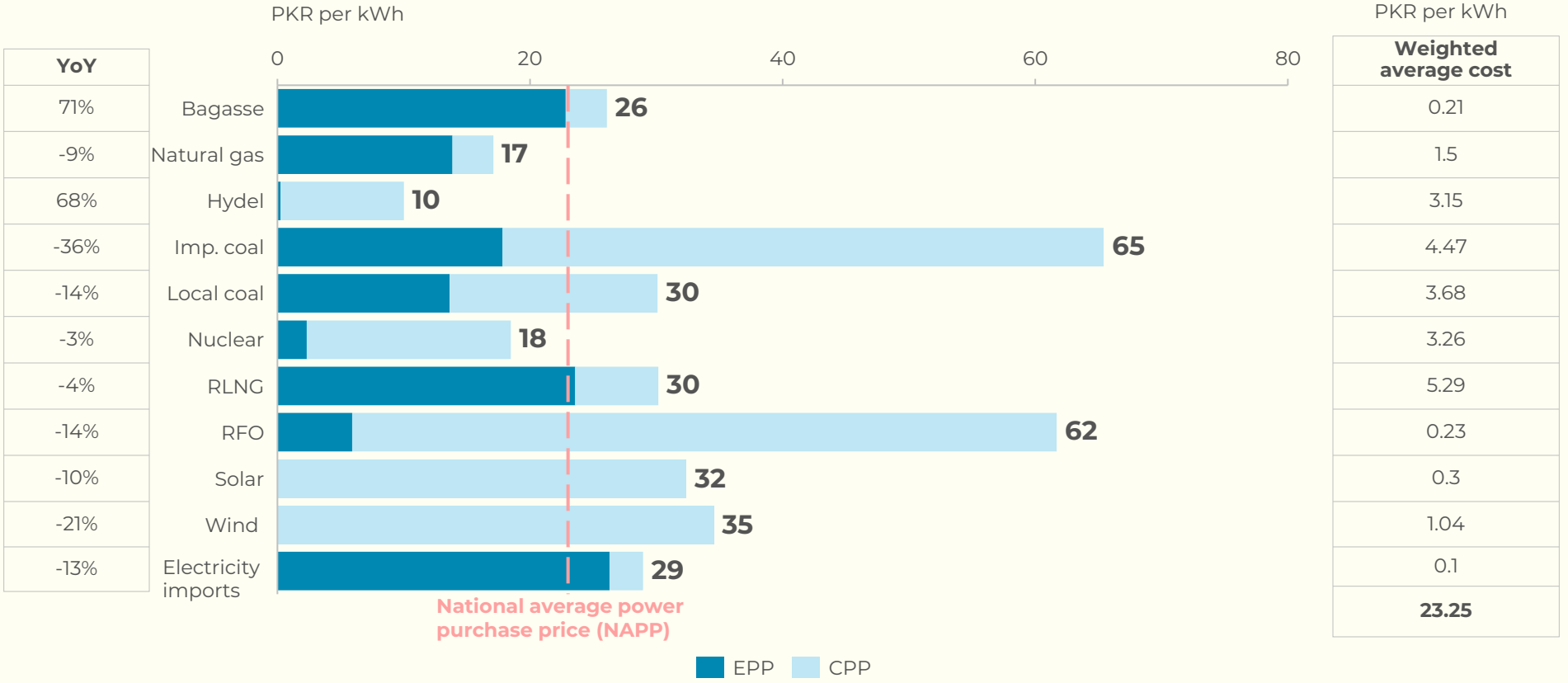
Thermal source-wise EPP, CPP and plant utilization factor, FY22 - FY25

Note: K-Electric numbers are not included in the above graphs

Data source: NEPRA State of Industry Report 2025 & RF's calculations

Reliance on imported fuels drove Pakistan's weighted average cost of generation (WACOG) at PKR 23 per kWh in FY25

In FY25, RLNG and imported coal together supplied just 24% of total energy yet contributed 42% of system generation cost, underscoring the disproportionate impact of import-dependent fuels on electricity costs. Meanwhile, hydel, nuclear and natural gas, collectively supplying 58% of total energy, accounted for just 34% of system generation cost, preventing WACOG from rising further.



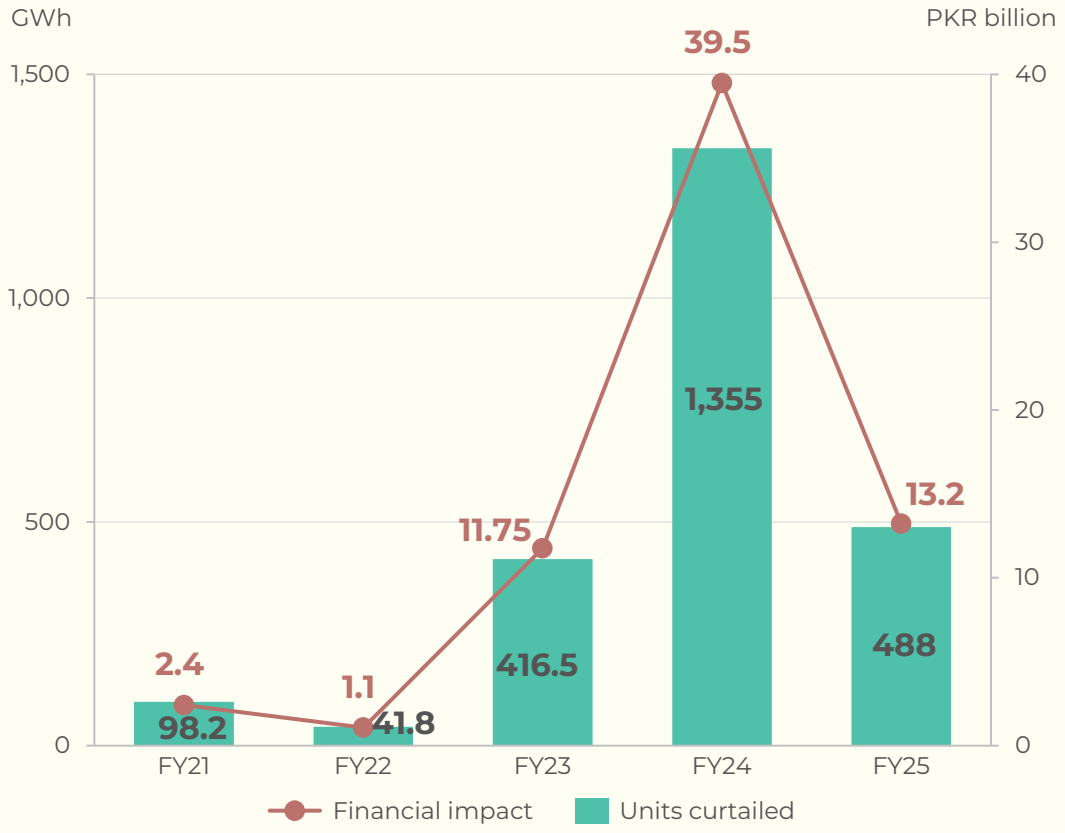
YoY	Weighted average cost
	PKR per kWh
71%	0.21
-9%	1.5
68%	3.15
-36%	4.47
-14%	3.68
-3%	3.26
-4%	5.29
-14%	0.23
-10%	0.3
-21%	1.04
-13%	0.1
	23.25

Energy source-wise power purchase price and WACOG, FY25

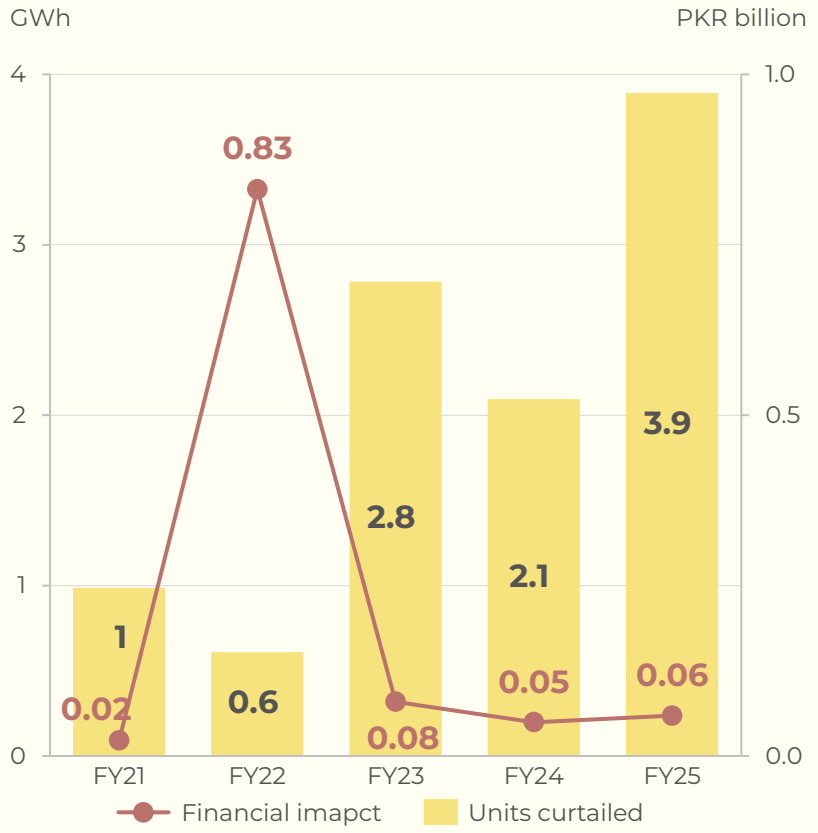
Data source: NEPRA State of Industry Report 2025 & RF's calculations

Grid constraints curtail 492 GWh of wind and solar generation in FY25

Transmission bottlenecks limit the evacuation of wind and solar energy, causing curtailment and underutilization. In FY25, NPMV fell from PKR 39.5 B in FY24 to PKR 13.3 B, a 66% YoY reduction, as NPMV from transmission or distribution limits is charged to the responsible transmission and distribution companies. This shields consumers from grid inefficiencies while incentivizing operators to optimize infrastructure and renewable energy use.



Wind power plants NPMV and its financial impact, FY21 - FY25



Solar power plants NPMV and its financial impact, FY21 - FY25

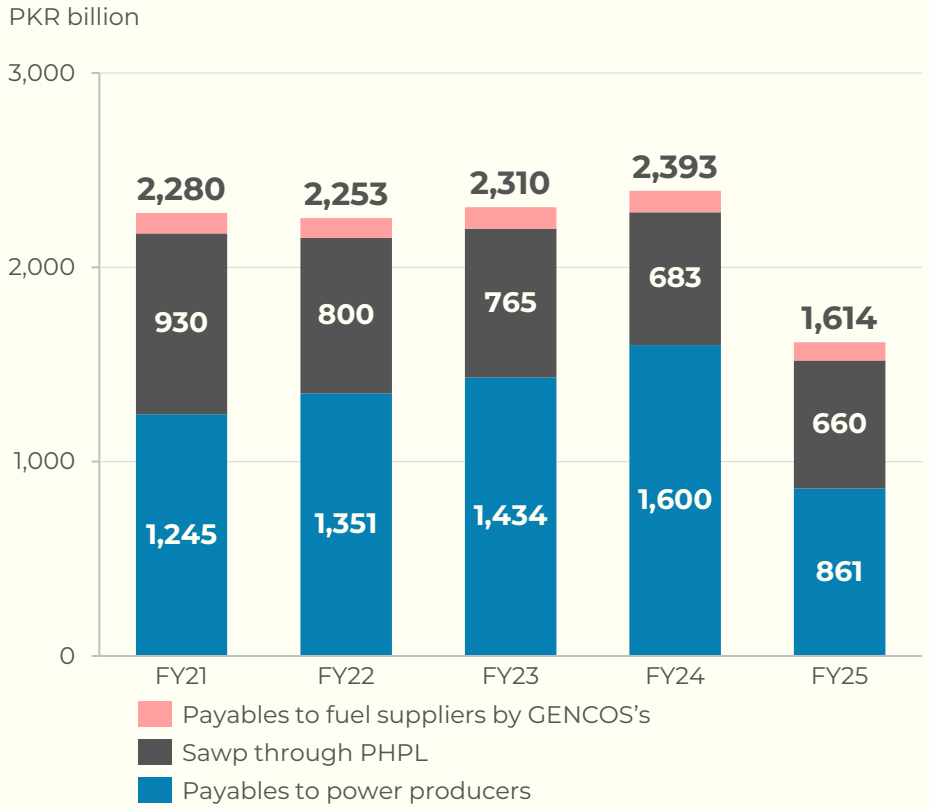
Note: K-Electric numbers are not included in the above graphs

Data source: NEPRA State of Industry Report 2025 & RF's calculations

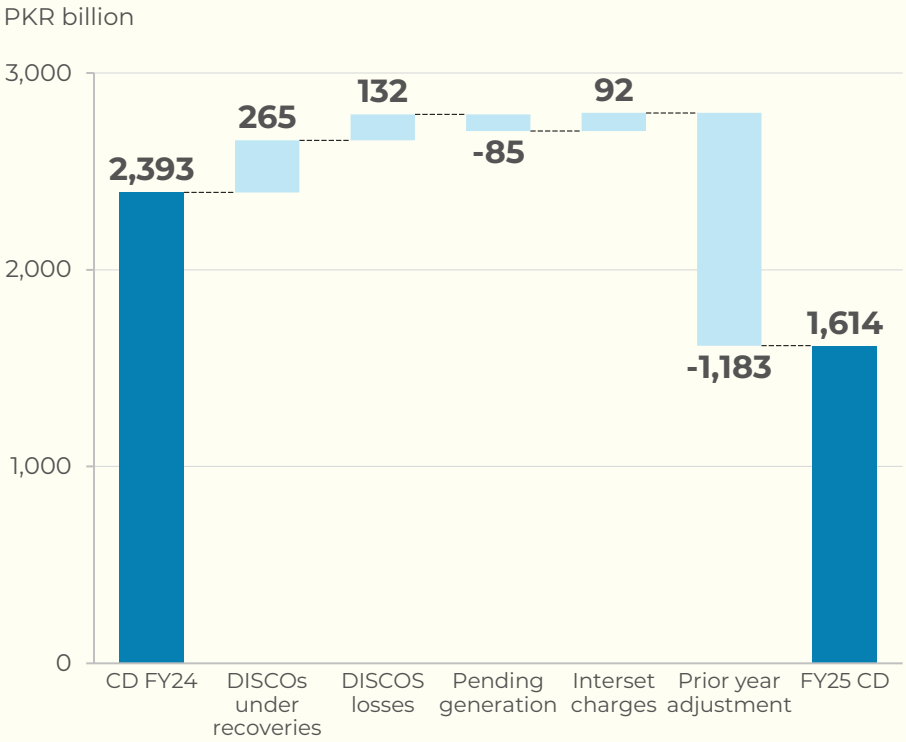
Circular debt

In FY25, circular debt declined to PKR 1.6 T, still standing at 14% of the country's annual tax revenue

As of Jun 25, the power sector's circular debt declined by 32.5% YoY, falling from PKR 2.39 T in FY24 to PKR 1.61 T in FY25. The payable amount to generation dropped by 46% YoY, reaching PKR 0.9 T from PKR 1.6 T in FY24. Government guarantees remain heavily concentrated, with 57% issued for power sector entities.



Power sector circular debt, FY21 - FY25

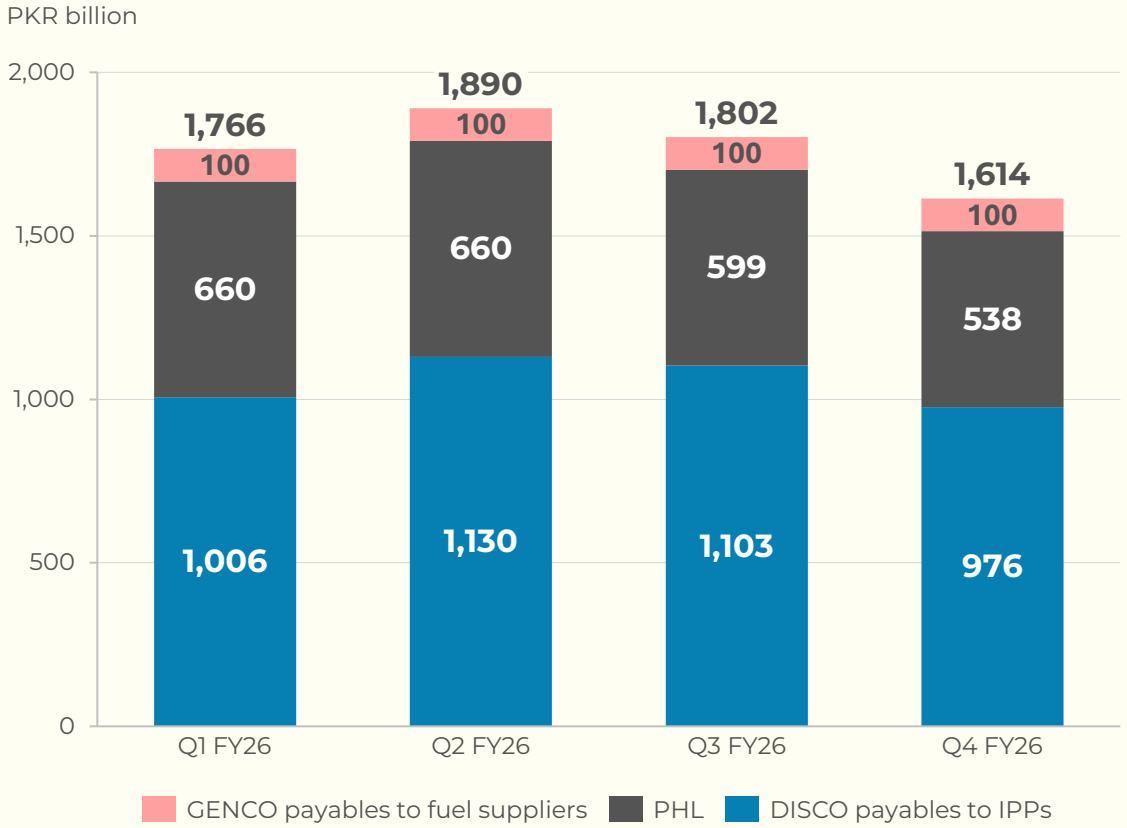


Circular debt composition, FY24 - FY25

Data source: NEPRA, Ministry of Finance, Industry Sources & RF's calculations

CDMP reforms introduced, but stock payments drove FY25 circular debt reduction

Under the new Circular Debt Management Plan (CDMP), Pakistan launched a multi-pronged strategy combining large-scale refinancing, tariff reforms and operational efficiency measures to halt the accumulation of circular debt and gradually eliminate the existing stock by 2031.



CDMP target projections, FY26

1. Financial Restructuring

- Retiring entire Power Holding Limited (PHL) debt and repaying IPPs' arrears with PKR 1,225 B syndicated Islamic financing at KIBOR -0.9%, lowering financing costs.
- A ring-fenced Debt Service Surcharge (DSS) now covers both principal and interest, replacing the earlier interest-only mechanism.

2. IPP Contract Rationalization

Termination of 6 IPPs, renegotiation of 18 contracts under take-and-pay terms, late payment surcharge waivers and debt reprofiling aimed at reducing capacity payments.

3. DISCO Efficiency Reforms

Privatization of DISCOs alongside anti-theft enforcement, AMI metering and operational reforms to reduce distribution losses. Parallel reforms underway in GENCOs to enhance their efficiency.

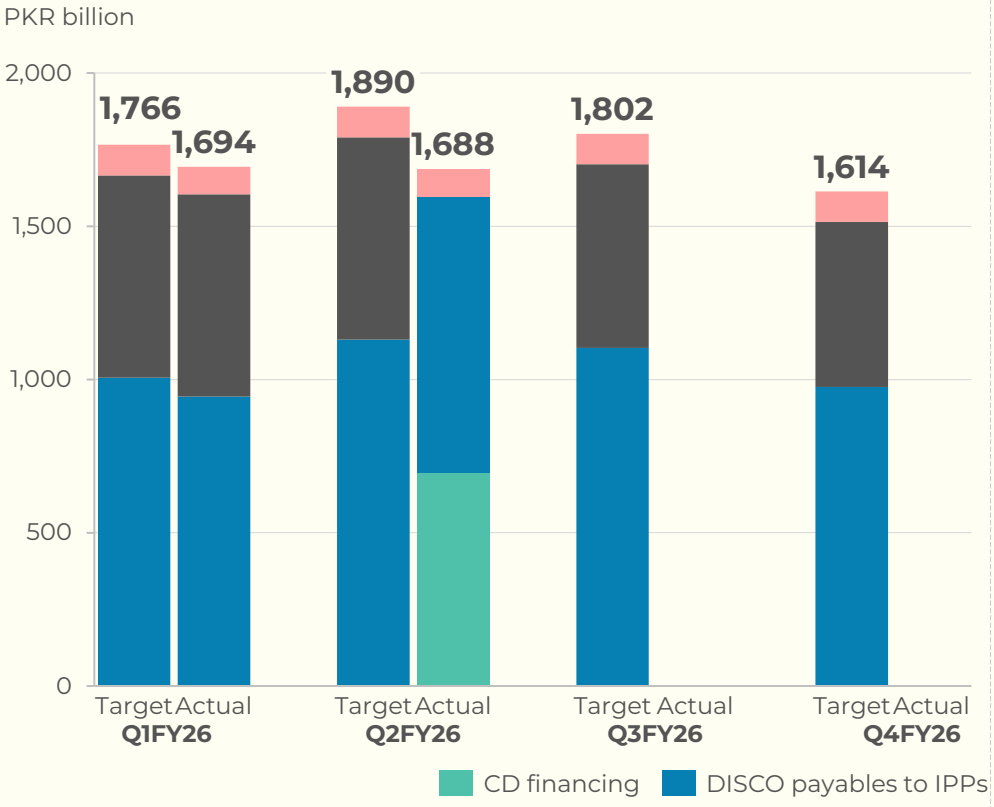
4. Fiscal & Tariff Measures

Targeted subsidies and tariff adjustments to ensure cost recovery, alongside temporary fiscal support estimated at PKR 250 B in FY26.

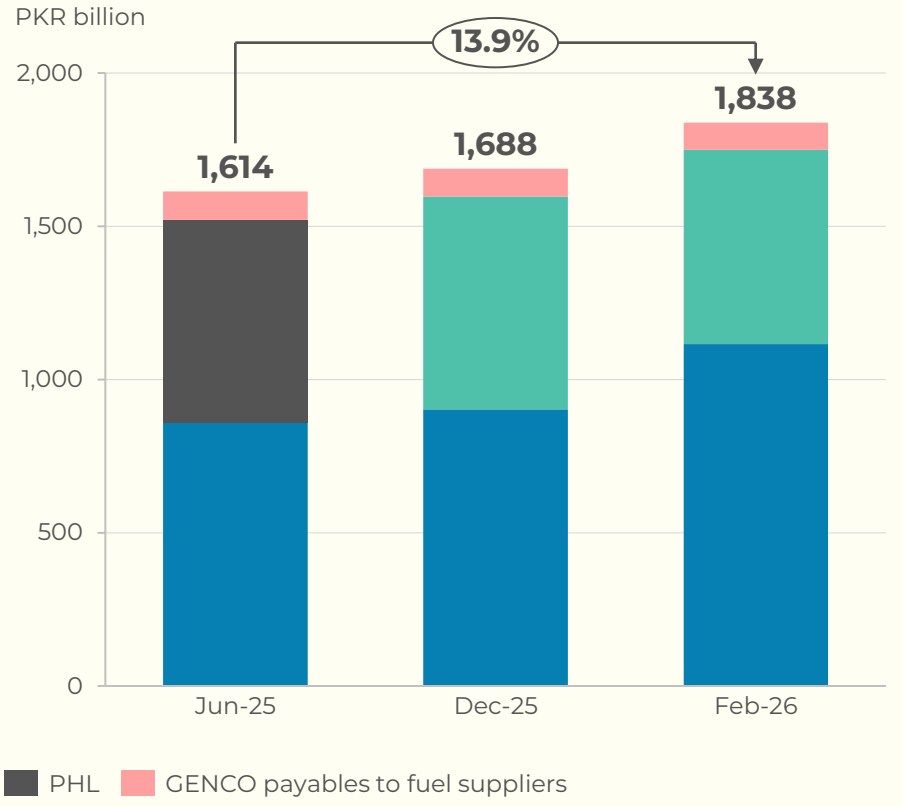
Data source: Ministry of Energy & RF's calculations

Circular debt below targets in FY26, but remains above FY25 levels amid structural shift

Circular debt remained below targets in FY26 Q1 - Q2, driven by lower DISCOs' operational losses and stock payments. While it declined from Q1 to Q2, it remains above Jun 25 levels. The composition has shifted, with PHL debt replaced by new financing, while rising DISCOs' payables (19%) have driven an overall 9% increase in circular debt from Jun 25 to Feb 26.



Circular debt composition FY26: Actual vs Projection



Shift in Circular Debt, Jun25 - Feb26

Data source: NEPRA State of Industry Report 2025, Power Division Circular Debt Report Sep-25 & RF's calculations

CDMP cuts financing costs, but DSS weakens under combined sales and KIBOR stress

The CDMP refinancing reduces financing costs by replacing expensive PHL borrowing with DSS-funded structured repayments. Consumers paid PKR 233 B in FY25 alone for debt servicing. However, DSS sustainability remains sensitive to electricity sales and KIBOR, weakening sharply if sales decline beyond 6% and KIBOR exceeds 11%, while underlying operational drivers of circular debt remain unresolved.

Point change	-10	-5	Base Kibor	+5	+10
Sales Change	9.8%	10.4%	10.9%	11.5%	12.0%
-2%	302	278	255	232	208
-3%	255	232	208	185	161
-4%	209	186	162	139	116
-5%	165	141	118	95	71
-6%	122	98	75	51	28
-7%	79	56	33	9	(14)
-8%	38	15	(8)	(32)	(55)

- **Assumptions:** Years = 6 years, baseline sales = 104 TWh (FY26), principal repayments = PKR 204 billion/year, interest payments: Kibor-0.9% x outstanding loan, DSS = PKR 3.23/unit, Collection = 6-year sales x DSS
- **Surplus / shortfall** = Collection - 6-year loan instalments

DSS Sensitivity (PKR B, FY26 - FY31)

Feature	Previous Structure	New Structure
Borrowing Entity	Power Holding Limited (PHL)	CPPA-G / Power Sector
Financing Type	Bank loans + Energy Sukuk	Syndicated Shariah-compliant financing from 18 banks
Size	PES I & II: PKR ~400 B Bank Loans: PKR ~260 B	Ijara SLB: PKR 825 B Bai-Muajjal: PKR 400 B
Interest Rate	KIBOR +1-4%	3 Month KIBOR -0.9%
Tenor	Short-term rollovers	6 year repayment
Repayment Source	PHL Surcharge + Government borrowing / subsidies	Debt Service Surcharge (DSS)

Old vs New Financing Structure

Data source: NEPRA, Ministry of Finance, Industry Sources & RF's calculations

- Pakistan’s **power sector generated 84 TWh in 8MFY26**, yet the grid still burns imports, with imported coal and RLNG contributing 25% of the output. Meanwhile, electrification is accelerating outside the grid, as distributed solar erodes utility revenues faster than thermal capacity can be rationalized, pushing the sector towards an **inflection point with insufficient policy frameworks** to navigate it.

- Pakistan's transmission network, strained by **overloaded transformers and evacuation bottlenecks,** is set for a capacity surge to 98,610 MVA by 2028, backed by PKR 750 B in phased investment to modernize infrastructure, integrate renewables, and lay the grid foundation for Pakistan's energy transition.

- 8MFY26 grid sales, totaling 74 TWh, face pressure as declining domestic and industrial offtake, coupled with rapid DER adoption, **weaken cost recovery under the volumetric revenue model** and threaten both financial and operational sustainability.
- Integrating **batteries and smart storage** allows the grid to store low-cost renewable energy, reduce thermal imports, ease grid congestion, and manage peak demand amid rising DERs.

- Despite ongoing reforms, Pakistan’s **circular debt rose to PKR 1,838 B** by Feb 26, driven by entrenched inefficiencies, legacy contractual and tariff gaps, and limited traction from subsidy rationalization, highlighting persistent fiscal stress in the power sector.

- Conventional loss metrics will become increasingly distorted in a **bi-directional system,** requiring revised baselines and improved energy accounting frameworks.

- The sector’s inflection point will depend on how quickly planning and policy frameworks adapt to decentralized, bi-directional electricity flows. A **shift in focus from capacity expansion to system optimization** (flexibility, storage and demand side manageemnt) will be critical to improving efficiency and reducing costs.

- If aligned effectively**, ongoing electrification can reduce fossil fuel dependence and improve macroeconomic resilience**; if not, structural mismatches across the system will deepen.

Future outlook

Abbreviations

B	Billion
BQTPS	Bin Qasim Thermal Power Station
BTM	Behind the Meter
CAGR	Compound Annual Growth Rate
CCPP	Combined Cycle Power Plant
CD	Circular Debt
CDMP	Circular Debt Management Plan
CER	Carbon Emission Reduction
COD	Commercial Operations Date
CPP	Capacity Purchase Price
CPPA-G	Central Power Purchasing Agency (Guarantee)
CUF	Capacity Utilization Factor
DISCOs	Distribution Companies
DSS	Debt Servicing Surcharge
EPP	Energy Purchase Price
FY	Fiscal Year
GDP	Gross Domestic Product
GENCOs	Generation Companies
GEPCO	Gujranwala Electric Power Company
GTPS	Gas Turbine Power Station
GW	Gigawatt
GWh	Gigawatt-hour
HESCO	Hyderabad Electric Supply Company
HVDC	High Voltage Direct Current
IESCO	Islamabad Electric Supply Company
IMF	International Monetary Fund
IPP	Independent Power Producer
K2/K3	Karachi Nuclear Power Plants 2 & 3
KE	Karachi Electric
KIBOR	Karachi Interbank Offered Rate
KKI	Karachi-Keti Bandar Interconnection
KM	Kilometer
KV	Kilovolt
KW	Kilowatt
LESCO	Lahore Electric Supply Company
Li-ion	Lithium-ion
MEPCO	Multan Electric Power Company
M	Million
MTOE	Million Tonnes of Oil Equivalent
MVA	Megavolt Ampere
MW	Megawatt
NAPP	Nuclear Power Plant
NEPRA	National Electric Power Regulatory Authority
NGC	National Grid Company
NPMV	Negative Price Market Variance
PES	Pakistan Energy Situation
PESCO	Peshawar Electric Supply Company
PHL	Polar Hub Limited
PKR	Pakistani Rupee
PMTLC	Pak Matiari-Lahore Transmission Line Company
PPA	Power Purchase Agreement
PV	Photovoltaic
Q1	Quarter 1
Q2	Quarter 2
QESCO	Quetta Electric Supply Company
RE	Renewable Energy
RES	Renewable Energy Sources
RF	Renewables First
RFO	Residual Fuel Oil
RLNG	Re-gasified Liquefied Natural Gas
SEPCO	Sukkur Electric Power Company
SITE	Sindh Industrial Trading Estate
SLB	Sukuk Linked Bond
SPP	Small power producer
STDC	Sindh Transmission & Dispatch Company
Sukuk	Islamic Bond/Certificate
T	Trillion
T&D	Transmission and Distribution
T&T	Transmission and Transformation
TESCO	Tribal Electric Supply Company
K	Thousands
TWh	Terawatt-hour
USD	United States Dollar
WACOG	Weighted Average Cost of Gas
YoY	Year-on-Year
°C	Degrees Celsius
6M	6 Months

Renewables First (RF) is a think and do tank for energy and environment. Our work addresses critical energy and natural resource issues with the aim to make energy and climate transitions fair and inclusive.

Disclaimer:
All the information and analysis provided in this document are accurate and to the best of our knowledge and understanding. In case you identify any errors, please email:
DataTeam@renewablesfirst.org

RENEWABLES FIRST

10 - 11, 3rd Floor, Executive Complex,
G-8 Markaz, Islamabad
+92 51 - 8773676
info@renewablesfirst.org