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Beyond the Generation – Cost Debate

Electricity Prices, Tariffs and Cost Recovery in Pakistan

With

Epilogue

What Consumers Pay, What the System Requires, and Where Pakistan Stands Globally

An Analytical Companion to

Sustainable Energy Systems and Energy Security in Pakistan

Khan Arshad

enerbrill, Pakistan

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Abstract

Pakistan's electricity-price debate often compresses fundamentally different quantities into a single comparison: plant-level generation or power-procurement cost, capacity-related obligations, national revenue requirement, the final retail tariff paid by households and businesses, and taxes, duties, surcharges and other identifiable public-sector receipts. Such comparisons can obscure both the structure of the electricity bill and the distinction between what consumers pay, what the power system must recover, and what can legitimately be interpreted as public revenue or profit.

This paper separates these quantities through two linked analytical frameworks. First, a Pakistan-specific reconstruction for 2016–2026 evaluates standardized household and commercial electricity cases at 100, 500 and 1,500 kWh/month, preserves unsupported historical gaps, and distinguishes structural all-in consumer prices from procurement and national revenue-requirement benchmarks. Second, a 58-country current-price comparison places Pakistan's household and commercial electricity prices in international context, with natural-gas and road-fuel benchmarks providing additional energy-price perspective. The analysis uses Brill-Viz for standardized calculation, comparative analytics and visualization, while retaining the cited regulatory and public-source evidence as the underlying evidentiary basis.

The Pakistan analysis demonstrates strong consumption- and customer-class differentiation. Low-use household tariffs remain substantially below medium- and high-consumption household cases, while like-for-like 500 kWh/month household and commercial prices converge much more closely. Explicitly identified taxes, duties, surcharges and fee-type components can be quantified where evidence permits, but neither these receipts nor the wider consumer-to-procurement spread is interpreted as Government of Pakistan profit without a complete audited bridge covering system costs, subsidies, transfers, recoveries and liabilities.

Internationally, Pakistan occupies a differentiated position. Its standardized household electricity price is relatively low in nominal USD/kWh terms, whereas its standardized commercial benchmark is less favorable and lies moderately above the loaded-country median. This does not mean that electricity is necessarily affordable to Pakistani households. World Bank household-survey evidence found that, under its study-specific 100 kWh/month and protected-tariff test, **22.2% of grid-connected households spent at least 5% of household expenditure on electricity**, illustrating why nominal international price ranking and affordability should not be treated as equivalent concepts.

The paper therefore reframes the electricity-cost debate away from a simple classification of electricity as either ‘cheap’ or ‘expensive’. The evidence instead points to the interaction of tariff architecture, capacity and energy purchase costs, transmission and distribution, losses and theft, recovery performance, imported-fuel exposure, fixed system obligations, consumer income and service quality. NEPRA's FY2024-25 generation evidence further illustrates this distinction: approximately **61% of power-purchase cost was Capacity Purchase Price and 39% Energy Purchase Price**, while low utilization contributed to the capacity-cost burden. The resulting conclusion is that Pakistan can have a comparatively low nominal household tariff while simultaneously facing substantial affordability, efficiency and financial-sustainability challenges.

Keywords: Pakistan; electricity tariffs; household electricity; commercial electricity; cost recovery; Energy Purchase Price; Capacity Purchase Price; public-sector receipts; affordability; system efficiency; international electricity prices; Brill-Viz.

Source basis: Brill-Viz companion electricity-price and energy-price databases; NEPRA tariff, power-purchase, generation- and distribution-performance evidence; Government of Pakistan tax, tariff and energy-sector records; World Bank household energy-access evidence; and standardized international retail-price comparisons. Missing evidence is retained as missing and is not converted to zero or filled by unsupported interpolation.

Why this paper is issued separately from the synthesis '*Sustainable Energy Systems and Energy Security in Pakistan*'

The master synthesis, ***Sustainable Energy Systems and Energy Security in Pakistan***, was designed principally to evaluate Pakistan's energy resources, generation technologies, system integration, transmission, water constraints, asset utilization, project economics and long-term energy-security options. Retail tariffs, taxes, subsidies, public charges, capacity payments, affordability and perceptions of government or private-sector gain involve a different set of accounting boundaries and are also subjects of significant public and policy debate.

Embedding those questions within the master synthesis risked allowing the tariff and ownership debate to dominate or obscure its wider technical purpose. This standalone paper therefore separates the retail-price and cost-recovery question from the broader resource and technology analysis. The separation is intended to improve analytical clarity rather than to avoid the debate: it allows consumer payments, system costs, capacity obligations, public charges and international price comparisons to be examined explicitly without attributing profit, motive, responsibility or policy success or failure beyond what the evidence can establish.

The distinction is especially important because apparently conflicting statements can all be true simultaneously. Pakistan can have a comparatively low nominal household electricity price internationally; electricity can still be difficult to afford relative to household income; and the national power system can still carry substantial fixed-capacity, fuel, network, loss, recovery and financing burdens. These are different analytical questions and should not be collapsed into a single tariff comparison.

The paper should, therefore, be read as an **analytical companion** to the master synthesis. The separate *Energy Policy Options for Pakistan* paper provides the implementation-facing translation of the broader evidence into decision conditions for authorities and other stakeholders. The present study does not prescribe a political or institutional choice; its purpose is to clarify what consumers pay, what the system must recover, how Pakistan compares internationally, and where the evidence does and does not support commonly made interpretations.

1. Introduction

Electricity-price discussions in Pakistan frequently begin with an apparently simple question: **if electricity can be generated or purchased at a certain cost per kWh, why does the final consumer bill appear substantially higher?** The question is legitimate, but the comparison becomes misleading when plant-level generation cost, Energy Purchase Price, Capacity Purchase Price, transmission and distribution costs, taxes and public charges, system losses, revenue requirements and final retail tariffs are treated as though they represent the same economic quantity.

This paper addresses that problem through a layered analytical framework. It asks what standardized Pakistani households and commercial users actually pay; how those payments differ by consumption level and customer class; which portions of the bill can be explicitly identified as public charges; how consumer payments compare with procurement and national revenue-requirement benchmarks; and where Pakistan's household and commercial electricity prices sit in a broader international context.

Several interpretation boundaries are fundamental to the analysis.

- **Final retail electricity price is not equivalent to plant-generation or fuel cost.** The retail bill can incorporate energy-purchase and capacity costs, transmission and market charges, distribution and supply costs, fixed charges, taxes and levies, adjustment mechanisms, subsidies or cross-subsidies and other regulated components.
- **Energy Purchase Price and Capacity Purchase Price represent different cost structures.** EPP is principally associated with electricity actually generated and energy-linked costs, while CPP reflects fixed obligations associated with maintaining contracted capacity. Consequently, CPP may remain substantial even when plant utilization or electricity sales decline. In FY2024-25, NEPRA reported that 61% of total power-purchase cost, excluding Iranian imports, comprised CPP and 39% EPP; average thermal utilization was approximately 42.5%.
- **Pakistan's domestic tariff structure is strongly consumption dependent.** In the 2026 standardized household scenarios, structural all-in prices are approximately PKR 17.80/kWh at 100 kWh/month, PKR 54.98/kWh at 500 kWh/month and PKR 62.22/kWh at 1,500 kWh/month. A single national household price therefore cannot adequately represent the burden across consumption classes.
- **Equal-consumption comparison produces a different result from international standardized benchmarks.** At a common 500 kWh/month, the modeled 2026 household and commercial structural all-in prices are relatively close, at approximately PKR 54.98/kWh and PKR 50.82/kWh respectively. This illustrates why consumption level must be controlled when comparing customer classes.
- **Identifiable public receipts are not equivalent to government profit.** Taxes, duties, surcharges and fee-type components can be isolated where evidence supports them, but a defensible estimate of net government gain would require a complete audited bridge incorporating subsidies, public-sector costs, arrears, recovery performance, transfers and other financial obligations.
- **Pakistan's international position is differentiated rather than uniformly expensive or inexpensive.** In the 58-country comparison, Pakistan's standardized household electricity price is relatively low in nominal USD/kWh terms, while its commercial benchmark is less competitive and sits above the loaded-country median.
- **Nominal price is not the same as affordability.** Household income, expenditure, consumption band, fixed charges, purchasing power and service quality determine the actual burden experienced by consumers. World Bank survey evidence found that 22.2% of grid-connected Pakistani households crossed its study-specific 5%-of-household-expenditure affordability threshold for a protected-tariff 100 kWh/month electricity package. Thus Pakistan can appear inexpensive in a nominal global tariff comparison while electricity remains financially difficult for a material share of households.
- **System inefficiency and affordability should also be separated.** Technical T&D losses, electricity theft, poor recovery, transmission constraints, inefficient dispatch, imported-fuel exposure, circular-debt financing and under-utilized capacity affect the economic burden through different mechanisms. Some increase the amount of energy that must be generated; some reduce the amount billed or collected; and others increase fixed cost per sold kWh. Their remedies therefore differ.
- **Natural-gas, petrol and diesel comparisons require consistent units and methodologies.** The Brill-Viz analysis reports natural gas in both USD/MMBtu and equivalent USD/kWh. Pakistan is intentionally left without a standardized value in the same-source international gas ranking because the public Pakistan page displays 0.000 USD/kWh while the provider's ranked comparison omits Pakistan; the value is therefore treated as unavailable rather than as evidence of zero-priced gas.

The analytical objective is, therefore, not to prove that Pakistan's electricity is inherently cheap, expensive, fairly priced or unfairly priced. It is to establish **what is actually being compared** and to distinguish nominal retail price, affordability, system cost and cost recovery from one another.

The broader result emerging from the paper is that Pakistan's challenge is not simply the level of the tariff or the addition of further generating capacity. It is the amount of **reliable, billed and economically productive electricity obtained from the generation capacity, fuel, network infrastructure and capital already being financed**. This interpretation provides the bridge between the present tariff analysis and the wider conclusions of *Sustainable Energy Systems and Energy Security in Pakistan*.

2. Why This Analysis Is Issued Separately from the Master Synthesis

2.1 Analytical separation, not substantive exclusion

The master synthesis, Sustainable Energy Systems and Energy Security in Pakistan, was structured as a technical and economic evidence framework spanning resources, generation technologies, grid and transmission, water, storage, efficiency, project economics and system resilience. Its central question is how Pakistan can obtain more reliable, affordable and secure energy service from domestic resources, imported fuels, infrastructure, water and invested capital without reducing the analysis to one technology or one tariff outcome.

2.2 Why tariff and public-receipt analysis is better treated separately

Retail electricity tariffs sit at the intersection of regulation, taxation, subsidy, distribution performance, public finance, consumer protection and political debate. These issues are legitimate analytical subjects, but they use different accounting boundaries from resource assessment, plant performance or project bankability. Keeping the tariff study separate reduces the risk that discussion of taxes, subsidies or government receipts masks the technical essence of the master synthesis or causes the synthesis to be read as a political judgment. The present paper therefore treats tariff structure descriptively and preserves explicit limits on what the data can establish.

2.3 Relationship to the policy-options paper

The companion Energy Policy Options for Pakistan paper translates the master synthesis into evidence-supported decision conditions without prescribing a single national mix. The present paper plays a different role: it isolates retail-price formation and international price position. It does not rank political choices, assess government performance, advocate a particular tariff level or infer motive. Its decision value is narrower: clarifying what is being compared when consumers, system costs and public receipts are discussed.

2.4 What this paper does not claim

No result in this paper should be read as an estimate of Government of Pakistan profit from electricity, as proof that any tariff level is intrinsically fair or unfair, or as a conclusion about affordability based solely on nominal price. The analysis also does not assume that every system loss, recovery shortfall or adjustment is efficiently incurred or correctly allocated to a specific consumer. Those questions require separate audited financial, operational and incidence analysis.

3. Purpose, Research Questions and Scope

The purpose of this paper is to separate the generation-cost debate from the final-retail-price question and to place Pakistan's household and commercial electricity prices in both national historical and international context. The analysis uses a deliberately layered design so that observed/reference inputs, standardized analytical scenarios, system benchmarks and global retail-price comparisons are not treated as interchangeable evidence.

Table 1. Research questions, evidence used and interpretation boundary.

Research question	Primary evidence	What the analysis can show	What it cannot show alone
What do standardized Pakistan household and commercial users pay over 2016-2026?	Official/reference tariff schedules and loaded bill components	Structural all-in price trajectories and customer-class/consumption differences	Exact invoice for every DISCO, month or individual consumer
How does consumer payment compare with system/procurement and revenue-requirement benchmarks?	NEPRA power-purchase and revenue-requirement evidence	Relative position and cost-recovery context	Government or utility profit

Research question	Primary evidence	What the analysis can show	What it cannot show alone
What part of the bill is explicitly identifiable as public-sector receipts?	Loaded taxes, duties, surcharges and fees	Gross identifiable public-charge component	Net fiscal take after subsidy, transfers, costs or sector liabilities
Where does Pakistan stand internationally?	58-country standardized final-retail-price comparison	Nominal household/commercial price position by country and region	Income-adjusted affordability or identical-consumption bills in every country
What is the next analytical step?	Income/PPP and consumption-specific evidence	Affordability research design	A completed affordability ranking with the present dataset

Source: analytical design of this standalone paper; evidence classes follow the master synthesis and companion Brill-Viz datasets.

4. Data Sources, Analytical Design and Evidence Boundaries

Pakistan tariff and system-cost inputs are drawn principally from National Electric Power Regulatory Authority (NEPRA) consumer-end tariff determinations, tariff rationalization and notified schedules, power-purchase and revenue-requirement decisions, State of Industry material, and related Government of Pakistan bill-component and tax guidance (NEPRA, 2023, 2024a, 2024b, 2025a, 2026a-e; FBR, 2023; Ministry of Energy [Power Division], n.d.). The scenario model converts official/reference tariff inputs into standardized 100, 500 and 1,500 kWh/month household and commercial cases. Fixed monthly charges are allocated per kWh for those standardized cases. Where volatile Fuel Charges Adjustment (FCA) or Quarterly Tariff Adjustment (QTA) evidence is absent for a historical period, it is not invented.

The international dataset uses GlobalPetrolPrices public comparison pages and country pages for standardized final retail prices. These values are not plant-gate generation costs. The country-level comparison intentionally retains the same publicly visible December 2025 electricity observation basis across the expanded country set rather than mixing those public observations with newer subscription-only country downloads. They reflect end-user price outcomes that can include the energy or commodity charge, transmission and distribution, taxes and fees, and other regulated bill components. Household and business benchmarks also use different representative consumption assumptions (GlobalPetrolPrices, 2026a-d). Consequently, the international household and commercial series are appropriate for price-level comparison, but they are not identical-consumption bill comparisons such as the Pakistan 500 kWh/month case.

Table 2. Analytical coverage and principal interpretation rules.

Analytical block	Coverage	Primary unit / basis	Interpretation boundary
Pakistan standardized electricity scenarios	2016-2026; household and commercial; 100/500/1,500 kWh per month	PKR/kWh structural all-in; system/procurement and revenue-requirement benchmarks	Consumer-system spread is not government profit; missing FCA/QTA and subsidy allocations remain missing.
Global household electricity	57 comparable country values, primarily Dec 2025	USD/kWh final retail price	Nominal price comparison only; household consumption benchmark varies by source methodology.

Analytical block	Coverage	Primary unit / basis	Interpretation boundary
Global commercial electricity	55 comparable country values, primarily Dec 2025	USD/kWh final retail price	Business benchmark is not the same consumption level as household; commercial-household gap reflects tariff architecture.
Global natural gas	32 household and 28 commercial country values, primarily Dec 2025	USD/MMBtu with USD/kWh equivalent	Compare gas with gas or on a common energy basis; coverage is smaller than electricity. Pakistan has official OGRA tariff data but no defensible same-source standardized value in the ranked global gas series, so Pakistan remains blank rather than zero.
Global petrol/gasoline and diesel	57 country values, latest public 2026 observations in dataset	USD/litre retail pump price	Current product-price comparison; not an affordability or taxation ranking by itself.

Source: Brill-Viz companion energy-price database compiled from the cited NEPRA, Government of Pakistan and GlobalPetrolPrices sources. Blank values are treated as evidence gaps, not zero.

5. Pakistan Electricity Payments and Cost Recovery, 2016-2026

The Pakistan analysis shows that the final electricity payment is a composite outcome rather than a direct restatement of generation or procurement cost. Across the scenario set, the structural all-in price is constructed from the official/reference base tariff, allocated fixed charge and explicitly identified public surcharge, tax, duty and fee components. The model keeps those public receipts separate from the consumer-minus-system gap. This distinction is central: a retail price above a generation or procurement benchmark does not by itself demonstrate state profit because the retail chain also has to absorb transmission and distribution, capacity and market costs, administration, losses, recovery shortfalls, financing and other regulated components, while subsidies and cross-subsidies may move costs between customer classes.

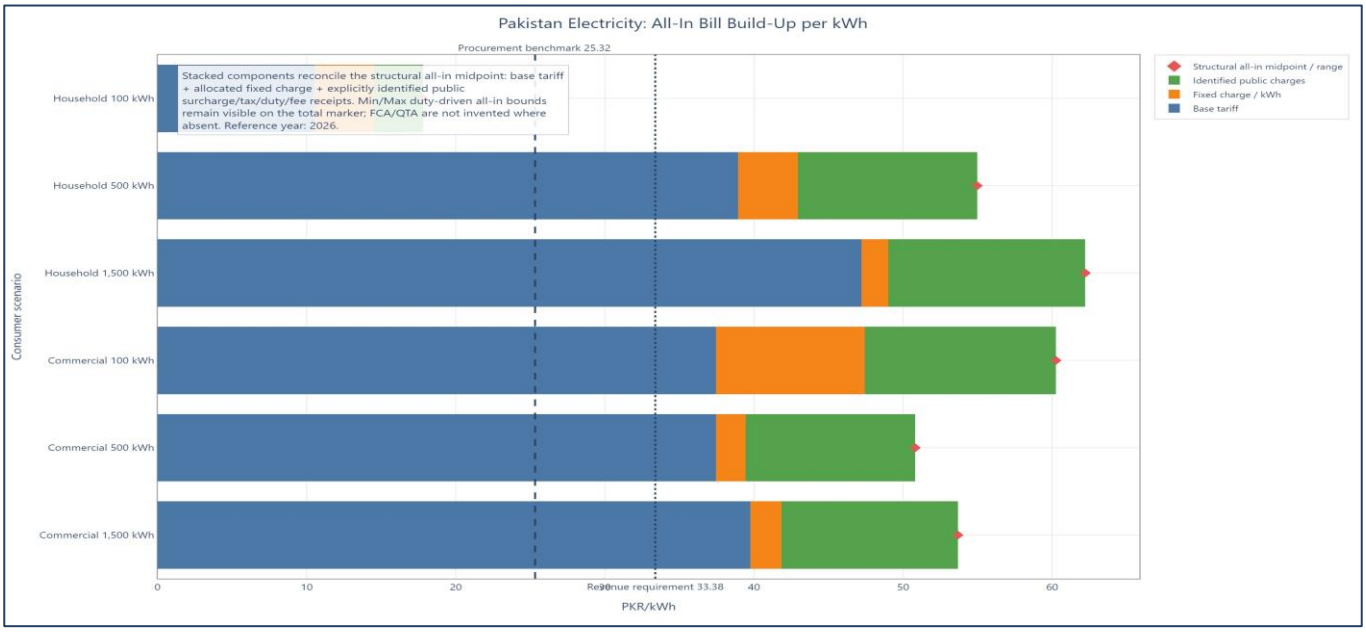


Figure 1. Pakistan electricity all-in bill build-up by standardized consumer case. The 2026 comparison shows how base tariff, fixed-charge allocation and identified public charges combine into the structural all-in price; the procurement and revenue-requirement lines are system benchmarks rather than profit thresholds.

Source: Brill-Viz analysis of NEPRA and Government of Pakistan tariff, system-cost and bill-component evidence compiled in the companion dataset. The 2026 procurement benchmark is approximately PKR 25.32/kWh and the revenue-requirement reference approximately PKR 33.38/kWh.

For 2026, the modeled household structural all-in prices are approximately PKR 17.80/kWh at 100 kWh/month, PKR 54.98/kWh at 500 kWh/month and PKR 62.22/kWh at 1,500 kWh/month. The corresponding commercial cases are approximately PKR 60.26, 50.82 and 53.68/kWh. The shape is therefore not a simple monotonic statement that more consumption always produces a higher unit price. Tariff category, protected/slab treatment and the allocation of fixed charges are material to the effective price.

5.1 Household Consumption Cases

The household series shows a pronounced differentiation between the low-use protected case and the higher-consumption cases. The 100 kWh household remains far below the 500 and 1,500 kWh cases, especially after the tariff step-up of the early 2020s. In 2026, the 100 kWh case is below both the procurement and revenue-requirement references, whereas the higher-consumption cases are well above the revenue-requirement reference. This is consistent with a deliberately differentiated residential tariff architecture, but the figure alone does not identify the fiscal source of any support to the low-use case.

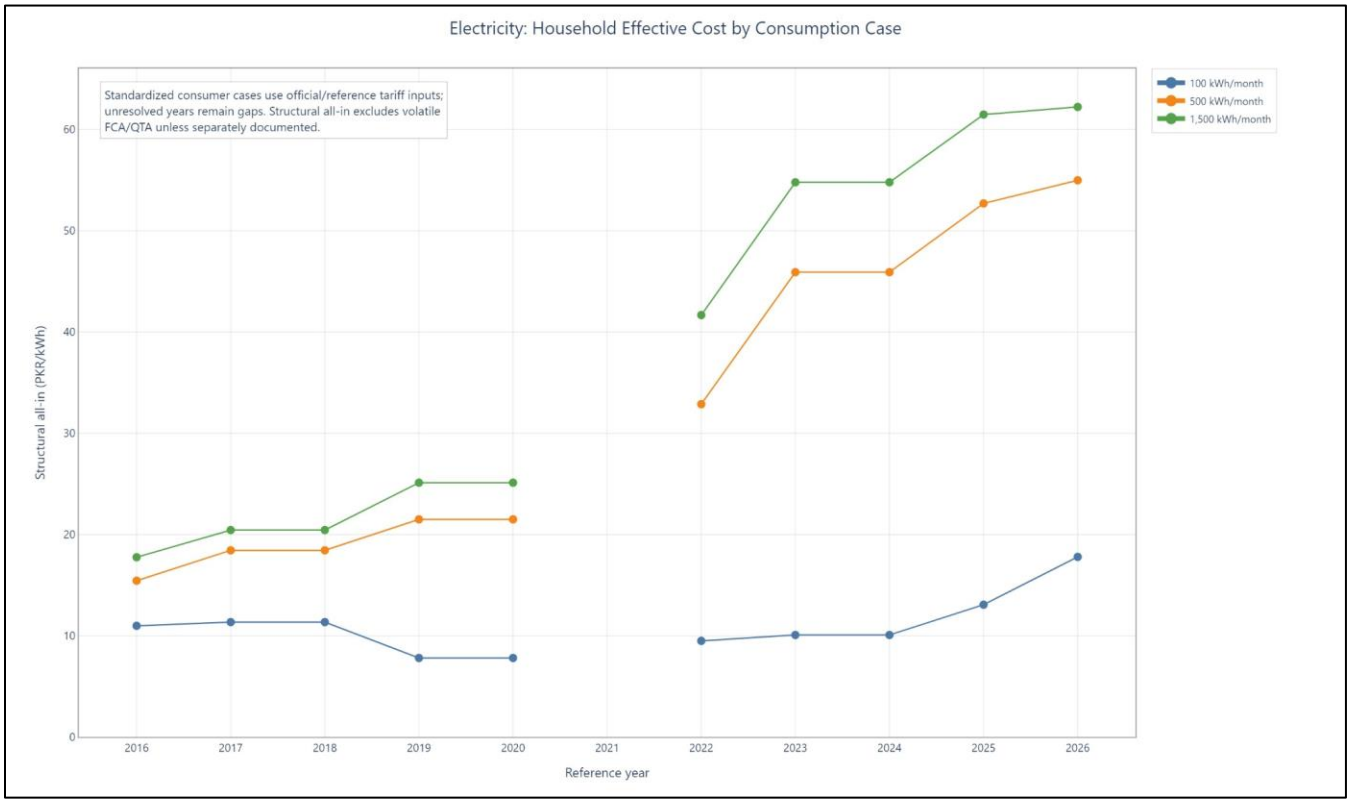


Figure 2. Household structural all-in electricity price by standardized consumption case, 2016-2026. Low-use households remain strongly differentiated from the 500 and 1,500 kWh/month cases, while unsupported historical gaps are preserved rather than interpolated.

Source: Brill-Viz reconstruction from official/reference tariff inputs. Structural all-in excludes unsupported volatile FCA/QTA observations in periods where they are not documented.

5.2 Commercial Consumption Cases

The commercial series behaves differently. In 2026, the standardized 100 kWh commercial case is the most expensive of the three commercial cases on a per-kWh basis. This is economically plausible when a fixed monthly charge is spread across a very small consumption base. The comparison therefore illustrates why a low monthly volume does not necessarily imply a low effective commercial unit cost.

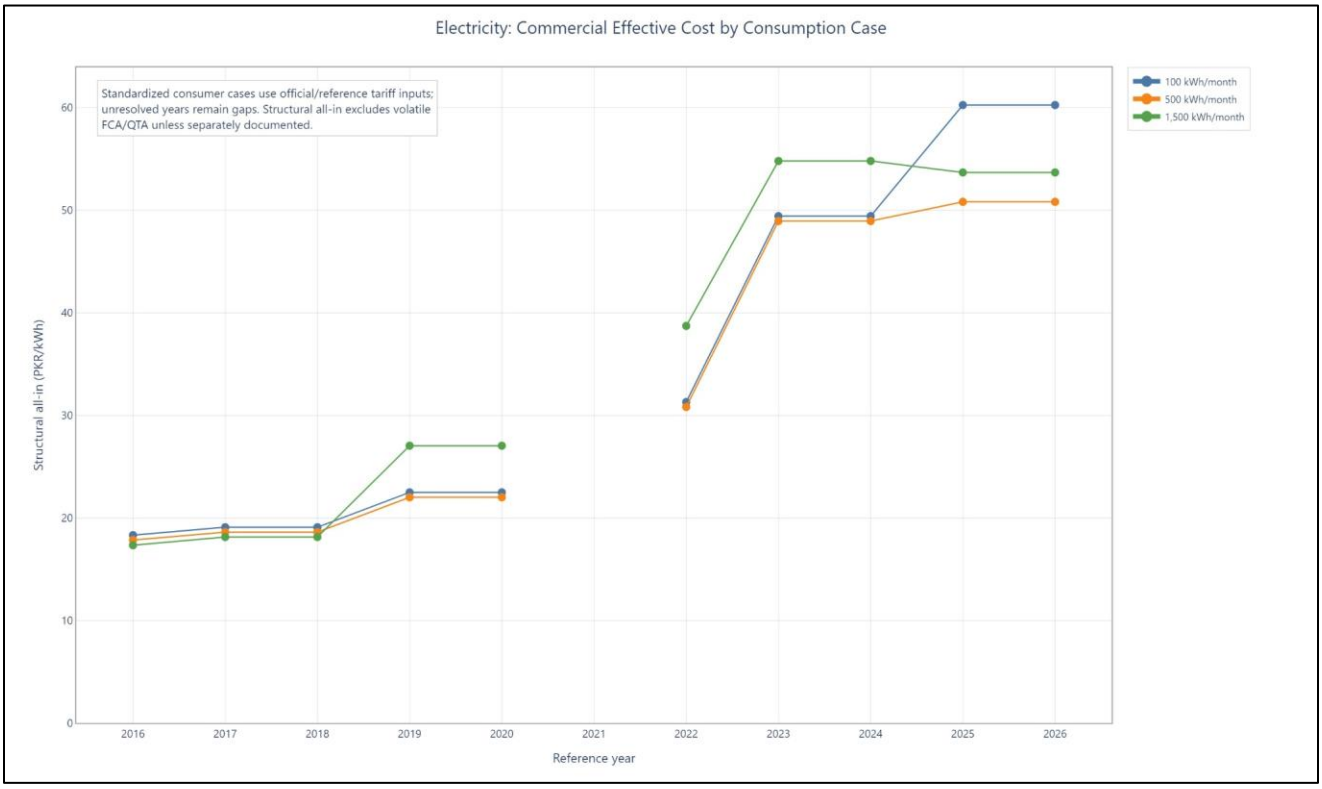


Figure 3. Commercial structural all-in electricity price by standardized consumption case, 2016-2026. The 100 kWh/month case can carry a high unit burden because fixed charges are allocated over relatively few units.

Source: Brill-Viz reconstruction from official/reference commercial tariff schedules and identified bill components.

5.3 Like-for-Like Household versus Commercial Comparison at 500 kWh/month

The 500 kWh/month comparison is analytically important because it holds monthly consumption constant across customer classes. By 2026, the household structural all-in price is approximately PKR 54.98/kWh and the commercial value approximately PKR 50.82/kWh. The difference is therefore modest at this specific usage level even though the global standardized household and business benchmarks for Pakistan are much farther apart. There is no contradiction: the Pakistan figure is an equal-consumption scenario, whereas the international household and business benchmarks use different representative consumption assumptions and tariff definitions.

5.4 Identified Public-Sector Receipts Are Not Government Profit

The public-receipts series isolates the portion of the modeled bill that can be explicitly linked to loaded taxes, duties, surcharges and fee-type components. In 2026, identified gross public receipts span approximately PKR 3.26-13.22/kWh across the standardized cases. In the broader bill-build-up analysis, the median identified public-charge component is approximately PKR 4.42/kWh, equivalent to about 18.3% of modeled effective payment across comparable scenarios. These are gross identifiable receipts, not net fiscal profit. A net government gain or loss would require defensible allocation of subsidies/support, intergovernmental transfers, utility and public-sector costs, arrears and audited financial results.

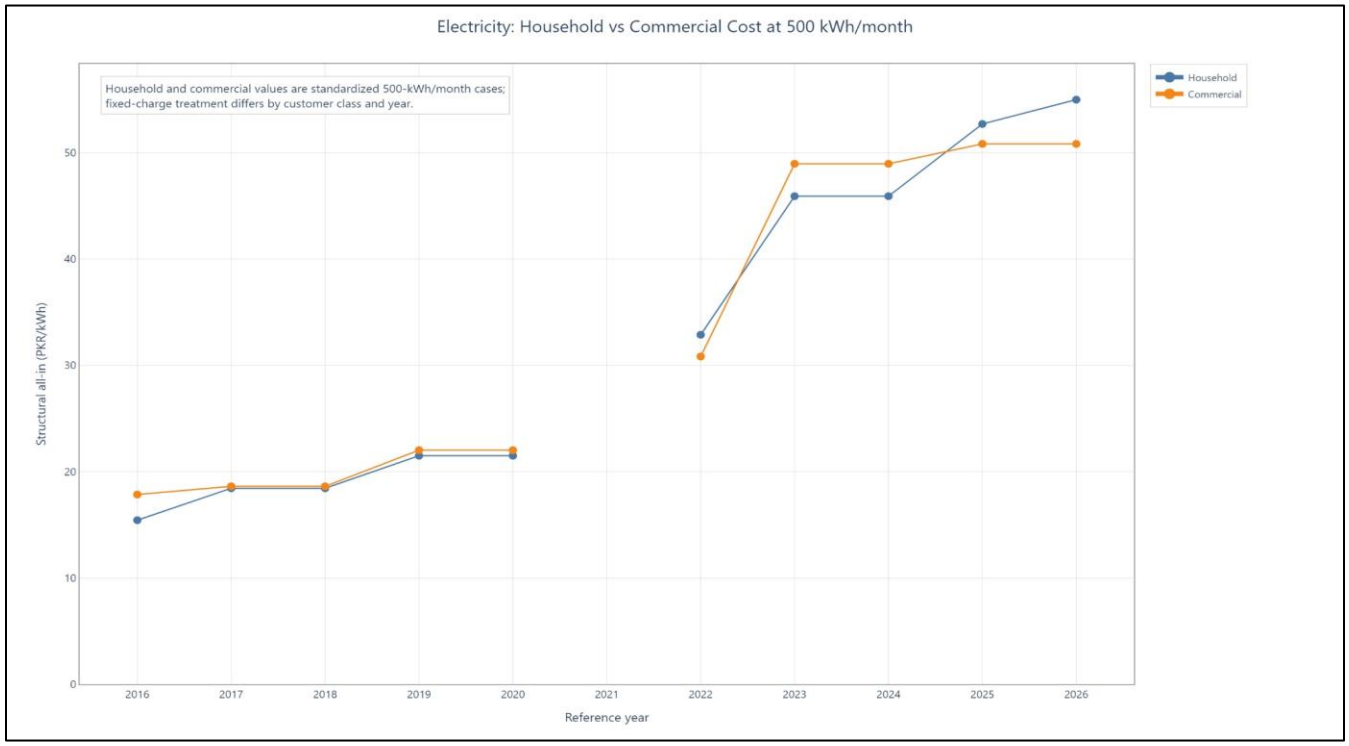


Figure 4. Household versus commercial structural all-in price at 500 kWh/month. Holding consumption constant makes the customer-class effect visible without conflating it with different usage volumes.

Source: Brill-Viz standardized Pakistan scenario analysis, 2016-2026.

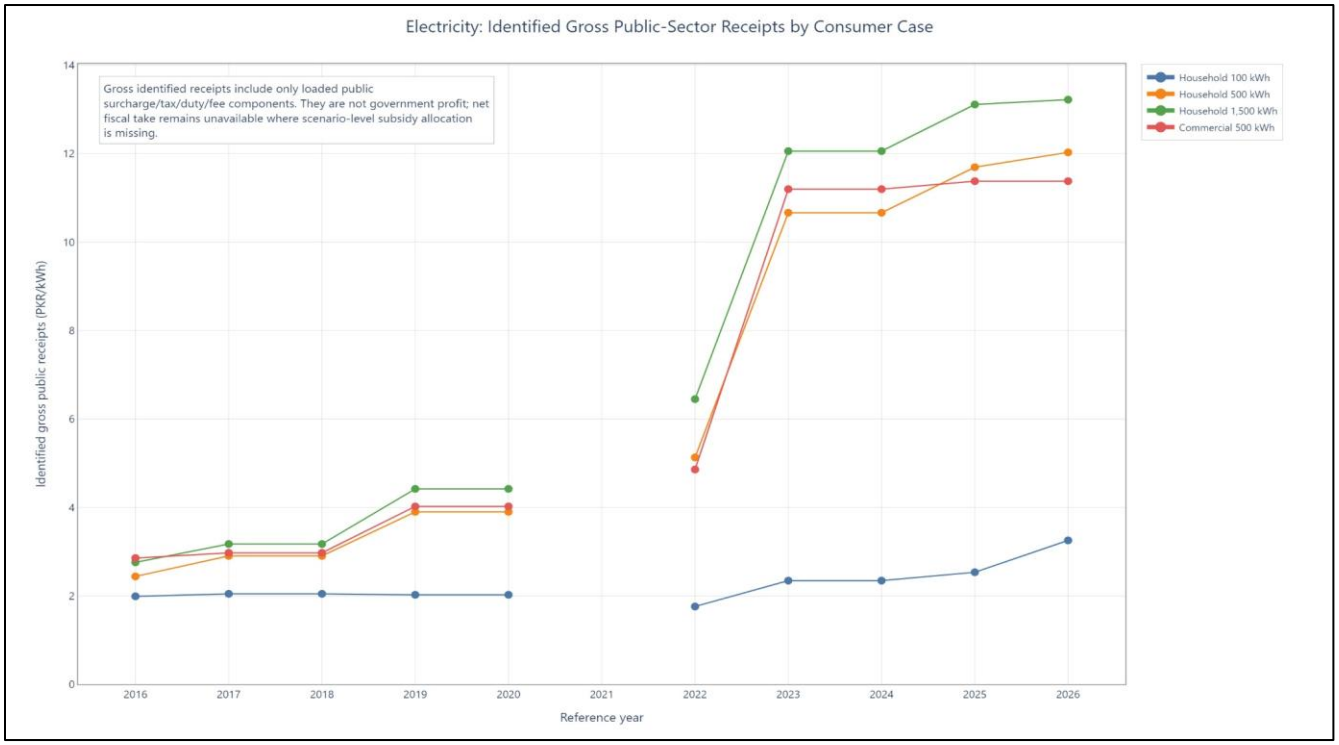


Figure 5. Identified gross public-sector receipts by standardized consumer case. The chart isolates explicit loaded public charges but does not convert them into a government-profit estimate.

Source: Brill-Viz analysis of loaded electricity-duty, GST, surcharge and fee evidence. Scenario-level subsidy allocation is not inferred where the source evidence does not provide it.

5.5 Consumer Payment Relative to National Revenue Requirement

The consumer-payment/revenue-requirement ratio begins in 2022 because the standardized consumer-price and comparable national revenue-requirement series overlap from that point in the loaded evidence. Most of the medium- and higher-use cases show a decline in the ratio from 2022 toward 2025 and a modest rise in 2026. This means the revenue-requirement reference rose faster than the modeled consumer price over much of 2022-2025, followed by some relative tariff increase in 2026. The 1.0 line is a cost-recovery reference, not a profit threshold. Across overlapping observations the ratio spans roughly 0.34x-2.46x, which demonstrates heterogeneity in tariff treatment rather than an implied margin earned by government.

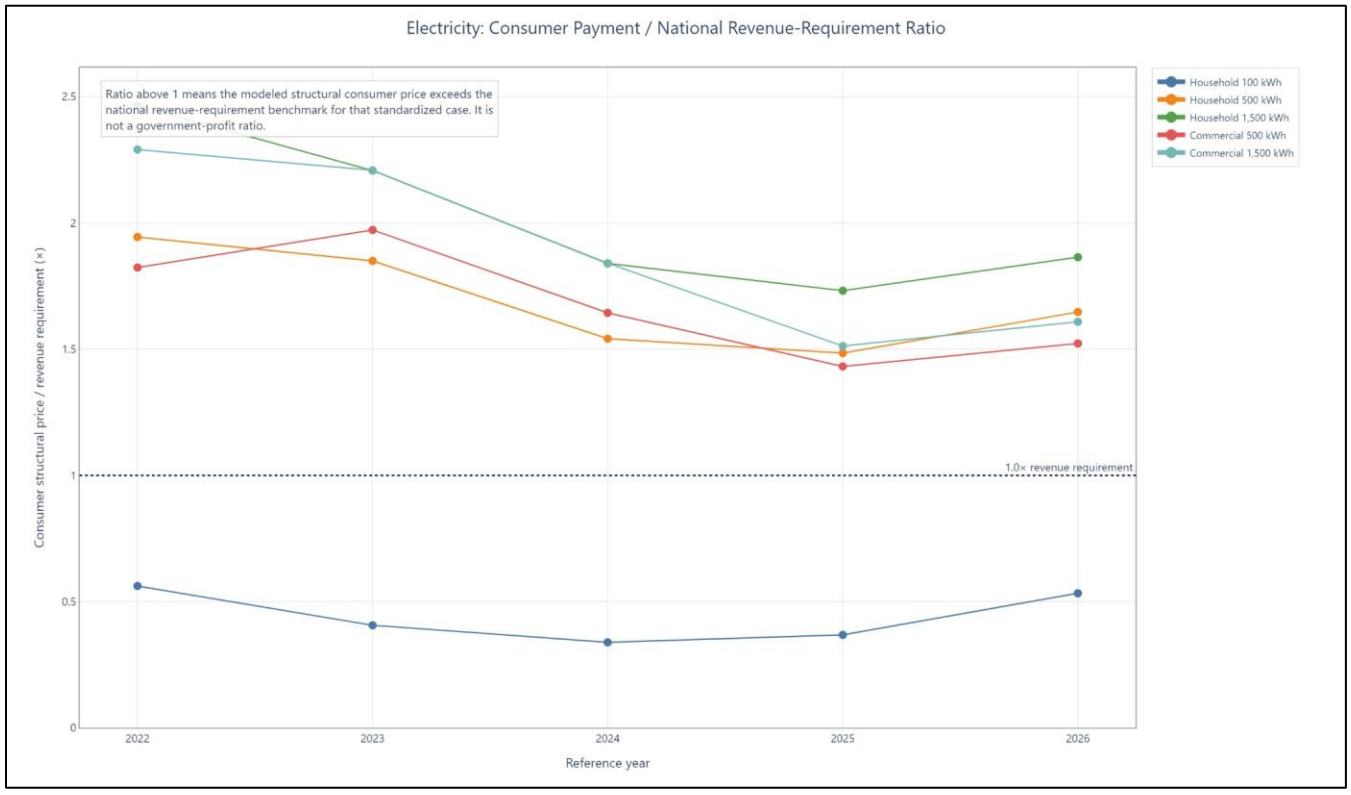


Figure 6. Consumer structural price divided by the national revenue-requirement benchmark, 2022-2026. Values above 1.0 indicate a modeled price above the reference requirement for that standardized case; values below 1.0 indicate the opposite. The ratio is not a profit margin.

Source: Brill-Viz comparison of standardized consumer prices with loaded national revenue-requirement evidence.

6. Why Electricity Cannot Normally Be Sold at Plant-Generation Cost

A recurring misconception is that a retail tariff should be close to the fuel or plant-level cost of producing one kWh. That comparison omits the wider electricity value chain. NEPRA power-purchase and consumer-end decisions distinguish energy/fuel cost from capacity charges, variable operation and maintenance, transmission-use charges, market-operation costs and distribution/supply margins (NEPRA, 2024b, 2025a, 2026a-c). The system also has to finance and operate networks, maintain reserves and reliability, recover fixed and capacity-related commitments, and manage adjustment mechanisms. Pakistan additionally faces transmission and distribution losses, non-technical losses/theft, incomplete billing recovery and circular-debt pressures (NEPRA, 2023, 2024a, 2026d). These factors do not justify every inefficiency or every tariff component, but they explain why plant-level generation cost and final consumer price are not the same economic object.

The analytical implication is that the consumer-to-procurement gap must remain decomposed. Part may represent network and system costs, part explicit public charges, part recovery of fixed/capacity commitments, and part may reflect inefficiency, losses or policy transfers. Without complete cost-to-serve and audited fiscal evidence, the gap cannot defensibly be relabelled as Government of Pakistan profit.

7. Pakistan in the 58-Country Global Electricity-Price Comparison

The global analysis materially changes the framing of the Pakistan electricity-price debate. On a nominal final-retail-price basis, Pakistan is not among the highest-priced household electricity markets in the loaded sample. At the same time, its standardized commercial price is considerably less competitive. The contrast between household and commercial positions is more informative than a single claim that electricity in Pakistan is either 'cheap' or 'expensive'.

7.1 Household Electricity: Pakistan Is Below the Loaded-Country Median

The 2025 current household comparison contains 57 comparable country values. The loaded-country median is approximately USD 0.124/kWh, with a range of about USD 0.006-0.432/kWh. Pakistan is approximately USD 0.058/kWh, which is 53.2% below the loaded-country median and about 4.1% below the loaded Southern Asia median under the United Nations Statistics Division M49 geographic classification. The nominal household benchmark is also below those of India, Bangladesh, Sri Lanka, China, Thailand, the Philippines, Singapore, Australia, South Africa and the United States in the loaded dataset. This establishes a relatively low nominal retail price position, not a conclusion that electricity is affordable relative to Pakistani income (GlobalPetrolPrices, 2026a, 2026c).

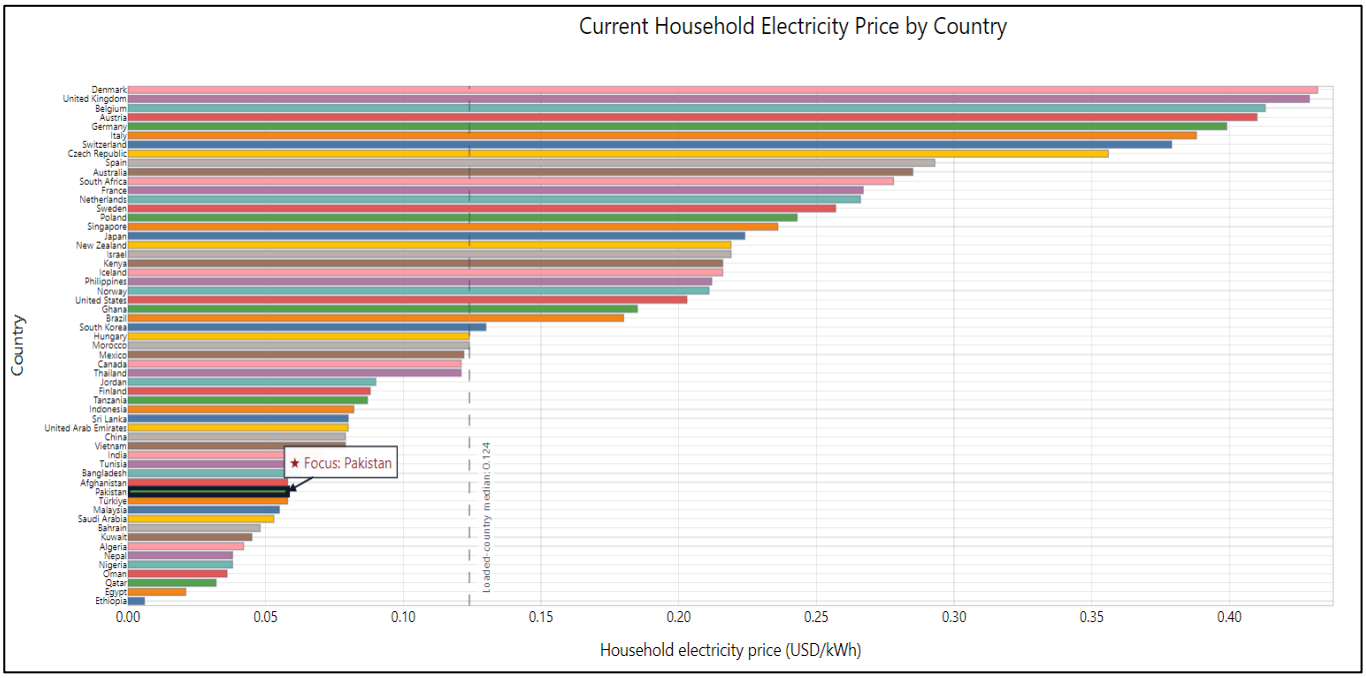


Figure 7. Current household electricity price by country. Pakistan lies well below the loaded-country median in nominal USD/kWh, although this chart does not measure income-adjusted affordability.

Source: Brill-Viz analysis of the 58-country public comparison dataset; primarily December 2025 electricity observations from GlobalPetrolPrices country pages.

7.2 Commercial Electricity: Pakistan Is Above the Loaded-Country Median

The commercial comparison contains 55 comparable country values with a median of approximately USD 0.126/kWh and a range of about USD 0.016-0.451/kWh. Pakistan is approximately USD 0.148/kWh, 17.5% above the loaded-country median and about 44.4% above the loaded Southern Asia median under the revised M49 grouping. Pakistan therefore appears relatively inexpensive for the standardized household benchmark but materially less favorable for business users. This difference is analytically relevant to industrial and commercial competitiveness, though electricity price is only one component of overall business cost and reliability exposure (GlobalPetrolPrices, 2026a, 2026c).

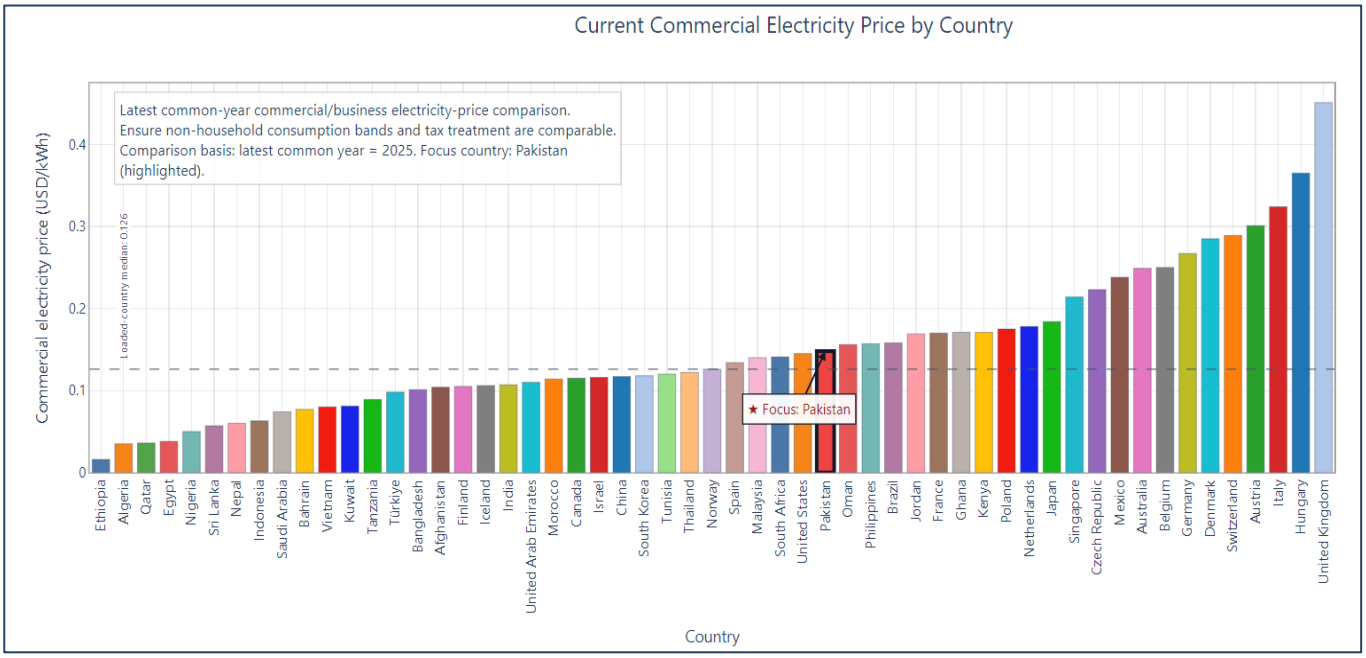


Figure 8. Current commercial electricity price by country. Pakistan is above both the loaded-country and loaded Southern Asia commercial medians, contrasting with its low nominal household position.

Source: Brill-Viz analysis of the 58-country public comparison dataset; primarily December 2025 commercial electricity observations from GlobalPetrolPrices country pages.

7.3 Household-Commercial Tariff Architecture

Across 55 paired countries, commercial electricity is more expensive than household electricity in 26 and lower in 29; the median commercial-household gap is slightly negative at approximately USD -0.007/kWh. Pakistan is a clear positive-gap case: approximately USD 0.058/kWh household versus USD 0.148/kWh commercial, a gap of about USD +0.090/kWh. This does not identify one specific cross-subsidy mechanism by itself, but it demonstrates that Pakistan's tariff architecture differentiates customer classes much more strongly than the median paired country in the loaded sample (GlobalPetrolPrices, 2026a, 2026c).

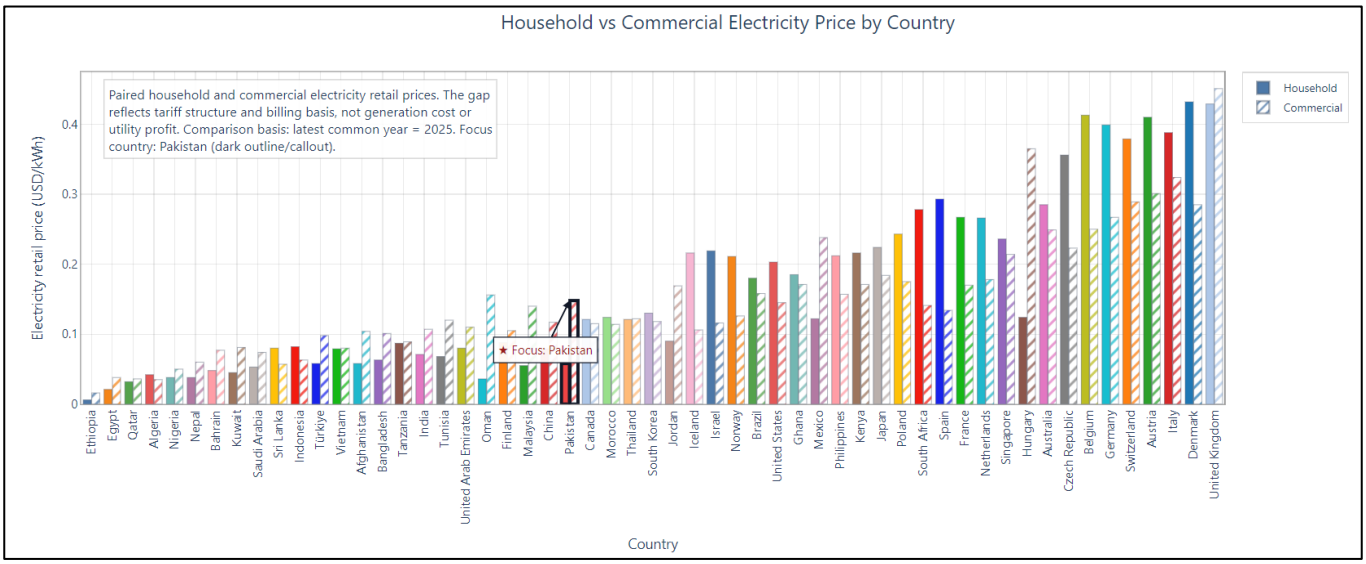


Figure 9. Household versus commercial electricity retail price by country. The paired bars show the direction and magnitude of customer-class differentiation; Pakistan combines a low household benchmark with a materially higher commercial benchmark.

Source: Brill-Viz paired-country analysis. Household and business benchmarks use source-defined representative consumption assumptions and are not identical-consumption invoices.

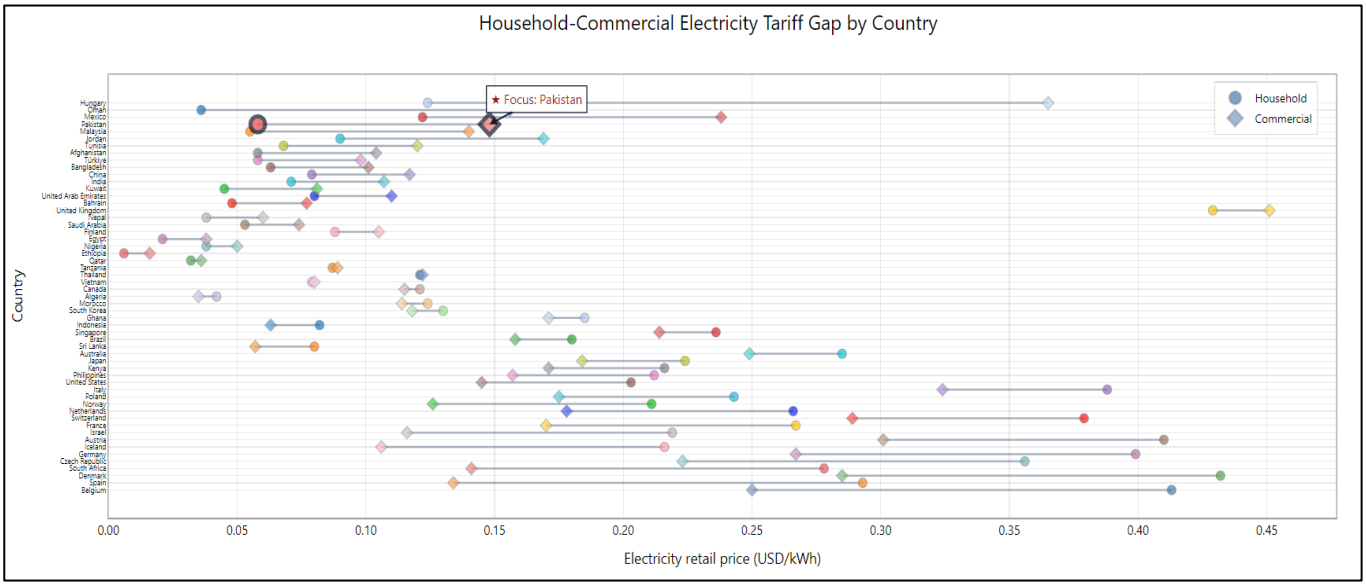


Figure 10. Household-commercial electricity tariff gap by country. The dumbbell distance visualizes the observed price separation between customer classes and highlights the comparatively wide positive gap for Pakistan.

Source: Brill-Viz paired-country analysis of standardized final retail electricity prices.

7.4 Regional Context and Benchmark Deviation

Regional medians are now calculated using United Nations Statistics Division M49 geographic subregions to avoid overlapping or mixed labels such as South/Central Asia, Middle East / West Asia, or Europe / West Asia (UNSD, n.d.). Under this consistent scheme, Pakistan, India, Afghanistan, Iran, Bangladesh, Nepal and Sri Lanka belong to Southern Asia; the Gulf states, Jordan, Israel and Türkiye are grouped in Western Asia. The represented Western European and Southern European markets occupy the high end of household electricity prices, while several Western Asian and Northern African markets remain much lower. South-eastern Asia is internally diverse, ranging from relatively inexpensive Malaysia and Vietnam to much higher Singapore and Philippine household prices. Southern Asia is generally lower-priced for households but less uniform for commercial customers. These medians describe only the countries loaded in the dataset and are not population-, consumption- or GDP-weighted regional averages.

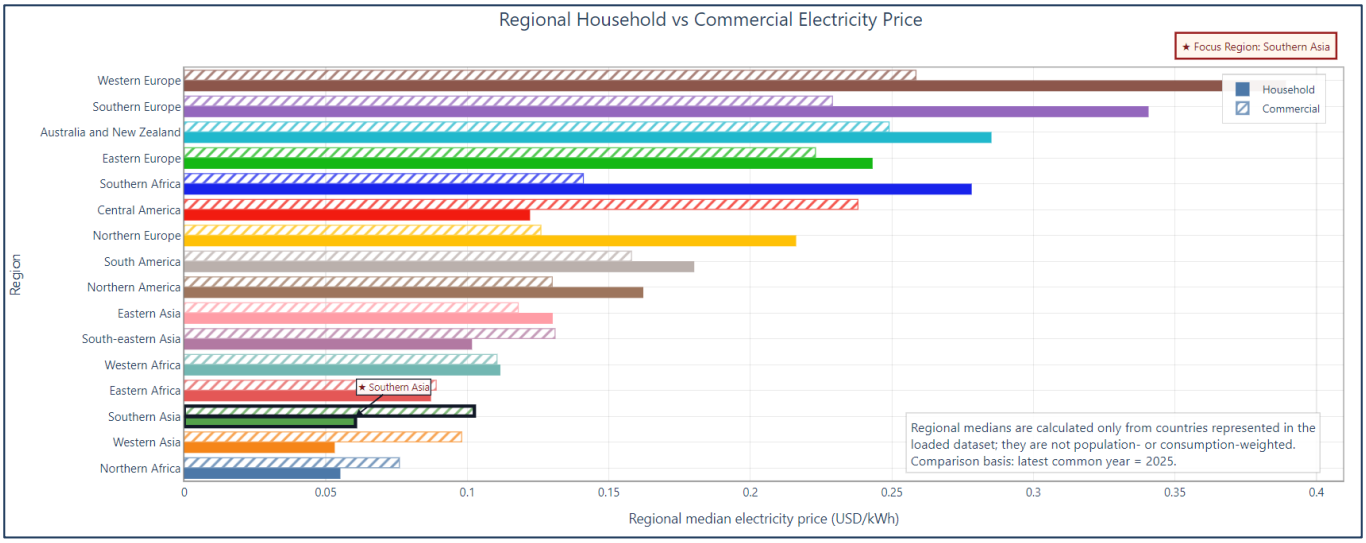


Figure 11. Regional household and commercial electricity medians using UN M49 geographic subregions. The chart shows broad geographic structure but should be read as medians of the represented countries rather than weighted regional averages.

Source: Brill-Viz regional aggregation of the loaded 58-country current electricity dataset; country-to-subregion assignments follow UN Statistics Division M49. Medians are unweighted descriptions of represented countries.

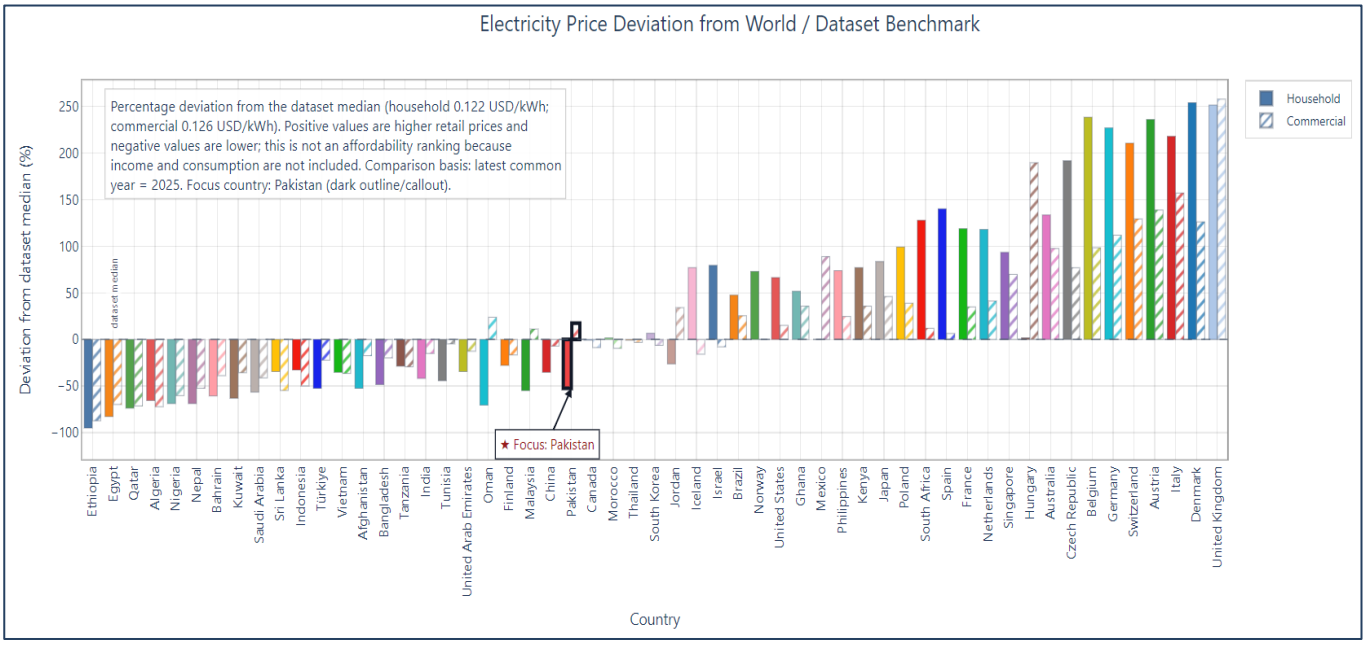


Figure 12. Country electricity-price deviation from the loaded dataset benchmark. Negative values indicate prices below the benchmark and positive values above it; the measure is a price-level comparison, not an affordability ranking.

Source: Brill-Viz calculation from current household and commercial electricity observations.

7.5 Spatial and Multi-Metric Views

World maps make the geographic concentration of high and low nominal prices visually explicit, while the normalized heatmaps compare each country or region with the median of the same metric. A heatmap value above 1.0 therefore means relatively high price on that metric, not a composite score of affordability or policy quality. Different products retain their own physical units, and missing values remain blank rather than being converted to zero.

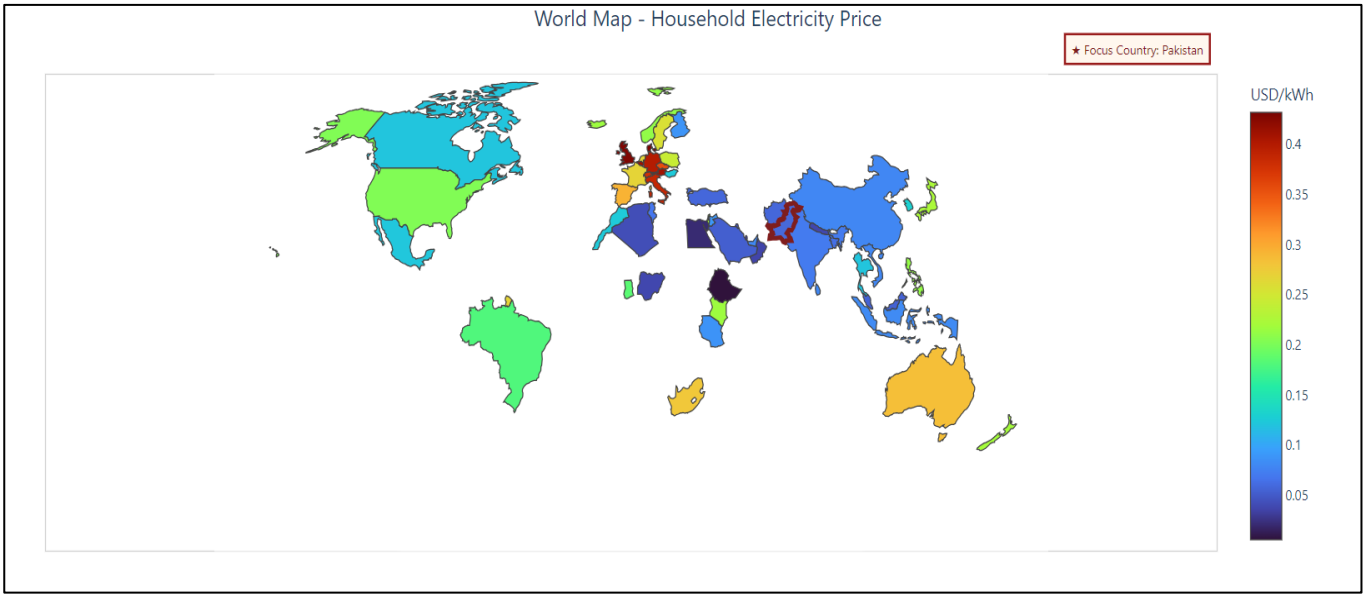


Figure 13. World map of household electricity prices. The map emphasizes the spatial distribution of nominal retail price levels; unshaded countries represent missing observations rather than zero prices.

Source: Brill-Viz choropleth from the loaded 2025 household electricity observations.

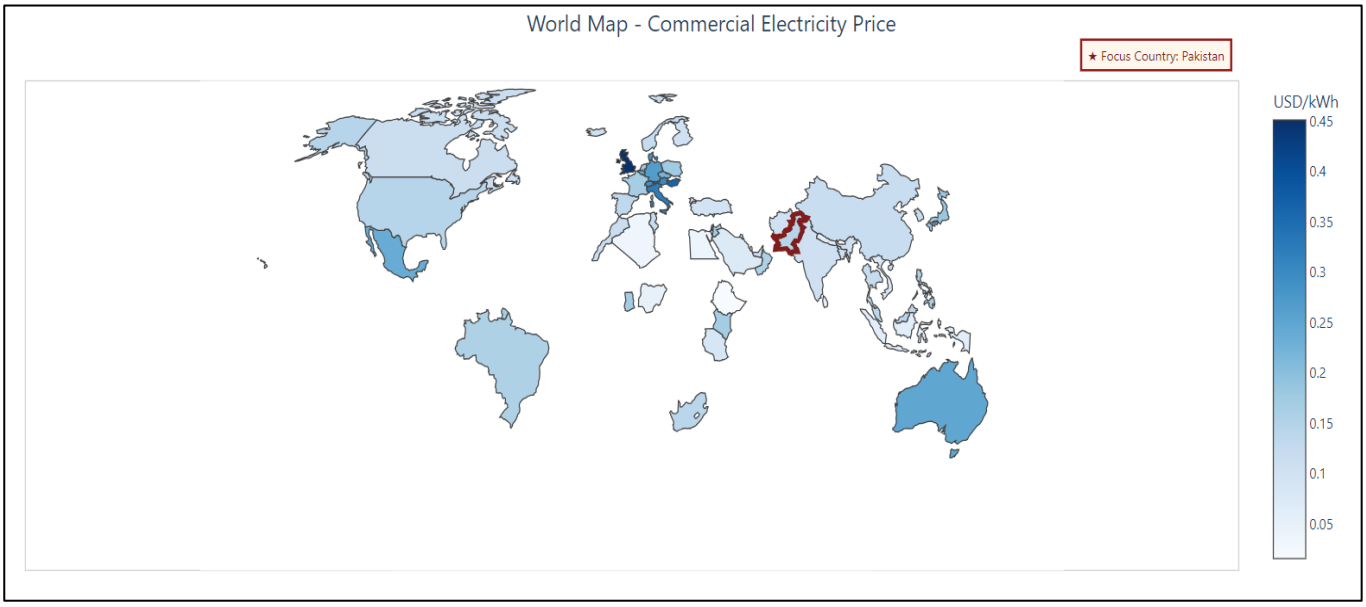


Figure 14. World map of commercial electricity prices. Pakistan's commercial position is less favorable than its household position when viewed against the same international sample.

Source: Brill-Viz choropleth from the loaded 2025 commercial electricity observations.

8. Natural Gas and Transport-Fuel Context

The updated Brill-Viz key facts deliberately show natural gas in both USD/MMBtu and its equivalent USD/kWh because direct numerical comparison with petrol or diesel in USD/litre is misleading. The loaded household natural-gas median is approximately USD 27.11/MMBtu, equivalent to USD 0.093/kWh, based on 32 countries. The commercial median is approximately USD 21.10/MMBtu, equivalent to USD 0.072/kWh, based on 28 countries. The fact that the household gas benchmark can be higher than the business benchmark is not contradictory: many systems apply different consumption bands, margins or tariff structures to larger commercial users. The provider's separate world averages for December 2025 differ from these loaded-sample medians because coverage and aggregation are not identical (GlobalPetrolPrices, 2026b).

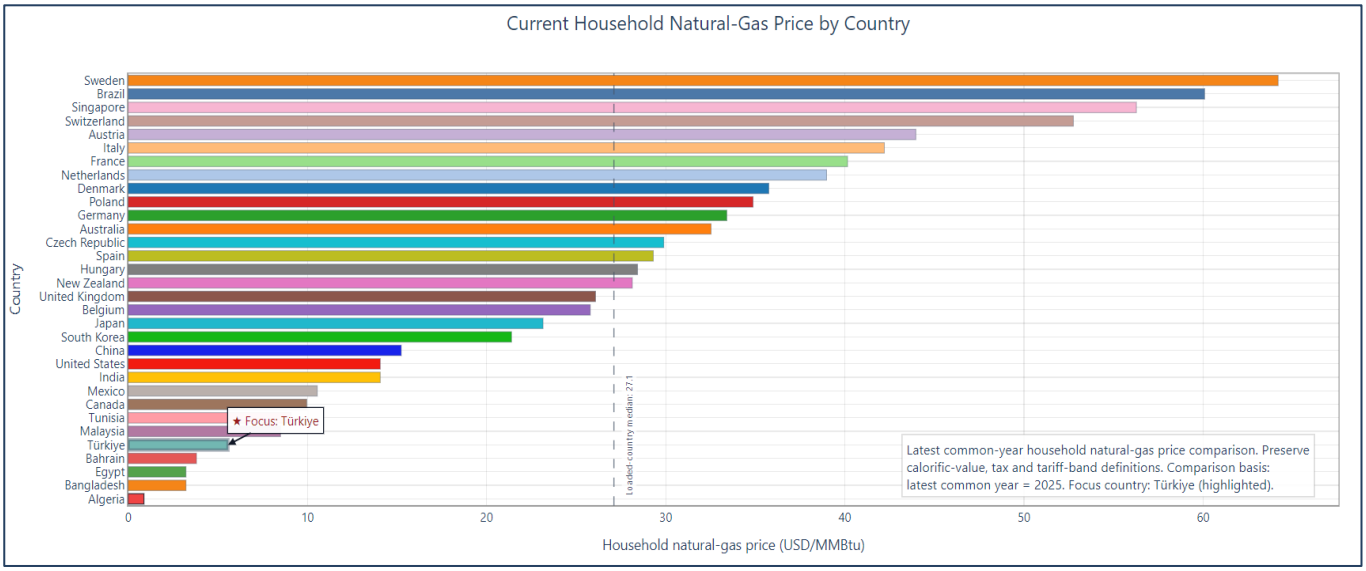


Figure 15. Current household natural-gas price by country. The loaded median is approximately USD 27.11/MMBtu (about USD 0.093/kWh) across 32 comparable country observations. Pakistan is not plotted because no defensible same-source standardized public value is available in the ranked comparison; official OGRA tariffs are retained separately.

Source: Brill-Viz analysis of public December 2025 natural-gas observations from GlobalPetrolPrices; gas coverage is smaller than electricity coverage.

Pakistan is intentionally absent from Figures 15-17. The public Pakistan natural-gas page displays 0.000 USD/kWh for household and business users, but Pakistan is absent from the provider's ranked international gas comparison (GlobalPetrolPrices, 2026b, 2026d). This paper therefore treats that 0.000 display as unavailable/placeholder evidence rather than a real zero retail price. Official OGRA notified gas-sale schedules effective 1 July 2025 are available and retained separately in the companion workbook, including slab-specific household and commercial tariffs and fixed charges (OGRA, 2025); however, those tariff schedules are not inserted into the same-source global ranking without a separate standardized all-in bill reconstruction.

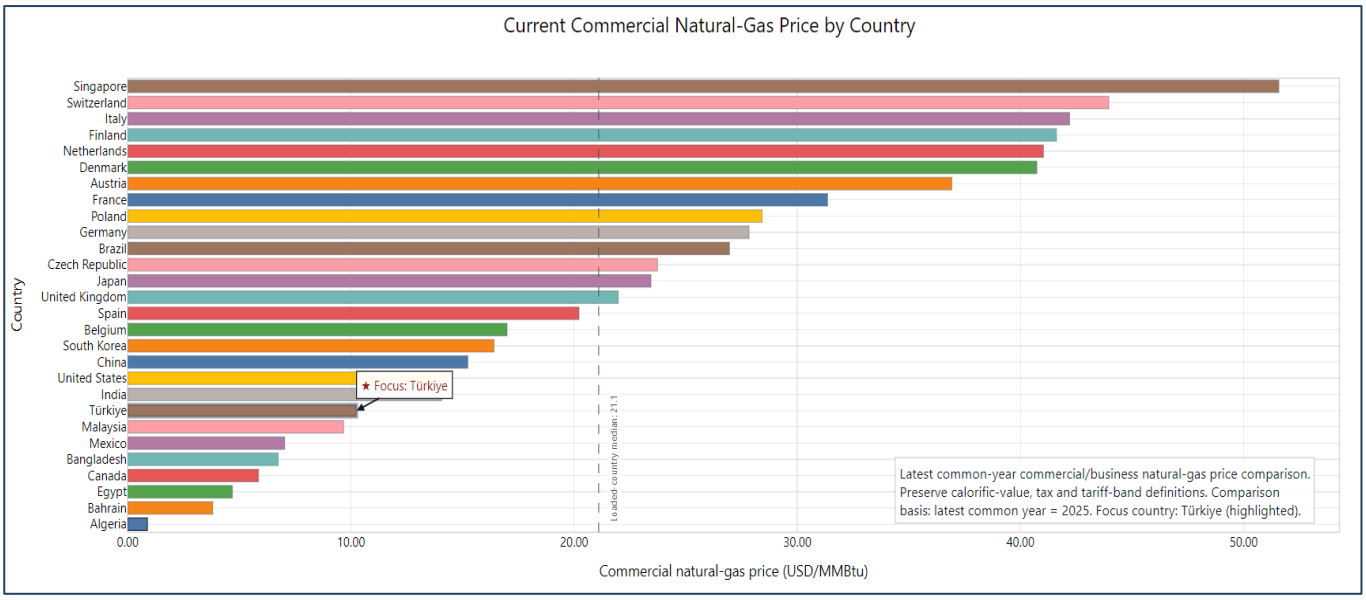


Figure 16. Current commercial natural-gas price by country. The loaded median is approximately USD 21.10/MMBtu (about USD 0.072/kWh) across 28 comparable observations. Pakistan is not plotted for the same comparability reason; the official tariff schedule is not equivalent to the source provider's standardized all-in business benchmark.

Source: Brill-Viz analysis of public December 2025 natural-gas observations from GlobalPetrolPrices.

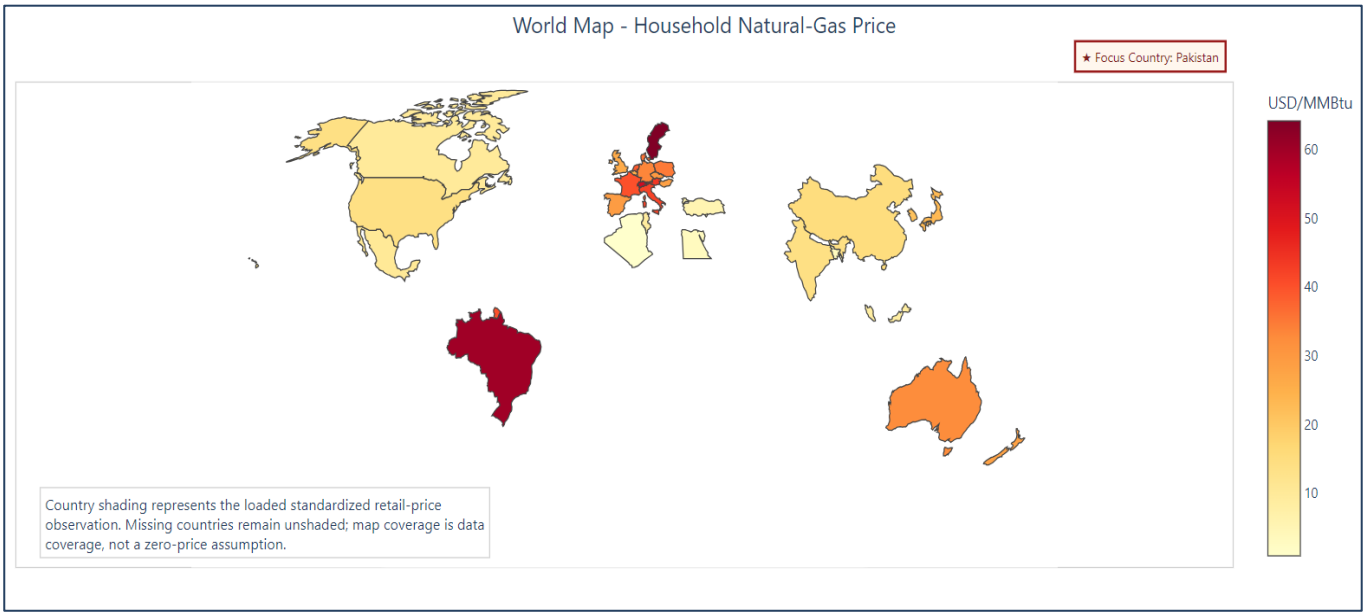


Figure 17. World map of household natural-gas prices. Sparse coverage relative to electricity should be treated as an evidence limitation, not as evidence of zero-priced gas markets. Pakistan remains unshaded because its standardized same-source value is treated as unavailable, not zero.

Source: Brill-Viz choropleth from the loaded household natural-gas observations.

For road fuels, Pakistan is much closer to the loaded global median than its household electricity position would suggest. The 2026 petrol/gasoline sample contains 57 countries with a median of approximately USD 1.477/litre; Pakistan is about USD 1.386/litre, 6.2% below the loaded-country median but about 6.3% above the loaded Southern Asia median. Diesel also contains 57 country values with a median of approximately USD 1.500/litre; Pakistan is approximately USD 1.500/litre, effectively at the loaded-country median and about 23.2% above the loaded Southern Asia median under the revised M49 grouping (GlobalPetrolPrices, 2026c).

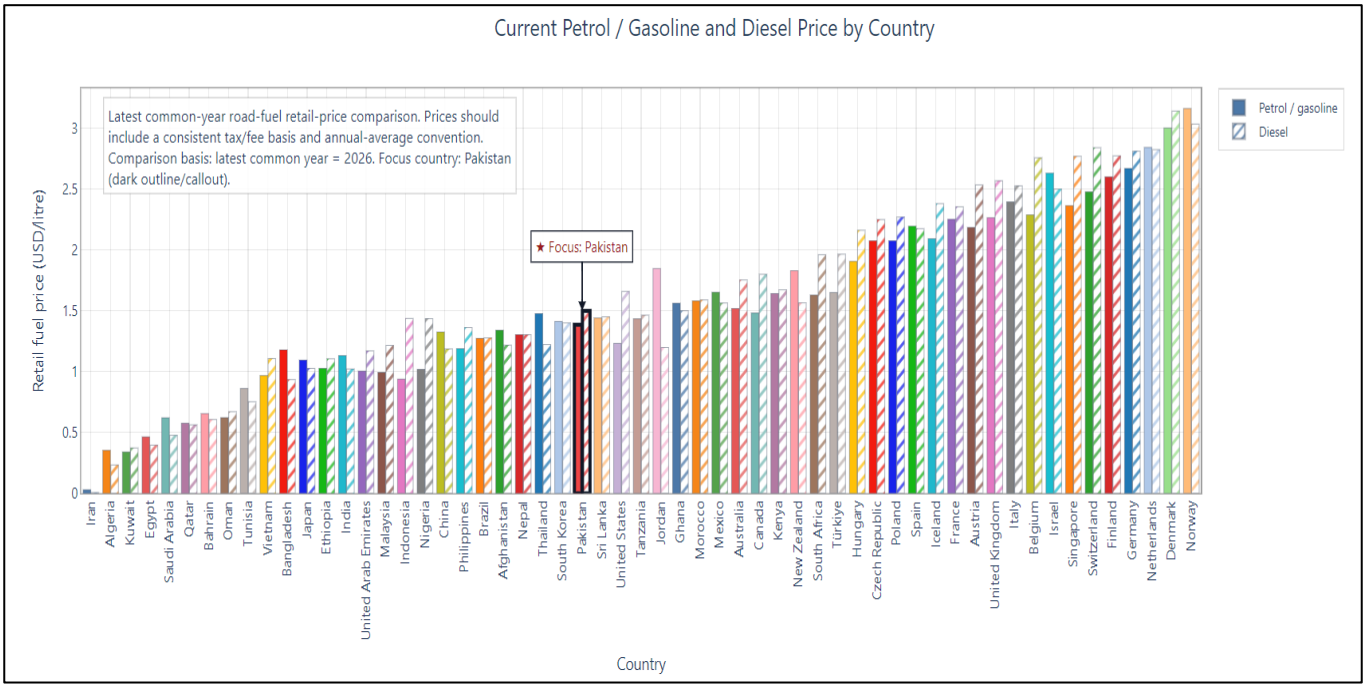


Figure 18. Current petrol/gasoline and diesel price by country. Pakistan is near the loaded global medians for road fuels, in contrast to its substantially below-median household electricity position.

Source: Brill-Viz analysis of the latest public 2026 road-fuel observations recorded in the 58-country dataset.

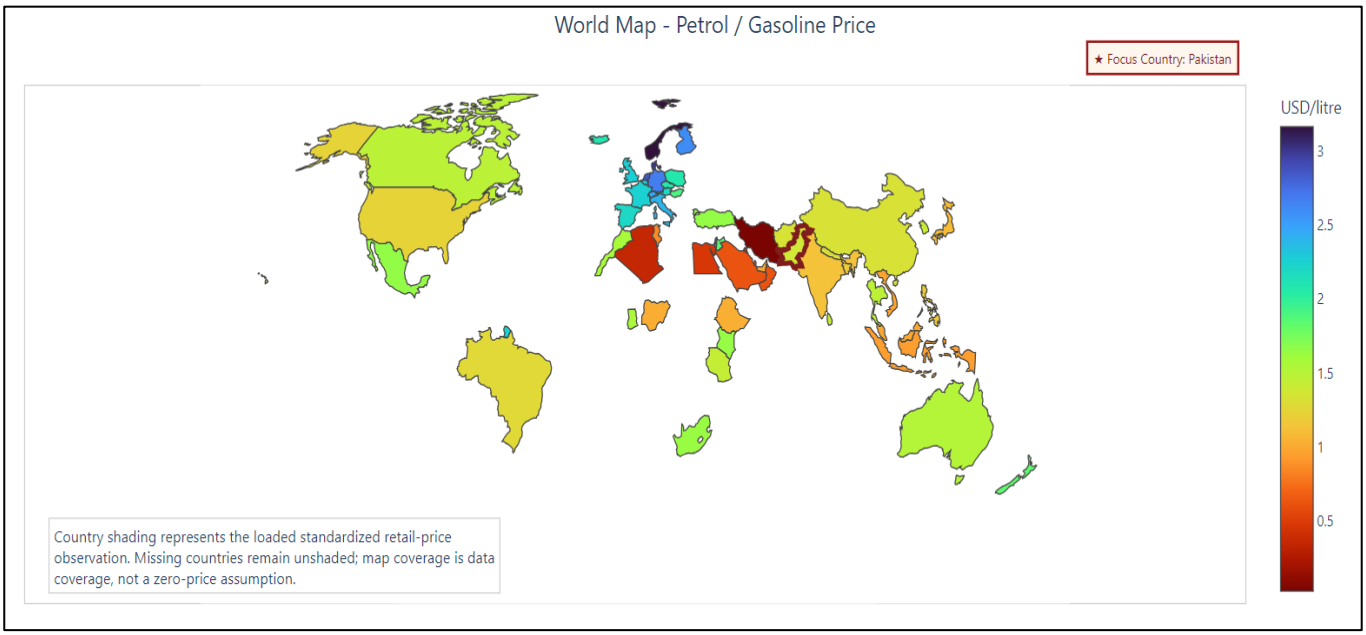


Figure 19. World map of petrol/gasoline retail prices. Pakistan is moderately below the loaded global median but about 6.3% above the loaded Southern Asia median under the M49 grouping.

Source: Brill-Viz choropleth of 57 comparable 2026 petrol/gasoline observations.

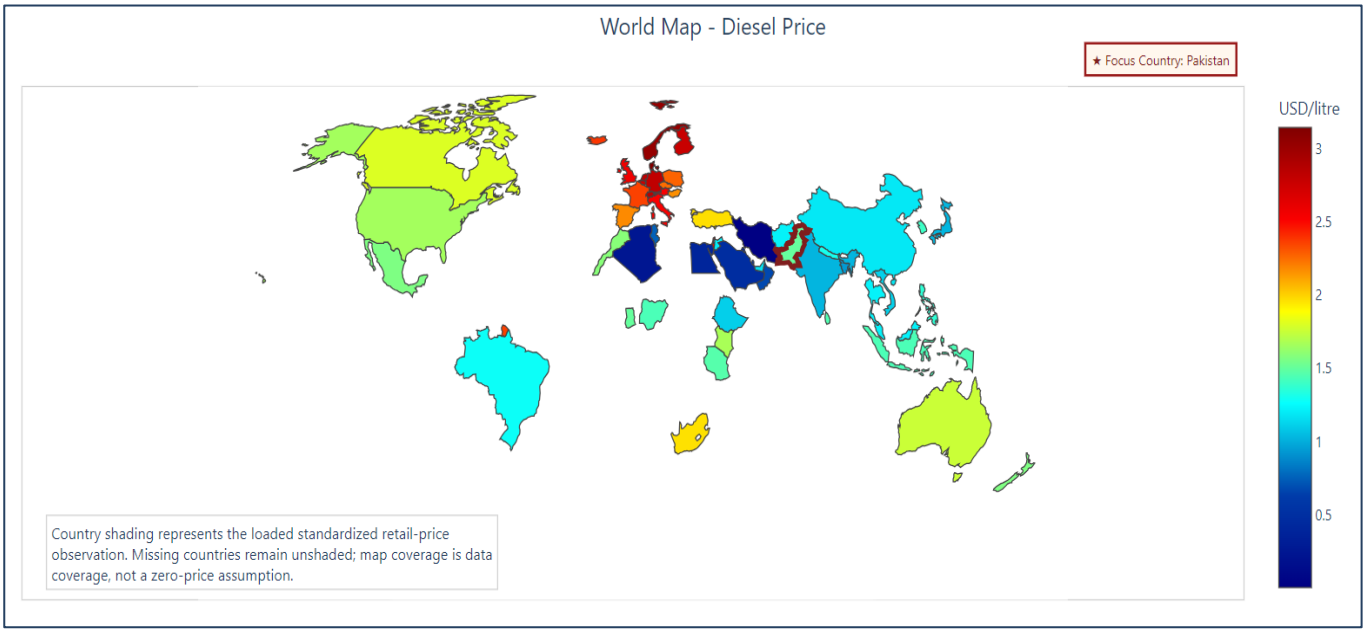


Figure 20. World map of diesel retail prices. Pakistan is approximately at the loaded-country diesel median while remaining about 23.2% above the loaded Southern Asia median under the M49 grouping.

Source: Brill-Viz choropleth of 57 comparable 2026 diesel observations.

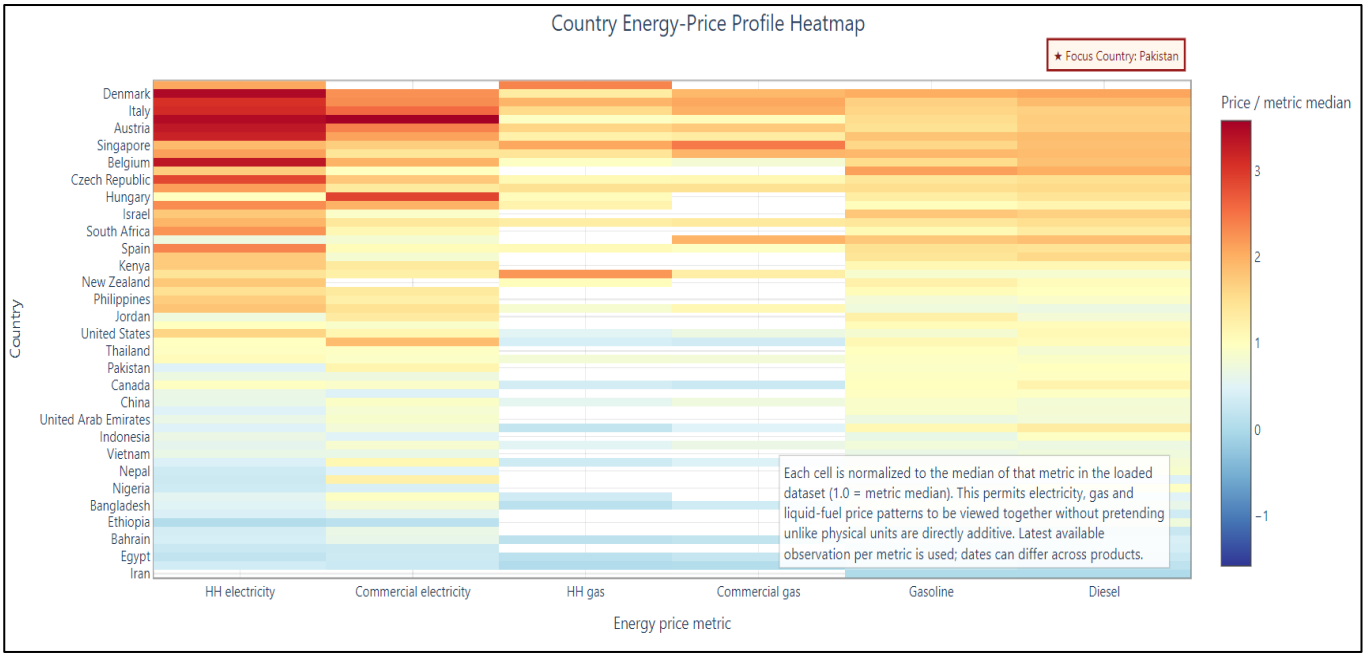


Figure 21. Country energy-price profile heatmap. Each metric is normalized to its own loaded-sample median, allowing cross-product profile comparison without adding unlike physical units into a single score.

Source: Brill-Viz normalized current-price analysis. Missing values remain blank; the heatmap is not an affordability index.

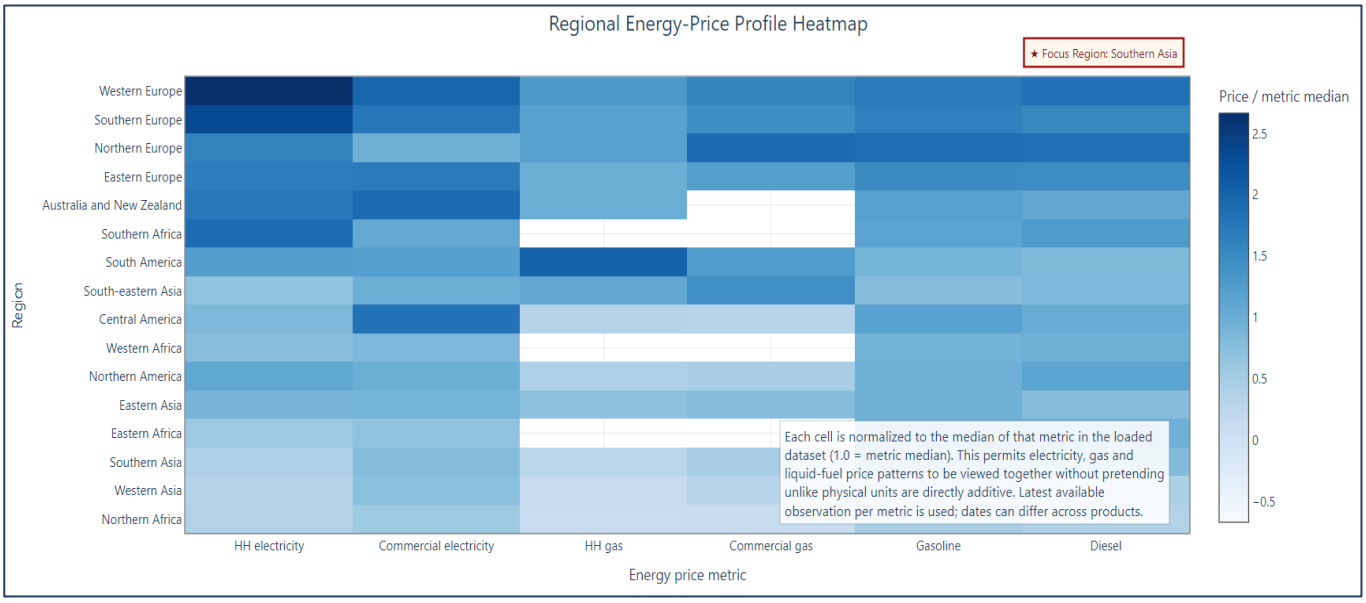


Figure 22. Regional energy-price profile heatmap. The figure summarizes relative electricity, gas and road-fuel price levels within the represented regional groups while retaining metric-specific normalization.

Source: Brill-Viz regional aggregation of the current 58-country price dataset; medians are unweighted descriptions of represented countries.

9. What the Combined Pakistan and Global Evidence Establishes

The combined evidence supports a more precise conclusion than either ‘Pakistan electricity is extremely expensive’ or ‘Pakistan electricity is cheap’. Pakistan's standardized household electricity price is low in nominal international comparison, while its standardized commercial price is above the loaded global and Southern Asia medians. Within Pakistan, the equal-consumption scenario shows that household and commercial prices can converge at 500 kWh/month, demonstrating that the apparent household-commercial gap depends strongly on consumption level and tariff structure. These findings are complementary because the domestic scenario fixes consumption, whereas the international benchmarks use source-defined representative consumption levels.

The analysis also shows why a gap between retail price and generation/procurement cost must not be described as government profit. Final retail price contains costs and policy layers that do not appear in a plant-level cost. The Pakistan decomposition identifies some of those layers directly, including fixed-charge allocation and public taxes/surcharges, while leaving unresolved subsidy allocations and full cost-to-serve components blank. The global comparison demonstrates that retail prices exceeding a narrow energy-production cost are normal across many regulatory systems because network, fixed, tax and policy components are embedded in the customer-facing price.

Table 3. Principal findings for Pakistan in the current evidence base.

Indicator	Pakistan result	Interpretation
2026 household structural all-in	PKR 17.80 / 54.98 / 62.22 per kWh at 100 / 500 / 1,500 kWh	Strong consumption-band differentiation; low-use household case is protected relative to higher-use cases.
2026 commercial structural all-in	PKR 60.26 / 50.82 / 53.68 per kWh at 100 / 500 / 1,500 kWh	Fixed-charge allocation can make very low commercial consumption expensive per kWh.
500 kWh/month equal-consumption comparison	Household PKR 54.98/kWh; commercial PKR 50.82/kWh	Customer-class prices are close at this specific standardized usage level.
Identified public receipts	PKR 3.26-13.22/kWh across 2026 cases	Gross identified public charges, not net government profit.

Indicator	Pakistan result	Interpretation
Global household electricity	USD 0.058/kWh; 53.2% below loaded-country median	Relatively low nominal retail household price; not an affordability ranking.
Global commercial electricity	USD 0.148/kWh; 17.5% above loaded-country median	Commercial position is materially less favorable than household position.
Petrol/gasoline	USD 1.386/litre; 6.2% below loaded-country median	Near the loaded global median; about 6.3% above the loaded Southern Asia median (UN M49).
Diesel	USD 1.500/litre; approximately equal to loaded-country median	Near the loaded global median; about 23.2% above the loaded Southern Asia median (UN M49).

Source: Brill-Viz deterministic analysis of the companion Pakistan and global current-price datasets. Percentage comparisons are descriptive of the loaded sample, not population- or consumption-weighted world averages.

10. Price Level Is Not Affordability

The most important unresolved question is affordability. A nominal household price of USD 0.058/kWh can be far below European or Australian prices while still imposing a severe burden on a lower-income household. A genuine affordability analysis requires the retail price to be combined with typical monthly consumption, household disposable income or expenditure, purchasing-power-parity measures, fixed charges, reliability and the cost of backup supply. For commercial users, competitiveness also depends on demand charges, load factor, reliability, self-generation alternatives and the energy intensity of the business. The present paper therefore establishes Pakistan's nominal price position but deliberately stops short of ranking countries by affordability.

11. Limitations and Evidence Guardrails

Several limitations should remain explicit. First, the Pakistan historical structural series is a standardized reconstruction from official/reference tariff evidence rather than a complete archive of every observed monthly invoice; volatile adjustments are excluded where source evidence is absent. Second, the early 2016-2018 tariff references include explicit IESCO evidence and should not be represented as a perfectly uniform national tariff. Third, the global current snapshot mixes primarily December 2025 electricity/gas observations with 2026 road-fuel observations, and natural-gas country coverage is materially smaller than electricity coverage; Pakistan has no defensible same-source standardized gas value in the ranked public comparison and is therefore left blank rather than treated as zero. Fourth, the global household and commercial values are source-standardized retail benchmarks at different representative consumption levels; they are not equal-consumption bill simulations. Fifth, country and regional medians are unweighted descriptions of the loaded sample; geographic regions follow UN M49 subregions for statistical consistency. Finally, neither the Pakistan nor global analysis provides a complete audited fiscal bridge from customer payment to net government profit or loss.

12. Conclusions with Epilogue

The Pakistan and international analyses together support five principal, evidence-supported conclusions. First, final retail electricity price is not equivalent to plant-generation or procurement cost. Second, Pakistan's domestic tariff burden varies substantially by customer class and consumption case; low-use households, higher-use households and commercial users cannot be represented by one national price. Third, the identifiable public-charge component should remain separate from the wider consumer-to-system gap and should not be labelled government profit. Fourth, Pakistan's standardized household electricity price is relatively low in nominal global comparison, whereas its commercial electricity price is above the loaded-country and Southern Asia medians. Fifth, nominal international price ranking is not the same as affordability. Independent household-survey evidence shows that a material share of Pakistani households can still experience electricity as burdensome even at relatively low nominal USD/kWh prices; a full income- and consumption-adjusted international affordability analysis therefore remains an important next analytical stage.

Epilogue: From Nominal Price to System Efficiency

This epilogue is principally the collective analytical outcome of two evidence papers: the master synthesis, Sustainable Energy Systems and Energy Security in Pakistan, and the present electricity-price and cost-recovery analysis. The companion Energy Policy Options for Pakistan paper is best read as the implementation and decision-gate translation of that evidence rather than as a separate evidentiary pillar. Read together, the studies clarify why Pakistan can appear comparatively inexpensive in a nominal international household tariff comparison and yet still operate a power system that is financially stressed, operationally inefficient in important areas, and burdensome for many domestic consumers (Arshad, 2026a, 2026b).

The apparent contradiction: lower nominal tariff, high domestic burden

The international comparison in this paper remains valid: Pakistan is not among the highest-priced household electricity markets in the loaded sample in nominal USD/kWh terms, while its standardized commercial benchmark is only moderately above the loaded-country median. That finding, however, is a statement about nominal retail price level, not about household affordability or the internal efficiency of the power system. A tariff that appears low beside Europe or Australia can still be difficult to afford when incomes are lower, while the electricity system itself can remain expensive because fixed generation commitments, imported-fuel exposure, network costs, losses, weak recoveries and financing burdens must still be recovered from the units that are actually billed and paid for.

The useful reconciliation is therefore not that one of the two narratives is wrong. Rather, they describe different accounting questions. International retail-price ranking asks what consumers pay per unit. System-cost analysis asks what the sector must spend and recover to keep capacity, fuel, networks and service available. Affordability asks what the final bill means relative to household or business income. Service quality asks what consumers actually receive for that payment. These questions should not be collapsed into one.

Affordability and service quality: why ‘globally cheaper’ does not necessarily mean affordable

The affordability issue deserves explicit treatment because it helps explain why a country can appear inexpensive in a nominal international price comparison while consumers still perceive electricity as costly. The World Bank's *Pakistan Energy Survey* applies a study-specific affordability test based on household expenditure. Using an assumed protected tariff and a 100 kWh/month electricity package, the study classified electricity as unaffordable where the monthly electricity cost reached 5% or more of total household expenditure. On that basis, **22.2% of grid-connected Pakistani households** were above the 5% threshold; the corresponding shares were **23.5% in rural areas and 19.3% in urban areas** (World Bank, 2024). The 5% value should be read as the study's analytical threshold rather than as a universal statutory definition of affordability.

This result is particularly important because the test deliberately used a relatively modest 100 kWh/month package and a protected-tariff assumption. It therefore demonstrates that a low nominal tariff can still represent a material household-budget burden. The burden can become larger for households whose consumption moves into higher tariff bands, who face fixed charges and adjustments, or who must spend additionally on backup electricity, batteries, generators or other coping arrangements when grid service is unreliable.

Service quality further complicates the meaning of ‘cheap electricity’. The same World Bank survey, based on fieldwork undertaken in 2021-2022, reported that **80.8% of households experienced four to fourteen unscheduled interruptions per week lasting more than two hours, while about 11% experienced more than fourteen interruptions per week**. It also reported that **16.9% of households experienced voltage fluctuations that damaged appliances** (World Bank, 2024). These are survey-period observations rather than a claim about current 2026 service quality, but they illustrate why nominal PKR/kWh or USD/kWh alone cannot capture the full economic burden of electricity service. Reliability and quality problems can create additional private costs even when the official tariff itself appears internationally modest.

Income context reinforces the same point. The World Bank reports Pakistan's GDP per capita at approximately **USD 1,596 in 2025**, compared with about **USD 2,705 for South Asia as a whole**. GDP per capita is not household disposable income and should not be equated with a poverty line, so it is not itself an affordability metric. It does, however,

underline why direct comparison of Pakistan's nominal electricity tariff with high-income economies can be misleading unless income and purchasing power are also considered (World Bank, 2025).

The correct interpretation is therefore not that Pakistan's electricity is 'cheap' in an absolute welfare sense. It is that Pakistan's **nominal household retail price is relatively low in the international dataset used here**, while affordability for Pakistani households remains a separate and more demanding question. That distinction strengthens rather than weakens the international comparison.

Energy Purchase Price and Capacity Purchase Price: complementary, not equivalent

The key issue is not EPP-CPP parity; the two components are not expected to be equal. Energy Purchase Price (EPP) is principally associated with the variable cost of electricity actually generated and purchased, including fuel and other energy-linked costs. Capacity Purchase Price (CPP) is principally associated with keeping contracted generation capacity available and recovering fixed capacity-related obligations. CPP therefore does not necessarily disappear when a plant generates fewer units. When demand or dispatch falls, the remaining fixed capacity burden can instead be spread over fewer delivered or sold kWh.

Table 4. Energy Purchase Price (EPP) and Capacity Purchase Price (CPP): analytical distinction.

Component	What it represents	Why utilization matters
EPP - Energy Purchase Price	Variable or energy-linked cost of electricity actually generated/purchased, including fuel and other dispatch-linked components.	Generally falls when less energy is generated, although the per-unit value still depends on fuel mix, efficiency and imported-fuel prices.
CPP - Capacity Purchase Price	Fixed capacity-related obligations paid to keep contracted generation capacity available, including plant-specific fixed tariff components.	Can remain payable when utilization falls; lower utilization can therefore raise the capacity-cost burden per kWh actually delivered or sold.

Source: analytical distinction based on NEPRA power-purchase and generation-performance evidence. Exact tariff components vary by plant and contract; the table is a conceptual summary rather than a reconstruction of every PPA.

NEPRA's FY2024-25 generation-performance report illustrates why CPP is central to the present debate. Excluding electricity imported from Iran, total power-purchase cost was reported at approximately PKR 2,943.214 billion, of which 61% was CPP and 39% EPP. Average CPP was about PKR 14.3/kWh and EPP about PKR 9.0/kWh, while thermal plant utilization was about 42.5%. NEPRA linked the elevated CPP principally to surplus capacity and low utilization, and identified dependence on imported fuels such as RLNG, RFO and imported coal as an important driver of EPP (NEPRA, 2026e).

This explains why concern about capacity payments has an economic basis. If a system has contracted capacity that remains available but is used only partially, many fixed obligations remain even though fewer kWh are generated and sold. Capacity cost per sold unit can therefore rise as utilization falls. But this does not mean that the entire structural cost problem can be attributed to private IPPs alone.

Where efficiency improvement can genuinely reduce the burden

It would be incorrect to say that most fuel used for power generation is physically lost through poor management. The losses occur through several different mechanisms, and their remedies have different effects. **Technical T&D losses** are real electrical-energy losses between system input and useful delivery. Reducing them means that less electricity has to be generated or purchased to provide the same level of billed service. Where the marginal generation being avoided is based on imported RLNG, oil or coal, this can also reduce foreign-exchange and fuel-import exposure.

Electricity theft and other non-technical losses are different. The electricity has generally still been generated and consumed, so the fuel or other generation cost has already been incurred, but the consumption is not fully metered or billed. **Poor recovery** is different again: the energy may be correctly metered and billed but the cash is not collected.

Improving recovery does not by itself undo the fuel already used; it improves the cash available to pay generators, fuel suppliers, lenders and network operators and can therefore reduce circular-debt pressure.

The scale of the distribution problem is material. NEPRA reported that no DISCO met its prescribed T&D-loss target in FY2024-25 and estimated the associated financial impact at about PKR 265 billion. The same performance framework identifies weak recovery and unreliable system operation as continuing contributors to circular-debt accumulation (NEPRA, 2026d). The IMF likewise defines power-sector arrears as arising from several sources, including unrecognized line losses and non-recoveries, financing and markup costs, late-payment surcharges, subsidy-payment delays and other payment shortfalls (IMF, 2026).

Transmission and dispatch constraints create another kind of inefficiency. If low-cost or more efficient generation cannot reach load centres, the system may curtail available generation or dispatch more expensive plants. Strengthening the network and operating the system closer to economic merit order can therefore reduce delivered cost even without adding new generation capacity. These improvements can also reduce load management where network or distribution constraints are binding, although they cannot eliminate every cause of load shedding.

Efficiency gains can therefore produce several different benefits at once: lower gross generation requirements for the same paid demand, lower imported-fuel exposure where imported thermal generation is marginal, stronger cash recovery, reduced circular-debt accumulation, better utilization of existing low-cost generation, and potentially improved reliability. The effect of each measure, however, depends on where in the system the inefficiency occurs and what type of generation is displaced.

Why the CPP burden can persist even after losses and theft improve

Efficiency gains are important, but they do not automatically extinguish CPP. Fixed contractual and public-sector capacity obligations can remain even when technical losses fall, theft is reduced or recoveries improve. If grid demand remains weak, or if AT&C-based load management suppresses sales, those fixed costs can be spread across fewer units, which can keep the capacity charge per sold kWh high. NEPRA has specifically warned that low plant utilization, transmission constraints and DISCO load-management practices can reinforce this cycle (NEPRA, 2025b).

This is also why the power-sector problem should not be attributed exclusively to private IPPs. NEPRA has called for review of capacity payments associated with old, inefficient and under- or non-utilized public-sector plants, including older GENCOs and WAPDA hydel assets, while also identifying low utilization of take-or-pay thermal plants and transmission-constrained dispatch as contributors to system cost (NEPRA, 2025b). The economically relevant question is therefore not simply whether an asset is privately or publicly owned, but whether its fixed and variable costs, availability, dispatch role and remaining contractual obligations deliver sufficient system value.

The CPP problem also explains why efficiency reform is necessary but not sufficient. Pakistan can reduce avoidable losses, theft and non-recovery and still face substantial fixed-capacity payments in the near term. Those obligations may decline only as contracts expire, are lawfully restructured, demand grows productively, or inefficient assets are retired. This makes the transition more difficult, but it does not make efficiency reform irrelevant: a more efficient system increases the useful economic output obtained from each rupee of unavoidable fixed cost.

What the two analytical papers collectively imply

The master synthesis and the present analytical paper converge on the same broad system interpretation. Pakistan's energy challenge is not only to add generation capacity or to reduce one tariff component. It is to obtain more useful economic output from the generation, fuel, networks and capital already being paid for. The synthesis therefore argues for a shift from simply adding capacity toward resource productivity, system efficiency, indigenous energy delivery, stronger transmission, better utilization of existing assets and demand-side efficiency (Arshad, 2026a). The policy-options paper translates those findings into decision conditions such as loss reduction, better dispatch, productive utilization of existing generation, transmission reinforcement and demand efficiency (Arshad, 2026b).

Within that framework, the principal system levers should be evaluated together rather than in isolation:

reduce technical and commercial losses, theft and non-recovery;

improve DISCO efficiency, metering, billing, recovery and governance;

strengthen transmission so that lower-cost available generation can reach demand centres;

improve economic dispatch and utilization of efficient existing plants;

review, restructure where lawful, or retire persistently inefficient and uneconomic capacity, whether publicly or privately owned, using transparent contractual and economic tests;

avoid adding generation capacity merely because a technology is available; new projects should demonstrate full system value after capacity payments, grid costs, intermittency, financing and expected utilization are considered;

expand productive demand where it creates sufficient economic value and can spread unavoidable fixed system costs over more efficiently supplied kWh;

reduce exposure to imported fuels and exchange-rate shocks through commercially deliverable indigenous resources, competitive renewables, hydropower, nuclear energy, efficiency and appropriate storage rather than through reliance on one technology;

target subsidies toward consumers that genuinely require protection rather than allowing generalized distortions to accumulate; and

evaluate electricity affordability explicitly against household income, expenditure, purchasing power, consumption band and service quality rather than relying on nominal international tariff rankings alone.

These measures do not all affect EPP and CPP in the same way. Loss reduction and better dispatch can lower energy requirements and EPP exposure. Better recovery can strengthen sector liquidity without changing physical energy use. Productive demand can spread unavoidable fixed CPP over more sold units, but only where the incremental demand can be served economically. Retirement or lawful restructuring of persistently uneconomic capacity can address CPP more directly, but contractual, financing and reliability constraints mean that such adjustments are rarely instantaneous.

The same caution applies to demand growth. Productive electricity demand can help spread unavoidable fixed costs over more kWh and improve utilization of efficient existing capacity, but additional consumption is not automatically beneficial if it must be served by high-cost marginal generation or creates new network constraints. The relevant test is whether additional demand creates sufficient economic value and can be served at a defensible marginal and system cost.

The three-paper sequence can therefore be read as a hierarchy rather than three separate conclusions. The master synthesis establishes the resource, technology and system evidence. This analytical tariff paper clarifies what consumers pay, what the system must recover, how Pakistan compares internationally, and why nominal price should not be confused with affordability. The policy-options paper provides the implementation-facing translation of those findings for authorities and other decision makers. The analytical foundation rests principally on the first and third papers; the second does not change the evidence, but organizes it into decision conditions.

Final perspective

The resulting conclusion is more nuanced than either ‘Pakistan has cheap electricity’ or ‘capacity payments alone have made Pakistan uniquely expensive’. Pakistan's standardized household electricity price is comparatively low in nominal international terms, while its commercial benchmark is somewhat less favorable. At the same time, the sector carries substantial fixed-capacity, fuel, network, loss, recovery and financing burdens. Capacity payments are an important part of that burden, but they interact with utilization, demand, and transmission capability and distribution performance and are not confined to one ownership class.

Equally important, a lower nominal tariff does not prove that electricity is affordable to Pakistani households. The World Bank household evidence shows that, even using a protected-tariff assumption and a modest 100 kWh/month package, more than one-fifth of grid-connected households crossed the study's 5%-of-household-expenditure affordability threshold. Income levels, consumption bands, reliability and power quality therefore matter alongside the tariff itself.

Pakistan can simultaneously rank relatively low in nominal household USD/kWh and still have many households that reasonably experience electricity as expensive.

A lower nominal tariff therefore does not prove that the power system is efficient, just as a high system cost does not prove that every rupee of the consumer-to-generation spread is profit. The more defensible national objective emerging from the combined evidence is to increase the amount of reliable, billed and productively used electricity obtained from each unit of fuel, each unit of installed capacity, each kilometre of network and each rupee of invested capital. Reducing avoidable losses and theft, improving recovery, strengthening transmission and dispatch, using efficient existing capacity more productively, reducing unnecessary imported-fuel exposure and subjecting both public and private capacity to transparent economic and contractual tests can all improve that ratio. The solutions are not straightforward because CPP and other fixed obligations can persist, but better system efficiency can still lower the amount of fuel, foreign exchange and financial support required to deliver a given level of useful electricity service.

The central message of the combined work is, therefore, simple: Pakistan's first challenge is not merely to generate more electricity, but to obtain substantially more reliable, affordable and economically useful electricity from the assets, fuel and infrastructure for which the country is already paying.

13. Data Availability and Reproducibility

The analytical figures in this paper were generated in Brill-Viz from companion datasets that retain source URL, evidence class, period, unit, geography and interpretation notes at row level. The Pakistan scenario reconstruction preserves unsupported gaps rather than interpolating volatile components, and the global comparison keeps missing country/product observations blank rather than treating them as zero. The 58-country comparison uses standardized final retail prices on the source provider's benchmark consumption basis; these are not identical-consumption invoices across countries. Reproduction of the results therefore requires both the analytical dataset and the stated benchmark definitions, not only the plotted values. Country-to-region assignments in the updated global dataset follow UN Statistics Division M49 geographic subregions. Pakistan official gas tariffs remain available in a separate OGRA-based sheet, while the standardized global gas series preserves Pakistan as missing because no defensible same-source ranked value is available.

A frozen supplementary package containing the companion datasets, source register/URLs, benchmark definitions and representative Brill-Viz outputs can accompany publication or be deposited in an open repository; any accession number or DOI should be added to the accepted manuscript. The master synthesis and policy-options paper provide the wider energy-system context. Brill-Viz is an analytical implementation layer; it does not replace source evidence or infer missing fiscal or cost-allocation values.

14. Declarations

Funding. This research received no external research grant, institutional sponsorship or commissioned funding. The study was conceived, developed and undertaken independently by the author.

Conflict of interest. The author is the founder of enerbrill and the developer of Brill-Viz, the analytical and visualization platform used for data preparation, standardized scenario reconstruction, comparative analysis, visualization and interpretive workflow in this study. Brill-Viz and related applications may have present or future commercial value. This relationship is disclosed as a potential commercial interest. No external commercial organization, utility, fuel supplier, financial institution or government entity influenced the research questions, data selection, analytical treatment, interpretation or conclusions of the study. The author declares no other competing interests.

Author contributions. Khan Arshad is solely responsible for the conceptualization and design of the study; definition of its research questions and analytical framework; review of tariff, regulatory, fiscal and international price sources; compilation, quality control and integration of the Pakistan electricity and global energy-price datasets; development of standardized household and commercial scenarios and comparative analyses; visualization; interpretation; development

and application of the Brill-Viz analytical workflow; preparation of figures and supporting datasets; manuscript drafting; and subsequent revision and integration of the study.

Use of analytical software: Brill-Viz was used as an author-developed analytical and visualization platform for data structuring, deterministic calculations, comparative analysis, charting and interpretive summaries. Source selection, quantitative inputs, interpretation, methodological decisions and final conclusions remained under the author's responsibility.

About the Author



Khan Arshad is a petroleum geologist, exploration professional and independent energy-data researcher with nearly three decades of experience in oil and gas exploration, regional geological studies, petroleum-system analysis, prospect evaluation, petroleum economics and exploration project management. He holds an M.Sc. in Petroleum Geology from the University of Aberdeen, United Kingdom, and an M.Sc. in Geology from the University of Karachi, Pakistan.

His professional career has included technical and managerial assignments in Pakistan with Baker Hughes INTEQ, OMV, PETRONAS, MND, Eni and Dewan Petroleum. His experience spans wellsite and operations geology, seismic and petrophysical interpretation, sequence stratigraphy, regional basin analysis, new ventures, prospect generation, exploration-risk and reserves assessment, exploration-team leadership and major exploration-project management.

A substantial part of his professional work has focused on the geological and petroleum-system evaluation of Pakistan's sedimentary basins, including the Middle and Lower Indus basins, Kirthar and Sulaiman fold belts, Potwar Basin and Punjab Platform. His work has involved regional fairway analysis, source-reservoir-seal evaluation, conventional and unconventional resource assessment, exploration portfolio development and integration of geological, geophysical, petrophysical and geochemical evidence.

He is currently self-employed as the founder of **enerbrill**, where he combines petroleum exploration experience with data analytics, scientific visualization and software development. He has independently developed **Brill-Viz**, an integrated analytical and visualization platform, together with specialized applications for probabilistic volumetrics, geological chance-of-success assessment, petrophysical evaluation, Total Organic Carbon estimation, decision analysis, mind mapping, research synthesis and AI-assisted document intelligence.

His recent research extends this multidisciplinary background into broader energy-system questions, including energy security, electricity pricing, tariff structures, cost recovery, consumer affordability, renewable and firm generation options, indigenous and imported fuels, infrastructure constraints and comparative energy economics.

The present paper focuses specifically on the relationship between electricity generation/procurement cost, final consumer tariffs, identifiable public-sector charges and international retail-price benchmarks. It applies standardized household and commercial comparisons to clarify what consumers pay, what the electricity system must recover, and how Pakistan's nominal electricity prices compare internationally, while explicitly avoiding interpretation of the consumer-to-system cost difference as Government profit. This distinction is central to the paper's analytical design.

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Glossary and Definitions

Usage note. Definitions below describe how terms are used in this paper and its Brill-Viz analytical framework. They are intended to clarify analytical meaning and should not be read as replacements for legal, regulatory, tax or tariff definitions issued by the Government of Pakistan, NEPRA, FBR or other competent authorities.

Term / acronym	Definition and analytical use in this paper
Affordability	The burden of an energy bill relative to the economic resources of the consumer. In this paper, nominal USD/kWh comparisons are not treated as affordability rankings because income, purchasing power, consumption level and fixed charges differ among countries.
All-in bill / structural all-in price	The modeled end-user electricity price after combining the tariff components that are explicitly represented in the dataset, such as base tariff, allocated fixed charges and identified public charges. It is an analytical reconstruction rather than a universal invoice for every customer.
Base tariff	The underlying regulated electricity tariff component before adding separately identified fixed charges, taxes, duties, surcharges or other bill components.
Benchmark consumption	The standardized consumption level used by a source or analytical case to make prices more comparable. Different household and business benchmark consumptions mean that international household and commercial values are not identical-consumption bill comparisons.
Brill-Viz	The analytical and visualization environment used in this study to structure source data, generate standardized comparisons, build charts, calculate derived measures and produce deterministic interpretive summaries while preserving evidence and missing-data boundaries.
Capacity charge / capacity payment (CPP)	Capacity Purchase Price (CPP) is the fixed-capacity-related component of power purchase cost associated with keeping contracted generation capacity available and recovering plant-specific fixed obligations. It is distinct from the energy-linked EPP and can remain payable even when utilization falls, increasing the capacity burden per kWh actually delivered or sold.
Commercial / business electricity price	The standardized retail electricity price applicable to non-household users under the source methodology. International business benchmarks can use substantially larger consumption levels than household benchmarks.
Consumer-end tariff	The regulated tariff applied at the consumer side of the electricity system. It can incorporate energy and network costs together with policy, tax, surcharge or adjustment components, depending on the applicable tariff schedule.
Cost recovery	The extent to which allowed or required system revenues are recovered from tariffs and other defined sources. A cost-recovery comparison is not the same as a calculation of government or utility profit.
Cross-subsidy	A tariff arrangement in which one consumer group or tariff class contributes more toward common system costs so that another class can pay less than it otherwise would under a fully cost-reflective structure.
Debt Service Surcharge (DSS)	A separately identified surcharge used in Pakistan electricity billing to support specified power-sector debt-service obligations where applicable. Its regulatory treatment can change over time.
DISCO	Electricity distribution company. In Pakistan, DISCOs distribute and supply electricity within defined service territories under regulated tariff and performance arrangements.
Electricity duty	A statutory charge applied to electricity consumption under the relevant provincial or legal framework. The applicable rate and treatment can differ by consumer class and jurisdiction.

Term / acronym	Definition and analytical use in this paper
Energy charge / variable charge (EPP context)	The consumption- or generation-linked component associated with electricity actually produced or used. In power-purchase accounting, Energy Purchase Price (EPP) principally reflects variable/energy-linked costs, including fuel and other dispatch-related components. It is distinct from CPP and from consumer fixed charges.
Evidence class	A label used in the companion datasets to distinguish the strength and nature of a value, for example direct official observation, source-derived calculation, scenario reconstruction or unresolved/missing evidence.
FCA - Fuel Charges Adjustment	A periodic tariff adjustment reflecting changes in fuel-related power-purchase costs relative to the reference assumptions used in the tariff. FCA values are not invented or interpolated in this study where source evidence is absent.
Final retail electricity price	The price paid by the end user under the source methodology after relevant energy, network, tax and fee components are included. It is not equivalent to plant-level generation cost.
Fixed charge	A charge that is not proportional to monthly kWh consumption, for example a monthly amount linked to connection or sanctioned load. When expressed as PKR/kWh for comparison, it is allocated across the assumed monthly consumption.
Generation cost	The cost of producing electricity at the generating stage. Depending on the measure used, it may exclude transmission, distribution, system operation, losses, taxes, surcharges and other downstream costs.
GoP - Government of Pakistan	The federal Government of Pakistan. The paper does not estimate GoP profit from electricity sales; it separates identifiable public receipts from wider system and tariff components.
Gross public-sector receipts	The identifiable taxes, duties, surcharges and other loaded public-charge components associated with a modeled consumer case. Gross receipts are not net fiscal profit because expenditure, subsidies, transfers and sector obligations are not deducted.
GST - General Sales Tax	A tax component applied under the relevant tax rules. In the analytical reconstruction it is included only where the applicable source basis is available.
Household / residential electricity price	The standardized retail electricity price applicable to residential consumers under the relevant tariff or international source methodology.
IESCO	Islamabad Electric Supply Company, one of Pakistan's electricity distribution companies. Some earlier historical tariff observations in the Pakistan reconstruction use IESCO as an explicitly identified reference basis rather than a national average.
kWh - kilowatt-hour	A unit of electrical energy equal to one kilowatt used continuously for one hour. Retail electricity prices in this paper are commonly expressed as PKR/kWh or USD/kWh.
Loaded-country median	The median calculated from countries actually represented with valid values in the loaded dataset. It is a descriptive sample statistic and is not a population-, consumption- or income-weighted world average.
MMBtu - million British thermal units	A unit of thermal energy commonly used for natural gas. In the global Key Facts, gas is shown in USD/MMBtu and also converted to an equivalent USD/kWh basis to prevent misleading comparison with electricity.
NEPRA	National Electric Power Regulatory Authority, Pakistan's electricity-sector regulator. NEPRA tariff determinations, notifications, performance reports and power-purchase/revenue-requirement records are principal official sources for the Pakistan analysis.
Net fiscal take	The amount remaining to the public sector after relevant fiscal inflows and outflows are accounted for. The present dataset does not contain sufficient scenario-level subsidy, transfer and expenditure information to calculate a defensible net fiscal take for electricity.

Term / acronym	Definition and analytical use in this paper
Power Purchase Price / procurement cost	The cost of purchasing electricity for supply into the system under the applicable regulatory accounting framework. It is a system-side benchmark and should not be equated with the final retail tariff or with a utility/government profit margin.
Protected consumer / protected tariff	A residential tariff category designed to provide lower electricity prices to qualifying low-consumption consumers subject to the prevailing regulatory eligibility rules.
QTA - Quarterly Tariff Adjustment	A periodic tariff adjustment mechanism used to reconcile specified quarterly cost changes under the regulatory framework. Missing QTA observations are preserved as gaps in this analysis rather than fabricated.
Revenue requirement	The regulated amount or unit benchmark representing the revenue needed to recover allowed system costs for the relevant period and accounting boundary. It is broader than generation fuel cost alone.
Scenario	A standardized analytical case used to compare defined consumer types or consumption levels. Scenario values are model outputs constructed from documented inputs and are not automatically observed bills.
Standardized price	A price placed on a common unit and source-defined consumption basis to support comparison. Standardization improves comparability but does not make tariff structures, taxes, fixed charges or consumer circumstances identical across countries.
Subsidy / tariff differential support	Financial support that reduces the amount a consumer class pays relative to the amount otherwise required under the tariff or cost-recovery framework. Scenario-level subsidy allocation is incomplete in the present Pakistan dataset.
Surcharge	A separately identified additional charge added to the tariff for a specified regulatory, fiscal or sector purpose. The paper reports a surcharge only when it is supported by the underlying source.
Tariff	The regulated schedule of prices and charges applicable to electricity supply for a defined consumer class, consumption band, time period and other eligibility conditions.
Tariff rebasing / rationalization	A regulatory process that updates or restructures tariff levels and their allocation across consumer classes in response to revised revenue requirements, costs or government policy decisions.
T&D - transmission and distribution	The network stages that move electricity from generation through the high-voltage transmission system and distribution networks to end users.
T&D losses	Electricity lost between system input and useful delivered/billed output because of technical and non-technical factors. Technical losses are physical electrical losses; theft and other non-technical losses generally represent energy generated/consumed but not fully metered or billed. Recovery shortfalls are financially important but are not themselves physical energy losses.
Taxes, duties and public charges	Collective term used for explicitly identified statutory or public-sector bill components. They form part of the end-user payment but are not, by themselves, evidence of net government profit.
USD/kWh	US dollars per kilowatt-hour, the principal common unit used for international electricity-price comparison in this paper.
USD/MMBtu	US dollars per million British thermal units, a common natural-gas price unit. It should not be numerically compared with USD/litre fuel prices or USD/kWh electricity prices without unit conversion.
World / international benchmark	A source-defined or dataset-derived reference used to provide context for a country result. Where this paper uses a loaded-country median rather than an externally weighted world statistic, that distinction is stated explicitly.

Term / acronym	Definition and analytical use in this paper
UN M49 geographic subregion	A geographic grouping defined by the United Nations Statistics Division for statistical use. This paper uses M49 subregions to avoid overlapping labels; the grouping is for statistical convenience and does not imply political affiliation.
Unavailable / not comparable	A value intentionally left blank because the evidence is missing, contradictory, placeholder-like or not comparable under the selected methodology. In this paper, Pakistan's standardized international natural-gas value is treated as unavailable rather than interpreting a displayed 0.000 USD/kWh as a real zero retail price.

Source/definition basis: *terminology used in the Pakistan electricity-scenario reconstruction, the 58-country global comparison, NEPRA/FBR/Government of Pakistan source records, and the Brill-Viz analytical framework documented in this paper. Definitions are explanatory and do not supersede source-agency legal or regulatory wording.*