RENEWABLES FIRST

Clean Energy Finance Innovation Lab (CEFIL)

Building The Financial Rails For Pakistan's Clean Energy Transition

Designing catalytic financial instruments to scale clean energy investment

Pakistan’s solar rush has disrupted current power patterns

Pakistan’s Solar Rush

Pakistan’s citizen-led solar momentum continues to accelerate, with FY25 solar panel imports reaching 17.9 GW, making Pakistan the second-largest global importer of Chinese solar panels in a single year. The rapid adoption of distributed solar reflects households and businesses increasingly turn to cheap, decentralized electricity solutions.

Reshaping the Power System

The proliferation of distributed solar is fundamentally shifting Pakistan’s power generation landscape. Around 32 GW of deployed solar capacity has the potential to generate nearly 42 TWh of electricity annually, equivalent to about 38% of current national grid electricity sales.

Pakistan's Solar Rush

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Estimated 35 million Mt. CO_2-eq

emissions reduction in **FY25** (*Mt. = Metric Tonnes)

Thermal utilization collapse

Imported coal plant usage fell from **78%** to **11%** in two years

300,000 direct & 200,000 indirect

jobs in Pakistan

Approx. 15 billion USD

mobilization in private capital

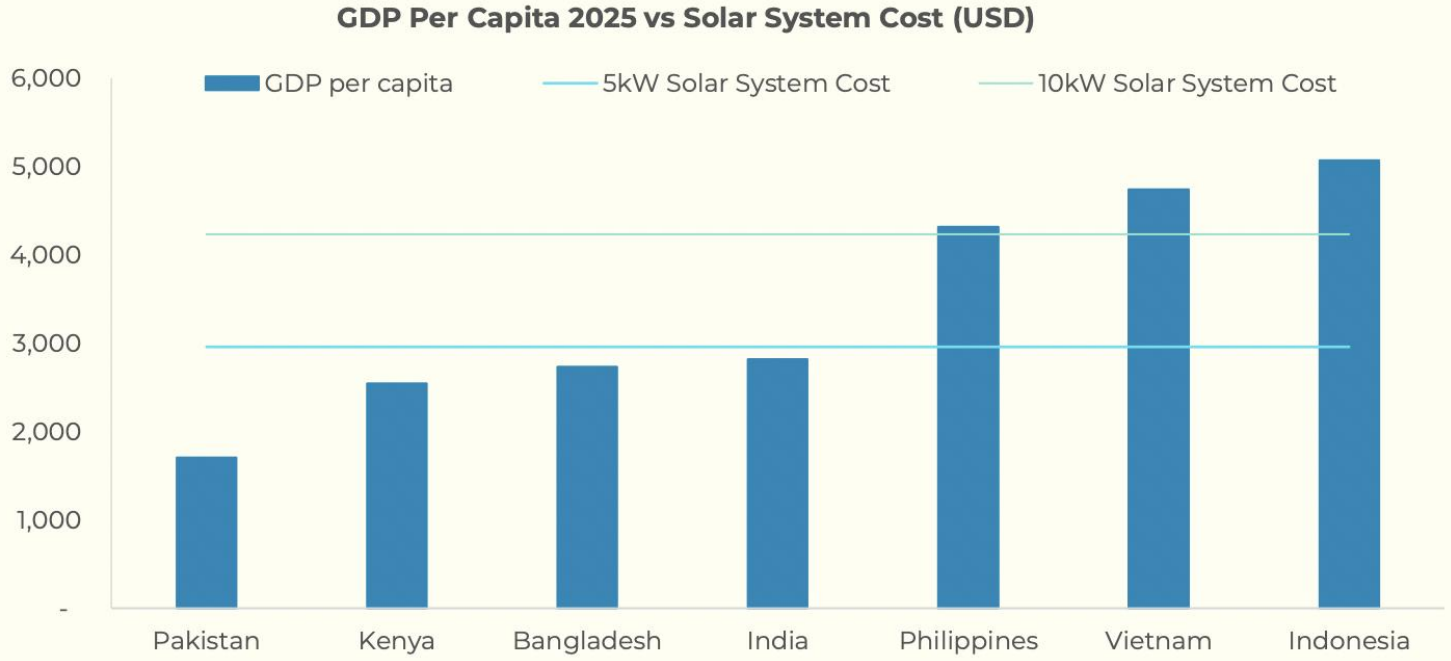
But this transition lacks equity due to high upfront costs that limit wider adoption

The Inclusivity Problem

While solar is increasingly the lowest-cost electricity option, the upfront investment remains prohibitively high relative to household incomes. In Pakistan, the cost of a typical 5 kW rooftop system can be double the annual income, far higher than in most peer economies.

Access to financing

Less than USD 0.2 billion of this build-out has been financed through the formal financial system, highlighting a massive financing gap. As a result, solar adoption is concentrated among wealthier households and large businesses while SMEs and middle-income consumers remain locked out without access to financing.



Source: IMF GDP per Capita 2025, USD Solar System Costs from Industry Sources

Inaction risks inequity in the next wave of transition tech

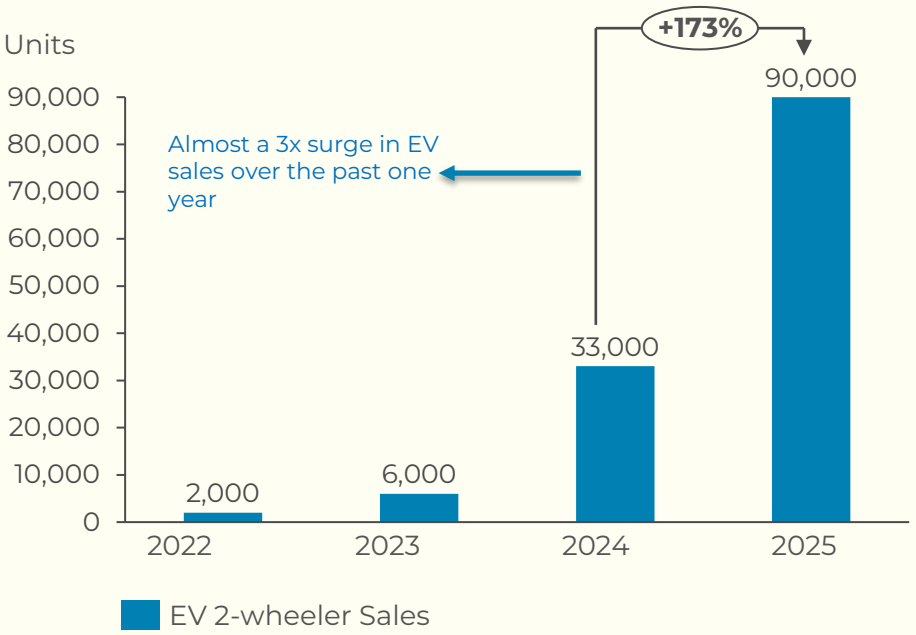
EV Transition Push

Pakistan's EV transition is accelerating under a policy target of 30% of new vehicle sales by 2030, equivalent to 2.2 million EVs, compared with only ~0.1 million projected in FY2025-26. However, adoption remains constrained by high upfront costs, with EVs typically 50-100% more expensive than comparable ICE vehicles.

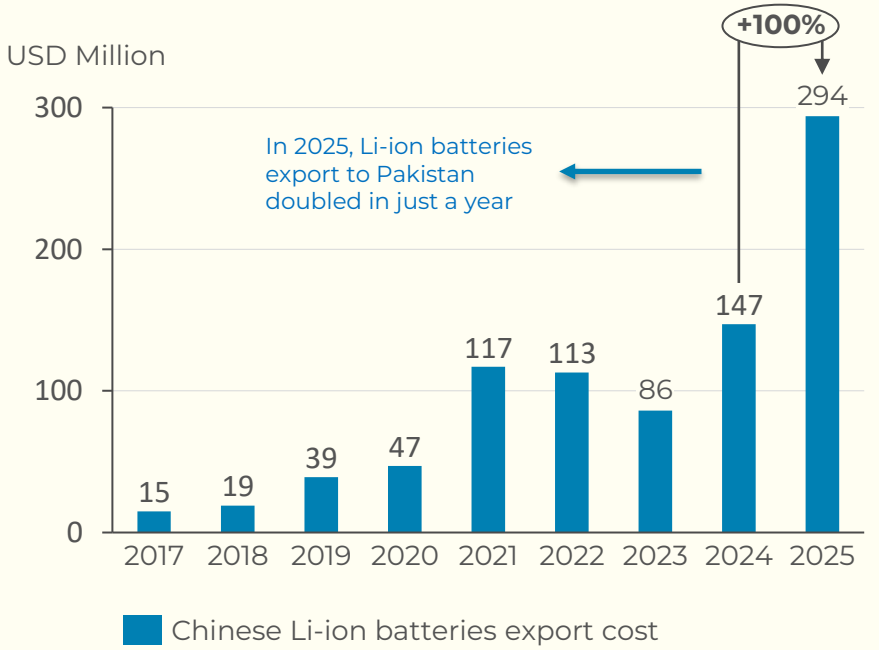
Battery Storage Surge

As solar deployment expands and consumers seek backup power and energy independence, battery imports have doubled in 2025 to USD 294 million. However, solar+battery systems remain more expensive than solar-only systems which continues to limit widespread adoption despite their growing role in enabling solar self-consumption and resilience.

EV 2-wheeler sales in Pakistan, FY22-25



Chinese lithium-ion battery export to Pakistan, FY17-25



The market has already moved, yet finance has not kept up

Opportunity Exists

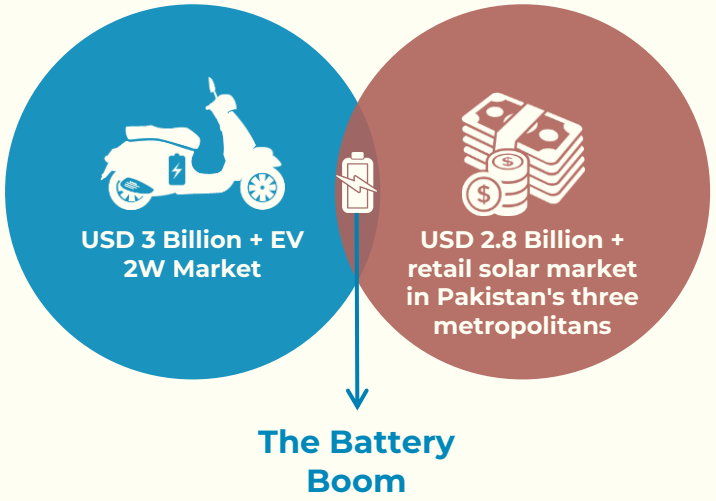
Pakistan's energy transition is no longer hypothetical. Distributed solar has already scaled rapidly, EV 2-wheelers are entering a high-growth phase, and battery imports are accelerating alongside demand for backup power and self-consumption. The opportunity is not demand creation, it is financing intermediation

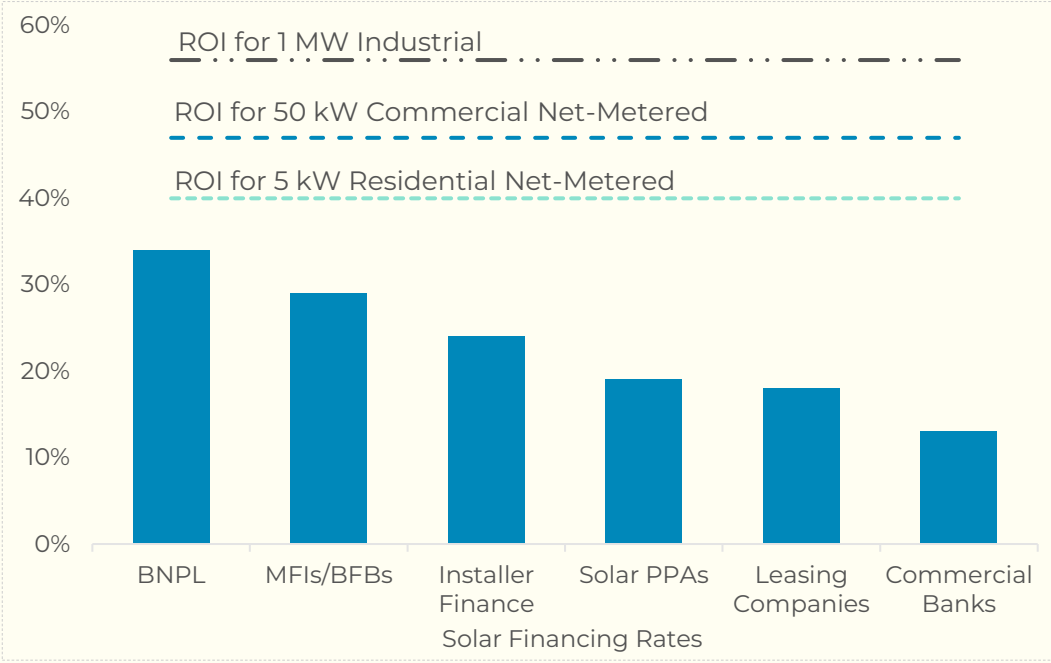
Scale Exists

The absence of financing is not due to weak project economics. Solar returns comfortably exceed most financing costs, with indicative ROI of 40% for residential and 47-56% for commercial & industrial systems. EVs and batteries also demonstrate strong underlying economics, reflected in rapid market penetration and rising import volumes.

Double Loss

Without financing, access remains concentrated among households and firms with internal capital. This creates a double loss: the country misses a major clean energy investment opportunity, and the social benefits of lower-cost energy remain concentrated among the few.





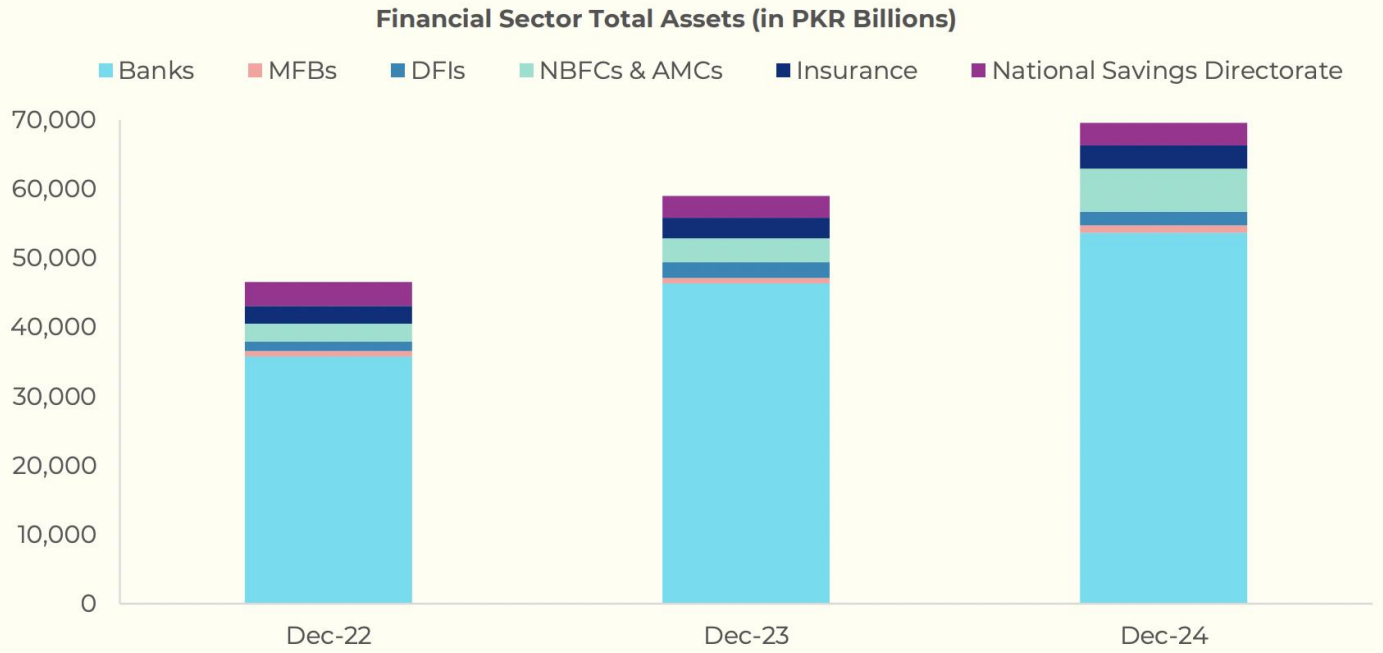
THE *"PERCEPTION"* OF CAPITAL SCARCITY

Liquidity is not the constraint

Ample liquidity exists in Pakistan's financial system

Pakistan's financial sector holds substantial liquidity, with bank deposits exceeding USD 131 billion (PKR 37.4 trillion) as of June 2025. Deposits continue to expand rapidly, growing 17.7% in H1CY25, the fastest pace since 2014, reinforcing that the system has ample funding available for lending.

The financial sector itself is highly concentrated in commercial banks, which account for 77% of total financial sector assets (PKR 53.7 trillion). Other financial institutions including mutual funds (8%), insurance companies (5%), DFIs (3%), and microfinance institutions (2%) represent much smaller shares of the system. As a result, banks remain the primary channel through which capital can reach the real economy, making their lending behavior critical for financing Pakistan's energy transition. Despite controlling most system liquidity, banks remain reluctant to expand retail credit. In contrast, NBFCs and microfinance institutions hold a much smaller share of assets but serve a far larger number of retail borrowers, making them more active in small-ticket lending.



Source: *State Bank of Pakistan Financial Stability Review 2024*

NBFCs: Non-Bank Financial Companies
AMCs: Asset Management Companies
DFIs: Development Finance Institutions

The financing gap is structural, not cyclical

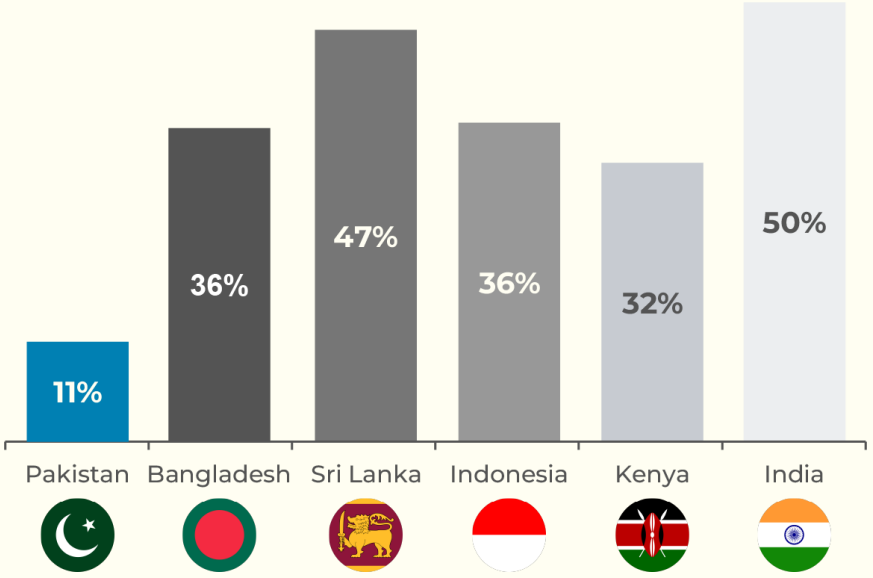
Shallow credit intermediation

Pakistan's financial system struggles to translate liquidity into productive lending. Gross advances are only about USD 50 billion (PKR 14.3 trillion), resulting in an advances-to-deposits ratio of roughly 35%, which indicates that banks are operating well below their lending capacity. Lending to the private sector remains around 12–15% of GDP, significantly lower than regional peers. This reflects a structural weakness in financial intermediation.

Credit flows to comfort zones

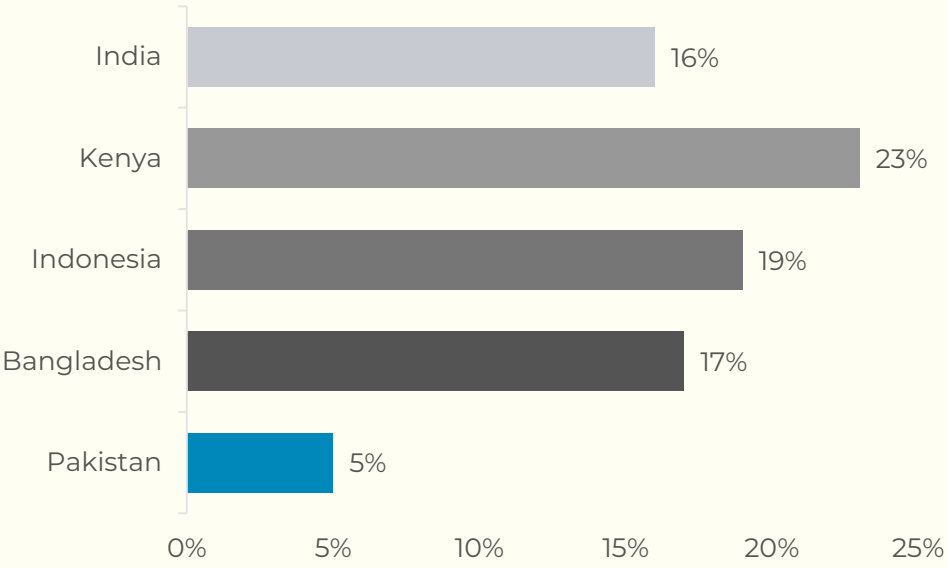
Pakistan's commercial banks hold ~77% of total financial sector assets and their lending remains concentrated in familiar, collateralized segments. Government securities account for roughly 63% of banking assets, crowding out private sector lending. Meanwhile, consumer and SME lending together account for ~15% of total loans, leaving productive but smaller borrowers underserved. Capital flows toward low-risk, established sectors rather than toward emerging transition technologies where financing needs are rapidly growing.

Lending to private sector as % GDP - 2024



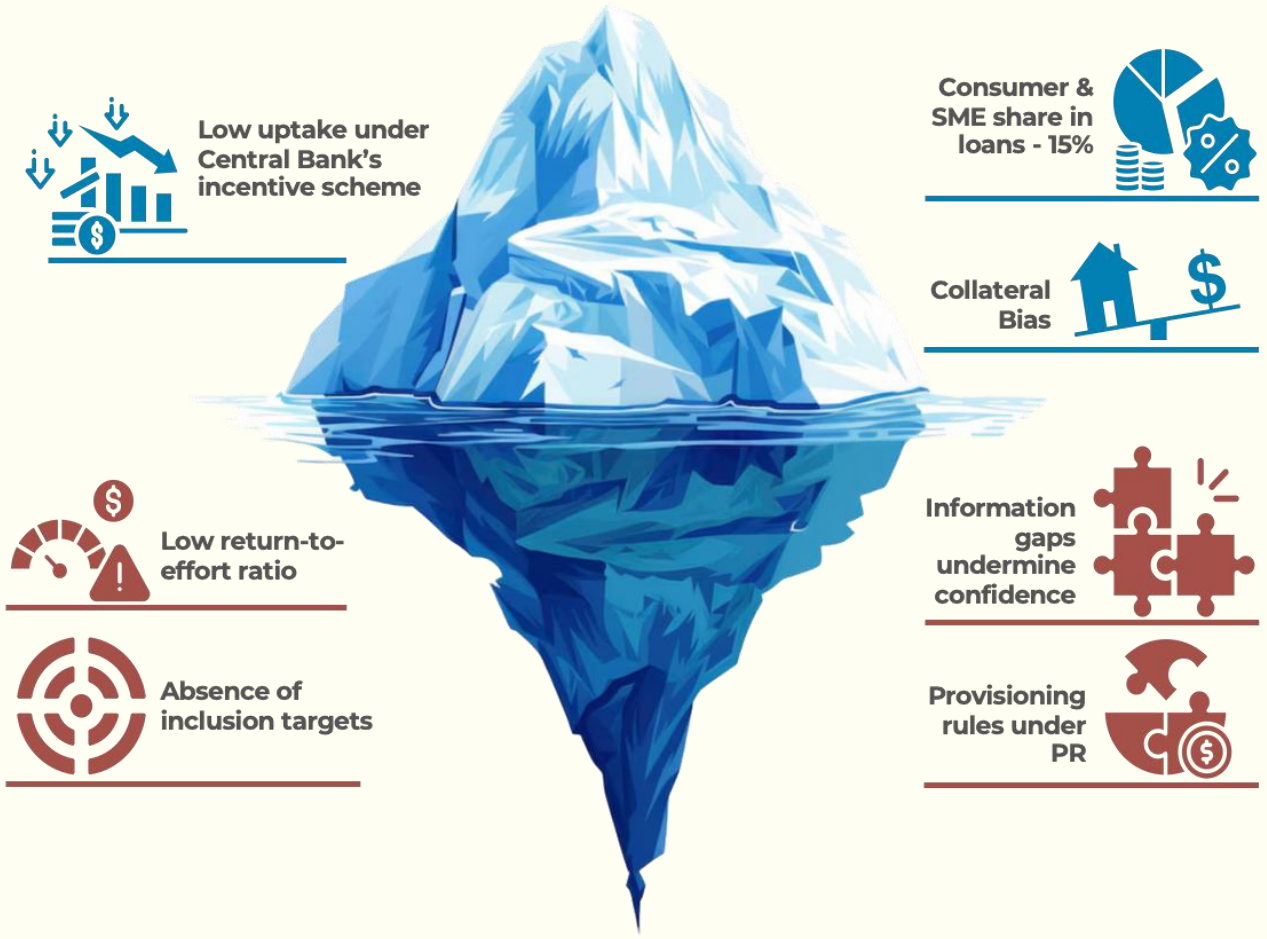
Source: PwC Banking Publication 2025

SME loans as a % of total advances 2024



Source: PwC Banking Publication 2025

Why financial institutions do not lend



Commercial Banks
Banks prioritize collateral over cashflow, and solar (DER) assets perform poorly due to depreciation, repossession uncertainty, and the lack of a secondary market. This keeps lending tied to traditional collateral even when project economics are strong.

Microfinance & Digital Lenders
Better suited to DER borrowers, relying on behavioral and cashflow-based models rather than asset security. But structural constraints limit their effectiveness: short-term funding creates a tenor mismatch, thin balance sheets cap ticket sizes, and higher perceived risk inflates their cost of capital limiting scale and affordability.

Capital Market Gap
Pakistan's underdeveloped capital markets mean securitization, green bonds, and institutional take-out financing remain limited, keeping risk on lender balance sheets and slowing transition finance.

The missing link: policy signals and catalytic finance

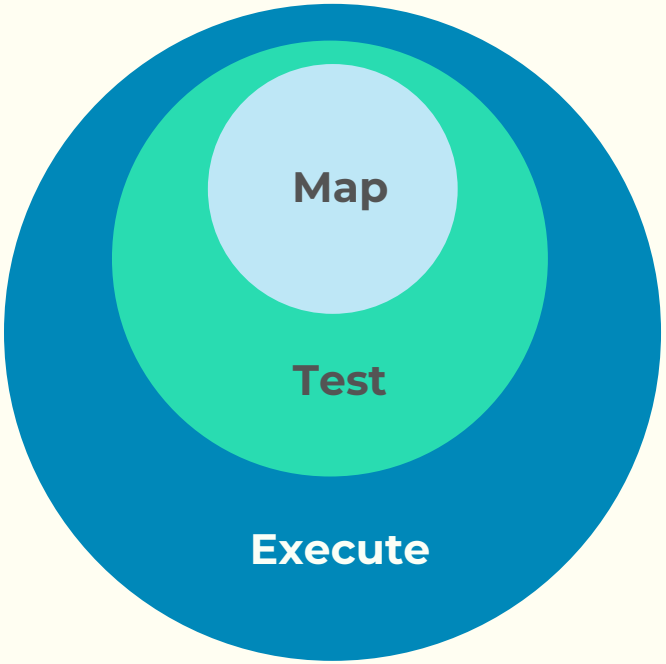
Limited Regulatory Push	Although SBP concessional facilities such as SAAF, SME modernization refinance schemes, and risk-sharing facilities exist, uptake remains limited due to procedural barriers and weak institutional adoption. Prudential requirements, asset recognition challenges, and operational bottlenecks continue to discourage financial institutions from scaling lending to distributed energy assets. At the same time, no clear regulatory incentives exist to promote transition assets as a lending category, and many banking credit teams lack familiarity with assessing cash-flow-based solar projects or designing suitable financial products for this market.
The Missing Middle	Multilateral and development finance institutions remain a key source of climate finance in emerging markets. However, their investment structures typically focus on large infrastructure projects with ticket sizes above USD 15-20 million, leaving a financing gap for SME and mid-scale climate projects in the USD 3-10 million range. This creates a "missing middle" in Pakistan's climate finance ecosystem, where distributed energy developers, climate technology companies, and mid-scale projects struggle to access growth capital despite having commercially viable pipelines.
Misaligned Fiscal Interventions	Fiscal support to the power sector remains concentrated in subsidies and guarantees rather than transition investments. Subsidies increased from PKR 584 billion in FY23 to PKR 1.19 trillion in FY25, while 57% of sovereign guarantees are linked to power sector liabilities. Redirecting part of this support toward catalytic instruments such as credit guarantees and blended finance could unlock greater private investment. Limited data on green finance also constrains market development, highlighting the need to accelerate implementation of the Pakistan Green Taxonomy (PGT) to standardize definitions and improve disclosure.
IMF Reform Agenda	Under IMF-supported programs, Pakistan has committed to subsidy rationalization and improved targeting of electricity subsidies to restore fiscal sustainability. The reform direction emphasizes reducing broad consumption subsidies and improving cost recovery in the power sector. This creates an opportunity to redirect a portion of fiscal support toward catalytic instruments such as credit guarantees, blended finance structures, and green investment vehicles that mobilize private capital for energy transition investments rather than subsidizing electricity consumption.

The progression Pakistan's challenge is not liquidity but risk allocation, where risk aversion and regulatory inertia limit lending to new asset classes.

***Ammar Habib Khan, CEO at National Credit Guarantee Company Limited (NCGCL)**

**Quoted from Profit Pakistan 'Why Pakistan's banks won't finance the solar revolution'*

The pathway to solving these challenges is a singular platform for targeted financial innovation

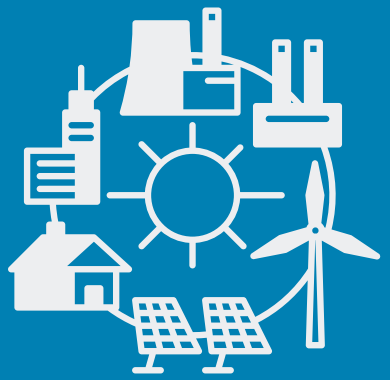


Clean Energy Finance Innovation Lab (CEFIL)

CEFIL is a specialized platform designed to identify, structure, and pilot innovative financial instruments that unlock capital for Pakistan's energy transition. While technologies such as distributed solar, EVs, and battery storage are scaling rapidly, financial systems have not adapted at the same pace.

CEFIL addresses this gap by designing market-specific financing solutions that reduce risk, lower cost of capital, and enable scalable lending models. It focuses on translating market opportunities into bankable financial instruments that can be adopted by domestic financial institutions.

Market Mapping	Feasibility & Structuring	Pilot & Execute
Identify financing gaps across distributed clean energy sectors by analyzing market demand, regulatory barriers, and institutional constraints.	Structure investment-ready financial instruments through financial modelling exercise and industry consultations.	Pilot transactions with financial institutions to demonstrate viability, generate market evidence, and scale successful financing models.



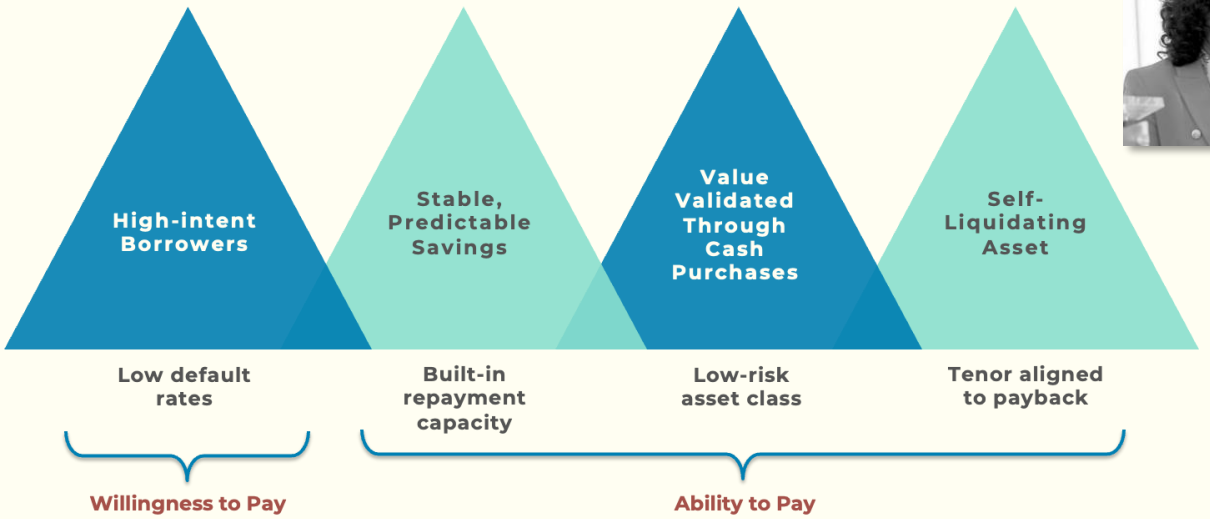
Scaling Clean Energy Lending

A Practical Framework based on CEFIL's Market Diagnostic & Industry Consultations

CEFIL's take on *Why Distributed Solar Finance Has Not Scaled*

Mismatch with conventional lending	Distributed solar sits awkwardly within conventional credit models. Loan sizes are small, transaction costs per borrower are high, and underwriting remains collateral-centric even when repayment capacity is visible through energy savings and payment behaviour.
Differentiated Products based on Borrowers	Solar demand spans a wide credit spectrum, from low-visibility rural and informal households to fully banked commercial and industrial users. A single product cannot serve all of them; financing models must be matched to system size, documentation quality, ownership structure, and repayment visibility.
Delivery model determines risk	Risk varies materially by model. Turn-key EPC sales keep risk with the borrower, while lease-to-own, ESCO, and PAYG models shift more performance, servicing, and collection risk to institutions. This affects who can lend, how they underwrite, and what de-risking support is needed.

Solar Loans Warrant a Different Risk Lens



For commercial banks, solar loans are a low-risk entry point into cashflow-based lending without traditional collateral. Energy underpins both business operations and daily life, so default rates are typically very low. The asset pays for itself through avoided energy costs with repayment discipline built into the financing structure.

***Naveen Ahmed, Energy Finance Expert**

**Quoted from Profit Pakistan 'Why Pakistan's banks won't finance the solar revolution'*

Practical framework to scale distributed '*solar & other clean energy*' lending

Commercial banks remain the anchor institution, given their large deposit base and medium- to long-tenor rupee liquidity.

Other institutions expand the frontier:

- Development Finance Institutions (DFIs) for targeted expansion via refinance / risk-sharing
- Microfinance Banks/Institutions (MFBs / MFIs) for smaller-ticket informal borrowers
- Non-Bank Financial Companies (NBFCs) / leasing / modarabas for SME and C&I structures
- Asset Management Companies (AMCs) / insurers as future take-out or pooling anchors

Bankable Adjacency Framework for Expansion

Start where credit is visible	Begin with banked households, established SMEs, and formal commercial users where repayment capacity is easiest to assess and collections are easiest to control.
Match product to segment	Use consumer loans for highly visible customers, installer finance and MFB products for partially documented segments, and leasing / ESCO / structured models for larger C&I users.
Shift from collateral to cashflow	Build underwriting around utility payment history, transaction behavior, installer quality, and system performance rather than immovable collateral alone.
Enable scale through market infrastructure	Aggregation, guarantees, standard documentation, servicing platforms, and secondary market pathways are needed to reduce costs and crowd in institutional capital.

Climate finance is shifting from subsidizing distributed energy resources like solar to fixing the financial plumbing. The focus now is on de-risking financial intermediation i.e. guarantees, liquidity facilities, and securitization so markets can scale.

***Sohail Malik, Team Lead CRCC / Former GCF and IsDB Climate Finance Specialist**

**Quoted from Panel Discussion – Market Diagnostic Study on Solar Financing Launch Event (2025)*

Why guarantees matter but why portfolio guarantees are insufficient

Portfolio guarantees are blunt instruments	Portfolio-wide guarantees provide the same coverage to every loan regardless of borrower risk, sector, or value chain. While easy to administer, banks tend to allocate this cover to clients they already understand- collateralized traders, distributors, and established service firms.
Limited impact on pricing	Guarantees reduce expected losses but do not provide capital relief under prudential rules. Banks still hold the same regulatory capital against these loans, meaning the cost of credit for SMEs/consumers remains largely unchanged.
Excluded segments remain excluded	SMEs and households already outside the banking system remain outside the credit funnel because the underlying risk perception is unchanged.
A More Effective Approach	Guarantees should be structured segment-by-segment, calibrated to the specific economics of each activity. Targeted guarantees direct scarce public risk capital to sectors where credit is missing, rather than protecting loans banks would have made anyway. Process: a. Start with higher coverage where banks would not lend b. Build performance history and credit understanding c. Gradually reduce guarantee coverage d. Allow the market to function independently

When we evaluate a portfolio for guarantees, our focus is not just the borrower but the institution: its credit policies, due diligence processes, and the geographic and climate risks embedded in the loan book.

***Maheen Rahman, CEO of Infrazamin**

**Quoted from Panel Discussion – Market Diagnostic Study on Solar Financing Launch Event (2025)*

Key Levers For Unlocking Capital

Liquidity to Execution

Anchor-based Finance Model

Immediate scale-up through employers, supply chains, and institutional anchors
Why It Matters: Anchor structures convert informal repayment visibility into bankable credit signals.

The Problem

Small ticket unit economics: Banks avoid smaller tickets because origination and monitoring costs are high relative to loan size.

Weak recoveries for retail loans: Individual borrowers are harder to track and enforce compared to corporate clients.

Limited collateral recognition: Solar panels and batteries are movable assets and are not treated as strong collateral by banks.

Transaction Design

Payroll deduction / invoice set-off: Loan repayments automatically deducted from salaries or supplier payments.

Pre-vetted EPC network: Certified installers serve as quality filters for customer onboarding.

Alternative credit proxies: Utility bills, payment history, bank statements, or digital transactions used instead of formal income documents.

What this unlocks

Low-cost origination: Banks leverage existing employer/vendor networks instead of building retail lending channels.

Access for semi-formal borrowers: Households and SMEs without documented income can access loans.

Improved repayment discipline: Auto-payments through e-wallets or dedicated bank accounts.

Ticket Size:
Small

Credit enhancement:
Low

Example Structures:

Retail salaried
- Ticket: PKR 0.7 Mn
- Credit enhancement: 20% portfolio first loss

SME vendors of large anchors
- Ticket: PKR 7.5 Mn
- Credit enhancement: SBP SAAF/ISAAF cover

The progression pathway from microfinance to commercial banking, where successful small borrowers graduate to mainstream financial services, has failed to materialize at meaningful scale. This leaves a missing middle: enterprises and households too large for microfinance but too small or informal for commercial banks.

***Shezad Abdullah, Energy Finance Expert**

**Quoted from Profit Pakistan 'Why Pakistan's banks won't finance the solar revolution'*

Vendor-Linked Finance Model

Rapid expansion through EPC-led point-of-sale financing
Why It Matters: Converting DER purchases into a retail financial product, similar to consumer electronics financing.

The Problem

Weak documentation at point of sale: Many households and SMEs lack formal income proof.

Informal cash flows: Mixed household/business revenues make traditional credit scoring difficult.

High administrative cost per loan: Banks incur similar underwriting costs for PKR 500k loans as for PKR 50m loans.

Transaction Design

Financing offered at EPC point-of-sale: Customers apply for loans when purchasing solar systems and other DER such as EVs.

Pre-vetted EPC network: Certified installers serve as quality filters for customer onboarding.

Alternative credit proxies: Utility bills, payment history, bank statements, or digital transactions used instead of formal income documents.

What this unlocks

Low-cost origination: EPC networks act as distribution channels for financial institutions.

Access for semi-formal borrowers: Households and SMEs without documented income can access loans.

Risk transfer mechanisms: First-loss guarantees or portfolio insurance reduce lender exposure.

Ticket Size:
Small

Credit enhancement:
High

Example Structures:
Retail Semi-formal or Micro-Enterprises
- Ticket: PKR 0.5 Mn
- Credit enhancement: 50% portfolio first loss or PMYB&ALS Coverage

SME/Commercial
- Ticket: PKR 2 Mn
- Credit enhancement: 50% portfolio first loss

Small-ticket retailer and SME solar projects inherently carry higher risks than commercial and industrial customers. So, vendors are the primary touchpoints for quality customer acquisitions.
***Talha Ameer Khan, Managing Director at Burj Clean Energy Modaraba**

**Quoted from Stakeholder Interview – Market Diagnostic Study on Solar Financing*

Installer Finance Model

Scaling solar/DER credit through EPCs, aggregators, and fintech lenders
Why It Matters: Installers already originate demand, making them natural financial intermediaries.

The Problem

Banks cannot efficiently underwrite granular retail risk: Evaluating thousands of small borrowers is operationally expensive.

High servicing and collection costs: Retail loan management requires field collection and monitoring infrastructure..

Thin credit files: Many borrowers lack formal credit histories.

Transaction Design

Credit line to EPC / Aggregator: Bank provides bulk financing to a vetted company.

Wholesale on-lending to customers: EPC originates and services small solar/DER loans to end users.

Portfolio monitoring: Aggregator reports repayment performance to the lender periodically.

What this unlocks

Scale without retail banking infrastructure: Banks finance portfolios instead of individual borrowers.

Access to informal segments: Installers understand customer risk better than banks.

Risk transfer mechanisms: First-loss guarantees or portfolio insurance reduce lender exposure.

Ticket Size:
Large

Credit enhancement:
Medium

Coverage Structures:
Installer / Aggregator on-lending

- Ticket: PKR 560 Mn
- Credit enhancement: 30% portfolio first loss

Solar vendors already act as the bridge between customers and financing institutions, particularly for SMEs and businesses where installers help structure the project and connect borrowers with banks.
***Zubair Obaid, Director at SolarTech & Finance Committee Head at Pakistan Solar Association**

**Quoted from Panel Discussion – Market Diagnostic Study on Solar Financing Launch Event (2025)*

BNPL Model

Digital consumer financing through fintech platforms
Why It Matters: BNPL aligns solar/DER financing with existing consumer behavior in electronics and appliance markets.

The Problem

Retail consumers already finance appliances informally but solar remains outside regulated lending.

Traditional banks cannot process large volumes of small loans quickly.

Transaction Design

Digital credit approval: Loan underwriting using mobile wallet data, payment history, and alternative credit scoring.

Instant approval at point-of-sale: Purchases bundled with instalment plan.

Digital repayment channels: Auto-debit via wallets or payment apps.

What this unlocks

Mass-market DER adoption: Access for households without bank credit history.

Lower transaction costs: Digital underwriting replaces manual loan processing.

Rapid scaling: Fintech platforms can process thousands of small loans.

Ticket Size:
Large

Credit enhancement:
Medium

Coverage Structures:
BNPL via Microfinance & Fintechs

- Ticket: PKR 1 Bn
- Credit enhancement: 25% portfolio first-loss

An average Pakistani already finances many household assets informally - smartphones, bikes, appliances. Solar, batteries and EVs are already being sold on installment plans in informal markets; the challenge is bringing this demand into regulated finance.

***Arif Lakhani, Co-Founder at Qist Bazaar**

**Quoted from Panel Discussion – Market Diagnostic Study on Solar Financing Launch Event (2025)*

Securitization Model

Recycling capital through asset-backed solar/DER portfolios
Why It Matters: Securitization transforms distributed energy receivables into investable financial assets.

The Problem

Balance sheet constraints: Banks and NBFIs have limited capital and regulatory CAR limits.

Tenor mismatch: Solar loans are 5-7 years while funding sources are often shorter term.

Capital locked in portfolios: Lending capacity declines as portfolios grow.

Transaction Design

True-sale transfer to SPV: Solar/DER loan receivables are sold to a Special Purpose Vehicle (SPV).

Credit enhancement layers: Reserves, overcollateralization, or guarantees improve credit ratings.

Servicing retained by originator: EPC/NBFI continues billing and collections.

What this unlocks

Capital recycling: Originators recover liquidity to issue new solar/DER loans.

Access to capital market investors: Pension funds, insurers, and impact investors.

Lower cost of capital: Risk diversification across pooled portfolios.

Ticket Size:
Large

Credit enhancement:
Medium

Example Structure:
Installer / Aggregator on-lending
- Ticket: PKR 3 Bn
- Credit enhancement: 40% portfolio first-loss

Originators:
- EPCs / ESCOs (PPAs/leases)
- NBFIs and Modarabas
- Microfinance banks

Microfinance institutions are increasingly exploring capital-market avenues such as securitization to diversify funding sources and provide liquidity against secured cash flows
***Ali Ladhubhai, Fintech & Microfinance Expert**

**Quoted from Stakeholder Interview – Market Diagnostic Study on Solar Financing*

Prioritization Matrix: Near-Term Scalability vs System Impact

Where formal lenders can scale fastest based on repayment visibility, operational feasibility, and risk appetite.

Product	Capital Availability	Complexity	Cost to Consumer	Development Impact	Mitigation Potential
Anchor-based Finance	**High**	**Low**	**Low**	**Medium**	**Medium**
Vendor-linked Finance	**Medium**	**Low**	**Medium**	**Medium**	**Medium**
Installer Finance	**Low**	**Medium**	**Medium to High**	**Medium to High**	**Low**
Securitization	**Low**	**High**	**Medium**	**Medium**	**Medium**
BNPL	**Low**	**Medium**	**High**	**High**	**Low**

Capital Availability refers to willingness of financiers to participate based on the perceived risk of the financial product

Complexity depends on the number of stakeholders and approvals required to execute

Cost to consumer refers to credit spreads built in a financial product (< 3% low, 3%-7% medium, 7%-15% high)

Development Impact refers to improvements in energy affordability and energy access for the target segment

Mitigation Potential refers to the quantum of grid energy displacement

The Credit Enhancement Cover

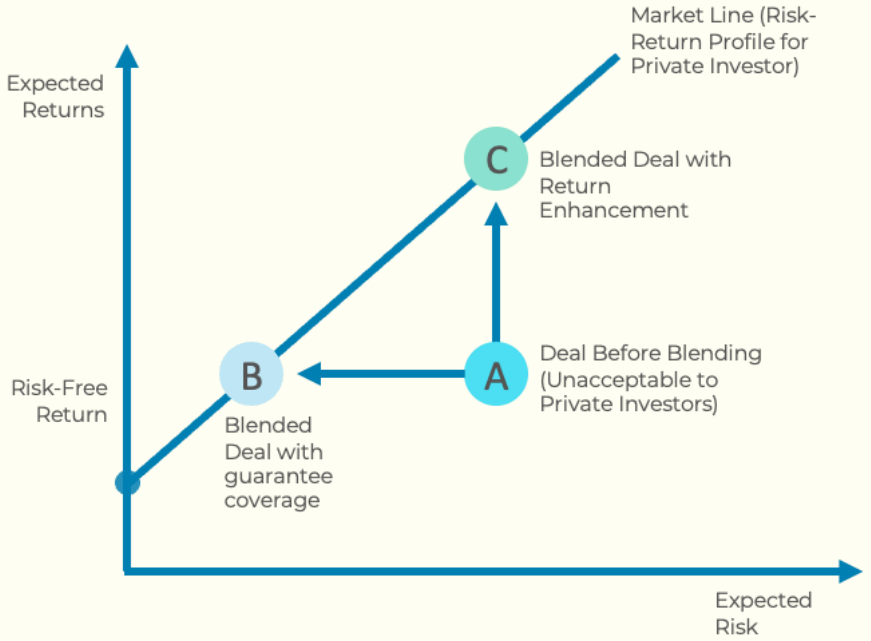
Perceived default risk and weak collateral prevent financing of small-ticket DER loans. Guarantees reduce downside risk and unlock lending.

Portfolio Guarantees to Financial Institutions

- Ring-fence distributed energy portfolios from broader SME risk
- Reduce perceived default risk for small-ticket loans
- Enable banks and NBFCs to scale consumer and SME lending
- Support transition from collateral-based to cash-flow lending

Guarantees for Aggregated Vehicles

- Credit enhancement for pooled distributed energy loan portfolios
- Enables securitization and secondary market take-outs
- Improves credit ratings for institutional investors



Catalytic Role in Market Development

- Reduces required returns for private investors entering Pakistan's distributed energy market
- Crowds in domestic institutional capital
- Accelerates scaling of distributed energy finance

Example Structures:

- Retail / Consumer
  20-30% portfolio first-loss guarantee
- SME / Commercial
  30-50% portfolio guarantee coverage
- Securitized Portfolios
  Subordinated guarantee tranche

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

RENEWABLES FIRST

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