Working Paper on

Innovative Financing Models for Rooftop Solar Deployment in Rajasthan

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Table of Contents

1. Introduction

The Government of Rajasthan has set out an ambitious programme to deploy rooftop solar systems across the state's domestic electricity consumers. Operating under the Mukhya Mantri Nishulk Bijli Yojana (MMSGY), which runs alongside the central government's PM Nishulk Bijli Yojana, the programme targets approximately 1.04 crore (10.4 million) eligible households served by two state-owned distribution companies: Ajmer Vidyut Vitran Nigam Limited (AVVNL) and Jaipur Vidyut Vitran Nigam Limited (JVVNL). JdVVNL, the third Rajasthan DISCOM serving the western region, is excluded from the scope of this note.

Each eligible consumer is to receive a 1.1 kilowatt rooftop solar system under a net metering arrangement. Under net metering, the solar system generates electricity during the day, which the household uses directly. Any generation in excess of the household's consumption is fed back into the grid and credited against future electricity bills. Eligible consumers receive up to 150 units of free electricity per month. For generation beyond 150 units, the excess flows to the DISCOM at a rate significantly cheaper than its average power purchase cost, giving the DISCOM access to green electricity at approximately ₹3.40 per unit compared to its blended purchase cost of ₹5 to ₹7 per unit.

The subsidy structure is straightforward. The Ministry of New and Renewable Energy (MNRE) provides a central subsidy of ₹33,000 per consumer through the PM Surya Ghar scheme. The Government of Rajasthan (GoR) provides a state subsidy of ₹17,000 per consumer. A point that bears emphasis: the GoR's ₹17,000 is embedded within the system cost of approximately ₹50,000, not added on top of it. Together, these subsidies cover nearly the full system cost, meaning the consumer's out-of-pocket contribution is minimal or nil.

Running parallel to the rooftop programme is a community solar initiative. This involves ground-mounted solar plants of 1 MW each across 100 villages on government-owned land, totalling 100 MW. Unlike the rooftop programme, community solar receives no MNRE or GoR subsidy. It operates as a standalone project, with electricity provided to eligible consumers through virtual net metering, a system where the solar plant is not physically on the consumer's roof but its generation is credited to their account.

2. Background: Distribution Companies

Both AVVNL and JVVNL are wholly owned by the Government of Rajasthan, created through the unbundling of the erstwhile Rajasthan State Electricity Board. They perform the essential public function of distributing electricity to domestic, agricultural, commercial and industrial consumers across the state. Their financial health, like that of most Indian state-owned DISCOMs, is structurally challenged.

2.1. Financial Snapshot (FY2025 Audited)

Metric	AVVNL (FY25)	JVVNL (FY25)
Revenue from Operations	₹21,204 Cr	₹27,590 Cr
Finance Costs (Interest)	₹2,919 Cr	₹3,954 Cr
Profit Before Exceptional Items	(₹289 Cr) Loss	(₹2,683 Cr) Loss
Net Profit/(Loss) after Exceptionals	+₹1,876 Cr	(₹706 Cr) Loss
Total Debt	₹26,084 Cr	₹35,569 Cr
Net Worth	(₹14,444 Cr) Negative	(₹17,919 Cr) Negative
ICR (Interest Coverage Ratio)	2.03x (with exceptionals)	1.15x
DSCR (Debt Service Coverage Ratio)	0.84x	0.58x
AT&C Losses	9.19%	14.22%
Acuité Rating (Supported / Unsupported)	BBB+/Stable / BB	BBB+/Stable / BB

A few observations stand out from this table. Both DISCOMs are loss-making at the operational level.[1] AVVNL's reported profit of ₹1,876 crore exists only because of ₹1,982 crore in exceptional items, primarily the reclassification of UDAY grants. Strip out those grants and AVVNL lost ₹289 crore. JVVNL is in worse shape: a loss of ₹2,683 crore before exceptional items, remaining in loss even after them.[2] Both have negative net worth, meaning their accumulated losses exceed their total equity. In commercial terms, both entities are technically insolvent on a standalone basis.

Their DSCR (Debt Service Coverage Ratio) is below 1.0x for both. The DSCR measures whether an entity generates enough cash to cover both its interest payments and the principal repayments falling due in a given year. A DSCR of 0.84x for AVVNL means it generates only 84 paise for every rupee of debt service it owes. The shortfall is covered by GoR grants and additional borrowing. JVVNL's position is weaker still at 0.58x.

Yet both DISCOMs carry a BBB+/Stable rating from Acuité, which is investment grade. This is because the rating reflects GoR's support: its 100% ownership, its track record of equity infusions and grant disbursals, the strategic importance of electricity distribution to the state, and the implicit understanding that GoR will not allow a DISCOM to default. The unsupported or standalone rating, which looks at the DISCOM's finances in isolation, is BB,

1 AVVNL Audited P&L and Cash Flow Statement, FY2024-25. Acuité Rating Report, December 2025.
2 JVVNL Audited P&L and Cash Flow Statement, FY2024-25. Acuité Rating Report, October 2025.

which is below investment grade. The four-notch gap represents the entire value of GoR's backing.

For this programme, GoR's support is treated as a given throughout. The state government has committed to bearing the cost of the solar programme, including servicing any debt raised for the purpose. This is consistent with how existing DISCOM debt is serviced: GoR provides grants, equity and subsidy disbursals that flow through the DISCOMs' accounts and are used to meet debt obligations. The question, then, is not whether GoR will pay, but how to manage the timing gap between disbursement and reimbursement in the most cost-effective way at this scale. That is the subject of the rest of this note.

2.2. The Need for Structured Financing

If GoR is going to pay for everything, why do the DISCOMs need anything beyond a conventional loan from PFC or REC? The answer lies in scale, timing and efficiency.

Scale. The total GoR subsidy outgo across 1.04 crore consumers is ₹17,680 crore. If the RESCO model is adopted, the upfront float (the amount the DISCOMs need to lay out before any subsidies arrive) is ₹52,000 crore. These are very large numbers. For context, AVVNL's total revenue in FY25 was ₹21,899 crore and JVVNL's was ₹28,682 crore. Borrowing ₹17,680 crore on the DISCOMs' balance sheets would increase their combined debt by roughly 29%. A single conventional loan of this size would concentrate risk and strain already stretched balance sheets.

Timing. The DISCOMs need money now, but GoR's reimbursement timeline is not yet determined. This gap between cash outflow and inflow is called the 'float': the amount the DISCOMs must hold or borrow to cover the period between paying out the subsidy and receiving reimbursement. If GoR takes three years to reimburse, the DISCOMs pay interest on borrowed money for three years. The longer the float period, the higher the interest cost, sometimes referred to as the 'carrying cost' or 'carry cost' of holding the receivable.

Efficiency. Different financing instruments have different costs. A conventional bridge loan at 11% costs more than a PTC securitisation that might achieve 8-9% by tapping into a different pool of investors. Off-balance-sheet instruments (those that do not add to the DISCOM's reported debt) improve the DISCOM's financial ratios, which can reduce the cost of other borrowings. Sustainability-linked instruments can attract ESG-focused investors at potentially lower rates. The goal is not merely to borrow, but to borrow at the lowest possible cost with the least balance sheet strain.

2.3. Deployment Models

Scenario A: State Subsidy Top-Up

Under this model, the DISCOM disburses ₹17,000 per consumer as the GoR subsidy portion and submits a reimbursement claim to GoR. The MNRE's ₹33,000 goes directly to the consumer through a separate channel. No solar asset is created on the DISCOM's balance sheet; the consumer owns the system. The DISCOM's role is limited to facilitating the subsidy flow. The total float exposure is ₹17,680 crore.

Scenario B: RESCO Model (DISCOM-Owned Systems)

RESCO stands for Renewable Energy Service Company. The DISCOM deploys the full system cost of ₹50,000 per consumer, installs and owns the system for 25 years, and claims both the MNRE and GoR subsidies for itself as the developer. The consumer does not own the system but benefits from net metering: 150 units of free electricity per month and, for generation above that threshold, the excess feeds into the DISCOM's grid at approximately ₹3.26 per unit. This gives the DISCOM access to cheap green power well below its purchase cost. The total upfront float – the time delay of upfront expenditure vs receivable arrival – is ₹52,000 crore, though net capex after both subsidies arrive is zero.

Scenario C: EPC Aggregation

The DISCOM aggregates consumer demand and issues bulk tenders to EPC contractors. The consumer owns the system after installation. The GoR's ₹17,000 is embedded within the EPC contract price rather than paid separately. The DISCOM's float exposure is the same as Scenario A: ₹17,680 crore.

Scenario D: Community Solar (100 MW / 100 Villages)

Ground-mounted solar on government-owned land, no subsidy, 1 MW per village. Total capex approximately ₹450 crore at 75:25 debt-to-equity. Electricity provided through virtual net metering with 150 free units per month to eligible consumers. This is a standalone project finance structure with a DSCR of approximately 1.56x at base case assumptions.

3. Financing Instruments

4.1. Common Financing Instruments

The instruments in this section can be deployed across multiple deployment models. For each instrument, the note explains what it is and how it works, its merits and limitations, the key actors the DISCOMs would need to engage, what steps are involved, and what Indian precedent exists.

A. Bridge Facility

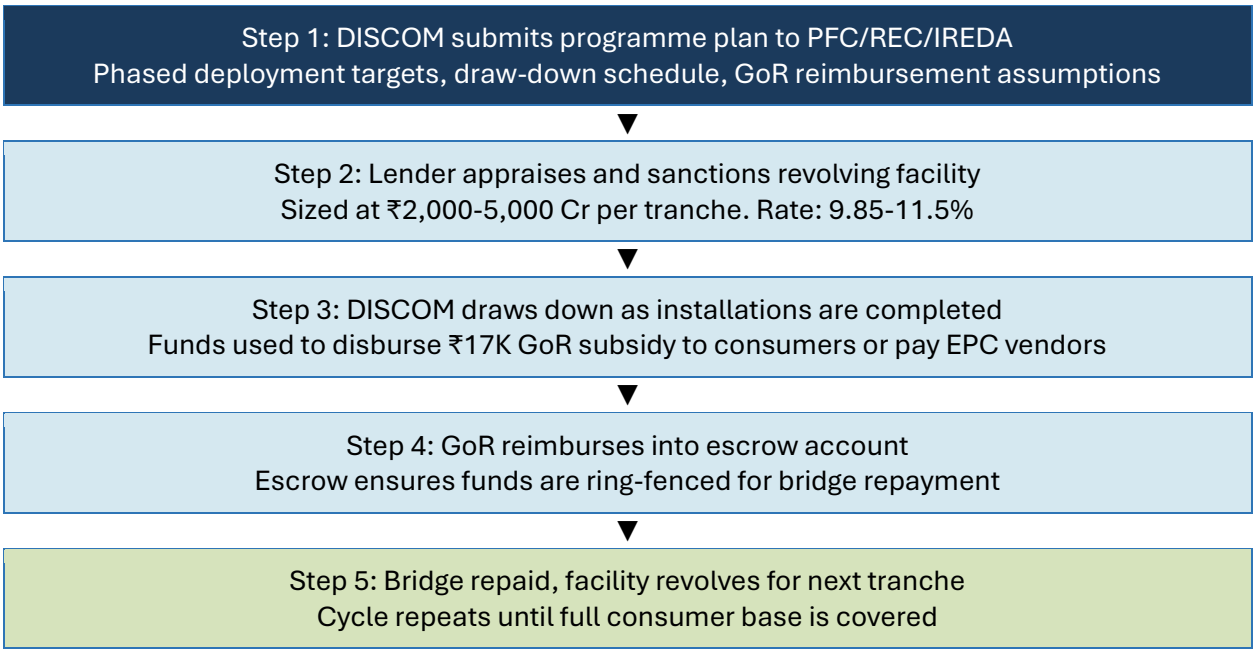
Applicable to: Scenarios A: State Subsidy Top-Up, Scenario B: RESCO Model (DISCOM-Owned Systems) and Scenario C: EPC Aggregation

A bridge facility is a short-to-medium term loan designed to cover a temporary cash shortfall. The name comes from the idea that the loan 'bridges' the gap between two events: in this case, the disbursement of the GoR subsidy by the DISCOM and the eventual reimbursement from GoR. Once GoR pays, the DISCOM repays the bridge.

For the solar programme, PFC, REC and IREDA are the natural lenders. All three have long-standing relationships with Rajasthan's DISCOMs. As of December 2024, PFC's total loan book stood at ₹5.04 lakh crore, of which 41% was lent to DISCOMs.[3] The interest rate with GoR's implicit backing would fall in the range of 9.85% to 11.5%, depending on tenor and terms.

How It Works

The DISCOM submits a programme plan to PFC or REC, detailing the number of consumers per phase, the expected draw-down schedule and the anticipated GoR reimbursement timeline. The lender appraises the proposal, a quick process given the existing credit relationship. Once sanctioned, the facility operates on a revolving basis: the DISCOM draws down funds as installations proceed, GoR reimburses into a designated escrow account (a bank account controlled by a third-party trustee, ensuring that the money is used only to repay the bridge), and the repaid funds become available for the next round of installations.



Merits and Limitations

Merits	Limitations and Considerations

3 CARE Ratings, PFC Rating Note, April 2025. Loan book as of 31 December 2024.

• Fastest instrument to arrange: 3-6 months from application to first draw-down • PFC and REC are familiar counterparties with established DISCOM lending processes • Flexible sizing: can start small and scale up as the programme gains momentum • GoR's implicit support keeps the rate within investment-grade range	• Adds to the DISCOM's on-balance-sheet debt, worsening leverage ratios • Interest accrues on the full principal until GoR reimburses; three-year delay means cumulative interest of approximately 33% of the receivable at 11% • Both DISCOMs already have DSCR below 1.0x; new debt further strains cash flows • Designed only for the interim gap; not a long-term solution

Steps and Key Actors

The DISCOM's board passes a resolution authorising new borrowing. GoR's consent is obtained if outside existing limits. The programme plan is submitted to the lender. Credit appraisal takes four to eight weeks. Sanction, documentation and first draw-down follow. Total timeline: three to six months.

Actor / Entity	Role	Examples / Notes
PFC / REC / IREDA	Lender. Appraises, sanctions and disburses the facility	Existing relationship with both DISCOMs. PFC 41% loan book to DISCOMs
GoR (Energy Department)	Provides consent for additional borrowing; commits to reimbursement schedule	May issue comfort letter to lender confirming programme backing
Escrow Bank	Holds GoR reimbursement in trust; releases to lender per agreed terms	Any scheduled commercial bank; typically the DISCOM's existing banker
DISCOM Board	Passes borrowing resolution; oversees programme deployment	Internal governance step

Indian Precedent: PFC's COVID Liquidity Package for DISCOMs

During the pandemic in 2020, the Government of India routed a ₹90,000 crore liquidity support package for DISCOMs through PFC and REC. PFC alone approved ₹30,607 crore by July 2020. The mechanism was identical: PFC lent to DISCOMs, DISCOMs covered revenue shortfalls, and GoI/GoR reimbursed over subsequent years. Cumulative PFC-REC-IREDA disbursements to the power sector in FY25 reached ₹3,896 crore, growing 24% year-on-year.

[Sources: PFC Annual Report 2024-25; CARE Ratings, April 2025; Power Line Magazine, October 2025]

B. Sustainability-Linked Bonds

Applicable to: All Scenarios

A sustainability-linked bond (SLB) is a bond whose coupon is linked to the issuer's performance against pre-agreed sustainability targets. At the point of issuance, the issuer selects one or more Key Performance Indicators (KPIs), sets quantified Sustainability Performance Targets (SPTs) for each KPI, and agrees on an observation date during the bond's life when performance will be assessed. Depending on the outcome at that observation date, the coupon adjusts.

SLBs can be structured in three ways, summarised in the table below.

Structure	How It Works	Prevalence and Examples
Step-Up	The coupon increases if the issuer misses its SPTs. It remains unchanged if targets are met. The issuer is penalised for underperformance. The most common step-up is 25 basis points (one-quarter of a percentage point), though some issuances have used 50 or 75 basis points.	The most widely used structure, accounting for roughly three-quarters of global SLB issuance by value. Used by AEML (USD 300M, 2021), JSW Steel (USD 500M, 2021), Cube Highways (₹860 Cr, 2025).
Step-Down	The coupon decreases if the issuer achieves its SPTs. It remains unchanged if targets are missed. The issuer is rewarded for achievement. Step-down structures tend to set observation dates earlier in the bond's tenor (around one-third of the way through).	Uncommon as a standalone structure. Used in some ESG-rating-linked bonds where the issuer's overall rating can improve.
Combined Step-Up / Step-Down	The coupon can move in either direction: it rises if targets are missed and falls if targets are met or exceeded. Where multiple KPIs are used, missing one and exceeding another can offset each other, leaving the coupon unchanged.	Used in more complex SLBs, particularly sovereign issuances. Uruguay's sovereign SLB uses this structure, tying the coupon to both emissions intensity reduction and native forest area preservation.

The critical difference between an SLB and a green bond is that SLB proceeds can be used for any purpose. There is no requirement to track or report how the money was spent. What matters is the issuer's overall sustainability performance, measured through Key Performance Indicators (KPIs). This makes SLBs applicable across all four deployment scenarios. In Scenario A, where the DISCOM disburses a subsidy without creating a green asset on its balance sheet, a green bond would face a use-of-proceeds mismatch because

there is no identifiable green asset to which the proceeds can be traced. An SLB avoids this entirely. In Scenarios B, C and D, where green assets do exist, an SLB can still be used alongside or instead of a green bond, particularly if the DISCOM wishes to raise unrestricted corporate funding rather than asset-specific funding.

For this programme, the step-up structure is attractive. A step-up creates a visible financial consequence for missing the solar programme's targets, which strengthens the credibility of the instrument in the eyes of investors and regulators. The utilities sector is already the largest category of SLB issuers globally, accounting for 21% of issuances since 2020, meaning investors are familiar with utility-sector SLBs and the KPIs they typically carry.[4] A step-up of 25 to 50 basis points on missed targets signals that the programme has financial accountability without placing undue cash flow pressure on the DISCOMs (at 25 basis points on a ₹2,000 crore issuance, the annual step-up cost would be ₹5 crore, which is modest relative to the DISCOMs' revenue base).

For the Rajasthan DISCOMs, the natural KPIs would be the number of rooftop solar installations facilitated, and the share of renewable energy in the DISCOM's power purchase mix. The SPTs would set specific numerical targets for each KPI (for instance, 10 lakh installations by a defined date, AT&C losses below 8%) with observation dates during the bond's tenor.

Pricing: What Has Been Observed

Indian SLB issuances have achieved meaningful pricing advantages. AEML's USD 300 million SLB, issued in July 2021, achieved the tightest coupon ever recorded for a BBB- rated utility issuer in Asia outside Japan, suggesting that the sustainability label attracted a broader and more competitive investor base than a conventional bond would have.[5] UltraTech Cement's SLB, India's first, priced one basis point below a vanilla bond issued by IRFC around the same time, which was notable because IRFC is a government-owned entity with a stronger standalone credit profile.[6] Globally, studies of the SLB market have observed that issuers can achieve a modest yield discount at the point of issuance, as sustainability-focused investors are willing to accept slightly lower returns for the ESG label.[7] The discount tends to be more pronounced for bonds with more demanding targets and longer penalty periods.[8]

4Banque de France, 'Sustainability-linked bonds, an effective tool for decarbonisation?', 2022.
5 AEML Press Release, 23 July 2021; Hello Entrepreneurs, 23 July 2021. AEML achieved the tightest coupon ever by a BBB- rated utility issuer in Asia (ex-Japan).
6 IFR, February 2021. UltraTech's SLB priced 1 basis point inside IRFC's vanilla bond issued around the same time.
7 Kölbel, J.F. and Lambillon, A.-P., 'Pricing of sustainability-linked bonds', Journal of Financial Economics, 2024. See also Kölbel, J.F. and Lambillon, A.-P., 'Who pays for sustainability? An analysis of sustainability-linked bonds', IFC/World Bank Working Paper, 2022.
8 Anderson, A.-M. and Kish, R., 'Rewarding performance through sustainability-linked bonds'.

For the DISCOMs, this suggests that a well-structured SLB with ambitious, credible targets tied to the solar programme could attract a broader investor base than a conventional bond and potentially achieve tighter pricing. The 9.2 times oversubscription of AEML's issuance, from an Indian distribution company with a comparable profile to the Rajasthan DISCOMs, is a strong precedent.

How It Works

The issuance process begins with the DISCOM developing an SLB Framework document that sets out its sustainability strategy, selected KPIs, calibrated SPTs and the financial consequences of missing targets. This framework is reviewed by an independent Second Party Opinion (SPO) provider to confirm that the targets are sufficiently ambitious and not merely business-as-usual. The DISCOM then obtains a credit rating for the bond, complies with SEBI's ESG Debt Framework and issues the bond. After issuance, the DISCOM reports annually on KPI progress, verified by an independent third party. At the SPT observation date, if targets have been met the coupon remains unchanged; if missed, the coupon steps up for the remaining tenor.

Step 1: DISCOM develops SLB Framework
Selects KPIs, sets SPTs with observation dates. Aligns with ICMA SLB Principles 2024

▼

Step 2: Independent Second Party Opinion obtained
SPO provider confirms targets are ambitious, measurable and beyond business-as-usual

▼

Step 3: SEBI ESG Debt Framework compliance
Follows June 2025 circular. Mandatory disclosures, third-party review pre- and post-issuance

▼

Step 4: Bond issuance with step-up mechanism
Base coupon (say 10%). Step-up of 25-50 bps if SPTs missed. Proceeds unrestricted

▼

Step 5: Annual reporting and SPT observation
Third-party verifies KPI progress annually. At observation date: coupon adjusts or stays

Merits and Limitations

Merits	Limitations and Considerations
• Proceeds unrestricted: avoids the use-of-proceeds mismatch that makes green bonds unsuitable for Scenario A	• Base coupon of 10-11% is comparable to existing borrowing costs; the SLB label alone does not make debt cheaper

• First DISCOM SLB in India would be a significant first-mover milestone, attracting attentions • Step-up mechanism creates financial accountability for programme delivery • SEBI framework provides regulatory certainty for domestic issuance	• Requires ongoing annual reporting and third-party verification, adding administrative cost • The step-up penalty (25-50 bps) is modest; if the DISCOM misses targets, the debt gets costlier, not cheaper • Without a DFI anchor investor or partial guarantee, investor appetite may be limited

Steps and Key Actors

The timeline for an SLB issuance is typically 9 to 15 months. This includes developing the framework (2-3 months), obtaining the SPO (1-2 months), SEBI compliance and rating (2-3 months), and investor marketing and placement (2-3 months). This can run in parallel with a bridge facility, which provides immediate funding while the SLB is being structured. If the DISCOM seeks competitive pricing, engaging a DFI as an anchor investor or partial guarantor is strongly recommended.

Actor / Entity	Role	Examples / Notes
SPO Provider	Validates KPI selection and SPT ambition	Sustainalytics, CICERO, S&P Global Ratings ESG
Rating Agency	Rates the bond	Acuité, CRISIL, CARE, ICRA
SEBI	ESG Debt Framework compliance	Circular of 5 June 2025
DFI Anchor (optional but recommended)	Subscribes to a portion of the bond, de-risking it for others	IFC, IREDA, ADB
Arranger / Lead Manager	Structures the bond, manages book-building	SBI Capital, ICICI Securities, Axis Capital
Third-Party Verifier	Verifies annual KPI progress post-issuance	Big Four audit firms, specialist ESG verifiers

Indian Precedent: AEML, JSW Steel and Cube Highways SLBs

Adani Electricity Mumbai Limited (AEML), a distribution company serving Mumbai, issued a USD 300 million SLB in July 2021. Its KPIs were tied to increasing its renewable energy share from 3% to 60% and reducing greenhouse gas emissions intensity by 60%. The bond was oversubscribed 9.2 times. AEML is

the closest structural parallel to the Rajasthan DISCOMs: it is a power distribution company, and the KPIs it selected translate directly to the solar programme's objectives.[9]

JSW Steel issued a USD 500 million SLB in September 2021 at a BB credit rating, which is the same as the Rajasthan DISCOMs' unsupported standalone rating. Despite the sub-investment-grade credit, the bond attracted a USD 4.7 billion order book, demonstrating strong investor appetite when the sustainability narrative is credible.[10]

Domestically, Cube Highways Infrastructure Investment Trust issued India's first INR-denominated SLB in February 2025, raising ₹860 crore with IFC as anchor investor. This confirmed that the domestic INR SLB market exists and that DFI anchoring is a viable pathway.[11]

C. DFI/MDB Blended Finance and Partial Guarantees

Applicable to: All scenarios. Particularly well suited to Scenarios B: Resco Model and D: Community Solar Plants.

Development Finance Institutions (DFIs) and Multilateral Development Banks (MDBs) such as the World Bank, Asian Development Bank (ADB), Asian Infrastructure Investment Bank (AIIB), International Finance Corporation (IFC), KfW and JBIC provide financing on terms that commercial lenders cannot match. Their loans carry lower interest rates (often 4-8% for concessional facilities), longer repayment periods (up to 25 years) and grace periods during construction. They can also provide partial credit guarantees, where the DFI promises to cover a portion of losses (say 50%) if the borrower defaults. This guarantee improves the borrower's effective credit rating by two to three notches, allowing it to access commercial capital at investment-grade rates.

The term 'blended finance' refers to combining concessional DFI capital with commercial capital. The concessional portion absorbs the first layer of risk, encouraging commercial lenders to participate at lower rates. The blended rate (the weighted average) falls in the range of 8.5% to 10%, compared to 11-13% for purely commercial borrowing.

For this programme, a DFI engagement could take several forms: a sovereign-routed concessional loan (where GoR borrows through the Government of India and on-lends to the DISCOMs, carrying the lowest rate but requiring central government approval through the Department of Economic Affairs), a partial guarantee on an SLB or green bond (allowing investment-grade pricing) or a results-based programme loan (tying disbursements to verified outcomes, similar to the AIIB-MSEDCL transaction described below).

Merits and Limitations

9 AEML Press Release, July 2021; IFR Awards 2021.
10 IFR Awards 2021, Asia-Pacific SLB of the Year.
11 IFC Press Release, February 2025.

Merits	Limitations and Considerations
• Lowest achievable cost of capital across all instruments • Partial guarantee provides 2-3 notch credit enhancement • Long tenors (15-25 years) match the useful life of solar assets • Technical assistance often bundled	• Slowest to arrange: 12-30 months from concept to disbursement • Extensive due diligence including environmental and social safeguards • Sovereign or state government involvement adds bureaucratic layers • Conditionality on procurement, governance and reporting

Steps and Key Actors

GoR or the DISCOM identifies the target DFI, prepares a concept note and project information document, and submits for screening. The DFI conducts a full appraisal. Terms are negotiated and board or sovereign approvals obtained. Total timeline: 12 to 30 months. This instrument should be initiated immediately but not relied upon for the first phase; the bridge facility covers the interim.

Applicable to: Scenarios B: RESCO Model and D: Community Solar Plants

Actor / Entity	Role	Examples / Notes
DFI / MDB	Provides concessional loan or partial guarantee	ADB, AIIB, IFC, KfW, JBIC, World Bank
DEA (if sovereign route)	Central government approval for external borrowing	Department of Economic Affairs, Ministry of Finance
GoR (Energy / Finance Dept)	State-level approval and programme ownership	Issues sovereign/sub-sovereign borrowing consent
Implementation Agency	Executes the programme, reports to DFI	DISCOM or dedicated PMU

Indian Precedent: AIIB-MSEDCL Maharashtra Solar Programme (USD 1.1 Billion, September 2025)

In September 2025, AIIB approved a USD 1.1 billion sovereign-backed loan to Maharashtra State Electricity Distribution Company Limited (MSEDCL) for distributed renewable energy. The programme finances 500,000 off-grid solar water pumps for farmers and distribution grid upgrades. It is structured as a results-based programme, where disbursements are linked to verified outcomes. This is the closest precedent to what Rajasthan is proposing: a large-scale DFI loan to a state DISCOM for distributed solar

deployment. MSEDCL, like the Rajasthan DISCOMs, is state-owned with a challenging financial profile. The sovereign backing addresses the DISCOM's credit limitations.[12]

Other recent DFI transactions in the Indian power sector include: PFC's €150 million facility with KfW for RDSS projects (September 2025); PFC's JPY 120 billion credit line with JBIC, described by JBIC as its largest green financing deal with an Indian company (March 2025); ADB's loans of USD 241 million for West Bengal distribution modernisation and USD 434 million for Assam RE and battery storage; and ADB-GCF's India Green Finance Facility mobilising nearly USD 8 billion for clean energy (July 2025).[13]

D. Green Bonds

A green bond is a bond whose proceeds are restricted to funding projects with a clear environmental benefit. The issuer must define eligible green project categories, track the allocation of proceeds and report annually on both allocation and environmental impact. An external reviewer verifies alignment with recognised standards such as the ICMA Green Bond Principles or the Climate Bonds Standard.

The use-of-proceeds restriction distinguishes green bonds from SLBs. Because green bond investors need a direct link between their money and a green asset, green bonds work only for deployment models where the DISCOM creates or owns a physical green asset. In Scenario B (RESCO), the DISCOM owns rooftop solar systems. In Scenario D (community solar), the SPV owns ground-mounted solar plants. Both qualify. Scenario A, where the DISCOM merely disburses a subsidy without creating an asset on its books, does not meet this requirement.

Steps and Key Actors

The DISCOM or SPV develops a Green Bond Framework aligned with ICMA Green Bond Principles, obtains an external review or Climate Bonds certification, complies with SEBI's green debt regulations and issues through private placement or public offer. Timeline: 9-15 months.

Actor / Entity	Role	Examples / Notes
External Reviewer / Certifier	Verifies green bond framework and eligible projects	Sustainalytics, CICERO, Climate Bonds Initiative
Rating Agency	Rates the bond	Acuité, CRISIL, CARE, ICRA
SEBI	Green debt securities regulatory compliance	SEBI Green Bond Guidelines

12AIIB Project Page, 'India: Maharashtra Climate Resilient Distributed Renewable Energy Access Program', approved 25 September 2025.
13Power Line Magazine, 'Rising Capital Flows', October 2025; PFC Annual Report.

Arranger	Structures the bond, manages placement	SBI Capital, ICICI Securities

Indian Precedent: PFC, REC, IREDA and Municipal Green Bonds

PFC issued India's first Euro-denominated green bond (€300 million, seven-year, 1.841% coupon) in September 2021, oversubscribed 2.65 times. PFC's green bond portfolio has funded 13,492 MW of solar and wind. REC raised USD 750 million through green bonds in April 2023 and JPY 61.1 billion in January 2024. IREDA issued green perpetual bonds at 8.40% and ten-year green bonds at 7.74% in March 2025.[14]

At sub-sovereign level, Ghaziabad Municipal Corporation issued ₹150 crore in green bonds (April 2025) and Pimpri-Chinchwad Municipal Corporation issued ₹200 crore (June 2025), oversubscribed five times. These municipal bodies have weaker credit than GoR-backed DISCOMs, yet successfully accessed the market.[15]

4. Scenario-Specific Instruments

The instruments in this section apply to a single deployment model only, unlike the common instruments discussed above.

A. Supply Chain Finance

Applicable to – Scenario C: EPC Aggregation

Supply chain finance shifts the financing burden from the DISCOM to either the EPC vendor or a financial intermediary. The simplest way to understand it is through an example. An EPC vendor installs a rooftop solar system. Under normal circumstances, the DISCOM would pay the vendor promptly. But the DISCOM does not have the cash because GoR has not yet reimbursed. Under supply chain finance, a bank steps in, pays the vendor now (at a slight discount, say 2-3% of invoice value, to compensate the bank for the time value of money) and the DISCOM pays the bank later, when GoR reimburses.

14Mercom India, September 2021; PFC Wikipedia; Renewable Watch, March 2025.
15Renewable Watch, April and July 2025.

Merits and Limitations

Merits	Limitations and Considerations
• Zero or near-zero direct financing cost for the DISCOM • No new debt on DISCOM's balance sheet • Vendor gets paid faster, improving willingness to participate • Uses DISCOM's stronger credit rating to benefit the supply chain	• Higher EPC contract price (vendor embeds financing cost) • Requires large, well-capitalised EPC vendors willing to accept delayed payment • Only applicable to Scenario C • Quality risk: cost pressure on vendors may affect installation standards

Steps and Key Actors

The DISCOM structures its EPC contracts with payment milestones allowing for supply chain financing (for example, 30% advance, 50% on commissioning, 20% post-verification). Existing banking partners set up reverse factoring programmes. India's TReDS platforms (Trade Receivables Discounting System, operational since 2017) provide ready infrastructure for electronic invoice discounting.

Actor / Entity	Role	Examples / Notes
EPC Contractors	Install solar systems, bear working capital during installation period	Tata Power Solar, Adani Solar, Vikram Solar, Waaree
DISCOM's Banker	Provides reverse factoring facility; pays vendor early	SBI, Bank of Baroda, PNB
TReDS Platform	Electronic invoice discounting infrastructure	M1xchange, RXIL, Invoicemart

Indian Precedent: Tata Power Odisha Utility-Led Aggregation Model

Tata Power-led Odisha DISCOMs launched a 1 kW rooftop solar scheme in September 2025 under the Utility-Led Aggregation (ULA) model, aligned with PM Surya Ghar. The consumer pays only ₹5,000 to ₹5,622. The balance is covered by central (₹30,000) and state (₹25,000) subsidies aggregated and facilitated by the DISCOMs. Tata Power manages the entire lifecycle: vendor selection, bulk procurement, installation, quality assurance and after-sales service. By December 2025, 70% of consumers achieved a 90% reduction in electricity bills. The model is structurally identical to Rajasthan's

Scenario C: DISCOMs aggregate demand, centralise vendor management and facilitate subsidy flow-through.[16]

B. SPV Project Finance

Applicable to – Scenario D: Community Solar

For an indicative size of 100 MW community solar programme, one approach could be to create a Special Purpose Vehicle (SPV), a separate company or entity whose sole purpose is to own and operate the solar plants. The SPV can borrow debt (70% of capex) and the DISCOM or GoR provides equity (30%). The debt is repaid from the project's own cash flows (electricity revenue and, if applicable, carbon credits). Because the SPV is a separate entity, its debt does not appear on the DISCOM's balance sheet (this is what 'off-balance-sheet' means in practice). Lenders assess the project on its own merits: the quality of the solar resource, the reliability of the off-taker (the DISCOM), the DSCR and the regulatory framework, rather than the DISCOM's overall financial health.

With a DSCR of 1.56x at base case assumptions, the community solar project is comfortably financeable. The capex of ₹450 crore is modest by infrastructure standards and well within the lending capacity of PFC, REC or any large commercial bank.

Steps and Key Actors

Actor / Entity	Role	Examples / Notes
SPV	Owns and operates solar plants; borrows debt, receives revenue	DISCOM subsidiary or standalone entity
PFC / REC / Commercial Bank	Provides project term loan (75% of capex)	Existing DISCOM lending relationships
EPC Contractor	Builds the solar plants under a fixed-price turnkey contract	Competitive tender
RERC	Approves virtual net metering regulations and tariff	Rajasthan Electricity Regulatory Commission
GoR (Revenue / Land Dept)	Provides government land for solar plants	Land availability confirmed for 100 villages

C. PTC Securitisation

Applicable to – Scenarios A: Subsidy Pass on

16Business Standard, 1 September 2025; Tata Power Press Release, December 2025; Energetica India, 4 September 2025.

Securitisation is the process of converting a future receivable into immediate cash by selling it to investors. In this programme's context, the DISCOM has a receivable from GoR: ₹17,000 per consumer, totalling ₹17,680 crore. This receivable is real (GoR has committed to paying it) but its timing is uncertain. Securitisation allows the DISCOM to monetise this receivable now rather than waiting.

The instrument used is a Pass-Through Certificate, or PTC. The process works as follows. The DISCOM sells its pool of GoR receivables to a separate legal entity called a Special Purpose Vehicle (SPV), typically set up as a trust. This sale must be a 'true sale', meaning the receivables genuinely leave the DISCOM's ownership and move to the SPV. This is not just an accounting formality; it is the mechanism by which the receivable moves off the DISCOM's balance sheet. The SPV is structured to be 'bankruptcy-remote', which means that even if the DISCOM were to face financial difficulties, the SPV's assets (the GoR receivables) are legally protected from the DISCOM's creditors. The SPV then issues PTCs to investors such as banks, mutual funds and insurance companies. These certificates represent the investors' claim on the cash flows from the receivable pool.

When GoR eventually reimburses, the money flows into an escrow account managed by an independent trustee. The trustee distributes the cash to PTC holders according to a pre-agreed priority sequence called a 'waterfall'. This waterfall determines who gets paid first. PTC issuances are typically divided into layers called 'tranches', each carrying different risk and return. The senior tranche gets paid first and carries the lowest risk and yield. The mezzanine tranche gets paid second with moderate risk. The subordinated tranche (sometimes called the 'first-loss' tranche) absorbs any losses first and gets paid last. The DISCOM usually retains the subordinated tranche as 'skin in the game', reassuring senior investors and meeting RBI's Minimum Retention Requirement.

Two variants of PTC securitisation are possible for this programme.

Variant 1: Sell Receivable at a Discount

The DISCOM sells the GoR receivable to the SPV at a discount to its face value. If the discount is 15%, the DISCOM receives ₹15,028 crore immediately instead of ₹17,680 crore. The ₹2,652 crore difference is the cost of getting cash now rather than waiting. Investors buy the PTCs and receive the full amount when GoR reimburses, earning the difference as their return. The discount reflects how long investors expect to wait and how confident they are in GoR's credit.

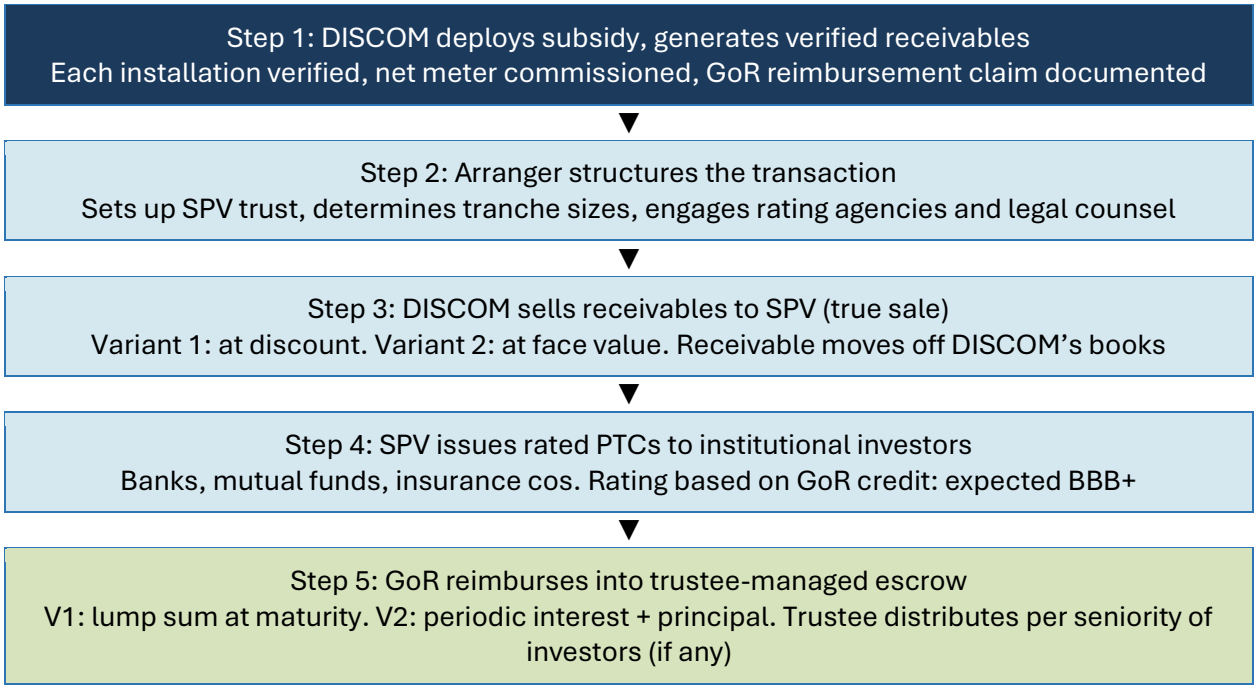
Variant 2: Interest Pass-Through

Since GoR is the party causing the timing gap (it committed to the subsidy but has not fixed the reimbursement schedule), it is reasonable for GoR to pay interest on the outstanding amount. Under this variant, the DISCOM receives the full face value of the receivable upfront

with no discount. GoR makes periodic interest payments (say quarterly at 8-9%) into the escrow, which the trustee passes through to PTC investors as their coupon. When GoR reimburses the principal, the PTCs mature. The DISCOM bears no cost because GoR pays the interest, which GoR would have to bear anyway since the delay is on its side.

This variant is structurally similar to the Jamnagar Utilities transaction described below. In that deal, the underlying receivable pool carried a 12% annual interest rate, and the PTCs paid investors approximately 7.75%. The difference between the two rates (roughly 4.25 percentage points, called the 'spread') covered the SPV's operating costs, credit enhancement reserves and the originator's retained margin.[17]

How It Works (Both Variants)



17IFR (International Financing Review), 'Reliance sets Indian securitisation milestone', 20 September 2025.

Merits and Limitations

Merits	Limitations and Considerations
• Off-balance-sheet: removes the receivable and associated bridge debt from DISCOM books • PTCs rated on GoR's credit, which as a state government is stronger than DISCOM standalone • India's PTC market is large and growing: ₹1.88 lakh crore in FY24, projected ₹2.5 lakh crore in FY25 • Variant 2 eliminates the discount cost entirely if GoR agrees to bear carrying cost • Can be executed in tranches as receivables are verified, reducing concentration risk	• Requires specialist structuring: arranger, legal counsel, SPV trust, independent trustee, rating agencies. This is a more involved process than a simple loan • Timeline of 6-9 months from arranger appointment to first placement; needs verified receivables as a prerequisite • SEBI compliance required if PTCs are listed; RBI Minimum Retention Requirement applies • First-of-kind for DISCOM subsidy receivables; investor education will be needed initially • Discount (V1) or GoR interest commitment (V2) represents a real cost to someone

Steps and Key Actors

The DISCOM accumulates a pool of verified GoR receivables (minimum ₹2,000-3,000 crore recommended for the first tranche). It appoints an arranger and legal counsel, who set up the SPV trust with an independent trustee. At least two rating agencies rate the PTCs. An information memorandum is prepared for investors. If listing on an exchange, SEBI registration is completed. A roadshow is conducted, the book is built, PTCs are allocated and settled. Total timeline from arranger appointment: six to nine months. Practical start: 12-18 months from programme launch, since verified receivables are the prerequisite.

Actor / Entity	Role	Examples / Notes
Arranger (Investment Bank)	Structures the transaction, manages investor placement	SBI Capital Markets, ICICI Securities, Barclays, JM Financial
Legal Counsel	Drafts trust deed, true sale documentation, investor agreements	AZB & Partners, Cyril Amarchand Mangaldas, Khaitan & Co
SPV Trustee	Manages the trust, holds assets, administers waterfall payments	Vistra ITCL, IDBI Trusteeship, Catalyst Trusteeship
Rating Agencies (min. 2)	Rate the PTCs; rating based on GoR credit quality	Acuité, CRISIL, CARE, ICRA

SEBI	Regulatory compliance if PTCs are listed on exchange	SEBI SDI Regulations, 2008 (under revision)
RBI	Minimum Retention Requirement; securitisation directions	RBI SSA Directions, 2021
Escrow Bank	Receives GoR reimbursement, distributes per trustee instructions	Scheduled commercial bank

Indian Precedent: Jamnagar Utilities & Power, ₹21,000 Crore PTC (September 2025)

In September 2025, two Reliance Industries subsidiaries, Jamnagar Utilities & Power Private Limited and Sikka Ports & Terminals Limited, completed India's largest securitisation transaction, raising ₹21,000 crore (approximately USD 2.38 billion) through pass-through certificates. The deal was backed by loan receivables from Digital Fibre Infrastructure Trust, an entity that holds Reliance's telecoms infrastructure through its subsidiary Jio Digital Fibre. The cash flows underpinning the PTCs came from monthly payments that Reliance Jio Infocomm makes for fibre use and maintenance.

The PTCs were structured across three separate trusts (named Siddhivinayak, Shivshakti and Radhakrishna Securitisation Trusts) to comply with the regulatory requirement that no single borrower or obligor can account for more than 25% of the total asset pool. This multi-trust approach is directly applicable to the DISCOM programme, where AVVNL and JVVNL could originate PTCs through separate trusts.

The certificates carried tenors of three, four and five years at an average yield of approximately 7.75%. Both CRISIL and CareEdge assigned their highest structured obligation rating, AAA(SO). The underlying loan pool carried an interest rate of 12% per annum. The PTC yield of 7.75% offered investors a premium of 75 to 80 basis points (a basis point is one-hundredth of a percentage point, so 75 basis points equals 0.75 percentage points) over what comparable AAA-rated corporate bonds were yielding at the time. This premium compensated investors for the structural novelty of the transaction.

India's largest mutual fund houses, including ICICI Prudential, SBI Mutual Fund, HDFC Mutual Fund, Nippon India, Kotak Mahindra, Aditya Birla Sun Life and Axis Mutual Fund, together subscribed to roughly four-fifths of the total issuance. Barclays acted as the sole arranger. The deal was initially sized at ₹18,000 crore but upsized to ₹21,000 crore in response to strong demand.

For the first time in an Indian securitisation, put options were embedded in the structure. A put option gives the investor the right to sell back the PTC to the issuer at a specified date, effectively shortening the holding period. This addressed the maturity mismatch between the 15-year underlying loan tenor and investors' preference for shorter holding periods of three to five years.

[Source: IFR, 20 September 2025]

D. Carbon Credits and Renewable Energy Certificates

Carbon credits and Renewable Energy Certificates (RECs) are supplementary revenue streams rather than primary financing instruments. They improve project economics by generating additional income from the environmental attributes of the electricity produced.

Carbon Credits

A carbon credit represents one tonne of CO_2 emissions avoided or removed. Solar projects earn credits by displacing fossil-fuel-based grid electricity. Two markets exist. The voluntary market (certified by Verra or Gold Standard) currently prices Indian solar credits at USD 3 to 10 per tonne. India's compliance market, the Carbon Credit Trading Scheme (CCTS), had its first eight methodologies approved in March 2025, with trading expected by mid-2026.[18]

There is an important concept called 'additionality' that determines whether a project qualifies for credits. To be additional, a project must demonstrate that it would not have happened without the carbon credit revenue. Large grid-connected solar projects in India, which are already commercially viable and receive government subsidies, often struggle to prove additionality because they would have been built anyway. Community solar with a social component (free electricity to low-income households, village-level deployment) has a stronger additionality case and may qualify for premium credits under Gold Standard's community benefit criteria.

For the 100 MW community solar programme, annual CO_2 avoidance is estimated at approximately 118,000 tonnes (based on 166,000 MWh generation and India's grid emission factor of 0.71 tCO_2/MWh). At voluntary market prices of USD 3 to 10 per tonne, this translates to annual revenue of ₹3 crore to ₹10 crore, or ₹75 crore to ₹250 crore over the project's 25-year life.

Renewable Energy Certificates (RECs)

A Renewable Energy Certificate is a market-based instrument proving that one megawatt-hour of electricity was generated from a renewable source. RECs are issued by the National Load Despatch Centre (NLDC) under CERC and traded on the Indian Energy Exchange (IEX) and PXIL. As of May 2025, solar RECs were trading at approximately ₹345 to ₹349 per certificate on the IEX, with trading volumes increasing 65% year-on-year.19

There is an important eligibility condition. RECs are issued only for renewable generation that is not tied to a preferential tariff or power purchase agreement with a distribution company. If the community solar project sells its electricity to the DISCOM under any form of PPA or internal arrangement, it may not qualify for separate REC issuance, because the green attribute is already bundled into the off-take arrangement. In that case, the DISCOM receives Renewable Purchase Obligation (RPO) compliance credit from the purchase. This RPO compliance has real value: it avoids the DISCOM having to buy RECs from the open

18PIB, 'Carbon Pricing in India', June 2025; CEEW, 'India's Voluntary Offset Scheme', August 2025.
19IEX trading data, May 2025; CERC REC Regulations 2022; S&P Global Commodity Insights, November 2024.

market to meet its renewable purchase targets (effectively saving ₹345 per MWh), but the revenue accrues as avoided cost rather than as a separate incoming cash flow.

5. Financing Matrix

Instrument	A: Subsidy Top-Up	B: RESCO	C: EPC Aggregation	D: Community Solar
Bridge Facility	Primary (seed)	Interim only	If needed	Not applicable
PTC Securitisation	Primary (recycle)	Not applicable	Not applicable	Not applicable
SLB (Step-Up Bond)	Ideal	Ideal	Less suited	Ideal
DFI/MDB Blended	Via guarantee	Excellent fit	Via guarantee	Excellent fit
Green Bond	Not suited	Excellent fit	Not suited	Excellent fit
Supply Chain Finance	Not applicable	Not applicable	Primary	Not applicable
SPV Project Finance	Not applicable	Applicable	Not applicable	Primary
Carbon Credits / RECs	Not applicable	RPO compliance	Not applicable	Supplementary

6. Viability and Feasibility Assessment

The following table assesses each instrument across six dimensions: implementation complexity, speed to first disbursement, indicative cost of capital, balance sheet impact, scalability and precedent strength in India.

Instrument	Complexity	Speed	Cost Range	B/S Impact	Precedent
Bridge Facility	Low	3-6 months	9.85-11.5%	On-B/S	Very strong
PTC (V1: Discount)	High	12-18 months	8-10% effective	Off-B/S	Strong
PTC (V2: Pass-Through)	High	12-18 months	Nil for DISCOM	Off-B/S	Moderate
SLB (Step-Up)	Medium	9-15 months	10-11%	On-B/S	Moderate
DFI / MDB	High	12-30 months	4-8%	Varies	Very strong
Green Bond	Medium	9-15 months	9.5-11%	On-B/S	Strong

Supply Chain Finance	Low	3-6 months	Nil for DISCOM	Nil	Strong
SPV Project Finance	Medium	6-12 months	9.5-11%	Off-B/S	Very strong

Green shading indicates favourable. Yellow indicates moderate. Orange or red indicates a constraint. 'Nil for DISCOM' means the cost is borne by another party (GoR in PTC Variant 2, the vendor in supply chain finance).

7. Recommended Approach

The financing strategy should be layered, with each instrument building on the previous one. No single instrument can handle the full scale at the speed required. But taken together, sequenced correctly, they form a financing architecture that matches the programme's needs.

7.1. Phase 1: Months 1 to 6

Arrange the bridge facility from PFC or REC. This is the fastest instrument and provides seed capital to begin installations. In parallel, initiate engagement with one or two DFIs by submitting a concept note. Begin developing the SLB framework and selecting KPIs. For community solar, start SPV formation and identify the first tranche of village sites.

7.2. Phase 2: Months 6 to 12

As installations proceed under the bridge, verified GoR receivables accumulate. Appoint an arranger for the first PTC tranche. Continue DFI negotiations. Finalise the SLB framework and obtain the Second Party Opinion. For Scenario C, engage EPC vendors and set up reverse factoring arrangements. Launch the community solar EPC tender.

7.3. Phase 3: Months 12 to 18

Execute the first PTC securitisation and use proceeds to repay the bridge, freeing capacity for the next cycle. Issue the SLB (with DFI anchor if available). Achieve financial close for the community solar SPV. Register the community solar project for carbon credit certification.

7.4. Phase 4: Months 18 to 30

DFI concessional finance closes, refinancing costlier debt. Subsequent PTC tranches are placed as new batches of installations are verified. Community solar plants are commissioned and begin generating revenue and RPO compliance credit. The first carbon credit issuance takes place.

The bridge facility is the starting point because it is the fastest. PTC securitisation is the workhorse that recycles capital and keeps the programme moving without accumulating

debt on the DISCOM's books. The SLB builds a platform for future issuances and signals the DISCOM's commitment to clean energy transition. DFI concessional finance is the long-term cost optimiser, brought in once the programme has demonstrated delivery. Community solar runs as a parallel track with its own financing structure. Carbon credits and RECs provide supplementary revenue that improves project returns over the 25-year operating life.

The programme's success depends less on any single instrument and more on how they are sequenced. Layered in the right order, they deliver a fast start, efficient capital recycling, declining cost over time and minimal balance sheet burden.