From Projects to Asset Classes

Two-stage finance and synthetic sovereign bonds for clean power

Clean power plants are financed one at a time, on bespoke terms. Split each project at commissioning, pool operating plants under one standard contract and refinance them through first loss, a thin mezzanine and a senior synthetic sovereign bond. The price of solar power falls by about a fifth.

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In developing countries the price of solar power is mostly the price of money

+80%

cost of power from the same plant at a 12% cost of capital instead of 4% (3.6 to 6.5 US c/kWh)

>2×

the cost of capital for utility-scale solar in emerging and developing economies, against advanced economies

$0.37

private money mobilized per dollar of development finance in low-income countries, deal by deal ($0.75 in all developing countries)

Payment risk is the first problem (Brief 3.1). Once it is removed, the rest of the premium is packaging: each plant is financed alone, on bespoke documents, by a lender who cannot sell the loan.

Source: Author's calculation (stylized plant: $800/kW, 20% capacity factor, 25 years); IEA (2024), Reducing the Cost of Capital; Attridge and Engen (2019), 2012–2015 data.

A plant under construction and a plant in operation are different credits

Construction (about two years): default rates like speculative-grade borrowers in the first three years after financial close.

Operation (25 years): default rates fall toward single-A levels by year seven. Loans that survived three years defaulted at under 3% over the next seven.

Recovery is high: lenders recovered 80% on average; in over 60% of defaults they lost nothing.

Yet single-stage finance prices them together, carrying the construction-era price of risk through 25 years of operation.

Source: Moody's (2017), Default and Recovery Rates for Project Finance Bank Loans, 1983–2015 (6,389 projects); Sorge (2004).

Split each project at commissioning, and give each phase to the investor who prices it cheapest

Stage one: banks and development finance institutions lend for the build, against a contingent power purchase agreement from the payment intermediary.

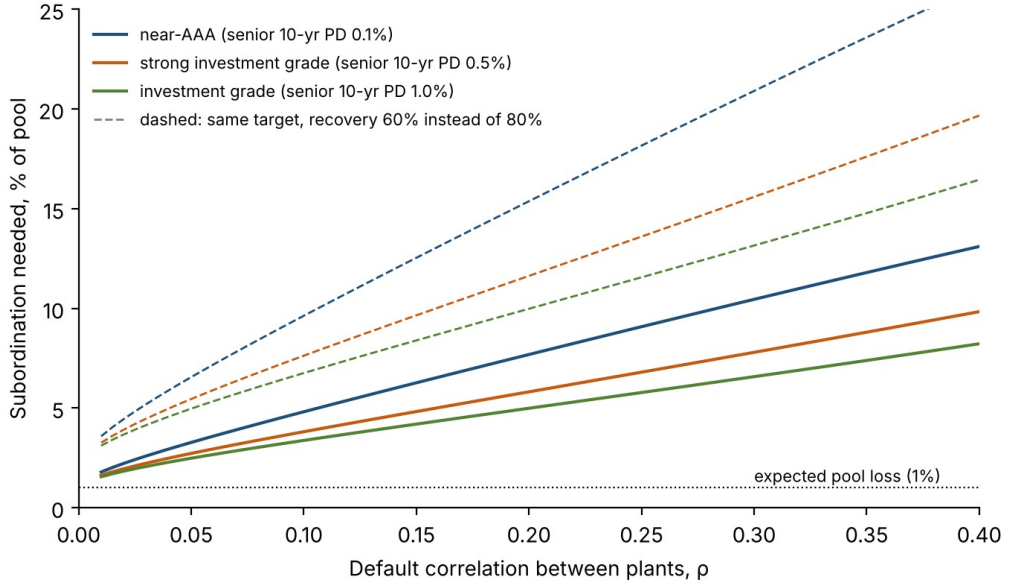
Stage two: the operating plant's senior debt (80% of its cost) is refinanced into a pool; the sponsor keeps the equity.

The long phase decides the tariff: a point off the operating cost of capital is worth nine to eleven times a point off the construction rate.

Developers bid on the refinanced cost only if the take-out is assured, so write it into the auction.

Source: Working paper 3.2, Proposition 1.

In a large pool of operating plants, a 5–8% cushion makes the senior bond near-AAA



Subordination needed under the senior bond, % of pool, by default correlation. Solid: recovery 80%; dashed: 60%.

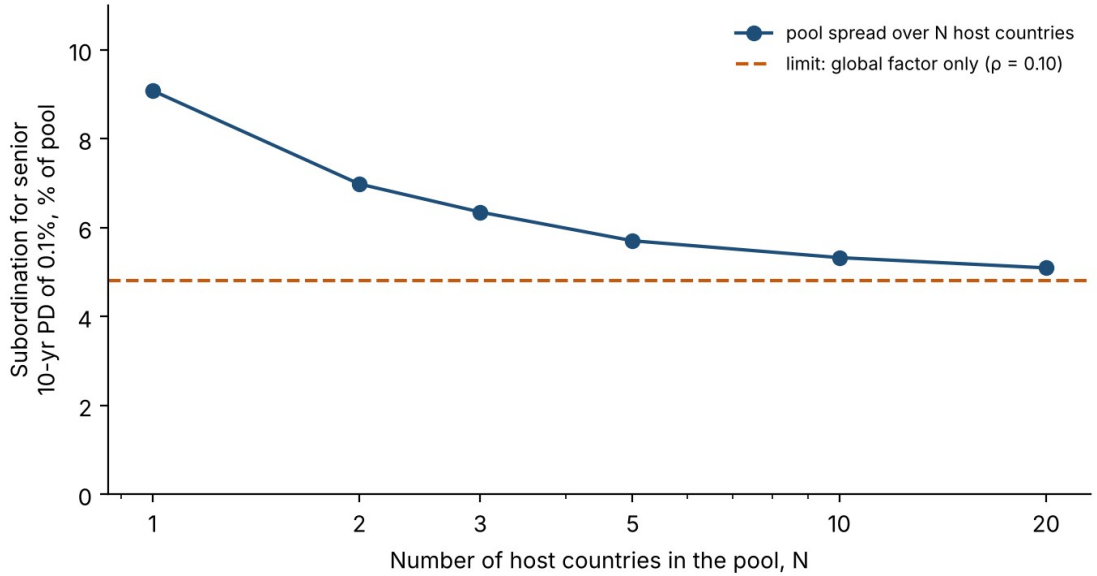
Source: Working paper 3.2, Proposition 2 and Tables 2–3; ten-year default probability 5%, senior target 0.1%.

Three tranches: first loss (3.1%, a regional fund), mezzanine (4.6%, or a sovereign co-guarantee), senior bond (92.3%).

Correlation drives the cushion: 4.8% at 0.10, 7.7% at 0.20. Halving recovery doubles it.

Blended cost 5.65%, with stylized returns of 12% (first loss), 8% (mezzanine), 5% (senior) and 0.3% fees.

The host government is the main source of correlation; pooling across countries removes it



One country: 9.1%. A sovereign crisis hits every plant at once.

Ten countries: 5.3%, about 40% less. The global factor remains (limit 4.8%).

Only identical contracts pool: a regional intermediary with one standard contract creates the pool.

Subordination for a near-AAA senior bond, % of pool, by number of host countries in the pool.

Source: Working paper 3.2, Proposition 3 and Table 5 (global correlation 0.10, host-country 0.15; stylized).

Refinancing into a tranched pool cuts the price of solar power by about a fifth

How the plant is financed	Cost of operating plant's money	US c/kWh	Change
Single-stage at 10%	10.0%	6.2	—
Two-stage, debt into a project bond at 8%	8.8%	5.8	−7%
Two-stage, debt into the pool at 5.65%	6.9%	5.0	−19%
Pool in lower-middle-income stress case	7.25%	5.2	−17%
Pool with a 30% cushion, as in real deals	7.7%	5.3	−14%

Two-year build at 12%; in two-stage cases 80% of the plant's cost is senior debt and 20% is equity at 12%. The saving beyond a project bond comes from tranching.

Source: Author's calculation; working paper 3.2, Tables 4 and 6.

Real deals carry far thicker cushions, and the saving survives them

Bayfront 2018: $458m of 37 Asian and Middle Eastern infrastructure loans; 30% of the notes sat below the top class.

Why thicker: a small pool, mixed sectors, a quarter still under construction, no record for agencies.

Pool size alone: 40 loans need 8.5% at correlation 0.20, against 7.7% in a large pool.

With a 30% cushion the saving is still 14%; 5–8% is where a standard pool with a record ends up, not where it starts. Bayfront's ninth deal (2026) had Aaa/AAA Class A notes.

Source: Allen & Gledhill (2018); GTR (2018); Latham & Watkins (2026); working paper 3.2, Section 6.

Where there is no contract, guarantee the bond; where savers are local, issue in local currency

Grids decide whether cheap power arrives: Vietnam curtailed 364 GWh of solar in 2020; South Africa's 2022 auction awarded no wind for lack of grid in the Cape.

Contract the wire first: private transmission paid on availability raised over $24.5bn in Brazil, Chile, Peru and India (1998–2015).

Otherwise, a tiered bond guarantee, conditional on reform: state, then national government, then a donor vehicle. Tiers fail together, so the donor tier is called three times as often at a correlation of 0.5.

A local-currency senior tranche gives domestic savers a safe asset, with a thicker cushion or a guarantor such as GuarantCo.

Source: ETP (2023); pv magazine (2022); World Bank (2017), Linking Up; PIDG; working paper 3.2, Sections 7–8.

What to do

What the analysis shows

Two stages: the operating rate decides the tariff.

Thin cushions: 5–8% in large standard pools; more at first.

Pool across countries: about 40% less cushion.

The saving: 14–19% off the price of solar power. The host keeps a contingent liability.

Actions

Payment intermediaries: a contingent contract and a take-out in every auction.

Development banks: regional pools under one contract, with published first-loss sizing.

Climate Investment Trust funds: hold first loss; rated sovereigns guarantee the mezzanine and reserve for the tail.

Host governments and regulators: tiered guarantees for grids; local-currency tranches as eligible assets; record contingent liabilities.