LITE PAPER

SPARC Lite Paper

A plain-language guide to the SPARC mechanism, generated from the controlled Markdown source and open for private feedback notes.

SPARC Labs

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For review

Canonical web version: https://sparc.now/litepaper/

Contents

Draft for review. Not for citation or distribution. SPARC is a concept in active development. All descriptions, parameters, and structures are indicative and subject to change.

1. The problem

Southeast Asia's power grids are not short of renewable energy ambition. The Philippines and Thailand have aggressive decarbonization targets. Solar and wind costs have dropped faster than almost any forecast predicted. The investment appetite is real.

But the obstacle to actually reducing coal output has little to do with technology or money. It is a contract.

A coal power purchase agreement grants a plant the right to supply electricity and the right to be paid for that supply. Those rights are legally enforceable, typically for twenty to twenty-five years. When a utility cannot simply stop dispatching coal because solar has become cheaper, the reason is not obstruction. The coal operator holds a production right that is backed by contract law, lender covenants, and in many cases direct government support.

In Thailand, reserve margins exceed 40 percent. In the Philippines, the grid generated over 100,000 GWh in 2025, with more than three-quarters of that from fossil fuels. Adding renewable capacity on top of this structure does not automatically fix the problem. It can create overlapping contractual obligations: the new renewable MWh is added, while the coal-backed production right remains in place.

> KEY POINT
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> The grids of Southeast Asia are not simply undersupplied with energy. In many cases, they are contractually full. Large volumes of future production are already allocated through long-term PPAs.

Coal policy often focuses on installed capacity: how many gigawatts of coal are connected to the grid. But emissions are a function of dispatched energy, not installed capacity. A gigawatt of coal that runs at 70 percent load factor produces far more emissions than one running at 15 percent. The lever that matters is dispatch, and dispatch is governed by contract.

A significant portion of the regional coal fleet is also young. Many plants were commissioned in the past fifteen years and are still within their contracted capital recovery periods. These assets were financed on the expectation of long-term PPA cash flows. Asking for early retirement means either writing down unrecovered capital or mobilizing substantial external funding to compensate investors. Neither is easy, and neither scales quickly enough to match the pace the climate requires.

1.1 Why existing approaches fall short

Most coal transition financing frameworks in this region are built around the same core logic: a plant retires early, renewable capacity replaces it, and the avoided emissions become a carbon credit that helps finance the transaction.

That logic tends to require a binary decision. The plant is either closed or it is not. There is no credit for running at 40 percent of contracted capacity instead of 90 percent, and limited reward for displacing emissions

progressively while maintaining grid reliability. In many methodologies, permanent shutdown is the crediting event.

This creates a direct conflict with how power systems in this region actually function. Grid operators cannot switch off baseload coal capacity on a schedule dictated by a carbon finance transaction. Regulators face real energy security constraints. Operators have plants still recovering capital and long-term contracts not written to accommodate early termination.

The full PPA buyout this requires is capital-intensive. Preparation timelines typically run three to five years. The transaction creates a concentrated loss on the coal operator's balance sheet and requires someone to absorb it. Where that cost passes through to carbon credit buyers, the credit price becomes prohibitive for most market participants.

> INSIGHT
>
> **The structural mismatch**
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> Existing transition frameworks often offer carbon revenue against a promise of future closure. The coal operator's financial logic runs in the opposite direction: contract cash flows, not carbon markets, are the core business. SPARC is designed to address this by working inside the financial logic that already governs these plants, not against it.

There is also a leakage question. When a plant shuts, there is no inherent guarantee that its contracted capacity is retired with it. Generation can migrate to less efficient peakers or other fossil reserves elsewhere on the grid. The emissions accounting improves while the physical situation does not always follow.

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2. What SPARC does

SPARC is a mechanism for shifting the fulfillment of coal-backed production rights to lower-emission generators, one MWh at a time.

It does not require a plant buyout. It does not terminate the PPA. It does not ask a coal operator to absorb a loss or surrender a contractual position built over decades. It works inside the contract architecture that already exists.

> KEY POINT
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> SPARC transfers who fulfills a coal-backed production right. The PPA stays intact. Production shifts. Emissions fall.

A coal PPA contains a bundle of rights and obligations. The coal operator holds the right to supply power under a defined delivery band, the right to receive payment for that supply, and an embedded emission right associated with the MWh that would otherwise be delivered from coal. Those rights were previously inseparable from the physical plant. SPARC makes them transferable.

A renewable operator, approved under the SPARC product code, can fulfill a defined slice of the coal plant's delivery band. The coal plant reduces its output for that slice. The renewable operator delivers the electricity instead. Payment flows are preserved and shared between the parties. Emissions fall where verified delivery uses less than the embedded emission right carried by the SPARC.

The coal operator does not exit the PPA. It does not lose its position as the grid-facing counterparty. The utility continues to pay under the existing agreement. The coal operator enters into a separate bilateral arrangement, a SPARC stream agreement, with the renewable operator for the defined delivery band. That bilateral arrangement is where value is negotiated and shared.

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3. The mechanism in detail

3.1 The three objects

SPARC is built around three distinct records. Each evidences a different claim. They are siblings, not a hierarchy, and they should not be conflated with one another.

A SPARC stream is the forward contractual object: a defined delivery band inside an existing coal PPA that has been registered or recognized through the relevant regulator, system operator, or registry process. It carries the right to supply power under that band, the right to receive the associated payment, the embedded emission right, and the corresponding delivery and availability obligations where applicable. No electricity needs to have been delivered yet. The SPARC stream makes a previously inseparable part of the coal PPA transferable.

A SPARC is created only after eligible delivery. One metered and verified MWh delivered under a registered SPARC stream creates one SPARC. SPARCs are not issued in advance and they are not pre-allocated certificates. The total number of SPARCs under any SPARC stream grows only as verified delivery occurs.

An ARC (Avoided Right to emit Carbon) is the unused emission right from a SPARC. It is issued when verified emissions from the delivered MWh are lower than the embedded emission right carried by that SPARC. The ARC does not rely on a modeled counterfactual. The reference point is the embedded emission right recorded in the registered SPARC stream before any delivery occurs, established by the originating plant's approved emission factor and recognized under the relevant product code and host-country framework.

A fourth instrument, the Renewable Energy Certificate (REC) or equivalent energy-attribute certificate, evidences the renewable attribute of the delivered MWh. The REC confirms that the delivered electricity came from a qualifying renewable source. It does not by itself record the coal-band substitution or the unused emission right. Each instrument makes a distinct claim; none substitutes for another.

The lifecycle runs in sequence: the SPARC stream is registered, eligible MWh are delivered, SPARCs are created, REC or equivalent renewable-energy evidence is linked where the delivery is renewable, and ARCs are issued where the embedded emission right goes unused.

3.2 The ARC calculation

> $ARC_{QUANTITY}\ (tCO_2)$ = *embedded emission right of the SPARC – verified emissions of the delivered MWh*

The embedded emission right comes from the originating coal plant's approved emission factor, a recognized benchmark, an ETS allocation, or another host-country-recognized method. It is established in the SPARC stream at registration, before any delivery occurs. It is recorded through the SPARC stream, not derived from a modeling exercise after the fact.

Only a positive difference results in ARC issuance. For renewable delivery, verified operational emissions may be minimal, in which case the ARC represents most or all of the embedded emission right carried by the SPARC. Once the stream, embedded emission right, metered delivery, and renewable evidence have been verified, the ARC is issued according to the product code. The registry records the chain from source PPA through registered SPARC stream through delivered MWh through issued ARC. Every link is documented.

3.3 Claim discipline

The three records, SPARC, REC evidence, and ARC, are distinct instruments because they make distinct claims.

The SPARC records that an MWh fulfilled a coal-backed delivery band. The REC or equivalent certificate evidences that the MWh was generated from a qualifying renewable source. The ARC records the unused emission right created by that substitution.

> INSIGHT
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> **Why claim discipline matters**
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> Blurring these three instruments undermines the mechanism's credibility. A renewable MWh is not the same as a renewable MWh that replaced a contracted coal delivery band. And replacing a contracted coal delivery band is not the same as recording the specific emission right that went unused when it did. SPARC holds these three claims apart because each one has independent value and independent verification requirements.

4. Deal economics

4.1 The commercial structure

The coal-fired plant operator remains the PPA-facing party. The utility or market operator continues paying under the existing agreement. Under the SPARC stream agreement, the coal operator assigns an agreed delivery band to the renewable operator, who fulfills it and receives compensation from the value allocated to that stream.

The economic test is direct: can the SPARC stream agreement leave the coal operator no worse off than self-delivery, while giving the renewable operator sufficient compensation to cover delivery cost and risk?

4.2 For the coal operator

When a renewable operator fulfills the SPARC stream, the coal plant does not burn fuel for those MWh and does not run its variable operations for them. That avoided cost is real and immediate: no fuel, lower variable operating cost, and reduced emissions exposure for that band. Beyond cost avoidance, the coal operator may reduce

selected downside risk and may release capacity or availability value where the matching firm obligation moves with the stream.

The coal operator retains the PPA value it needs for fixed-cost recovery, debt service, margin, residual PPA standing, regulatory responsibility, and any obligations it continues to carry. Capacity or availability value can move to the renewable operator only where the matching obligation moves with the stream. The transaction changes who performs the defined delivery band and how the stream value is shared.

The coal operator does not become a loser in this arrangement. It becomes an originator of SPARC streams inside a contract it already holds, earning margin from the difference between what the SPARC stream pays and what it would have cost to produce those MWh in-house.

> KEY POINT
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> The coal operator avoids coal cost, reduces selected risk where agreed, and preserves the fixed-cost recovery and retained PPA position it needs to rationally support the stream. Capacity or availability value can move only where the matching firm obligation moves with the stream. Its institutional position as the grid-facing PPA counterparty is unchanged.

4.3 For the renewable operator

For a renewable developer seeking contracted revenue in a market where offtake agreements are scarce, a SPARC stream agreement provides exactly that: a contracted delivery band with a defined payment structure.

The renewable operator receives a delivery payment for fulfilling the registered SPARC stream, and may capture an allocated share of ARC value or recognized grid value. The delivery payment can be supported by avoided coal cost, risk relief, released capacity or availability value, and the payment layers allocated under the stream agreement. ARC value and recognized grid value are separate top-up sources where they are allocated to the delivery party and can be monetized with sufficient certainty.

The renewable operator does not need to buy a speculative certificate or front capital against a promise of future credit issuance. It delivers electricity under a contracted band and receives compensation tied to that delivery.

4.4 ARC value as a gap-closer

ARCs are a residual value source, not the primary financing mechanism. A SPARC deal is financed first by value moving in the power market: avoided coal cost, risk relief, released capacity or availability value, and any recognized grid value. Once those primary value flows have been established, ARCs can close the remaining financing gap.

INSIGHT

Where the value comes from

The potential value sources in a SPARC stream transaction are avoided coal cost, coal-side risk relief, released capacity or availability value, recognized grid value, and ARC value. A deal that depends entirely on ARC revenue to clear its economics carries significant exposure to carbon market conditions. A deal where ARCs close a residual gap after power-market value has been allocated is a structurally stronger proposition.

ARC value also depends on host-country rules. Where ARCs can be used domestically, international transfer authorization is not required. Where international transfer is sought, host-country authorization is required and corresponding adjustments may apply. This is not a weakness of the mechanism. It reflects appropriate sovereign control over carbon accounting, and it is a variable that deal economics must account for.

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5. How SPARC differs from existing frameworks

5.1 Ex-post, not ex-ante

Under many transition credit frameworks, capital is committed before any emissions reduction has occurred, against a modeled projection of future credits. The buyer may be asked to fund a future outcome before delivery has been verified.

Under SPARC, SPARCs are created after metered delivery. ARCs are issued after the unused emission right has been verified against the delivered MWh. A buyer of an ARC pays for verified impact already recorded, not for a projected future event.

KEY POINT

SPARCs are receipts for impact already delivered. Front-loaded transition instruments rely more heavily on promises about future delivery.

This matters because it changes who bears the delivery and verification risk. Under a front-loaded credit structure, the credit buyer takes on significant exposure to whether the promised outcome actually occurs. Under SPARC, the ARC exists because something already happened. The registry holds the evidence.

5.2 Gradual, not binary

SPARC operates at the MWh level. A coal plant does not need to commit to closure to participate. It does not need to find a buyer for its entire remaining cash flow. It needs to agree on a delivery band, identify a renewable counterparty, and sign a SPARC stream agreement for a defined term.

That is a much lower entry bar. The arrangement can start small, with one delivery window or one seasonal block, and expand as confidence builds on both sides and as renewable capacity comes online. The coal operator's

participation can grow without renegotiating the underlying PPA. The commitment is bounded.

Over time, as more SPARC streams are established across a plant's contracted output, its load factor declines. The plant continues to exist as contracted backup capacity, available for grid reliability, but producing progressively less of the generation it was originally designed to supply. At some point, the remaining contracted output is small enough that a conventional retirement mechanism, if one is wanted, becomes a much lighter transaction. The NPV buyout that was prohibitive at full contracted capacity becomes manageable at minimum stable load.

SPARC does not compete with retirement mechanisms. It reduces the scale of the problem progressively until the remaining step is smaller and cheaper than it would have been at the outset.

5.3 No double-counting structure

Because the embedded emission right is anchored in the registered SPARC stream before any delivery occurs, and because ARC issuance requires verified delivery against that specific registered right, the accounting chain is tight. The ARC is not a claim that a counterfactual reduction occurred somewhere. It is the record of a specific embedded emission right that was held and not used.

This matters for regulatory recognition. An ETS or host-country framework can connect the ARC to an actual registered delivery band, verified MWh, and recorded emission right. The claim does not rest on a modeled baseline.

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6. Who participates and what they need

Coal operators are the SPARC stream originators. An operator with an existing PPA can register a SPARC stream for a defined delivery band within that PPA. The coal plant remains the formal counterparty to the utility. The operator retains the fixed-cost recovery, margin, and retained PPA value it needs to support the transfer. Output falls for the transferred band. Coal cost, delivery risk, and defined obligations fall or move where the stream agreement allocates them.

Renewable operators are the delivery parties. A renewable developer approved under the SPARC product code fulfills the registered SPARC stream and receives a delivery payment, plus any allocated ARC value or recognized grid value. A SPARC stream agreement provides contracted revenue in a market structure where bilateral offtake is often difficult for independent renewable generators to secure.

Regulators and system operators do not need to force the transition. They recognize a defined delivery band, approve the delivery party, and allow emissions to fall through verified lower-emission delivery. The coal plant retains its availability obligations and replacement-power responsibilities where applicable. The grid reliability case is not disturbed.

Carbon market participants receive ex-post records of verified coal-to-clean substitution anchored in embedded emission rights. For international buyers, where host-country authorization has been granted, ARCs may be eligible for transfer under Article 6.2 of the Paris Agreement, with corresponding adjustments applied by the host government where required.

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7. The evidence chain

Registry infrastructure underpins the entire mechanism. SPARC Labs maintains the product-code infrastructure and may operate the SPARC registry or coordinate with an approved registry operator. The intended I-TRACK alignment provides the governance reference point for product-code recognition and registry governance.

A registered SPARC stream creates an auditable record linking the source PPA, the delivery band, the approved delivery party, the embedded emission right, and the evidence requirements for eligible delivery. When eligible MWh are delivered, the SPARC record connects each delivered MWh to the originating SPARC stream. Where delivery is renewable, the linked REC or equivalent certificate confirms the attribute. Where verified emissions are lower than the embedded emission right, the ARC records the unused portion.

The chain runs from PPA to registered SPARC stream to delivered MWh to issued SPARC to issued ARC. No element of the claim rests on an unverified projection. SPARC creates the evidence layer; the host-country framework determines how it is used.

> INSIGHT
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> **What the registry makes possible**
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> By linking contract performance to metered delivery to emission-right accounting, the SPARC registry creates a data layer that existing power-sector MRV systems do not produce. That layer can inform future ETS design, allocation methodology, and compliance accounting, not only for participants in SPARC transactions, but for regulators building toward broader carbon market coverage.

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8. Current status

SPARC is a concept in active development. The mechanism described here reflects current thinking and will evolve through structured engagement with operators, regulators, and market participants across the Philippines and Thailand. Current engagement is focused on testing the mechanism against real market constraints in both markets.

This lite paper is a consultation document. Nothing in it constitutes a final position, a commitment, or an offer by any party. The white paper provides the full technical treatment, covering mechanism design, legal structure, dispatch mechanics, emissions governance, ETS integration pathways, and implementation sequencing.

We are not attached to any specific formulation on structure, regulatory pathway, or economic logic. If something described here does not work in your context, we want to know.

To engage with the SPARC development process: info@sparc.now