RESEARCH NOTE

Economics of SPARC Stream Transfers

A deeper framework for assessing when a SPARC stream can preserve the coal operator's economics while paying a delivery party enough to perform lower-emission delivery.

SPARC Labs

Version economics/v0.3.2

Working framework

Canonical web version: https://sparc.now/research/economics/

Contents

This document sets out the economic logic for SPARC stream agreements. It is the reference framework for assessing when a coal operator, a renewable operator or another approved delivery party, and the relevant public authorities can rationally support a SPARC transaction.

This framework follows the current SPARC white paper logic and should be read together with the current white paper at sparc.now/whitepaper.

All numerical values and worked examples in this document are illustrative scenario inputs. They are not transaction terms, tariff recommendations, forecasts, offers, or final SPARC parameters. Any transaction model, regulatory submission, or asset-level negotiation must replace them with source PPA data, asset data, market data, and jurisdiction-specific assumptions.

The forward commercial object is the SPARC stream. A SPARC stream is the registered basket of rights and obligations attached to a defined delivery band inside an existing coal PPA. It carries the right to supply power under the band, the right to receive the associated payment, and the embedded right to emit carbon dioxide per delivered MWh. It also carries the corresponding availability, delivery, replacement-power, scheduling, and capacity obligations where these apply.

Individual SPARCs are created only after eligible MWh are delivered under that registered stream and evidenced through the required metering and attribute systems. The economics therefore do not start from a free-standing price for individual SPARCs. They start from the value and obligations of the stream agreement. The parties define the delivery band, the performance obligations, the payment-sharing formula, the risk allocation, and the allocation of ARC value. Actual SPARCs then arise from metered delivery under the registered stream.

The purpose of this framework is to answer one question: can the stream agreement preserve the coal operator's economic position while paying the delivery party enough to perform lower-emission delivery?

A SPARC stream clears only when both sides can be satisfied at the same time. The coal operator must retain enough value to be financially neutral or better compared with self-delivery. The delivery party must receive enough value to cover its delivery cost, performance risk, and required return. Avoided coal cost, risk relief, released capacity or availability value, ARC value, and any recognized grid value create the economic headroom that can make this possible.

1. The Economic Object

A SPARC stream is a defined commercial and operational band inside an existing coal PPA or equivalent coal-backed contractual structure. The stream agreement determines how the value of that band is shared between the coal operator and the delivery party.

The PPA remains intact. The coal operator remains the PPA-facing party in the preferred early model. The delivery party fulfills the agreed stream under the rules recognized by the regulator, system operator, or registry process.

This distinction matters for economics. The object being negotiated is not a pre-issued MWh certificate. The parties negotiate a forward stream. The registry creates MWh-level SPARC records only when eligible delivery occurs. Payment may be expressed per delivered MWh, as an availability fee, as a revenue-share formula, as a true-up mechanism, or as a combination of these elements. The form can vary. The economic test remains the same.

The SPARC stream must be evaluated as a package of value and obligation:

ELEMENT	ECONOMIC MEANING
Delivery band	The agreed volume, profile, window, or performance band to be fulfilled by the delivery party.
Stream value	The expected value of PPA or market payments allocated to the stream, expressed per eligible MWh.
Capacity or availability value	The value attached to capacity or availability obligations where the underlying PPA includes them and the stream agreement allocates them.
Energy value	The value attached to eligible MWh that are dispatched, scheduled, nominated, delivered, metered, and settled.
Embedded emission right	The tCO2/MWh value carried by each SPARC created under the stream.
Delivery obligation	The obligation to perform, including replacement power, imbalance, curtailment, and penalty treatment where applicable.
ARC allocation	The commercial allocation of ARC value created when the embedded emission right is unused.
Grid value	Any recognized value created by the delivery profile, injection point, congestion relief, or system benefit.

INSIGHT

Plain-English summary

V_{STREAM} is the value of the SPARC stream. $P_{DELIVERY}$ is what the delivery party gets paid for fulfilling that stream. The coal operator keeps $V_{STREAM} - P_{DELIVERY}$. The delivery payment can be supported by avoided coal cost, risk relief, and released capacity or availability value. ARC value and recognized grid value can close the remaining gap where they are real and allocated to the delivery party.

2. Stream Value

For analytical purposes, and because SPARC is a gradual instrument, this framework translates all payments and costs into a consistent MWh-equivalent basis. It uses V_{STREAM} for the total PPA value assigned to the SPARC stream, expressed per eligible MWh.

V_{STREAM} is not the absolute value of the whole PPA. It is the part of the PPA value assigned to the SPARC stream, converted to a MWh-equivalent basis. It includes the energy value assigned to eligible MWh and, where applicable, the capacity or availability value assigned to the stream.

The energy value assigned to eligible MWh is the full energy-side PPA value allocated to the stream, not only the coal operator's avoidable fuel cost. Where the PPA compensates the coal operator for producing, operating, and carrying delivery risk for those MWh, the energy value used in V_{STREAM} should reflect that risk-bearing value. R_{RELIEF} then measures the part of that PPA-compensated risk burden that the coal operator no longer needs to retain because the stream agreement transfers it away. It is not an external value source outside the stream.

In an energy-only PPA, V_{STREAM} may be close to the expected energy payment per MWh, adjusted for dispatch probability, settlement timing, performance deductions, and regulatory treatment.

$$V_{STREAM} = \text{expected energy value per MWh} - \text{expected performance deductions per MWh}$$

In a capacity-plus-energy PPA, V_{STREAM} must allocate the relevant capacity or availability value to the stream and add the expected energy value. Capacity and availability payments are not naturally MWh-based. They should first be allocated to the SPARC stream and then converted into MWh-equivalent value using expected eligible MWh for that stream, not final dispatched MWh that will only be known after system-operator dispatch.

> $V_{CAP\ STREAM}$ = *allocated capacity or availability payment for the SPARC stream / expected eligible MWh under the SPARC stream*

If the stream is a firm daytime band, expected eligible MWh should reflect the MW band, delivery hours, delivery days, and assumed availability for that band. If the stream is seasonal, dispatch-linked, or shaped, the expected eligible MWh denominator should follow the recognized stream parameters. A detailed implementation may apply a periodic true-up if actual eligible MWh differ materially from expected eligible MWh.

> V_{STREAM} = *expected energy value per MWh +* $V_{CAP\ STREAM}$ *- expected performance deductions per MWh*

Equivalently:

> V_{STREAM} = *(Capacity_Value_allocated + Energy_Value_expected - Performance_Deductions_expected) / expected eligible MWh*

In the second formulation, each numerator is the expected value allocated to the stream for the relevant settlement period. This approach avoids false precision. The stream agreement does not require every payment to be fixed in advance. It requires a formula that can allocate realized settlement value, capacity value, performance adjustments, ARC value, and grid value in a way that both parties can underwrite.

3. Stream Profiles and Delivery Cost

A SPARC stream may take different shapes. The economics depend heavily on that shape.

For coal-linked streams, the main commercial case is likely to be a firm or near-firm band. Coal units cannot easily ramp around intermittent injections. A predictable delivery band is easier for the coal operator, system operator, and regulator to recognize as a true substitute for self-delivery. Examples include a firm daytime band, a 12-hour band, a seasonal block, or another availability-backed profile.

Coal operators and delivery parties may also agree to more flexible stream designs. The default modelling treatment for a flexible stream should be energy-only unless the stream agreement clearly assigns capacity or availability value and the matching firm obligation to the delivery party. A gas-fired plant or another rampable resource may be able to run around a shaped delivery profile more easily than a coal unit. In those cases, the delivery obligation may be less firm, provided the stream agreement and system rules define how the originating plant, delivery party, and system operator manage the profile.

For a firm band, the simpler default treatment is different. If the parties define a firm SPARC band and assign capacity or availability value to that band, part of that value can be paid to the delivery party where the delivery party assumes the matching firm obligation for the stream. That value is expressed as $V_{CAP\ RELEASED}$, subject to the coal operator retaining the fixed-cost recovery, debt service, required margin, residual PPA standing, and any obligations it continues to carry.

The stream profile determines $C_{DELIVERY}$ and $R_{DELIVERY}$.

$C_{DELIVERY}$ is the delivery party's cost of eligible performance. For a renewable operator, it may include generation cost, firming cost, storage cost, balancing cost, replacement-power cost, financing premium, incremental operating cost, settlement administration, compliance, and any metering or evidence cost required by the product code.

$R_{DELIVERY}$ is the delivery party's risk premium. It should cover performance risk, imbalance risk, replacement-power exposure, curtailment risk, settlement timing, penalty exposure, and other obligations allocated under the stream agreement.

A firm band usually raises both $C_{DELIVERY}$ and $R_{DELIVERY}$ because the delivery party must shape intermittent generation into a reliable contractual profile. A shaped stream may reduce delivery cost, but it may leave more balancing and operational risk with the coal operator or system operator. That affects the coal operator's required retained value and the stream's regulatory acceptability.

For a fixed band, annual eligible volume is calculated as:

> *Annual eligible MWh = MW_{band} x delivery_hours_per_day x delivery_days_per_year x availability_factor*

For a dispatch-linked stream:

> *Eligible MWh = sum of metered eligible MWh delivered under the registered stream during the settlement period*

For example:

> *Annual eligible MWh = 50 MW x 12 hours/day x 365 days = 219,000 MWh/year*

If every eligible MWh is delivered under the registered stream, the registry can create up to 219,000 SPARCs per year, subject to dispatch, metering, evidence, and product-code rules.

4. Coal Operator Economics

The coal operator assigns fulfillment of a SPARC stream only if it is financially neutral or better compared with self-delivery.

When the delivery party fulfills the agreed band, the coal operator does not produce the corresponding MWh itself. It avoids fuel cost, variable operating cost, and some operational risk. It may also release capacity or availability value where the delivery party assumes the matching firm obligation for the stream.

The coal operator still needs to preserve the economic position attached to the underlying PPA. That includes fixed-cost recovery, debt service, required return, and any value it would have retained by self-performing the same band.

The coal operator's required retained value is:

> $V_{COAL\ REQ} = V_{STREAM} - C_{AVOIDED} - R_{RELIEF} - V_{CAP\ RELEASED}$

Where:

TERM	MEANING
V_{STREAM}	Total PPA value assigned to the SPARC stream, expressed per eligible MWh.
$C_{AVOIDED}$	Fuel cost, variable O&M, avoidable emissions cost, and any fixed operating cost genuinely avoided because the coal operator does not produce or support the relevant delivery band itself.
R_{RELIEF}	Monetized value of risk transferred away from the coal operator under the stream agreement.
$V_{CAP\ RELEASED}$	Capacity or availability value available for delivery-party payment because the delivery party assumes the matching firm obligation for the SPARC stream.
$V_{COAL\ REQ}$	Minimum retained value the coal operator needs to be financially neutral compared with self-delivery.

The coal operator is economically whole when its retained value under the stream agreement is at least equal to $V_{COAL\ REQ}$. If the retained value is below $V_{COAL\ REQ}$, the operator is better off delivering the stream itself.

The stream agreement then defines $P_{DELIVERY}$, the expected stream fulfillment compensation allocated to the delivery party per eligible delivered MWh.

> $P_{DELIVERY}$ = *expected stream fulfillment compensation allocated to the delivery party per eligible delivered MWh*

Under the preferred bilateral model:

> $\text{Coal Retained Value} = V_{STREAM} - P_{DELIVERY}$

The coal condition is:

> $V_{STREAM} - P_{DELIVERY} >= V_{COAL\ REQ}$

Substituting $V_{COAL\ REQ}$:

> $V_{STREAM} - P_{DELIVERY} >= V_{STREAM} - C_{AVOIDED} - R_{RELIEF} - V_{CAP\ RELEASED}$

After cancelling V_{STREAM}:

> $P_{DELIVERY} <= C_{AVOIDED} + R_{RELIEF} + V_{CAP\ RELEASED}$

This available stream payment is $P_{DELIVERY\ MAX}$:

> $P_{DELIVERY\ MAX} = C_{AVOIDED} + R_{RELIEF} + V_{CAP\ RELEASED}$

The coal operator can release value to the delivery party up to the value of avoided cost, risk relief, and released capacity or availability value while remaining economically whole. V_{STREAM} still matters because it determines the gross value pool, fixed-cost recovery, tariff integrity, and regulatory reasonableness.

4.1 Avoided Coal Cost

$C_{AVOIDED}$ should be based on plant physics and contract treatment. In a simple model, it includes avoided fuel cost and variable O&M. Where an emissions cost exists, it may also include avoidable emissions cost. Where a transferred stream genuinely reduces fixed operating burden at the relevant scale, it may include the fixed operating cost that is actually avoided. It should not include fixed-cost recovery, debt service, or required return that the coal operator still needs to retain under the underlying PPA.

Where fuel is fully passed through to the offtaker, the analysis must be careful: avoided fuel cost may reduce system cost or customer cost but may not accrue entirely to the coal operator unless the stream agreement or regulatory treatment allocates that value.

> $C_{AVOIDED}$ = *Fuel_Cost_per_MWh + Variable_OM_per_MWh + applicable avoided emissions cost + genuinely avoided fixed operating cost*

For coal fuel:

> *Fuel_Cost_per_MWh = Delivered_Coal_Price_per_tonne x Heat_Rate_GJ_per_MWh / Coal_Energy_Content_GJ_per_tonne*

Illustrative physical assumptions:

- Coal energy content: about 25 GJ/tonne for 6,000 kcal/kg coal.
- Heat rate: about 10 GJ/MWh for a modern subcritical or supercritical baseload unit.
- Non-fuel variable O&M: about USD 4-6/MWh.

At a delivered coal price of USD 100/tonne:

> *Fuel_Cost_per_MWh = 100 x 10 / 25 = USD 40/MWh*

> $C_{AVOIDED}$ = *40 + 4 to 6 = USD 44-46/MWh*

At a Newcastle-linked benchmark of USD 132.5/tonne:

> *Fuel_Cost_per_MWh = 132.5 x 10 / 25 = USD 53/MWh*

> $C_{AVOIDED}$ = *53 + 4 to 6 = USD 57-59/MWh*

The delivered coal price used in a live model should reflect the relevant fuel procurement terms, coal quality, freight, handling, pass-through rules, and settlement period. Any fixed operating cost included in $C_{AVOIDED}$ should be separately identified and justified. In many early SPARC stream models, this term may be zero.

4.2 Risk Relief

R_{RELIEF} should be estimated on an expected-value basis rather than assumed. The calculation should identify expected annual avoided downside cost and divide it by the expected eligible MWh under the stream.

> R_{RELIEF} = *Expected annual avoided downside cost / Annual eligible MWh*

R_{RELIEF} may include:

COMPONENT	CALCULATION LOGIC
Replacement-power exposure	Probability of non-delivery multiplied by expected replacement-cost spread during those events.
Penalty and performance charges	Expected value of availability penalties, imbalance charges, liquidated damages, or disallowance exposure transferred to the delivery party.
Fuel and operating volatility	Expected value of reduced exposure to fuel price volatility, forced outage risk, cycling stress, and operating intensity.
Maintenance and outage relief	Annualized value of avoided thermal stress, reduced forced-outage probability, or lower variable maintenance burden where material.

An illustrative assumption of USD 2–3/MWh may be used for early modelling. A bankable or regulatory model should derive the value from event probabilities, historical outage data, replacement-power spreads, penalty terms, and the actual allocation of risk in the stream agreement.

R_{RELIEF} should not include capacity or availability value assigned to the stream. Capacity or availability value is handled through $V_{CAP\ STREAM}$, $V_{CAP\ RETAINED}$, and $V_{CAP\ RELEASED}$. Risk relief measures expected downside exposure moved away from the coal operator. It is not a separate top-up source outside the PPA stream; it is the value of PPA-compensated risk that the coal operator can stop retaining where the stream agreement transfers that risk to the delivery party.

4.3 Released Capacity Value

$V_{CAP\ RELEASED}$ is capacity or availability value available for delivery-party payment because the delivery party assumes the matching firm obligation for the SPARC stream. It is not an additional external value source. It is a reallocation of value already inside V_{STREAM}.

Where the coal operator keeps the capacity or availability obligation, the associated value remains in the coal operator floor. Where the delivery party assumes the matching firm obligation, the released value can support delivery compensation. The default modelling treatment should stay simple: an energy-only or flexible stream has no released capacity value, while a capacity-plus-energy firm band can release capacity or availability value only where the delivery party assumes the matching firm obligation.

For capacity or availability payments, the calculation first allocates the relevant MW-based payment to the SPARC stream and converts it into MWh-equivalent value using expected eligible MWh.

> $V_{CAP\ STREAM}$ = *allocated capacity or availability payment for the SPARC stream / expected eligible MWh under the SPARC stream*

The coal operator may need to retain part of that capacity or availability value for fixed-cost recovery, debt service, required margin, residual PPA standing, retained regulatory responsibility, or obligations it continues to carry. This retained capacity value is expressed as $V_{CAP\ RETAINED}$.

For an energy-only stream, or a stream where no capacity or availability value is released:

$$V_{CAP\ RELEASED} = 0$$

For a capacity-plus-energy firm band where the delivery party assumes the matching firm obligation:

$$V_{CAP\ RELEASED} = V_{CAP\ STREAM} - V_{CAP\ RETAINED}$$

Where no capacity or availability value is assigned to the stream, or where the delivery party does not assume the matching firm obligation, $V_{CAP\ RELEASED}$ is zero.

This framework assumes that a rational coal operator will not agree to release capacity or availability value required for residual PPA standing, fixed-cost recovery, debt service, required margin, retained regulatory responsibility, or a retained obligation. Replacement-power exposure, balancing risk, penalties, and performance risk remain important. They should be accounted for in $C_{DELIVERY}$, $R_{DELIVERY}$, R_{RELIEF}, or contract-specific performance adjustments, rather than treated as separate released-value buckets.

5. Delivery Party Economics

The delivery party fulfills a SPARC stream when the compensation it receives is sufficient to cover cost, risk, and required return.

The delivery party's required value is $V_{DELIVERY\ REQ}$:

$$V_{DELIVERY\ REQ} = C_{DELIVERY} + R_{DELIVERY}$$

Where:

TERM	MEANING
$C_{DELIVERY}$	Cost of eligible delivery, including generation, firming, storage, balancing, replacement power, financing premium, incremental operations, and compliance where applicable.
$R_{DELIVERY}$	Risk premium for performance, imbalance, curtailment, replacement-power, and settlement risk allocated to the delivery party.
V_{ARC}	ARC value allocated to the delivery party under the stream agreement and applicable product-code or host-country rules.
V_{GRID}	Recognized grid value allocated to the delivery party, where such value exists.
$V_{DELIVERY\ REQ}$	Total value the delivery party needs to cover cost, risk, and required return.

The delivery party may receive value through several channels. $P_{DELIVERY}$ is the payment to the delivery party for fulfilling the SPARC stream, expressed per eligible MWh. It may take the legal form of a per-MWh fee, availability payment, revenue share, true-up, or blended formula. ARC value and grid value are separate value sources that may top up the delivery party's position where they are allocated to the delivery party and can be monetized with sufficient certainty.

The delivery condition is:

> $P_{DELIVERY} + V_{ARC} + V_{GRID} >= V_{DELIVERY\ REQ}$

Equivalently:

> $P_{DELIVERY} + V_{ARC} + V_{GRID} >= C_{DELIVERY} + R_{DELIVERY}$

If ARC value is allocated to the coal operator, a jointly controlled account, or a public authority, it does not support the delivery party's economics unless the stream agreement shares that value with the delivery party.

V_{GRID} should be included only when there is a defined mechanism, credible counterparty, or recognized regulatory value, and when that value is allocated to the delivery party. It should not be assumed as a generic benefit. If included, it should be net of eligibility limits, measurement requirements, verification delay, curtailment risk, clawback risk, and probability of payment.

6. ARC Value

An ARC is the unused emission right from a SPARC. Each SPARC carries an embedded emission right expressed in tCO2/MWh. That value is derived from the originating coal plant, an approved benchmark, an ETS allocation, or another host-country-recognized method.

When a SPARC is created from lower-emission delivery, the registry compares the embedded emission right with the verified emissions of the delivered MWh. A positive difference may be issued as an ARC under the product code and host-country framework.

$ARC_{QUANTITY}$ per delivered MWh is:

> $ARC_{QUANTITY} = Embedded\_Emission\_Right - Verified\_Delivery\_Emissions$

ARC value per delivered MWh is:

> $V_{ARC} = ARC_{QUANTITY}\ x\ NET_{ARC\ PRICE}$

$NET_{ARC\ PRICE}$ should reflect gross carbon price, issuance probability, authorization probability, registry fees, transfer discounts, transaction costs, and any required sharing with the host country or other parties.

This value is not automatic. It depends on product-code rules, host-country treatment, authorization where required, issuance controls, and market demand. The calculation should therefore separate $ARC_{QUANTITY}$ from monetizable ARC value. In the worked examples below, ARC value is treated as part of the residual top-up value required for the stream to clear, not as a pre-assumed input.

7. Grid Value

A SPARC stream may create grid value if the delivery profile or injection point improves the system position. For example, lower-emission delivery may reduce congestion, relieve a local network constraint, reduce losses, improve the match between generation and load, or reduce reliance on more expensive balancing resources.

V_{GRID} should be treated as recognized value, not assumed value. It should be included only if the regulator, system operator, offtaker, or another credible counterparty can define the benefit and allocate payment or settlement value to the stream.

The calculation should identify:

QUESTION	PURPOSE
What system benefit is created?	Congestion relief, loss reduction, avoided redispatch, improved injection point, local reliability, or other benefit.
Who recognizes it?	System operator, regulator, offtaker, market operator, or another authorized body.
How is it measured?	Metering data, dispatch records, settlement outcomes, load-zone comparison, or engineering study.
Who receives it?	Coal operator, delivery party, jointly controlled account, offtaker, or public mechanism.
Is it firm or contingent?	Determines whether it can be included in base-case economics or only sensitivity analysis.

Unless these questions can be answered, V_{GRID} should be set to zero in the base case.

8. Clearing Condition and Negotiation Band

A SPARC stream clears when both sides can be satisfied at the same time.

The coal operator condition is:

$$\text{Coal Retained Value} >= V_{COAL\ REQ}$$

The delivery party condition is:

$$P_{DELIVERY} + V_{ARC} + V_{GRID} >= V_{DELIVERY\ REQ}$$

In terms of $P_{DELIVERY}$, the available stream payment for delivery-party compensation is:

$$P_{DELIVERY\ MAX} = C_{AVOIDED} + R_{RELIEF} + V_{CAP\ RELEASED}$$

The delivery party does not need a minimum stream payment as a standalone concept. It needs total value sufficient to cover $V_{DELIVERY\ REQ}$. That value can come from $P_{DELIVERY}$, allocated V_{ARC}, recognized V_{GRID}, or another agreed value source.

A feasible negotiation range exists when there is a $P_{DELIVERY}$ that satisfies both sides:

> $P_{DELIVERY} <= P_{DELIVERY\ MAX}$

> $P_{DELIVERY} + V_{ARC} + V_{GRID} >= V_{DELIVERY\ REQ}$

For a simplified clearing test, use the maximum available stream payment and ask whether the delivery party's total required value can be covered:

> $P_{DELIVERY\ MAX} + V_{ARC} + V_{GRID} >= V_{DELIVERY\ REQ}$

Substituting the definitions:

> $C_{AVOIDED} + R_{RELIEF} + V_{CAP\ RELEASED} + V_{ARC} + V_{GRID} >= C_{DELIVERY} + R_{DELIVERY}$

This is the compact expression of the methodology. The left side is the value available from avoided coal cost, risk relief, released capacity or availability value, allocated ARC value, and recognized grid value. The right side is the delivery party's required value.

The combined feasibility condition is therefore:

> $V_{ARC} + V_{GRID} + C_{AVOIDED} + R_{RELIEF} + V_{CAP\ RELEASED} >= V_{DELIVERY\ REQ}$

This is the core economic logic of SPARC. The stream can clear when the value created by substitution is large enough to cover the cost and risk of lower-emission delivery while preserving the coal operator's economic position.

The left side contains value sources:

VALUE SOURCE	ROLE
$C_{AVOIDED}$	Coal cost no longer incurred, including fuel, variable O&M, avoidable emissions cost, and any genuinely avoided fixed operating cost.
R_{RELIEF}	Coal-side risk transferred or reduced.
$V_{CAP\ RELEASED}$	Capacity or availability value released because the delivery party assumes the matching firm obligation.
V_{ARC}	Monetizable value of the unused emission right.
V_{GRID}	Recognized system value created by the delivery profile or injection point.

The right side contains delivery-side required value:

DELIVERY-SIDE TERM	ROLE
$C_{DELIVERY}$	Physical and operational cost of eligible delivery.
$R_{DELIVERY}$	Risk premium required by the delivery party.
$V_{DELIVERY\ REQ}$	Total value required by the delivery party.

If the left side is smaller than the right side, no voluntary stream agreement can clear without another agreed value source, a lower delivery-cost profile, a different risk allocation, higher ARC value, recognized grid value, or a change in stream design.

If the left side is larger than the right side, a negotiation range exists. The parties can then decide how to split the available surplus through retained coal value, delivery payment, ARC allocation, grid-value allocation, or risk-sharing terms.

9. Illustrative Calculations by PPA Structure

The following calculations are illustrative. They do not represent a final parameter set for any specific plant or market. The purpose is to show how the framework operates under two common PPA structures. The numerical settlement inputs are anonymized and rounded values adapted from actual Philippine PPA data, simplified to show the method rather than to identify a specific contract or proposed transaction term.

The SPARC streams calculator uses IRENA (2026), *24/7 renewables: The economics of firm solar and wind*, as a source for delivery-cost benchmark assumptions where a stream requires firm or semi-firm renewable delivery. The worked examples below remain illustrative scenario inputs. A live model should replace them with asset-specific, jurisdiction-specific, and financing-specific source data.

Assume a 50 MW delivery band for 12 hours per day.

> *Annual eligible MWh = 50 MW x 12 hours/day x 365 days = 219,000 MWh/year*

If every eligible MWh is delivered under the registered SPARC stream, the registry can create up to 219,000 SPARCs per year, subject to dispatch, metering, evidence, and product-code rules.

The delivery-side assumptions are the same in both examples. V_{STREAM} differs because the examples represent different PPA payment structures: an energy-only structure, and a capacity-plus-energy firm-band structure. The comparison intentionally holds the delivery task constant, not the stream value. Holding V_{STREAM} constant would hide the economic effect of the PPA structure being tested.

DELIVERY-SIDE COMPONENT	VALUE
Benchmark generation cost	USD 50/MWh
Profile and firming cost	USD 25/MWh
Compliance, metering, and settlement cost	USD 3/MWh
Financing premium, where applicable	USD 0/MWh
$C_{DELIVERY}$	USD 78/MWh
$R_{DELIVERY}$	USD 3/MWh

Total delivery-side required value:

$$V_{DELIVERY\ REQ} = C_{DELIVERY} + R_{DELIVERY} = 78 + 3 = USD\ 81/MWh$$

The worked examples do not assume an ARC price or recognized grid value at this stage. They first calculate the available stream payment, then calculate the residual top-up value that must be covered by V_{ARC}, V_{GRID}, or another agreed value source.

For translating a residual value requirement into a required $NET_{ARC\ PRICE}$, assume:

$$Embedded\ emission\ right = 0.95\ tCO2/MWh$$

$$Verified\ emissions\ under\ the\ approved\ boundary = 0\ tCO2/MWh$$

$$ARC_{QUANTITY} = 0.95\ tCO2/MWh$$

9.1 Energy-Only Case

In an energy-only PPA, the contract value is embedded in the per-MWh energy rate. Fixed-cost recovery, margin, fuel treatment, and variable O&M may all be reflected in the energy payment. In a flexible stream, or in a firm stream where the capacity or availability obligation does not transfer, $V_{CAP\ RELEASED}$ is zero.

Illustrative assumptions:

TERM	VALUE
V_{STREAM}	USD 102.70/MWh
$C_{AVOIDED}$	USD 45.00/MWh
R_{RELIEF}	USD 2.00/MWh
$V_{CAP\ RELEASED}$	USD 0.00/MWh

Then:

$$V_{COAL\ REQ} = 102.70 - 45.00 - 2.00 - 0.00 = USD\ 55.70/MWh$$

The coal operator must retain roughly USD 55.70/MWh in expected value for the stream transfer to be rational on a consent basis. The available stream payment for delivery-party compensation is:

$$P_{DELIVERY\ MAX} = C_{AVOIDED} + R_{RELIEF} + V_{CAP\ RELEASED}$$

$$P_{DELIVERY\ MAX} = 45.00 + 2.00 + 0.00 = USD\ 47.00/MWh$$

At this point, the stream does not clear:

$$V_{DELIVERY\ REQ} = USD\ 81.00/MWh$$

$$P_{DELIVERY\ MAX} = USD\ 47.00/MWh$$

The delivery party's required value exceeds the available stream payment. The required top-up value is:

$$Required\ top\text{-}up\ value = V_{DELIVERY\ REQ} - P_{DELIVERY\ MAX}$$

$$Required\ top\text{-}up\ value = 81.00 - 47.00 = USD\ 34.00/MWh$$

The stream does not clear from the stream payment alone. It requires USD 34.00/MWh of ARC value, recognized grid value, or another agreed top-up value source.

9.2 Capacity-Plus-Energy Firm-Band Case

In a capacity-plus-energy PPA, V_{STREAM} is the MWh-equivalent value of the payment layers allocated to the SPARC stream. It includes the energy component linked to actual MWh production and the capacity or availability component allocated to the stream. The energy component normally includes fuel, variable O&M, and any energy-side value for operating or risk-bearing responsibilities allocated to the stream. The capacity-related component reflects the portion of fixed, capacity, or availability payments allocated to the stream and converted into a MWh-equivalent value using expected eligible MWh for the stream.

For this illustrative case, assume the parties have negotiated a firm SPARC band and the delivery party assumes the matching firm-delivery, balancing, replacement-power, penalty, and performance obligations for that band. The model treats the energy component as the primary avoided-cost layer and the capacity component as the primary retained-value layer. This is a simplifying allocation assumption. Actual PPAs may embed fixed-cost recovery or margin in either layer, and transaction models should replace this allocation with source PPA data.

Illustrative assumptions:

TERM	VALUE
Fuel component	USD 34.39/MWh
Variable O&M	USD 2.37/MWh
Energy component (total)	USD 36.76/MWh
$V_{CAP\ STREAM}$	USD 57.89/MWh
$V_{CAP\ RETAINED}$	USD 42.89/MWh
$V_{CAP\ RELEASED}$	USD 15.00/MWh
V_{STREAM}	USD 94.65/MWh
$C_{AVOIDED}$	USD 36.76/MWh
R_{RELIEF}	USD 2.00/MWh

The released capacity value is the net capacity-linked value released after the coal operator retains the capacity value it rationally requires:

$$V_{CAP\ RELEASED} = V_{CAP\ STREAM} - V_{CAP\ RETAINED}$$

$$V_{CAP\ RELEASED} = 57.89 - 42.89 = USD\ 15.00/MWh$$

In a real transaction, $V_{CAP\ RETAINED}$ would be derived from the coal operator's fixed-cost recovery requirement, debt service, required margin, residual PPA standing, regulatory responsibility, and any obligations it continues to carry.

The coal operator's required retained value is:

$$V_{COAL\ REQ} = 94.65 - 36.76 - 2.00 - 15.00 = USD\ 40.89/MWh$$

The available stream payment for delivery-party compensation is:

$$P_{DELIVERY\ MAX} = 36.76 + 2.00 + 15.00 = USD\ 53.76/MWh$$

At this point, the stream still does not clear:

$$V_{DELIVERY\ REQ} = USD\ 81.00/MWh$$

$$P_{DELIVERY\ MAX} = USD\ 53.76/MWh$$

The delivery party's required value exceeds the available stream payment. The required top-up value is:

> *Required top-up value* = $V_{DELIVERY\ REQ} - P_{DELIVERY\ MAX}$

> *Required top-up value* = 81.00 - 53.76 = USD 27.24/MWh

The stream still does not clear from the stream payment alone, but the shortfall is smaller than in the energy-only case. The firm-band capacity structure increases the available stream payment because a net portion of the capacity-related value moves with the matching firm obligation.

9.3 Clearing Comparison

The two examples produce different available stream payments and therefore different residual top-up value requirements:

CASE	DELIVERY REQUIRED VALUE	AVAILABLE STREAM PAYMENT	REQUIRED TOP-UP VALUE
Energy-only case	USD 81.00/MWh	USD 47.00/MWh	USD 34.00/MWh
Capacity-plus-energy firm-band case	USD 81.00/MWh	USD 53.76/MWh	USD 27.24/MWh

If ARC value and grid value are the only top-up sources allocated to the delivery party, the required combined ARC and grid value can be calculated directly:

> *Required* $V_{ARC} + V_{GRID} = V_{DELIVERY\ REQ} - C_{AVOIDED} - R_{RELIEF} - V_{CAP\ RELEASED}$

For the energy-only case:

> *Required* $V_{ARC} + V_{GRID}$ = 81 - 45.00 - 2.00 - 0.00 = USD 34.00/MWh

For the capacity-plus-energy firm-band case:

> *Required* $V_{ARC} + V_{GRID}$ = 81 - 36.76 - 2.00 - 15.00 = USD 27.24/MWh

This calculation should not be read as a claim that ARC value must carry the economics alone. It shows the residual top-up value required after avoided coal cost, risk relief, released capacity or availability value, delivery cost, and delivery risk have been accounted for.

10. Clearing Gap and ARC/Grid Price Scenarios

The residual top-up value requirement can be met by ARC value, recognized grid value, another agreed value source, or a combination of these sources. If ARC value and grid value are the only top-up sources allocated to the delivery party, recognized grid value reduces the ARC value required for clearing.

Using the illustrative $ARC_{QUANTITY}$ of 0.95 tCO2/MWh:

$$Required\ NET_{ARC\ PRICE} = Required\ V_{ARC} / ARC_{QUANTITY}$$

CASE	REQUIRED TOP-UP VALUE BEFORE GRID	V_{GRID}	REQUIRED V_{ARC}	REQUIRED $NET_{ARC\ PRICE}$
Energy-only case	USD 34.00/MWh	USD 0/MWh	USD 34.00/MWh	USD 35.79/tCO2
Energy-only case	USD 34.00/MWh	USD 5/MWh	USD 29.00/MWh	USD 30.53/tCO2
Energy-only case	USD 34.00/MWh	USD 10/MWh	USD 24.00/MWh	USD 25.26/tCO2
Capacity-plus-energy firm-band case	USD 27.24/MWh	USD 0/MWh	USD 27.24/MWh	USD 28.67/tCO2
Capacity-plus-energy firm-band case	USD 27.24/MWh	USD 5/MWh	USD 22.24/MWh	USD 23.41/tCO2
Capacity-plus-energy firm-band case	USD 27.24/MWh	USD 10/MWh	USD 17.24/MWh	USD 18.15/tCO2

If recognized grid value is zero, the full residual top-up value requirement must be met by ARC value or another agreed value source. If recognized grid value exists and is allocated to the delivery party, the required ARC value falls. The model should therefore show grid value as a recognized and contingent clearing source, not as an assumed benefit.

11. Sensitivity Analysis

The feasibility of a SPARC stream is most sensitive to avoided coal cost, delivery cost, firming cost, delivery risk, $ARC_{QUANTITY}$, $NET_{ARC\ PRICE}$, and recognized grid value. The tables below use the energy-only case as the reference case unless stated otherwise, because it isolates each driver without adding the firm-band capacity allocation.

11.1 Avoided Coal Cost

This sensitivity holds $V_{DELIVERY\ REQ}$ at USD 81/MWh, R_{RELIEF} at USD 2/MWh, $V_{CAP\ RELEASED}$ at zero, V_{GRID} at zero, and $ARC_{QUANTITY}$ at 0.95 tCO2/MWh.

$C_{AVOIDED}$	AVAILABLE STREAM PAYMENT	REQUIRED TOP-UP VALUE	REQUIRED $NET_{ARC\ PRICE}$
USD 45/MWh	USD 47/MWh	USD 34/MWh	USD 35.79/tCO2
USD 58/MWh	USD 60/MWh	USD 21/MWh	USD 22.11/tCO2
USD 65/MWh	USD 67/MWh	USD 14/MWh	USD 14.74/tCO2

Higher avoided coal cost improves clearing because it increases the available stream payment while the coal operator remains whole.

11.2 Firming Cost

This sensitivity holds solar generation cost at USD 50/MWh, incremental operating, compliance, and settlement cost at USD 3/MWh, $R_{DELIVERY}$ at USD 3/MWh, $C_{AVOIDED}$ at USD 45/MWh, R_{RELIEF} at USD 2/MWh, $V_{CAP\ RELEASED}$ at zero, V_{GRID} at zero, and $ARC_{QUANTITY}$ at 0.95 tCO2/MWh.

FIRMING AND STORAGE ADDER	$C_{DELIVERY}$	$V_{DELIVERY\ REQ}$	REQUIRED TOP-UP VALUE	REQUIRED $NET_{ARC\ PRICE}$
USD 25/MWh	USD 78/MWh	USD 81/MWh	USD 34/MWh	USD 35.79/tCO2
USD 15/MWh	USD 68/MWh	USD 71/MWh	USD 24/MWh	USD 25.26/tCO2
USD 10/MWh	USD 63/MWh	USD 66/MWh	USD 19/MWh	USD 20.00/tCO2

A lower-cost firming configuration, better generation profile, lower replacement-power exposure, or more flexible delivery obligation can materially reduce the top-up value required for the stream to clear.

11.3 Combined Drivers

The most important insight is not that one variable solves the gap. It is that several modest changes can compound.

SCENARIO	$C_{AVOIDED}$	FIRMING ADDER	AVAILABLE STREAM PAYMENT	$V_{DELIVERY\ REQ}$	REQUIRED TOP-UP VALUE	REQUIRED $NET_{ARC\ PRICE}$
Reference case	USD 45/MWh	USD 25/MWh	USD 47/MWh	USD 81/MWh	USD 34/MWh	USD 35.79/tCO2
Higher avoided coal cost	USD 58/MWh	USD 25/MWh	USD 60/MWh	USD 81/MWh	USD 21/MWh	USD 22.11/tCO2
Lower firming cost	USD 45/MWh	USD 10/MWh	USD 47/MWh	USD 66/MWh	USD 19/MWh	USD 20.00/tCO2
Higher avoided coal cost plus lower firming cost	USD 58/MWh	USD 10/MWh	USD 60/MWh	USD 66/MWh	USD 6/MWh	USD 6.32/tCO2

This is why the stream design matters. The clearing gap is not a fixed ARC-price problem. It changes with fuel cost, delivery profile, firming cost, released capacity value, risk allocation, and recognized grid value.

11.4 ARC Quantity and Net ARC Price

$ARC_{QUANTITY}$ also matters. The same USD/MWh clearing gap requires a higher $NET_{ARC\ PRICE}$ when the verified emissions of the delivery resource are above zero.

CASE	REQUIRED TOP-UP VALUE BEFORE GRID	$NET_{ARC\ PRICE}$ AT 0.95 TCO2/MWH	$NET_{ARC\ PRICE}$ AT 0.75 TCO2/MWH	$NET_{ARC\ PRICE}$ AT 0.55 TCO2/MWH
Energy-only case	USD 34.00/MWh	USD 35.79/tCO2	USD 45.33/tCO2	USD 61.82/tCO2
Capacity-plus-energy firm-band case	USD 27.24/MWh	USD 28.67/tCO2	USD 36.32/tCO2	USD 49.53/tCO2

The model therefore does not depend on ARC value alone. ARC value becomes one component in a broader value stack that also includes avoided coal cost, risk relief, released capacity or availability value, firming cost reduction, $ARC_{QUANTITY}$, and any recognized grid value.

12. Efficient Fossil or Flexible Lower-Emission Delivery

The delivery party does not have to be renewable in every case. A more efficient or more flexible lower-emission generator may fulfill a SPARC stream where full renewable substitution is not yet technically or economically feasible.

The same economics apply. The delivery party's $C_{DELIVERY}$ includes its fuel cost, variable O&M, emissions cost, operational cost, and balancing or replacement obligations. Its $R_{DELIVERY}$ reflects its own performance and settlement risk. $ARC_{QUANTITY}$ is lower if verified emissions are above zero, because the ARC records only the unused portion of the embedded emission right.

For example, if the embedded emission right is 0.95 tCO2/MWh and a lower-emission thermal delivery party verifies emissions of 0.40 tCO2/MWh, $ARC_{QUANTITY}$ is:

> $ARC_{QUANTITY} = 0.95 - 0.40 = 0.55\ tCO2/MWh$

The stream may still create value if the delivery party's lower fuel cost, lower emissions, better flexibility, or improved dispatch profile reduces total system cost or creates ARC value. This pathway may be useful as a transitional step, but the claim must remain precise: the substitution is lower-emission delivery, not renewable delivery, unless linked REC or equivalent renewable-energy evidence exists.

13. Required Diligence Inputs

A credible SPARC stream economics analysis should collect the following inputs before presenting a clearing case.

INPUT	REQUIRED DETAIL
PPA structure	Energy-only, capacity-plus-energy, availability payment, minimum generation threshold, pass-through treatment, penalties, disallowance clauses.
Delivery band	MW, hours, season, dispatch linkage, firmness, expected eligible MWh, curtailment treatment, term, location, injection point.
Settlement rules	Dispatch, scheduling, nomination, metering, payment timing, settlement intervals, payment deductions.
Capacity allocation	Whether capacity or availability value attaches to the stream, how $V_{CAP\ STREAM}$ is calculated, what $V_{CAP\ RETAINED}$ the coal operator must keep, whether the delivery party assumes the matching firm obligation, and therefore whether $V_{CAP\ RELEASED}$ is greater than zero.
Coal avoided cost	Fuel price, heat rate, variable O&M, emissions cost, fuel pass-through treatment, cycling effects, and any genuinely avoidable fixed operating cost.
Risk relief	Replacement-power exposure, outage risk, fuel volatility, penalties, disallowance risk, operating stress.
Delivery cost	Generation cost, storage, firming, balancing, replacement power, losses, financing/WACC, compliance, metering, settlement operations.
Delivery risk	Imbalance, curtailment, non-delivery, replacement-power price spikes, equipment outage, force majeure, payment delay.
Embedded emission right	Plant factor, benchmark, ETS allocation, operating-license value, or host-country-recognized method.
ARC treatment	Issuance conditions, allocation, authorization, cancellation rules, corresponding adjustment treatment where relevant, marketability.
Grid value	Recognized benefit, payment mechanism, measurement method, beneficiary, probability, clawback exposure.
Regulatory recognition	Required approvals from regulator, system operator, environmental authority, registry, offtaker, lenders, or other parties.

14. Practical Interpretation

The economics of a SPARC stream are not driven by one price. They are driven by whether the stream agreement can align internal value released from the coal operator floor, top-up value, and delivery-side cost.

The internal value released from the coal operator floor consists of avoided coal cost, coal-side risk relief, and released capacity or availability value where the delivery party assumes the matching firm obligation. ARC value and recognized grid value can add top-up value where they exist and are allocated to the delivery party.

The two delivery-side categories are delivery cost and delivery risk, expressed together as $V_{DELIVERY\ REQ}$.

The coal operator does not need to lose the PPA or surrender its fixed-cost recovery. It can retain the value required to remain whole while avoiding cost, reducing selected risks, and releasing capacity or availability value only where the delivery party assumes the matching firm obligation. The delivery party does not need to buy a speculative certificate. It performs an approved stream and receives delivery payment, ARC value, grid value, or a combination of these sources according to the stream agreement. The regulator does not need to force immediate plant retirement. It can recognize a defined delivery band, preserve system reliability, and allow emissions to fall through verified lower-emission delivery.

The mechanism is strongest where the stream can be designed so that avoided coal cost, risk relief, released capacity or availability value, ARC value, and recognized grid value exceed the delivery cost and risk of lower-emission performance. That is the economic center of SPARC.

15. Core Formulas

15.1 Stream and capacity value terms

TERM	DEFINITION	FORMULA
V_{STREAM}	Total PPA value assigned to the SPARC stream, expressed per eligible MWh	Full energy-side PPA value assigned to eligible MWh, including the value of producing, operating, and carrying delivery risk for those MWh where allocated to the stream, plus capacity or availability value assigned to the stream, net of expected performance deductions where applicable.
$V_{CAP\ STREAM}$	Capacity or availability value assigned to the SPARC stream, expressed per eligible MWh	Allocated capacity or availability payment for the SPARC stream divided by expected eligible MWh under the SPARC stream.
$V_{CAP\ RETAINED}$	Capacity or availability value retained by the coal operator	Capacity or availability value required for fixed-cost recovery, debt service, required margin, residual PPA standing, retained regulatory responsibility, or retained obligations.
$V_{CAP\ RELEASED}$	Released capacity or availability value	$V_{CAP\ STREAM} - V_{CAP\ RETAINED}$, counted only where the delivery party assumes the matching firm obligation for the SPARC stream.

15.2 Coal-side economics

TERM	DEFINITION	FORMULA
$C_{AVOIDED}$	Coal cost avoided when another party fulfills the stream	Avoided fuel cost plus avoided variable O&M plus avoidable emissions cost and genuinely avoided fixed operating cost where applicable.
R_{RELIEF}	Monetized risk relief for the coal operator	Expected annual avoided downside cost divided by expected eligible MWh under the stream.
$V_{COAL\ REQ}$	Minimum retained value required by the coal operator	$V_{STREAM} - C_{AVOIDED} - R_{RELIEF} - V_{CAP\ RELEASED}$.
$P_{DELIVERY\ MAX}$	Available stream payment for delivery-party compensation while the coal operator remains whole	$C_{AVOIDED} + R_{RELIEF} + V_{CAP\ RELEASED}$.

15.3 Delivery-side economics

TERM	DEFINITION	FORMULA
$P_{DELIVERY}$	Payment to the delivery party for fulfilling the SPARC stream	Per-MWh fee, availability payment, revenue share, true-up, or blended compensation expressed per eligible MWh.
$C_{DELIVERY}$	Delivery party cost of eligible performance	Generation cost plus firming, storage, balancing, replacement-power, financing premium, incremental operations, and compliance.
$R_{DELIVERY}$	Delivery party risk premium	Expected downside cost from performance, imbalance, curtailment, replacement power, and other allocated obligations.
$V_{DELIVERY\ REQ}$	Total value required by the delivery party	$C_{DELIVERY} + R_{DELIVERY}$.

15.4 ARC and grid value terms

TERM	DEFINITION	FORMULA
$ARC_{QUANTITY}$	Unused emission right per delivered MWh	Embedded_Emission_Right – Verified_Delivery_Emissions.
$NET_{ARC\ PRICE}$	Net price used to value ARC quantity	Gross carbon price adjusted for issuance probability, authorization probability, registry fees, transfer discounts, transaction costs, and any required sharing with the host country or other parties.
V_{ARC}	Monetizable ARC value allocated to the relevant party	$ARC_{QUANTITY} \times NET_{ARC\ PRICE}$.
V_{GRID}	Recognized grid value allocated to the relevant party	Expected net grid benefit per eligible delivered MWh.

15.5 Clearing tests

TERM	DEFINITION	FORMULA
Coal condition	Coal operator clearing test	Coal Retained Value >= $V_{COAL\ REQ}$.
Delivery condition	Delivery party clearing test	$P_{DELIVERY} + V_{ARC} + V_{GRID} >= V_{DELIVERY\ REQ}$.
Clearing condition	Combined feasibility test	$P_{DELIVERY\ MAX} + V_{ARC} + V_{GRID} >= V_{DELIVERY\ REQ}$.

16. Data Source Discipline

The settlement figures used in Chapter 9 are anonymized and rounded values adapted from actual Philippine PPA data. The remaining market and delivery assumptions are illustrative. The figures are included to show how the formulas work, not to establish current market values or transaction terms.

All market inputs should be dated and replaced with asset-specific data before a transaction model is used for negotiation or regulatory submission. The model should distinguish between physical parameters, contract parameters, market parameters, policy parameters, carbon-value parameters, and grid-value parameters.

INPUT TYPE	TREATMENT
Physical parameter	Use plant, asset, or engineering data where possible.
Contract parameter	Use source PPA, side letter, settlement rule, or approved tariff data.
Market parameter	Date the source and test sensitivity.
Policy parameter	Separate current rule, expected rule, and desired rule.
Carbon-value parameter	Separate ARC quantity from monetizable ARC value.
Grid-value parameter	Include only when recognized by a credible counterparty or authority.

The illustrative solar cost assumption should be checked against country-specific project data. IRENA (2026), *24/7 renewables: The economics of firm solar and wind*, may be used as a reference source for renewable and renewable-plus-storage delivery-cost benchmarks in the SPARC streams calculator. Where an IRENA benchmark or any other external benchmark is used, the model should record the source, year, geography, technology profile, reliability target, financing assumptions, WACC, and whether storage, firming, or balancing cost is included.

The coal-price sensitivity should be updated against the relevant delivered fuel cost, not merely an index. ICE's Newcastle coal futures are financially settled against the globalCOAL Monthly NEWC Index. Public market snapshots can provide a benchmark, but the model should use the plant's delivered coal price, quality, freight, and handling assumptions.

Carbon-price scenarios should not be treated as forecast values. They are scenarios for testing how ARC value affects stream feasibility. Carbon-price context should be checked against the latest World Bank State and Trends of Carbon Pricing report, domestic ETS prices where relevant, and buyer-specific ARC eligibility assumptions.

17. Canonical Wording for Shorter Materials

SPARC stream economics test whether a defined delivery band inside an existing coal PPA can be fulfilled by a lower-emission delivery party while preserving the coal operator's financial position. The coal operator's required retained value is the stream value minus avoided coal cost, risk relief, and released capacity or availability value where the delivery party assumes the matching firm obligation. Released capacity value is not an external subsidy or additional value source. It is the portion of capacity or availability value already assigned to the SPARC stream that can support delivery-party payment because the delivery party assumes the matching firm obligation. A flexible stream may be energy-only where the originating plant runs around the delivered MWh and no capacity or availability value is released. The delivery party's required value is its delivery cost and performance risk. $P_{DELIVERY}$, allocated ARC value, recognized grid value, or another agreed top-up source must be sufficient to cover $V_{DELIVERY\ REQ}$. A SPARC stream clears when avoided coal cost, risk relief, released capacity or availability value, ARC value, and recognized grid value are sufficient to cover the cost and risk of lower-emission delivery.

Individual SPARCs are not priced as forward commodities. The parties negotiate the SPARC stream. Individual SPARCs are created only when eligible MWh are delivered under the registered stream and evidenced through the required metering and attribute systems.