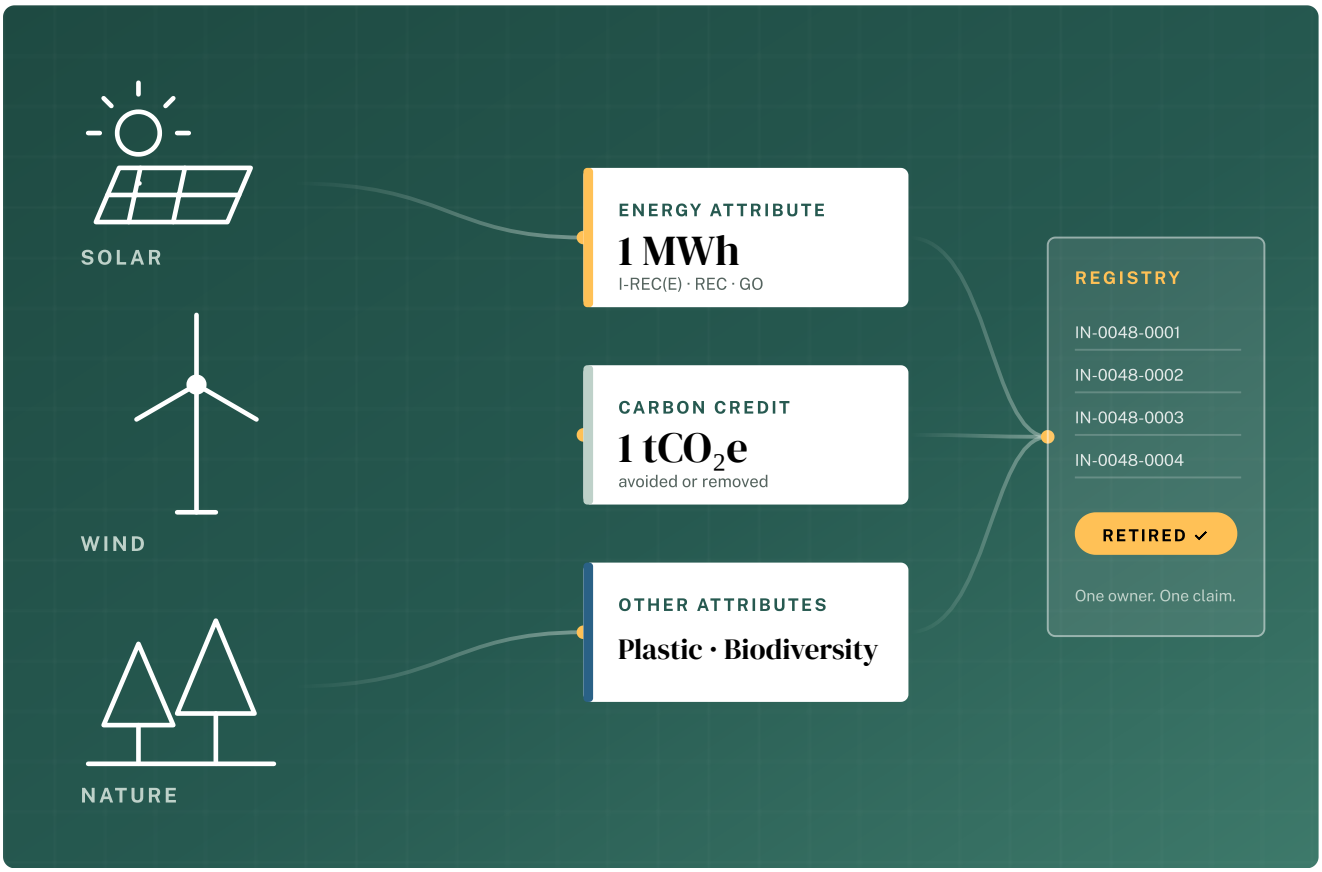
Environmental Attributes

How Environmental Commodities Are Created, Funded and Tracked



A structured overview of energy attribute certificates, carbon credits, the certification lifecycle, and how tracking systems differ across markets, with a focused look at India.

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KEY TERMS

EAC Energy Attribute Certificate · **REC** Renewable Energy Certificate · **I-REC(E)** International REC for electricity · **GO** Guarantee of Origin · **MRV** measurement, reporting and verification · **VVB** validation/verification body · **PPA** Power Purchase Agreement · **VPPA** Virtual PPA · **CERC** Central Electricity Regulatory Commission · **CORSIA** Carbon Offsetting and Reduction Scheme for International Aviation · **CDR** carbon dioxide removal · **tCO_2e** tonnes of carbon dioxide equivalent

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OVERVIEW

Executive Summary

As organisations commit to renewable electricity targets and net-zero pathways, they increasingly rely on documentary instruments rather than physical delivery to prove where their energy came from and how much greenhouse gas it avoided.

Two families of instruments dominate this space: Energy Attribute Certificates (EACs), which certify the source of a unit of energy, most commonly renewable electricity; and carbon credits, which certify avoided or removed emissions more broadly. Although the two are often used interchangeably in casual conversation, they differ in scope, measurement method, and the claims they support. Both instruments sit within a wider universe of environmental commodities that also includes biofuels and biofuel certificates, feedstock, plastic credits, and biodiversity credits, all created and funded through a mix of project-level financing and government pricing mechanisms such as carbon taxes and cap-and-trade schemes.

This paper sets out what EACs are and how they differ from carbon credits; where they sit within the broader spectrum of environmental commodities used for offsets, including biofuels, feedstock, plastic credits and biodiversity credits; how carbon commodities are created and funded through mechanisms such as carbon taxes and cap-and-trade; why certificate schemes vary from one country to another; and what the certification and registration process looks like end to end. It closes with a case study on India, whose market runs two parallel EAC systems: a large domestic Renewable Energy Certificate (REC) mechanism and a separate I-REC channel for multinational corporate reporting. India also updated its REC regulatory framework in 2026.

SOURCES GHG Protocol [1]; U.S. EPA [2]; I-TRACK Foundation [3][17]; CERC [13].

1 MWh
of renewable electricity generated and metered onto the grid = one EAC

1 tCO_2e
avoided or removed = one carbon credit

2
parallel EAC channels in India: domestic RECs and I-REC(E)

AT A GLANCE

- **Different instruments, different claims.** EACs support Scope 2 market-based reporting. Under the GHG Protocol, carbon credits are reported separately and cannot reduce reported Scope 1, 2 or 3 totals.
- **No single global system.** A certificate bought in one market cannot automatically be assumed to satisfy a reporting requirement in another.
- **Registry approval is not a static credential.** Credit quality must be assessed at the level of methodology, project assumptions, monitoring and verification record.
- **India is changing fast.** CERC's 2026 amendment revised REC multipliers and added rules for certificates under VPPAs.

SECTION 01

1 Energy Attribute Certificates

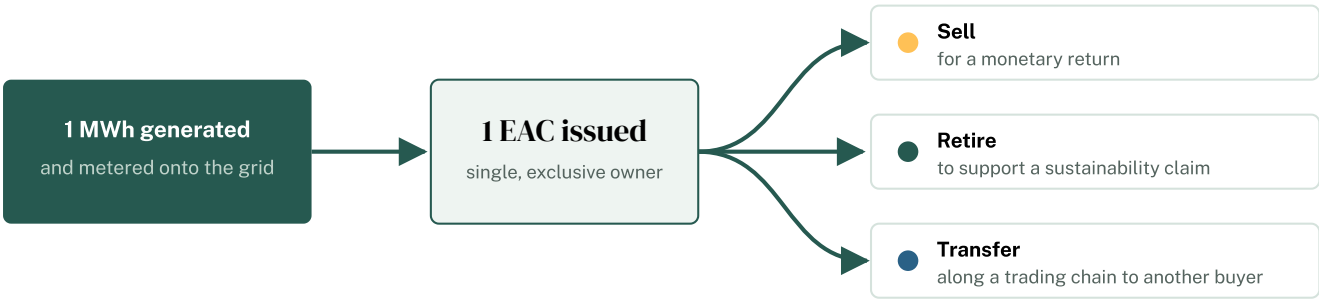
Electricity that enters a shared grid cannot be physically traced back to its generating source once it mixes with other supply. Energy Attribute Certificates (EACs) solve this traceability problem indirectly.

Rather than tracking electrons, EACs document and verify that a specific quantity of renewable electricity was generated and injected into the grid, and they assign the associated environmental attributes to a single, exclusive owner.

An EAC is typically issued for every megawatt-hour (MWh) of electricity generated from a renewable source and metered onto the grid. Once issued, the certificate becomes a tradable asset: the holder can sell it for a monetary return, retire it to support a sustainability claim, or pass it along a trading chain to another buyer.

> **SOURCES** GHG Protocol Scope 2 Guidance [1]; U.S. EPA, Energy Attribute Certificates [2].

FIGURE 1 · AN EAC AFTER ISSUANCE



1.1 EACs in Emissions Accounting

Corporate greenhouse gas accounting conventionally separates emissions into three categories, arranged here from most direct to least direct:

FIGURE 2 · THE THREE SCOPES

SCOPE 1

Direct

Emissions the organisation generates itself, such as fuel combustion at a factory.

SCOPE 2 · EACS APPLY HERE

Purchased Energy

Indirect emissions from the generation of purchased electricity, steam, heat and cooling consumed by the organisation.

SCOPE 3

Value Chain

Emissions embedded in the wider value chain: purchased goods and services, distribution, and product use.

EACs and RECs are the primary instruments used to address Scope 2 emissions, since they let a buyer substantiate a claim of renewable electricity consumption even though the physical electrons on the grid cannot be individually tracked.

> **SOURCES** GHG Protocol Scope 2 Guidance [1].

SECTION 02

2 Environmental Commodities

EACs and carbon credits are the instruments most commonly discussed in corporate sustainability reporting, but they sit within a wider family of environmental commodities.

These are non-tangible instruments whose value derives from the need of market participants to produce and consume cleaner forms of energy, and more broadly to manage other environmental externalities. Government policy typically creates this market in one of two ways: by restricting the right to pollute, which makes that right scarce and valuable, or by rewarding clean production through certificates that function as a form of subsidy.

Policy is one source of demand. Voluntary markets for I-RECs and carbon credits run on corporate demand for credible claims, and there the scarcity is enforced by the tracking rules themselves: each certificate or credit represents a defined unit, has a single owner at any time, and can be retired only once. In both compliance and voluntary settings, an instrument holds value only while its issuance rules, registry and verification keep supply tied to a real, measured outcome.

The main families that populate this market are:

- Renewable electricity and Energy Attribute Certificates (EACs), examined in detail in Sections 3 and 4 of this paper.
- Biofuels, biofuel certificates and feedstock.
- Carbon credits, examined in detail in Sections 3 and 5.
- Plastic credits.
- Biodiversity credits.

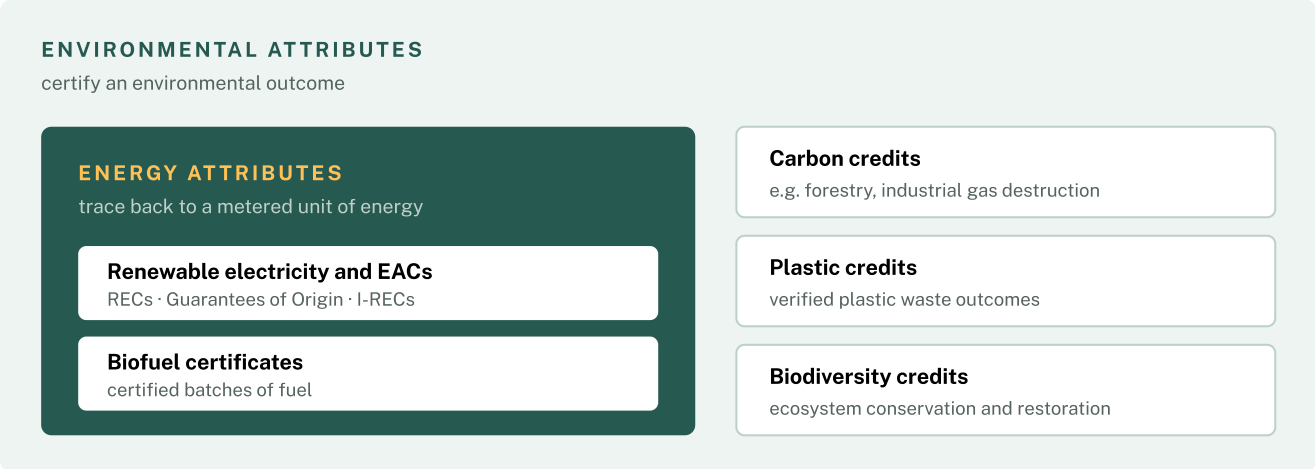
> **SOURCES** UNEP [4]; OECD [5]; World Bank [6].

2.1 Energy vs Environmental Attributes

The terms "energy attribute" and "environmental attribute" are often used interchangeably, but this paper treats them as related rather than identical. An energy attribute certifies that a specific, metered unit of energy (electricity or fuel) was produced from a renewable or low-carbon source. EACs, RECs, Guarantees of Origin, I-RECs and biofuel certificates all fall into this category, and each certificate traces back to a physical unit of energy generation.

Environmental attribute is the broader umbrella term used throughout this paper: it includes every energy attribute, but also covers instruments that certify an environmental outcome with no underlying unit of energy production at all, such as a forestry carbon credit, an industrial gas-destruction credit, a plastic credit or a biodiversity credit. Put simply, every energy attribute is an environmental attribute, but not every environmental attribute is an energy attribute.

FIGURE 3 · ENERGY VS ENVIRONMENTAL ATTRIBUTES



Of the five families introduced above, renewable electricity and EACs, along with biofuel certificates, are energy attributes; carbon credits, plastic credits and biodiversity credits are environmental attributes that are not, by themselves, tied to a unit of energy.

> **SOURCES** GHG Protocol Scope 2 Guidance [1]; I-TRACK Foundation [3].

2.2 Biofuels and Feedstock

Biofuels are liquid or gaseous fuels made from biomass and are used mainly in transport. Road transport accounts for most demand today, while aviation and shipping account for most of the forecast growth [23]. Common feedstocks include maize (corn), sugarcane, soybean and palm oil, and wastes and residues such as used cooking oil and animal fats [21].

Feedstock largely determines a biofuel's sustainability. Policy frameworks increasingly favour wastes and residues and restrict crops associated with land-use pressure; the EU, for example, is phasing out palm oil and has capped other crop feedstocks [21]. In the EU, a biofuel counts towards renewable transport targets only if it meets sustainability criteria, including that its raw material does not come from land with high biodiversity value or high carbon stock, and compliance is demonstrated through certification by voluntary schemes recognised by the European Commission [22][24].

That certification plays a role similar to an EAC for electricity: a traceable record that a given batch of fuel meets defined environmental criteria. Organisations that buy certified biofuels, or use them directly in their operations, typically do so to meet compliance obligations and reduce transport and logistics emissions.

> **SOURCES** IEA [21][23]; European Court of Auditors [22]; Directive (EU) 2018/2001, Articles 29 and 30 [24].

2.3

Plastic Credits

Plastic credits are a more recent addition to the environmental commodities market, developed in response to the global plastic pollution crisis. They represent verified reductions, recycling, or responsible management of plastic waste, and organisations can earn or purchase them by funding measures that support a circular economy for plastics, reducing the volume of plastic that is produced, discarded, or left unmanaged at end of life.

SOURCE UNEP [4].

2.4

Biodiversity Credits

Biodiversity credits fund initiatives that conserve or restore natural ecosystems, rather than reduce a specific pollutant. Eligible projects include habitat preservation, protection of endangered species, and the promotion of sustainable land-use practices, giving organisations a way to support environmental outcomes that fall outside the scope of energy or emissions accounting altogether.

SOURCE OECD, Scaling Up Biodiversity-Positive Incentives [5].

2.5 Carbon Taxes vs Cap-and-Trade

Project-based carbon credits are typically created and funded through project financing. Government carbon markets instead put a price on emissions across whole sectors, through one of two mechanisms.

FIGURE 4 · TWO WAYS TO PRICE CARBON

A · DIRECT PRICING

Carbon Tax

Government levies a charge per tonne of emissions on the producers or consumers of carbon-intensive goods, often designed to rise over time so the incentive to cut emissions strengthens. Revenue can be recycled back through cuts to other taxes, or channelled into climate-related programmes.

B · INDIRECT PRICING

Emissions Trading (Cap-and-Trade)

Regulators set a ceiling on total emissions for a given period and issue tradable allowances up to that ceiling, either allocated free of charge or sold at auction. Companies that emit less than their holdings can sell the surplus, while companies that exceed them must buy allowances to cover the shortfall. Auction revenue, like carbon-tax revenue, can be recycled or used to fund further climate initiatives.

Carbon pricing and project-based carbon credits are distinct instruments: the former is a policy mechanism for pricing emissions, while the latter represent quantified mitigation outcomes under a crediting methodology. The two can meet, however, where a jurisdiction allows liable entities to surrender eligible carbon credits against part of their obligation; South Africa, Colombia and Singapore, for example, permit this under their carbon taxes, subject to their own eligibility rules and limits.

SOURCES World Bank, State and Trends of Carbon Pricing 2026 [6].

SECTION 03

3 EACs vs Carbon Credits

Although both instruments circulate in similar sustainability markets and are sometimes discussed together, EACs and carbon credits certify different things and are not interchangeable.

An EAC, most commonly issued as a Renewable Energy Certificate (REC), represents proof that one megawatt-hour of renewable electricity was generated and delivered to the grid. A carbon credit, by contrast, represents proof that one tonne of carbon dioxide (or its equivalent) was prevented from being released into the atmosphere, or was actively removed from it. This makes carbon credits a broader instrument in principle: they can be generated from renewable electricity projects, but equally from reforestation, methane capture, energy efficiency, or industrial process improvements that have nothing to do with electricity generation.

TABLE 1 · EACS VS CARBON CREDITS

	Energy Attribute Certificate	Carbon credit
Unit	1 MWh of renewable electricity generated and delivered to the grid	1 tonne of CO_2 (or equivalent) avoided or removed
Possible sources	Renewable electricity generation	Renewable electricity, reforestation, methane capture, energy efficiency, industrial process improvements
Role in accounting	Supports market-based Scope 2 reporting	Reported separately from the inventory; cannot reduce reported Scope 1, 2 or 3 totals
Measurement basis	Automated grid metering by certified meters	Measurement, reporting and verification (MRV), with independent VVB checks

The role each instrument plays in corporate accounting also differs. I-RECs and other EACs apply specifically to Scope 2, indirect emissions tied to purchased electricity, where they support market-based reporting. Carbon credits do not work this way. Under the GHG Protocol, carbon credits are reported separately from the corporate inventory and cannot be used to reduce the reported Scope 1, 2 or 3 totals; a buyer may disclose them alongside the inventory as a distinct, voluntary claim. The Science Based Targets initiative (SBTi) likewise does not count carbon credits towards progress on its emission-reduction targets. The Scope 1, 2 and 3 categories therefore describe where an organisation's inventoried emissions arise, not where a credit can be netted off.

SOURCES GHG Protocol Scope 2 Guidance [1]; GHG Protocol Corporate Standard [19]; SBTi [20]; U.S. EPA [2].

3.1 How Each Is Measured

The two instruments also rely on different measurement infrastructure. EAC issuance depends on automated grid metering: certified meters record every megawatt-hour of renewable electricity fed into the grid, forming the basis for issuing RECs in the United States, Guarantees of Origin in Europe, and I-RECs elsewhere.

Carbon credit issuance instead relies on measurement, reporting and verification (MRV) of the emission reductions or removals achieved. Most issuance today still runs on conventional MRV: project monitoring reports, field sampling and measurement, and site visits by a validation/verification body (VVB) before credits are issued. Digital MRV (dMRV), which uses Internet of Things sensors, remote sensing including satellite imagery, and automated data pipelines, is an emerging complement that is being adopted in some methodologies and project types, but it is not yet the basis for most issuance.

SOURCES GHG Protocol Scope 2 Guidance [1]; I-TRACK Foundation [3]; Verra [8]; Gold Standard [11].

SECTION 04

4 Types of EACs

EACs are best classified by the product they track.

Regional scheme names differ (RECs in the United States, Guarantees of Origin in Europe), while the I-TRACK Foundation's International Attribute Tracking Standard organises its offering into Product Codes:

FIGURE 5 · I-TRACK PRODUCT CODES

I-REC(E) · LIVE

Electricity

Covers renewable electricity in more than 70 countries, mainly across Asia, Africa, Latin America and the Middle East, alongside RECs in the United States and Guarantees of Origin in Europe.

I-TRACK(G) · LIVE

Gas and Biogas

For non-fossil gas, including biogas and biomethane, operating through a registry in Brazil and a global registry for the rest of the world.

I-TRACK(HX) · PRE-ACCREDITED

Hydrogen

For hydrogen and hydrogen derivatives, currently pre-accredited.

I-TRACK(CDR) · PRE-ACCREDITED

Carbon Dioxide Removal

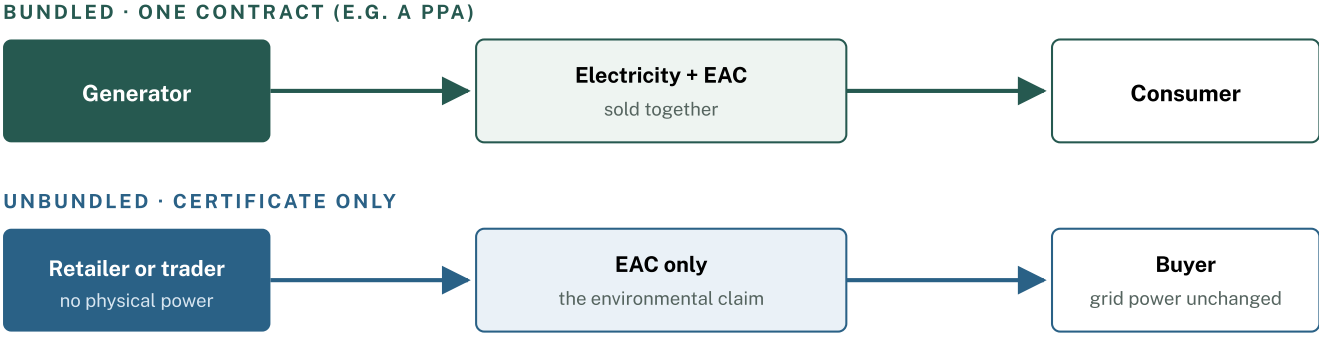
For carbon dioxide removal (CDR), currently pre-accredited.

SOURCES U.S. EPA [2]; I-TRACK Foundation [3].

4.1 Bundled vs Unbundled

EACs are also distinguished by how they are purchased. Bundled EACs are sold together with the physical electricity itself, under a single contract: the arrangement typically seen in Power Purchase Agreements (PPAs) between a generator and a consumer. Unbundled EACs, by contrast, are sold on their own by third-party retailers or traders who supply no physical electricity at all; the buyer acquires only the environmental claim, independent of where their actual grid power comes from.

FIGURE 6 · BUNDLED VS UNBUNDLED



SOURCES GHG Protocol Scope 2 Guidance [1]; U.S. EPA [2].

4.2 I-RECs by Market

I-REC(E) is an exchangeable Energy Attribute Certificate issued under the I-TRACK Foundation's International Attribute Tracking Standard. Availability is country-specific and depends on an accredited issuer being authorised to operate in that market. The I-TRACK Foundation lists ICX Private Limited as the accredited I-REC(E) issuer for India.

SOURCES I-TRACK Foundation [3][17].

SECTION 05

5 Types of Carbon Credits

Carbon credits are not a single uniform instrument.

They are issued against a range of underlying standards, sector-specific eligibility rules and project types, each carrying different assurances about additionality, permanence and verification rigour. The subsections below set out the main standards, the aviation sector's narrower eligibility rules, the emerging category of removal credits, and the two broad families of underlying project.

SOURCES Gold Standard [11]; Verra [8]; ICAO [7]; Puro.earth [12].

5.1 Standards and Registries

The credibility of a carbon credit depends on more than the name of the registry. A credit is underpinned by the applicable standard, methodology, validation and verification process, monitoring requirements, registry controls and the specific version of the methodology under which it was issued. Verra's VCS programme, for example, uses approved methodologies and third-party validation/verification within its certification system, while Gold Standard applies additional sustainable-development and safeguard requirements.

SOURCES Verra [8]; Gold Standard [11].

WHAT UNDERPINS A CARBON CREDIT

Standard → methodology (and its version) → validation and verification → monitoring requirements → registry controls. The name of the registry alone is not enough.

5.2 CORSIA Credits for Aviation

The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), administered by the International Civil Aviation Organization (ICAO), has a narrower eligibility framework than the broader voluntary carbon market. ICAO assesses emissions-unit programmes against its Emissions Unit Eligibility Criteria and publishes the programmes approved to supply CORSIA Eligible Emissions Units for each compliance phase. For the first phase (2024–2026), ICAO's current list contains eight approved programmes; eligibility of individual units also depends on the applicable programme scope and other CORSIA conditions.

SOURCES ICAO [7].

5.3 Biochar and Removal Credits

Carbon dioxide removal (CDR) credits represent removals rather than avoided emissions. Biochar is one established CDR pathway: biomass is heated under oxygen-limited conditions to create a stable, carbon-rich material that can store carbon for long periods. The relevant durability, monitoring and accounting requirements depend on the methodology and standard used; therefore, claims about permanence should be tied to the specific methodology rather than treated as a generic property of all biochar credits.

SOURCES Puro.earth [12].

5.4 Industrial vs Nature-Based Projects

Underlying carbon credit projects are broadly grouped into two families, which differ in risk profile as well as mechanism.

FIGURE 7 · TWO FAMILIES OF CARBON PROJECT

INDUSTRIAL

Engineered Processes

Capture or avoid emissions through engineered processes.

- Methane capture at landfills or coal mines
- Industrial gas destruction
- Energy-efficiency retrofits
- Fuel-switching at manufacturing facilities

Risk profile: generally more precise, engineering-based measurement.

NATURE-BASED

Natural Carbon Sinks

Work with natural carbon sinks.

- Afforestation and reforestation
- Avoided deforestation (REDD+)
- Improved forest management
- Wetland or soil-carbon restoration

Risk profile: additional considerations around *permanence* (the risk of reversal through fire or land-use change) and *leakage* (displacement of the avoided activity to another location).

SOURCES Gold Standard [11]; West, Bomfim & Haya [10].

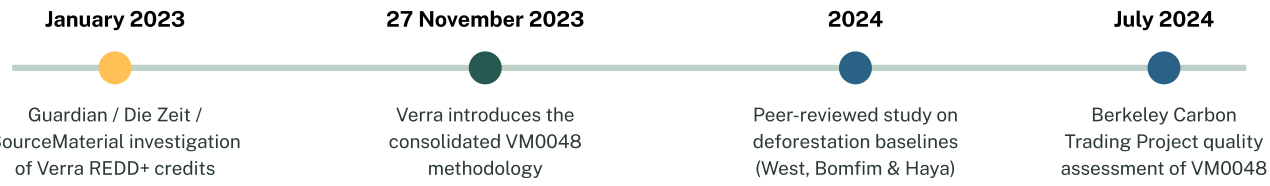
SECTION 06

6 Registry Credibility and REDD+

Registry approval should not be treated as a stand-alone proxy for credit quality.

The 2023 investigation into Verra's REDD+ portfolio raised significant questions about baseline setting and the resulting volume of credited emission reductions. Peer-reviewed research subsequently found that methodological differences in deforestation baselines could materially affect the amount of reductions credited to projects. Verra introduced the consolidated VM0048 methodology on 27 November 2023, replacing the fragmented methodology structure with a more centralised framework for REDD+ accounting.

FIGURE 8 · REDD+ INTEGRITY TIMELINE



VM0048 changes how REDD+ baselines and project-level accounting are structured, with greater use of standardised data, reference regions and jurisdictional information. Independent assessments have nevertheless identified residual integrity risks, including questions around leakage and the assumptions used

to quantify avoided deforestation. The appropriate conclusion is therefore not that registry-issued credits are inherently unreliable, but that credit quality must be assessed at the level of the methodology, project assumptions, monitoring and verification record, and applicable integrity rules.

Registry approval is not a static credential.

The practical takeaway for a buyer is that a credit's standing depends on the methodology version under which it was issued, the project's monitoring and verification record, subsequent methodological changes, and the applicable integrity assessment or eligibility rules.

BUYER CHECKLIST: NATURE-BASED CREDITS

Before relying on the credit for a reporting claim, review:

- ☐ Methodology vintage
- ☐ Baseline assumptions
- ☐ Leakage treatment
- ☐ Permanence and reversal provisions
- ☐ Any required transition to an updated methodology

SOURCES Verra [8]; West, Bomfim & Haya [10]; Berkeley Carbon Trading Project [9]; Guardian/Die Zeit/SourceMaterial [18].

SECTION 07

7 Why Certificates Differ by Country

There is no single global EAC tracking system.

Multiple schemes operate under different legal and institutional arrangements, generally recording attributes such as generation technology, location, vintage and certificate identity. The rules governing eligibility, geographic boundaries, temporal matching, issuance and retirement can nevertheless differ materially between systems.

SOURCES GHG Protocol Scope 2 Guidance [1]; I-TRACK Foundation [3].

TABLE 2 · MAJOR CERTIFICATE SCHEMES

Certificate scheme	Region / coverage	Attributes typically tracked
I-REC	International (70+ countries)	Source/fuel type, vintage, country and grid of origin
Guarantee of Origin (GO)	Europe (EU and other participating countries)	Source/fuel type, vintage, country of origin; some markets piloting hourly certificates
REC	United States	Source/fuel type, vintage and location, recorded in regional tracking systems; eligibility rules vary by state
TIGR	Global registry operated by Xpansiv	Source/fuel type, vintage and location of the generating project
24/7 CFE certificates	Various (industry-led initiatives)	Hourly vintage combined with location matching

Note: "EAC" is the umbrella category covering the certificate schemes listed above; it is not a separate scheme.

7.1 Drivers of Variation

Several structural factors explain why an EAC in one country cannot simply be substituted for an EAC issued in another:

1

Regulatory Origin

Each scheme was created under different national or regional legislation, with different objectives and legal authority.

2

Grid and Market Structure

The degree to which a country's electricity market is unbundled and open to competition shapes how certificates can be issued and traded.

3

Mandatory vs Voluntary

Some schemes are backed by binding obligations (such as renewable purchase quotas), while others operate purely on voluntary corporate demand.

4

Registry Infrastructure

The maturity of the body responsible for issuing, tracking and retiring certificates varies significantly between markets.

5

What Counts as Renewable

What counts as "renewable" for certification purposes is not standardised globally.

6

Metering Standards

The precision and technology used to measure generation (for example, periodic/block metering versus increasingly granular or hourly data) differs by market.

Current GHG Protocol work is also examining tighter temporal matching and deliverability requirements for Scope 2 accounting.

> **SOURCES** GHG Protocol Scope 2 Guidance [1]; I-TRACK Foundation [3].

SECTION 08

8 Certification and Registration

EAC and carbon-credit systems do not follow one universal certification process.

Most contain comparable control points (eligibility, applicable methodology or product rules, monitoring or metering, verification where required, issuance into a registry, transfer and final retirement), but the documents, actors and sequencing differ by scheme. The two routes are therefore shown separately: project-based carbon credits, which pass through validation and verification by an independent VVB, and I-REC(E) issuance, where the Issuer checks the registrant's meter data and no VVB is involved.

FIGURE 9 · TWO CERTIFICATION ROUTES

ROUTE A · PROJECT-BASED CARBON CREDITS



ROUTE B · I-REC(E) AND OTHER EACS · NO VVB



8.1 Route A: Carbon Credits

TABLE 3 · ROUTE A DOCUMENTS

Document	Purpose
Project Design Document (PDD)	Sets out the project, methodology, baseline and additionality analysis, and expected emission reductions or removals: the foundation document created before any crediting begins.
Validation report	An independent validation/verification body (VVB) checks the PDD against the chosen methodology and confirms eligibility, once, before issuance starts.
Monitoring report	A periodic report, often annual, with actual project performance data. Under conventional MRV it rests on monitoring records, sampling and field measurement; digital MRV (dMRV) using IoT sensors and satellite data is emerging and is used in some methodologies and project types.
Verification report / statement	A VVB independently re-checks the monitoring data for accuracy, usually including site visits; only after this step does the registry issue credits.
Registry entry / serial number	Each credit receives a unique serial number in a registry (for example Verra, Gold Standard, ACR or Puro.earth), forming the authoritative ledger record.

Document	Purpose
Redemption / retirement statement	Issued when a buyer uses (retires) a credit to make a claim: proof that it cannot be resold or counted twice.
Letters of authorisation / corresponding adjustments	For Article 6 credits transferred internationally, the host country issues a letter of authorisation and applies the corresponding adjustment in its own national accounts to prevent double-counting between countries. Registries only record the authorisation and adjustment status; they do not apply the adjustment.
Methodology documents	The approved, project-independent methodology (for example a Verra VM00xx standard) that underpins every credit issued against it.

8.2 Route B: I-RECs and Other EACs

TABLE 4 · ROUTE B STEPS AND RECORDS

Step / record	Purpose
Registrant and device registration	The production device owner, or an agent acting for it, registers with the accredited Issuer for the country, providing details of the device such as location, capacity, technology and ownership. Without Issuer authorisation for a country, no I-REC(E) can be issued for devices there.
Product Code rules	The I-REC(E) Product Code, managed by Evident (an Xpansiv company) as the accredited Code Manager, sets the definitions, processes and procedures for issuance, transfer and redemption that the Issuer applies.
Metered generation data	For each production period, metered generation data for the registered device is submitted to the Issuer.
Issuer verification and issuance	The Issuer checks the submitted data, including the meter data, and issues I-REC(E) to the registrant's account in the registry. No PDD is prepared and no VVB validation or verification takes place; the Issuer's own check of meter data takes its place.
Registry entry / serial number	Each I-REC(E) receives a unique serial number in the registry (the I-REC/Evident registry), forming the authoritative ledger record.
Attestations / certificates of ownership	Ownership-transfer records issued as certificates change hands through a trading chain, common where I-RECs pass through intermediaries before final use.
Redemption / retirement statement	Issued when an end user redeems (retires) an I-REC(E) to make a claim: proof that it cannot be resold or counted twice.

In practice, many systems are increasingly digitised. I-TRACK requires an auditable registry record for the lifecycle of a product certificate, while carbon standards maintain project and credit records through their own registries. Buyers should distinguish between the registry record itself and independent validation/verification performed by accredited or approved third parties, which applies to project-based carbon credits but not to I-REC(E) issuance.

> **SOURCES** I-TRACK Foundation [3]; Gold Standard [11]; Verra [8].

SECTION 09

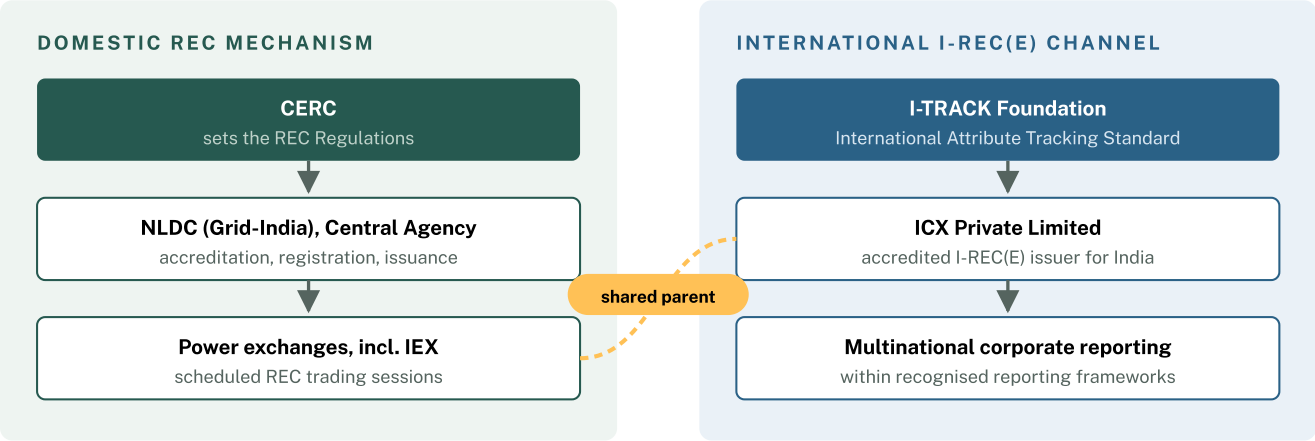
9 Case Study: India

India illustrates how a domestic REC framework can operate alongside an international attribute-tracking channel.

The domestic REC mechanism is governed by CERC and administered through the Central Agency/NLDC framework, while I-REC(E) certificates are available through the international I-TRACK system for eligible Indian generation facilities.

SOURCES CERC [13]; I-TRACK Foundation [17].

FIGURE 10 · INDIA'S TWO CHANNELS



ICX is a wholly owned subsidiary of IEX. The two channels run under separate rules but share a corporate parent.

9.1 Domestic RECs

India's domestic Renewable Energy Certificate (REC) mechanism is governed by CERC's REC regulations, with the National Load Despatch Centre (NLDC), operated by Grid Controller of India (Grid-India), acting as the Central Agency. The framework covers accreditation, registration, issuance, trading and redemption. One REC represents one MWh of renewable electricity generated and injected, or deemed to be injected, into the grid under the applicable rules.

Trading on power exchanges takes place through scheduled REC sessions. IEX currently describes REC trading as occurring twice a month, with the exact trading calendar subject to exchange circulars. The 2026 CERC amendment also changed the certificate-multiplier framework and introduced specific treatment for certificates associated with VPPAs.

SOURCES CERC [13]; IEX [14].

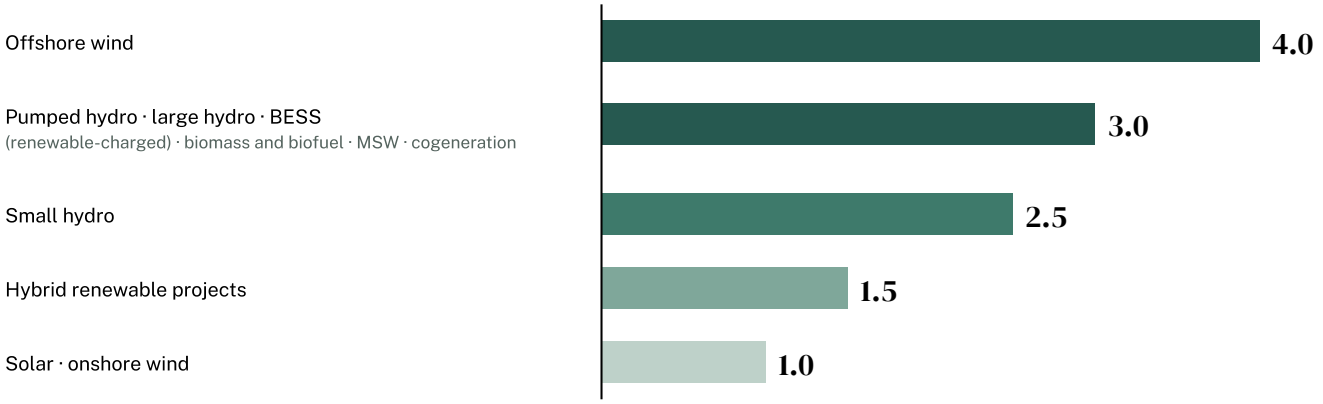
9.2 The 2026 REC Amendment

On 24 March 2026, CERC notified the First Amendment to the 2022 REC Regulations, which takes effect from the date of its publication in the Official Gazette. It introduced definitions for Designated Consumer, Renewable Consumption Obligation (RCO) and Virtual Power Purchase Agreement (VPPA), expanded eligibility in specified cases, revised certificate multipliers, and added rules for certificates under VPPAs.

Two multiplier tiers now apply. Projects commissioned after 5 December 2022 and before the amendment took effect keep a transitional schedule: 1.0 for onshore wind and solar, 1.5 for hydro, 2.0 for municipal solid waste and non-fossil fuel-based cogeneration, and 2.5 for biomass and biofuel.

Projects commissioned after the amendment took effect are assigned multipliers under the new framework, which weights three factors: 40% tariff range, 30% technology maturity and 30% capacity credit/peak support. The resulting multipliers are 4.0 for offshore wind; 3.0 for pumped hydro, large hydro, battery energy storage charged only by renewable sources, biomass and biofuel, municipal solid waste and cogeneration; 2.5 for small hydro; 1.5 for hybrid renewable projects; and 1.0 for solar and onshore wind.

FIGURE 11 · NEW REC MULTIPLIERS



HOW MULTIPLIERS ARE WEIGHTED



The assigned multiplier remains valid for fifteen years from commissioning; thereafter, one certificate is issued per MWh for the remaining registration period. For technologies not listed, the Commission assigns a multiplier by separate order, applying the same principles.

SOURCES CERC, First Amendment Regulations, 2026 [13].

9.3 I-RECs in India

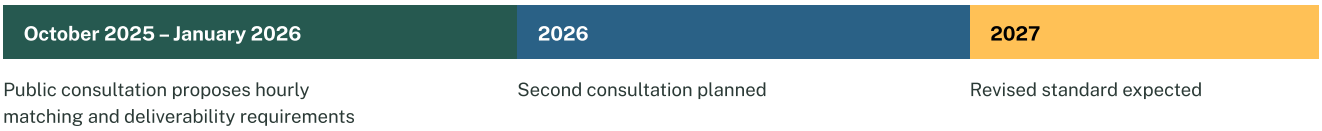
India also has an active I-REC(E) channel. The I-TRACK Foundation lists ICX Private Limited as the accredited I-REC(E) issuer for India. ICX is a wholly owned subsidiary of the Indian Energy Exchange (IEX), one of the power exchanges on which domestic RECs trade, so the two channels are run under separate rules but share a corporate parent. I-REC(E) certificates can be used within recognised reporting frameworks, subject to the specific rules of the framework and claim being made.

> **SOURCES** I-TRACK Foundation [3][17]; IEX [14].

9.4 Hourly Matching and India

India's domestic REC framework is not an hourly certificate system: the regulatory process is based on metered generation and issuance cycles rather than real-time hourly certificate generation. This differs from emerging approaches that place greater emphasis on temporal matching.

FIGURE 12 · SCOPE 2 REVISION TIMELINE



The GHG Protocol's Scope 2 public consultation (October 2025 to January 2026) proposed hourly matching and deliverability requirements for market-based reporting, with a second consultation planned for 2026 and the revised standard expected in 2027. The direction of travel is therefore an emerging international trend, not yet a settled rule.

> **SOURCES** CERC [13]; GHG Protocol [16].

SECTION 10

10 Long-Term Procurement

As corporate renewable procurement becomes more sophisticated, buyers may combine spot purchases with multi-year contractual arrangements for electricity, EACs or carbon credits.

These arrangements can provide greater visibility on volume, price and project attributes, but their accounting, financing and claim implications depend on the structure of the contract.

For renewable electricity, physical PPAs can bundle delivered electricity with RECs, while virtual PPAs are financial contracts, typically structured as contracts for differences, with no physical delivery to the buyer; U.S. EPA describes a virtual PPA as a financial instrument rather than a power purchase contract. In either

structure, a long-term contract gives the developer a predictable revenue stream that supports project financing, and the associated RECs support the buyer's renewable-energy claim only when conveyed and retired appropriately.

FIGURE 13 · PHYSICAL VS VIRTUAL PPAS

PHYSICAL PPA

Power and Certificates

Delivered electricity can be bundled with RECs under one contract.

VIRTUAL PPA

Financial Contract

Typically a contract for differences, with no physical delivery to the buyer.

In both, the RECs support the buyer's claim only when conveyed and retired appropriately.

For carbon credits, forward or offtake contracts can similarly provide developers with contracted future demand, but the financing, delivery and credit-quality implications vary by project and contract, and a forward purchase does not by itself establish that a project is additional.

BEFORE A LONG-TERM COMMITMENT

Regardless of instrument, organisations entering long-term offtake or procurement arrangements typically need to evaluate:

- ☐ **Additionality and permanence risk** over the full contract term, particularly for nature-based and removal credits where reversal risk compounds over decades.
- ☐ **Delivery risk**, including the project's construction, commissioning or validation timeline relative to the buyer's own reporting deadlines.
- ☐ **Price and volume flexibility**, since fixed-price, fixed-volume contracts expose both counterparties to market movements over a multi-year term.
- ☐ **Registry and standard eligibility**, to confirm the instrument will still satisfy the buyer's reporting framework, whether CORSIA, a Scope 2 market-based method or a corporate net-zero standard, for the full duration of the contract.
- ☐ **Counterparty and project-level due diligence**, since a long-dated commitment concentrates risk in a single generator, developer or registry relationship rather than spreading it across the spot market.

Because these agreements typically span multiple years and material volumes, procurement decisions increasingly sit alongside, rather than separate from, an organisation's wider risk management and treasury functions.

SOURCES U.S. EPA [15].

SECTION 11

11 Outlook and Conclusion

EACs and carbon credits are likely to remain distinct because they serve different accounting and claim functions.

The more important convergence is in the quality of evidence behind environmental claims.

Buyers increasingly need to understand the methodology, tracking system, geographic and temporal rules, verification status and retirement record associated with the unit they purchase.

For organisations operating across multiple jurisdictions, a certificate purchased in one market cannot automatically be assumed to satisfy a reporting requirement in another. The applicable tracking system, governing institution, market boundary, measurement granularity and claim rules all matter. India's parallel domestic REC and I-REC(E) channels illustrate why procurement decisions need to be tied to the intended reporting framework.

SOURCES GHG Protocol [1]; I-TRACK Foundation [3]; CERC [13].

QUESTIONS FOR EVERY BUYER

- ☐ Which methodology and tracking system sits behind this unit?
- ☐ Do its geographic and temporal rules match my reporting framework?
- ☐ What is its verification status and retirement record?

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Ploxi Earth's environmental attributes module covers carbon credits, I-RECs and plastic credits, alongside measurement and reporting tools. Ploxi Consult advises on carbon markets strategy and decarbonisation. If you are working out which instruments fit your reporting framework, talk to our team.

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