reneum

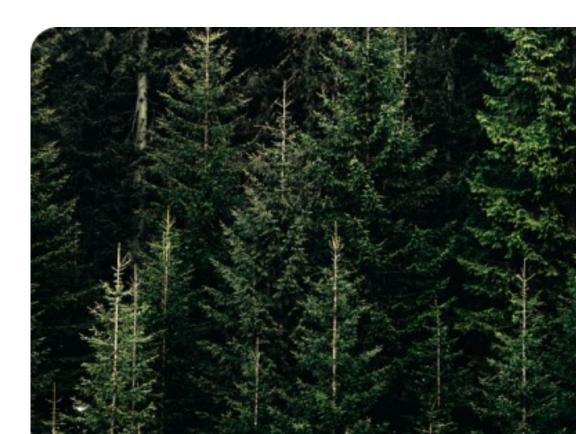The fight against climate change is on.
Humanity is mobilizing.

RENEUM CERTIFICATION METHODLOGY

JULY
2022

RENEUM is a new form of digitized REC designed to accelerate renewable energy deployment everywhere where equivalent mechanisms do not currently exist.

Although Reneum is not managed through a centralized registry operated by a central authority and traded on a regulated market, Reneum's tokenized RECs can be tracked like any other. Moreover, like existing REC systems associated with renewable energy, to obtain Reneum tokens, projects must meet a number of eligibility requirements and be open to independent auditing.

Reneum tokens can only be issued to projects that do not receive other certificates or tokens that embody their non-power attributes. In this way Reneum tokens represent a credible, unique and traceable instrument for valuing and accounting for renewable energy that can be used internationally.

This document outlines the Reneum platform token creation and issuance process, via the certification and connection of renewable energy projects, into its decentralized database.

For more on the Reneum ecosystem and technical infrastructure, please see the Reneum.com official website.

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1.0 RENEWABLE ENERGY CERTIFICATE (REC)

WHAT IS A RENEWABLE ENERGY CERTIFICATE (REC)?

A Renewable Energy Certificate (REC) represents a property right to the environmental, social and other non-power attributes associated with one megawatt-hour of renewable electricity generation. These qualities include reduced or avoided greenhouse gas emissions, air quality improvements and other environmental and/or social benefits related to the displacement of fossil fuel-based generation by renewable energy. RECs contain factual information of how a specific standard volume of clean energy was generated.

RECs can be sold together with or separately from the underlying physical electricity (green electrons) associated with a renewable-based generation source. Acknowledging the present inability to track electrons through a grid, a REC scheme enables the trade of credits, conveying factual and verifiable information of the underlying commodity, while remaining independent from the underlying commodity ('green electrons').

They are traded and designed to be retired (or cancelled) to demonstrate compliance with a regulatory obligation or voluntary commitment for procuring renewable energy. REC schemes allow end-buyers to make reliable claims about their energy usage. RECs can be purchased according to the needs of the buyers, as long-term contracts or one-off trades to represent the buyer's clean energy strategy.

RECs were created as a vehicle for climate finance, to support a cleaner generation mix, to act as a subsidy for accelerated renewable energy deployment, and to send a price signal to investors and developers in new markets to initiate new build-outs. In this way, RECs can directly influence the energy transition.

PRINCIPLES OF RECs

- One REC represents the non-power attributes of one MWh of renewable electricity generated.
- Each REC can be defined as the verifiable, auditable and evidence-based characteristics of a unit of electricity produced.
- Only one REC can be issued for a given MWh of renewable electricity generated.
- RECs can be bought and sold separately from the underlying electricity produced (unbundled) provided that any electricity sold does not include any environmental claims e.g. through a Power Purchase Agreement (PPA).
- A REC represents all the non-power attributes of a project: Greenhouse Gas (GHG) emissions avoided, other environmental benefits, social and health benefits - the benefits cannot be further disaggregated.
- The entity owning the certificate has exclusive ownership of all the attributes this certificate conveys.
- Once a REC has been retired or cancelled to meet a regulatory obligation or voluntary commitment it can no longer be traded or used.

RECS VS. CARBON OFFSETS

GREENHOUSE GAS REPORTING

Many organizations start managing their environmental footprint by developing a Greenhouse Gas (GHG) emissions inventory.

According to the World Resources Institute (WRI) GHG Protocol, an organization must follow a standard set of accounting guidelines to measure emissions and develop an inventory that distinctly accounts for the emissions they are responsible for from their operations, energy purchases to power their facilities, and total supply chain, all accounted for in three different ledgers. These are referred to as scopes 1, 2, and 3, respectively.

"The scopes help distinguish emissions from sources that the organization directly owns or controls (direct emissions) from emissions that are a consequence of the activities of the organization, but occur at sources owned or controlled by another organization (indirect emissions)".

This separate accounting is to ensure that two or more organizations will not account for emissions in the same scope, thereby disentangling emissions reporting. Through this framework, organizations can apply a standard to assess their environmental performance and determine which mitigation options to pursue.

Mitigation options across all three scopes can include a variety of environmentally positive initiatives, including energy efficiency measures, local procurement of renewable energy, adoption of electric vehicles, curbing of transport, waste management and water conservation, among many others.

The procurement of environmental instruments – carbon offsets and RECs – can also address direct and indirect GHG emissions by verifying global emissions reductions at additional, external projects. Carbon Offsets (verified emissions reductions) are subtracted from organizational emissions to determine net organizational emissions.

RECs are used to address indirect GHG emissions associated with purchased electricity (scope 2 emissions) by verifying use of zero-or low-emissions renewable sources of electricity. RECs are calculated in the larger, market-based scope 2 emission market, based on the emissions factor of the renewable generation conveyed with the REC.

The GHG Protocol states that for corporate reporting, RECs are generally referring to regional or local products being linked in some way to the physical transmission of electricity or some defined market boundary, whereas offsets are global fungible commodities with the same value for consumers in any part of the world.

There is no limit on the volume of RENW tokens available to buy or the basket of countries, provided they do not exceed the number of RENW tokens listed on the Platform.

Reneum plans to integrate a payment gateway to give parties a way to buy RENW using digital assets and eventually fiat money. At the initial stage, these digital assets include MATIC, WETH, USDT and USDC but this list may be modified from time to time by Reneum.

Gas fees in general are likely to be low since RENW tokens and Eisbaer NFTs are minted on Polygon and can be further optimized by reducing the frequency of mints across days or weeks. Reneum is exploring gasless transactions which may be implemented in a later phase.

"In energy markets, a given MWh of renewable energy generation can either produce energy attribute certificates or an offset credit (if certain criteria such as additionality are met), but could not produce both".

RECs VS OFFSETs

Both offsets and RECs represent the environmental benefits of certain actions that can help mitigate GHG emissions. Offsets represent a metric ton of emissions avoided or reduced; RECs represent attributes of 1MWh renewable electricity generation. Offsets and RECs, however, are fundamentally different instruments with different impacts, representing different criteria for qualification and crediting in the context of inventory or emissions footprint.

For corporate reporting, RECs are generally referring to regional or local products being linked in some way to the physical transmission of electricity or some defined market boundary, whereas offsets are global fungible commodities with the same value for consumers in any part of the world.

HOW RECs WORK

RECs embody the non-power attributes of one megawatt-hour (MWh) of underlying electricity. These attributes can be independently verified and, provided there is no local government mandate creating them and regulating them, or a bundled power-purchase agreement selling the power, irrefutably belong to the generator of that MWh. Attributes of a REC include, the source (technology) type, vintage (year) of MWh generation, the location and the time the MWh was generated.

The emissions factor (grams or pounds of CO_2 per MWh) is also an 'attribute' which can be verified as a fact. A 'grid emission factor' refers to a CO_2 emission factor (tCO_2/MWh) which will be associated with each unit of electricity provided by an electricity system. It is, for example, a parameter to determine the baseline emissions for Clean Development Mechanism (CDM) projects in the renewable energy sector (hydro, wind, solar PV and geothermal power) and waste heat/gas recovery sector. It refers to 'avoided emissions', meaning, by building or powering a renewable energy plant rather than a thermal plant, you are in fact, avoiding emissions.

Avoided emissions are something that are estimated by comparison to an assumed future, the business as usual (BAU) case. Avoided emissions are not facts measured at the generator and cannot be either calculated or independently verified without knowledge of a fixed BAU, which itself is an assumption or calculation. Therefore, REC attributes do not include avoided emissions and renewable energy projects should either be generating RECs or carbon offsets but not both.

RECs can be a flexible tool to help achieve clean energy goals, reduce scope 2 emissions associated with purchased thermal electricity and support the acceleration of the energy transition.

Though RECs are the essential accounting instrument required for all renewable energy usage claims, RECs can also be purchased separately from electricity and independently matched with electricity consumption.

This can be an attractive option for organizations in regions where renewable energy options, such as utility green pricing or utility green power, is not offered by local suppliers, where policy support for renewable energy projects is lacking, or where these other options are too expensive or not suited to the organizations size or needs.

RECs VS OFFSETs

According to the GHG Protocol, an offset project is "A specific activity or set of activities intended to reduce GHG emissions, increase the storage of carbon, or enhance GHG removals from the atmosphere."

The project must be deemed 'additional'; the resulting emissions reductions must be real, permanent and verified; and offsets issued for verified emissions reductions must be enforceable. The offset may be used to address direct and indirect emissions associated with an organization's operations (for example, emissions from a boiler used to heat your organization's office building).

The reduction in GHG emissions from one place can be used to offset the emissions taking place somewhere else. Offsets can be purchased by an organization to address its scope 1 and 3 emissions. Offsets can be used in addition to an organization taking actions within its own operational boundary to lower emissions.

Offsets are often used for meeting voluntary commitments to lower GHG emissions where it is not feasible to lower an organization's direct or indirect emissions.

KEY DIFFERENCES
BETWEEN RECs & OFFSETs

While both offsets and RECs can help an organization lower its emissions footprint, they are different instruments used for different purposes.

Think of offsets and RECs as two different tools in your sustainability tool box; they are not interchangeable. 'Avoided emissions', and 'emission reductions', are indeed, distinct.

INTERNATIONAL COMPLIANCE REC MARKET PRICES

FEATURES	RECs	OFFSETS
Unit of Measure	Physical Megawatt hours (MWh)	Metric tons of CO_2
Sources	Renewable energy producers	Any environmental project that avoids, reduces or sequesters GHG emissions in the atmosphere
Purpose	Demonstrate use of renewable energy generation; underscoring renewable energy use claims; expanding consumers clean energy choices; and supporting renewable energy development	Representing GHG emissions reduction; provide financial support for emission reduction activities, incentivizing new projects reducing emissions, and lowering costs of GHG emissions mitigation
GHG Reporting	Scope 2 emissions for companies purchasing electricity, reflected either retroactively or purchased in forwards	Scope 2 emissions for companies purchasing electricity, reflected either retroactively or purchased in forwards
Consumer Environmental Claims	Claiming renewable electricity from a low or zero emissions source	Claiming reductions or avoided GHG emissions outside organization's operations
Additionality Requirement	Not required	Required; project's earning credits to be sold as offsets must satisfy and additionality test to ensure it is beyond 'BAU'

HOW RECs HELP IN THE ENERGY TRANSITION

Renewable Energy Certificates act as bridge finance to new renewable developments or direct subsidies to capitalize existing operations. RECs are tools to help in the transition to net zero. By providing a secure revenue stream for project developers, they not only enable the bankability of project development but also send an attractive price signal to capital markets that fuels further investment into these regions.

Due to the systemic reduction in renewable energy technology costs, many governments are lifting their Feed-in-Tariff programs to support renewable producers, leaving them to fend for themselves while competing against highly subsidized fossil fuel incumbents.

Despite being cheaper and cleaner, renewable energy deployment is slowed down by these fossil fuel subsidies and by fossil fuel vested interest. A buoyant REC market can unleash the potential of emerging and developed markets, and in the case of emerging markets in particular, prioritizing the certification of RECs for renewable energy projects there can significantly ramp-up renewable energy deployment.

RECs are a reliable source of immediate income which the renewable energy company can reinvest directly into expanding their portfolio, allowing them to accelerate deployment and overcome the hurdle of upfront financing

With enough RECs driving more finance to renewable energy, fossil fuel plants will eventually close; expensive, polluting and no longer needed.

WHO IS A REC FOR?

Other than conserving energy and upgrading energy efficiency to reduce GHG emissions, these scope 2 entities can switch to low-carbon electricity generated by renewable sources, whether through on-site installations or through energy products purchased. An electricity tracking and certification framework, such as that surrounding the issuance of RECs, can be a powerful instrument to promote the acquisition of low-carbon electricity by Scope 2 users.

REC schemes allow for transparency in the market on who consumes energy from what source or specific power plant. Without a mechanism such a REC, it would be impossible to link energy production with energy consumption unless the renewable energy is being consumed directly. In the traditional REC market, market stakeholders include: the renewable energy project owner (the supplier of RECs); the end-user or beneficiary (who will most likely be a corporate entity with a renewable energy consumption target); and verifiers and brokers acting as intermediaries to facilitate the certification, issuance and trading of RECs. The (frequently multiple) intermediaries take healthy cuts and operate with opaque pricing, thus allowing little value to accrue to the underlying renewable project developers.

In an ideal (transparent) ecosystem that publicizes pricing and transaction history, the primary stakeholders would be the renewable energy project earning additional revenues via the RECs for producing clean energy; the buyers purchasing RECs to green their energy footprint or to help accelerate renewable energy deployment; and an automated marketplace facilitating transactions with unambiguous pricing.

2.0 MEASUREMENT REPORTING & VERIFICATION

HOW IS RENEUM'S STANDARD DIFFERENT?

GREENHOUSE GAS REPORTING

Reneum is a standard for reliably and robustly implementing an attribute issuance, tracking and trading system. Intending to establish a truly global mechanism, it is not limited to a specific type of renewable energy, nor to a specific geography.

When a certified project is verified to have produced a MWh, Reneum issues them with a RENW token that represents the non-power attributes of that MWh - a digital REC. Buyers in the Reneum marketplace choose to fund projects by buying these live digital RECs. Then they are bundled together and retired, and a verified green receipt in the form of an Eisbaer NFT is given to the buyer as proof of their contribution.

Like other RECs, Reneum's NFTs (called Eisbaers) have unique identification data immutably coded into them and supplementary data accessible through the marketplace, showing the following characteristics:

- Source of electricity
- Date when the MWh was produced
- Identity, location (GPS reference), and country of provenance
- Type and capacity of the production facility
- Whether and to what extent the installation has benefited from outside support
- Date when the installation became operational
- Historical trades of either offsets or RECs

Though Eisbaers share many of the same characteristics of and are based on the same principles as existing RECs, they are different in a number of important ways:

- There will be no central issuing authority such as a government, delegated agency or private organization
- Reneum is not explicitly linked to a specific regulatory regime

- There is no central registry; instead Reneum tokens are created, stored, sold and retired by 'burning' them on the blockchain
- Reneum is international; Eisbaers can be created anywhere in the world by projects that meet the basic eligibility criteria, and used anywhere in the world to demonstrate compliance with voluntary commitments

	TRADITIONAL RECs	EISBAER NFT RECs
Unique Identification Number	Yes	Yes
Double Counting Prevention	Yes	Yes
Rigorous Eligibility Criteria	Yes	Yes
Independent Auditing	Yes	Yes
International Tradability	No	Yes
Central Regulator	No	Yes
Central Trading/Pricing Mechanism	Yes	No

RENW AND EISBAERS AS A DIGITAL UPGRADE TO RECS

Historically traded as a commodity over-the-counter (OTC) via multiple intermediaries and protracted negotiations, the RENW (representing an unretired REC) and the associated Reneum Eisbaer NFT (representing a retired REC) deviate from market standards in many ways. Leveraging the blockchain to transcend the technological limitations of the REC market, Reneum allows for:

- Smart contracts to direct capital to those who need it most, acting like a targeted stimulus package

- Disintermediation of brokers and traders to reduce costs and transaction times and increase price transparency

- Disintermediation of siloed and non-interoperable platforms, radically upgrading the user experience

- Aggregation of RECs on a single public marketplace, allowing anyone to purchase unrestricted by geographical boundaries, finally democratizing the market

- Open-source software to enable automated certification and eventually dis-intermediating the certifiers to help reach mass adoption and scale, truly accelerating the democratization of the market

- Real price discovery based on true market value rather than artificial OTC constraints or predatory broker pricing

	TRADITIONAL RECs	EISBAER NFT RECs
Transaction Process	Purchased OTC via brokers requiring complex and lengthy contract negotiations, via multiple intermediaries and iterations	RENW can be purchased on the marketplace, but also are enabled for off market and bespoke solutions for ease of use
User Experience	RECs are only available via analogue UX systems that are opaque, cumbersome and outdated for digital natives (more like Web1 than Web3)	Reneum was designed following dozens of market interviews to understand the true needs of the market. It is entirely digitally-native and is designed for transparency and simplicity
REC Issuance	Layers of centralized bureaucracy, regional restrictions, and compliance processes lead to delays	RENW are issued to projects automatically once certification takes place, based on algorithmically-programmed smart contracts
Transparency	RECs are transacted on private registries with no interoperability or public ledger access, meaning the risk of double counting via other registries is high	All RENW transactions are listed on our public marketplace ledger for complete transparency and all NFTs issued upon burning of RENW include full proof-of-provenance
Project Certification	Verification and certification are cost prohibitive, along with being geographically limited, prohibiting most emerging markets from participation	Verification is done via online monitoring and satellite imagery, combined with un-falsifiable documentation and random site visits, expediting the certification and enabling a truly global market

The benefits of a blockchain-based REC registry rather than a standard online database are as follows:

- *Automated transaction capabilities*: Smart contracts are digitally self-executing contracts based on a set of predefined parameters ('if this, then that' criteria). This facilitates a seamless exchange system unhindered by bottlenecks such as regional compliance and data verification processes, thereby streamlining processes and minimizing transaction fees.

- *Immutability and verification*: The immutability of the data provides for an easily-auditable history of transactions that are relevant for government reporting and data integrity.

- *Decentralization and disintermediation*: Blockchain facilitates a global marketplace in an industry that has traditionally been localized.

- *Data security*: Blockchain's distributed ledger technology is unique in its ability to provide transparent, accurate and immutable data monitoring and reporting. Blockchain is unparalleled in its data security and transparency of protocol as all transactions are publicly available and verifiable to any third-party.

RENEUM ELIGIBLITY

As outlined above, there are fundamental and globally-accepted conditions for a renewable energy project to be issued a REC. The same conditions are applied to Reneum token issuance as well. Specifically, in order for a project to receive RENW tokens, it must:

Produce 100% renewable power from an eligible source. Eligible sources include: solar (PV and concentrated solar thermal), wind (onshore and offshore), geothermal and micro-hydro.

Currently receive no other RECs or any type of financial instrument that represents a property right to its non-power attributes OR cancel any other instrument(s) that it receives.

Currently receive no carbon credits associated with the emissions reduced compared to a fossil fuel alternative.

Not have a Power Purchase Agreement (PPA) with a third-party that includes/bundles non-power attributes.

In some countries, governments are entitled to a portion of the non-power attributes, so each project needs to undergo a regional and local assessment to demonstrate ownership. Similarly, in regions where Renewable Portfolio Standards (RPS) regulations exist, projects must be assessed for the portion of non-power attributes owned and therefore eligibility to be monetized by RENW.

Provide all project documentation including single line diagrams, historical meter readings, previous offset or REC trade history, PPAs and off-taker invoicing.

Be open to periodic spot audits to test the project's credentials, REC issuance and generation claims.

Be in a country where less than 80% of the electricity generated is supplied by renewable energy.

DOUBLE-COUNTING

A global and robust REC scheme prevents multiple environmental claims from being made on the same MWh of clean energy. Without a clear mechanism in place to make claims, one single MWh can be easily counted (and sold) multiple times by, for example, claiming the national grid average, claiming based upon power contracts or claiming based upon geographic proximity to the plant.

Many governments — national and local — and a number of voluntary programs have established energy REC schemes to enable energy producers, suppliers and/or users to demonstrate compliance with renewable energy obligations or commitments. These are of differing quality and integrity ranging from high, in the case of compliance programs, to low or non-existent, in the case of voluntary ones. Examples include:

RECs: In the USA, Renewable Energy Certificates (RECs), also known as Green tags, Renewable Energy Credits or Tradable Renewable Certificates (TRCs),

are used as proof that 1MWh of electricity was generated from an eligible renewable source and fed into the grid. RECs can be used by utilities to demonstrate compliance with an RPS (a state-level requirement in 29 states) or by parties to meet voluntary energy greening commitments.

ROCs: In the UK the Renewables Obligation (RO) requires licensed electricity suppliers to provide an increasing proportion of electricity supplied from renewable sources. To meet their obligations, suppliers must present sufficient Renewable Obligation Certificates (ROCs) to the regulator, which they can acquire from generators producing eligible renewable power within the UK. Each ROC represents 1MWh of electricity generated (although some technologies may be rewarded with more ROCs, for example offshore wind receives two ROCs per MWh). The RO closed for new projects in 2017.

GUARANTEES OF ORIGIN: In the E.U., Guarantees of Origin (GOs) and RECs fulfill the same function to demonstrate that electricity has been generated from renewable sources, with each GO representing 1MWh of renewable electricity, and are of the same quality. GOs are issued by E.U. governments and are recognized in all E.U. Member States, while RECs are issued by energy companies and are not accepted by all countries. Like RECs and ROCs, GOs are tradable and can be used by companies to meet energy greening commitments.

To avoid double counting of the non-power attributes of renewable electricity, projects are only entitled to receive one REC for each MWh of renewable electricity generated. Therefore, any project wishing to receive RENW must not also be receiving RECs from any other source, whether regulated (compliance-based),or voluntary. If a project is receiving RECs from another scheme but wishes to receive RENW it must cancel all other RECs.

Reneum modulates the above criteria via the following mechanisms:

1. Projects are contractually obliged to notify Reneum in advance of registration of any credit registration or sales via third-party registries from any form of environmental credits, including carbon offsets. Reneum will only issue tokens to projects for periods that have not already been certified by other registries or standards.

2. The Reneum marketplace is unique in that it lists transaction history and project data on its public dashboard, meaning any stakeholder may cross-reference Reneum's transaction feed to prevent double counting (double dipping).

3. Any double dippers will be disqualified and immediately terminated from Reneum, their unsold past and presently outstanding tokens will be cancelled (burned by Reneum) and a public statement will be made so other registries may take similar actions.

4. RENW tokens embody all the non-power attributes of a project, including the reduction of GHG emissions below the most likely alternative source of power in its location. Therefore, as is the case with projects that receive other RECs (per above), a project that receives carbon credits for reducing GHG emissions — whether in a regulated or voluntary carbon market — cannot also receive RENW.

Provided that the provision of this support does not confer on the providing authority (or any other entity) rights over the environmental or other non-power attributes (and, as above, the project receives no other RECs), all projects receiving such support are eligible to receive RENW tokens.

NATIONAL RENEWABLE ENERGY TARGETS AND NDCs

One of the challenges facing internationally tradable RECs, including RENW tokens, is that the non-power attributes they represent — GHG emissions reductions, etc. — may be counted by more than one country or jurisdiction towards their respective renewable energy production or emission reduction targets even if the strict rules aimed at preventing double issuance laid out above are observed.

For example, the government of the country in which a given renewable power project is located ('the seller's country') is likely to include its output in national power statistics and its greenhouse gas inventory will reflect the (zero) emissions associated with the project.

At the same time, in using them to demonstrate compliance with its own mandated or voluntary commitments in a second country ('the buyer's country'), the purchase of RECs may lead to them to being counted as cutting net emissions from this second country's greenhouse gas inventory and/or adding to its net renewable energy output. In such a scenario, the non-power attributes of the project would be counted twice..

Despite this hypothetical scenario, we believe that, provided the rules preventing double counting of RECs are followed (see above), this is unlikely to be a problem in reality. This is because:

a) RENW tokens are not designed to demonstrate compliance with GHG emissions obligations.
b) Currently no country allows RECs from other countries — or overseas power generation in general — to count towards its national renewable energy targets.

RECs & ADDITIONALITY

c) RENW tokens are designed to increase renewable energy capacity deployment rates and as such are designed to help a country meet its renewable energy target[1].

d) As a non-government initiative, Reneum aims to increase the ambition and action of non-state actors by mobilizing corporate demand and opening up market segments that are currently not supported by domestic REC systems.

e) We encourage buyers to use RENW tokens to green for their energy footprint in the same jurisdiction (if possible) in which the project being issued RENW tokens is located, or failing that, in the same region, and to state this in their corporate reporting.

f) Companies facing mandated renewable energy obligations in one country — usually electricity suppliers — are not permitted to use RECs issued elsewhere to demonstrate compliance.

Additionality is a criterion used in carbon markets to determine whether the GHG emissions reduction achieved by a project would have occurred without the existence of carbon finance or a carbon market. To qualify as a genuine carbon offset, the reductions achieved by a project need to be 'additional' to what would have happened if the project had not been carried out (or continued as BAU).

Carbon credits are intended to be only awarded to activities that would not have happened otherwise or are *additional* to the base case scenario. The Kyoto Protocol established three tests which a project can use to demonstrate its additionality: (1) Barrier test, (2) First-of-its-Kind test, 3) Financial Additionality test. These in turn have been adopted or modified by other voluntary and compliance schemes[2].

Within the energy community, IRENA defines a renewable energy project as being additional if:

"*The net incremental renewable capacity deployed or renewable energy generated as a direct result of corporate sourcing of renewable energy is beyond what would occur in its absence.*"

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[1]Many countries spell out relative or absolute renewable energy targets in their National Determined Contributions. Developing countries, in particular, often further specify that meeting their targets is conditional on external support and/or investment.

[2]A list of the additionality requirements of various carbon market systems is shown in the appendix.

Reneum supports IRENA's recommendations for renewable-backed RECs. Reneum is designed to encourage the development of new renewable power projects by accelerating the pace of renewable energy deployment.

Reneum therefore exists to support the accelerated deployment of additional renewable energy projects that would not otherwise happen. At the project level, however, there is no requirement for projects looking to receive Reneum to demonstrate additionality explicitly. This is because:

a) Renewable energy deployment is still far short of its potential and the levels required — 60% by 2030 — to meet agreed GHG emissions reduction targets.

b) Renewable energy projects are still disadvantaged with respect to fossil fuel alternatives in many countries with fossil fuel subsidies deeply embedded in public spending budgets.

c) In almost all cases, RENW tokens will be issued in countries that do not have compliance energy greening targets for producers, suppliers or consumers.

d) Achievement of the climate targets that countries set out in their Nationally Determined Contributions under the Paris Agreement often depends on external finance to deliver the investment roadmaps desired. Reneum is intended to increase a project's revenue stream which will in consequence increase its bankability and hence attract finance. The renewable energy community in most countries still has no other means to bring their non-power attributes to market.

Though additionality is not technically required for RECs, Reneum undertakes the following best practices to ensure it presents the most material impact to renewable energy deployment:

1. Recommending buyers to purchase RECs from new projects.

2. Prioritizing project registration in under-developed or less structured markets.

3. Working with utilities to create green tariff options that bundle energy with the associated RECs.

4. Working with buyers and financial intermediaries to improve project bankability by accepting Reneum cashflows.

5. Issuing RENW only to projects that do not receive other certificates or tokens that embody their non-power attributes.

6. Closely following accounting requirements as are emerging under the Paris Agreement to prevent double counting of results in more than one country.

REGISTRATION & ONBOARDING

REGISTRATION PROCESS

PROJECT VERIFICATION PROCESS

Reneum abides by industry best practices regarding certification requirements. Reneum's certification methodology is based on internationally-recognized certification processes, qualified by both CDM and IRENA for REC validation requirements.

Prior to registration to Reneum, a project undergoes a detailed diligence process which includes a site evaluation. Reneum validates project legitimacy via satellite imagery, publicly available meter readings, PPAs and assessment of historical crediting via other standards. In countries where generation data is publicly available, a project's existence and history will be confirmed through the local regulator's website.

The certification process validates all of the following criteria:

1. The project is currently generating clean energy as per the eligibility requirements.

2. Satellite imagery validates project location and estimates potential output.

3. Energy produced is verified via six-month historical meter readings.

4. End consumption of power is not relevant for Reneum, but the project must produce its PPA or Off-Take Agreement to evidence Non-Power Attribute ownership.

5. All projects must contractually commit to no double counting.

6. Projects must produce any historical carbon or REC certification or transaction history

7. Projects must share plant schematics and monitoring systems for online integration.

8. Projects are connected to Reneum via an API SCADA connection to transmit live generation data, preventing any meter tampering or data adjustment, as is best practice. In addition, Reneum is exploring the feasibility of IOT integration devices for projects unable to provide API access.

9. In countries where generation data is publicly available, a project's existence and history will be confirmed through the local regulator's website.

Following project verification and connection to the platform, Reneum conducts spot audits of generation data by reconciling meter readings with Reneum's accrued inventory to ensure projects are credited for the precise number of MWh generated. Finally, periodic third-party reviews conducted by *independent* auditors through a blockchain-specific attestation service will be undertaken in order to offer an additional layer of data integrity.

REGISTRATION PROCESS

The process for registering a project to receive Reneum tokens is as follows:

1. A project will apply for certification via the online Reneum platform, where they will be prompted to register for an account. The initial account creation process is the initiation of the application and requires only basic account credentials, including company name, project owner name, country and contact details. The platform Terms and Conditions will be displayed at this stage as a required click-through to create an account.

2. Reneum's commercial team will then contact the project to arrange an introductory meeting to discuss the project's previous experience in the REC market, the Reneum ecosystem and commercial expectations.

3. Once projects agree in principle to join the system, they will be prompted to complete the fields detailed in a Site Assessment Questionnaire (see below) in their online account to help the Reneum Client Relations team initiate the project assessment. All data will be stored in the project's online account for data security purposes.

4. A follow-up meeting will be held between the project's operations / technical team and the Reneum team to evaluate connectivity options as per the Connection Process defined below. At this point, the two teams will jointly identify the optimal method of connection and documentation required will be adjusted according to this outcome.

5. The project owner will then be prompted to upload their specified key documentation about the site specifications and generation data for Reneum to evaluate. This usually requires the collaboration of multiple individuals at the project site, as the initial commercial team evaluating the Reneum proposal may not be physically on site with the operations team managing meters or SCADAs.

6. In the event the project requires an additional meter or IOT device to be integrated, our team will handle the purchasing and distribution of the meter and will support the project site manager to install it at a local level.

7. Testing of any of the connectivity options will commence which will take up to two weeks depending on meter / SCADA components.

8. Once integration has been finalized on the platform, the project's commercial lead will be prompted to complete the token sale terms, referred to as a SAFT (Simple Agreement for Future Tokens), which allows Reneum to represent the project in token sales and facilitate token transactions.

9. The project owner will then be required to integrate either their individually-custodied cryptocurrency wallet or their bank account, to enable automatic deposits from token sales. projects will have the option to select payment in fiat currency or cryptocurrency.

10. Following the formal connection to the platform, the project's generation data will appear on both the public Reneum marketplace (revealing the amount of tokens available for sale, the year of issuance (vintage) and country) and also in their private online account. The private account will detail all transaction history of the tokens.

REGISTRATION PROCESS

1. *Online registration*: to be completed upon agreement to join Reneum which includes the Terms & Conditions detailing the policies and procedures of the platform.

2. *Project site assessment*: to be completed following initial application and account registration, detailing site-level project details.

3. *Project documentation*:
   1. Single line diagram
   2. Six-month historical generation data
   3. Power-Purchase Agreement of off-take contract (if not confidential)
   4. Net exported energy invoices
   5. Meter or SCADA monitoring information

4. *Token sale agreement*: acknowledging the release of tokens to Reneum to sell on the marketplace and agreeing to payment terms.

PROJECT SITE ASSESSMENT

Applicant Details	
Applicant Legal Name	
Registered Address	
Year of Registration	
Legal Status	Registered corporate/Public sector entity/Private individual/Other (please state)
Country of Company	

Primary Contact Details	Name/position/email/telephone no.
Authorized Signatory	Name/position/email/telephone no.
Project Details	
Project Name	Official name
Location	Google coordinates and full address
Project Type	Solar PV/CSP/Mini Hydro/Geothermal/Wind/Tidal/Wave etc
Nameplate Capacity	Supporting document
Commissioning Date	Supporting document (if phased please add dates for commissioning of different phases)
Offtaker	Supporting document
Single Line Diagram	Power plant single line diagram in PDF
Grid	Grid that the power is exported to/If no grid then direct sale to an onsite customer then should be noted here
What types of Meters are used	Export/Import meter – utility owned Meters used to measure plant energy exported to grid
Average Capacity Factor	%
Average auxiliary or import electricity	% of generation
Details of any environmental commodity schemes registered for	CDM/VCS/GS/IREC/Other If so generation dates (monitoring period) covered

History Data Last 6 Month	Daily or Monthly Energy exported to grid, Auxiliary consumption monthly in Excel
Control Network Diagram	Control network diagram to be supplied in PDF
Plant Internet	Plant internet configuration details

FEES TO PARTICIPATE

No upfront charges apply to the project to join Reneum. Reneum will cover the cost of the site inspection, as well as any necessary meter upgrades. Reneum will however take a 10% platform fee from all issued tokens following registration to cover operational costs.

PROJECT CONNECTION PROCESS

CONNECTING PROJECTS TO RENEUM

Reneum endeavors to establish an un-tamperable off-chain-to-on-chain data conversion system, though it is technically constrained by the infrastructure available at the local level of each renewable project.

Reneum prioritizes projects to join the platform who operate an online SCADA system or who are prepared to install a pre-configured IOT device to ensure automatic connectivity. Occasionally, this process is interrupted by technical complexities, in which case, MWh may be monitored via energy exported invoicing with tokens credited based on publicly available meter readings. Reneum is currently partnering with a large SCADA solution provider to create a bespoke IOT device to enable its automated onboarding process as defined in the White Paper. Following the conclusion of this technical development, all project monitoring will occur via the same architecture.

Until this bespoke IOT device is established, Reneum will be primarily connecting projects to the platform via energy SCADAs. Reneum leverages these existing networks by transmitting key data points from the project's existing SCADA network into the Reneum admin panel where it monitors MWh generated in real-time.

To achieve a fast and smooth data integration between the local SCADA and the Reneum server, protocol toolkits are provided by Reneum outlining connection options. SCADA systems have several built-in types of connections to provide data to third-party software systems like Reneum, via one of:

- OPC Server

- FTP push

- Web services server for Real time, Alarms and Historical data.

- Modbus TCP/IP Slave

- REST API server

Once the appropriate connection is established, data is fetched hourly and pushed to the Reneum off-chain database and also on-chain via a decentralized file storage for data integrity checks. The back-end administrative panel storing the project data is built via a combination of smart contract-based on-chain data, structured SQL and unstructured NoSQL off-chain databases. Data includes amount of electricity produced (in MWh), source type, project location and time stamps. The IPFS hash of the relevant data will be referenced on the smart contract for provenance.

Immutable and fixed data like the project's name, country, vintage, SDG goals, smart-meter or SCADA ID and source type, will be stored directly on-chain. Additional data including the downloadable audit reports conducted by Reneum, project data including power purchase agreements, historical meter readings and dynamic satellite imagery, will all be stored in IPFS files and available for Buyers as downloadable reports once tokens are transferred.

Following the Phase I marketplace launch, a web-based control panel will be activated for configurable settings in smart contracts. To migrate towards a decentralized monitoring system, Reneum is also exploring the application of smart contract oracles to aggregate data directly from project meters and SCADAs. This development will likely occur in Phase II of the platform.

TOKEN ISSUANCE PROCESS

Once the project has satisfied the data validation and verification phase, it will be onboarded to the Reneum monitoring system. The system fetches on-demand MWh generation data from the project site, aggregates and reconciles on the back-end, and then validates values before agreeing to commit on-chain.

Any discrepancies in data will be flagged to the Reneum admin portal immediately and the transaction will be temporarily halted until manually reviewed. Once the system agrees to the MWh values, it uses a pre-programmed if-then-based smart contract to issue RENW tokens to the project's account, ready to be sold. Project onboarding documentation is also stored via an IPFS file off-chain, which can be assessed by the purchaser of the token.

PROJECT MONITORING

Due to the significant penalties associated with project-level data manipulation and double counting, bad actors are likely to be deterred. However, to ensure a robust and reliable platform, Reneum will engage a manual attestation service to conduct periodic spot checks. They will audit select projects and conduct data manual reconciliation and background checks on each project reviewed.

RENEUM CERTIFICATION
METHODOLOGY
Ver 1.0