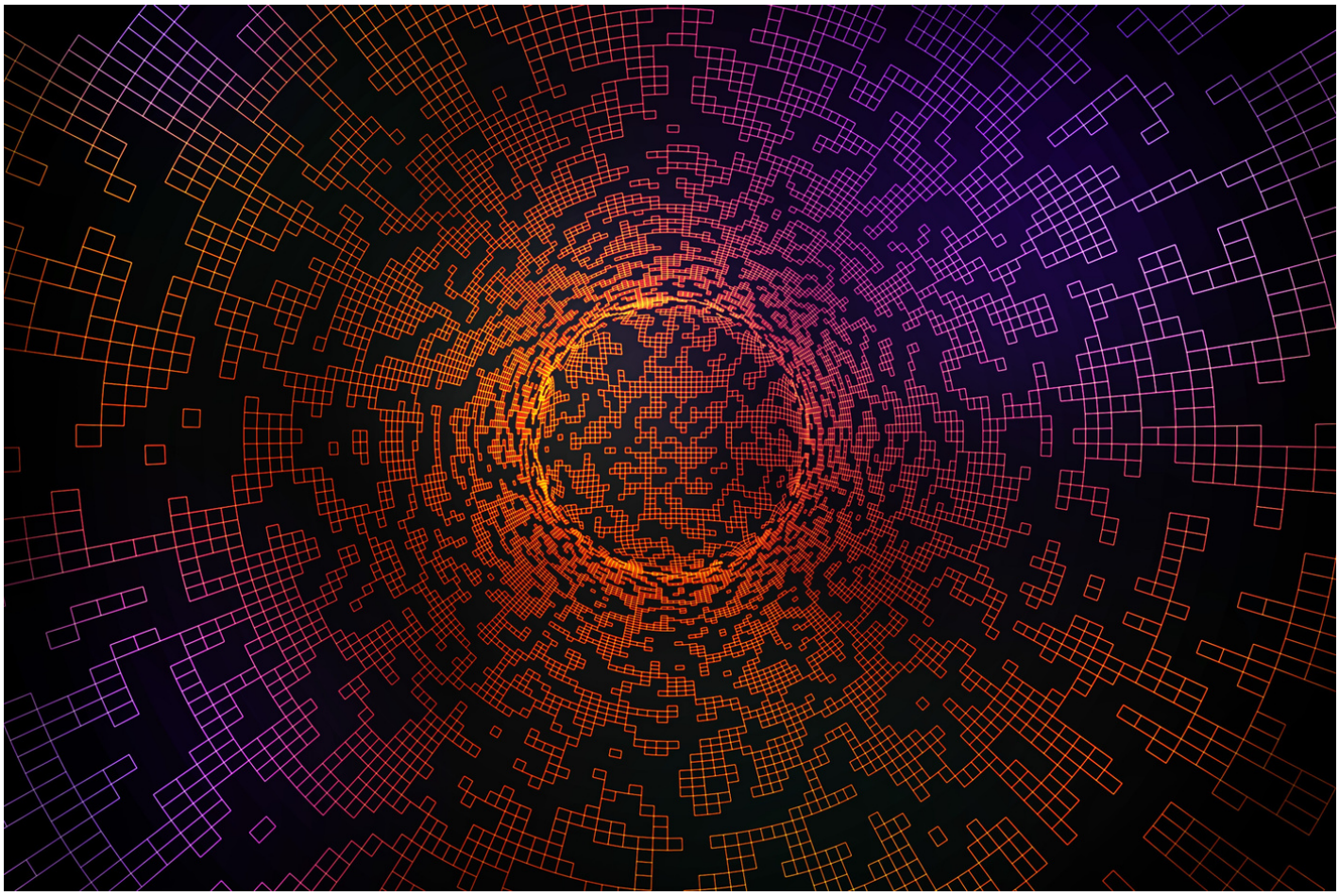
Approach to Quantify Net Material Emissions Impact of Renewable Energy Purchases



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Why is the Renewable Energy (RE) Emissions Score Needed?

RE Procurement Evaluation

Renewable energy (RE) is a key pillar in the global energy transition to mitigate climate change. Recent publications such as IRENA's World Energy Transitions Outlook: 1.5C Pathway and the IPCC Sixth Assessment Report emphasize the need for increased investment in renewable energy assets. Science Based Targets initiative estimates that to stay within a 1.5° C Pathway, the power sector needs to be net-zero by 2040. Renewable energy procurement must drive this change by creating the demand for additional renewable energy generation.

Renewable Energy purchased to make environmental claims must have a measurable, quantitative impact to drive increased renewable generation capacity. Today, corporate actors can purchase RE in several ways but there is no existing market structure that allows actors to understand their net emissions impact. Furthermore, renewable energy procurement and investment must be anchored in the purpose of reducing emissions as much as possible. Electricity usage in low carbon grids should be prioritized, while new investment should focus on adding renewable energy to grids that currently have high emissions. By prioritizing further investment and grid dynamics, renewable energy procurement can help accelerate widespread decarbonization and enact real change.

Current RE Procurement Practices

There are a variety of different ways in which companies buy and use renewable energy, and each can have different impacts on electricity grid emissions. Procurement options range from self-generation to power purchase agreements (PPAs), green electricity products from a utility, and unbundled energy attribute certificates (Unbundled EACs). Some of these options are more effective than others when it comes to driving an increase in renewable energy capacity. For example, buying renewable energy from a utility that operates on a grid that already has a high percentage of renewables may signal increasing consumer demand for renewable energy, but fails to translate to an actual increase in renewable capacity. On the other hand, self-generation through a new renewable generation project owned by the consumer has a clear, direct material impact. To have positive material impact, procurement should reduce absolute carbon output and add new RE capacity to the grid, rather than just shifting the emissions 'attribution' to someone else and taking up existing supply.

Renewable energy procurement is tracked and reported using EACs. Regardless of how a consumer purchases renewable energy, they must own these certificates in order to make a renewable energy claim. The flaw in this system is that "all certificates are equal in the eyes of GHG accounting" – they do not show the context of renewable energy procurement or measure the level of material impact that actually occurred. This makes it possible for an organization to make an environmental claim despite choosing a

procurement action that does not provide enough funding for new projects and may not lower emissions absolutely.

Today, corporate actors report their GHG emissions using market-based reporting (using certificates to account for a given volume of emissions) and location-based reporting (using localized emissions factors to determine consumption). The practice of using market and location-based reporting mechanisms is sound and should continue. However, a data-driven comparison of the impact of market-based procurement to the induced emissions from location-based practices is necessary to evaluate material impact given that all certificates are created equal. RMI's proposed quantitative approach compares market and location-based reporting practices to compare the material impact of renewable procurement to purchased electricity.

As a result, organizations with ambitions to drive the electricity sector toward cleaner, renewable energy must go beyond traditional corporate GHG accounting. Current approaches to evaluate renewable energy procurement rely on qualitative measurements of different procurement mechanisms. The RE Emissions Score approach offers a groundbreaking quantitative approach to measure the impact of renewable energy procurement, by measuring the extent of investment possible from purchases.

Who Should Use the RE Emissions Score Approach?

The RE Emissions Score Approach is designed to measure the impact of renewable energy procurement, allowing the approach to be used by any party currently involved in purchasing renewable electricity. Examples of electricity customers who may use the RE Emissions Score include, but are not limited to, cryptocurrency miners, data centers, manufacturing facilities, and commercial real estate owners.

The RE Emissions Score is useful for all organizations making electricity purchases – particularly those who purchase (or wish to purchase) large amounts of renewable energy that would fall under Scope 2 emissions in GHG accounting by measuring the impact level their procurement has on emissions and the energy transition.

The RE Emissions Score is sector-agnostic but is especially useful for energy customers that use large amounts of power and have flexibility about where to deploy this load. The RE Emissions Score allows them to prove their energy usage is providing a net benefit to electricity grids, a distinct benefit lacking from other more qualitative approaches.

The RE Emissions Score may also be useful for third-party environmental auditors or in-house sustainability reporters who wish to evaluate the impact of companies making renewable electricity purchases.

What is the RE Emissions Score?

Renewable Energy Score is a composite score, represented by the percentage of Weighted Avoided Emissions (defined as the renewable energy purchased multiplied by the marginal emissions factor of the location of that renewable energy), relative to the Total Induced Emissions (defined as the total electricity purchases multiplied by the marginal emissions factor of the location of that power usage). The avoided emissions are weighted with a procurement factor, derived from the cost of EAC (Energy Attribute Certificates) as a percentage of the LCOE (levelized cost of electricity).

$$RE_{score} = \%\ of\ \frac{Weighted\ Avoided\ Emissions}{Total\ Induced\ Emissions}$$

How is the RE Emissions Score Calculated?

$$RE_{score} = \%\ of\ \frac{\sum_{i=1}^{n} PF_i \times RE_i \times ME_i}{\sum_{j=1}^{m} E_j \times ME_j}$$

Where:

RE_{Score} = Renewable Energy Score (%)

PF_i = Procurement Factor for the i^{th} renewable energy procurement method *(price of EAC ($)/MWh)/ (LCOE ($)/MWh)*

RE_i = Electricity purchase for the i^{th} renewable energy procurement method *(MWh)*

ME_i = Marginal emission factor for the i^{th} renewable energy procurement method *($MtCO_2e/MWh$)*

E_j = Electricity purchase for the j^{th} energy use method (MWh)

ME_j = Marginal emission factor for the j^{th} energy use method *($MtCO_2e/MWh$)*

n = The number of renewable energy procurement methods considered

m = The number of energy usage methods considered

Power Consumption is Defined as:
All purchased or acquired electricity

Renewable Energy is Defined as:

- Geothermal
- Hydropower
- Wind
- Solar
- Sustainable Biomass as defined by ISO 13065:2015

Claims for renewable energy usage require the usage of EACs or equivalent contractual instruments, except in areas of >95% renewable grid power where no such mechanism exists.

Accepted Procurement Mechanisms Outside of These Grids are:

- Self-generation owned by the company
- Purchase from on-site installations owned by a supplier
- Direct line to off-site generator with no grid transfers
- PPAs (Power Purchase Agreement) and VPPAs (Virtual Power Purchase Agreement)
- Green electricity products from energy supplier or utility (e.g. Green Tariff)
- Unbundled EACs (e.g. RECs, GOs, I-RECs, etc.)
- Default renewable energy from the grid, supported by EACs

Procurement Factor (PF_i) **:**

$$\frac{price\ of\ EAC}{LCOE}$$

The procurement factor, a ratio of the price of EAC to the LCOE for a given project, is designed to ensure that renewable energy purchases by companies are contributing to the creation of new, renewable energy generation. Without this consideration, loads from companies could crowd out existing renewables and contribute to a more carbon-intensive grid mix. By weighting the procured renewable energy, we incentivize the purchase of EACs in a way that demonstrates material impact and helps finance low-cost renewables.

This attempt to define impactful procurement in a quantitative manner represents a break from earlier qualitative approaches. With feedback, the procurement factor calculation is likely to be refined to correctly value the cost of power compared to the cost of new renewable energy generation. This could include the cost of electricity in the case of bundled certificates, such as in a Power Purchase Agreement.

When the certificates are purchased unconnected to the purchasing of power, such as an unbundled EAC, the cost of electricity would not factor into new generation, and so would not be a relevant component of the procurement factor.

Renewable Energy Purchases (RE_i)**:**
Renewable energy purchases must be proven with the use of retired EACs. For each EAC retired, a company can claim 1 MWh of renewable electricity to be counted towards their certification. EACs are the accepted market-based instrument that represent the property rights to the environmental attributes of renewable energy generation.

Marginal Emissions Factors (ME_i) + (ME_j)**:**
Marginal emissions factors refer to the rate at which emissions would change with a small addition to electricity load. This is determined by understanding what power source an additional load on the grid would come from. In areas with robust, flexible renewables the marginal emissions rate will be low. In areas that require fossil fuel generation to make up the difference, or are dominated by fossil fuel generation, marginal emissions rates are high. The use of the marginal emissions factors – as opposed to generalized, average emissions factors – is crucial for creating an accurate picture of consumption emissions impact. Companies are incentivized to use electricity from clean, robust grids, while sourcing renewables from areas that need further renewable investment by weighting the score on a ratio of marginal emissions factors.

Electricity Purchases (E_j)**:**
Electricity purchases refer to all purchased or acquired electricity. This includes all electricity used by companies to power operations, including purchased electricity, self-generation, and electricity used by data centers that companies lease equipment to.

Why is the RE Emissions Score Calculated This Way?

Material Impact
The approach is based upon the concept that renewable energy procurement must be "materially impactful" in order to lower total emissions and advance the energy transition. "Materially impactful" procurement refers to procurement with the effect of a net emissions reduction, by re-locating operations or funding new renewable assets to cover energy usage. The RE Emissions Score developed by RMI's Climate Intelligence Program is an approach devised to measure this impact in a quantitative manner. The score's ultimate market goal is achieved through a combination of marginal emission factors and procurement factors, with a clear ranking of procurement mechanisms that offer the greatest emissions reduction opportunities.

The use of marginal emissions shows the effect of a change in load to an electricity grid, thereby showing the induced or avoided emissions of a company's activities. The score relies on this ratio of avoided to induced emissions. A greater score is achieved by locating operations in an area of low marginal emissions and procuring renewables in areas of higher marginal emissions. This creates an incentive to drive broad grid decarbonization by directing investment towards renewable energy development in areas that are currently lagging. The procurement factor is a measure of how likely renewable energy is to add more generation to a grid. The procurement factor is obtained by a ratio of the cost of a renewable EAC over the LCOE, with a higher score relying on EACs that are more likely to finance new projects. This creates an incentive to purchase EACs from renewables with a low LCOE.

Time-Dependent Procurement

Hourly load matching has become a leading practice in corporate renewable energy procurement. This approach allows the measurement of more impactful time-dependent procurement. Marginal emissions rates change throughout the day, month, and year. Electricity usage and renewable energy procurement should be timed to match these grid dynamics. Electricity usage during times of renewable curtailment (when generation is high) causes low induced emissions. Renewable energy procurement during times of low renewable energy generation, when marginal emissions are high, avoids greater emissions. Whether calculated on an annualized or hourly basis, this approach will demonstrate material impact.

At a minimum, calculations should be made on an annual basis. More granular calculations on a monthly or hourly basis are recommended if that data is available. Power usage during renewable curtailment for instance, would create no induced emissions. Matching power usage and procurement to the grid's needs will result in a higher RE Emissions Score.

For more information or calculation guidance contact Samuel Huestis, shuestis@rmi.org or Charles Cannon, ccannon@rmi.org.