

INTEGRATING A DECADE OF LEARNING IN VOLUNTARY LOW-CARBON ENERGY MARKETS

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Setting the scene

Energy decarbonization continues to be the most urgent solution to limit global heating. Low-carbon power capacity additions have slowed since 2024, yet the International Energy Agency (IEA) predicts that global renewable power capacity will reach 2.6 times its 2022 level in 2030 (short of the COP28 tripling pledge)¹. A report from Ember shows that renewables now account for more power generation than coal². The corporate sector is playing an increasingly important role in adding low-carbon power capacity, and the IEA has nearly doubled its estimate of the share of low-carbon power capacity additions over the rest of this decade that will result from the voluntary market.

This document reviews existing practices in voluntary low-carbon energy claims, and introduces updates being considered by the SBTi for scope 2 target setting as part of the revision of the SBTi Corporate Net Zero Standard, while maintaining interoperability with the Greenhouse Gas Protocol (GHG Protocol).

Low-carbon energy claims to date

Companies report emissions from purchased electricity, heat, steam and cooling in their scope 2 greenhouse gas (GHG) inventory. They do so in two ways: a location-based approach, which attributes the average emissions intensity of energy generation across the grids supplying energy to the company, and a market-based approach, which attributes emissions according to contractual relationships the company has with specific energy sources. The location-based approach best captures the carbon intensity of where a company operates and how much energy it consumes, whereas the market-based approach best captures the energy procurement choices made by the company. This article will focus its attention on electricity.

The market-based approach has provided a foundation for voluntary target setting and low-carbon energy initiatives to collectively stimulate grid decarbonization. However, its rules can enable misleading value chain decarbonization claims by companies through contractual instruments that contribute little to energy system transformation. The next sections will explore existing practices in the market-based approach and proposed revisions to them.

Matching practices

A shared electricity grid makes it impossible to physically trace electricity from one generator to one company. Instead, the market-based method assigns emissions to companies contractually rather than physically based on the emissions from generators from which the company contractually purchases electricity bundled with contractual instruments, or based on contractual instruments on their own. Because instruments can be transacted separately from electricity, there are rules that govern how they are 'matched' to electricity consumption in location and time.

The 2015 GHG Protocol Scope 2 Guidance requires instruments to come from the 'same market' as consumption, and to correspond to generation occurring as 'close as possible' in time to consumption. In practice, these rules have given rise to broad market boundaries

¹ <https://www.iea.org/reports/renewables-2025>

² <https://ember-energy.org/latest-insights/global-electricity-mid-year-insights-2025/>

defined by regulatory and political features. These permit claims from generation disconnected from consumption: for example, Europe operates an environmental attribute certificate (EAC) system that permits export of certificates from Iceland to the mainland, despite Iceland having an islanded grid. Similarly, Norway, with abundant hydropower, exports at least double the volume of certificates as it does physical electricity.

The current 'as close as possible' time matching requirement in practice results in annual matching. This conceals daily and seasonal variability in low-carbon power generation. For example, a company can consume electricity throughout the year and match it with certificates corresponding to an equivalent volume of solar power produced in the summer, and report zero market-based emissions. Ultimately, these matching practices yield inaccurate and misleading value chain emissions reporting.

Towards better matching rules

Location and time matching can be more tightly defined to improve integrity of scope 2 reporting and target-setting. Location matching can adopt a principle of *physical deliverability* to better connect a company's energy-related claims with its value chain. This principle still requires interpretation, and some initiatives have produced initial definitions that refer to electricity market pricing areas or government-defined grid regions. For many markets, physical deliverability regions may be no less restrictive than existing market boundary conventions. Time matching is now being explored at the hourly level, which is a profound change from annual matching. It requires a company to know its hour-by-hour electricity consumption (or to use an assumed consumption profile), and for low-carbon contractual instruments to include information about the hour in which the low-carbon electricity they represent is generated. Together, physical deliverability and hourly matching are sometimes termed 'granular matching'.

Granular matching not only increases accuracy and represents action more credibly linked to the value chain, it also has broader impacts on decarbonization. It produces more specific signals for low-carbon energy at the times and locations it is needed, and incentivizes the development of new technologies that are needed to integrate high shares of variable low-carbon generation into energy systems: energy storage, and advanced low-carbon power generation technologies. Furthermore, it creates a strong incentive for demand response action from companies, limiting energy consumption at times when there is less low-carbon energy to contract with. A significant body of academic research supports these conclusions, and grid operators in several countries also support a move towards hourly matching.

Resource eligibility

There are few provisions addressing the policy context in which low-carbon energy resources are deployed and the eligibility of those resources for voluntary low-carbon energy claims. For example, generators receiving public subsidies or operating under a regulatory mandate may have their output claimed by a single company. Similarly, companies may claim instruments from generators that are decades old, free from debt, and operate as merchant power plants that do not depend on the voluntary market to operate.

Setting limits on resource eligibility

The concept of low-carbon energy as a public good exists, which should imply that a company cannot claim beyond its fair share of that public good. Some markets recognize this principle in some form: for example, in Germany, generators receiving a feed-in tariff subsidy are ineligible to receive Guarantees of Origin. In Australia, the Large-scale Generation Certificate (LGC) system does not issue certificates to any generators that existed before the creation of the system. Several voluntary initiatives, labels and regional certifications use a generator age limit for the low-carbon energy they recognize. These limits create scarcity, and more direct signals for low-carbon capacity additions. As evidenced in the introduction, low-carbon energy is not scarce, and mechanisms to create scarcity will help the voluntary market have more impact.

Consequential effects of inventory decarbonization

The corporate power purchase agreement (PPA) is among the more impactful instruments brought to energy decarbonization by the voluntary market in recent years. These instruments are long-term offtake agreements that companies enter into with new energy projects. They enable companies and projects to de-risk by agreeing a fixed cashflow. A corporate PPA can serve as the basis for a project to prove its commercial viability and receive financing. These instruments can bring consequential emissions effects which are not accounted for in the emissions inventory (scope 2)³. For the purpose of attributing emissions to a company's value chain, a MWh matched through a corporate PPA with a new generator and a MWh matched with an one-time unbundled certificate purchase are the same, but the system-wide consequential effects of each differ. A corporate PPA would retain consequential effects even if its generation was not deliverable to the company's electricity consumption (e.g., as can be the case with cross-border financial PPAs, which should often be considered to sit outside a company's value chain). Few (if any) established frameworks have given consideration to both the attributional and consequential aspects of low-carbon energy instruments.

SBTi's proposed updates to scope 2 target setting

The new draft of the Corporate Net-Zero Standard V2 proposes near-term alignment targets for low-carbon electricity that include physical deliverability and hourly matching criteria, and a generator age limit of ten years. The SBTi is proposing three options for companies to exclude limited amounts of electricity consumption from their near-term targets. Two options are intended to account for consumption in locations where no access to low-carbon electricity exists (defined by the lack of an EAC system or a low-carbon electricity product available from an electricity supplier). The third option is a simple, 5% exemption for companies to use as they choose. Heat, steam and cooling may be excluded from a near-term target when they account for 5% or less of the location-based scope 2 total, and otherwise use a location or market-based emissions metric.

Long-term targets are only required for Category A companies, which may choose a location or market-based emissions metric in addition to the alignment target. 100% of purchased electricity, heat, steam and cooling are in the long-term target coverage. The target ambition is aligned with the SBTi Power Sector pathway: 100% low-carbon energy by 2040 for an

³ For an overview of attributional and consequential accounting concepts, please see [this resource](#) from the GHG Protocol.

alignment target, a 99.8% reduction in location-based scope 2 emissions for electricity by 2040 for Category A companies and 2050 for Category B companies, or a market-based GHG intensity of 0.001 kg CO₂/kWh for purchased electricity by 2040. The SBTi refers to the draft Power Sector Standard's definition of low-carbon energy as natural gas CCS power generation achieving a 95% capture rate; or 0.024 kg CO₂/kWh in direct emissions. Heat, steam and cooling follow a pathway aligned with the IEA Net Zero Emissions scenario, targeting zero emissions in either the location or market-based approach by 2040.

Companies also have significant interest in the electricity use outside their own operational control, as this can represent a significant share of Scope 3 emissions. Therefore, the Standard also proposes that companies address Scope 3 emissions by incentivising the use of low-carbon electricity upstream or downstream in the value chain. While hourly matching is not proposed to these sources of electricity use at present, physical deliverability (which requires companies to use the best estimates of where electricity consumption occurs in their value chain) and a ten year generator age limit are retained from the scope 2 rules.

Alignment and interoperability with the GHG Protocol

The GHG Protocol is undergoing a multistakeholder revision process to revise its series of GHG accounting standards, and has convened Technical Working Groups (TWGs) across several topics, each of which the SBTi contributes to. SBTi is engaging in the process and in coordination with the GHG Protocol to ensure alignment throughout the respective revision processes.