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RECEIVED 30 December 2024

ACCEPTED 03 March 2025

PUBLISHED 31 March 2025

## CITATION

Kittner N (2025) Expand grid decarbonization by associating more technology investment with voluntary corporate procurement. *Front. Sustain. Energy Policy* 4:1553475. doi: 10.3389/fsuep.2025.1553475

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# Expand grid decarbonization by associating more technology investment with voluntary corporate procurement

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Corporate greenhouse gas emission reporting standards are being revised. There is a new opportunity to include investments in much-needed technologies such as energy storage, electricity transmission upgrades, and generation as part of a new accounting method. Revising the protocol could catalyze private investment in critical technologies that have been excluded from these systems.

## KEYWORDS

**voluntary corporate environmental initiatives, renewable energy credits, GHG protocol initiative, grid decarbonization, energy storage investment**

The transition to a decarbonized power system will require vast investments in carbon free electricity generation, transmission, and storage. Corporations, which collectively are linked to nearly 70% of annual greenhouse gas emissions (Otto et al., 2020; Griffin, 2017), are an obvious source of potential investment, and thousands of companies have set public goals to reduce their emissions (SBTI, 2025). Companies measure their progress in reducing emissions using a complex system of greenhouse gas accounting standards. These voluntary standards are undergoing once-in-a-decade revision processes, and regulators are increasingly relying on these standards to design their corporate climate change disclosure requirements. There is a unique and vital opportunity to revise corporate climate accounting, reporting, and target setting systems to catalyze private spending on critical decarbonization strategies like increasing electricity transmission or storage capacity which have historically been excluded or unrecognized by these systems.

First developed by the World Business Council for Sustainable Development and the World Resources Institute in the early 2000s, the Greenhouse Gas Protocol (GHGP) accounting standards have grown considerably to measure and report the GHG emissions attributed to companies' operations and value chains. By 2016, 92 percent of Fortune 500 companies reported their GHG emissions using the Greenhouse Gas Protocol (Greenhouse Gas Protocol Standards, 2024). The GHGP corporate standards categorize emissions as Scope 1—direct emissions from owned or controlled sources, Scope 2—indirect emissions from the generation of purchased energy and Scope 3—all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions (Greenhouse Gas Protocol Standards, 2024). The GHGP standards have inspired corporate voluntary renewable energy goals and net zero goals, and have driven billions of dollars worth of clean energy investment in the US and Europe. Over the past decade, corporate voluntary procurement actions have been associated with 40% of the new solar and wind capacity in the US (CEBA, 2023).

This voluntary system is increasingly being adopted by governments in mandatory corporate climate change disclosure programs. By 2026, companies will be required to disclose their corporate GHG emission inventories in California, European Union, and

global markets (Ceres, 2024). These programs either explicitly require the use of GHGP standards or incorporate them by reference.<sup>1</sup>

In 2022, the GHGP announced it will revise the suite of corporate GHG accounting standards, with the technical working groups convening in Fall 2024. The revision of the 2015 Scope 2 Guidance, in particular, offers a critical opportunity to revise how greenhouse gas emission reduction claims are associated with corporate investments. Yet there are differing perspectives on which accounting revisions may result in the largest and fastest path to reducing greenhouse gas emissions. This Scope 2 guidance codifies two distinct methods for emissions accounting: location-based method and the market-based method. A location-based method reflects the average emissions intensity of grids on which energy consumption occurs (using mostly grid-average emission factor data). It refers to the electricity consumed on site. A market-based method reflects emission factors from contractual instruments for the sale and purchase of energy.

Active proposals present new accounting rules for the market-based method. The main new rules being proposed are *emissionality*, also known as *carbon matching*, and *24/7 hourly matching*, respectively. What is missing in many of the debates are methodologies to account for the emissions mitigation value, and thus incentivize investment, in critical decarbonization infrastructure and non-REC generating projects, such as upgraded transmission lines or emerging energy storage technologies. The upcoming GHGP revision process represents a critical opportunity to envision how these types of projects that reduce GHG emissions indirectly can be voluntarily credited and associated with corporate investment.

Investment to enable non-generation technologies is critically needed to realize emission reductions from low-carbon electricity sources such as solar photovoltaics and wind turbines. These technologies include everything from grid enhancing technologies such as advanced conductors in existing transmission corridors to investing in long-duration energy storage and grid flexibility devices. For example, a recent study from MIT found that widespread dynamic transmission line rating upgrades in Texas's power grid could increase output from existing wind and photovoltaic power plants by 4 and 8%, respectively and reduce ERCOT system-wide greenhouse gas emissions by 2% annually (Lee et al., 2022). Reconductoring transmission lines with advanced conductors is one potential option, with a recent study demonstrating the \$180 billion in cost savings to consumers while doubling transmission capacity on existing right-of-ways (Chojkiewicz et al., 2024)—all while enabling scale of investments to move GHG emission reductions toward 50% of 2005 levels or roughly 3,000 MMT CO<sub>2</sub>-eq by 2030 for the US power sector. The US Department of Energy suggests the US needs 50–60 GW of large-scale solar per year, but that will also require investment in the transmission grid to gain meaningful emission

reductions from that level of solar capacity. Unfortunately, these technologies are not currently included in the accounting framework for corporate voluntary carbon accounting because they do not generate environmental attribute certificates (EACs), of which RECs are the most common form. In addition, there is not a standardized methodology to account for investments in transmission or storage that can enable greater emission reductions and receive credit for greenhouse gas emission reductions. Given the pace and urgency to decarbonize the economy, corporations may have capability to invest in transmission and energy storage upgrades where policies have not filled the gap quickly enough to deal with climate change. As the systems are being revised, there is a tremendous opportunity to re-examine costs, benefits, and potential innovation impacts from developing alternative accounting frameworks to credit voluntary carbon emission reduction actions.

What could a revised voluntary reporting mechanism accomplish? One solution could be to revise and value consequential emission accounting standards such that it reflects the emissions impact of a broad range of a company's interventions using marginal emission rates (MER). This could include carbon emissions credit for the investments and additional transmission and energy storage can channel more investment toward these areas that incentivizes broader participation in voluntary programs (Gillenwater, 2025). Consider California's famous "duck" curve problem where more than 2 TWh of PV electricity is curtailed in CAISO annually due to the inability to move PV electricity from southern California to northern California. Providing a mechanism to channel investments to solve the transmission bottleneck may lead to more rapid greenhouse gas emission reductions overall. In 2023, CAISO curtailed 23 TWh of solar and 1 TWh of wind generation due to transmission congestion (CAISO, 2024). For instance, an additional megawatt-capacity of energy storage investment in California is likely to provide an additional 1 MW/4 MWh of displaced natural gas electricity at night, whereas an additional megawatt of solar capacity would not necessarily alter the planned operation of natural gas and coal plants. The current Scope 2 market-based accounting system does little to value this difference, or encourage companies to make the storage investment. One possible enhancement is to use the marginal emission rates (MER) to evaluate the carbon impact of a grid connected asset, similar to current locational marginal price (LMP) base power market financial mechanisms. Since the late 1990s, restructured power markets provided market mechanisms to value transmission, storage and other grid assets based on granular market LMP data. This market mechanism and crediting system has successfully incentivized merchant investment into the power grid. Much research has been done to explore similar mechanisms using a granular grid locational marginal emission rate (LMER) to quantify emission impact and footprint of non-generation technologies. For example, a 2010 study proposed a framework to quantify emission impact of transmission assets with LMER and transmission flow data (Ruiz and Rudkevich, 2010). A recently proposed methodology could quantify emission footprint of grid-connected energy storage devices (VERRA, 2024). In recent years, major grid operators such as PJM and MISO, two of the largest grids in the world, have begun to publish the LMER that would support these novel metrics. California has

<sup>1</sup> CA SB 253 includes GHGP standard use requirements in statute. CSRD, and the stayed SEC disclosure rule, include more indirect references to GHGP, and require the use of certain GHGP-developed concepts in their reporting rules.

already implemented the use of a carbon signal in energy storage operations to qualify for subsidies and use a carbon signal provided by SGIP and WattTime (Verdant Associates, 2022).

Valuing corporate carbon-free energy procurements by their marginal grid emissions impact can facilitate corporate investments globally by recognizing the different carbon free energy penetrations across grids. For example, a corporation in California would be incentivized to procure renewable energy in states like West Virginia or Ohio where the marginal rate of electricity emissions may be high during peak periods. This also facilitates investment of renewable energy projects in regions where there is less experience for new solar and wind projects—and helps contribute to a cleaner electric grid by allowing for new business models and encourages use of newly developed technologies. If rigid frameworks limit investments locally in California, as is advocated by 24/7-style proposals, there may be fewer opportunities to aim corporate procurement in ways that focus on solar and wind buildout and expand the benefits of solar and wind generation.

With the urgency of climate change looming, there is a once-in-a-decade opportunity to revise voluntary corporate emission accounting standards and provide flexible frameworks that allow for investment in transmission, storage, and non-generation technologies. Encouraging broader voluntary corporate emission reductions could help the corporate sector reduce its greenhouse gas emissions and provide critical investments where other sectors have lagged. Revisiting the GHG protocols offers an opportunity to examine how corporations participate in voluntary emission reduction programs and can set the the pace of decarbonization.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

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## Author contributions

NK: Conceptualization, Investigation, Writing – original draft, Writing – review & editing.

## Funding

The author(s) declare that no financial support was received for the research and/or publication of this article.

## Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of *Frontiers*, at the time of submission. This had no impact on the peer review process and the final decision.

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