



Key Technical Considerations and Requirements for Greenhouse Gas Emissions Offsets

This Program 201 (P201) back-pocket-insight (BPI) is the first of three future BPI's that will summarize key issues associated with efforts to develop, procure, and use greenhouse gas (GHG) emissions offsets, and the role that offsets may play in the broader global goal of rapidly reducing global GHG emissions by mid-century.

This first BPI describes key technical considerations and conceptual requirements for GHG offsets and provides a short overview of project monitoring and third-party verification associated with offset project implementation. This BPI is based on research recently completed as part of a supplemental project on *Exploring the Role of Greenhouse Gas Emissions Offsets to Achieve Corporate Decarbonization Goals* sponsored by Program 201 (*Energy and Environmental Policy Analysis*).¹

GHG Emissions Offset Quality

GHG emissions offsets provide a way for organizations to substitute less costly "external" GHG emission reductions for potentially more costly GHG emissions reductions that an organization may be able to achieve by reducing its own direct emissions. In addition, GHG offsets provide a mechanism for companies to reduce their GHG emissions beyond what they may be legally required to reduce or in addition to GHG emissions reductions they may be able to achieve cost-effectively by reducing their own direct emissions. However, in order for GHG offsets to contribute to mitigating global climate change, GHG emissions to the atmosphere must be the same (or lower) when a GHG emission offset credit is used (i.e., retired) as they would have been if an entity had reduced its own direct GHG emissions by a similar amount. Offset credits that meet this condition preserve "environmental integrity." The quality of a GHG emission offset credit refers to the level of confidence an offset credit will fulfill this basic principle.

GHG Offset Quality Criteria and Descriptions

There are five essential criteria used to determine the "quality" of a GHG emissions offset. These criteria include *additionality, avoiding overestimation, permanence, exclusivity, and avoiding harm*. Each of these criteria are described in Table 1. To ensure these criteria are met, GHG offset programs require offset projects to be validated, verified, and monitored. An

overarching requirement is that offset projects or activities be (i) *validated* against eligibility conditions related to these criteria; and (ii) *verified* to ensure their performance in reducing or removing emissions and (iii) *monitored* at prescribed intervals during project implementation and in some cases for many years in the future. Typically, validation and verification functions are performed by accredited, third-party auditors (aka "validators" or "verifiers") on behalf of offset programs as a precondition for the issuance of offset credits.

GHG Emissions Offset Protocols

All existing GHG offset programs in both the voluntary² and compliance³ carbon markets require potential GHG offset projects to be developed, validated, executed, monitored, and verified in a manner consistent with one or more specific offset project *protocols*. To develop an offset project that can be issued credits, an offset project first must be eligible to be accepted under a specific offset program. Additionally, each potentially eligible offset project must be developed in a manner consistent with an approved offsets protocol that includes relevant project eligibility rules, quantification methods, and measurement, monitoring and verification (MRV) requirements that have been developed by the relevant program.

Validation, Monitoring, and Verification

Under all existing offset programs, proposed offset projects must be validated against eligibility requirements (including correct application of additionality tests and accounting methods); they must actively monitor parameters related to project performance and quantification of emissions reductions and ensure all monitoring data are verified. Independent, third-party auditors (aka "validators" and/or "verifiers") perform validation and verification functions. Auditors check that projects have properly applied prescribed methods for measuring, monitoring, and quantifying associated GHG emissions reductions. In most cases, offset credits are only issued after GHG reductions or removals have occurred and been verified by an auditor. Established programs all have processes for accrediting and approving third-party auditors to conduct validation and verification services.

¹ *Exploring the Role of Greenhouse Gas Emissions Offsets to Achieve Corporate Decarbonization Goals: A Compendium of Technical Briefing Papers and Frequently Asked Questions*. EPRI, Palo Alto, CA: 2022. 3002025723. <https://www.epri.com/research/products/00000003002025723>.

² Examples in the voluntary carbon market include the American Carbon Registry (ACR), the Climate Action Reserve (CAR) and the Verified Carbon Standard (VCS), now VERRA.

³ An example in the compliance carbon market include the California Air Resource Board's Compliance Offsets Program (see <https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program>).

Table 1: GHG Offset Quality Criteria and Descriptions

Criteria	Description
Additionality	Additionality refers to the requirement that an emissions reduction project (aka offsets project) or activity must generate emission reductions that are beyond what would have occurred in a “business-as-usual” scenario. It is designed to ensure that an offset project actually reduces GHG emissions and does not simply claim credit for actions that already have been taken or planned. Rigorous additionality assessments are crucial to maintain the integrity of offset projects. Additionality can be determined by evaluating whether a project is required by law, comparing a project activity to common practice, evaluating project finances, identifying implementation barriers, and evaluating against performance standards or other eligibility conditions.
Avoiding Overestimation	Overestimation can occur as a result of overestimating baseline emissions ⁴ for a proposed offset project, underestimating actual project emissions, and not considering indirect effects or “leakage.” Baseline emissions serve as a reference for calculating GHG reductions and are based on predicted emissions scenarios “with” and “without” the offset project. Overestimating baseline emissions can lead to inflated GHG reduction claims. Actual emissions also can be underestimated due to measurement errors, such as uncertainties in carbon sequestration measurements. Leakage refers to unintended GHG emissions increases (or decreases) caused by a project, which can occur through activity-shifting leakage (shifting emissions elsewhere) or market leakage (altering commodity supply and demand).
Permanence	Permanence is important because offset credits aim to compensate for long-term emissions of carbon dioxide (CO ₂) and other GHGs (e.g., methane, nitrous oxide) which can persist in the atmosphere for thousands of years. Projects like fuel switching and methane capture are considered permanent as they lead to irreversible emission reductions. However, projects that enhance carbon storage, like forest carbon sequestration projects and agriculture-based projects, often face the risk of reversals, where stored carbon can be released unintentionally due to natural events (e.g., forest fires) or intentional decisions (e.g., deciding to harvest a forest used to generate offsets). Unintentional reversals can be insured against, while addressing intentional reversals often requires legal mechanisms. Different projects face varying levels of permanence risk, with some being inherently permanent, like nitrous oxide reduction through reduced fertilizer application, while others project types are more susceptible to reversals, like soil carbon sequestration through enhanced tillage practices.
Exclusivity	GHG emission offset credits must convey an <i>exclusive claim</i> to resulting GHG emissions reductions. To ensure a credit is exclusively claimed by only one entity, three types of potential double counting must be avoided: <i>double issuance</i> , <i>double use</i> , and <i>double claiming</i> . Double issuance refers to issuance of multiple credits for the same GHG emissions reduction, either to one project or to different projects that claim the same reduction. Double use occurs when two parties attempt to use the same offset credit for their GHG reduction claims, often through misrepresentation. Double claiming takes place when a project is issued offset credits, but another entity also counts the same GHG reductions towards its own reduction goals, leading to a situation where the same reduction is claimed by multiple parties.
Avoiding Harm	From a policy and reputational standpoint, it is important for offset projects to avoid social and environmental harms. At a minimum, offset projects typically are required to demonstrate they comply with all legal requirements in the jurisdiction where they are located. Depending on the type of project and the jurisdiction, additional reviews and safeguards sometimes are required to guard against negative outcomes not directly related to GHG emissions (especially in developing countries).

Additional EPRI Resources

EPRI has developed a wide range of research reports and other resources on GHG emissions offsets that are available to EPRI members and the wider public.⁵

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⁴A common misconception is that a project baseline represents what would have happened “in the absence of the project.” However, it is essential to evaluate

whether a proposed project itself represents the appropriate baseline (i.e., is not additional), and therefore will not generate emission reductions.

⁵ <https://esca.epri.com/GHG-Accounting-Markets-and-Offsets.html> .