Last updated 6 November 2024

BRIEFING: TRACE-AND-CLAIM ACCOUNTING FOR DIFFERENTIATED NATURAL GAS – AN EXPLANATION

Credibly tracking the provenance of emissions data for natural gas across the supply chain is increasingly critical to meet company targets, regulatory obligations, and standards to produce secondary energy products such as blue hydrogen. There are several widely adopted accounting models that can be used to differentiate a commodity product based on the environmental impact of its production, and in some cases, tracking its delivery to users. As these models are tailored to the physical nature of the commodity, its mode of transportation, and the markets on which it is sold, there is no one-size-fits all approach. However, elements of existing models are critical to develop the optimal system for tracking differentiated natural gas.

System For tangible products:

The simplest model assesses the environmental performance of a particular product, such as wood grown in specific areas where logging and forestry management practices meet defined criteria. The certification that the product meets the criteria is attached to that physical product (in the case of wood, it's often stapled or stenciled on the wood), enabling the certification to follow that product to the market. It can't be separated or transferred. This works well for tangible products, especially when they can be physically labeled, and is highly valid when environmental impacts of transportation are either minor or irrelevant for the environmental criteria which differentiates the product. These systems guarantee that the buyer receives the exact product that was produced with lower environmental impact.

Book-and-claim systems: A common approach for electricity and RNG

At the other extreme are accounting systems for fungible products that do not claim that the buyer receives the exact product produced with lower impact. These systems rather guarantee that a quantity of the product meeting the environmental criteria was produced and put on the market, which can be 'claimed' by any buyer. In some cases, it does not even claim a plausible transportation path to show that the environmentally produced product could have been received by the buyer. This system includes the EU's Guarantees of Origin (GOs) for buying and selling renewable or low-emissions electricity, and any systems where credits for lower impacts from producing the product can be traded. For the EU's GOs, generators can collect a premium for low-carbon electricity by putting electricity on the grid in one location, if a buyer 'claims' that electricity from the grid in any other location. For low-carbon electricity, there is validity to this approach: the GHG emissions associated with producing electricity vastly outweigh the emissions associated with transmitting electricity, and of course electricity is not tangible so "electrons can't be tracked."

However, while this approach can efficiently incentivize investment in low-carbon generation, the absence of any physical link between the buyer and the seller means that the system can incentivize disproportionate production of zero-carbon electricity in areas where it is easy to do so, without incentivizing generation in areas where demand is concentrated or sufficient transmission

infrastructure to get that power to markets.[1] This type of book-and-claim system is also used for RNG under California's Low Carbon Fuel Standard incentive system.

Trace-and-claim systems for natural gas – a hybrid approach:

Tracking the environmental properties of differentiated natural gas across the supply chain requires a hybrid approach that builds on the limitations of existing models. Due to the higher GHG emissions associated with transporting gas, and the need to physically move volumes along transmission infrastructure, a book-and-claim system that is wholly indifferent to where gas is produced and consumed would be inadequate and may simply incentivize production of low-emissions gas where it is easiest and cheapest to produce. Similar to physical commodities like timber, a linkage between gas producers and end users is critical. Unlike most physical commodities, however, tracking specific gas molecules across the supply chain is essentially impossible due to comingling in pipelines.

The trace-and-claim system for differentiated natural gas solves both challenges – it allows a purchaser to buy natural gas produced with lower emissions and receive the credit for those environmental attributes by demonstrating the link back to the producer through sale and purchase agreements. This system does not claim that the physical gas a buyer received came from the producer's wells and does not attempt to "track the molecules." However, trace-and-claim accounting does require that the pipeline path from the production wells to the point of use be specified. Essentially, under trace-and-claim, one "follows the money," matching the commercial pathway to specific assets, which are sharing operational and emissions data. This system initially considers:

- What producer (ultimately) facility received the buyer's money for producing the gas?
- What gathering and processing facilities received money to gather and process the gas?
- What transmission pipelines received money to transport the gas?
- What was the emissions intensity of those facilities[2]

How does trace-and-claim work in practice? Calculating emissions from production, gathering and processing:

A robust trace-and-claim system is predicated on secure access to operational and emissions data from all upstream assets, which should be shared into a secure platform to avoid manipulation. This data gathering is key to producing unique digital ID profiles and certificates for specific volumes of gas from the meter, which can be traced across the supply chain in sale and purchase agreements.

For these segments of the industry, emissions from production and gathering and processing can be compiled, on an intensity basis, with appropriate energy-weighting adjustments to account for facilities which produce more than one product – i.e., production emissions are discounted to account for oil production, while processing emissions are discounted to account for liquids production.

---

[1] An extreme case is where credits for electricity generation can be traded irrespective of the time of generation/consumption, which is problematic since renewable capacity varies so much over the course of a day, and such trading allows claims that electricity purchases are low-carbon despite the consumption of electricity during hours when little low-carbon power is being produced. Such a system may not properly incentivize generation of low-carbon power outside of the hours when it is easiest/cheapest to do so.

[2] The system should identify the emissions intensity of the facility during a fixed time-period within which the specific volume was produced. An approach based on annual emissions intensity data would be adequate, whereas an approach based on quarterly, monthly, or even real-time emissions intensity data would be more effective.

It is important to note that in the USGHGRP, emissions for the production and gathering segments are compiled for all sites in a single basin operated by a single firm, into single "facility" reports for production or gathering for each operator. CATF believes that production and gathering emissions intensity for any differentiated gas must be based on intensities calculated at this level (basin-wide, by operator), rather than for a subset of an operator's assets in a basin.[3]

How does trace-and-claim work in practice? Transferring certificates and calculating emissions from transmission and storage of gas:

As natural gas moves down the supply chain to midstream operators, a trace-and-claim system relies on a central registry to move certificates for specific volumes of gas through sale and purchase agreements (SPAs). This requires the digital environmental attributes to be bundled with in SPAs, ideally in a standardized format, which is linked to the registry and enables the ownership of the gas volume and environmental attributes to be securely stored until a subsequent SPA notifies the registry of a change. The North American Energy Standards Board (NAESB) has been developing a standardized approach to transferring environmental attributes in SPAs since 2018, as well as a distributed ledger technology (DLT) platform to track the data (Request R18007).

This central registry is critical to prevent double-counting of low-intensity gas volumes, for example in a trading point where both high-and low intensity gas is mixed. For example, if only 5.3 million MMBTU of low-intensity gas goes into a point along the supply chain where gas is co-mingled, only 5.3 million MMBTU of low-intensity gas can come out. Further, this amount may be discounted to account for the partial consumption of gas along the value chain as it is used to power compressors, etc.

The trace-and-claim system can also integrate midstream emissions into the unique digital ID profile of a volume of gas. Emissions from transmission and storage of gas are also based on the pipelines and related facilities that are paid to transport, inject, store, and deliver the gas to the customer.

Simply put, gas transmission emissions are compiled by aggregating the emissions (on an intensity basis) from the transmission compressor stations along the hired pipeline between the processor and the user or exporter, the metering and regulating stations along that segment of pipeline, and the pipeline segments themselves (in GHGRP, the only reported emissions for pipeline segments are blowdowns). Similar to emissions data for upstream assets, it is essential for all midstream assets to share emissions data to the system's secure platform.

Note that the physical gas the user or exporter receives may not have traveled through that particular segment of pipeline, and it may not have originated from the selling producer (or even from the same basin), because of extensive intermingling in the transmission system. For example, it is not uncommon for a single pipeline to link buyers and sellers of gas who are nominally moving gas in opposite directions; the pipeline operator operates the pipeline equipment to optimize capacity and complete all deliveries with minimal energy consumption. In this system, some customers may receive gas produced in a place quite separated from the location of the producer from which they purchased their gas. Nonetheless, by allowing a customer to select a producer based on GHG emissions (and

[3] Intensity should be calculated at the basin level because there will usually be significant variability among the wells in an operator's portfolio in a basin. Newer wells will be producing higher volumes of gas, and as the emissions rate from many sources (e.g. leaks) does not vary with production level, the emissions intensity of these wells (emissions divided by amount of gas produced) will usually be quite low. If operators are permitted to sell differentiated gas with emissions calculated at the well level, they will simply be able to sell gas from their newest wells in the basin as "low-emissions gas," then shift the source of this differentiated gas to newer wells in future years as the intensity of the aging wells rises. Calculating intensity at the basin level avoids this scenario and gives a fuller picture of the intensity of the wells in the basin over a larger portion of their life cycle. It should be noted, however, that other differentiated gas stakeholders have different points of view on this issue, and the ideal level of granularity may vary with the stringency of the emissions standard for the differentiated gas, and other factors.

potentially other segment operators), this trace-and-claim system enables the customer to track the emissions associated with the facilities that are paid to deliver the gas to them, and thereby incentivize each part of the producer-processor-transportation supply chain to reduce their respective emissions.

Advantages of trace-and-claim over a book-and-claim system:

A trace-and-claim system has important advantages over a simpler book-and-claim system.

- Trace-and-claim can account for emissions from the whole natural gas value chain, rather than just emissions from production.
- Trace-and-claim requires that a credible path, with throughput capacity, from production to end-use be defined and that processing and transportation capacity over that path is available. This is useful because in the absence of such a requirement, it is possible that gas production would be incentivized in locations where it is easier or cheaper to produce gas with low emissions, without regard for the existence or development of infrastructure to get that low-production-emissions to diverse markets.

Finally, this description focuses on accounting for emissions that occur over the full delivery chain of natural gas: production, gathering, processing, transportation and storage. Some differentiated gas initiatives only require emissions from upstream gas production and data on countries it was transported through; most prominent being the importer obligations in the European Union's Methane Regulation.

Although such initiatives do not require accounting for emissions after the gas is produced, utilizing the trace-and-claim system is nevertheless advantageous in such initiatives. This arises from the second advantage listed above for trace-and-claim systems, compared to book-and-claim systems. Without the requirement to document a credible path with available capacity from production to end-use, a differentiated gas initiative can incentivize low-emissions production distant from export hubs, rather than focusing on the full supply chain and incentivizing reduction in emissions from production operations that are more proximate to exporting infrastructure and across the whole supply chain.