

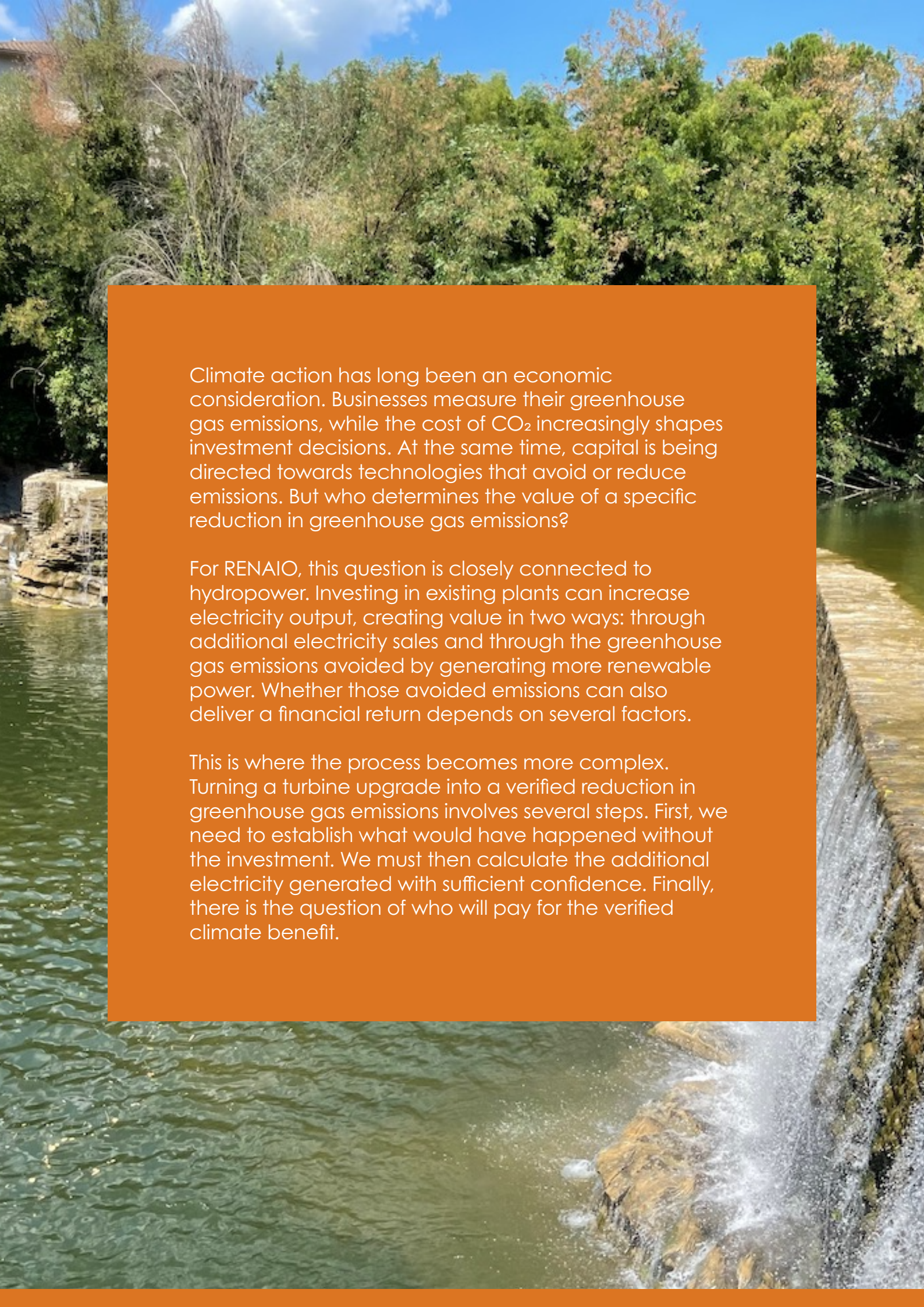


How increased electricity generation creates additional value

Supplement to the Q3 2026 Quarterly Report

IN-DEPTH INFORMATION FOR THE WEBSITE



A scenic view of a river with a small waterfall and lush green trees in the background. The water is a murky green color, and the waterfall is on the right side of the frame. The trees are dense and green, with some yellowing leaves visible. The sky is blue with some white clouds.

Climate action has long been an economic consideration. Businesses measure their greenhouse gas emissions, while the cost of CO₂ increasingly shapes investment decisions. At the same time, capital is being directed towards technologies that avoid or reduce emissions. But who determines the value of a specific reduction in greenhouse gas emissions?

For RENAIO, this question is closely connected to hydropower. Investing in existing plants can increase electricity output, creating value in two ways: through additional electricity sales and through the greenhouse gas emissions avoided by generating more renewable power. Whether those avoided emissions can also deliver a financial return depends on several factors.

This is where the process becomes more complex. Turning a turbine upgrade into a verified reduction in greenhouse gas emissions involves several steps. First, we need to establish what would have happened without the investment. We must then calculate the additional electricity generated with sufficient confidence. Finally, there is the question of who will pay for the verified climate benefit.

More electricity, greater climate benefits

Consider a hydropower plant that previously generated 10,000 megawatt-hours of electricity a year. Following investment in technical improvements, annual output rises to 11,000 megawatt-hours. The additional 1,000 megawatt-hours generate more revenue from electricity sales. They may also displace electricity that would otherwise have been supplied to the grid from other sources.

This raises a second question: how much additional greenhouse gas reduction can be attributed to the investment? The calculation is less straightforward than it might appear. We cannot simply multiply the extra 1,000 megawatt-hours by a CO₂ emissions factor. We must first establish, on a reliable basis, how much electricity the plant would have generated without the upgrade. Only by comparing actual output with this reference level can we identify the increase attributable to the investment.

Establishing the baseline

This reference level is known as the 'baseline': an estimate of what would have happened without the investment. For an existing hydropower plant, historical generation data may be used to establish the baseline, provided certain conditions are met. Any increase in output following the upgrade can then be assessed against it.

This distinction is more than a technical detail. The plant was already generating renewable electricity before the investment. What matters is the increase that can be attributed to the upgrade. In carbon-market terminology, this is the principle of 'additionality': the climate benefit must go beyond what would otherwise have occurred. The resulting additional benefit is expressed as an emissions reduction, measured in tonnes of CO₂ equivalent.

Converting megawatt-hours into tonnes of CO₂

Once the additional electricity generation has been established, the next step is to calculate the greenhouse gas emissions that have been avoided. This involves applying an emissions factor to the additional output. The factor reflects the emissions associated with the electricity generation that the additional renewable power is assumed to displace. The result is an estimated emissions reduction, expressed in equivalent tonnes of CO₂.

This calculation does not rely on a methodology developed by RENAIO. The United Nations Framework Convention on Climate Change (UNFCCC) has established methodologies for quantifying additional emissions reductions from renewable electricity generation. One addresses existing hydropower plants where technical measures increase output. Methodology AM0052, 'Increased electricity generation from existing hydropower stations', sets out how to determine additional generation against a baseline and calculate the resulting emissions reductions.

Broader methodologies also exist for grid-connected renewable electricity generation. Whichever methodology applies, the underlying requirement is the same: emissions reductions must be calculated transparently and must reflect a benefit that would not have arisen without the investment.

The economic value of emissions reductions

Quantifying a reduction in greenhouse gas emissions does not, in itself, create a tradable asset. A regulatory or market framework is needed to recognise or transfer the reduction. Such mechanisms operate at different levels. In Germany, the greenhouse gas reduction quota (GHG quota) in the transport sector illustrates how emissions reduction credits can acquire economic

value. Businesses placing fossil fuels on the market must meet statutory greenhouse gas reduction obligations. Eligible reductions achieved by other market participants may help them fulfil those obligations.

At EU level, the Effort Sharing Regulation allows Member States, subject to certain conditions, to transfer emissions allocations. Such transfers may be associated with specific emissions reduction projects in the transferring country. Article 6 of the Paris Agreement, meanwhile, provides a framework for the international transfer and accounting of emissions reductions.

These mechanisms differ substantially in their rules and scope. Not all of them can be applied to emissions reductions from hydropower. The important principle is that a verified reduction may have economic value where its origin can be traced and that double counting is prevented.

Putting a price on CO₂

The EU's Carbon Border Adjustment Mechanism (CBAM) illustrates how greenhouse gas emissions increasingly influence commercial decisions. Under the mechanism, which enters its definitive phase in 2026, importers of certain emissions-intensive goods from outside the EU are required to purchase CBAM certificates, with obligations linked to the emissions embedded in those goods.

Higher emissions can therefore translate into higher costs. This also changes how businesses assess the carbon footprint of their operations and supply chains. Avoiding or demonstrably reducing emissions is no longer simply a matter of improving sustainability indicators: emissions can affect prices and competitive positioning. As a result, there is growing commercial interest in accurate emissions measurement and robust evidence of reductions.

However, CBAM does not create a direct market for emissions reduction credits from hydropower, nor is it a mechanism through which RENAIO could sell such credits. Rather, it illustrates a broader shift: CO₂ is becoming not only a reporting metric but also a factor in commercial calculations.

From principle to practice

For approximately four years, we have been working to quantify and commercially realise the value of additional greenhouse gas emissions reductions from hydropower. The identified reductions are recorded in accordance with an international standard and documented in a registry. This provides transparency about their origin and use, with safeguards intended to prevent double counting.

This work has moved well beyond the conceptual stage: the first emissions reductions are already being marketed. At the same time, the regulatory landscape continues to evolve. The conditions under which a reduction may be recognised or credited are not yet settled for every potential application. We therefore monitor developments alongside specialist legal advisers and assess the opportunities they may create for the hydropower plants in our portfolio.

The distinction is important: internationally established methodologies provide a basis for quantifying additional greenhouse gas emissions reductions, but their commercial use depends on the market or regulatory mechanism applicable in each case. A calculated tonne of CO₂ does not automatically become a freely tradable credit.

Funding the next investment

For RENAIO, the opportunity does not end when an emissions reduction credit is sold. What makes the approach compelling is its connection to the original investment in the hydropower plant. Technical improvements increase electricity output; the resulting additional climate benefit can be quantified and, where the relevant conditions are met, monetised. The intention is to reinvest the proceeds in our plants. In this way, the climate benefits of one investment

could help fund the next. This is particularly relevant to hydropower, where existing plants may offer opportunities to generate more renewable electricity. The potential economic value is twofold: revenue from additional electricity sales and value derived from verified greenhouse gas emissions reductions associated with that increased output. At its best, each additional megawatt-hour could therefore deliver two benefits: more renewable electricity for the market and funding for future investment.

