

Management Accounting and Decarbonization Strategies

By Anette Mikes and Marcel Metzner

Working squib: How heavy industry is embracing new strategies and novel accounting tools for decarbonization

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Where society goes, business must follow. Given the current geopolitical turmoil – Russia's war on Ukraine and an accelerating reversal of globalization – the world is bracing itself for huge energy shocks. Concerns with affordability and energy security are leading many European countries to temporarily relax the phase-out of fossil fuels, while simultaneously accelerating decarbonization efforts to reduce the dependence on Russian fossil fuels. The European Commission's REPowerEU Plan, for example, combines measures to diversify (fossil) energy supplies, enhance energy efficiency, and speed-up the deployment of renewables (European Commission, 2022). And while some national governments ramp up coal-fired energy generation to avert gas shortages in the short-term (Meijer & Deutsch, 2022; Storbeck & Sheppard, 2022), many EU member states have also significantly accelerated their energy transition plans by boosting the deployment of low-carbon energy sources (Czyżak, Uusivuori, Ilas, & Candlin, 2022). Delivering on these plans requires more public and private investment in nuclear, solar, wind and energy-efficiency projects.

Can business rise to the occasion? In Europe, where the regulatory response has gone the furthest, some of the most threatened industries—such as steel and utilities—are finding a way to make this transition a once-in-a-lifetime business opportunity rather than a near-death (or worse) experience.

Let's set the scene.

By signing the 2015 Paris Agreement, politicians agreed to start a process of decarbonizing economies across the board, including energy generation, manufacturing, transport, construction, and agriculture. In 2022, the IPCC presented policymakers with a constraint—a remaining carbon budget of 500 GtCO₂—implying that CO₂ emissions should reach carbon neutrality in about 30 years. All emissions beyond that level must stop or be sequestered (IPCC, 2022).

Such change demands wholesale corporate mobilization and commitment. Governments are therefore implementing incentives—both sticks and carrots—for businesses to lower emissions and invest in green technologies. The sticks are formulated as carbon taxation, currently paid through the trading of “emission allowances” in markets such as the European Emissions Trading Scheme (ETS). As the allowed amount decreases over time, it will become increasingly expensive for companies to cover their carbon emissions.

Some of Europe's most polluting industries, such as steel and chemicals, have been granted exemptions in order to protect European industry, but that will come to an end in the second half of this decade (European Parliament, 2022b). The worst polluters will then face the specter of their EBITDA being wiped out, unless they can reduce or transfer the cost to their customers (Houlder & Livsey, 2021). In commodity markets such as steel and commodity chemicals that would be nigh-impossible, given that many low-cost Asian and American competitors are less hampered by environmental concerns and regulations.

Our research on European heavy industries over the last three years indicates that this story is the wrong narrative. Based on our comparative case study of 19 publicly listed

European companies in the chemical, steel, and utilities industries (Mikes & Metzner, 2022a, 2022b), we observe that a new economic order is on the rise, in which climate action is no longer a threat, but an opportunity. Instead of framing climate action as an existential risk, heavy industries are gradually recognizing that the green transition holds several strategic opportunities to innovate and invest in the technologies needed to reach net zero by 2050. With political instability and growing fears for the environment from downstream businesses and consumers, primary industries such as steel, chemicals and utilities may actually benefit by differentiating themselves – for example, by combining a lighter carbon footprint with ethical sourcing, moving away from carbon-intensive raw materials and production methods. Such strategies can only succeed if companies also invest in corporate activism, negotiating with governments the necessary policy frameworks, tax and other incentives.

In other words, a new economic narrative is emerging. Instead of framing the required green transition as an existential risk, Europe’s heavy industries are gradually recognizing that it offers strategic opportunities, even in turbulent geopolitical times, and there is now a sufficient number of industry champions, and investors backing them, to make the opportunity narrative the new reality. The first movers are stirring. But it remains an open question which ones will reap a first-mover advantage. Business history suggests that advantage goes not to the first company that starts up, but to the first ones that do so profitably (Christensen, Raynor, & Anthony, 2022)—a process demanding, as we will see below, its own clutch of accounting as well as strategic and technical innovations.

Step 1: Reconfigure the business portfolio

The first step for many companies is to reconfigure their portfolios of assets and businesses, abandoning carbon-intensive products, production methods, and business units and developing low-carbon products with clean production processes.

This strategy is readily available to companies in countries whose governments support the transition. Among the first to switch to green were state-supported entities such as Equinor (formerly the Norwegian oil company Statoil) and Orsted (formerly Danish Oil and Gas Energy). Both are rebranding and are partially or fully divesting from oil and gas, with Equinor aiming at a 50–50 split between fossil fuels and renewables and Orsted becoming one of the world’s first 100% renewable (wind) energy companies. Russia’s war on Ukraine may even accelerate European oil and gas companies’ move away from fossil fuels, as they cancelled new investments in Russian fossil fuel assets, or jettisoned their stake in joint ventures with Russian SOEs, based on ethical – and, no doubt, reputational and geopolitical – considerations.

Among non-state enterprises, the German energy company E.ON decided in 2015 to divest from its large-scale fossil power-generation portfolio and, in 2018, acquired a renewables company. Another, more complex portfolio management move involves both divestiture and a change of industry. In 2002, DSM (Dutch State Mines) sold its petrochemical business and then acquired Roche Vitamins and Fine Chemicals, making its move into nutrition.

But although portfolio management strategies like these may help a given company with its green transition, at an aggregate level, carbon consumption is simply being redirected to markets in which regulatory arbitrage allows their profitable exploitation. In the current climate, this strategy is no longer sufficient. With the EU committed to introducing a carbon border adjustment mechanism, and discussions of similar measures are under way in the US, shifting the strategic deckchairs is no longer a sufficient response (European Parliament, 2022a).

The corporate sector seems to recognize the new reality. Our research shows that leading heavy-industry companies in Europe have switched from defiance (e.g. climate

change denial, see Oreskes & Conway, 2010; Supran & Oreskes, 2017) to corporate activism (Mikes & Metzner, 2022a), looking for compromises that balance external demands for substantial emission reductions with internal technological constraints and financial pressures (Oliver, 1991). Some of these compromises are more defensively geared towards shielding companies from external demands, others are more radical in terms of embracing – and in some cases urging – ambitious climate action. Companies will in future have to make fruitful long-term investments in climate-saving assets while working hard to convince governments, customers, and investors to co-fund the requisite innovation.

Step 2: Select the right differentiation strategy

We find that companies are deploying two types of innovation strategies that offer significant opportunities for differentiation: carbon lightweighting and circularity.

Borrowing a concept from the auto industry signifying the design of lighter vehicles for better fuel efficiency, **carbon lightweighting** helps customers meet their own carbon-reduction goals by providing them with low-emission components and products; for example, by replacing the energy used in manufacturing with energy from renewable sources. “Green steel,” once the holy grail of heavy industries, is becoming a reality via rapid innovation in the industry’s energy infrastructure and production technologies.¹

First-mover energy companies such as E.ON are now poised for a major role in European project partnerships such as H2.Ruhr, the aim of which is to make Germany’s industrial heartland a hydrogen (clean-energy) region. A similar project partnership in Sweden enabled the green steel venture HYBRIT to make the world’s first customer delivery of steel produced without using coal. This is a landmark moment, expected to revolutionize an industry that accounts for around 8% of global anthropogenic greenhouse gas emissions (World Steel Association, 2021). Another green steel venture, H2 Green Steel, is planning to build a fossil-fuel-free plant in Sweden, with production starting in 2024, while the world’s largest steelmaker, ArcelorMittal, has pledged to open its first green steel plant (in Spain) in 2025. Without any fanfare, an industrial revolution is taking place, with increasing competition to provide major steel customers—the automotive and construction industries—with green steel.

The second strategy, **circularity** aims at keeping natural resources in economic use for as long as possible through zero waste and full recycling in the value chain. US steel producer Nucor, an industry leader in steel recycling, manufactures from an average of 71.4% recycled content, with some products containing almost 100% recycled content. Salzgitter, a 150-year-old German steelmaker, is now embarking on the “biggest change in its history” by implementing circularity in its operations and across its entire value chain.

Both lightweighting and circularity require substantial investment. The higher the green ambition, the higher the capital expenditure. Accordingly, firms vary the speed and extent of their decarbonization considerably. Chemical giant Solvay earmarked €1 billion of its investments for decarbonizing all business units other than soda ash by 2040 and an additional €1 billion for decarbonizing the soda ash business by 2050. ArcelorMittal pledged to spend US\$ 10 billion this decade to achieve emission reductions of 25% by 2030. E.ON is set to invest €27 billion in its energy transition until 2026, upgrading its grid to deal with the stresses of decentralized renewable energy production. The differences in these investment amounts are indicative of the technological constraints (and legacy of climate-forcing assets) that plague some industries and product lines more than others. Steel and chemicals are especially “hard to abate” sectors because they entail emissions not only from heat and power generation but also from manufacturing and process industries along the value chain.

¹ <https://www.industrytransition.org/green-steel-tracker/>

To benefit from these innovations, however, companies need to be able to properly measure, report, and market their impact.

Step 3: Factor in the carbon cost

Traditional investment appraisal tools do not internalize the cost of carbon emissions that a company is not yet liable to pay, but many companies in anticipation of tougher carbon-tax regimes in their investment horizon are already factoring in a carbon charge, thereby internalizing hitherto invisible carbon costs and making them affect the IRR of green – and less green – investments.

A diversified chemical company is a case in point. The company introduced an internal carbon cost both in the appraisal of key investment projects and in the income statements of its business units. As one senior manager told us:

Since 2019, business growth projects must either be GHG-neutral or else be compensated for within the same business. This increases the visibility of—and encourages accountability for—the impact of carbon on the business. In 2021, we increased the internal carbon charge from €50/t CO₂eq to €100/t CO₂eq to better reflect the actual price of CO₂ to society.

The benefits of applying internal carbon costs to investment appraisal are several. First, a carbon-cost-adjusted valuation examines whether the business case (likely to be a long-term project) will be resilient against external carbon taxes, once they bite in earnest.

Second, making the cost of carbon visible in monetary form stimulates new conversations on emissions. At one company, executives were relieved to see that very few of their proposed investment projects were so carbon-intensive that a (then hypothetical, now understated) carbon cost of €50 per tonne would derail them, while at another company, that level of carbon charge would put new projects in the red. In the first case, the company went ahead with the projects and marketed them as low-carbon alternatives; in the other case, the company realized it needed additional innovation to change its production technologies and remain competitive.

But simply putting a price on carbon isn't enough. To get a competitive advantage, companies also need to make their emission transparent, so that environmentally and ethically sensitive customers can make informed purchase decisions. This means that companies need a handle on the volume of emissions they actually make in their operations and acquire from their suppliers.

Step 4: Account for the impact

Companies need novel accounting practices not only to measure but also to market the climate benefits of their new low-carbon products. For example, at another prominent chemical company, the finance function took the practice of internal carbon costing right down to product level and into the supply chain. They developed a methodology to allow the consistent calculation and reporting of the carbon emissions that customers could avoid by using the company's products. The company can now market its products as "climate solutions" that may, for example, lead to a combined total of 850,500 tonnes CO₂ avoided in 2019.

Certifying low-carbon or green products requires not only expertise, but also outsiders' trust. Due to obvious conflicts of interest, self-certification is less effective and may not withstand outside scrutiny. Therefore, taking a hint from the renewable energy sector, ArcelorMittal has introduced an externally audited certification process to affirm its

innovative XCarb® certificates (Barker, Mikes, & Tufano, 2021). The senior executive responsible for sustainability explained:

In 2020, we launched the first XCarb virtual green steel certificates. Because we are still four to five years away from being able to make green steel, we pool the carbon savings from all our technology investments and, via an audited certification scheme, we offer our customers the virtual equivalent of net-zero steel. Customers have indeed paid a premium—we know there is a market there.

By extending carbon accounting along the value chain, such certified products will enable a firm to pass down its emissions savings to customers as a value-adding product offering. There are three steps: First, effort-intensive investments towards a zero-emission product must produce considerable CO₂ savings. Second, these savings must be aggregated, independently verified, and converted into green certificates. Third, customers can use the certificates to report and verify a reduction in their Scope 3 carbon emissions.

Belgian chemicals giant Solvay leveraged its Sustainability Portfolio Management tool—initially used in decisions related to mergers and acquisitions, capital appraisal, and new product assessment—to support its salespeople in marketing products based on environmental benefits. In its Integrated Report 2020, Solvay stated that it generated €1.6 billion in “sales from solutions reducing our customers' overall climate impact,” accounting for 18% of net sales.

The trouble is that these initiatives are challenging to develop because most follow the structure of the Greenhouse Gas (GHG) Protocol. Initially introduced in 2001 the Protocol distinguishes between three scopes of GHG emissions: Scope 1 includes direct emissions from sources that are owned or controlled by a company; Scope 2 comprises emissions from the generation of electricity that companies purchase and consume; and Scope 3 captures emissions from sources that are not owned or controlled by a company, but that a company indirectly impacts in its value chain (both upstream generated by suppliers and downstream generated in the distribution, use, and end-of-life phase of a company's products).

But the Protocol's methodology is problematic. First, the standards measure emissions at the level of the organization, while making the carbon footprint of differentiated carbon-light products transparent requires the analysis to dig deeper and occur at product level. Second, the Scope 1 emissions of one company are the Scope 3 emissions of another company (and vice versa), which results in double counting of carbon emissions in value chains. Third, counting Scope 3 emissions is a fiendishly complex exercise that requires companies to track emissions along complex value chains, from the extraction of raw materials all the way to the disposal or recycling of a product. The complexity of this task might explain why few companies comprehensively measure and report Scope 3 emissions (9% in a recent survey, BCG, 2021), even though upstream Scope 3 emissions are over 11 times higher than operational Scope 1 and 2 emissions (CDP, 2021).

For these reasons, current carbon emission accounting provides at best an incomplete and at worst a downright misleading picture of corporate carbon emissions. To address these shortcomings, Bob Kaplan and Karthik Ramanna (2021) recently proposed an alternative emission accounting system that enables the precise measurement and transfer of GHG emissions along all stages of a corporate value chain. Each company records the Scope 1 emissions from producing a unit of output and when this unit of output is passed on to the next company in the value chain, the associated carbon emissions, labeled as E-Liabilities - are transferred with it. Any additional E-liabilities that a company generates in its own

production processes are added to this account and then transferred to the company's purchasing customer.

This system enables the precise measurement and attribution of GHG emissions along value chains, encouraging companies to systematically incorporate emissions into product design, purchasing, and sales decisions. By creating a reliable, complete, and transparent picture of companies' GHG emissions, such a reformed emission accounting system would further accelerate the ascent of climate action as a source of competitive advantage. This brings us to the fifth step.

Step 5: Engage in corporate activism

As decarbonization strategies are generally costly short-term, in most cases, they are yet to deliver higher financial returns to investors. Without support from governments, customers, and investors, early movers run the risk of seeing their investments in green technologies go unrewarded, as demonstrated by BP's "Beyond Petroleum" trials and tribulations in the early 2000s. Therefore, supportive industrial policy is crucial. An important source of funding for decarbonization technologies is government subsidies—direct funds or indirect allowances (such as Europe's ETS allowances).

To support their positioning as first-adopters, as innovators and providers of "climate solutions", therefore, companies that have upgraded their accounting practices to demonstrate the emissions-reductions (and carbon-cost savings) inherent in their products need to publicly lobby governments for ambitious policies and carbon-tax incentives for climate action, raising the bar for their whole and "punishing" higher carbon competitors.

According to the 2021 Influence Map report, the power sector in particular stood out as a leading advocate for an ambitious European climate-policy agenda. Advocating companies had invested in climate-saving technologies and changed their business model around low-carbon offerings. The companies we studied also engaged actively in corporate activism (Love & Eccles, 2022), in order to convince policymakers not only about their own decarbonization efforts, but also, about their secondary drawdown effects by providing customers with low-carbon technologies and reducing the carbon footprint of their town, region, and country. Because many constituencies (cities, states, and the EU) have declared net-zero targets, it is now important to policymakers that companies demonstrate such positive spillover.

A prominent German metals manufacturer, is a case in point. The company has been investing in an industrial heat project supplying heat to households in a nearby town, rather than — as the sustainability manager wryly remarked — "warming the waters of the [river], as we used to do." The company calculates that the next phase of the project will reduce Hamburg's annual emissions by CO₂eq 150,000 /tn.

Innovation has come from unexpected corners. The same metals manufacturer's production processes create a waste product ("slack") containing iron, which the company used to sell to road-builders. Recently, a partner company came up with a new technology that extracts iron and glass from this slack—at half the carbon-intensity of normal pig iron production. With this, the company calculates it can save CO₂eq 500,000 ton a year. The new technology is expensive; the price of pig iron alone does not justify it. But once policymakers and the ETS system allow the company to include these emissions reductions in its financials, the company will be able to recoup its capital outlays and continue to develop such innovative technologies.

With both policy and technology in states of rapid flux, companies need to monitor and update their decarbonization targets, investments and performance indicators. To this end, companies can leverage hybrid expert groups that combine different but complementary areas of expertise. These include, for example, *climate science and policymaking* to consult and

agree with policymakers and other stakeholders on specific, company-relevant and achievable decarbonization objectives, and up-to-date *carbon accounting* methods to deploy the necessary tools for measuring, monitoring, and reporting carbon emissions at the product level.

Bringing multiple experts to bear on business processes and decision-making requires the collaboration and coordination of different corporate functions. Climate action and corporate activism at ArcelorMittal, for example, spans sustainability, risk management, finance, technology, strategy, and government affairs functions (Barker et al., 2021). This work is coordinated by a cross-functional Climate Change Committee. Within ArcelorMittal, the responsibility for managing climate risks is thus not siloed in the sustainability function, instead it is a cross-functional effort that is anchored in the respective workflows of traditional business functions such as strategy and finance. For example, the Investment Allocation Committee authorises large investment projects and reviews the climate impacts of all proposed projects to ensure that projects are aligned with the company's emission reduction targets.

Demonstrating carbon-cost-adjusted profitability

Responding to the decarbonization challenge is part strategic differentiation, part accounting (investment appraisal and emissions-reporting), and part corporate activism. The ways in which companies pursue these steps is conditioned by the carbon-intensity of their asset base as well as the extent to which climate change concerns have reverberated through their value chains. While the former determines a company's starting point (e.g. reconfiguring the business portfolio is considerably more challenging for a utility with a large coal power plant fleet), the latter shapes the prospect of unlocking new business opportunities with low-carbon offerings. As more and more companies set emission reduction targets that cover purchased goods and services (Scope 3 emissions), carbon emissions ripple through value chains as a meaningful product feature. For example, the emerging demand for low-carbon steel is driven by commitments of leading car manufacturers to lower carbon emissions in their supplier networks (Muslemani, Ascui, Liang, Kaesehage, & Wilson, 2022).

Companies need to project demonstrable and credible long-term benefits that compensate investors, governments, customers, and taxpayers for the investments they are making in green technologies. Much of the new infrastructure is novel and requires proof that it can be operated reliably and, ultimately, profitably. This requires companies to account for the present and future costs of carbon emissions in profit calculations, both in internal capital appraisals and external engagements with policy makers, customers, and investors.

The ability to credibly demonstrate carbon-cost-adjusted profitability is an important lever for companies to recruit—and then keep—patient capital. Factoring in carbon costs (carbon accounting) and convincing internal and external investors about the reliability of carbon-cost-adjusted profit calculations to drive investment decisions is an important part of corporate communications. At the same time, it is accountants' and investors' expectations about the changing policy environment that make these costs relevant. Thus, leaders of transitioning companies need to embrace another form of corporate activism: engaging actively with accounting standard setters, regulators and policy makers about the acceptable, relevant and reliable ways of internalizing carbon costs – and in some cases, benefits - in financial decision-making.

Ultimately, long-term investors seek companies that can demonstrably and reliably produce profitable solutions to the decarbonization challenge. Companies armed with reliable information about the costs and benefits of their emission reductions to all their stakeholders will gain not only emissions-conscious customers but also government and investor support.

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