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# Greenwheel Insights

## An Investor Guide to Interpreting Avoided Emissions

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### Executive Summary

Companies are increasingly interested in not only their direct and value chain emissions (e.g., Scopes 1-3 or their carbon footprint), but also their 'avoided emissions.'

**Avoided emissions**, or the emissions that will no longer be produced because a new, lower-emitting product or service has displaced a high-emitting alternative, are **a useful metric for capturing the potential climate impact of investments**.

This metric can help **identify products and services that enable other companies to avoid or reduce their own emissions**. We believe that these products and services are **likely to experience demand growth as regulatory requirements and consumer preferences support the transition to a lower-carbon economy**.

However, there are no widely accepted guidance, standards, or agreement on best practices in reporting avoided emissions.

In the absence of an established avoided emissions methodology, this paper aims to **equip investors with the knowledge and a simple framework to better understand and assess companies' reported avoided emissions** based on six key factors:

1. Attributional versus Consequential Approaches
2. Reference Product Selection
3. System Boundary
4. Data Quality and Uncertainty
5. Cherry-Picking
6. Aggregating Results

Key investor questions to understand the strengths and limitations of reporting using each of these factors are on the first page of this report, which also includes a case study that applies the framework to Schneider Electric.

There are **three core principles for investors to consider when interpreting avoided emissions data:**

1. **Methods vary:** Avoided emissions estimates are rarely equivalent or comparable.
2. **Assurance is non-existent:** Unlike traditional carbon accounting, there is no external assurance to indicate data reliability.
3. **Greenwashing risk:** Lack of data assurance and varied, opaque methodologies place more responsibility on investors to ensure that avoided emissions data is not misleading.

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| Section | Key Questions for Investors |
|---|---|
| Attributional and Consequential Approaches | - **Does the company take the attributional or consequential approach**?<br>  o *Is the company planning to transition to the consequential approach? What are the key barriers and enablers to doing so?* |
| Reference Product Selection | - **What is the reference product?**<br>  o *How does the company justify its choice of reference product? Does the company compare against multiple reference products?*<br>- **For long-lived products, does the company incorporate relevant change drivers that might significantly affect the impact of the product over its lifetime?**<br>  o *If the company does not consider potential changes over the product's lifetime, it may be more credible to limit the assessment to one year of the product's life.* |
| System Boundary | - **Does the company include the full product lifecycle in its assessment?**<br>- **Does the company account for any potential tradeoffs with non-GHG environmental or social impacts?**<br>  o *Does the company report on both positive and negative impacts from its product or service?* |
| Data Quality and Uncertainty | - **To what extent does the company's avoided emissions estimation use primary, secondary, or estimated data for both the assessed and the reference products?**<br>  o *Is there a significant difference in data quality between the assessed and reference products?*<br>- **Does the company conduct an uncertainty analysis?**<br>  o *Do they report its findings?*<br>  o *What are the key sources of uncertainty?* |
| Cherry-Picking | - **Does the company disclose avoided emissions for all products and services or for a subset?**<br>  o *If the company discloses avoided emissions for a subset of products, what percentage of its portfolio does that subset represent?*<br>  o *Which products have been excluded? What percentage of the company's portfolio do these products represent?* |
| Aggregating Results | - **Does the company report aggregate or portfolio-wide avoided emissions?**<br>  o *What methods or extrapolation techniques were used to derive this estimate?*<br>- **How many products were assessed for the aggregate avoided emissions estimate?**<br>  o *What percentage of the company's total product portfolio do these products represent?*<br>  o *How were products selected for inclusion?* |

***Table 1*** *– Created by Greenwheel, as at December 2024.*

*Institutions, corporates and individuals continue to pursue decarbonisation goals. To do so, they must deploy solutions which can offer the greatest reduction in emissions for the investment required. This means the products that most effectively avoid emissions have a competitive advantage and should take market share in their growth markets.*

*Avoided emissions should be the metric which identifies the companies with leading decarbonisation technologies but the lack of consistency and transparency in the data has made the exercise challenging. We are therefore delighted that Greenwheel has developed a tool we can use to bring some clarity to the process of identifying the most impactful decarbonisation solutions.*

**Amanda O'Toole, PM**
Clean Economy and Biodiversity Strategies

## Why Are Investors and Companies Interested in Avoided Emissions?

In order to limit global temperature rise to between 1.5°C and 2°C, global greenhouse gas (GHG) emissions must peak before 2025.[i] We are not currently on track to achieve these goals.

Investors and companies have a significant role to play in closing the gap between our current emissions trajectory and the reductions required by 2030. By allocating capital to stimulate the broader deployment of existing renewable energy and other low-carbon technologies, we can greatly reduce our emissions.

In this context, companies are increasingly interested in not only their direct and value chain emissions (e.g., Scopes 1-3 or their carbon footprint), but also their 'avoided emissions.' **Avoided emissions**, or the emissions that will no longer be produced because a new, lower-emitting product or service has displaced a higher-emitting alternative, are **a useful metric for capturing the potential climate impact of investments**.[ii] They can help investors understand how a company is contributing to a lower-carbon world.

Investors may use avoided emissions to identify investment opportunities. This metric can help **identify products and services that enable other companies to avoid or reduce their own emissions**. These products and services are **likely to experience demand growth as regulatory requirements and consumer preferences support the transition to a lower-carbon economy**.

If an investor has made a commitment to decarbonise their portfolio, they may be penalised for their investments in climate solutions. **Many impactful products and services have high carbon footprints**: for example, energy companies transitioning to renewable power sources are often still high emitters. **Rather than deprive these companies of the capital they need to transition away from fossil fuels, sustainable investors may wish to use avoided emissions to articulate the company's contribution to clean energy beyond its carbon footprint**.

In the absence of an established avoided emissions methodology, this paper aims to **equip investors with the knowledge and a simple framework to better understand and assess companies' reported avoided emissions**. Over seven sections, this paper defines terms, outlines concepts, and identifies key questions for investors when interrogating and understanding avoided emissions metrics. It also applies the framework to a case study, Schneider Electric, at both the company and product level. Schneider specializes in energy management and digital automation. Their variable speed drives (VSDs) are used to regulate motor speed in electric motors.

## Avoided Emissions Reporting Standards and Frameworks

The Greenhouse Gas (GHG) Protocol is the most common set of accounting principles for companies to measure, manage, and report GHG emissions from their operations and value chains.[iii] It is considered the international standard for GHG accounting and reporting, **but it does not provide explicit guidance on avoided emissions**.

Instead, the GHG Protocol has a working paper on estimating and disclosing avoided emissions. However, **this is not a framework or guidance**: it speaks to **what avoided emissions reporting *could* look like**.[iv] There is no one widely accepted framework or methodology for calculating avoided emissions. As such, **there is no way to assure or audit avoided emissions data**. This means that **investors should take care to understand how variations in approach can impact avoided emissions estimates**.

## Attributional and Consequential Approaches

There are two methods for estimating the avoided emissions of any given product or service: the attributional and consequential approaches. **The consequential approach is strongly recommended**, but limited data availability and company resources make it **impractical for most businesses**. The second piece in this series will focus on the consequential approach. The **attributional approach is far more common and is the focus of this paper**.

The results of an attributional approach are a **static inventory of the absolute emissions and removals that can be attributed to a given product or service**. By comparing the total lifecycle GHG inventory of the company's product or service (the 'assessed' product) and an alternative product or service that fulfills the same function (the 'reference' product), we can establish the comparative GHG impact of the assessed product or service (the 'avoided emissions').

| Key Questions for Investors | Schneider's Methodology | Case Study: Variable Speed Drives (VSD) |
|---|---|---|
| **Does the company take the attributional or consequential approach?**<br>- *Is the company planning to transition to the consequential approach? What are the key barriers and enablers to doing so?* | Schneider takes the attributional approach. They do not reference an attempt to transition to the consequential approach. They cite data availability, reproducibility and consistency of results, and accuracy of results as the three key reasons for their methodological choice. | Schneider uses the attributional approach. |

*Figure 1: Key Investor Questions: Attributional and Consequential Approaches (Source: Greenwheel, 2024; Schneider Electric $CO_2$ Impact Methodology, 2022). The information shown above is for illustrative purposes only and is not intended to be, and should not be interpreted as, recommendations or advice.*

## Reference Product Selection

The **choice of an appropriate baseline for comparison is essential for producing a credible estimate of avoided emissions**. The lifecycle emissions of the assessed product are compared to a reference product, which forms the baseline of the comparison.[v]

There are **many options for reference products**, including an alternative product, the average of all similar products sold on the market in one year, products with the highest market share, best available technologies, or previous versions of the same product made by the company. **Different reference products result in substantially different results for the same assessed product and it is often not clear whether a reference product is an appropriate choice for comparison.** Take the example of a highly energy efficient dishwasher. Comparing this product to the market average might overstate the dishwasher's positive impact because the market is comprised of a wide range of dishwashers. Instead, a more appropriate reference product would be another highly energy-efficient dishwasher because it is representative of what a consumer would purchase if the assessed product did not exist.

**The choice of reference product for long-lived products, such as renewable energy products, is particularly challenging**. Multiple drivers, such as changes to the energy mix or regulatory regime, significantly influence the climate impact of such products over their lifetime. This is a significant shortcoming: **no product has positive impacts**

**forever**. Most guidance documents and company assessments do not take this into account.

**Intermediate products or products with multiple end-uses, such as semiconductors, also have a distinct practical challenges** that investors and companies should be aware of**. It is extremely difficult for manufacturers to know the end uses of their products**, which makes it equally as difficult to choose an appropriate reference product.

| Key Questions for Investors | Schneider's Methodology | Case Study: Variable Speed Drives (VSD) |
|---|---|---|
| **What is the reference product?**<br>- *How does the company justify its choice of reference product? Does the company compare against multiple reference products?*<br><br>**For long-lived products, does the company incorporate relevant change drivers that might significantly affect the impact of the product over its lifetime?**<br>- *If the company does not consider potential changes over the product's lifetime, it may be more credible to limit the assessment to one year of the product's life.* | For each avoided emissions assessment, Schneider creates a list of plausible reference scenarios that provide the same output as its product or service. After eliminating non-viable alternatives based on investment or technological barriers, it transparently discloses the chosen reference product. Typically, Schneider does not compare against multiple reference products.<br><br>For long-lived products (like PPAs), Schneider considers how market dynamics may change in the coming years due to a number of factors, including the energy and climate transition and economic growth. | There are four reference scenarios to encapsulate different use cases, with details explaining the rationale for all.<br>- Brownfield with no previous VSD<br>- Brownfield VSD replacement<br>- Greenfield where market solution is not adopted<br>- Greenfield where market solution is adopted<br><br>VSD are fairly long-lived. Schneider considers forward looking electricity discounting when applying emissions factors as a way for accounting for changing impact over the product's lifetime. |

*Figure 2: Key Investor Questions: Reference Product Selection (Source: Greenwheel, 2024; Schneider Electric $CO_2$ Impact Methodology, 2022). The information shown above is for illustrative purposes only and is not intended to be, and should not be interpreted as, recommendations or advice.*

## System Boundary

The **system boundary refers to the lifecycle phases of a product or service that are included in the assessment**. Typically, companies focus on one lifecycle phase for most products. For example, avoided emissions for almost all renewable energy are based only on the use phase. However, **most guidelines recommend using the entire product lifecycle**.

Regardless of the system boundary, some emissions changes from products may occur outside of their lifecycle and thus not be assessed. An example of these extraboundary effects is the rebound effect, where a product's emissions savings from increased energy efficiency are offset by increased use of the product. This is generally not accounted for in practice.

Lastly, a product may contribute to avoided emissions but also cause harm to other environmental or social metrics. There is limited guidance on how to account for trade-offs.

| Key Questions for Investors | Schneider's Methodology | Case Study: Variable Speed Drives (VSD) |
|---|---|---|
| **Does the company include the full product lifecycle in its assessment?**<br><br>**Does the company account for any potential tradeoffs with non-GHG environmental or social impacts?**<br>- *Does the company report on both positive and negative impacts from its product or service?* | Schneider notes that both the reference and assessed product or service should be assessed across their whole lifecycle. By conducting a full lifecycle assessment, Schneider identifies which lifecycle phases are the most impactful.<br><br>In the $CO_2$ Impact Methodology, there is no explicit mention if accounting for non $CO_2$ impacts/tradeoffs. However, Schneider reports on its Scopes 1, 2, and 3 emissions and operational impacts in tandem with its avoided emissions in the Universal Registration Document (URD). | Schneider includes the full lifecycle in its avoided emissions assessment for VSDs.<br><br>Schneider does not account for potential tradeoffs with non-GHG environmental or social impacts in its reporting on VSD. |

*Figure 3: Key Investor Questions: System Boundary (Source: Greenwheel, 2024; Schneider Electric $CO_2$ Impact Methodology, 2022). The information shown above is for illustrative purposes only and is not intended to be, and should not be interpreted as, recommendations or advice.*

## Data Quality and Uncertainty

**The quality of the input data determines the accuracy and reliability of the assessment's results**. To enable a useful comparison, data for both the assessed and reference products needs to be specific to geography, technology, and time. In practice, **companies typically have high-quality data for their own products, but not for the reference product**. This can **limit the usefulness of the comparison and call into question the impact estimate it provides**.

Conducting an uncertainty analysis can help companies and investors understand the impact of data quality on the final avoided emissions estimate and better interpret the assessment's results. Generally, it helps companies understand what actions they might take to improve data quality and thus improve confidence in their results.

| Key Questions for Investors | Schneider's Methodology | Case Study: Variable Speed Drives (VSD) |
|---|---|---|
| **To what extent does the company's avoided emissions estimation use primary, secondary, or estimated data for both the assessed and the reference products?**<br>- *Is there a significant difference in data quality between the assessed and reference products?*<br>**Does the company conduct an uncertainty analysis?**<br>- *Do they report its findings? What are the key sources of uncertainty?* | There is some variation by product and service, but generally Schneider uses a mixture of all three data types. Schneider's methodology offers an extremely detailed disclosure on data sources and variables used for each calculation, as well as the formulas themselves.<br><br>Schneider's methodology emphasizes the importance of identifying and reducing key sources of uncertainty. They identify the following 5 significant sources: sales data; energy and material efficiency, brownfield/greenfield split, and use case scenario; lifetime; emissions factors for electricity consumption; and rebound effects.<br><br>Schneider also notes that its methodology generally produces uncertainties in results of +/-30%. This is | While there is higher quality data for Schneider's VSD (e.g. primary from its own sales and technical databases), data for the reference cases comes from a mix of market studies and expert estimates.<br><br>While Schneider notes that its methodology generally produces uncertainties in results of +/-30%, it does not specially report on its findings for VSD, nor does it report on VSD-specific sources of uncertainty. |

| | | |
|---|---|---|
| | roughly equivalent to the typical uncertainty associated with Scope 3 accounting. | |

*Figure 4: Key Investor Questions: Data Quality and Uncertainty (Source: Greenwheel, 2024; Schneider Electric $CO_2$ Impact Methodology, 2022). The information shown above is for illustrative purposes only and is not intended to be, and should not be interpreted as, recommendations or advice.*

## Cherry-Picking

**Cherry-picking occurs when companies and investors report on only the products and services that help avoid emissions** and ignore other elements of their portfolio that have negative impacts. Ideally, reporting should cover all of a company's products and services, not just the ones that have a positive impact. However, this may not be possible in practice due to the resources required to conduct an impact assessment. In this case, **companies should report both their total emissions footprint and any avoided emissions associated with specific products or services to avoid greenwashing**.

| Key Questions for Investors | Schneider's Methodology | Case Study: Variable Speed Drives (VSD) |
|---|---|---|
| **Does the company disclose avoided emissions for all products and services or for a subset?**<br>- *If the company discloses avoided emissions for a subset of products, what percentage of its portfolio does that subset represent?*<br>- *Which products have been excluded? What percentage of the company's portfolio do these products represent?* | Schneider discloses avoided emissions for a subset (17) of its products and services. While this is a small percentage of its total offerings, this disclosure is significantly more thorough than many other companies.<br><br>It is not immediately clear what percentage of Schneider's portfolio has an avoided emissions estimate or which products and services have been excluded. | VSD are 1 of 17 products and services covered by avoided emissions estimates.<br><br>It is not immediately clear what percentage of Schneider's portfolio is made up of VSD, nor which models have been included in this estimate |

*Figure 5: Key Investor Questions: Cherry Picking (Source: Greenwheel, 2024; Schneider Electric $CO_2$ Impact Methodology, 2022) The information shown above is for illustrative purposes only and is not intended to be, and should not be interpreted as, recommendations or advice.*

## Aggregating Results Across Products and Services

Aggregating avoided emissions across a portfolio of products and services is extremely resource intensive. To do so, the company would have to set a baseline for each product and service in its portfolio and develop a GHG inventory for both the assessed and reference products. Generally, these calculations are performed manually and each requires well over a hundred data points and staff hours.

Given the resource requirements and lack of guidance at an individual product and aggregate level, **very few companies are capable of credibly estimating portfolio-wide avoided emissions**. Regardless, many companies do report portfolio-wide avoided emission using some of the following techniques:

- Product category averages
- Identifying a 'typical' or 'average' product and extrapolating its avoided emissions to all products, for example by using a regression analysis
- Identifying the avoided emissions of a few products and services and estimating company-wide impact using only these parts of the portfolio.

**We believe that most of these approaches are not appropriate or are misinterpretation of existing guidance**. Their usage may represent **cherry-picking, whereby companies base their portfolio-wide estimates on only their products and services that have a positive impact**.

| Key Questions for Investors | Schneider's Methodology | Case Study: Variable Speed Drives (VSD) |
|---|---|---|
| **Does the company report aggregate or portfolio-wide avoided emissions?**<br>- *What methods/extrapolation techniques were used to derive this estimate?*<br><br>**How many products were assessed for the aggregate avoided emissions estimate?**<br>- *What percentage of the company's total product portfolio do these products represent? How were products selected for inclusion?* | Schneider aggregates their avoided emissions calculations for assessed products and services, but does not attempt to extrapolate these findings to its entire portfolio.<br><br>17 products were assessed. It is unclear what percentage of Schneider's total product portfolio these products represents and how they were selected for inclusion. | Not applicable at the individual product or service level |

*Figure 6: Key Investor Questions: Aggregating Results (Source: Greenwheel, 2024; Schneider Electric $CO_2$ Impact Methodology, 2022). The information shown above is for illustrative purposes only and is not intended to be, and should not be interpreted as, recommendations or advice.*

## Ongoing Debate: Scaling Results

This is potentially the most contentious and difficult topic when considering avoided emissions. Generally, **impacts are calculated at the level of the functional unit, or the expected service a product fulfills over a certain duration**. For example, to compare an Electric Vehicle (EV) to an Internal Combustion Engine (ICE), the functional unit might be "operating a medium-sized automobile for 200,000 kilometres using an electric engine versus a gasoline engine."[vi]

Often, **companies and investors are interested in scaling up results to the product's market size to better reflect the product's overall impact**. They do this by multiplying actual or budgeted sales, production, or shipment volumes (as a proxy for the number of final products in use) by the avoided emissions of one product. While the source of proxy data may not correspond to the actual number of products in use, it is widely accepted as an intuitive and easy to implement approach.

However, **scaling results does not distinguish between changes in market share and changes in market size**. Some guidance states that **only changes in market share can have positive impacts**: changes in market size just mean there are more products. As such, the proxy data should be adjusted reflect only the number of products estimated to replace existing stock. **Many investors and companies are sceptical of this distinction and instead believe that both changes in market size and market share can lead to avoided emissions.** Indeed, failure to account for changes in market size may be unrealistic, as changing demographics in emerging markets continue to create new demand for a variety of products and services.

### The Implications of Market Size versus Market Share

For example, consider an EV that has lower lifecycle emissions than a conventional ICE car. In some guidance, the EV only has a positive impact to the extent to which it replaces conventional cars. Any additional EVs sold above the replacement rate do not avoid emissions because they are simply growing the market size. However, investors and companies note that this methodology fails to account for new consumers who otherwise might have purchased an ICE, but instead choose an EV. In other words, it **does not account for dynamic markets**.

This distinction is especially relevant in emerging markets, which can have the ability to leap-frog directly to lower-carbon products and services. Consider again our EV example: under current guidance, many EV purchases in emerging markets do not 'count' towards avoided emissions as they represent an increase in market size. This approach may limit the ability of companies and investors to use avoided emissions as a tool for identifying lower-carbon growth opportunities.

**Avoided emissions that account for changes in market size, as well as market share, can help investors allocate capital to the lower-carbon products and services that need to grow to limit climate change**.

*Figure 7: The Implications of Market Size versus Market Share (Source: Greenwheel, 2024; WRI, 2019).*

## Conclusion

After applying the avoided emissions framework, we determine that Schneider Electric's avoided emissions reporting is comprehensive. However, there is also room for improvement, particularly regarding cherry-picking. For example, it is unclear what percentage of Schneider's total product portfolio is assessed for avoided emissions and how these products were selected for inclusion.

Investors and companies are increasingly interested in avoided emissions to help articulate their positive impact. When evaluating a company's reported avoided emissions, investors should consider **three core principles:**

- **Methods vary:** avoided emissions estimates are rarely equivalent or comparable because there is no accepted standard or framework.
- **Assurance is non-existent:** unlike traditional carbon accounting, there is no external assurance to indicate data reliability.
- **Greenwashing risk:** lack of data assurance and varied, opaque methodologies place more responsibility on investors to ensure that avoided emissions data is not misleading.

This paper provides an overview of key themes and clarifying questions that investors can use to better understand what is actually included in a company's reported avoided emissions estimate.

Endnotes

[i] The evidence is clear: the time for action is now. We can halve emissions by 2030. — IPCC
[ii] *18_WP_Comparative-Emissions_final.pdf; Investing in the Future: Unlocking Value Through Avoided Emissions | Ceres: Sustainability is the bottom line
[iii] GHG Protocol, n.d.
[iv] *18_WP_Comparative-Emissions_final.pdf
[v] *18_WP_Comparative-Emissions_final.pdf
[vi] *18_WP_Comparative-Emissions_final.pdf

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