

INSIGHTS FROM
CFA SOCIETY SINGAPORE

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Hidden environmental costs of tech giants' AI investments

Should investors demand these companies disclose their energy consumption to calculate Scope 3 emissions?

GLOBAL technology leaders including Alphabet, Amazon, Apple, Meta and Microsoft are increasingly integrating artificial intelligence (AI) technologies into their product offerings.

The substantial energy consumption associated with AI training and operation has raised concerns about the environmental impact, particularly regarding greenhouse gas (GHG) emissions. Should investors demand these companies disclose their energy consumption to calculate Scope 3 GHG emissions?

From a sustainable investor's perspective, the carbon emissions of a company can have implications on its discount factor (that is, cost of capital).

Companies with higher emissions may face increased regulatory scrutiny, potential carbon taxes and reputational risks, all of which could increase their weighted average cost of capital (WACC). On the other hand, companies which have made long-term commitments, for example, to clean energy, might enjoy a lower discount rate due to lower environmental risks.

A carbon footprint is a measure of the total amount of carbon emissions that is directly and indirectly created by an activity or over the life of a product. It can also be used by investors as a proxy for the sustainability of companies' operations.

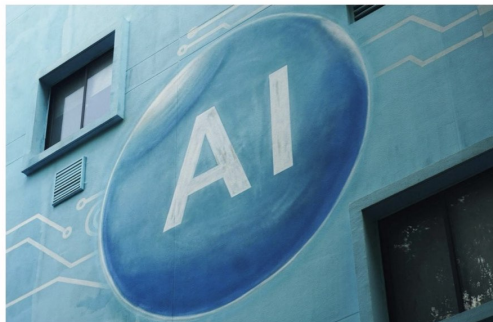
Companies with efficient energy use may signal to investors that they are more resilient to energy price fluctuations and regulatory changes, as well as the feasibility of success in achieving net-zero pledges.

For the technology leaders whose energy consumption has very significantly increased due to AI operations, and yet whose reported carbon footprint may not seem as greatly increased, investors might question the integrity of the company's overall carbon neutrality.

Microsoft's AI efforts have historically been somewhat fragmented, compared to the more focused strategies of competitors like Alphabet and Amazon. By investing heavily in OpenAI (around US\$10 billion), Microsoft aimed to catch up and potentially surpass its competitors. OpenAI's models, integrated into Microsoft's Azure cloud platform, have positioned Microsoft as a formidable player in the AI space.

Another case of significant investment in a private AI company by mega technology companies is Anthropic. Amazon has announced a US\$4 billion investment. Prior to that, Alphabet committed to investing up to US\$2 billion in Anthropic.

This combined stake is still thought to be in



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PHOTO: AFP

the region of 30 per cent, putting their scale and timing a distant second to Microsoft, from an investment point of view. How Amazon and Alphabet will report their investment in Anthropic is yet to be seen in the upcoming financial reports and sustainability disclosures.

All these large-scale corporate investments add substantially more complexity to an already-difficult problem of assessing and reporting correctly total GHG emissions. This issue of complexity and a lack of agreed approach has been explored in detail in a recent *Financial Times* report, "Big Tech's bid to rewrite the rules on net zero", which describes where potential loopholes are, and how large energy users might be able to hide their true emissions.

We examine these issues and consider the broader implications for disclosures where companies have substantial corporate investments in AI-focused ventures.

Challenges and implications

The Greenhouse Gas Protocol, which supplies the world's most widely used GHG accounting standards and guidance, introduced three "Scopes" (Scope 1, Scope 2, and Scope 3) for GHG accounting and reporting purposes:

■ **Scope 1:** Direct GHG emissions. Direct GHG emissions occur from sources that are owned or controlled by the company.

■ **Scope 2:** Electricity-indirect GHG emissions. Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company. Scope 2 emissions physically occur at the facility where electricity is generated.

■ **Scope 3:** Other indirect GHG emissions. Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but they occur from sources not owned or controlled by the company.

Technical Guidance for Calculating Scope 3 Emissions provided by the Greenhouse Gas Protocol recommends that companies should account for the proportional Scope 1 and Scope 2 emissions of the investments that occur in the reporting year.

As such, disclosing investee company's Scope 1 and 2 in the investor company's Scope 3 emissions, proportionally to the ownership, aligns with global sustainability goals and guidance, but there are several challenges:

- Accurately measuring and reporting indirect emissions requires robust data-collection and verification processes,
- Detailed disclosures may reveal sensitive information about operational efficiencies and competitive strategies,
- Integrating GHG emissions data from partners, such as OpenAI, for example, into Microsoft's reporting framework involves significant logistical and technical challenges, and possible double counting.

Understanding carbon neutrality and net zero

To evaluate a company's environmental commitments, it is important to distinguish between carbon neutrality and net-zero emissions.

Carbon neutrality refers to the reduction of a

company's emissions through credits or other measures without necessarily reducing the emissions at the source. In contrast, achieving net zero means that a company is reducing its overall emissions across its supply chain and operations to as close to zero as possible, using offsets only to cover unavoidable emissions.

The Science-Based Targets Initiative (SBTI) defines net zero as "a state of balance between anthropogenic emissions and anthropogenic removals". To stabilise global temperatures, net-zero GHG emissions must be achieved worldwide, and targets under the SBTI Net-Zero Standard must cover all emissions defined by the United Nations Framework Convention on Climate Change, also known as the Kyoto Protocol.

The SBTI's Corporate Net-Zero Standard guides companies on how to align with global net-zero goals. It requires rapid, deep emission cuts, with a 50 per cent reduction by 2030 and at least 90 per cent by 2050, to limit global warming to 1.5 degrees Celsius above pre-industrial levels.

Companies claiming carbon neutrality may offset CO₂ without reducing emissions to the levels needed for net zero or covering all GHGs.

Renewable energy certificates

Furthermore, current GHG accounting standards allow companies to use renewable energy certificates (RECs) to report reductions in emissions from purchased electricity (Scope 2) as progress towards meeting their science-based targets.

An REC is a market-based instrument that represents the property rights to the environmental, social and other non-power attributes of renewable electricity generation.

One REC is issued when 1 megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable-energy resource. RECs are the legal instruments used in renewable-electricity markets to account for renewable electricity and its attributes, whether that renewable electricity is installed on the organisation's facility or purchased from elsewhere.

The owner of an REC may make unique claims associated with renewable electricity that generated the REC (for example, using or being supplied with a MWh of renewable electricity, reducing the emissions footprint associated with electricity use).

Scope 3 emissions, which include indirect emissions from a company's entire value chain, represent the largest and most complex category of GHG emissions. For technology companies investing in AI, the energy consumed by data centres, suppliers and partners can be significant.

Furthermore, according to the Greenhouse Gas Protocol, Scope 3 emissions also encompass emissions from investments (Category 15), and the Protocol recommends that companies should account for the proportional Scope 1 and Scope 2 emissions of the investments that occur in the reporting year.

Carbon neutrality and clean energy consumption

	ALPHABET	MICROSOFT
Carbon neutrality	Since 2007	Since 2012
Environmental report	Since 2016	Since 2021
Net zero	By 2030	By 2030
REC used (%) reported in 2023	0%	53%
Carbon-free energy	A global average of ~64% carbon-free energy	~83% (19.8 GWh from carbon-free energy and 24 GWh consumed in 2023)

GRAPHIC: TEOH YI CHIE, BT

One example is Microsoft's partnership with OpenAI, which involves very significant computational resources for training and deploying AI models. It is well-documented that AI-model-development processes are highly energy-intensive and can contribute significantly to absolute GHG emissions unless powered by clean energy.

Even in the case of smaller models, such as GPT-3, it is estimated to have consumed 1,287 MWh for training. This equates to 591 tonnes of carbon dioxide equivalent, which is equivalent to GHG emissions from 60,000 gallons of petrol or 591,000 pounds of coal, as per the GHG Equivalencies Calculator of the US Environmental Protection Agency.

To date, electricity is still largely (>61 per cent) generated from fossil fuels. This consumption would leave a significant carbon footprint.

Given the critical role that AI now plays in Microsoft's products and services, an investor could consider OpenAI's energy consumption as an indirect consequence of Microsoft's operations. Per the Greenhouse Gas Protocol, investors could include OpenAI's GHG emissions in Microsoft's Scope 3 emissions.

To our knowledge, Microsoft does not explicitly report OpenAI's emissions. Similarly, Amazon and Alphabet have also invested in external AI companies, such as Anthropic, which raises the question of how these emissions should be accounted for by these companies in their upcoming reports.

Although there may be indirect evidence of OpenAI's contribution to Microsoft's emissions in its reported 30.9 per cent increase in Scope 3 emissions since its 2020 baseline, I found no direct reference to OpenAI. Microsoft's disclosure of Scope 3 excludes Category 15 of the Greenhouse Gas Protocol, as it is not being identified as relevant for Microsoft. Category 15 is to do with investments.

Given their partnership, some of OpenAI's usage of Microsoft's services would have been accounted for in Microsoft's disclosure of Scopes 1 and 2. With such a large stake in OpenAI (around 49 per cent), Microsoft should include OpenAI's Scopes 1 and 2 in its Scope 3 emissions.

Technology companies face challenges in Scope 3 emissions reporting, particularly for indirect emissions from partners.

Even for Scope 1 and Scope 2, the tech world seems to be divided in their approach. Alphabet has so far been the only company among the five

which has taken an approach to directly offset all energy consumption.

Judging from the disclosures, Microsoft's net-zero efforts appear to be comparable to Alphabet's. However, if one accounts for the use of the RECs, their success to achieve net zero by their own target of 2030 might require closer examination.

An accurate picture

Investors need to consider whether a company's Scope 3 emissions fully reflect its operational carbon footprint, and whether they can provide a more accurate picture of the company's environmental impact.

Microsoft and Alphabet provide useful case studies for investors looking to understand how large technology companies manage their sustainability commitments. Alphabet is a comparator because it was, at least initially, the concern over Alphabet's lead in the AI development that drove Microsoft's investment in OpenAI.

Microsoft and Alphabet have taken different approaches to advancing AI, with Microsoft heavily investing in OpenAI, and Alphabet largely relying on in-house advancements. These distinct strategies also influence how each company manages its environmental impact.

As summarised in the table, Microsoft has been carbon-neutral since 2012. But achieving net zero by 2030, as they pledged, may require more substantial reductions in emissions due to their reliance on RECs.

Alphabet has taken a unique approach among the Big Tech companies and has phased out buying RECs. It achieved carbon neutrality in 2007, and has committed to operating on 100 per cent carbon-free energy by 2030. These different approaches have important implications for investors, who should closely examine each company's progress towards their sustainability goals.

For a climate change-conscious investor to form a sage judgement as to how plausible it is for a company to achieve its net-zero pledge, which most companies set forward, the disclosure of carbon-free energy consumption is a good yardstick, but different approaches taken by different companies make this analysis difficult.

The table shows a top-line comparison between Alphabet and Microsoft from their environmental reports for 2023, published in 2024.

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