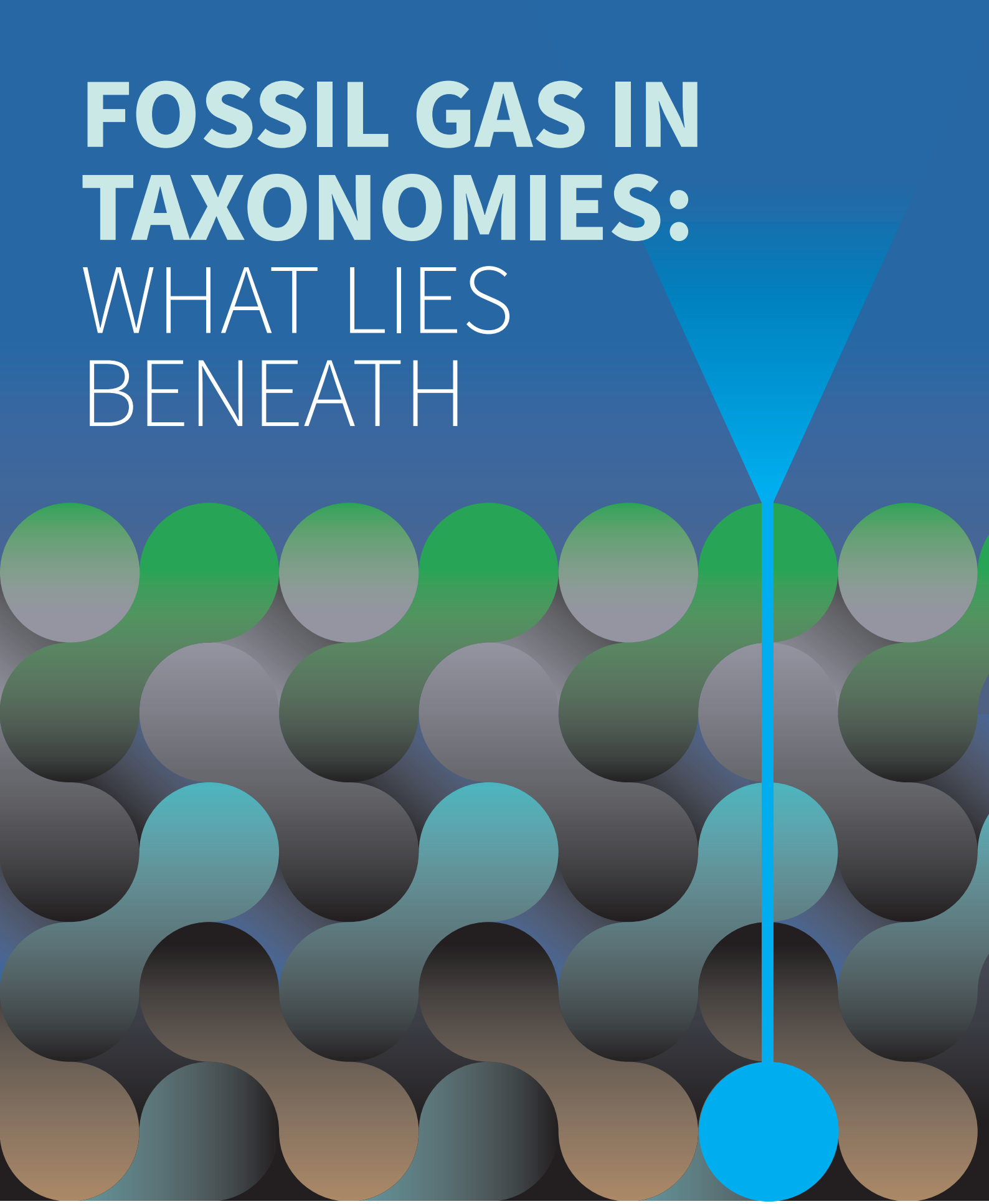
FOSSIL GAS IN TAXONOMIES: WHAT LIES BENEATH



Climate Bonds INITIATIVE

Prepared by the Climate Bonds Initiative

Key messages

- **Recent studies confirm that fugitive emissions from fossil gas operations double the lifecycle emissions of fossil gas-fired generation**, when correctly calculated, making its climate impact comparable to that of oil- and coal-fired generation.
- **Most green or sustainable taxonomies do not consider any hydrocarbon-related activities to be green or sustainable**. Where fossil gas electricity generation is included, it is generally subject to rigorous carbon intensity thresholds and its use limited by time constraints.
- **Compliance with the EU criteria for fossil gas generation renders the creation of a new power plant economically unviable** when compared with existing alternatives in the field of renewable energy.

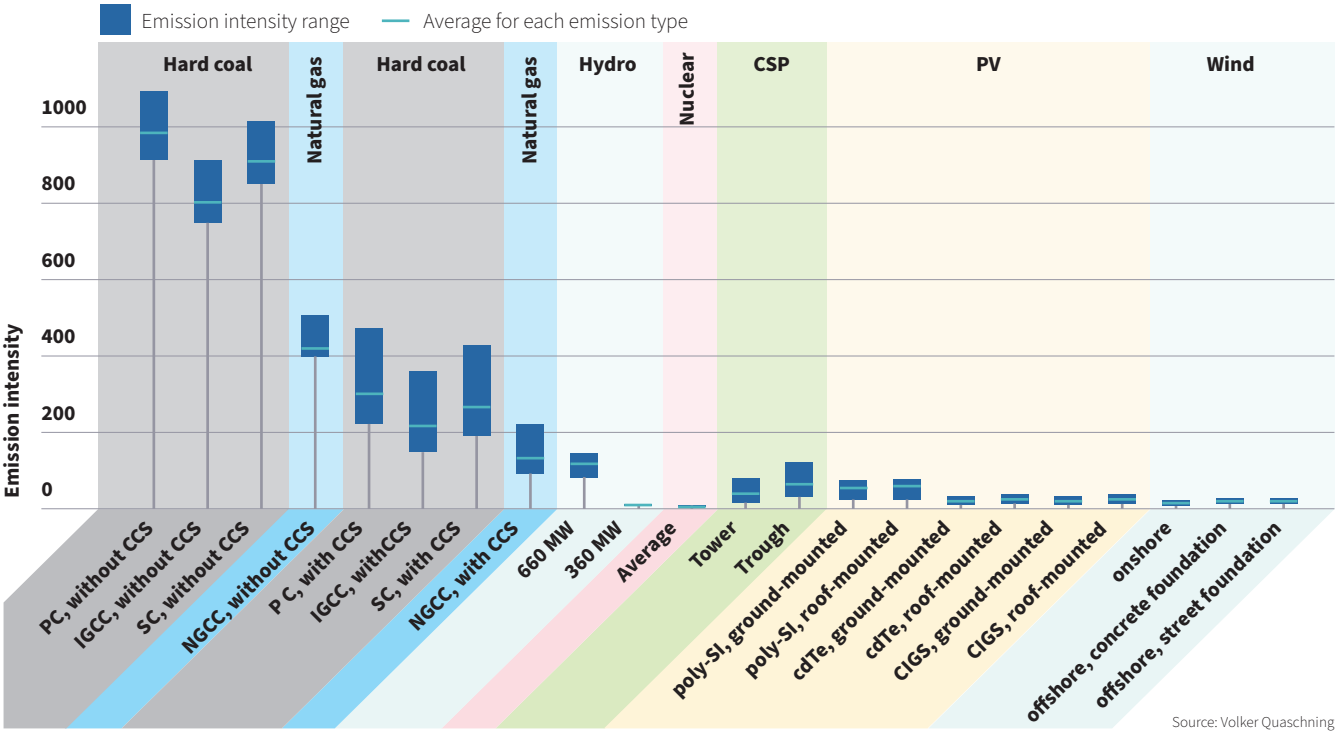
Fossil gas and energy transition

In 2023, global methane emission levels in the atmosphere reached record highs, at more than two and a half times their pre-industrial level.[1] One of the major causes identified was the increased extraction, transportation, and utilisation of fossil gas, which cause unintended and often significant leakages of methane (fugitive emissions) across the supply chain. Recent studies put the average US leakage rate between 1.4% and 3.7%.[2] In Canada, the fugitive emissions rate is at least 2.7%, which is double that previously thought.[3]

Satellite detection of fugitive emissions via continuous monitoring of oil and gas operations on a global scale confirms that methane emissions are much higher than previously reported.[4] Adding fugitive emissions to the life-cycle assessment of energy-generation emissions intensity significantly changes the profile for fossil gas-based generation.[5] While a modern combined cycle gas turbine (CCGT) plant has an average emissions intensity of 360–380 gCO_2e/kWh, the addition of just 3% of fugitive emissions makes fossil gas generation almost comparable in its greenhouse potential to coal.[6] Research conducted by a consortium of US scientists found that on a 100-year timeframe, the effects of life-cycle GHGs from fossil gas with an approximate 5% leakage rate are on a par with low-methane content coal mines, and 7.6% leakage is on a par with average coal mine methane leakage.[7]

In 2022, Climate Bonds Initiative (Climate Bonds) released *Accelerating the Fossil Gas Transition to Net-Zero* to draw attention to the hidden danger within fossil gas operations; methane, which threatens the energy transition and climate goals of the Paris Agreement.[9] The policy paper demonstrated how fossil gas, which mostly consists of methane, cannot be called a credible transition fuel and must be phased out to avoid the catastrophic consequences of the worst climate-change scenarios. The paper provided a science-based examination of the risks and hidden emissions of fossil gas infrastructure and investments, providing key policy recommendations on how these risks can be avoided. It also identified that methane emissions from the energy sector were 70% higher than official figures and called for urgent leakage mitigation measures in all fossil gas operations. These findings have been confirmed by further research and studies since then, which have put the extent of methane emissions even higher.[10]

Figure 1. Average lifecycle CO_2 equivalent emissions by energy type, gCO_2/kWh



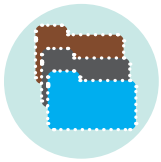
Source: Volker Quaschning

The consequences of fugitive methane emissions may erase years of energetic and ambitious climate policy. In 2020, a study conducted by the Environmental Defense Fund found that 3.7% of natural gas produced in the US Permian Basin had leaked into the atmosphere, which alone was enough to erase the greenhouse gas benefits of the coal-to-gas switching programme that, on paper, allowed the US to substantially cut its emissions.[8]

As a result, government policies based on international climate science are addressing this alarming growth in excess methane emissions. The Inflation Reduction Act (IRA), enacted in 2022 in the US, imposes methane emission fees of USD900 (by 2024) to USD1500 (post-2026) per tonne, equivalent to USD36 and USD60 per metric ton of CO_2. It allocates USD850m for methane reduction technology and USD700m for conventional well emissions.

This was followed by the EU which voted in May 2023 to enhance leak detection and repair requirements, extending them to all exporters by 2026, as part of broader decarbonisation policies adopted by developed countries like the US, Germany, and China. Increasingly, the key pillars of national decarbonisation policies are based on green and sustainable taxonomies which do not recognise any operations with fossil fuels as green or sustainable.

Fossil fuels in world taxonomies



Taxonomies have gained the status of an effective tool for the implementation of government policy because they provide a system for classifying activities into different categories related to their place in the transition to net zero by 2050. These taxonomies serve as a dual-purpose guide, classifying activities to attract investments that align with climate objectives while avoiding the perpetuation of outdated technologies, particularly in the energy sector, which is a major contributor to global greenhouse gas emissions.

The table below reviews three main sources of fossil energy (coal, oil, and gas) and four categories of activities: extraction of fossil fuels, processing or transportation of fossil fuels; inclusion of construction of natural gas or oil pipelines; creation of new capacities involved in the generation of electricity, heating, and cooling from fossil fuels; retrofitting of existing facilities, including fossil fuels infrastructure and power plants, to reduce emissions.

Despite the many other uses of fossil fuels within industry (e.g., as a feedstock for chemicals or as a heat source in industrial processes) the vast majority of emissions, both direct and indirect, arise from these types of usage, so this table provides an accurate summary.

While the majority of taxonomies exclude hydrocarbon-related activity from green, fossil gas appears the exception in some cases. However, in the countries where it is included in the taxonomy, none do so without significant restrictions.

The most common restrictions are an emission threshold of 100g CO_2e/kWh (which would require the power plant owner to make investments that render the project uneconomical), a so-called sunset date (after which fossil gas generation can no longer be considered eligible, currently defined as 2030–2035), and the removal of gas-fired generation from the green category to a transitional category to indicate its status. Some taxonomies (e.g., China and Kazakhstan) also allow for a deep modernisation of existing fossil fuel capacity to reduce emission intensity and switch from coal and oil to fossil gas.

Fossil gas and the Canadian Taxonomy

A recent Climate Bonds white paper *The role of fossil fuels in taxonomies: Canada* case study took a deep dive into the future content of the Canadian Taxonomy where the debate on the inclusion of fossil fuels, particularly fossil gas where Canada is the world's fifth-largest producer, has presented a major stumbling block. The controversy centres on whether fossil gas should contribute to a decarbonisation pathway as an interim or a transitional fuel, or be phased out completely.

The white paper provides guidance on how to structure the future taxonomy to make it consistent with global best practices, and define its principles and objectives. It is estimated that the country needs CAD115bn per year to implement the decarbonisation policy, and a taxonomy is a proven means of attracting private capital to this task, including foreign direct investment.

A review of the taxonomies of 12 countries or trading blocs with different economic structures was conducted for the purpose of the research, informed by a discussion from the perspective of Canada's three key economic partners: China, Germany, and the US.

Table 1. Fossil fuels in world taxonomies (Continued over page)

	Oil	Gas	Coal
EU Taxonomy A sustainable finance taxonomy with transition activities, but a single compliance label	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
Climate Bonds Taxonomy A green taxonomy with transition activities, but a single compliance label	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting

Ineligible and non-compliant
Eligible with additional criteria (impossible or very hard to meet)
Eligible with additional criteria (easy to meet)
Eligible and compliant with minimal or no criteria

Table 1. Fossil fuels in world taxonomies (Continued)

	Oil	Gas	Coal
Chinese Green Bonds Project Catalogue 2021 A white list of eligible activities and technologies with a single label	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
Colombian Green Taxonomy A green taxonomy with a single label	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
Russian Taxonomy A green taxonomy with a single label plus a catalogue of energy efficiency measures	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
ASEAN Taxonomy A three-tier green and transition taxonomy with a single label (a tick or cross applies to all three tiers)	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
South African Taxonomy A green taxonomy with transition activities and a single label	Extraction	Extraction	Extraction
	Processing	Processing	Processing
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
Kazakhstan Taxonomy A sustainable taxonomy with energy efficiency activities and a single label	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
Thailand Taxonomy A green and transition taxonomy with two separate labels	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
Mexican Taxonomy A green taxonomy with a single label	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
South Korean Taxonomy A sustainable finance taxonomy with transition activities but a single compliance label	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting
Singapore-Asia Taxonomy (draft) A green and transition taxonomy with two separate labels	Extraction	Extraction	Extraction
	Processing/transportation	Processing/transportation	Processing/transportation
	Electricity/heating/cooling generation	Electricity/heating/cooling generation	Electricity/heating/cooling generation
	Retrofitting	Retrofitting	Retrofitting

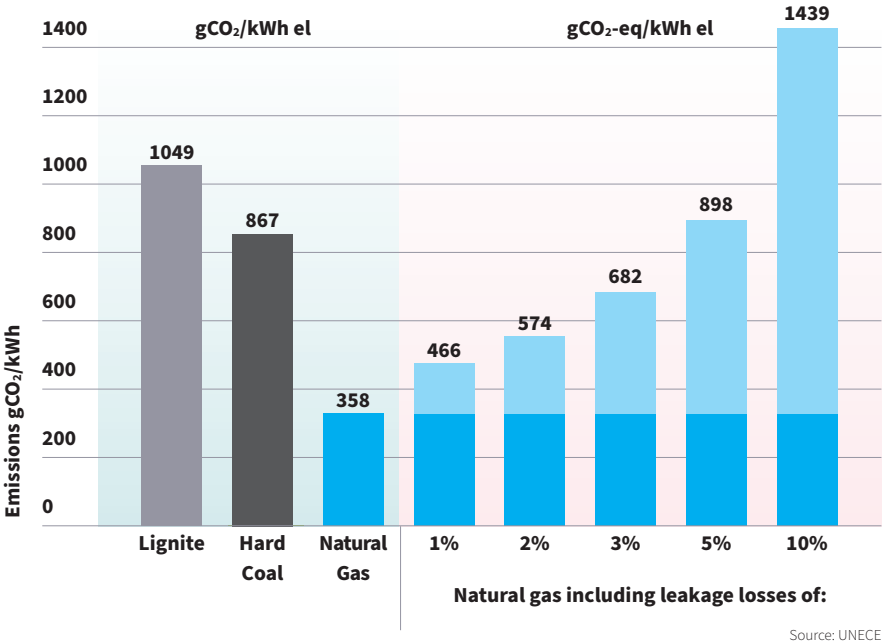
Ineligible and non-compliant
Eligible with additional criteria (impossible or very hard to meet)
Eligible with additional criteria (easy to meet)
Eligible and compliant with minimal or no criteria

The EU Taxonomy gas criteria

The inclusion of fossil gas criteria in the European Taxonomy in early 2022 raised serious concerns among the international climate community, not least the risk that many developing countries might follow this lead by diluting requirements to allow gas-fired generation to be classified as green. When the first draft was published in June 2020, fossil gas-related activities were not in scope. It was the adoption of a subsequent Complementary Climate Delegated Act that permitted the inclusion of two fossil gas-related activities: activity 4.29 Electricity generation from fossil gaseous fuels and activity 4.30 High-efficiency co-generation of heat/cool and power from fossil gaseous fuels.[11] When these activities were included under a transitional category of the Taxonomy Regulation, the justification provided by the European Commission was that it would 'allow us to accelerate the shift from more polluting activities, such as coal generation, towards a climate-neutral future, mostly based on renewable energy sources.'[12]

Fortunately, the criteria for these two activities are so specific and limiting in nature, that it is unlikely that any green financial products will align with the requirements. The criteria specify that the activity in question must comply with either a 100g CO_2e/kWh threshold or comply with all requirements on an extensive list, which includes a 270g CO_2e/kWh threshold (alternatively 550kg CO_2e/kWh on average over 20 years). The threshold of 100 gCO_2/kWh lifecycle emissions as well as the threshold of 270 gCO_2e/kWh of direct (scope 1) emissions are currently unachievable by gas-powered plants unless fitted with additional CCS/CCUS installations. Current best-in-class combined-cycle gas turbines (CCGT) have direct emissions of approximately 320–350g CO_2/KWh (see Figure 2) to achieve lower emissions than currently possible through further efficiency gains via H2 blending or with CCS. Real-world emissions can be much higher.

Figure 2. Specific emissions from electricity generation, considering leakages



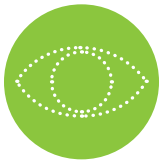
Source: UNECE

Detailed 2022 data on the emissions intensity of different types of fossil fuels, calculated by the German Federal Agency for Environmental Protection, clearly shows direct CO_2 emissions from natural gas in relation to the primary energy content of around 358g CO_2e/kWh.[13] The average efficiency of modern fossil gas power plants (based on German data) varies between 39% (turbine) and 59% (CCGT).[14] Consequently, the real emissions intensity of these types of installations fluctuates from 512–340 gCO_2/kWh of direct emissions respectively.[15] The United Nations Economic Convention for Europe gives similar numbers: 434 gCO_2e/kWh on average of direct emissions for unabated gas power plants (CCGT) and 128 gCO_2e/kWh for natural gas plants (CCGT) with CCS.[16]

Importantly, the first entry within the EU Taxonomy fossil gas criteria limits emissions not only to 100g CO_2e/kWh but also on a lifecycle (LCA) basis, which requires taking account of the emissions during fossil gas extraction, transportation, storage, and utilisation. This makes it challenging for any company to comply with the EU Taxonomy gas generation criteria without deploying the most up-to-date CCS installations. Research conducted by the Institute for Energy Economics and Financial Analysis estimates the levelised cost of energy for gas with CCS power plants to be significantly higher than that of ordinary gas power plants and almost two times above current alternatives such as renewable energy plus storage.[17]

Although the alternative average annual direct emissions threshold of 550kg CO_2e/kW of capacity over 20 years initially appears feasible, it still creates investment risk. Compliance with the threshold requires a justified projection of future emissions that together add up to 550gCO_2e/kWh on average over the 20-year horizon, which may not be demonstrable. Even if it were (many financial professionals question its feasibility) the owner of the activity is also required to prove compliance with a further eight requirements.[18] As a consequence, these obligations make the project so expensive and cumbersome (no existing gas-powered plant meeting the requirements was identified at the time of writing) that the taxonomy can hardly be called gas-friendly.

Outlook



While the debate continues on the future phase-out of the harmful climate effects related to oil and coal, fossil gas has been perceived as a safer and cleaner fuel. However, increasing atmospheric concentrations of methane emitted in huge quantities during the extraction and utilisation of fossil fuels highlights the risks that this poses to the energy transition and climate goals of the Paris Agreement. Methane accounts for 12% of GHG emissions and is shorter-lived than CO_2 but is 84 times more potent in its ability to absorb heat over a 20-year period.[19]

Fossil fuels are not only a climate problem, but also a political one, given that Russia was the largest supplier of natural gas imports to the EU before 2022.[20] This underlines the need to transition away from fossil energy sources to renewables and increase energy efficiency measures through the adoption of credible transition plans.

Endnotes

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