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Defining low-carbon gas and renewable gas in the European Union's gas Directive

The European Commission proposed the hydrogen and decarbonized gas market package in December 2021 to scale up gases that could help decarbonize the gas sector in the European Union (EU). Definitions for these gases are provided in Article 2 of the proposed Directive on Common Rules for the Internal Markets in Renewable and Natural Gases and in Hydrogen (the proposed gas Directive). Two groups of gases are incentivized in the gas Directive. Gases designated as low-carbon gas include those produced from non-renewable feedstocks such as coal and fossil gas. Those designated as renewable gas are produced from biomass (biogas) or renewable fuels of non-biological origin (RFNBOs).[1] For these gases to truly help decarbonize the gas sector, however, their definitions require more detail. A recent ICCT study proposes clear definitions for renewable gas and low-carbon gas.

Article 8—Certification of renewable and low carbon fuels—in the proposed gas Directive mentions that a delegated act will set the methodology for assessing greenhouse gas (GHG) emissions savings from low-carbon fuels, which must be completed by the end of 2024. While a delegated act will be necessary to provide the detailed methodology for assessing all low-carbon gas pathways, there is an opportunity to provide sustainability safeguards in the definitions of these gases in Article 8 of the proposed gas Directive. There is a precedent in EU policy for such safeguards, for example in the recast of the Renewable Energy Directive (RED II), which caps the contribution of food and feed and waste oil fuels to the transport targets.

Safeguards for low-carbon gas and renewable gas definitions could include thresholds for different factors influencing the climate impact of the gas. An ICCT study assessed what key factors impact the life-cycle GHG intensity of low-carbon gas and renewable gas and determined thresholds for these factors would need to be for the gases to achieve an 80% reduction in life-cycle GHG emissions relative to a fossil comparator.[2] As shown in Table 1, the GHG intensity of an 80% reduction from the RED II's comparator of petroleum is similar to a 70% reduction compared to fossil gas. It is

1 Defined as *'renewable liquid and gaseous fuels of non-biological origin' means liquid or gaseous fuels which are used in the transport sector other than biofuels or biogas, the energy content of which is derived from renewable sources other than biomass* in the Article 2 of the recast Renewable Energy Directive (RED II).

2 The fossil comparator is 94 gCO_2e/MJ, which is the fossil comparator for the transport sector in the RED II.

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also similar to the low-carbon hydrogen definition used in the United Kingdom for the British Energy Security Strategy.[3]

Table 1. Life-cycle GHG intensity based on different comparators and GHG reduction thresholds.

Life-cycle GHG intensity (gCO_2e per MJ)	Fossil gas comparator (65.9 gCO_2e per MJ)	RED II comparator (94 gCO_2e per MJ)	Low-carbon hydrogen defined in the UK
70% GHG reduction threshold	19.8	28.2	20
80% GHG reduction threshold	13.2	18.8	

Note: Fossil gas comparator taken from the Council Directive 2015/652.

A life-cycle analysis allows a comprehensive understanding of the total potential climate impacts of a gas, including upstream emissions from feedstock production and transportation, midstream emissions from gas production and processing, and downstream emissions from gas transportation and combustion. Life-cycle analysis is already utilized in European legislation, such as in the RED II.

KEY FINDINGS AND RECOMMENDATIONS

Low-carbon gas produced from fossil fuels poses a significant climate risk. The GHG intensity of hydrogen produced from fossil natural gas combined with carbon capture and storage (CCS) can be as high as natural gas itself, depending on leakage from drilling equipment and pipes and the amount of CO_2 that is captured.[4] Hydrogen produced from fossil fuels can only be defined as low-carbon gas under exceptional circumstances where minimum capture rates and maximum leakage rates are regulated. Were low-carbon gas to remain in the Directive, strict requirements for methane leakage and carbon capture are needed. Suggested thresholds for these factors are provided in Table 2.

Table 2. ICCT definitions for low-carbon gas and renewable gas based on life-cycle GHG thresholds.

	Gas pathway	Thresholds
Low-carbon gas	Hydrogen made from fossil gas combined with carbon capture and storage (CCS)	Upstream methane leakage rate ≤ 0.3% & Carbon capture and storage rate ≥ 83%
	Hydrogen from coal with CCS	Carbon capture and storage rate ≥ 94%
Renewable gas	Renewable Fuels of Non-Biological Origin (RFNBOs)	Produced using ≥ 90% additional, renewable electricity in the total process
	Hydrogen or biomethane from biomass	Produced only from waste and residue as defined in Annex IX, A of the RED II (except stemwood) & Methane leakage rate ≤ 9%

Note: Based on an 80% GHG reduction relative to the fossil comparator in the RED II (94 gCO2e/MJ).

The requirements in the proposed Regulation on Methane Emissions Reduction in the Energy Sector (the "proposed methane Regulation"), another policy in the gas package, could complement a methane leakage cap in the proposed gas Directive. By itself, the proposed methane Regulation does not quantitatively cap upstream methane emissions. The proposed methane Regulation would provide gas suppliers

3 Department for Business, Energy & Industrial Strategy, "UK Low Carbon Hydrogen Standard: Emissions Reporting and Sustainability Criteria," 2022, https://www.gov.uk/government/publications/uk-low-carbon-hydrogen-standard-emissions-reporting-and-sustainability-criteria.

4 Yuanrong Zhou, Diana Swidler, Stephanie Searle, and Chelsea Baldino, "Life-Cycle Greenhouse Gas Emissions of Biomethane and Hydrogen Pathways in the European Union" (Washington, DC.: ICCT, 2021), https://theicct.org/publication/life-cycle-greenhouse-gas-emissions-of-biomethane-and-hydrogen-pathways-in-the-european-union/.

with the methodology needed to reduce methane emissions at operation sites, but not necessarily to reduce leakage throughout the supply chain. Further, the methane Regulation is only optional for gas imports. A cap on methane emissions in the proposed gas Directive would help ensure both imports and domestically produced low-carbon gas are held to the same sustainability standard.

For renewable gas, any biogas should only be considered low-GHG if it is produced from wastes and residues as defined in Annex IX, A of the RED II, with the exception of stemwood. Annex IX, A of the RED II provides a list of waste biomass, such as agricultural and forestry residues; biogas produced from majority of this list can have low GHG emissions. Biogas produced from silage maize and stemwood–the latter is included in the category "other cellulosic material" in Annex IX, A–is not low-GHG due to land use change emissions.[5]

Renewable fuels of non-biological origin (RFNBOs), including electrolysis hydrogen, should only be considered low-GHG if made almost entirely from additional renewable electricity in its total production process. The proposed gas Directive could reference the proposed delegated regulation to the RED II for detailed rules on additionality.

To ensure real reductions in the GHG emissions of low-carbon gas and renewable gas, we suggest policymakers adopt an 80% life-cycle GHG reduction requirement relative to a fossil comparator. However, our proposed thresholds could still be utilized should different GHG savings requirement and fossil comparator are used.

5 Jacopo Giuntoli, "Forest Bioenergy and Canada's Clean Fuels Standard: Potential Carbon Impacts" (Washington, DC: ICCT: 2020), https://theicct.org/publication/forest-bioenergy-and-canadas-clean-fuels-standard-potential-carbon-impacts/.

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Authors: Yuanrong Zhou and Chelsea Baldino

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Contacts: Yuanrong Zhou, y.zhou@theicct.org; Chelsea Baldino, chelsea.baldino@theicct.org

www.theicct.org

communications@theicct.org

twitter @theicct

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