

Testimony for 3/7/24 – H.F. 4322 Sustainable aviation fuel definition amended.

Representatives and members of the public,

I am a retired chemist who has been working on the problem of reducing the concentration of carbon dioxide (CO₂) greenhouse gas in the atmosphere for over 17 years. I believe a more appropriate and less limiting wording for subdivision 1 (g) (1) of bill H.F. 4322 would be as follows:

"is derived from biomass, as defined in section 41A.15, subdivision 2e; is derived from gaseous carbon oxides derived from biomass or direct air capture; or is derived from green electrolytic hydrogen having a carbon intensity (CI) of less than or equal to 2.0 kg CO₂eq/kg H₂;".

The selected carbon intensity limit could be dropped to 0.5 kg CO₂eq/kg H₂ or less if we want to limit this to hydrogen produced from a water electrolyzer operating on nearly 100% renewable energy. See page 8 at [this link](https://www.energy.gov/sites/default/files/2022-06/hfto-june-h2iqhour-2022-argonne.pdf) (https://www.energy.gov/sites/default/files/2022-06/hfto-june-h2iqhour-2022-argonne.pdf).

Addressing global warming requires reducing the amount of greenhouse gases like CO₂ present in the atmosphere during each minute, now and into the future. This requires leaving fossil fuels underground and recycling the carbon already above the ground to fill our remaining needs for hydrocarbons, as shown in the system diagram on the [Renewable Carbon Initiative's](#) website.



[Renewable Carbon Initiative \(RCI\)](#)

The aim of the Renewable Carbon Initiative (RCI) is to support and speed up the transition from fossil carbon to renewable carbon for all organic chemicals and materials.

renewable-carbon-initiative.com

I believe the point of the bill is to reduce the carbon intensity of aviation fuels (without causing other environmental damage). This is already achieved by subdivision 1 (g) (2-3). **There is no need to limit the source of the gaseous carbon oxides to biomass, especially since some of the most difficult sources of CO₂ to abate are not biomass-based.**

Specifically, I believe the proposed amended definition is still too limiting, for the following reasons:

1. The phrase "is derived from gaseous carbon oxides **derived from biomass** or direct air capture; or is derived from green electrolytic hydrogen" excludes at least two of the

large, hard-to-abate sources of carbon oxides that are not directly from biomass, cement production and steel production. Carbon oxides (e.g., CO₂ and /or CO) can be captured at the source using various technologies that are not included in the definition of direct air capture. CO can be used with H₂O in a water-gas-shift reaction to produce syngas (CO + H₂ + CO₂ +...), which in turn can be converted into sustainable aviation fuel without the need to add "green electrolytic hydrogen". CO₂ can be converted to CO in a CO₂ electrolyzer like those being used by company [Twelve at their E-Jet plant](#). Thus, making E-Jet[®] fuel using CO₂ from a cement plant would be excluded.



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www.twelve.co

2. The proposed bill does not define "green electrolytic hydrogen". It would be useful to set a limit, such as a carbon intensity (CI) of less than or equal to 2.0 kg_CO₂eq/kg_H₂, as calculated by the most recent version of the [Argonne National Laboratory's GREET[®] model](#) [see page 8 at that link]. The carbon intensity would depend strongly on the source of the electricity powering the electrolyzer (and on the type of electrolyzer used.)

In summary, there is no need to require that the carbon oxides are derived from biomass.

Best regards,
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