

HyNet Hydrogen Production Plant 1 – Technical Note

EPR 4c – Validate CO₂ Emissions

Summary

Problem Statement

Validate the CO₂ emissions figure presented in table 3-12 of the Permit Application Supporting Document.

Notes: The CO₂ emissions associated to the combustion of PSA tail gas for the NG BOL case are stated to be 1,986 tonnes/h. The units of measure seem incorrect, as this figure doesn't match with the CO_{2eq} emissions reported in Table 7-2 (Global Warming Potential).

Background

Typo: it should say 1.986 tonnes/h. The calculation comes from the Emissions Data Sheets referred to in Item 4a.

Action

Consents team - check for inclusion of the figure elsewhere in the application.

Process team – confirm the 1.986 tonnes/h CO₂ emission.

Details

Cross check completed against the NG BOL mass balance (stream 603), which yields 2.074 ton/hr CO₂ which is a 4.4% difference, and confirms that there is a typo when using tonnes/hr in Table 3.12 of the permit application, and therefore that the value should be 1.986 tonne/hr and not 1,986tonne/hr.

Note that this matches table 7.2 in which CO₂ emissions are 0.84te/h + 1.15 te/h = 1.99 te/h.

Also note that, 1.986 tonnes/h equates to 2.54% of the total CO₂ equivalent delivered to the plant as the total CO₂ equivalent delivered to the plant as NG (78,162 kgCO_{2eq}).

Figure *Error! No text of specified style in document.* Calculations of CO₂

PSA Tailgas to fired heaters			
Mass flow	t/h	3.2	
molar flow	kNm ³ /h	16.4	
Calculated molar flow	fromNm ³	731.7	kmol/hr
Calculated molar flow	from MW	740.7	kmol/hr
Composition (mol%)	mol %	Mol flow	
Methane	2.2	16.1	kmol/hr
Carbon Monoxide	4.16	30.4	kmol/hr
Carbon dioxide	0.06	0.4	kmol/hr
Methanol	0.02	0.1	kmol/hr
All of these convert to CO ₂ in fired heater			
Total mol/hr CO ₂		47.1	
Mol wt CO ₂		44.0	
kg/hr		2074	
ton/hr		2.074	