HyNet Hydrogen Production Plant 1 – Technical Note

EPR Response – 4b - Composition of PSA Tail Gas and Carbon Balance

Summary

Background

Fuel gas composition taken from Stream 603 of Mass Balance Table - Nat Gas Case (BOL) [5194812-100-49EC-3-0003 Rev 1], “PSA Tailgas to Fired Heaters”

Problem Statement

Confirm whether the composition stated in the second bullet of table 3-12 of the Permit Application Supporting Document [i.e. H2: 89.2 mol%; CO: 4.16 mol%; methane: 2.20 mol%; N2: 1.86 mol%; water: 2.47 mol%; CO2: 0.06 mol%; methanol: 0.02 mol%; and ammonia: 0.03 mol%] refers to the PSA tail gas proposed to be combusted in the feed gas fired heater and steam boiler.

Response

The composition of the stream in table 3-12 of the of the Permit Application Supporting Document matches stream 603 of the mass balance NAT GAS (BOL) from document number 5194812-100-49EC-3-0003.

Table -1 Comparison between stream 603 (NG BOL case) and table 3.12 in Permit Application Supporting Document

PSA Tailgas to fired heaters		
	NG BOL	Report
Composition	mol%	mol%
Methane	2.2	2.2
Ethane	-	
Ethylene	-	
Propane	-	
Butanes	-	
Pentanes	-	
Hydrogen	89.2	89.2
Carbon Monoxide	4.16	4.16
Carbon Dioxide	0.06	0.06
Oxygen	-	
Nitrogen	1.86	1.86
Argon	-	
Water	2.47	2.47
Methanol	0.02	0.02
Ammonia	0.03	0.03
Total	100	100

The Steam Boiler and Feed Fired Heater are referred to in table 7.2 of Permit Application Supporting Document. In this section the GHG emissions from Feed Fired Heater GHG emissions have been calculated on the basis of the combustion of PSA tail gas at maximum rate 8760 hours per year. The Steam boiler emissions are noted to have been calculated on the same basis.

From the PFD document 5194812-100-49DG02-3-0001-01 Rev 3 it can be seen that the PSA Tail Gas is split and routed to both the Feed Fired Heater and the Steam Boiler and that this stream is labelled stream 603 – matching the stream label in the mass balance. A screenshot of the PFD is shown below with stream 603 labelled as PSA Tailgas from PSA Separation unit. This stream is routed in two directions, with part of it routed to F-101 shown below. F-101 is the Feed Fired Heater. The Stream is also routed to the Steam Boiler B-101.

Figure 1. Screenshot of PFD 5194812-100-49DG02-3-0001-01 Rev 3