

## HyNet Hydrogen Production Plant 1 – Technical Note

### EPR RESPONSE – 20 - Risk assessment for emissions from TEG still column vent

#### Summary

##### Schedule 5 Notice Query No. 20

Risk assessment for emissions from TEG still column vent. Provide a quantitative risk assessment for the residual methanol emissions from TEG still column, following the methodology set out in Environment Agency guidance <https://www.gov.uk/guidance/air-emissions-riskassessment-for-your-environmental-permit>.

#### Background

The TEG still column emissions are described in para 3.7.9 of the Environmental Permit Application Supporting Document: “Off-gases from the TEG still column. This stream comprises steam, with CO<sub>2</sub> (23.4 mol %) and methanol (9.5 mol%); there is no residual TEG carry-over as the TEG has been removed in the TEG regeneration system. Proposals to provide a condenser to remove the methanol emission are being pursued by the project.”

#### Response

The composition of the TEG Still column off-gas stream is shown in Table 1; this is consistent with para 3.7.9 of the Environmental Permit Application Supporting Document.

Table 1: Still Column Off Gas Composition and Flow Rates:

Component Name	Component Mole%	Flow (kg/hr)	Flow (g/s)
Methanol	9.48	27.32	7.59
Water	66.75	108.25	30.07
CO <sub>2</sub>	23.77	94.14	26.15
Hydrogen	0.01	0.00	0.00

As stated in the application, work on the design of a condenser and knock-out pot has progressed. This still column off-gas was simulated in HYSYS to condense methanol. An air cooler has been used to reduce off-gas temperature, condensing the methanol. A knock-out vessel installed downstream of condenser will be used to collect the liquid methanol and water, which will be directed to the Membrane Bioreactor (MBR) for treatment.

The resultant cooled off-gas exiting the condenser has the flow rates in Table 2 below.

Table 2 Condenser Outlet Off Gas Flow Rates:

Component Name	Vapor Phase Flow (kg/hr)	Vapor Phase Flow (g/s)
Methanol	1.4	0.40
Water	2.7	0.74
CO <sub>2</sub>	94.0	26.11
Hydrogen	0.0016	0.00

## Quantitative risk assessment

A quantitative risk assessment was conducted for the vented still gas stream after installation of the condenser for abatement of methanol emissions. The risk assessment was conducted following EA guidance at <https://www.gov.uk/guidance/air-emissions-riskassessment-for-your-environmental-permit>.

The completed H1 Tool is sent as an attachment, and screenshots of the input panes are provided in Annex 1.

## Assumptions and input values:

- Continuous venting
- Vent height 13m (top of the TEG Still Column)
- The TEG still column is part of the TEG Regeneration Skid, it is not located on a building, but rather in a process area comprising widely-spaced pipework, process vessels and tanks and supporting steel framework, allowing the relatively unimpeded passage of air around the process plant. The effective stack height was therefore set at the actual release height (13m).
- The methanol mass emission rate used was 0.4 g/s.
- Arbitrary values for the efflux velocity, total volumetric flow rate and methanol concentration were entered into the H1 tool, to arrive at the required g/s mass release rate (the H1 tool operates on g/s mass release rate and internal dispersion factors)
- Environmental Assessment levels for methanol were those specified in the EA Guidance website and contained in the H1 tool.

## Results

The H1 assessment tool results are shown in Table 3; the methanol emissions screen out as not significant and no further assessment is required.

Table 3 H1 Tool Results

Air Impact Screening Base Option										
Air Impact Screening Stage One										
Screen out Insignificant Emissions to Air										
This page displays the Process Contribution as a proportion of the EAL or EQS. Emissions with PCs that are less than the criteria indicated may be screened from further assessment as they are likely to have an insignificant impact.										
Number	Substance	Long Term	Short Term	Long Term			Short Term			
		EAL	EAL	PC	% PC of EAL	> 1% of EAL?	PC	% PC of EAL	> 10% of EAL?	
		µg/m3	µg/m3	µg/m3	%		µg/m3	%		
1	Methanol	2,660	33,300	9.52	0.358	No	182	0.546	No	

## Annex 1 - H1 Tool Screenshots

**Air Release Points Base Option**

### Air Release Points

**Please define your Release Points for Releases to Air**

Are there any Air emissions?  Yes

Number	Description	Location or Grid Reference	Activity or Activities	Effective Height metres	Efflux Velocity m/s	Total Flow m3/hr
1	TEG Vent			13	10	10000

Comments

**Air Emissions Inventory Base Option**

### Air Emissions Inventory

**Please list all Substances released to Air for each Release Point identified in the previous page.**

Number	Substance	Meas'ment Method	Operating Mode (% of)	Data relating to Long Term effects			Data relating to Short Term effects			Annual Rate tonne/yr	ELV Conc. mg/m3
				Conc. mg/m3	Release Rate g/s	Meas'ment Basis	Conc. mg/m3	Release Rate g/s	Meas'ment Basis		
1	Methanol	Estimated*	100.0%	144.0	0.400000		144.0	0.400000		12.6144	

Measurement method: \* provide detail in comments box      Comments: