

## HyNet Hydrogen Production Plant 1 – Technical Note

### EPR Response – 9b – BAT for energy efficiency

#### Summary

##### Problem Statement

Electric Power Usage. Explain and justify the higher specific electric power consumption of 12 MJ/kg H<sub>2</sub> stated in table 3-4 of the Permit Application Supporting Document, compared to the benchmark figure of 8.8 MJ/kg H<sub>2</sub> from the draft ‘Guidance for Establishing Best Available Techniques for Hydrogen Production from Methane and Refinery Fuel Gas with Carbon Capture’.

#### Response

##### Background

During FEED, Progressive Energy was involved in supporting the development of this draft BAT. As part of this consultation, Costain requested an indicative power consumption for HPP, at that stage of development. The project’s estimate of average power consumption at this time was 22 MWe, when producing 9,000 kg/h of H<sub>2</sub> product, which equates to 8.8 MJ/kg H<sub>2</sub>. As HPP was the only project deploying “ATR+GHR” technology that responded to this request for information, this number was provisionally inserted into the draft BAT document.

##### Reply

The Permit Application figure of 12 MJ/kg H<sub>2</sub> was based upon an imported normal electrical power figure of 29.56 MWe (taken from Utility Summary 5194812-000-49EL-4-0003 Rev 03) and hydrogen production of 9,000 kg/h. The plant design has developed since then and the initial imported electrical power figure has changed.

The Total power import is currently = 22.8 MWe per hr based on the plant’s operational scenario.

With a weighted average of 96% efficiency over the operational scenario throughout the year, the total power import then becomes. = 23.7 MWe.

Based on a total H<sub>2</sub> production = 9,000 kg/hr.

Then the power consumption per kg of hydrogen = 9.49 MJ (considering 1 MJ = 0.00278 MWh).

There are further value engineering activities to be completed, such as an update to the Hydrogen compressor requirements (as intermediate operation or deletion of this compressor), and the cooling medium system finalisation (against an evaporation system), which may bring down the specific electrical power consumption further, approaching benchmark requirement of 8.8 MJ/Kg H<sub>2</sub>, as stated in table 3-4 of the Permit Application Supporting Document, compared from ‘Guidance for Establishing Best Available Techniques for Hydrogen Production from Methane and Refinery Fuel Gas with Carbon Capture’.

## Further Developments:

Permit Application data with table 3-4 shall be updated as required.

Further updates are envisaged to Appendix#2 and Electrical load list update, with respect to;

- Finalisation of individual loads from vendor data
- Operation synchronisation
- Further heat integration
- Possible removal of equipment such as the Natural Gas inlet compressors
- Intermediate operation of H<sub>2</sub> compressor

All of which shall drive the import power requirements down.

## References Used:

[1] Appendix#2

[2] Utility Summary 5194812-000-49EL-4-0003 Rev 03