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Controlled Document

Quest CCS Project

Quest CO2 Capture Ratio Performance

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Summary

This document summarizes the CO₂ capture ratio performance of the Quest facility for the reporting period.

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1. CO2 CAPTURE RATIO INTRODUCTION

This document provides the annual CO₂ capture ratio performance of the Quest CCS facility. The CO₂ capture ratio is defined as the percentage of CO₂ in the three HMU raw hydrogen streams that is removed in the amine absorbers (V-24118, V-24218, and V-44118), separated in the CO₂ stripper, compressed, and sent to the CO₂ pipeline for injection. The typical CO₂ content in the absorber feed gas (raw hydrogen stream) is typically between 16 and 18% by volume.

2. 2015 PERFORMANCE

The CO₂ capture ratio data has been provided on a daily basis, and reported as the combined CO₂ capture ratio for the three HMUs. The data for the reporting period was selected to be from August 23rd through December 31st, 2015 since first injection occurred on August 23rd. This reporting period aligns with the Quest carbon offset reporting protocol. The average capture ratio for the reporting period was 77.6%. Capture ratio during the commissioning and startup phase prior to injection has not been supplied. See figure 1 below for the daily averaged data.

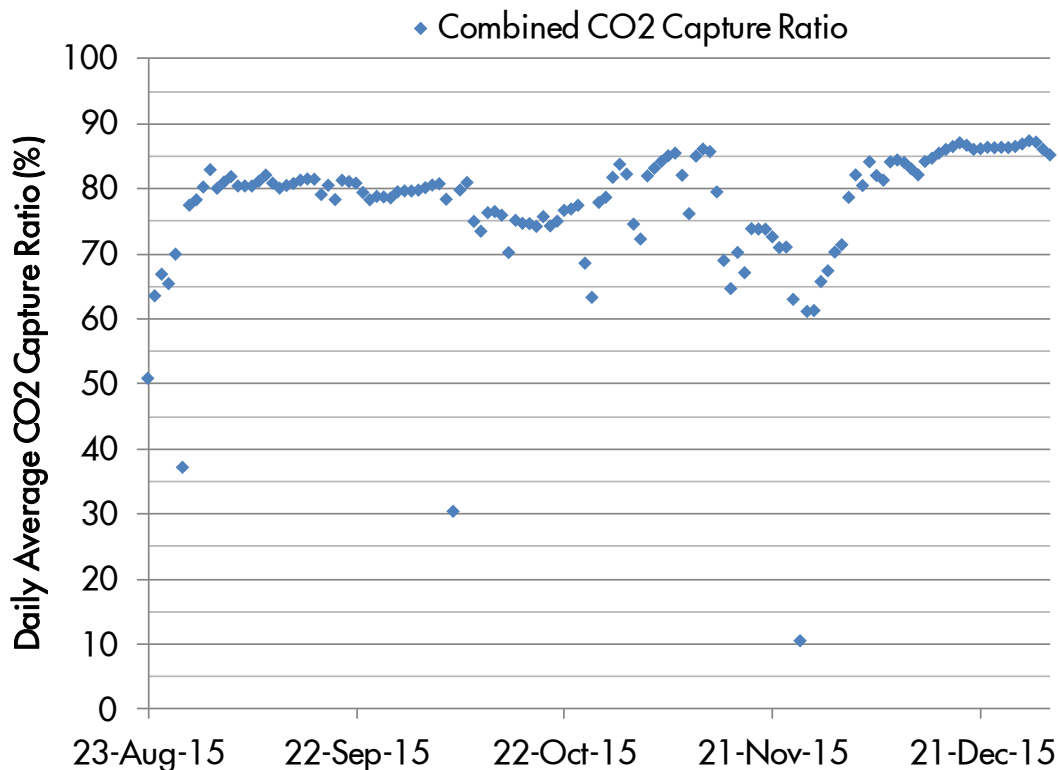


Figure 1: CO₂ Capture Ratio – Daily Averages

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The data from figure 1 shows that there were a few periods where performance on a daily basis was below the typical 80% capture rate expected. The following events in 2015 contributed to low overall CO2 capture ratio performance:

- August 23rd through August 28th: low capture ratios were associated with ramp up of injection rates after initial injection. On August 26 for 2 hours, and again on the 27-28 for 14 hours, a compressor upset associated with rapid, unexpected, opening of the compressor anti-surge valve resulted in a loss of flow to the pipeline for roughly 14 hours.
- October 6th, 2015: A 12 hour outage of the compression unit was taken to repair the positioner/regulator on the compressor anti-surge valve, plus some other minor repairs, contributing to an average capture ratio of ~30% for the day.
- November 14 through December 1: Reduced hydrogen demand at the Upgrader resulted in turndown conditions in the Upgrader HMUs. When the HMUs go into turndown, capture ratios are reduced due to a low fuel gas pressure constraint. This constraint is a result of removing large volumes of CO2 from the PSA feed streams via the absorbers, resulting in lower tail gas volumetric flowrates, and hence less pressure in the fuel gas piping to the reformer burners. Hydrogen plants are equipped with low fuel gas pressure differential trips as part of the safety system, so a minimum fuel gas pressure is maintained for reliability.
- November 24/25: a trip of the CO2 pipeline occurred due to power supply issues at LBV3. The outage duration was roughly 22 hours.

Capture ratio performance was very strong through December, with capture ratios above 85% combined for the majority of the month. This shows that the installed Quest technology/capacity is capable of strong, sustained CO2 capture ratios with good reliability performance and stable hydrogen demand.

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