Attachment I

Causal Analysis Report

Chevron Richmond Refinery
Reportable Flaring Events

May 22, 2022
Flaring Due to Shutdown of Hydrogen Plant Train 1
1. Date on which the report was drafted: July 28, 2022

2. The refinery name and site number:
   Refinery: Chevron Richmond Refinery
   Refinery Site Number: A0010

3. The assigned refinery contact name and phone number:
   Contact Name: Brandon Sutter
   Contact Phone Number: (510) 242-5212

4. Identification of flare(s) at which the reportable event occurred by reviewing water seal monitoring data to determine which seals were breached during the event

<table>
<thead>
<tr>
<th>Flare</th>
<th>Reportable Event (SO2 or Vent Gas Volume)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2 (S-6021)</td>
<td>Vent Gas Volume</td>
</tr>
</tbody>
</table>

5. The flaring event duration for each affected flare

   Flare (Source Number): H2 (S-6021)
   The Date(s) of the event: May 22, 2022
   The start time of the event: 5/22/2022 12:10 PM
   The end time of the event: 5/22/2022 11:59 PM

6. A brief description of the flaring event –

   On May 22, 2022, Hydrogen Plant Train 1 depressured to relief due to low steam to carbon ratio. It was determined that the low steam to carbon ratio was due to valve faults within the plant. Operations shutdown Train 1 to perform valve repairs. Hydrogen Plant shutdown procedures include routing flows to relief and subsequent flaring. Operations timely proceeded with the shutdown activities per the procedure to reduce the emissions.

7. A process flow diagram showing the equipment and process units that were the primary cause of the event.

   See Attachment Ia.

8. The total volume of vent gas flared (MMSCF) throughout the event

<table>
<thead>
<tr>
<th>Flare</th>
<th>Volume (MMSCF)</th>
</tr>
</thead>
</table>

Attachment I
9. The emissions associated with the flaring event per calendar day

<table>
<thead>
<tr>
<th>Flare</th>
<th>Calendar Day</th>
<th>CH4 (lbs.)</th>
<th>NMHC (lbs.)</th>
<th>SO2 (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2</td>
<td>May 22, 2022</td>
<td>536</td>
<td>175</td>
<td>1</td>
</tr>
</tbody>
</table>

Assumptions used to calculate emissions – consistent with the reporting under Reg. 12-11.

10. A statement as to whether or not the gas was scrubbed to eliminate or reduce any entrained compounds and a list of the compounds for which the scrubbing was performed.

The vent gas was not scrubbed to eliminate or reduce any entrained compounds.

11. The primary cause of the flaring event including a detailed description of the cause and all contributing factors. Also identify the upstream process units that contributed vent Gas flow to the flare header and provide other flow instrumentation data where available.

Primary causal factor: A valve was sent to a third-party company for maintenance, which included replacing the valve positioner. However, the valve positioner was not replaced by the third-party company before the valve was put back into service. The valve then subsequently failed.

Contributing causal factor: Valve had overtightened packing.

The primary contributor of the vent gas to the flare was the Hydrogen Plant Train 1.

12. Describe all immediate corrective actions to stabilize the flaring event, and to reduce or eliminate emissions (flare gas recovered or stored to minimize flaring during the event). If a decision was made not to store or recover flare gas, explain why.

Operations shutdown Train 1 to perform valve repairs. Operations timely proceeded with the shutdown activities per the procedure to reduce the emissions. The Hydrogen Plant does not have flare gas recovery.

13. Was the flaring the result of an emergency? If so, was the flaring necessary to prevent an accident, hazard or release to the atmosphere?

Flaring was not due to an Emergency (defined in Regulation 12-12-201) as interpreted by the BAAQMD.

14. If not the result of an emergency and necessary to prevent an accident, hazard or release to the atmosphere, was the flaring consistent with an approved FMP? If yes, provide a citation to the facility’s FMP and any explanation necessary to understand the basis for this determination.

Flaring was consistent with Chevron’s FMP Section 2.1 Table 2-4. Table 2-4 identifies sources that can be flared in non-emergency situations (e.g. start-up, shut-down).

15. If the flaring was due to a regulatory mandate to vent to flare, why couldn’t the gas be recovered, treated, and used as fuel gas?

N/A. Flaring was not due to a regulatory mandate.

16. Identify and describe in detail each prevention measure (PM) considered to minimize flaring from the type of reportable flaring event that occurred.
   a) State whether the PM is feasible (and will be implemented), or not feasible
   b) Explain why the PM is not feasible, if applicable
1. Evaluate addition of alarm for positioner controller feedback.
2. Consider installing bypass for control valves associated with this event.
3. Evaluate improvements to control valve work order process to ensure scope of work is fully executed.
4. Perform work order trainings with relevant personnel.
Flaring Due to Shutdown of Hydrogen Plant Train 1

Low steam to carbon ratio at Hydrogen Plant Train 1 caused by valve faults led to the depressuring and shutdown of the plant.