Attachment II

Causal Analysis Report

Chevron Richmond Refinery
Reportable Flaring Events

June 12, 2019
Shutdown of Hydrogen Plant Train 2
(S-4450)

1. Date on which the report was drafted: August 29, 2019

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: Laura Kurt
Contact Phone Number: (510) 242-5219

Is this a rescission/modification of a previous report: No.

Date of initial report: N/A

Reason for rescission/modification: N/A

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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**

Flare	Reportable Event (SO2 or Vent Gas Volume)
H2 (S-6021)*	Vent Gas Volume

**Note: The Hydrogen Plant (H2) flare does not have a water seal.*

5. The flaring event duration for each affected flare

Flare (Source Number): H2 (S-6021)
The Date(s) of the event: June 11, 2019-June 12, 2019
The start time of the event: 9:18PM on June 11, 2019
The end time of the event: 3:20AM on June 12, 2019
The net duration of event: 3 hours and 2 minutes
Note: 500,000 SCF was only exceeded on June 12, 2019

6. A brief description of the flaring event –

On June 11, 2019, at approximately 9:18PM, Hydrogen Plant Train 2 tripped offline following the shutdown of the induced draft fan. Operations took immediate actions to safely posture the plant.

Hydrogen plant shutdown procedures include routing flows to relief. The Hydrogen Plant does not have flare gas recovery or a water seal, and therefore all relief flow results in flaring. The vent gas volume exceeded 500,000 scf on June 12, 2019.

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

See Attachment IIa

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

Flare	Volume (MMSCF)
H2	1.6

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

Flare	Calendar Day	CH4 (lbs.)	NMHC (lbs.)	SO2 (lbs.)
H2	June 11, 2019	146	14.9	0.0
H2	June 12, 2019	642	71	0.2

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.

The Train 2 shutdown and subsequent flaring was caused by the malfunction of the induced draft fan. The run indication contact falsely indicated that the motor was not running, triggering computerized safety systems to shutdown the fan and subsequently Hydrogen Plant Train 2.

Vent gas flow originated from the Hydrogen Plant Train 2 (S-4450) and associated equipment, including S-4472.

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 took immediate actions following the Train 2 shutdown to stabilize the plant per procedure.

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

The flaring was not due to an Emergency (defined in Regulation 12-12-201) as interpreted by the BAAQMD. However, the flaring was the result of a malfunction.

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.

The flaring was consistent with Chevron's FMP Section 2.1 Table 2-4. Table 2-4 identifies the vent before PSA1 and PSA 2 (S-4449 and S-4450) and PSA 1 and PSA2 as sources that may flare in non-emergency events (e.g. start-up, shutdown). Additionally, the flaring was consistent with Chevron's FMP Section 5.4 Figure 5-1. The shutdown was unplanned. Causes for the flaring were analyzed through an investigation and the corrective actions have already been or will be implemented to reduce the likelihood of a recurrence of flaring resulting from the same causes.

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 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

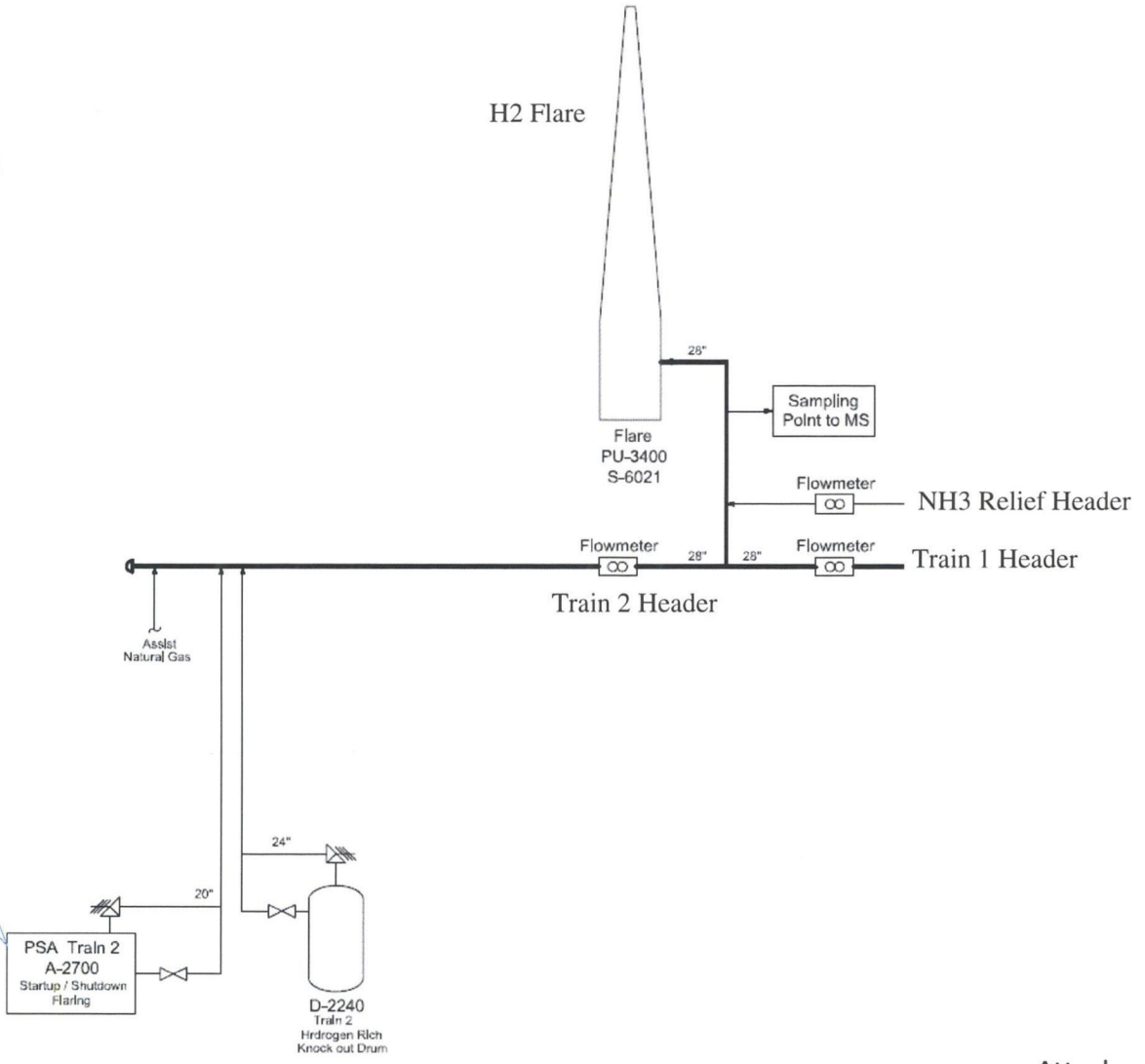
1. Modify the Distributed Control System automatic safety shutdown condition to use two-of-two voting logic on induced air fans
   Completion Date: August 12, 2019

Note: Flaring cannot be prevented during plant start-up due to facility and relief system design.

Hydrogen Plant Train 2 Shutdown

On June 11, 2019, at approximately 9:18PM, Hydrogen Plant Train 2 tripped offline following the shutdown of the induced draft fan. Operations took immediate actions to safely posture the plant.

Hydrogen plant shutdown procedures include routing flows to relief. The Hydrogen Plant does not have flare gas recovery or a water seal, and therefore all relief flow results in flaring. The vent gas volume exceeded 500,000 scf on June 12, 2019.



Chevron Richmond Refinery

Attachment IIa