

**Attachment II**

Causal Analysis Report

Chevron Richmond Refinery  
Reportable Flaring Events

March 5, 2019 – April 12, 2019  
Start-up and Commissioning of Hydrogen Plant Train 2 (S-4450)

Refinery Flare Event – Cause Investigation Report

**1. Date on which the report was drafted:** May 30, 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

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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: 3/5/2019 – 4/12/2019

The start time of the event: 5:42AM on 3/5/2019

The end time of the event: 6:24PM on 4/12/2019

The net duration of event: 38 days, 12 hours, and 42 minutes

**6. A brief description of the flaring event –**

The Chevron Richmond Refinery began start-up of the newly constructed Hydrogen Plant on November 16, 2018. Natural gas feed was introduced into Train 2 for the first time on January 4, 2019. The Train 2 commissioning period continued until April 17<sup>th</sup> as equipment was tested and implemented.

On March 5, 2019, Train 2 shutdown and was subsequently restarted on the same day per procedure. Flaring continued from March 6, 2019 through April 12, 2019 as part of the commissioning period activities of both Train 1 and Train 2. Both start-up and shutdown procedures and commissioning activities include routing flows, comprised mostly of hydrogen gas, 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 each day March 5, 2019 – April 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	790

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

Flare	Calendar Day	CH4 (lbs.)	NMHC (lbs.)	SO2 (lbs.)
H2	March 5, 2019	3604	342	1
H2	March 6, 2019	1243	175	14
H2	March 7, 2019	635	145	7
H2	March 8, 2019	600	115	5
H2	March 9, 2019	575	95	5
H2	March 10, 2019	496	73	3
H2	March 11, 2019	510	66	2
H2	March 12, 2019	489	58	2
H2	March 13, 2019	408	47	2
H2	March 14, 2019	460	53	1
H2	March 15, 2019	476	66	2
H2	March 16, 2019	499	73	3
H2	March 17, 2019	393	48	1
H2	March 18, 2019	418	51	1
H2	March 19, 2019	365	45	1
H2	March 20, 2019	283	35	1
H2	March 21, 2019	434	64	1
H2	March 22, 2019	521	91	2
H2	March 23, 2019	496	69	2
H2	March 24, 2019	504	71	3
H2	March 25, 2019	486	68	3
H2	March 26, 2019	468	63	2
H2	March 27, 2019	612	116	2
H2	March 28, 2019	513	75	3
H2	March 29, 2019	533	79	3
H2	March 30, 2019	531	83	3
H2	March 31, 2019	496	69	3
H2	April 1, 2019	409	51	1
H2	April 2, 2019	335	42	1
H2	April 3, 2019	433	58	3
H2	April 4, 2019	527	97	9
H2	April 5, 2019	551	118	14
H2	April 6, 2019	564	110	12
H2	April 7, 2019	557	87	8
H2	April 8, 2019	545	75	6
H2	April 9, 2019	350	41	2

H2	April 10, 2019	512	71	5
H2	April 11, 2019	490	59	3
H2	April 12, 2019	234	27	1

*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.**

Flaring was due to Train 2 shutdown, startup and commissioning activities.

Vent gas flow originated from the Hydrogen Plant Train 2 (S-4450) and associated equipment, including S-4472. Vent gas flow also originated from Hydrogen Plant Train 1 (S-4449) and associated equipment, including S-4471.

**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 followed start-up procedures and commissioning requirements. The Hydrogen Plant does not have flare gas recovery.

**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.

**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).

**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

Flaring cannot be prevented during plant start-up or shutdown due to facility and relief system design. Lessons learned during the commissioning period have been incorporated into procedures and plant operation to support reliable operations.

# Hydrogen Plant Train 2 Start-up and Commissioning

On March 5, 2019, Train 2 shutdown and was subsequently restarted on the same day per procedure. Flaring continued from March 6, 2019 through April 12, 2019 as part of the commissioning period activities of both Train 1 and Train 2. Both start-up and shutdown procedures and commissioning activities include routing flows, comprised mostly of hydrogen gas, to relief. The Hydrogen Plant does not have flare gas recovery or a water seal, and therefore all relief flow results in flaring.

