Qenos

Olefins Flaring Incident Analysis Summary (2017 & 1H2018)

EMT Update

August, 2018

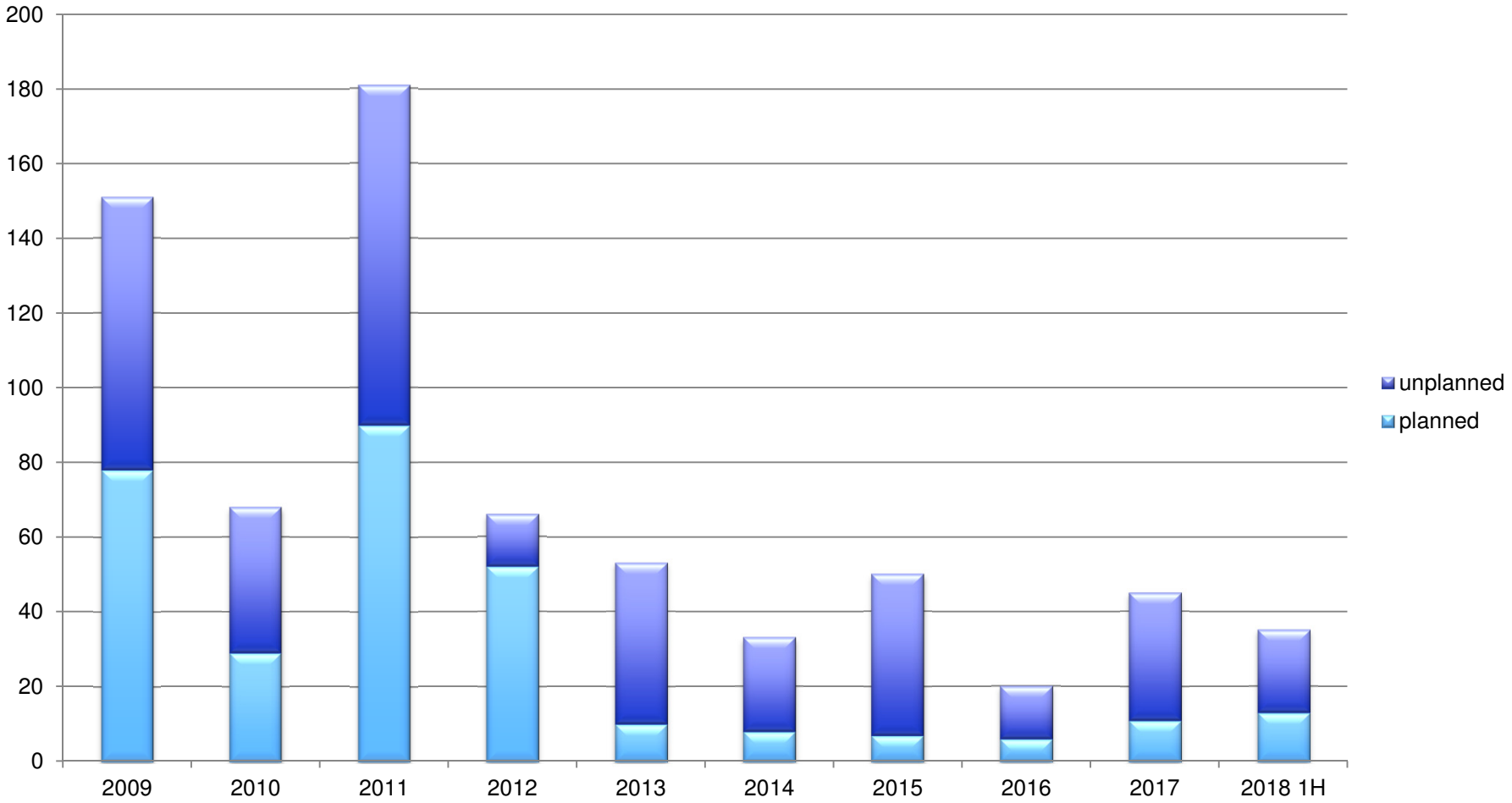
Olefins Annual Flaring review

- Has operated since 2009.
  - Continues to provide valuable information
- Follow up review for the past 18 months
  - Summary of causes and opportunities to reduce
- Review high flaring event data
  - Summary of causes and opportunities to reduce

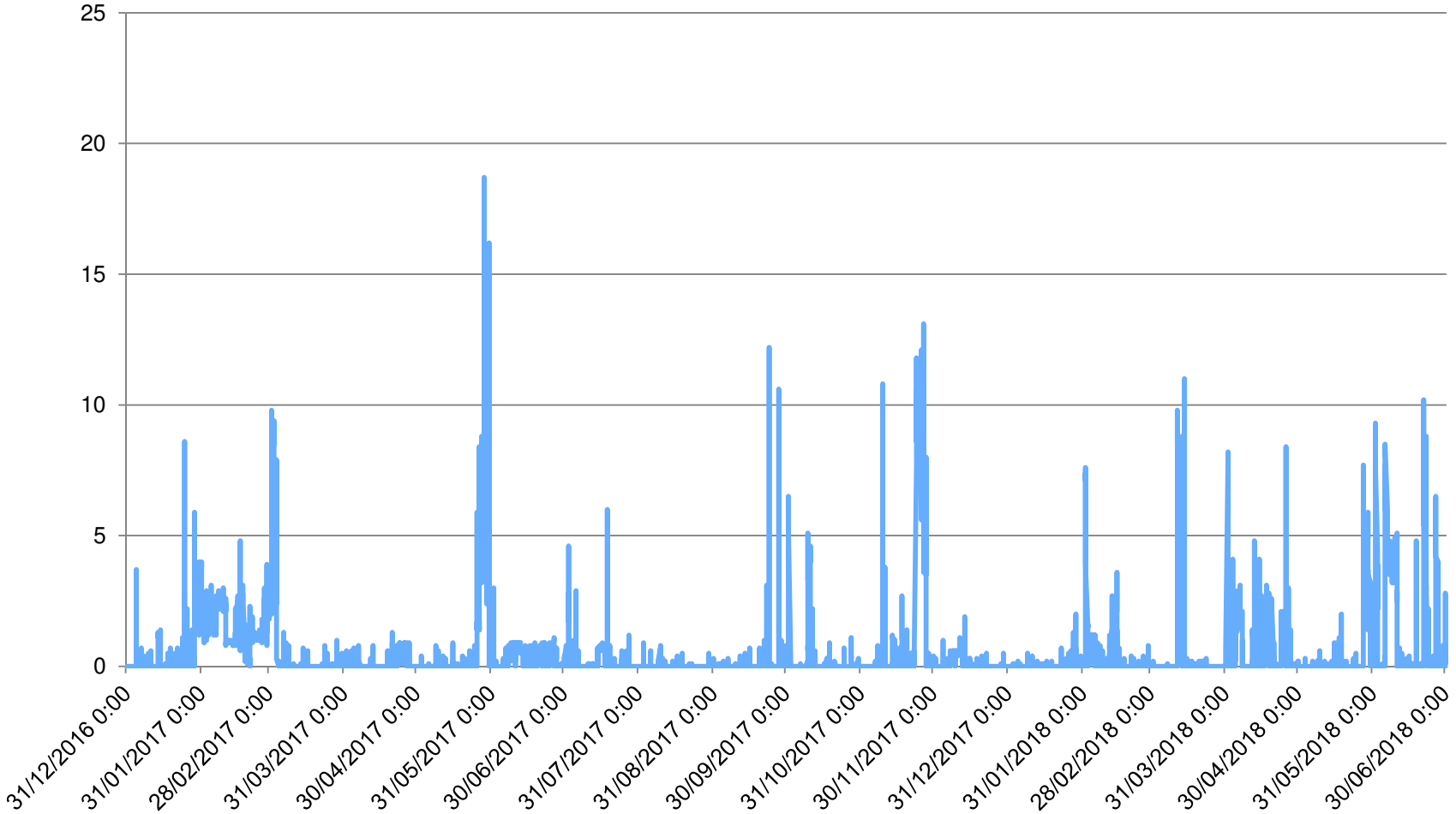
2017 & 1H2018 Summary

- Disappointing period with increased flaring in 2017 and 1H2018
- This was due to a combination of major planned events and a number of unplanned events
- Flaring monitoring is well embedded within the Olefins Operations Group
  - Process Alarms and Manufacturing Alert system to minimise flaring above 5tph
  - Maximise product recovery to fuel gas to minimise flaring
  - Noise monitoring to reduce community impact
- Communication to community when flaring is to occur can help prevent community alarm to flaring
- Our focus is to re-establish steady “non flaring” production

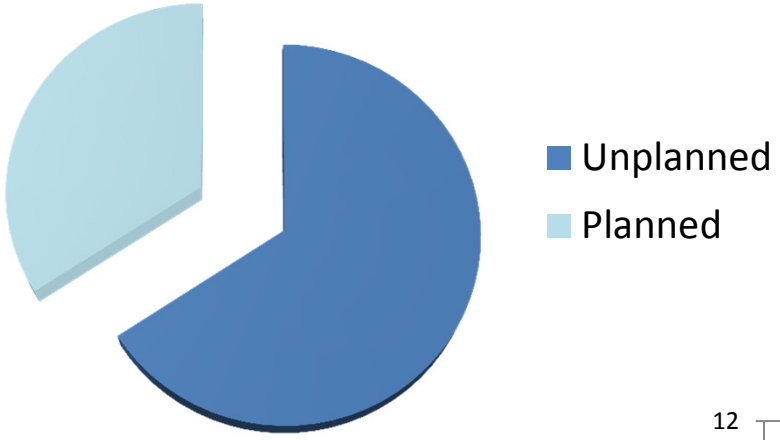
Overall Flaring Rates increased in 2017 and 1H2018 after recent years of improvement. Graph below shows # events > 5t/hr over recent years

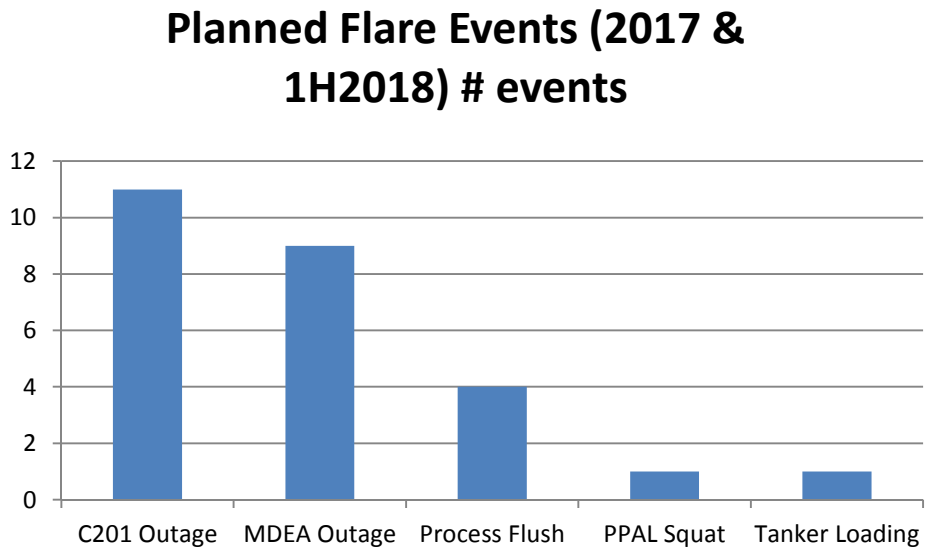


Flaring Rate Jan 2017 - June2018 (2 hr average rate) shows that in recent times there has been an increase in flaring between 5 and 10 tph



Unplanned Flaring was higher than planned flaring in 2017 and 1H2018



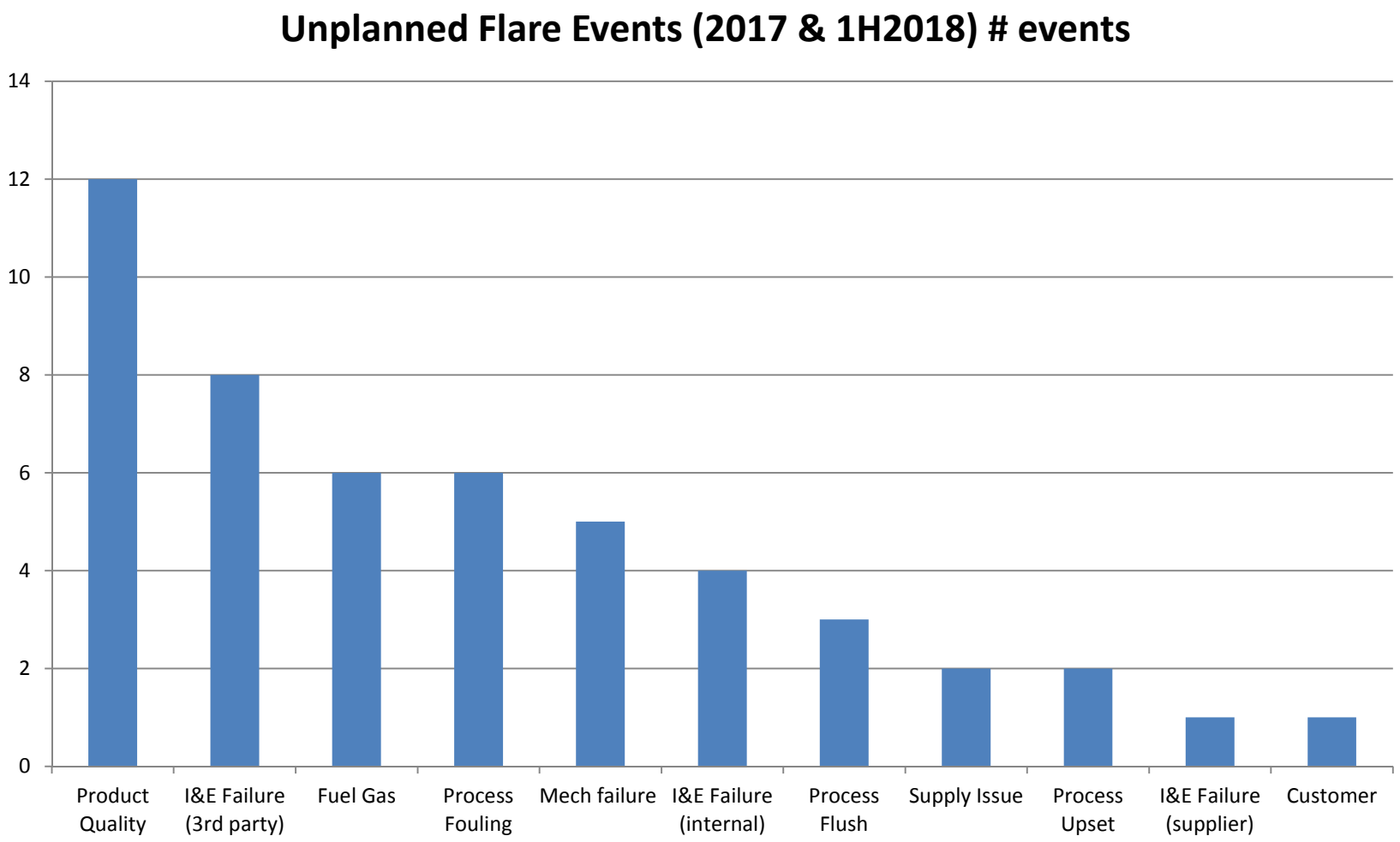


76 events – 26 planned and 50 unplanned

Flaring from planned activities was impacted by two major outages in 2017/1H2018

- Observations
  - The Scal-2 shutdown associated with Esso MDEA outage (no ethane) and the Scal-1 outage to clean C-201 provided the majority of planned events (20 of 26 events)
  - Process Flushing to remove hydrates was next highest cause
  - No repeats from 2016- demonstrating focus on rectifying known planned flaring causes
  - Reflects conscious effort by the shift group to keep flaring rate below 5tph where possible
- Plant start-ups and shutdowns
  - Flaring is an integral part of the process
  - For the planned shutdown & start-ups, procedures have been amended to reduce the flaring during a start-up or shutdown
  - No major planned plant shutdowns over next 12 months ahead
  - Challenge is to prevent the unplanned events

The total number of unplanned events was 50 across 2017 and 1H 2018. Product Quality was the highest contributor to unplanned flaring.



Opportunities continue to be explored to reduce unplanned flaring activities

- Observations
  - The highest cause of unplanned flaring was associated with product quality
  - A number of plant upsets caused increased unplanned flaring. The cause of these included instrument/electrical and mechanical issues as well as external plant impacts (ethane supply)
  - Equipment issues worked on a case by case basis

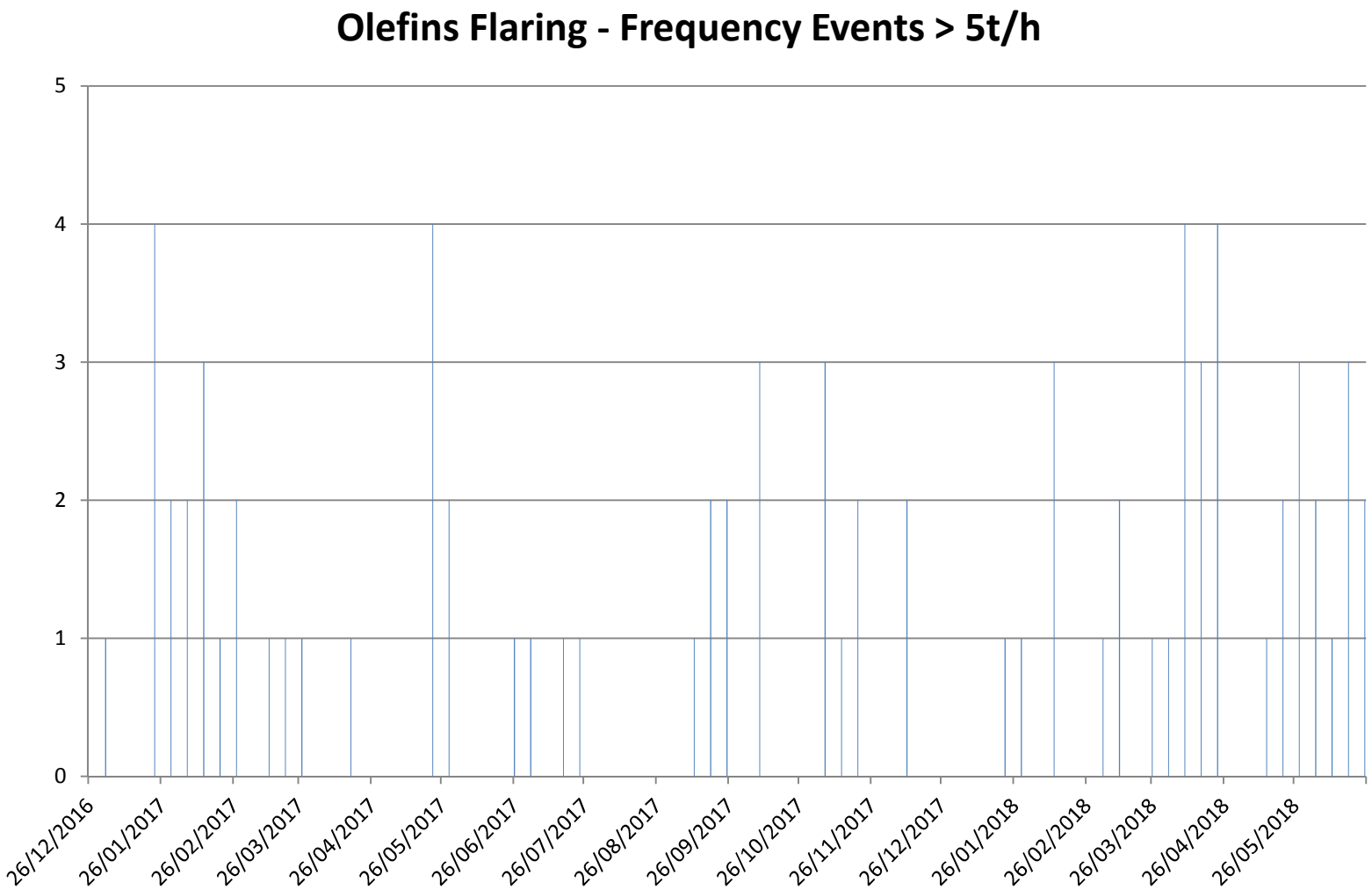
- Opportunities
  - Continued focus on reducing quality incidents
  - Eliminating one off major events
  - External power disruptions incidents remain at 0 with Cogen operating well. It enables the plant to remain on line in island mode during loss of external power from the network
  - Continued emphasis on well planned activities that factor in stable plant operation and flare management
  - Video flare recording now implemented to enhance review of flaring incidents

A number of improvements to flare operation are underway to minimise community impact

- Scheduling of peak flaring activity to avoid night time period. (After 10 pm)
  - For planned flaring
  - Recovery from unplanned flare events
- Flare smoke suppression control system reviewed
  - Retuned steam addition rate which has reduced flare noise
  - Evaluating the operating of the flare emissivity cameras
- Balancing the load between both flares reduces the noise
  - Compromise is increased luminosity
  - Requires more hands on operation to manage
- Cross functional team overviewing flare
  - Flare performance
  - Flare improvement activities

Back-up

#Events/week of flaring has increased over period vs previous years



Summary for Major Flaring Events:

- Increase in number of major flaring events
- All events have been investigated or are in the process of being investigated and appropriate actions implemented or to be implemented.
- Learnings are applied broadly across the plant to prevent reoccurrence elsewhere
- Internal initiated events, have been captured through our internal incident registration (QIDS or QNCS)
  - Independent investigation have been completed.
  - Actions identified for each investigation.
- Considerable effort is made to minimise the rate and duration of the flaring during offspec incidents (rates reduced and noise level monitored).