

Smarter, Faster, Cleaner: Redefining the Modern Turnaround Cycle

- Shutdown for Turnaround (Jay)
- Turnaround Process Engineer Roles (Phil)
- Startup from Turnaround (Scott)
- **The SRU Run-Length Dilemma (Jonathan)**

The SRU Run-Length Dilemma

How Long Can We Go Between Turnarounds? (an ABPG Survey)

Survey background

43 respondents (most facilities with multiple trains per response)

- Predominantly US (but significant international exposure)
- 39 Refinery
- 4 Oil & Gas Plants

Some important definitions:

Spared vs Unspared

- Survey focus: on units where shutdown of SRU/TGUs results in loss of profitability on other units (rate reductions on HC units)

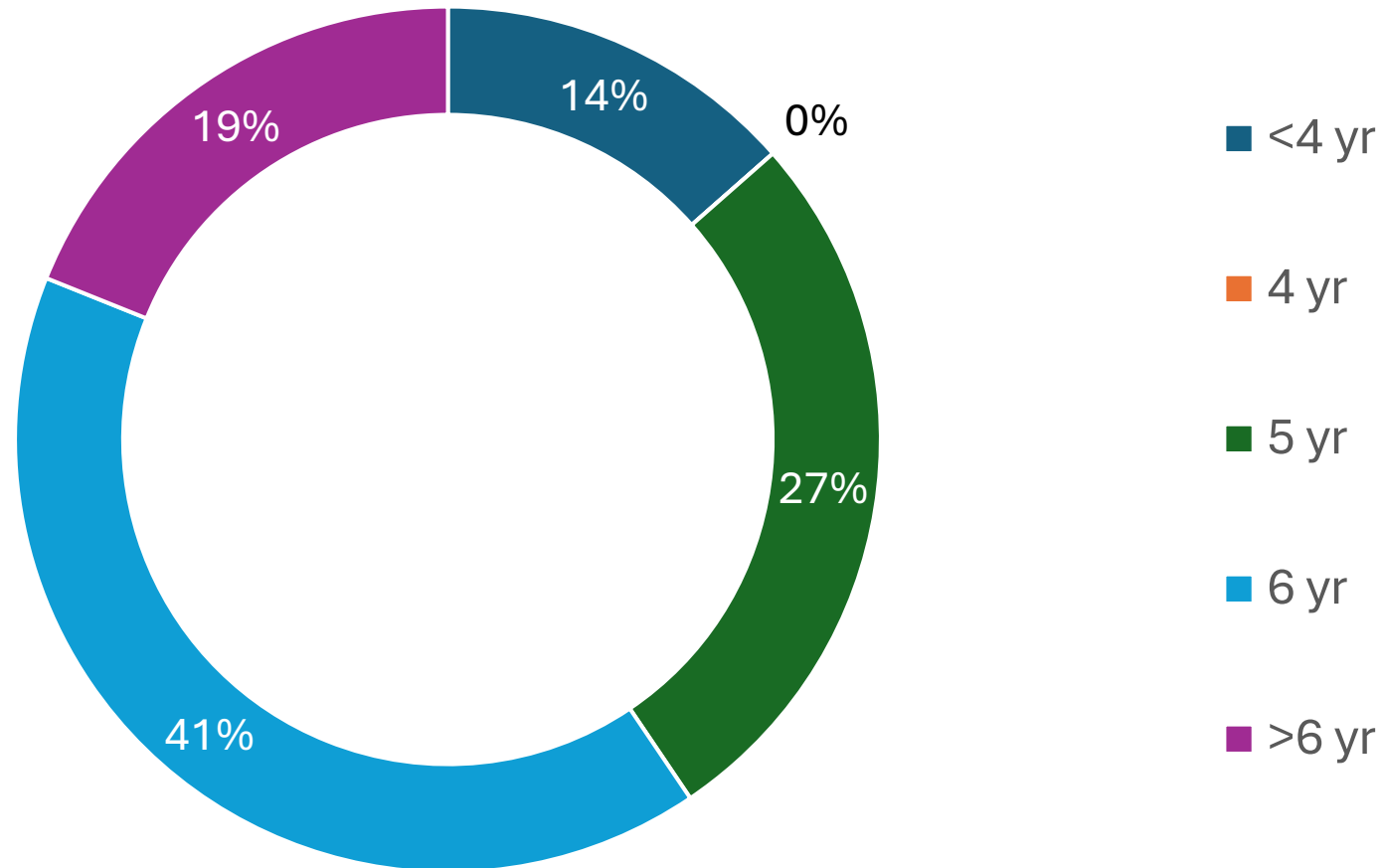
Planned Event: Normal turnaround that is planned in advance (>12 months)

Unplanned Event: Some equipment malfunction leading to a shutdown

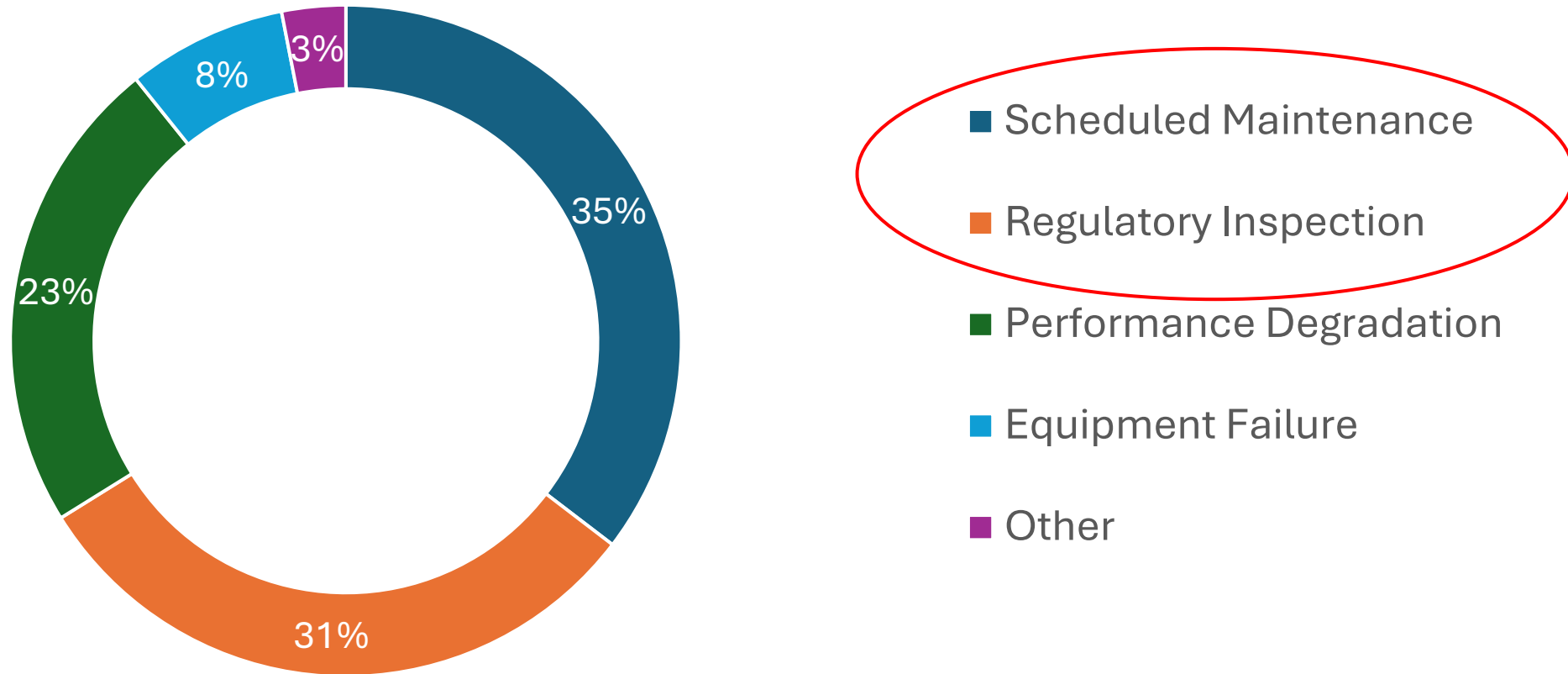
Survey background

- Unit:** Normally the Claus and Tail Gas treating sections
- Turnaround:** A planned maintenance event when the unit is not operating
- Outage:** Normally an unplanned maintenance event
- External:** Factors outside of the SRU/TGU (power, utilities, upstream unit etc)
- Internal:** Factors inside the plot of the SRU/TGU

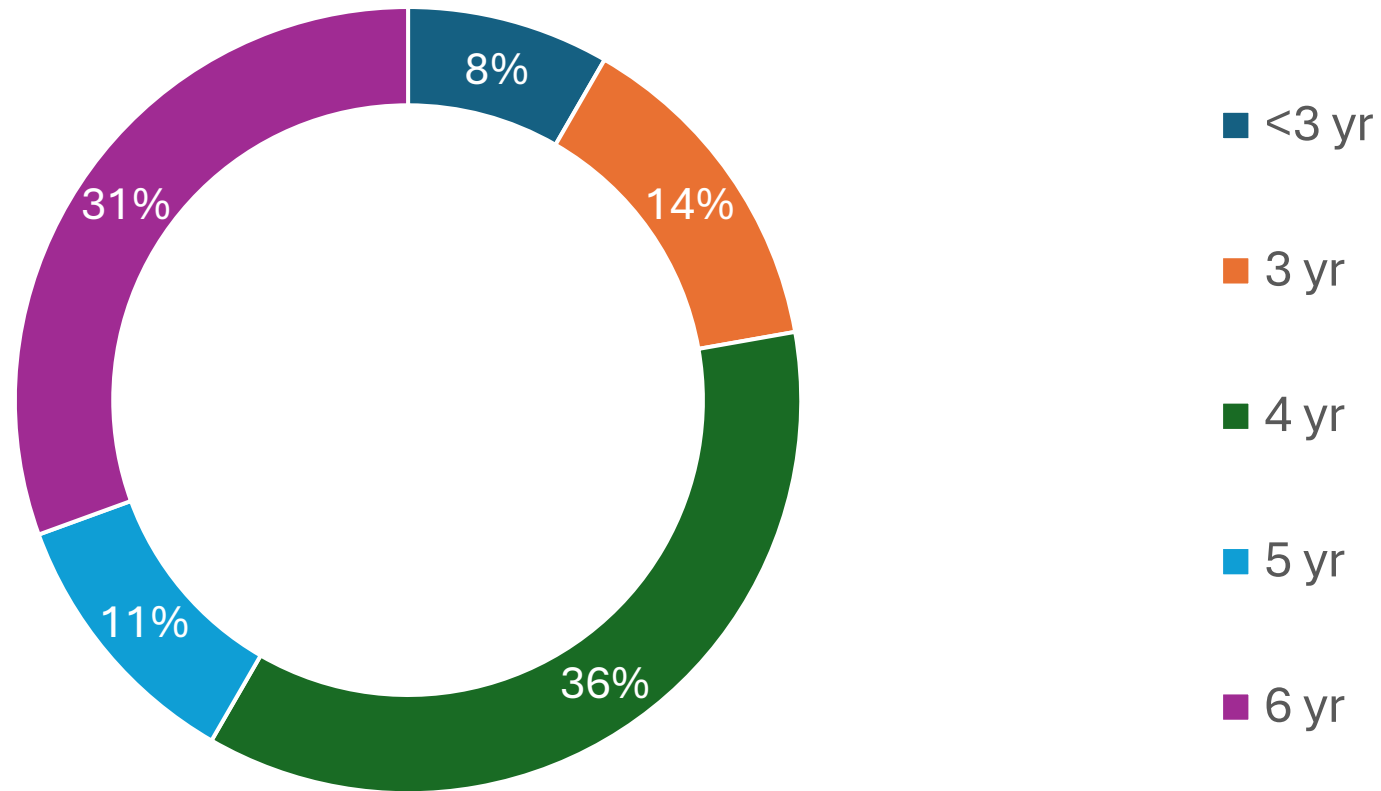
What is your longest ACTUAL duration between Turnarounds for your critical/unspared SRU/TGU?



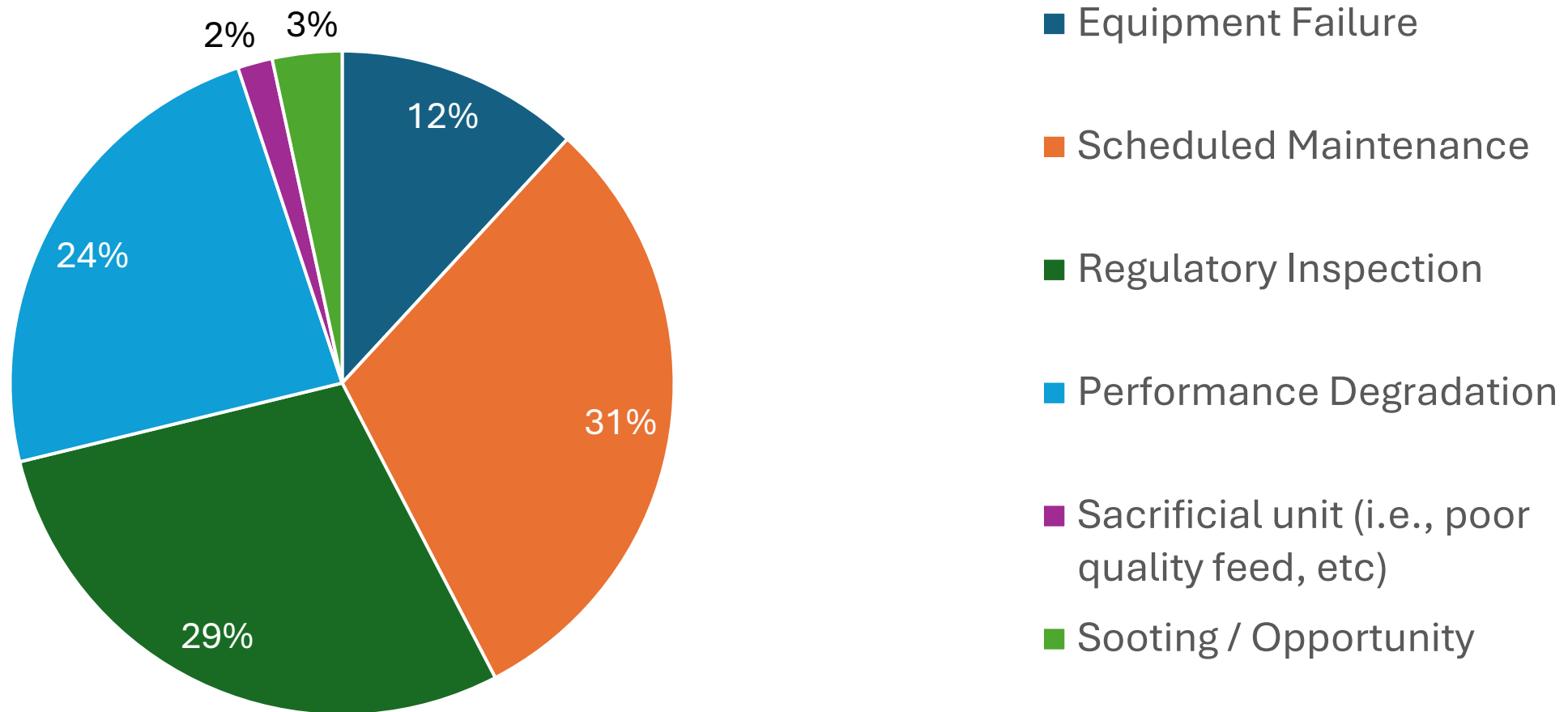
Which of the following were the primary factors that triggered the Turnaround of your critical/unspared unit after your longest duration?



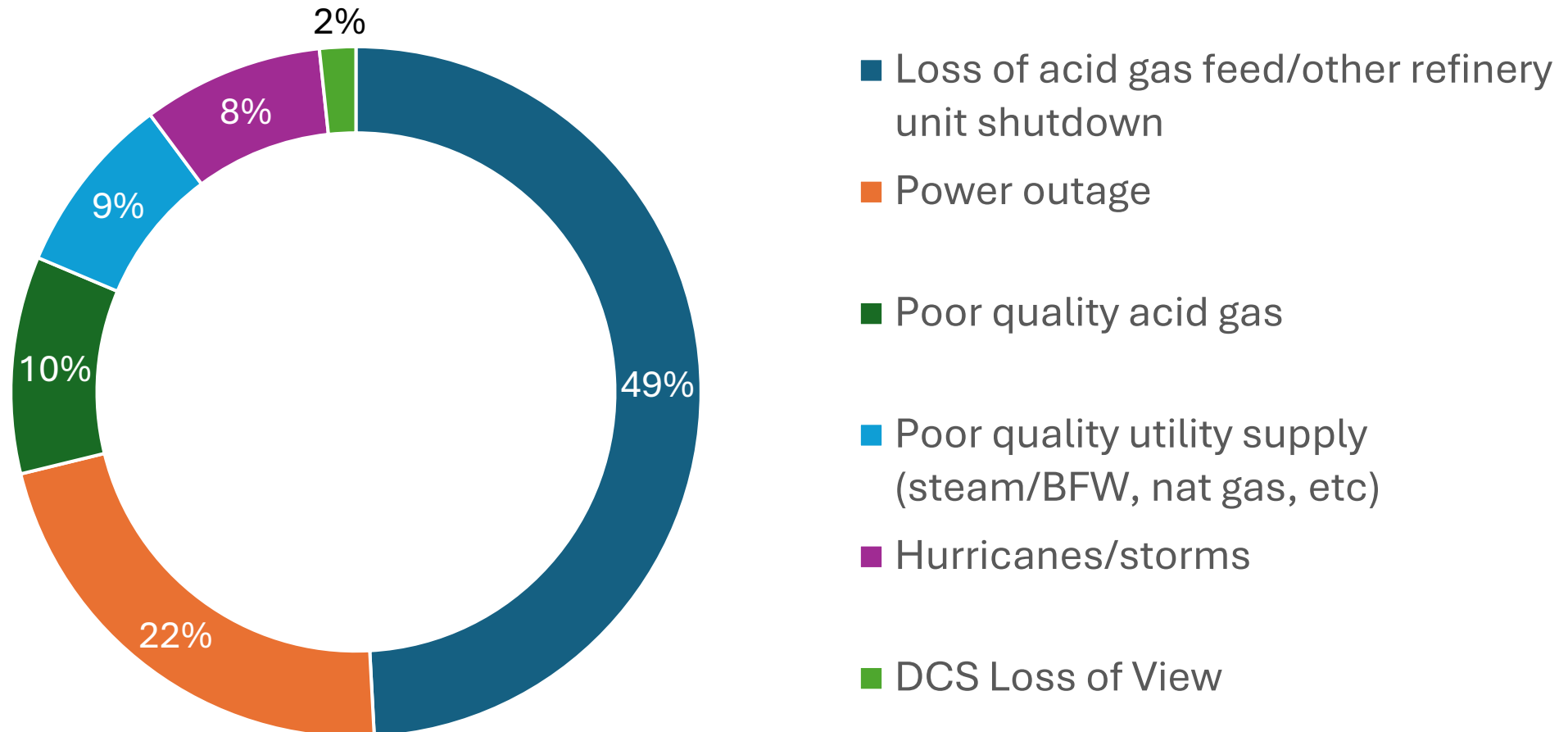
What is your shortest PLANNED duration between
Turnarounds for your critical/unspared units?



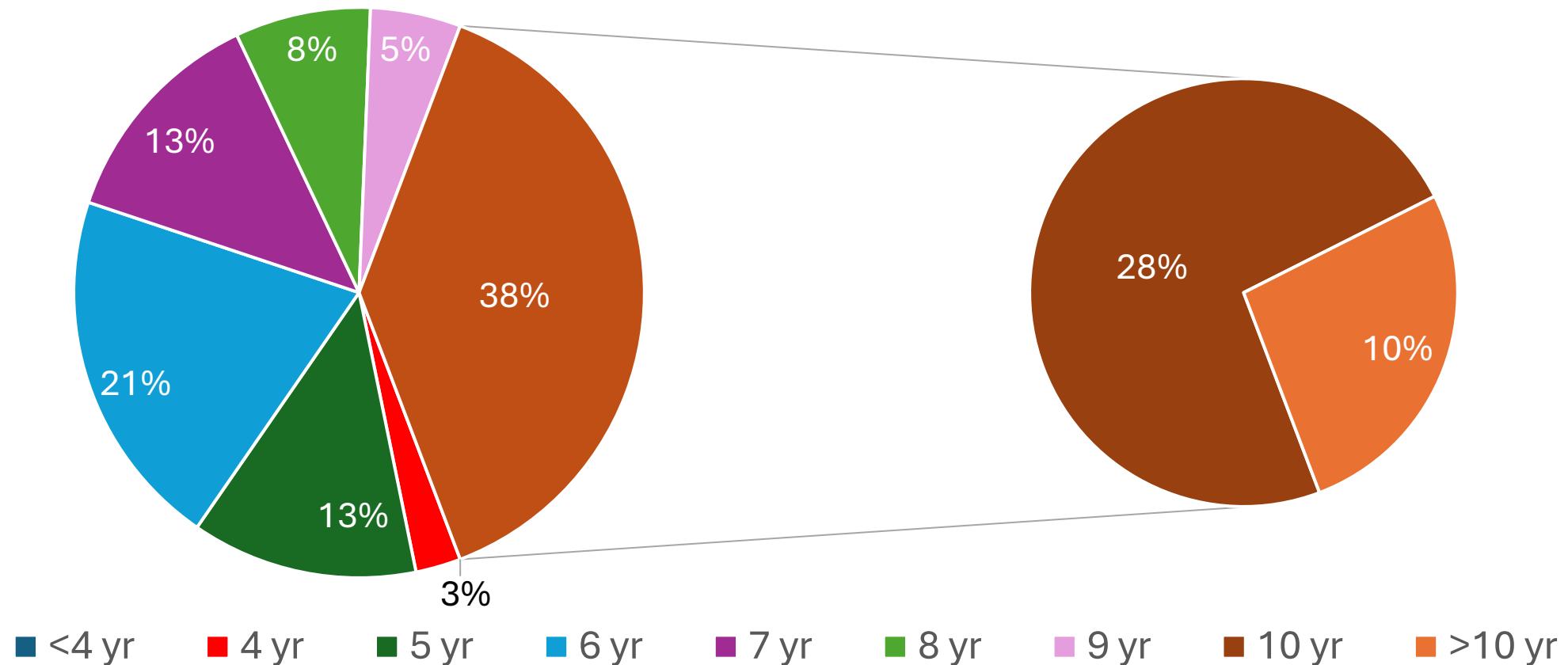
What were the primary factors that triggered the Turnaround for the shortest duration?



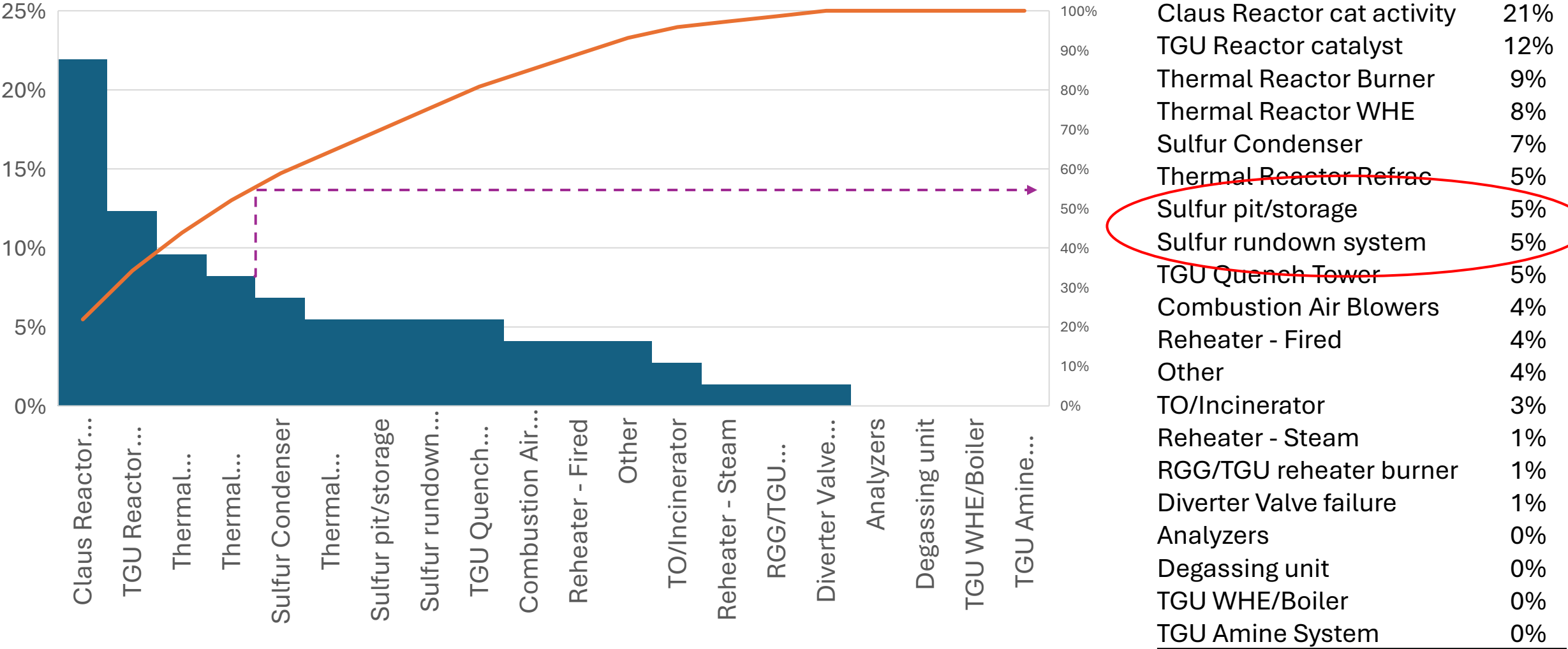
What are the most common EXTERNAL reasons for unplanned outages in your operating units?



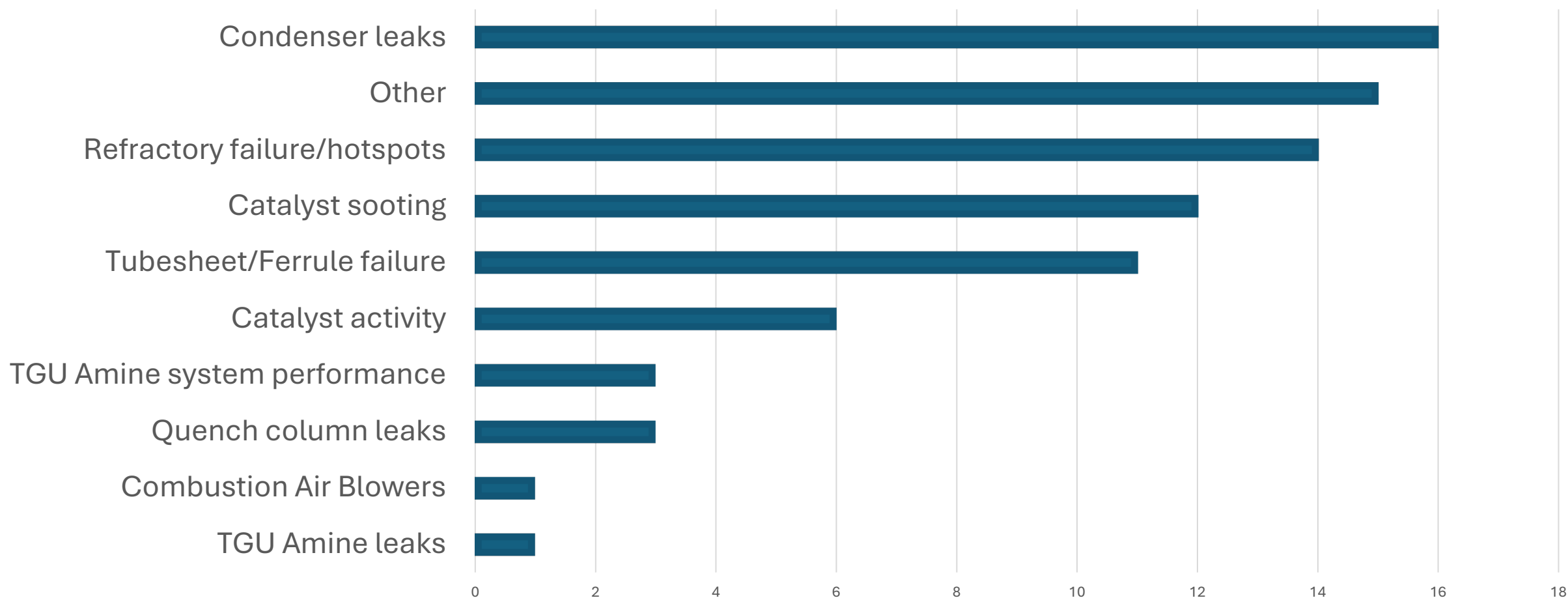
Removing all external (non SRU/TGU) reasons for a Turnaround, how long could you run between Turnarounds (in years)?



Removing all external reasons for a Turnaround, what limit (equipment, catalyst, etc) would be reached first in an extended run - assuming error-free operation?



What are the most common INTERNAL reasons for unplanned outages in your operating units?



Other: Quench tower plugging x 2; Instrumentation x 2; Other equipment x 3; sulfur traps; old reheaters; steam system; condenser performance (high rundown temp); plugging; SIS operator error; steam reheater tube failure; amine leaks (?)

Technologies or practices that have moved the needle

- Improved process monitoring and focus on reliable instrumentation/analyzers (dP) (9)
 - ADA upgrades, proactive/routine maintenance
- Rundown system upgrades (6)
 - Moved from sulfur pit to sulfur surge/rundown vessel
 - Above-ground sulfur seal device upgrades
- Cat trap on Claus bed to mitigate impact of sooting (6)
- Improved acid gas quality monitoring (5)
- Catalyst: Titania in Bed 1 and low temp TGU cat (4)
- Refractory/tubesheet protection (temperature monitoring, vector wall, heat up and dry out) (3)
- Minimize cycling units by use of co-firing or hot standby (3)
- Improved air/steam control to Thermal reactor – logic/control valve type (3)
- Full flow filtration in rich amine (2)
- Fired reheater upgrades / advanced technology burners (2)
- Operator training (2)
- Added H₂ firing for Thermal Reactors (2)
- Others: BFW quality monitoring and chemical treatment, Implemented firm HSS protocol, Improved startup and SD procedures

So where does that leave us?

- Vendors – feels like there are some clear calls for help
- Operators – any highlights?