

# Virginia City Hybrid Energy Center (VCHEC)

## Air In-Leakage - Experience Report



2023 ACCUG Richmond, VA  
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# VCHEC Air In-Leakage

## VCHEC General Info

- 2 Boilers
- 1 T-G Set
- 610 nMW
- Coal (GOB and run-of-mine) and Biomass Fired Plant
  
- Air-Cooled Condenser (ACC)
  - Use hoppers and ejectors for non-condensable removal

# VCHEC Air In-Leakage ACC General Info

- OEM – SPG Dry Cooling
- 60 Fans
- 10 streets of 6 bays
- 36' diameter fans



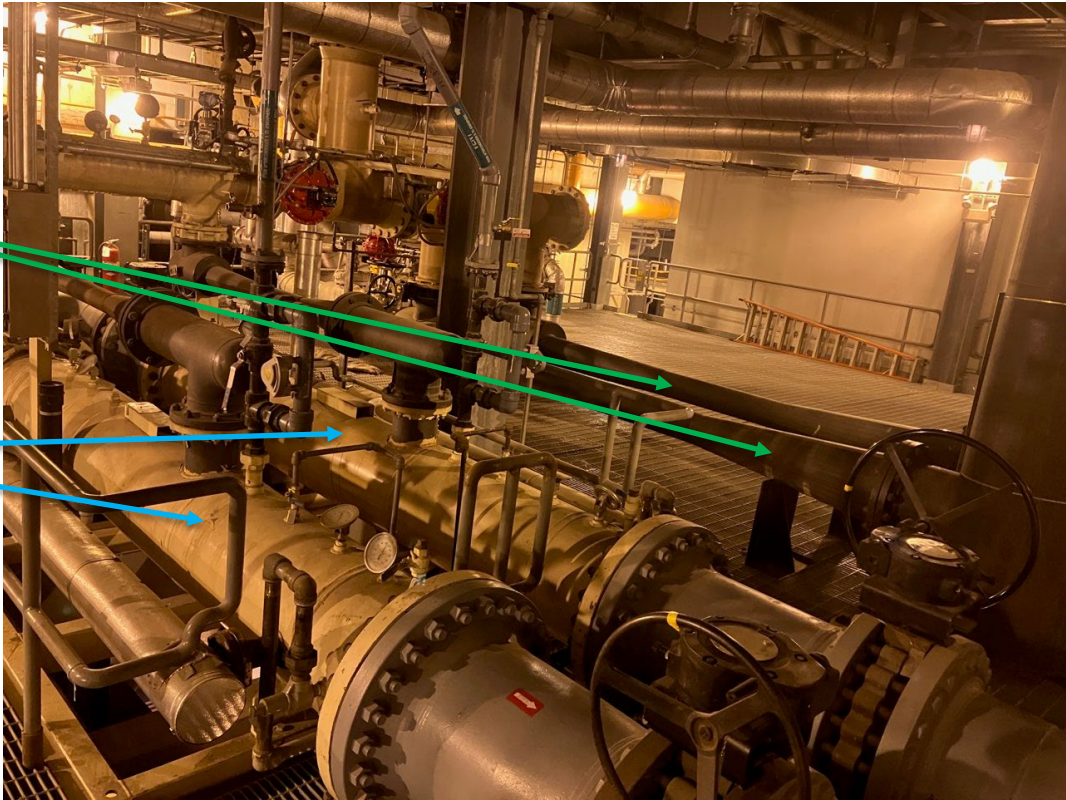
# VCHEC Air In-Leakage Background

- VCHEC utilizes steam jet air ejectors (SJAE) to remove non-condensable gasses from the ACC
- Hogging ejectors (2 x 100%) are used to evacuate the ACC
- Dual stage holding ejectors (2 x 100%) for normal operations

# VCHEC Air In-Leakage Background

Hogging  
Ejectors

Holding  
Ejectors



# VCHEC Air In-Leakage

- Post-outage, November 2021 – Unit dispatched to full load
- During startup, operations noticed that when switching from the hogger to the holding ejector, backpressure was not maintained
- Immediately, the hogger was placed back into service to catch the falling backpressure
- The typical air in leakage indications (monitor, dissolved oxygen, duct vs. saturation temp) suggested there was a major leak on the ACC
- The unit was derated ~ 200MW for 2 days, followed by 100MW derate for 5 days

# VCHEC Air In-Leakage

- Several days of troubleshooting followed
  - Helium leak detection,
  - Thermal imaging cameras,
  - Ultrasonic leak detection, and
  - Operations checked and rechecked equipment associated with vacuum side operations.
  
- No success in finding the leak.

# VCHEC Air In-Leakage

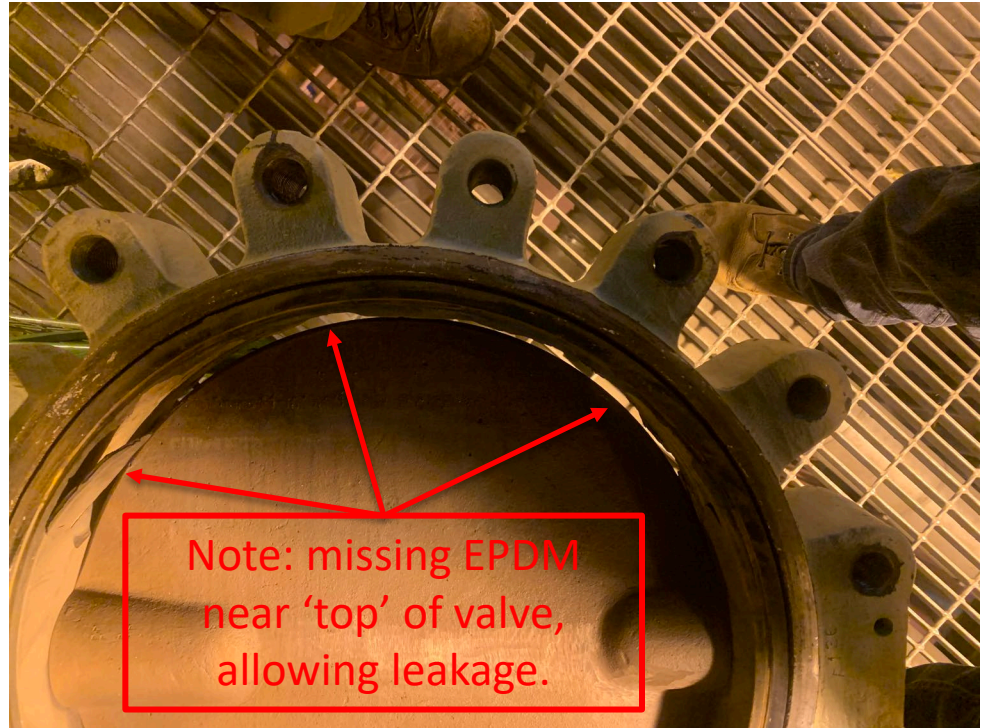
- A large leak was found in the isolation valves to the hogging ejectors
- The hogging ejectors discharge to atmosphere and the leakage through the isolation valves allowed air to be pulled back in through the discharge side of the out of service hogger
- Inspection of the valves' internals showed the rubber (EPDM) seated valves had lost over half of the seal creating a cumulative fist sized leak area. The rubber had become severely brittle, and the adhesive used to hold the seal was deteriorating
- Additional valves in the same service were inspected and all were experiencing similar types of failure at the valve seats



# VCHEC Air In-Leakage

- EPDM-seated valve was removed from service.
- Valve shown closed.

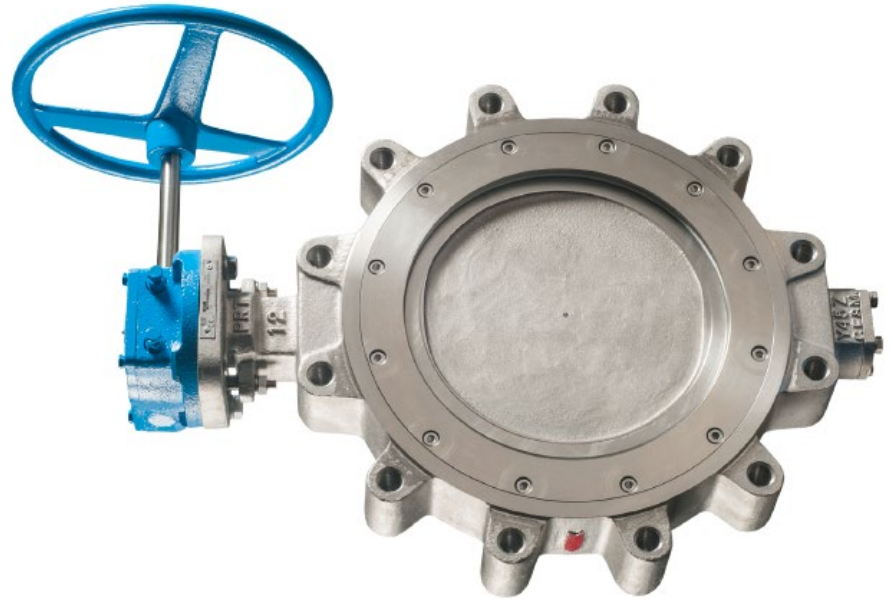
EPDM: Ethylene Propylene Diene Monomer



## VCHEC Air In-Leakage

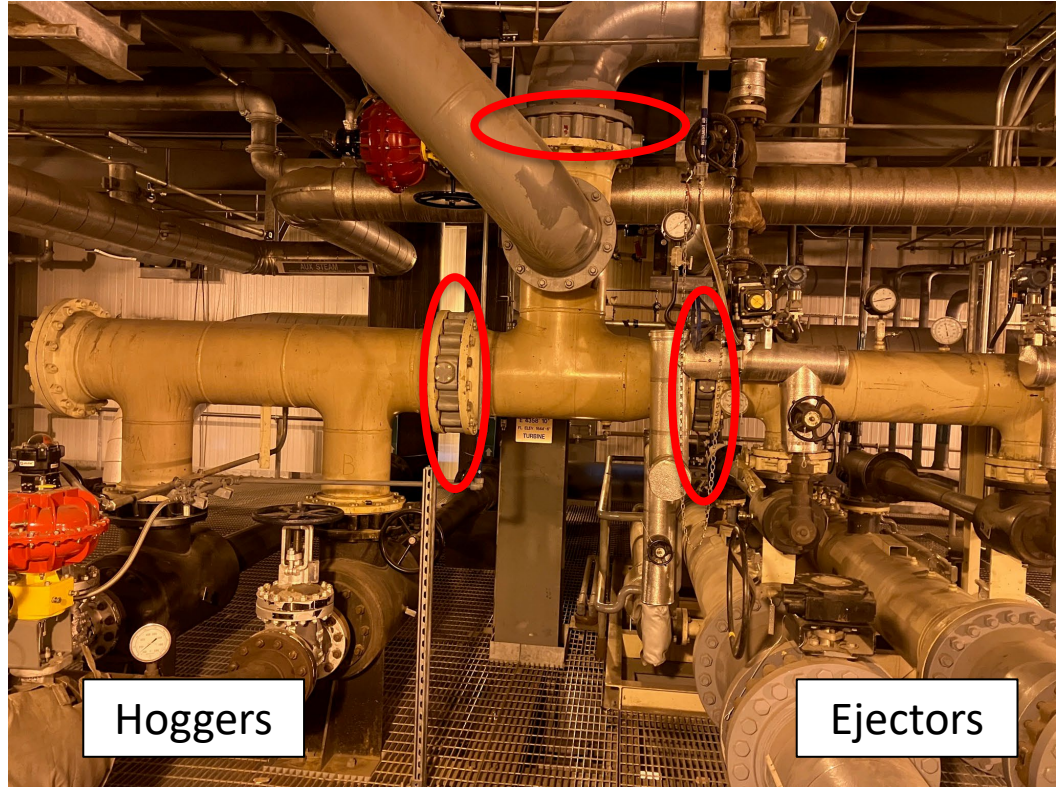
Corrective actions:

- ASAP, replaced valves 'in kind'.
- At a later outage, replaced valves with metal-seated valves.



# VCHEC Air In-Leakage Corrective action Cont.:

Valves that were replaced in the non-condensable gas piping from the ACC to the hoggers/ejectors



Hoggers

Ejectors

# VCHEC Air In-Leakage Recommendations:

- Equipment that is rubber lined in vacuum service should be scrutinized before approving for installation. Specifically, the seat design of the seal severely limits the level of vacuum valves can be rated for. Most valve manufacturers only allow for “light” vacuum service which is not adequate for levels experienced by power plant condensing systems.
- High performance butterfly, including triple offset styles should be considered for the vacuum service conditions.
- If rubber lined/seated valves are currently in vacuum service, inspections should be considered to determine the integrity of the rubber. This should be done periodically and more frequently as valves age.

# VCHEC Air In-Leakage

Questions?