

# Slam Shut Strategy

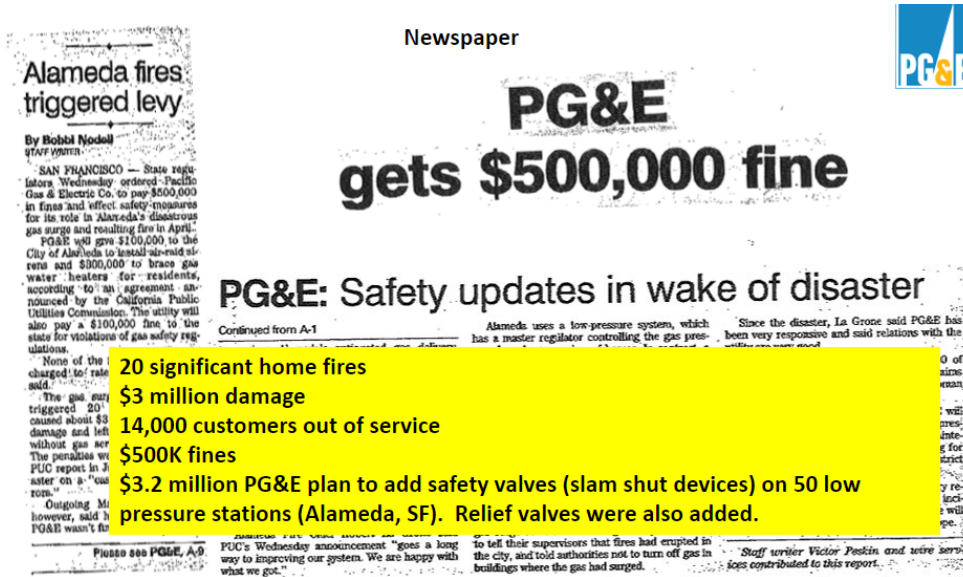
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# Introduction

Design & Installation Considerations

Set Point Recommendations

Activation Indication

Maintenance Considerations

Response Planning

Follow up Actions

Q & A



# Design & Installation Considerations

## Standalone vs. Integrated

### Standalone

- Pro:
  - Maintainability (top entry)  
Ergonomic stability for internal inspections & rubber good replacement
  - Preference of placement
- Con:
  - Constructability  
May require station piping alteration (cutting, welding) and station pressure testing to accommodate installation

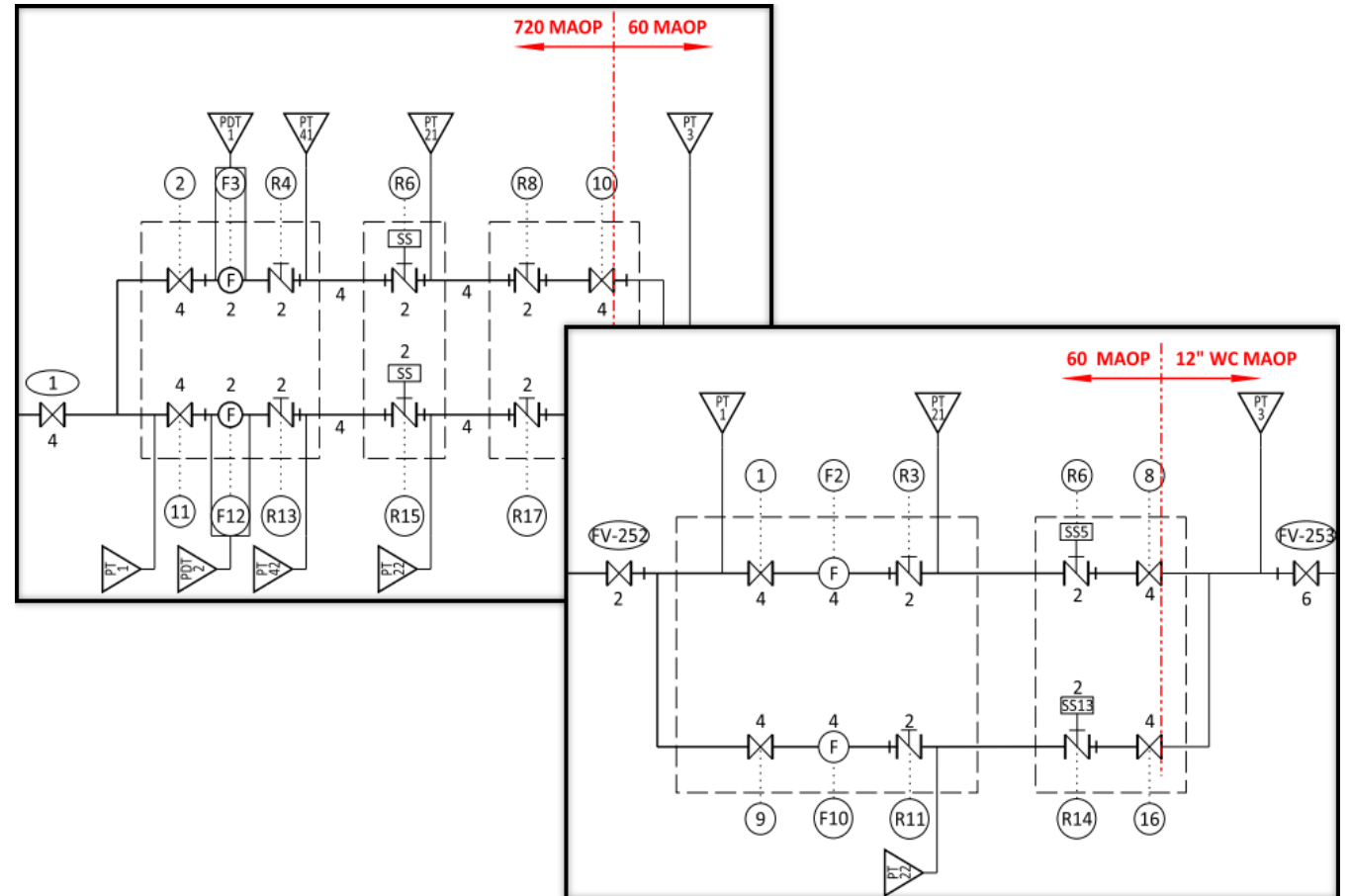
### Integrated

- Pro:
  - Constructability  
Eliminates civil work required for standalone
- Con:
  - Some installations will not have a top entry accessibility point (dependent on regulator choice and station rating)
  - Possible reduction of workspace leading to accessibility issues
  - If top entry is desired, may have different regulator brands



## Position

- **Constructability**
  - Minimal civil work required
- **Maintainability**
  - Easily accessible to operations personnel for inspections and emergency response
- **Station Configuration**
  - Applies to common header style station configurations and parallel regulators fed by single monitor configurations



# Installation Considerations

## Single & Dual Functionality

### Option 1: Single - Over Pressure Shut Off (OPSO)

- Station located within lockable structure
- Station design prevents full station failure from dig-in
- Damage Prevention control points in place

### Option 2: Dual OPSO & Under Pressure Shut-Off (UPSO) for stations prone to:

- Vehicular damage
- Third-Party dig-in
- Accessible to public
- Environmental impacts



# Design & Installation Considerations

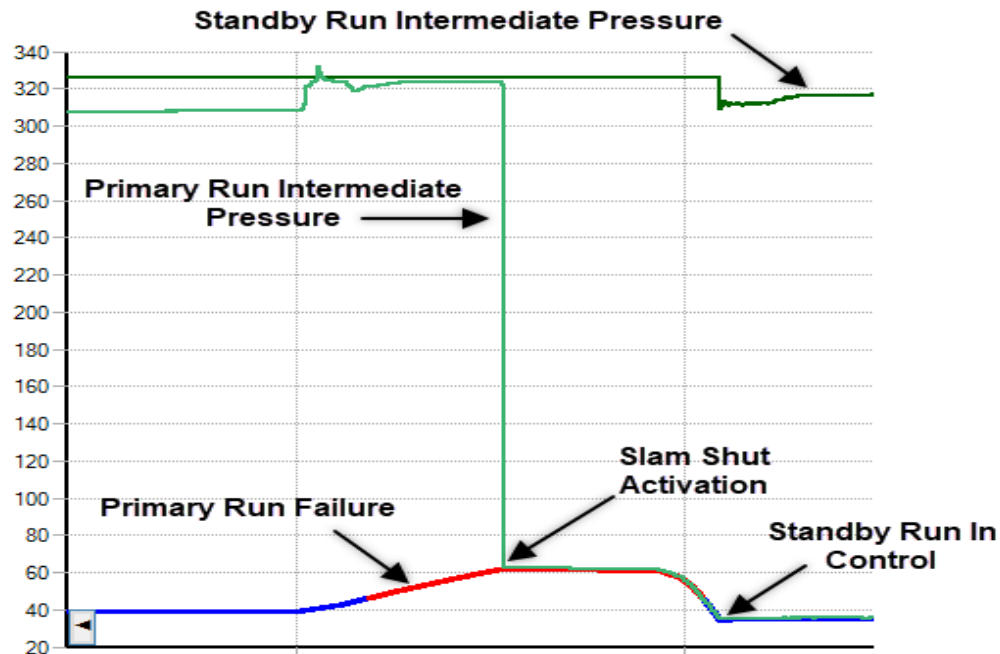
## Set Point

### MAOP limitations per CFR Title 49 Section (§)192.201

- Mechanical tolerance (accuracy)
- Separation from other regulation/relief equipment
- Staggered (dual run configuration)

| MAOP                                            | Pressure May Not Exceed                                                                                              |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| 60 psig or more                                 | MAOP plus 10% OR<br>75% SMYS, whichever is lower                                                                     |
| 12 psig or more AND less than 60 psig           | MAOP plus 6 psig                                                                                                     |
| Less than 12 psig AND greater than low pressure | MAOP plus 50%                                                                                                        |
| Low pressure                                    | Pressure not to exceed the safe operating pressure for any connected and properly adjusted gas utilization equipment |

| Regulator or OPP Device                         | Low Pressure Set Point    | Semi-High Pressure Set Point                               |                                                                         | High Pressure Set Point          |
|-------------------------------------------------|---------------------------|------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------|
|                                                 |                           | MAOP equal to or greater than 5 psig AND less than 12 psig | MAOP equal to or greater than 12 psig AND less than or equal to 25 psig |                                  |
| Regulator (pilot-operated) <sup>1</sup>         | 9 in. WC                  | 2 psig below MAOP                                          | 3 psig below MAOP                                                       | 4 psig below MAOP                |
| Standby Regulator (pilot-operated) <sup>1</sup> | NA                        | 2 psig below regulator set point                           | 2 psig below regulator set point                                        | 4 psig below regulator set point |
| Monitor valve (pilot-operated) <sup>1</sup>     | 10.5 in. WC               | 1 psig below MAOP                                          | 1 psig below MAOP                                                       | 2 psig below MAOP                |
| Relief valve                                    | 16 in. WC (system relief) | Refer to GDS H-70, "Pressure-Relief Devices"               |                                                                         |                                  |
| Primary slam-shut (used as secondary OPP)       | 14 in. WC                 | 1 psig above MAOP                                          | 2 psig above MAOP                                                       | 2 psig above MAOP                |
| Standby slam-shut (used as secondary OPP)       | 16 in. WC <sup>2</sup>    | 3 psig above MAOP                                          | 4 psig above MAOP                                                       | 4 psig above MAOP                |



# Indication

## Switch & System Pressure Monitoring (Alarm)

### Indication Switch

1. Available for most pilot operated regulators
2. Increased response time
  - Real time change of state
  - Location identification
3. Compatible with SCADAPak and ERX Digital I/O
4. NEC 500 & IEC options
  - Class 1 Div 1
  - IP67/67 of IPx8



# Indication

## Switch & System Pressure Monitoring (Alarm)

### Station / System Pressure Monitoring

#### 1. Utilization of High- and Low-pressure alarms

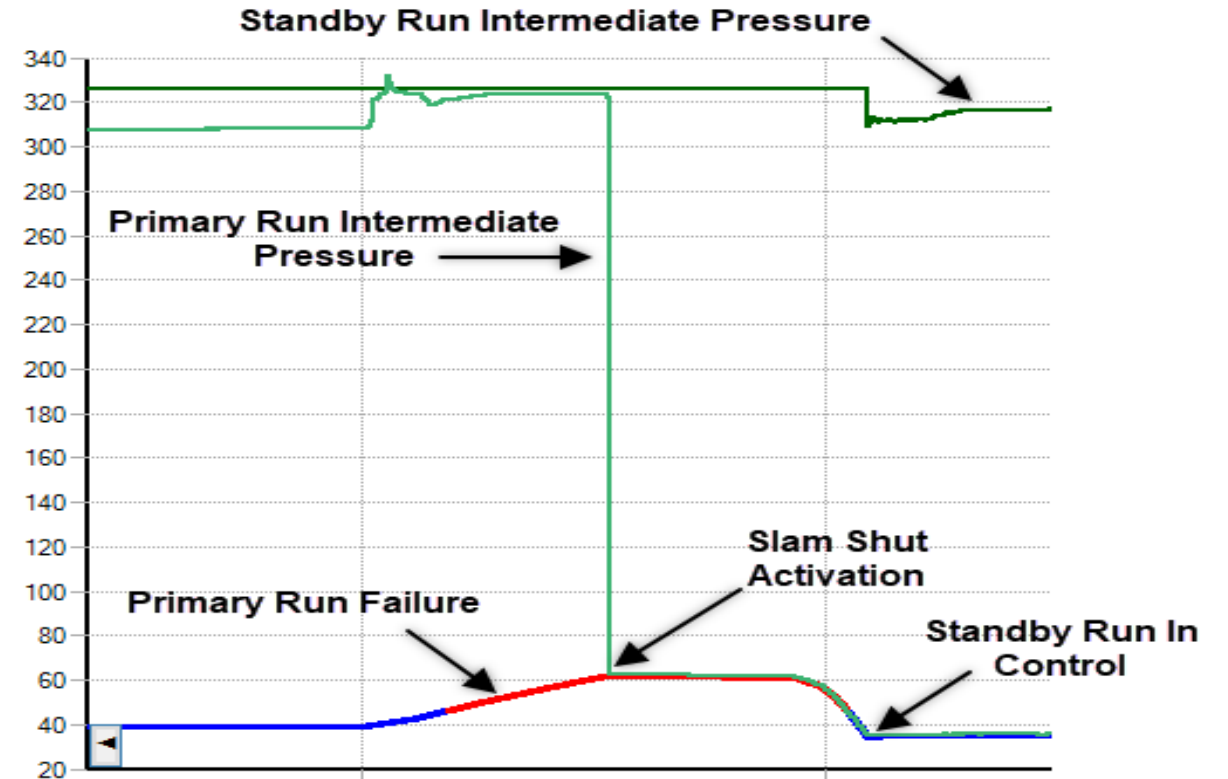
- Most effective with multipoint monitoring within a station to be reduce “guessing”
- Analytics to determine High & Low settings
- Training to identify trends identifying activation

Pressure Monitoring Point Between Regulator (downstream) and Monitor (upstream)

| Alarm                | HH                                                                            | LL                                                                                                                                                               |
|----------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standby Monitor      | =PT1 HH                                                                       | =20psig + D/S MAOP-S for sites where Intermediate pressure (IP) NOP is greater than 80psig, otherwise = D/S MAOP-S IF D/S MAOP-S and IP NOP is less than 40 psig |
| Working Monitor (WM) | =PT21/22 HH= 18-25% of WM or at discretion of Gas Ops Engineering & Analytics | = 50 psig below WM Set Point                                                                                                                                     |

Pressure Monitoring Point Downstream of Regulator & Monitor

| Alarm | MAOP-S      | HH                                                                                          | LL                       |
|-------|-------------|---------------------------------------------------------------------------------------------|--------------------------|
| HP    | =D/S MAOP-S | =IF D/S(MAOP-S-NOP) > 10psig, PT-3 HH = NOP + 6psig, OTHERWISE PT-3 HH = D/S MAOP-S minus 1 | =6 psig below D/S Reg SP |
| SHP   | =D/S MAOP-S | =D/S MAOP-S minus 1                                                                         | =75% of D/S NOP          |
| LP    | =12" WC     | =11" WC                                                                                     | =5.5" WC                 |

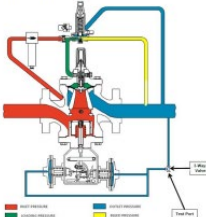


# Maintenance

1. Development of hands-on training to support annual inspection frequency per CFR Title 49 Section (§)192.739
  - Testing
    - Set point validation and adjustment
    - Lockup
    - Reset
    - Repeatability
    - Rubber good replacement
  - Troubleshooting
  - Assembly/Disassembly
2. Written procedures to support testing, troubleshooting and assembly/disassembly

**Maintenance of Regulator Stations (Non-HPR, HPR) and Farm Tap Sets Field Guide**  
Chapter 1: Class A Inspection January 2024 Revision 1

**EZR-OSX Slam Shut Set Point Verification and Adjustment for Low Side and High Side**



**Testing**

1. Remove the vent line from the 3-way ball valve test port.
2. Connect the Moore regulator serving as the slam shut test apparatus and set it at the pressure matching the downstream pressure set point.
3. Attach the downstream gauge and open the downstream indicator valve.
4. Slowly turn the 3-way ball valve until the system sensing pressure is isolated from the slam shut device and the slam shut sees the test pressure.
5. Slowly raise the test pressure until the unit trips and record the AF set point and lock-up test results (Y/N) on maintenance form.
6. Return the test pressure to the regulator set point and reset only the first stage tripping mechanism.

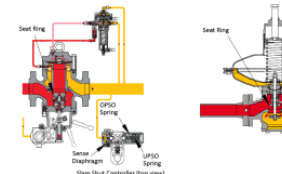
**Low Side Test Only**

1. If the slam shut does not have a fire fuse plug, use the Moore regulator to test the low side. (If it has a fire fuse plug, no low side test is required).
2. Observe whether there is a 1/16-inch gap between the inside of the head of the low side threaded stem and the tripping plate pin.
3. Slowly lower the test pressure until the unit trips and record the AF trip point value. Put slam shut back into service.

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**Maintenance of Regulator Stations (Non-HPR, HPR) and Farm Tap Sets Field Guide**  
Chapter 1: Class A Inspection January 2024 Revision 1

**Pietro Fiorentini SB/82 and SN91 Slam Shut Set Point Verification and Adjustment for OPSO and UPSO**



**OPSO Set Point Verification and Adjustment**

1. Isolate slam shut from downstream system.
2. Using a pressure source and an approved calibrated pressure gauge, slowly increase pressure into the slam shut until the unit activates.
3. Record AF set point and lock-up test results (Y/N) on maintenance form.
4. Validate slam shut activation with gas control, as necessary.
5. Return the test pressure below the regulator set point.
6. Equalize pressure on both sides of the slam shut by throttling the slam shut handle in the open position.
7. Reset slam shut.
8. IF AF set point does not need to be adjusted, THEN go to Step 11. OTHERWISE, continue with the following steps.
9. Use OPSO adjustment screw to increase OR decrease set point.
10. Slowly increase the test pressure until slam shut trips.

**NOTE**  
Multiple activations may be necessary to reach desired set point.

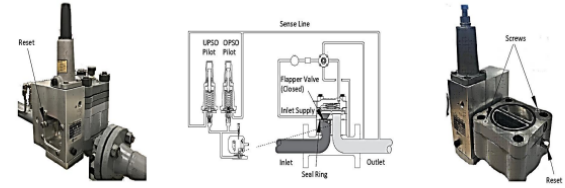
11. Repeat Steps 5, 6, and 10 until desired set point is established.
12. Record AL set point AND add corrective actions taken on maintenance form.
13. Repeat Steps 5 and 6 to reset slam shut.
14. Put slam shut back into service.

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**Maintenance of Regulator Stations (Non-HPR, HPR) and Farm Tap Sets Field Guide**  
Chapter 1: Class A Inspection January 2024 Revision 1

**Inspections and Operation Testing Slam Shut**

**Mooney Flowgrid Slam Shut Set Point Verification and Adjustment for Over-Pressure Shut Off (OPSO) and Under-Pressure Shut Off (UPSO)**



**OPSO Set Point Verification and Adjustment**

1. Isolate slam shut from downstream system.
2. Using a pressure source and an approved calibrated pressure gauge, slowly increase test pressure into the slam shut until the unit activates.
3. Record AF set point and lock-up test results (Y/N) on maintenance form.
4. Validate slam shut activation with gas control.
5. Equalize pressure on both sides of the slam shut flapper before resetting.<sup>1</sup>
6. Return test pressure below regulator set point.
7. Using either of the two reset screws, reset the slam shut in the open position.
8. IF AF set point does not need to be adjusted, THEN go to Step 13. OTHERWISE, continue with the following steps.

**NOTE**  
Multiple activations may be necessary to reach desired set point.

9. Use OPSO adjustment screw to increase OR decrease set point.
10. Slowly increase the test pressure until slam shut trips.
11. Repeat Steps 5, 6, and 10 until desired set point is established.
12. Record AL set point AND add corrective actions taken on maintenance form.
13. Repeat Steps 5 and 6 to reset slam shut.
14. Put slam shut back into service.

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# Maintenance

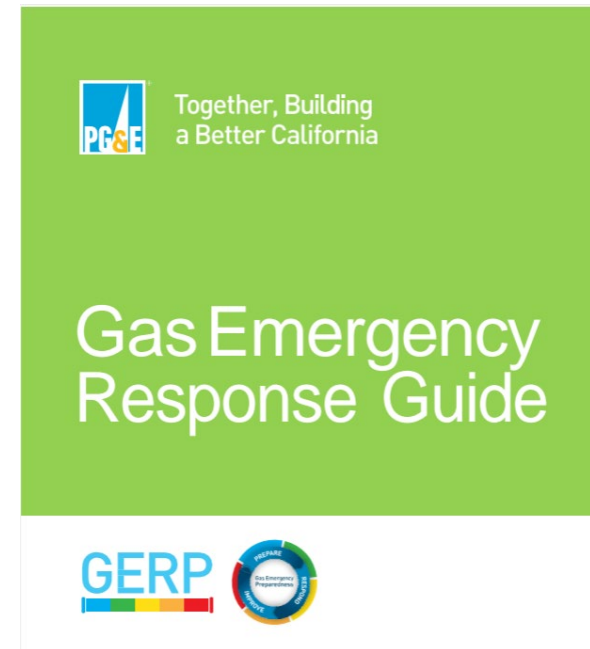
1. Design practices to support testing
2. Proper tools to support inspections in ergonomically challenging areas



# Response Plan

## Written Procedures and Training Post Activation

- Roles and Responsibilities
  - Gas Control
  - Gas System Planning
  - Engineering
  - Operations and Maintenance Personnel
- Actions to take immediately after activation
  - Make safe
  - System analysis
- Actions to take before placing the station back into service
  - Equipment inspection
  - Leak survey
- Actions to take post activation
  - Apparent Cause Analysis
  - Root Cause Evaluation
  - Continuous improvement



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Utility Procedure: TD-4911P-02  
Publication Date: 12/16/2021 Effective Date: 01/01/2021 Rev: 0a

## Immediate Actions After an Over-Pressure Event

### SUMMARY

This utility procedure describes required actions when the pressure in any portion of a gas system is identified as having exceeded the maximum allowable operating pressure of the system (MAOP-S or MAOP).

Level of Use: Informational Use

### TARGET AUDIENCE

Gas operations personnel, including maintenance and construction (M&C), gas pipeline operations and maintenance (GPOM), distribution portfolio management and engineering (DPM&E), gas system planning, distribution integrity management program (DIMP), transmission integrity management program (TIMP), facilities integrity management program (FIMP), gas control, gas control strategy and support (GCS&S), regulatory compliance, field services, and leak survey personnel.

### SAFETY

NA

### BEFORE YOU START

NA

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# PGE Implementation Timeline

## 2017-2018 Pilot

- Limited to one division at approximately 8 locations
- Stations / system required pressure monitoring
- Leading indicator

## 2018

- Pilot successful, began implementing on secondary feed stations and stations feeding < 2000 customers
- Design requirement (monitor only)
- Limited to distribution and LVCR stations only

## 2019

- Indication required
- OP procedural requirements for Engineering, Operations and Maintenance personnel
- New transmission station requirement & Transmission customers (repeat offenders)
- Updated design requirement to allow slam shut installation on regulator or monitor

## 2020

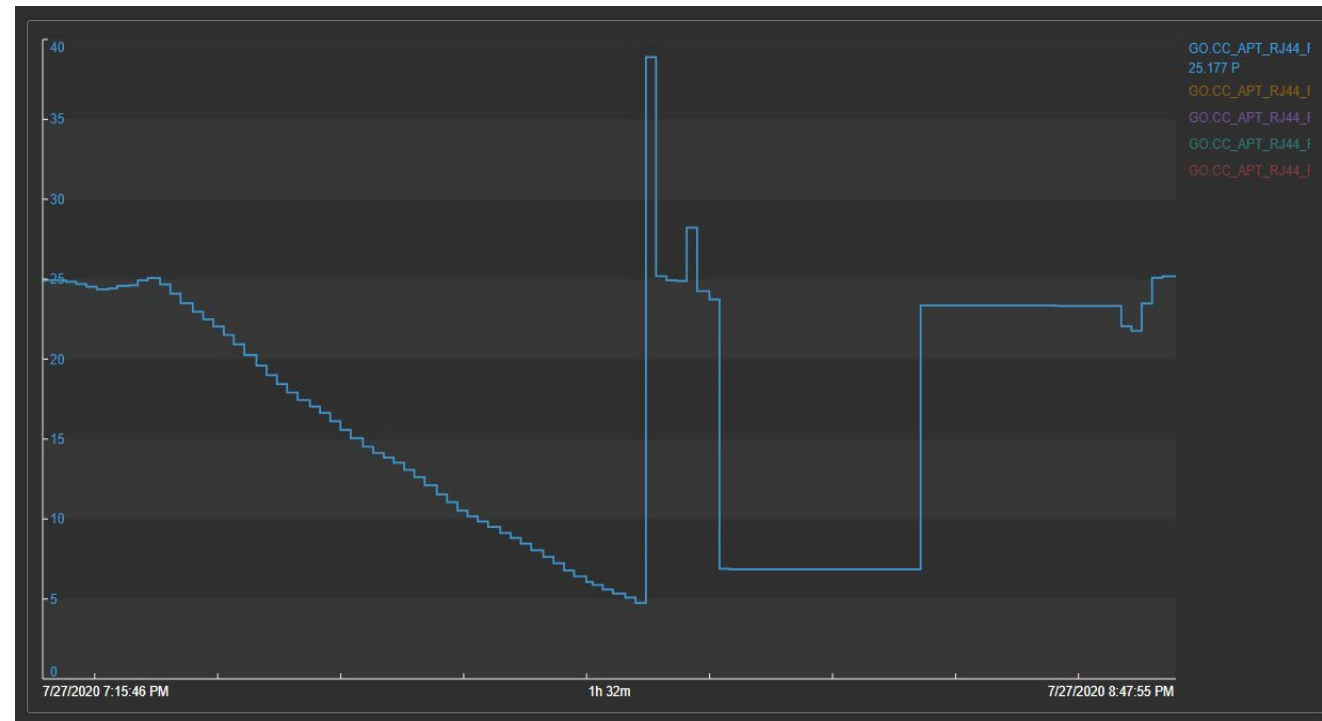
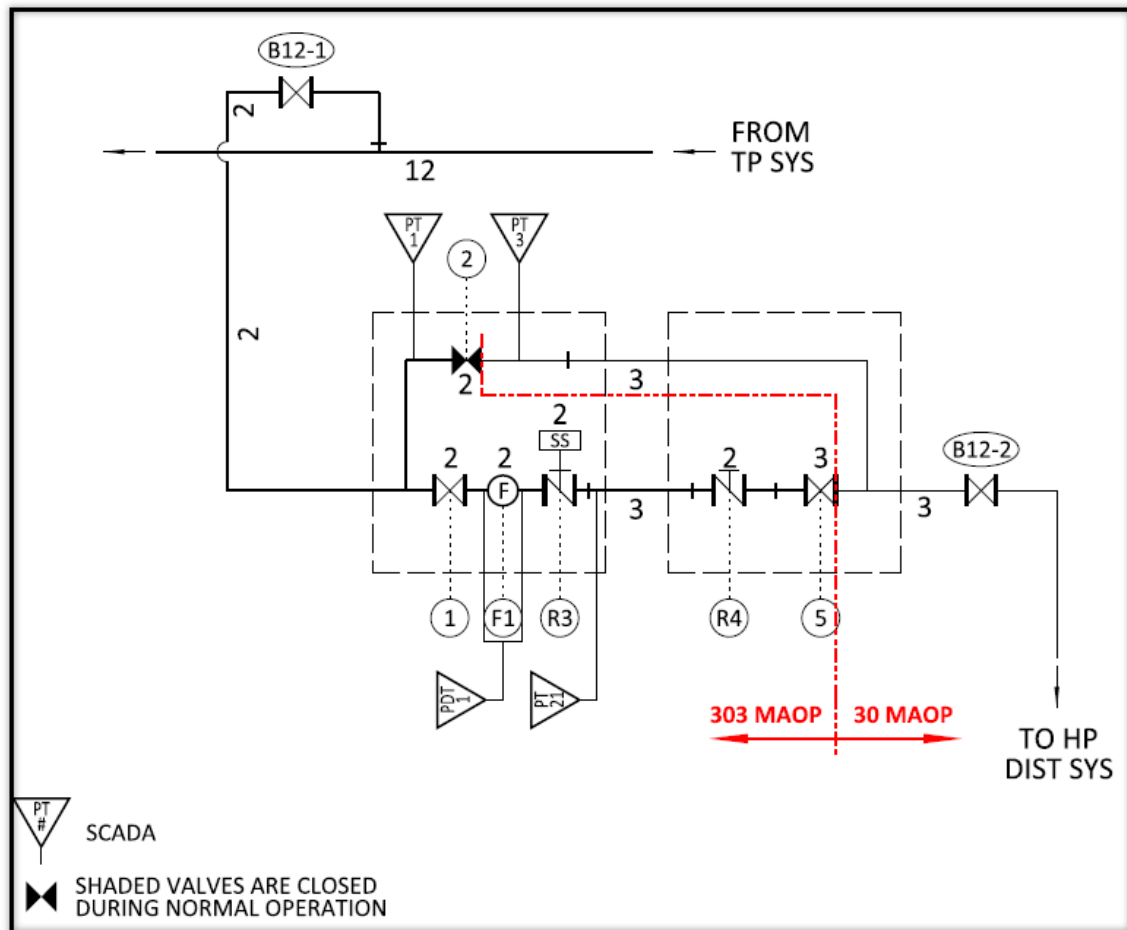
- Formal hands-on training
- Updated GERP to include guidance for under pressure due to slam shut activation

## 2018-present

- 720 of 1271 distribution stations with slam shut
- 187 low pressure stations with slam shut
- 38 LVCRs with slam shut
- 50 slam shut activations preventing OP

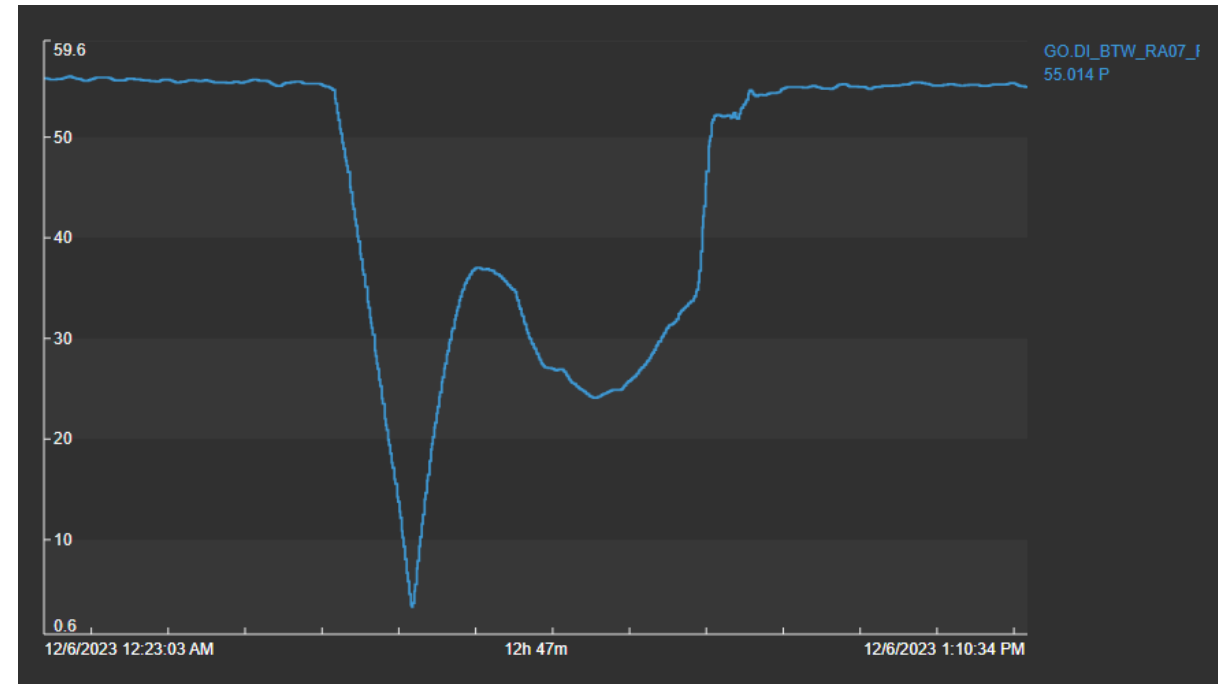
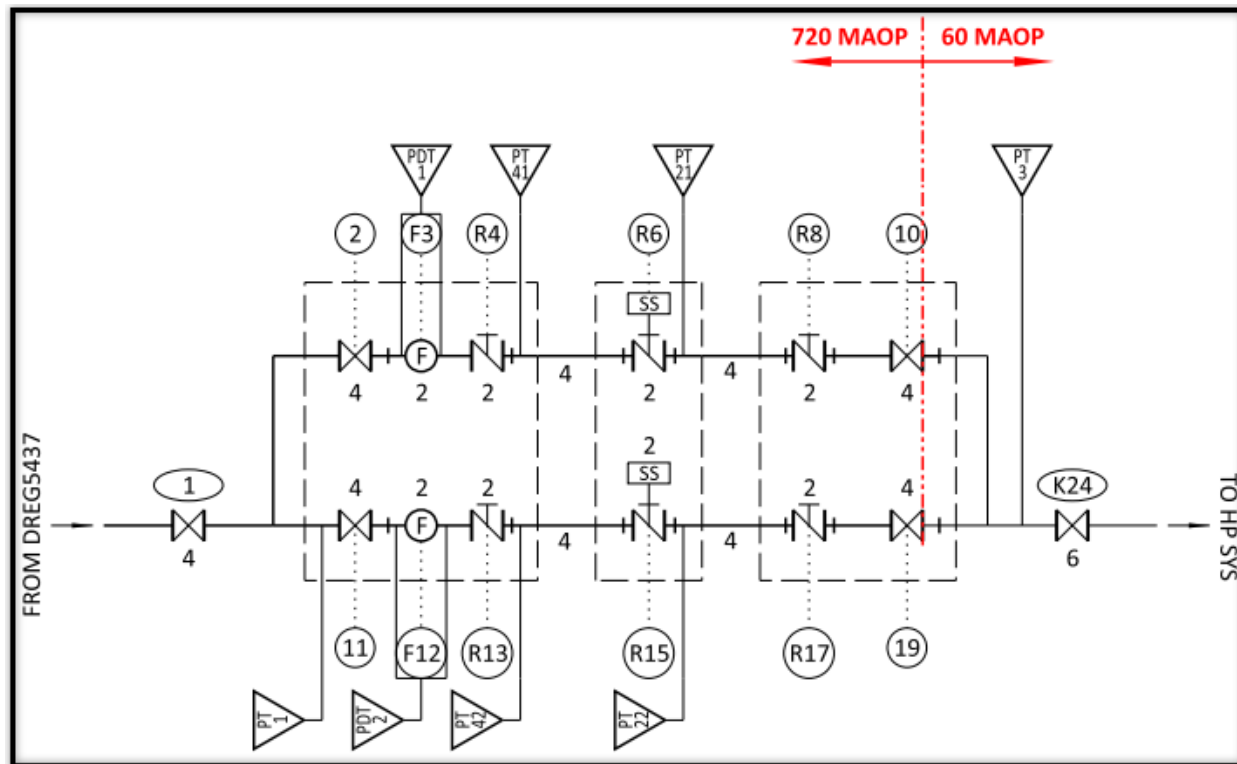
# PG&E Lessons Learned

## Aptos Regulator Station (2020)



# PG&E Lessons Learned

## Balfour Regulator Station (2023)



Questions?