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Proposed BMP: Targeting Unit Isolation & Blowdown Valves

2020 EPA Webinar

April 8, 2020

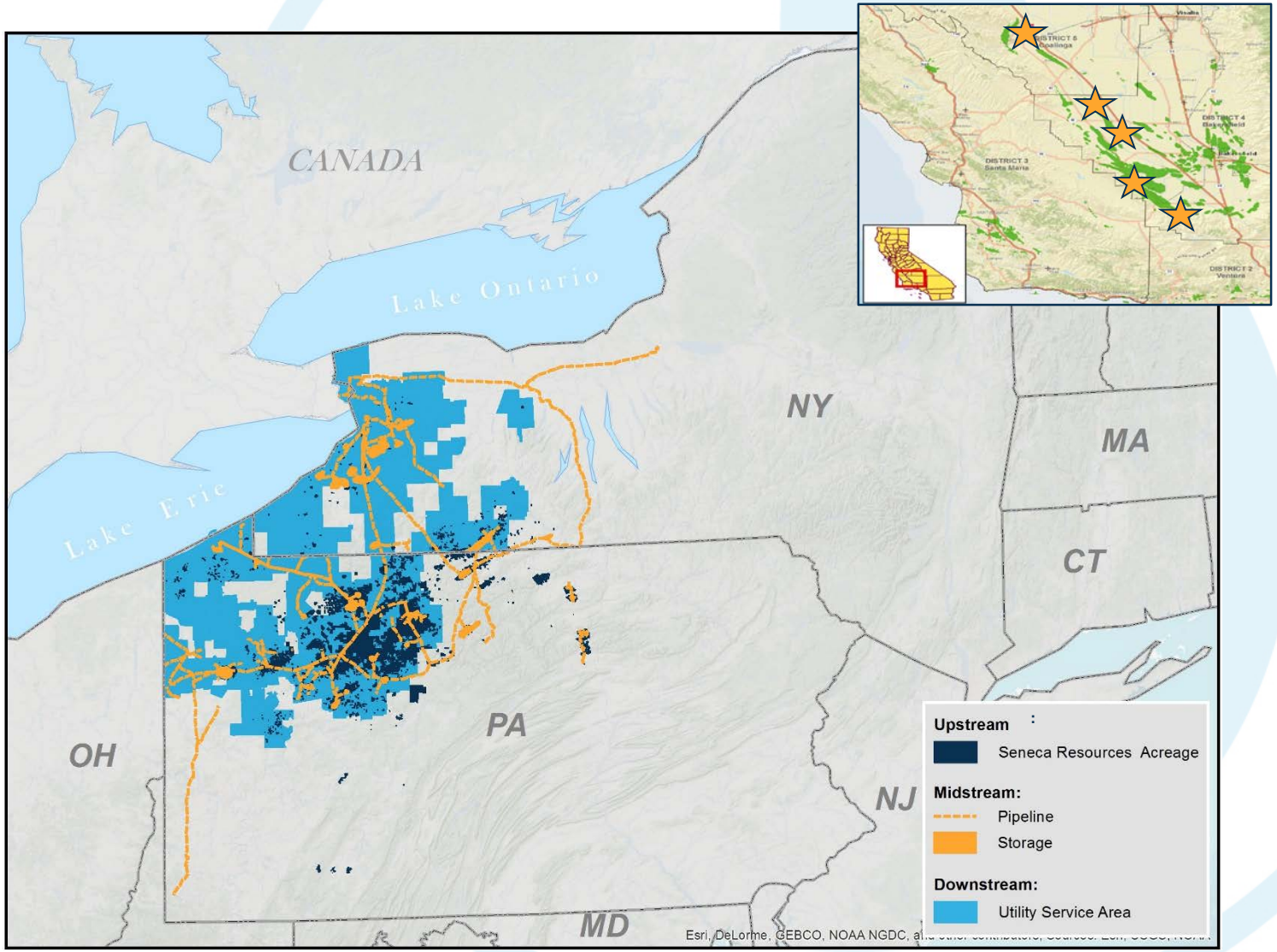
Presented by Emily Nuding

Corporate Overview

NFG: A Diversified, Integrated Natural Gas Company

More than 100 years of Operating History, with Uniquely Integrated Assets Across the Natural Gas Value Chain

- ✓ **Buffalo, New York headquartered company, incorporated in 1902**
- ✓ **Geographic and operational integration across Western New York and Pennsylvania**
- ✓ **Serving local communities – providing natural gas service to over 750,000 customers in New York and Pennsylvania**
- ✓ **Over 2,000 employees in New York, Pennsylvania, Texas, and California.**



Corporate Overview

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Upstream

Exploration & Production

SENECA RESOURCES

Midstream

Gathering

National Fuel Gas Midstream

Pipeline & Storage

National Fuel Supply Corporation

empire pipeline
A National Fuel Gas Company

Downstream

Utility

National Fuel Distribution Corporation

Energy Marketing

NFR
NATIONAL FUEL RESOURCES, INC.
DEREGULATED NATURAL GAS EXPERTISE
WWW.NFRINC.COM

Proposed BMP – Equipment Leaks/Fugitive Emissions for Compressor Isolation and Blowdown Valve Leakage

Overview

Methane Challenge Commitments – Supply, Empire, & Midstream

Committed in 2018

Pneumatic Controllers

- Supply, Empire, & Midstream
- Prioritize compressor stations
- Conduct inventories and replace high bleed pneumatic devices when practical

Committed in 2018

Rod Packing

- Supply & Midstream
- Commit to maintenance schedule of 26,000 operating hours
- Document results annually as they occur

Approval Pending

Equipment Leaks/Fugitives*

- Supply
- Commit to measuring leaks from Isolation & Blowdown Valves
- Develop a valve maintenance, repair, and replacement program

*Proposed BMP submitted on 3/21/2019

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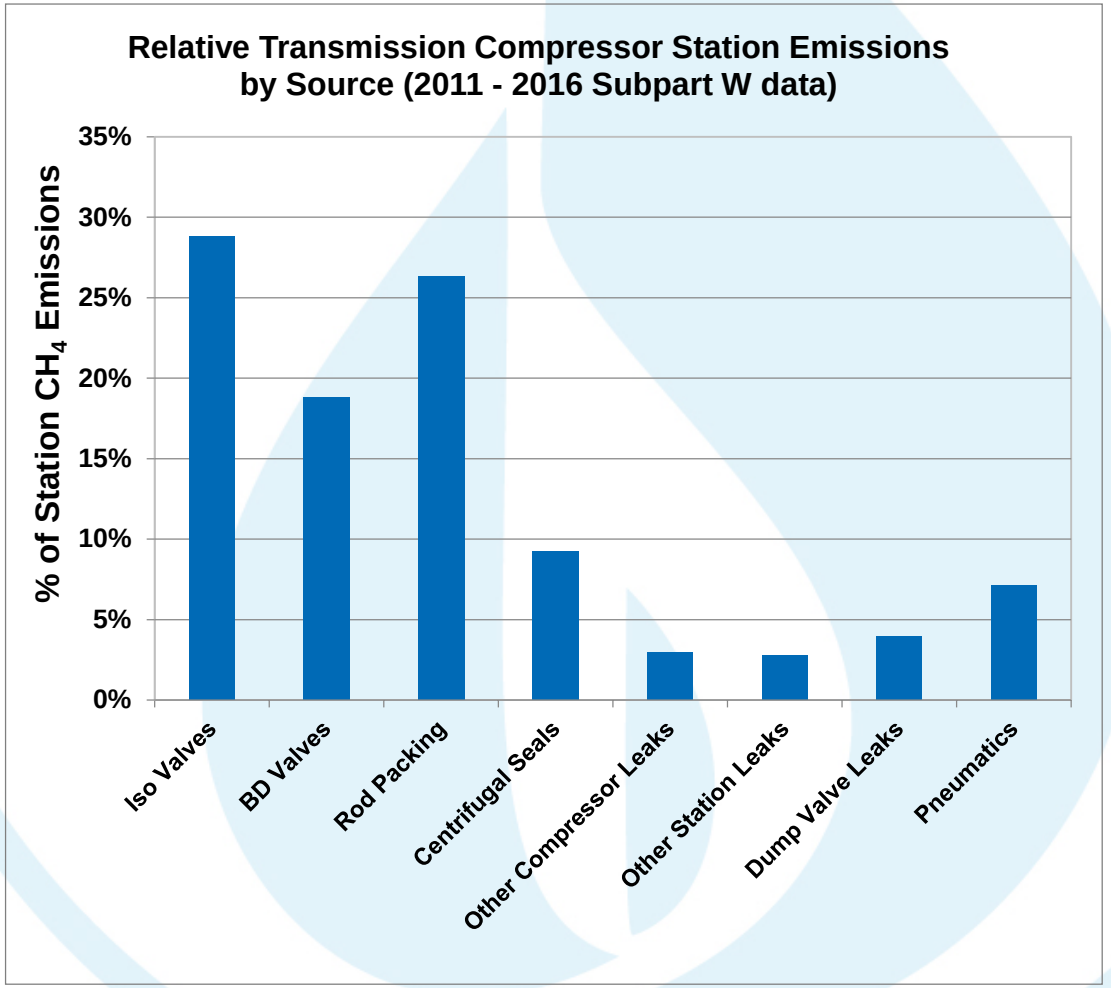
Background Information

- April 2018 Pipeline Research Council International (PRCI) report analyzed Subpart W data from natural gas T&S facilities.
  - Over 10,000 compressor-related measurements were analyzed from 2011 – 2016 GHGRP Subpart W data *(14,000 Total - Acoustical Data Filtered Out)*
  - Data confirms isolation valves, and, to a lesser extent, blowdown valves are key emissions source when leakage occurs

- EPA's Annual GHG Inventory data indicates that about 90% of transmission and 80% of storage compressor stations GHG emissions from station leaks are from compressor components



Background Information - Continued

- Compressor components include:
  - Compressor isolation valves,
  - Blowdown valves, &
  - Seals
    - Reciprocating compressor rod packing and
    - Centrifugal compressor wet or dry seals

- Supply developed and submitted a proposed BMP under the Methane Challenge "Continuous Improvement Process"
  - Addresses through-valve leakage from compressor isolation and blowdown valves
  - Submitted: March 21, 2019

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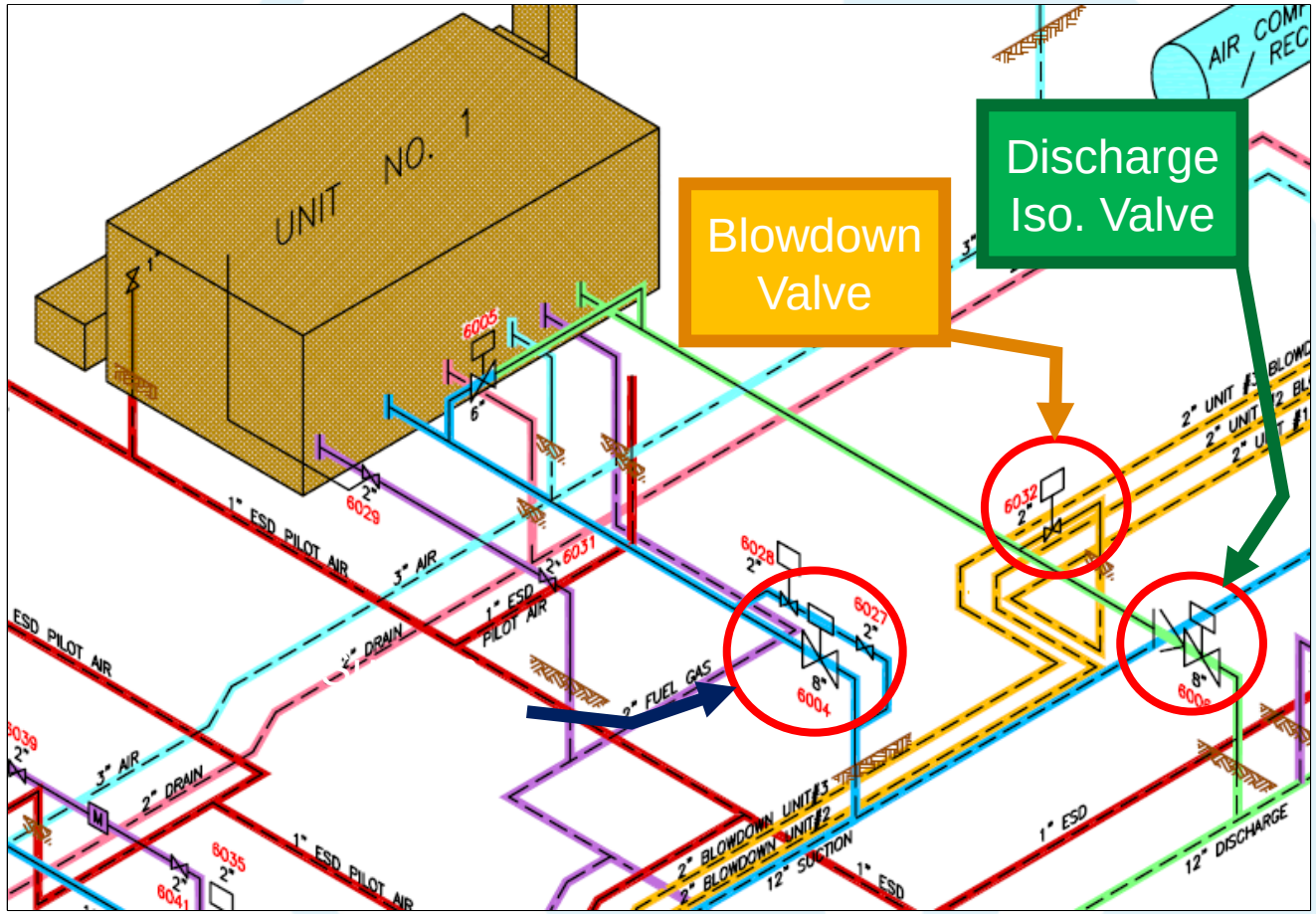
Schematics – Isolation and Blowdown Valves

- Facility Schematic
  - Suction & Discharge Isolation valves
  - Blowdown valves

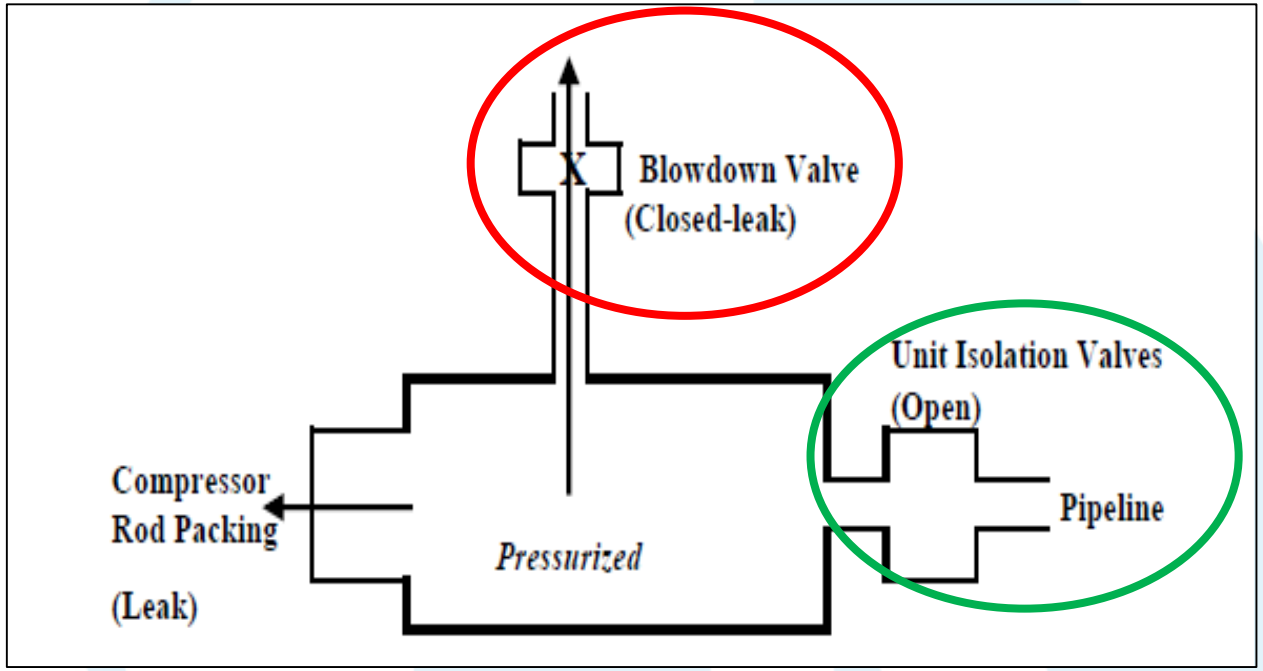
- Two Primary Modes of Operation
  - Operating Pressurized Mode
  - Not Operating Depressurized Mode



Example Facility Schematic

Mode of Operation – Operating Pressurized Mode

- Isolation valves are open and the blowdown valve(s) is closed against both high-pressure suction and discharge compressor gas
- Natural gas may leak to atmosphere via blowdown valve(s)
- Blowdown valve leakage is typically routed to the atmosphere via the blowdown valve vent line
- Vent lines are considered “Elevated vent sources,” and visualized using optical gas imaging
- 1” Ports on vent lines allow for leak measurement and quantification



Potential Leak during Operating Pressurized Mode

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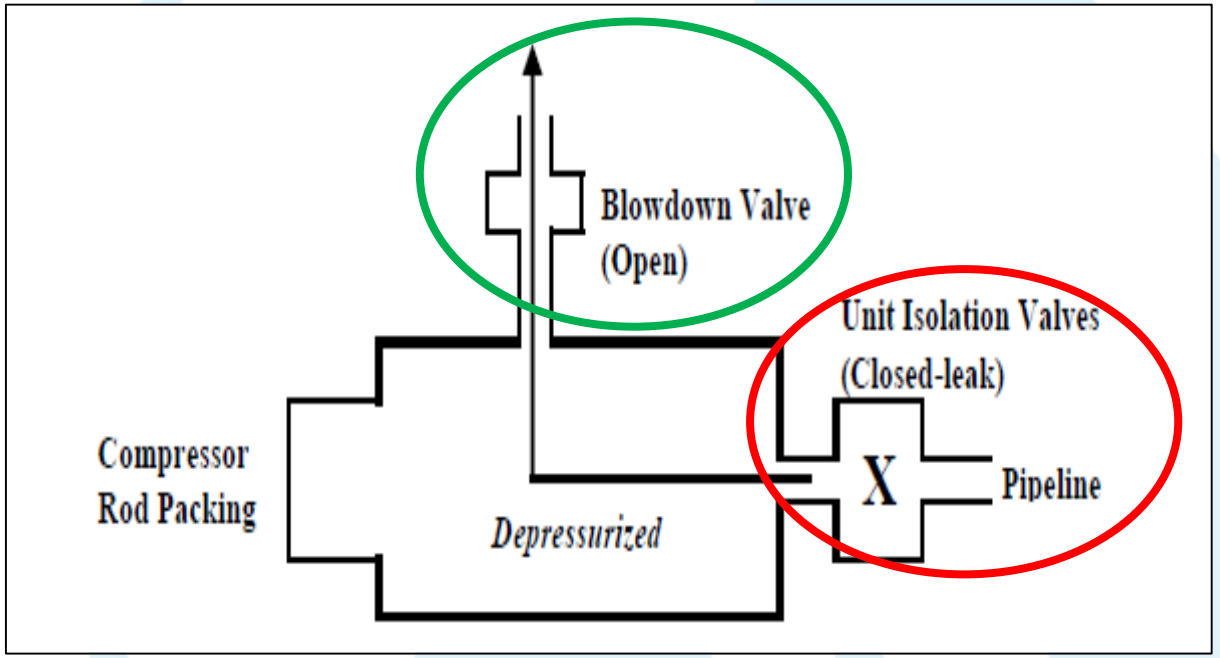
Mode of Operation – Not Operating Depressurized Mode

- Isolation valves are closed against both high-pressure suction and discharge pipeline gas and the blowdown valve(s) is open
- Natural gas may leak to atmosphere via isolation valves
- Isolation valve leakage is typically routed to the atmosphere via the open blowdown valve vent line
- Vent lines are considered “Elevated vent sources,” and visualized using optical gas imaging
- 1” Ports on vent lines allow for leak measurement and quantification



Potential Leak during Not Operating Depressurized Mode

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Valve Replacement - Challenges

- Significant Cost - Example: 8” plug valve replacement ≈ $50k
- Replacement valve purchasing - long lead times ≈ 6 months+
- Station downtime from valve repairs or replacement
- Need improved isolation valve technologies – 2019 PRCI Study
- Gas loss (and emissions) from station blowdowns
- New valves may have through-valve leaks when (re)commissioned

Proposed BMP Addresses

1) Methods to identify and measure through-valve leakage

2) Maintenance and repair practices for isolation and blowdown valves

3) Compressor station design considerations to facilitate improved access to isolation and blowdown valves for maintenance, repair, and replacement

4) Isolation and blowdown valves that are less prone to through-valve leakage

5) Leaking isolation and blowdown valve repair or replacement decision guidelines

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Proposed BMP – Key Program Elements

- **Annual valve survey across all T&S compressor stations within 5 years**
  - Prioritize Stations - based on GHGRP data, age, utilization, etc.
  - Additional 20% of facilities incorporated each year
  - After end of 5 year period all stations have annual survey completed each year

- **Build a more detailed valve inventory for all T&S compressor stations**
  - Type, Manufacturer, Size, Model, etc.

- **Develop & Implement <u>enhanced</u> maintenance plan across all T&S compressor stations within 5 years**
  - Specific for Isolation & Blowdown Valves
    - Manufacturer's recommendations
    - Data-driven "living document"
    - Documentation

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Proposed BMP – Key Program Elements

- **Leak rate measurement will utilize Methodologies from Subpart W of the GHGRP**
  - Measurement data will be utilized for program applicability – maintenance, repair or replacement
  - Emission reductions will be based on leak rate ***measurements***

- **Valve ***repairs*** and/or ***replacement*** will be completed when/where practical, and within 3 years**
  - Operational issues such as the need for system/facility blowdown, scheduled outages for maintenance, parts, availability of repair personnel, etc. will be considered when determining the valve repair or replacement schedule

- **Annual facility-level reporting will include:**
  - Program results, status, and future plans - survey, maintenance, repair, and replacement data
  - 5th year will include a discussion of “lessons learned” regarding leak counts, year-to-year leak changes, repair methods and practices, equipment / valve-specific recommendations, maintenance plan results and costs

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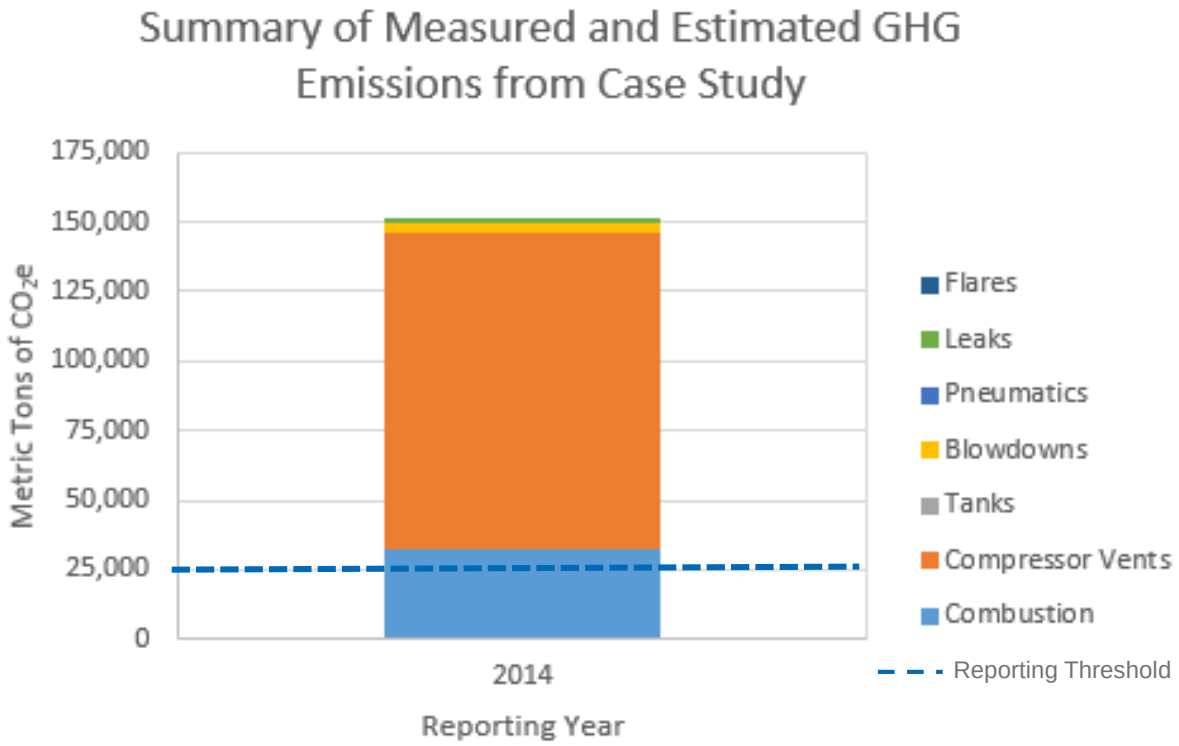
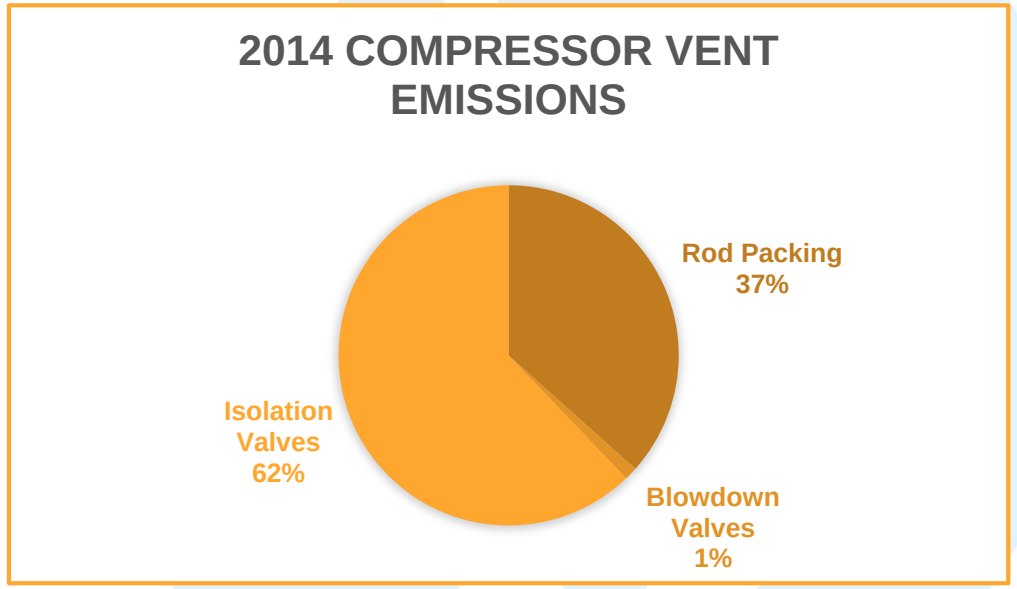
NFG Case Study:
Iso Valve Enhanced Maintenance & Replacement

NFG Case Study: Pre 2015 Compressor Components





Compressor Component Venting ≈ *75% of facility CO_2e emissions*

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NFG Case Study: Enhanced Maintenance Program

- Enhanced program started 2015

- Expansion of standard valve maintenance

  - Prepopulated library of valve numbers, location description, size, type, sealant

  - Field operations indicates date, employee number, and % injected (i.e.,15%, 25%, 50%, and 100%)

Ball Valves					Maximum Injection Pressure	Plug Valves				
Valve Size	Volumes in oz's 100%	50%	25%	15%		Valve Size	Volumes in oz's 100%	50%	25%	15%
1					Forged Steel & High	1	1 oz	.5 oz	.25 oz	.15 oz
2	4 oz	2 oz	1 oz	.5 oz	Pressure Plug Valves	2	2 oz	1 oz	.5 oz	.3 oz
4	8 oz	4 oz	2 oz	1.2 oz	9000 psi max	4	4 oz	2 oz	1 oz	.5 oz
6	12 oz	6 oz	3 oz	1.8 oz		6	9 oz	4.5 oz	2 oz	1.3 oz
8	16 oz	8 oz	4 oz	2.4 oz	High Pressure Ball Valves	8	12 oz	6 oz	3 oz	1.8 oz
10	20 oz	10 oz	5 oz	3 oz	4500 psi max	10	15 oz	7.5	3.7 oz	2.25 oz
12	24 oz	12 oz	6 oz	3.6 oz		12	18 oz	9 oz	4.5 oz	2.7 oz
16	32 oz	16 oz	8 oz	4.8 oz	Low Pressure and Cast	16	40 oz	20 oz	10 oz	6 oz
20	40 oz	20 oz	10 oz	6 oz	Iron Plug Valves 2500	20	72 oz	36 oz	18 oz	10.8 oz
24	48 oz	24 oz	12 oz	7.2 oz	psi max	24	88 oz	44 oz	22 oz	13.2 oz
Hydraulic Hand Pump 45 - 50 strokes per ounce Activ-8 Injection Pump - One stroke of the Jack loads 2 ounces										

Reference guide at the bottom of every field form

Unit 1A - Valve Sealant/Lubricant Injected (Activity Number 530452)							
Date	Employee number	Valve Number	Location	Size	Type	Sealant Used	Percent Injected
		5919	Suction Valve 16" Suction Header	10	[] Ball [x] Plug	[] Equalube [x] 1033	[] 15% []25% [] 50% []100%

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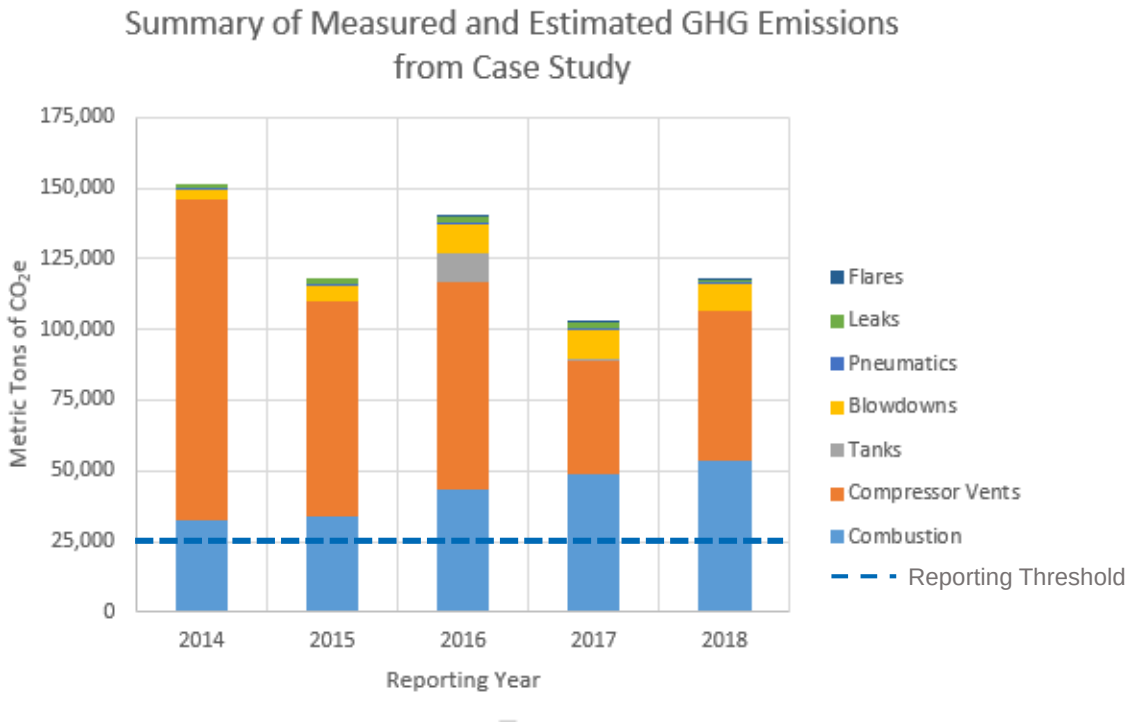
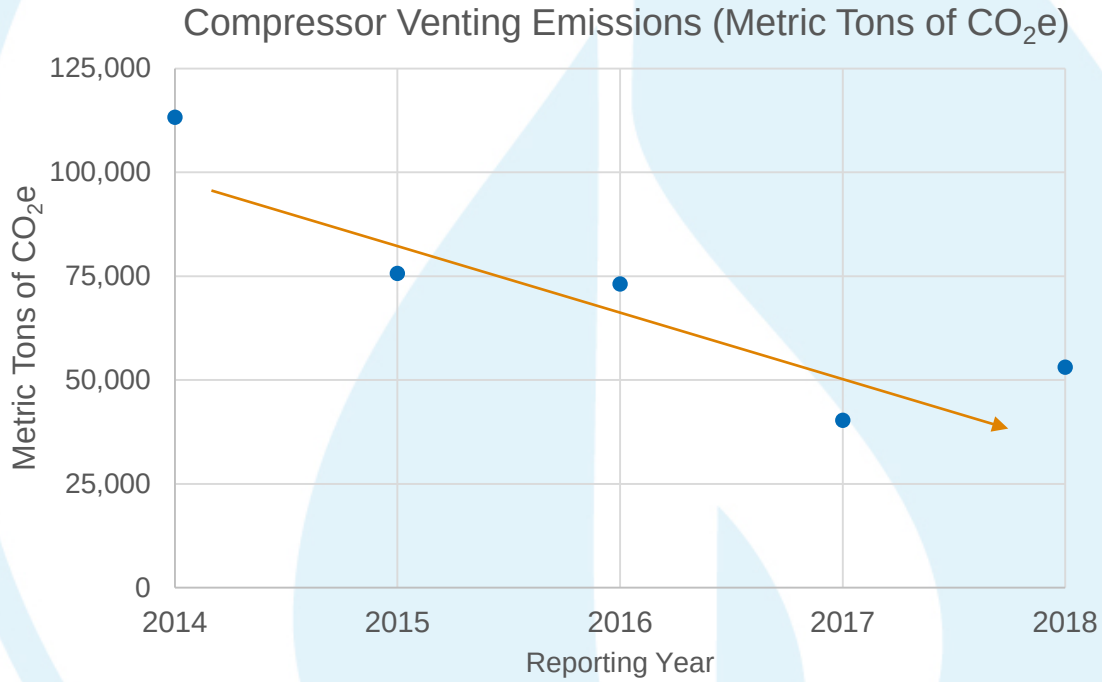
NFG Case Study: 2015 + Maintenance & Replacement





Enhanced Maintenance Program commenced in 2015 led to reductions

2014 – 2018 Total Compressor Venting
≈ *54% decrease*

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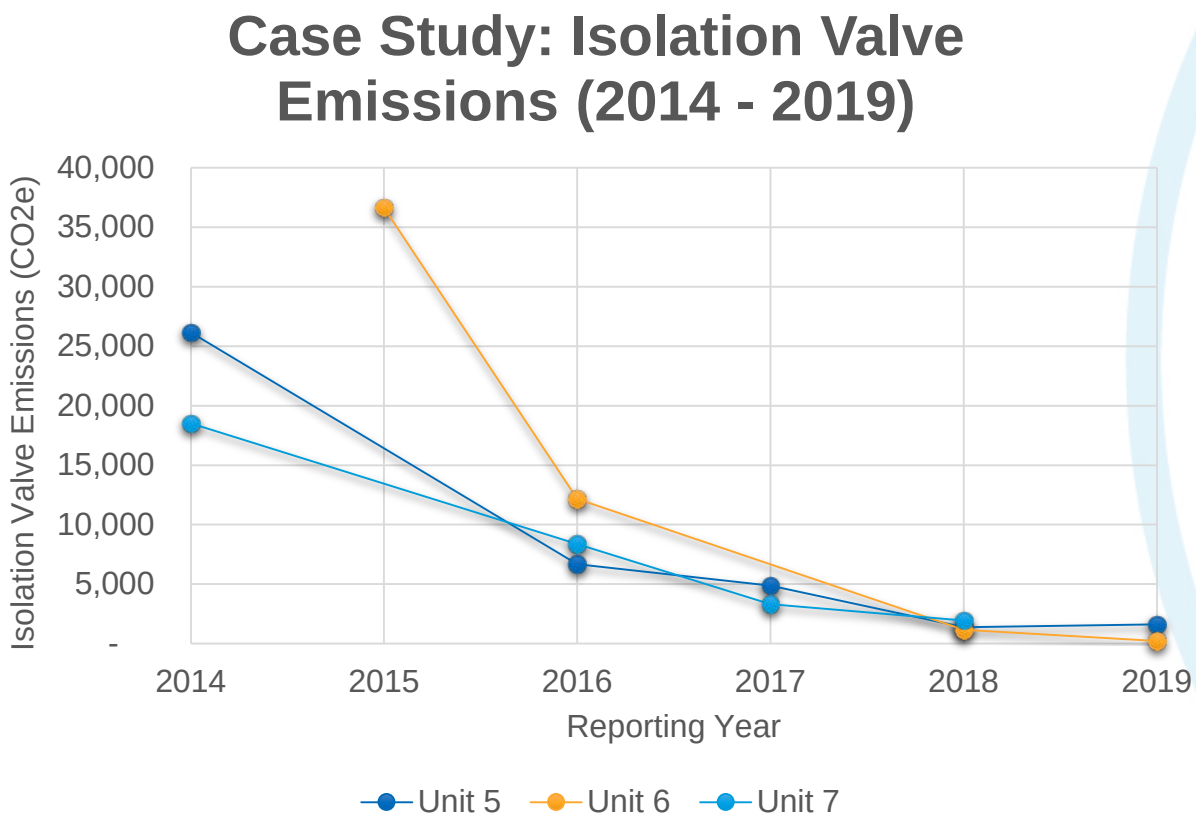
NFG Case Study: 2015 + Valve Replacement



*2019 Values are Projections Only for Remainder of Year

- Replacement of the Suction Isolation Valves on Units 5, 6, & 7 occurred in late 2017 and resulted in further reductions

- In total - 9 Suction Isolation Valves were replaced

Reductions	Unit 5	Unit 6	Unit 7
’14/’15 – ’16	74%	67%	55%
’14/’15 – ’17	81%	N/A*	82%
’14/’15 – ’18	95%	97%	90%
’14/’15 – ’19	95%	99%	N/A*

*N/A = no measurement taken

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Current Status and Future Plans

- **NFG moving forward …**
  - Completed detailed valve inventory in Spring 2020
  - Developing enhanced valve maintenance program
  - Implementing enhanced valve maintenance program at additional 20% of facilities incorporated each year
  - Replacement of isolation valves at additional facility Fall 2019
    - Currently taking measurements to track progress

- **BMP out for public review and comment**

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Thank you!