# Gas Distribution Integrity Management Program Best Practices and Considerations

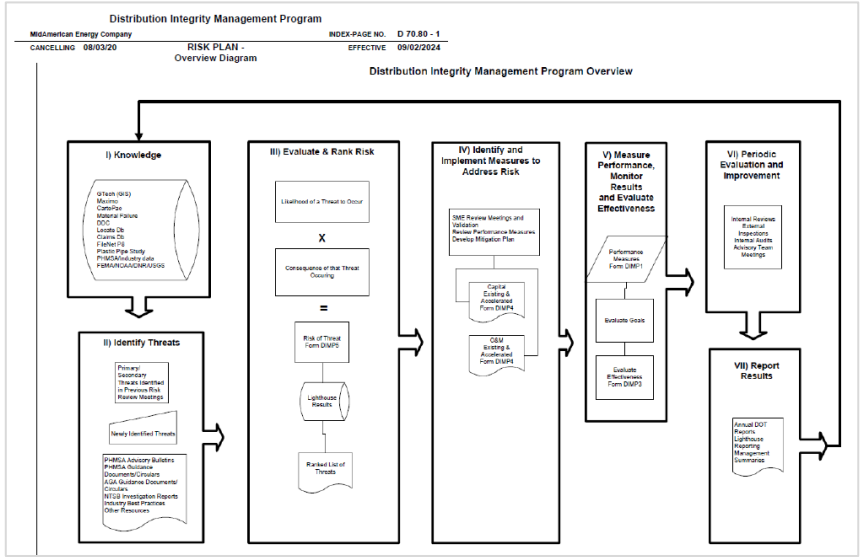
Dan Miller, Principal Engineer – Integrity Management at MidAmerican Energy

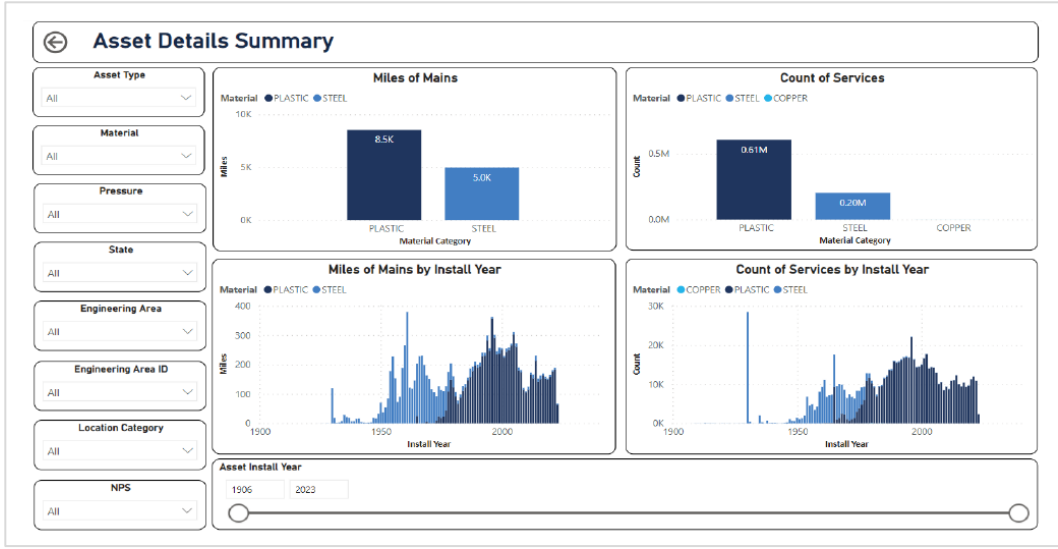
March 11, 2025

MIDAMERICAN ENERGY COMPANY®

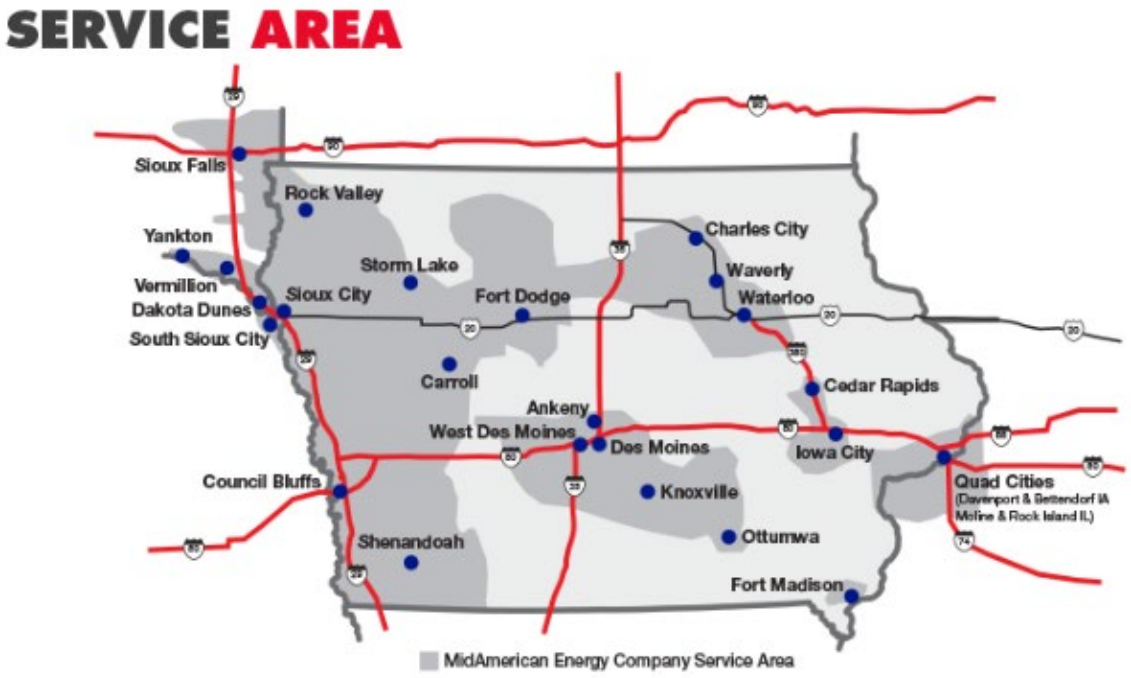
# Agenda

- MidAmerican Background
- DIMP Journey
- Best Practices & Considerations
  - Metrics
  - Goals
  - Tying DIMP to SMS
  - Risk Modeling
  - Interaction with Operator Qualifications
  - Continuous improvement
- Q&A



# MidAmerican Overview




**803,000**
gas customers

**30**
towns with gas services in SD

**623**
miles of transmission gas mains

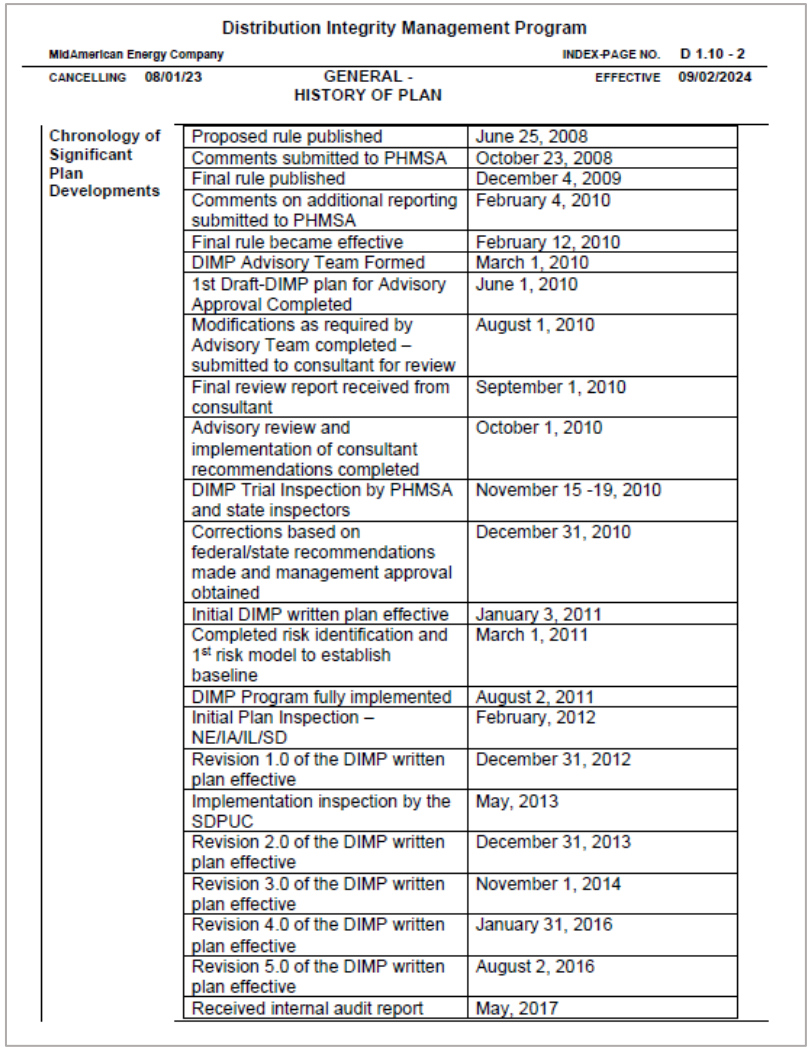
**13,712**
miles of distribution gas mains

# MidAmerican's Gas System

- Unique aspects of MidAmerican's gas system:
  - Distribution pressures range from low pressure to 410 PSIG
  - Pipe sizes range from 0.5 inch to 24 inch
  - Materials include steel, polyethylene and copper (SD only)
    - Steel includes bare, coated, protected and unprotected
    - Polyethylene includes first and second generation plastics (Orangeburg, Aldyl A, Continental, Performance, Phillips, JM Eagle, Extron)

# DIMP Journey

- Like all operators, MidAmerican has been on a journey with its DIMP.
- Consider adding a master table of program milestones to your written plans as a future reference.



Distribution Integrity Management Program

MidAmerican Energy Company — INDEX-PAGE NO. D 1.10 - 2

CANCELLING 08/01/23 — EFFECTIVE 09/02/2024

GENERAL - HISTORY OF PLAN

| Chronology of Significant Plan Developments | |
|---|---|
| Proposed rule published | June 25, 2008 |
| Comments submitted to PHMSA | October 23, 2008 |
| Final rule published | December 4, 2009 |
| Comments on additional reporting submitted to PHMSA | February 4, 2010 |
| Final rule became effective | February 12, 2010 |
| DIMP Advisory Team Formed | March 1, 2010 |
| 1st Draft-DIMP plan for Advisory Approval Completed | June 1, 2010 |
| Modifications as required by Advisory Team completed – submitted to consultant for review | August 1, 2010 |
| Final review report received from consultant | September 1, 2010 |
| Advisory review and implementation of consultant recommendations completed | October 1, 2010 |
| DIMP Trial Inspection by PHMSA and state inspectors | November 15 -19, 2010 |
| Corrections based on federal/state recommendations made and management approval obtained | December 31, 2010 |
| Initial DIMP written plan effective | January 3, 2011 |
| Completed risk identification and 1st risk model to establish baseline | March 1, 2011 |
| DIMP Program fully implemented | August 2, 2011 |
| Initial Plan Inspection – NE/IA/IL/SD | February, 2012 |
| Revision 1.0 of the DIMP written plan effective | December 31, 2012 |
| Implementation inspection by the SDPUC | May, 2013 |
| Revision 2.0 of the DIMP written plan effective | December 31, 2013 |
| Revision 3.0 of the DIMP written plan effective | November 1, 2014 |
| Revision 4.0 of the DIMP written plan effective | January 31, 2016 |
| Revision 5.0 of the DIMP written plan effective | August 2, 2016 |
| Received internal audit report | May, 2017 |

# Best Practices & Considerations

## Metrics

- Consider a standard naming convention for performance metrics
- Example:
  - Primary Threat Category of 1 = External Corrosion for first decimal
  - Subthreat Category of 1 = Atmospheric Corrosion for second decimal
  - Metrics would use a third decimal
    - 1.1.1: No. of External Corrosion Leaks Above Grade
    - 1.1.2: No. of Conditions Reported as Grade 1 (Severe) Corrosion
- Can tie the threat ID system to events, such as material failures or reportable events for trending/analysis

# Best Practices & Considerations

Metrics Examples

## Example threat listing from the plan, includes categories and measures

| Pri # | Sub # | Primary Threat Category | Threat Subcategory | Prior Yr Existing Program | Proposed Existing Program | Prior Yr Accelerated Action (AA) | Proposed Accelerated Action (AA) | Ref1 | Measure 1 | Ref2 | Measure 2 | Ref3 | Measure 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | External Corrosion | Atmospheric | Operations G 30, Corrosion Control G 50, Post Top Regulator Inspection | Operations G 30, Corrosion Control G 50, Post Top Regulator Inspection | Reference Capital table DIMP4 for project list. | Reference Capital table DIMP4 for project list. | 1.1.1 | Number of leaks categorized as "External Corrosion" cause above grade | 1.1.2 | Number of Conditions reported grade red | 1.1.3 | Number of Conditions reported grade red MAOP compromised |

## Example listing of reportable incident and threat associated with event

| Incident | Date | Description | 6.1.1 Over Pressure | 6.4.2 Incidents due to Failure to follow OQ | 6.9.1 Improper Valve Operation/Stoppering/Squeezing. | 8.1.2 Flood | 8.7.2 Ice Snow | 10.1.2 Relief valve malfun | 10.2.2 Regulator or valve malfun | 10.10.2 Debris | Other Reportable Event | 7.1.4 Number of outage events due to excavaton |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4/27/2023 | Pleasant Valley, Iowa - At approximately 7:30 a.m. on April 27, 2023, MidAmerican determined that the number of customers that would need to be shut off due to Mississippi River flooding in Pleasant Valley, Iowa would exceed the reportable threshold of 50 customers. | | | | 1 | | | | | | |

# Best Practices & Considerations

## Metrics Example – Material Failure Record Entry

Matl Failure ID: 54240
Leak Grade: 1
Leak Cause: EQUIPMENT
Leak Source: Compression Fitting

Sender: T40584 PAGE, TERRY PHMSA Reportable: YES
Mailing Code: SFS Yes No
Status: CLOSED Peer Reviewed: 01/26/2022
Closed On: 02/16/2023 Discovery Year: 2022

Service Area: WEST
Sub Area: SIOUX FALLS
Predecessor Company: MGC

Material Failure | Pre Analysis | Manufacturer Detail | Analysis Notes | Post Analysis | Photo | Attachments

MEC Analysis By: T39669 MILLER, DANIEL
Action Taken: ANALYSIS PERFORMED BY MEC QUALITY ASSURANCE ENGINEER
Material Leak Location: Leak Through Seal
Related DIMP THREAT: Equipment/Mechanical Fitting Failure (Threat 10.4.1)
Response Due Date: 00/00/0000
Reminder Letter Sent:
Response Received
Lab/Manufacturer Analysis By:
Caused Analysis Category: EQUIPMENT
Cause Analysis: SEAL FAILURES ON GASKETS

PHMSA Apparent Cause: EQUIPMENT
PHMSA Subcause:
Explanation:

Evaluation Results:
RENEWED PART OF EXISTING SERVICE TO ELIMINATE A DRESSER COUPLING THAT WE COULD NOT GET TO SEAL BY TIGHTENING.

FIELD INDICATING A 3/4" STEEL COMPRESSION COMPLING LEAKING. UPON RECEPT OF PART. SEVERE DETERIORATION WAS NOTED. CAUSE ASSUMED EQUIPMENT SEAL FAILURE.

PHMSA Record ID: 2022-54240 Date: 02/16/2023

*Applicable only to Mechanical Fitting Failures reported to PHMSA. Auto-generated by PHMSA for each submitted mechanicall fitting failure report.

# Best Practices & Considerations

## Goals

- PHMSA Advisory ADB-2012-10 suggests that operators should use goals as part of DIMP and that metrics should be meaningful and categorized into leading, deteriorating and lagging.
  - Shouldn’t use all lagging metrics!
  - Consider adding categories to your forms/documents that collect metrics.
- Consider having a list of company goals for your program, including accelerated actions and other initiatives (like data closure projects) that might not be recorded.
  - This is a great place for documenting data gap closures, for example.

# Best Practices & Considerations

## Goal Examples

| Goa | Establishe | Goal Description | Goal Typ | Goal Measureme | Modifications to Goal | Met for 201 | Met for 2017 | Met for 2018 | Met for 2019 | Met for 2020 | Met for 2021 | Met for 2022 | Met for 2023 | Met for 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 8/2015 | Complete zone verification analysis of 500 zones annually – assumes completion by 2027 | Leading | Number of zones analyzed | Goal Updated to 660,000 feet for 2024 | Yes, analyzed 621 zones | Yes, analyzed 739 zones | Yes, completed analysis of 704 zones | Yes, analyzed 1320 | Yes, analyzed 510 zones | Yes, analyzed 522 zones | Complete - verified 1.56M feet | Yes - verified 1,064,406 | Yes - verified 655,594 feet |
| 6 | 8/2016 | Verify and collect FIDS for GTech data population for DIMP, 5000 for 2017, 6000 beyond (KPI) | Leading | Number of remaining gaps specified in plan | No longer a KPI but is continually monitored | n/a | Yes, completed 7952 gaps | Yes, completed 9,383 gaps | Yes, completed 12,822 gaps | Yes, completed 11070 gaps | Yes, completed 10235 gaps | Yes, completed 12959 gaps | Yes, completed 10,194 as of 12/5/23 | Yes, completed 10,338 as of 12/11/2024 |
| 10 | 1/1/20 | Replace 30 miles of low pressure systems | Leading | Completion of replacements | Continue replacement of low pressure pipeline systems | N/A, 2020 Goal | N/A, 2020 Goal | N/A, 2020 Goal | N/A, 2020 Goal | Yes, completed 54.2 miles of main | Yes, completed 42 miles of main | N/A 2021 KPI | Yes, completed 24.9 miles of main plus service footage | In progress |
| 11 | 1/1/20 | Replace 5 miles of leaking and aging distribution to reduce gas emmissions | Leading | Completion of replacements | Continue replacement of legacy pipeline systems | N/A, 2020 Goal | N/A, 2020 Goal | N/A, 2020 Goal | N/A, 2020 Goal | Yes, completed 10.9 miles including mains and services | Yes, completed 7.79 miles including mains and services | Yes, completed 6.3 miles including mains and services | Yes, completed 1.99 miles of main plus service footage | Yes, completed 1.05 miles of mains and services |
| 12 | 1/1/20 | Develop plan for probabilistic risk modelling for transmission and distribution assets | Leading | Completion of plan | Updated to go live by Aug. 2024. | N/A, 2020 Goal | N/A, 2020 Goal | N/A, 2020 Goal | N/A, 2020 Goal | Yes, write up completed and provided to Ralph Martens | N/A, 2020 Goal | N/A, 2020 Goal | N/A 2024 Goal | Completed with go live on 8/28/24 |
| 16 | 3/7/23 | Develop a process for discovering, tracking and replacing potential Century pipe sections from service. This includes a technical solution for tracking beyond simple email requests. Discoveries may be field or office-based. | Leading | | | N/A, 2023 Goal | N/A, 2023 Goal | N/A, 2023 Goal | N/A, 2023 Goal | N/A, 2023 Goal | N/A, 2023 Goal | N/A, 2023 Goal | Complete | N/A 2023 Goal |

# Best Practices & Considerations

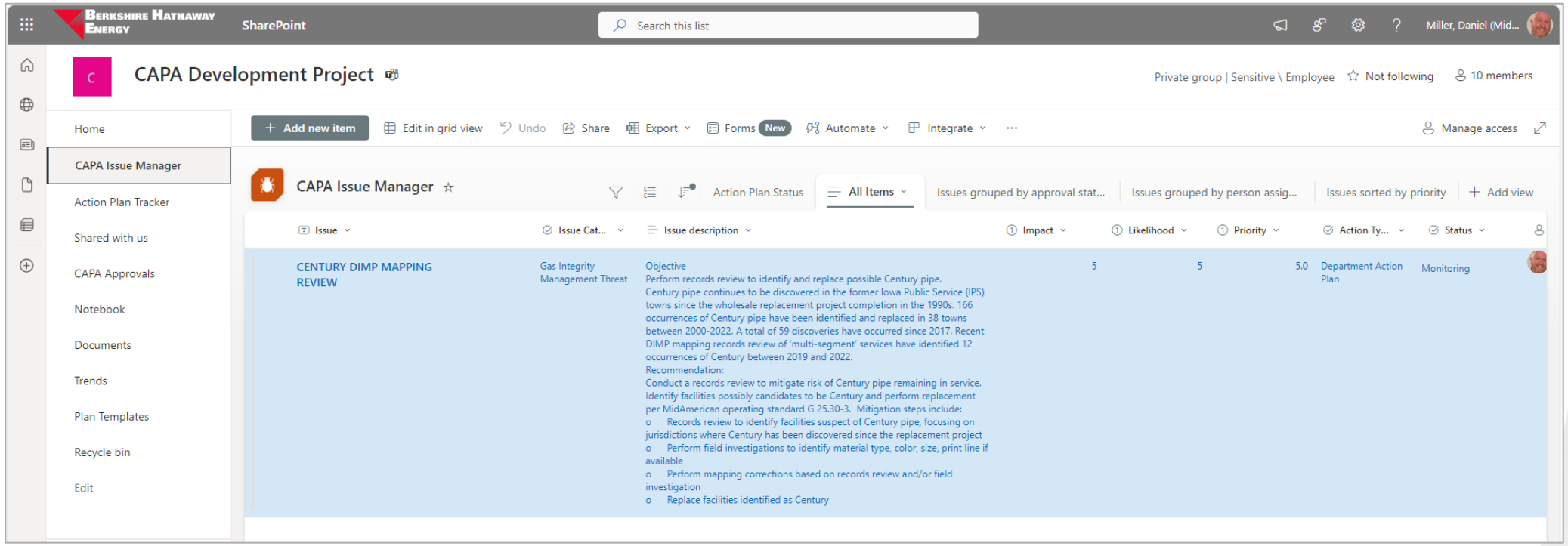
## Tying DIMP to PSMS

- Pipeline Safety Management Systems (PSMS) is an overarching program that should cover several elements.
- DIMP does not have to be contained within PSMS, but there should be ties as one of the PSMS elements is Safety Risk Management.
- For process or procedural items that don’t necessarily fit well in a written DIMP plan, PSMS may be the perfect home.

# Best Practices & Considerations

## Tying DIMP to SMS

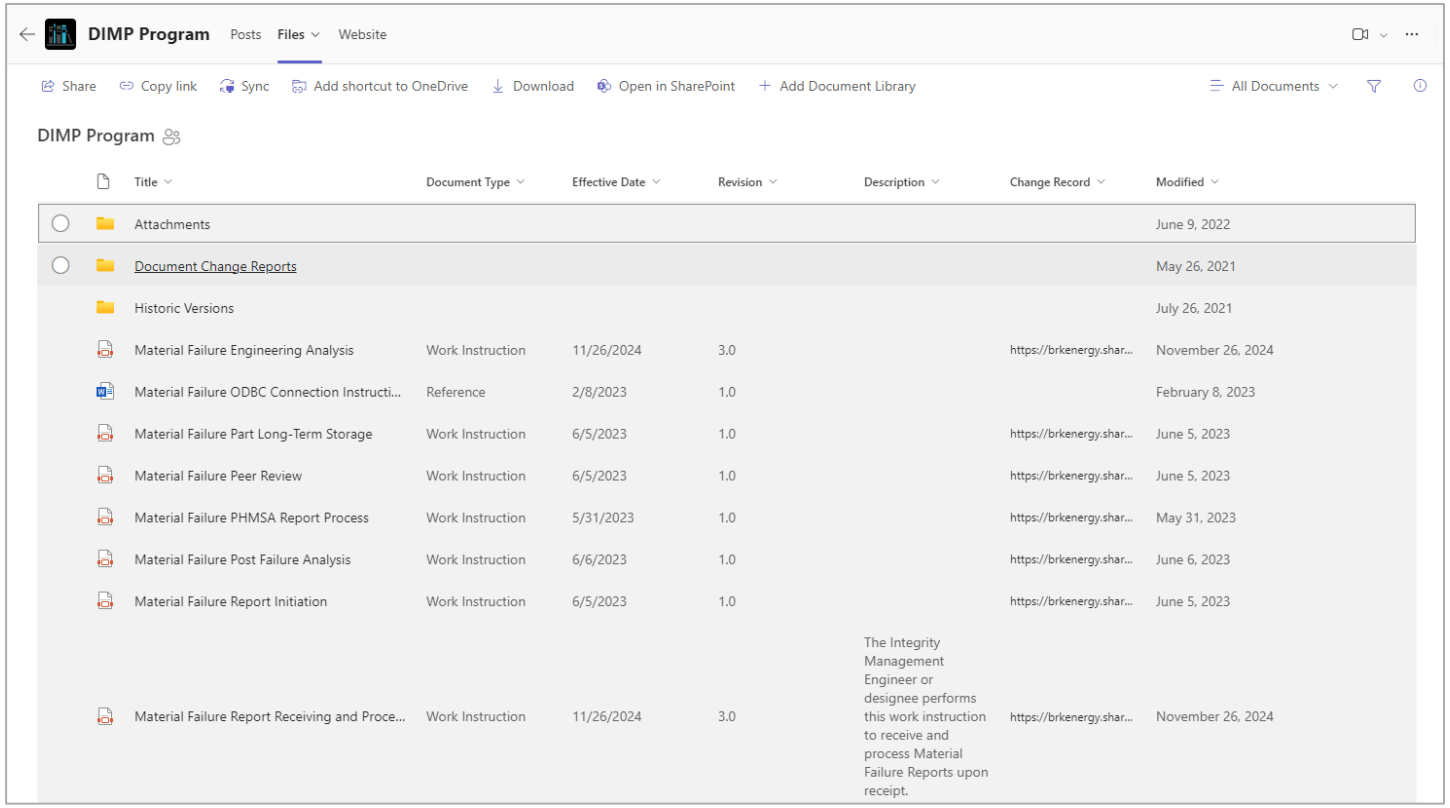
- Century Pipe Elimination Project is now tracked via SMS as a corrective and preventative action (CAPA) item.



# Best Practices & Considerations

## Tying DIMP to SMS Example

- Material failure procedures are held in SMS plan rather than DIMP.




| Title | Document Type | Effective Date | Revision | Description | Change Record | Modified |
|---|---|---|---|---|---|---|
| Attachments | | | | | | June 9, 2022 |
| Document Change Reports | | | | | | May 26, 2021 |
| Historic Versions | | | | | | July 26, 2021 |
| Material Failure Engineering Analysis | Work Instruction | 11/26/2024 | 3.0 | | https://brkenergy.shar... | November 26, 2024 |
| Material Failure ODBC Connection Instructi... | Reference | 2/8/2023 | 1.0 | | | February 8, 2023 |
| Material Failure Part Long-Term Storage | Work Instruction | 6/5/2023 | 1.0 | | https://brkenergy.shar... | June 5, 2023 |
| Material Failure Peer Review | Work Instruction | 6/5/2023 | 1.0 | | https://brkenergy.shar... | June 5, 2023 |
| Material Failure PHMSA Report Process | Work Instruction | 5/31/2023 | 1.0 | | https://brkenergy.shar... | May 31, 2023 |
| Material Failure Post Failure Analysis | Work Instruction | 6/6/2023 | 1.0 | | https://brkenergy.shar... | June 6, 2023 |
| Material Failure Report Initiation | Work Instruction | 6/5/2023 | 1.0 | | https://brkenergy.shar... | June 5, 2023 |
| Material Failure Report Receiving and Proce... | Work Instruction | 11/26/2024 | 3.0 | The Integrity Management Engineer or designee performs this work instruction to receive and process Material Failure Reports upon receipt. | https://brkenergy.shar... | November 26, 2024 |

# Best Practices & Considerations

## Risk Modeling

- 49 CFR Part 192.1007(c) requires that risks to the distribution system are evaluated and ranked
- While PHMSA does not require any mathematical method for ranking risks, the use of a consistent calculation tool is recommended, especially for operators of medium to large size.
- When choosing a model for risk evaluation, consider the questions:
  - Is your model based on actual performance history of the system?
  - Does your model provide a way to evaluate/predict risk reduction over time?
  - For those with both distribution and transmission assets, do your integrity models provide a basis for comparison of risks between assets?
- MidAmerican implemented a probabilistic risk model for transmission in December 2023 and for distribution in August 2024.

# Best Practices & Considerations

## Risk Modeling Examples*

**Risk Model Types and Applicability to Decisions**

| Decision Type | Model Category | | | |
|---|---|---|---|---|
| | A. Qualitative Model | B. Relative Assessment/ Index Model | C. Quantitative System Model | D. Probabilistic Model |
| Risk Priorities for Baseline Integrity Assessment | A | A | A | BP |
| Preventive and Mitigative Measure Identification | A | A | A | BP |
| Preventive and Mitigative Measure Evaluation and Comparison | AI | AI | A | BP |
| Benefit-Cost Analysis for Risk Reduction Options | AI | AI | A | BP |
| Integrity Assessment Interval Determination | AI | AI | A | BP |
| General Risk Management Decision Making | AI | AI | A | BP |

**Key:**

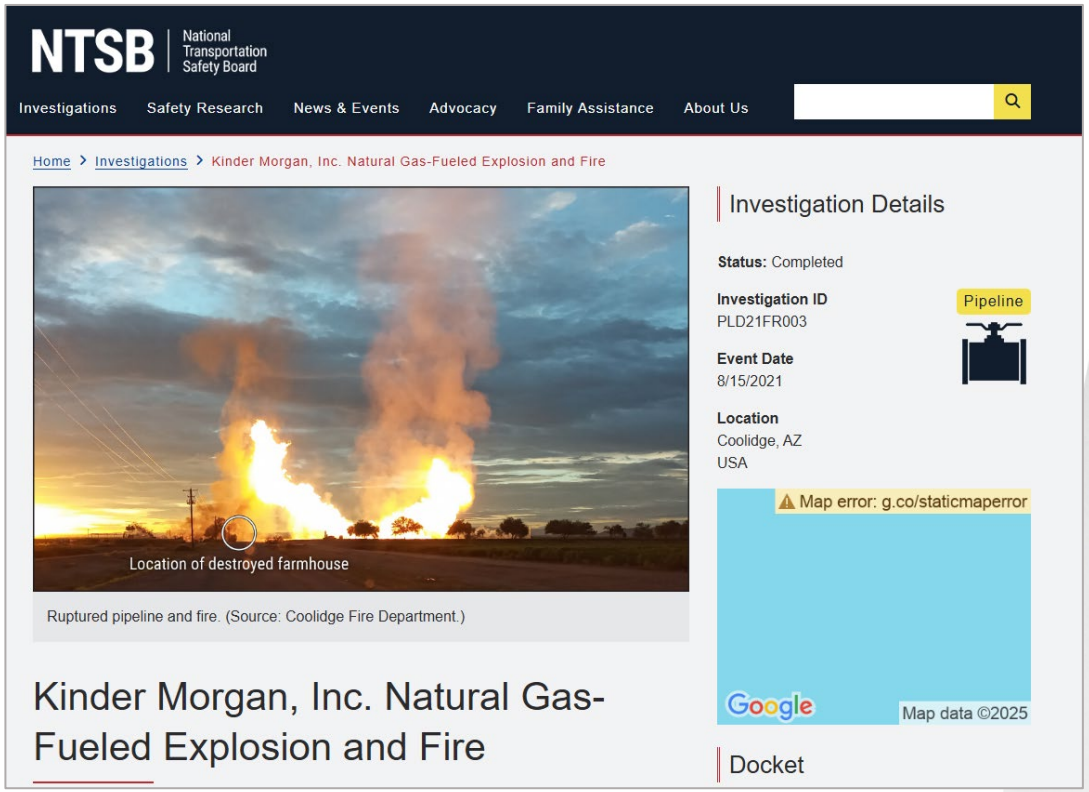
| | |
|---|---|
| Can be Applicable with Additional Inputs to Risk Assessment Process | AI |
| Can be Applicable | A |
| Best Practice | BP |

*Taken from PHMA's whitepaper *Pipeline Risk Modelling Overview of Methods and Tools for Improved Implementation*, February 2020

# Best Practices & Considerations

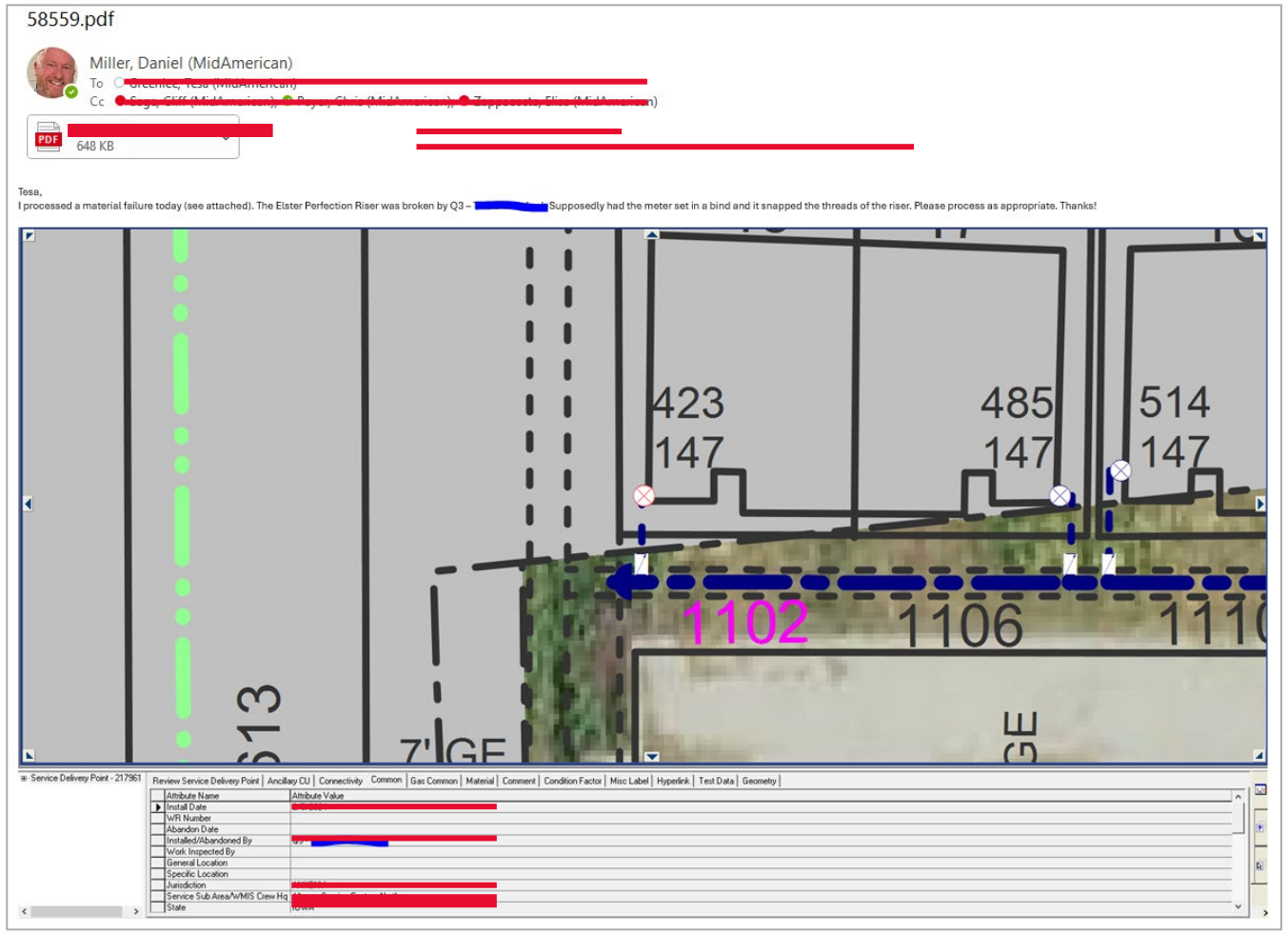
## Interaction with OQ

- The QA/QC processes of field personnel have a direct impact on risk within a gas distribution system.
- Consider the following interactions with your Operator Qualification group/department:
  - Share performance metrics, especially construction-caused failures
  - Share industry lessons learned, event reviews
  - Have someone from integrity management participate in OQ committees or boards



# Best Practices & Considerations

## Example of Hypothetical Material Failure Record



# Best Practices & Considerations

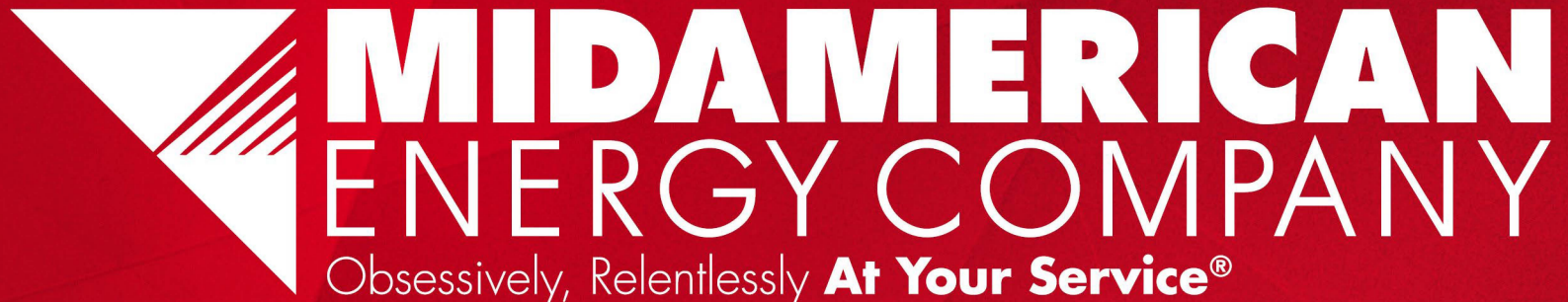
## Continual Improvement

- 49 CFR Part 192.1007(f) requires that operators periodically evaluate and improve their DIMP plans.
- Since DIMP is a mature program subject to tunnel vision, consider the following:
  - Have internal corporate audits of the plan
  - Procure a third-party audit through a third-party contractor
  - If you are part of a larger organization with affiliates, have affiliate participation in DIMP meetings
  - Develop an advisory team or “board” for the DIMP program, ideally composed of employees from operations, engineering, compliance/standards, gas control and measurement/regulation.
    - This group can be an asset for not only reviewing/approving program changes, but also for championing the DIMP program companywide.

# Finally, because this is a joint state event…


# GO BISON!

# Questions?


MIDAMERICAN
ENERGY COMPANY
Obsessively, Relentlessly At Your Service®