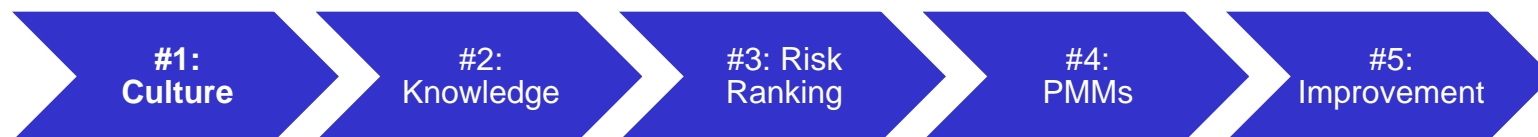**PECO**

An Exelon Company

Overview of PECO's Distribution Integrity Management Plan

**PUC Gas Safety Seminar**

September 8, 2016

David Bonner, PE

Robert Ridgeway, PE

Agenda

- ✓ PECO Distribution System Overview
- ✓ DIMP Pillar #1 – DIMP Culture
- ✓ DIMP Pillar #2 – Knowledge of the Distribution System
- ✓ DIMP Pillar #3 – Risk Ranking
- ✓ DIMP Pillar #4 – Preventative and Mitigative Measures (PMMs)
- ✓ DIMP Pillar #5 – Continuous Improvement
- ✓ Key Takeaways
- ✓ Questions

#1: Culture	#2: Knowledge	#3: Risk Ranking	#4: PMMs	#5: Improvement

PECO Service Territory
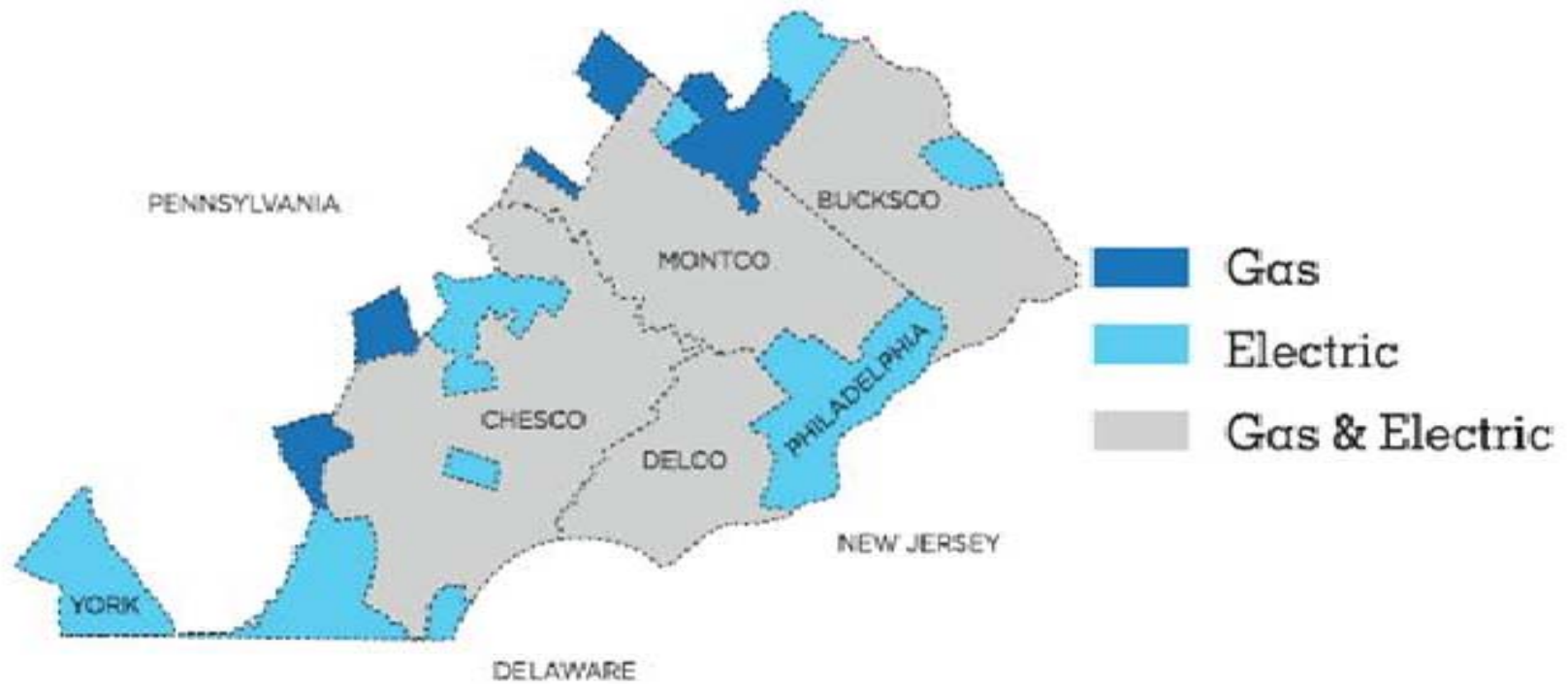
PECO Distribution System Overview

Serving: 513,088 natural gas customers

Via

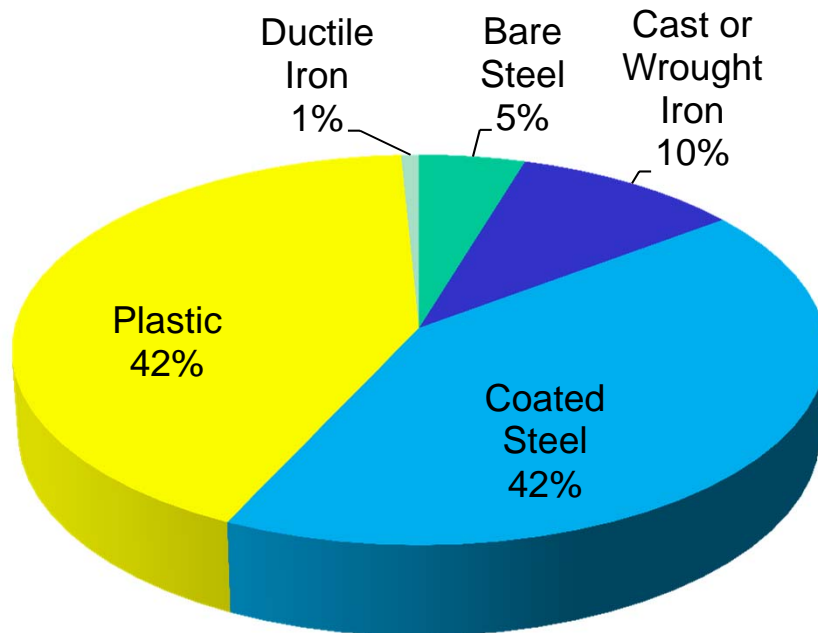|		
6,825 miles of distribution main	And	30 miles of transmission pipeline

With

447,470 services	365 reg stations	10,263 valves

PECO Distribution System Overview

Mains by Material

Ductile Iron 1%

Bare Steel 5%

Cast or Wrought Iron 10%

Plastic 42%

Coated Steel 42%

Services by Material

Copper 1%

Bare Steel 6%

Coated Steel 4%

Plastic 89%
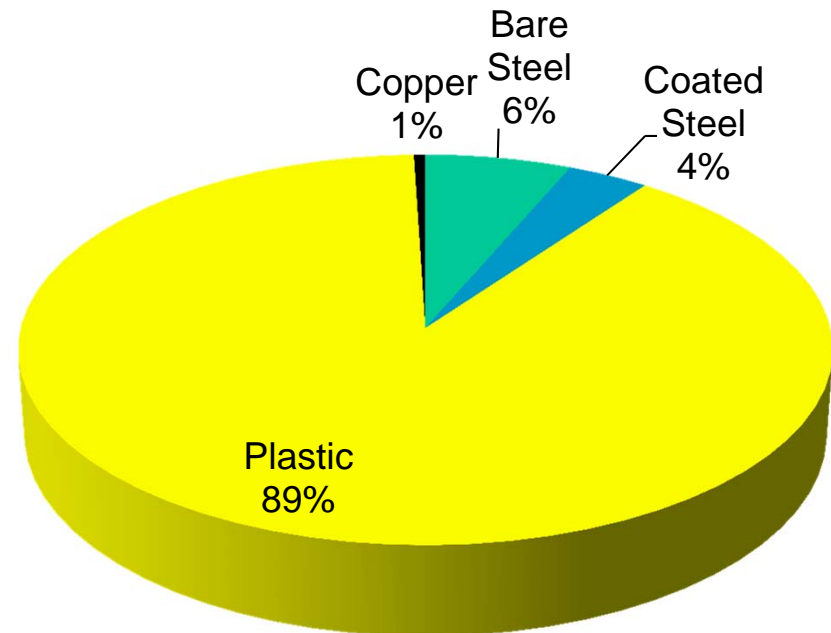
PECO Distribution System Overview

Age of Mains

POST-2010 4%
2000s 13%
1990s 20%
1980s 15%
1970s 11%
PRE-1970 37%

Age of Services

POST-2010 11%
2000s 16%
1990s 23%
1980s 20%
1970s 16%
PRE-1970 14%

![PECO logo](An Exelon Company)
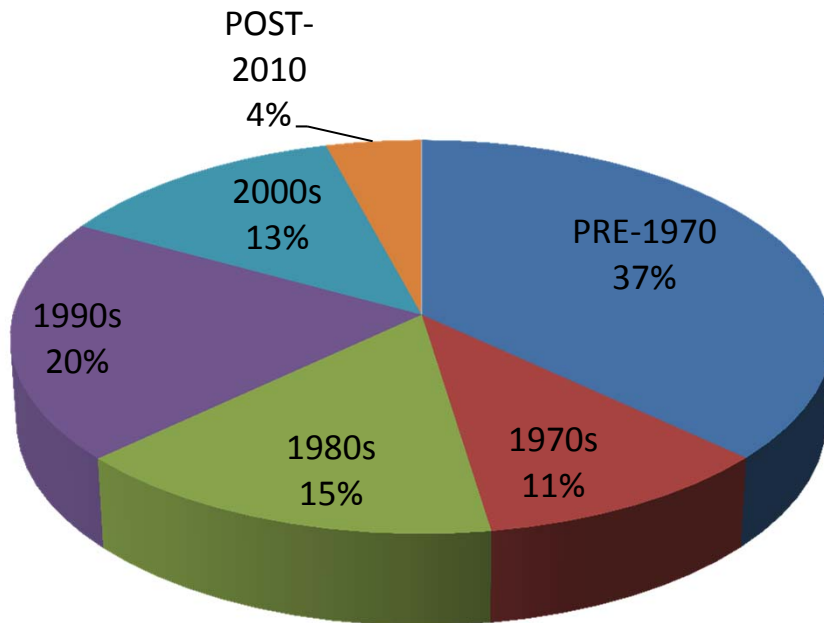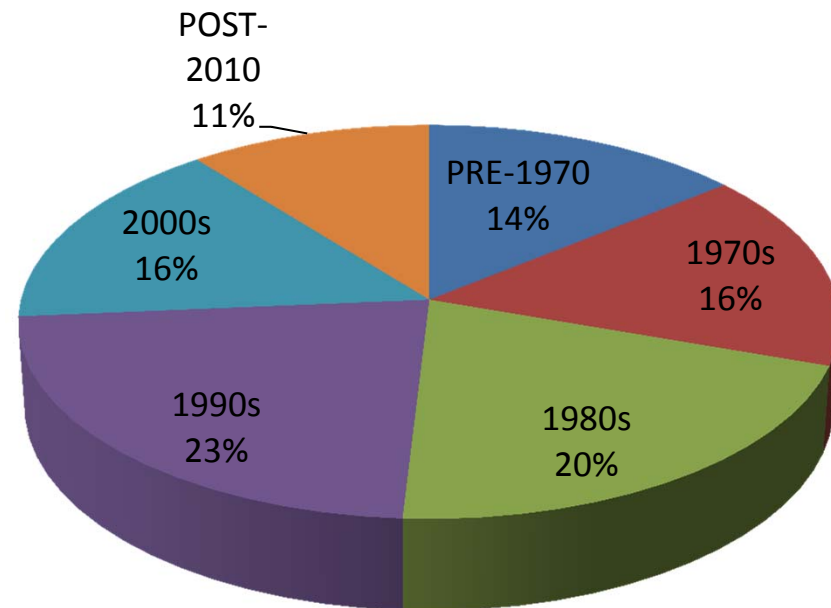
PECO Distribution System Overview

Total Leaks on Mains

Other 5%

Pipe, Weld or Joint 33%

Corrosion 52%

Damage 3%

Natural Forces 7%
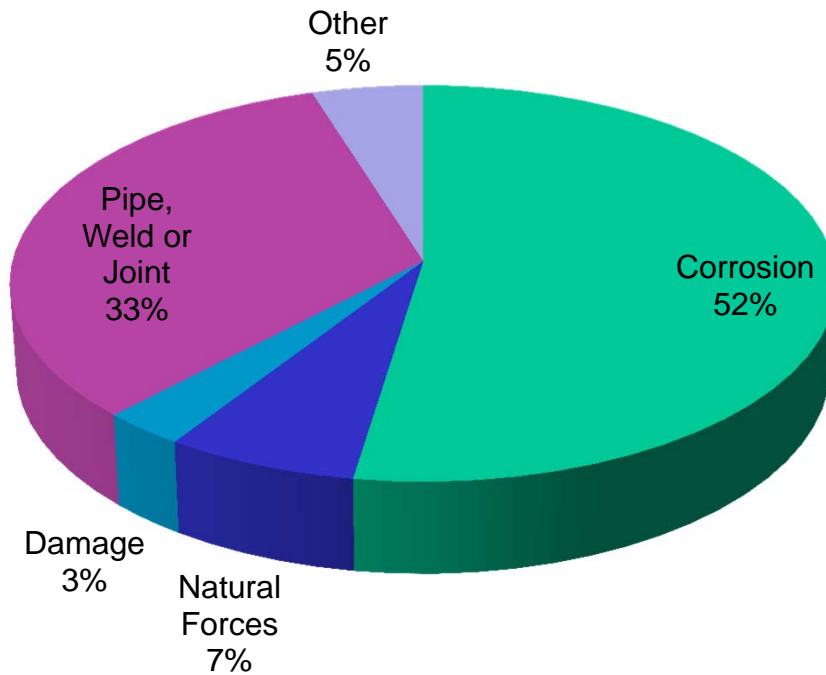
Total leaks on Services

Pipe, Weld or Joint 14%

Other 7%

Corrosion 45%

Damage 34%

7
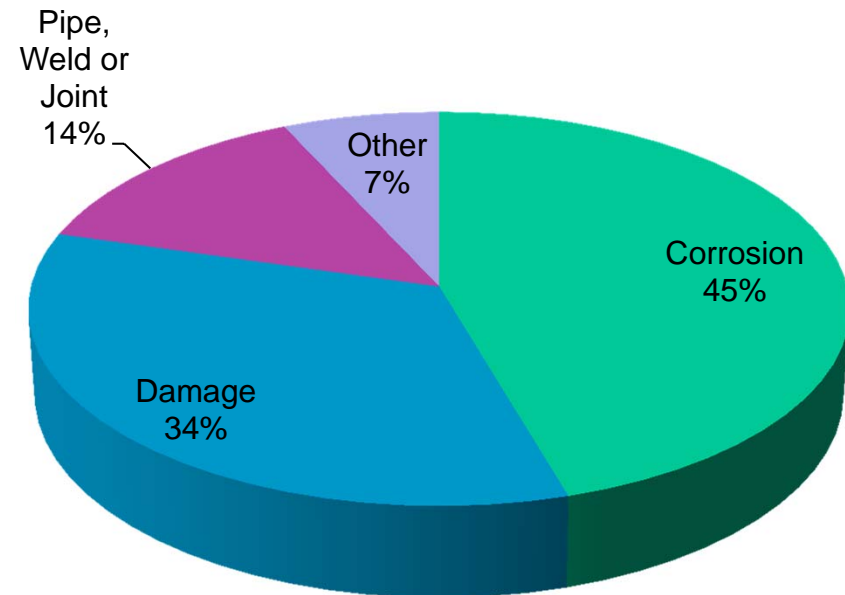
PHMSA DIMP Elements

- Knowledge of the Distribution System

- Identify Threats

- Evaluate and Rank Risk

- Identify and implement measures to address risks

- Measure performance, monitor results, and evaluate effectiveness

- Periodic Evaluation and Improvement
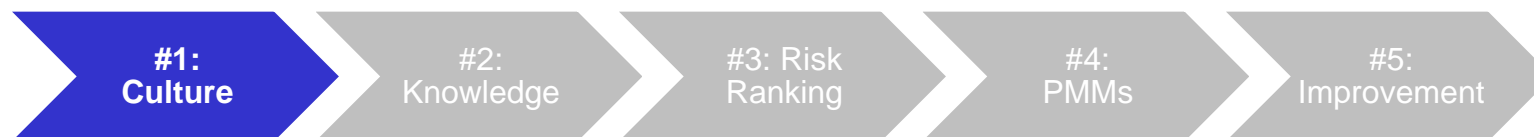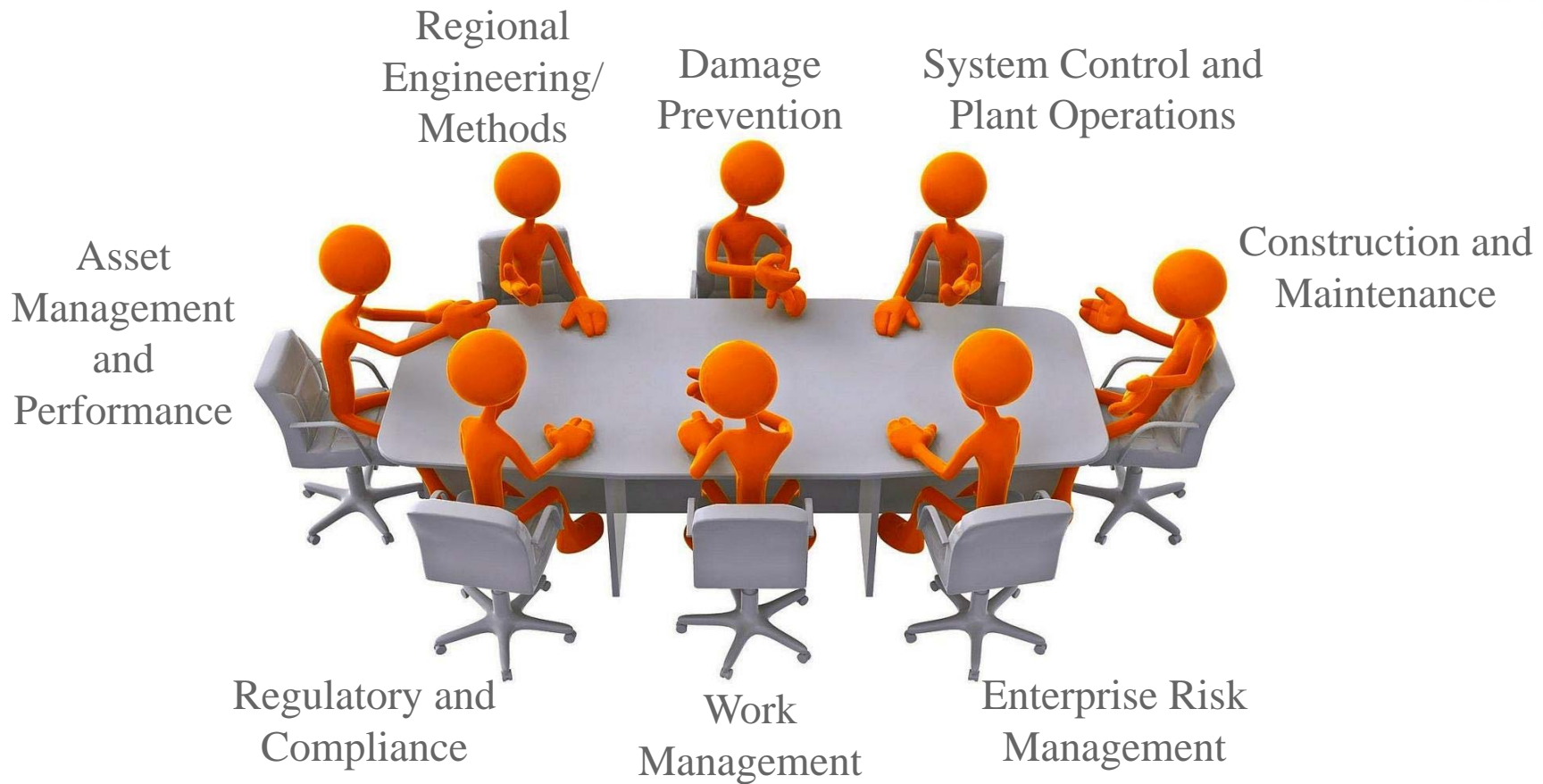
- Report Results

DIMP Pillar #1: DIMP Culture

✓ Establish Executive Sponsorship

✓ Define Roles and Responsibilities

✓ Identify SMEs

| #1: Culture | #2: Knowledge | #3: Risk Ranking | #4: PMMs | #5: Improvement |
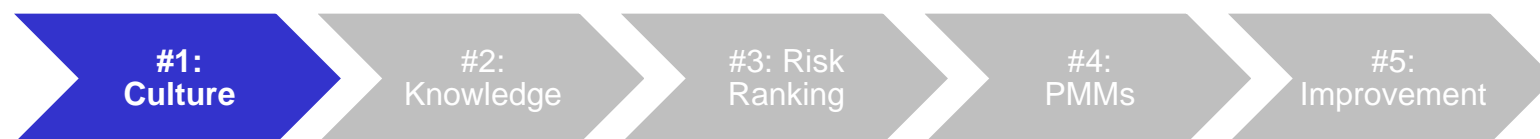
DIMP Organizational Chart


```
                          Vice President Gas
                                |
        +----------------------+----------------------+
        |                                             |
  Director Regional                          Manager Gas Asset
  Operations Gas                             Management &
  Distribution                               Performance
```

Support (dashed box, left column)

- Mapping & Document Services
- Gas Methods & Training
- Gas IT

Director Regional Operations Gas Distribution

- Gas Regulatory& Compliance
- Gas Regional Engineering
- Gas Damage Prevention
- Gas Work Management
- Gas Contract Controls
- Gas Construction & Maintenance
- Gas System Control and Plant Ops

Manager Gas Asset Management & Performance

- DIMP Engineers
- Data Specialist

#1: Culture → #2: Knowledge → #3: Risk Ranking → #4: PMMs → #5: Improvement

DIMP SMEs and Risk Council

Regional Engineering/ Methods

Damage Prevention

System Control and Plant Operations

Asset Management and Performance

Construction and Maintenance

Regulatory and Compliance

Work Management

Enterprise Risk Management

#1: Culture

#2: Knowledge

#3: Risk Ranking

#4: PMMs

#5: Improvement

Risk Council Annual Activities

Develop PMMs

Develop annual goals

Discuss procedural changes

Review advisory bulletins

Evaluate new threats

Review risk model results

Evaluate effectiveness

#1: Culture

#2: Knowledge

#3: Risk Ranking

#4: PMMs

#5: Improvement
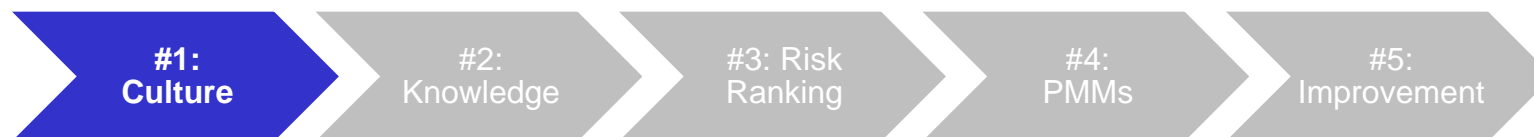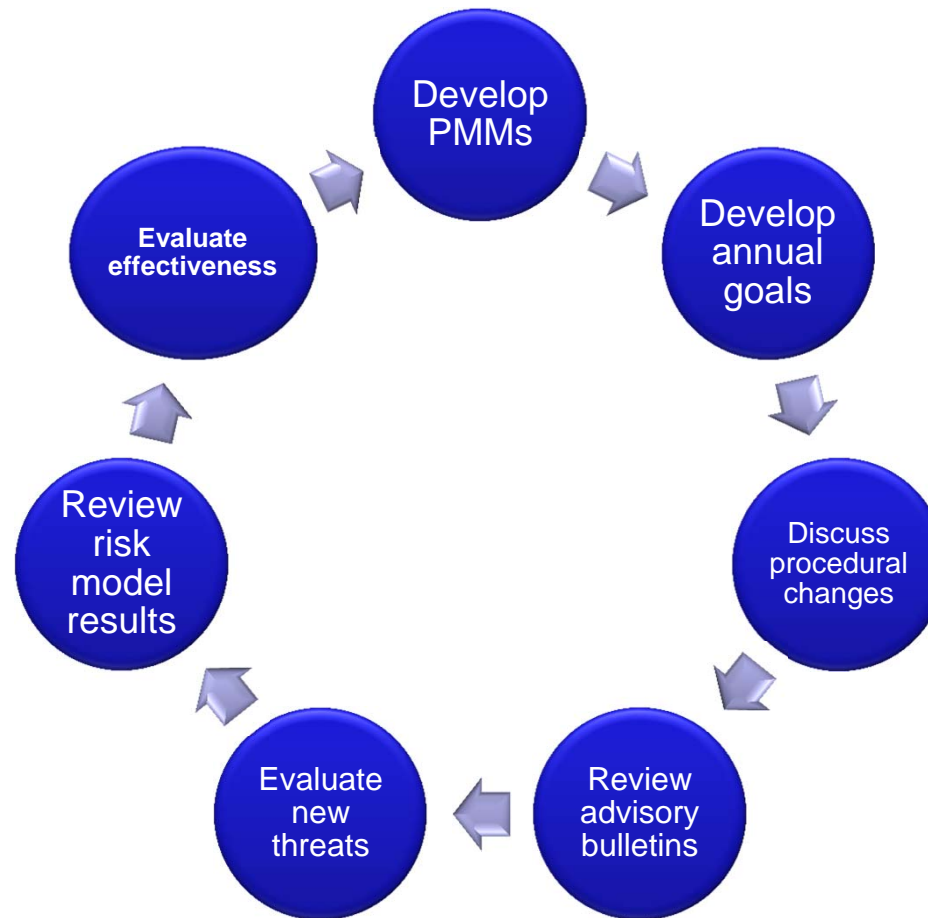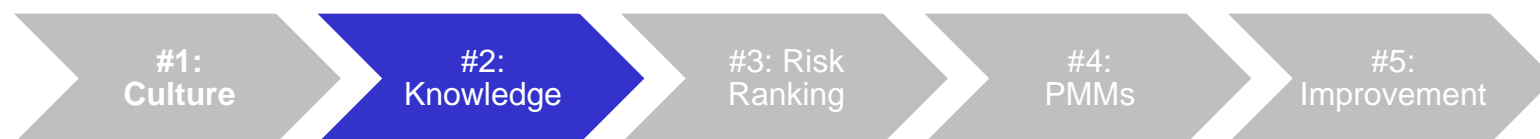
DIMP Pillar #2:
Knowledge of Your Distribution System

✓ Utilize all available data sources

✓ Review data sources regularly to identify trends

✓ Formulate a plan of action to address data gaps

| #1: Culture	#2: Knowledge	#3: Risk Ranking	#4: PMMs	#5: Improvement

Knowledge of the System

- ✓ Data Sources
  - Asset Management System
    - Work/Asset Management System • Main/Service Replacement Software • Leak Management • Compliance Programs • Regulator Station Database • Corrosion
  - Damage Prevention
  - Component Failure Database
    - Failure Investigation • Apparent Cause Evaluation •

      Root Cause Investigation
  - Outage Management
- ✓ Inaccurate or Incomplete Data
 - Targeted areas of data improvement
    - Data acquisition • Data management

| #1: Culture | #2: Knowledge | #3: Risk Ranking | #4: PMMs | #5: Improvement |
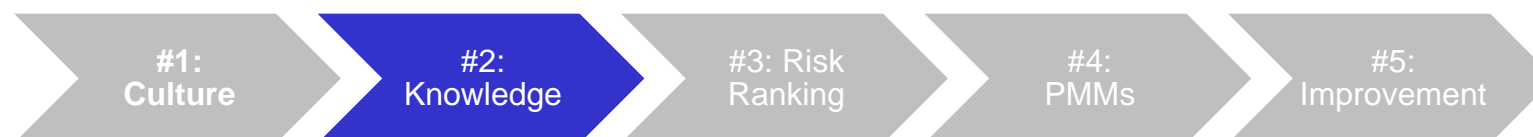
Threat Identification

Primary Threat	No. of Sub-threats	Example(s)
1. Corrosion	3	External, Internal, Atmospheric
2. Natural Forces	13	Earth Movements, Earthquakes, Landslides
3. Excavation Damage	13	No Locate Request, Expired Dig Ticket, Dug Early
4. Other Outside Force Damage	4	Fire First, Vehicular Damage, Blasting
5. Material/Weld/Joint Failure	11	Faulty Welds, Defective Pipe Seams, Defective Pipe Wall
6. Equipment Failure	3	Regulator Station Equipment Malfunction, Valve Leaks, Other Equipment Failure
7. Incorrect Operations	5	Incorrect Construction, Incorrect Operation, Inadequate Procedures
8. Other	7	Blockage, Encroachment, Unknown
9. Electrical Arcing (Common Trench)	N/A	N/A

DIMP Pillar #3 – Risk Ranking

✓ Customize risk model

✓ Review periodically

✓ Communicate risk model results

#1: Culture → #2: Knowledge → #3: Risk Ranking → #4: PMMs → #5: Improvement
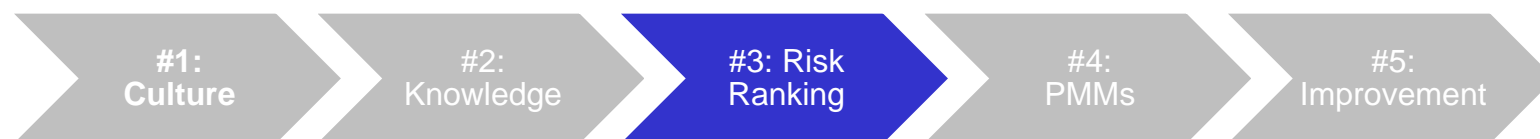
Risk Assessment

Risk potential = risk frequency x consequence

- Risk frequency
  - Rolling 10 years of leak data
  - Normalized to leaks/mile for asset type and material
- Consequence factors
  - Pressure
  - Incident
  - Hazardous leak
  - Average service length
  - Penetrations
  - Common trench

| #1: Culture	#2: Knowledge	#3: Risk Ranking	#4: PMMs	#5: Improvement

Risk Prioritization

Risk scores above a certain criteria are considered to be primary threats to PECO's distribution system

1. Cast Iron Main – Natural Force (Breaks)
2. Bare Steel Main – Corrosion
3. Bare Steel Service – Corrosion
4. Plastic Service – Excavation Damage

| #1: Culture | #2: Knowledge | #3: Risk Ranking | #4: PMMs | #5: Improvement |
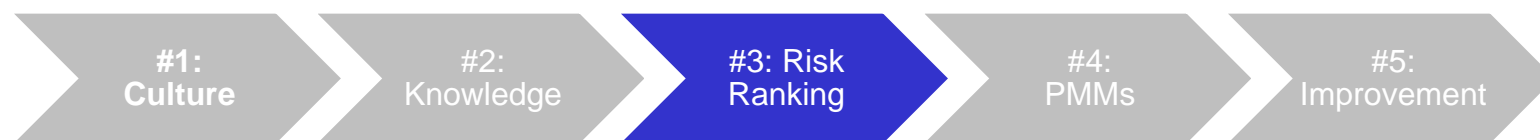
DIMP Pillar #4 – Preventative and Mitigative Measures (PMMs)

✓ Develop PMMs for each primary threat

✓ Develop meaningful metrics

✓ Review and update PMMs after each risk model update

| #1: Culture	#2: Knowledge	#3: Risk Ranking	#4: PMMs	#5: Improvement
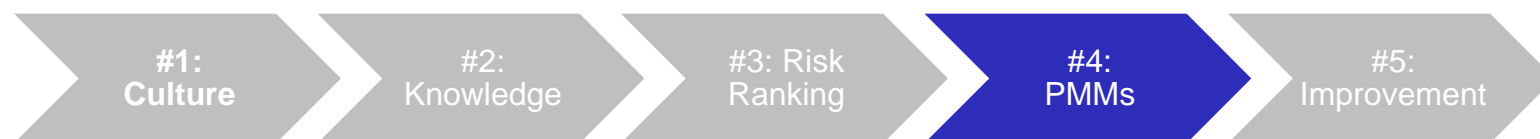
Risk Mitigation Business Practices

✓ Risk council reviews PMM forms for all threat categories per DOT (general)

✓ Each PECO primary threat require

- PMMs
- Risk Trending (from baseline)
- Annual goals

| #1: Culture | #2: Knowledge | #3: Risk Ranking | #4: PMMs | #5: Improvement |
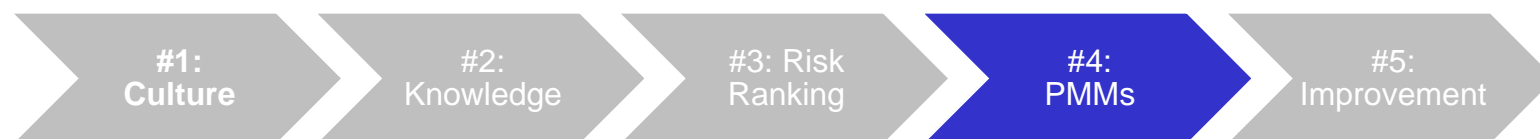
# Preventative and Mitigation Measures

Based on primary threats, PECO has initiated a number of risk mitigation activities

- Pipe Replacement Programs
- Damage prevention activities
- Increased leak survey frequency
- Excess flow valve policy and deployment
- Leak management
- Electric fault investigations

#1: Culture ▸ #2: Knowledge ▸ #3: Risk Ranking ▸ #4: PMMs ▸ #5: Improvement
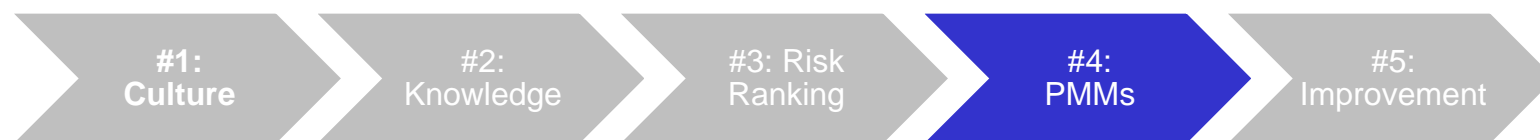
Pipe Replacement Program

✓ Material replacement rates are correlated to the DIMP Risk Model results

✓ Cast Iron Pipe Maintenance and Replacement
  - Program established prioritization criteria for choosing mains to be replaced based on
    – Pipe pressure
    – Pipe size
    – Number of breaks
    – Wall to wall paving

✓ Accelerated Gas Infrastructure Modernization Program
  - Retire all bare steel services by 2022
  - Retire all bare steel, cast iron, wrought iron and ductile iron main by 2035
 - Retirements will be prioritized based on potential risk

| #1: Culture | #2: Knowledge | #3: Risk Ranking | #4: PMMs | #5: Improvement |
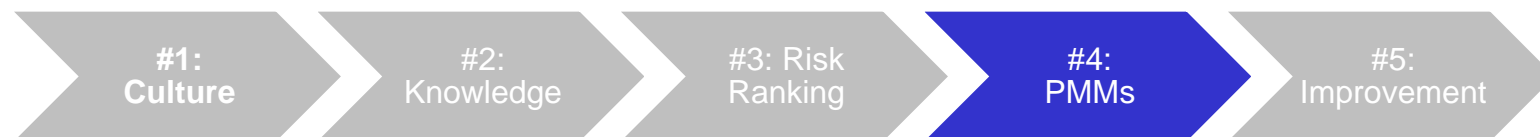
Damage Prevention Initiatives

✓ Represent Gas Industry on the PA One Call Board of Directors
✓ On-going coordination to work in conjunction with third-party contractors performing municipal and state road improvement projects and outside utility work
✓ Conduct enhanced awareness education
✓ Inspect targeted excavation and backfill activities
✓ Underground utility verification pre-construction
✓ Utilization of vacuum excavation
✓ Maintain track and analyze damage data to identify trends and improvement opportunities, then implement corrective actions to reduce damages
✓ Marker balls are installed to track location of installed infrastructure

#1: Culture	#2: Knowledge	#3: Risk Ranking	#4: PMMs	#5: Improvement
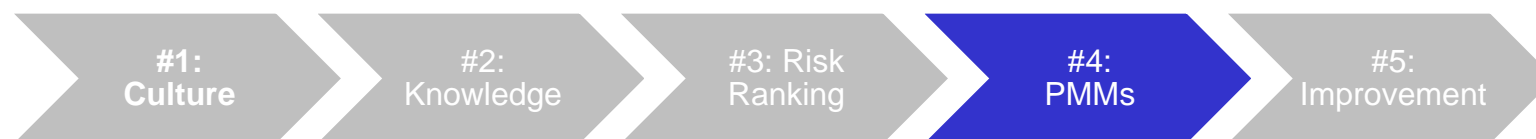
Plastic Service – Excavation Damage

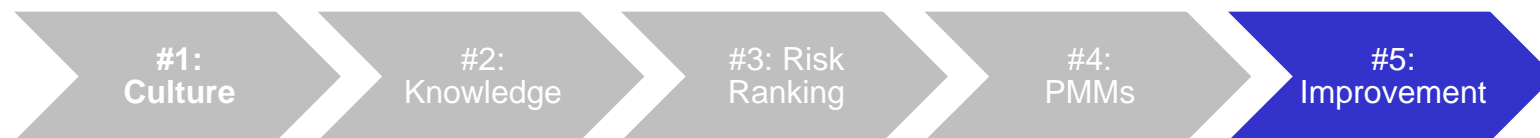**Excavation Damages per 1000 Locates**
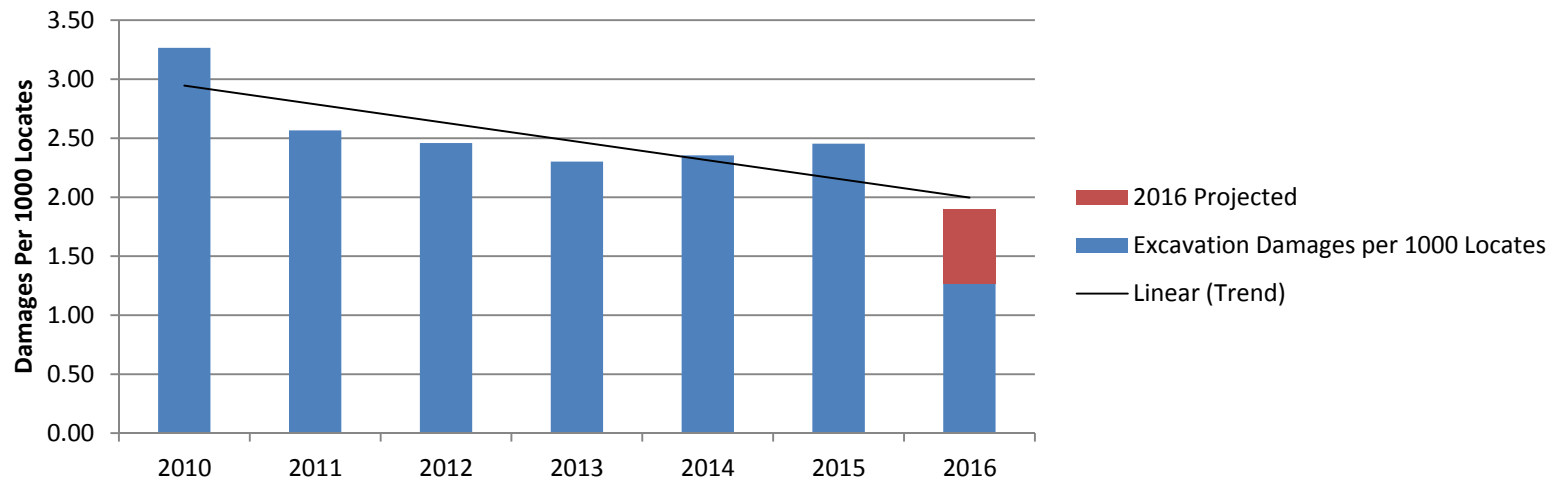
2016 Goals established via

- Trend line
- PMM's established by SME and approved by Risk Council
- Other DIMP related metrics

DIMP Pillar #5 – Continuous Improvement

✓ Determine methods to evaluate effectiveness

✓ Monitor results

✓ Perform periodic reviews

#1: Culture → #2: Knowledge → #3: Risk Ranking → #4: PMMs → #5: Improvement

Plan Element Review

✓ Measuring performance

- Annual performance metrics
- Mechanical fitting failures
- Integrity performance analysis
- Baseline performance measures

✓ Monitoring results

- Risk Council agenda item

✓ Evaluating effectiveness

- Data trending/statistical analysis
- Review of annual goals

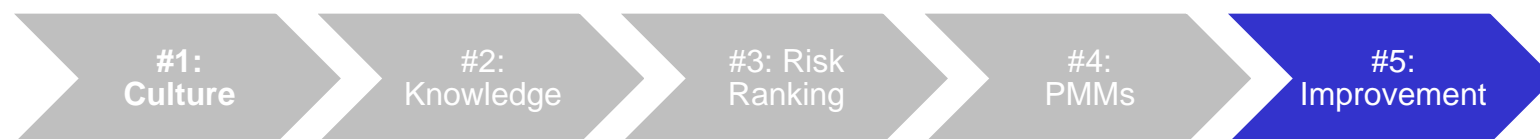| #1: Culture | #2: Knowledge | #3: Risk Ranking | #4: PMMs | #5: Improvement |
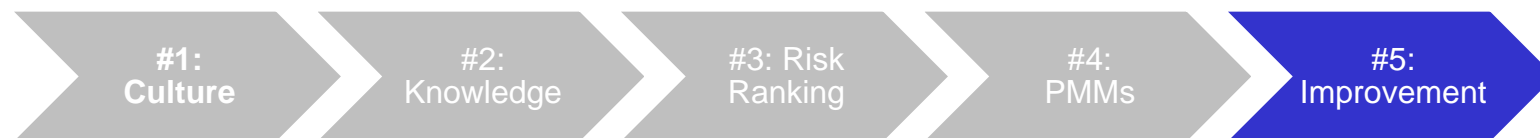
Program Review
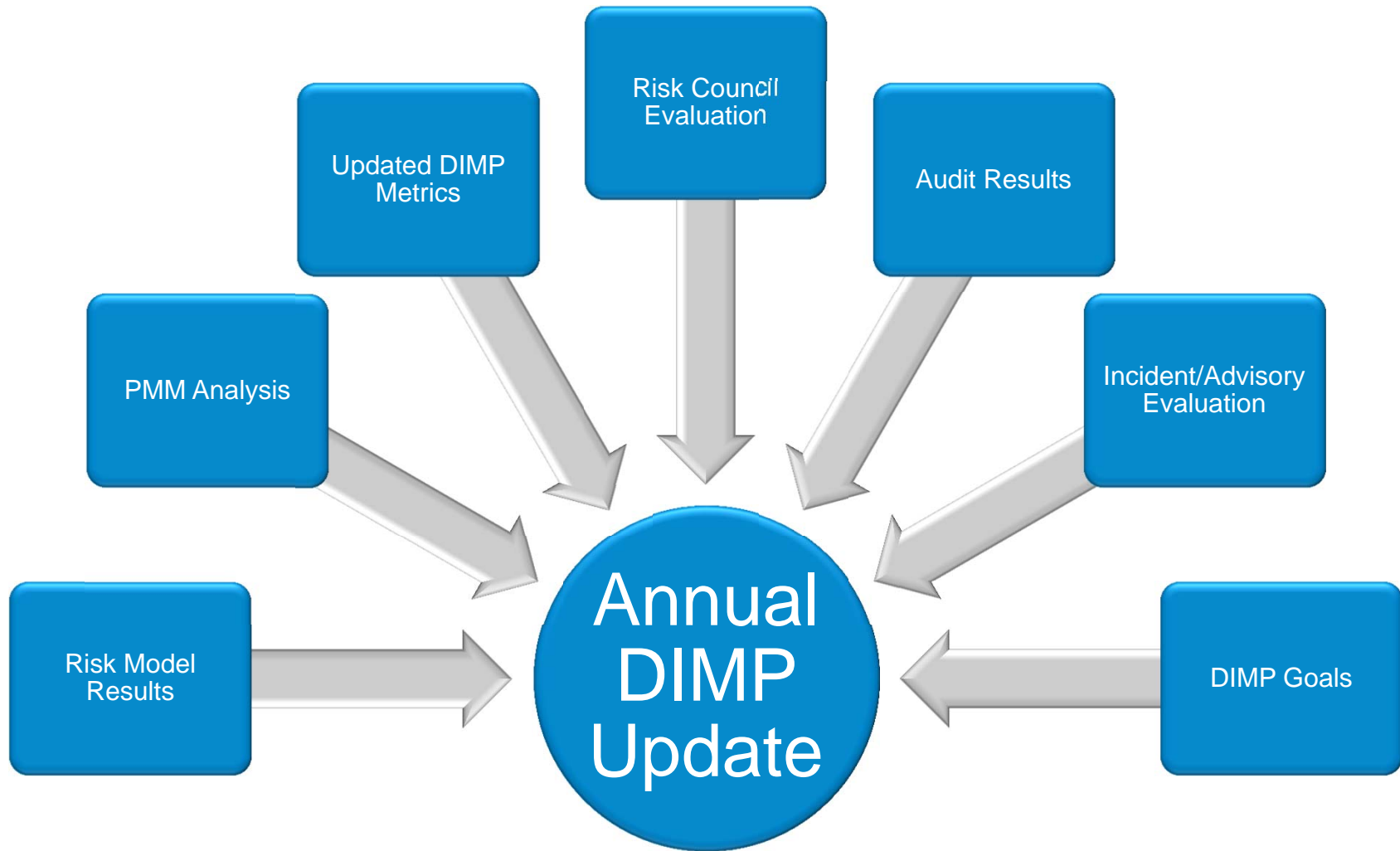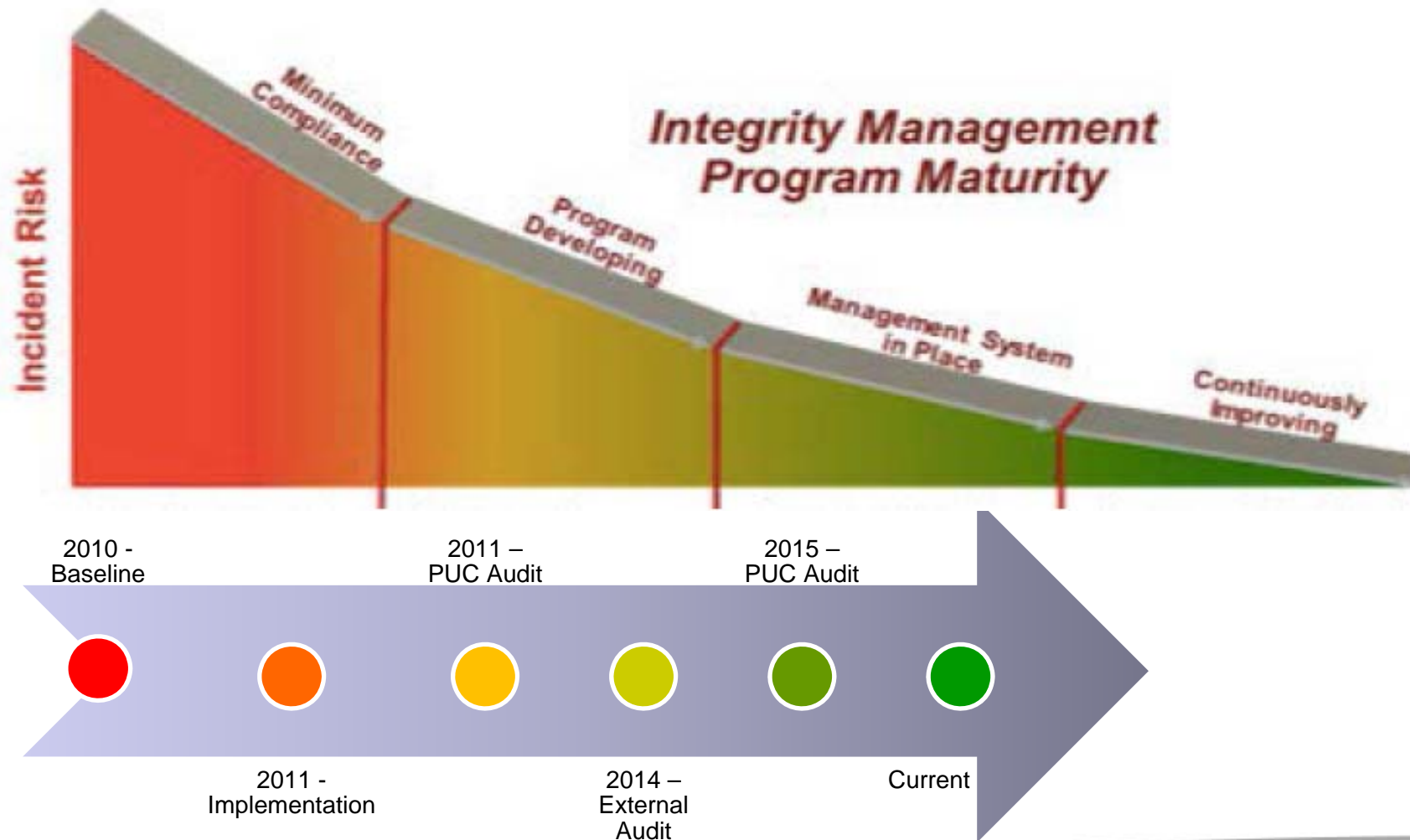
Data Improvements

✓ Data acquisition

- Piloting geocoded electronic data entry solution
  - GNSS coordinate utilization
  - Domain driven data entry fields
  - Secure cloud hosted data
  - Material barcode utilization for tracking and traceability

✓ Data management

- GIS conflation
  - Adjust alignment of current maps to match impervious surface features land base
  - Converting legacy raster images to GIS features with associated asset data
- GIS conversion
  - Moving to GE Smallword Gas Distribution Office
  - Utilize the GE Gas Office tools to better manage asset data

#1: Culture → #2: Knowledge → #3: Risk Ranking → #4: PMMs → #5: Improvement

DIMP Maturity

Key Takeaways

Five Pillars of DIMP

1. DIMP Culture
2. Knowledge of Your Distribution System
3. Risk Ranking
4. Preventative and Mitigative Measures
5. Continuous Improvement

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