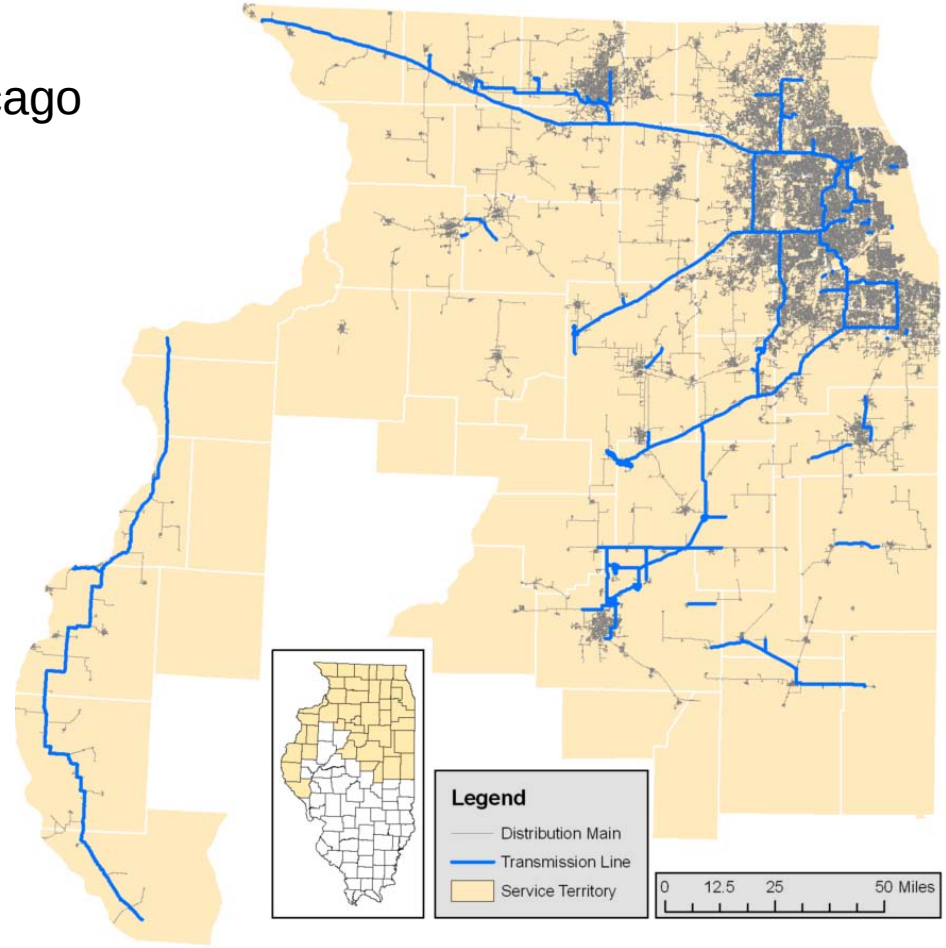
Panel 4
Identifying Interactive Threats and Understanding Options

July 21, 2011

Hans G. Bell, P.E.
Assistant Vice President, Engineering
Nicor Gas Company
Naperville, IL

Nicor Gas Systems Overview

- Intrastate LDC Operator
- Northern 1/3 of Illinois, outside of Chicago
- 32,864 Miles Distribution Main
- 2,069,400 Service Lines
- 1,173 Miles Transmission Pipelines
- 8 Underground Aquifer Storage Fields

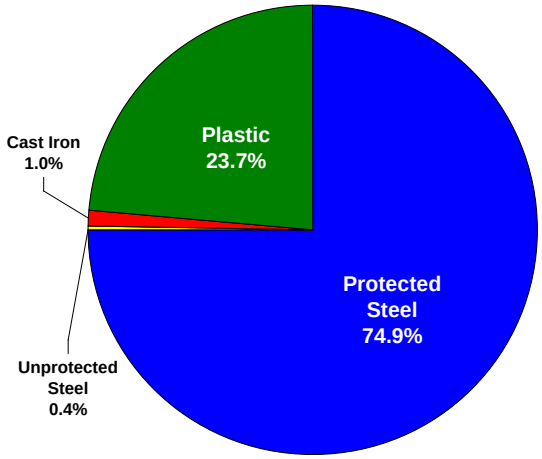


Know Your System – System Segmentation by Material

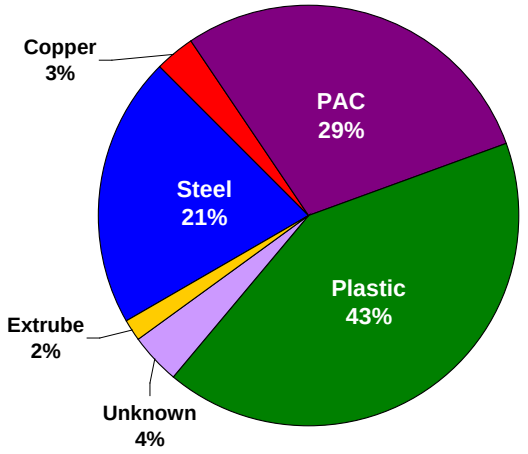
Miles of Main by Material	
Protected Steel	24,626
Unprotected Steel	131
Cast Iron	314
Plastic	7,793
Total Miles of Main	**32,864**

Number of Service Lines by Material	
Steel	433,190
Extrube	36,501
P.A.C.	595,984
Unknown	78,580
Plastic	864,236
Copper	60,909
Total	**2.069.400**

2010 System Composition



2010 System Composition (Services)



Threat Identification Methodology

- Data Driven Threat Identification
  - Multiple Years of Leak History & Operational History
    - Corrosion
    - Equipment
    - Excavation Damage
    - Material & Welds
    - Natural Forces
    - Operations
    - Other – Requires review & analysis – use should be minimized
    - Outside Force
  - Excavation Damage Report history
  - Laboratory analysis of defective items retrieved from field
  - Non Leaking Damages
    - Over pressurizations
    - Sewer lateral trans-sections

Threat Identification Methodology (Continued)

- Subject Matter Expert Based Threat Identification
  - Helpful with identification of localized threats
  - Useful in identification of threats not resulting in leaks
  - Useful in identifying & understanding geographic trends
  - Useful in identifying historical context of threats
- Other Sources for Threat Identification
  - PHMSA Advisories
  - Trade Associations – National & Regional
  - AGA Plastic Pipe Database - PPDC
  - Damage Information Reporting Tool - DIRT
  - Benchmarking Studies

Threat Identification Methodology (Continued)

- Threat Data is Analyzed, Trended, and Assigned to Assets

- System Segmentation
  - Geography – analyzed at local level – ½ mile grid, aggregated to regional level
  - Asset Type –service, main, equipment
  - Material – plastic, vintage plastic, steel, bare steel, cast iron
  - Age – decade / vintage
  - Pressure – Inches Water, P<= 60 psig, P > 60

Risk Analysis Methodology

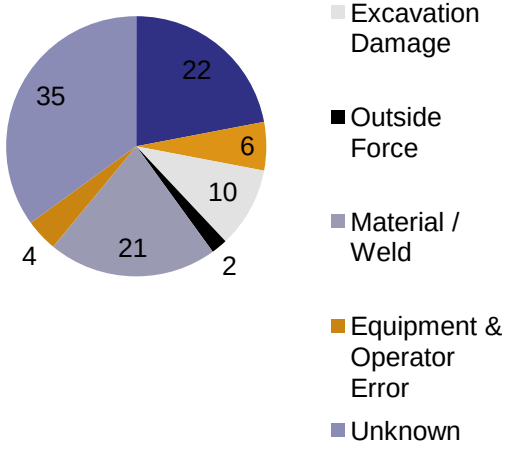
- Calculate relative risk for each grid by threat, asset, and pressure
- Total Risk = $\sum_{Grid}$ ($\sum_{Threat}$ ($\sum_{Material}$ ($\sum_{Pressure\ System}$ [Asset Quantity x Threat Factor(s) x Consequence Factors])))

- Sample Threat Factors for Corrosion (not inclusive)
  - Coating Factor (Bare / Coated)
  - Relative Leak History (Do not to multiply by zero)
  - Soil Factor
  - Stray Current Factor
- Sample Consequence Factors (not inclusive)
  - Public Building & Business Area Factors
  - Pressure Factors
- Grids may aggregated into larger regions for comparison purposes and allocation of additional & accelerated measures

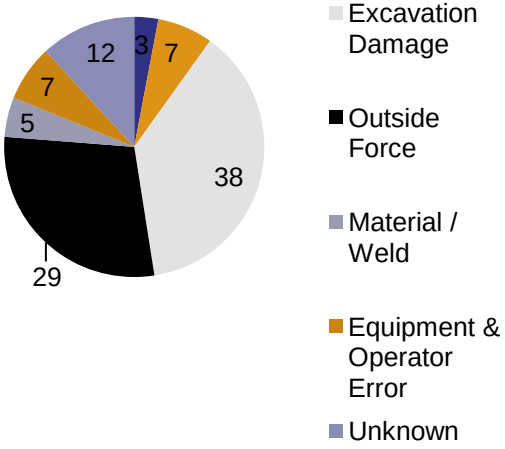
Calibration & Analysis of Risk Results

- Modeled risk proportions for each threat are compared to industry incident history & operator experience
- Individual threat weightings are reviewed, adjusted, and / or explained

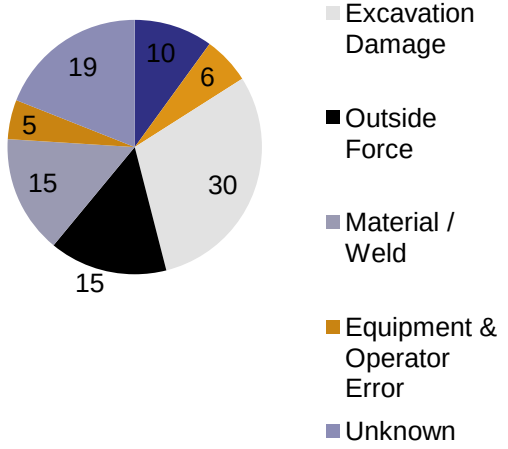
Risk Model 1st Iteration



DIMP Phase I Report



Adjusted Risk Model



Additional & Accelerated Measures

- A/A Measures Developed For Each Threat
  - Implementation Prioritized in Accordance with Risk Modeling
  - A/A Effectiveness Measures – Leading & Lagging

- Sample A/A Measure – Excavation Damage
  - Watch & Protect Program
  - Monitoring of 3rd Party Excavations
  - Pipe Size >6” or Pressure >60 psig

- Sample A/A Effectiveness Metrics
  - Damage Prevention Monthly Score Card
    - Total Damage Ratio (Damages / 1000 locates),
    - At Fault Damage ratio (per 1000)
    - Total Critical Damages (Watch & Protect Criteria)
    - Damages by Root Cause

Suggestions to Improve Threat Identification

- Ongoing Communication Forums
  - Industry Trade Association & Regulatory Joint Efforts
    - Case Studies
    - Research on Technologies to Increase A/A Effectiveness
- Further Development of PHMSA DIMP Website
  - Threat Library
  - Future Visibility to Mechanical Fitting Failure Report Data

Thank You