PHMSA Pipeline Seam Workshop Perspectives on LDC Transmission & Distribution Pipelines

Arlington, Virginia
July 20, 2011

Bruce Paskett
Principal Compliance Engineer
NW Natural

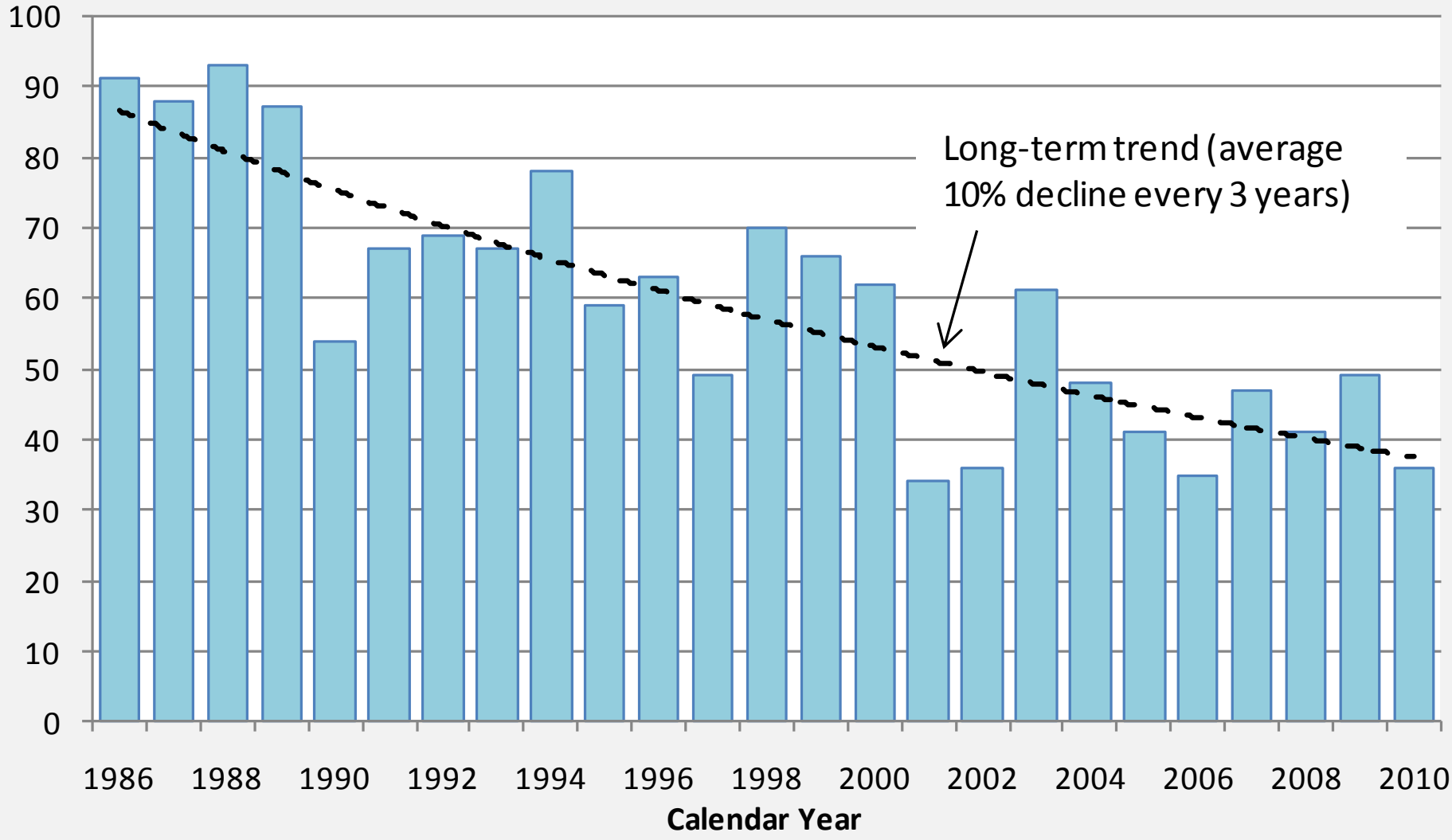
Overview of Transmission PL Infrastructure

- ~ 300,000 miles of transmission pipelines
- ~ 45,000 miles of transmission pipe operated by Local Distribution Companies (LDCs)
- ~ 8,000 miles of LDC transmission pipe in HCAs
- LDC transmission pipe different from interstate transmission lines
  - Often integrated into distribution system
  - 62% of LDC transmission pipe in HCAs is unpiggable

Overview of Distribution PL Infrastructure

- ~ 2.1 million miles of mains and services
  - ~ 1.14 million miles of mains
  - ~ 61 million service lines
- Diversity of materials
  - Bare steel
  - Coated steel
  - Cast iron
  - Plastics
  - Other

Pipeline Incidents w/Death or Major Injury (1986-2010)



Data: DOT/PHMSA Pipeline Incident Data (as of Jan. 19, 2011)

Distribution Safety Performance Leaks & Incidents

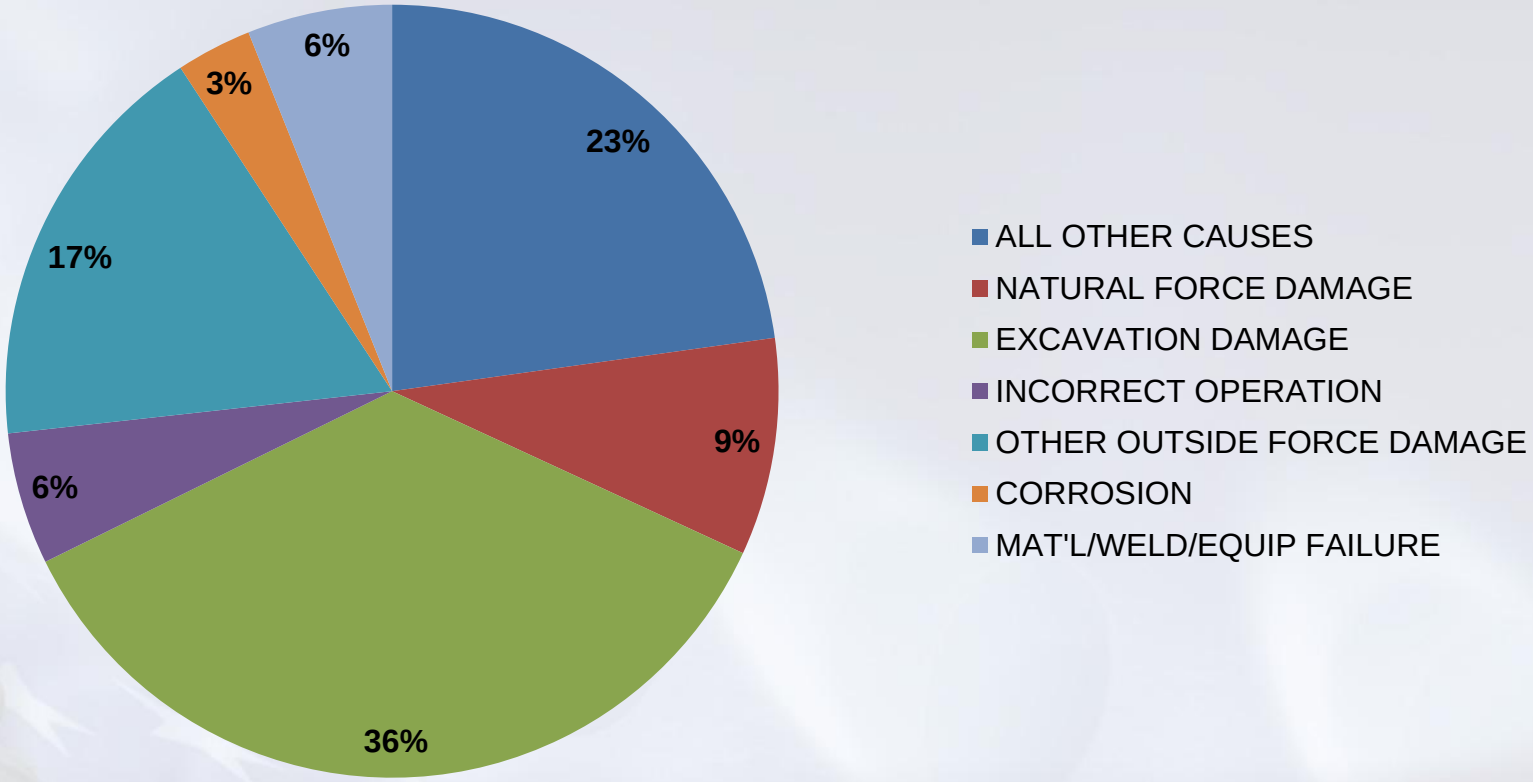
Note: Leak and mileage data for 2010 is not yet available. 2010 Incidents are per 10,000 miles using 2009 miles.

Conclusions From Safety Metrics

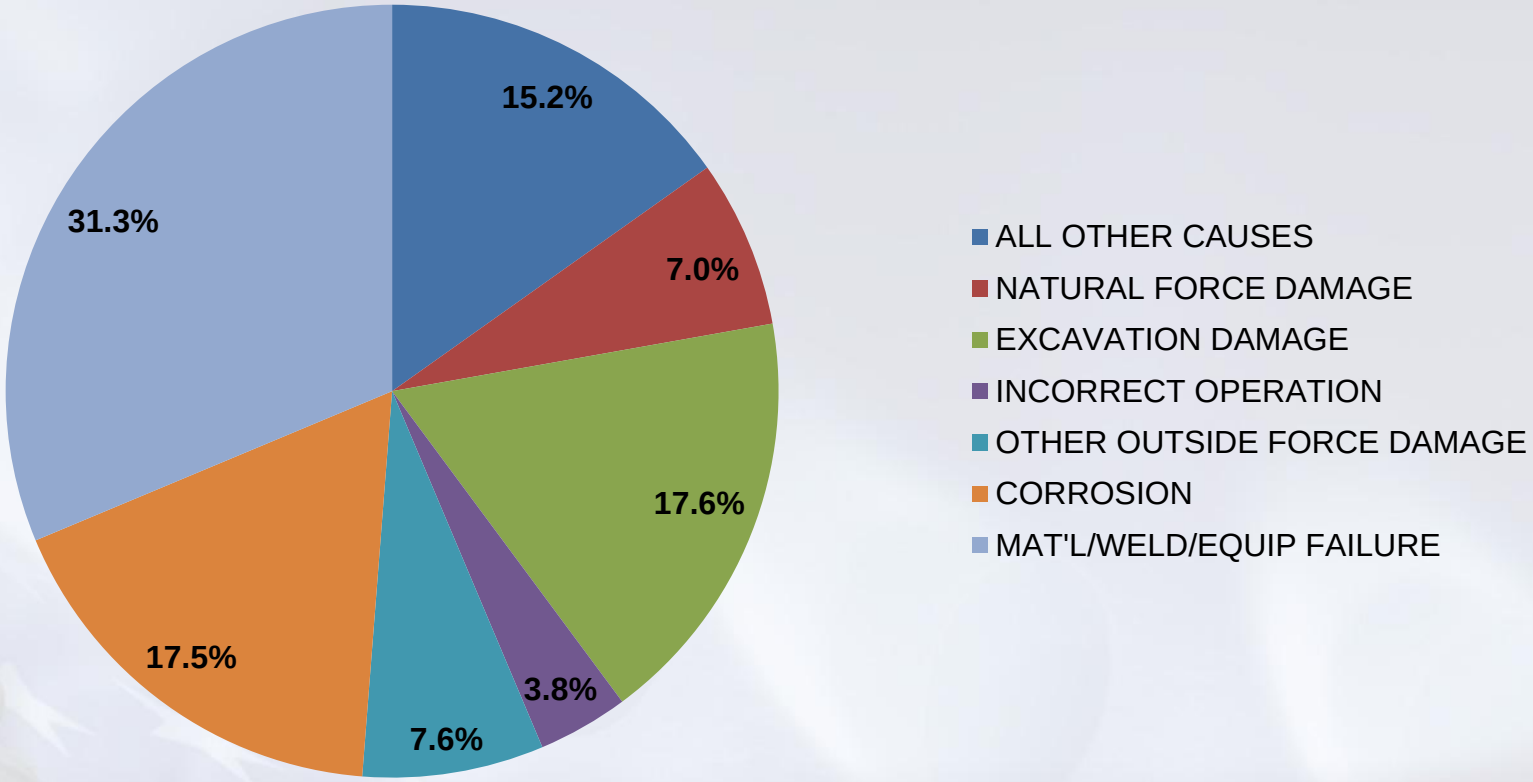
- Pipeline safety incidents declining in spite of increasing energy transported and a growing pipeline infrastructure
- Although serious and significant incidents are declining, serious accidents occur too often, providing an urgency to “Raise the Bar”

➢ Important to understand the major causes of reportable incidents

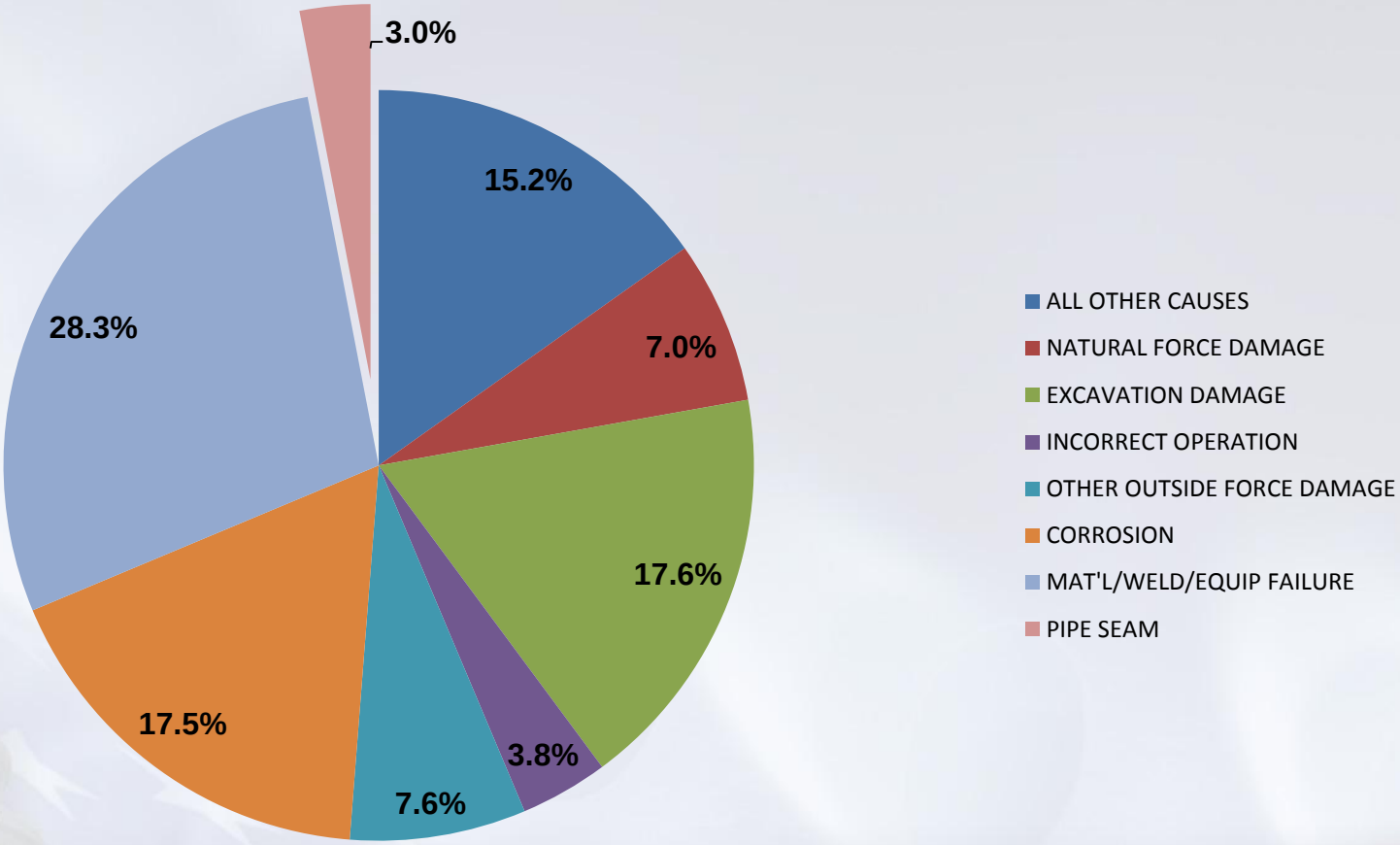
DOT Significant Dist. Incidents 2001-2010



DOT Significant Onshore T. Line Incidents 2001-2010



DOT Significant Onshore T. Line Incidents 2001-2010

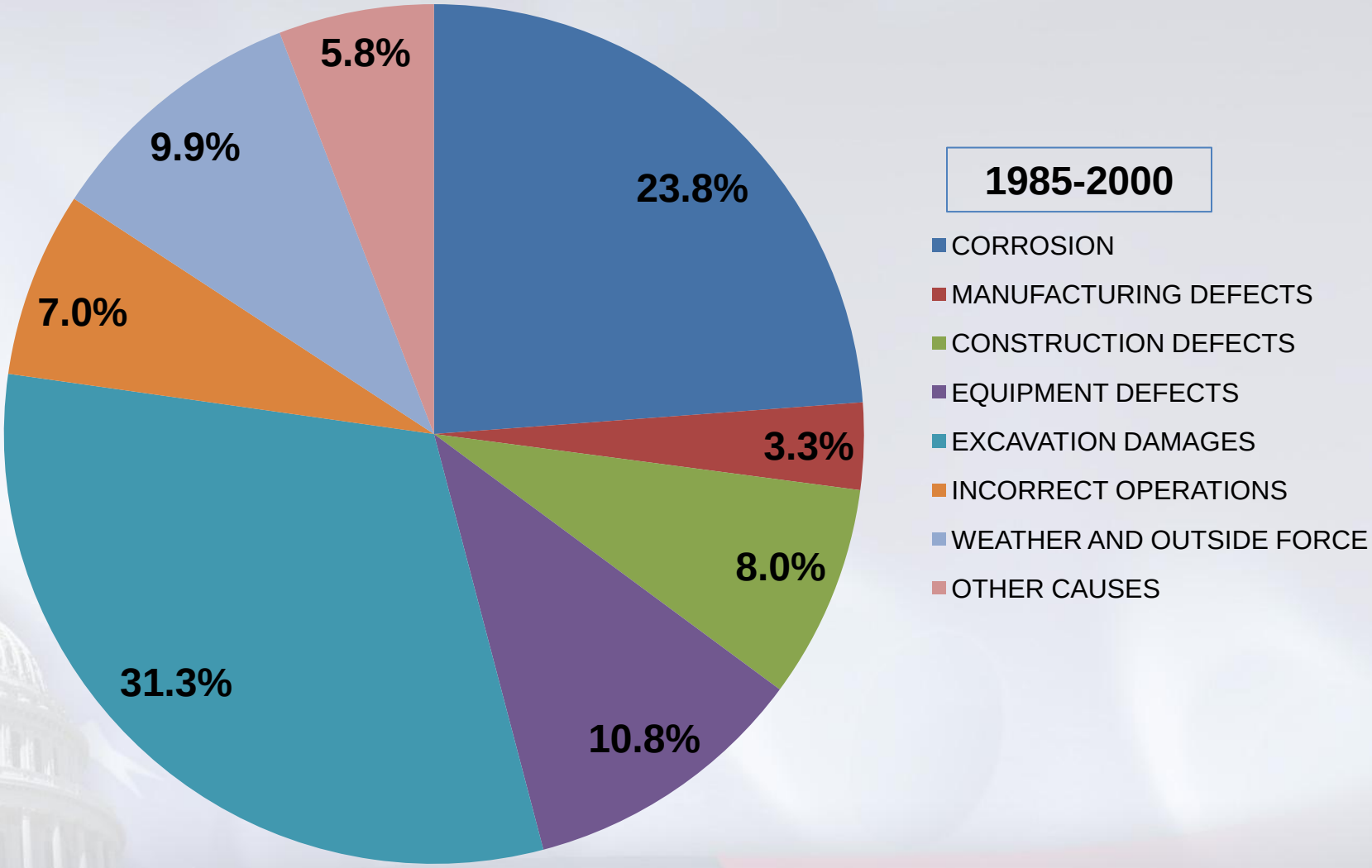


Technical Reports on Pipe Seam Issues

- *Putting Manufacturing and Construction Defects into Perspective-*
  - *Manufacturing defects (defective pipe and defective seams) accounted for only 3.3 percent of the reportable incidents (*incidents from 1985-2000*)*
  - *The relative significance of the threats from manufacturing and construction defects is small compared to that of many of the other threats recognized by ASME B31.8S*
  - *Even though the mill test is of short duration, it is an effective screening tool*

❖ Evaluating the Stability of Manufacturing and Construction Defects in Natural Gas Pipelines, DOT by John F. Kiefner, April, 2007

DOT Reportable T. Line Incidents 1985-2000



Reference: “Evaluating the Stability of Manufacturing and Construction Defects in Natural Gas Pipelines“, April, 2007, John F. Kiefner

Technical Reports on Pipe Seam Issues

- *In most circumstances, gas pipelines are not at significant risk of failure from the pressure-cycle-induced growth of original manufacturing-related or transportation-related defects. Therefore, there is no need, in general, to conduct periodic integrity assessments of gas pipelines from the standpoint of pressure-cycle-induced fatigue*

❖ Effects of Pressure Cycles on Gas Pipelines, for P-PIC and GRI, by John F. Kiefner and Michael J. Rosenfeld,

Technical Reports on Pipe Seam Issues- San Bruno Incident

- *NTSB's findings to date identified both the material and the fabrication welds of the section of pipeline that failed did not meet either: (1) the engineering consensus standards applicable to natural gas transmission pipelines at the time, or (2) the PG&E specifications in effect at the time of construction.*
- *Our consultants support the theory there was an external force that triggered the manufacturing defect to propagate, causing the pipe to fail*

❖ Report of the Independent Review Panel created by CPUC Resolution No. L-403 to investigate the San Bruno Incident

Addressing Pipeline Seam Issues

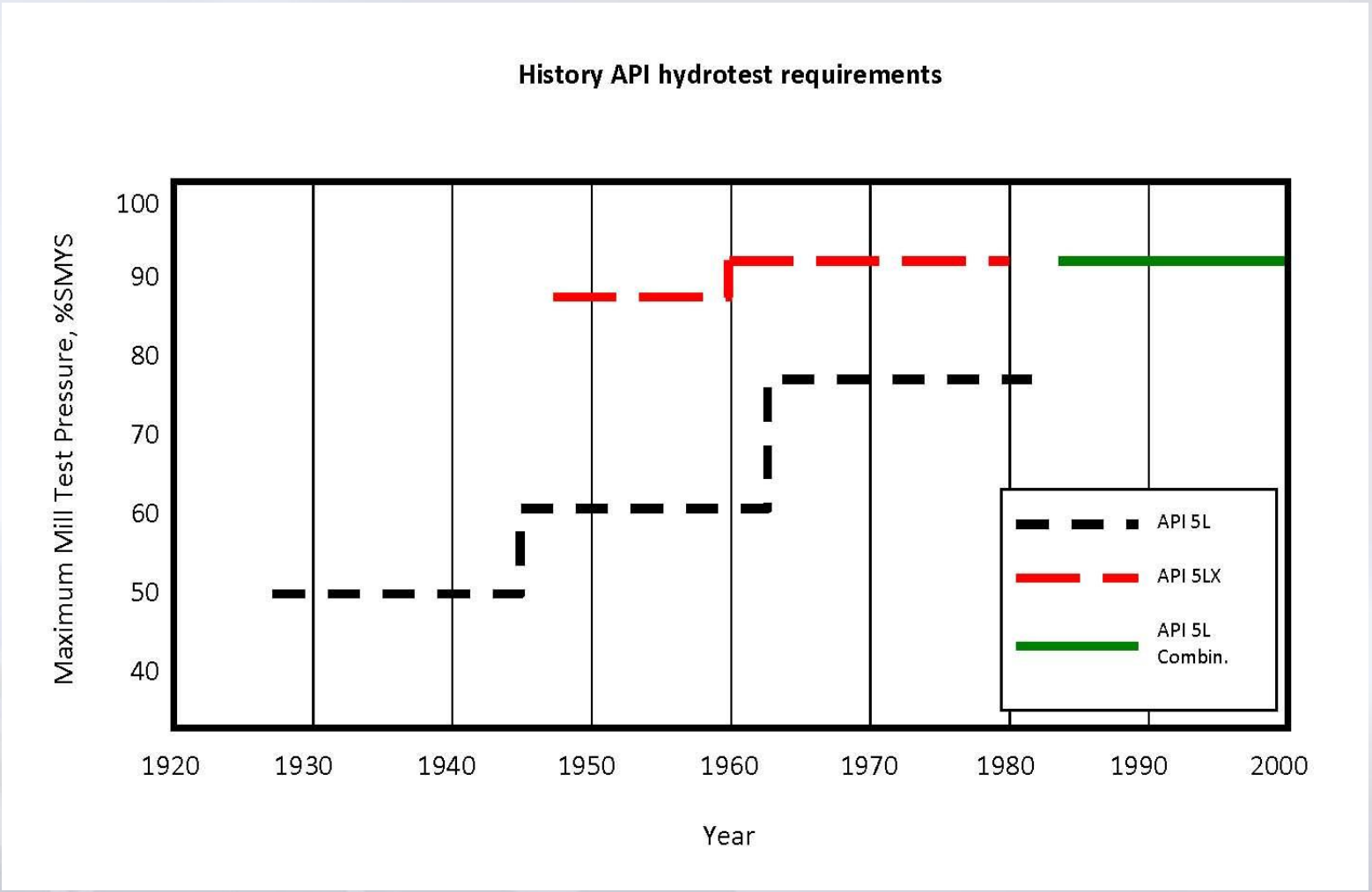
- Much has already been done to address pipe seam issues-
  - Improvements in pipe quality at the mill
  - Post-construction pressure tests
  - Transmission Integrity Management (TIMP)
  - Distribution Integrity Management (DIMP)

Dramatic Improvements in Pipe Quality

- API 5L (1928) & API 5LX (1948) provide minimum requirements for pipe used in nat. gas and HL lines
- Most line pipe in service today manufactured per API 5L or 5LX specifications which specify:
  - Chemical composition
  - Mechanical properties
  - Mill pressure testing
  - Dimensions
  - Inspection- Destructive and NDT seam inspections
  - Quality criteria
  - ➢ Mill test pressures have increased over time

Mill Hydrostatic Testing

Pipe mills have pressure tested pipe beginning in 1928. The mill tests as a percent of SMYS have increased over the years. API 5LX currently tests to 90% SMYS



Source: Integrity Characteristics of Vintage Pipeline, INGAA, 2005

Post-Construction Pressure Tests

- Pressure tests are an effective tool to identify manufacturing and construction defects
- Many operators conducted pressure tests in accordance with consensus standards before 1970
- Mandatory pressure tests since 1970 (Subpart J)
- Based on AGA survey, est. 61% of LDC transmission lines have at least one documented pressure test
- AGA supports pressure tests for new construction, but hydro/pressure testing in-service pipe has serious unintended consequences (internal corrosion, loss of reliability of service, pressure test safety, etc.)

Addressing Gas Transmission Pipeline Threats

Threat Category	Time Based Behavior	Mitigation
Corrosion: - External - Internal - Stress Corrosion Cracking	Time Dependent	Periodic Assessment
Defects: - Manufacturing Defects - Fabrication & Construction Defects - Equipment Defects	Stable unless activated by a change in service conditions	One-Time Assessment
Excavation Damage Incorrect Operation Natural Force Damage Other Outside Force Damage All Other Causes	Time Independent or Random	Prevention & Surveillance

References: ASME B31.8s
Integrity Characteristics of Vintage Pipelines, INGAA, 2005

ILI Limitations & Benefits

Limitations	Benefits
• Many lines are not piggable. An estimated 62% of LDC transmission pipe is not piggable.	• It is a non-destructive test
• Complex character of some seams or flaws makes accurate detecting, identifying, and sizing difficult	• It is more sensitive and efficient than a hydrotest
• Sometimes important flaws are missed	• Many operators have had good success finding significant flaws
• Meticulous non-destructive evaluation in the field required to validate ILI – Difficult to consistently achieve.	• Periodic runs can compare defects for growth
• Must select specific ILI tool(s) to detect seam issues – some are challenging for gas lines (UT)	• Possible to detect seam issues

Hydro-test Limitations & Benefits

Limitations	Benefits
• In-service pipe difficult to shutdown for testing	• Applies to corrosion, SCC, fatigue, and seams
• Incomplete dewatering can cause severe corrosion problems, freezing/loss of svc	• Capability is generally predictable
• Effectiveness is reduced by variable pipe properties	• Proven success for managing progressive degradation conditions
• Not a mitigation of circumferential defects	
• Less sensitive than ILI for many defect types	
• Can grow subcritical defects	

Summary

- AGA is committed to work with other stakeholders to further improve the industry's pipeline safety performance
- The relative threat from manufacturing (seam) and construction defects is small compared to other threats
- There has been considerable progress in addressing pipe manufacturing (seam) issues
- AGA supports ongoing R&D to develop new pipe inspection technology

QUESTIONS?

Bruce Paskett
Principal Compliance Engineer
NW Natural
blp@nwnatural.com