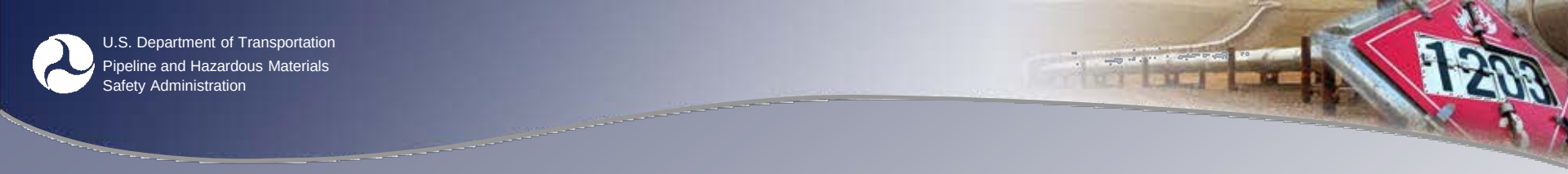


LGA Pipeline Safety Conference
Houma, LA

Pipeline and Hazardous Materials Administration
Office of Pipeline Safety

Chris McLaren
PHMSA DIMP Coordinator

Welcome

Thank you for Your Participation at LGA's 2012 Annual Operations Conference!

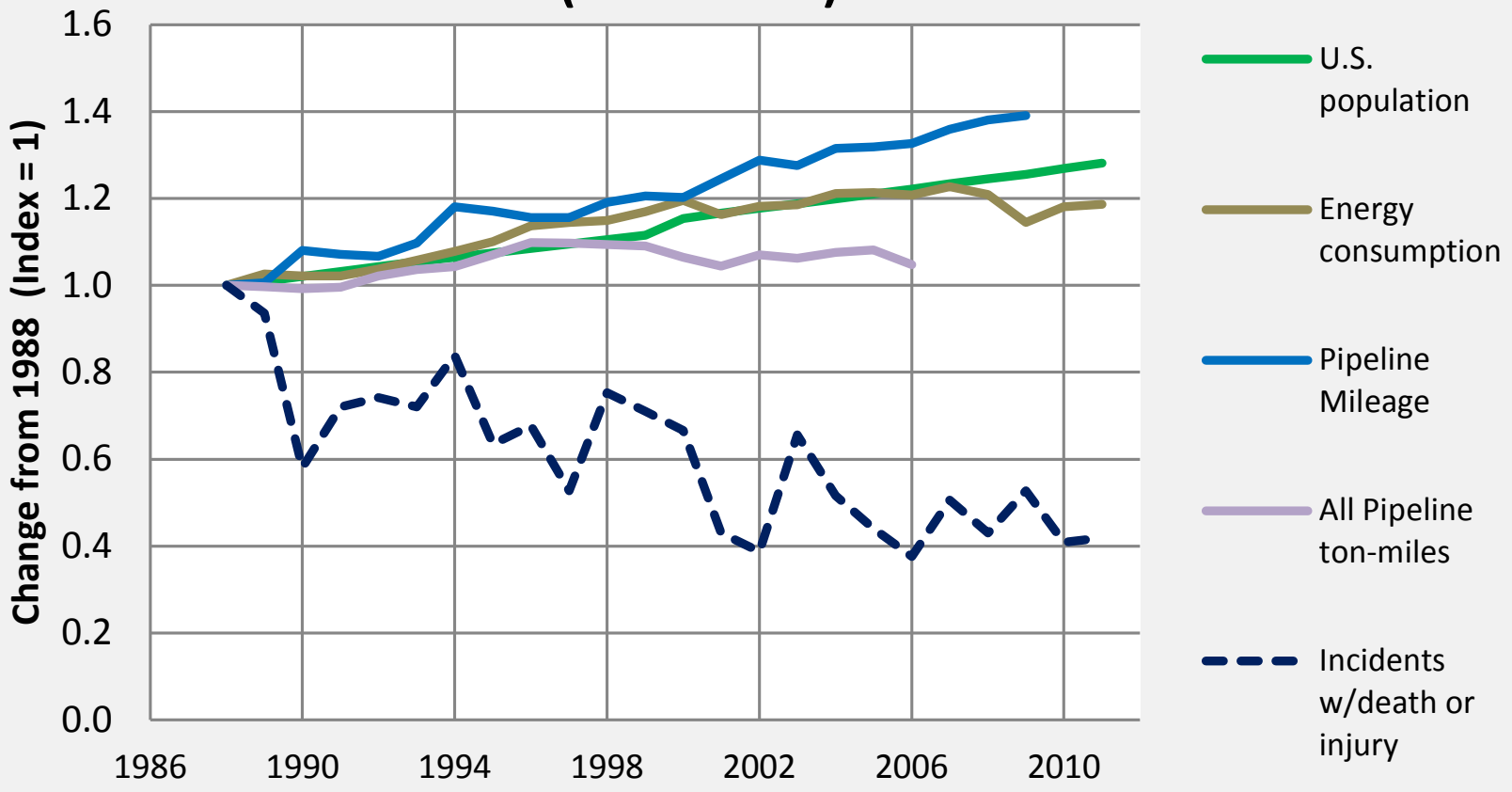
Today's Topics

- Current Events
- Review of ANPRM topics
- Impact of Recent Incidents
- Integrity Threats on Vintage Pipelines
- Integrity Assessments

A Systematic Way to Manage Risks

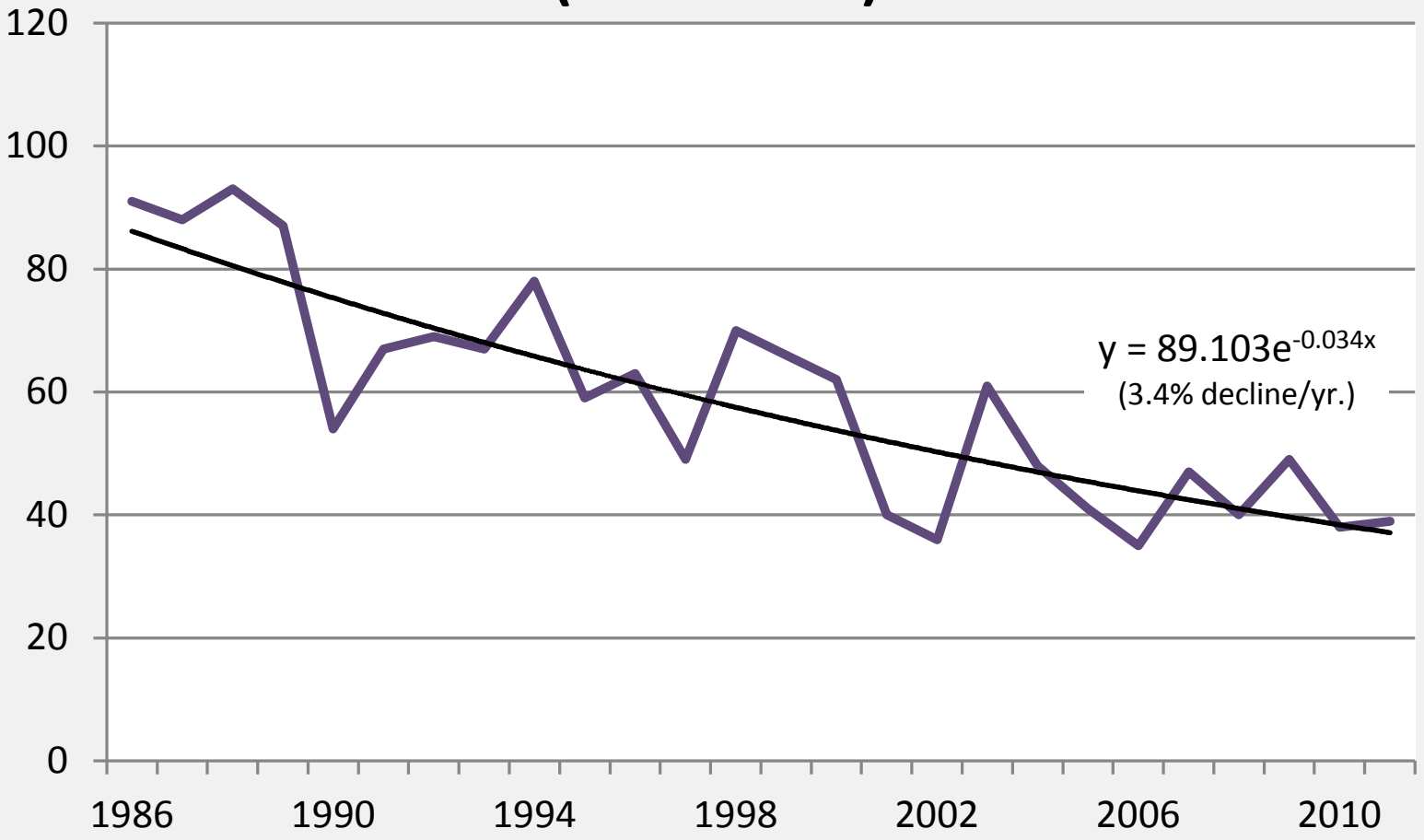
- High profile incidents reinforced the need for Integrity Management Systems
  - Know pipeline systems better
  - Understand threats
  - Assess for current conditions
  - Prevent and Mitigate
  - Continually learn and Improve
- Feds, States, Industry, Gas Workers, Public – Everyone is working hard to improve safety

Pipeline Safety: Context Measures
(1988-2011)



Data Sources: Census Bureau, Energy Information Administration, PHMSA Annual Report Data, BTS ton-mile estimates, PHMSA Incident Data - as of Jan. 18, 2012

Pipeline Incidents w/Death or Injury (1986-2011)



Data source: DOT-PHMSA Incident data (as of Jan. 18, 2012)

Many Are Still Concerned

- Overall safety has improved, but significant incidents continue to occur
- The World is Changing...Recent Events are Bringing a LOT of Attention Our Way
- The Public is Expecting and Demanding more from Regulators and Operators
- We all Need to Be Ready with reasonable explanations for the actions we have and have not taken

Gas Transmission ANPRM

- On August 25, 2011, (76 FR 53086) PHMSA published in the Federal Register an Advance Notice of Proposed Rulemaking (ANPRM) titled: “Safety of Gas Transmission Pipelines” seeking comments on the need for changes to the regulations covering gas transmission pipelines. PHMSA has received requests to extend the comment period in order to have more time to evaluate the ANPRM. PHMSA is extending the comment period from December 2, 2011, to January 20, 2012.

Gas Transmission ANPRM

- "In particular, PHMSA is considering whether integrity management (IM) requirements should be changed, including adding more prescriptive language in some areas, and whether other issues related to system integrity should be addressed by strengthening or expanding non-IM requirements."
- Expert Forum on the Use of Performance-based Regulatory Models in the U.S. Oil and Gas Industry, Offshore and Onshore in Texas City, TX on September 20-21, 2012. http://primis.phmsa.dot.gov/meetings/MtgHome.mtg?mtg=79

Performance Based Regulations

- Regulators have commented that performance based language is a challenge to inspect.
- Time must be allowed during inspections for drill downs of data sets to obtain a comprehensive understanding of an operator's system.
- Inspectors are required to use judgment during their inspections in making decisions regarding compliance.

Gas Transmission ANPRM

- PHMSA Management has placed a high priority on this rulemaking
- The topics discussed in the ANPRM will probably be handled in 2 phases of rulemaking as some topics have required studies that must be performed
- Today, I am going to provide highlights of what topics are in the ANPRM as I provided details at the LA Pipeline Safety Conference in July, 2012

Gas Transmission ANPRM

A. Modifying the Definition of HCA

B. Strengthening Requirements To Implement Preventive and Mitigative Measures for Pipeline Segments in HCAs

C. Modifying Repair Criteria

D. Improving Requirements for Collecting, Validating, and Integrating Pipeline Data

Gas Transmission ANPRM

E. Making Requirements Related to the Nature and Application of Risk Models More Prescriptive

F. Strengthening Requirements for Applying Knowledge Gained Through the IM Program

G. Strengthening Requirements on the Selection and Use of Assessment Methods

Gas Transmission ANPRM

H. Valve Spacing and the Need for Remotely or Automatically Controlled Valves

I. Corrosion Control

J. Pipe Manufactured Using Longitudinal Weld Seams

K. Establishing Requirements Applicable to Underground Gas Storage

Gas Transmission ANPRM

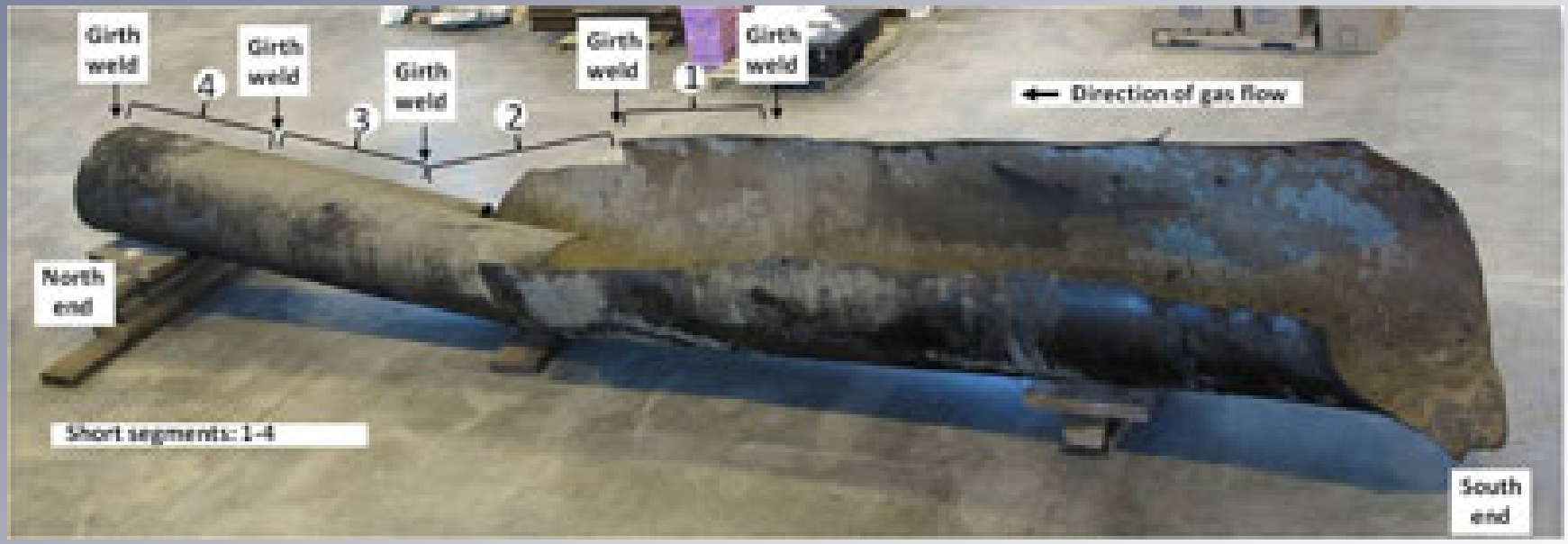
L. Management of Change

M. Quality Management Systems (QMS)

N. Exemption of Facilities Installed Prior to the Regulations

O. Modifying the Regulation of Gas Gathering Lines

San Bruno, CA Incident on 9/9/10



- Eight fatalities and numerous injuries. Destroyed 37 homes and damaged 18 others.
- Pipeline was 30” in diameter, operating at 375 - 390 psig.
- Records indicated seamless pipe, but segments of seam-welded pipe were discovered.

NTSB Findings on San Bruno, CA Incident on September 9, 2010

- The NTSB identified certain deficiencies and areas for improvement in Pipeline Safety IM Programs.
- PHMSA is working to address the NTSB recommendations
- A finding discussed in several recommendations is that without effective and meaningful metrics in performance- based pipeline safety programs, neither the Operator nor the Regulator was able to effectively evaluate or assess the Operator's pipeline system and detect the inadequacies of the Operator's IMP.

NTSB Findings

- Relevant to Integrity Management Programs NTSB also made the following comments:
  - The IM Program was based on incomplete and inaccurate pipeline information
  - The IM Program did not consider the design and materials contribution to the risk of a pipeline failure.
  - The structure of the IM Program led to internal assessments of the program that were superficial and resulted in no improvements.

NTSB Recommendations

- Recommendations that can be immediately addressed:
  - Operators should provide system-specific information about their pipeline systems to the emergency response agencies of the communities and jurisdictions in which those pipelines are located. [P-11-8]
  - Operators immediately and directly notify the 911 emergency call center(s) for the communities and jurisdictions in which those pipelines are located when a possible rupture of any pipeline is indicated. [P-11-9]
  - Operators should conduct post accident drug and alcohol testing of all potentially involved personnel despite uncertainty about the circumstances of the accident. [P-11-12 & P-11-13]

NTSB Recommendations

- NTSB has discussed with PHMSA several key topics:
  - Pressure excursions
  - Appropriate records
  - QA/QC to ensure validity of records/assumptions
  - Identification of information gaps
  - Knowledge of what information is unknown
  - Documentation of replacements and decisions made
  - Performance metrics that provide meaningful insight
- NTSB's concerns include ensuring adequate oversight of the operator and adequate field inspections.

Recent Vintage Pipe Failures in USA

- 2007: 12-inch X52 LF-ERW – Carmichael, MS
  - Pipe seam failure
  - Constructed in 1961
- 2010: 30-inch X52 SAW – San Bruno, CA
  - Pipe seam failure
  - Constructed in 1956
- 2011: 12-inch Cast Iron – Allentown & Philadelphia, PA
  - Constructed in 1928 and 1942

Vintage Pipelines

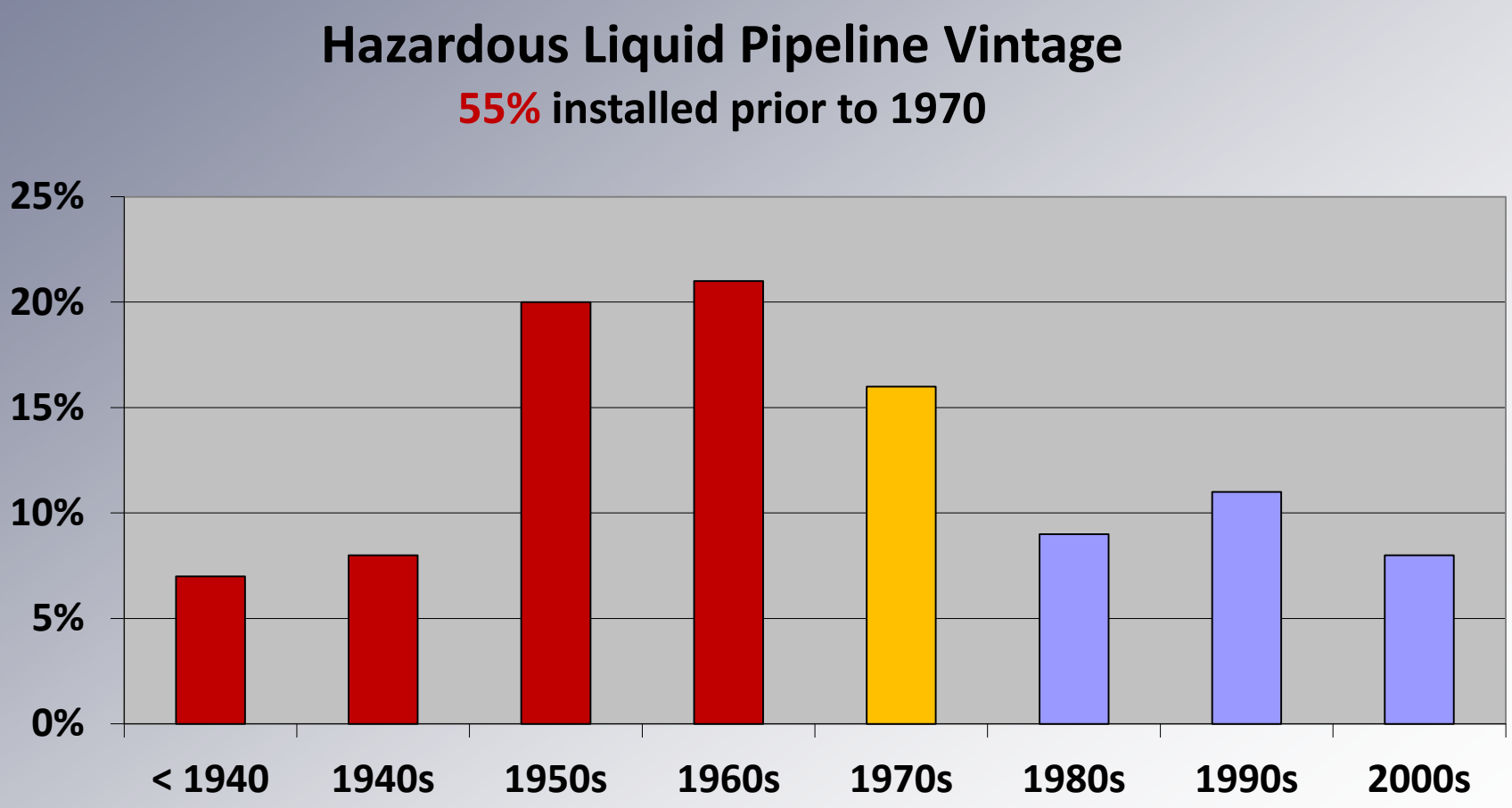
- What are Vintage Pipelines?

- Pipeline Operators must:
  - Understand all of the risks associated with vintage pipelines and
  - Take appropriate actions

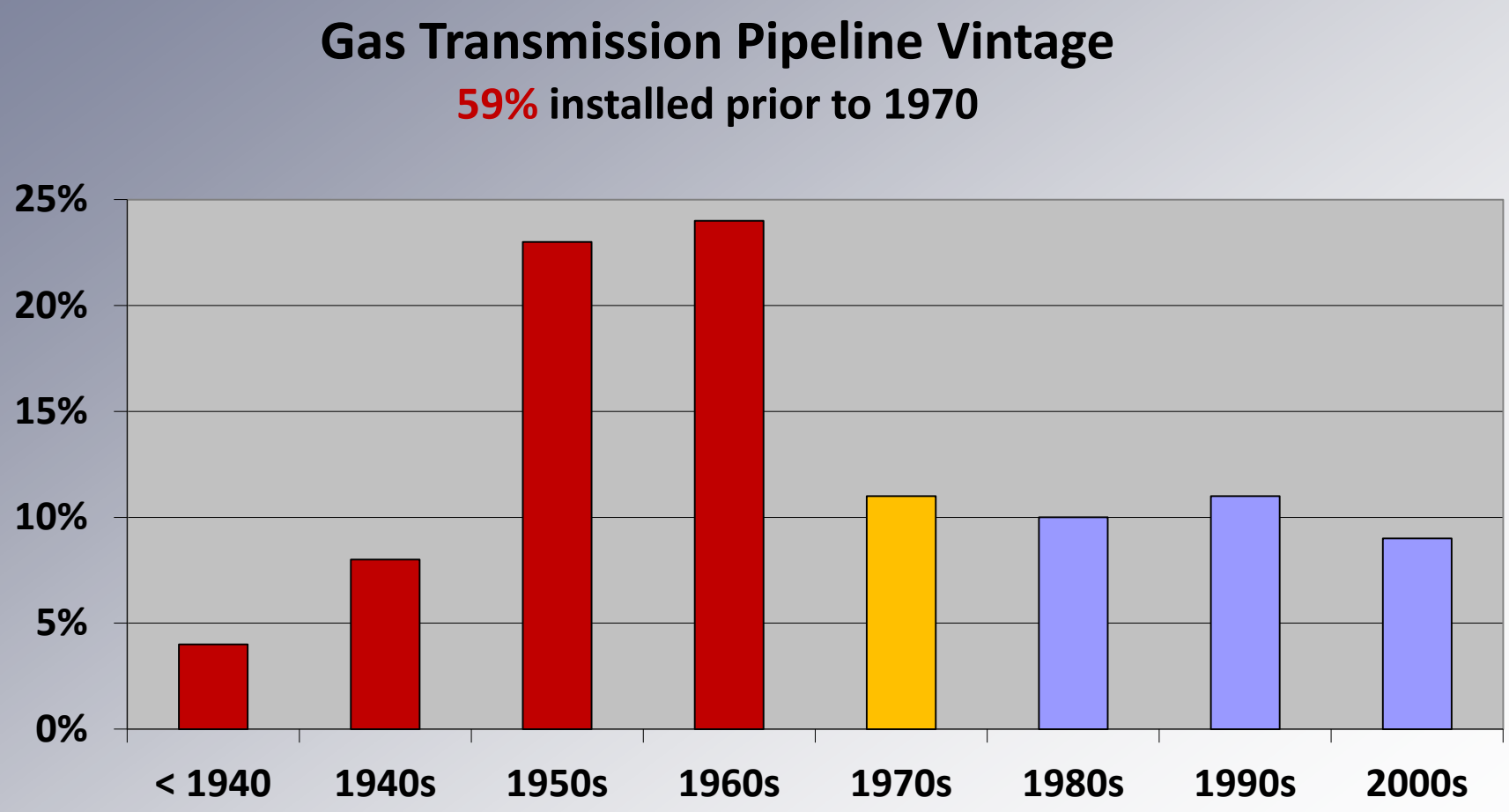
Aging Infrastructure (% by Decade in USA)

Decade	Hazardous Liquid	Gas Transmission	Gas Distribution Main	Gas Distribution Service
Unknown & < 1920	2%	---		
1920s	2%	2%	---	---
1930s	3%	4%	6%	3%
1940s	8%	7%	2%	2%
1950s	20%	22%	10%	8%
1960s	21%	23%	17%	13%
1970s	16%	11%	12%	14%
1980s	9%	10%	14%	17%
1990s	11%	11%	21%	22%
2000s	8%	10%	18%	21%

Aging Infrastructure (% by Decade in USA)



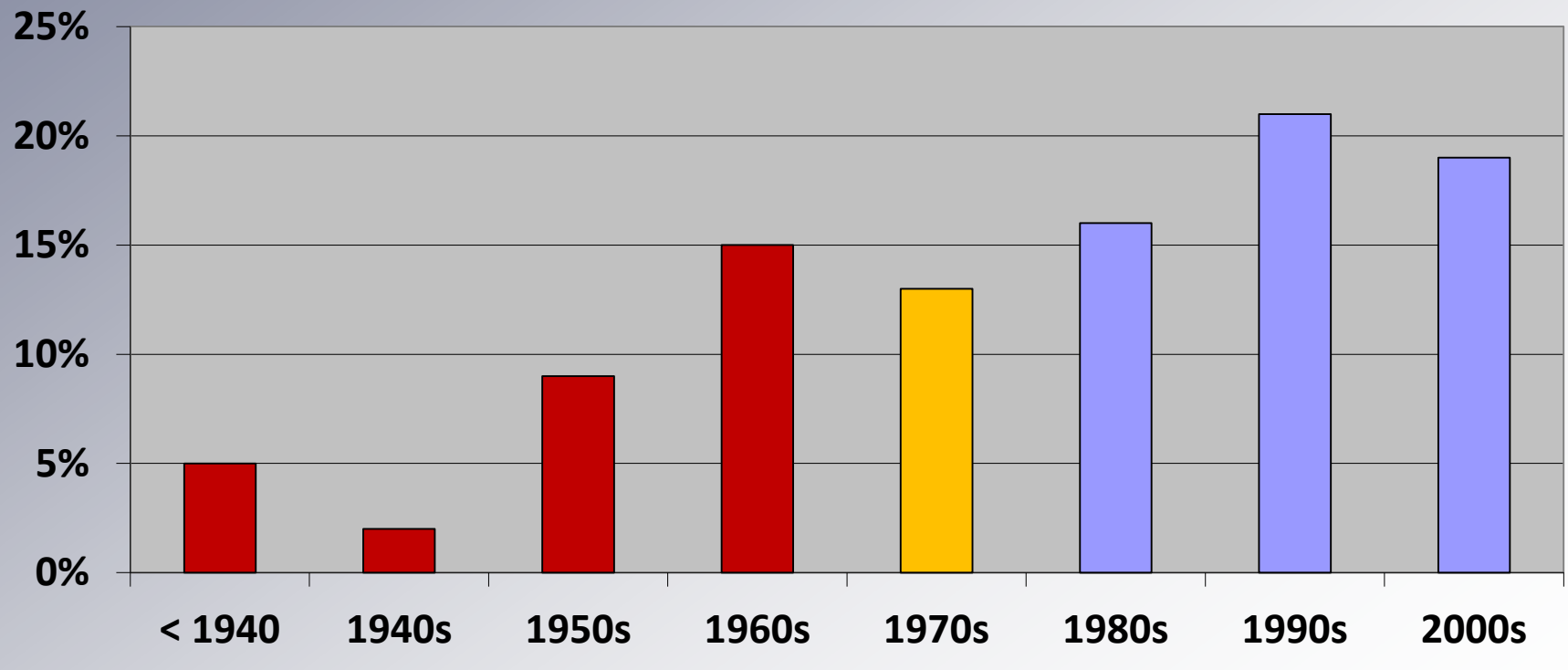
Aging Infrastructure (% by Decade in USA)



Aging Infrastructure (% by Decade in USA)

Gas Distribution Pipeline Vintage

31% installed prior to 1970



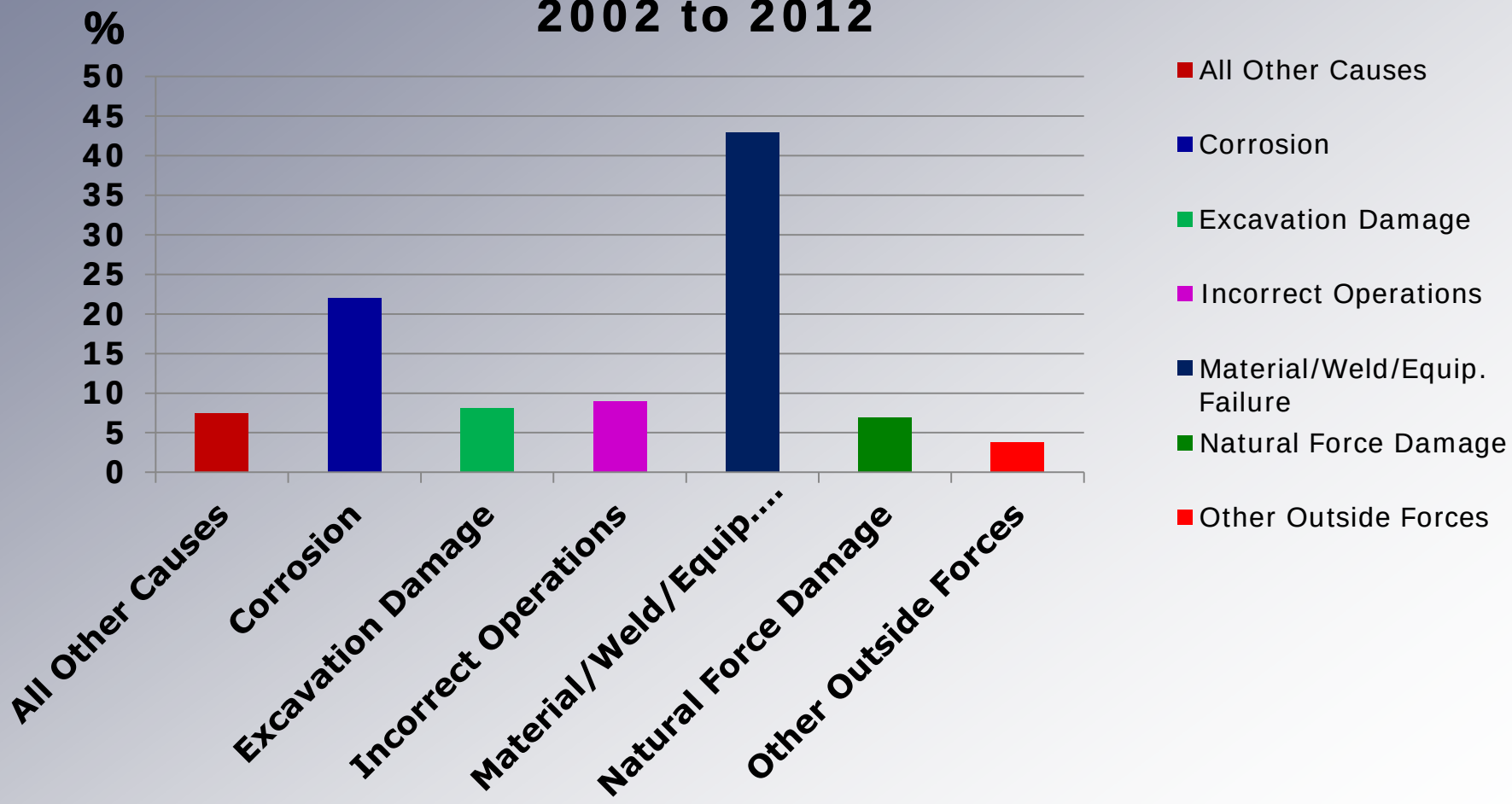
What are some of the integrity issues?

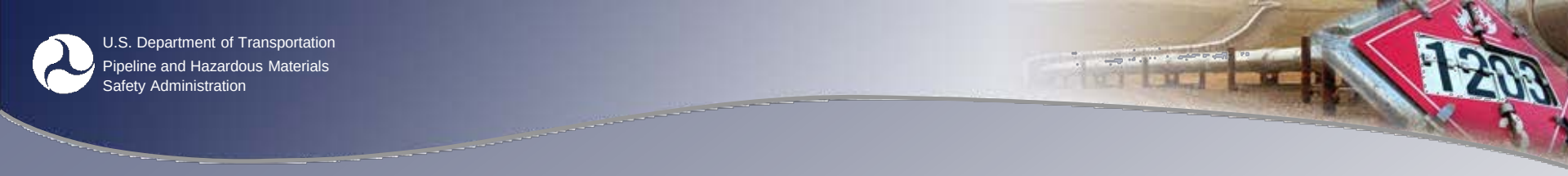
- Vintage Pipelines can contain:
  - Material, Manufacturing, and Construction Defects
  - Time-dependent nature - Growth of Defects
  - Impact of Operations on the Growth of Defects

All Incidents – USA

Gas Transmission and Liquid Pipelines

2002 to 2012





Pipe Seam Failures in USA (2002-2012)

Seam Type	Gas	Hazardous Liquid	TOTAL	% of Total
DSAW	9	5	14	18
Flash Welded	1	5	6	8
HF ERW	3	15	18	23
LF ERW	5	23	28	35
Lap Weld	1	2	3	4
SAW	2	3	5	6
Other	4	2	6	7
Total	25	55	80	100

Materials – pipe and coatings

- Pipe Material
  - Seams – cold welds, lack of fusion, stitched welds, hook cracks
  - Laminations and non-metallic inclusions
  - Hard spots
  - Low Toughness values
- Pipe Coatings
  - Dis-bonding
  - Shielding CP

What are some of the integrity issues?

- Pipe Material
  - LF-ERW – widely manufactured from 1920 to 1970's
    - PHMSA Advisory Bulletins in 1988 and 1989
  - EFW – produced between 1930 through 1969
    - Seams – cold welds, lack of fusion, stitched welds, hook cracks
    - Leads to – selective seam corrosion and corrosion fatigue
  - SAW/SSAW – produced in 1930's through today as DSAW
    - Older pipe has lack of fusion and cracking defects

What are some of the integrity issues?

- Pipe Material
  - Cast iron used in Distribution systems
    - Tends to be brittle
    - Graphitization
    - Joint connections have poor strength and flexibility
    - PHMSA Advisory Bulletins – 1991, 1992, & 2012

What are some of the integrity issues?

- Pipe Material
  - Plastic Pipe - Pipe installed in the 1960's to 1980's
    - Susceptible to premature brittle-like cracking and slow crack growth
    - PHMSA advisory bulletins – 1999, 2002, 2007, & 2012

What are some of the integrity issues?

- Pipe Coatings
  - Bare pipe (lack of coating)
  - Poorly installed coatings
  - Disbonded coatings
  - CP Shielding coatings
  - Tenting over the weld and poorly applied shrink sleeves
  - Poor Coating Systems

Vintage Pipelines

- Vintage pipelines require:
  - Reliable periodic non-destructive inspection
  - Accurate integrity evaluation
  - Remediation and/or Replacement

What Actions Have PHMSA Taken?

- Advisory Bulletin ADB-11-01 issued 1/10/2011
  - Records to establish MAOP/MOP must be:
  - Complete, valid and reliable
  - Identify all risk factors
  - Perform robust, integrated analysis of risk data
  - Identify and implement Preventative & Mitigative Measures to address all risks

Advisory Bulletin ADB-11-01

- Operator not fully cognizant of risk data:
  - Institute an aggressive program to obtain the information
  - Assess the risks
  - Take proper mitigative measures
- If no verified information on key risk factors, mitigation measures to be considered are:
  - Pressure reduction
  - Hydrostatic testing
  - Remediation program
- Fitness for Service
  - Not allowed by 49 CFR Parts 192 and 195 Codes

Pipeline-Specific Assessments

- Success depends on the OPERATOR to be:
  - Investigative
  - Data-driven
  - Analytical
  - Integrity-related decision-making
  - Preventive Measures
  - Mitigative Actions
- Multiple Assessment Strategies may need to be employed during an assessment or over time

Challenges to Success

- Data validation
- Response to missing or suspect data
- Integrity-related decision-making
- Data Integration – what does it show?
- Preventive and mitigative measures
  - Run the tools – dig, test, & survey (ILI, CIS, DCVG, ground patrols, etc.)
  - Remediate/Replace – dig, repair, re-coat, replace, etc.
- Reassessment and resurvey
- Rigorous processes to manage pipeline integrity
- Must commit resources to be successful

Integrity Assessments

- An operator must complete the baseline assessment of all covered segments by December 17, 2012.
- Approved assessment methods that PHMSA put into the regulations, as specified in the congressional mandate are:
  - Pressure testing per Subpart J of Part 192
  - In line inspection (ILI)
  - Direct Assessment (DA)
  - Other Technology, provided:
    - It can provide an understanding of the condition of the line pipe that is equivalent to the other methods, and
    - The operator notifies PHMSA, or the state agency exercising jurisdiction in advance of its intent to use the technology.

Integrity Assessments

- Baseline and Re-assessments are occurring and there is lots of work going on as these tasks overlap
- While hydro-testing can be problematic for a variety of reasons, it provides assurance that the critical flaws have been removed from the pipeline at that time at that testing pressure.
- Some operators are moving to make their pipeline piggable to improve assessed integrity and operations and in preparation for possible regulatory requirements
- ECDA is being scrutinized more vigorously following the San Bruno, CA incident in September, 2010
- Other technologies (e.g., GWUT) are being used in specific applications

Assessing Cased Crossings

- A subset of all pipelines located in HCAs includes pipelines installed inside casing pipe (casing) beneath roadways, railroads and other locations. Complying with the integrity assessment requirement for gas transmission pipe inside a casing has proven challenging for operators, especially distribution system operators, that operate lines that meet the definition of transmission pipelines.
- The use of DA and/or Other Technologies tools must be well thought through with assumptions and decisions documented
- NACE SP 0502-2008 provides limited guidance on assessing cased crossings

NACE SP 0502-2008 guidance on assessing Cased Crossings

- NACE SP 0502-2008 provides limited guidance on assessing cased crossings. It implies that each casing must be its own Region, and "Table 1: ECDA Data Elements" provides one element for Cased Crossings under "CONSTRUCTION-RELATED"

Data Elements	Indirect Inspection Tool Selection	ECDA Region Definition	Use and Interpretation of Results
Locations of and construction methods used at casings	May preclude use of some indirect inspection tools.	Requires separate ECDA regions.	May require operator to extrapolate nearby results to inaccessible regions. Additional tools and other assessment activities may be required.

NACE SP 0502-2008 guidance on assessing Cased Crossings

- ECDA for cased pipe, NACE SP 0502-2008 requires implementation of:
  - "other assessment activities" (RP0502 §3.3.2, & Table 1)
  - "other considerations" (RP0502, Table 2, footnote 3)
- NACE did not address these "other" areas

PHMSA's website guidance on assessing Cased Crossings

- PHMSA's website provides a guidance document from 2010 on the performance of DA integrity assessments on cased crossings
- http://primis.phmsa.dot.gov/gasimp/casedcrossings/index.htm
- PHMSA, the pipeline industry, and Standards Developing Organizations (SDO) collaborated to create assessment options for cased crossings. A comprehensive program to address the integrity management of cased crossings. This web page documents the relevant collaboration and is a resource for all affected stakeholders.

PHMSA Guidance Document

- PHMSA's website provides guidance on the performance of these assessments
- PHMSA has identified "other assessment activities" and "other considerations" which it finds acceptable to compensate for the limited effectiveness of indirect inspection tools
- Guidance for "other activities" address:
  - Quality casing construction and fill
  - Monitoring the effectiveness of casing performance
    - Both filled and unfilled

PHMSA Guidelines for Integrity Assessment of Cased Pipe

- The guidelines in this document address considerations for tailoring the ECDA methodology to conditions specific to cased pipe. All four steps of the ECDA process are discussed:
  - Pre-assessment, Indirect assessment, Direct Examination, and Post assessment
- "Other assessment activities" and "other considerations" (Section 3 and Appendix D)
  - Assist in the analysis of indirect assessment results
  - Aid the selection the highest risk casings for direct examination

PHMSA Guidelines (continued)

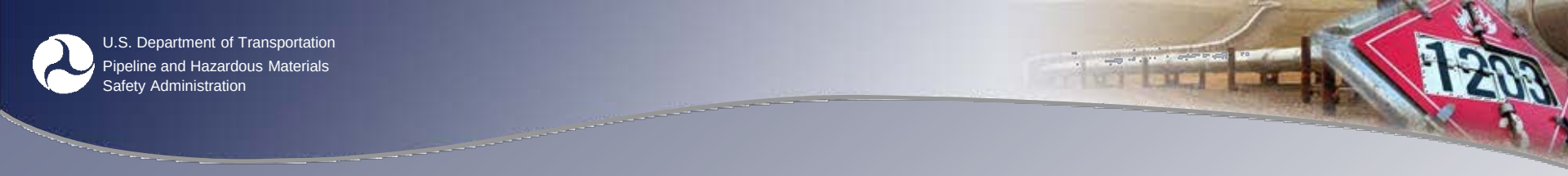
Pre-Assessment

- Whenever these guidelines cannot be effectively implemented for a casing/region, PHMSA considers the ECDA process not feasible for that casing/region.
- The initial pre-assessment encompasses historic and current data collection, feasibility, indirect tool selection, region determination, etc. Operators need to address important considerations when conducting ECDA/CDA on cased pipe, and these are discussed in the guidance. For example:
  - Data Collection (§3.1.1)
  - Feasibility reviews (§3.1.2)
  - Indirect inspection tool selection (§3.1.3 & Exhibit A)
  - Region setting (§3.1.4)

PHMSA Guidelines (continued)

Indirect Assessment

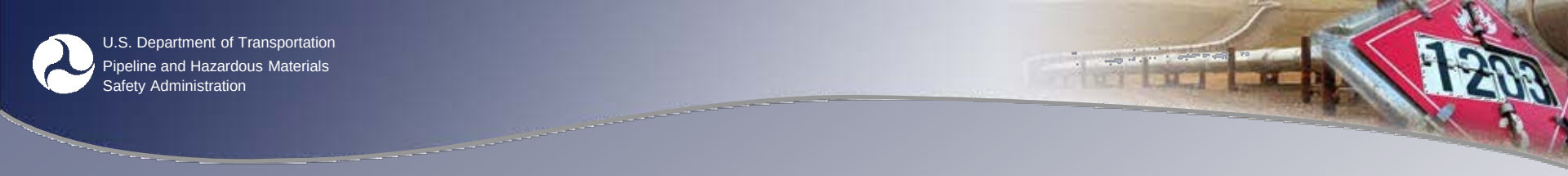
- While NACE SP 0502-2008 document focuses on using the tools for buried pipe, not cased pipe, Exhibit C *Above-Ground Survey Techniques for Carrier Pipe in Casing Using ECDA Indirect Inspection Tools* provides supplementary guidance on special considerations, cautions, engineering considerations, and limitations that should be taken into account when using, interpreting, and analyzing the results of indirect inspection tools used to assess cased pipe.



PHMSA Guidelines (continued)

Indirect Assessment (continued)

- In addition, NACE RP 0502-2002, §3.3.2 and Table 1, states that locations of, and construction methods used at, casings may require usage of ”other assessment activities.” Because indirect assessment tools have limited effectiveness when used for cased pipe, other assessment activities are necessary to effectively conduct an integrity assessment for cased pipe. The other assessment activities (such as monitoring casing integrity) supplement the indirect inspection tool data with additional data which is indicative of the effectiveness of engineered systems (such as casings, end seals, and fill material) in preventing corrosion and protecting carrier pipe integrity.
- These other assessment activities are provided in Exhibit D, *Casing Quality and Monitoring Guidelines*, and address activities necessary



PHMSA Guidelines (continued)

Direct Examination

- Guidance regarding the conduct of direct examination and prioritization of defects is provided.
- Combining Regions when Prioritizing Indications is discussed - For purposes of identifying the minimum number of direct examinations, regions can be combined under the following circumstance. If all casings in multiple regions do not contain any immediate or scheduled indications, a direct examination is not required in each region. Instead, one excavation is required in one of the ECDA regions identified as most likely to have external corrosion during the pre-assessment, as specified in NACE RP 0502 §5.10.2.3

What the guidance DOES NOT allow

- DOES NOT allow for skipping casing assessments
  - **All pipe in HCA must be periodically reassessed in accordance with 49 CFR 192.939 or 195.452**
  - **For time dependent threats, 7 year reassessment per Gas IMP (5 year for HL IMP)**

What the guidance DOES NOT allow

- DOES NOT allow operator to declare that cased pipe has no corrosion threat
  - **Effectively managing a threat is not a valid basis for declaring that you do not have the threat**
  - **Purpose of integrity assessment is to verify that threat management / mitigation continues to be effective**

What the guidance DOES NOT allow

- DOES NOT mandate the use of GWUT or any other specific indirect inspection tools
  - **Guidance provided to help select tools appropriate for circumstances unique to cased pipe**
  - **Guidance provided to help interpret tool results appropriate for cased pipe**

What the guidance DOES NOT allow

- DOES NOT take additional state regulations into account, if any
  - **Guidelines address federal requirements only**

Casing Assessment Resources

- Casing FAQs are located at: http://primis.phmsa.dot.gov/gasimp/ccfaqs.htm
- Cased Crossings & Guided Wave Ultrasonics Webpage http://primis.phmsa.dot.gov/gasimp/casedcrossings/index.htm
- Workshop on Guidelines for Integrity Assessment of Cased Pipe Apr 28, 2010. http://primis.phmsa.dot.gov/meetings/MtgHome.mtg?mtg=64

Thank you for Your Participation

Questions and Answers