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PHMSA R&D Forum

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PRCI Crack Management Strategic Research Priority (SRP) Overview

- Crack Management SRP divided into four areas with core goal for each:

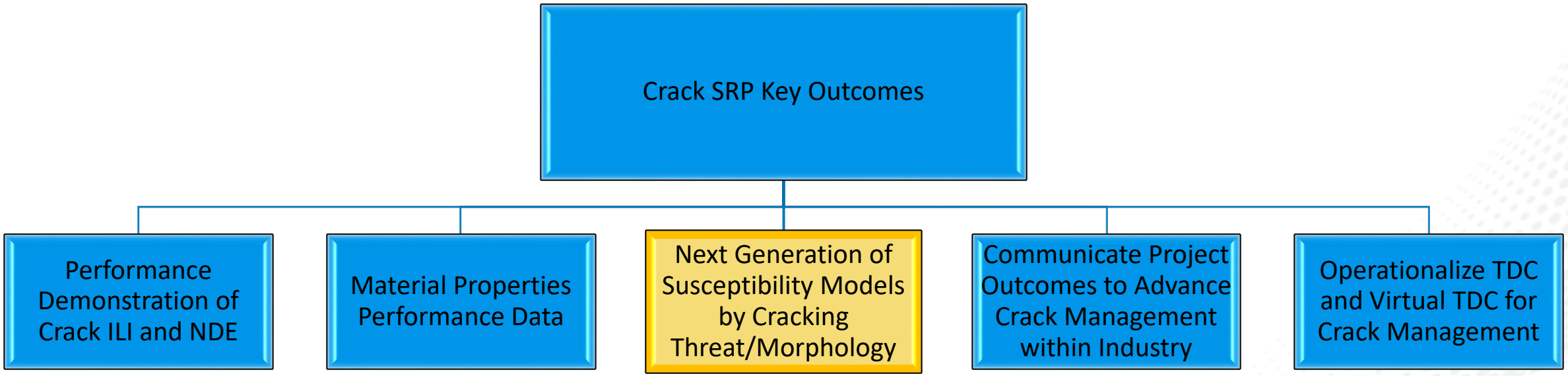
Susceptibility
Susceptibility assessments by cracking threat/morphology lead to selection of the appropriate integrity assessment method

Inspection
Known strengths and limitations of the inspection technique(s) allow operators to have confidence in their assessment and remediation program and ultimately to improved threat management

Management
Management of known crack-related threats to reduce failure rates and minimize likelihood of releases before reassessment

Assessment and Remediation
Effective and efficient response to inspections including improved remaining strength equation variables, dig criteria, repair criteria, and reassessment intervals

Crack Strategic Research Priority (PRCI)



Next Generation of Susceptibility Models by Cracking Threat/Morphology

Susceptibility Models Gap

Largest gap identified from MAT 8-3:

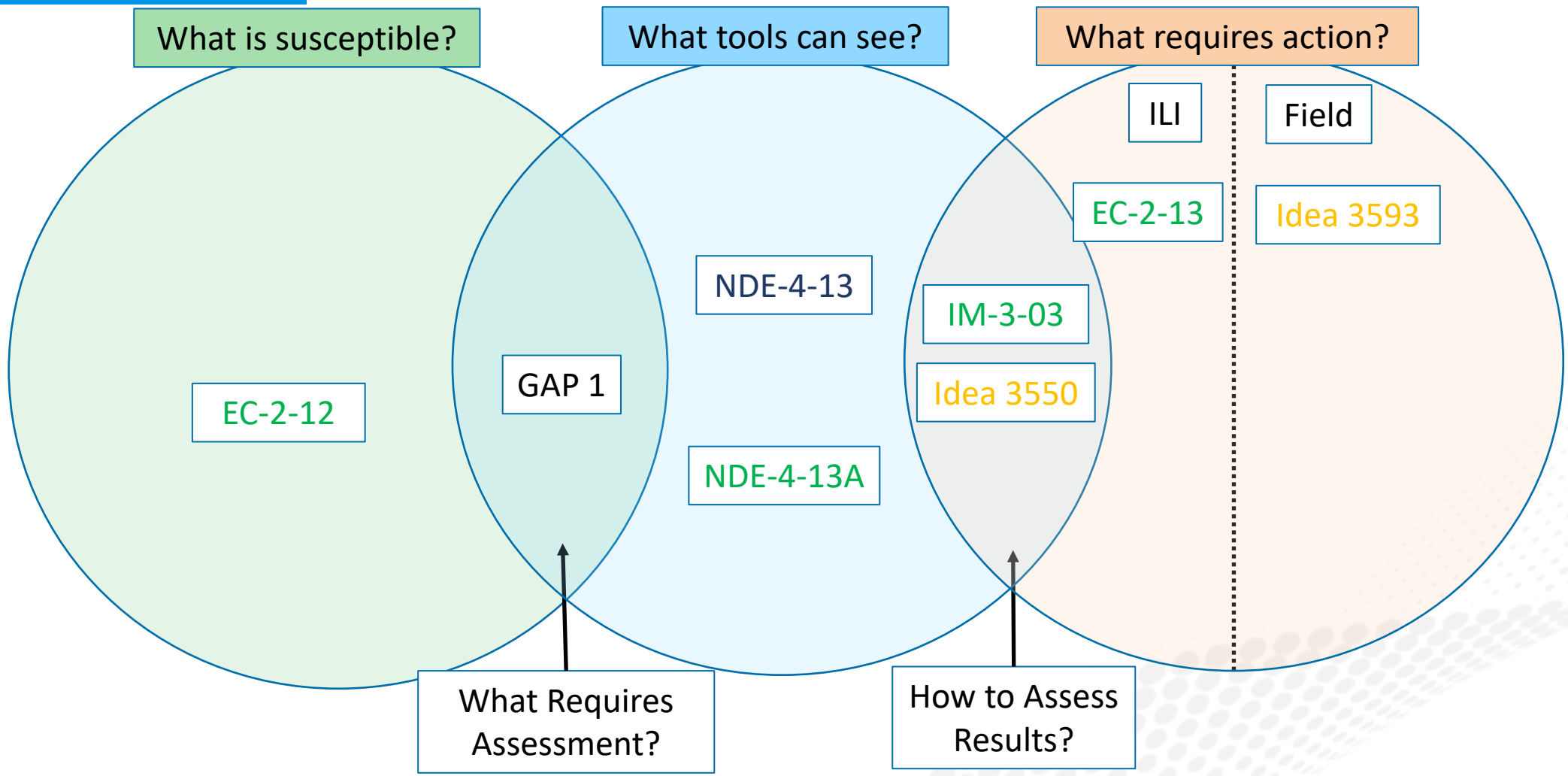
Identify which pipelines are susceptible to the different forms of cracking mechanisms

SRP Projects to Close Gap

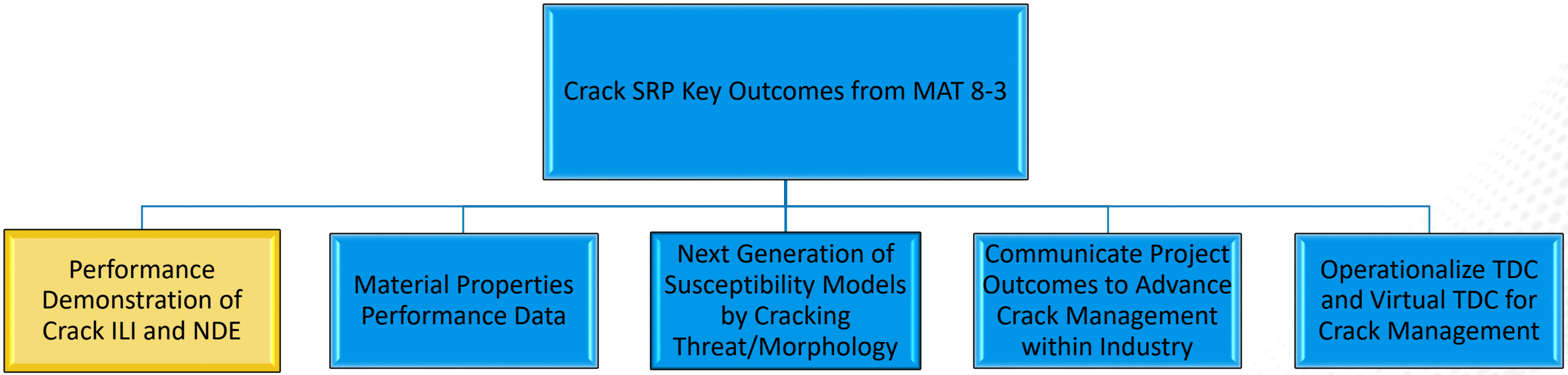
PRCI Project List:

EC-2-12 - Evaluation of Selective Seam Weld Corrosion Susceptibility
NDE-4-22 - Guidelines for When to Perform a Crack Detection ILI Survey
NDE-4-24 - Circumferential Crack Management Risk Evaluation Framework
MAT-7-2 - Hard Spot Susceptibility Review
EC-08-13 - Influence of External Hydrogen on Crack Growth
IM-03-03 – Comprehensive review of SSWC assessment
Idea 3318 – Guidelines for matching ILI technology to expected crack-like morphology

Example of susceptibility models put into action: Evaluation of Selective Seam Weld Corrosion



Crack Strategic Research Priority (PRCI)



Close Identified Gaps in Performance Demonstration for Crack ILI and NDE

Performance Demonstration of ILI and NDE Gap

Problem Statement:

ILI tools must identify which features warrant response.

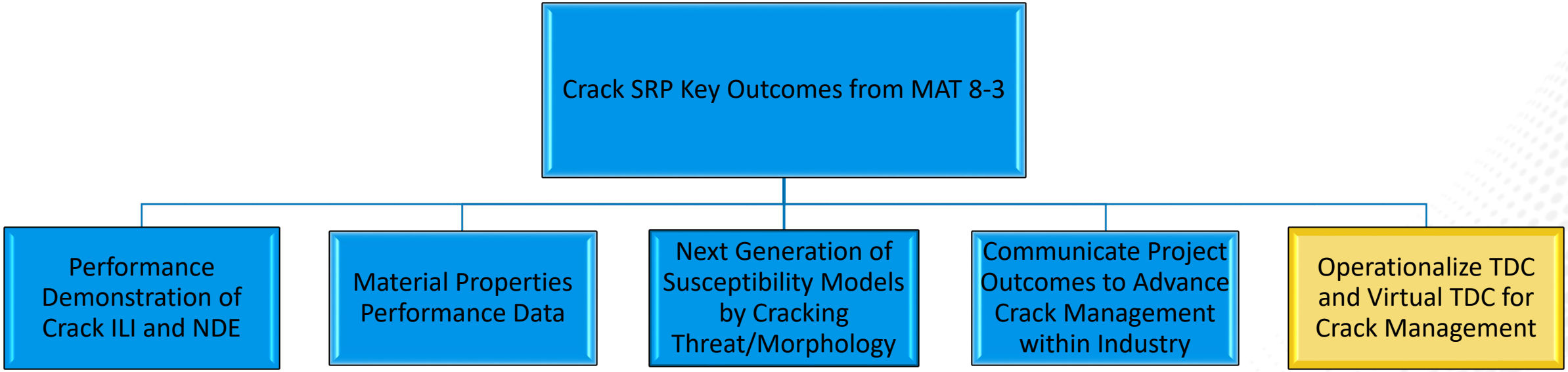
NDE must provide accurate data back to ILI vendor and operator

SRP Projects to Close Gap

PRCI Project List:

NDE-4-12 - Continuous Improvement of ILI Capabilities
NDE-2-14 - NDE Technician Improvement Training Course for LSW Testing
NDE-4-25 - Fast and Accurate Feedback from Site to ILI Vendor
NDE-4-27 - Protocol for PRCI Pipe Sample Evaluation and Documentation
NDE-4-26 - In-Line Inspection Performance on Tight Cracks
NDE-4-28 - Protocol for Testing New Technologies at the TDC
EC-02-13 – Response to corrosion intersecting the LSW in liquid pipelines
MAT 7-2A – Hard spot ILI performance round robin study
Idea 3459 – Demonstrate reliability to discriminate blunt vs sharp cracks
Idea 3550 – When do SSWC features behave as cracks

Crack Strategic Research Priority (PRCI)



Further Operationalize the TDC and VTDC for Crack Management

Operationalize TDC and VTDC Gap

Problem Statement:

Samples that allow for targeted validation of ILI and NDE technology

Accessible and consumable database of material properties

Accessible and consumable database of ILI performance by cracking threat/morphology

SRP Projects to Close Gap

PRCI Project List:

NDE-4-12 - Continuous Improvement of ILI Capabilities
NDE-4-17A - Pipeline Material Property Database Enhancement
MAT-8-3C - Understanding Why Crack Fail - Results Sharing
NDE-2-14 - NDE Technician Improvement Training Course for LSW Testing
NDE-4-27 - Protocol for PRCI Pipe Sample Evaluation and Documentation
NDE-4-26 - In-Line Inspection Performance on Tight Cracks
NDE-4-28 - Protocol for Testing New Technologies at the TDC

Other Gaps in Crack Management

Current State	Gap	Actions to Close Gap	Future State
Limitations with current assessment methodologies for circumferential cracks on natural gas pipelines. Some MFL-A approaches have had more recent success in pipe body	Circumferential crack inspection gas transmission pipelines in pipe body and welds. Some limitations on liquid pipelines as well.	Research new sensor development to understand fundamental requirements to assess circumferential cracks in welds and pipe body	Circumferential crack inspection for hazardous liquids and gas transmission pipelines with similar performance capabilities as axial crack inspections
Limited to no availability for small diameter crack inspection (4” to 8”)	Limited small diameter crack inspection tools (hazardous liquid and gas transmission). Other options: direct assessment or hydro-testing which can be less effective options	Research and development around miniaturizing electronics packaging, sensor design, and tool length to allow for suitable inspections on small diameter pipelines	Smaller diameter crack inspection tools with same performance as larger diameter tools
ILI tools can identify the long seam and detect/size seam weld anomalies within them	ILI tools cannot reliably differentiate the location and types of seam weld anomalies which increases number of digs required.	Part 1: Research new sensor technology to aid in discrimination of seam weld anomaly types Part 2: Use machine learning from a database collection of types of seam weld anomalies and associated signal responses.	Reliably identify the location (ID, OD, Mid-wall) and type of the seam weld anomalies
No available non-destructive technology to measure toughness of pipe body and welds on pipelines	Non-destructively (ILI and NDE) measure the toughness of pipe body and welds on pipelines. Destructive testing is only means to measure toughness (≥$50k+ per dig)	Research available sensing technology and methodologies to provide comparable accuracies as destructive testing.	Leverage ILI and NDE technology to non-destructively measure toughness to assist in 192.607(c) and 192.712(e) requirement

Questions/Discussions