DATA TO INFORMATION TO DECISION

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WORKGROUP

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Automation Solutions for Integrity Management Challenges – This group will discuss opportunities for developing and demonstrating automation measures to improve safety, reduce costs, and maximize knowledge and technology applications to address a wide range of integrity challenges. These opportunities include:

- Automatic tools for inspection in the areas to prevent human exposure to hazards and improve data collection accuracy and effectiveness;

- Best management practices of alarms and instrumentation systems; and

- Artificial intelligence, statistical models, and computational statistics.

CHANGING ENVIRONMENT - COMPLIANCE, SAFETY, ZERO

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New Requirements for Selecting and Using Assessment Methods

49 CFR part 192

§192.7 What documents are incorporated by reference partly or wholly in this part?

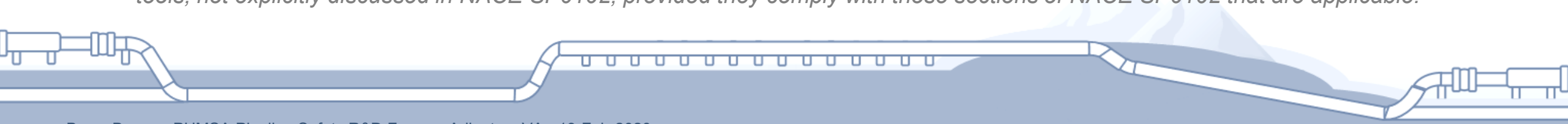
(12) API Standard 1163, "In-Line Inspection Systems Qualification," Second edition, April 2013, Reaffirmed August 2018, (API STD 1163), IBR approved for § 192.493.

(1) ANSI/ASNT ILI-PQ-2005(2010), "In-line Inspection Personnel Qualification and Certification," Reapproved October 11, 2010, (ANSI/ASNT ILI-PQ), IBR approved for § 192.493.

(2) NACE Standard Practice 0102-2010, "In-Line Inspection of Pipelines," Revised 2010-03-13, (NACE SP0102), IBR approved for §§ 192.150(a) and 192.493.

§192.493 In-line inspection of pipelines.

When conducting in-line inspections of pipelines required by this part, an operator must comply with API STD 1163, ANSI/ASNT ILI-PQ, and NACE SP0102, (incorporated by reference, see § 192.7). Assessments may be conducted using tethered or remotely controlled tools, not explicitly discussed in NACE SP0102, provided they comply with those sections of NACE SP0102 that are applicable.



CHANGING ENVIRONMENT - COMPLIANCE, SAFETY, ZERO

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New Requirements for Selecting and Using Assessment Methods

49 CFR part 195

§195.3 What documents are incorporated by reference partly or wholly in this part?

> *(23) API Standard 1163, "In-Line Inspection Systems Qualification" Second edition, April 2013, (API Std 1163), IBR approved for §195.591.*
>
> *(1) ANSI/ASNT ILI-PQ-2005(2010), "In-line Inspection Personnel Qualification and Certification" reapproved October 11, 2010, (ANSI/ASNT ILI-PQ), IBR approved for §195.591.*
>
> *(3) NACE SP0102-2010, "Standard Practice, Inline Inspection of Pipelines" revised March 13, 2010, (NACE SP0102), IBR approved for §195.591.*

§195.591 In-Line inspection of pipelines.

> *When conducting in-line inspection of pipelines required by this part, each operator must comply with the requirements and recommendations of API Std 1163, Inline Inspection Systems Qualification Standard; ANSI/ASNT ILI-PQ, Inline Inspection Personnel Qualification and Certification; and NACE SP0102-2010, Inline Inspection of Pipelines (incorporated by reference, see §195.3). An in-line inspection may also be conducted using tethered or remote control tools provided they generally comply with those sections of NACE SP0102-2010 that are applicable.*

CHANGING ENVIRONMENT - COMPLIANCE, SAFETY, ZERO

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New Requirements for Selecting and Using Assessment Methods

- Internal/external procedures and further alignment with API 1163 (ASNT and NACE)
- In-The-Ditch (ITD) NDE Field Measurements will be a strong focus,
  - from **ILI System Selection** and verification of Performance Specification,
  - Qualification of **Performance Specifications**,
  - to **ILI System Results Validation** and confirming Performance Specifications were met,
  - and for **Continuous Improvement**.

CHANGING ENVIRONMENT - COMPLIANCE, SAFETY, ZERO

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Voluntary Information-sharing System (VIS)

Strategic Mission: *"To provide the Secretary of Transportation with independent advice and recommendations on the development of a secure, voluntary information-sharing system(s) that encourages collection and analysis of integrity inspection and risk assessment information and other appropriate data to improve pipeline safety for gas transmission, gas distribution and hazardous liquid pipelines in a measurable way. The intent of the system(s) is to provide a collaborative environment that is proactive in nature, facilitate technological advancements and lead industry to actionable outcomes."*

The committee will ultimately provide recommendations to the Secretary addressing:

(a) The need for, and the identification of, a system *to ensure that dig verification data are shared with in-line inspection operators …. to improve pipeline safety and inspection technology*

(b) Ways to encourage the *exchange of pipeline inspection information and the development of advanced pipeline inspection technologies and enhanced risk analysis*;

(c) Opportunities to share data, including *dig verification data between operators of pipeline facilities and in-line inspection vendors to expand knowledge of the advantages and disadvantages of the different types of in-line inspection technology and methodologies*;

(d) Options to create a secure system that protects proprietary data while encouraging the exchange of pipeline inspection information and the development of advanced pipeline inspection technologies and enhanced risk analysis;

(e) Means and best practices for the protection of safety and security-sensitive information and proprietary information; and

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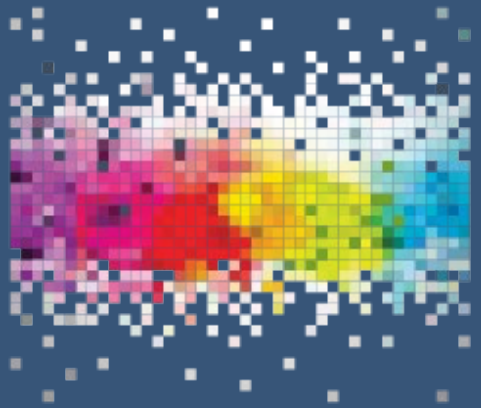
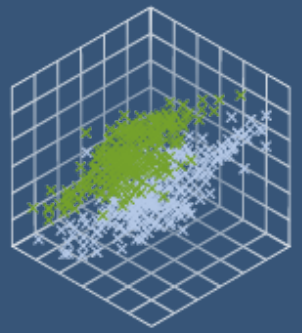


Data



Analytics

Knowledge

DATA FROM ILI

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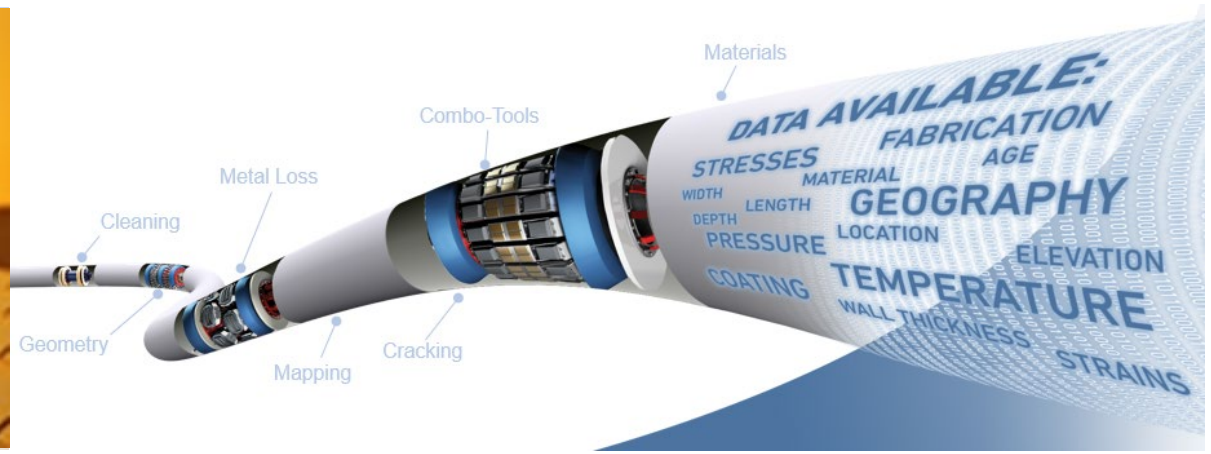

17 feet every second

12 miles per hour

280 miles every day

>100,000 miles in a year

3” – 56” (6” – 42” typical)

Sampling down to **1.6mm x 1mm***

** High Resolution MFL-A*

DATA SCIENCE IN ILI

CALCULATION OF 3D METAL LOSS FROM ILI DATA

PROOF OF CONCEPT: BLIND TEST

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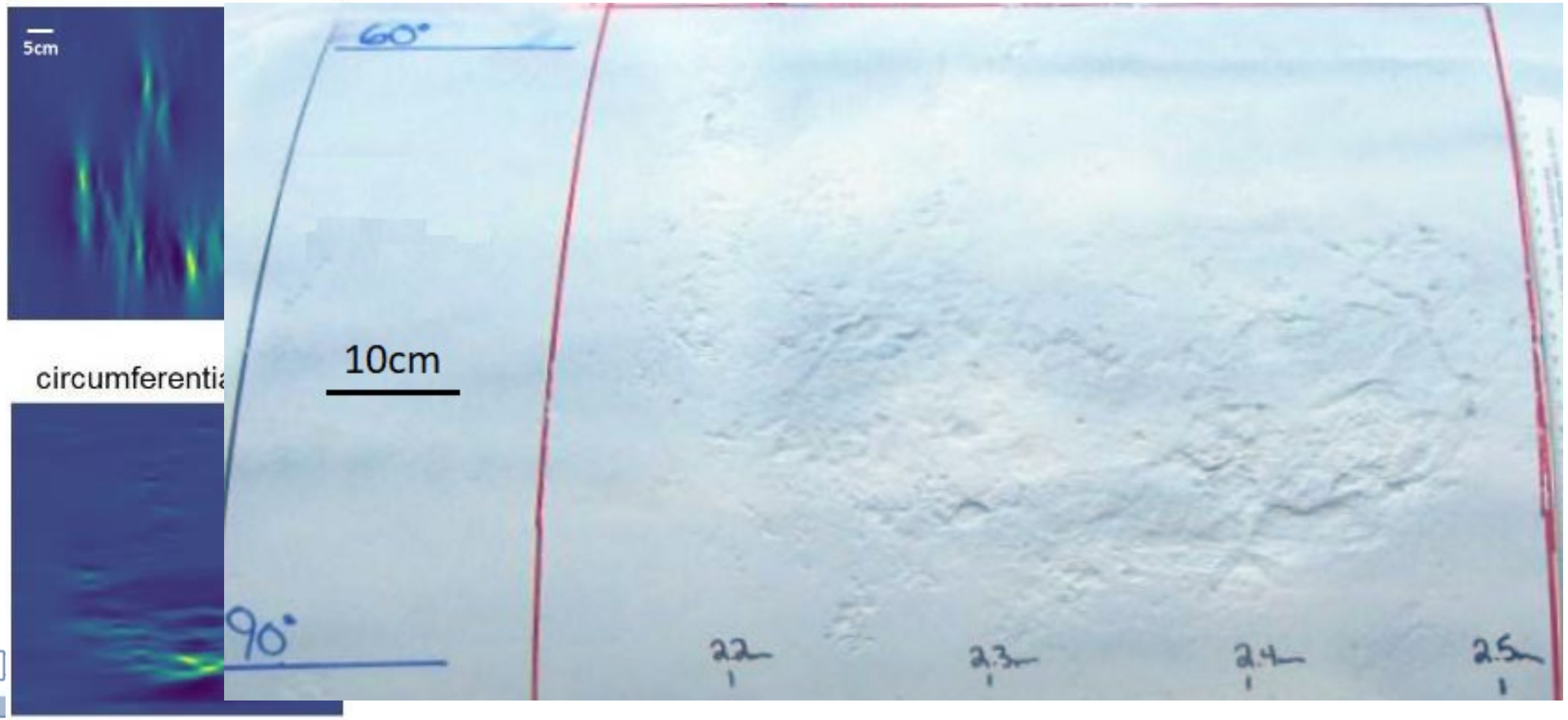

DATA SCIENCE IN ILI

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Input Data Requirements

- Requires high resolution 3D data of the anomaly
- Ground truth data with highest accuracy of the input data;
  - Laser scan data for corrosion and dent-like anomalies
  - X-ray CT data for crack-like anomalies – crack depth in 2D grid with high resolution
- The data exchange sources are;
  - 3D grid based data sets – length, width and depth of the anomaly
  - Anomaly geometry is the exchange format
  - Direct comparison between ILI assessment results and the ITD NDE measurements or ‘ground truth’
- High-resolution 3D anomaly geometry data sets are the basis for;
  - Direct burst pressure calculations
  - Best suited input data for corrosion growth assessments
  - Better input data for development purposes
  - Ideal source for quality control

INTEGRITY ANALYTICS FOR DECISION-MAKING

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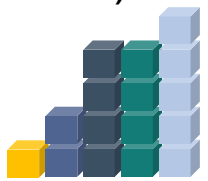
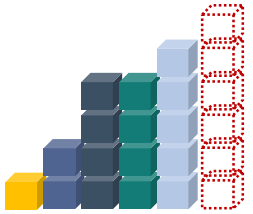
Artificial Intelligence, via Machine Learning, is progressing in the assessment of ILI data collected, processed and analyzed,

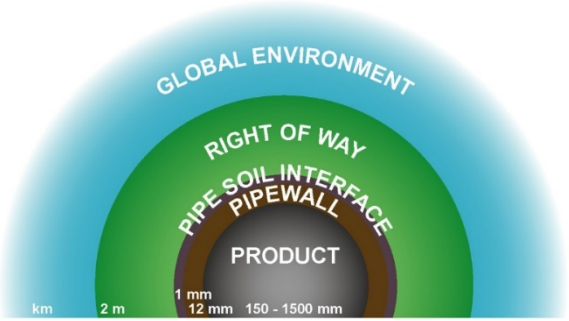
- and being enhanced, for more efficient, reliable, repeatable analyses and reporting of results,
- for validation of ILI assessment results in comparison to ITD NDE (API 1163)
- risk ranking similar pipelines which are not inspected yet,
- modelling to understand the future,
- and overall Decisions for integrity.



Descriptive Analytics
What has happened?



Predictive Analytics
What will happen?



\+ Physical/ Operational Data +

YOU HAVE THE DATA, NOW WHAT?

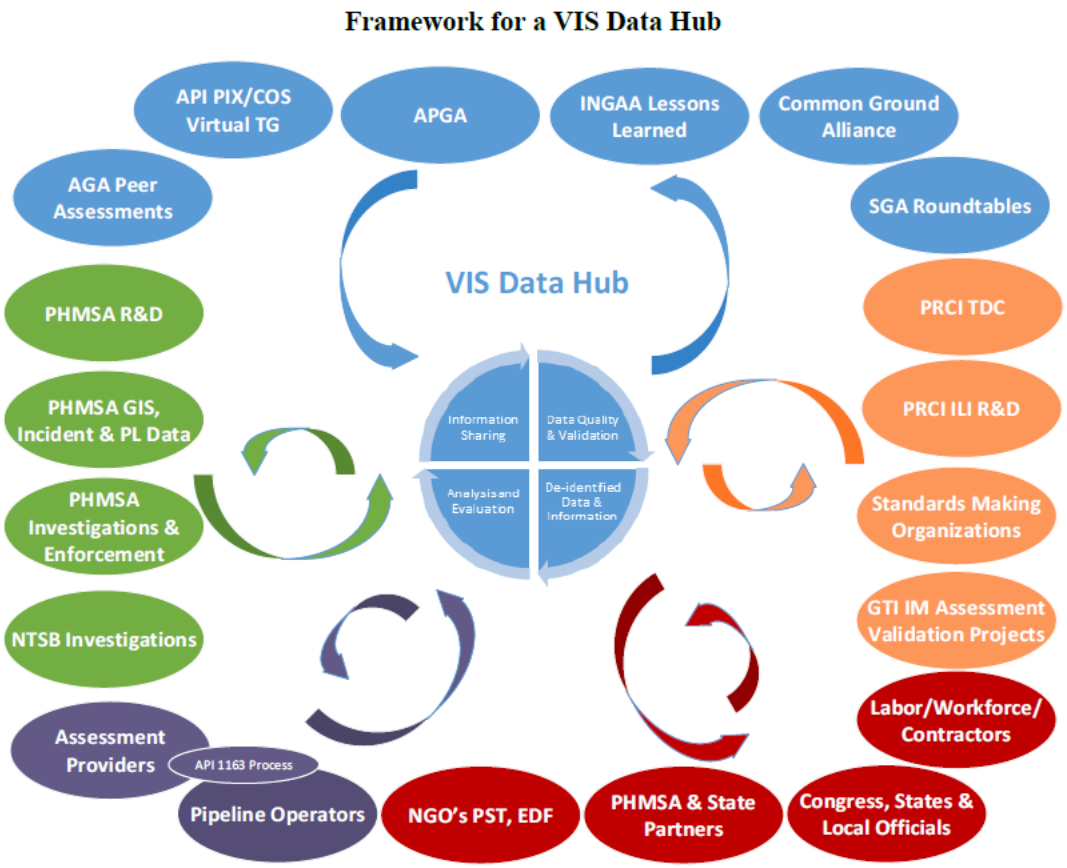
Voluntary Information-sharing System (VIS)

Supporting Recommendation
Process Sharing-1 *Define the types and what information* to be shared to enhance integrity management including pipeline integrity assessments and risk management.

Supporting Recommendation
Process Sharing-2 *Develop a plan for an information sharing center*, hereafter referred to as a voluntary information sharing *Hub (VIS Hub).*

Supporting Recommendation
Process Sharing-3 *Encourage adoption of API RP 1163* as a starting framework for information sharing between operators and ILI service providers within the VIS Hub and foster its broader use.

Supporting Recommendation
Process Sharing-4 Develop *a process for pipeline operators to share lessons learned from integrity assessments*.



YOU HAVE THE DATA, NOW WHAT?

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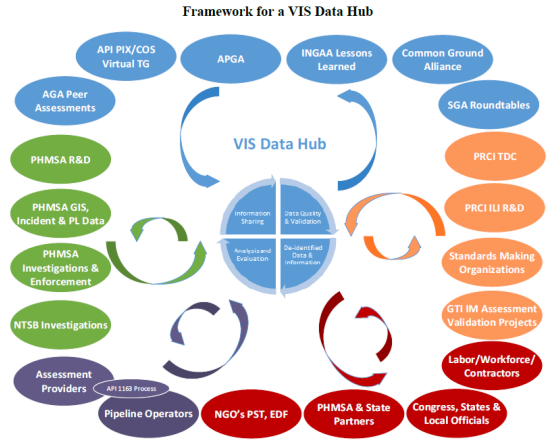
Voluntary Information-sharing System (VIS)



Supporting Recommendation
Process Sharing-5 Define the *processes to be used in a VIS Hub to facilitate the sharing discrete data from integrity assessments*.

Supporting Recommendation
Process Sharing-7 Develop a *process for pipeline integrity assessment service providers to share lessons learned from integrity assessments*.

Supporting Recommendation
Process Sharing-8 Develop *a process for non-destructive evaluation (NDE) service providers to share lessons learned from integrity assessment excavations*.

Supporting Recommendation
Technology-3 Standards Developing Organization (SDO) *create the minimum requirements for the collection of field verification data*

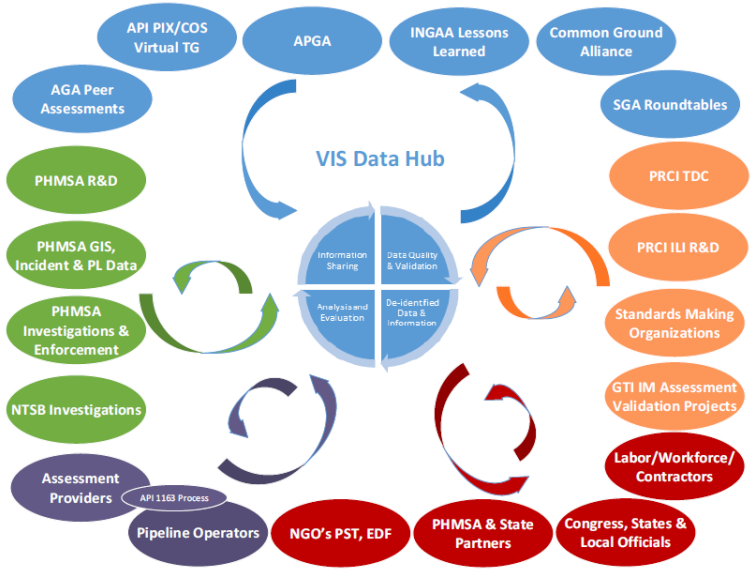
Supporting Recommendation
Technology-4 SDO *establish a protocol for comparing pipeline integrity assessment results with ITD/NDE field measurements*.

PATH FORWARD …

Let's better understand our source data ;

- Make clear the need for 3D anomaly dimension data, and define accordingly
- Support the needed developments for ITD NDE, our 'ground truth'
- Understand and align on the data/information types, origin, content, format, quality

  … as associated with Industry Standards, e.g. API 1163, NACE SP0102, POF, others



THANK YOU FOR JOINING THIS PRESENTATION.

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