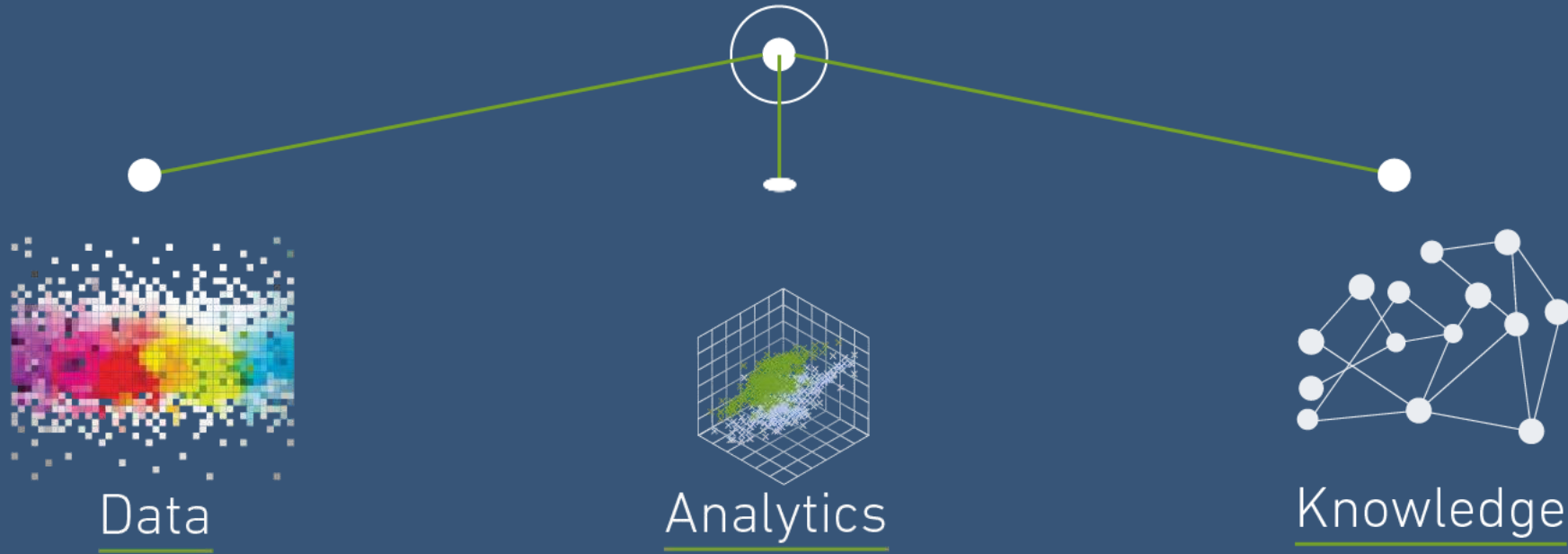




WHAT CAN INDUSTRY DATA WAREHOUSES DO FOR YOU?

Christopher De Leon (MSmith) · IDT Expo · Houston, TX · 29-Aug-2019

NIMA



MACHINE LEARNING



**Machine learning algorithms learn patterns from data
without explicit programming**



MACHINE LEARNING

1. Start with an “empty” predictive model, with unknown parameters
2. Take some labelled training data and use them to estimate the parameters
3. Use the “trained” predictive model on unseen test data



1. Start with an “empty” predictive model, with unknown parameters

$$y = m x + b$$

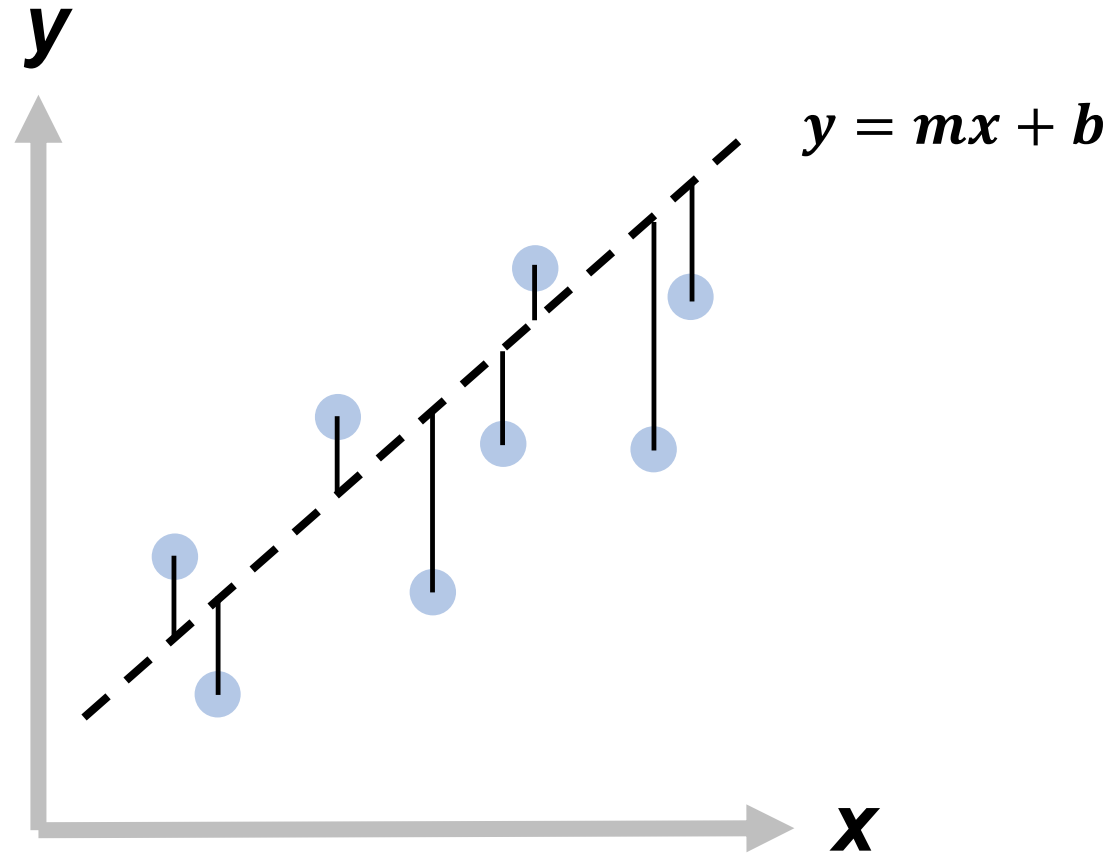


MACHINE LEARNING

1. Start with an “empty” predictive model, with unknown parameters
- 2. Take some labelled training data and use them to estimate the parameters**



MACHINE LEARNING



Find b and m such that

$$\sum (\Delta y)_i^2$$

is minimized

Training dataset



MACHINE LEARNING

1. Start with an “empty” predictive model, with unknown parameters
2. Take some labelled training data and use them (with a learning algorithm) to estimate the parameters
- 3. Use the predictive model on unseen test data**

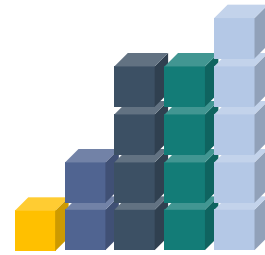


INNOVATION: MODERN ANALYTICS

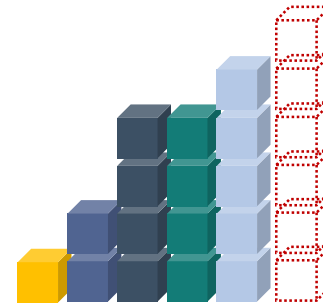
- **Key: Data is the most precious resource for machine learning applications**
- **ROSEN has successfully applied machine learning models to several products and services**
- **Data Science and Machine Learning have many ILI related uses (detection, classification, sizing)**
- **Human feedback is used make our algorithms better, also consider supervised learning.**



INTEGRITY ANALYTICS



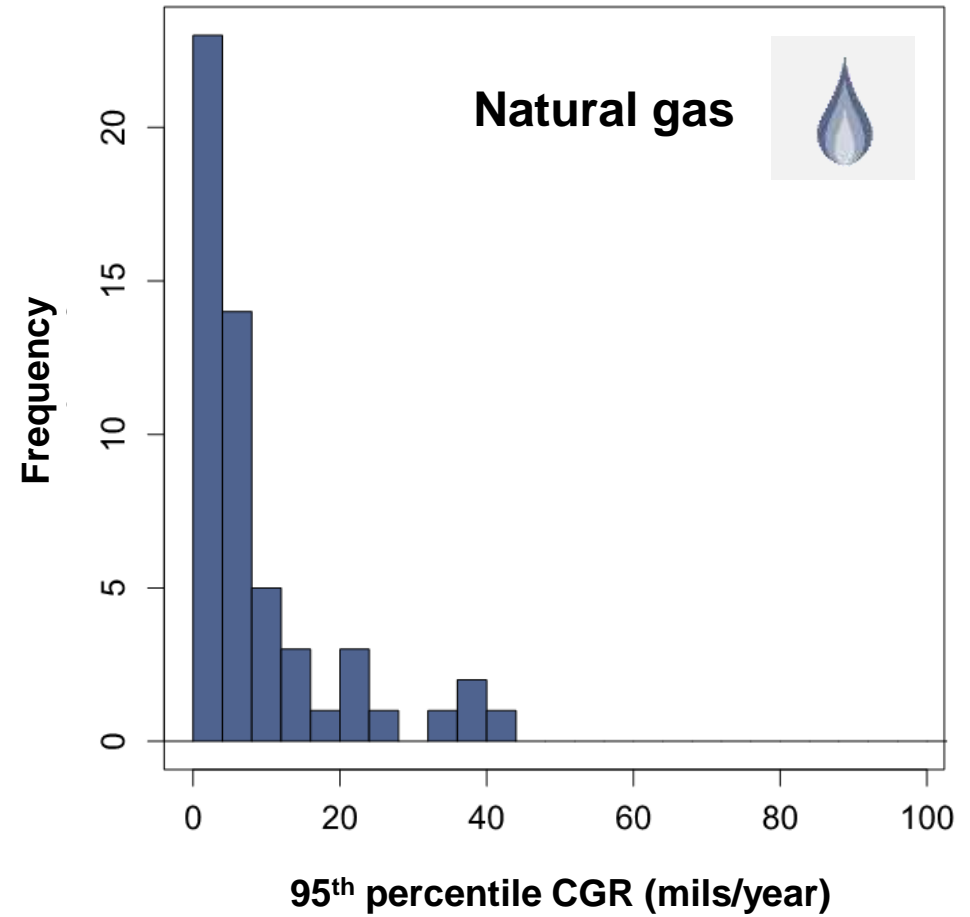
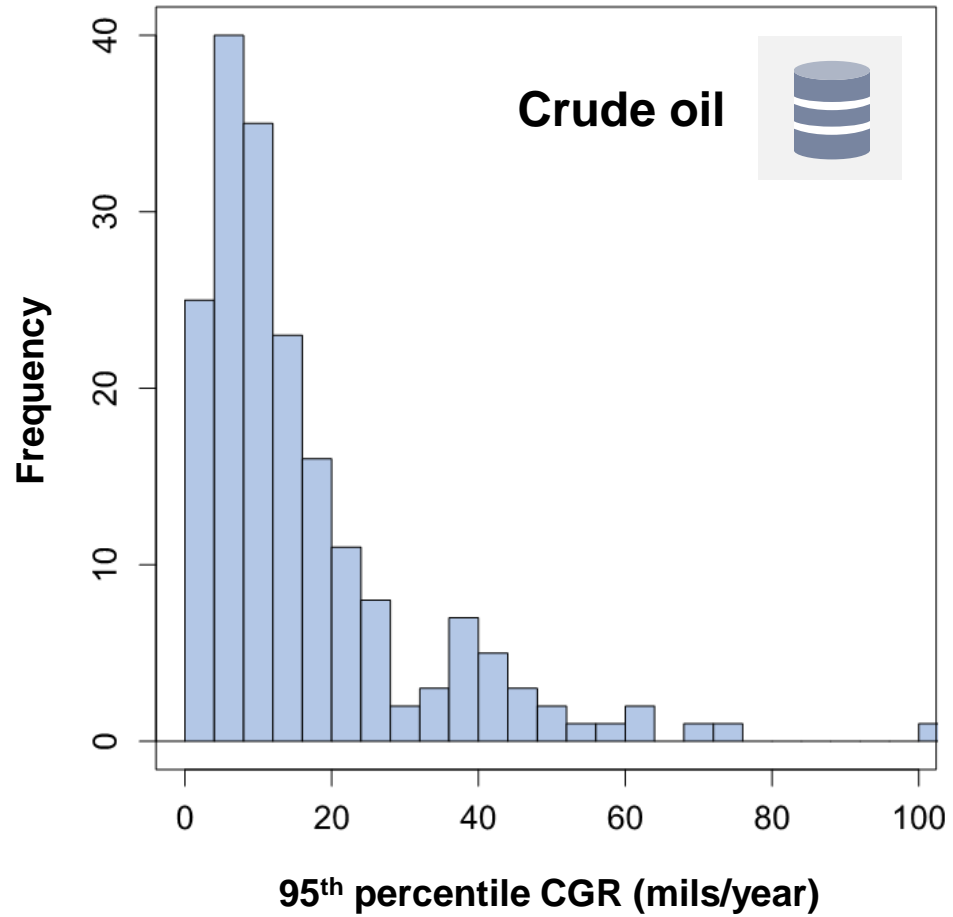
Descriptive Analytics
What has happened?



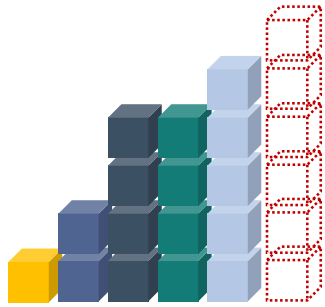
Predictive Analytics
What will happen?



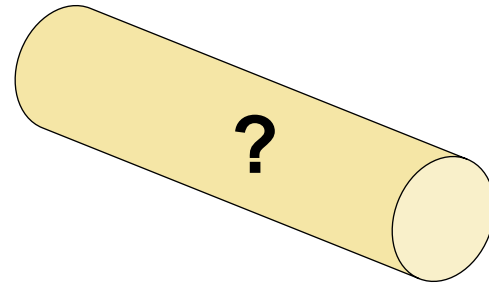
INTEGRITY ANALYTICS



INTEGRITY ANALYTICS



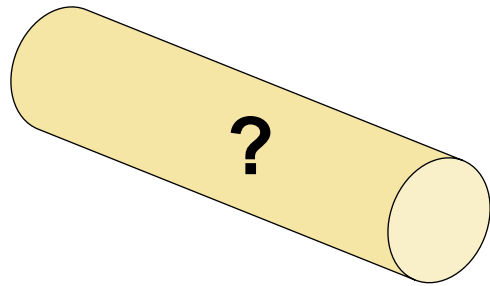
Predictive Analytics
What will happen?



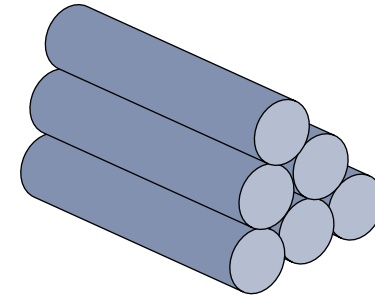
Product	Crude oil
Inlet temperature	120°F
Inlet pressure	640 psi
Velocity	1.4 m s ⁻¹
CO₂ content	1.0 mol%
Basic sediment and water	< 5%



INTEGRITY ANALYTICS



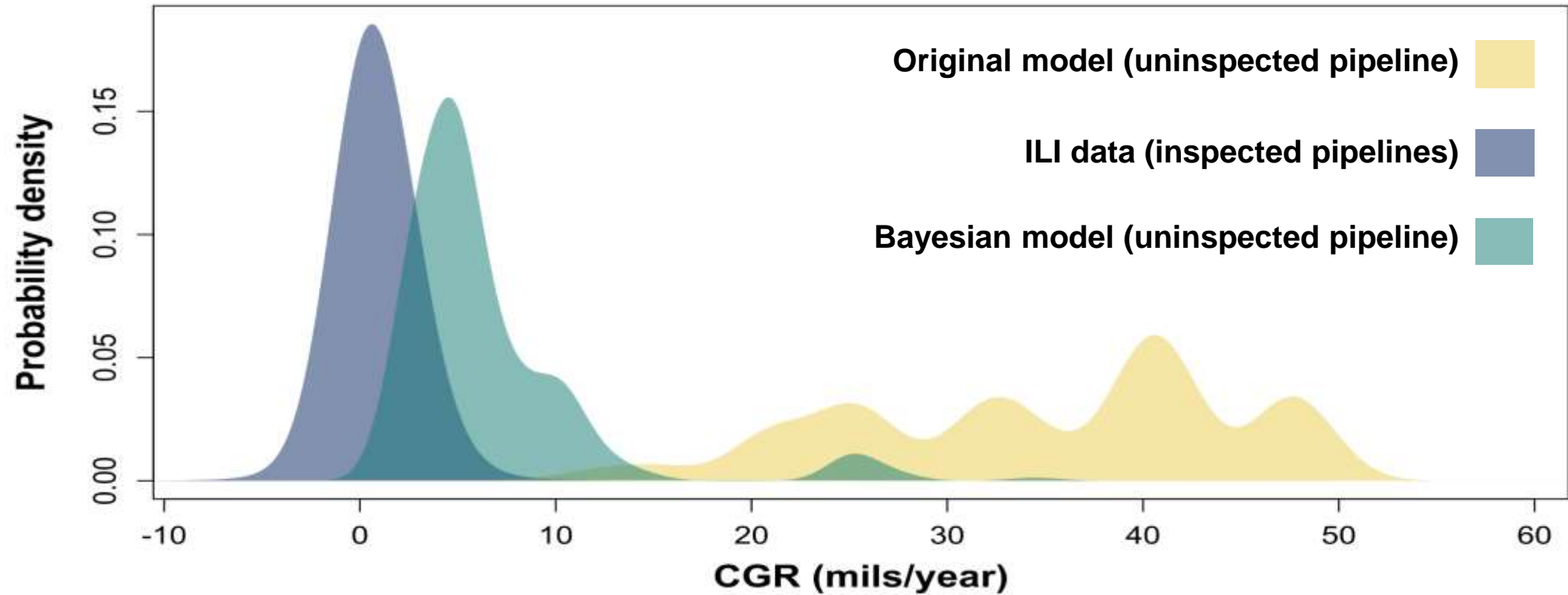
**Bayesian
learning**



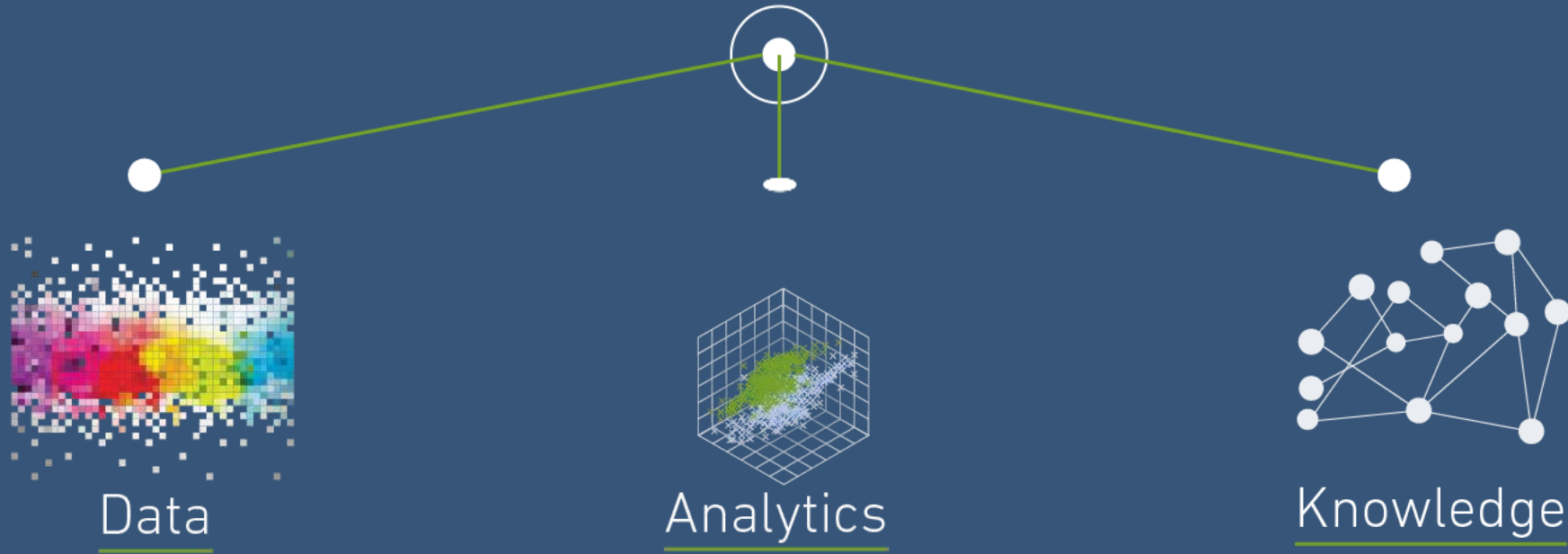
**Inspected
pipelines**



INTEGRITY ANALYTICS



NIMA



YOU HAVE THE DATA, NOW WHAT?

Voluntary Information Sharing

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



YOU HAVE THE DATA, NOW WHAT?

PRCI: Pipeline Data Hub

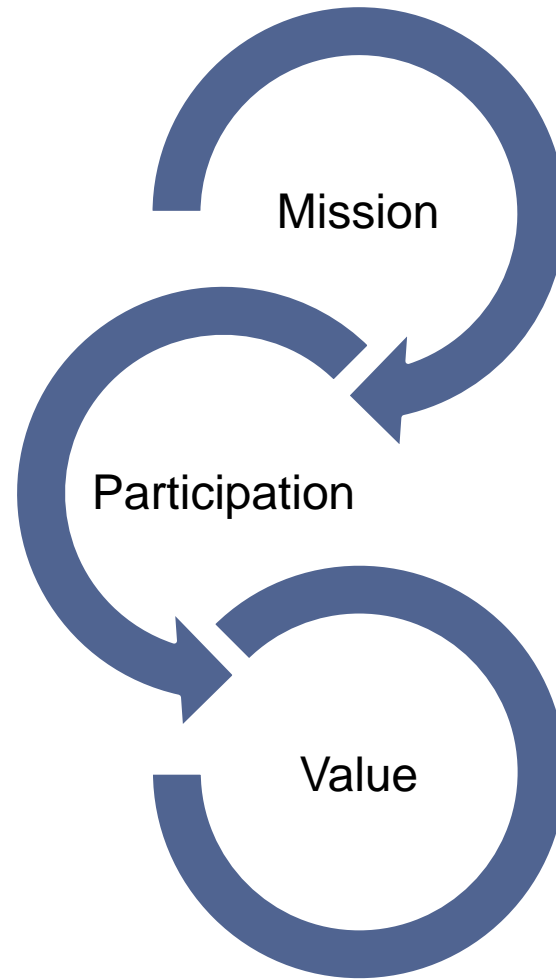
Mission: The Pipeline Data Hub (PDH) will be the center for pooled data, analytics, and information in support of the PRCI R&D . The PDH will be managed by PRCI Staff and the Pipeline Data Hub Advisory Committee.

Scope

- (a) The PDH will establish the basis of sharing of data for enhancing tools, techniques, process, and people associated with PRCI research Objectives
- (b) Opportunity to benchmark and compare performance with others in the industry
- (c) Raising the awareness for continuous improvement efforts being led by PRCI Larger sets of data and information to identify systemic trends that an operator may not discover with their own set of data and information



CONCLUSION



THANK YOU

ROSEN
empowered by technology

