Doug Slater
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July 16, 2019

British Columbia Utilities Commission
Suite 410, 900 Howe Street
Vancouver, BC
V6Z 2N3

Attention: Mr. Patrick Wruck, Commission Secretary and Manager, Regulatory Support

Dear Mr. Wruck:

Re: FortisBC Energy Inc. (FEI)

Project No. 1598988

Application for a Certificate of Public Convenience and Necessity for the Inland Gas Upgrades Project (Application)

FEI Procedural Conference Transcript Clarification

FEI writes to thank the British Columbia Utilities Commission (BCUC) for granting the opportunity for FEI to make a presentation at the procedural conference held on July 10, 2019.

FEI has reviewed the transcript of the procedural conference and is writing to make two clarifications to its evidence.

First, on pages 78 of the Transcript, Commissioner Loski asked a follow-up question regarding whether the 18 laterals that FEI has proposed to reduce the hoop stress to below 30 percent specified minimum yield strength (SMYS) will require the segment-by-segment risk assessment directed by the BC Oil and Gas Commission (BC OGC). Upon review of its responses to this question, FEI wishes to confirm that it is developing and implementing a segment-by-segment risk assessment process to determine the risk associated with all of FEI's BC OGC-regulated pipeline assets, including the 18 laterals that FEI proposes to install pressure regulating stations or replace such that they operate below 30 percent SMYS. In this regard, FEI is attaching FEI's latest quarterly report to the BC OGC on FEI's risk assessment process implementation.

Second, on page 79 of the Transcript, Mr. Chernikhowsky indicated that, subject to check, the date of FEI's meeting with the BC OGC was June 20. Mr. Chernikhowsky has checked and the date of the meeting was in fact on June 24, 2019.

If further information is required, please contact the undersigned.

Sincerely,

FORTISBC ENERGY INC.

Original signed:

Doug Slater

cc (email only): Registered Parties

FORTIS BC

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July 12, 2019

Submitted via e-mail to: Gouri.Bhuyan@BCOGC.ca and Linda.King@BCOGC.ca

Gouri Bhuyan, Ph.D., P.Eng., FASME, FCAE
Supervisor, Integrity Management & Dam Safety
BC Oil & Gas Commission
#203 - 1500 Hardy Street
Kelowna B.C., V1Y 8H2

RE: Quarterly Update to BC OGC On Risk Assessment Process Implementation – for 2019 Q2

Dear Gouri,

In response to a commitment to the BC Oil & Gas Commission (BC OGC) in a letter dated December 8, 2017, FortisBC Energy Inc. (FEI) is providing a quarterly update regarding its progress toward development and implementation of a segment-by-segment risk assessment process to determine the risk associated with its BC OGC regulated pipeline assets in BC.

As FEI has previously discussed with the BC OGC, FEI's segment-by-segment risk assessment process will be a Quantitative Risk Assessment process that can be applied to FEI's BC OGC regulated pipeline assets in BC. FEI's first iteration of the Quantitative Risk Assessment will apply to lines with in-line inspection data. This first iteration will assist in establishing the priority and urgency of upgrades to FEI's transmission mainlines for enabling in-line inspection with crack-detection (EMAT) tools. FEI will use its experience with this first iteration of the Quantitative Risk Assessment to identify and evaluate process improvements prior to undertaking further iterations that will be expanded to include FEI's other pipeline assets (i.e. BC OGC-regulated pipelines not currently subject to in-line inspection).

Further to the update provided for Q1 2019, the following activities have been undertaken by FEI during Q2 2019:

- October 2018 – present: FEI's contracts with JANA Corporation pertaining to integrity data improvements and Quantitative Risk Assessment are progressing. FEI's first iteration of a segment-by-segment risk assessment process will be demonstrated through this work. FEI has been, and will continue to work closely with JANA through completion of these contracts, which is expected by year-end 2019.

- April 16, 2019: FEI and JANA delivered presentations to the BC Utilities Commission staff and Interveners on its planned Transmission Integrity Management Capabilities (TIMC) Project, which is anticipated to provide required upgrades for enabling in-line inspection with crack-detection (EMAT) tools or alternate crack-management strategies that may be deemed preferable through FEI's analysis. JANA's presentations comprised a general overview of quantitative risk assessments as well as updates on both the integrity data improvements and FEI's quantitative risk assessment. Copies of these presentations are attached.

- Preliminary documentation (e.g. methodology) has been made available by JANA for FEI review beginning in Q2 2019.

- Preliminary results have been presented by JANA to FEI in Q2 2019.

Further technical workshops are being scheduled between FEI and JANA representatives for Q3 2019 to confirm technical defensibility and documentation of these results are in line with FEI's expectation. FEI expects to meet with the BC OGC to review the results of the first iteration Quantitative Risk Assessment in Q4 2019 or Q1 2020.

FEI will submit its next update in Q4 2019 for the preceding quarter.

Sincerely,

Paul Chernikhowsky, P.Eng.
Director, Integrity Management and Damage Prevention
FortisBC Energy Inc.

cc: Nicole Koosmann, VP, Engineering, Energy Infrastructure & Integrity, BC OGC
Bryan Balmer, Manager, System Integrity Programs, FortisBC Energy Inc.

Attachment

FEI Transmission Integrity Management Capabilities (TIMC) Project

Workshop

April 16, 2019

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Agenda

- Introductions & Workshop Objectives
- Overview of the TIMC Project
- Phase 1 Development Activities

Paul Chernikhowsky
(FEI) Director, Integrity Management and Damage Prevention

- Quantitative Risk Assessment Overview
- TIMC Phase 1: Quality Risk Assessment Project
- TIMC Phase 1: Integrity Data Project

Ken Oliphant, Ph.D., P.Eng.
(JANA Corporation) Executive Vice President & Chief Technology Officer

- Question Period
- Next Steps

Introductions & Workshop Objectives

Paul Chernikhowsky, *Director, Integrity Management and Damage Prevention*

Workshop Objectives

Continue dialogue with the BCUC and interveners regarding Transmission Integrity Management Capabilities (TIMC) Project.

Overview of TIMC Project

Describe TIMC Project Phase 1 CPCN development activities, including Integrity Data and Quality Risk Assessment Project

Overview of TIMC Project

Paul Chernikhowsky, *Director, Integrity Management and Damage Prevention*

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TIMC Project is About Managing Risk

- Development of risk management capabilities
  - to determine preferred alternative(s) for managing cracking threats to FEI's transmission pipelines
  - to enhance risk-based decision making for integrity/asset management of transmission pipelines

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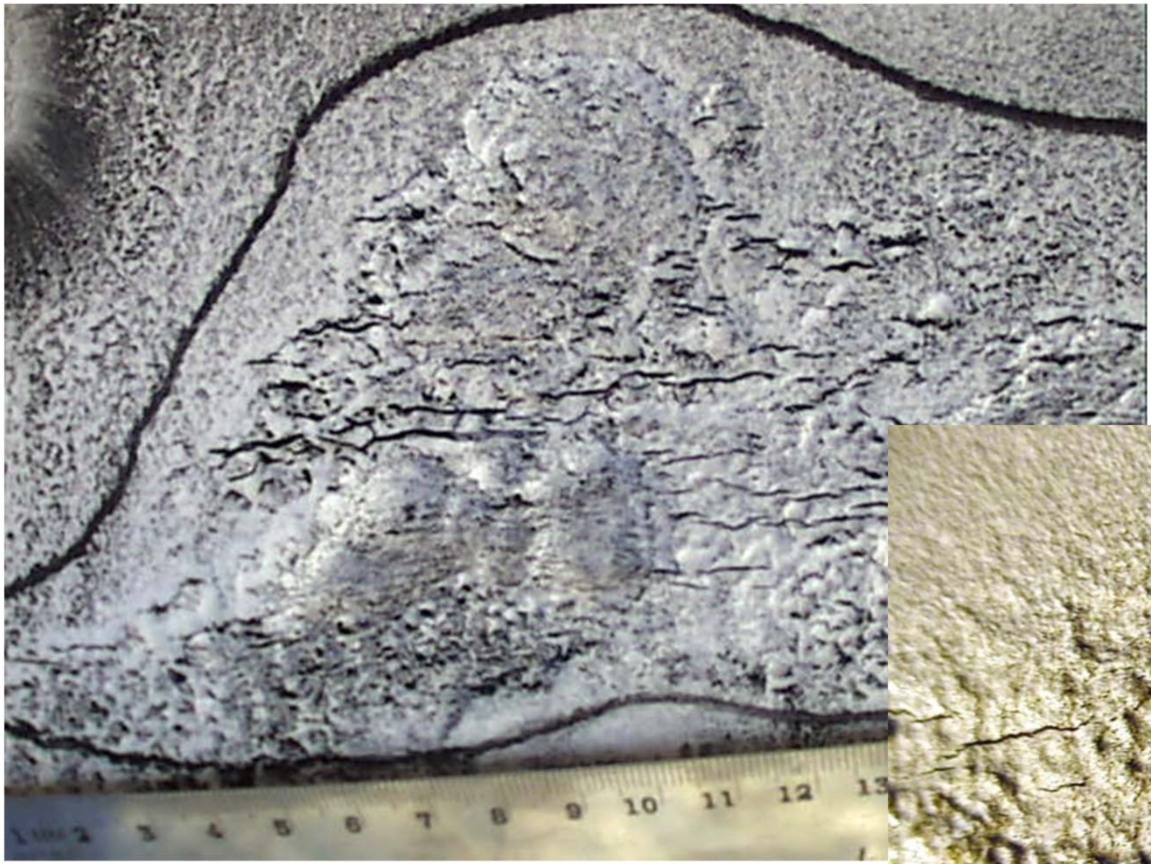
Integrity Management Program for Pipelines (IMP-P) Hazards

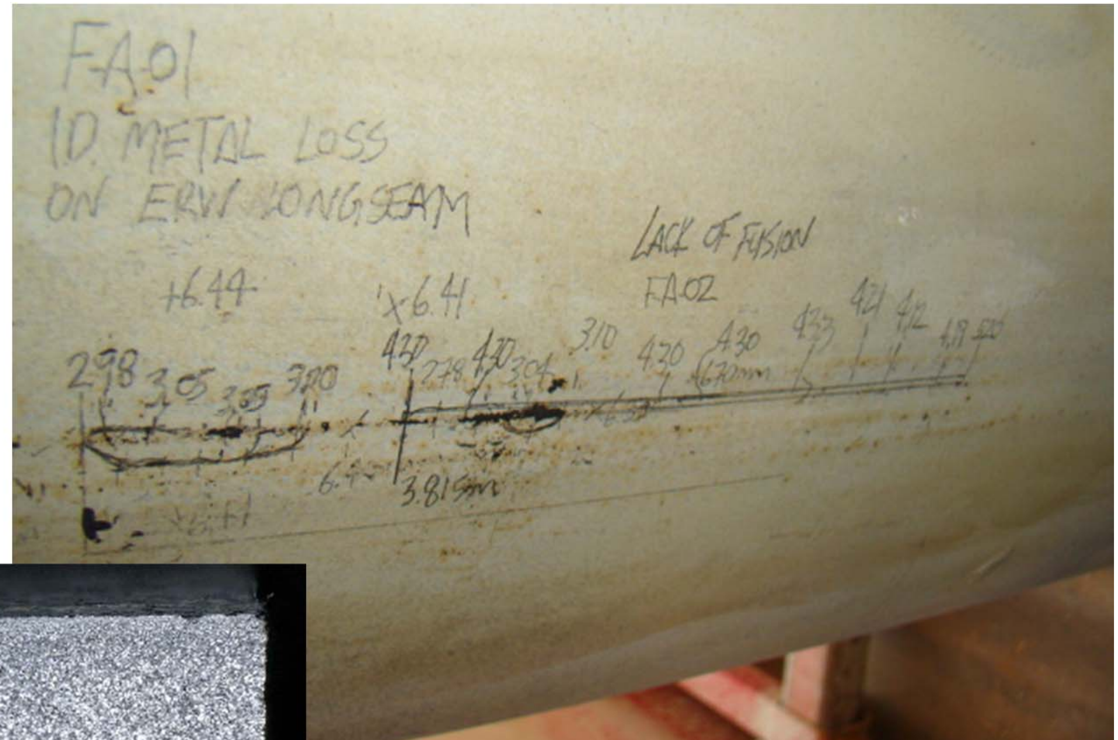
- Third-party damage
- Natural hazards (includes geotechnical, hydrotechnical, and seismic)
- Pipe condition (includes time-dependent hazards of external corrosion and stress corrosion cracking)
- Material defects and equipment failures
- Human factors

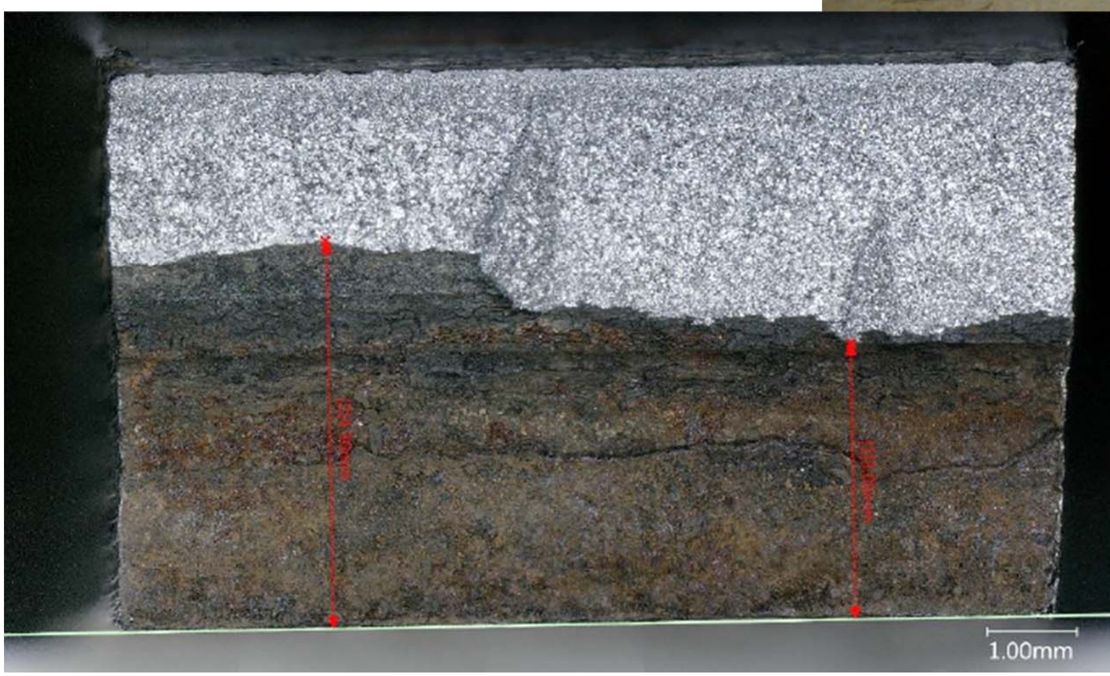
Examples of Stress Corrosion Cracking



Examples of Longitudinal Seam Weld Flaws

- Failure potential if interacting hazards (e.g. external corrosion and cracking features) occur.





Stress Corrosion Cracking Failures

- Ruptures of National Energy Board-Regulated Pipelines (1992-2014):

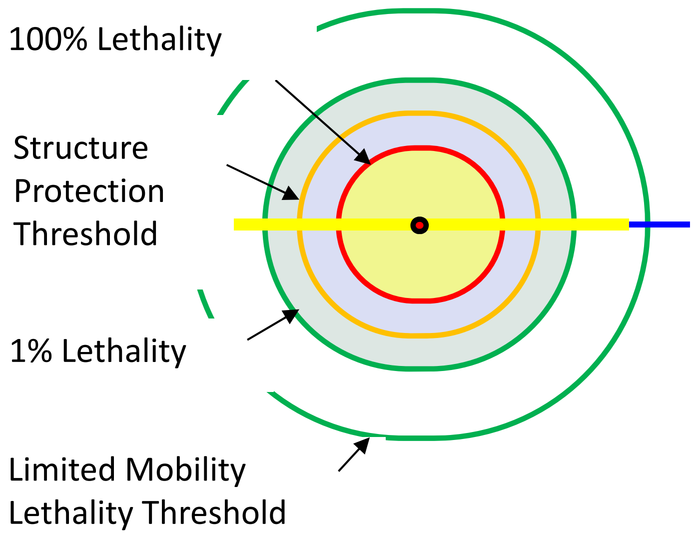
Product = Gas	
Rupture Sub-cause	**Total**
Company Contractor	1
Defective Pipe Body	2
External Metal Loss	5
Fatigue	1
Hydrogen Induced Cracking	1
Stress Corrosion Cracking	6
Grand Total	**16**

Potential Consequences

- Pipeline failures can have a range of consequences:
  - ❑ Safety
  - ❑ Reliability
  - ❑ Environmental
  - ❑ Regulatory

Potential Impact Radius (PIR)

- Thermal radiation hazard
  - Population within impact radius
    - Count of structures
    - Structure occupancy

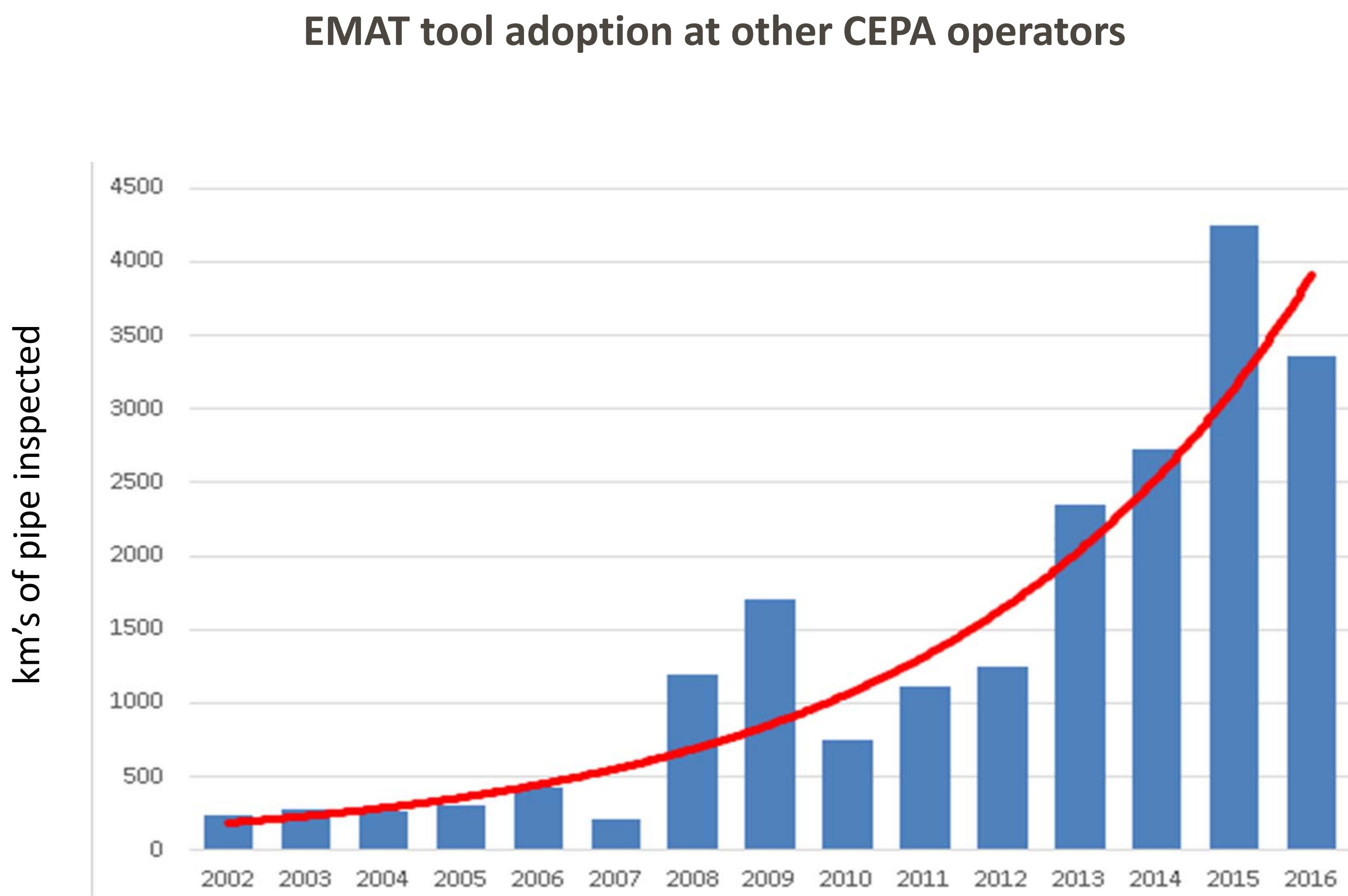


Crack-Detection ILI Tools

Electromagnetic Acoustic Transducer (EMAT) tools

- have been evolving especially over the past decade and are now increasingly being adopted by Canadian gas transmission pipeline operators as the standard method for managing stress corrosion cracking
- sensors must be positioned very close to the pipe wall (direct contact); therefore tools are designed with a tighter fit versus MFL tools
- increased drag forces have the potential to result in speed fluctuations that exceed tool specifications

Crack-Detection ILI by CEPA Operators



CEPA = Canadian Energy Pipeline Association

TIMC Project is Comprised of:

- FEI's vision for adopting crack-detection ILI capability or other crack management solutions for transmission pipelines
- Quantitative Risk Assessment of FEI's transmission pipelines
- Scope of work for pipeline system enhancements to enable crack-detection ILI capability, non-ILI alternatives for SCC management/mitigation, and sustainment resources for quantitative risk management and crack management at FEI

TIMC Project
Phase One Development Activities

Paul Chernikhowsky, *Director, Integrity Management and Damage Prevention*

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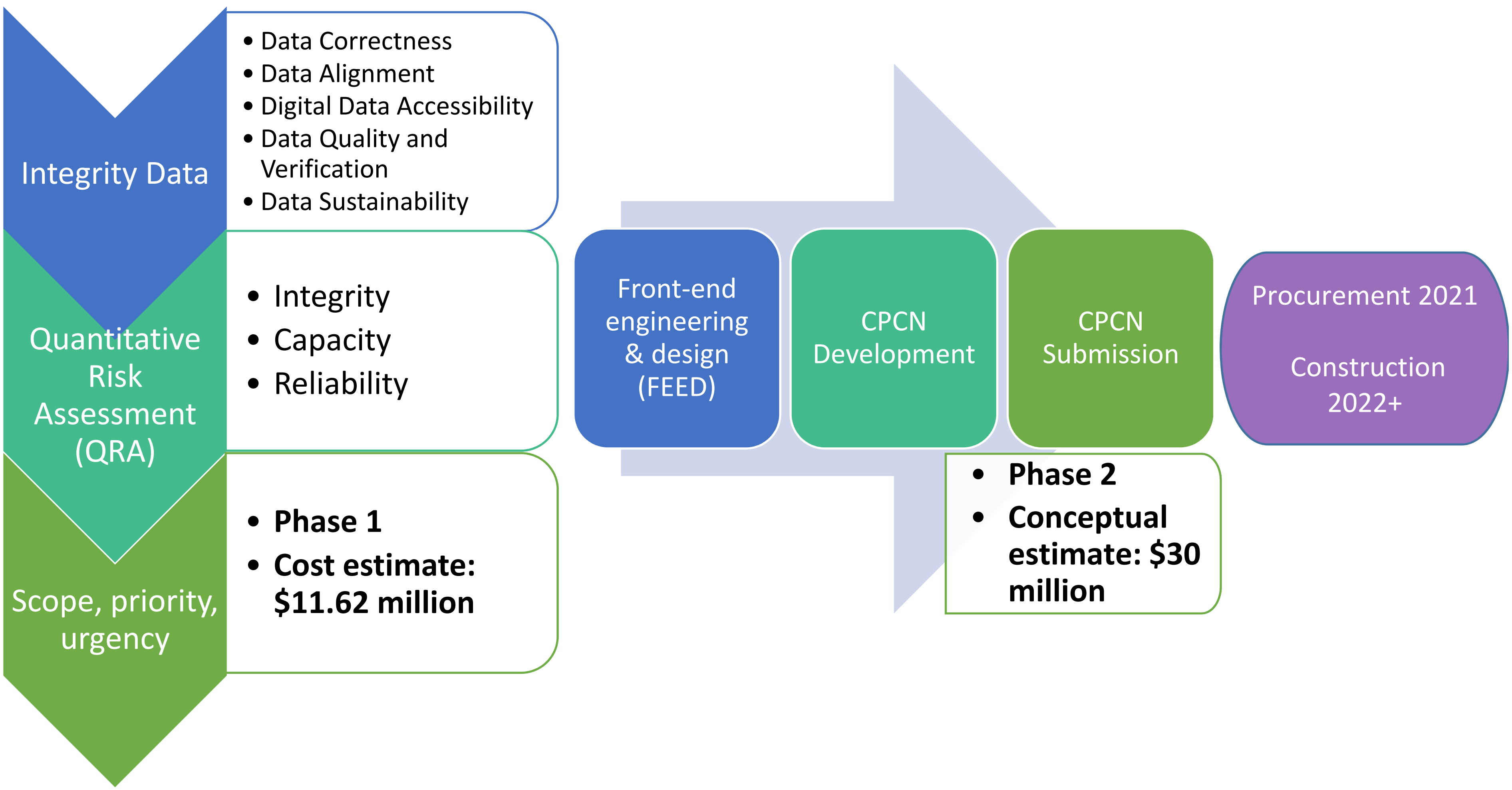
TIMC CPCN Development



Trial of EMAT Tools

- Up to three (3) pipeline segments identified as potentially feasible for EMAT inspection as part of CPCN development

  - LIV-PAT 457 mm: planned for inspection in October 2019
    - Modifications to launcher / receiver
    - Temporary pressure-regulating station
    - Two station bypasses
  - CPH-BUR 508 mm: portion of this line planned for inspection in 2020
  - LIV-COQ 323 mm: capability of EMAT tool to pass through existing bends & fittings remains under evaluation by FEI and vendor

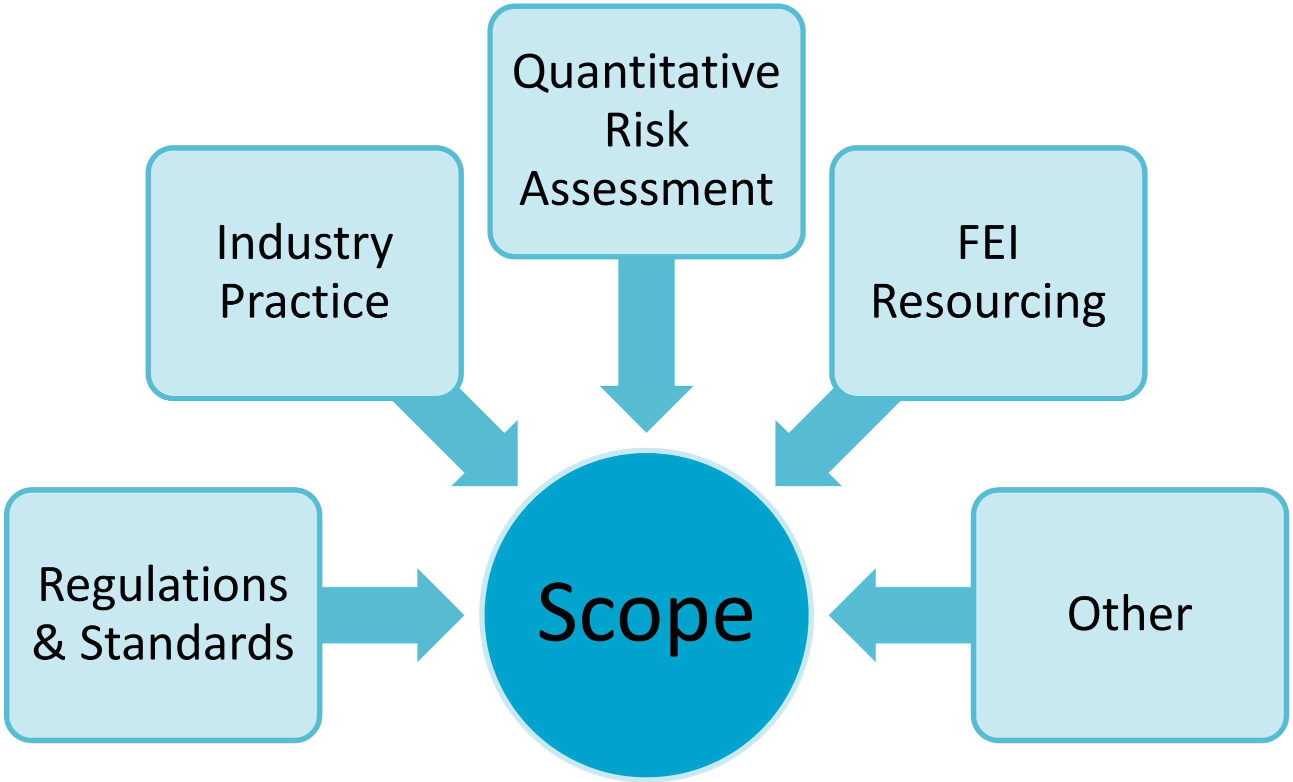
Integrity Data Project

- Providing data for Quantitative Risk Assessment
- Defining framework and requirements for ongoing provision of traceable, verifiable, and complete data for future QRA's of transmission pipeline assets
- Scope includes:
  - Data verification
  - Document linking
  - Location linear referencing
  - Data accessibility
  - Improvement procedures
  - Management of change

Quantitative Risk Assessment (QRA) Project

- First iteration
- Estimation of probability of failure for each of the threats included in FEI's IMP-P (external corrosion, 3rd-party damage, SCC, etc.)
- Estimation of potential location-specific safety, security of supply (outage), environmental, regulatory and reputation consequences for each potential failure type (leak, rupture)
- Combining probabilities and consequences will give an estimate of operational risk on a segment-by-segment basis

TIMC Project Scope Inputs



Quantitative Risk Assessment (QRA) Overview

Ken Oliphant, Ph.D., P.Eng. (JANA Corporation), *Executive Vice President & Chief Technology Officer*

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QRA Overview

BCUC Workshop

April 16th, 2019

Agenda

- Asset Management, Integrity Management and Risk
- Types of Risk Assessment
- Quantitative Risk Assessment

What is Asset Management?

- ISO 55000 Definition
  - Coordinated activity of an organization to realize value from assets

- CGA Definition
  - A strategic management system used to optimally manage assets over their life cycle by balancing performance, risk and expenditures to achieve corporate strategic objectives

What is Integrity Management?

- CSA Definition
  - Practices used by an operating company to ensure the safe, environmentally responsible and reliable service of a pipeline system

- PHMSA Definition
  - A risk-based approach to improving pipeline safety

Asset & Integrity Management

- Asset Management: Strategic Function
- Integrity Management: Technical Function

Integrity Management outputs are inputs to the Asset Management System

Risk in Asset & Integrity Management

- Risk is core to both Asset and Integrity Management

  - Asset Management
    - *… by balancing performance, risk and expenditures*
  - Integrity Management
    - *A risk-based approach to…*

Assessing Risk

- How risk is assessed is critical to ability to use risk to guide Asset Management and Integrity Management decision making
- Typical modeling approaches
  - Qualitative (e.g. risk matrix)
  - Relative (e.g. Index Model)
  - Quantitative (e.g. QRA)

Assessing Risk

- PHMSA Stance:
  - "The overriding principle in employing any type of risk model/assessment is that it supports risk management decision to reduce risks."
  - "Quantitative System and Probabilistic models are considered more robust and capable of supporting all risk reduction decisions."

PHMSA, Pipeline Risk Modeling, Overview of Methods and Tools for Improved Implementation, May 2018

Quantitative Risk Assessment (QRA)

- What is a QRA?

Quantitative Risk Assessment (QRA)

- What is a QRA?

“A QRA is a formal and systematic approach to estimating the likelihood and consequences of hazardous events, and expressing the results quantitatively as risk to people, the environment or your business”

Quantitative Risk Assessment (QRA)

- What is a QRA?

"Using quantitative risk models to estimate risk so as to assess the potential impact of risk and determine the appropriate response"

Quantitative Risk Assessment (QRA)

- Why QRA?

Quantitative Risk Assessment (QRA)

- Why QRA?

- Quantitative Risk Assessments turn raw data about the asset into information about the asset that when combined with SME (Subject Matter Expert) knowledge provides for more informed decision making

Quantitative Risk Models

Risk = Probability of Event X Consequences of Event

Quantitative Risk Models

"All models are wrong, some are useful"

George Box, Statistician

Quantitative Risk Models

"The output of any risk model is an estimation of actual risk"

PHMSA, Pipeline Risk Modeling, Overview of Methods and Tools for Improved Implementation, May 2018

Quantitative Risk Models

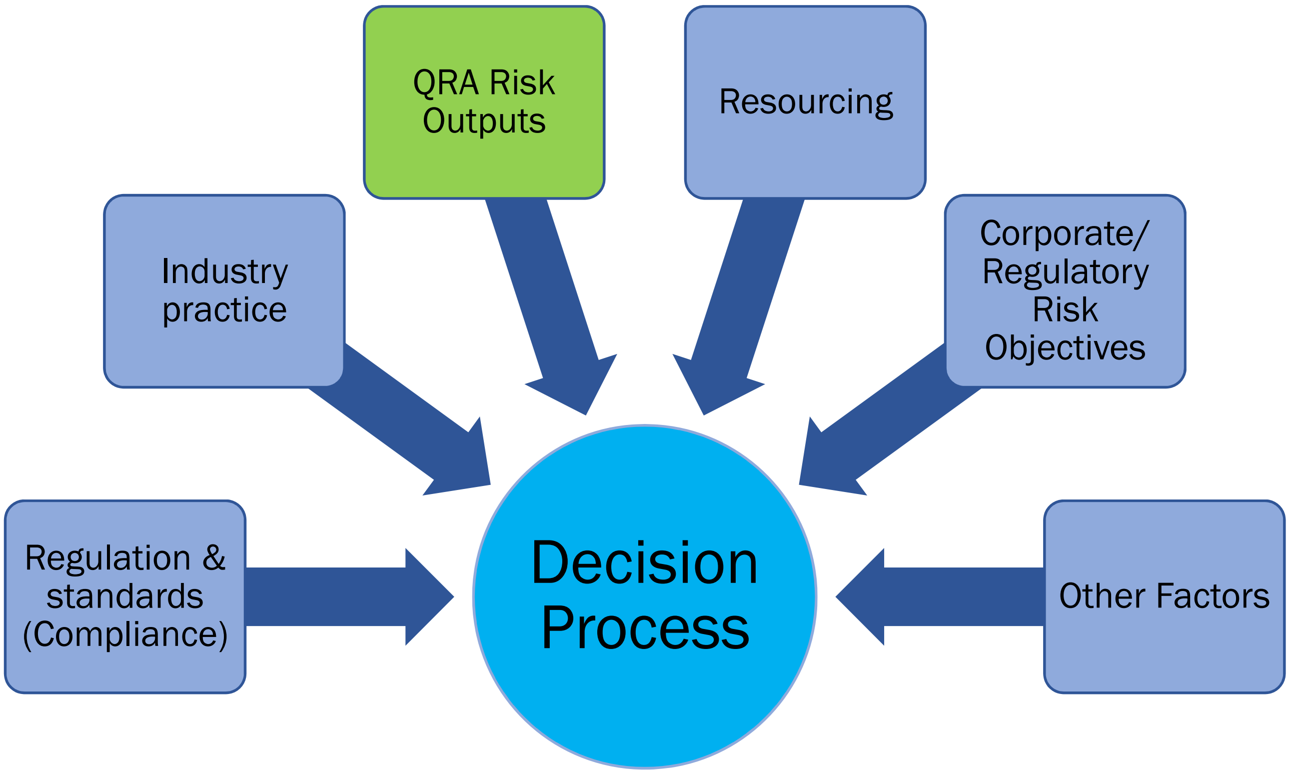
"A data-driven person will never have all the data they need to make a perfect decision. Perfectionism is dangerous and it regularly prevents smart people from pursuing good ideas"

Anna Kegler

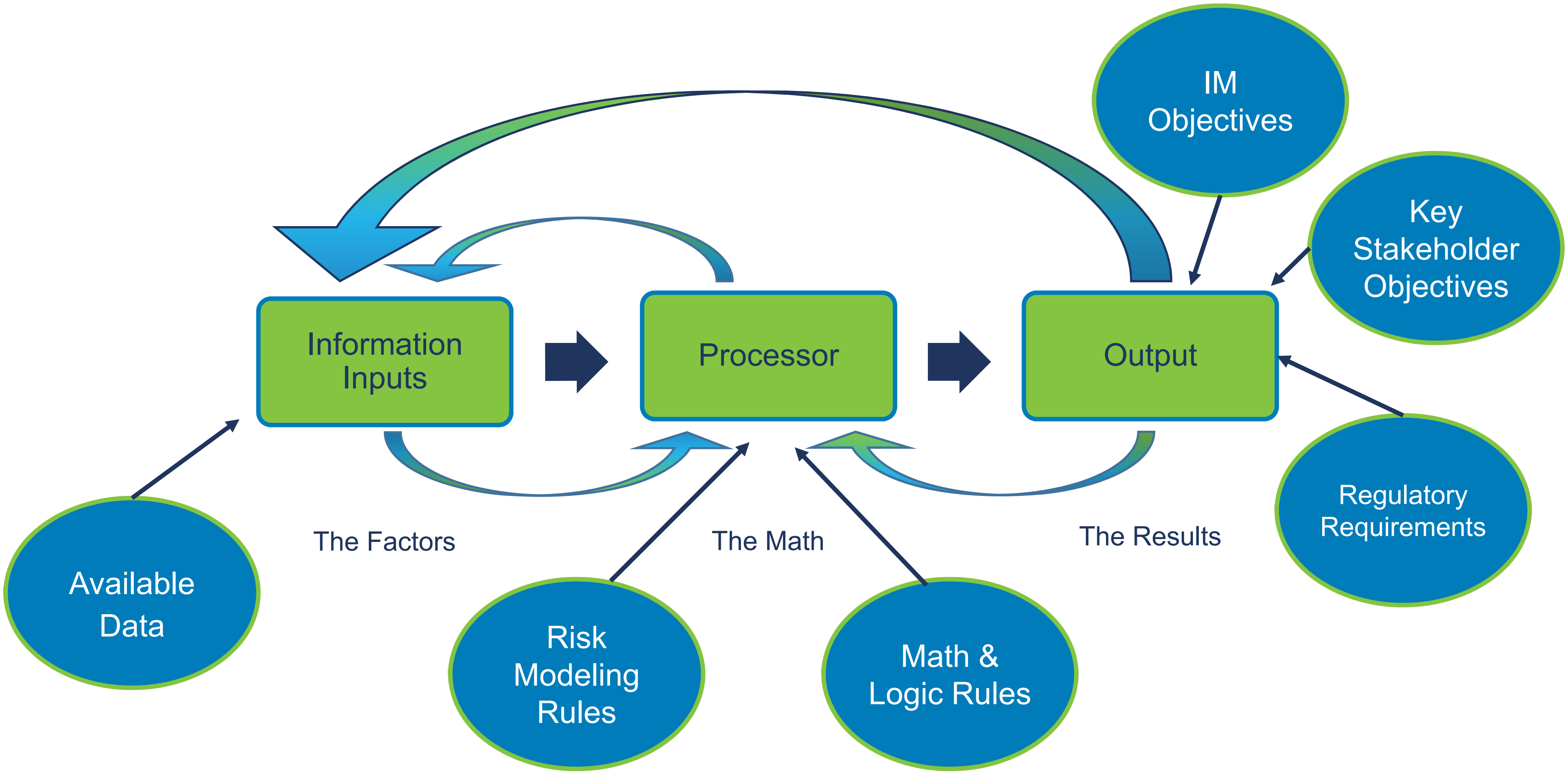
Quantitative Risk Models

- Quantitative Risk Models help reduce uncertainty in the decision making process, help support the decision making process

Quantitative Risk Models



Developing a Useful Risk Model



Developing a Useful Risk Model

- **What makes a model "useful"?**
  - Certain inherent rules we need to follow
  - These rules apply no matter what type of modeling approach we are applying
  - Why is this important?
    - GIGO
      - Garbage in ⟶ Garbage out
    - More than just GIGO
      - Perfect Data processed wrong ⟶ Garbage out

LPHC Event (Low Probability – High Consequence)

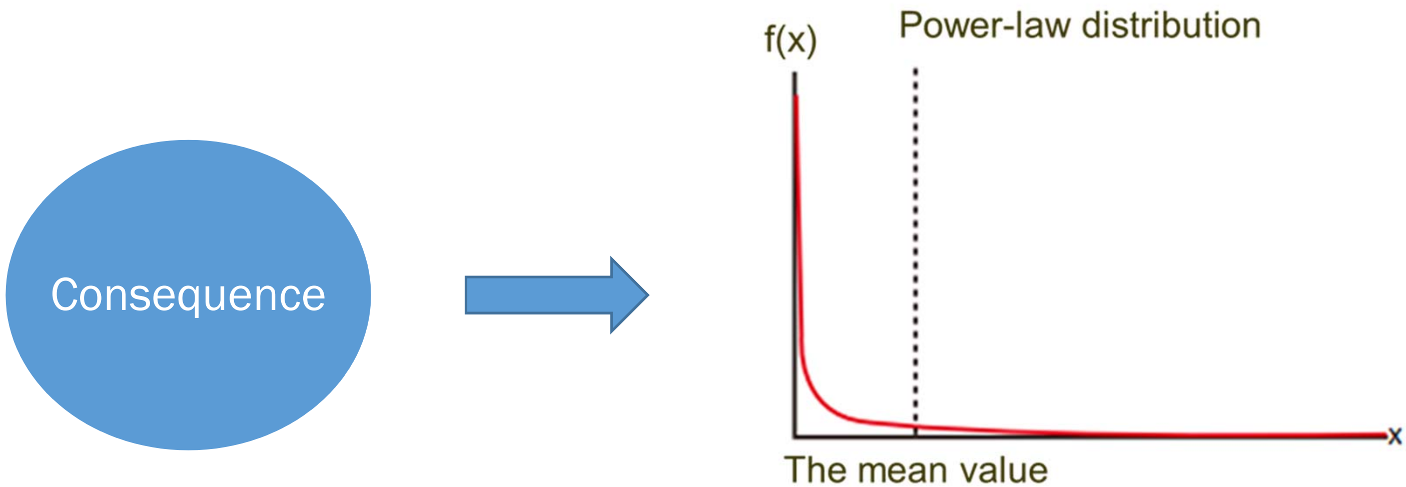
LPHC events dominate the risk in gas pipelines

- Top 1% of PHMSA reportable incidents account for 20% of reported property damage

↓

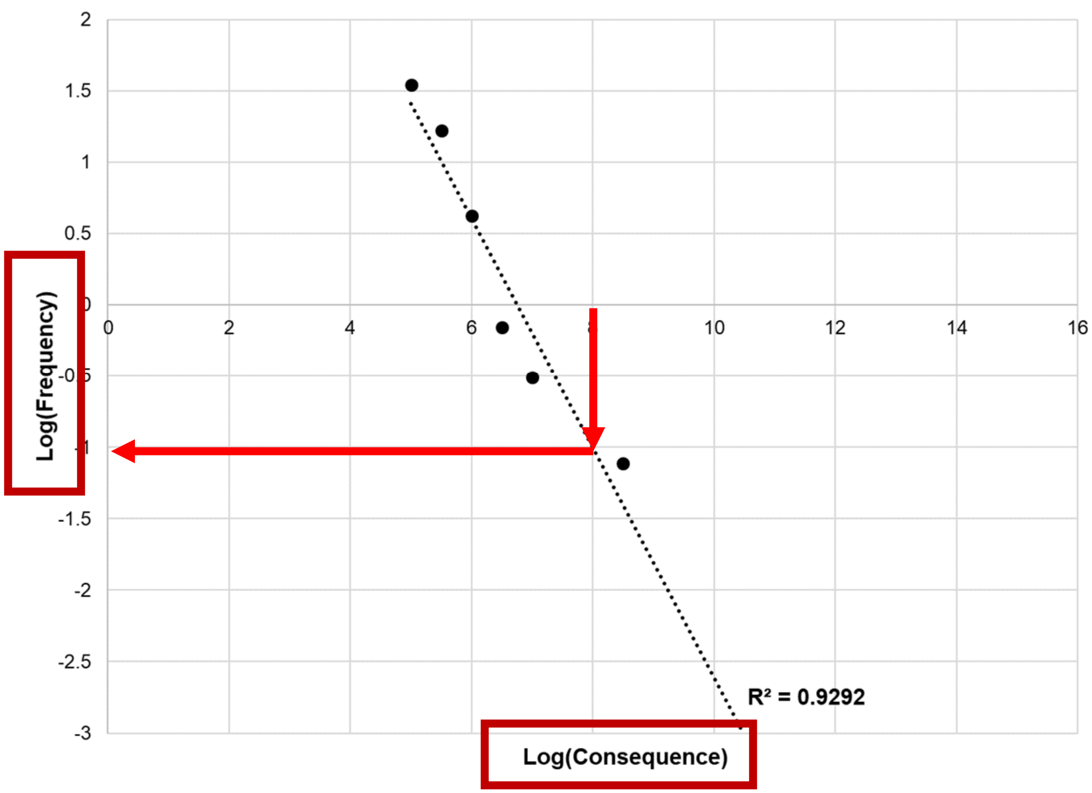
- It is necessary to include LPHC events in the overall risk analysis

Pareto or Power-Law Distribution



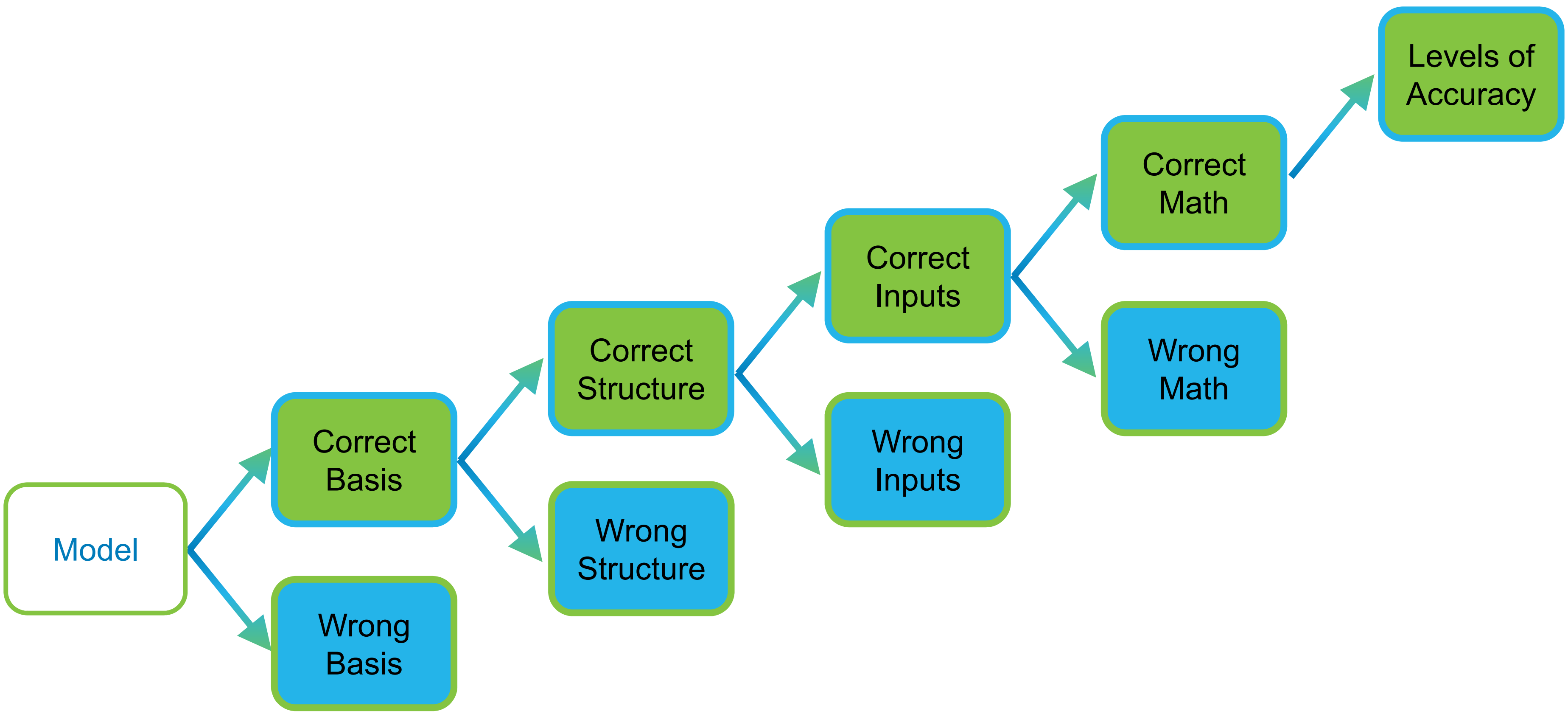
- Small number of incidents account for the majority of the overall risk

Power Law Curve for PHMSA Incidents (2004 – 2016)



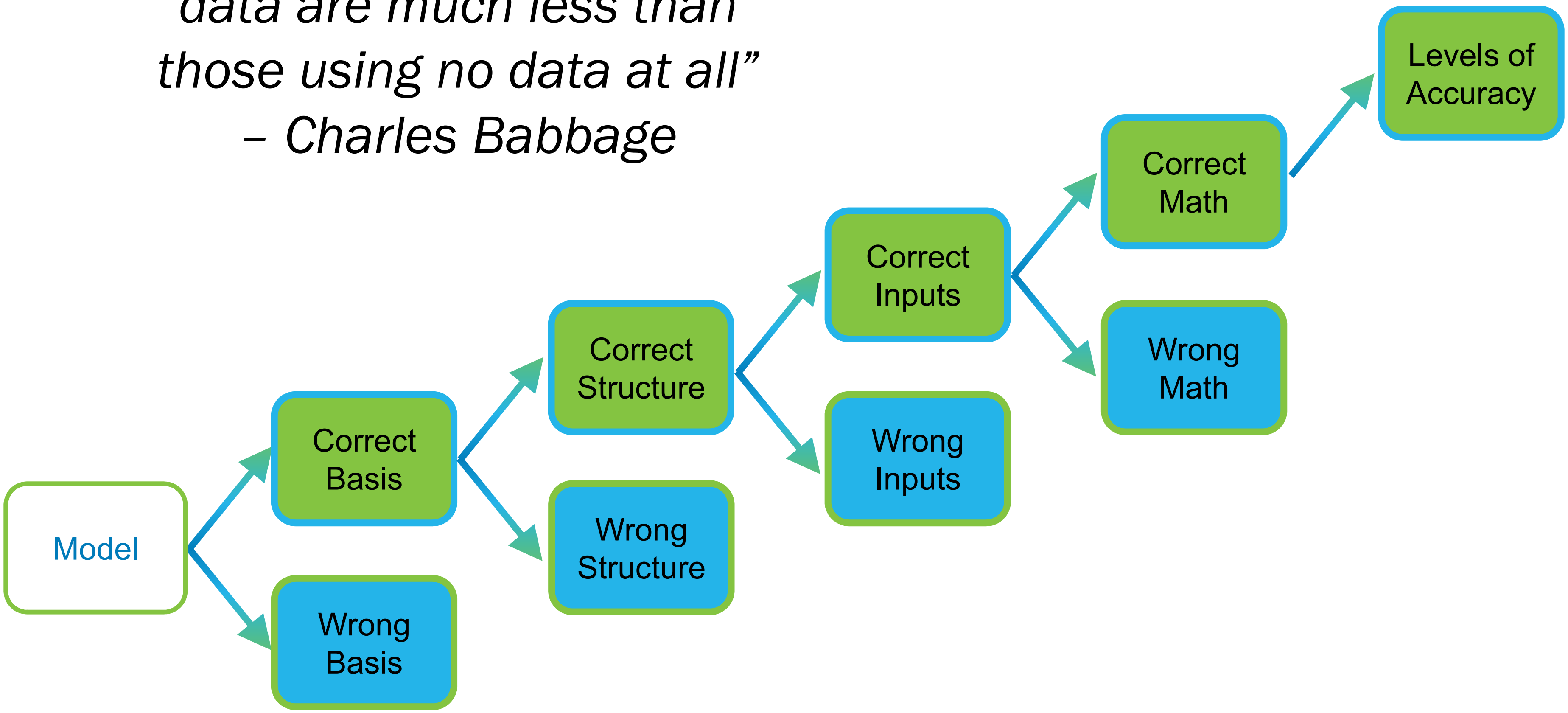
Power law curve defines the relationship between **frequency** & **incident size.**

Developing a Useful Risk Model



Developing a Useful Risk Model

"Errors using inadequate data are much less than those using no data at all"
– Charles Babbage



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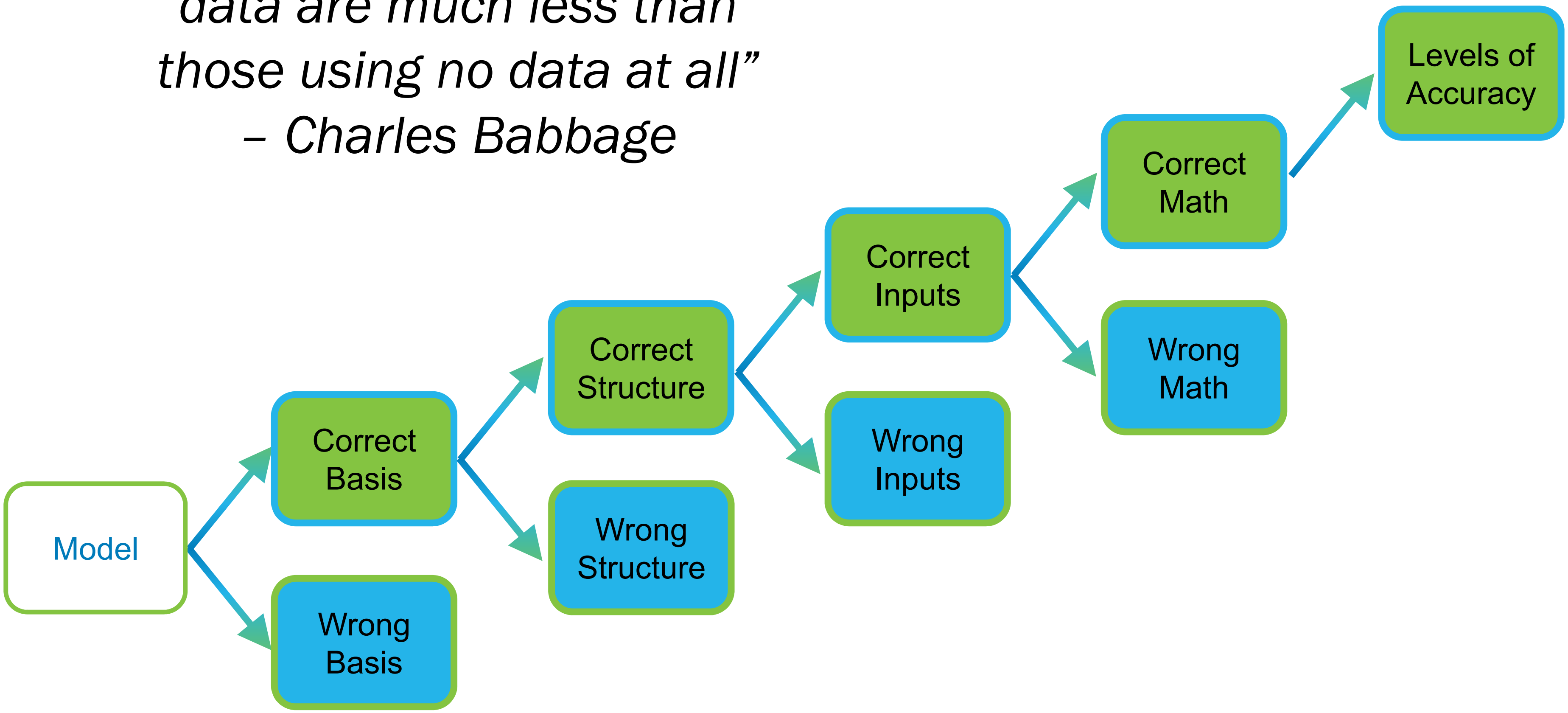
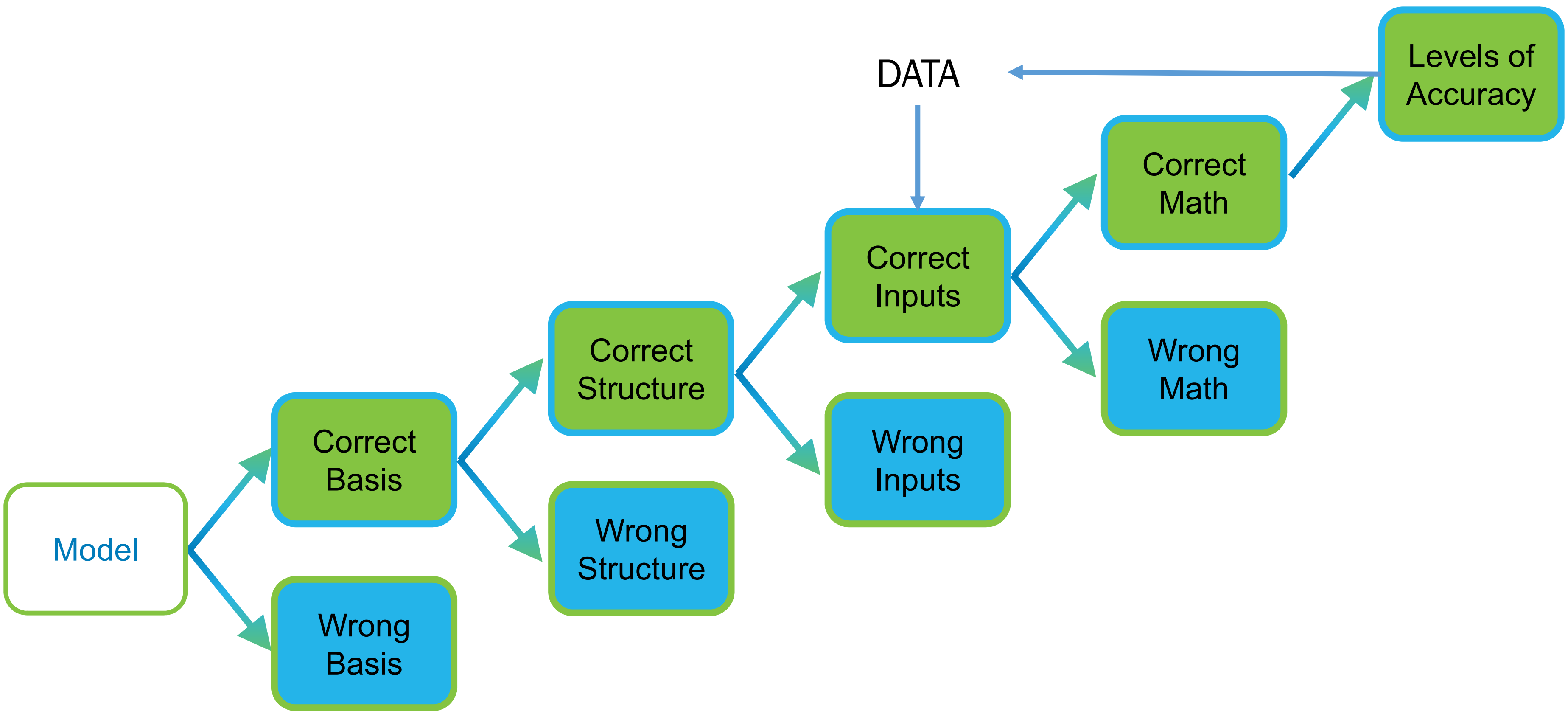


Developing a Useful Risk Model



Quantitative Risk Assessment

- QRA is an on-going process
- As risk is assessed, data gaps identified, prioritized and addressed the picture of risk becomes clearer and more refined
- It is a continual improvement process
- Example:
  - Initial risk assessment identified need to run In-Line Inspection
  - ILI provides more detailed data to conduct more refined assessment of risk
  - This enables higher level of integrity management

Quantitative Risk Assessment (QRA) Project

Ken Oliphant, Ph.D., P.Eng. (JANA Corporation), *Executive Vice President & Chief Technology Officer*

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QRA Project

BCUC Workshop

April 16th, 2019

Agenda

- Summary of QRA approach
- Risk Bask Asset and Integrity Management Framework
- Process Flow for Analysis

QRA Process

- System QRA of Coastal, Interior and Island Transmission Pipeline systems
- Assess Societal, Individual and Monetary risk
  - Societal Risk: Collective risk to all exposed individuals
  - Individual Risk: Risk to individual in proximity of pipeline
  - Monetary Risk: $ based summation of all risks
- First Iteration Assessment to:
  - Gain understanding of system risk
  - Identify target lines for crack management
  - Feed into Optimized Infrastructure Planning Process
  - Direct Data Project

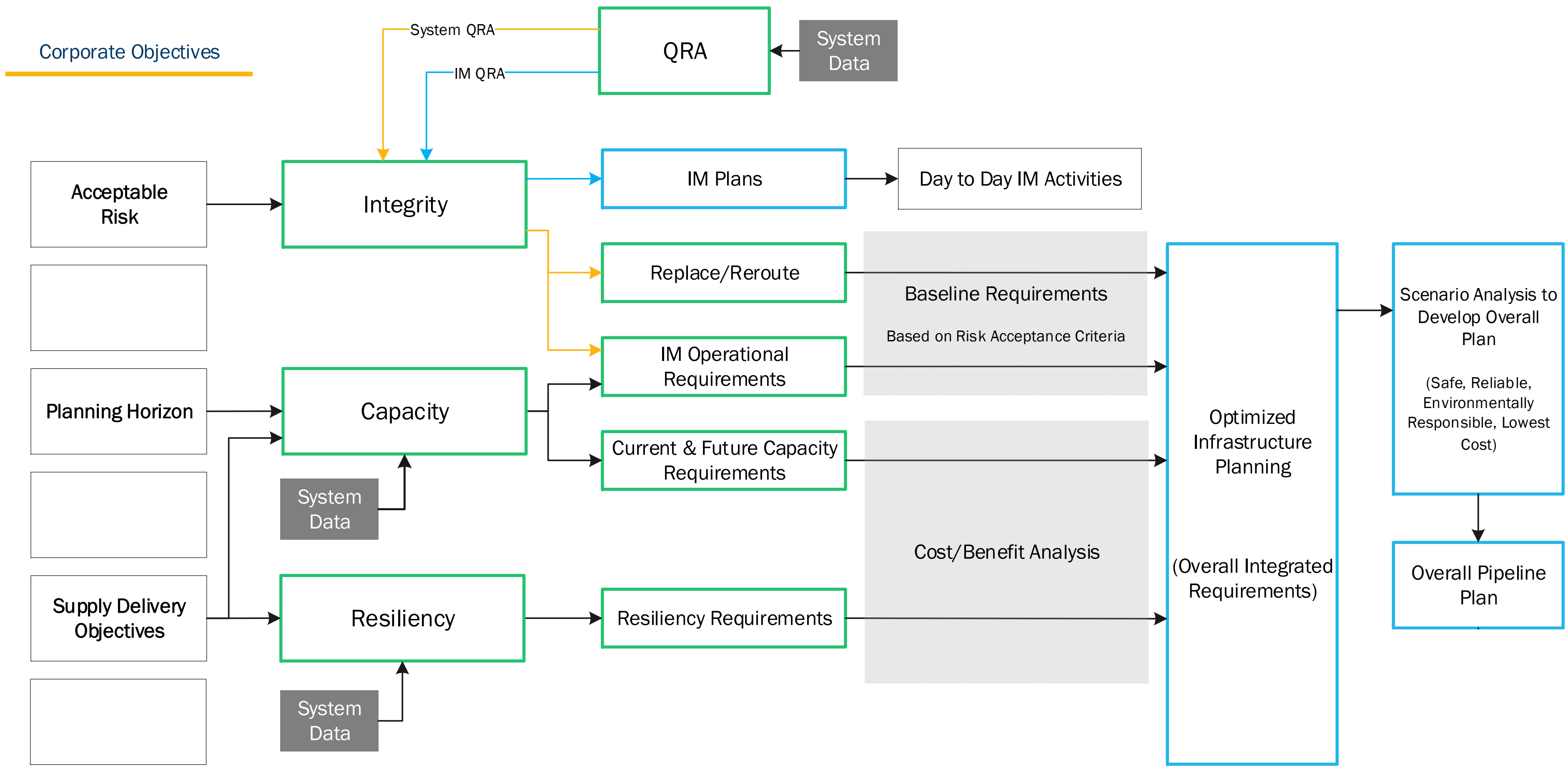
QRA Process

- Quantitative Risk Assessment
  - Assessing all threats
  - Roughly 70,000 individual pipeline segments
  - Over 4 million risk outputs
  - Multiple assessment approaches and sensitivity analysis used to assess output uncertainty

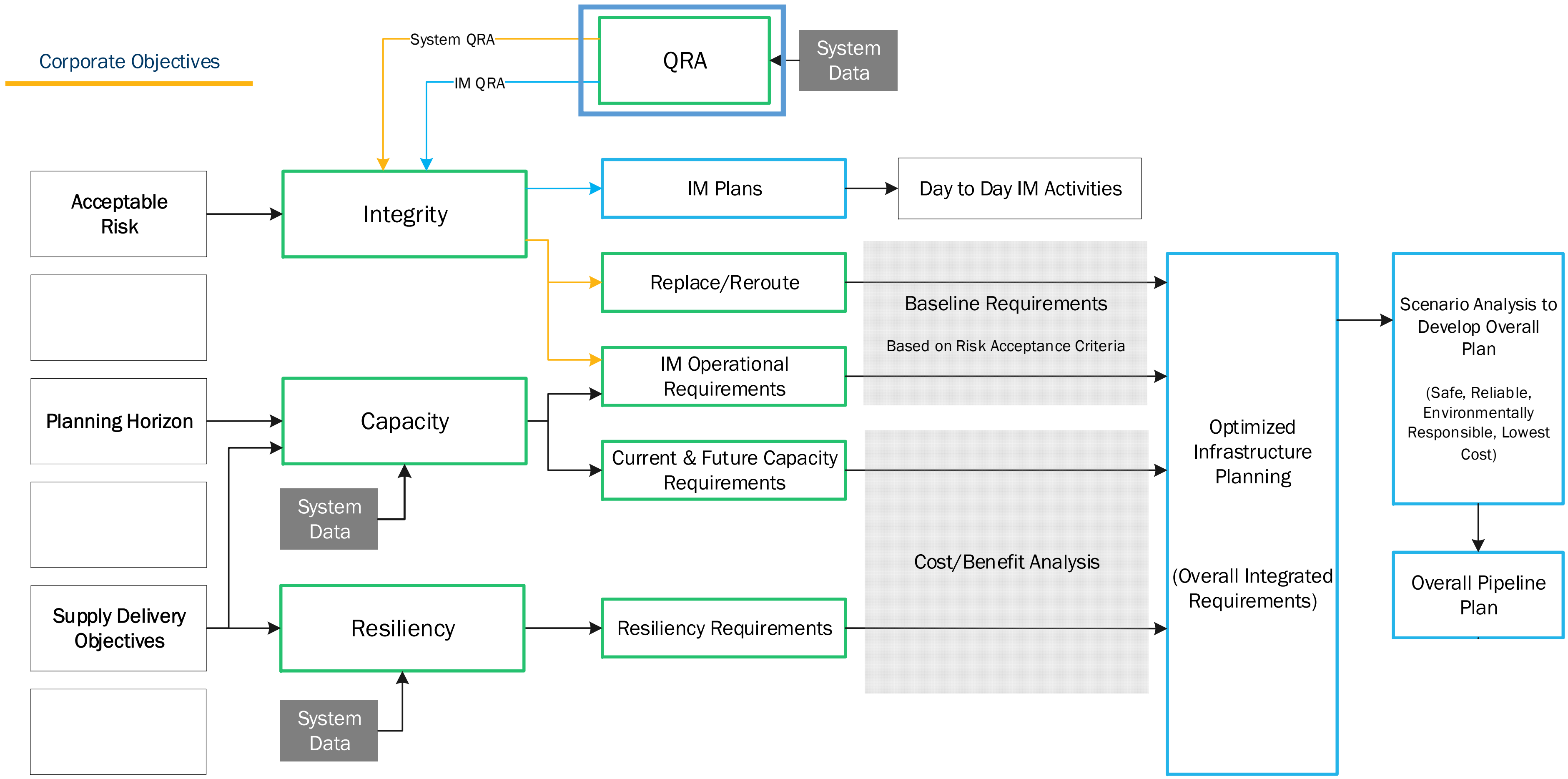
Risk Based Asset and Integrity Management Framework

- System QRA outputs used to guide decision making process for identifying required crack management capabilities and potential system upgrades
- As all threats considered in QRA, also used to identify other potential threat management approaches that may be required

Risk Based Asset and Integrity Management Framework



Risk Based Asset and Integrity Management Framework



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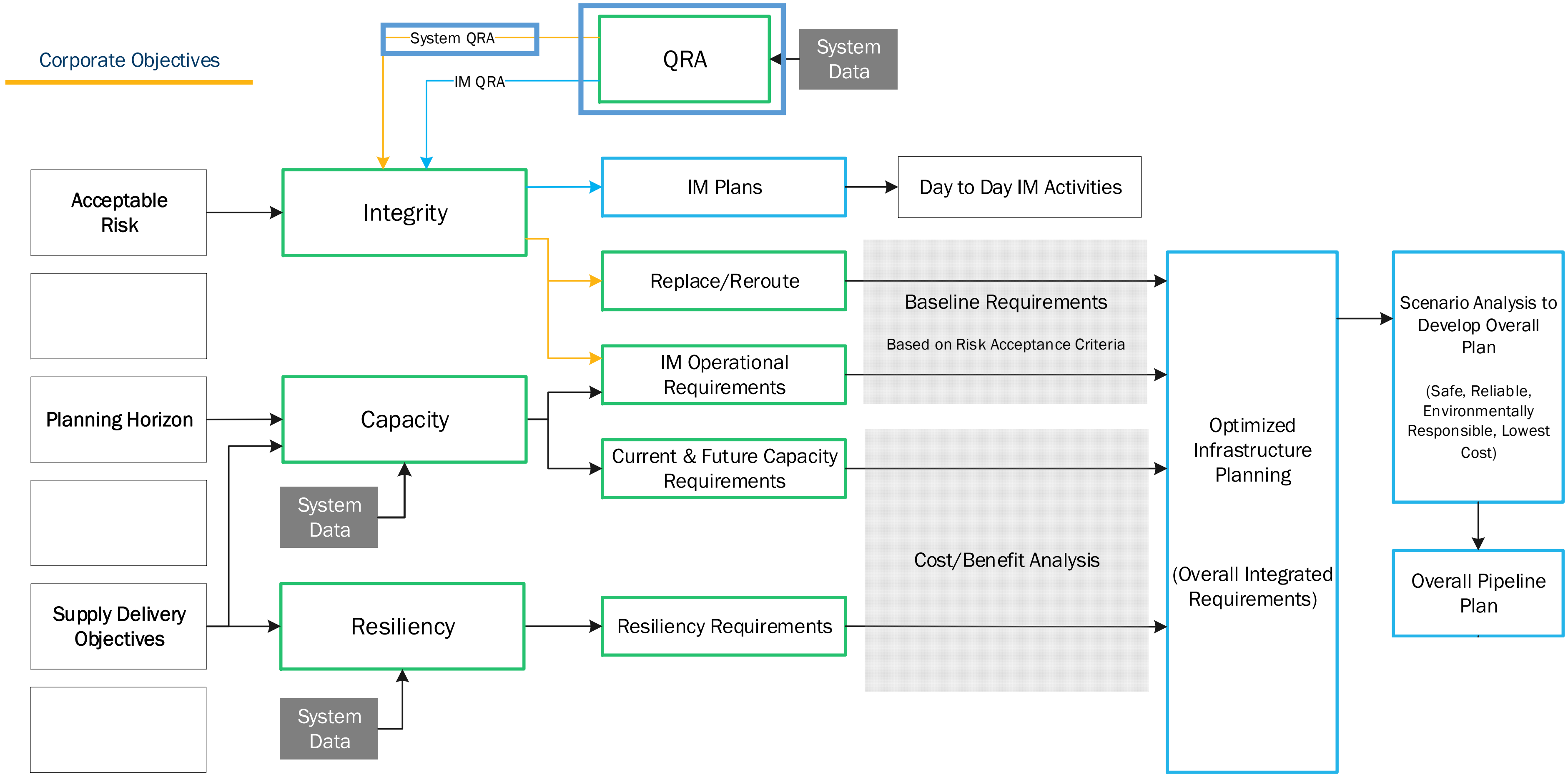

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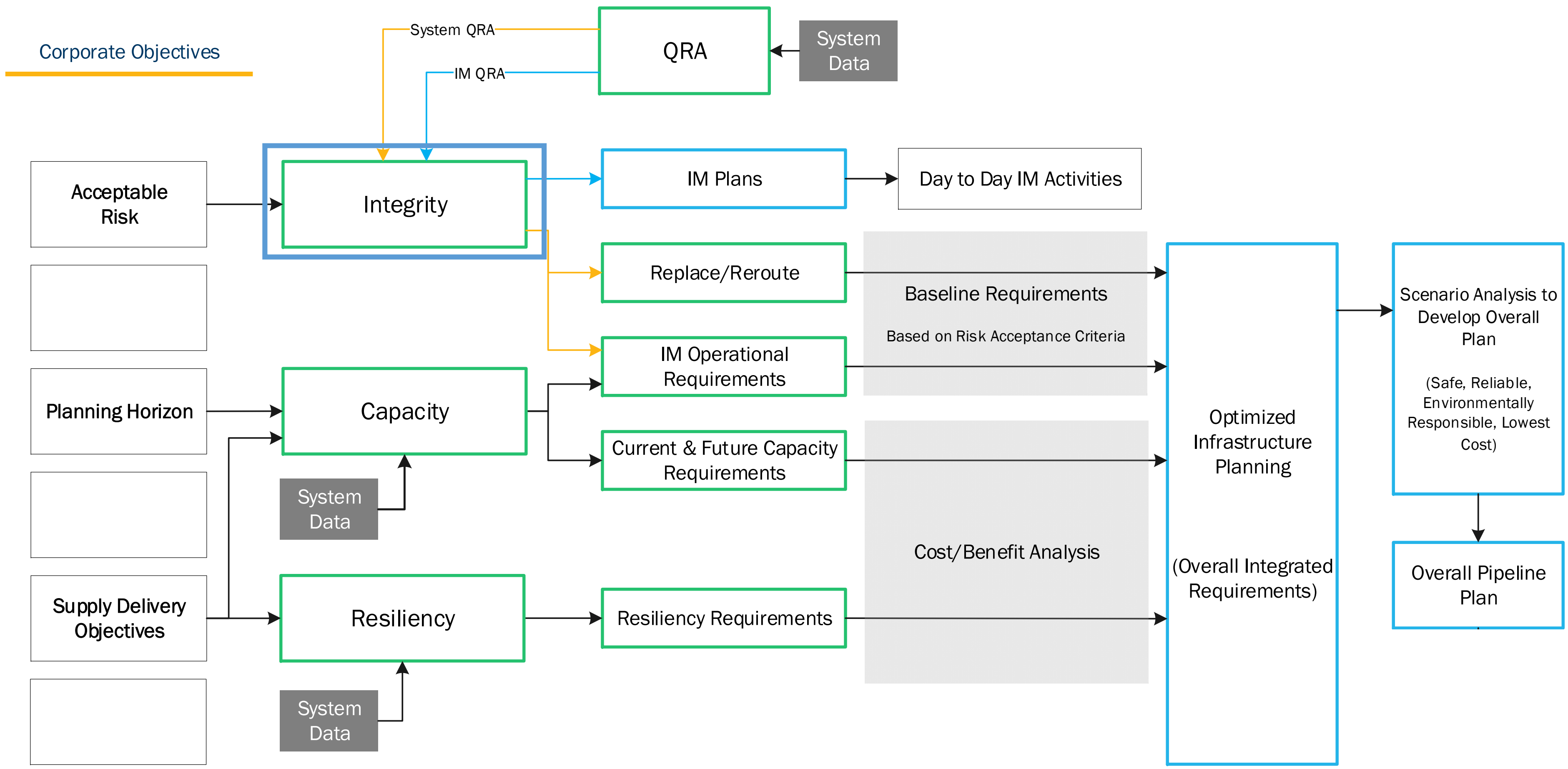

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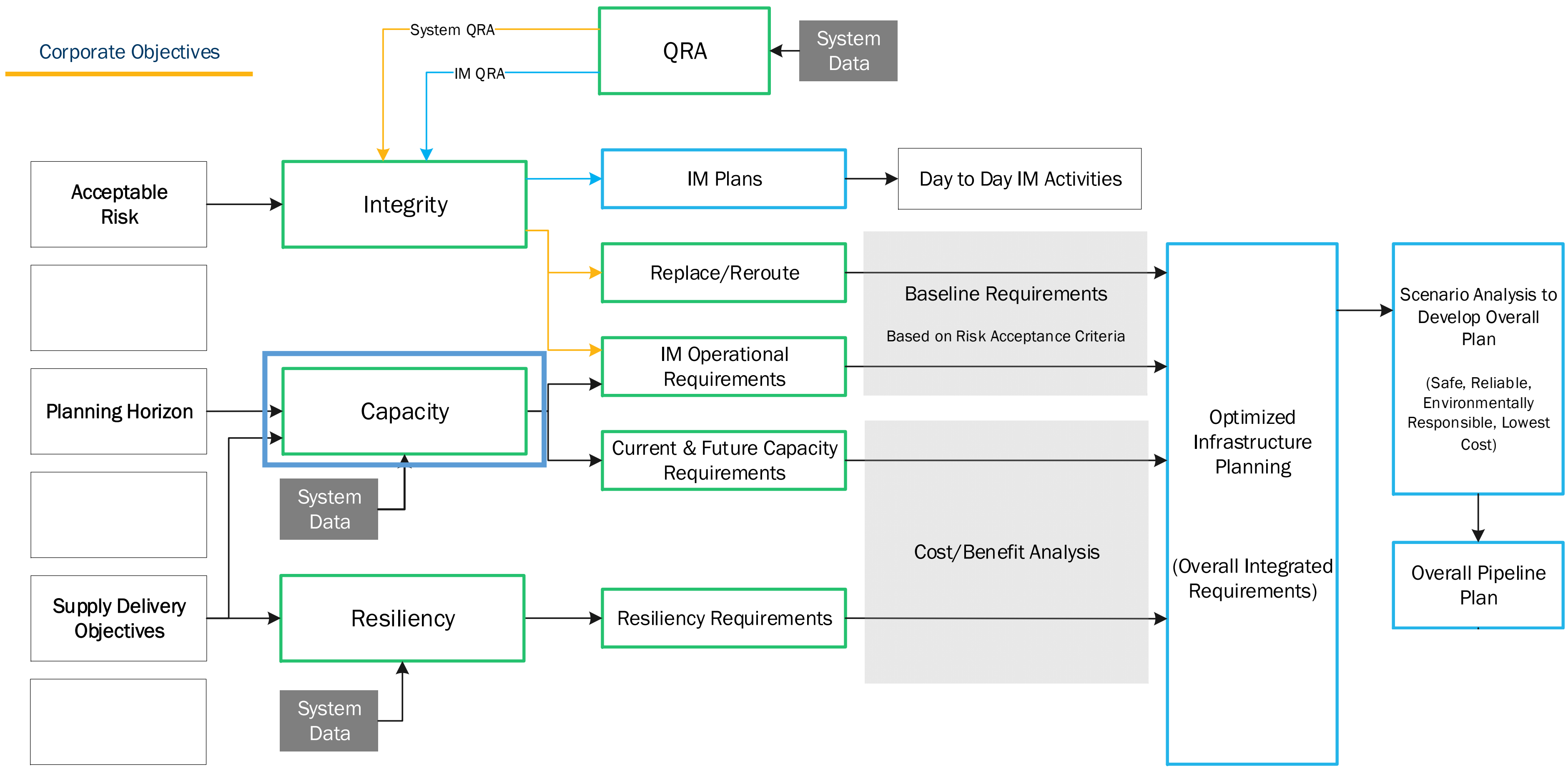
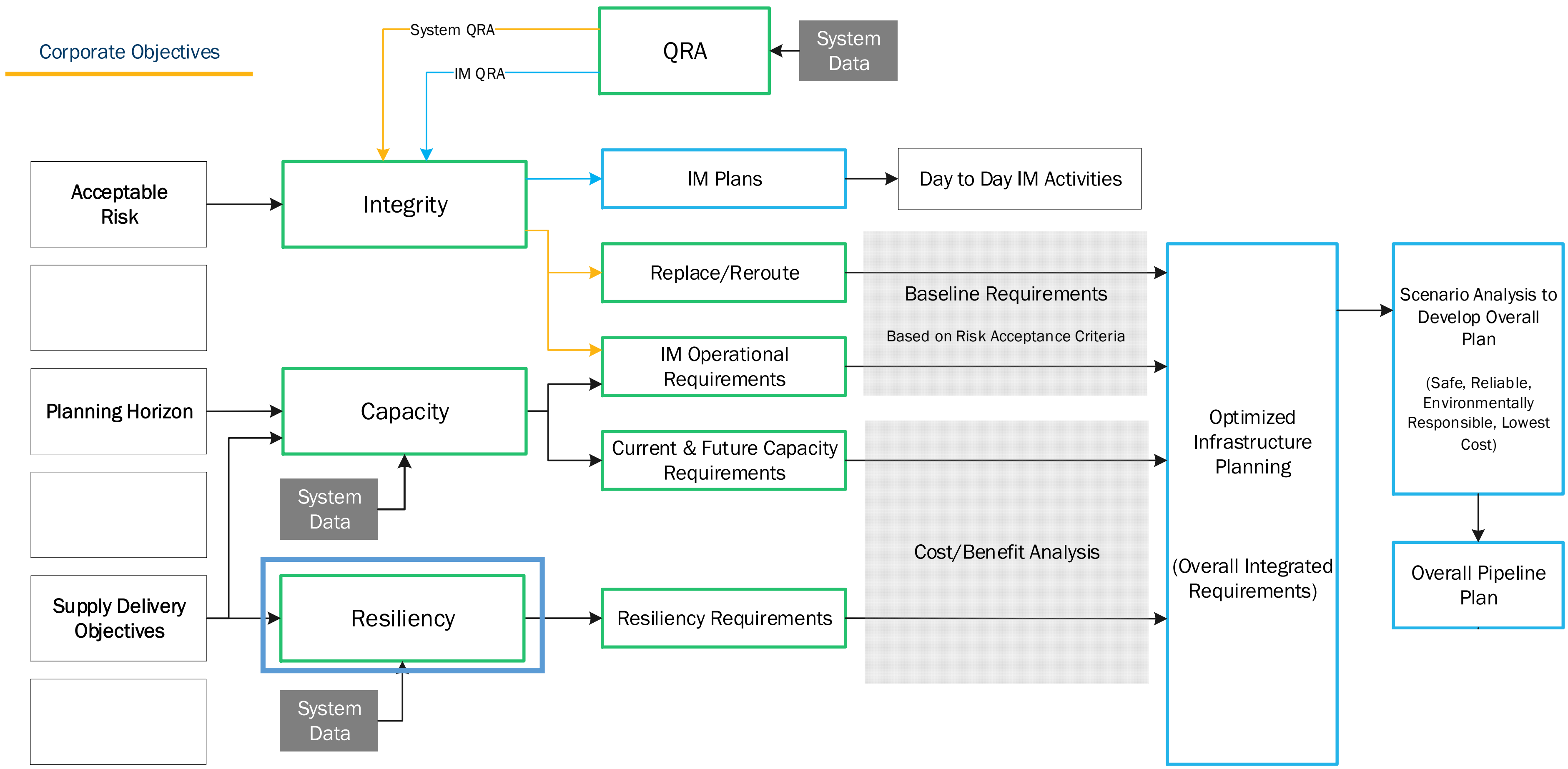
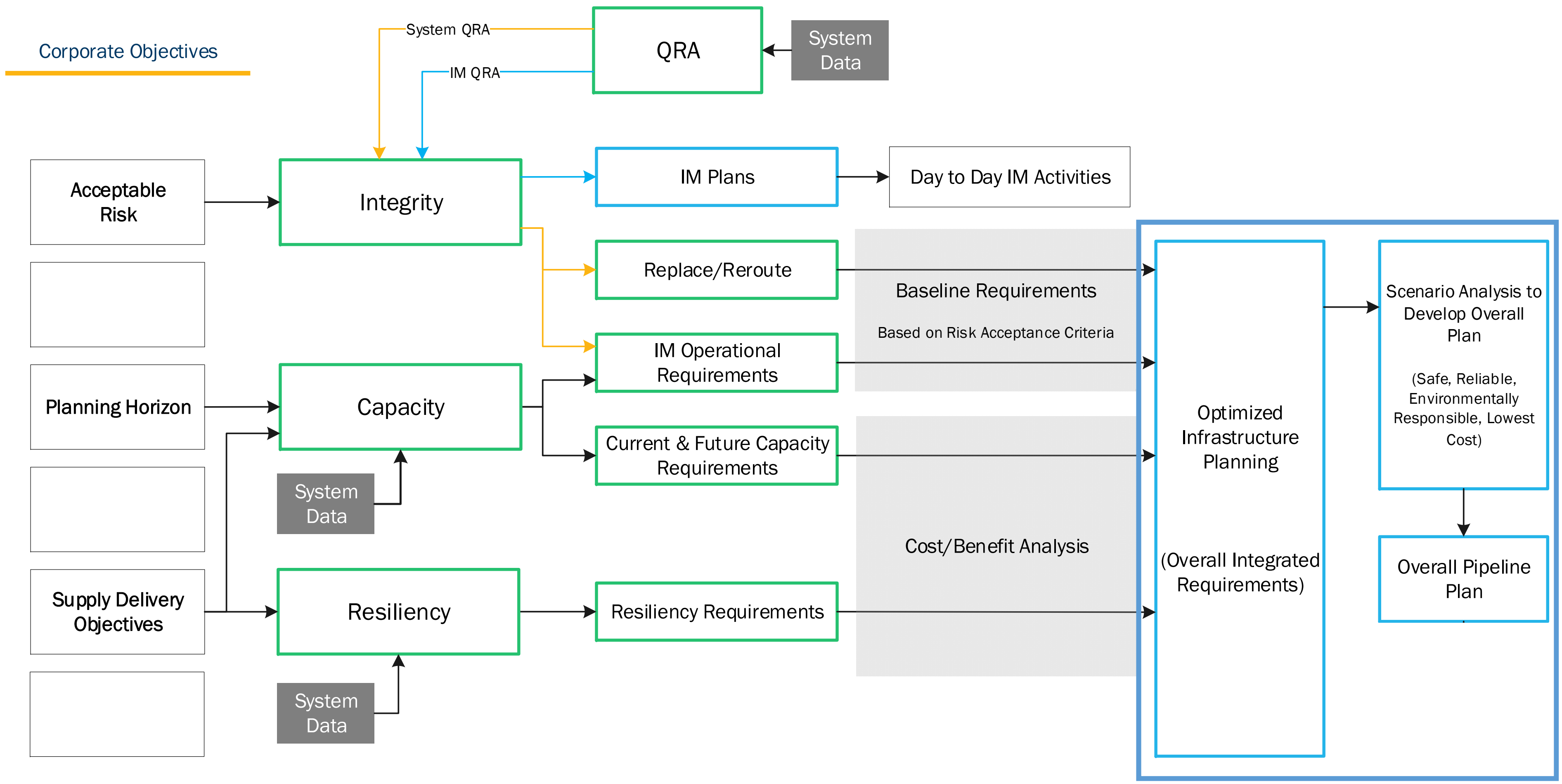


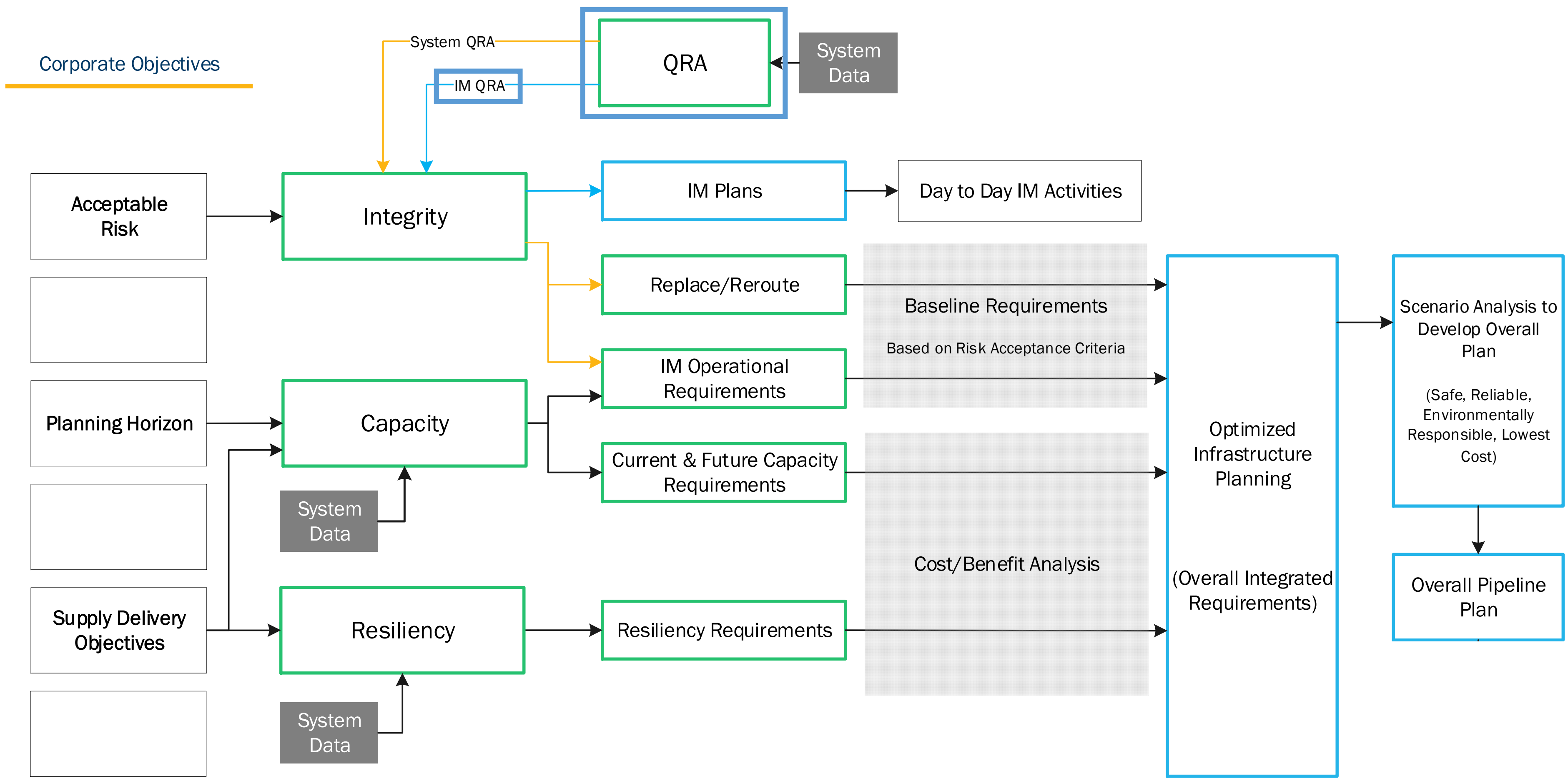
Framework Overview



Framework Overview



Risk Based Asset and Integrity Management Framework



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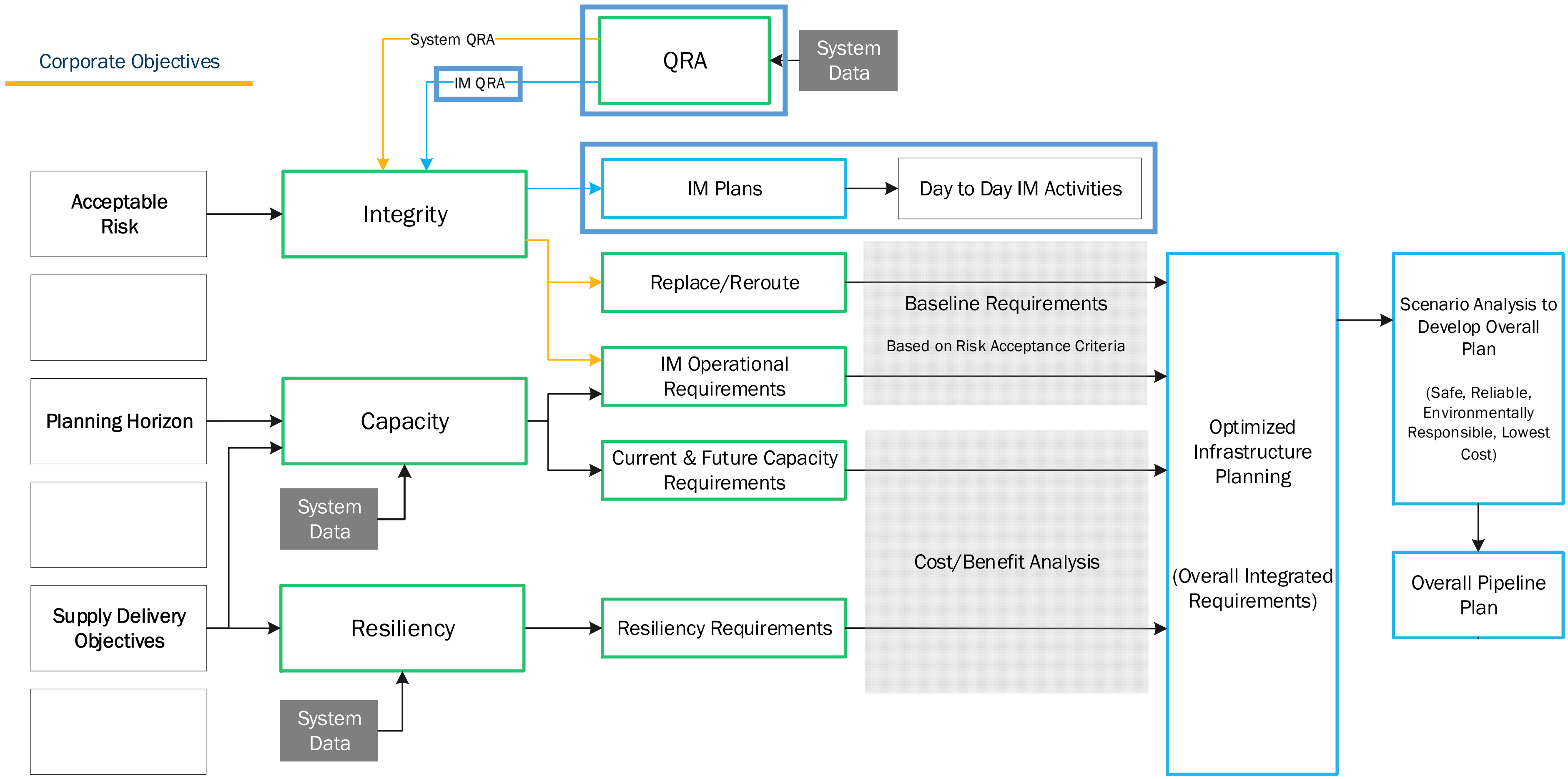
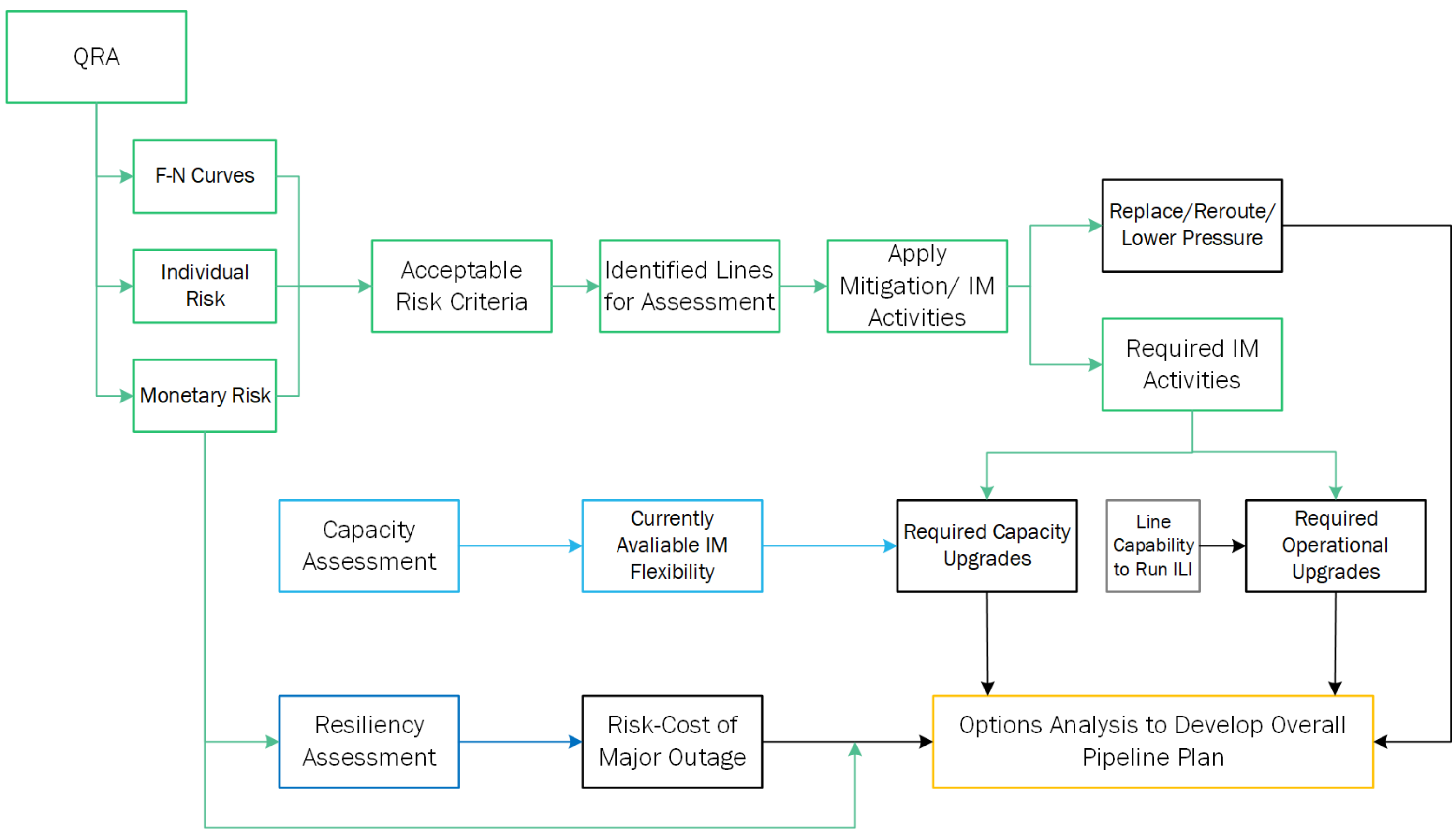


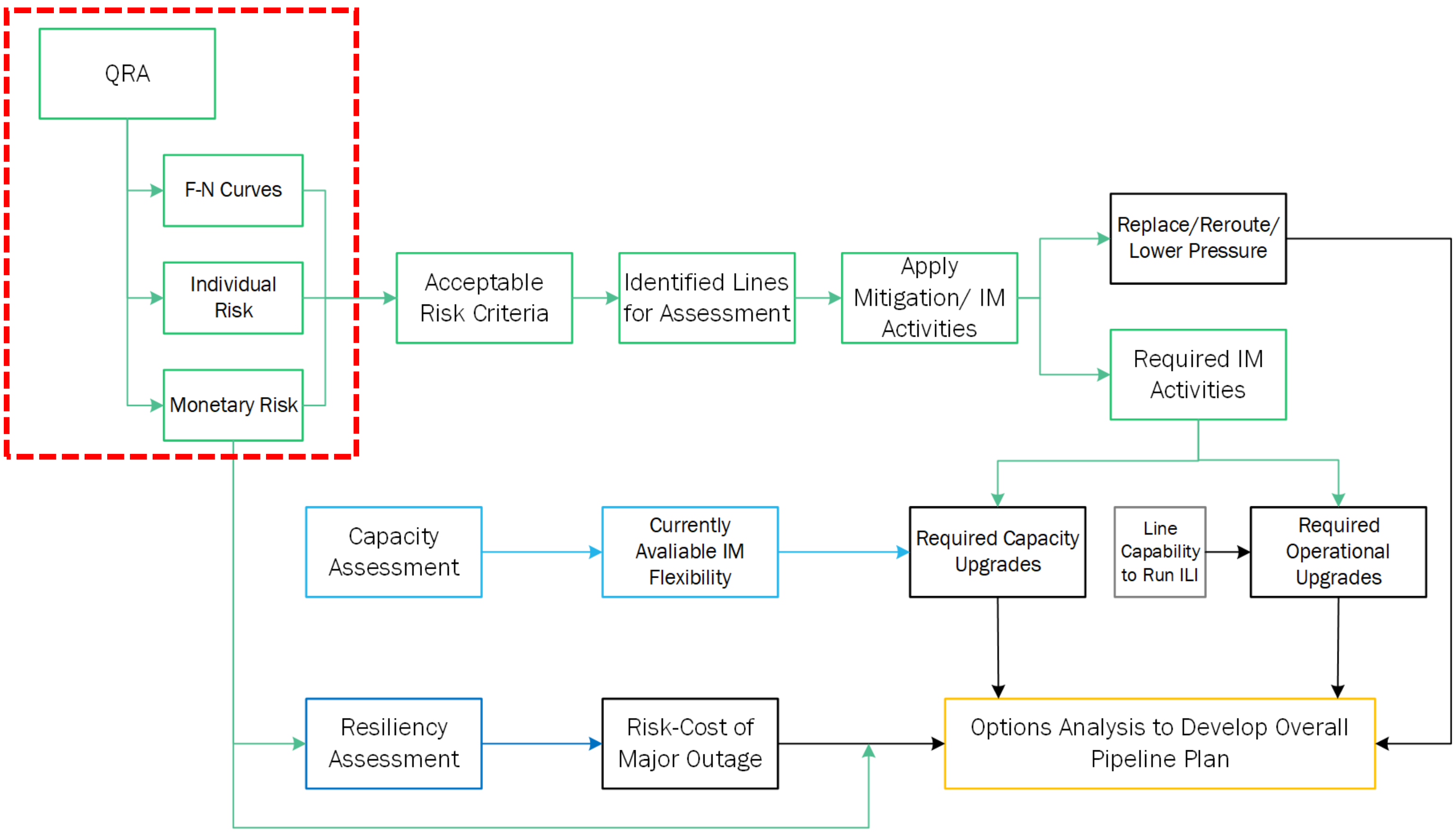
Optimized Infrastructure Assessment

- **Process Flow**



Optimized Infrastructure Assessment

- **Process Flow**

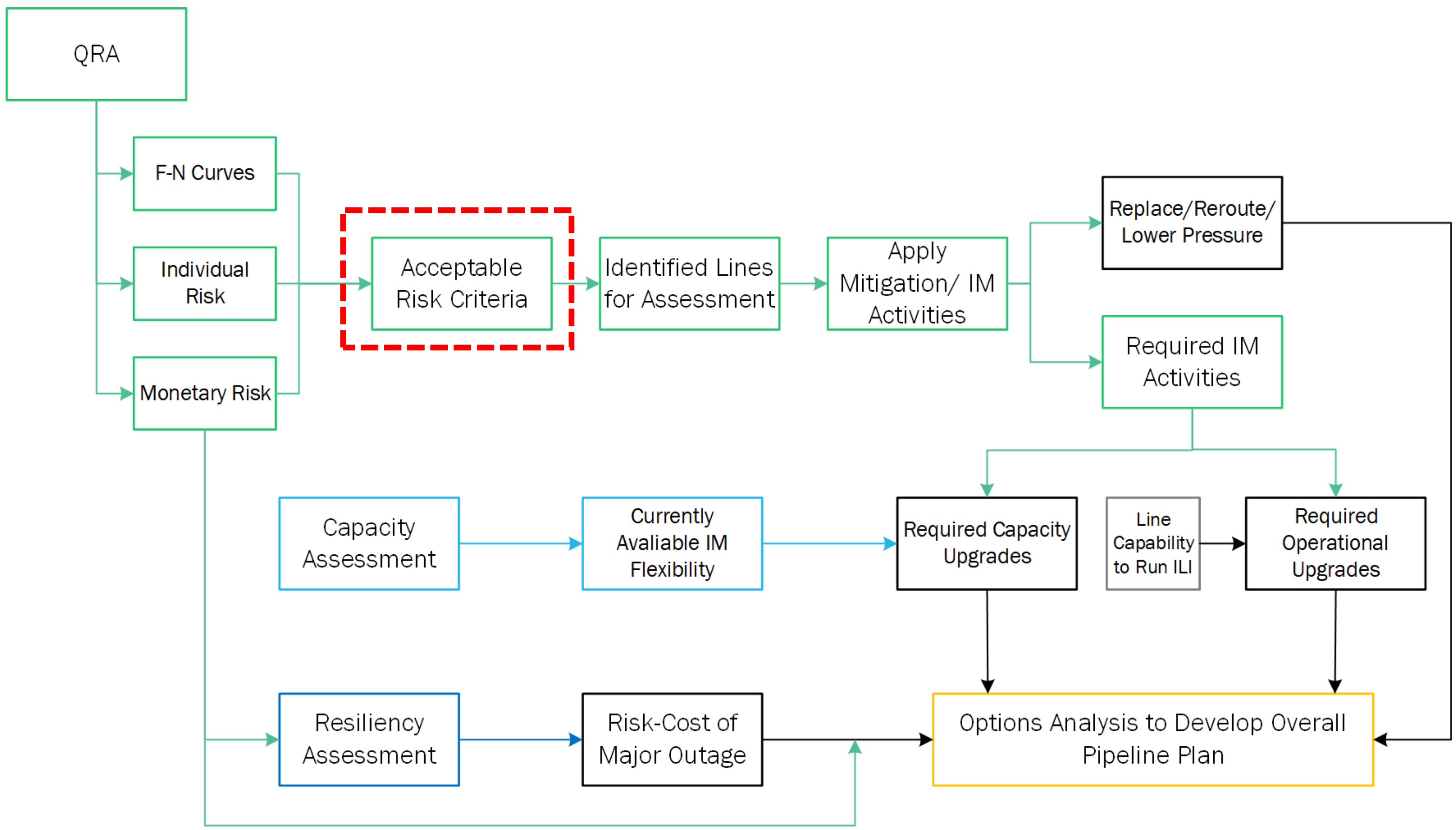


QRA Results

- The QRA results feed into overall process
- Societal Risk
  - F-N Curves
- Individual Risk
  - Individual Risk values
- Monetary Risk
  - Used in Cost-Benefit analysis of scenarios
  - Used in Resiliency Assessment

Optimized Infrastructure Assessment

- **Process Flow**



Risk Acceptance Criteria

Acceptable Risk Criteria

- ALARP (As Low As Reasonably Practicable) criteria under development by CSA Z662 Task Group

Risk Acceptance Criteria

Acceptable Risk Criteria

- ALARP (As Low As Reasonably Practicable) criteria under development by CSA Z662 Task Group

- Risk-informed decision framework used to determine if and how much risk mitigation is needed in a way that balances safety with cost

Risk Acceptance Criteria
Acceptable Risk Criteria

- Based on defining three criteria for Individual and Societal Risk

Risk Acceptance Criteria
Acceptable Risk Criteria

- Based on defining three criteria for Individual and Societal Risk
- Broadly Acceptable Risk Criteria
  - Risk below this level is considered to be acceptable from health and safety side, action taking for compliance, other factors

Risk Acceptance Criteria

Acceptable Risk Criteria

- Based on defining three criteria for Individual and Societal Risk
- Broadly Acceptable Risk Criteria
  - Risk below this level is considered to be acceptable from health and safety side, action taking for compliance, other factors
- Maximum Tolerable Risk Criteria
  - Risk above this level is considered unacceptable and must be addressed regardless of cost

Risk Acceptance Criteria

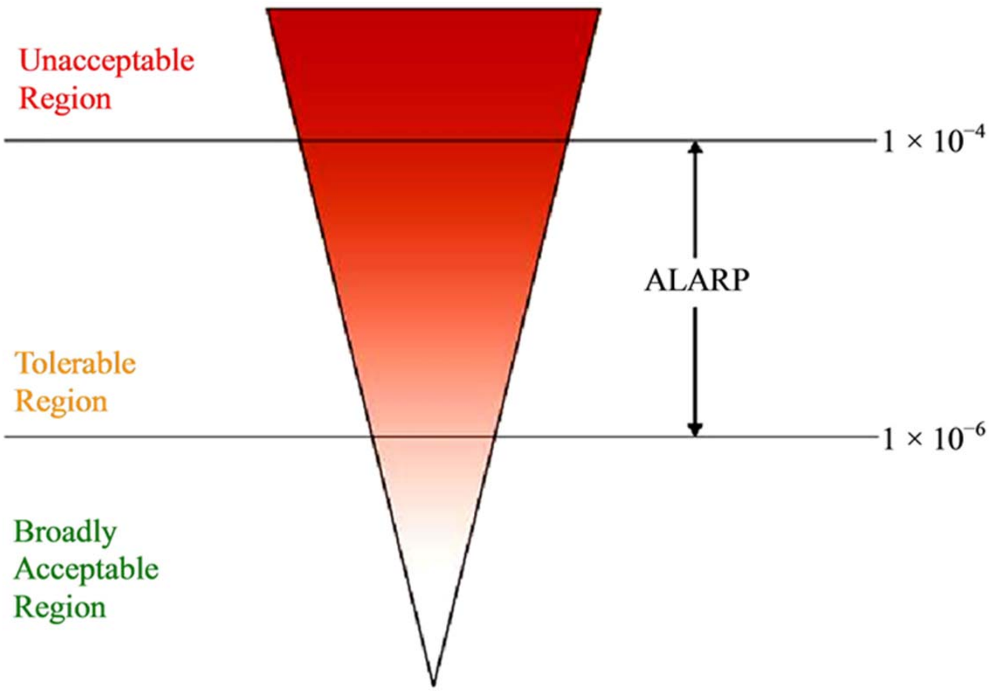
Acceptable Risk Criteria

- **Based on defining three criteria for Individual and Societal Risk**
- **Broadly Acceptable Risk Criteria**
  - Risk below this level is considered to be acceptable from health and safety side, action taking for compliance, other factors
- **Maximum Tolerable Risk Criteria**
  - Risk above this level is considered unacceptable and must be addressed regardless of cost
- **ALARP**
  - The region between the two is considered ALARP, risk should be addressed until cost 'disproportionally' exceeds the benefit

Risk Acceptance Criteria

Acceptable Risk Criteria

- Individual Risk (Risk to individual in proximity of pipeline)
    - Criteria relatively consistent worldwide

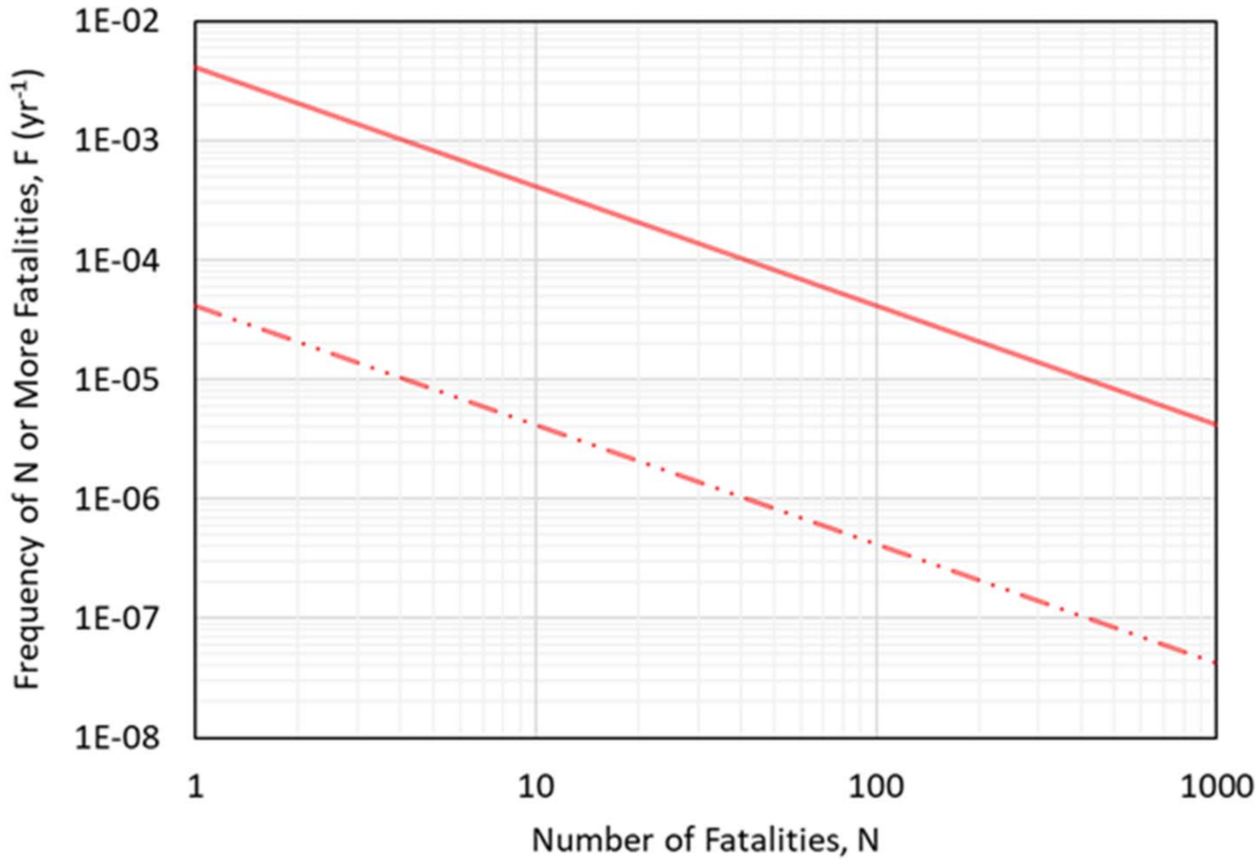


Risk Acceptance Criteria
Acceptable Risk Criteria

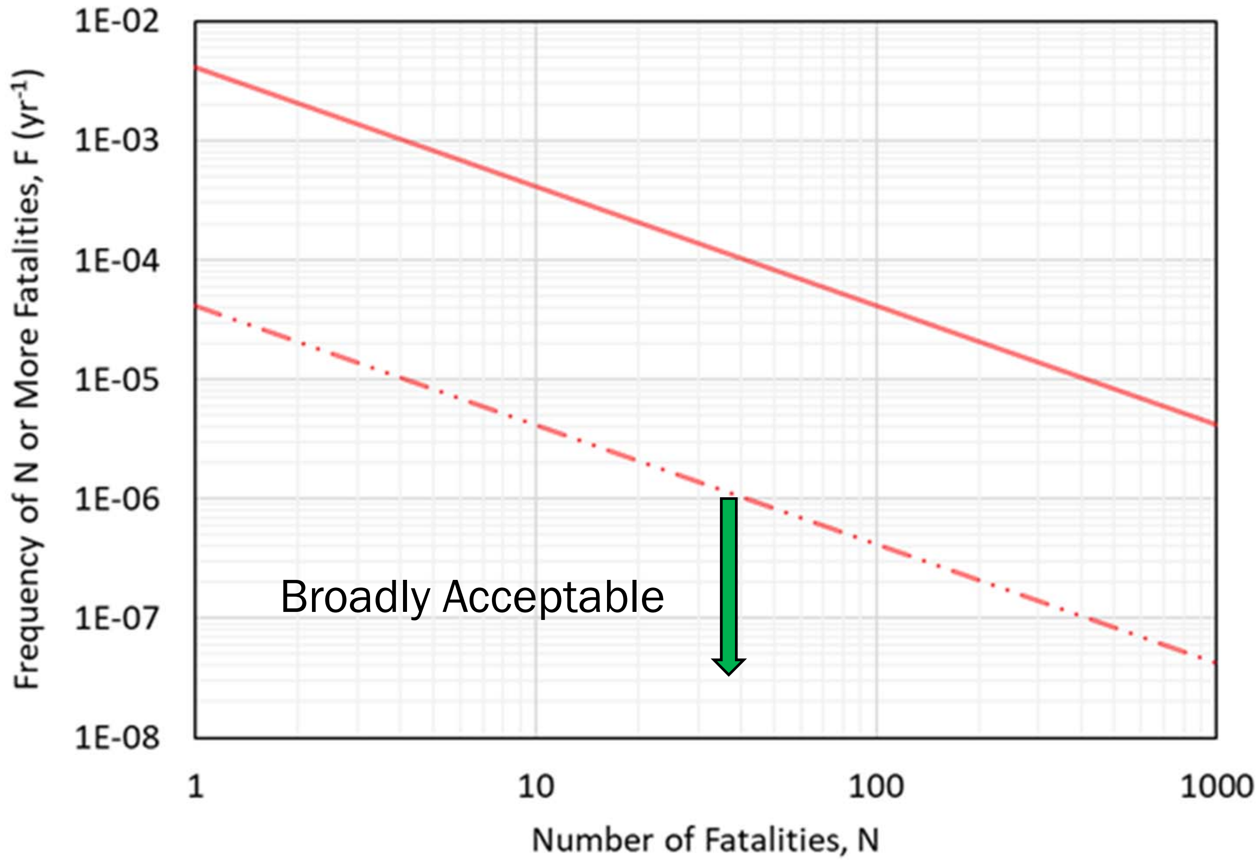
- Societal Risk:
  - Being developed with CSA Z662 Task Group
  - Defined in terms of F-N curve
    - Frequency-fatalities cumulative distribution curve

Risk Acceptance Criteria

Acceptable Risk Criteria

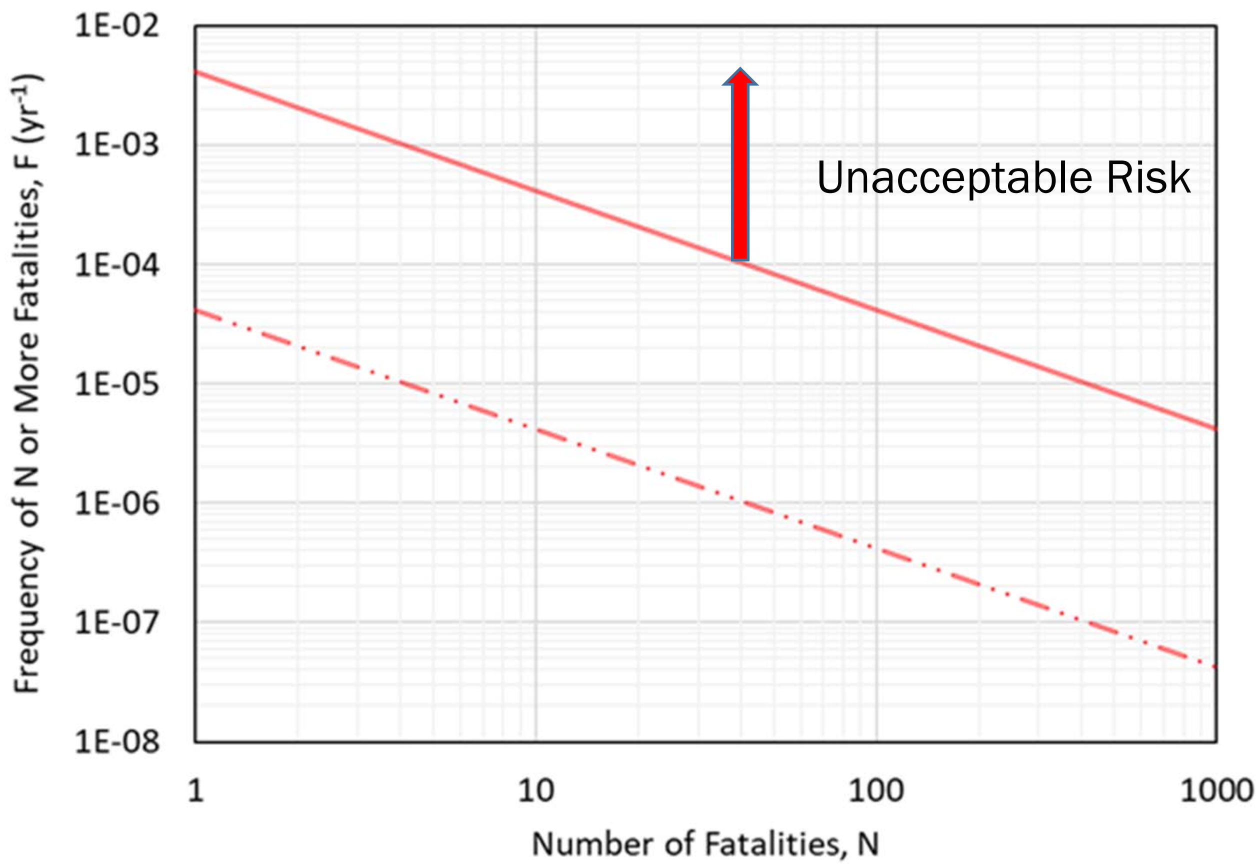


Risk Acceptance Criteria
Acceptable Risk Criteria



Risk Acceptance Criteria

Acceptable Risk Criteria



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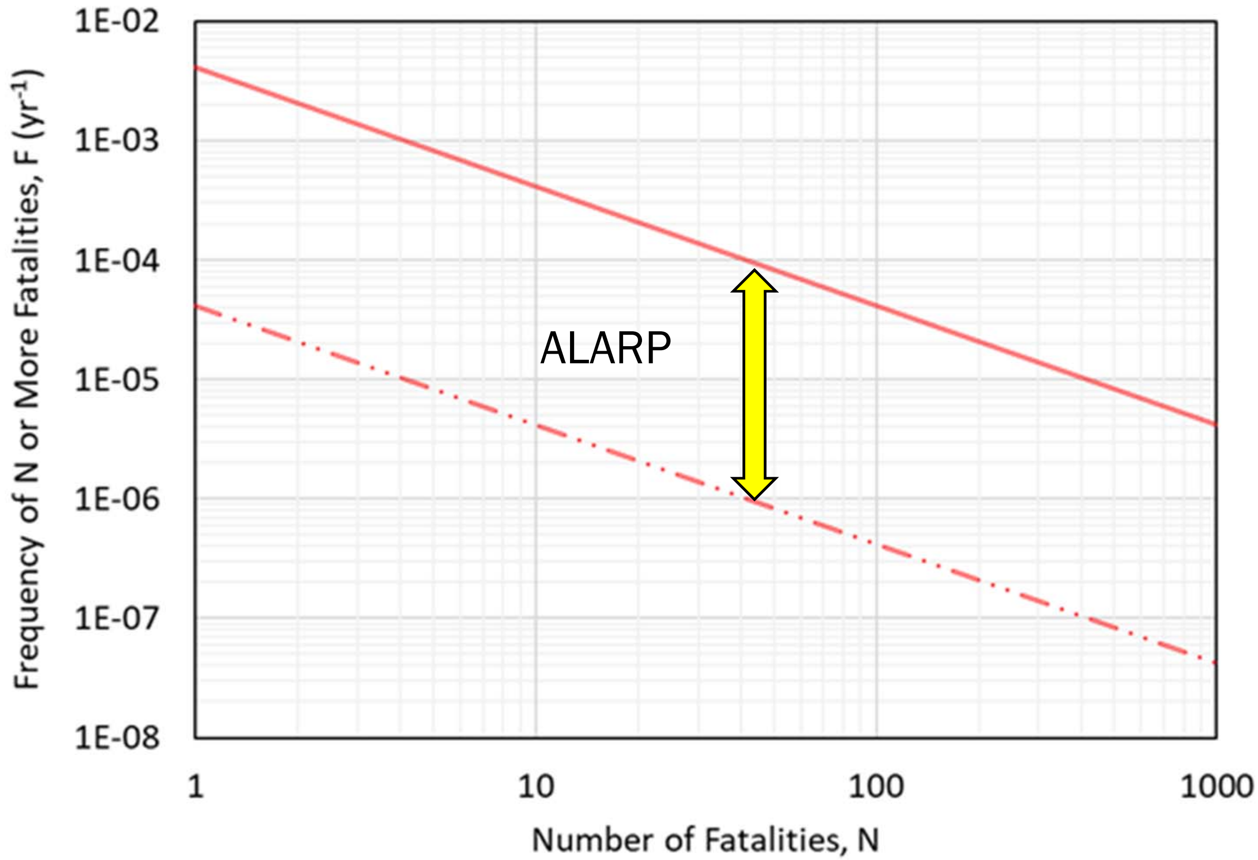

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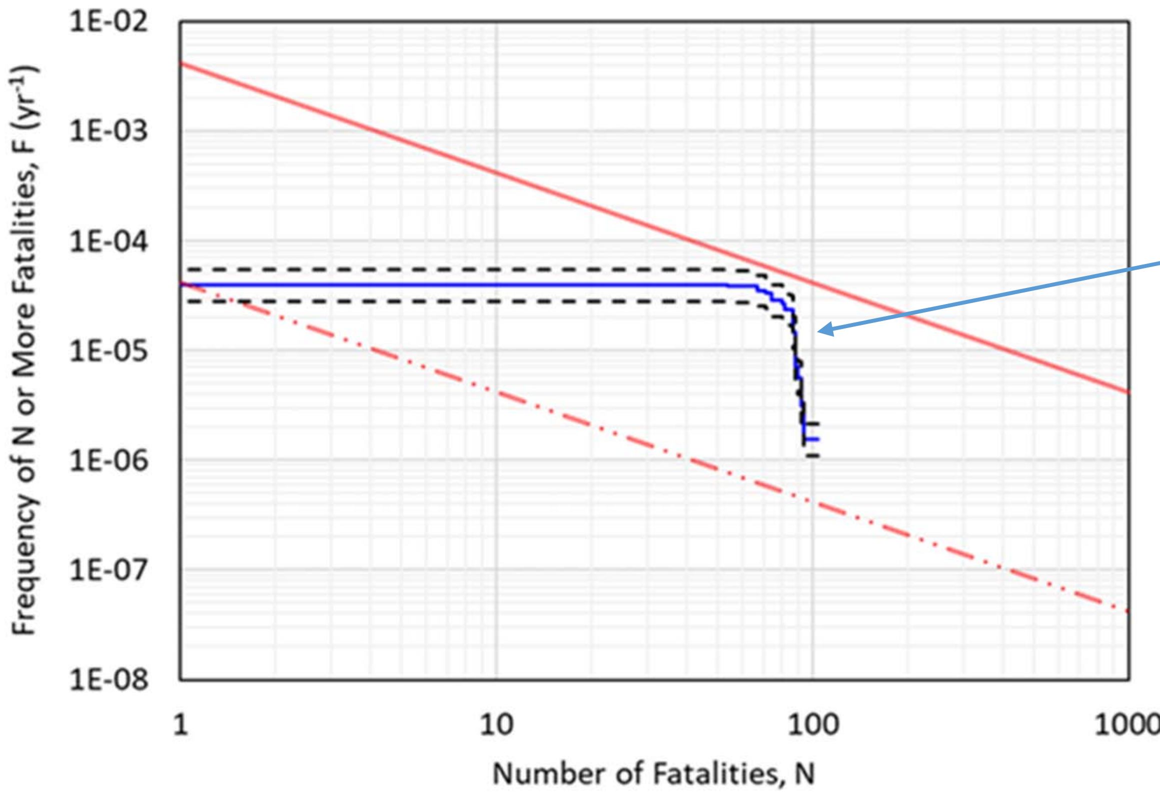
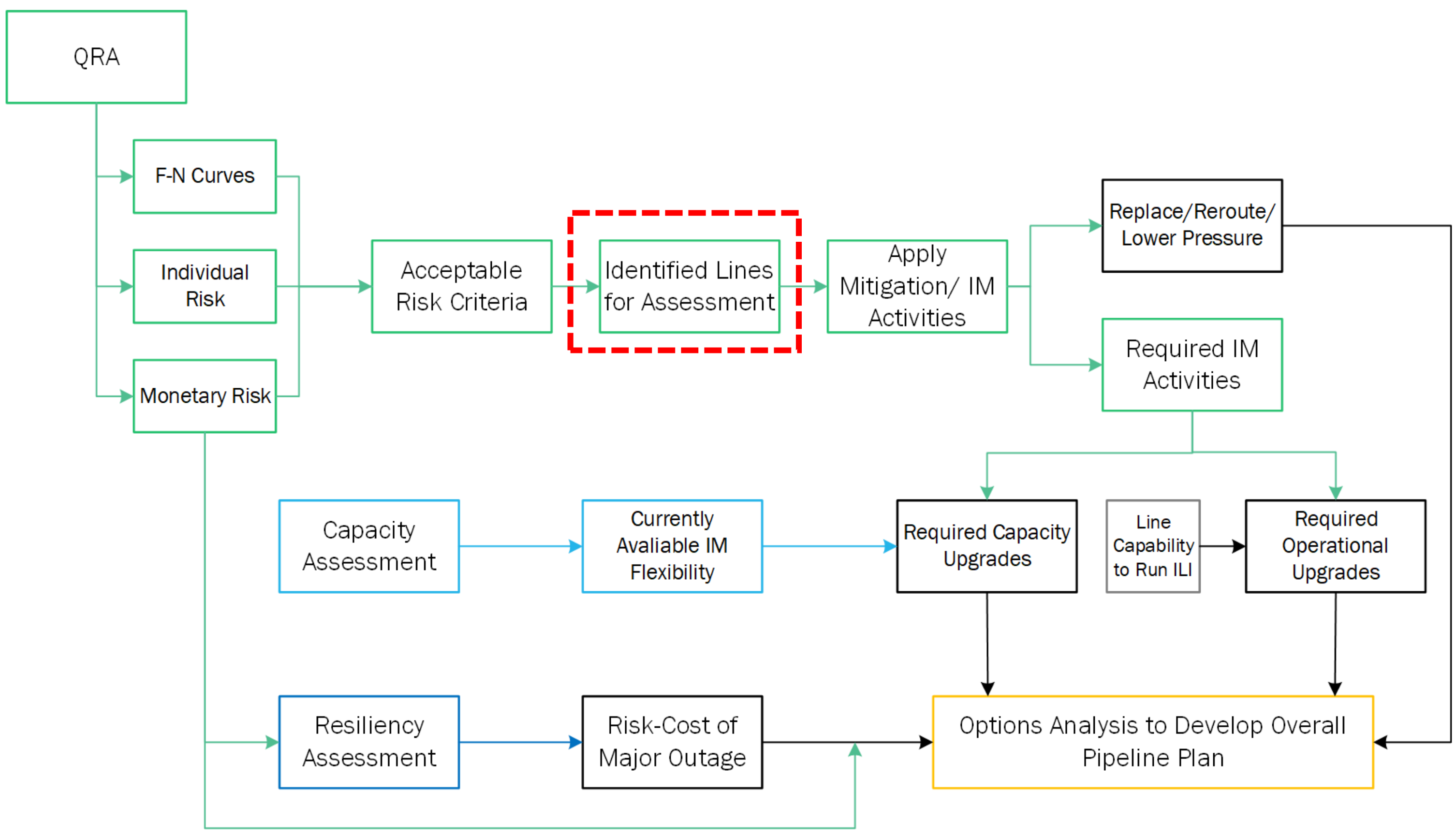


Assessed for each section of the pipeline

Optimized Infrastructure Assessment

- **Process Flow**

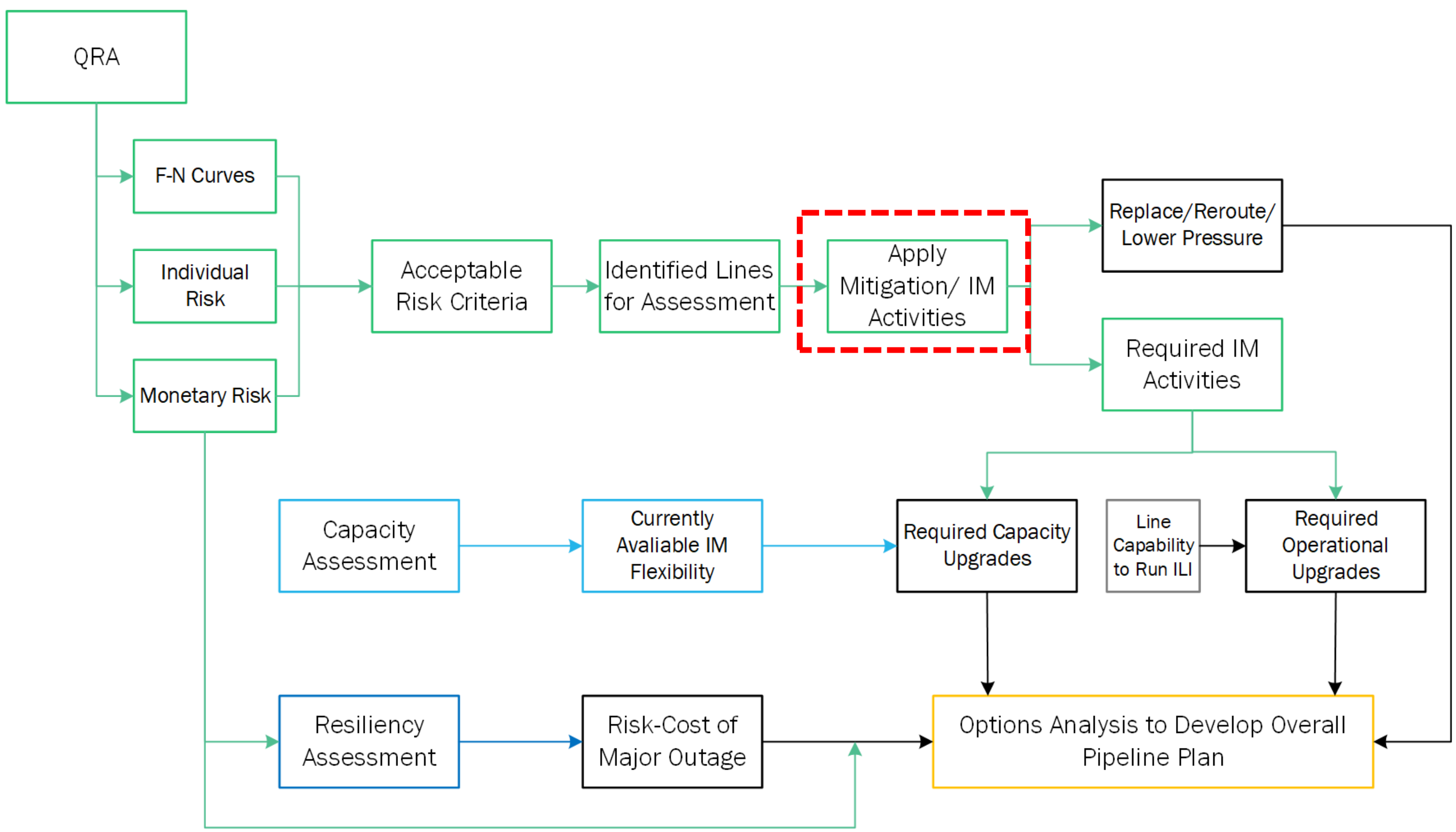


Risk Acceptance Criteria
Applying Criteria

- **Apply risk criteria and select lines for further analysis**
  - Characterize line segments for Societal and Individual Risk:
    - Unacceptable risk
    - ALARP
    - Acceptable risk
  - Lines with unacceptable risk/ALARP move to next step in process
  - Lines with acceptable risk not considered further from societal/individual risk standpoint (other factors may impact these lines in development of overall pipeline plan)

Optimized Infrastructure Assessment

- **Process Flow**



Apply Mitigations

- Risk impact of mitigations assessed using QRA for lines in unacceptable or ALARP regions

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Apply Mitigations

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  - Mitigations can reduce risk to acceptable level if applied (e.g. running EMAT)
    - The mitigation requirements for these lines are fed to next step in process (e.g. need capability to run EMAT)
  - Mitigations do not reduce risk to acceptable level
    - The lines are flagged for consideration of Alternative Risk Reduction Activities (e.g. replace, pressure reduction, etc.), application of ALARP

Optimized Infrastructure Assessment

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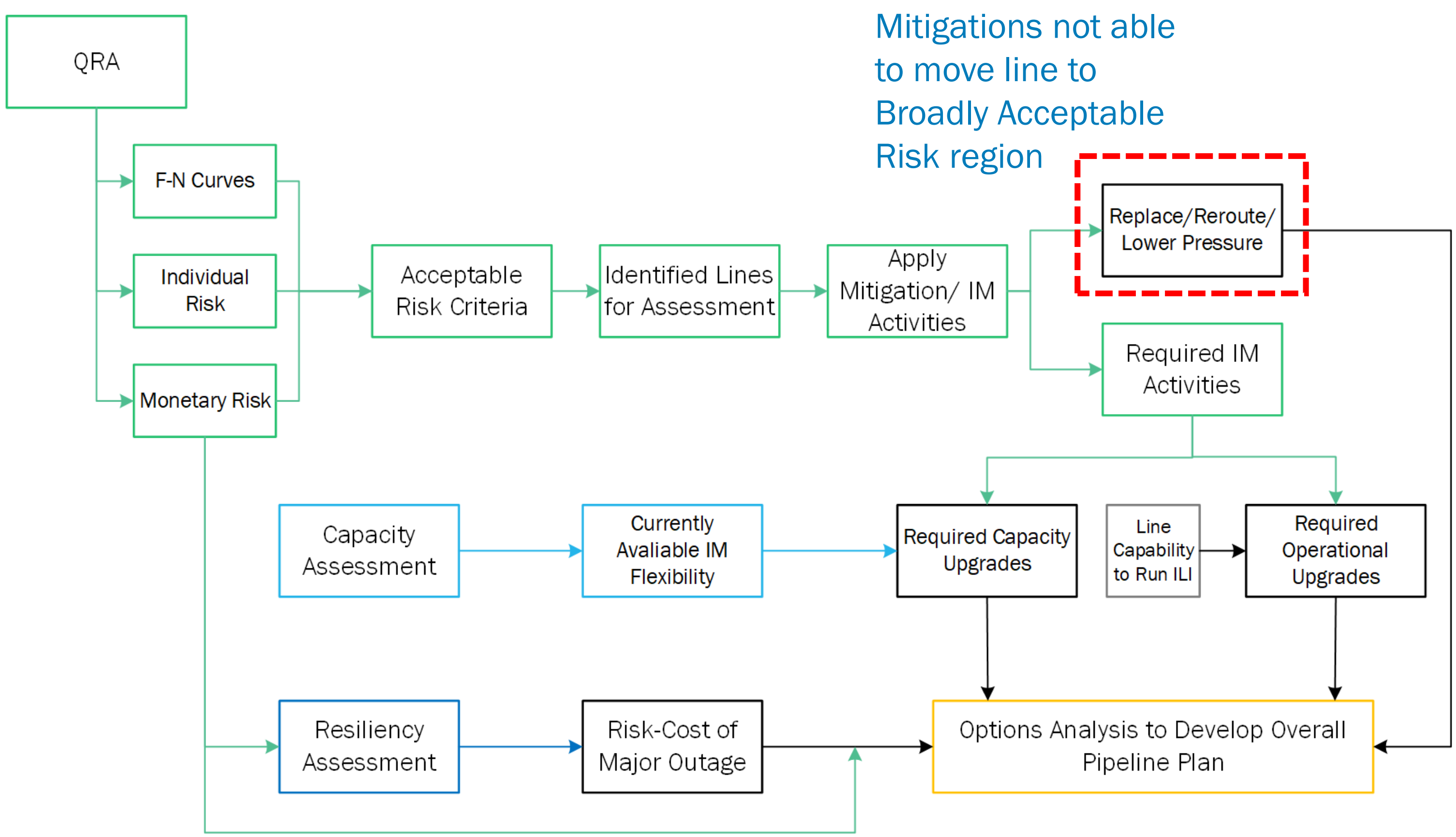
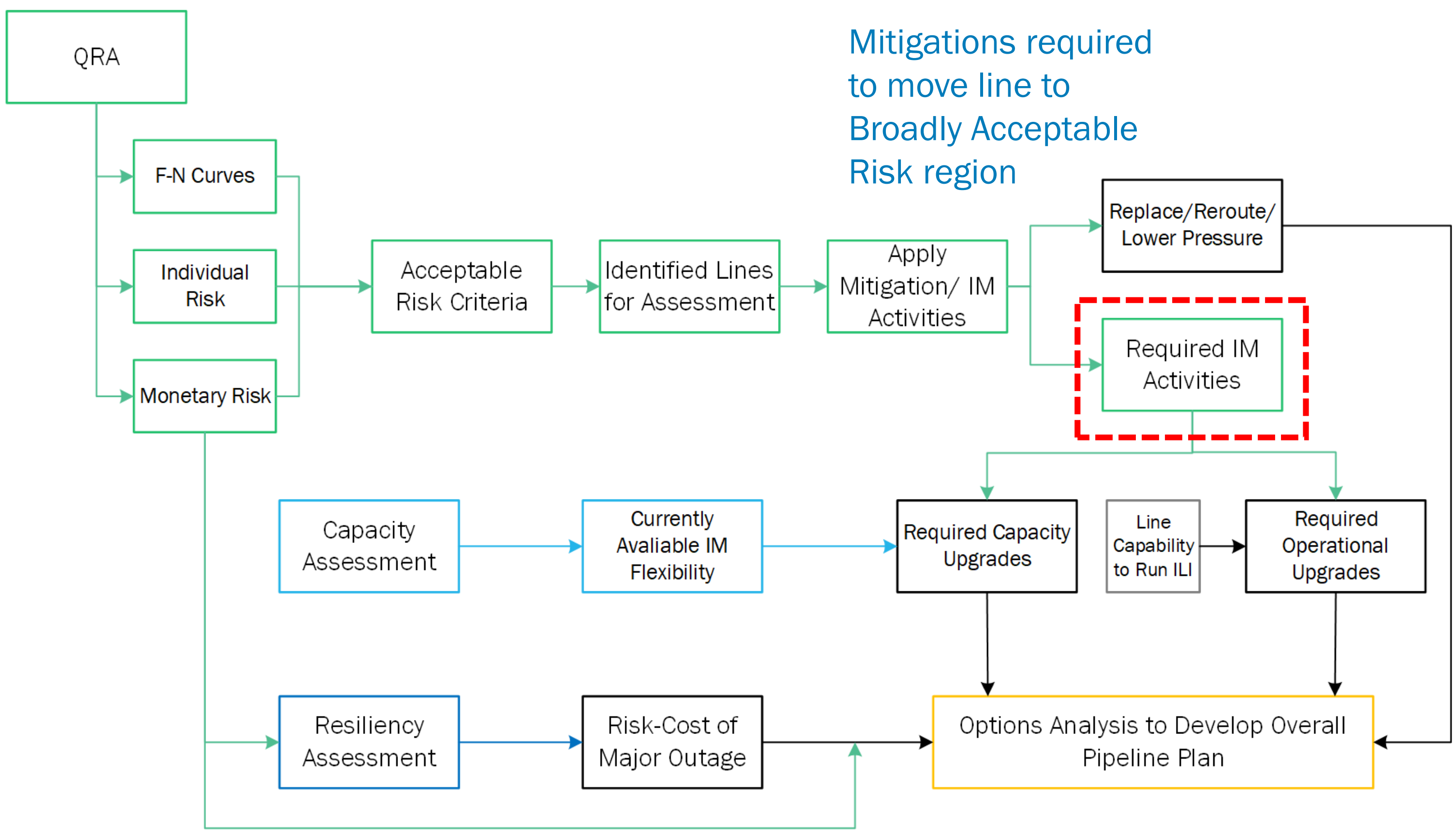


Optimized Infrastructure Assessment

- **Process Flow**



Required Capacity and Operational Upgrades

- The Capacity Assessment combined with required operational capacity to conduct IM activities defines the required capacity upgrades

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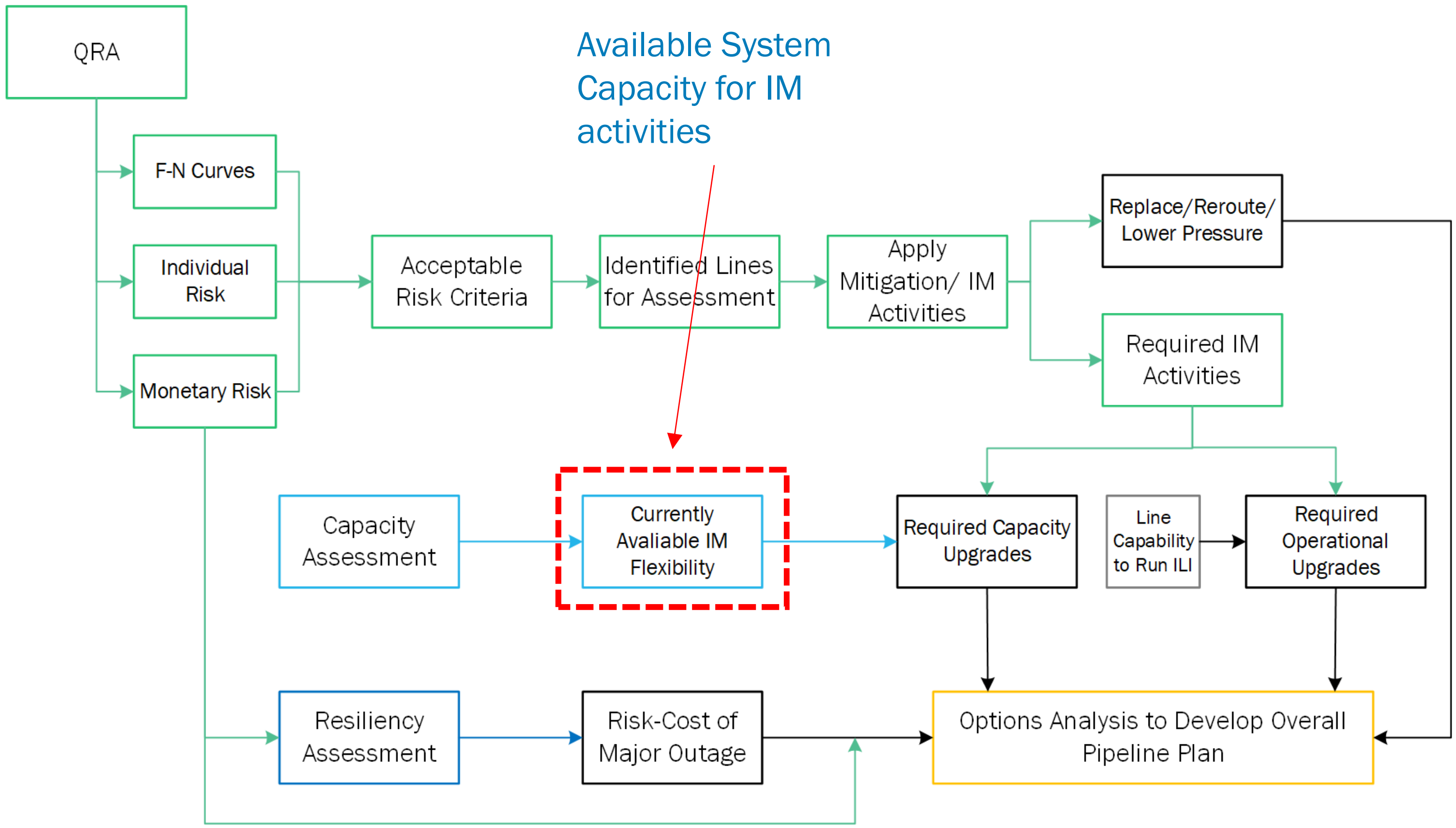
- The required IM activities could also require operational upgrades
  - e.g. need to remove bends to enable EMAT tool passage

Optimized Infrastructure Assessment

- **Process Flow**



Optimized Infrastructure Assessment

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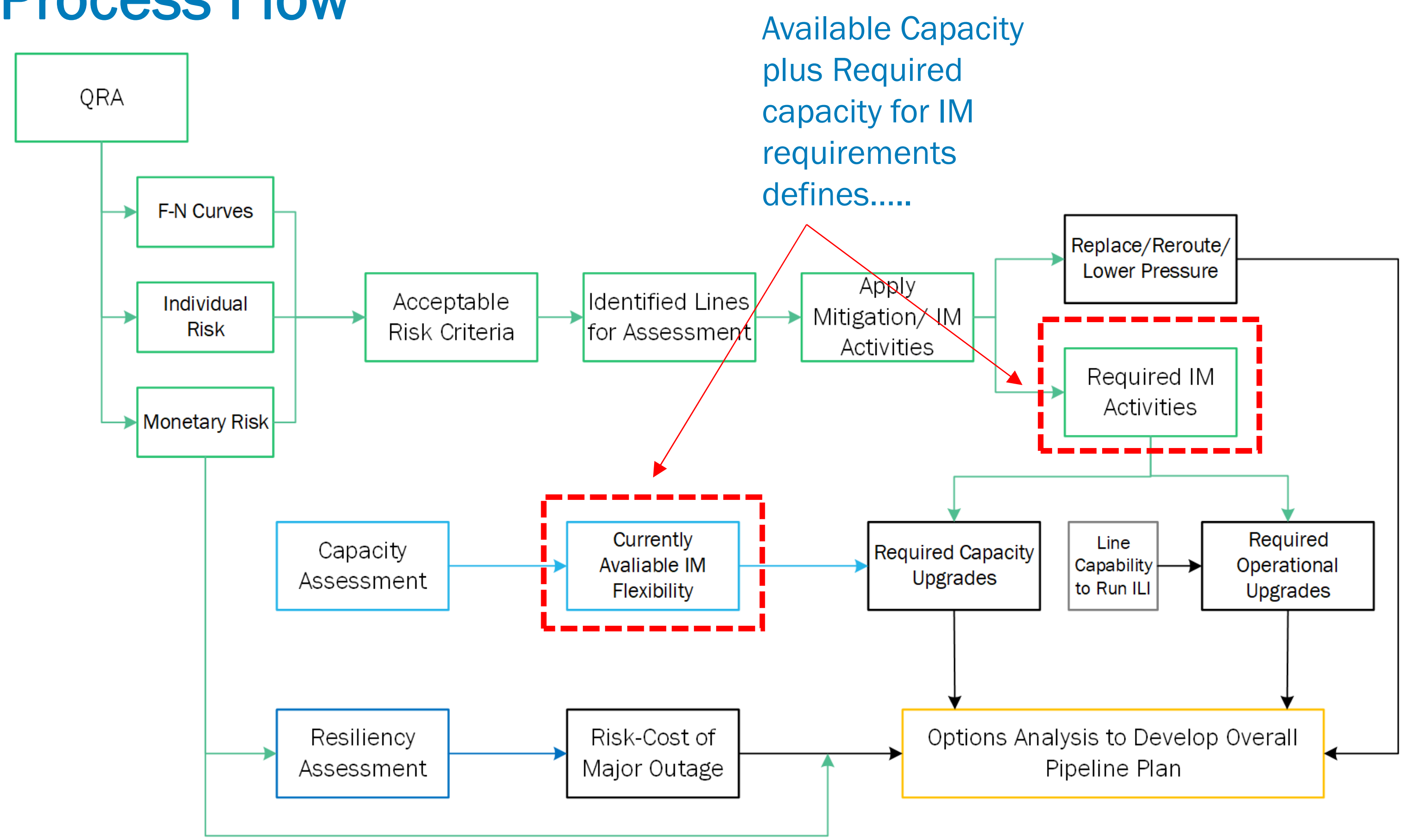

Optimized Infrastructure Assessment

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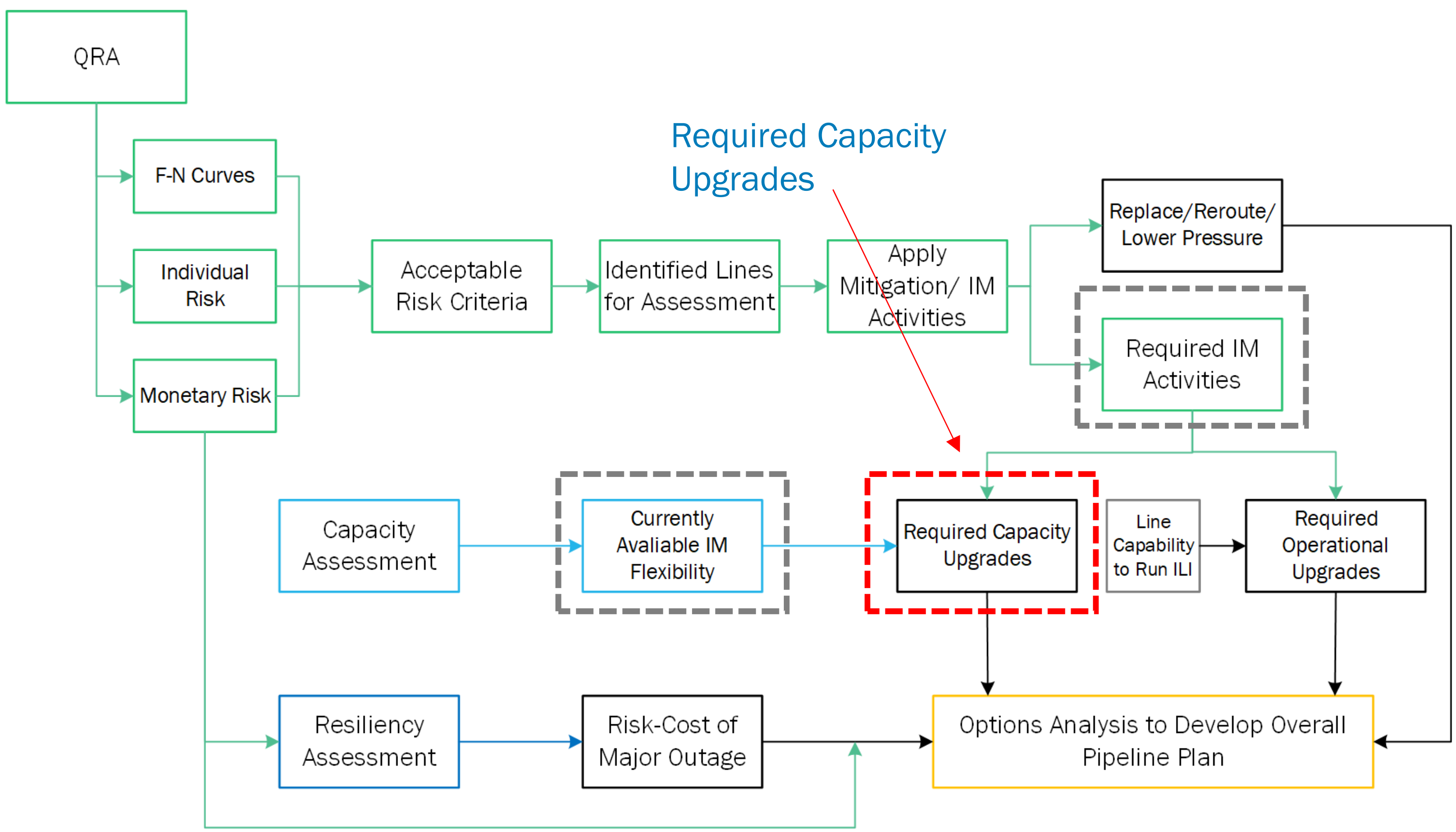
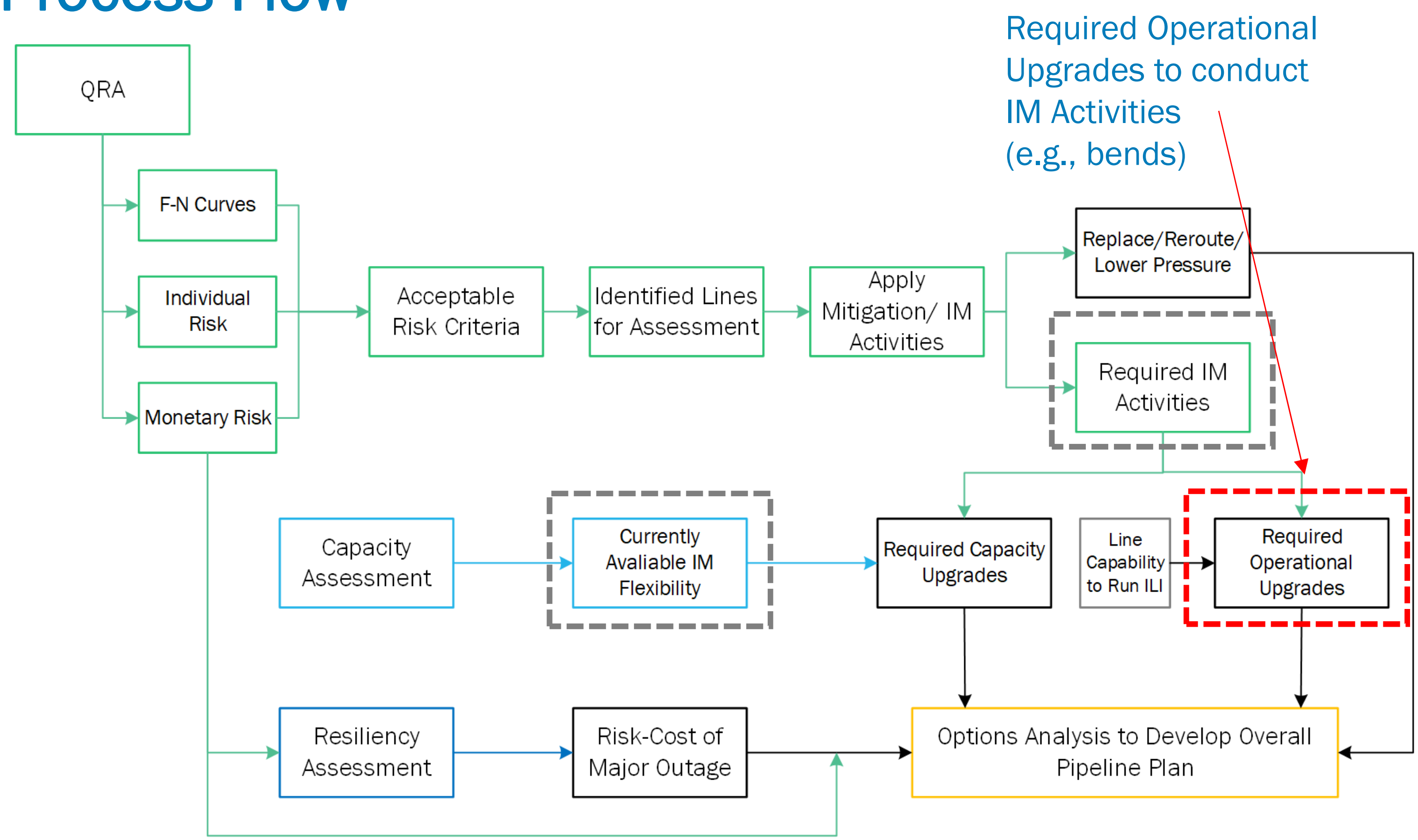


Optimized Infrastructure Assessment

- ## Process Flow



Optimized Infrastructure Assessment

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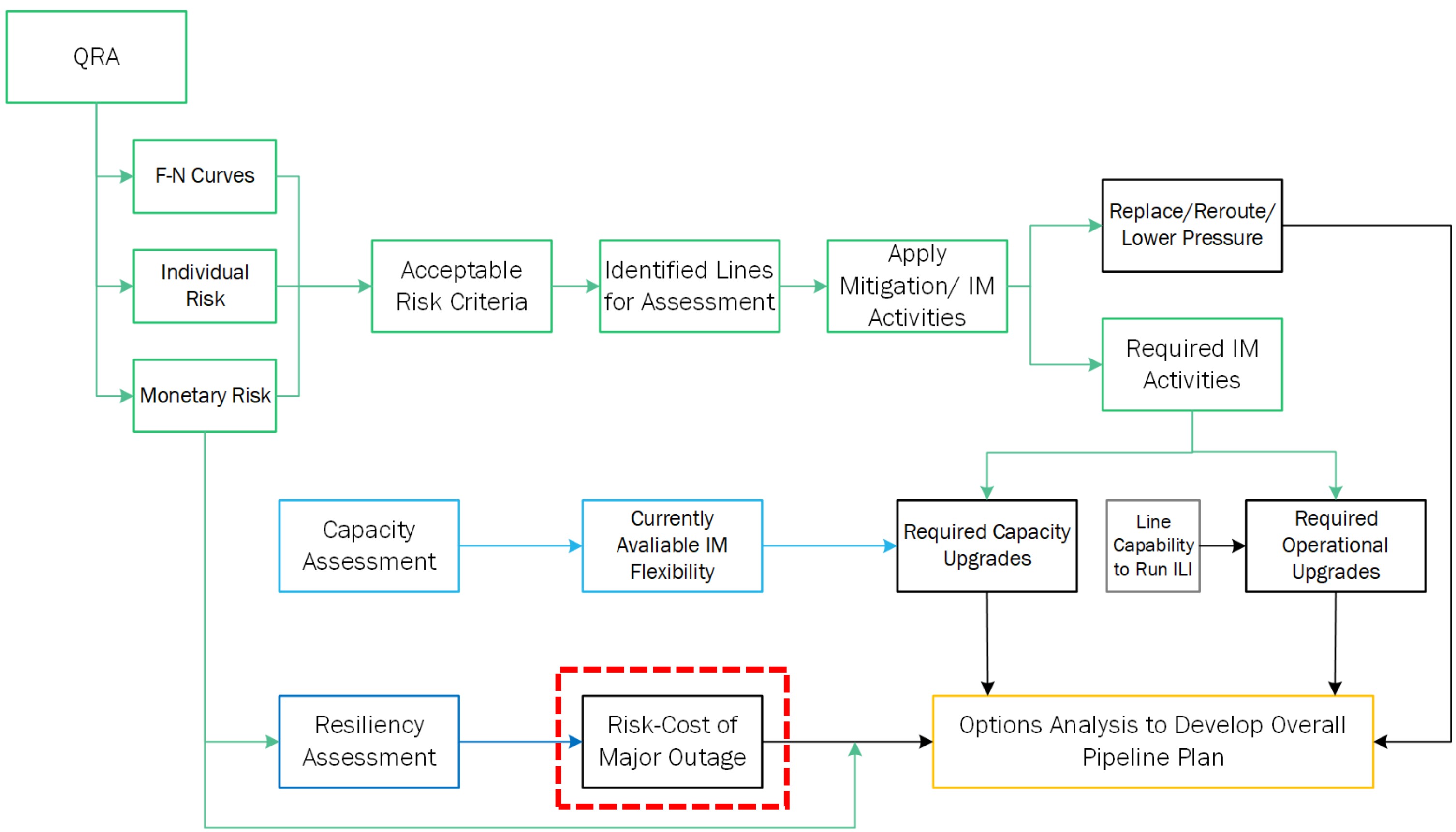


Resiliency Assessment

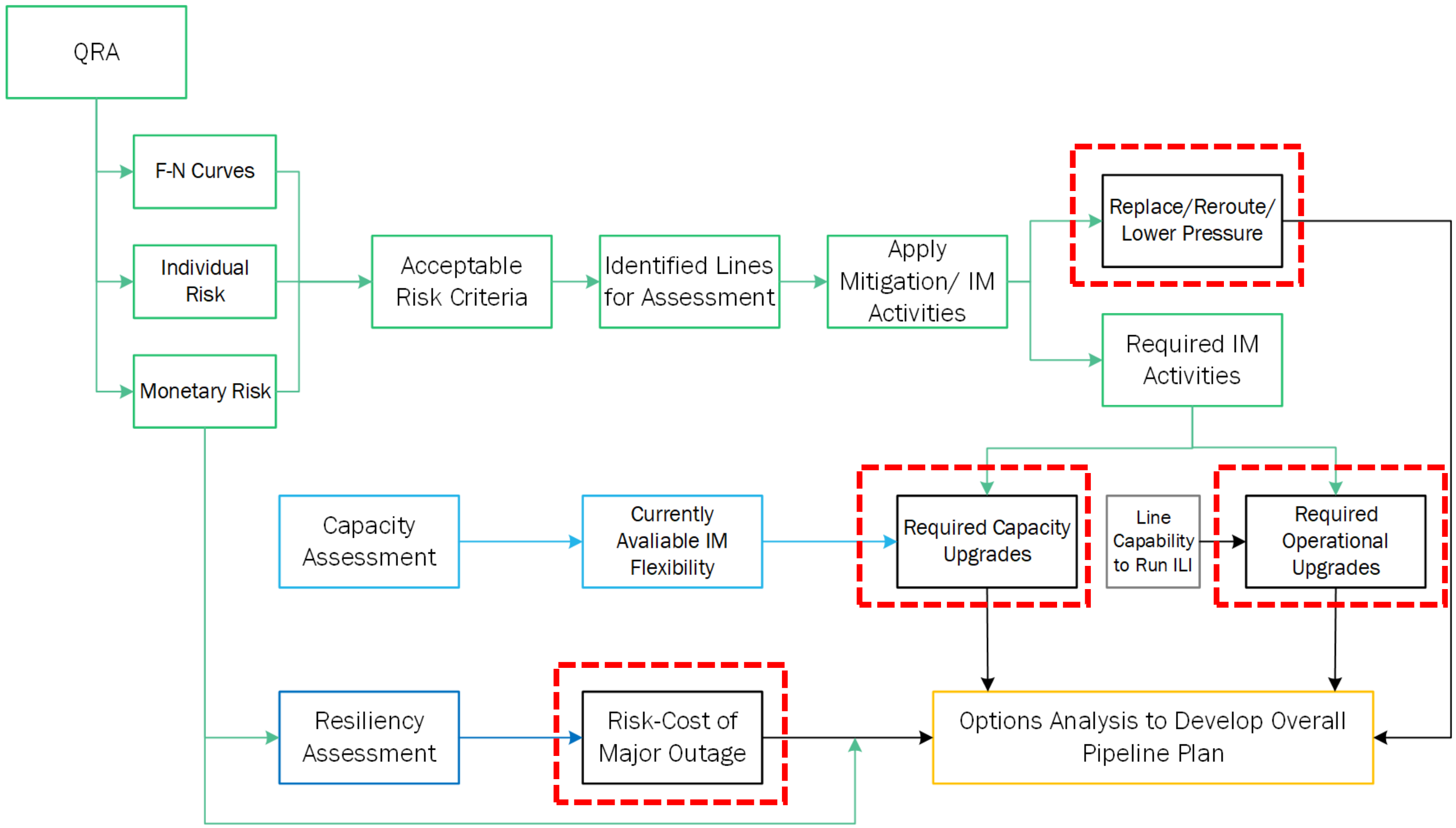
- Quantitative estimate of economic consequences of disruption in gas supply
- Example:
  - Rupture of line disrupts supply
- Used in cost-benefit analysis of scenarios

Options Analysis
to Develop Overall Pipeline Plan

- All inputs from previous steps feed into overall options analysis
  - Replace/Reroute/Pressure Reduction
  - Capacity Upgrades
  - Operational Upgrades
  - Resiliency

Optimized Infrastructure Assessment

- **Process Flow**



Optimized Infrastructure Assessment

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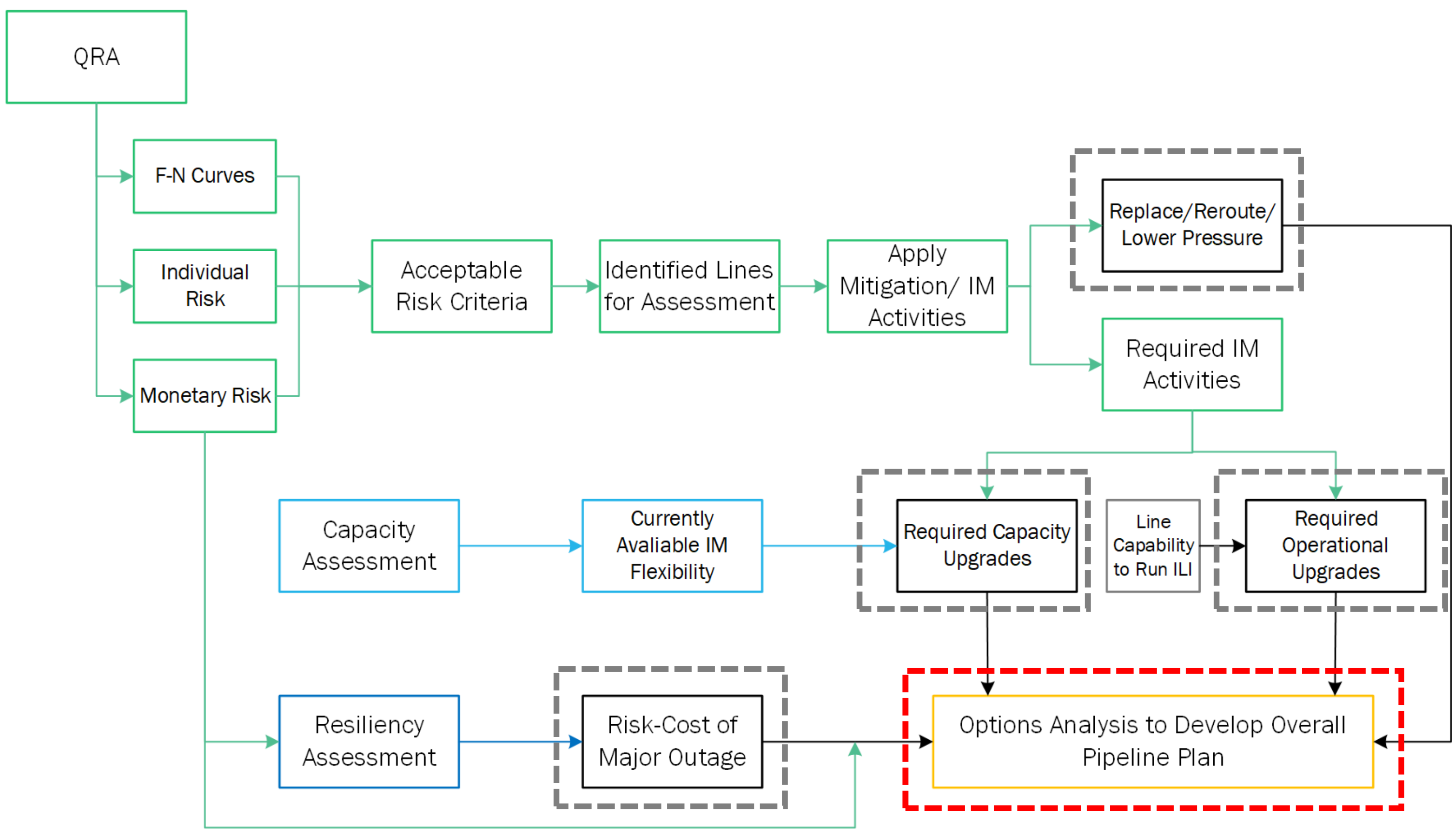


Options Analysis
to Develop Overall Pipeline Plan

- Options Analysis Process
  - Based on overall outputs, scope of work selected for Engineering FEED process

Summary

- Holistic approach to apply System QRA results to Optimized Infrastructure Planning process
- Provides for incorporation of quantitative risk assessment outputs into decision making framework

Integrity Data Project

Ken Oliphant, Ph.D., P.Eng. (JANA Corporation), *Executive Vice President & Chief Technology Officer*

Data Project

BCUC Workshop

April 16th, 2019

Data

- The common data challenge:
  - You don’t know what you need or what’s missing until you go to use it
  - The transition to QRA approach identifies the data gaps, challenges and new data requirements that are not ‘seen’ in traditional Integrity Management approaches

Data

"Improving the scope and quality of input data is a long-term process"

PHMSA, Pipeline Risk Modeling, Overview of Methods and Tools for Improved Implementation, May 2018

Data Management

Data Management

- Desired State of Existing Integrity Data
  - Complete
  - Correct
  - Trusted
  - Accessible

Data needs to be Traceable, Verifiable and Complete

Data Management

- Desired State of Future Integrity Data
  - Clear processes
  - Clear ownership
  - Consistent Control and Quality
    - Accuracy
    - Timeliness
    - Accessibility

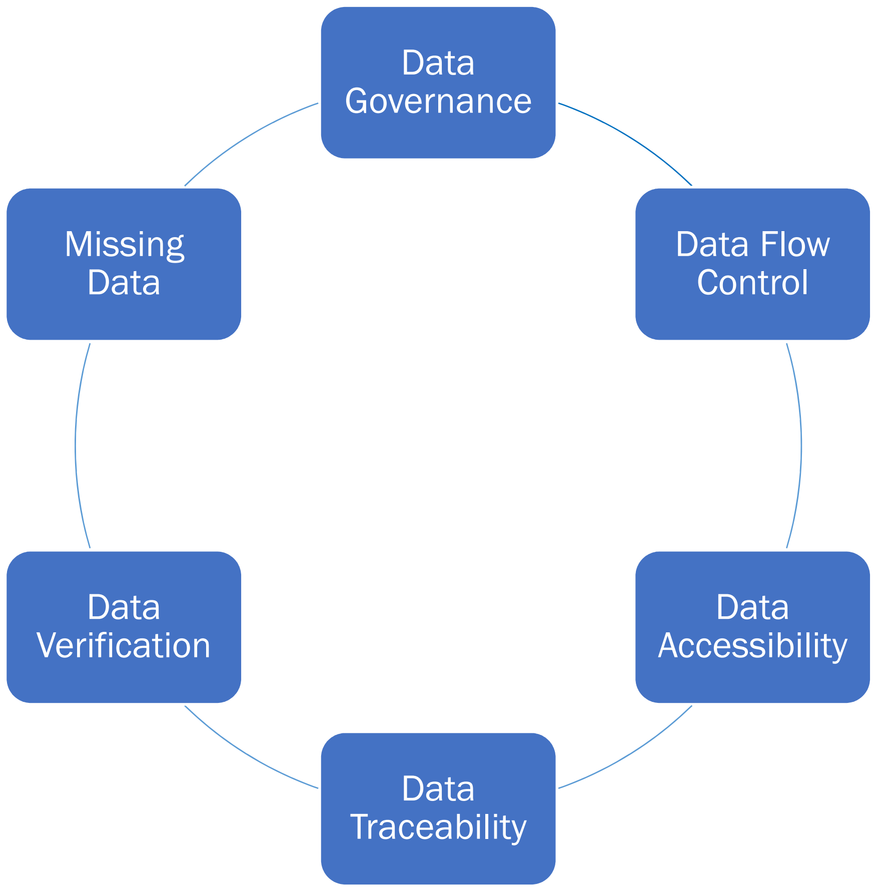
Data Management

- Solution
  - Establish Data Control
    - Establish effective Data Governance for new data
    - Existing Data: Know what you know and what you don't
  - Verify and Fix existing integrity data

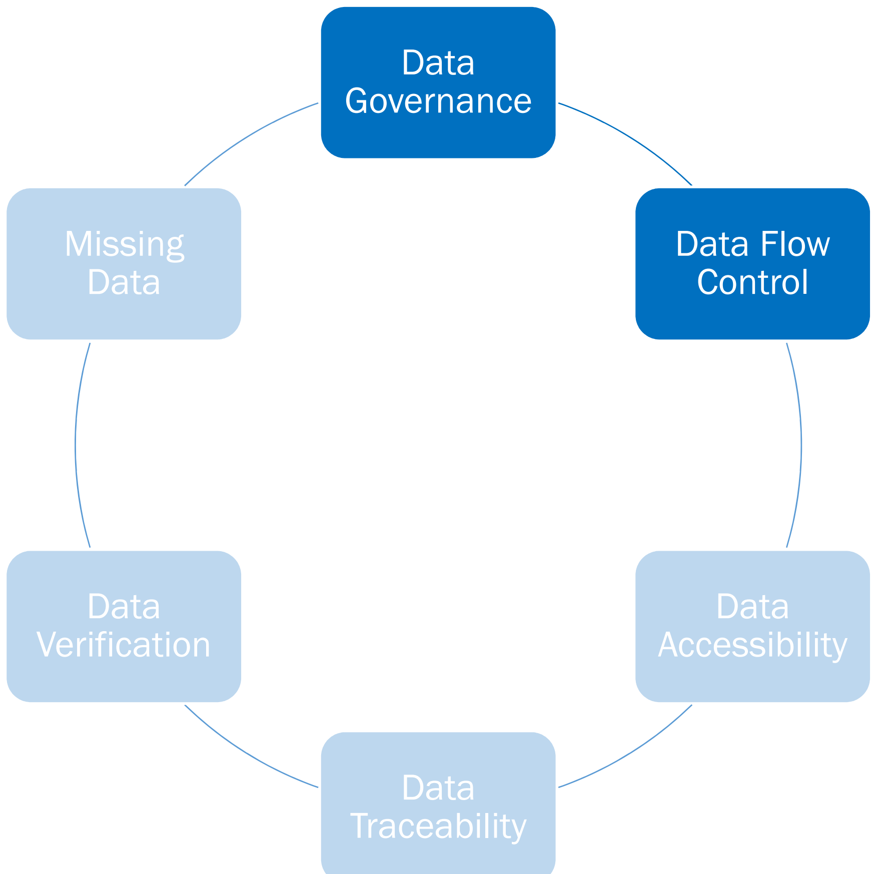
Focus on sustainable processes/procedures

Data Quality

Foundations of Data Quality



Governance and Data Flow Control



Governance and Data Flow Control

- **Situation:**
  - New integrity data being collected all the time, originating from multiple sources and residing in multiple destinations
- **Desired State:**
  - Processes for managing new data
  - Clearly defined Source of Truth as destination for new data
  - Clear procedures on what data is recorded
  - QC on data
  - Timely data updating

Governance and Data Flow Control

- **Solution**
  - Data Governance
    - Targets FortisBC Integrity data needs
    - Identifies Data Governors and Data SMLs
    - Establishes and formalizes roles and practices
  - Data Flow Control
    - Sustainable procedures for each Data Flow
      - Procedures to formalize informal procedures
      - Upgrades to existing procedures to ensure quality data
      - Establish QA

Governance and Data Flow Control

- ## Data Governors Identified

Data Governors	Data Flows
Paul Chernikhowsky	Design and Construction New Project/Project Closure Process Flows
	Records Assessment Project Data Flow
Janet Green	Maintenance and Operation Data Flow
	Gas Quality Data Flow
	SCADA Data Flow
	Class Location Data Flow
	Alignment/Encroachments Data Flow
Bryan Balmer	Natural Hazard Data Flow
	ILI Report/Results Data Flow
	Integrity Dig Data Flow
	CIS Data Flow
	CP System Data Flow

Governance and Data Flow Control

- ## Data SMLs Identified

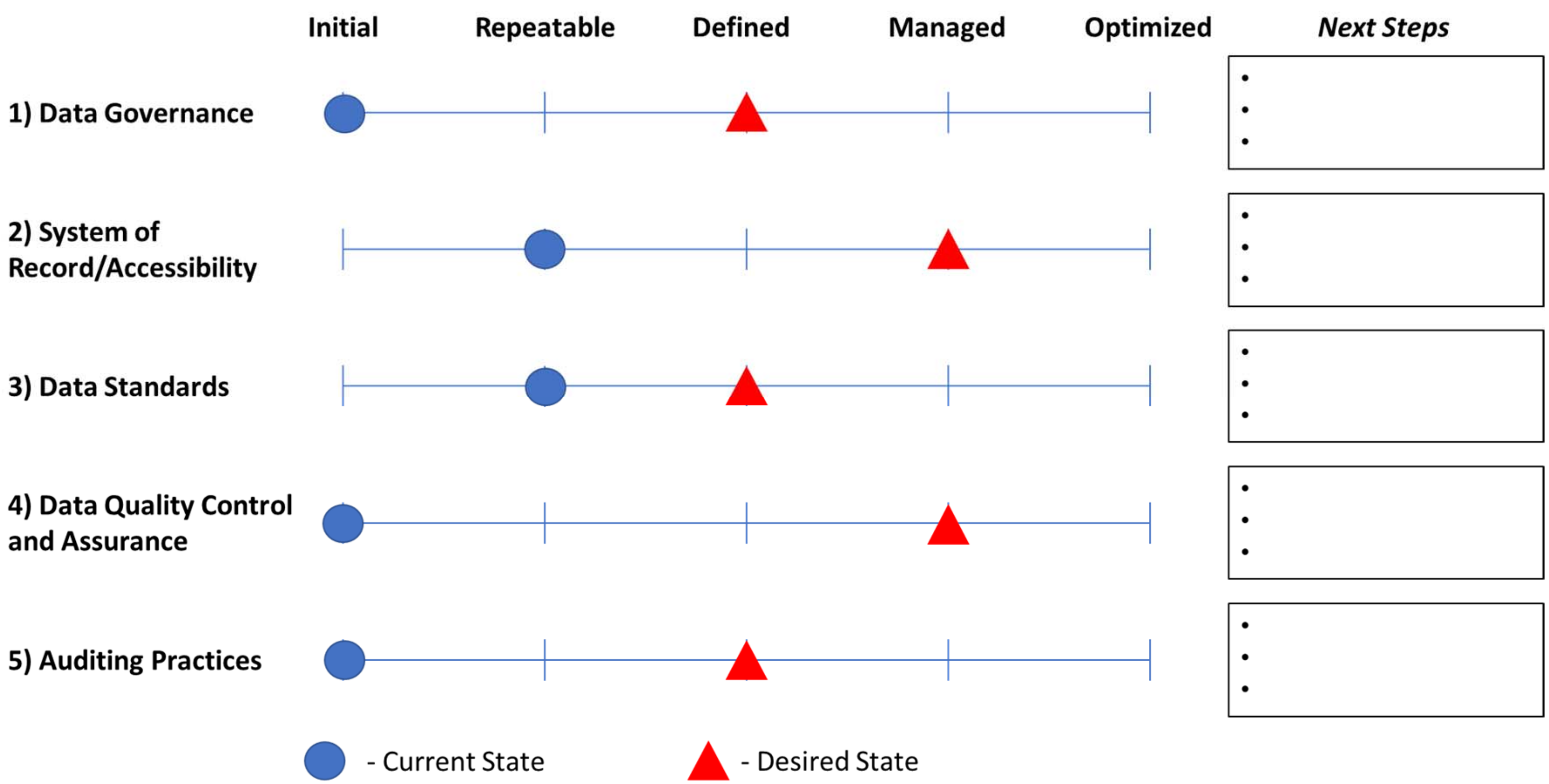
Data Flows	Data SML
Design and Construction New Project/Project Closure Process Flows	Andrew Loge
Records Assessment Project Data Flow	Donna Salahub
Maintenance and Operation Data Flow	John Byers
Gas Quality Data Flow	Gary Johnson
SCADA Data Flow	Gary Johnson
Natural Hazard Data Flow	Mujib Rahman
ILI Report/Results Data Flow	Sunjin Park
Integrity Dig Data Flow	Sunjin Park
CIS Data Flow	Ian Thornton
CP System Data Flow	Scott Bowing
Class Location Data Flow	Gary Johnson
Alignment/Encroachments Data Flow	Angela Cormano

Governance and Data Flow Control

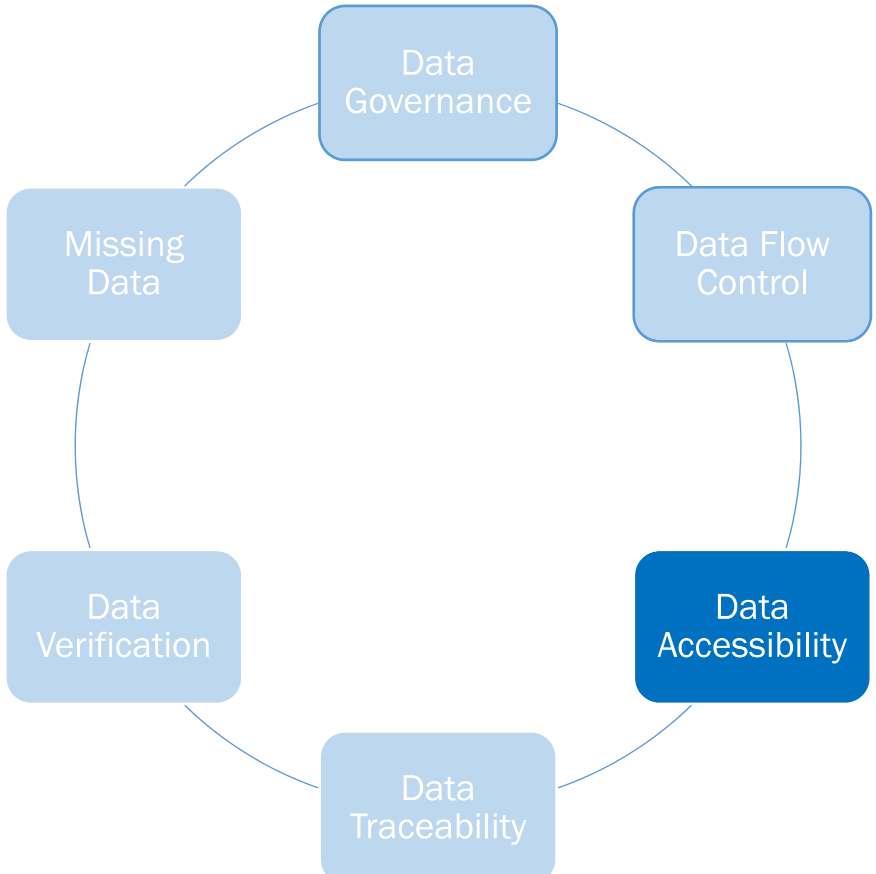
- Data Flow Controls
  - SMLs socialized to role and responsibilities
  - Using Data Capability Maturity Model (CMM) to assess each Data Flow
    - Industry accepted framework for assessing data practices
    - Considers standard dimensions of data
    - Set criteria for each level within each dimension
    - Allows Current and Desired States to be defined

Governance and Data Flow Control

- Example CMM Assessment Summary for a Data Flow



Data Accessibility



Data Accessibility:
Making Quality Integrity Data Accessible

- **Desired State**
  - Integration of integrity data across multiples systems
  - Ease of access
  - Trustworthy data
  - Data traceability and quality information accessible

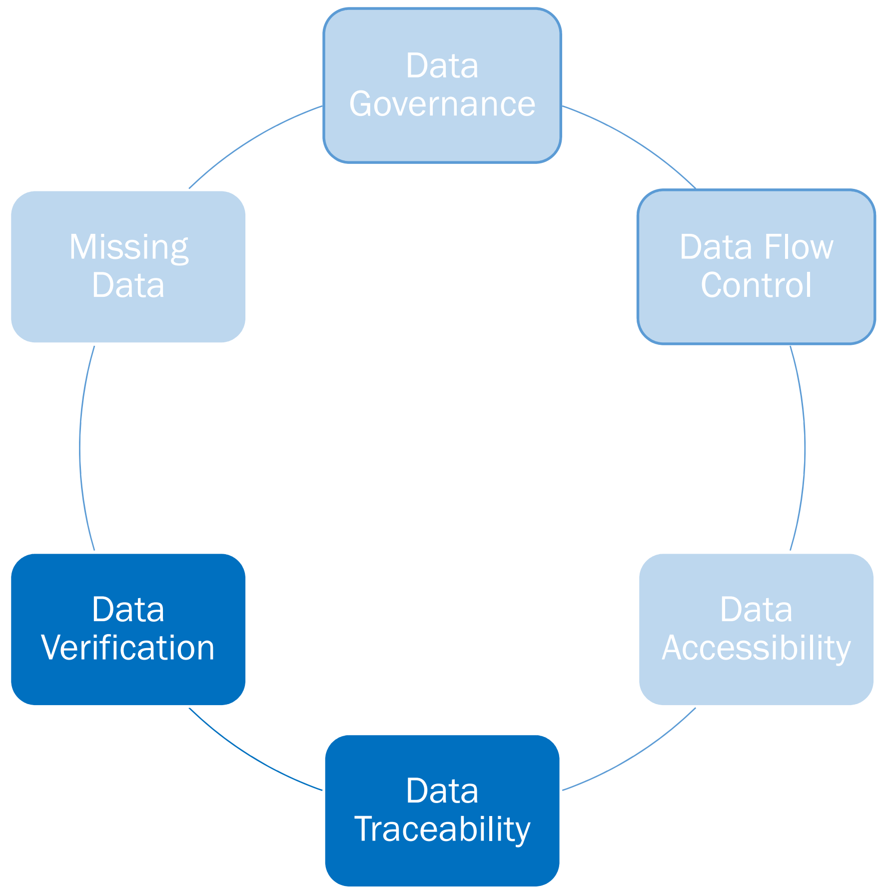
Data Accessibility:
Making Quality Integrity Data Accessible

- Data Sources: **GIS**
  - SAP
  - SCADA
  - PCS
  - BGS
  - FileNet
  - S:Drive (ILI, excel, inspections, etc.)
  - RAP results

Data Accessibility:
Making Quality Integrity Data Accessible

- Solution
  - Identify Sources of Truth for integrity data attributes
  - Recommend path to making internal data readily accessible
  - Identify repositories for missing attributes in external or internal source systems that can be used to improve the quality of risk calculations
  - Identify repository for GIS data traceability and quality information that complies that demonstrates traceability, verifiability and completeness
  - Specification documenting the above

Data Traceability and Verification



Data Traceability & Verification:
Verifying Existing GIS Integrity Data

- **Situation:**
  - GIS data is core to conducting Risk Assessments
- **Desired State:**
  - GIS data traceable to Source of Truth (e.g. filenet)
  - GIS data quality verified
  - GIS data is complete

Data Traceability & Verification:
Verifying Existing GIS Integrity Data

- Solution
  - Make Integrity Data
    - Traceable: Linked to source documents (e.g. filenet)
    - Verifiable: Quality Ranked
    - Complete: Identify values for missing or blank values in GIS

Data Traceability & Verification:
Verifying Existing GIS Integrity Data

- Approach
  - Very large number of attributes and data points over 148 TP lines
  - Develop systematic Verification Process
    - Procedures/Guidelines for each attribute type
    - Tools to facilitate and manage process to ensure quality and efficiency
      - Cataloging Process/Procedures/Tool
      - Verification Processes/Procedures/Tool

Data Traceability & Verification:
Verifying Existing GIS Integrity Data

- **Cataloging Process**
  - Verification process requires identification of source document, necessitating searchable inventory of documents
  - Document Cataloging Process for Searchability
    - FileNet Files are unstructured beyond line/loop level
    - Structuring documents within files to map:
      - Document Type,
      - Document Quality,
      - Location on the Line/Loop
      - Information (attributes) contained

Data Traceability & Verification:
Verifying Existing GIS Integrity Data

- **Cataloging Process**
  - Developed DB solution (Cataloging Tool) to facilitate and structure Cataloging Process
    - Cataloging completed on CPH-BUR and SAV-PEN Lines
    - 5400 Documents mapped

Data Traceability & Verification:
Verifying Existing GIS Integrity Data

- Verification
    - Scope of Verification
        - Large Amount of Data to be verified
        - ~350k items on 148 TP lines (unprioritized)
        - Systematic approach and tool required

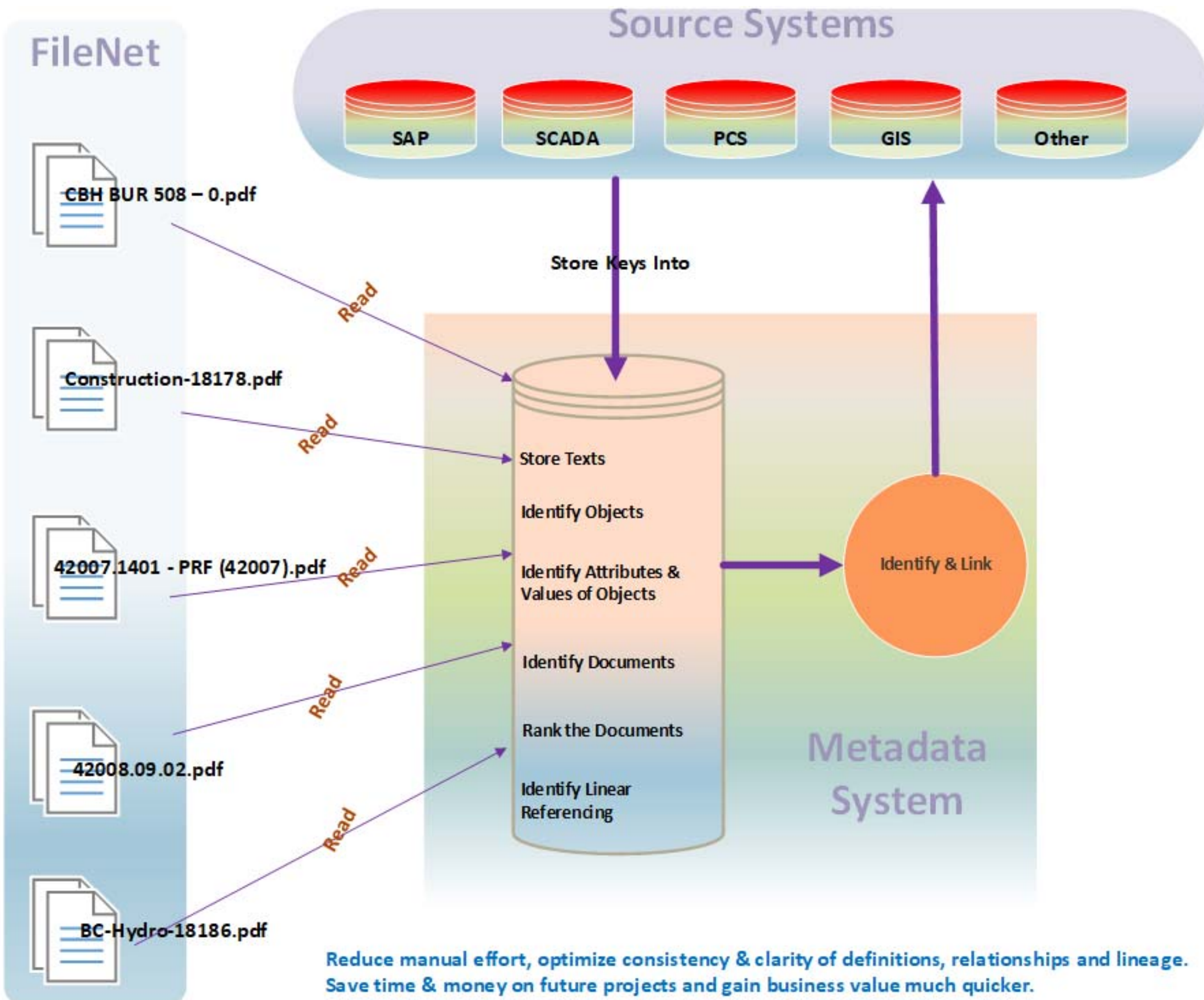
Data Traceability & Verification:
Verifying Existing GIS Integrity Data

- Verification
  - Data Verification Process and Tool
    - Structures work to GIS data analyst doing verification
    - Presents best documents to analyst (location, rank, attribute)
    - Captures all data traceability information
      - Filenet document, value, etc.
    - Traceability data can be uploaded to destination of choice
    - Data corrections/fill identified

Data Traceability & Verification:
Automated Cataloging & Verification

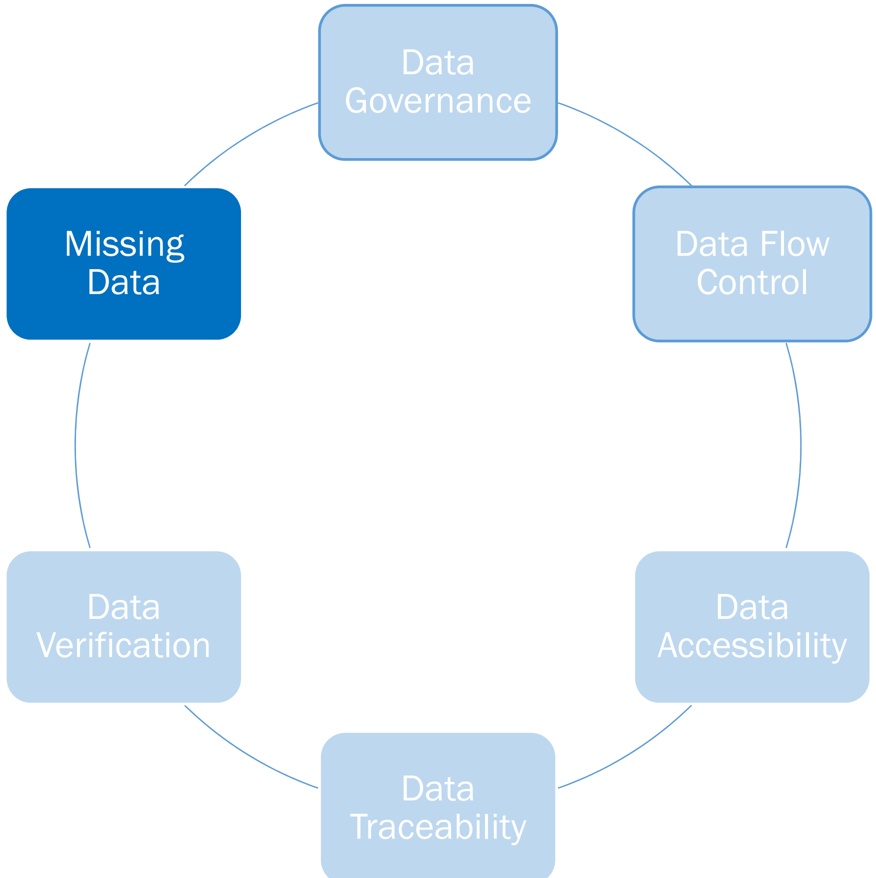
- **Automated Cataloging & Verification**
  - Manual effort/tools provides framework
  - Data integration & advanced analytics
  - Eliminates or reduces manual effort
  - Enhances Quality
  - Tunable and testable against manual effort
  - Scalable

Data Traceability & Verification:
Automated Cataloging & Verification



Reduce manual effort, optimize consistency & clarity of definitions, relationships and lineage.
Save time & money on future projects and gain business value much quicker.

Fill Missing Attribute Data



Fill Missing Attribute Data

- Desired State
  - All attribute data for QRA available

Fill Missing Attribute Data

- Solution
  - Identify potential sources for needed data
  - Risk based prioritization of data collection (based on First Iteration QRA
  - Recommend system of record for data

Summary

- QRA approach needs data to feed models that drive integrity management decision making
- Systematic approach being developed informed by First Iteration QRA

Question Period

Next Steps

- October 2019
  - Results of Phase 1 QRA
  - Scope of work for TIMC Project CPCN application
- Mid-2020
  - Expected CPCN filing