NGA Pipeline Safety Management System Collaborative

Guideline for Gas System Engineering Design Review

Guideline for Gas System Engineering Design Review (EDR) Workshop

March 8th & 9th 2021

Northeast GAS ASSOCIATION

Guideline for Gas System Engineering Design Review (EDR) Workshop

Tom Kiley, President and CEO, Northeast Gas Association

NGA'S ANTITRUST COMPLIANCE PROCEDURES

Adopted by the NGA Board of Directors on June 20, 2018

Objective

The Northeast Gas Association (NGA) and its member companies are committed to full compliance with all laws and regulations, and to maintaining the highest ethical standards in the way we conduct our operations and activities. Our commitment includes strict compliance with federal and state antitrust laws, which are designed to protect this country's free competitive economy.

Responsibility for Antitrust Compliance

Compliance with the antitrust laws is a serious business. Antitrust violations may result in heavy fines for corporations, and in fines and even imprisonment for individuals. While NGA's attorneys provide guidance on antitrust matters, you bear the ultimate responsibility for assuring that your actions and the actions of any of those under your direction comply with the antitrust laws.

Antitrust Guidelines

In all NGA operations and activities, you must avoid any discussions or conduct that might violate the antitrust laws or even raise an appearance of impropriety. The following guidelines will help you do that:

- ***Do*** consult counsel about any documents that touch on sensitive antitrust subjects such as pricing, market allocations, anti-employee poaching practices, refusals to deal with any company, and the like.
- ***Do*** consult with counsel on any non-routine correspondence that requests an NGA member company to participate in projects or programs, submit data for such activities, or otherwise join other member companies in NGA actions.
- ***Do*** use an agenda and take accurate minutes at every meeting. Have counsel review the agenda and minutes on sensitive antitrust subjects such as pricing, market allocations, anti-employee poaching practices, refusals to deal with any company, and the like before they are put into final form and circulated.
- ***Do not*** have discussions with other member companies about:
  - your company's prices for products or services, or prices charged by your competitors.
  - costs, discounts, terms of sale, profit margins or anything else that might affect those prices.
  - the resale prices your customers should charge for products you sell them.
  - allocating markets, customers, territories or products with your competitors.
  - limiting production.
  - whether or not to deal with any other company.
  - any competitively sensitive information concerning your own company or a competitor's.
  - anti-employee poaching practices.
- ***Do not*** stay at a meeting, or any other gathering, if those kinds of discussions are taking place.
- ***Do not*** discuss any other sensitive antitrust subjects (such as price discrimination, reciprocal dealing, or exclusive dealing agreements) without first consulting counsel.
- ***Do not*** create any documents or other records that might be misinterpreted to suggest that NGA condones or is involved in anticompetitive behavior.
- ***Please notify NGA of any conduct at an NGA-sponsored event that you believe raises antitrust issues.***

A copy of NGA's full "Antitrust Compliance Procedures" document is available by contacting NGA at 781-455-6800, and is also posted on the NGA web site at www.northeastgas.org.

Northeast
GAS ASSOCIATION

- Non-profit trade association
- Local gas utilities (LDCs) serving New England, New York, New Jersey and Pennsylvania
- Several interstate pipeline companies
- LNG and CNG importers/suppliers
- Over 400 “associate member” companies, from industry suppliers and contractors to electric grid operators
- www.northeastgas.org

NGA Functional Areas

- **Education & Training**

Advocacy

RD&D

Gas System Engineering Design Review Webinar Series

A Safety Management System Perspective March 8th & 9th, 2021

AGENDA

Day 1

1. Welcome & Opening Remarks ..... 1:00 – 1:10

Tom Kiley, President & CEO, Northeast Gas Association

2. Workshop Overview ..... 1:10 – 1:20

Mark Hereth, Managing Director, The Blacksmith Group

3.Gas System Design Review Regulatory & Policy Considerations ..... 1:20 – 1:45

Hon. Diane X. Burman, Commissioner, New York State Public Service Commission

4.NGA Guideline for Gas System Engineering Design Review ..... 1:45 – 2:30

Bob Wilson, Vice President Special Projects, Northeast Gas Association

Essential Elements of Gas Engineering Design Review

- ✓ The Gas Engineering Design Review Process
- ✓ Core Principles of Design Review
- ✓ Typical Roles and Responsibilities
- ✓ Standard vs Complex, Non-Standard Designs & Execution Planning
- ✓ Training, Education & Experience of Competent Persons

5.GTI Competent Engineer Certificate Program ..... 2:30 – 3:00

Vanessa O'Neil, Sr. Program Manager, Education-GTI Dave Keeling, President, Keevestic Inc.

Day 1 Wrap-up 3:00

Mark Hereth, Managing Director, The Blacksmith Group

Gas System Engineering Design Review Webinar Series

A Safety Management System Perspective March 8th & 9th, 2021

AGENDA

Day 2

Day 2 Overview ……. 10:00 – 10:10

Mark Hereth, Managing Director, The Blacksmith Group

2. Design Review as a Strategic Approach to & Risk Mitigation; Lessons Learned… 10:10 – 10:40

Robert Hall, Director, Railroad, Pipeline, and Hazardous Material Investigations National Transportation Safety Board (NTSB)

3. Connecting Engineering Design Review to Key PSMS Elements……. 10:40 – 11:15

Stacey Gerard, Senior Fellow, The Blacksmith Group Mark Hereth, Managing Director, The Blacksmith Group

- ✓ **Leadership**
- ✓ **Stakeholder Engagement**
- ✓ **Risk Management**
- ✓ **Operational Controls/ Management of Change**
- ✓ **Safety Assurance**
- ✓ **Competency, Awareness & Training**
- ✓ **Continuous Improvement, including incident investigation.**

4. The Engineering Design Review Process; RP 1173 in Action

Design Review Process ……. 11:15 – 11:45

Alan Mayberry, Associate Administrator for Pipeline Safety, Pipeline and Hazardous Materials Safety Administration (PHMSA)

***Program Wrap-up, Q&A* ……11:45 – Noon**

Mark Hereth, Managing Director, The Blacksmith Group

Department of Public Service

Gas System Engineering Design Regulatory & Policy Considerations

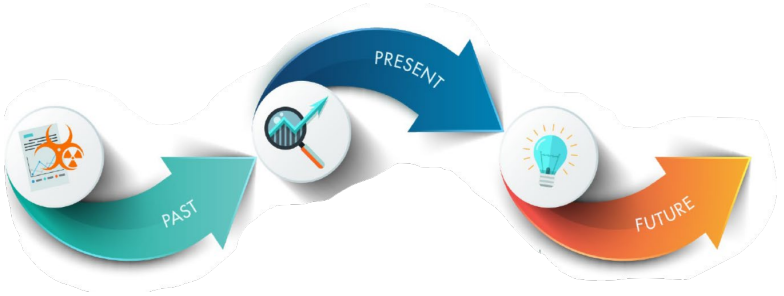
Hon. Diane X. Burman, Commissioner,
New York State Public Service Commission

NGA Guideline for Gas System Engineering Design Review (EDR)

Bob Wilson, VP Special Projects, NGA

- ✓ EDR Development & Evolution
- ✓ Intended Use – *Defense in Depth Strategy*
- ✓ Guideline Overview
- ✓ Practical Application of EDR Guideline Considerations
  Complexity, Accountability & Competency
- ✓ EDR "Tools" – The Appendix
- ✓ PSMS Connections

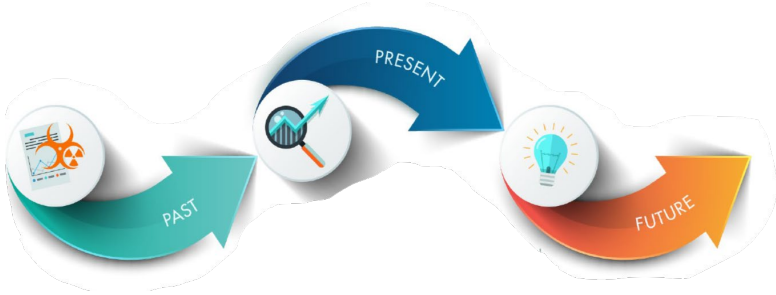
Acknowledgement



The Northeast Gas Association would like to acknowledge members that participated in the development, review and approval of the Engineering Design Review Guideline. In addition, NGA would like to acknowledge the Blacksmith Group for their support in development and review of the Guideline to ensure conformance with pipeline safety management system principles.

- Central Hudson Gas & Electric Corp.
- Columbia Gas of Massachusetts
- Columbia Gas of Pennsylvania
- Connecticut Natural Gas
- Consolidated Edison Company of New York
- Corning Natural Gas Corporation
- Elizabethtown Gas Company
- Eversource Energy
- Iroquois Gas Transmission System
- Iroquois Pipeline Operating Company
- Liberty Utilities
- National Fuel Gas Distribution Corporation
- National Grid
- New Jersey Natural Gas Company
- New York State Electric and Gas
- Norwich Public Utilities
- Orange & Rockland Utilities, Inc.
- PECO Energy
- Philadelphia Gas Works
- Public Service Electric & Gas Company
- Rochester Gas & Electric
- South Jersey Gas Company
- Southern Connecticut Gas
- Summit Natural Gas of Maine
- UGI Utilities, Inc
- Unitil Gas & Electric Light Company
- Vermont Gas Systems Inc.

Historical Perspective.....

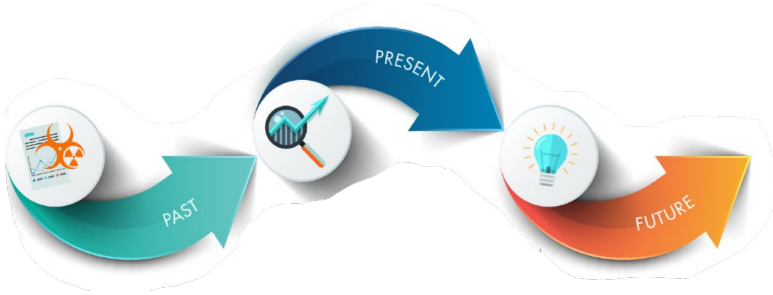


NTSB Recommendations Following CMA Incident September 13, 2018

- **(Preliminary)** Revise the engineering plan and constructability review process to ensure that all applicable departments review construction documents for accuracy, completeness, and correctness, and that the documents or plan be sealed by a professional engineer prior to commencing work
- **(Final)** To the States of Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Idaho, Illinois, Iowa, Kentucky, Louisiana, Maine, Maryland, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New York, North Carolina, Pennsylvania, South Carolina, South Dakota, Texas, Utah, Virginia, and Wyoming:

  Remove the exemption so that all future natural gas infrastructure projects require licensed professional engineer approval and stamping.

Historical Perspective.....



Regional Regulatory Changes in MA Following CMA Incident September 13, 2018

On December 31, 2018, Governor Baker signed as an emergency law Chapter 339 of the Acts of 2018, An Act Further Providing for the Safety of the Commonwealth's Natural Gas Infrastructure ("Act"). Section 2 of the Act amends G.L. c. 164 by adding Section 148, which provides for professional engineers certified under G.L. c. 112, § 81E to stamp any gas company's engineering plans or specifications for engineering work or services that could pose *a material risk to public safety, as determined by the Department.*

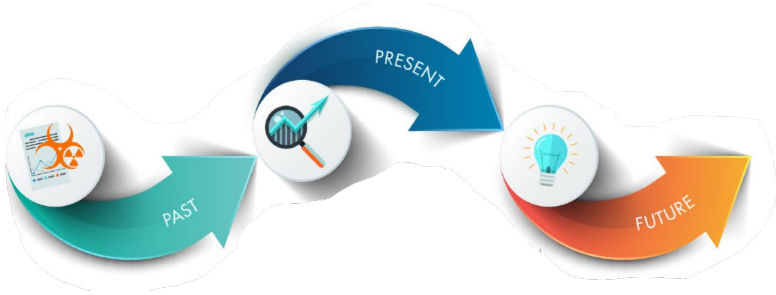
- MA Straw Proposal based on analysis of stakeholder comments received regarding specific criteria for use of professional engineers in relation to design review & approval of gas engineering plans, defined "complex" projects and other criteria for determination of when a PE review and approval is required
- MA recently issued D.P.U. 21-04 February 18, 2021Investigation of the Department of Public Utilities, on its own motion, instituting a rulemaking pursuant to G.L. c. 164, § 148; G.L. c. 30A, § 2; and 220 CMR 2.00, to establish requirements for Use of Professional Engineers for Gas Utility Work, 220 CMR 105.00.
- Other states have proposed legislation and continue looking to industry for guidance on this issue

NGA membership proactively developed a safety management system approach to gas engineering design review by establishing review process guidelines that ensure on-going system reliability while maximizing public safety value

Guideline Development

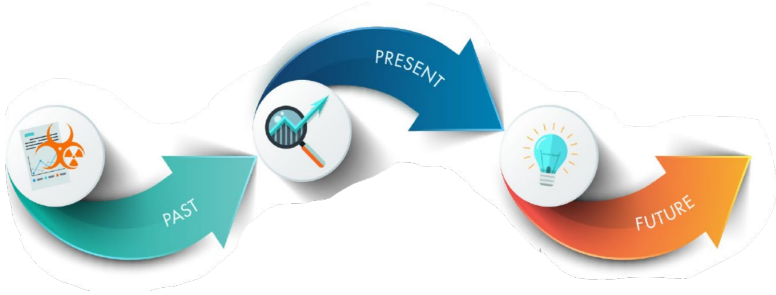
The guideline was developed by members of the Northeast Gas Association (NGA) and is intended to provide NGA Pipeline Operators with a framework and considerations for developing and enhancing an organization specific gas system engineering design review (EDR) process. The goal of implementing a gas system engineering design review process is to ensure that gas transmission and distribution systems are designed, constructed and operated in a safe and reliable manner with the goal of zero incidents.

Defense-in-Depth Strategy



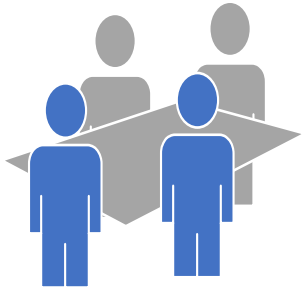
- The structure of this Design Review essentially follows the principles of Plan, Do, Check, Act, which underpins the API RP 1173.
- By assuring more than adequate levels of protection in the review process, member organizations adopting the practice bring in sufficient, broad technical perspectives to identify potential risks or weak links.
- With the focus of the Gas System EDR being on inclusiveness of layers of protection, it opens the process to ***employee involvement and contribution of personal responsibility on their part.*** This concept is central to API RP 1173.
- Defense-in-Depth is also exemplified through "layers of protection" that are built through the selection of subject matter experts and reviewers who can bring a very robust set of "multi-disciplinary "skills, knowledge and experience to the process.
- This process raises the ***visibility of the accountability*** of all involved and makes accountability a continual process. Accountability is intended to be transparent which is an important factor in growing the safety culture in member organizations employing the review process.

Guideline Overview……..

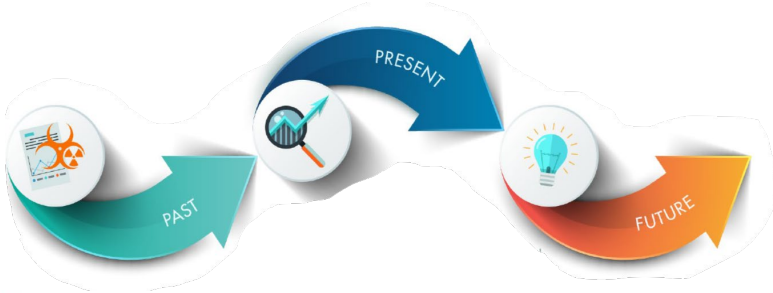


- ✓ Guideline is focused on "***Process***", in combination with competency of individual(s) involved in design, design review, design approval, construction and operation
- ✓ The Guideline builds on lessons learned from design/construction industry acceptable practices applied to pipeline construction *initial design through constructability*
- ✓ Provides a framework that is *complexity proportional* for pipeline operators to consider when developing company specific design review policies and procedures.
- ✓ Fundamental principles *scalable* and applicable to small through large operators
- ✓ Is intended to conform with API RP 1173 Pipeline Safety Management Systems, connects to **ALL** 10 elements

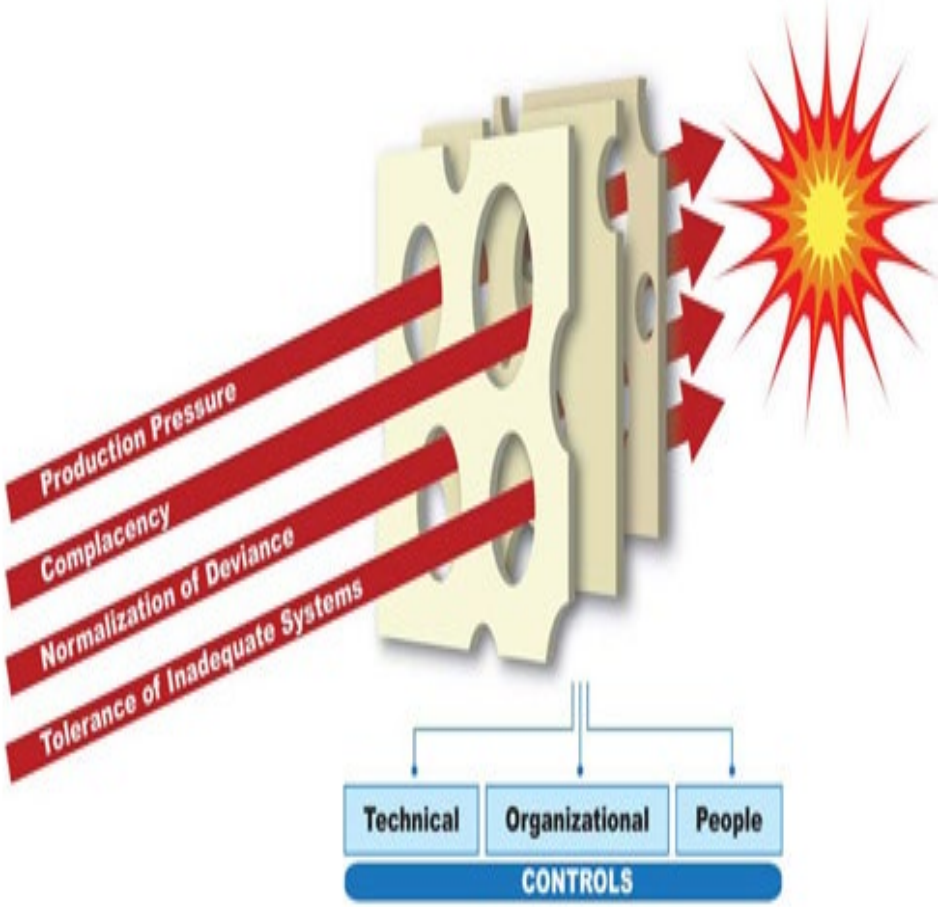
The Guideline Provides for a Systematic "Layered" Approach of Review and Approval by Competent Individuals and Subject Matter Experts with Appropriate Gas System Experience to Minimize Potential Risk and Unintended Consequences from Initial Design through Operation…….



Risk Mitigation Tool…..



EDR, as applied to natural gas system construction (including pipeline abandonment) and operations, **is an evaluation process that is a fundamental component of risk management.**



The Process Takes a Layers-of-Protection Approach Using Competent Individuals / Teams Commensurate with Complexity of Design

Core Principles of Design Review

- ✓Personnel responsible for design-construction may include appropriate engineering and operations departments, engineering professionals (PE or equivalent technical experts), consultants and contractors.
- ✓Participants in the design-construction process have individual responsibilities and obligations that are in many cases integrated and interrelated commensurate with the scope and complexity of the design.
- ✓Regardless of complexity, design review begins with the project design engineer as each designer is responsible for his/her own work.
- ✓The desired outcome of the EDR process is to ensure any design affecting the gas system minimizes system operational risk while maximizing public safety value.
- ✓To achieve this goal, EDR must be carried out using an operator approved process that's inclusive of all appropriate stakeholders.
- ✓Stakeholders are defined as those individuals that may be affected by the work incorporated within an individual design or who have knowledge or experience to contribute which might not be otherwise included.

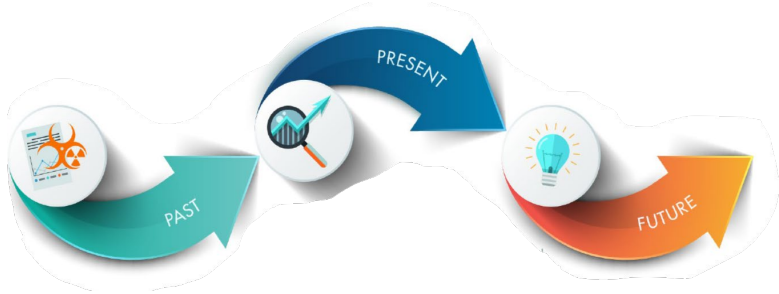
Let's Take a Look.....

The Gas System Engineering Design Review Process includes the following content:

- Purpose
- Leadership and Stakeholder Engagement
- Essential Elements of Gas Engineering Design Review
- Training, Education and Experience of Competent Person(s)
- Standard Engineering Designs, Application of Standard Designs, Construction Drawings and Procedure Reviews
- Complex, Non-Standard Engineering Design, Development of Site/Project Specific Non- Standard Designs, Construction Drawings and Procedure Reviews
- Management of Change Policy (MOC)/Operational Controls
- Safety Assurance
- Continuous Improvement Practices Related to Engineering Design/Management Review
- Documentation and Recordkeeping.

Defining "Complexity" of Design

A Good Science / Common Sense Approach



For distribution system operations, the EDR process typically falls within three sub-processes:

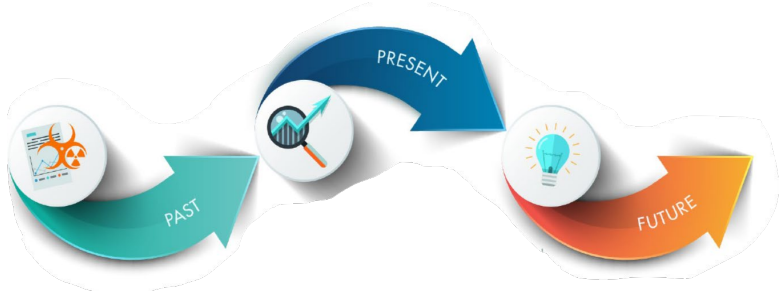
1. Standards, Procedures and Work Practices (including operational enhancements to existing systems, procedures or designs)

2. Standard Designs Applied to Site Specific Projects

3. Site/Project Specific Complex, Non-Standard Designs

Defining "Complexity" of Design

A Good Science / Common Sense Approach

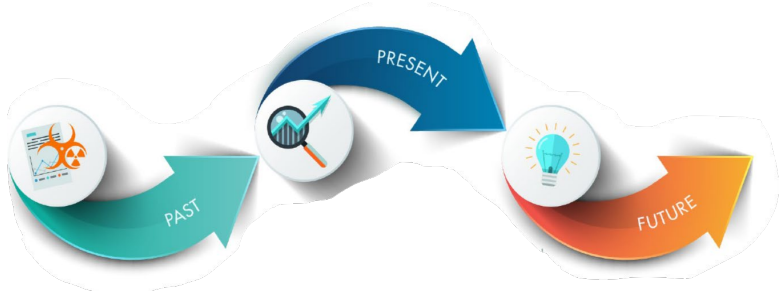


Standards, Procedures and Work Practices (including operational enhancements to existing systems, procedures or designs)

- Standard designs, enable consistency in design, construction, training, operations and maintenance and help ensure compliance and pipeline safety.
- The EDR process for Standards, Procedures and Work Practices includes a structured approach to review by *individuals directly accountable for performing work in accordance with these documents,*
- Approval would be followed by Standards & Procedures Supervisor/Manager/Technical Expert and in some cases, approval by the Chief Engineer, Engineering Director and/or Operations Director *and in some cases review and stamp by a PE (Shoring Standards etc)*.
- In some organizations, standard construction designs/drawings are incorporated directly into O&M Procedures and Work Methods and follow an integrated design, policy, procedure approval like that described for Standard Designs.
- In other cases, "enabling" construction procedures, or operating procedures that must be carried out as part of construction, (i.e. purging, tie-in's, etc.) are incorporated into the project specific design review processes.

Defining "Complexity" of Design

A Good Science / Common Sense Approach



Standard Designs Applied to Site Specific Projects

- Incorporate approved construction standards, specifications, drawings and/or procedures that have gone through a prior EDR process in accordance with an operator's specific policies such as simple mains and services design.

- These designs typically have a "review gate" process with two or three layers of review starting with the design engineer and associated project SME's (from other related functional areas of the organization such as operations, construction, regulatory, safety, etc.)

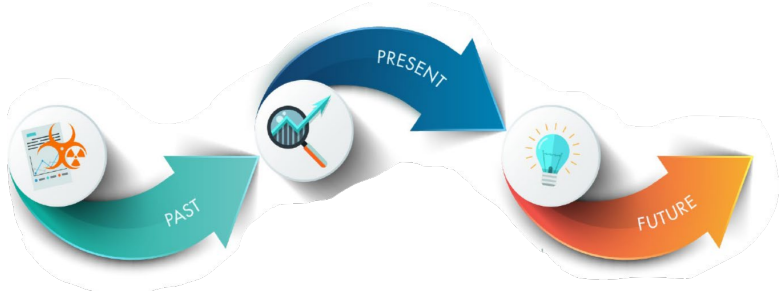
- Includes a final review by an Engineering Supervisor/Manager, and, in some unique/select cases, for more complex standard project designs, the Engineering Director/Executive.

Examples of *standard project designs* include:

- Simple main installation, renewal, replacement, abandonment
- Simple service installation, renewal, replacement, abandonment
- Non-complex new valve installation or replacement (not requiring a by-pass)
- Simple customer meter/regulator installation or replacement

Defining "Complexity" of Design

A Good Science / Common Sense Approach



Site/Project Specific Complex, Non-Standard Designs

- Include complex designs or modifications to standard designs *that are not addressed in an operator's specific standard designs, operating procedures, and/or standard construction drawings.*

- The EDR process for complex, non-standard designs may include an additional review gate by a competent person, independent of the original design team. While most reviews can be effectively conducted by appropriate internal competent personnel, in some specific cases, complex, non-standard EDRs may warrant review by an independent, competent third party.

- A third party may include a Licensed Professional Engineer (PE) or equivalent Technical Expert with gas engineering design and operating experience commensurate with the complexity of the project.

Examples include:

•Design and construction of new or reconfigured district pressure regulator or custody transfer facility including pressure/flow control and safety monitoring systems beyond the scope of a simple, pressure control standard design

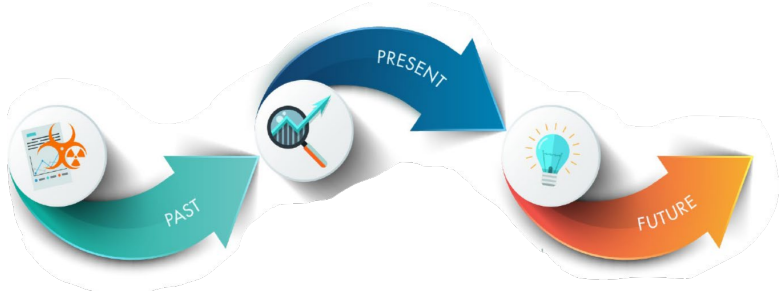
•Pipeline construction and maintenance activity in the vicinity of a pressure regulator station as defined by an organization's policy or procedure

•Uprating of intrastate transmission or distribution pipelines outside of the scope of routine uprate projects defined in an organization's standard policy or procedure

•Gas transmission and/or distribution complex construction/abandonment such as projects incorporating multiple standard design options which in aggregate result in a potential high-risk complex project

•Design and construction of compressor stations and gas processing facilities.

Competency……



While an operator may have different titles for the roles within a company specific EDR policy, to be effective the EDR process must include a layered approach reviewed by appropriately trained and experienced individuals with subject matter experience.

- The EDR process starts with the design engineer and ends with final approval by a specified position of authority as defined by the operator.
- The process includes defined roles and responsibility and the defense-in-depth of multiple disciplines interacting to provide many perspectives.
- The EDR promotes a robust process through the necessary inclusion of stakeholders who could be affected by the work and have knowledge and competence to contribute to the assessment process.
- EDR effectiveness should not be dependent on a single credentialed individual, this could lead to unintended consequences and a false sense of design safety.

Guideline Appendix
EDR “Tools”.....

1. Sample Review Process for Standards, Procedures & Construction Practices

2. Sample Review Process for Application of Standard Designs to Site Specific Projects

3. Sample Review Process for Site/Project Specific Complex Non-Standard Designs

4. Gas System Engineering Design Review Roles, Responsibilities and Qualification Considerations

5. References

6. Sample Complex Design & Construction Review Checklists:

- ✓ Intrastate Transmission Pipelines
- ✓ Distribution Pipelines
- ✓ District Pressure Regulator Stations
- ✓ Gate Stations
- ✓ Bridge & Railroad Crossings
- ✓ Uprating Intrastate Transmission and Distribution Pipelines

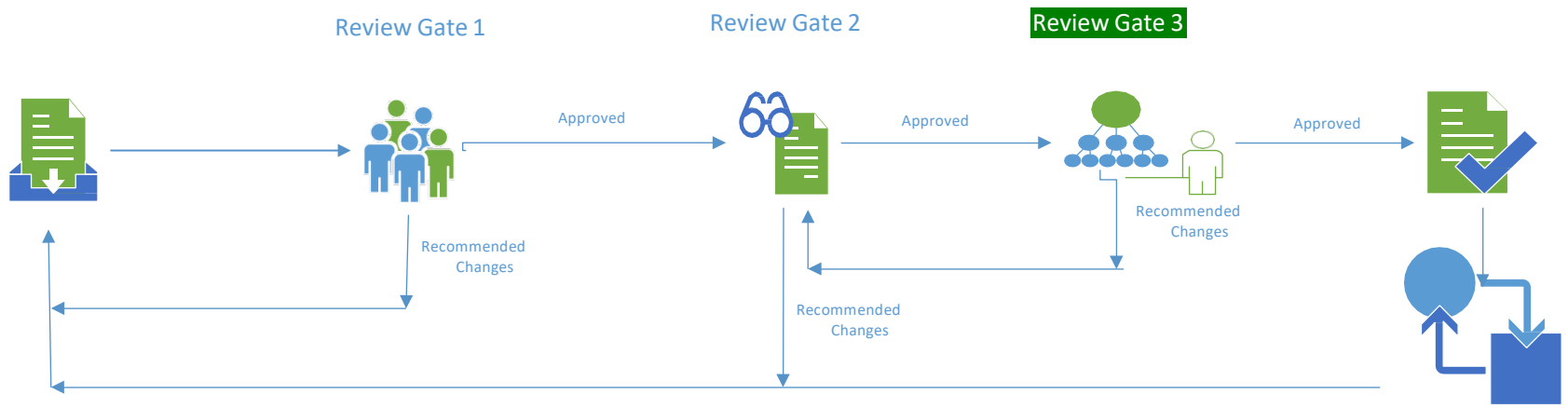
7. Sample System Operations Procedure (SOP)

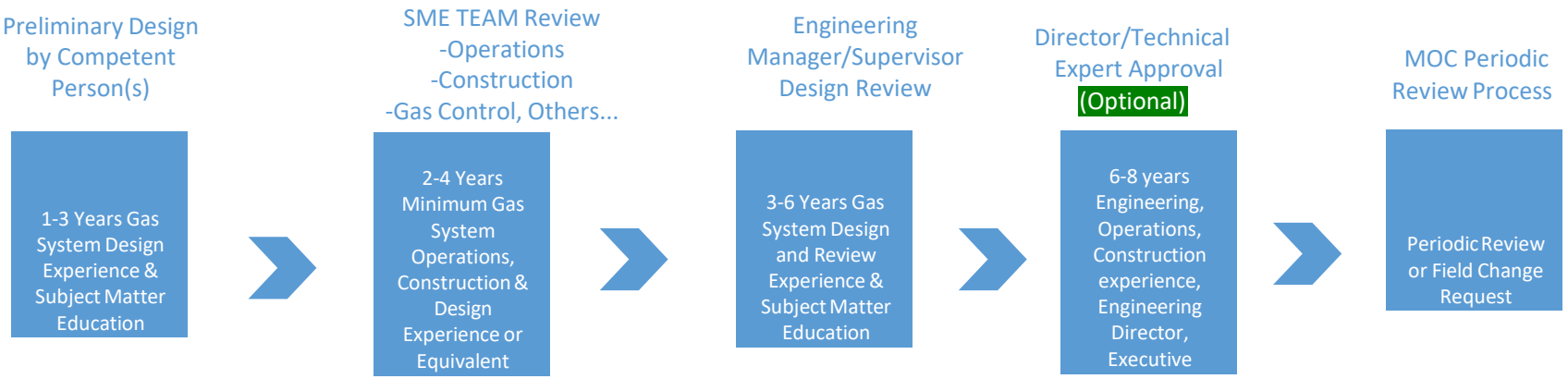
8. Sample Pre-Startup Safety Review Checklist

9. Sample Change Control Procedure for Construction Projects1

10. EDR Guideline Safety Management System Conformance Independent Assessment

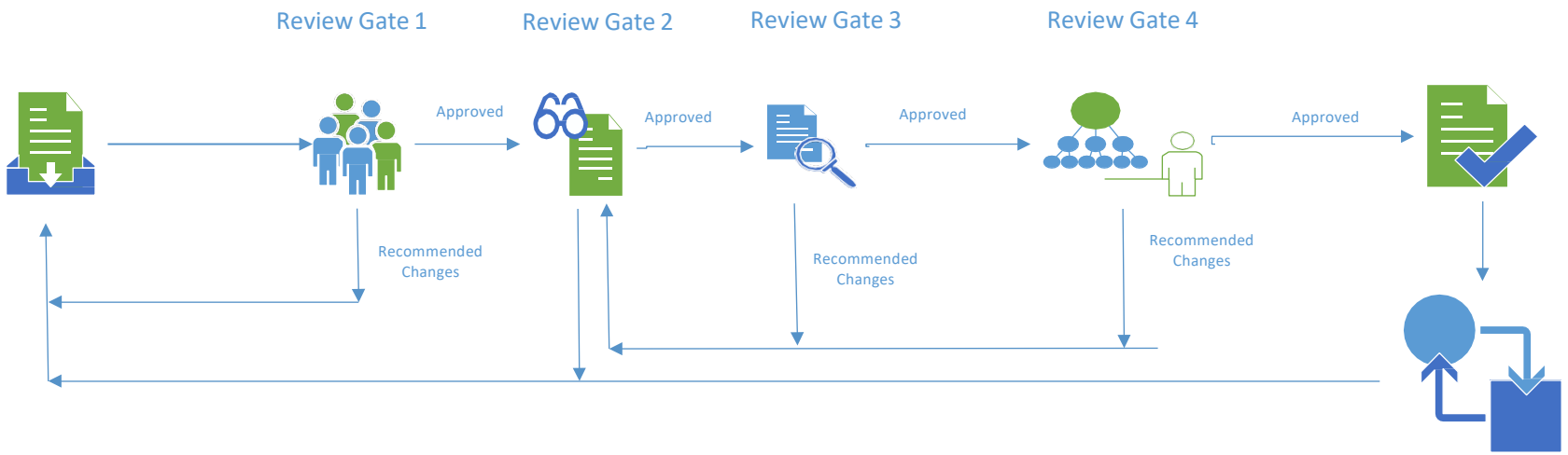
Appendix 2 Sample Review Process for Application of Standard Designs to Site Specific Projects

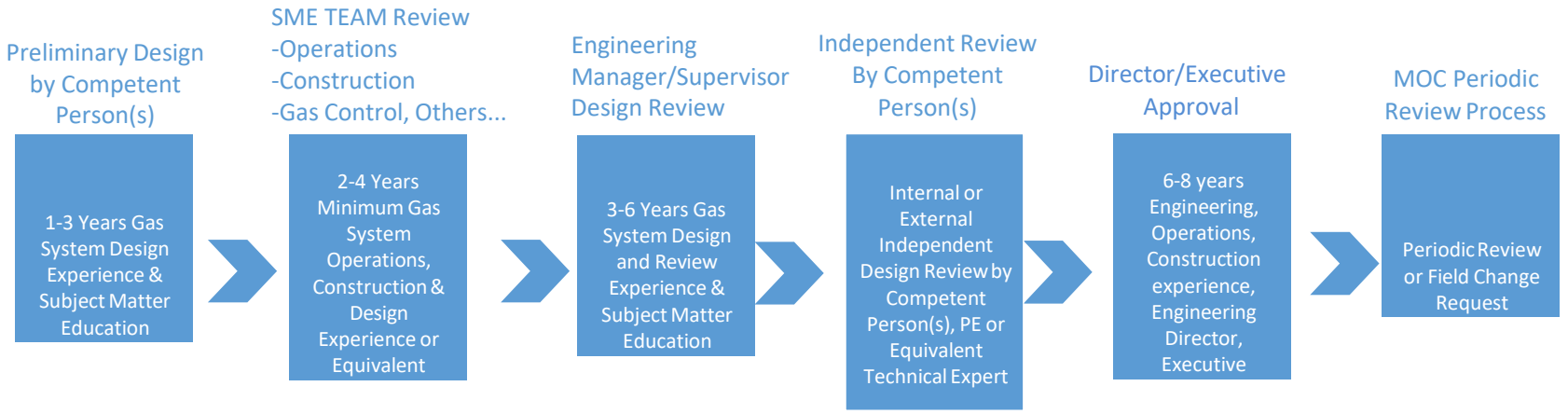




Note: Depending on the complexity of the standard design, the size and scale of company specific operations, the review process may incorporate *2-3 levels of review*. In many cases, the Preliminary Design by a Competent Person incorporates a "design team" combining the SME Team review with work by the Designer, then reviewed and approved by the Engineering Manager/Supervisor (***essentially a two-step process***). For more complex standard designs, or larger, organizations managing more complex systems, the process may be expanded as shown above to include optional review by the Engineering Director/Technical Expert or for routine designs on a "spot check" periodic basis. Regardless of size/scale of an organization or standard design complexity, the Process MUST include design review gates, review by competent person(s) with final approval by a position of authority. ***The key to maximizing public safety value and system reliability associated with gas engineering designs are in the "layers of protection" a properly executed design review process results in rather than relying on a single level review by an individual.***

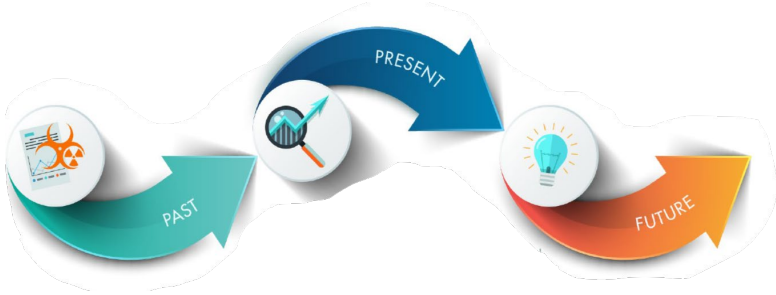
Appendix 3 Sample Review Process for Site/Project Specific Non-Standard Designs





Note: Like the Standard Design Review Process, the Non-Standard review process *is scalable based on project complexity*, the size of a company and complexity of assets being managed. A fundamental element in Non-Standard Design Review is the independent review by Competent Person(s). In this case, Competent Person(s) is defined as an ***internal employee OR contractor*** with a PE **AND** associated gas experience in the subject matter under review (minimum 3- 5 years' experience) OR ***equivalent*** Technical Expert which includes an experienced gas engineering professional with an engineering degree in an appropriate discipline with 6-8 years' experience and successful completion of a Gas Distribution/Transmission Engineering Certificate Program and associated continuing education.

Making the PSMS Connection ……



- The NGA Guideline for Gas System Engineering Design Review
- ***A Reflection of an API RP 1173 Pipeline Safety Management System***

Mark Weesner P.E., Stacey Gerard and Mark Hereth,
The Blacksmith Group

- ✓ *The NGA Gas System design review process draws in many of the element requirements of the API RP 1173 Recommended Practice.*
- ✓ *Inclusion of the API RP 1173 elements in the design review process results in required actions by individuals and the organization consistent with key Leadership, Stakeholder Engagement, Risk Management, Operational Control, Lessons Learned, Safety Assurance, Management Review/ Continuous Improvement, Competency/Training, and Documentation principles, all of which serve to strengthen and add cohesiveness to the design review process.*

More to Come on Day 2 !!

Questions?

Discussion

Contact NGA for Additional Information Regarding Guideline Availability, all Participants will Receive a Copy of the Guideline for Gas System Engineering Design Review

bwilson@northeastgas.org

GTI Engineering Education & Assessment

- Vanessa O'Neil, Sr. Program Manager, Education-GTI
- Dave Keeling, President, Keevestic Inc.

gti®

Demonstrating Competency for Engineering Design Review

GTI Energy Education Programs

GTI Gas Industry Training PAST & PRESENT

- Offered since 1941
- Over 40 courses offered annually
- Over 70,000 gas industry professionals trained

Gas Industry Training ACROSS THE VALUE CHAIN

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- Gas supply (unconventional gas, LNG)
- Gas utilization & marketing

GTI Training DELIVERY OPTIONS

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- Onsite classroom courses
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- RGDP – Registered Gas Distribution Professional
- CGTP – Certified Gas Transmission Professional
- Representative T & D Courses listed below
  - Many delivered in a variety of formats: classroom, virtual instructor led and online/self-study

- Gas Distribution Engineering
- Pipeline Safety Regulatory Compliance
- Gas Distribution Operations
- Measurement & Regulator Station Design
- Gas Transmission Operations
- Gas Controller
- Compressor Station Design
- Horizontal Directional Drilling
- Fundamentals of In-Line Inspection
- Natural Gas Field Skills

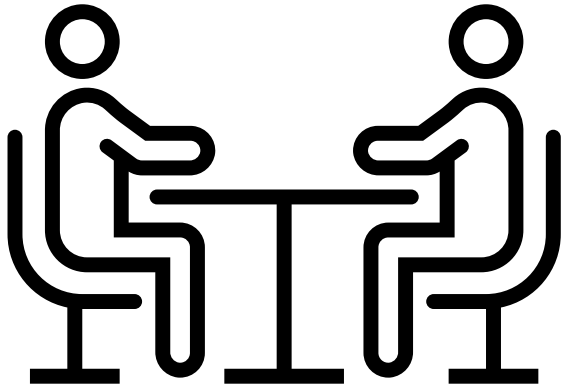
GTI Engineering Education & Assessment

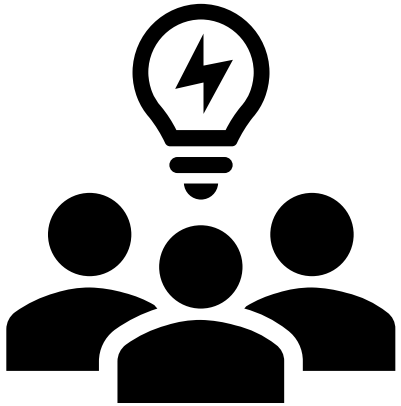
Competent Engineer Education & Assessment Program

- Four Week Program with Rigorous 4-hour Assessment
- Addresses AGA recommended Competencies for Natural Gas Utility Engineers
- Nine Competency Areas covered:

  - Pipeline Design and O&M
  - Corrosion Control
  - Equipment & Material/Selection Testing
  - Telemetry
  - Metering & Regulator Station Design
  - Integrity Decisions
  - Development of Engineering & Operation Standards
  - Control Room Management
  - Asset Management

Gap Analysis Component





Gap Analysis

Self-appraisal Questionnaire

- Optional preliminary opportunity, available to the utility
- Covers competency and confidence levels in specific types of activities

Formal Gap Analysis

- Involves two, two-hour tests (200 questions)
- Comprehensive coverage
- Developed from input from SMAs, AGA, NGA suggestions and white papers
- Open book exam, taken individually
- Designed that the person may not finish
- Based on 49 CFR 191 & 192
- Designed to identify where extra learning is required by company and individual
- Initially should not impact position or performance review
- Failure to develop may impact position or performance review

Sample Question

61		A section of protected bare steel distribution pipe with a wall thickness of 0.25 inches is found to have a single spot of corrosion that is 0.03 inches deep. The pipe is not leaking. Calculations show that the remaining wall thickness is acceptable for the existing MAOP of the pipeline. According to 49 CFR 192 what must be done?	
		a. The corroded section of pipe must be replaced	O
		b. The corroded section of pipe must be repaired by a method that reliable engineering tests and analysis show can permanently restore the service ability of the pipe.	O
		c. The cathodic protection must be increased for that section of pipe.	O
		d. There is no need to do anything, but documentation is required and it is good practice to inspect the pipe for leakage within one calendar year.	O
		e. None of the above	O

Gap Analysis

Suggestions received on training and experience priorities

- Based on group and individual results
- How to best fill gaps
- Classroom, hands on, OQ, mentoring, field skills or experience

Could be used as a first step on assumed level of competency

Basis of Program

Northeast GAS ASSOCIATION

GUIDELINE FOR GAS SYSTEM ENGINEERING DESIGN REVIEW

Forward

This Guideline is intended to provide NGA Pipeline Organizations a framework and considerations for developing and enhancing an organization specific gas system engineering design review process. The goal of implementing a gas system design review process is to ensure that gas transmission and distribution systems are designed and operated in a safe and reliable manner. Engineering design reviews as applied to natural gas system assets and operations can range from:

- Simple changes based on field operations enhancements to existing applications of organization specific standard designs approved for use throughout an organization;
- To complex, non-standard designs that include many linked stakeholders and subject matter experts (SME's) organization.

Regardless of design complexity, organization size or scale of assets being managed, each organization should have a design review process in place that ensures appropriate review of essential elements of design with a focus on pipeline and process safety, constructability and operability. The design, as well as the design review, must be conducted by competent person(s) familiar with the specific subject matter commensurate with the complexity of the project. The scope of this document includes gas transmission and distribution pipelines, systems and appurtenances.

gti

A Publication for AGA Members

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AGA White Paper

Skills and Experience for Effectively Designing Natural Gas Systems

December 18, 2019

Northeast GAS ASSOCIATION

Guideline for Gas System Engineering Design Review

Approved by: _____ Document No. _____ Date_____

Table 1: Recommended Competencies

Work Function	Examples of Training Topics	
Pipeline Design and O&M	• Applicable regulations • Pipe material selection • Replacement, repair, and installing mains and services • Pipe testing • Requirements	• Uprating • Gas planning and system modelling • Considerations for land, environmental, and regional impacts • Recordkeeping • Joining methods and pipe welding
Corrosion Control	• Applicable regulations • Fundamental corrosion control design (coatings, cathodic protection, electrical insulation) • Recordkeeping	• Effectiveness of corrosion control measures in place • Methods, tools, and technologies for monitoring, testing, and mitigation
Equipment and Material Selection/Testing	• Applicable regulation • Pipe testing • Recordkeeping	• Understanding of equipment to monitor and control the volume, flow and pressure of natural gas
Telemetry	• Applicable regulations • Supervisory Control and Data Acquisition (SCADA) systems and processes	• Managing communication and data from transmitters and remote equipment • Maintenance of equipment
Metering and Regulator Station Design	• Applicable regulations • Fundamentals of pressure regulation • Regulator sizing basics • Regulator station configurations • Valves, fittings, and over pressure protection • Odorization and heating of gas	• Fundamental meter sizing and configuration • Customer meter and regulation • Meter auxiliary equipment • Gas quality and gas conditioning • Aerodynamic noise • Gas conditioning equipment
Integrity Decisions	• Part 192-Subparts O or P • ASME B31.8S and other standards incorporated by reference • Pipeline threats • Preventative and mitigative actions • Repair methods	• Assessment methods • Assessment Intervals • Data gathering • Risk modeling • Recordkeeping
Development of Engineering and Operation Standards	• Overview of regulatory environment • History of gas pipeline safety guidance an regulations • Pipeline inspections and audits • Recordkeeping	• Part 191—Annual Reports, Incident Reports, and Safety-Related Condition Reports • Part 192—Minimum Federal Safety Standards; Subparts A
Control Room Management	• Measurement units • Basic pipeline hydraulics • Pipeline model and map • Fundamentals of pressure regulation and compression •	• Abnormal Operating Conditions (AOC) • Supervisory Control and Data Acquisition (SCADA) systems and processes • Incident Command Structure (ICS) • Response to outages • Recordkeeping
Asset Management	• Inputs for risk modeling • Identification of and recommended plans for piping and equipment repair or replacement	• Compliance requirements for pipeline system • O&M requirements • Recordkeeping

Scope of The Training Program

To introduce the participants to multiple aspects of natural gas utility engineering

- Based on AGA White Paper on Engineering Competency with additions as felt appropriate.

The information provided is typical within the gas industry; not necessarily specific to a particular utility

The program is based on 49 CFR 191 & 192

- State and local codes and regulations will also apply

Experience and exposure to field activities is also critical for “competency

AGA White Paper - Skills and Experience for Effectively Designing Natural Gas Systems

Tier 1: Developing a Foundational Understanding of Natural Gas Systems

- Establish a fundamental understanding of natural gas systems.
- This includes developing an understanding in the areas of natural gas system design, delivery of natural gas to end users, the operations and maintenance of natural gas systems and an overview of federal and state regulations that govern the natural gas industry.

AGA White Paper

Tier 2: Improving Knowledge about Operator-Specific Processes and Procedures

- Develop *and understand* operator-specific requirements that address each unique pipeline system and the processes each company utilizes to operate and maintain them

- The operator-specific processes may provide guidance on functions such as design, material selection, replacement of pipe facilities, testing, and maintenance. This tier focuses on ensuring employees understand how to perform the work safely, as well as standardizing the communication between cross-functional work groups.

AGA White Paper

Tier 3: Building Technical Knowledge Acumen

- Focuses on developing, maintaining, and enhancing technical acumen in system-specific areas of expertise.

- This system-specific technical acumen may be further enhanced by on-the-job training, attending and participating in industry conferences, attending continuing education courses, obtaining gas-related certifications, or receiving and maintaining engineering licensure.

- It is important when considering appropriate Tier 3 technical knowledge that it is specific to the natural gas area of expertise

GTI Competent Engineer Program Goal

- To meet the AGA Tier 1 requirements: Developing a Foundational Understanding of Natural Gas Systems

- Tier 2 – Operator Specific Knowledge

- Tier 3 – Operator Specific Knowledge Enhancement

Program Coverage

Week 1

- Pipeline Design
- Corrosion Control
- Equipment and Material Selection & Testing
- Construction

Week 2

- Telemetry
- Meter & Regulator Station Design
- Control Room Management

Week 3

- O&M
- Integrity Decisions
- Development of Engineering & Operations
- Asset Management

Week 4

- Review
- Assessment

Questions

Day-1

Wrap-Up

Reminder: Day-2 Start Time 10:00 am

Thank You !

NGA Pipeline Safety Management System Collaborative

Guideline for Gas System Engineering Design Review

Guideline for Gas System Engineering Design Review (EDR) Workshop

March 8th & 9th 2021

Day 1Re-Cap
Welcome to Day 2 !

Gas System Engineering Design Review Webinar Series

A Safety Management System Perspective March 8th & 9th, 2021

AGENDA

Day 2

Day 2 Overview ..... 10:00 – 10:10

Mark Hereth, Managing Director, The Blacksmith Group

2. Design Review as a Strategic Approach to Risk Mitigation; Lessons Learned... 10:10 – 10:40

Robert Hall, Director, Railroad, Pipeline, and Hazardous Material Investigations National Transportation Safety Board (NTSB)

3. Connecting Engineering Design Review to Key PSMS Elements..... 10:40 – 11:15

Stacey Gerard, Senior Fellow, The Blacksmith Group Mark Hereth, Managing Director, The Blacksmith Group

- ✓ **Leadership**
- ✓ **Stakeholder Engagement**
- ✓ **Risk Management**
- ✓ **Operational Controls/ Management of Change**
- ✓ **Safety Assurance**
- ✓ **Competency, Awareness & Training**
- ✓ **Continuous Improvement, including incident investigation.**

4. The Engineering Design Review Process; RP 1173 in Action

Design Review Process ..... 11:15 – 11:45

Alan Mayberry, Associate Administrator for Pipeline Safety, Pipeline and Hazardous Materials Safety Administration (PHMSA)

Program Wrap-up, Q&A **.....11:45 – Noon**

Mark Hereth, Managing Director, The Blacksmith Group

National Transportation Safety Board

NTSB
An Independent United States Federal Government Agency

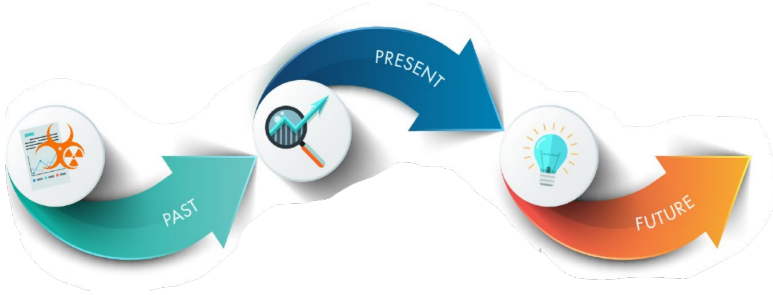
Design Review as a Strategic Approach to Risk Mitigation

Lessons Learned

Robert Hall, Director, Railroad, Pipeline, and Hazardous Material Investigations

National Transportation Safety Board

The Blacksmith Group



Connecting Engineering Design Review to Key PSMS Elements

Stacey Gerard, Senior Fellow, The Blacksmith Group

Mark Hereth, Managing Director, The Blacksmith Group

Why Build EDR on a PSMS Foundation?

Stacey Gerard and Mark Hereth
The Blacksmith Group/ P-PIC
NGA Engineering Design Review Workshop
March 9, 2021

To Systematize and Strengthen the Process!

- Be Risk Management Focused
- Require and Strengthen Competency
- Drive Safety Assurance – a Framework of Checks and Balance – Building *Layers of Protection*
- Add Rigor/Be Robust
- Recognize that Safety Culture is Essential

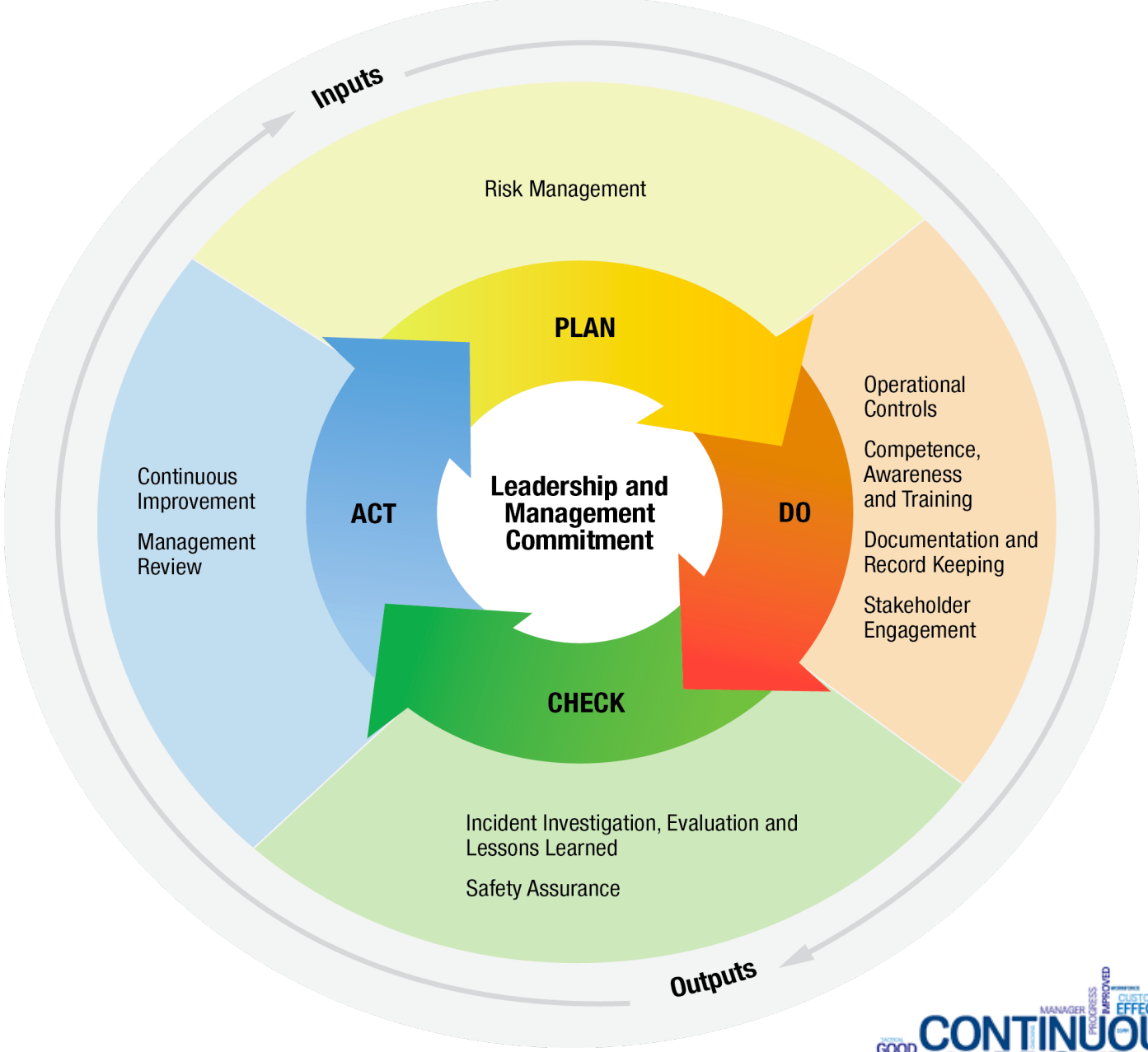
All These Factors are Critical to an Effective Pipeline Safety Management System

Enable Higher Levels of Performance

Do We All Know the PSMS Elements?

We see them embedded in EDR Process

Plan, Do, Check, Act Model is at the Core of EDR and PSMS/API RP 1173



- ***Continuous Improvement is the Goal***

EDR Expectations Consistent with Standard for Leadership in API RP 1173

- Organization will conform to specific **standards, specifications, processes, and procedures**.
- All personnel and contractors participate consistent with their training, knowledge and competency, commensurate with complexity of scope.
- **Responsibilities, authority and accountability** for each position are clearly defined.
- **Delegation of Authority defined** for Engineering Approval and visible sign off by senior technical leader/executive.

To achieve to improved safety performance and system reliability.

EDR Expectation Meets Standard for Stakeholder Engagement

- Drawing upon personnel from **key parts of the organization**, including **field operations, engineering (including Professional Engineers and/or technically equivalent), contractors and SMEs**.
- Leadership **welcomes employee involvement** and **taking ownership** of the assets as their personal responsibility.
- **Emphasis on transparency** leads to an open environment where employees feel safe about offering their safety concerns.

EDR Process Built on Engineering Risk Management

Speaking directly to lessons from Columbia Gas - Merrimack Valley:

- The EDR review process includes a **requirement for assessing design/operational risk**, where appropriate, including identification of potential abnormal operating conditions (AOC's).
- The process considers design and operational risk, and where appropriate a Pre-Startup Safety Review (PSSR) and a **Site-Specific System Operating Procedure** (SOP).
- The process requires identification of **potential risks associated with change** and any required approvals prior to introduction of such changes.

EDR Strengthens Operational Controls

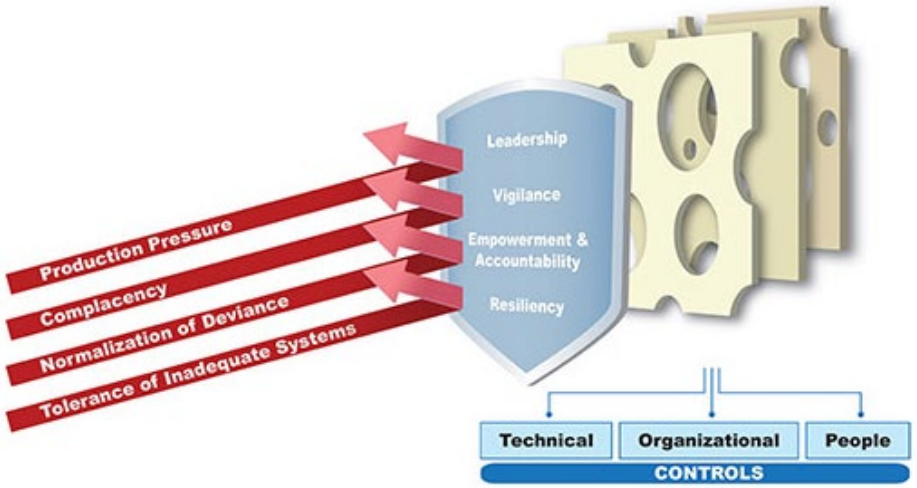
- The design review process relies on an **organization's written construction, maintenance and operations procedures**.
- The process emphasizes the **importance of the connections** between material specifications, system/equipment design, construction processes and field construction inspection consistent with design requirements.
- The process contains requirements for a **robust MOC process** consistent with the requirements of API RP 1173.

EDR Requires Incident Investigation, Evaluation, and Lessons Learned

The design review process requires a continuous improvement process related to engineering design to **incorporate the results of incident investigations, evaluations and lessons learned**.

Consistent monitoring through management review of lessons learned and applied provides greater assurance learning **from specific findings is system-wide**.

EDR Process Builds Safety Assurance-- Layers Are “Defense in Depth”



Speaking to lessons from Columbia Gas - Merrimack Valley:

- The design review process requires the use of **pre-defined “Design Review Gates”**, creating an objective and transparent review process that, in many cases, is independent of the initial design review.
- The process requires, when specified, use of individual(s) not directly involved in the process to ensure that conflicts of interests do not arise.
- **Commitment to an audit of this process** as a priority provides an added level of safety assurance.

EDR Periodic Reviews consistent with Management Review and Continuous Improvement Standard

- **EDR specifies use of a continuous improvement process** requiring:
  - the use of periodic reviews of gas system designs to ensure changes to specific designs,
  - feedback from lessons learned, and
  - evaluation of risk are feedback to the training organization.
- **Periodic reviews of metrics require**:
  - stakeholder feedback,
  - equipment reliability,
  - performance and availability,
  - gas system operational performance,
  - incident investigations, near-miss evaluations and lessons learned, and
  - results of risk management reviews, internal and external audits.

EDR Definitions of Knowledge and Experience Exceed Standard for Competency, Awareness and Training

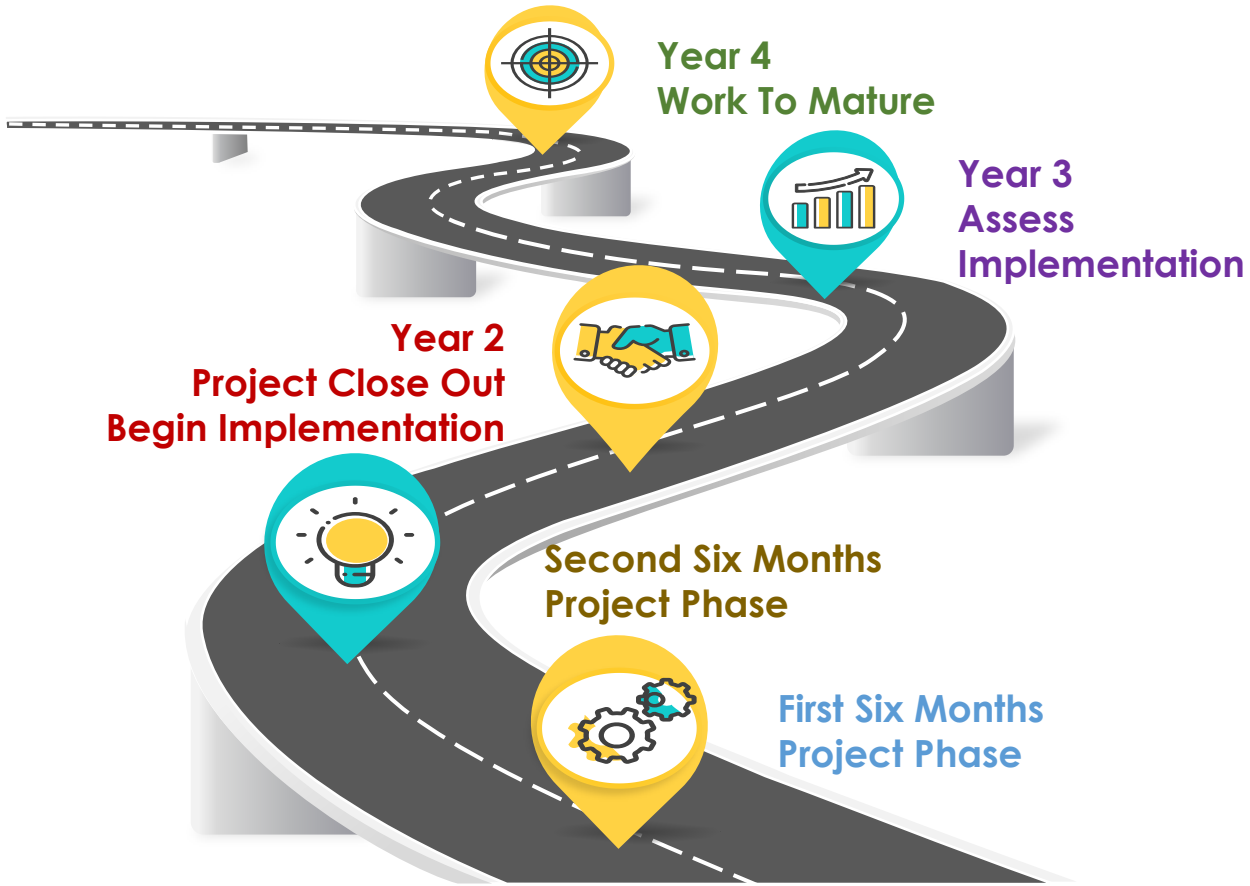
- EDR requires that design reviews are carried out by **suitably trained, competent individuals experienced in gas system design and operations** able to comment constructively on constructability, operations, pressure control and work site safety.
- Requirements are detailed for **training, education and experience** needed to carry out the design-construction review process.
- Specific competency requirements are very detailed for each role in the process along with **sources with options and variations to provide adequate knowledge** required.

EDR Bolsters Documentation and Recordkeeping

- EDR requires **identification, distribution, and control of documents** to memorialize the review process.
- The process requires **identification of the approval authority for document approval/sign-off, re-approval and assurance** that documents and records supporting the design review process are readily identifiable and available for future use.
- Requirements for **accessibility and transparency** provide an added level of assurance that employees can reliably find and use what is needed.

EDR Built on PSMS Intends to Raise the Safety Bar

- **Framework of checks and balances** to ensure facility construction, operation and maintenance are performed consistently and provide pipeline operating organizations with the fundamental rules to ensure sustainable positive safety outcomes.
- Added **focus on objectivity, multidisciplinary characteristics, visible and continuous accountability** builds assurance.
- **Deepening levels of protection avoids potential for weaknesses** aligning to cause a failure as depicted in the “Swiss Cheese Model”.



EDR and PSMS Share Concept of Journey/Roadmap to Continuous Maturing

- It is a more robust process providing better depth of protections through added layers gradually.
- Emphasis on visibility, transparency and accountability should motivate employees to add their perspective, adding a sense of more well- rounded review.
- Over time, the safety bar is raised through greater completeness and comprehensiveness of reviews.

Questions
Discussions

Pipeline and Hazardous Materials Safety Administration

The Engineering Design Review Process; RP 1173 in Action

Alan Mayberry, Associate Administrator for Pipeline Safety,
Pipeline and Hazardous Materials Safety Administration

Questions?

Discussion

Contact NGA for Additional Information Regarding Guideline Availability, all Participants will Receive a Copy of the Guideline for Gas System Engineering Design Review

bwilson@northeastgas.org