Peer Review Report

Pipeline & Hazardous Materials Safety Administration

Pipeline Safety Research & Development Program

Peer Reviews Conducted
May 20 & 22, 2014

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EXECUTIVE SUMMARY

The Pipeline and Hazardous Materials Safety Administration's (PHMSA) Pipeline Safety Research and Development (R&D) Program has held annual structured peer reviews of active research projects since 2006 in accordance with mandates by the Office of Management and Budget (OMB) and the Office of the Secretary of Transportation (OST) to maintain research data quality. PHMSA holds these reviews virtually via teleconference and the Internet, saving time and resources. This execution is also working well with panelists, researchers, Agreement Officers' Technical Representatives, and project co-sponsors. Most impressively, the PHMSA approach facilitates attendance from all U.S. time zones, Canada, and Europe.

The annual peer review continues to build on an already strong and systematic evaluation process developed by PHMSA's Pipeline Safety R&D Program and certified by the Government Accountability Office. The 2014 peer review panel consisted of two retired and three active independent technical consultants and one academic representative.

Twenty-four research projects were peer reviewed by expert panelists using 13 evaluation criteria. These criteria were grouped within the following five evaluation categories:

1. Project relevance to the PHMSA mission.
2. Project management.
3. Approach taken for transferring results to end users.
4. Project coordination with other closely related programs.
5. Quality of project results.

The rating scale possibilities were "Ineffective," "Effective," "More than Effective" or "Very Effective." During the May 2014 review, the average program rating between all the evaluation categories was "More than Effective." For this year, 13 projects were rated "Very Effective" with 11 projects ranked as "More than Effective." The average sub-criteria scoring were also rated very high and underpin these findings. The majority of peered projects and the overall program rating is down to "More than Effective" from the 2013 rating of "Very Effective." Weakness in project management contributed to the lower program average. The government shutdown in CY 2013 was identified as a contributor to lower rating for project management. Table 4 summarizes the overall program performance based on the summary of the reviewed projects. Table 5 itemizes the project ranking order, where projects of the same score have an equal ranking. Additional details are available in Section 7, Tables 4 and 5, and in Appendix C of this report.

PHMSA is very satisfied with the process performed to conduct these reviews, as well as the CY 2014 findings and recommendations provided by the panelists. PHMSA accepts the findings and recommendations summarized in the report. The official PHMSA response memorandum is found in Appendix A.

1.0 Introduction

The purpose of this document is to report findings from the research peer reviews held May 20 & 22, 2014, for PHMSA's Pipeline Safety Research and Development Program. The findings and recommendations in this report are derived from the scoring and comments collected from the peer review panelists.

Department of Transportation (DOT) Operating Agencies (OA) are required to develop and execute a systematic process for peer reviews and for all influential and highly influential information that the OA plans to disseminate in the foreseeable future.

Through the Information Quality Act[1], Congress directed the Office of Management and Budget (OMB) to "provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information, (including statistical information) disseminated by Federal agencies." A resulting OMB Bulletin, titled "Final Information Quality Bulletin for Peer Review," was issued, which prescribes required procedures for Federal programs.

The Office of the Secretary of Transportation (OST) produced procedures governing modal implementation of this OMB Bulletin. These procedures, as well as the OMB Bulletin, serve as the basis and justification for the PHMSA Pipeline Safety R&D Program peer reviews.

The purpose of these peer reviews is to uncover technical problems to keep projects on target or aligned with stakeholder needs and to give technical guidance using technically competent and independent, objective experts. These reviews are held annually for active research projects and usually occur in the second quarter of each calendar year.

2.0 Research Program Background

PHMSA regulates safety in the design, construction, operation and maintenance, and spill response planning for over 2.6 million miles of natural gas and hazardous materials pipelines. It is focused on the continual reduction in the number of incidents on natural gas and hazardous liquid pipelines resulting in death, injury, or significant property damage. Additionally PHMSA aims to reduce spills that harm the environment.

The vision of the PHMSA Pipeline Safety R&D Program is to support the pipeline safety mission of PHMSA, which is "to ensure the safe, reliable, and environmentally sound operation of America's energy transportation pipelines." The mission of the PHMSA Pipeline Safety R&D Program is "to sponsor research and development projects focused on providing near-term solutions that will improve the safety, reduce environmental impact, and enhance the reliability of the Nation's pipeline transportation system."

PHMSA has regulatory responsibility for the safety of natural gas and hazardous liquid pipelines. Beginning in 2001, PHMSA began strengthening its role in assuring the safety of the Nation's pipeline system in numerous ways, including promulgating new regulations on integrity

[1] Pub. Law. No. 106-554-515(a)

management.[2,3,4] These regulations, together with the new inspection processes being used by regulators to evaluate operator compliance, rely on operator access to new technologies that support improved safety and integrity performance and on regulator access to information on the appropriate use and limitations of these technologies. To address the need for new integrity-related technologies and information on the validity of these technologies, Congress expanded the support for the PHMSA Pipeline Safety R&D Program in 2002.[5] As authorized by Congress, PHMSA sponsors research and development projects focused on providing near-term solutions that will increase the safe, reliable, and environmentally sound operation of America's energy transmission and distribution pipelines.

The R&D program contributes directly to the PHMSA mission by pursuing three program objectives:

1. Fostering the development of new technologies that can be used by operators to improve safety performance and to more effectively address regulatory requirements.
2. Strengthening regulatory requirements and related national consensus standards.
3. Promoting and improving the state of knowledge for pipeline safety officials so industry and regulatory managers and PHMSA pipeline safety field inspectors can make better decisions with safety issues and resource allocation.

The R&D Program is organized around six R&D program elements. Each program element has associated safety issues, technology needs or gaps, and R&D opportunities. Ongoing and future planned projects are linked to at least one of these program elements. The program elements reflect the responsibilities of DOT in the Five-Year Interagency R&D Program Plan[6] and guidance from pipeline experts and stakeholder groups.

Program goals are associated with each program element. The goals define the desired outcomes for the R&D projects. Each goal bears a direct relationship to longer-term enhancement of pipeline safety. Table 1 identifies these program elements and the improvements desired.

[2] "Pipeline Integrity Management in High Consequence Areas for Hazardous Liquid Operators" (49 CFR Part 195); Rules effective May 29, 2001, and February 15, 2002. <http://primis.phmsa.dot.gov/iim/ruletextamended.htm>
[3] "Pipeline Safety: Pipeline Integrity Management in High Consequence Areas (Gas Transmission Pipelines)"; Final Rule. December 15, 2003. < http://primis.phmsa.dot.gov/gasimp/docs/GasTransmissionIMRule.pdf>
[4] "Pipeline Integrity Management in High Consequence Areas (Gas Transmission Pipelines)"; Final Rule (as amended), May 26, 2004. <http://primis.phmsa.dot.gov/gasimp/docs/FinalRuleAmended_gas_full.pdf>
[5] Pipeline Safety Improvement Act of 2002 < http://ops.dot.gov/Pub_Law/107_cong_public_laws.pdf>
[6] Five Year Interagency R&D Program Plan < http://primis.phmsa.dot.gov/rd/psia.htm

Table 1. Program Elements of PHMSA Pipeline Safety R&D Program		
	Program Element	**Program Element Goal**
1.	Damage Prevention	Develop new or improved tools, technology or practices for reducing damage to pipelines that will prevent releases to the environment.
2.	Leak Detection	Develop new or improved tools and technology solutions for reducing the volume of product released to the environment.
3.	Anomaly Detection and Characterization and	Develop new or improved tools, technology and assessment processes for identifying and locating critical pipeline defects and to improve the capability to characterize the severity of such defects identified in pipeline systems.
4.	Anomaly Repair and Remediation	Enhance repair materials, techniques or processes, repair tools and technology for quickly bringing pipeline systems back on line and serving the Nation.
5.	Design, Materials and Welding/Joining	Improve the industry's ability to design and construct safe and long lasting pipelines using the most appropriate materials and welding/joining procedures for the operating environment.
6.	Alternative Fuels, Climate Change & Other	Identify and remove technical issues preventing the safe transportation of alternative fuels in pipelines and for addressing other emerging technological or policy issues of a national scale.

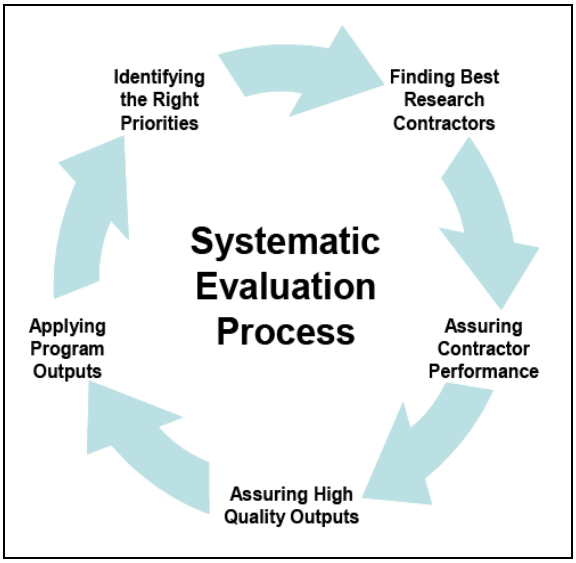
More information on the program strategy is outlined in the R&D Program Strategy portion of the program website at http://primis.phmsa.dot.gov/rd/

Research Program Quality

While the program addresses the general strategy, a systematic evaluation process has been designed and implemented for raising and validating program quality. The process contains five steps and follows research projects from their inception to their resulting implementation. Each step of this systematic process ensures that project outcomes will be of high quality, relevant to PHMSA's mission, and applied to the appropriate end users.

Figure 1 identifies the steps in the systematic evaluation process and how it follows the lifecycle of research projects. Please visit http://primis.phmsa.dot.gov/rd/evaluation.htm to view more information on this process.

Figure 1. Systematic Evaluation Process



The quality of the research projects is first established while identifying the right priorities. This roadmapping at joint Government and industry R&D forums and other meetings collaboratively identifies the right priorities and structures the projects to meet end user technical needs. This allows government and industry pipeline stakeholders to agree on the technical gaps and challenges for future R&D. It also minimizes duplication of programs, leverages funds, broadens synergies, and factors ongoing research efforts with other agencies and private organizations.

Appropriate priority and good project design are refined while finding the best research contractors. A merit review panel composed of representatives from Federal and State agencies, industry operators, and trade organizations uses strong evaluation criteria to review research white papers and proposals.

PHMSA uses its Management Information System (MIS) to assure that awarded projects are performing well. The MIS electronically monitors and tracks contractor performance as the project moves toward completion. This system provides the necessary oversight so that contract accounting and specific contractual milestones are systematically followed as prescribed in the award documents. The system design improves and maintains program quality, efficiency, accounting and accountability. Additional oversight is provided by Agreement Officers' Technical Representatives (AOTRs) who are trained, certified, and designated to each project in accordance with the Federal Acquisition Regulations.

The peer review is designed to further improve quality and keep research projects on track to meet their ultimate goal(s). If the first three steps of the systematic evaluation process are applied correctly and efficiently, PHMSA pipeline safety research projects have a higher probability of being successful, which means that the results are used by end users.

3.0 Peer Review Panelists

Peer review panelists are chosen based on three criteria: expertise, balance, and independence. Specifics for choosing panelists are derived from the OMB Bulletin, and panelists can range from academics to active and/or retired personnel from regulators, academics, independent consultants and standards developing organizations.

The 2014 peer review panel consisted of two retired and three active independent technical consultants and one academic representative. Table 2 identifies the panelists.

Each panelist provided a short biography describing work history and technical qualifications. These biographies are included in Appendix B.

Table 2. Peer Review Panelists

	Name	Affiliation
1	W. R. (Bill) Byrd, P.E.	Consultant Independent Technical and President, RCP Inc.
2	A.S. "Sandy" Kirkindall	Independent Technical Consultant and President, Old Sarum Analytics, LLC
3	Randall Webb	Independent Technical Consultant, National Association of Corrosion Engineers
4	Kent Muhlbauer, P.E.	Independent Technical Consultant and Owner, WKM Consultancy, LLC
5	Walter Robert (Bob) Nixon Jr, P.E.	Independent Technical Consultant
6	Lou Hayden Jr., P.E.	Professor, Lafayette College and Independent Technical Consultant

4.0 Panelist Charge

The Peer Review Panelist charge, initially developed in December 2005 and revised annually, is provided to each panelist prior to the review. It contains specific instructions regarding what is expected in terms of their review. This charge is important for the following reasons:

1. It focuses the review by presenting specific questions and concerns that PHMSA expects the peer reviewers to address.
2. It invites general comments on the entire work product. The specific and general comments should focus mostly on whether the scientific and technical studies have been applied in a sound manner.

The charge is a separate document not attached to this report. It is publicly available for each year's review at http://primis.phmsa.dot.gov/rd/annual_peer_review.htm and may be revised after researcher and panelist post review feedback.

5.0 Scope of the Peer Review

During the annual peer review of projects, the members of the panel review focused, high-level presentations from researchers addressing 13 evaluation criteria within five specific evaluation categories. Presentations are scheduled to take no more than 20 minutes followed by ten minutes for panelist questions including any possible written public questions. In its entirety, the review of each project by the panelists should occupy approximately 2.5 hours. This entails the time to review project background information including reporting, the advance copy of the review slides, 30 minutes of review and questioning from the panel and the time in post review including possible follow up questioning, consensus review meeting and review of the peer review report. An underlying R&D Program objective is not to compare one project to another, but to provide the best assessment of each project's performance addressing the specific criteria. Scorecards for rating performance on the specific categories are provided to the panelists. Each category has equal rating from one to five. The scorecard included the following questions in five performance categories:

1. Project relevance to PHMSA mission.

- How well does the project illustrate its relevance for enhancing pipeline safety and/or protecting the environment?
- How well does the project describe its relevance to PHMSA's Research Program Goals?

2. Project management.

- Is the project being managed on budget and schedule?
- Is the project making progress toward the work scope objectives and the PHMSA goals?

3. Approach taken for transferring results to end users.

- Is there a plan for dissemination of results, including publications, reporting, and patents?
- How much end user involvement is incorporated into the work scope?
- For results that may include marketable products and technologies, are commercialization plans established?

4. Project coordination with other related programs.

- Does the project build on, or make use of, related or prior work?
- Is the work of the project being communicated to other related research efforts?
- Has consideration been given to possible future work?

5. Quality of project results.

- Are the intended results supported by the work performed during the project?
- Are the intended results consistent with scientific knowledge and/or engineering principles?
- Are the intended results presented in such a manner as to be useful for identified end users?

Essentially, projects rating well on these criteria are expected to have a high likelihood of success in the objectives they were designed to accomplish.

These criteria will provide a numeric rating, which will be converted and illustrated as "Ineffective," "Effective," "More than Effective," or "Very Effective." This rating conversion is illustrated in Table 3.

Table 3. Peer Review Rating Conversion	
Rating Scale	
Very Effective	4.5 - 5.0
More than Effective	3.0 – 4.4
Effective	1.9 - 2.9
Ineffective	0.0 – 1.8

The rating scale is defined to illustrate how well a project is addressing the goals of the peer review.

Very Effective
The most clarity of method in accomplishing the purpose; producing the intended or expected result in a superior manner.

More than Effective
Better, clearer and more distinct in accomplishing the purpose; producing the intended or expected result in more than a satisfactory manner.

Effective
Adequate to accomplish the purpose; producing the intended or expected result in a satisfactory manner.

Ineffective
Not effective; not producing desired results; ineffectual or lacking in the details to support a satisfactory desired outcome.

6.0 Associated Research

Specific research project subject matter will vary from one annual peer review to another. Generally, subject matter falls within the six program elements shown in Table 1. Technical issues usually address metallurgical, structural, technological, and risk-based subjects commonly seen in the pipeline industry.

The research peered during the April 2014 review varied among metallurgical, corrosion mitigation, various technological solutions, and general knowledge focused projects. A short description of each peer reviewed project is found in Appendix D.

7.0 Peer Review Findings

During the 2014 review, the average program rating between twenty-four reviewed projects and between all evaluation categories was “More than Effective.” For this year, 13 projects were rated “Very Effective” with 11 projects ranked as “More than Effective.” The average sub-criteria scoring were also rated very high and underpin these findings. The majority of peered projects and the overall program rating is down to “More than Effective” from the 2013 rating of “Very Effective.” Weakness in project management contributed to the lower program average. The government shutdown in CY 2013 was identified as a contributor to lower rating for project management. Table 4 summarizes the overall program performance based on the summary of the reviewed projects. Table 5 itemizes the project ranking order, where projects of the same score have an equal ranking.

At the time of the reviews, the majority of the projects were approximately 5 to 10 percent complete with a remaining couple 80 to 90 percent complete. It is well understood from years of conducting such reviews that the ratings on projects early in their scope execution can change over multiple years of such reviews.

The panelists made several recommendations in the course of the review. These recommendations were categorized into “Strong” and “Weak” points and were associated with each project. However, none of these comments identified critical actions required to salvage a project from failing, but recommended actions to further improve upon good performance.

Appendix C, Table 6 itemizes the strong and weak points collected from all 24 projects reviewed by the six panelists. These points were consistent among several panelists and are reflected in the scoring of multiple evaluation categories. Any specific recommendations will be disseminated to researchers and AOTRs as necessary so that individual decisions on scope changes can be determined.

Table 4. Summary of Total Average Score & Rating for the Review Categories and Sub-Criteria		
Review Categories and Sub-Criteria	**Score**	**Rating**
1. Project relevance to PHMSA mission.	**4.7**	**Very Effective**
1.1. How well does the project illustrate its relevance to enhancing pipeline safety and or with protecting the environment?	4.7	Very Effective
1.2. How well does the project describe its relevance to PHMSA's research program goals?	4.7	Very Effective
2. Project management.	**4.3**	**More than Effective**
2.1. How well is the project being managed (on budget and schedule)?	4.2	More than Effective
2.2. How well is the project making progress toward the work scope objectives?	4.4	More than Effective
3. Approach taken for transferring results to end users.	**4.4**	**More than Effective**
3.1. Is there a plan for dissemination of results, including publications, and reporting?	4.4	More than Effective
3.2. How much end user involvement is incorporated into the work scope?	4.4	More than Effective
3.3. For results that may include marketable products and technologies, are commercialization or U.S. Patent plans established?	4.4	More than Effective
4. Project coordination with other related programs.	**4.2**	**More than Effective**
4.1. Does the project build on, or make use of, related or prior work?	4.5	Very Effective
4.2. Is the work of the project being communicated to other related research efforts?	4.0	More than Effective
4.3. Has consideration been given to possible future work?	4.2	More than Effective
5. Quality of project results.	**4.5**	**Very Effective**
5.1. Are the intended results supported by the work performed during the project?	4.5	Very Effective
5.2. Are the intended results consistent with scientific knowledge and/or engineering principles?	4.5	Very Effective
5.3. Are the intended results presented in such a manner as to be useful for identified end users?	4.3	More than Effective
Program Summary:	**4.4**	**Very Effective**

Table 5. Summary Ranking & Rating of Individually Reviewed Research Projects					
Rank	**Project ID**	**Project Title**	**Contractor**	**Rating**	**Score**
1	DTPH56-13-T-000010	Utilization of a Test Facility for Qualifying Processes for Inline Inspection (ILI) Technology Evaluation and Enhancements	*Pipeline Research Council International*	4.8	Very Effective
2	DTPH56-13-T-000007	EMAT Sensor for Small Diameter and Unpiggable Pipe	*Operations Technology Development*	4.7	Very Effective
3	DTPH56-10-T-000009	MWM-Array Characterization of Mechanical Damage and Corrosion	*JENTEK Sensors, Inc.*	4.6	Very Effective
3	DTPH56-11-T-000003	Comprehensive Study to Understand Longitudinal ERW Seam Failures	*Battelle Memorial Institute*	4.6	Very Effective
3	DTPH56-13-T-000004	Advanced Leak Detection LiDAR	*Ball Aerospace & Technologies Corp.*	4.6	Very Effective
3	DTPH56-13-T-000005	Advanced Development and Technology Transfer of a Methane/Natural Gas Microsensor	*Northeast Gas Association/NYSEARCH*	4.6	Very Effective
3	DTPH56-13-T-000006	Development, Field Testing and Commercialization of a Crack and Mechanical Damage Sensor for Unpiggable Natural Gas Transmission Pipelines	*Northeast Gas Association/NYSEARCH*	4.6	Very Effective
3	DTPH56-13-T-000009	Improve and Develop ILI Tools to Locate, Size, and Quantify Complex/Interacting Metal Loss Features	*Kiefner Applus RTD*	4.6	Very Effective
4	DTPH56-13-T-000003	INO Technologies Assessment of Leak Detection Systems for Hazardous Liquid Pipelines	*Electricore, Inc.*	4.5	Very Effective
4	DTPH56-13-T-000002	Real-Time Multiple Utility Detection During Pipe Installation Using Horizontal Directional Drilling (HDD) System	*Operations Technology Development*	4.5	Very Effective
4	DTPH56-13-T-000008	In-Ditch Validation Methodology for Determination of Defect Sizing	*RTD Quality Services USA, L.P.*	4.5	Very Effective
4	DTPH56-14-H-00001	Effects of Hydrocarbon Permeation on Plastic Pipe Strength and Fusion	*Gas Technology Institute*	4.5	Very Effective

		Performance			
4	DTPH56-14-H-00006	Repair/Replacement Considerations for Pre-Regulation Pipe	*Kiefner Applus RTD*	4.5	Very Effective
5	DTPH56-13-T-000001	Subsurface Multi-Utility Asset Location Tool	*Gas Technology Institute*	4.4	More than Effective
5	DTPH56-14-H-00005	Threat/Anomaly Mitigation Decision-Making Process	*Kiefner Applus RTD*	4.4	More than Effective
6	DTPH56-13-T-000011	Above-ground Detection Tools Including Disbondment and Metal Loss for all Metals Including Cast-Iron Graphitization	*Gas Technology Institute*	4.3	More than Effective
6	DTPH56-13-T-000012	Evaluation of Structural Liners for the Rehabilitation of Liquid and Natural Gas Piping Systems	*Operations Technology Development*	4.3	More than Effective
6	DTPH56-14-H-00004	Improving Models to Consider Complex Loadings, Operational Considerations, and Interactive Threats	*Kiefner Applus RTD*	4.3	More than Effective
7	DTPH56-14-H-00002	Consolidated Project Full Scale Testing of Interactive Features for Improved Models	*Electricore, Inc.*	4.2	More than Effective
7	DTPH56-14-H-00003	Strain-Based Design and Assessment of Segments of Pipelines with and without Fittings	*Center For Reliable Energy Systems*	4.2	More than Effective
7	DTPH56-14-H-00007	Improving Leak Detection System Design Redundancy & Accuracy	*Kiefner Applus RTD*	4.2	More than Effective
8	DTPH56-13-T-000013	Technology Transfer, Demonstrations and Post-Mortem Testing of Cast Iron and Steel Pipe Lined with Cured-in-Place Pipe Liners	*Northeast Gas Association/NYSEARCH*	4.1	More than Effective
9	DTPH56-14-H-00008	Definition of Geotechnical and Operational Load Effects on Pipeline Anomalies	*BMT Fleet Technology Limited*	4.0	More than Effective
10	DTPH56-13-T-000014	Improving Quality Management Systems (QMS) for Pipeline Construction Activities	*DNV-GL*	3.8	More than Effective

8.0 PHMSA Official Response to Panelists Findings and Recommendations

The CY 2013 reviews were the eighth structured peer review of PHMSA's Pipeline Safety R&D Program. PHMSA is satisfied with the process for conducting these reviews as well as the findings and recommendations provided by the peer review panelists. PHMSA accepts the findings and recommendations summarized in the report. The panel indicated that some immediate actions can be taken to further safeguard research projects in achieving contractual milestones. These recommendations are summarized in Appendix C, Table 6. PHMSA will address specific recommendations with the project co-sponsor and the researcher and will use these to improve the likelihood that project scopes can achieve proposed goals. The official PHMSA response memorandum can be found in Appendix A.

PHMSA will continue refining the annual peer review process as needed by incorporating feedback submitted by the researchers and peer review panelists. Other specific recommendations from panelists will be disseminated to researchers and AOTRs.

A number of initiatives are planned to provide further guidance on commercialization of technology projects and better coordination with projects strengthening standards. These program initiatives will bring transparency to the panel's recommendations. PHMSA can still make improvements even with high annual ratings.

APPENDIX A

PHMSA Acceptance Memo

U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, D.C. 20590

MEMORANDUM FOR THE RECORD

From: Jeffrey D. Wiese, Associate Administrator for Pipeline Safety

Subject: Pipeline Safety Research Program Peer Reviews, May 20 & 22, 2014

SUMMARY

The Pipeline and Hazardous Materials Safety Administration (PHMSA) is pleased with the process for conducting these reviews as well as the findings and recommendations provided by the peer review panelists. The CY 2014 average quality rating for the reviewed projects remained at "Very Effective," from the prior CY 2013 reviews. This is the highest possible rating, indicating that these projects are performing well and on track to deliver desired results. In addition, a number of suggestions were identified by the panelists for maintaining or improving research quality.

PHMSA will use feedback submitted by researchers and panelists to refine the process for holding annual peer reviews. Since none of the reviewed projects are rated "Ineffective," no immediate project modifications are warranted. Specific recommendations from panelists will be disseminated to researchers and Agreement Officers' Representatives to decide if any scope changes are warranted.

PHMSA will continue refining the process, the review criteria, and the guidance so future review outcomes better support our goals.

RECOMMENDATION

The PHMSA Pipeline Safety Program accepts the findings and recommendations summarized in the Peer Review Report.

The Associate Administrator for Pipeline Safety

APPROVED: _____

DISAPPROVED: _____

COMMENTS: _____

DATE: 9/3/2014

APPENDIX B

Peer Review Panelist Bios

W. R. (Bill) Byrd, P.E.

Mr. Byrd has 32 years in the energy industry as an engineer, manager, and consulting expert. He is president of RCP Inc., an engineering and regulatory consulting firm specializing in energy pipeline issues. He is on the Board of the Pipeline Research Council International and of the Interstate Natural Gas Association of America Foundation. He is the Chair of the American Society of Mechanical Engineers Safety Engineering and Risk Analysis Division (SERAD), and is a past-Chair of ASME's Pipeline Systems Division. He received a B.S. in Mechanical Engineering, Summa Cum Laude, and an M.S. with high honors from Georgia Institute of Technology.

A.S. "Sandy" Kirkindall

Mr. Kirkindall has 35 years' experience in aerospace R&D work with the U.S. Army Missile Command and the National Aeronautics and Space Administration. That includes 19 years working as an engineer in aerospace structures and propulsion and 16 years as a program and project manager. Mr. Kirkindall retired from NASA in 2004 and served as Mayor and CEO of the City of Madison, Alabama, until 2008. Since 2008 he has provided management and technical consulting services to aerospace contractors and the U.S. Government. Mr. Kirkindall has a Bachelor of Aerospace Engineering and a Master of Science in Industrial Management from Georgia Tech. He has also completed numerous professional education courses in subjects including advanced statistics, rocket propulsion technology, and engineering management.

Mr. Kirkindall's technical experience includes design, development, testing, and flight operations of both solid and liquid rocket propulsion systems and structures. As lead engineer, he performed and directed senior engineers in the performance of stress, structural stability, and fracture mechanics analyses for structural verification of advanced aerospace vehicles and associated equipment. He directed research on properties of insulating materials for rocket nozzles and blast tubes and determined vehicle operating environments and defined requirements for structural designs and tests. Mr. Kirkindall served as the stress analyst responsible for the structural design, analysis, test, and post-flight evaluation of weapon systems including LANCE, TOW, Improved Light Assault Weapon System, DRAGON, VIPER, PERSHING, and HAWK/Improved HAWK. He co-developed an innovative procedure to determine gas pressures in hermetically sealed missile components and coordinated a design team to develop a solid rocket motor case redesign to correct fractures occurring during field operations. To meet design requirements for high performance solid propellants, he co-developed a new metallic rocket motor case coating technology.

As a senior cost analyst for the U.S. Army Missile Command, he performed cost, economic, and operations analyses of weapon systems, support equipment, and facilities. He developed and validated life cycle cost estimates, cost and operational effectiveness evaluations, cost/benefit analyses, economic

analyses, cost estimating relationships, and other special studies. He also developed the Missile Command Strategic Plan for NATO Standardization and Interoperability.

As a Program and Project Manager, he served as an expert authority in research and development activities in high specific impulse and high thrust-to-weight launch propulsion systems and directed advanced research activities in beamed energy propulsion concepts. He coordinated and managed NASA, Air Force, and Army activities in the development of micro-spacecraft and the optics associated with beamed energy propulsion. Mr. Kirkindall managed the solicitation and selection of Principal Investigators for scientific research for all of the glovebox systems in the NASA flight manifest. He assigned experiment priorities and allocated space flight assignments to meet multi-science-discipline program goals assigned by NASA HQ. He established and implemented project parameters involving schedules, costs, resource allocation and technical performance requirements.

Mr. Kirkindall has received numerous NASA, Army, and civic awards and holds U.S. Government certifications as a Contracting Officer's Technical Representative and as a Cost Analyst. He is also a Member of the National Institute for Rocket Propulsion Systems.

Randall Webb

I have more than 30 years of corrosion control experience obtained through education and employment with a gas distribution utility and a corrosion engineering firm. I have an extensive background in cathodic protection testing, design, and installation.

After working for five years in the power industry, I went to work for a corrosion engineering firm. While working for this firm, I performed testing on, design and installation of cathodic protection systems for pipelines, tanks (internal, external, below ground, and above ground), well casings, docks, and other structures. I also performed design and installation for lightning protection and structure grounding. After going to work for Southwest Gas in 1990, I developed and taught two-two week training courses for the corrosion technicians. I was responsible for the Corrosion Control Training, Policies, Procedures, Material Specifications and Operator Qualification for corrosion personnel. I have been active in NACE International serving on a number of task groups developing recommended practices, serving a term on the Public Affairs Committee and the Annual Program Coordinating Committee for NACE symposia. I have been a NACE International instructor teaching several cathodic protection classes since 2003.

Graduate of Mississippi State University with a B.S. degree in Electrical Engineering December 1974.

Kent Muhlbauer, P.E.

Mr. Muhlbauer is an internationally recognized authority on pipeline risk management. In this field, he is an author, lecturer, consultant, and software developer. Techniques developed by Mr. Muhlbauer are in use by the largest pipeline operators in the U.S. and in pipeline operations in many other countries. Mr. Muhlbauer is an advisor to private industry, government agencies,

and academia, as well as a frequently invited speaker at industry conferences worldwide. Mr. Muhlbauer also has an extensive background in pipeline design, operations, and maintenance, having held technical and management positions in a pipeline operating company for over 13 years prior to becoming a full time pipeline risk management consultant.

He has a B.S. in Civil Engineering (Summa Cum Laude), University of Missouri, 1981 and Post-graduate and continuing education in areas of Business Administration, Total Quality Management and Engineering.

Certifications/Affiliations:

- Certified Quality Engineer (C.Q.E.) by A.S.Q.C.
- Professional Engineer, Registered in Texas, 1988
- Member, American Society of Civil Engineers (Technical committee chairman)
- Member, National Society of Professional Engineers, (Committee Chairman)
- Past Member, American Society of Quality Control

Walter Robert (Bob) Nixon Jr, P.E.

I am retired from 40 years of process and project engineering. I have experience in process inhibitors for water treatment and hydrocarbon process treatment as well as cathodic protection. After three years as chemistry major I changed over to chemical engineering at Ohio State University. There I became acquainted with Mars G Fontana from whom all Chem E's were required to take a corrosion course. I received a Bachelors and Masters of Chemical Engineering from OSU in 1970 and worked for Dow Chemical for 3 years. This work was mainly process engineering with the chlorine and hydrocarbon reaction processes. Over the rest of the 70s I worked for Betz Laboratories and Pacific Gas and Electric with water treatment chemical problems and process for compliance with the new NPDES regulations (discharge permitting) as well as process selection for a large coal fired power system that was ultimately cancelled. During these years, I acquired my Professional Engineering registrations in Chemical Engineering and Corrosion Engineering from the State of California. I moved to Denver in 1979 with Stearns Roger Engineering with the Air Pollution Process Control Group. Here I acquired my Colorado Professional Engineering registration. During the eighties I worked with Stearns and their merged Stearns Catalytic Engineers as well as with Betz Laboratories and Petrolite Refinery Chemicals group. At the end of the eighties I joined with the City and County of Denver in their Environmental Services group, first operating a landfill Superfund underground water process plant, then on the cleanup of the Stapleton Airport and on the Denver International Airport environmental systems, air permitting and water use cascade control policies and strategies. With my chemical engineering and corrosion background I was selected to follow and manage the cathodic protection programs implemented by all utilities, users (airlines and other private renters and vendors who operated CP systems) and the airport, itself. I have to thank Mr. Robert Coe (then of Public Service Company of Colorado) for my training and familiarization with the various aspects of cathodic protection. DIA was and is an intense agglomeration of CP systems that work in the vicinity of each other and in conjunction with large stray current

potentials. The systems include mainly sacrificial anodes and undertank CP systems in leak containment closed environments. My 17-1/2 years at the airport were challenging technically and professionally as the airport changed from an engineered facility to a more political institution. I have been a member of NACE since 1976 with a 5 year hiatus in the 1980s. With my background in chemistry, electrochemistry, process chemistry, chemical corrosion problems and cathodic protection realities, I believe I have a unique approach to problem evaluation and solutions. I operate a small corporation, Willow Point Technical Services.

BCHE, MS CHE, Ohio State University 1970

Certifications: Californian PE ChE 3566, California PE Corr 480 & Colorado PE 18246

Louis E. Hayden Jr, Ph.D., P.E.

Louis Hayden has over 35 years of experience as a mechanical engineer, project manager and vice president of engineering. This experience has been in the design, analysis, fabrication, installation, start-up and maintenance of industrial piping and equipment. Systems have included above and below ground piping and pipelines in process plants, fossil and nuclear power plants, transmission pipelines and industrial manufacturing facilities. He has managed and directed the manufacturer of high yield pipeline pipe fittings and developed new pipeline closure and flange products as well as managed the efforts of new product development and research groups.

Currently a consulting mechanical engineer and adjunct professor of mechanical engineering at the Lafayette College, Easton, PA. Previous employers have been Fluor Corp., Houston; Brown&Root Inc., Houston; Tube Turns, Inc., Louisville; Victaulic Corp., Easton, PA.

Member of ASME B31 Piping Standards Committee since 1985
Vice Chair ASME B31 Piping Standards Committee 1990-1993 and 2001-2004
Chairman ASME B31 Piping Standards Committee 1993-2001
Member ASME Board on Pressure Technology Codes and Standards 1993-2005
Vice Chair ASME Board on Pressure Technology Codes and Standards 2005-2008
Vice President and Chair of ASME Board on Pressure Technology Codes and Standards 2008 - 2011
Chairman ASME Task Group for development of B31.12 Hydrogen Piping and Pipeline Code 2006 - present
Member Board on Pressure Technology Codes and Standards Materials for Hydrogen Service Task Group

APPENDIX C

Table 6 – Peer Reviewed Project Strong and Weak Points

(In order as shown in Table 5)

NOTE: No comments shown means that there were no highlighted considerations to include.

Project Title	Strong Points	Weak Points
Utilization of a Test Facility for Qualifying Processes for Inline Inspection (ILI) Technology Evaluation and Enhancements - *Pipeline Research Council International*	Good potential for 3rd party testing of tech vendor services. Very good end user involvement.	The project needs further PRCI funding and support of the PRCI Board which did not exist at the time of these reviews.
EMAT Sensor for Small Diameter and Unpiggable Pipe - *Operations Technology Development*	Good project management techniques are being employed. Clearly focused to PHMSA mission. Very good end user involvement.	Still need to secure field testing dates with operators.
MWM-Array Characterization of Mechanical Damage and Corrosion - *JENTEK Sensors, Inc.*	Clearly focused to PHMSA mission.	Lack of attention to welds. Not addressing any standards issues.
Comprehensive Study to Understand Longitudinal ERW Seam Failures – *Battelle Memorial Institute*	Scope is very well tied to the technical challenges.	Suggestion to get more pipeline mills involved. Suggestion to expand our work to develop guidelines for operators vs a compilation of subject reporting.
Advanced Leak Detection LiDAR - *Ball Aerospace & Technologies Corp.*	Very good end user involvement and clear plan for disseminating results.	Limited details were presented to illustrate project progress.
Advanced Development and Technology Transfer of a Methane/Natural Gas Microsensor - *Northeast Gas Association/NYSEARCH*	Good plan for commercialization. Very good end user involvement.	Project is behind schedule with more information needed to discern the effectiveness of project management.
Development, Field Testing and Commercialization of a Crack and Mechanical Damage Sensor for Unpiggable Natural Gas Transmission Pipelines - *Northeast Gas Association/NYSEARCH*	Clearly focused to PHMSA mission. Very good end user involvement and clear plan for disseminating results. Good lineage from prior successes.	Limited details to illustrate project progress.

Project Title	Strong Points	Weak Points
Improve and Develop ILI Tools to Locate, Size, and Quantify Complex/Interacting Metal Loss Features - *Kiefner Applus RTD*	Good plan for commercialization. Very good end user involvement.	More clarity needed with dissemination/publications strategy. Limited details to illustrate project progress.
INO Technologies Assessment of Leak Detection Systems for Hazardous Liquid Pipelines - *Electricore, Inc.*		More clarity needed with dissemination/ publications strategy. Suggestion to add more end user involvement.
Real-Time Multiple Utility Detection During Pipe Installation Using Horizontal Directional Drilling (HDD) System - *Operations Technology Development*	Technology is well transferable to multiple other tools on the market.	
In-Ditch Validation Methodology for Determination of Defect Sizing - *RTD Quality Services USA, L.P.*	Good plan for commercialization. Very good end user involvement.	Limited details were presented to illustrate project progress.
Effects of Hydrocarbon Permeation on Plastic Pipe Strength and Fusion Performance - *Gas Technology Institute*	Clearly focused to PHMSA mission.	Suggestion to expand inclusion of standards bodies to the American Society of Mechanical Engineers and non-metallic piping committee.
Repair/Replacement Considerations for Pre-Regulation Pipe - *Kiefner Applus RTD*		Suggestion to add population density as part of the consequence assessment. Suggestion to establish safety targets inspired by project results.
Subsurface Multi-Utility Asset Location Tool - *Gas Technology Institute*	Very good end user involvement. Proposed solution is very versatile.	Suggestion to integrate this sensor with other technologies.
Threat/Anomaly Mitigation Decision-Making Process - *Kiefner Applus RTD*		Suggestion to expand inclusion of standards bodies to the American Society of Mechanical Engineers. Lacking descriptions on how included topics will be rolled up into an integrated process. It was unclear what the deliverables really are.
Above-ground Detection Tools Including Disbondment and Metal Loss	Very good end user involvement.	Not factoring soil types and no plan to characterize the level of disband. More clarity needed with

for all Metals Including Cast-Iron Graphitization - *Gas Technology Institute*		dissemination/ publications strategy. Looking for more info on commercialization strategy.
Project Title	**Strong Points**	**Weak Points**
Evaluation of Structural Liners for the Rehabilitation of Liquid and Natural Gas Piping Systems - *Operations Technology Development*	Very good end user involvement.	Lack of consideration to complex loadings vs. just hoop stress.
Improving Models to Consider Complex Loadings, Operational Considerations, and Interactive Threats - *Kiefner Applus RTD*	Scope is very well tied to the technical challenges.	More discussion should be included on how the results are applied.
Consolidated Project Full Scale Testing of Interactive Features for Improved Models - *Electricore, Inc.*	Clearly focused to PHMSA mission.	Suggestion to expand inclusion of standards bodies to the American Society of Mechanical Engineers with some focus to fitness for service. Suggestion to expand scope to be more systematic with how the results correlate with/to other forces during pipeline operation. It was unclear what the deliverables really are.
Strain-Based Design and Assessment of Segments of Pipelines with and without Fittings - *Center For Reliable Energy Systems*		Suggestion to include narrative on thermal strains in service.
Improving Leak Detection System Design Redundancy & Accuracy - *Kiefner Applus RTD*	Very good end user involvement.	More clarity needed with dissemination/ publications strategy. Limited details to illustrate project progress. Seemed to be some disconnect between scope and achieving objectives.
Technology Transfer, Demonstrations and Post-Mortem Testing of Cast Iron and Steel Pipe Lined with Cured-in-Place Pipe Liners - *Northeast Gas Association/NYSEARCH*	Clearly focused to PHMSA mission. Very good end user involvement and clear plan for disseminating results.	Limited details to illustrate project progress.
Definition of Geotechnical and Operational Load Effects on Pipeline Anomalies - *BMT Fleet Technology Limited*	Clearly focused to PHMSA mission.	Suggestion to better integrate project results into a greater assessment process. Limited details to illustrate the types of defects to be investigated.

Project Title	Strong Points	Weak Points
Improving Quality Management Systems (QMS) for Pipeline Construction Activities - *DNV-GL*	Scope is very well tied to the technical challenges.	Suggestion to expand inclusion of standards bodies to the American Society of Mechanical Engineers. Suggestion to increase focus to the management side of these challenges. Detail for this review was poor making it hard to evaluate.

APPENDIX D

Peer Review Project Summaries
(In order as shown in Tables 5-6)

Additional summaries and publicly available reports are available at:
http://primis.phmsa.dot.gov/matrix/

Utilization of a Test Facility for Qualifying Processes for Inline Inspection (ILI) Technology Evaluation and Enhancements

Pipeline Research Council International

The project will standardize a process for evaluating in-line inspection technologies for the energy pipeline industry. The project will complete the design and construction of a highly flexible and modern pipeline pull test facility at PRCI's Non Destructive Evaluation repository, where a range of real world pipeline test samples have been accumulated and are retained to support technology improvements and developments for pipeline inspection.

EMAT Sensor for Small Diameter and Unpiggable Pipe

Operations Technology Development

This project will develop Electromagnetic Acoustic Transducer (EMAT) sensors that can be used to detect cracks and assess welds in unpiggable pipe segments. The work will develop an EMAT sensor independent of any specific platform to allow integration with multiple unpiggable pipe inspection platforms and for use by multiple vendors. OTD has partnered with GTI and Quest Integrated, Inc on this project to bring EMAT technology to the natural gas industry for unpiggable pipes.

MWM-Array Characterization of Mechanical Damage and Corrosion

JENTEK Sensors Inc.

This project will advance the JENTEK Meandering Winding Magnetometer (MWM) -Array technology to provide quantitative characterization of corrosion and mechanical damage. This includes characterization through coatings/insulation; followed by higher resolution imaging with coatings/insulation removed. For mechanical damage, quantitative characterization includes geometric variations and multidirectional residual stresses (near the surface and deeper within the pipeline). In addition, this project will develop capability to detect cracks at damage sites. For corrosion, enhanced high resolution imaging of both external and internal corrosion will be developed for specific applications to support life management decisions. This team will build on demonstrated MWM-Array (and MR-MWM-Array) detection capabilities to deliver substantially enhanced characterization of damage and practical means for implementation. Matching funding will be provided by Chevron, BP, TransCanada, PRCI, GDF Suez and others.

Comprehensive Study to Understand Longitudinal ERW Seam Failures
Battelle Memorial Institute

The objective of the proposed project is to assist PHMSA in favorably closing National Transportation Safety Board (NTSB) Recommendation P-09-1 arising from the Carmichael MS pipeline rupture involving an ERW seam, which directed that PHMSA conduct a comprehensive study of ERW pipe properties and the means to assure that they do not fail in service. Three primary objectives –

1. Integrate industry and PHMSA data to quantify vintage seam failure statistics with focus on LFERW seams;
2. Understand longitudinal ERW seam failures and on that basis quantify the effectiveness of inspection and hydrotesting to manage integrity and ensure safety to avoid/eliminate catastrophic failures; and
3. Combine outcomes of the first two objectives to help favorably close NTSB Recommendation P-09-1

Advanced Leak Detection LiDAR
Ball Aerospace & Technologies Corp.

This R&D project will accomplish design, analysis, fabrication and test of the Advanced Leak Detection LiDAR (LIght Detection And Ranging), culminating in a flight demonstration proving feasibility of detecting gases evolving from liquid leaks from petrochemical pipelines. Key elements of the Advanced Leak Detection LiDAR are to be built and integrated onto a pallet including an optical bench with instrument testing within a laboratory environment. Thereafter, flight testing will further validate the technical performance and pave the way for industry implementation.

Advanced Development and Technology Transfer of a Methane/Natural Gas Microsensor
Northeast Gas Association/NYSEARCH

The project will carry out the design of the pre-commercial microresonator methane/natural gas sensor and complete the development of the commercial system(s) prior to introducing to the market. The focus will be on building pre-commercial prototype devices in two versions - an analytical instrument "A" and a safety monitor sensor "S" (alarm only). The analytical methane and natural gas sensor/instrument will include all necessary outputs, alarm signal with a preset concentration level, LCD display, operator setting of instrument parameters, and dual power capabilities. The safety monitor sensor will be based on the design approach developed for the full analytical instrument but with a number of functions and hardware elements removed. This safety sensor should have equivalent performance with the full analytical instrument but at reduced cost. The sensor will comply with necessary standards and regulations. The sensor has been proven in prior and on-going work to be robust, accurate, inexpensive, and immune to common industrial and household chemicals thus resulting in no false positives; something that has plagued many of the existing sensors in the market for decades.

Development, Field Testing and Commercialization of a Crack and Mechanical Damage Sensor for Unpiggable Natural Gas Transmission Pipelines
Northeast Gas Association/NYSEARCH

The project will carry out demonstrations of the combined mechanical sensor and crack sensor technologies in live natural gas pipelines using the Explorer 20”/26” robotic system for the inspection of unpiggable natural gas pipelines. This combined sensor is under development through an on-going effort. These additional demonstrations are needed in order to validate the new sensors, establish their ability to detect mechanical damage and crack defects in complex live pipeline environments, and carry out improvements on their design and sizing algorithms based on the results of each prior demonstration. While two demonstrations are planned for the mechanical damage sensor and one for the crack sensor through the existing on-going program, the complexity of these new sensors requires additional field demonstrations prior to their commercialization. The effort will be completed over a fifteen (15)-month period and will validate and improve the mechanical damage/ovality sensor and the crack sensor for the Explorer 20"-26" system. All results will be scalable to the other Explorer sizes developed or under development. This will greatly enhance the sensing capabilities of the Explorer family of robotics devices and provide the industry with the ability to identify all types of defects in their unpiggable pipelines

Improve and Develop ILI Tools to Locate, Size, and Quantify Complex/Interacting Metal Loss Features
Kiefner Applus RTD

The ability to accurately locate and size individual metal loss pits within an area of large corrosion and characterization of metal loss associated with dents/gouges and the longitudinal seam are three of the remaining problems with in-line inspection (ILI) integrity assessment of metal loss defects. The regulations address each of these type anomalies by requiring the remediation of: * metal loss with a calculated burst pressure less than the maximum operating pressure for liquid pipelines or 1.1 times maximum allowable operating pressure for gas pipelines * any dent that has any indication of metal loss, cracking or a stress riser * corrosion of or along a longitudinal seam weld We will use two measurement technologies and computer comparisons to investigate these three problems: a Multi-measurement ILI tool, state-of-the-art in-ditch Non Destructive Evaluation measurements, and computer based comparisons of the technologies.

INO Technologies Assessment of Leak Detection Systems for Hazardous Liquid Pipelines
Electricore, Inc.

This project will assess the stand-off capabilities of National Optics Institute (INO) developed instruments for the detection of vapors from liquid petroleum pipeline leaks. The prototype sensor on a mobile platform will include one or more of three spectroscopic instruments: 1) a standoff UV laser induced fluorescence device, 2) a UV Raman remote sensor, and 3) an open path, active, laser based IR Differential Optical Absorption Spectroscopy (DOAS) sensor.

Remote capability up to 100 yards will be evaluated for several concentrations of vapors from petroleum products (typically transported by pipelines) in a laboratory and in a simulated pipeline setting.

Real-Time Multiple Utility Detection During Pipe Installation Using Horizontal Directional Drilling (HDD) System
Operations Technology Development

This project will integrate acoustic and radar technologies to detect buried pipes/objects in front and adjacent to the drill-head during installation of pipes using the horizontal directional drilling (HDD) machine.

In-Ditch Validation Methodology for Determination of Defect Sizing
RTD Quality Services USA, L.P.

The project will develop, improve and demonstrate a robust technology for accurate and reliable sizing of complex crack like anomalies by adopting an existing, proven technology for the purpose. Applus RTD has developed the technology over the last several years, primarily for girth weld inspection in new pipeline construction. However, the capabilities of the technology and the robustness of the tool make it ideally suited for in-ditch application for pipeline integrity. The tool's ability to discriminate closely spaced defects and accurately size cracks irrespective of their orientation make it an ideal solution for sizing complex cracks such as stress corrosion cracks and seam weld defects. Successful completion of this project would provide the industry with valuable defect measurements as well as enable a step change in the way in-line inspection data from crack tools is used.

Effects of Hydrocarbon Permeation on Plastic Pipe Strength and Fusion Performance
Gas Technology Institute

The objective of this project is to develop a validated method to be used by any plastic testing laboratory to quantify the effects of hydrocarbon permeation on: 1) the fusibility of plastic pipe, 2) the life expectancy of existing fused joints that have been subjected to hydrocarbon permeation, 3) the Hydrostatic Design Basis (strength) of plastic pipe, and 4) the impact on slow crack growth.

Repair/Replacement Considerations for Pre-Regulation Pipe
Kiefner Applus RTD

This project will create guidelines for implementing and executing a pre-regulation pipeline repair/replace program. The guidelines will be tailored not only to natural gas transmission pipelines but to the special concerns associated with natural gas distribution pipelines and hazardous liquid pipelines as well. The resulting guidelines will be made suitable for inclusion

in consensus pipeline safety standards including American Society of Mechanical Engineers (ASME) B31.4 and ASME B31.8.

Subsurface Multi-Utility Asset Location Tool
Gas Technology Institute

The project will determine parameters that would be critical to assure detection of multiple pipes in a vertical strata.

Threat/Anomaly Mitigation Decision-Making Process
Kiefner Applus RTD

Better guidance is needed for deciding when the combined effects of two or more threats and the associated anomalies create a higher probability of failure than the individual threats/anomalies themselves. While satisfactory models exist for calculating the effects on pressure-carrying capacity of individual types of anomalies (e.g., corrosion-caused metal loss, cracks, gouges, plain dents), better guidance is needed regarding how to assess the effects of combined threats/anomalies.

Above-ground Detection Tools Including Disbondment and Metal Loss for all Metals Including Cast-Iron Graphitization
Gas Technology Institute

The project will develop, test, and then commercialize a mobile platform for detecting coating disbondment and external corrosion by measuring magnetic fields from above ground. Alternating current is injected into the pipe being tested. The current creates magnetic fields around the pipe. These fields are affected by corrosion and disbondment.

Evaluation of Structural Liners for the Rehabilitation of Liquid and Natural Gas Piping Systems
Operations Technology Development

The project will conduct an assessment of structural liners and composites and their interaction with the pipe to demonstrate their capability to carry the loads of a degraded host pipe. The focus will be on the systems installed using trenchless technologies for remediation to the pipe and its appurtenances. This will be achieved by: - Establish performance criteria, testing and analytical procedures. - Coordinate field installations with the manufacturers and organizations to establish best practices.

Improving Models to Consider Complex Loadings, Operational Considerations, and Interactive Threats
Kiefner Applus RTD

Some pipeline failures suggest that more complex situations need to be accounted for than is currently the practice. Interactions of pipe defect conditions with variable loadings, increased loadings, complex loadings, or changing conditions have led to failures under conditions normally considered safe. The industry should be applying a second level of complexity to the evaluation of degraded conditions where one or all of the following circumstances could exist: (a) loadings are biaxial, (b) loadings vary with time, or (c) environments interact with conditions to adversely alter the condition's stability or rate of degradation. Recognizing and quantifying these effects will require integration of data from ILI (perhaps from tools an operator would not normally use such as slope-curvature tools or crack-detection tools), ground or aerial patrols, or at some sites, actual monitoring or measurement of changing conditions. Thus the outcome of this project will be guidance in the form of decision processes and data needs for identifying and evaluating complex and/or interactive situations.

Consolidated Project Full Scale Testing of Interactive Features for Improved Models
Electricore, Inc.

This project addresses pipeline crack growth as influenced by complex operational circumstances by expanding on existing work performed through PHMSA and Pipeline Research Council International, Inc. Through full scale testing, the team will gather data on mechanical damage interacting with secondary features – gouges (with cracks and micro-cracks), corrosion, and welds. The team will create a database which will be used by others to validate and improve burst and fatigue strength models. The team will also gather experimental data to estimate when cracks in stress corrosion cracking (SCC) colonies coalesce. The project will improve knowledge on the influence of complex loadings on both mechanical damage exposed to environmentally assisted cracking (EAC) or to combined pressure and high axial strains, and on crack growth dynamics of SCC. The primary objectives of the project are to strengthen industry consensus standards and to generate data which will promote new knowledge. The benefits of the program will improve safety and environmental protection by filling critical knowledge gaps on pipeline response to crack growth in mechanical damage and SCC as driven by complex loads and interacting threats.

Strain-Based Design and Assessment of Segments of Pipelines with and without Fittings
Center For Reliable Energy Systems

The overall objective of this project is to develop a set of practical and ready-to-use guidelines and tools for SBDA of pipelines containing fittings, and corrosion and mechanical damage subjected to high longitudinal strains.

Improving Leak Detection System Design Redundancy & Accuracy
Kiefner Applus RTD

Leak detection systems are an important part of any overall pipeline safety and integrity strategy. The benefits of reliably and rapidly identifying a leak, so that the resulting fluid loss can be controlled and contained as soon as possible, can be very significant, particularly in High Consequence Areas (HCAs). The mission of this project is standardize the approach to designing an appropriate LDS for all pipelines, and that will be accessible to all operators – including the smaller ones – without extended and laborious front-end engineering. A central part of this approach is to concentrate upon certain key issues: 1. Beginning any LDS design process with a systematic focus on assessing requirements. 2. Accepting that one single technology will probably not provide perfect performance for all objectives, on a given pipeline. Therefore, a key issue is exploring ways to combine multiple technologies / physical principles into one system in order to address each requirement optimally. 3. Allowing the operator to be able to predict performance – and therefore cost/benefit – more reliably from the design.

Technology Transfer, Demonstrations and Post-Mortem Testing of Cast Iron and Steel Pipe Lined with Cured-in-Place Pipe Liners
Northeast Gas Association/NYSEARCH

The project will advance a broad understanding of cured-in-place pipe (CIPP) liners as they interact with host steel or cast iron pipe. CIPP lined pipe will be removed after years of gas service and tested using a solid foundation of protocols by Cornell University; an independent expert with a long history in testing of infrastructure. Also, a live gas company demonstration of re-conditioning job using CIPP liners will be performed and added to past test and usage information.

Definition of Geotechnical and Operational Load Effects on Pipeline Anomalies
BMT Fleet Technology Limited

The objective of this project is to use the previously validated pipe soil interaction model to develop an engineering tool to define the effects of operational and geotechnical loads on liquid and gas pipeline systems to support decision making regarding threat severity or repair scheduling. This tool would be incorporated in strain based design and assessment to facilitate the consideration of complex loading scenarios inducing significant flexural loads, including pipeline subsidence or lowering, and ground movements inducing lateral pipeline movements. The results of this project will define the local nominal strain state that can be used to assess localized anomalies / defects (e.g. corrosion, cracks, dents, weld faults, gouges, etc.).

Improving Quality Management Systems (QMS) for Pipeline Construction Activities
DNV-GL

The main objectives of the project are:
1) to develop guidance pertaining to issues related to quality of a new pipeline and how these issues should be addressed through standards, specification, and in the field;
2) to develop general guidelines for a QMS for pipeline projects to provide greater assurance of consistent and acceptable quality; and
3) to suggest enhancements to regulations and standards to improve the overall quality of new pipelines.

APPENDIX E

The Peer Review Coordinator (PRC) organizes, coordinates, monitors, and facilitates the annual panel peer review. The PRC is the main contact for panelists and the researchers involved with a peer review and for public inquiries. The PRC for the 2014 peer reviews was Mr. Robert Smith of PHMSA.

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