2010

Peer Review Report 2010

Peer Review Report

Pipeline & Hazardous Materials Safety Administration

Pipeline Safety Research & Development Program

Peer Reviews Conducted
April 14, 15, 27 & 28, 2010

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EXECUTIVE SUMMARY

The Pipeline and Hazardous Materials Safety Administration's (PHMSA) Pipeline Safety Research and Development (R&D) Program held its first structured peer review of active research projects in February 2006 and the most recent peer review in April 2010. Mandates by the Office of Management and Budget (OMB) and the Office of the Secretary of Transportation (OST) govern these reviews and conducting them maintains research data quality. PHMSA holds these reviews via teleconference and the Internet to save time and resources. Holding these reviews this way 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 peer review panel consisted of twelve government and industry experts. Two panelists were active Government representatives from the Bureau of Ocean Energy Management, Regulation, and Enforcement and one was an active Government representative from the National Institute of Standards and Technology. The remaining nine panelists are retired Government and retired and active industry personnel who play vital roles as peers for the American Petroleum Institute, the American Society of Mechanical Engineers, the National Association of Corrosion Engineers and other standards developing organizations.

Thirty-five active research projects were peer reviewed by expert panelists using 14 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," "Moderately Effective," "Effective," or "Very Effective." During the April 2010 review, the average program rating was "Very Effective" for each of the evaluation categories. For this year, 26 projects were rated "Very Effective" with 9 projects ranked as "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 remain "Very Effective" since the initial reviews in 2006. Additional details are available in Section 7 and Tables 4, 5 and 6 of this report.

PHMSA is very satisfied with the process performed to conduct these reviews, as well as the 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 April 14, April 15, April 27 & April 28, 2010 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, that prescribe 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 with technically competent and independent, objective experts. These reviews are held annually for active research projects and usually occur in the second quarter of each fiscal year.

2.0 Research Program Background

PHMSA regulates safety in the design, construction, operation and maintenance, and spill response planning for over 2.5 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 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. Over the past several years, PHMSA has strengthened 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 new 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 seven 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	Reduce the likelihood of incidents and accidents resulting from excavation damage and outside force.
2.	Pipeline Assessment and Leak Detection	Identify and locate critical pipeline defects using inline inspection, direct assessment, and leak detection.
3.	Defect Characterization and Mitigation	Improve the capability to characterize the severity of defects in pipeline systems and to mitigate them before they lead to serious incidents or accidents.
4.	Improved Design, Construction, and Materials	Improve the integrity of pipeline facilities through enhanced materials, and techniques for design and construction.
5.	Enhanced Operation Controls and Human Factors Management	Improve the safety of pipeline operations through enhanced controls and human factors management.
6.	Risk Management & Communications	Reduce the probability of incidents and accidents, and mitigate the consequences of hazards to pipelines.
7.	Safety Issues for Emerging Technologies	Identify and assess emerging pipeline system technologies for opportunities to enhance safety.

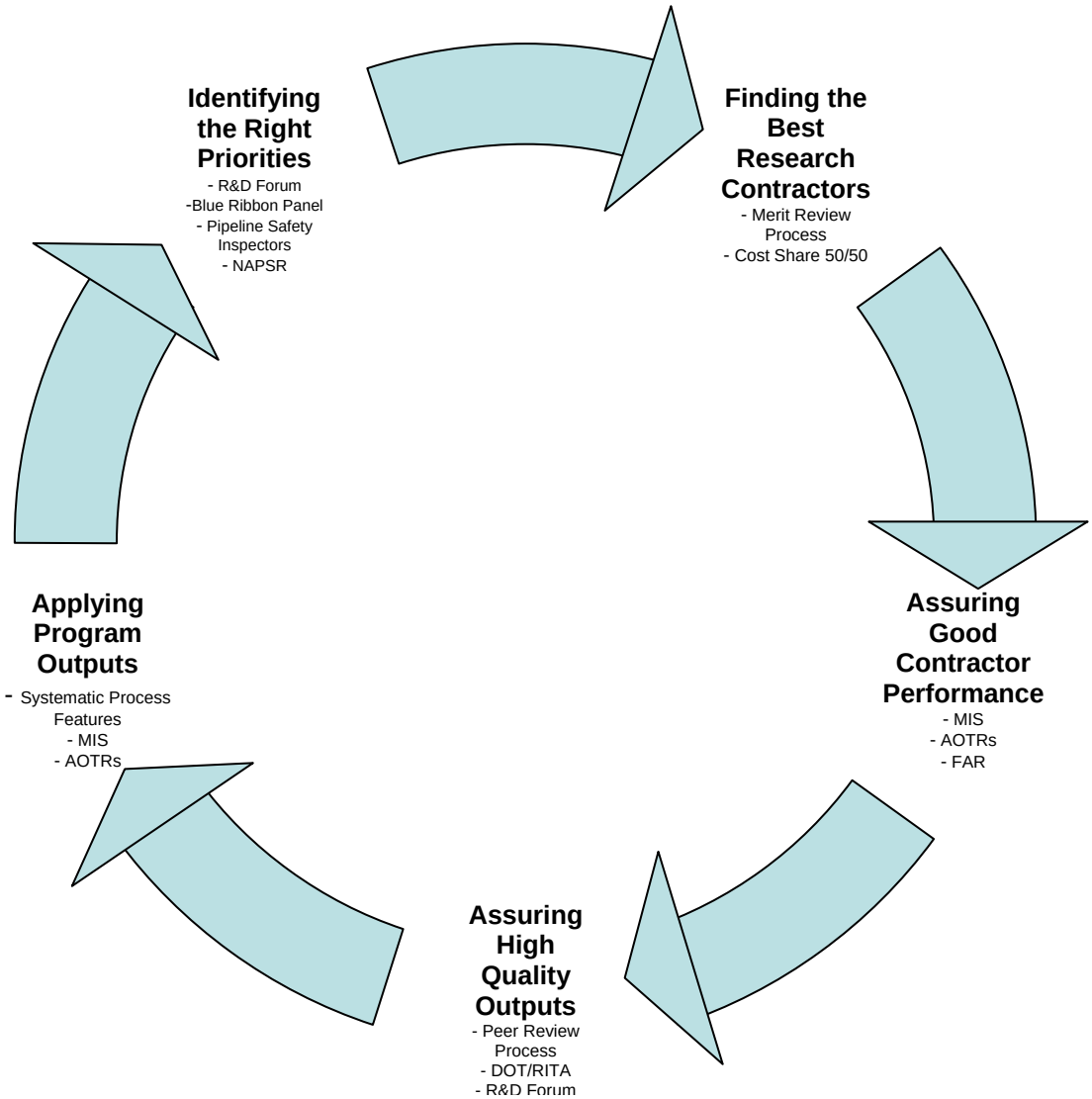
More information on the program strategy is outlined in the R&D Program Strategic Plan and on the program website at http://primis.phmsa.dot.gov/rd/

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 pre-solicitation input 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 develop a consensus 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 comprised of representatives from Federal and State agencies, industry operators, and trade organizations uses strong evaluation criteria to review research white papers and proposals. In addition, a 50 percent cost share between the Government and industry is required, which forces researchers to partner with credible groups increasing the credibility and applicability of the proposed work, while providing for technical input.

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 specific contractual milestones and contract accounting 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 pipeline personnel from operators, regulators and industry trade organizations.

The peer review panel consisted of twelve Government and industry experts. Two panelists were active Government representatives from the Minerals Management Service and one was an active Government representative from the National Institute of Standards and Technology. The remaining nine panelists were retired Government and retired and active industry personnel who play vital roles as peers for the American Petroleum Institute, the American Society of Mechanical Engineers, the National Association of Corrosion Engineers and other standards developing organizations. Table 2 identifies the panelists.

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

Table 2. Peer Review Panelists		
	Name	**Affiliation**
1	Theresa Bell	Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement
2	Timothy Steffek	Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement
3	Tom Siewert, Ph.D	Department of Commerce, National Institute of Standards and Technology
4	David McColskey	Department of Commerce, National Institute of Standards and Technology (retired)
5	Richard Fields	Department of Commerce, National Institute of Standards and Technology (retired)
6	Virgil Wallace	Williams Pipeline, representing the National Association of Corrosion Engineers
7	Louis E. Hayden, Jr., P.E.	Lafayette College, Easton, PA
8	Harold Kraft, P.Eng.	Alliance Pipeline
9	Robert J. Appleby	Independent Consultant, representing the American Society of Mechanical Engineers
10	Keith Leewis, Ph.D, P.Eng.	Independent Consultant
11	Charley Jones	Marathon Pipeline, representing the American Petroleum Institute
12	Michael Pearson	Magellan Pipeline, representing the American Petroleum Institute

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 reviewed focused, high-level presentations from researchers addressing 14 evaluation criteria within five specific evaluation categories. Presentations take no more than 20 minutes with ten minutes of panelist questions including any possible written public questions. 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. A scorecard for rating performance on the specific categories is provided. 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.

- Is the project still relevant for enhancing pipeline safety and or protecting the environment?
- Does the project address a technology gap, consensus standard or produce general knowledge?

2. Project management.

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

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 appropriate for the resources expended?
- 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," "Moderately Effective," "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
Effective	3.0 – 4.4
Moderately Effective	2.0 - 2.9
Ineffective	0.0 – 1.9

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

Very Effective
Exceptional clarity in describing the method to accomplishing the purpose; producing the intended or expected result in a superior manner.

Moderately 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 needed 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 eight 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 2010 review varied among welding, corrosion mitigation, biofuels, technological, and general knowledge focused projects. A short description of each peer reviewed project is found in Appendix C.

7.0 Peer Review Findings

During the April reviews, 35 research projects were peer reviewed by twelve expert panelists using 15 different evaluation criteria. The rating scale possibilities were "Ineffective," "Moderately Effective," "Effective," or "Very Effective." As shown in Table 4, the average program rating was “Very Effective” for each of the five evaluation categories. For this year, 26 peered projects were rated “Very Effective” with nine projects ranked as “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 remain very effective since the initial reviews in 2006. 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 these projects were approximately 55 percent complete. 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. Having these high ratings precluded the need for itemization of recommendations on specific research projects. None of these comments identified critical actions required to salvage a project from failing, but recommended actions to further improve upon good performance.

Table 6 itemizes the strong and weak points collected from the twelve panelists. These points were consistent among several panelists and are reflected in the scoring of multiple evaluation categories. Specific recommendations will be disseminated to researchers and AOTRs so 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 the PHMSA mission.	**4.8**	**Very Effective**
1.1 Is the project still relevant for enhancing pipeline safety and or protecting the environment?	4.8	Very Effective
1.2 Does the project address a technology gap, consensus standard or produce general knowledge?	4.7	Very Effective
2. Project management.	**4.6**	**Very Effective**
2.1 Is the project making progress toward the work scope objectives and the PHMSA goals?	4.8	Very Effective
2.2 Is the project being managed on budget and schedule?	4.4	Effective
3. Approach taken for transferring results to end users.	**4.5**	**Very Effective**
3.1 Is there a plan for dissemination of results, including publications, reporting, and patents?	4.6	Very Effective
3.2 How much end user involvement is incorporated into the work scope?	4.7	Very Effective
3.3 For results that may include marketable products and technologies, are commercialization plans established?	4.3	Effective
4. Project coordination with other closely related programs.	**4.5**	**Very Effective**
4.1 Does the project build on, or make use of, related or prior work?	4.8	Very Effective
4.2 Is the work of the project being communicated to other related research efforts?	4.4	Effective
4.3 Has consideration been given to possible future work?	4.4	Effective
5. Quality of project results.	**4.7**	**Very Effective**
5.1 Are the intended results supported by the work performed during the project?	4.6	Very Effective
5.2 Are the intended results consistent with scientific knowledge and/or engineering principles?	4.8	Very Effective
5.3 Are the intended results appropriate for the resources expended?	4.7	Very Effective
5.4 Are the intended results presented in such a manner as to be useful for identified end users?	4.7	Very Effective
Summary:	**4.6**	**Very Effective**

Table 5. Summary Ranking & Rating of Individually Reviewed Research Projects					
Rank	**Project ID**	**Project Title**	**Contractor**	**Rating**	**Score**
1	DTPH56-08-T-000012	ECDA Cased Pipes	Corrpro Companies, Inc.	Very Effective	5.0
1	DTPH56-08-T-000012	ECDA - Potential Measurements on Paved Areas	Corrpro Companies, Inc.	Very Effective	5.0
1	DTPH56-08-T-000022	Validation of External Corrosion Growth-Rate Using Polarization Resistance and Soil Properties	Operations Technology Development	Very Effective	5.0
2	DTPH56-07-T-000005	Development of Optimized Welding Solutions for X100 Linepipe Steel	Electricore, Inc.	Very Effective	4.9
2	DTPH56-08-T-000011	Structural Significance of Mechanical Damage	Electricore, Inc.	Very Effective	4.9
2	DTPH56-08-T-000012	Severity Ranking of ECDA Indirect Inspection Indications	Corrpro Companies, Inc.	Very Effective	4.9
2	DTPH56-08-T-000013	Effect of Ethanol Blends and Batching Operations on Stress Corrosion Cracking of Carbon Steel	DNV Columbus	Very Effective	4.9
3	DTPH56-06-T-000013	Guidelines for the Identification of SCC Sites and the Estimation of Re-Inspection Intervals for SCCDA	Pipeline Research Council International	Very Effective	4.8
3	DTPH56-07-T-000002	Advanced Technologies and Methodology for Automated Ultrasonic Testing Systems Quantification	Edison Welding Institute	Very Effective	4.8
3	DTPH56-07-T-000005	Update of Weld Design, Testing, and Assessment Procedures for High Strength Pipelines	Electricore, Inc.	Very Effective	4.8
3	DTPH56-08-T-000009	Adaptation of MWM-Array and MFL Technology for Enhanced Detection/Characterization of Damage from Inside Pipelines	JENTEK Sensors, Inc.	Very Effective	4.8
3	DTPH56-08-T-000010	Direct strain measurements and failure pressure prediction in mechanically damaged and strained pipes	Luna Innovations, Inc.	Very Effective	4.8

3	DTPH56-08-T-000021	Feasibility of Using Plastic Pipe for Ethanol Low Stress Lines	Gas Technology Institute	Very Effective	4.8
4	DTPH56-08-T-000002	Enhanced Defect Detection and Sizing Accuracy Using Matrix Phased Array Ultrasonics Tools	Edison Welding Institute	Very Effective	4.7
4	DTPH56-08-T-000007	Development of a Free-Swimming Acoustic Tool for Liquid Pipeline Leak Detection Including Evaluation for Natural Gas Pipeline Applications	Arizona State University	Very Effective	4.7
4	DTPH56-08-T-000009	MWM-Array Detection & Characterization of Damage through Coatings and Insulation	JENTEK Sensors, Inc.	Very Effective	4.7
4	DTPH56-08-T-000023	Validation for Flaw Acceptance of Mechanical Damage to Low Stress Natural Gas Pipelines	Operations Technology Development	Very Effective	4.7
4	DTPH56-09-T-000005	Performance Evaluation of High-Strength Steel Pipelines for High-Pressure Gaseous Hydrogen Transportation	Center for Reliable Energy Systems	Very Effective	4.7
5	DTPH56-08-T-000013	Monitoring Conditions Leading to SCC/Corrosion of Carbon Steel	DNV Columbus	Very Effective	4.6
5	DTPH56-08-T-000019	Advanced Development of Proactive Infrasonic Gas Pipeline Evaluation Network	Northeast Gas Association/NYSEARCH	Very Effective	4.6
5	DTPH56-09-T-000002	Modeling of Microbial Induced Corrosion on Metallic Pipelines Resulting from Biomethane & the Integrity Impact of Biomethane on Non-Metallic Pipelines	Gas Technology Institute	Very Effective	4.6
6	DTPH56-06-T-000016	Development of Dual Field MFL Inspection Technology to Detect Mechanical Damage	Pipeline Research Council International	Very Effective	4.5
6	DTPH56-07-T-000006	Validation of Assessment Methods for Production Scale Girth Welding of High Strength Pipelines with Multiple Pipe Sources	Electricore, Inc.	Very Effective	4.5
6	DTPH56-08-T-000003	Development of Tools to Estimate Actual Corrosion Growth Rates (Internal and External) of Gas Pipelines	Southwest Research Institute	Very Effective	4.5
6	DTPH56-08-T-000014	Effect of Concentration and Temperature of Ethanol in Fuel Blends on Microbial and Stress Corrosion Cracking of Pipeline Steels	Colorado School of Mines	Very Effective	4.5

6	DTPH56-09-T-000003	New Design and Construction Techniques for Transportation of Ethanol and Ethanol/Gasoline Blends in New Pipelines	Electricore, Inc.	Very Effective	4.5
7	DTPH56-07-T-000009	In-Situ Hydrogen Analysis in Weldments: Novel NDE for Weld Inspection	Colorado School of Mines	Effective	4.4
7	DTPH56-08-T-000001	Development of a Commercial Model to Predict Stress Corrosion Cracking Growth Rates in Operating Pipelines	Southwest Research Institute	Effective	4.4
7	DTPH56-08-T-000013	Effect of Ethanol Source on Stress Corrosion Cracking of Carbon Steel	DNV Columbus	Effective	4.4
7	DTPH56-08-T-000024	Broadband Electromagnetic Technology Sensor to Assess Ferrous Pipes without Removing Coatings in Both Traditional and Keyhole Excavations	Operations Technology Development	Effective	4.4
7	DTPH56-09-T-000004	Stress Corrosion Cracking of Pipeline Steels in Fuel Grade Ethanol and Blends	Georgia Tech Research Corporation	Effective	4.4
8	DTPH56-08-T-000004	Improving Magnetic Flux Leakage In-Line Inspection Corrosion Sizing Using Phased Array Guided Ultrasonic Waves	Battelle Memorial Institute	Effective	4.3
9	DTPH56-08-T-000005	Development and demonstration of an integrated tool for mapping, sizing and evaluation of SCC for remaining strength prediction	RTD Quality Services USA, L.P.	Effective	4.2
9	DTPH56-08-T-000008	Achieving Maximum Crack Remediation Effect from Optimized Hydrotesting	University of Alberta	Effective	4.2
10	DTPH56-09-T-000001	Pig Mounted Trials for Internal Corrosion Monitoring Fluidized Sensors	DNV Columbus	Effective	4.0

Table 6. Summary of Strong and Weak Point Recommendations*	
Strong Points	**Weak Points**
• Overall high level of industry involvement in most projects.	• Improve researcher documentation of coordination with standards developing organizations and expand literature searches for other relevant efforts.
• Projects well matched with multiple pipeline threats with impacts addressing several industry challenges.	• Widen standards developing organization involvement with biofuel research.
• Technology demonstrations are applied with most project scopes.	• Better tailor results targeting standards into the format of that standard developing organization.
• Technology transfer is working well on some projects.	• In general, project management approaches need strengthening.
• Some projects have relevance to both onshore and offshore challenges.	• Several contractors have ambitious schedules and have problems adhering to them with multiple factors causing delays. More time should be factored by researchers conducting significant testing.
• Project outputs exhibiting a good rate of return on a leveraged government and industry investment.	• Testing type projects should better explain how to relate small scale with large scale and with any modeling.
• Significant amounts of data are being released to the public via project web pages.	• Testing protocols need improvement in some projects. Especially when conducing round robin testing.
	• Improve the clarity of researcher intellectual property plans for technology development projects.
	• For technology projects, more clarity needed in determining the market niche of that technology with development of commercial plans.
	• Technology projects need more integration of establishing probability of detection while developing work scopes.
	• Natural defects should be sought versus machined ones to better establish technology's effectiveness in detecting or sizing defects.
	• Improve coordination with other related projects within PHMSA and other related programs, especially with projects addressing mechanical damage.

	• Researchers need to better define how the project possibly only addresses one facet of a challenge or if the project is only one step toward solving the challenge. Are there appropriate next steps to be taken without excessively researching technical topics?
	• Improve the efficiency and rigor with literature searches – Can improvements here save time and further remove duplication? Can more data be shared among researchers?

*This is a summation of comments based from the reviewed projects.

8.0 PHMSA Official Response to Panelists Findings and Recommendations

Being the fifth structured peer review of its 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 these 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 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 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.

In addition, the guidance and presentation template provided to the researchers will be slightly revised to more streamline the reviews. This will improve the manner in which questions are answered, support effective reviews by the panelists, and increase project and program quality.

APPENDIX A

PHMSA Acceptance Memo

U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

1200 New Jersey Ave, S.E.
Washington, D.C. 20590

MEMORANDUM FOR THE RECORD

From: Jeffrey D. Wiese, Associate Administrator for Pipeline Safety, PHP-1

Subject: Pipeline Safety Research Program Peer Reviews, April 14, 15, 27, & 28, 2010

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 2010 average quality rating for the reviewed projects is "Very Effective," the highest possible rating. 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" or "Moderately Effective," no immediate project modifications are warranted. Specific recommendations from panelists will be disseminated to researchers and Agreement Officer's Technical 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: JDWiese

DISAPPROVED: _____

COMMENTS: _____

DATE: 9/8/2010

APPENDIX B

Peer Review Panelist Bios

Theresa Bell

Theresa P. Bell is a Petroleum Engineer at U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement and since 1991. Ms. Bell currently works in the BOEMRE Pacific OCS Region's Office of Field Operations and has worked on a variety of issues related to pipelines since 1994. She is the BOEMRE Pacific OCS Region's representative on the pipeline research team. She also works on a variety of pipeline projects including repairs, inspections, leak detection systems, new pipeline permitting and installation, and regulations. Ms. Bell has extensive experience with pipeline inspections and integrity issues. She is also involved with the re-write of the BOEMRE pipeline regulations. Ms. Bell has an Associates of Science degree in Laser/Electro-Optics and received her Bachelor of Science degree in Engineering with an emphasis on electrical control systems at California State University, Northridge (CSUN) in 1991. Her prior work experience included aerospace working on the International Space Station and military lasers.

Timothy Steffek

Timothy graduated the Pennsylvania State University in May of 2009 with a B.S. in Petroleum and Natural Gas Engineering. Since 2009 he is working for the Department of the Interior's Bureau of Ocean Energy Management, Regulation, and Enforcement. He is leading a wide variety of research projects for the Engineering and Research Branch and within the Office of Offshore Regulatory Programs.

Tom Siewert, Ph.D.

Education:

B.S.	Applied Math and Physics	Univ. of Wis.- Milw.	1969
M.S.	Materials Science	Univ. of Wis.- Madison	1973
Ph.D.	Metallurgy	Univ. of Wis. - Madison	1976

Experience:

Government: Leader of structural materials, welding, and then process sensing and modeling groups at NIST since 1984. Publications in the areas of joining, cryogenic properties, nondestructive evaluation, and mechanical properties. Leadership in conference and workshop organization committees, Active in various societies.

Industry: Supervisory Research Engineer, then Manager of Research and Development, Alloy Rods (welding filler metal developer) 1976 to 1984.

Academic: Active with a number of Universities teaching short courses in Materials, Welding, and NDE for OSHA inspectors (OSHA Training Institute), about 20 one-day courses since 1989. Adjunct Professor and Research Scientist in the Metallurgical and Materials Engineering Department, Colorado School of Mines

Professional Society Memberships:

- American Society for Metals
- American Society for Testing and Materials
- American Welding Society
- International Institute of Welding
- Welding Journal Reviewer

Active Committee Work:

- American Society for Testing and Materials
  - A01 Steel
  - E28 Mechanical Testing
  - E07 Nondestructive Evaluation
- American Welding Society
  - American Council of the IIW
  - International Standards Activities Committee
  - Government Affairs Activity Committee

David McColskey

David McColskey, now retired but formerly a Physical Scientist at the National Institute of Standards and Technology (NIST), has over 42 years experience as a materials researcher. This experience has been in the measurement of properties of materials in a variety of environments (cryogenic to elevated temperatures, gaseous hydrogen, and gaseous and liquid oxygen), on a variety of specimen scales (micrometer-size thin films to 9-meter-long wide-plate specimens) and on a variety of materials (ferrous and non-ferrous alloys, glass-fiber, graphite-fiber and aramid-fiber composites and combinations of each of these). He has experience in NDE measurement techniques, specifically acoustic emission on bridge steels and on composite tubulars for offshore risers. He has been principal investigator of several projects, including the Superconducting Magnetic Energy Storage (SMES) composite insulator program, and he led the NIST-Boulder effort in the analysis of the steels for the World Trade Center collapse investigation. He is currently co-PI on the establishment of a standard test method for the use of fire-resistant steels in high-rise construction and is co-PI on the establishment of a high pressure hydrogen test facility at NIST-Boulder under a proposed Hydrogen Initiative. In addition, he is co-PI on the existing DOT/PHMSA funded research effort on high-strength pipeline steels. He has authored or co-authored numerous papers on properties of materials, acoustic emission, and thin-films for electronic packaging.

He is currently an active member of ASTM E28 and has served as a U.S. delegate to ISO Committee TC164 on Mechanical Properties Testing.

Richard Fields

Relevant Experience:
R. J. Fields has conducted metallurgical research and participated in mechanical test standards development activities for nearly 40 years. He is currently the US representative on the Ductility Subcommittee of ISO, Chairman of the ASTM Subcommittee on Ductility and Formability, and an active member of the ASTM Fire Resistive Steel Task Group and the National Materials Advisory Board's Committee on Corrosion Prevention Standards for Ductile Iron Pipe. He received a Bronze Medal from the Bureau of Standards for his research on fracture and crack arrest in high strength steels and a Silver Medal from the Department of Commerce for research on mechanical properties and modeling. From 2002 until 2004, he was the principal technical investigator on metallurgical aspects of the congressionally mandated investigation of the collapse of the World Trade Center Towers. He has performed research and written numerous papers relevant to the prediction of fracture behavior in pipeline steels. In particular, he was principal author on NIST Report 89-4136 written at the request of Senators Bond and Danforth entitled "An Assessment of the Performance and Reliability of Older ERW Pipelines". He was appointed by Secretary of Transportation E. Dole to the Office of Pipeline Safety's Hazardous Liquid Pipeline Safety Committee and served for six years, three of these as secretary. He is now part of a research team that is developing experimental and analytical methods to assess the high rate fracture and crack arrest behavior of high strength pipeline steels.

Education:
Undergraduate degrees in Chemistry and Metallurgical Engineering were awarded to R. J. Fields in 1971 by the University of Pennsylvania in Philadelphia. He received a Masters in Engineering and Applied Physics from Harvard University in 1973 and a PhD in Engineering Materials from Cambridge University in 1977 in England.

Work History:
From 1977 until 2004, R. J. Fields worked at the National Bureau of Standards/National Institute of Standards and Technology (NIST). He retired in May of 2004, and now works for KT Consulting on a contract with NIST. Highlights of his career include 6 years as a Supervisory Metallurgist managing the Time Dependent Failure Group in NBS's Fracture and Deformation Division. This group ran the metallographic facilities as well as carrying out mechanical testing research programs for the US Navy, the Federal Railroad Administration, the National Transportation Safety Board, and the Nuclear Regulatory Commission. More recently, R. J. Fields was Group Leader for the Materials Performance Group in NIST's Metallurgy Division. Part of this group of 11 professionals runs the US National Hardness Standardization Facility, certifying primary hardness standards. As the supervisor of the Materials Performance Group, he started a program on sheet metal forming with the auto industry. This is now the largest program in the Division. He also started a program on modeling bullets and armor for the National Institute of Justice and a program on fire resistant structural steels. He has an extensive list of publications, patents, and awards available on request.

Professional Society Membership:
R. J. Fields is a member of ASTM International and the American Academy of Mechanics.

Virgil Wallace

Mr. Wallace has worked in the Pipeline Industry for over 30 years mainly in the natural gas transmission area. While working with Williams since (1980) Mr. Wallace has worked primarily in control of corrosion through the utilization of cathodic protection and internal inspection tools. Mr. Wallace is presently responsible for the implementation of the External Corrosion Direct Assessment Program at Williams. Mr. Wallace is active with NACE, PRCI and Sothern Gas Association.

Mr. Wallace holds a BS degree from Texas Tech University and is a NACE Certified CP Specialist, Sr. Corrosion Technologist and Internal Corrosion Technologist.

Louis E. Hayden Jr, PE

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-present
Chairman ASME Task Group for development of B31.12 Hydrogen Piping and Pipeline Code.
Member Board on Pressure Technology Codes and Standards Materials for Hydrogen Service Task Group

Harold Kraft, P. Eng.

Mr. Kraft is employed by Alliance Pipeline as Vice President, Engineering and Construction. In this position, his responsibilities include overseeing all aspects of engineering, construction, integrity engineering, damage prevention, public awareness, aboriginal relations, land, rights-of-way, and corridor management in Canada and the United States.

A graduate from the University of Calgary, Calgary, Alberta with a B.Sc. in Civil Engineering in 1980, Mr. Kraft is registered as a Professional Engineer in the provinces of Alberta (APEGGA), British Columbia (APEGBC), and Saskatchewan (APEGS).

With over twenty-nine years of varied experience in the natural gas industry, Mr. Kraft was initially employed by Monenco Engineering where he was involved with design engineering for the Alaska Highway Gas Pipeline Project (Yukon portion).

Subsequently, he worked as Project Manager with a general contractor in central Alberta (Quinn Contracting) where his responsibilities included business development, bid submissions, contract negotiations and project management.

In 1985, Mr. Kraft joined Alberta Natural Gas Company Ltd. (ANG) as Pipeline Engineer in Cranbrook, B.C. His responsibilities included technical aspects of the operation of the ANG system in Southeastern B.C. From 1988 to 1995, Mr. Kraft was located in Calgary with ANG and held various positions of increasing responsibility including the position of Engineering Coordinator (1989-1993) with responsibility for technical aspects for the Canadian portion of the Alberta to California pipeline project. This project included 42" looping of the ANG system in Southeastern B.C. From 1993 to 1995, Mr. Kraft was responsible for technical matters related to business development ventures in the U.S. and Canada.

Mr. Kraft was employed by Westcoast Energy Inc. from 1995 to 1997 as Project Engineer where his responsibilities included the initial phase of high pressure, 42" looping of the Westcoast transmission system. He subsequently assumed the position of Manager of Engineering & Construction for the Palliser Pipeline Project, a joint venture between Westcoast and PanCanadian Petroleum Limited in Southern Alberta. Prior to his departure from Westcoast in mid-1997, Mr. Kraft was Team Leader, Pipeline Engineering & Services for Westcoast Energy. In this position he was responsible for providing pipeline technical support and engineering services for facilities in B.C. as well as development of international projects.

As Senior Manager, Ventures, North American Pipeline Investments with TransCanada Pipelines from mid-1997 to mid-1998, his responsibilities included overseeing all technical aspects of business development, implementation and execution of large-scale pipeline projects and associated facilities in North America.

Mr. Kraft joined Alliance Pipeline in July, 1998 as Manager, Pipeline Engineering and was responsible for overall construction management, scheduling and cost management of the Alliance mainline and lateral pipeline system in Canada and the United States. Key responsibilities included engineering design, material specifications and procurement, construction contract documents and specifications.

Robert J T Appleby

Summary

Over 35 years experience in research, design and construction of onshore and offshore pipelines. Activities have included pipeline engineering design and analysis, research and development, technical consulting, engineering management, project management and standards development. Until September 2009 providing technical consulting services within the ExxonMobil Upstream Companies as well as representing USA on the committee responsible for development of ISO Pipeline Standards.

Education

University of Cambridge, England, B. A. Engineering 1972
University of Cambridge, England, M. A. Engineering 1975

Professional Experience

10/2009 – present: Director, Pipeline Experts LLC providing consulting services to the oil and gas pipeline industry.

2/2005- 9/2009: Senior Research Associate, ExxonMobil Upstream Research Company, Houston, TX

- Led multidisciplinary, multi company team to assess innovative pipeline design and construction research project
- Coordinated pipeline research activities including arctic / strain based design
- Head of Delegation for USA on ISO TC67 SC2 (ISO Pipeline Standards Development)
- Member ASME B31 and B31.8 Code Committees (>20 yrs)

12/2002- 1/2005 Pipeline Staff Consultant / Acting Pipelines Engineering Manager, ExxonMobil Development Company, Houston, TX

- Project Manager for installation of X120 pipeline segment in Northern Alberta, Canada to demonstrate cold weather installation feasibility
- Point Thomson pipeline FEED engineering
- Staff consultant on multiple projects in USA and worldwide

8/1992 – 12/2002 Research Associate, Exxon Production Research Company, Houston TX

- Participated in multiple design audits, risk assessments and design reviews
- Provided technical support for innovative pipeline technologies including: riser repair, pipe-in-pipe reeled flowlines, multi-diameter pigging, subsea hot-tap development, electrically heated pipelines
- Coordinated research into pipeline repair, pipeline abandonment, internal inspection tools, pipeline fitness for purpose analysis etc.

8/1986 – 8/1992 Pipeline Project Engineer, Exxon USA, Thousand Oaks, CA

- Responsible for the pipeline and power cable design and construction engineering of the Santa Ynez Unit Expansion Project, including design and product development of 20”

diameter diverless pipeline connections in 1200ft water depths (record water depth) and first use of dynamically positioned pipelay equipment in deep water.

2/1981 – 8/1986 Group Leader, Exxon Production Research Company, Houston TX

- Group Leader for the Arctic Pipeline Research Project assessing onshore and offshore arctic pipelines. Developed pipeline design and installation techniques and cost estimates for several Alaskan projects.

12/1972 – 2/1981 Experience prior to joining Exxon:

- Project Manager, R.J. Brown & Associates Houston TX (1980-1981). Hibernia Export Pipeline Feasibility Assessment, Malaspina Straits Pipeline Crossing Design, (Vancouver)
- Pipeline Engineering Coordinator, Earl & Wright Consulting Engineers, Houston TX (1977-1980) : Insulated Subsea Pipeline Design (Chile); Warri/Lagos gas pipeline preliminary design, Nigeria; Brine Pipeline and Diffuser design for Strategic Petroleum Reserve facility; Detailed design, procurement and construction planning for Mobil's patented flowline installation method.
- Construction Engineer / Project Engineer, Brown & Root (UK), Great Yarmouth, England & Houston TX (1972-1977); Field engineer for multiple pipelines in Ekofisk, Leman, Forties, Beryl fields in the North Sea.

Keith Leewis, Ph.D., P. Eng.

Keith Leewis has over twenty years of extensive and comprehensive experience in pipeline engineering, design, materials, operations, and integrity management, in the operations and engineering sectors of the natural gas industry. As an engineer he provides technical assessments that assist clients in achieving timely regulatory approvals. As an American Society of Mechanical Engineers B31.8 committee member, he improves the international standards for the design and integrity management of natural gas pipelines, including those American Petroleum, Institute & NACE International standards related to integrity assessment. In addition Keith has over 50 published public papers into a wide variety of domestic and international pipeline topics.

Dr Leewis at DOFASCO made and rolled steel for skelp, was the Technology Director of the Welding Institute of Canada, a welding metallurgist and integrity engineer at TransCanada Pipelines, a tenured engineering professor at NSTU and a senior pipeline integrity scientist at GRI, GTI, & PRCI, before helping operators with materials, regulatory, and standards issues at P-PIC. Keith graduated with B.ENG. from McMaster University, a M.A.Sc. from the University of Toronto and PhD. from Nova Scotia Technical University, all in metallurgical engineering. He is a PE registered in Ontario and Nova Scotia.

Charley Jones, P.E.

Charley Jones has worked in the liquids pipeline industry area for over 30 years. While working for Marathon Pipe Lines LLC Charley has worked primarily in the engineering and integrity management. Currently Charley is presently responsible work implementation of the assessments required by the Integrity Management Rule. Charley is active member of Pipeline Research Council International. Charley graduated in 1980 with a BS degree in Mechanical Engineering from Oklahoma State University. Charley holds Professional Engineer licenses in Oklahoma, Ohio and Pennsylvania.

Michael Pearson

Michael Pearson has over twenty years of experience in pipeline engineering & construction, design, materials, operations, operations control, measurement and integrity management in the hazardous liquid industry. His experience spans various leadership positions for pipeline operators in engineering/construction, design, operations control, integrity management and field operations.

APPENDIX C

Peer Review Project Summaries
(In Day 1-4 Agenda Order)

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

Update of Weld Design, Testing, and Assessment Procedures for High Strength Pipelines

Electricore, Inc.

The objectives of this work are to fill critical gaps and provide guidelines on the effective use of high strength linepipes, from design and testing to weld integrity assessment procedures. The planned work builds up the extensive research and development efforts completed by the project team members. Several key deliverables are: 1. A recommended format for the specifications of high strength linepipes; 2. Relevant testing procedures and protocols for the assessment of strength and toughness that are consistent with the design, construction, and maintenance requirements of high strength pipelines; 3. inclusion of weld strength mismatch requirements for different design conditions; and 4. Updated ECA (Engineering Critical Assessment) procedures for the construction and maintenance of high strength pipelines.

Development of Optimized Welding Solutions for X100 Linepipe Steel

Electricore, Inc.

The objectives of the proposed work are to establish the range of viable welding options for X100 line pipe, define essential variables to provide for welding process control that ensures reliable and consistent mechanical performance, validate the new essential variables methodology for relevant field welding conditions, and verify weldment performance through a combination of small and large scale tests. Full implementation will be achieved through changes to applicable codes and standards.

Guidelines for the Identification of SCC Sites and the Estimation of Re-Inspection Intervals for SCCDA

Pipeline Research Council International

This project will develop a set of quantitative guidelines for predicting where and when Stress Corrosion Cracking (SCC) might be an integrity threat for gas and liquid hydrocarbon pipelines. These guidelines would complement other methodologies, such as the NACE RP0204, ASME B31.8S, and the CEPA Recommended Practices. These guidelines are aimed at improving the industry's ability to locate SCC in the field where the in-ditch protocols detailed in NACE RP0204 would be followed. In addition, the quantitative nature of the proposed guidelines would

allow more-informed estimation of the re-inspection interval for repeat Direct Assessment procedures.

Development of a Commercial Model to Predict Stress Corrosion Cracking Growth Rates in Operating Pipelines
Southwest Research Institute

The objective of this proposed project is to develop a crack growth rate (CGR) model for pipeline operators to use to: a) Identify locations that should be given a high priority for assessment of Stress Corrosion Cracking (SCC), and b) Determine the re-assessment and re-inspection intervals. The outcome of this project will be a tool to predict where SCC is most likely to occur, to prevent SCC failures, to ensure continued reliable pipeline operation, and to improve public safety.

ECDA - Potential Measurements on Paved Areas
Corrpro Companies Inc

The project is addressing External Corrosion Direct Assessments for cased crossings, severity ranking of indirect inspection indications and potential measurements on pavement. Specifically, the project will identify assessment technologies for shorted, electrolytically-coupled and electrolytically isolated conditions of cased crossings; to better define severity-ranking classification criteria for data and to develop procedures for recording pipe-to-soil potential and CDVG measurements on pipelines under paving.

Severity Ranking of ECDA Indirect Inspection Indications
Corrpro Companies Inc

The project is addressing External Corrosion Direct Assessments for cased crossings, severity ranking of indirect inspection indications and potential measurements on pavement. Specifically, the project will identify assessment technologies for shorted, electrolytically-coupled and electrolytically isolated conditions of cased crossings; to better define severity-ranking classification criteria for data and to develop procedures for recording pipe-to-soil potential and CDVG measurements on pipelines under paving.

ECDA of Cased Pipes
Corrpro Companies Inc

The project is addressing External Corrosion Direct Assessments for cased crossings, severity ranking of indirect inspection indications and potential measurements on pavement. Specifically, the project will identify assessment technologies for shorted, electrolytically-coupled and electrolytically isolated conditions of cased crossings; to better define severity-

ranking classification criteria for data and to develop procedures for recording pipe-to-soil potential and CDVG measurements on pipelines under paving.

Validation for Flaw Acceptance of Mechanical Damage to Low Stress Natural Gas Pipelines
Operations Technology Development

The ability to discriminate flaws that do and do not affect pipeline integrity is important for low stress pipelines which are subject to new DOT pipeline integrity management regulations. Current federal regulations do not provide guidance on the need to repair mechanical damage to low stress pipelines. The objective of this research is to demonstrate that flaw acceptance criteria normally applied to high stress pipelines are overly conservative and may be relaxed for low stress pipelines.

Validation of External Corrosion Growth-Rate Using Polarization Resistance and Soil Properties
Operations Technology Development

The objective is to estimate corrosion growth-rates, reduce assessment costs, and improve the selection of reassessment intervals of pipelines and increase their safety. This will be achieved by: 1 Perform field tests and demonstrations using LPR and ER technologies, 2. Correlate results with weight-loss of buried coupons, 3. Evaluate soil parameters that affect corrosion, and 4. Incorporate the measurements into a database and program that improves corrosion-rate estimates.

Monitoring Conditions Leading to SCC/Corrosion of Carbon Steel
DNV Columbus

This project will develop a field operable monitoring system to determine the conditions under which steel pipelines or other equipment may be susceptible to SCC. It will install an oxygen monitoring system and conduct studies over an extended period of time. Finally, it will develop guidelines for decision making from monitoring and other laboratory information.

Effect of Ethanol Blends and Batching Operations on Stress Corrosion Cracking of Carbon Steel
DNV Columbus

This program will categorize ethanol blends into three categories: blends that can be transported in existing pipelines without significant modification of the system and operations (Category 1), blends that require significant modifications (Category 2), and blends that cannot be transported in existing pipelines, but could be moved in specially designed systems (Category 3). It will

develop data necessary to make engineering assessments of the feasibility of transporting fuel-grade ethanol (FGE) and FGE blends in existing pipelines in a batching or dedicated mode.

Effect of Ethanol Source on Stress Corrosion Cracking of Carbon Steel
DNV Columbus

This program will determine the stress corrosion cracking susceptibility of steels in ethanol from different sources. In addition, it will develop an understanding of the factors that cause source to source to variation in the potency of ethanol towards corrosion/SCC. It will also identify parameters that can be used to determine the degree of potency of a given source of ethanol in causing SCC for transportability decisions.

Feasibility of Using Plastic Pipe for Ethanol Low Stress Lines
Gas Technology Institute

This research project will address the non-metallic issues associated with use and conversion of existing pipelines for ethanol/biofuel transport, as well as develop low-cost options for new non-metallic pipelines. Evaluating effects of ethanol/biofuel blends on non-metallic pipeline components and relevant pipe lining applications are included for existing pipelines. For new pipelines, GTI will research new materials as potential low cost alternatives to specially designed metallic pipelines.

Effect of Concentration and Temperature of Ethanol in Fuel Blends on Microbial and Stress Corrosion Cracking of High-Strength Steels
Colorado School of Mines

The Colorado School of Mines, in association with the National Institute of Standards & Technology (NIST), will measure the effect of concentration and temperature of ethanol in fuel blends on microbiological and caustic corrosion of high strength steels used in handling and transportation. The project will also determine tested solutions for identified corrosion problems while transporting ethanol-fuel blends.

Stress Corrosion Cracking of Pipeline Steels in Fuel Grade Ethanol and Blends
Georgia Tech Research Corporation

This project will evaluate and use standard test methods to investigate stress corrosion cracking (SCC) of pipeline steels in fuel grade ethanol(FGE)and gasoline/FGE blends as alternative tests for slow strain rate tests. Ethanol from different sources, including corn, sugarcane, and cellulose based FGE will be tested in this three year project. Two graduate and three undergraduate students will be actively involved in this project. Industrial sponsors including Colonial Pipeline Company, Archer Daniels Midland (ADM), and others industry representatives will serve as advisors on this project.

Modeling of Microbial Induced Corrosion on Metallic Pipelines Resulting from Biomethane & the Integrity Impact of Biomethane on Non-Metallic Pipelines
Gas Technology Institute

As biogas production sources increase, they will eventually be fed into a gathering network that allows the common collection and distribution of the fuel to processing locations followed by distribution to the end user. The main objective of this research is on the immediate need to understand the impacts of transporting various biogas blends on the integrity of non-metallic materials (thermoplastics and elastomers) that could be used to construct regional gathering networks.

New Design and Construction Techniques for Transportation of Ethanol and Ethanol/Gasoline Blends in New Pipelines
Electricore, Inc.

The project objectives are to: Develop supporting data, related analyses and recommendations for cost-effective design and construction methods for reducing the effects of stress-corrosion cracking (SCC) that can be implemented in new pipeline systems to allow safe and efficient transportation of Fuel Grade Ethanol (FGE); Evaluate design aspects for control and monitoring of oxygen uptake and internal corrosion for pipelines transporting FGE; and Recommend the most advantageous direction for expanded and improved pipeline design and testing standards for operations involving exposure to FGE.

Enhanced Defect Detection and Sizing Accuracy Using Matrix Phased Array Ultrasonics Tools
Edison Welding Institute

This program has the following objectives: To develop a concept for Matrix Phased Array Ultrasonics probes/modules applicable for either outside or inside pipe inspection and carried by different inspection tools, platforms and systems; To define and optimize detection and sizing capabilities of the modules via modeling and simulation; To design and fabricate (2) two probes/modules, one for outside and one for inside inspection; and To determine and demonstrate the detection and sizing performance of the probes/modules.

Advanced Technologies and Methodology for Automated Ultrasonic Testing Systems Quantification
Edison Welding Institute

The overall objective of the program is to reduce the uncertainty of Automated Ultrasonic Testing (AUT) detection and sizing accuracy with the goal of dramatically improving the predicted reliability of pipelines in the early design stage. This will be accomplished by the following manner: 1. Develop a methodology for quantification of AUT systems; 2. Advance and quantify AUT systems image-capture capabilities; 3. Quantify the performance of multiple

AUT systems and establish a guidance document; and 4. Implement the quantification methodology in field tests and guidance document in Reliability Based Design and Assessment (RBDA) standards. The deliverables for this program will include a methodology to quantify imaging capabilities and AUT systems, probability of detection (POD) and sizing accuracy curves for multiple representative systems, guidance for AUT capabilities and ECA/strain-based design approach applicability, and technical justification for modifications of the current requirements for AUT quantification trails demanded by the global practices of majors companies and codes.

Development of Tools to Estimate Actual Corrosion Growth Rates (Internal and External) of Gas Pipelines

Southwest Research Institute

The main objectives are: 1. Improving the current existing internal corrosion rate model for wet gas pipelines and further verifying the model using field corrosion growth rate data, 2. Developing a thin-film internal corrosion model to predict corrosion rates in dry gas pipelines with gas quality upsets, and verifying the model using field corrosion growth rate data, and 3. Using the existing external corrosion model to predict external corrosion rates with including the effect of CO2 permeation from soil into a disbonded region through a holiday and through the coating itself.

In-Situ Hydrogen Analysis in Weldments: Novel NDE for Weld Inspection

Colorado School of Mines

In this program, the Colorado School of Mines and the National Institute of Standards and Technology - Boulder will collaborate in the development of non-destructive technology for weld inspection, assessment, and repair in high strength pipeline steels and their weldments. Advanced sensors will allow the pipe integrity to be frequently or continuously monitored to assure pipeline safety and environmental protection. The research would be further advanced by the characterization of hydrogen in pipeline steel weldments. The characterization of hydrogen content and behavior in high strength steel weldments is timely and important with the introduction of new higher strength steels (*e.g.* X100, which have higher susceptibility to hydrogen damage) in the pipeline industry.

Direct strain measurements and failure pressure prediction in mechanically damaged and strained pipes

Luna Innovations Incorporated

The objective of this project is to couple in-service measurements with predictive tools to determine the maximum safe operating pressure and Code margins of safety. This would be based on direct measurements of the strains in pipelines that have suffered mechanical damage, or have been subjected to bending, either intentionally in construction or unintentionally from the effects of ground movement.

Development of a Free-Swimming Acoustic Tool for Liquid Pipeline Leak Detection Including Evaluation for Natural Gas Pipeline Applications

Arizona State University

The main objective of the proposed research is to leverage a free-swimming acoustic leak detection tool that is currently used in the water pipeline industry and further develop the device for application in oil product pipelines and evaluate its potential for natural gas pipelines. The target is to develop a device capable of detecting very small leaks (< 1 gpm) and further develop a software program to provide on-site evaluation of results to the end user.

Improving Magnetic Flux Leakage In-Line Inspection Corrosion Sizing Using Phased Array Guided Ultrasonic Waves

Battelle Memorial Institute

The goal of this development is to improve corrosion anomaly depth sizing of magnetic flux leakage (MFL) tools by adding phased array Guided-Wave Ultrasonic (GWUT) inspection technology.

Advanced Development of Proactive Infrasonic Gas Pipeline Evaluation Network

Northeast Gas Association/NYSEARCH

The primary objective of this project is to advance the PIGPEN technology to pre-production status by completing development of advanced algorithms, field testing in a range of pre-production scenarios and developing practical procedures for deploying and utilizing the technology. This effort will address PHMSA's and Industry's need to develop technology that will monitor encroachment and prevent damage while construction equipment is digging and/or boring.

Performance Evaluation of High-Strength Steel Pipelines for High-Pressure Gaseous Hydrogen Transportation

Center for Reliable Energy Systems

The project addresses the most critical issues related to the safe and efficient transportation of hydrogen using pipelines. The objects are to: Produce performance data for materials used in hydrogen pipelines; Use mechanistic-based analysis procedures and models for correlating the test data and predicting material behaviors under practical conditions; and Finally the test data and the analyses results will be used to enable informed updates and revisions of relevant codes and standards for industrial applications.

Broadband Electromagnetic Technology Sensor to Assess Ferrous Pipes without Removing Coatings in Both Traditional and Keyhole Excavations
Operations Technology Development

The objective of the project is to enhance and evaluate a portable, cost effective, and reliable direct-assessment tool capable of detecting metal loss, pits, and cracks in ferrous pipes that does not require the removal of pipe coatings, and has the ability to be used through keyhole and traditional excavations.

Development and demonstration of an integrated tool for mapping, sizing and evaluation of SCC for remaining strength prediction
RTD Quality Services USA, L.P.

The goal of this project is to develop and demonstrate a tool that enables operators to make judicious decisions about repairs and re-inspections with regard to pipeline segments affected by Stress Corrosion Cracking (SCC). One expected result is a solution that integrates the latest developments in non-destructive evaluation technology and provides a comprehensive, field ready, tool to evaluate, assess and determine repair requirements for SCC.

Adaptation of MWM-Array and MFL Technology for Enhanced Detection/Characterization of Damage from Inside Pipelines
JENTEK Sensors Inc.

In this program JENTEK is adapting Meandering Winding Magnetometer (MWM)-Array technology and using JENTEK multi-variate inverse methods to deliver hybrid MWM-Array/MFL methods for ILI applications. This program will also develop solutions for conventional pigs and platforms for unpiggable lines to detect/size internal/external corrosion, mechanical damage and SCC with internal liners and coatings.

MWM-Array Detection & Characterization of Damage through Coatings and Insulation
JENTEK Sensors Inc.

In this program JENTEK is delivering a new capability for inspection from outside pipelines, without coating/insulation removal. The goal is reliable/rapid imaging of external/internal corrosion, mechanical damage, and Stress corrosion Cracking (SCC) by adapting Meandering Winding Magnetometer (MWM)-Array technology for external damage, using high frequency methods. This includes integrated field demonstrations within twenty-four months. Solution for internal corrosion will transition later, using lower frequency methods.

Pig Mounted Trials for Internal Corrosion Monitoring Fluidized Sensors
DNV Columbus

Currently available inspection techniques are limited because some cannot be applied to all pipelines and others require prior knowledge of where to locate the sensors. This also requires costly pipeline excavation to emplace the sensors. Recently a mobile corrosion sensor technology integrated to a wireless network platform, called Motes, has been developed and tested. The technology represents a paradigm shift in monitoring the oil and gas infrastructure with respect to internal corrosion. The goals of this project is to build upon previous efforts that have led to the development and testing of functional prototype sensor systems by conducting additional validation trials on operating pipeline systems. The project will be conducted by a team consisting of DNV and Aginova (commercialization partner). The project will be co-funded by Southern Union (Panhandle). Other pipeline companies, such as Dominion, have also expressed interest in participating.

Validation of Assessment Methods for Production Scale Girth Welding of High Strength Pipelines with Multiple Pipe Sources
Electricore, Inc.

The goals of the proposed project are: 1. To test a large set of girth welds produced under realistic conditions by a state of the art high productivity GMAW system; 2. To demonstrate the effect of material variability between pipes, between heats and between pipe manufacturers; and 3. To validate current and proposed new weld defect assessment methods against the performance of a large set of welds made under field production conditions.

Structural Significance of Mechanical Damage
Electricore, Inc.

The primary objective of the project is to establish a detailed experimental database to support the development and validation of improved burst and fatigue strength models for assessing the interaction of mechanical damage with secondary features (gouges, corrosion, and welds). The use of this data to develop and validate mechanistic models will produce reliable tools to assess a wide range of mechanical damage forms, thereby increasing safety, reducing unnecessary maintenance, and supporting the improvement of pipeline standards and codes of practice.

Achieving Maximum Crack Remediation Effect from Optimized Hydrotesting
University of Alberta

The project will develop a working model to allow industry to predict the overall benefits of hydrotests. Such a prediction will be made with a consideration of various characteristics of a pipeline including the type of operation, stage of cracking, environmental susceptibility, steel metallurgy, and operation history. When hydrotesting is necessary, the model will help operators select the best parameters that would generate the most effective crack remediation.

Development of Dual Field MFL Inspection Technology to Detect Mechanical Damage
Pipeline Research Council International

This project will evaluate the capability of in-line inspection (ILI) to detect and characterize mechanical damage defects. The primary objective of the research is to provide guidance to the pipeline industry regarding the use of ILI to prioritize excavation and repair of mechanical damage. The secondary objective is to influence research on related topics such as the development of mechanical damage fitness-for-purpose models. The main scope is to evaluate the use of magnetic flux leakage technologies although other sensor methods will be considered for applicability to meet the primary objective.

APPENDIX D

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 2010 peer reviews was Mr. Robert Smith of PHMSA.

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