

**Interagency Research and Development
Five-Year Program Plan
For Pipeline Safety and Integrity**

Annual Update Report
Fiscal Year 2006

**Department of Transportation, the
Department of Energy and the
Department of Commerce's
National Institute of Standards and Technology**

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List of Acronyms

PSIA-2002	Pipeline Safety Improvement Act of 2002
FY	Fiscal Year
R&D	Research and Development
DOT	Department of Transportation
PHMSA	Pipeline and Hazardous Materials Safety Administration
OPS	Office of Pipeline Safety
DOE	Department of Energy
NETL	National Energy Technology Laboratory
DOC	Department of Commerce
NIST	National Institute of Standards and Technology
DOI	Department of the Interior
MMS	Minerals Management Service
SBIR	Small Business and Innovative Research
MIS	Management Information System
COR	Contracting Officer's Representative
COTR	Contracting Officer's Technical Representative
OMB	Office of Management and Budget
PSDOCC	Pipeline Standards Developing Organization Coordination Council
PART	Performance Assessment Rating Tool
GAO	Government Accountability Office
DHS	Department of Homeland Security
TSA	Transportation Security Administration
RITA	Research and Innovative Technology Administration

Interagency Research and Development Five-Year Program Plan For Pipeline Safety and Integrity Annual Update Report – Fiscal Year 2006

As required by law, the U.S. Department of Transportation, after coordination with the U.S. Department of Energy and the National Institute of Standards and Technology, submits this annual update report of the five year pipeline safety research and development program plan.

This annual update report to Congress describes the progress made during Fiscal Year (FY) 2006 toward implementing joint activities identified in the initial program plan.

Executive Summary

The Pipeline Safety Improvement Act of 2002 (PSIA-2002) mandates that the U.S. Department of Transportation (DOT), the U.S. Department of Energy (DOE) and the National Institute of Standards and Technology (NIST) in the U.S. Department of Commerce (DOC) “shall carry out a program of research, development, demonstration and standardization to ensure the integrity of pipeline facilities.” A fundamental component of this program was the 5-year program plan to guide and integrate research and development (R&D) activities of these agencies. While it was not one of the agencies formally mandated to participate, the U.S. Department of the Interior’s (DOI) Minerals Management Service (MMS) contributed to the development of the initial plan and has been part of the interagency group since its inception. These agencies are identified as the participating agencies.

This annual update report to Congress is the result of collaboration among the participating agencies during the FY 2006. The report updates the progress resulting from working together to achieve shared objectives. Collaboration is clarifying R&D focus areas as well as identifying alternative technology development opportunities, preventing inadvertent duplication of effort, and improving communications among the participating agencies. The collaboration described in this update report is better integrating the activities of each participating agency, including determining stakeholder perspective on critical issues and identifying promising technologies and areas deserving the highest priority for R&D funding. Agreement on these areas of collaboration is improving the effectiveness of our collective investment in R&D. A summary of FY 2006 collaboration is provided below. Further details illustrating collaborative success are found in the report’s body.

Changes in appropriations for the DOE Infrastructure Reliability Program led to the closure of this program and transfer of responsibility for future collaboration research from DOE to the other participating agencies. In FY 2006, the DOE program made no new research awards and formally closed many active projects. Except for quarterly interagency coordination meetings, DOE participation in all pipeline research activities was ceased. The implication of this change is the DOE historical focus area (developing new and advanced infrastructure technologies having greater developmental risk and expected to be commercialized over a longer time frame) is not currently covered. The Administration has proposed to transfer responsibility for developing these pipeline integrity and reliability technologies to the Department of Transportation’s Pipeline and Hazardous Materials Safety Administration (PHMSA).

All interagency information relevant to PSIA-2002 is kept current and publicly available at <http://primis.phmsa.dot.gov/rd/psia.htm>.

A summary of FY 2006 collaboration is provided below. Further details illustrating collaborative success are set forth in the body of the report.

Identifying the right priorities

- Four interagency coordination meetings were held during FY 2006.
- Two government/industry technical workshops were held to advance pipeline welding and joining and to better prevent, detect, and characterize mechanical damage.

Finding the best research contractors

- Both the DOT and DOI programs solicited research and collaborated on the reviews of submitted proposals. During FY 2006, DOC and DOI participated on two research solicitations for the DOT program.
- Thirty-four new pipeline research projects were awarded (25 DOT + 9 DOI), all co-funded with the pipeline industry. Over \$8 million in research awards were made by DOT and DOI with industry co-funding of over \$12 million. The DOE program made no new awards due to the program closure.

Assuring good contractor performance

- Automated email alerts implemented for the DOT program are keeping researchers aware of contract obligations and communicating any required actions to project and program managers.

Assuring high quality outputs

- The DOT program conducted its first formal peer review panel and is in compliance with Office of Management & Budget (OMB) mandates on Data Quality and Peer Reviews¹. These peer review panels are now convened annually and address relevance, quality, and performance of awarded research.

Applying outputs to end users

- The DOT program funded two technology demonstrations during FY 2006. One organized with the DOE program identified which developmental sensor is best suited for use in unpiggable gas pipelines and can be integrated with a robotic platform previously developed by DOE. The other demonstrated the effectiveness of guided wave ultrasonics and its application in assessing pipeline cased crossings.
- The Pipeline Standards-Developing Organizations Coordinating Council (PSDOCC) and the DOT program entered into an agreement in January 2006 to enhance cooperation and

¹ Information Quality Act (Pub. Law No. 106-554-515(a)) & Paperwork Reduction Act (44 U.S.C. § 3501 *et seq.*)

coordination. Specifically, this agreement facilitates more effective and efficient integration of pipeline safety R&D results into the development and revision of voluntary national consensus technical standards. In the near term this agreement will facilitate modification of standards guiding the application of direct assessment processes to incorporate newly demonstrated technologies.

Report appendices contain the following summary tables and figures:

- 1.0 Matrix of New Project Awards for FY 2006 (Table A.1)
- 2.0 Systematic Evaluation Process utilized by the Pipeline and Hazardous Materials Safety Administration in support of Reportable Research Performance Measures (Figure A.1)

1.0 GOAL OF THE INTERAGENCY PROGRAM

As stated in the PSIA-2002, the goal of the 5-year R&D program plan is to guide activities needed to carry out a program of research, development, demonstration and standardization to ensure the integrity of pipeline facilities. Attainment of this goal involves recognizing legitimate differences among the priorities of individual agencies and harmonizing these priorities to ensure complete coverage of critical developmental needs and opportunities.

2.0 OBJECTIVES OF THE INTERAGENCY R&D PROGRAM

The participating agencies believe that attainment of this goal requires joint pursuit of the following objectives:

1. *Identify Safety & Integrity Issues* - Understand stakeholder perspectives on the issues that must be resolved to ensure integrity of current and future pipeline facilities.
2. *Identify Opportunities to Resolve Issues* - Identify a broad spectrum of opportunities for resolving these issues through research, development, demonstration and standardization activities.
3. *Identify Gaps Between Needs and Available Technologies* - Understand the gaps between existing technologies and those needed to resolve the key issues.
4. *Solicit & Select Projects* - Collaborate with identifying solicitation topics and selecting and managing the projects needed to fill identified gaps.
5. *Promote Continuity in Technology Development* - Confirm proof-of-concept and promote continuity of technology development from the concept stage through demonstration and validation.
6. *Evaluate Project and Program Results* - Evaluate the results of program activities using jointly designed performance measures and jointly managed evaluation processes.
7. *Increase Accessibility of R&D Results to Users (Promote Application)* - Support increased accessibility of R&D results to users.
8. *Seek Promising Technologies from Outside Sources* - Collaborate with other agencies and stakeholder organizations in recognition, development and demonstration of promising new technologies.

3.0 MANAGEMENT PLAN

3.1 Areas of Responsibility

The PSIA-2002 enumerated ten R&D program elements as the focus of the agencies participating in the pipeline safety and integrity R&D program.

Lead agency responsibilities for each of these program elements are shown in Table 1.

Table 1. Summary of Planned Lead Agency Responsibilities from PSIA-2002 R&D Program Elements

Program Elements	On-Shore	Off-Shore
1. Materials inspection	DOT	DOI
2. Pipe anomaly detection	DOT	DOI
3. Internal inspection and leak detection technologies	DOT	DOI
4. Methods of analyzing content of pipeline throughput	DOT	DOI
5. Pipeline security	DOT	DOI
6. Risk assessment methodology	DOT	DOI
7. Communication, control, and information systems surety	DOT	DOI
8. Fire safety of pipelines	NIST	DOI
9. Improved excavation, construction, and repair technologies	DOT	DOI
10. Other appropriate elements	DOT	DOI
a. Materials analysis & development	NIST	NIST
b. Standardization activities	NIST	NIST

General agency responsibilities related to these ten R&D program elements are summarized below:

- DOT: Assuring the safety and integrity of hazardous liquid and natural gas pipelines through R&D activities designed to support identification, characterization, detection and management of risks to safety and integrity
- DOE: Historically focused on developing new and advanced infrastructure technologies having greater developmental risk and expected to be commercialized over a longer time frame. The Administration has proposed to transfer responsibility for developing these pipeline integrity and reliability technologies to the Department of Transportation's

Pipeline and Hazardous Materials Safety Administration. Table 1 reflects this anticipated reassignment of responsibility

- NIST: Test methods and standards research, modeling, analysis, and interpretation of data, advanced materials analysis and development, and fire modeling and safety technologies
- DOI: Through the Minerals Management Services, assuring pipeline safety and integrity through regulation and inspection of offshore pipelines

3.2 Management Processes to Achieve Objectives (How have we worked together?)

The objectives of the interagency pipeline safety and integrity R&D program are listed in Section 2.0. The areas of collaboration designed to achieve these objectives are discussed below. The participating agencies are committing to periodically examine areas of collaboration and documenting that program objectives are met. Successful attainment of these interagency objectives is assured through identifying research priorities and by making research outputs available to end users. As described below, each agency plays an active role throughout the life cycle of research in the following areas of collaboration.

- Identifying the right priorities
- Finding the best research contractors
- Assuring good contractor performance
- Assuring high quality outputs
- Applying outputs to end users

3.2.1 Identifying the Right Priorities

The following sections explain how the participating agencies identify and validate R&D and the sequencing of their implementation. Each agency uses the common set of priorities for strategic planning to promote attainment of PSIA-2002 directives. The participating agencies pursue the eight program objectives through the activities described in this section.

Interagency Coordination Meetings

This past year the participating agencies held quarterly coordination meetings to promote collaboration on the PSIA-2002 group activities. These meetings provided opportunities to assess progress on projects and overall program effectiveness and to support: review developing issues and their priorities; identify gaps between high priority safety, integrity and reliability issues and the R&D designed to support their resolution; identify promising technologies; review measures of performance; update and integrate plans for future solicitations; and update project portfolios.

The first interagency coordination meeting in FY 2006 was held on September 14, 2005. The meeting was attended by representatives from each participating agency. Subsequent meetings

were held on December 14, March 22, 2006 and August 15, 2006 and were also attended by representatives from each participating agency. These meetings have facilitated healthy discussions and the identification of further collaboration in the many areas described in section 2.0.

Collaboratively Organized Public Events

Forums, workshops, and conferences have been jointly organized by the participating agencies and involved many industry stakeholders. They served to identify priorities, eliminate redundancy, and disseminate research output to end users.

Joint Government and Industry Pipeline R&D Forum

The R&D Forum is held on a periodic basis to set a national pipeline research agenda. The objective of the forum is to allow government and industry pipeline stakeholders to develop a consensus on the technical gaps and challenges for future R&D. The Forum addressed both short and long-term research objectives for liquid and gas and transmission and distribution pipelines, covering onshore, offshore and Arctic environments. In addition, details of the ultimate research goals, technology demonstrations and transfer, and commercialization are discussed. Feedback received from this event directly contributed to planning guidance for program and project level direction. Pipeline stakeholders utilize identified gaps and challenges as input to determining which topics represent the highest priorities and to support research solicitations such as Broad Agency Announcements (BAA). This provides transparency on programmatic decisions to stakeholders and removes perceptions of a narrow expert driven model. During FY 2006, no forums were held. This decision reflected the consensus among R&D organizations that such a forum is most useful when held approximately every 18 months. The next forum is in development and planned for second quarter FY 2007. All previous events are viewable at <http://primis.phmsa.dot.gov/rd/workshops.htm>.

Advanced Welding and Joining Workshop

The Advanced Welding and Joining Workshop was held in Boulder, CO on January 25 - 26, 2006. The 1.5 day event included approximately 75 representatives from Federal, State and international government agencies, public representatives, research funding organizations, standards organizations, and pipeline operators from the U.S. and Canada.

The purpose of this workshop was to collaboratively identify mutual welding and joining goals for government and industry along with actions by the regulatory, standards and technology development organizations required to achieve them. Several critical gaps in technology, standards and knowledge were identified during five parallel breakout sessions.

Proceedings are available to the public on the DOT Pipeline Safety R&D Program website at http://primis.phmsa.dot.gov/rd/mtg_012506.htm.

Mechanical Damage Technical Workshop

The Mechanical Damage Workshop was held in Houston, Texas on February 28 - March 1, 2006. The 2-day event included approximately 225 representatives from Federal, State and international government agencies, public representatives, research funding organizations, standards organizations, and pipeline operators from the U.S., Canada, and Europe.

The workshop identified existing technology necessary to prevent, detect and characterize mechanical damage of pipelines as well as the gaps in associated regulations and industry standards. The workshop also identified several technologies under current research which will be deployed in the field.

Proceedings are available to the public on the DOT Pipeline Safety R&D Program website at http://primis.phmsa.dot.gov/rd/mtg_022806.htm.

3.2.2 Finding the Best Research Contractors

The following sections explain how the participating agencies collaborate to find the best research contractors to address jointly identified priorities. The participating agencies pursue many of the eight interagency objectives through the activities described in this section. Resulting awards represent the best researchers who propose the most promising technologies for research and development. These activities support attainment of the following interagency objectives: “Solicit & Select Projects,” “Promote Continuity in Technology Development,” “Increase Accessibility of R&D Results to Users,” and “Seek Promising Technologies from Outside Sources.”

Joint Interagency R&D Solicitations

The idea of consolidating research solicitations is seriously discussed at each interagency coordination meeting. The participating agencies developed a process or framework for joint research solicitations but many impediments identified and reported in the FY 2004 Annual Update Report continue to prevent joint solicitations from becoming a reality.

The participating agencies will continue to seek ways to remove these barriers. In the interim, the agencies will continue to participate in joint reviews of individual solicitations. This practice has succeeded in promoting the efficiency objectives described in PSIA-2002 and the Interagency Research and Development Five-Year Program Plan. The DOE program closure leaves only the DOT and DOI programs funding pipeline research. Both the DOT and DOI programs have systematically addressed joint research opportunities since FY 2000.

Interagency Review of R&D Solicitations

The participating agencies greatest success to date has been collaboration on merit review panels during research solicitations. Representation in each other’s solicitation review process

continues to provide assurance that programs are not duplicative and that the best researcher is selected for project awards.

During FY 2006, both the DOT and DOI programs solicited research and collaborated on the reviews of submitted proposals. By the end of FY 2006, DOC and DOI participated on two research solicitations for the DOT program. The first one addressed pipeline damage prevention, mechanical damage, direct assessment, inspection, leak detection, and pipeline design in support of pipeline safety improvements. The second addressed pipeline coating integrity, application, identification of disbanded coatings and coordination of pipeline welding and coating activities. In the DOI program, MMS issued two independent solicitations in FY 2006 covering safety research on multiple topics. With respect to pipeline research, the first solicitation addressed the development of guidelines for internal integrity inspection and for high temperature/high pressure deepwater pipelines, jumpers, and risers. The second addressed analysis, design and prevention of pipeline movements, damage, and impacts resulting from Hurricanes Katrina and Rita and the methods for eliminating hydrates in pipelines during restarts.

In addition, DOC assisted in reviewing Small Business and Innovative Research (SBIR) grants submitted to the DOT. The DOT Pipeline Safety Research program participates in the Department's SBIR program to encourage the initiative of the private sector and to use small business as effectively as possible in meeting specific Federal research and development objectives.

Cost Sharing R&D with the Pipeline Industry

In both the DOT and former DOE programs, cost sharing by proposing organizations is required. This practice is contributing to the goal of finding the best research contractors. The approach is working and reflected in the willingness of other funding organizations to contribute to project completion.

Cost sharing ranges from 30 (DOE) percent to 50 (DOT) percent. Research addressing proof of concept sometimes is more risky than research well on its way to commercialization. Cost sharing is lower for proof of concept research and more for development/deployment and is formalized though a contractual requirement with the researcher.

During FY 2006, thirty-four new pipeline research projects were awarded. Over \$8 million in research awards were made by the participating agencies with industry co-funding of over \$12 million. The DOE program made no new awards and has not been associated with interagency or industry leveraging noted above.

3.2.3 Assuring Good Contractor Performance

Each of the participating agencies establishes good contractor performance differently while addressing many interagency objectives with activities described in this section. These activities work toward the following interagency objectives: "Identify Opportunities to Resolve Issues," "Promote Continuity in Technology Development," "Evaluate Project and Program Results," and

“Increase Accessibility of R&D Results to Users.” The following sections explain how the participating agencies assure and maintain good contractor performance.

Contracting Officer’s Representatives/Contracting Officer’s Technical Representatives

Within DOT and DOI, Contracting Officer’s Representatives (COR)/Contracting Officer’s Technical Representatives (COTR) are trained, certified, and assigned to each project in accordance with the Federal Acquisition Regulations. They provide the day-to-day coordination and technical direction required to keep the research focused on the program goals. A COR/COTR is used to monitor all awarded research. As directed in PSIA-2002, DOC staff experts at NIST addressing materials and fire protection are available for a fee. Only DOT has current research contracts and interagency agreements with NIST designed to address technical areas specified in PSIA-2002.

Management Information System

A Management Information System (MIS) developed by the DOT program is utilized to assure pipeline safety research contractors are performing well. The MIS electronically monitors and tracks contractor performance as the project moves toward completion. DOT/PHMSA pipeline safety staff provides the necessary oversight for using the system in assuring specific contractual milestones are met and accounting procedures are systematically followed as prescribed in award documents. The system procedures improve and maintain program and project quality, efficiency, accounting, and accountability.

3.2.4 Assuring High Quality Outputs

The following section explains how the participating agencies assure and maintain high quality outputs. Each of the participating agencies manages project quality differently while addressing all interagency objectives except “Solicit & Select Projects” with activities described in this section.

Project Peer Reviews

The participating agencies establish the quality of project outcomes in different ways and through a combination of actions. Joint assurance of quality is a goal addressed through R&D forums, workshops and conferences that the participating agencies organize and jointly conduct with industry stakeholders. Public events vet research projects with diverse sets of peers, assuring that the engineering and science are based on sound fundamentals and aimed at the appropriate end users. The issue of project quality is addressed at multi-agency events discussed in section 3.2.1. When appropriate, interagency coordination meetings also serve as opportunities for peer discussion of awarded projects.

Peer review panels, papers, and expert reviews are some of the more formal systematic methods the participating agencies use to assure project quality. These are some of the options provided in OMB guidance when implementing statutory requirements on Data Quality and Peer

Reviews.² The DOT program held its first formal panel peer review in February 2006. Annual peer reviews meet the OMB requirements and address relevance, quality, and performance of awarded research. The DOT program posts peer review reporting at http://primis.phmsa.dot.gov/rd/annual_peer_review.htm and is publicly available. The former DOE program held formal peer reviews at annual technology conferences such as the Natural Gas Technologies Conference. At this event, papers were peer reviewed with industry partners who also addressed quality and commercialization of the results. Within NIST, expert and panel peer reviews are performed yearly through the National Research Council procedures. Projects awarded by DOT to NIST fall under this process for addressing scientific quality.

Technology demonstrations are specifically designed to assure the credibility of research projects. They validate the engineering approaches utilized during the research and benchmark it for ultimate use in the field. Several research projects awarded by the participating agencies factor demonstrations into project scopes. Section 3.2.5 provides more information on these demonstrations.

Pipeline R&D Forums described in section 3.2.1 also provide a level of peer review. Many ongoing research projects are presented during the working group meetings. These working groups are comprised of a wide variety of peers, and feedback can drive scope changes to enhance quality.

Finally, the COR/COTR provides another level of peer review. The representative is required to review all project deliverables for technical competency and to work with researchers so that final outputs are of high quality. The DOT program matches technical backgrounds of regional inspectors with the scopes of new projects. This process of COR/COTR assignment increases project quality while strengthening internal knowledge.

3.2.5 Applying Outputs to End Users

Each participating agency establishes quality differently while addressing all interagency objectives except “Solicit & Select Projects” with the activities described in this section. Several of the eight interagency objectives are handled collaboratively. The following section explains how the participating agencies apply research results to end users.

Technology Demonstrations

The purpose of these technology demonstrations is to provide realistic test beds to support benchmarking and technology transfer for several related government funded research efforts. A detailed demonstration test plan is developed with strong input from both an industry advisory board and the demonstration test participants.

Various aspects of holding technology demonstrations are discussed at the interagency coordination meetings. The participating agencies identify commonalities in technology currently being developed in their individual project portfolios. When common technologies are

² Information Quality Act (Pub. Law. No. 106-554-515(a)) & Paperwork Reduction Act (44 U.S.C. § 3501 *et seq.*)

ready to be benchmarked, a technology demonstration is planned and supported by the participating agencies.

The DOT program funded two technology demonstrations during FY 2006. One organized with the DOE program identified which sensor technology was best suited for use in unpiggable gas pipelines and could be integrated on to a robotic platform previously developed by DOE. The other demonstration, covering guided wave ultrasonics, demonstrated this technology's effectiveness and application with pipeline cased crossings.

These demonstrations are planned when groups of related technologies are ready for valid comparison. Organization of these events occurs on a periodic, not annual, basis. For further information on these initial and future collaborative technology demonstrations, please view the following pipeline research websites:

Department of Energy's National Energy Technology Laboratory

<http://www.netl.doe.gov/scngo>

Department of Transportation Pipeline and Hazardous Materials Safety Administration's Office of Pipeline Safety

<http://primis.phmsa.dot.gov/rd/techdemo.htm>

R&D Forums

Pipeline R&D Forums described in section 3.2.1 provide another opportunity to bring end users of the research into one setting. Many ongoing research projects are presented within the working group agendas. A variety of end users attend these working groups and provide feedback driving scope changes and improving research applicability toward a given challenge.

Memorandum of Agreements with End Users

The Pipeline Standards-Developing Organizations Coordinating Council (PSDOCC) and DOT's PHMSA entered into an agreement in January 2006 to enhance cooperation and coordination. Specifically, the agreement facilitates a more effective and efficient integration of pipeline safety R&D results into the development and revision of voluntary consensus technical standards. The DOT program will quantifiably measure program outputs and impacts demonstrating that outputs addressing standards are reaching end users. Reporting these metrics is planned for future fiscal updates. Please find this agreement at http://primis.phmsa.dot.gov/rd/PHMSA_PSDOCC_MOA.pdf.

4.0 OTHER COLLABORATIVE INITIATIVES

4.1 Interagency Hand-Off of R&D Project Responsibility

The participating agencies are discussing a formal process for interagency hand-off of R&D project responsibility (e.g., from proof of concept to demonstration). Coordination of the process occurs at quarterly meetings where candidate projects are informally identified. To date the most effective practice is for one soliciting agency to add a related technical topic to its next solicitation, and to notify the researcher managing the subject R&D project of this opportunity. Candidate projects are then reviewed by a merit review committee and new awards made as appropriate.

Changes in appropriations for the DOE Infrastructure Program led to transfer of responsibility for future collaborative research. The participating agencies continue discussing ways to address future research project hand-offs. Three project hand-offs were reported in the FY 2004 report but none occurred during the FY 2006 reporting period. This was the result of the DOE program's cessation of new research starts in FY 2006.

4.2 R&D Performance Measurement

The participating agencies conduct ongoing discussions on how to improve R&D performance measurement and to comply with requirements of the Government Performance and Results Act and the OMB Program Assessment Rating Tool (PART). Because of differences in agency missions, different research focus areas, and types of research funded (basic/development), the structure for performance measures must be derived from each agency's own mission directives. Program strategy and performance must be derived from an agency's mission statement and translated into agency specific Strategic and Performance Plans. The PART directs the focus on individual research programs but requires interagency involvement through external reviews. Interagency quarterly coordination meetings facilitate external reviews and contribute to improved performance.

The participating agencies periodically attend the Washington Research Evaluation Network (WREN) sponsored events. WREN serves as a forum for the R&D evaluation community to explore new approaches to improve the management and the performance measurement of science and technology organizations. Participation at WREN events provides critical insight for the participating agencies to comply with the directives of PART. Please visit <http://www.science.doe.gov/sc-5/wren/index.html> for more information on the Washington Research Evaluation Network and the types of events that have been held.

4.2.1 Update on Pipeline Safety R&D Program and Research Performance Measurement

The Government Accountability Office (GAO) recommended each annual update report devote a section to the PHMSA Pipeline Safety R&D Program on research performance measurement.

In September 2005, the PHMSA Pipeline Safety R&D Program addressed both of the GAO recommendations issued in June 2003. The GAO Final Report # GAO-03-746 recommended that the PHMSA Pipeline Safety R&D Program develop a systematic process for evaluating program outcomes using identified best practices and for including this information in its reports to Congress.

The R&D program is designed to fully support achievement of the PHMSA mission to ensure the safe, reliable, and environmentally sound operation of the Nation's pipeline transportation infrastructure. PHMSA achieves its mission by promulgating regulations, inspecting operators for compliance with these regulations, and taking enforcement action as appropriate. The R&D Program contributes directly to achieving the PHMSA mission through pursuing the following three program objectives:

1. Fostering 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. Improving the state of knowledge of pipeline safety officials so industry and regulatory managers and PHMSA pipeline safety field inspectors can use this knowledge to better understand safety issues and to make better resource allocation decisions leading to improved safety performance.

The GAO recommendation to systematically measure outputs of the PHMSA Pipeline Safety R&D Program created a positive momentum to design for success. Actions taken since the release of the report have improved the quality, efficiency, accounting and accountability of the program.

Table 2 illustrates performance measures reported by the PHMSA Pipeline Safety R&D Program within the hierarchy of goals, objectives, impacts and process features. These measures capture program activities from October 2002 to the end of FY 2006. The systematic evaluation process established by PHMSA's Pipeline Safety R&D Program is supporting this structure shown in Appendix A.2.

Table 2. Hierarchy of R&D Program Measures and Processes Features Flowing from the PHMSA Pipeline Safety R&D Program Mission and R&D Program Goals

PHMSA Pipeline Safety R&D Program Mission	To ensure the safe, reliable & environmentally sound operation of the nation's pipeline transportation system.					
Research Program Goals	<p><i>“To drive improvements in”</i></p> <ul style="list-style-type: none"> • Pipeline Damage Prevention and Leak Detection • Pipeline Operations, Controls, and Monitoring • Material Performance and Other Pipeline Safety Improvements 					
Research Program Objectives	Fostering Development of New Technologies		Strengthening Regulatory Requirements and Consensus Standards		Promoting Knowledge for Decision Makers	
Desired Impact Performance Measures	Number of projects contributing to these objectives	50	Number of projects addressing PHMSA regulations	46	Number of projects contributing to these objectives	61
	Number of projects demonstrating new technologies	25	Number of projects contributing to new or revised industry standards	51	Number of final reports publicly available	19
	Number of projects filing for U.S. Patents	9	Number of projects addressing NTSB recommendations	5	Number of conference papers presented	15
Process Features	Categorizing projects for mission relevance		Categorizing projects for mission relevance		Categorizing projects for mission relevance	
	Technology transfer process		Consensus standard integration process		Peer review process for qualifying output quality	
	Peer review process for qualifying output quality		PHMSA regulatory program integration process		Monitoring projects for contractual performance	
	Monitoring projects for contractual performance		Peer review process for qualifying output quality		Contractual requirement for submitting conference papers	
	Contractual requirement for notifying PHMSA of U.S. patents		Monitoring projects for contractual performance			
Fast Facts:						
<ol style="list-style-type: none"> 1. The data is reflecting the first project award on October 1, 2002 until the end of FY 2006. 2. Total number of research awards: 90 3. Current number of completed projects: 30 4. Total funding distribution for 90 projects: \$27,848,837 (PHMSA) \$33,268,005 (Industry co-Funding) 5. Contributing to new or revised standards or regulations is determined when research applicants submit their proposals. Each applicant characterizes what their project deliverable will impact and this information is tracked once a project is awarded. 						

5.0 INTERAGENCY COMMUNICATION OF R&D RESULTS

The participating agencies currently use several mechanisms to make potential users aware of newly-developed technologies. These individual efforts will continue into the future. In addition, several mechanisms will be explored to increase the consistency and quality of the processes used to communicate R&D results. The primary means of communicating R&D results among the agencies, stakeholders, and industry are discussed below.

Government/Industry Pipeline R&D Forum – As previously described, this is a mechanism to bring together government agencies, industry, and pipeline R&D funding organizations to identify the key challenges facing industry and government, current research efforts, and potential research that can help to meet these challenges.

Interagency Program Presentation – This informational presentation is utilized to consistently describe interagency R&D program focus and status. The main objective is to provide an informative, joint pipeline R&D program presentation describing the collaboration, coordination, and project co-funding activities resulting from the passage of the PSIA-2002. The presentation is updated periodically by PHMSA with input from the participating agencies and presented at various public events such as our R&D Forum. It is available to the public via the joint PSIA-2002 Interagency Group website.

More specifically, this presentation identifies and describes the following:

- The requirements of PSIA-2002 on affected Federal R&D Programs
- Introduction and background information on each agency's pipeline R&D program
- Current agency project funding levels
- Current agency project co-funding among programs
- Technology demonstrations
- Future joint activities

PSIA-2002 Interagency Group Website - For the participating agencies, PHMSA has established a joint website to describe and document the interagency group activities and milestones.

Please visit our joint PSIA-2002 Interagency Group website at the following address:

<http://primis.phmsa.dot.gov/rd/psia.htm>

6.0 SECURITY R&D AMONG THE PARTICIPATING AGENCIES

Since September 11, 2001, a greater awareness exists of security-related issues affecting transportation of natural gas and hazardous liquids. Pipeline research and development is an effective tool to investigate solutions to any recognized security gaps and challenges. These solutions may range from providing the knowledge required to make appropriate policy decisions to developing the technology needed to protect hard assets. With the post September 11, 2001 reorganization of Federal agency structures and missions, the Transportation Security Administration (TSA) and/or the Department of Homeland Security (DHS) are designated to

address overall security research and specifically, pipeline security research. The participating agencies have addressed some technical topics involving technologies for encroachment monitoring and third party damage prevention relate to pipeline security.

7.0 COLLABORATIVE RESEARCH

The participating agencies' strongest success to date is collaboration on merit review panels during research solicitations. Representation on each other's research solicitation is reducing duplication and recommending the best researchers for project awards.

For FY 2006, the participating agencies identified many opportunities for leveraging resources without duplicating efforts. The intent of this section is to categorize and quantify interagency co-funded research. Table A.1 itemizes all new awards for FY 2006 where some are co-funded between the participating agencies.

1. *DOT & DOI Research Project Co-Funding* – FY 2006 marked the seventh consecutive year DOT and DOI reviewed offshore pipeline research proposals and coordinated offshore activities. On some offshore pipelines, DOT and DOI have mutual jurisdiction. The FY 2006 marked new research awards by DOI but no new co-funding by DOT. Continued coordination and co-funding creates greater awareness in the offshore pipeline industry of regulatory intent. This joint focus is addressing our energy needs while promoting safety and environmental protection.

2. *DOT & DOC Research Project Co-Funding* – In FY 2006, DOT expanded a program of research and standardization activities with NIST focusing on pipeline materials, inspection processes, and measures of materials performance and reliability. This program directly supports DOT efforts to maintain and ensure the integrity of natural gas and hazardous liquid pipelines.

This program is expected to improve prediction of corrosion rates in steel pipelines leading to strengthened related consensus standards and making possible lengthened assessment intervals. In addition, materials testing directly supporting a strain based design standard are under way and vital for using high strength steels (as proposed for the Alaskan Natural Gas Pipeline).

3. *DOT & DOE Research Project Co-Funding* – In addition to co-funding technology demonstrations and collaborating on other events, DOT and DOE have coordinated hand-offs of R&D project responsibility, but have not co-funded research projects. The DOE program has addressed proof of concept research being long-term in nature. The DOT program awards research which is passed proof of concept, short-term in duration and near commercialization.

Changes in appropriations for the DOE Infrastructure Program led to transfer of responsibility for future collaborative research. The participating agencies continue discussing ways to address future research project hand-offs. Three project hand-offs were reported in the FY 2004 report but none occurred during the FY 2006 reporting period. This was the result of the DOE program's cessation of new research starts in FY 2006.

Appendices

A.1. Current R&D Activities

As evidence of the focus of recently funded R&D activities, the matrix below (Table A.1) shows new project starts categorized by the areas on which these activities are focused for FY 2006. The matrix also displays the amount of funding from the government (Agency Funding) along with the funding levels of the projects provided by industry (Co-Funding).

Specific project information can be found at the following R&D Program websites:

Department of Transportation

<http://primis.phmsa.dot.gov/rd/>

Department of Energy

<http://www.netl.doe.gov/scngo/>

Department of Commerce

<http://www.metallurgy.nist.gov>
<http://www.boulder.nist.gov/div853/>

Department of the Interior

<http://www.mms.gov/tarprojectcategories/pipeline.htm>

Table A.1. Matrix of New Project Awards for FY 2006^{1,2,3,4,5,6}

R&D Topic (Department)	Number of New Projects	Funding (\$)	Co-Funding (\$) (industry cost share)
Reducing Corrosion (DOT)	9	\$2,605,452	\$3,019,287
Damage Prevention (DOT)	2	\$731,989	\$732,215
Improved In-Line Inspection (DOT)	2	\$758,109	\$3,329,958
Improved Plastic Joint Inspection (DOT)	2	\$883,881	\$1,04,3000
Coating Integrity (DOT)	3	\$406,042	\$1,015,871
Coating Defect Detection (DOT)	3	\$697,511	\$817,537
Improved Pipeline Materials (DOT)	1	\$500,000	\$0
Improved Pipeline Design (DOT)	3	\$1,106,615	\$1,588,366
Improved Integrity Management (DOI)	3	\$324,663	\$244,498
Hurricane & Geo-hazard Assessment (DOI)	2	\$235,235	\$35,000
Improved Materials (DOI)	1	\$162,964	\$247,964
Improved Design Solutions (DOI)	3	\$330,000	\$1,150,000
Totals:	34	\$8,742,461	\$12,180,696

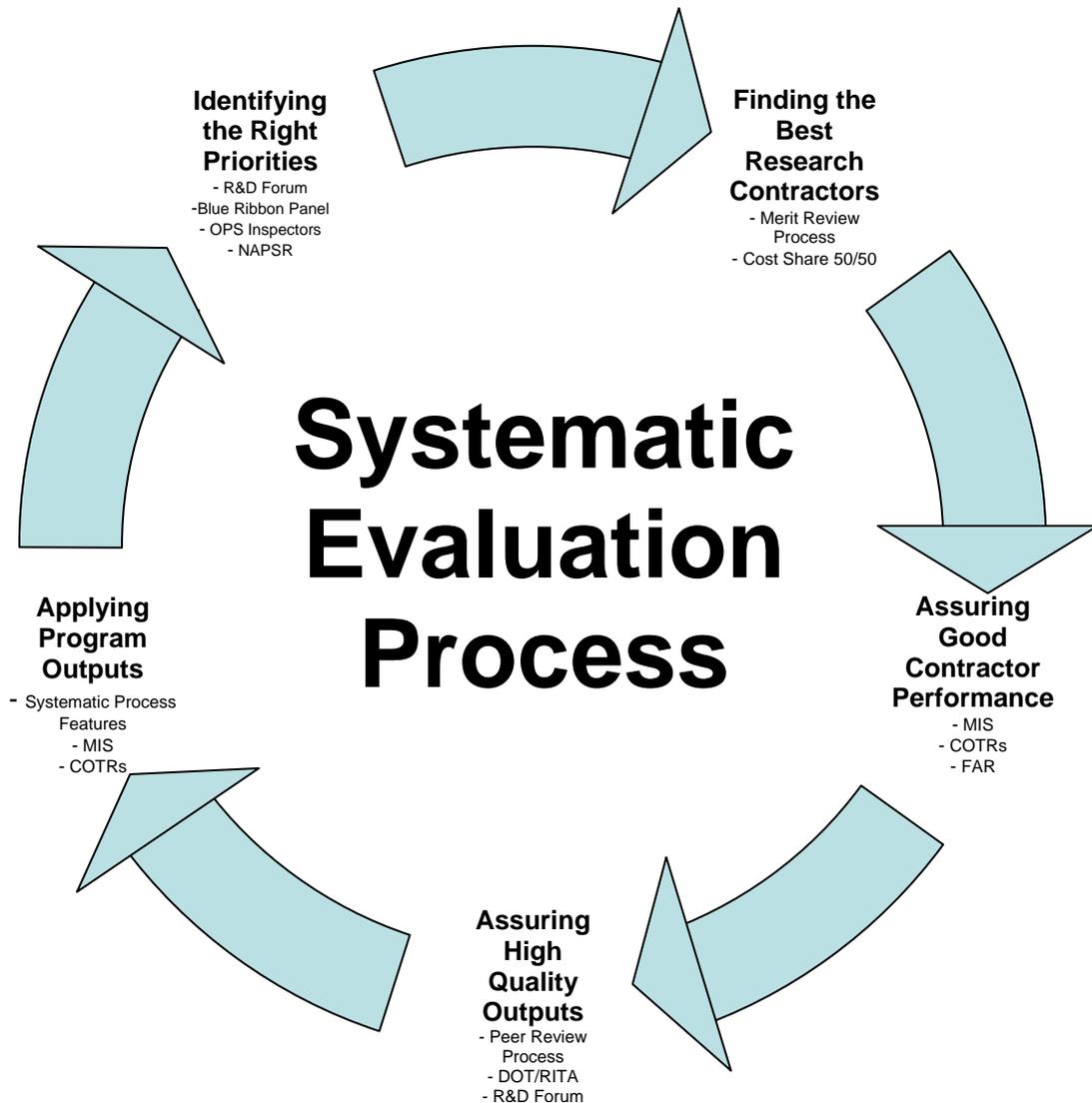
1. Table only illustrates new project awards for Fiscal 2006.
2. Table does not indicate if future funding for these projects will be proposed.
3. Co-Funding was not required on some awards.
4. DOE & DOC had no new starts in Fiscal 2006.
5. The number of new projects co-funded by DOI & DOT is not duplicated in the totals.
6. Table includes DOI pipeline safety research, however it does not include \$3,990,000 in DOI funding for oil-spill response and recovery (for all sources including pipelines) research.

A.2. PHMSA Pipeline Safety R&D Program Systematic Evaluation Process in Support of Research Performance Measurement

This high level representation of the PHMSA Pipeline Safety R&D Program systematic evaluation process is addressing activities described in the PHMSA Pipeline Safety R&D Program Performance Plan. Each step of this systematic process ensures that project outcomes will be of high quality, relevant to the mission of PHMSA and applied to the appropriate end users. It also provides many of the process measures required for quantitative reporting of the program performance.

Continuously working with stakeholders will undoubtedly lead to additional reportable measures and the processes to drive them. Refining of PHMSA Pipeline Safety R&D Program management and performance reporting will occur over time and improve program and project quality and effectiveness. Additional information about this management process is available upon request.

Figure A.1. Systematic Evaluation Process



A.3. Working Members of the FY 2006 Participating Agencies

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