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

Annual Update Report  
Fiscal Year 2005

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

**December 17, 2005**

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## **Interagency Research and Development Five-Year Program Plan For Pipeline Safety and Integrity Annual Update Report – Fiscal Year 2005**

As mandated by statute, 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 5-year pipeline safety research and development program plan.

This annual update report to Congress describes the progress made during Fiscal Year (FY) 2005 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 2005. The report updates the progress resulting from working together to achieve shared objectives. Collaboration has contributed to clarification of R&D focus areas as well as supported identification of alternative technology development opportunities, prevented inadvertent duplication of effort, and improved communications among the participating agencies. This collaboration has also resulted in leveraging expertise and harmonizing funding priorities among agencies in the development and demonstration of promising technologies.

Collaboration described in this update report is designed to better integrate the activities of each participating agency, including determining stakeholder perspective on critical issues, promising technologies and areas deserving the highest priority for R&D funding. Agreement on these areas of collaboration has served to improve the effectiveness of our collective investment in R&D. A summary of FY 2005 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 in 2006 have led to transfer of responsibility for future collaboration research from DOE to the other participating agencies. Fiscal 2005 represents a transition year for the DOE infrastructure reliability research program. It was the final year that DOE implemented programmatic activities. During this time the DOT pipeline safety research program closed three recommendations between the Inspector General and the Government Accountability Office. As a result, the DOT program is assuring

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contractual milestones are met and that the systematic measurements of research outputs are conducted and reported. These improvements to the DOT program will be coordinated with the participating agencies and documented in future reports.

A summary of FY 2005 collaboration is provided below. Further details illustrating collaborative success are found in the report's body.

*Identifying the right priorities*

- Four Interagency Coordination Meetings held to promote collaboration on the PSIA 2002 group activities and for setting a government research agenda.
- Natural Gas Technologies 2005 Conference held to advance next generation natural gas transmission and distribution technologies.
- Pipeline Research R&D Forum held to set a national research agenda by identifying key challenges facing industry and government and sharing information on current research efforts.
- Advanced Coatings for Pipelines and Related Facilities Workshop held to identify and prioritize R&D, technology, and standards development needs for protecting pipelines and related land-based facilities from corrosion.
- 2005 Offshore Hurricane Readiness and Recovery Conference held to learn from past hurricane events to improve future performance and reliability of oil and gas facilities in the Gulf of Mexico.

*Finding the best research contractors*

- Interagency review of three Federal research solicitations by DOT, DOE, DOC and DOI for providing assurance that programs are not duplicative and that the best researcher is selected for project awards.
- Pipeline industry review of PHMSA's Pipeline Safety R&D Program research solicitations for finding the best research contractors.
- Interagency R&D leveraging with the pipeline industry of over \$4.7 million from \$3.8 million in new research awards made by the participating agencies.
- Six consecutive years of DOT & DOI research co-funding for addressing pipeline safety and environmental protection of offshore areas.
- Expansion of DOT & DOC/NIST research that directly supports DOT efforts to maintain and ensure the integrity of natural gas and hazardous liquid pipelines.

*Assuring good contractor performance*

- A Management Information System (MIS) developed by PHMSA's Pipeline Safety R&D Program for assuring PHMSA contractors are performing well.
- Closure of an Inspector General recommendation by PHMSA's Pipeline Safety R&D Program for assuring contractual milestones are met.

*Assuring high quality outputs*

- Interagency participation at Washington Research Evaluation Network (WREN) events for exploring new approaches to improve research quality and measurement of program performance.
- Closure of two Government Accountability Office recommendations by Pipeline and Hazardous Material Safety Administration's (PHMSA) Pipeline Safety R&D Program for assuring the systematic measurement of research outputs are conducted and reported.

*Applying outputs to end users*

- Planned agreement with the Pipeline Standards-Developing Organizations Coordinating Council and Pipeline and Hazardous Materials Safety Administration (PHMSA) for expediting integration of pipeline safety research results into the development and revision of technical consensus standards.
- Interagency Program Presentation utilized at public events for describing the collaboration, coordination and project co-funding activities resulting from PSIA 2002.

Appendices to this report contain summary tables of the following:

- 1.0 FY 2005 Collaborative Activities and Milestones (Table A.1)
- 2.0 Matrix of New Project Awards for FY 2005 (Table A.2)
- 3.0 List of Future Interagency Group Activities and Milestones for FY 2006 (Table A.3)
- 4.0 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 Interagency R&D 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 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 in the identification of solicitation topics, selection and management of 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**

<b>Program Elements</b>	<b>On-Shore</b>	<b>Off-Shore</b>
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 Office of Pipeline Safety.
- NIST: Developing standards, advanced materials and fire safety technologies; and

- 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 committed to periodically examine areas of collaboration to ensure that program objectives continue to be 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 illustrate 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 provide opportunities to assess progress on projects and overall program effectiveness and to support: review of developing issues and their priorities; identification of gaps between high priority safety, integrity and reliability issues and R&D designed to support their resolution; identification of promising technologies; review of measures of performance; updating and integration of plans for future solicitations; and updating project portfolios.

The first interagency coordination meeting in FY 2005 was held on October 20, 2004. The meeting was attended by representatives from each participating agency. Subsequent meetings were held on February 15, June 8, and September 13, 2005 and were 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.

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## **Collaboratively Organized Public Events**

Forums, workshops, and conferences are jointly organized by the participating agencies and involve many industry stakeholders. They serve to identify priorities, eliminate redundancy, and disseminate research output to end users.

### *Natural Gas Technologies 2005 Conference*

This annual joint industry/government conference attracts open discussion on new technologies for the natural gas transmission and distribution industry. Dissemination of current research efforts drives advancement of next generation technologies. This conference was co-sponsored by DOE and the natural gas industry and was held in Orlando, Florida, January 30 – February 2, 2005.

### *R&D Forums*

The participating agencies and industry organize these forums as the primary vehicle for developing a national pipeline research agenda. These forums also serve to ensure that current priorities are pursued through individual research solicitations. Each agency presents its assessment of the research gaps and challenges along with an overview of its program activities. The interagency coordination meetings assure the planning and scheduling of these forums will support compatibility with procurement schedules. Forums are held on a periodic basis so that sequential events can reflect completion of past R&D activities and contribute to solicitation of new research projects.

On March 22-24, 2005, 13 government and industry organizations working through a steering committee organized, planned and executed the most recent R&D forum. The forum brought together over 185 representatives from State, Federal and foreign government offices along with domestic and foreign natural gas and hazardous liquid pipeline operators. The participating agencies' goal for the forum is identifying key challenges facing industry and government, sharing information on current research efforts, and identifying research that can help to meet the challenges.

The participating agencies identified key challenges facing industry and government. Many high level or overall challenges were noted. These included:

- Maintaining the safety, security and reliability of an aging pipeline infrastructure
- Managing significant energy demand forecasts
- Protecting the environment while addressing national energy needs
- Fostering the development of new technologies and strengthening industry consensus standards
- Leveraging R&D resources while improving R&D performance
- Conducting an effective program of technology transfer and communication with stakeholders

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To assure efficient use of participants' time, participating agencies structured the March forum into five concurrent and consecutive brainstorming sessions. These sessions involved discussions centered on how to integrate ideas into research programs and how government and industry can support program design and execution in the following areas:

1. Benefits from Research
2. Road Mapping
3. Technology Demonstrations & Transfer
4. Peer Reviews
5. Standards Development

In each of the brainstorming sessions, participants heard detailed presentations from industry and government leaders about their experience and perspective on the subject.

Proceedings are available to the public on the Pipeline and Hazardous Materials Safety Administration Pipeline Safety R&D Program website at [http://primis.phmsa.dot.gov/rd/mtg\\_032305.htm](http://primis.phmsa.dot.gov/rd/mtg_032305.htm).

#### *Advanced Coatings for Pipelines and Related Facilities Workshop*

The Advanced Coatings for Pipelines and Related Facilities Workshop was sponsored by PHMSA and held in Gaithersburg, MD, on June 9-10, 2005. The day and a half event included approximately 60 representatives from Federal, State and international government agencies, public representatives, research funding organizations, standards organizations, and pipeline operators from the U.S. and overseas.

The purpose of this workshop was to identify and prioritize R&D, technology, and standards development needs for coatings to protect pipelines and related land-based facilities from corrosion. In particular, this workshop covered needs in the areas of coatings development, test methods, application technologies, quality control, and the unique problems associated with identification, examination, and rehabilitation of coatings in the field including field application and repair technologies.

Proceedings are available to the public on the PHMSA Pipeline Safety R&D Program website at [http://primis.phmsa.dot.gov/rd/mtg\\_060905.htm](http://primis.phmsa.dot.gov/rd/mtg_060905.htm).

#### *2005 Offshore Hurricane Readiness and Recovery Conference*

This conference sponsored by the American Petroleum Institute (API) and co-sponsored by the Minerals Management Service, Offshore Operators Committee, United States Coast Guard, U.S. Department of Energy, PHMSA's Office of Pipeline Safety, National Ocean Industries Association and the Offshore Marine Service Association was held in Houston, Texas, on July 26-27, 2005. This was prior to the major hurricanes of the 2005 season.

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The main objective was to learn from past hurricane events to improve future performance and reliability of oil and gas facilities in the Gulf of Mexico. Discussions were focused around the metocean (wind/wave/current) data collected, the performance of drill rigs, production facilities and pipelines, and the best practices developed after previous major hurricanes.

Proceedings are available at <http://www.mms.gov/HurricaneConference.htm> with no cost to the public.

### **3.2.2 Finding the Best Research Contractors**

The following sections illustrate 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 may 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.

#### *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 others’ solicitations review process continues to provide assurance that programs are not duplicative and that the best researcher is selected for project awards.

During FY 2005, each of the participating agencies solicited research and collaborated on the reviews of submitted proposals. By the end of FY 2005, NIST, DOI, and DOE had partially reviewed proposals in response to the latest research solicitation issued by PHMSA.

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### Cost Sharing R&D with the Pipeline Industry

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

The amount of cost sharing required ranges from 30 percent to 50 percent depending on whether research is proof of concept or well on its way to commercialization. Cost sharing is codified through a contractual requirement with the researcher.

During FY 2005, over \$3.8 million in research awards were made by the participating agencies with industry co-funding of over \$4.7 million.

### **3.2.3 Assuring Good Contractor Performance**

The following sections illustrate how the participating agencies assure and maintain 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 towards 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.”

#### Contracting Officer’s Technical Representatives

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

#### Management Information System

The Management Information System (MIS) developed by PHMSA’s Pipeline Safety R&D Program is utilized to assure PHMSA contractors are performing well. The MIS electronically monitors and tracks contractor performance as the project moves toward completion. PHMSA 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.

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### 3.2.4 Assuring High Quality Outputs

The following section illustrates 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. Research projects are vetted using a diverse group of peers who have several opportunities to assure that 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, along with identification of future priorities. 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 given by the Office of Management & Budget’s (OMB) Bulletin<sup>1</sup> on Data Quality and Peer Reviews. The PHMSA Pipeline Safety R&D Program will hold its first formal panel peer review in January or February 2006. This panel peer review will occur annually and address relevance, quality, and performance of awarded research. The DOE program has participated in annual technology conferences such as the Natural Gas Technologies 2005 Conference described in section 3.2.1. At this event, papers are peer reviewed with industry partners who also address 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/PHMSA at 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.

Finally, the COTR provides another level of peer reviews. They are required to review all project deliverables for technical competency, and to work with researchers so that final outputs are of high quality. The PHMSA Pipeline Safety R&D Program matches technical backgrounds of regional inspectors with the scopes of new projects. This process of COTR assignment is increasing project quality while strengthening internal knowledge.

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

### **3.2.5 Applying Outputs to End Users**

The following section illustrates how the participating agencies assure and maintain high quality outputs. 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.

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

No technology demonstrations were jointly held during FY 2005. 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*

These joint government and industry events address several of the interagency objectives. Section 3.2.1 describes the role of these forums and the involvement of the participating agencies. To assure efficient use of participants’ time, the participating agencies structured the March forum into five concurrent and consecutive brainstorming sessions. Discussions centered on how to integrate ideas into research programs, and how government and industry can support program design and execution in the following areas:

1. Benefits from Research

2. Road Mapping
3. Technology Demonstrations & Transfer
4. Peer Reviews
5. Standards Development

In each of the brainstorming sessions, participants heard detailed presentations from industry and government leaders about their experience and knowledge of the subject.

At all forums ongoing and completed research is described to participating end users, illustrating the capabilities of new technologies or the improvement of existing technologies.

Proceedings are available to the public on the PHMSA Pipeline Safety R&D Program website at [http://primis.phmsa.dot.gov/rd/mtg\\_032305.htm](http://primis.phmsa.dot.gov/rd/mtg_032305.htm).

#### *Memorandum of Agreements with End Users*

The Pipeline Standards-Developing Organizations Coordinating Council (PSDOCC) and PHMSA plan to enter into an agreement to enhance cooperation and coordination between them to facilitate a more effective and efficient integration of pipeline safety R&D results into the development and revision of voluntary consensus technical standards. Additionally, a similar agreement is planned with the Inline Inspection Association (ILIA) to cover PHMSA Pipeline Safety R&D Program research that addresses technology development. The ILIA represents several of the internal and external inspection companies that work for industry operators to address integrity management regulations. The PHMSA Pipeline Safety R&D Program expects to improve program results through a process that demonstrates program outputs are reaching end users.

#### **4.0 Other Collaborative Initiatives**

##### **4.1 Interagency Hand-Off of R&D Project Responsibility**

The participating agencies have not yet identified a formal process for interagency hand-off of R&D project responsibility (e.g., from proof of concept to demonstration). However, discussions of project merit and technology transfer occur at coordination meetings where candidate projects are informally identified. To date the most effective practice has been for one soliciting agency to add a related technical topic to its next solicitation, and the researcher managing the subject R&D project to be notified 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 have led to transfer of responsibility for future collaborative research. The participating agencies are discussing ways to explore possible research project hand-offs. Results of these meetings and hand-offs will be enumerated in the annual update report for 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 Strategic and Performance Plans which are agency specific. The PART directs the focus on individual research programs but requires interagency involvement through external reviews. Holding interagency quarterly coordination meetings facilitates external reviews and contributes to improved performance.

Each of the participating agencies participates in the WREN, attending many 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 OPS 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 of 2005, the PHMSA Pipeline Safety R&D Program successfully 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 manages achievement of 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 achievement of 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

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managers and Office of Pipeline Safety (OPS) field inspectors can use this knowledge to better understand safety issues and to make better resource allocation decisions leading to improve safety performance.

The GAO requirements 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. The systematic evaluation process utilized by the PHMSA Pipeline Safety R&D Program in supporting this structure is shown in Appendix A.4.

**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**

<b>PHMSA Pipeline Safety R&amp;D Program Mission</b>	To ensure the safe, reliable & environmentally sound operation of the nation's pipeline transportation system.					
<b>Research Program Goals</b>	<i>"To drive improvements in"</i> <ul style="list-style-type: none"> <li>• Pipeline Damage Prevention and Leak Detection</li> <li>• Pipeline Operations, Controls, and Monitoring</li> <li>• Material Performance and Other Pipeline Safety Improvements</li> </ul>					
<b>Research Program Objectives</b>	Fostering Development of New Technologies		Strengthening Regulatory Requirements and Consensus Standards		Promoting Knowledge for Decision Makers	
<b>Desired Impact Performance Measures</b>	Number of projects contributing to objectives	40	Number of projects contributing to objectives	49	Number of projects contributing to objectives	49
	Number of projects that have demonstrated new technologies	16	Number of projects contributing to new or revised industry standards	49	Number of final reports publicly available	10
	Number of projects filing for U.S. Patents	7	Number of projects contributing to new or revised PHMSA regulations	38	Number of conference papers presented	4
<b>Process Features</b>	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			
<b>Fast Facts:</b>						
<ol style="list-style-type: none"> <li>1. First project award on October 1, 2002</li> <li>2. Total number of research projects: 69</li> <li>3. Current number of projects completed: 17</li> <li>4. Total funding distribution for 69 projects: \$18,212,828 (PHMSA) \$21,674,211 (Industry co-Funding)</li> <li>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.</li> </ol>						

## 5.0 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.

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*Government/Industry Pipeline R&D Forum* – As described above, 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.

*Natural Gas Technologies Conference* – This annual joint industry/government conference addresses new technologies for the natural gas transmission and distribution pipeline industry.

*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 which describes the collaboration, coordination, and project co-funding activities resulting from the passage of the Pipeline Safety Improvement Act of 2002. This presentation will be 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 Research & Development 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 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. For this reason, the participating agencies have not directly addressed pipeline security R&D. However, some technical topics involving technologies for encroachment monitoring and third party damage prevention relate to pipeline security.

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## 7.0 Collaborative Research

The participating agencies' strongest success to date has been collaboration on merit review panels during research solicitations. This representation on each others' solicitations has provided assurances that programs are not duplicative and that the best researcher is selected for project awards.

For FY 2005, 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.2 itemizes all new awards for FY 2005 where some are co-funded between the participating agencies.

1. *DOT/PHMSA & DOI Research Project Co-Funding* – Fiscal 2005 marked the sixth consecutive year for which DOT and DOI have leveraged R&D resources on mutual jurisdictional areas offshore. 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.

Some of the research resulting from the FY 2005 collaboration is addressing hurricane preparedness of offshore pipelines. Research outputs will address integrity management inspection programs for steel catenary risers; review current design and installation techniques and technologies to help mitigate pipeline damage; study mudslide prone areas and root cause of resulting pipeline and riser failure; and create recommendations for changes to best practices, codes and standards, and what repair options are available for returning damaged deepwater pipelines to service.

2. *DOT/PHMSA & DOC Research Project Co-Funding* – In FY 2005, 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 PHMSA efforts to maintain and ensure the integrity of natural gas and hazardous liquid pipelines.

From this program, the prediction of corrosion rates in steel pipelines has been greatly improved with these results being used to revise related consensus standards. In addition, materials testing directly supporting a strain based design standard is under way and vital for using high strength steels as is being proposed for the Alaskan Natural Gas Pipeline.

3. *DOT/PHMSA & 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 which is 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 Reliability Program in 2006 have led to transfer of responsibility for future collaboration research from DOE to the other participating agencies. Hand-offs of R&D project responsibility was reported in FY 2004, but none has

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occurred during FY 2005. Changes in appropriations for the DOE Program have likely ended future collaboration. The DOE has coordinated with the DOT program about research project hand-offs of existing research efforts. Results of this effort and project hand-offs will be itemized in the annual update report for FY 2006.

## Appendices

### A.1. FY 2005 Collaborative Activities and Milestones for the Participating Agencies

During FY 2005, the participating agencies have collaborated on and coordinated several activities. These activities and associated milestones are itemized in Table A-1.

**Table A.1. List of FY 2005 Collaborative Activities and Milestones for the Participating Agencies**

<b>FY 2005 Collaborative Activities and Milestones</b>	<b>DOT</b>	<b>DOE</b>	<b>NIST</b>	<b>DOI</b>
Interagency Coordination Meeting – October 20, 2004	X	X	X	X
Roadmapping Workshop on Liquefied Natural Gas – November 8-9, 2004	X	X	X	
Joint Review of DOI/MMS Research Solicitation Submissions	X			X
Transportation Research Board’s 84 <sup>th</sup> Annual Meeting – January 11, 2005	X	X	X	X
Natural Gas Technologies Conference - January 30-February 2, 2005	X	X	X	
Interagency Coordination Meeting – February 15, 2005	X	X	X	X
Government/Industry Pipeline R&D Forum - March 22-24, 2005	X	X	X	X
Interagency Coordination Meeting – June 8, 2005	X	X	X	X
Advanced Coatings for Pipelines and Related Facilities Workshop – June 9-10, 2005	X	X	X	X
2005 Offshore Hurricane Readiness and Recovery Conference – July 26-27, 2005	X	X		X
Joint Review of DOE/NETL Research Solicitation Submissions	X	X		
Joint Review of DOT/PHMSA Research Solicitation Submissions – August – December 2005	X	X	X	X
Interagency Coordination Meeting – September 13, 2005	X	X	X	X

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## **A.2. Current R&D Activities**

As evidence of the focus of recently funded R&D activities, the matrix below (Table A.2) shows new project starts categorized by the areas on which these activities are focused for FY 2005. 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.2. Matrix of New Project Awards for FY 2005<sup>1,2,3,4,5</sup>**

<b>R&amp;D Topic (Agency)</b>	<b>Number of New Projects</b>	<b>Agency Funding (\$)</b>	<b>Co-Funding (\$) (industry cost share)</b>
Improved Integrity Management (DOT/PHMSA)	7	\$719,618	\$686,114
Damage Prevention (DOT/PHMSA)	1	\$343,836	\$320,380
Improved In-Line Inspection (DOT/PHMSA)	2	\$454,000	\$504,000
Coating Improvement (DOT/PHMSA)	2	\$144,988	\$621,000
Repair Methods (DOT/PHMSA)	2	\$70,000	\$85,000
Improved Corrosion Rate Modeling (DOT/PHMSA)	1	\$250,000	\$0
Improved Materials (DOT/PHMSA)	2	\$349,564	\$5,000
Improved Leak Detection (DOT/PHMSA)	2	\$855,293	\$910,416
Standardization Activities (DOT/PHMSA)	1	\$41,018	\$25,000
Improved Integrity Management (DOI/MMS)	3	\$95,000	\$1,345,000
Hurricane & Geo-hazard Assessment (DOI/MMS)	4	\$390,261	\$0
Improved Materials (DOI/MMS)	1	\$5,000	\$99,564
Improved Coatings & Insulation (DOI/MMS)	1	\$48,000	\$0
Improved Repairs (DOI/MMS)	2	\$61,980	\$160,000
<b>Totals:</b>	<b>31</b>	<b>\$3,828,558</b>	<b>\$4,761,474</b>

1. Table only illustrates new project awards for Fiscal 2005.
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/NETL & DOC/NIST had no new starts in Fiscal 2005.
5. The number of new projects co-funded by DOI/MMS & DOT/PHMSA is not duplicated in the totals.

### A.3. Identification of Future Interagency Group Activities and Milestones for FY 2006

These known future activities and milestones for FY 2006 are itemized in Table A-3. Additional items are likely.

**Table A.3. FY 2006 Collaborative Activities and Milestones**

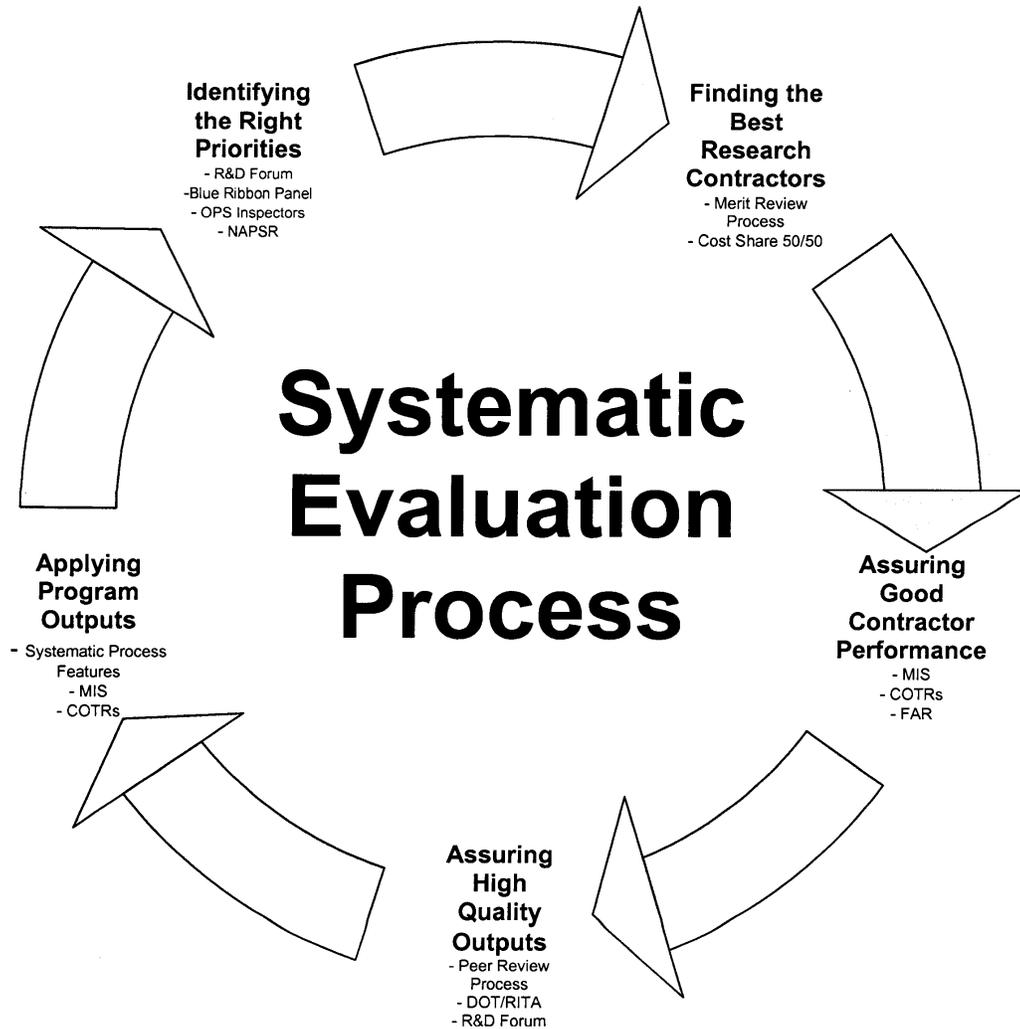
<b>FY 2006 Collaborative Activities and Milestones</b>	<b>DOT</b>	<b>DOE</b>	<b>NIST</b>	<b>DOI</b>
Interagency Coordination Meeting – January 2006	X		X	X
Advanced Welding Workshop – January 25-26, 2006	X		X	X
DOT R&D Solicitation Addressing Coatings – January 2006	X		X	X
Internal Inspection Technology Demonstration – January 2006	X			
Mechanical Damage Technical Workshop – Spring 2006	X		X	X
DOT R&D Solicitation Addressing Mechanical Damage – Fall 2006	X		X	X
Interagency Coordination Meeting – May 2006	X		X	X
Interagency Coordination Meeting – August 2006	X		X	X

#### A.4. 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



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### **A.5. Working Members of the FY 2005 Participating Agencies**

#### **Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety**

James Merritt  
R&D Program Manager  
Office: (303) 683-3117  
Fax: (303) 346-9192  
Email: james.merritt@dot.gov

Robert Smith  
R&D Manager  
Office: (202) 366-3814  
Fax: (202) 366-4566  
Email: robert.w.smith@dot.gov

#### **Department of Energy, National Energy Technology Laboratory**

Christopher Freitas  
R&D Program Manager  
Natural Delivery Reliability, Storage,  
and LNG  
Office: (202) 586-1657  
Fax: (202) 586-6221  
Email: christopher.freitas@hq.doe.gov

Rodney Anderson  
Technology Manager  
Natural Gas Delivery Reliability,  
Storage and LNG  
Office: (304) 285-4709  
Email: rodney.anderson@netl.doe.gov

#### **Department of Commerce, National Institute of Standards and Technology**

Frank Gayle  
Acting Chief, Metallurgy Division  
Office: (301) 975-6161  
Fax: (301) 975-4553  
Email: frank.gayle@nist.gov

Richard E. Ricker, Ph.D.  
Metallurgist  
Office: (301) 975-6023  
Email: richard.ricker@nist.gov

#### **Department of the Interior, Minerals Management Service**

Michael Else  
Pipeline Research Team Leader  
Office: (703) 787-1769  
Fax: (703) 787-1549  
Email: michael.else@mms.gov