Improving Pipeline Leak Detection System Effectiveness

Understanding the Application of Automatic/Remote Control Valves

Event Summary Report

The Hilton
Rockville, MD

March 27-28, 2012

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Event Forward

Among the Congressional mandates of the Pipeline Safety, Regulatory Certainty, and Job Creation Act of 2011 were requirements that the Pipeline and Hazardous Materials Safety Administration (PHMSA) complete reports to Congress concerning hazardous liquid and natural gas transmission pipeline leak detection and spill volume control. PHMSA and the National Association of Pipeline Safety Representatives (NAPSR) sponsored public meetings to identify methods that would:

1. Improve the effectiveness of leak detection systems (LDS).
2. Improve the effectiveness of remote control and automatic control valves that lessen the volume of natural gas and hazardous liquid released during catastrophic pipeline events.
3. Encourage operators to expand the use of LDS and automatic/remote control valves on the nation's pipelines.

These public meetings were designed to provide an open forum for exchanging information about the challenges associated with and the capabilities of LDS and automatic/remote control valves installed on both hazardous liquid (HL) and natural gas (NG) transmission pipelines. The objectives of each of the two days of discussions are listed below. Information collected will be utilized by PHMSA for the creation of reports to Congress.

March 27 - Improving Pipeline Leak Detection System Effectiveness

1. Gather information, for dissemination to the public, Federal and State regulatory agencies and legislators in Congress, concerning state of the art leak detection systems and the practical considerations involved with installation, operation and maintenance of these systems.
2. Identify the constraints and issues associated with deploying LDS on existing and newly constructed pipelines.
3. Record public input that will influence investigation and documentation of LDS system challenges and considerations by PHMSA.
4. Review the capabilities of currently available LDS. The history, operational limitations, and a description of ongoing and future research were to be included in this discussion.

March 28 - Understanding the Application of Automatic Control and Remote Control Valves

1. Gather information, for dissemination to the public, Federal and State regulatory agencies and legislators in Congress, concerning state of the art automatic/remote control valves and the practical considerations involved with installation, operation and maintenance of these systems.
2. Identify the constraints and issues associated with deploying automatic/remote control valves on existing and newly constructed pipelines.

3. Record public input that will influence investigation and documentation of automatic/remote control valve system challenges and considerations by PHMSA.
4. Review the capabilities of currently available automatic/remote control shutoff valves. The history, operational limitations, and a description of ongoing and future research were to be included in this discussion.

Executive Summary

Stakeholder turnout for day one, the Leak Detection System discussions, included more than 190 in person attendees and over 485 webcast participants and over 500 Twitter discussions. The day two valve event was attended by more than 170 in person, 312 webcast participants and over 170 Twitter discussions. Secretary of Transportation Ray LaHood participated in both events. Federal, state and provincial pipeline safety regulatory agencies from both North America and Europe were represented, as were industry standards developing organizations, equipment vendors, service providers, pipeline operators, trade organizations, independent contractors and the general public.

Discussion of LDS and automatic/remote control valves on hazardous liquid pipelines and gas transmission pipelines were conducted by panels of between three and six members and were moderated by representatives from PHMSA. Panel members represented regulatory agencies, the pipeline industry, research institutes and equipment vendors. LDS considerations, capabilities and research were discussed on day one; valve considerations, capabilities, limitations and research, on day two.

These public meetings were designed to provide an open forum for exchanging information about the capabilities, challenges, current application experience and constraints associated with LDS and automatic/remote control valves installed on both hazardous liquid and gas transmission pipelines. Objectives associated with each of the two stated topics included gathering information concerning state of the art technology for dissemination to the public, Federal and State regulatory agencies and legislators in Congress; identification of the constraints and issues associated with deploying LDS and automatic/remote control valves; consideration of public input; and review of technology that will be available in the future.

State and federal regulators of hazardous liquid and natural gas pipelines stressed the critical need for Leak Detection Systems to mitigate releases, reviewed current requirements and reported information gathered from oversight of the operator community. They also discussed the relationship of LDS to operator control room monitoring; valve placement, design and closure times; and emergency response for mitigating the impact from product releases. The regulators concluded that enhancement of pipeline emergency management and response plans involves utilization of automatic and remotely controlled valves other than those found in Integrity Management requirements.

The pipeline operators discussed LDS selection, installation, and operation on hazardous liquid and natural gas pipelines. They stressed that the purpose of Leak Detection Systems is not to prevent leaks, but to mitigate leak consequences. The American Petroleum Institute claimed that Integrity Management procedures for leak detection are being applied to 83% of all regulated pipelines. The operators explained that redundancy, which ensures that leak alarms are legitimate, is common practice on HL pipelines. Information on costs associated with deploying LDS was presented. Other comments concerned 1) the role that human factors play in the correlation of LDS operations to control room management of alarms, and 2) the effects on LDS of variations in the environment and changing operating conditions which can cause increased false alarms and reduced sensitivity levels. Operators concluded

with the statement that the majority of regulated pipelines have methods to detect pipeline leaks.

In the context of a discussion concerning valve selection and placement, pipeline operators explained that they comprehensively evaluate the impact of possible spills on High Consequence Areas (HCA) and determine whether or not additional EFRDs would mitigate the impact of a spill. They indicated that spill prevention activities were typically more effective in reducing damage to HCAs than mitigative measures such as EFRDs. Topics of further discussion were valve installation costs and challenges; the impact of operating constraints and external environmental conditions on valve operation; and the consequences of inadvertent activation. It was noted that there are large cost differences between installation and automation of valves on existing and new pipeline construction and that some valves can negatively impact pipeline in-line inspection devices. The national NG perspective presented information about the number of currently installed valves and valve types, the costs involved in the installation of new valves and the costs related to the automation of actuation. The NG industry stressed that they intend to protect people and property; that valve automation does not change the outcome during the critical first minutes when people are in greatest danger; that pre-planning and preparedness all help; and that they want to improve the response time required to close valves (either manually or with automation) so that the time elapsed before emergency responders can access the site and extinguish secondary fires is minimized.

The Subject Matter Experts provided details concerning LDS and automatic/remote valve capabilities and applications and the research being conducted on new technology. The SME stated that, since conventional industry approaches may be inappropriate to the operating scenario, operators should strive for two levels of independent signals confirming the need for closure. All panelists agreed that use of automation should be based on risk analysis and adherence to the requirements in 49 CFR 192 & 195. The panelists opined that operators would continue SCADA integration and, as technology upgrade costs get lower, would introduce advanced sensor technology, software and artificial intelligence. A brief description of intelligent line break detection systems for both HL and NG pipelines was presented. The final panelist briefly reviewed the history of automatic and remote controlled valves and presented research on the performance of these valves. To aid in the development of a valve that can be installed on existing NG pipelines without shutting off the flow of gas, various lab and field investigations have been performed to evaluate in-situ valves on NG distribution systems. The panelist noted that more accurate pipeline sensing systems that will minimize unintended valve closures are needed. He then summarized current research efforts: researchers are developing 1) options for conversion of existing manual valves to automatic or remote controlled; 2) computer models that assess pipeline rupture response and placement of valves and associated sensors; 3) methods for more cost effective installation of valves; and 4) new valve designs for various installation scenarios.

All presentation material will be available for viewing on the meeting website for six months after the event at http://primis.phmsa.dot.gov/meetings/MtgHome.mtg?mtg=75.

Introduction

These events, Improving Pipeline Leak Detection System Effectiveness and Understanding the Application of Automatic/Remote Control Valves, were designed to provide an open forum for the exchange of information concerning the capabilities, challenges, current application experience and constraints associated with leak detection systems and automatic/remote control valves. The discussions were held on March 27 and 28, 2012, at the Hilton Hotel in Rockville, MD.

Stakeholder turnout for day one, the LDS discussions, included more than 190 in person attendees and over 485 webcast and 500 Twitter participants. The day two valve event was attended by more than 170 in person, 312 webcast and 170 Twitter participants. Secretary of Transportation Ray LaHood participated in both events. Federal, state and provincial pipeline safety regulatory agencies from both North America and Europe were represented, as were developers of industry standards, equipment vendors, service providers, pipeline operators, trade organizations, independent contractors and the general public.

The objectives associated with each of the two stated topics were:

1. Gather information for dissemination to the public, Federal and State regulatory agencies and legislators in Congress concerning state of the art LDS and automatic/remote control valves and the practical considerations involved with installation, operation and maintenance of these systems.
2. Identify the constraints and issues associated with deploying LDS and automatic/remote control valves on existing and newly constructed pipelines.
3. Record public input that will influence investigation and documentation of LDS and automatic/remote control valve system challenges and considerations by PHMSA.
4. Review the capabilities of currently available LDS and automatic/remote control shutoff valves. The history, operational limitations, and a description of ongoing and future research were included in this discussion.

Discussions were conducted by panels of between three and six members and were moderated by representatives from PHMSA. Panel members represented regulatory agencies, the pipeline industry, research institutes and equipment vendors. LDS considerations, capabilities and research were discussed on day one; valve considerations, capabilities, limitations and research, on day two.

All presentation material will be available for viewing on the meeting website for six months after the event at http://primis.phmsa.dot.gov/meetings/MtgHome.mtg?mtg=75.

March 27 - Improving Pipeline Leak Detection System Effectiveness

Panel 1: Considerations for Hazardous Liquid Pipeline Leak Detection Systems

Goal - Provide a perspective of the application considerations for LDS on hazardous liquid pipelines. Please see *Panelist Charge for Panel 1* below for further details.

Federal and State regulators began this panel with an overview of the current LDS regulatory requirements and a perspective on the oversight of HL operators. The direction that Congress has set for regulators and operators with regard to LDS, including reporting requirements in the most recent pipeline safety act, was discussed, as were LDS rulemaking issues for HL pipelines and the recommendations of the National Transportation Safety Board (NTSB).

The national HL operator perspective stressed that the purpose of LDS is not to prevent leaks, but to mitigate leak consequences. Several nationally recognized LDS industry standards issued by the American Petroleum Institute (API), such as *API 1130 - Computational Pipeline Monitoring for Liquid Pipelines*, were reviewed. The API indicated Integrity Management procedures for leak detection are being applied to 83% of all regulated pipelines. Operators concluded with the statement that the majority of regulated pipelines have methods to detect pipeline leaks. There were also points made that the focus of leak detection should be on 'Tweeners', because LDS isn't needed on ruptures and isn't sensitive enough for seepers.

The individual perspectives were presented by two HL operators who described the changes they have implemented to their LDS programs in the wake of the HL Integrity Management rule issues by PHMSA in 2001. They also related LDS to the more recent Control Room Management rule. The operators explained that redundancy, which ensures that leak alarms are legitimate and not false, is common practice on HL pipelines. Information on costs associated with deploying these systems was presented. The operators revealed that they are testing new systems and have been doing so for some time. Other comments concerned the role that human factors play in the correlation of LDS operations to control room management of alarms, and the effects on LDS of variations in the environment and changing operating conditions which can cause increased false alarms and reduced sensitivity levels.

One of the primary problems in the use of commercial leak detection systems on liquids pipelines today is the number of false (non-leak) alarms which are created by such systems. As indicated in the presentations throughout the morning session, an inordinate number of leak detection false alarms may lead to:

- Loss of controller confidence in the leak detection system
- Additional stress on controller workload
- Missing of critical issues associated with other parts of the pipeline operation
- Missing of valid leak detection alarm

There are many reasons outside the control of the leak detection system for false alarms, among them are:

- Communication issues
- Measurement issues
- Instrumentation issues
- Maintenance activities
- New operational scenarios
- Tuning issues associated with the leak detection system

It was noted by the industry that any new regulation should not inadvertently focus on improving leak detection sensitivity to the detriment of the non-leak alarm rate. Both factors must be considered in concert to obtain an improvement in industry safety.

Panelist Charge for Panel 1

Regulatory Perspectives – Will set the regulatory expectations based on the current requirements. Data will be presented illustrating the recent record of the industry and will identify areas where improvements can be made. The presentations will also identify the recent direction provided by Congress and how this event will assist in addressing a wide range of goals.

National HL Industry Perspective – The National Perspective will provide a broad overview of the industry's position for utilizing leak detection systems. This presentation will briefly discuss the issues identified below.

1. To what extent is the HL industry using the computational pipeline monitoring (CPM) method to comply with 195.452(i)(3) or using other means to detect leaks via 195.452(i)(3)?
2. How can HL Pipeline Operators improve the operation/performance of their LDS strategy?
3. How can you factor layers of redundancy into an overall leak detection strategy?
4. What are some of the challenges with LDS for existing vs. new pipelines? Any technology gaps that can be identified?

Individual Company Perspectives – Should specifically address the considerations shown below.

1. Provide any examples of LDS changes that have been made due to the HL IMP rule (not including ongoing SCADA system upgrades which would be done regardless of the rule due to things like equipment obsolescence issues).
2. How can you factor layers of redundancy into an overall leak detection strategy?
3. How can shut in times be improved by utilizing leak detection technology along with valves, meters and CPM?
4. What are the CAPEX/OPEX costs with installing/maintaining systems on existing vs. new pipelines?
5. How are false positives/negatives addressed with LDS?
6. How do human factor issues impact leak detection performance?

7. How do external/environmental and operating conditions (i.e. temperature, pressure differentials and time lag) impact technology or system performance?
8. Are you following, pilot testing new advances in technology or are you supporting any related research?

Panel 2: Hazardous Liquid Pipeline Leak Detection System Capabilities and Research

Goal - Provide perspectives on the capabilities of LDS for HL pipelines. Describe current successes, investments and future strategy for LDS research funded by the pipeline industry. Please see *Panelist Charge for Panel 2* below for further details.

This panel began with Subject Matter Expert (SME) presentations depicting applicable technology types and deployment techniques. Panelists indicated that there is no *one size fits all* LDS; systems must be tuned to each pipeline segment. It was also noted that there is no standard testing procedure for custom applications of LDS technology. Finally, the panelists discussed the gap between actual LDS performance and public expectations of detection capability. Panelists stated that potential future research projects include detection capability for upstream operations, transient operations, shut-in lines, very small persistent leaks and pre-existing leaks.

The panel presented an overview of past, present and future leak detection technology research. Several projects were briefly described. A road map that illustrated the needs of the HL industry was proposed. Research coordination and funding by groups such as PHMSA was discussed.

Panelist Charge for Panel 2

HL LDS SME Panelists – Nationally or internationally recognized SME for LDS or leaders within the LDS vendor community provide a perspective of current system capabilities. No sales pitches will be tolerated. Presenters will need to discuss the considerations shown below.

1. What are some of the latest systems for hazardous liquid pipelines now and on the horizon and how do they operate?
2. How can an operators factor layers of redundancy into an overall leak detection strategy?
3. What are the CAPEX/OPEX costs with installing/maintaining systems on existing vs new pipelines?
4. How should false positives/negatives addressed with LDS?
5. How do human factor issues impact leak detection performance?
6. How do external/environmental and operating conditions (i.e. temperature, pressure differentials and time lag) impact technology or system performance?
7. Have there been new advances in technology from research? Can you identify any technology gaps?

LDS Technology Research – This panel agenda item should overview what is now underway in R&D that the public should be aware of and how it is an improvement to current systems. Technology gaps that still persist should be identified. Private organizations funding this type of research will be the presenters.

Panel 3: Considerations for Natural Gas Pipeline Leak Detection Systems

Goal - Provide a perspective of the application considerations for LDS on natural gas pipelines. Please see *Panelist Charge for Panel 3* below for further details.

This panel began with an overview of current LDS regulatory requirements and comments concerning the oversight of NG transmission and distribution operators. The direction that the Congress has given regulators and operators with regard to LDS, including the reporting requirement in the most recent pipeline safety act, was discussed. LDS issues concerning NG pipeline control rooms, emergency response and rulemaking were noted. Recommendations by the NTSB for the integration of additional tools into SCADA systems were also discussed.

The NG transmission industry related that their strategy for leak detection has a three part focus: prevention, mitigation and detection. Several points were made about leaks versus ruptures; ruptures have much higher consequences than leaks, due to the high operating pressures common on transmission pipelines. The industry representative explained that operators want to continue to focus on prevention and are working toward a goal of zero incidents. They recognize the importance of leak detection; will continue to embrace available, value-adding leak detection systems; and they recognize the need for and welcome additional and workable leak detection technologies and methodologies via research and collaborative demonstrations.

The NG operators emphasized that LDS is not *one size fits all*; LDS must be tailored to the individual pipeline system. An overview of both traditional leak detection and technology based types of LDS was presented. Human factors and control room operations were again mentioned as a major influence on system effectiveness. Finally, it was suggested that, in order to increase the likelihood of detecting smaller leaks, some redundancies should be part of a LDS to compensate for the gaps that may or may not be in operator strategies.

This panel also included a NG distribution operator because the recently passed Distribution Integrity Management Program Regulations have a strong focus on effective leak management program. The distribution operators provided information on issues not covered by the transmission operators due to the difference in system requirements such as the odorization of NG; the complexity of piping systems in congested areas; and the wide variety of pipe sizes, joining mechanisms, pipe materials, system pressures and gas loads involved with distribution systems. Operators acknowledged that they must know their system in order to educate their customers, have effective emergency response, schedule leak repairs, accelerate actions when warranted and conduct timely infrastructure replacement.

Panelist Charge for Panel 3

Regulatory Perspectives – Will set the regulatory expectations based on the current requirements. Data will be presented illustrating the recent record of the industry and will identify areas where improvements can be made. The presentations will also identify the recent direction provided by Congress and how this event will assist in addressing a wide range of goals.

National NG Industry Perspective – The national perspective will provide a broad overview of the industry's position for utilizing leak detection systems. This presentation will briefly discuss the issues identified below.

1. What is the current state of LDS usage in natural gas pipelines? Try to categorize high level if you try to respond.
2. How can NG Transmission Pipeline Operators improve the operation/performance of conventional LDS?
3. How can you factor layers of redundancy into an overall leak detection strategy?
4. What are some of the challenges with LDS for existing vs. new pipelines? Technology Gaps?
5. How can shut in times be improved by utilizing leak detection technology along with valves, meters and computational pipeline monitoring (CPM)?

Individual NG Transmission Operator Perspectives: Should specifically address the presentation considerations shown below.

1. How can you factor layers of redundancy into an overall leak detection strategy?
2. How can shut in times be improved by utilizing leak detection technology along with valves, meters and CPM?
3. What are the CAPEX/OPEX costs with installing/maintaining systems on existing vs new pipelines?
4. How are false positives/negatives addressed with LDS?
5. How do human factor issues impact leak detection performance?
6. How do external/environmental and operating conditions (i.e. temperature, pressure differentials and time lag) impact technology or system performance?
7. Are you following, pilot testing new advances in technology or are you supporting any related research?

Individual NG Distribution Industry Perspective – Should specifically address the presentation considerations shown below.

1. How can NG Distribution Pipeline Operators improve the operation/performance of their LDS strategy?
2. Are there any distinguishable differences on how LDS is applied to distribution vs. transmission pipelines?
3. How can you factor layers of redundancy into an overall leak detection strategy?
4. What are some of the challenges with LDS for existing vs. new pipelines?

Panel 4: Natural Gas Pipeline Leak Detection System Capabilities and Research

Goal - Provide perspectives on the capabilities of LDS for NG pipelines as well as discuss the successes to date, current investments and future strategy for LDS research funded by the pipeline industry. Please see *Panelist Charge for Panel 4* below for further details.

This panel began with SME presentations that depicted applicable technology types and deployment techniques. The SMEs largely agreed that the significant differences between NG transmission and distribution pipelines influence technology deployment. LDS options were further categorized by internal and external systems. Internal systems are susceptible to compressibility influenced variances that make mass balance or pressure drop measurement difficult. Redundant LDSs that can better determine the factual nature of alarms and assist in detection of small leaks were recommended.

The remainder of the presentation was given by organizations that fund leak detection research for NG transmission and distribution application. Each organization presented a history of LDS successes and investments and described their future research strategy. The presentations revealed that there is collaboration with DOT and among operators so that investments avoid overlap. Pipeline operators have cooperated with research organizations by allowing testing of prototypes on working pipelines.

Panelist Charge for Panel 4

NG LDS SME Panelists – Nationally or internationally recognized SMEs for leak detection technology and systems or leaders within the LDS vendor community will provide a perspective of current system capabilities. No sales pitches will be tolerated. Presenters will need to discuss the considerations shown below.

1. What are some of the latest systems for natural gas pipelines now and on the horizon and how do they operate?
2. How can an operator factor layers of redundancy into an overall leak detection strategy?
3. What are the CAPEX/OPEX costs with installing/maintaining systems on existing vs new pipelines?
4. How should false positives/negatives addressed with LDS?
5. How do human factor issues impact leak detection performance?
6. How do external/environmental and operating conditions (i.e. temperature, pressure differentials and time lag) impact technology or system performance?
7. Have there been new advances in technology from research? Gaps in technology?

LDS Technology Research – This panel agenda item should overview what is now underway in R&D that the public should be aware of and how it is an improvement to current systems. Technology gaps that still persist should be identified. Private organizations funding this type of research will be the presenters.

March 28 - Understanding the Application of Automatic Control and Remote Control Valves

Panel 1: Valve Considerations for Hazardous Liquid Pipelines

Goal - Provide a perspective of the application considerations for valves on HL pipelines. Please see *Panelist Charge for Panel 1* below for further details.

Federal and State regulators began this panel with an overview of the current valve regulatory requirements and a perspective on the oversight of HL operators. The direction that Congress has given regulators and operators with regard to valves, including the reporting requirement in the most recent pipeline safety act, was discussed. A brief history of recent valve regulation was presented: since 1978, in order to improve pipeline safety and environmental protection, PHMSA has instated more than seven regulatory actions regarding valves. Studies completed in the 1990s led to the optimal utilization of Emergency Flow Restricting Devices (EFRDs) for HL pipelines and were the basis for pertinent aspects of the HL Integrity Management Rule in 2001. Both PHMSA and NAPSR agreed that excavation damage remains a leading cause of HL incidents. The regulators emphasized that enhancement of pipeline emergency management and response plans involves utilization of automatic and remotely controlled valves other than those found in Integrity Management requirements. EFRDs should be installed where they have the most ability to reduce volume out and High Consequence Areas (HCA) impact.

The HL national perspective described different types of EFRDs including automatically operated valves, remote operated valves, manually operated valves and check valves. In the context of a discussion concerning valve selection and placement, it was noted that pipeline operators comprehensively evaluate the impact of possible spills on HCAs and determine whether or not additional EFRDs would mitigate the impact of a spill. The evaluation process indicated that spill prevention activities were more effective in reducing damage to HCAs than mitigative measures such as EFRDs. Topics of further discussion were valve installation costs and challenges; the impact of operating constraints and external environmental conditions on valve operation; and the consequences of inadvertent activation. It was pointed out that utilization of some valves such as check valves reduces the negative impact of human error.

The individual operator representative discussed valve placement and stated that the location at which valves are placed is based on a number of factors, primarily the ability of the valve to reduce volume out. Placement issues such as valve effectiveness, efficiency, total volume out reduction and average volume out in locations of significant HCA impact. The process for locating a valve was described: the company reviews its worst case scenarios, top risk areas and major water crossing information and uses a data driven approach to dictate valve placement. Closure times for valves were then discussed: check valves can be closed in seconds; remotely controlled valves, in minutes; and closure of manual control valves can take 30 minutes to several hours. The speaker stated that in an effort to optimize the company's system performance and mitigate human factor issues, control center operators become familiar with system capabilities and idiosyncrasies during scheduled valve function tests. It was noted that there are large cost differences between installation and automation of valves on existing and new pipeline construction and that some valves can negatively impact pipeline in-line inspection devices.

Panelist Charge for Panel 1

Regulatory Perspectives – Will set the regulatory expectations based on the current requirements. Data will be presented illustrating the recent record of the industry and will identify areas where improvements can be made. The presentations will also identify the recent direction provided by Congress and how this event will assist in addressing a wide range of goals.

National HL Industry Perspective – The National Perspective will provide a broad overview of the industry's position for utilizing Automatically, Remotely or Manually Controlled Valves. This should briefly discuss the issues identified in the considerations shown below.

1. Do you know how many Emergency Flow Restricting Devices (EFRD) or ACVs are in use Nationwide? #s or %? Can you identify areas where these would be commonly utilized?
2. What has been the experience since implementing the HL IMP rule EFRD requirements? Identify any notable considerations.
3. What are the CAPEX/OPEX costs with installing/maintaining (ACV/RCV/MCV) valves on existing vs. new pipelines?
4. How do external environmental and internal operating conditions impact valve (ACV/RCV/MCV) performance?
5. Do valves leak? Does installing more valves create additional leak paths or improve drain down times?
6. Is there a concern for increased risk of valve installation/facility security or equipment tampering?
7. Is there a concern from inadvertent operation of automatic valves? What has been the frequency for inadvertent closure?

Individual Company Perspectives – Should specifically address the considerations shown below.

1. What has been the experience since implementing the HL IMP rule EFRD requirements? Identify any notable considerations.
2. Can you paint some scenarios for the audience? These need to be supported by facts.
    a. Why and where do you install valves along a HL pipeline?
    b. How do you decide if you should use SCADA along with your valve choice?
    c. How does actuate time (any valve type) impact your choice of valve?
    d. How should transportation congestion impact your strategy for valve actuation times over time? Do you reevaluate?
    e. What are the CAPEX/OPEX costs with installing/maintaining (ACV/RCV/MCV) valves on existing vs. new pipelines?
    f. How do environmental and operating conditions impact valve (ACV/RCV/MCV) performance?
    g. How do human factor issues impact valve performance?
    h. How does actuate times affect operator and emergency response operations? Identify pros/cons.
    i. Is there a concern from inadvertent operation of automatic valves?

Panel 2: Valve Considerations for Natural Gas Transmission Pipelines

Goal - Provide a perspective of the application considerations for valves on NG transmission pipelines. Please see *Panelist Charge for Panel 2* below for further details.

The first perspectives came from the Federal and State regulators. Each discussed current requirements for valves on NG transmission pipelines as well as the emergency response considerations. The recent incident in San Bruno, CA and the resulting focus on the subject of valves by NTSB and Congress was discussed. A current PHMSA rulemaking that addresses valve spacing requirements, block valve installation in new class locations, requirements for automatic and remote controlled valves and the economic feasibility of automatic and remote controlled valve installation within HCAs was described. It was noted that both PHMSA and the Government Accountability Office are conducting studies that address the economic, technical and operational feasibility of utilizing automatic/remote control shutoff valves. Both agencies must report their findings, which will be utilized in rulemaking, to Congress. Finally, it was stressed that actuation of valves depends on parameters such as site and type of installation, maintenance history and most importantly, the amount of stored energy involved. All of these factors must be considered and appropriate decisions made to mitigate potential threats or risks.

The national NG perspective presented information about the number of currently installed valves and valve types in the US today, the costs involved in the installation of new valves and the costs related to the automation of actuation. The NG industry stressed that they intend to protect people and property; that valve automation does not change the outcome during the critical first minutes when people are in greatest danger; that preplanning and preparedness all help; and that they want to improve the response time required to close valves (either manually or with automation) so that the time elapsed before emergency responders can access the site and extinguish secondary fires is minimized. Finally, it was stated that industry wanted to invest in systems that clearly benefit safety programs and that they want a continued dialogue on these topics with all stakeholders.

The remaining panelists presented individual NG operator perspectives that reiterated their commitment to improve valve closure times. They also noted that most physical damage and injuries occur very quickly. The panelists stated that response time coordination with emergency responders was critical and that the staging of operations personnel in close proximity to valve sites is an important element in incident response. They did not feel that automation was the only issue to be considered or the only solution to the problem. The operators stressed the importance of improving incident response in HCAs. Operators indicated that they wanted to base their response strategy on a risk based approach, but noted that there are issues beyond physical impact which are difficult to quantify that need to be addressed. They cited the need to characterize secondary impacts for inclusion in accelerated response criteria when the risk based approach is utilized. Also discussed were valve closure times and valve spacing for Identified Sites with Limited Mobility such as nursing homes and hospitals. Finally, the operators voiced a strong commitment to a reduction in the probability of releases and to the relentless pursuit of zero incidents through Integrity Management Programs, technology developments (processes, tools) and public awareness and damage prevention programs.

Panelist Charge for Panel 2

Regulatory Perspectives – Will set the regulatory expectations based on the current requirements. Data will be presented illustrating the recent record of the industry and will identify areas where improvements can be made. The presentations will also identify the recent direction provided by Congress and how this event will assist in addressing a wide range of goals.

National NG Industry Perspective – The National Perspective will provide a broad overview of the industry's position for utilizing Automatically, Remotely or Manually Controlled Valves. This should briefly discuss the issues identified in the considerations shown below.

1. Do you know how many ACVs, RCVs or MCVs are in use Nationwide? #s or %? Can you identify areas where these would be commonly utilized?
2. What has been the experience since implementing the Gas IMP rule requirements? Identify any notable considerations.
3. What are the CAPEX/OPEX costs with installing/maintaining (ACV/RCV/MCV) valves on existing vs. new pipelines?
4. How do external environmental and internal operating conditions impact valve (ACV/RCV/MCV) performance?
5. Do valves leak? Does installing more valves create additional leak paths or improve blow down times?
6. Is there a concern for increased risk of valve installation/facility security or equipment tampering?
7. Is there a concern from inadvertent operation of automatic valves? What has been the frequency for inadvertent closure?

Individual Company Perspectives – Should specifically address the presentation considerations shown below.

1. What has been the experience since implementing the Gas IMP rule requirements? Identify any notable considerations.
2. Can you paint some scenarios for the audience? These need to be supported by facts.
    a. Why and where do you install valves along a NG Transmission pipeline?
    b. How do you decide if you should use SCADA along with your valve choice?
    c. How does actuate time (any valve type) impact your choice of valve?
    d. How should transportation congestion impact your strategy for valve actuation times over time? Do you reevaluate?
    e. What are the CAPEX/OPEX costs with installing/maintaining (ACV/RCV/MCV) valves on existing vs. new pipelines?
    f. How do environmental and operating conditions impact valve (ACV/RCV/MCV) performance?
    g. How do human factor issues impact valve performance?
    h. How do actuate times affect operator and emergency response operations? Identify pros/cons based on valve choice.
    i. Is there a concern from inadvertent operation of automatic valves?

Panel 3: Valve Capabilities, Limitations and Research

Goal - Provide perspectives on current system capabilities, limitations and research. Please see *Panelist Charge for Panel 3* below for further details.

The SMEs pointed out that control rooms are getting more complex and are more apt to experience a delayed response to an emergency. The SME stated that on HL pipelines terrain and the hydraulic profile play a major role in valve placement and automation decisions and that on NG pipelines emergency response is the first priority after a rupture because extremely high heat flux events are often seen soon after the pipeline ruptures, so the goal needs to be cutting off gas supply as quickly as possible, especially for large diameter pipelines. Since conventional industry approaches may be inappropriate to the operating scenario, the SME emphasized that operators should strive, not for redundancy, but for a *Smart Valve* design approach which includes two levels of independent signals confirming the need for closure.

All panelists agreed that use of automation should be based on risk analysis and adherence to the requirements in 49 CFR 192 & 195. The second panelist stated that, as the industry tests out new systems and demonstrates their effectiveness, actuation technology and hardware (ASV, RCV, MCV) would become better, faster, cheaper and more reliable in the future. The panelist opined that operators would continue SCADA integration and, as technology upgrade costs get lower, would introduce advanced sensor technology, software and artificial intelligence. A brief description of intelligent line break detection systems for both HL and NG pipelines was presented. The panelist concluded by stating that human intervention is still required no matter what type of valve closure system is utilized; that no automatic valve can ever be smart *enough* without human intervention; that the goal for operators is to create a failsafe operating procedure, even though risk can never be eliminated totally; and that human factors, hardware selection, education and constant testing are critical considerations.

The final panelist briefly reviewed the history of automatic and remote controlled valves and presented research on the performance of these valves. The research assessed valve technology by capturing field experience and by conducting simulation studies. Results indicated that the major source of unreliability, i.e., false closures, with valves is their inability to accurately detect a rupture event. To aid in the development of a valve that can be installed on existing NG pipelines without shutting off the flow of gas, various lab and field investigations have been performed to evaluate in-situ valves on NG distribution systems. The panelist noted that more accurate pipeline sensing systems that will minimize unintended valve closures are needed. He then summarized current research efforts: researchers are developing 1) options for conversion of existing manual valves to automatic or remote controlled; 2) computer models that assess pipeline rupture response and placement of valves and associated sensors; 3) methods for more cost effective installation of valves; and 4) new valve designs for various installation scenarios.

Panelist Charge for Panel 3

Valve SME Panelists – Nationally or internationally recognized SMEs for valves or leaders within the valve vendor community will provide a perspective of current system capabilities. No sales pitches will be tolerated. Presenters will need to discuss the considerations shown below.

1. Can you describe the difference in actuate/closure times for manually operated valves vs. ACV/RCV?
2. What are the CAPEX/OPEX costs with installing/maintaining (ACV/RCV/MCV) valves on existing vs. new pipelines?

3. How do external environmental and internal operating conditions impact valve (ACV/RCV/MCV) performance?
4. Has the performance of valves improved with newer era designs? (i.e. inadvertent operation)
5. How do human factor issues impact valve performance?
6. Do valves leak? Does installing more valves create additional leak paths or improve drain down times?

Valve Research – This panel agenda item will overview some of the historical operational limitations of valves and identify how improvements have been made over the years.

Appendix A: Definitions of Valve Types Discussed at the Event

1. Emergency Flow Restricting Device (EFRD) - A check valve or remote control valve usually deployed on hazardous liquid pipelines.
2. Automatic Control Valves (ACV) - Automatic valve with no controller action required; valve closes in response to a rate of pressure drop or to flow rate in the pipeline which exceeds a preset level. A Supervisory Control and Data Acquisition (SCADA) computer controls valve function. Any valve which automatically closes.
3. Remote Control Valves (RCV) - Manually operated by the controller from a control room via SCADA. Any valve which is operated from a location remote from where the valve is installed. Location is usually at the pipeline control or dispatching center.
4. Manually Control Valves (MCV) - Manually operated by deploying company personnel to the valve location site.
5. Check Valve (CV) - Automatically prevents back flow when a pipeline is shutdown.
6. Automatic Shut-Off Valve (ASV) - A valve that has electric or gas powered actuators to operate the valve automatically based on data sent to the actuator from pipeline sensors. The sensors will send a signal to close the valve based on predetermined criteria, generally based on pipeline operating pressure or flow rate. The ASV does not allow or require human evaluation or interpretation of information surrounding an event to determine if the event is a legitimate incident, and will close automatically based on the established criteria.

Appendix B: Available Speaker Biographies

Byron Coy PE
Eastern Region Director, DOT/PHMSA

Byron Coy is the Director of Pipeline Safety, Eastern Region (W. Trenton, NJ) for the Pipeline and Hazardous Materials Safety Administration of the U.S. Department of Transportation. This office is responsible of carrying out and administrating the federal/state pipeline safety program for the 14 Eastern states of Connecticut, Delaware, Maine, Maryland, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia; and the District of Columbia. The Eastern Region has a staff of 16, with individuals based in Trenton, Pittsburgh, Washington-DC and Boston.

Byron began his public service career with PHMSA in Trenton, when a district office was established there in 1995. Starting as a Senior Inspector, Byron became a Project Manager in 1999. He was responsible for inspections, accident investigations, and responding to the requests and inquiries of the public, state programs, the pipeline industry, and other government agencies. Byron was a key contributor to the development of the Hazardous Liquid Integrity Management Program, and is the Technical Team Leader for the development of Control Room Management regulations. He is PHMSA's representative on numerous standards development committees. He led the district office in Trenton, until it became the Eastern Region's main office in 2007, when he became the Eastern Region Director.

Byron began his pipeline career with Gulf Oil in 1969. His positions and responsibilities with several companies grew over the years as an engineer, administrative manager and project leader. Just prior to joining PHMSA, Byron was working with Trigon Engineering, a pipeline consulting and engineering firm. He had amassed 25 years of pipeline experience prior to joining PHMSA. Byron received a bachelor's degree in Electrical Engineering from Drexel University in Philadelphia. He is a professional engineer registered in the state of Pennsylvania.

Linda Daugherty
Deputy Associate Administrator for Pipeline Policy & Programs, DOT/PHMSA

Linda has worked with the Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) for over 22 years. Linda started her engineering career with a hazardous liquid pipeline company and then joined PHMSA as an inspector/investigator. She directed the national enforcement program and served as the emergency response coordinator for nine years. She was the Director of the PHMSA's Southern Region in Atlanta until her appointment as the Deputy Associate Administrator for Policy and Programs in Washington in 2010.

J. Andrew Drake, PE
V.P. Engineering and Construction Technical Services, Spectra Energy

Andy has a BS Industrial/Manufacturing Systems Engineering degree from The Ohio State University, 1982. He joined Texas Eastern as an Engineer in the Technical Services Department in 1982. Over the past 30 years, Andy has worked in numerous different roles of increasing responsibility across the Engineering and Operations Groups for Texas Eastern and its parent company, Spectra Energy, including serving as Vice President of Engineering and Construction, as well as Vice President of Technical Services. Andy currently serves in a new formed role within Spectra Energy as the newly formed Vice President of Asset Integrity.

Andy has served as Chairman of ASME's Gas Piping Standards Code, Chaired the development of ASME's Gas Piping Integrity Management Program Standard (B31.8S). He is one of the Gas Transmission Industry representatives on PHMSA's Technical Advisory Committee, and is a Professional Engineer in the State of Texas.

Mike Futch
Engineering Manager, Integrity Management for NiSource Gas Transmission & Storage

His responsibilities include leading the strategic direction for the Pipeline Engineering Team responsible for providing engineering technical support to Operations & Projects, including implementation of new processes for maintaining technical standards and assuming lead role for coordination of outside engineering partners. Mike's department also manages the Aerial Patrol Program charged with instrument patrols, serves as the custodian for Class compliance, and coordinates with functional engineering managers in Corrosion, System Integrity, and Program Delivery to deliver Projects & Pipeline Integrity.

Prior to joining NGT&S, Mike served in leadership positions for operations, engineering, & construction management at Panhandle Energy after starting his career at Duke Energy. Mike is a 1997 graduate of Louisiana Tech University and participates in PRCI & INGAA initiatives geared towards advancing pipeline design, operating & maintenance standards, integrity management programs, federal regulations for pipeline safety, and industry best practices.

Jeffery Gilliam
Director of the Engineering and Research Division, DOT/PHMSA

Jeff has worked for PHMSA for eight years. He manages the E&RD including technical projects, special permit review, congressional and management briefings on technical issues, LNG issues, and also provides technical support to PHMSA regional offices. Jeff is a member of the ASME B31.8 Operation and Maintenance Committee and his staff participates in API, ASME, ASTM, MSS, and NACE committees.

Jeff joined PHMSA in September of 2002 as a Sr. General Engineer/Project Manager focusing on the Integrity Management (IM) programs both Liquid and Gas. Jeff led both Liquid and Gas Integrity Management inspections throughout the United States. During his career at PHMSA, Jeff has had increasing responsibilities as a project manager and team coordinator and has served in multiple roles at the Western Regional office. Prior to joining PHMSA, Jeff spent 13 years in the energy industry working directly for major gas transmission operators and as a consultant in the Rocky Mountain region.

Jeff graduated from the University of Kentucky with a Bachelor of Science in Civil Engineering.

Chris Hoidal
Western Region Director, DOT/PHMSA

Chris Hoidal is the Western Region Director of the Pipeline and Hazardous Materials Safety Administration's, Office of Pipeline Safety. This office is responsible for carrying out and administering the federal/state pipeline safety program for twelve western states. His pipeline inspection staff is distributed among field offices in Denver, Colorado; Billings and Helena, Montana; Casper, Wyoming; Anchorage, Alaska; and Ontario, California. Chris has worked for the United States Department of Transportation since 1990, and the Office of Pipeline Safety since 1993. He has had the opportunity to work both in the DC headquarters and in field offices in Anchorage, Alaska and Denver, Colorado. Prior to working with the DOT, Chris was a licensed consulting geotechnical engineer in Colorado, Maryland, DC, and Virginia from 1982 until 1990.

He has his BS in Geotechnical Engineering from the University of Nevada – Reno, and Master of Business Administration from the University of Colorado.

James Hotinger
Assistant Director, Division of Utility and Railroad Safety,
Virginia State Corporation Commission

James Hotinger began his pipeline safety career with the Virginia State Corporation Commission in 1983. In his current position, Assistant Director of the Division of Utility and Railroad Safety, he is responsible for the pipeline safety program for both natural gas and hazardous liquid pipelines. He also assists in the management of Railroad Safety and Damage Prevention Programs. Mr. Hotinger holds a Bachelor of Science degree in Civil Engineering from the Virginia Military Institute and is a registered professional engineer in Virginia and

West Virginia. He is currently a member of the Gas Piping Technology Committee and the Pipeline and Hazardous Material Safety Administration's Plastic Pipe Ad-Hoc Committee.

Pete Kirsch

Sr. VP Midstream Technical & Compliance Services, CenterPoint Energy

He holds a bachelor's degree in Mechanical Engineering from Virginia Tech. His primary areas of responsibility include Pipeline Safety, Data Integrity, Environmental & Safety, Technical Training, and Workforce Development. He has previously served in a variety of roles in the Operations, Engineering, Planning, and Market Development functions. Prior to joining CenterPoint Energy, Pete worked for General Electric, where he graduated from GE's Manufacturing Management Program, and for Shell Offshore, where he worked with offshore oil and gas production platforms in the Gulf of Mexico. Pete is an active member of INGAA's Operations, Safety, & Environmental Committee and INGAA's Integrity Management Continuous Improvement Steering Committee and serves on the Boards of INGAA Foundation and Pipeline Research Council International.

Rick Lonn

Director, Regulatory Compliance, AGL Resources

Rick has been with AGL Resources for 27 years and has held a variety of positions in engineering, operations and regulatory for the Company. He first joined the company in 1985 as a distribution engineer. During his career, Rick has managed various operations for the company including areas such as Engineering Design, Dispatch, Corrosion, ROW and Land Use, Damage Prevention, Environmental Services, Codes & Standards, Safety, and Regulatory Compliance. He is currently Director of Regulatory Compliance and he and his group are responsible for working with both Federal as well as state pipeline safety regulators in the seven different states in which the corporation currently operates gas utilities.

Professionally, Rick holds a Bachelor of Civil Engineering (BCE) from Georgia Tech and is also a registered Professional Engineer (PE) in the state of Georgia. He is a past chairman of the Board of Directors for Georgia 811 where he has been a board member for 23 years. He also is chairman of the Georgia Utility Coordinating Council's (GUCC) Legislative Committee, a past chairman of Pipeliners of Atlanta and an AGA Gold Award of Merit winner.

Alan Mayberry

Deputy Associate Administrator for Pipeline Field Operations, DOT/PHMSA

Alan's professional career spans over 30 years in the energy industry and PHMSA. He began working for Atlanta Gas Light Company in Atlanta, Georgia when he graduated from college.

After four years Alan moved to Virginia Natural Gas in Norfolk, Virginia, where he continued to gain varied experience in the natural gas. Alan moved from engineering and technical roles to leadership roles in engineering and operations. After 14 years at Virginia Natural Gas, Alan moved to the DC area and Washington Gas, where he held leadership positions in operations and engineering. Most recently he was Manager of Project Management and Technical Services. While at Washington Gas, Alan served on the American Gas Association's Operations Safety and Regulatory Action and Plastic Materials Committees. He also served on the board of directors for the Northeast Gas Distribution Council.

In 2006, Alan joined PHMSA's Office of Pipeline Safety as a senior engineer in the headquarters Office of Engineering and Emergency Support. Alan was appointed Director of the group in 2008. In his role as PHMSA's technical lead, Alan was responsible for supporting program and regional offices on pipeline issues to ensure uniform policies. Additionally, Alan coordinated the agency's response to pipeline incidents. In early 2010, Alan was appointed Deputy Associate Administrator for Field Operations.

Alan is a graduate of the University of Tennessee, Knoxville, with a Bachelor of Science degree in Civil Engineering. He is a registered professional engineer in Virginia.

Shane Siebenaler

Group Leader, Fluid Dynamics, Southwest Research Institute

Mr. Siebenaler is the Group Leader of Fluid Dynamics at Southwest Research Institute. He oversees business related to leak detection, product qualification, erosion, and flow performance mapping.

Mr. Siebenaler has been involved in multiple projects to support the pipeline industry, including a number of projects studying the detection of leaks on hazardous liquid pipelines. This work has involved testing of various leak detection systems as well as the physics of actual leaks. Mr. Siebenaler conducted a study to assess uncertainty parameters in turbine meter change-out procedures. He also worked on a project to design the next generation of reciprocating compressor technology; his work focused on variable stroke methods for capacity control. He also led an effort to design a pipeline test facility for evaluation of inspection devices.

Mr. Siebenaler also serves as the manager for the Flow Component Testing Facilities (FCTF) at SwRI. His duties include overseeing the day-to-day business operations and supervising the technical staff. He provides support and upgrades to standard and custom testing configurations and processes used in safety valve testing standards. Mr. Siebenaler is also actively involved in industry-wide efforts to revise and update equipment design standards. As part of his work with the FCTF, Mr. Siebenaler designs and performs custom test evaluations of valves, piping, pumps, and gaskets at an array of environmental conditions, including cryogenic and elevated temperatures. He maintains, provides updates, and codes new versions of custom software that is used for testing activities, including data acquisition, analysis, and reporting. Other work to support the oil and gas industry has focused on topics such as downhole tool design, in situ leak detection of subsea equipment, and erosion testing.

Mr. Siebenaler has been involved in the design of several flow systems and facilities, including a large upgrade of the valve testing facility at SwRI to accommodate ultra high-pressure tests. His design work has spanned from small food processing equipment to large-scale oil and gas pilot plant and test facilities. He has sized relief valves and other equipment for a variety of test facilities. He has also been an integral part on the design, fabrication, and testing of a set of carbon dioxide compressors for use on the International Space Station. He holds a B.S. and M.S. in Mechanical Engineering from Georgia Tech.

Joseph Summa
President & CEO, Technical Toolboxes, Inc.

Joseph studied Chemical Engineering at Lehigh University where he obtained his Bachelor of Science (BS) and later went on for Master degrees in Chemical Engineering and Business. Early in his career he was an Officer in the US Air Force and began his commercial career in 1978 with Procter & Gamble (P&G). From 1985 to 1995 he worked at Scientific Software-Intercomp, Inc. (SSI) where many of the computational pipeline monitoring technologies for pipeline leak detection including but not limited to acoustic sensor technology, mass balance with line pack compensation, real time transient model based technologies and others were developed and implemented for worldwide pipeline operators. In 1996 he founded Technical Toolboxes (TT) a software and training company focused on integrated suites of technical software for the Oil & Gas industry with a focus on pipelines. In 1999 TT became the exclusive strategic partner for the Pipeline Research Council International (PRCI) and Mr. Summa continues to be advisor to the President & Board of PRCI. Mr. Summa is active in several international not-for-profit research and new technology organizations and is a regular speaker at conferences on a wide range of Oil & Gas related subjects.

Jeff Wiese
Associate Administrator for Pipeline Safety, DOT/PHMSA

Jeff Wiese serves as the Associate Administrator for Pipeline Safety for the Pipeline and Hazardous Materials Safety Administration (PHMSA) in the U.S. Department of Transportation. In this capacity, Mr. Wiese leads PHMSA's overall efforts to improve the design, construction, operation and maintenance, and emergency response planning for the Nation's energy pipeline transportation system.

Mr. Wiese has served the public for nearly thirty years, most recently in pipeline safety. Prior to arriving at PHMSA, Mr. Wiese worked for fifteen years in matters related to offshore oil and gas operations safety.