Workshop on Pipeline Safety Research and Development
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State Expectations for R&D

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I've been asked to address Pipeline Safety Research and Development (R&D) from the perspective of the State pipeline safety regulator. Before I do that, I'd like to briefly give you some background on the pipeline safety program in Washington State. The Washington Utilities and Transportation Commission (WUTC) signed interstate transportation agreements, covering both natural gas and hazardous liquids pipeline safety, with the U.S. Department of Transportation on June 9, 2000. This action was prompted by state legislative action in response to a rupture and spill on the Olympic Pipeline in Bellingham, Washington the preceding year. That spill resulted in the death of three people. It also changed the way the public in Washington views pipelines and their expectations of pipeline regulators.

To assist us in our identification of the needs that R&D can address from a public point of view, the WUTC queried two bodies of stakeholders that formed as a direct result of the Bellingham incident. These groups are the Washington State Citizens Committee on Pipeline Safety and the City-County Consortium. These groups represent local governments where pipeline facilities are located and a public advisory group formed of representatives appointed by the Governor.

The strongly held opinion in Washington State is that the greatest needs in pipeline safety relate to existing facilities as opposed to new pipeline projects. The pipeline R&D matrix discussed earlier today contains a variety of categories that clearly apply only to new pipelines. While it is important to have better coatings, better steel, and new damage and defect resistant pipelines, the fact remains that the largest present potential risk to the public is from existing facilities. If we were searching for R&D assistance in the areas of greatest need then it would seem that any projects applying to existing pipelines should be our first priority.

Three areas where pipeline R&D can address needs areas that we've identified in Washington State are: leak detection, third-party damage detection and evaluation, and investigation into the human factors related to pipeline failures.

We in Washington are particularly concerned with the ability of leak detection systems to identify and report small, seepage leaks on petroleum pipeline systems, especially in high consequence areas and where groundwater sources exist. Seepage leaks represent a hard to identify pollution source and safety concern. If left until they are discovered visually

on the surface or after affecting water quality, such leaks will cause great damage that is very expensive and difficult to remediate. Existing computer balancing models aren't very good at catching such events and longitudinal detection systems are most often considered too expensive to implement, especially along existing pipelines. Work should be done to look at various methods that could produce reliable results at affordable cost.

In addition, low-level leak detection needs to become industry practice either because it's the most cost-effective way to operate one's business or because it's required by federal rule. The industry has an opportunity in this area to prove that their integrity management efforts truly are worthwhile and effective; that pipelines are being operated with a zero tolerance for leaks. Effective seepage leak detection systems then need to be coupled with efficient reaction plans that identify exactly where a leak is discovered, shut down necessary systems, close isolation valves, and get necessary interim repair, containment and recovery equipment on site as soon as possible.

Existing seepage detection systems such as tapes and tubes most often seem to be more costly or more trouble than they are worth, except perhaps for areas of high concentration of product such as tank farms, or where very hazardous liquids are present. Research needs to be done into other types of external technologies that may be deployed, perhaps without the need to excavate existing facilities to get them installed. Development of low-cost and reliable components and systems would be desirable outcomes so that such detection systems are highly cost effective for operators.

A second area identified for R&D efforts is third party damage detection that can reveal intrusions on a near real-time basis. Damage that should be detectable ranges from actual strikes of the pipeline causing coating or pipe wall damage to land movement or abnormal loading that may be caused by near misses, which result in undermining or washouts. Most people in the industry agree that third-party damage is one of, if not the most important issues in pipeline integrity. Effective damage detection systems should not have to rely on batch process methods such as internal inspections. An effective third-party detection system would be one that provides a reliable signal to operators that can then be acted upon immediately.

Various technologies are now being considered or pursued; ranging from motion detection systems to satellite surveillance. Again a cost-effective, reliable system that identifies pipeline hits or near misses and allows operators to take responsive actions is needed. Operators need to have a high confidence that detected events are real events so that their actions are cost-efficient and timely.

The third area where R&D efforts support Washington interests is investigation into human-related reasons for incidents. Human factors can play a significant role in incident cause. Human factors would seem to increase with more alarms connected to more sensors, arrayed along longer stretches of pipe. What kinds of things lead to human error and how can these be avoided on a best practices basis? Questions to consider in this area of research include:

- How do human operators interact with control systems? Are operators acting as the first level of protection for pipelines or do they rely on redundant, automated systems?
- How do effective operators screen alarms when their numbers increase due to increasing control scope?
- How do employees get training on system changes or upgrades? What methods are most effective?
- What kinds of pressures are put on operations personnel doing shift work? What kind of support do shift workers need to be effective?
- What decision-making tools are available to support operators during times of abnormal operation?
- What influence do pressures associated with production have on operators? How do they react to alarms under such circumstances?

This area of R&D appears to me to be different avenue of investigation than existing efforts outlined in most of the pipeline technology profile matrix. This is not a hardware-based approach. But it is definitely a direction that the industry and OPS should consider.

As supported by the needs identified above, Washington's pipeline R&D priorities include environmental and public health protection. Rapid detection of groundwater invading seepage leaks is perhaps most important overall. Local jurisdictions that rely on sole-source aquifers must protect these resources for public health. With today's additional pressure on local government resources to protect public water supplies from potential terrorism, we would do well to significantly reduce the potential for impacts to these same water supplies from existing pipeline infrastructure.

We believe that focus on research and development actions positively affecting safety of existing pipelines is most important. Right now public and environmental safety is threatened by aging pipelines. We should focus dollars on preventing hazards by enabling better testing, monitoring, and operation of existing facilities.