Heater, Keith

From:	Beaulieu, David
Sent:	Monday, April 27, 2015 12:32 PM
To:	Pickett, Douglas; Miller, Chris; McCoppin, Michael; Tammara, Seshagiri; Setzer, Thomas; Carpenter, Robert; Cylkowski, David; Banic, Merrilee; Beasley, Benjamin; Stuchell, Sheldon
Cc:	Trapp, James; Dudek, Michael; Wilson, George; Gray, Mel; Krohn, Paul; Montgomery, Richard; Burritt, Arthur
Subject:	Indian Point Gas Line Isolation Time

PRB,
Below are the excerpts that I discussed during today's PRB meeting:

1) Excerpts from the Indian Point 50.59 evaluation states, "The estimated time to respond to the alarm (less than one minute) and the closure time of the valves (about one minute) was used as the basis for an assumed closure time of three minutes for the analysis performed in the attached report."
2) National Transportation Safety Board 2011 report excerpt that states that "there is no DOT requirement for response time."
3) Oak Ridge report from 2012 includes two separate statements about closure time:
"The time between a pipeline break and RCV closure can vary from about 3 minutes for immediate leak or rupture detection to hours if field confirmation of a break is necessary to validate the closure decision."
"Consequently, delays of about 10 minutes will be required before RCV closure can be initiated for a typical line break scenario, if field verification of the break is not required."

Excerpts from various sections of the Indian Point 50.59 evaluation involving the 3 minute isolation time.

"This would result in all the gas between these valves at the time of closure being able to vent or burn. The estimated time to respond to the alarm (less than one minute) and the closure time of the valves (about one minute) was used as the basis for an assumed closure time of three minutes for the analysis performed in the attached report."

"The next closest isolation valve locations are at the Stony Point Compressor Station mile post 0.0 and at MLV 15 at mile post 10.52. Valve operation follows the requirements of the DOT Code and is tested on a periodic basis to ensure compliance with code requirements."

"This hazards analysis considers the effects of the gas pipeline rupture to involve the approximately 3 miles of pipeline between isolation valves and considers the event to be terminated by manual action within 3 minutes after any pipeline rupture event by closing the closest isolation valves and limiting the event to the gas between these valves."

"In modeling releases and their consequences, we assume that the contents of a 3 mile length of gas pipeline are released at a pressure of 850psig (the MAOP of the 42" pipeline), that valves isolating this length of pipeline will be closed within 3 minutes of a major release and that the interior of this pipeline is smooth."

"After valve closure, full bore release from the pipeline will persist for another 2 to 3 minutes. The release following guillotine rupture will therefore be ~ 5 to 6 minutes duration."

"Based on an average release rate of 1877 kg/s for a 360-second period. This rate comprises the release of 376,000 kg in the first minute (from ALOHA), a release of 200,000 kg in the next two minutes (accounting for the pressure drop) and 100,000 kg after valve closure. This last will take an additional 3 minutes after the valves are closed (from ALOHA)."

National Transportation Safety Board. 2011. Pacific Gas and Electric Company Natural Gas Transmission Pipeline Rupture and Fire, San Bruno, California, September 9, 2010. Pipeline Accident Report NTSB/PAR-11/01. Washington, DC. http://www.ntsb.gov/investigations/AccidentReports/Reports/PAR1101.pdf

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Other than for pipelines with alternative maximum allowable operating pressures (MAOP), **the regulations do not require a response time to isolate a ruptured gas line, nor do they explicitly require the use of ASVs or RCVs**. The regulations give the pipeline operator discretion to decide whether ASVs or RCVs are needed in HCAs as long as they consider the factors listed under 49 CFR 192.935(c): Automatic shut-off valves (ASV) or Remote control valves (RCV). If an operator determines, based on a risk analysis, that an ASV or RCV would be an efficient means of adding protection to a high consequence area in the event of a gas release, an operator must install the ASV or RCV. In making that determination, an operator must, at least, consider the following factors—swiftness of leak detection and pipe shutdown capabilities, the type of gas being transported, operating pressure, the rate of potential release, pipeline profile, the potential for ignition, and location of nearest response personnel.

Oak Ridge National Laboratory ORNL/TM-2012/411, "Studies for the Requirements of Automatic and Remotely Controlled Shutoff Valves on Hazardous Liquids and Natural Gas Pipelines with Respect to Public and Environmental Safety," December 2012,
http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_2C1A725B08C5F72F305689E943053A96232AB200/filename/Final%20Valve_Study.pdf

Conclusions from the "Cost Benefit Study of Remote Controlled Main Line Valves" (Sparks, 1998) follow.

1. Virtually all injuries caused by pipeline breaks occur at, or very near, the time of the initial rupture. Of 81 injury incidents reviewed (1970 to 1997 NTSB Incident Reports), 75 reported injuries at the initial rupture. Of the other six incidents, four occurred within 3 minutes of the rupture. It seems clear, therefore, that early valve closure time will have little or no effect on injuries sustained, and no effect on rupture severity. Valve closure will be "after the fact" as far as most injuries and damage are concerned. There is no evidence that prolonged blowdown of a ruptured line causes injuries.
2. Further, a line break does not immediately evacuate the pipeline. Because of line pack (gas compressibility) some 5 to 10 minutes are normally required for low pressure alarms to be generated at Gas Control and/or nearby compressor stations. Delays depend upon break size and location, line size, operating pressure, and other operating and configurational variables. Additional time is then required (a) to determine the cause of low line pressure (e.g., loss of compression, load transients, faulty instrumentation, line break, or other causes) and (b) to determine break location. This will likely consume an additional 5 minutes. **Consequently, delays of about 10 minutes will be required before RCV closure can be initiated for a typical line break scenario, if field verification of the break is not required.** Early valve closure can, however, have a significant effect in reducing the volume of gas lost after a line break. Simulations show savings of about 50% for valve closure at 10 minutes versus closure at 40 minutes in a typical 30-inch/900-psi rupture scenario.

A different section of the Oak Ridge Report states:

> The decision to close a RCV involves evaluating the sensor data received at the remote location and determining whether a problem does, or does not, exist. The evaluation process includes consideration of real-time pressure and flow data and communications with the public, emergency responders, or company field personnel. If the operator determines that block valve closure is necessary, the operator initiates the closure procedure by sending a signal to the valve site via the communications link. **The time between a pipeline break and RCV closure can vary from about 3 minutes for immediate leak or rupture detection to hours if field confirmation of a break is necessary to validate the closure decision.**

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