Summary of the Algonquin Incremental Market (AIM) Pipeline Project Sited Next to the Indian Point Nuclear Power Facility

The Federal Energy Regulatory Commission (FERC) approved Spectra Energy's Algonquin Incremental Market (AIM) pipeline expansion, siting the 42-inch diameter, high-pressure gas pipeline 105 feet from critical infrastructure at the Indian Point Nuclear Power Plant. Experts have shown that if the pipeline ruptures, it could cause an explosion that would risk the operation of the diesel fuel tank as well as the switchyard that provides electricity for Indian Point and is critical to the functioning of Indian Point. If the switchyard became inoperable and the fuel tank for the backup diesel generators were destroyed, the reactors could lose power and cooling systems may fail, leading to a nuclear accident.

The Federal Energy Regulatory Commission (FERC) issued a Certificate to Spectra Energy on March 3, 2015, basing its approval on the Nuclear Regulatory Commission's (NRC) assessment that the pipeline poses "no additional risk" to Indian Point. NRC's approval was based on its confirmatory analysis of Entergy's risk assessment which used EPA's 'ALOHA' computer modeling program which, according to the ALOHA documentation is invalid in this pipeline configuration. Subsequently, new information obtained through Freedom of Information Act requests demonstrates that these risk calculations were based on a faulty analysis that significantly underestimates the dangers posed by the AIM pipeline in such close proximity to Indian Point. The NRC did not use its own approved equation in Regulatory Guide 1.91 to calculate the blast radius for an extended release. Had the NRC used its own equation, the blast radius may exceed 3000 feet.

Experts requested that their concerns be heard by the NRC Petition Review Board. The first Petition Review Board call was held in January 2015 and a second Petition Review Board conference call was held on July 15, 2015. The experts presented information to the NRC Petition Review Board, showing that the information NRC used to determine risks was incorrect and improperly calculated and that since FERC approved this project based on this incorrect information, the permits should be rescinded and a comprehensive, independent, transparent risk assessment should be conducted. NYS Assemblywoman Sandy Galef organized a public meeting on the July 15, 2015 at a library in Westchester County in order for the public to be able to hear the NRC Petition Review Board conference call. There were also a number of state and federal elected officials and their staff on the call including representatives from Senator Chuck Schumer's office, Senator Gillibrand's office, Congresswoman Lowey's office and the New York State Attorney General's office. Currently, the NRC Petition Review Board is reviewing the information presented by the experts, as well as a letter sent by Mr. Paul Blanch after the call with 39 essential questions.

A thorough public safety and risk assessment has been requested in resolutions by the Westchester, Rockland and Putnam County Legislatures, as well as seven towns and

cities on the pipeline route and numerous residents, experts, and elected officials, including United States Senators Schumer and Gillibrand, Congresswoman Lowey, NYS Assembly Members Galef, Buchwald, and Otis, and NYS Senators Latimer and Krueger, Town of Cortlandt Supervisor Linda Puglisi and many others. To date, there has been no independent public safety and risk assessment or agreement to perform this assessment.

Freedom of Information Act Documents

Richard Kuprewicz of Accufacts, a nationally recognized pipeline safety expert with over 40 years of experience in the oil and gas industry, and Paul Blanch, a nuclear power expert with over 45 years of experience in the nuclear industry, have been closely working with local residents and elected officials to analyze the risk posed by the AIM pipeline next to Indian Point. Mr. Kuprewicz was hired by the Town of Cortlandt to analyze the project and Mr. Blanch has been working on this pro bono because of his major nuclear safety concerns. Both experts provided formal comments to FERC in November and December. Both experts participated in the NRC Petition Review Board call and maintain that the internal analysis conducted by Entergy and NRC on the AIM pipeline's safety next to Indian Point severely underestimates the risk of catastrophic failure at the plant in the event of a pipeline rupture from either an accident, terrorist attack or earthquake. Further, the NRC has provided no documentation substantiating their claim that an analysis of a rupture of the existing 63-year old pipelines running within 400 feet of vital components and structures has been conducted or potential consequences analyzed.

Through the Freedom Of Information Act (FOIA), Paul Blanch requested NRC's calculation of the safety risk posed by a pipeline rupture to Indian Point's infrastructure. At first NRC refused to release the documents. Blanch appealed the failure to turn over critical documents under FOIA and with the assistance of New York State Assemblywoman Galef and U.S. Senator Markey's office, he subsequently received several key documents in June 2015, which revealed that the NRC's approval to FERC was based on inaccurate information including the incorrect shutdown time for the gas pipeline, the incorrect blast radius and detonation capacity of a pipeline rupture and explosion, and the omission of information regarding the threat of ignition of a vapor cloud.

3 Minute Pipeline Shut Down Time

In the event of a gas pipeline rupture or accident, Indian Point operators would not be able to promptly shut off the flow of gas because the shut-off valves are operated remotely from Houston, Texas by Spectra Energy. The isolation valves for the section of pipeline near Indian Point are approximately three miles apart. Spectra Energy has stated that in the event of a pipeline rupture, they would be able to shut down the section of pipeline in 3 minutes. Spectra's 3-minute shut down claim was used by Entergy as the basis of its risk analysis. The Entergy analysis was subsequently given to NRC and became the basis of the FERC approval of the pipeline. This information, however, is incorrect because most gas pipeline ruptures require field verification, which takes additional time. In an internal email from April 27, 2015 obtained through FOIA with the subject line "Indian Point Gas Isolation Time," it clearly states that if field

verification is required the shut down time can take “hours.” The risk analysis also did not take into consideration that ignition or an explosion in which the 3 miles worth of gas between the two valves that Spectra would need to shut off would burn with a high-temperature fire. Neglecting to even consider the failure of an isolation valve to close is in direct conflict with NRC Regulations.

In the case of the San Bruno pipeline rupture in 2010, it took over 2 hours for system operators to shut down the pipeline and the fire resulting from the rupture lasted 17 hours. The San Bruno pipeline is smaller then the AIM pipeline with a 30" diameter and much lower pressure. Its rupture resulted in 8 fatalities, 58 injuries, 38 homes destroyed, and $1.6 billion in fines and penalties, which included the largest fine to a utility in California’s history. NRC stated in the presentation on July 15, 2015, that as part of its confirmatory analysis, it did not look at the San Bruno pipeline rupture.

The cited reference in the analysis ,“ Handbook of Chemical Hazard Analysis Procedures, ” is dated circa 1987 and does not consider subsequent major gas-line explosions such as the San Bruno, CA, Sissonville WV, Cleburne TX, Carlsbad NM, and the Edison, NJ transmission and distribution explosions.

Pipeline rupture response time is dependent on the detection of a rupture and then field verification. On May 31, 2015 in Arkansas, a Spectra Energy pipeline called the “Texas Eastern Pipeline” ruptured, yet it was not until the following day, on June 1st, that Spectra Energy became aware of the rupture, which released 3.9 million cubic feet of gas.

Finally, in the confirmatory analysis of Entergy’s analysis of AIM pipeline risks, the NRC used the EPA’s “ALOHA” computer modeling system to predict the probability and consequences of fires, overpressure and radiant heat flux. This modeling system is prohibited for pipeline breaks whether they are caused by an accident, terrorist attack or earthquake. The EPA clearly states in its protocol that: “ALOHA cannot model gas release from a pipe that has broken in the middle and is leaking from both broken ends.” None of the cited references in EPA’s ALOHA modeling discuss a 3-minute shut down time for a gas pipeline rupture but do discuss a one-hour time to be considered.

Detonation Power of a Pipeline Explosion

Internal NRC emails confirm that a rupture of a gas pipeline of this pressure (850 psi) and diameter (42”), would release about 4 kilotons of energy a minute. (To put this in perspective, the nuclear blasts at Hiroshima and Nagasaki were about 15 kilotons.) NRC FOIAs 2015-00189 and 0246 include an NRC internal email that discusses gas release rate of 376,000 kg per minute, which is nearly 1 million pounds per minute of explosive gas. Natural gas contains 10 times more energy per pound than TNT. This energy release could cause multiple explosions that could destroy critical infrastructure required to provide cooling to the Indian Point nuclear reactors and spent fuel pools, thereby causing a major release of radioactive material. This scenario is similar to the one experienced with the Fukushima nuclear disaster, where plant operators were unable to cool reactors and spent fuel pools due to a loss of all power. The information in this email directly contradicts the information provided to FERC by the NRC in its confirmatory analysis claiming “no additional risk.”

Blast Radius of a Pipeline Explosion

Given new information obtained through FOIA about the incorrect shut down time and new information about the release of 4 kilotons of energy per minute in the case of a pipeline rupture, the blast radius of an explosion is much greater than that posed by NRC as the basis for its approval of the pipeline siting next to Indian Point to FERC. Using more realistic gas release of one to two orders of magnitude greater, the blast radius would encompass critical Indian Point structures such as the city water tank and possibly tanks used for core cooling and other vital components.

The NRC/Entergy analysis stated the switchyard and the diesel oil storage tank are within the blast radius. Loss of the switchyard and the oil tank may result in a station blackout and the further loss of the city water tank would render the Indian Point Unit 2 backup emergency diesel generator inoperable due to loss of coolant to the generators. The city water tank serves to supply back-up water to the Auxiliary Feedwater System used to cool the core during loss of AC power in a station blackout event. This could ultimately result in a worst-case scenario, a nuclear meltdown.

Furthermore, a NRC review of the construction and operating license application (COLA) for the Turkey Point Units 6 and 7 reactors, which would be located adjacent to a gas pipeline in Homestead, Florida, predicted a damage radius of more than 3000 feet from this smaller gas line operating at a lower pressure. This contradicts NRC's analysis and approval of the AIM pipeline in which NRC states a damage radius of about 1150 feet, for a pipeline more than double the capacity and operating at a higher pressure than the one at Turkey Point.

Omission of Vapor Cloud Ignition

Nothing in the FOIA documents, including notably FOIA 2015-0189, determining risk and safety calculations show that NRC considered the potential damage to Indian Point infrastructure from a vapor cloud, which is when gas or a flammable chemical is released and forms a cloud in the air that can then ignite into fire from a spark. Once a vapor cloud is ignited, if gas continues to pour out of a pipeline rupture, continuous explosions and fire can last for many hours. If a vapor cloud forms and is ignited, more of the Indian Point Nuclear Power Plant would be at risk of catching fire and being damaged. A vapor cloud is what was ignited in both the San Bruno pipeline fire and the East Harlem apartment buildings explosion.

In 1991 the NRC chastised the operator of a nuclear power plant in Colorado for not performing a proper analysis for a 16-inch low pressure gas line located almost one mile from the decommissioned Fort St. Vrain nuclear plant. Specifically the NRC discussed the failure of the operator to consider the potential impact due to vapor cloud explosions.

Potential of Pipeline Rupture and Explosion from an Earthquake

There is no evidence that FERC nor the NRC have considered the damage an earthquake could have on the AIM pipeline in causing a pipeline rupture and subsequent damage to Indian Point infrastructure and reactors, even though in 2014, NRC ordered Entergy to conduct a seismic study that is due to be completed in June

2017. We are not aware that this study will even consider the potential seismic impact on the existing gas lines.

Pipeline Ruptures

Transmission pipeline ruptures occur frequently. In fact, according to data from the U.S. Department of Transportation Pipeline Hazardous Material and Safety Administration (PHMSA), 119 gas transmission pipeline accidents occurred in 2014, an average of nearly one accident every 3 days.

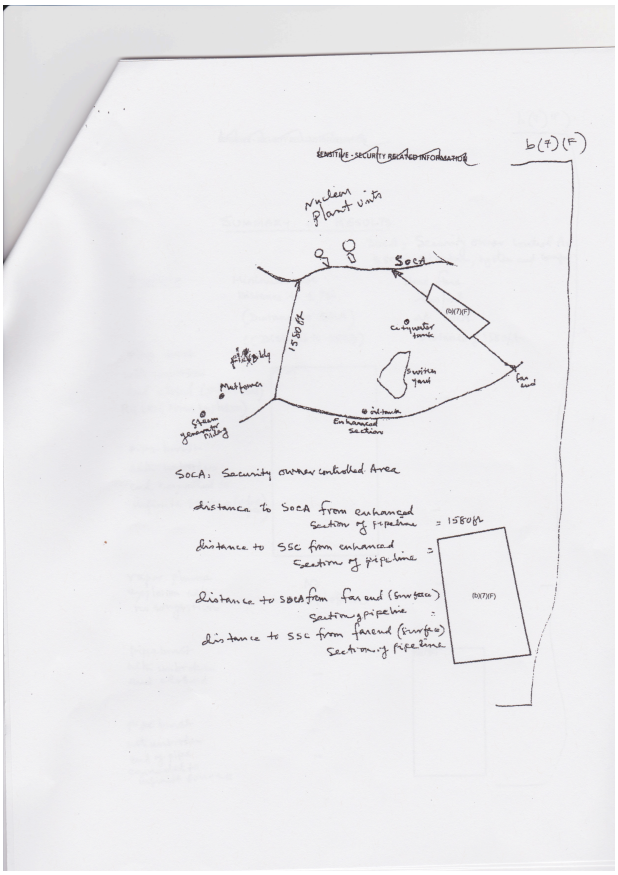
NRC stated in its analysis that the probability of an explosion after a pipe rupture is 5% yet this number is not contained in any of the cited references. Research shows almost 100% of pipe ruptures result in ignition. Its analysis assumes that a total pipeline rupture will occur in 1% of the pipeline accidents whereas the references clearly state this occurs in 20% of the accidents. The NRC analysis states: “If this release is due to the underground pipe, the frequency of explosion will be further reduced by at least an order of magnitude.” There is no documentation or reference supporting this non-conservative assumption.

NRC calculates the probability of a gas line explosion at 7.5E-7 per year. The experts’ calculations clearly show the probability of core damage to be orders of magnitude greater than predicted by the NRC and Entergy analyses.

Conclusion

If the NRC had used accurate information concerning the dynamics of a pipeline rupture, the impact radius of the explosion and heat flux would have been dramatically expanded. This would have demonstrated that a rupture could lead to a total electrical failure at Indian Point, including back-up systems. FERC was provided with material false information, originating from the NRC, Entergy, and Spectra Energy, thus the Certificate that was issued should be invalidated. With the public health and safety of 20 million people in jeopardy, action needs to be taken quickly to halt the construction of this project and to immediately conduct a comprehensive, independent and transparent risk assessment. Construction in Westchester County has begun as of October, 2015. Even if Indian Point is shut down and decommissioned, highly radioactive, long-lived spent nuclear fuel will remain on site.

“Back-of-Envelope calculation” from FOIA Document 2015-0189



Experts’ Statements and Background:

Nationally recognized pipeline expert Richard Kuprewicz, hired by the Town of Cortlandt to analyze the project, provided formal comments to FERC in November and December. Mr. Kuprewicz participated in the NRC Petition Review Board calls in Jan 2015 and most recently on July 16, 2015. He stated: *“ In reviewing the various analyses of information provided to date, it has become obvious that those attempting to perform rupture dynamics of the 42-inch pipeline should not be doing such work, as their analyses consistently fail to capture the fundamental basics of gas pipeline rupture dynamics, especially on this system in the vicinity of the nuclear plant. From my perspective, it appears the permitting agencies are attempting to take advantage of a loophole that permits the NRC to dismiss risks if such analysis can be categorized below a certain threshold value, while ignoring the severe consequences that might prevent the nuke plant to safely shutdown… Agency studies create the appearance of risk management tampering to favor a project agency decision and raise the question, Are involved agencies capable of performing a scientifically neutral study for such a sensitive issue? A truly independent safety analysis should be performed, subject to a reasonable open peer review. Security claims should not be permitted to shelter malfeasance in a scientific method involving incomplete risk analysis for such a highly sensitive infrastructure."*

Nuclear power expert, Paul Blanch, filed petition to NRC in October 2014 regarding regulatory violations concerning the siting of the AIM pipeline next to Indian Point. Mr. Blanch participated in the NRC Petition Review Board calls in January 2015 and most recently on July 16, 2015. He stated, *" The NRC has threatened the safety of more than 20 million residents and the infrastructure of the greater NY metropolitan area and is risking trillions of dollars of damage and possibly the US economy by basing its safety assessment on a calculation that was recently obtained from the NRC under FOIA[1].This new information confirms that this NRC 'calculation' which was partially handwritten, unapproved, undated and unsigned, used fictitious, false and unsupported assumptions. This NRC calculation supported the FERC approval of the AIM project and the transportation of thousands of tons of TNT equivalent across and in the vicinity of the Indian Point nuclear plants. This 'back of the envelope-type calculation,' which misled Congressional representatives, FERC and the general public, must be invalidated and an independent, transparent, structured risk assessment, as outlined in an Occupational Safety & Health Administration (OSHA) methodology, must be undertaken."*

Richard Kuprewicz:

Mr. Kuprewicz has over 40 years experience in the energy industry offering special focus on appropriate pipeline design and operation in areas of unique population density or of an environmentally sensitive nature. He is currently a member of the U.S. Department of Transportation Hazardous Liquids Pipeline Safety Standards Committee (THLPSSC) representing the public, a position appointed by the Secretary of the Department of Transportation. He has also served in the past on the Washington State Citizens Committee on Pipeline Safety a committee appointed by the Governor of the state that advises federal, state, and local governments on all matters related to pipeline safety, including routing, construction, operation and maintenance. He is a chemical engineer, experienced in production, pipeline, and refinery design, construction, operation, maintenance, risk analysis, management, acquisition, emergency response, and safety management processes, including hazard analysis. He has also authored many papers on pipeline safety, both nationally and internationally, and has proved various inputs throughout the development of federal pipeline safety regulation including liquid and gas pipeline safety rulemaking.

Paul M. Blanch:

45 Years Nuclear Power Experience, Navy Submarine Reactor operator and instructor, BS Engineering 1972, Registered Professional Engineer, Westinghouse Engineer of the Year, participated in design of Millstone and Connecticut nuclear plants, Three Mile Island expert witness, Davis Besse expert witness, Testified before US Senate, Vermont and Massachusetts legislatures.

Employed by/consultant to Millstone, Connecticut Yankee, Maine Yankee, Indian Point (Consolidated Edison and Entergy), Electric Power Research Institute (EPRI), Nuclear Entergy Institute (NEI), state agencies, and numerous law firms. Expert Witness for Indian Point License Renewal, Vermont Yankee License Renewal, Pilgrim License

Renewal, Seabrook License Renewal. Identified numerous shortcomings in the NRC's License Renewal programs/reviews including: Piping degradation, unqualified submerged vital cables, failure to require aging management programs for numerous passive components. Identified and petitioned the NRC to take action related to gas transmission lines at Indian Point.

References:

FOIA Document 1: (2015-0189):
https://www.dropbox.com/s/sheyzp8gcfazm1w/FOIAdocument1.pdf?dl=0

FOIA Document 2: 4/27/15 email:
https://www.dropbox.com/s/p8pjxrwvh61m5cm/FOIA_Doc2_NRC.pdf?dl=0

Transcript of presentation by Paul Blanch and Rick Kuprewicz to NRC Petition Review Board on July 15, 2015: https://sape2016.files.wordpress.com/2014/05/transcript-7-15-2015-ml15216a047.pdf

Final Signed Questions from Paul Blanch to NRC Petition Review Board:
https://sape2016.files.wordpress.com/2014/05/20150727-final-signed-prb-qiestions.pdf

Reviewed by Paul Blanch
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