FOIA/PA NO: 2015-0189

GROUP: A

RECORDS BEING RELEASED IN-PART

The following types of information are being withheld:

Ex. 1: ☐ Records properly classified pursuant to Executive Order 13526
Ex. 2: ☐ Records regarding personnel rules and/or human capital administration
Ex. 3: ☐ Information about the design, manufacture, or utilization of nuclear weapons
☐ Information about the protection or security of reactors and nuclear materials
☐ Contractor proposals not incorporated into a final contract with the NRC
☐ Other_____
Ex. 4: ☐ Proprietary information provided by a submitter to the NRC
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Ex. 5: ☐ Draft documents or other pre-decisional deliberative documents (D.P. Privilege)
☐ Records prepared by counsel in anticipation of litigation (A.W.P. Privilege)
☐ Privileged communications between counsel and a client (A.C. Privilege)
☐ Other_____
Ex. 6: ☐ Agency employee PII, including SSN, contact information, birthdates, etc.
☐ Third party PII, including names, phone numbers, or other personal information
Ex. 7(A): ☐ Copies of ongoing investigation case files, exhibits, notes, ROI's, etc.
☐ Records that reference or are related to a separate ongoing investigation(s)
Ex. 7(C): ☐ Special Agent or other law enforcement PII
☐ PII of third parties referenced in records compiled for law enforcement purposes
Ex. 7(D): ☐ Witnesses' and Allegers' PII in law enforcement records
☐ Confidential Informant or law enforcement information provided by other entity
Ex. 7(E): ☐ Law Enforcement Technique/Procedure used for criminal investigations
☐ Technique or procedure used for security or prevention of criminal activity
Ex. 7(F): ☒ Information that could aid a terrorist or compromise security

No Date
No Author
No Approval
No Procedure
One Reference
Flammable gas ingress not considered
No vapor cloud discussed
NRC modified RG 1.91 equation

Entergy's 10 CFR 50.59 Safety Evaluation

Algonquin Incremental Market (AIM)

Project Indian Point Energy Center (IPEC)

EXPLOSION

The ALOHA model was used for explosion scenario 1 of the original blast analysis report (ADAMS accession number ML14330A276) and used as a feeder to the Region I Inspecting Report (ADAMS accession number ML14314A052). The analysis conservatively assumed a pipe rupture (b)(7)(F) at a maximum operating pressure of 850 psig. The pipe rupture was assumed to occur at the far end of the pipeline where the pipe rises above ground level and includes the volume of gas within the 3 mile length of pipeline between the nearest isolation valves. The ALOHA calculation for this scenario resulted in a maximum sustained methane release rate of (b)(7)(F) and estimated the total release amount of (b)(7)(F) (b)(7)(F) The calculation assumed that the entire pipeline gas volume between the isolation valves is released. The calculation conservatively assumed the maximum release (b)(7)(F) and determined the TNT equivalent amount with a yield factor of (b)(7)(F) In the equation below, the minimum safe distance (d) to 1 psi overpressure is calculated to be (b)(7)(F) by using Regulatory Guide 1.91 methodology as follows:

WTNT= (Mf * DHC * Y)/4500
Where
WTNT= TNT equivalent Mass, kg
Mf = Mass of vapor, kg
DHC = Heat of combustion, kj/kg (50030)
Y = (b)(7)(F)

Undefined term in RG 1.91

$d = 45 * (w)^{1/3}$ where
d= minimum safe distance (ft) to 1 psi overpressure
w= TNT equivalent mass in pounds

The calculated minimum safe distance of (b)(7)(F) is smaller than the actual distance of (b)(7)(F) between the Security Owner Control Area (SOCA) barrier and the pipeline at the far end above ground. Furthermore, the pipeline at the far end above ground is located (b)(7)(F) from the nearest safety-related structure, system, or component (SSC) within the SOCA. This is because the nearest safety-related SSC inside the SOCA is about (b)(7)(F) from the edge of the SOCA barrier. Therefore, a 1 psi overpressure is not expected to occur at any safety-related SSC inside the SOCA from a potential rupture and explosion at the far end of the pipeline located above ground. However, since the calculated minimum safe distance of (b)(7)(F) is larger than the distance to SSC important to safety (ITS) outside the SOCA barrier, they may experience greater than 1 psi overpressure. Therefore, SSC ITS would be impacted. Nevertheless, their impacts are bounded by the severe/beyond design basis accidents considered as part of low

probability events such as natural phenomena that include seismic, hurricane and tornado events including Loss of Offsite Power and Station Black Out (SBO) considerations with design of redundant systems, engineering safeguards and mitigation measures in the plant UFSARs. A detailed discussion of the impact of SSC ITS, which was reviewed by NRC inspectors as part of their inspection report, is included in the licensee's submittal of their site hazards analysis submitted pursuant to 10 CFR 50.59 on August 21, 2014 (ADAMS accession number ML14253A339).

Due to concerns whether remote pipeline operators would be able to recognize that a pipeline ruptured occurred and then take timely actions to close the nearest pipeline isolation valves within 3 minutes, additional ALOHA modeling was performed to determine the sensitivity of valve closure times. The original scenario 1 modeling assumed (b)(7)(F) (b)(7)(F) as a conservative/bounding condition in determining the minimum safe distance to 1 psi overpressure and the potential heat flux due to a jet fire at the SSC/SOCA. In the bounding infinite source scenario, the analysis assumes that the pipeline isolation valves do not close and gas continues to flow, as if there was an infinite source, for one hour. Since the maximum calculated release of natural gas determined by the ALOHA model for the infinite source scenario is only slightly varied, the calculated results are marginally changed. The distance to 1 psi overpressure changed from (b)(7)(F) which remains lower than the distance to the most limiting SSC inside the SOCA barrier of (b)(7)(F)

JET FIRE

Similar to the assumptions used for the ALOHA pipe explosion modeling, the ALOHA model for Jet Fire original Scenario 1 conservatively assumed a pipe (b)(7)(F) (b)(7)(F) at a maximum operating pressure of 850 psig, the pipe rupture was assumed to occur at the far end of the pipeline where the pipe rises above ground level, and the modeling includes the volume of gas within the 3 mile length of pipeline between the nearest isolation valves. Methane is assumed to be released from the ruptured pipe as a flammable gas. The ALOHA model resulted in a maximum burn rate of (b)(7)(F) and an estimated total amount burned of (b)(7)(F) The calculation assumed that the entire pipeline gas volume between the isolation valves is released. The distances to thermal radiation levels of (b)(7)(F) 5.0 kW/m^2, and 2.0 kW/m^2 calculated by ALOHA are (b)(7)(F) (b)(7)(F) respectively. In the infinite source scenario, this analysis is remodeled with the same conditions by imposing that the unbroken end of pipe (i.e.,upstream) is assumed to be connected to an infinite source (with no valves closed) for an hour. The maximum calculated burn rate of natural gas determined by the ALOHA model is not changed. The calculated heat fluxes, which are marginally changed at the SOCA distance of 1580 ft from the enhanced pipeline from (b)(7)(F) due to the sustained burning for an extended period of time, remain much lower than the potential threshold heat flux rate of (b)(7)(F) that would potentially damage any digital equipment.

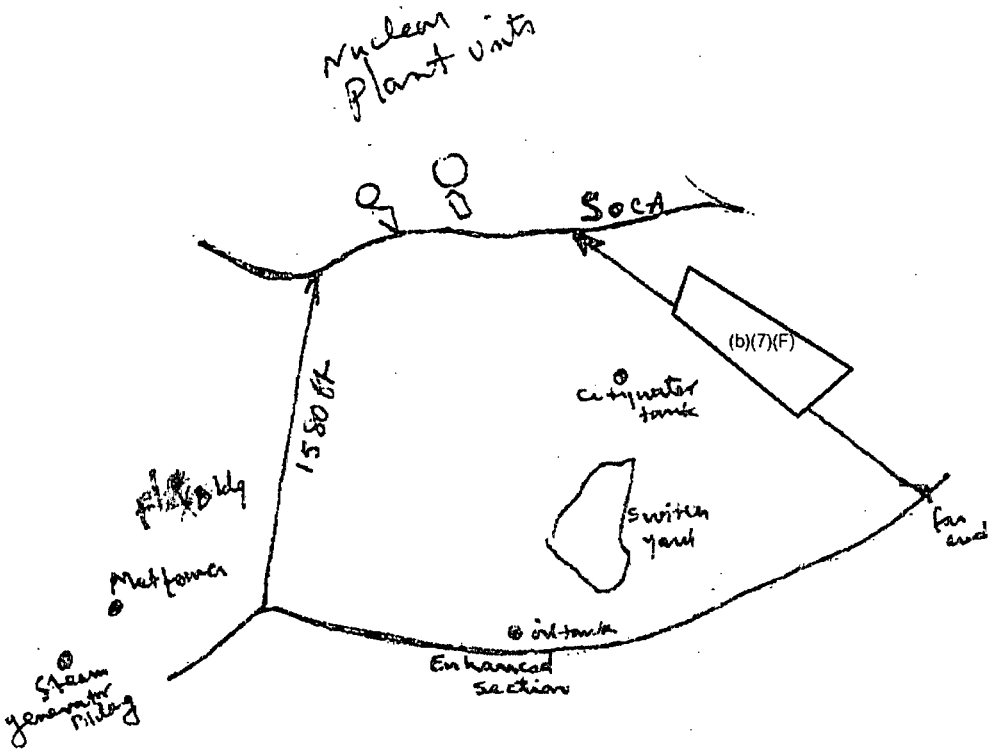
CONCLUSION

Due to concerns that Entergy's assumption that remote control room operators would be able to recognize a pipeline rupture and take actions to close the nearest pipeline isolation valves within 3 minutes may not be realistic, the NRC staff performed a bounding sensitivity analysis. The analysis assumed that following a complete pipeline rupture, the pipeline provides an infinite source of natural gas and the pipeline isolation valves do not close for an hour. Based on this analysis, the NRC staff has determined that there are only minimal changes to the peak overpressure calculation and the heat flux calculation. Therefore, the staff concludes that pipeline isolation valve closure times are inconsequential and the previous staff conclusions that the proposed 42-inch diameter natural gas pipeline at the Indian Point site does not represent an undue risk and that the plant could safely shut down following a postulated pipeline rupture remain valid.

It should be noted that if the valves are not closed for an extended period time, potential adverse impacts consisting of direct property damage, some injuries and possible fatalities may result due to the fire in the close proximity of the pipeline, which is outside the preview of the NRC's regulatory frame work, consideration and jurisdiction from safe operation/shutdown of the nearby IPEC nuclear plant's perspective.

b(7)(F)

SENSITIVE - SECURITY RELATED INFORMATION



SOCA: Security owner controlled Area

distance to SOCA from enhanced Section of pipeline = 1580ft

distance to SSC from enhanced Section of pipeline =

distance to SOCA from far end (surface) Section of pipeline =

distance to SSC from farend (surface) Section of pipeline

(b)(7)(F)

b(7)(F)

SUMMARY OF RESULTS

SOCA : Security owner control Ar
SSC : Structure, system and compo

Scenario	Minimum safe Distance to 1 psi (Distance to SOCA) ((Distance to SSC))	Heat flux kw/m² at SOCA Distance of 1580 ft
pipe burst with unbroken end closed (valve closed) RG 1.91 (Direct explosion)	(b)(7)(F)	—
pipe burst with unbroken end connected to infinite source (valve open)		—
vapor plume explosion with no congestion	No explosion	—
pipe burst with unbroken end closed	—	(b)(7)(F)
pipe burst with unbroken end of pipe connected to infinite source	—	

SITE DATA:
Location: KINGSTON, NEW YORK
Building Air Exchanges Per Hour: 0.50 (enclosed office)
Time: June 21, 2013 1200 hours EDT (user specified)

CHEMICAL DATA:
Chemical Name: METHANE Molecular Weight: 16.04 g/mol
TEEL-1: 3000 ppm TEEL-2: 5000 ppm TEEL-3: 25000 ppm
LEL: 44000 ppm UEL: 165000 ppm
Ambient Boiling Point: -258.8° F
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: (b)(7)(F) from E at 3 meters
Ground Roughness: open country Cloud Cover: (b)(7)(F)
Air Temperature: (b)(7)(F)
Stability Class: (b)(7)(F)
No Inversion Height Relative Humidity: (b)(7)(F)

SOURCE STRENGTH:
Flammable gas escaping from pipe (not burning)
Pipe Diameter: 42 inches Pipe Length: (b)(7)(F)
Unbroken end of the pipe is closed off
Pipe Roughness: smooth Hole Area: (b)(7)(F)
Pipe Press: 850 psia Pipe Temperature: (b)(7)(F)
Release Duration: (b)(7)(F)
Max Average Sustained Release Rate: (b)(7)(F)
(averaged over a minute or more)
Total Amount Released: (b)(7)(F)

THREAT ZONE:
Threat Modeled: Overpressure (blast force) from vapor cloud explosion
Type of Ignition: ignited by spark or flame
Level of Congestion: uncongested
Model Run: Gaussian
Red : LOC was never exceeded --- (8.0 psi = destruction of buildings)
Orange: LOC was never exceeded --- (3.5 psi = serious injury likely)
Yellow: LOC was never exceeded --- (1.0 psi = shatters glass)

THREAT AT POINT:
Overpressure Estimate at the point:
Downwind: (b)(7)(F) Off Centerline: 0. feet
Overpressure: (b)(7)(F)

SITE DATA:
Location: KINGSTON, NEW YORK
Building Air Exchanges Per Hour: 0.50 (enclosed office)
Time: June 21, 2013 1200 hours EDT (user specified)

CHEMICAL DATA:
Chemical Name: METHANE Molecular Weight: 16.04 g/mol
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ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: (b)(7)(F) from E at 3 meters
Ground Roughness: open country Cloud Cover: (b)(7)(F)
Air Temperature: (b)(7)(F)
Stability Class: (b)(7)(F)
No Inversion Height Relative Humidity: (b)(7)(F)

SOURCE STRENGTH:
Flammable gas escaping from pipe (not burning)
Pipe Diameter: 42 inches Pipe Length: (b)(7)(F)
Unbroken end of the pipe is connected to an infinite source
Pipe Roughness: smooth Hole Area: (b)(7)(F)
Pipe Press: 850 psia Pipe Temperature: (b)(7)(F)
Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: (b)(7)(F)
(averaged over a minute or more)
Total Amount Released: (b)(7)(F)

THREAT ZONE:
Threat Modeled: Overpressure (blast force) from vapor cloud explosion
Type of Ignition: ignited by spark or flame
Level of Congestion: uncongested
Model Run: Gaussian
Red : LOC was never exceeded --- (8.0 psi = destruction of buildings)
Orange: LOC was never exceeded --- (3.5 psi = serious injury likely)
Yellow: LOC was never exceeded --- (1.0 psi = shatters glass)

THREAT AT POINT:
Overpressure Estimate at the point:
Downwind: (b)(7)(F) Off Centerline: 0. feet
Overpressure: (b)(7)(F)