U.S. NUCLEAR REGULATORY COMMISSION

RESPONSE TO FREEDOM OF INFORMATION ACT (FOIA) REQUEST

FOIA	RESPONSE NUMBER
2016-0532	1

RESPONSE TYPE	☑ INTERIM	☐ FINAL

REQUESTER:	DATE:
Paul Blanch	07/29/2016

DESCRIPTION OF REQUESTED RECORDS:

The analysis performed for the buried portion of the natural gas lines at Indian Point, to which Glenn Dentel referred during the June 8, 2016 public meeting held in Tarrytown, NY, and all internal NRC communication related to this analysis.

PART I. -- INFORMATION RELEASED

☐ Agency records subject to the request are already available in public ADAMS or on microfiche in the NRC Public Document Room.

☐ Agency records subject to the request are enclosed.

☐ Records subject to the request that contain information originated by or of interest to another Federal agency have been referred to that agency (see comments section) for a disclosure determination and direct response to you.

☑ We are continuing to process your request.

☑ See Comments.

PART I.A -- FEES

AMOUNT*

$ [   ]

*See Comments for details

☐ You will be billed by NRC for the amount listed.

☐ You will receive a refund for the amount listed.

☐ None. Minimum fee threshold not met.

☐ Fees waived.

PART I.B -- INFORMATION NOT LOCATED OR WITHHELD FROM DISCLOSURE

☐ We did not locate any agency records responsive to your request. *Note*: Agencies may treat three discrete categories of law enforcement and national security records as not subject to the FOIA ("exclusions"). 5 U.S.C. 552(c). This is a standard notification given to all requesters; it should not be taken to mean that any excluded records do, or do not, exist.

☑ We have withheld certain information pursuant to the FOIA exemptions described, and for the reasons stated, in Part II.

☑ Because this is an interim response to your request, you may not appeal at this time. We will notify you of your right to appeal any of the responses we have issued in response to your request when we issue our final determination.

☐ You may appeal this final determination within 30 calendar days of the date of this response by sending a letter or email to the FOIA Officer, at U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, or FOIA.Resource@nrc.gov. Please be sure to include on your letter or email that it is a "FOIA Appeal."

PART I.C COMMENTS (Use attached Comments continuation page if required)

The incoming request will be made available in ADAMS as ML16169A122. Records with an ML accession number are publicly available in the NRC's Public Electronic Reading Room at http://www.nrc.gov/reading-rm.html. If you need assistance in obtaining these records, please contact the NRC's Public Document Room (PDR) at 301-415-4737, or 1-800-397-4209, or by email to PDR.Resource@nrc.gov.

This interim response addresses the analysis; we will address the internal NRC communications related to this analysis in our final response to you. Any fees owed will be billed as part of that final response.

SIGNATURE - FREEDOM OF INFORMATION ACT OFFICER

Stephanie A. Blaney (Acting)

NRC FORM 464 Part II
(12-2015)

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PART II.A -- APPLICABLE EXEMPTIONS

Records subject to the request are being withheld in their entirety or in part under the FOIA exemption(s) as indicated below (5 U.S.C. 552(b)).

☐ Exemption 1: The withheld information is properly classified pursuant to an Executive Order protecting national security information.

☐ Exemption 2: The withheld information relates solely to the internal personnel rules and practices of NRC.

☐ Exemption 3: The withheld information is specifically exempted from public disclosure by the statute indicated.

  ☐ Sections 141-145 of the Atomic Energy Act, which prohibits the disclosure of Restricted Data or Formerly Restricted Data (42 U.S.C. 2161-2165).

  ☐ Section 147 of the Atomic Energy Act, which prohibits the disclosure of Unclassified Safeguards Information (42 U.S.C. 2167).

  ☐ 41 U.S.C. 4702(b), which prohibits the disclosure of contractor proposals, except when incorporated into the contract between the agency and the submitter of the proposal.

☐ Exemption 4: The withheld information is a trade secret or confidential commercial or financial information that is being withheld for the reason(s) indicated.

  ☐ The information is considered to be proprietary because it concerns a licensee's or applicant's physical protection or material control and accounting program for special nuclear material pursuant to 10 CFR 2.390(d)(1).

  ☐ The information is considered to be another type or confidential business (proprietary) information.

  ☐ The information was submitted by a foreign source and received in confidence pursuant to 10 CFR 2.390(d)(2).

☐ Exemption 5: The withheld information consists of interagency or intraagency records that are normally privileged in civil litigation.

  ☐ Deliberative process privilege.

  ☐ Attorney work product privilege.

  ☐ Attorney-client privilege.

☐ Exemption 6: The withheld information from a personnel, medical, or similar file, is exempted from public disclosure because its disclosure would result in a clearly unwarranted invasion of personal privacy.

☑ Exemption 7: The withheld information consists of records compiled for law enforcement purposes and is being withheld for the reason(s) indicated.

  ☐ (A) Disclosure could reasonably be expected to interfere with an open enforcement proceeding.

  ☐ (C) Disclosure could reasonably be expected to constitute an unwarranted invasion of personal privacy.

  ☐ (D) The information consists of names and other information the disclosure of which could reasonably be expected to reveal identities of confidential sources.

  ☐ (E) Disclosure would reveal techniques and procedures for law enforcement investigations or prosecutions, or guidelines that could reasonably be expected to risk circumvention of the law.

  ☑ (F) Disclosure could reasonably be expected to endanger the life or physical safety of an individual.

  ☐ Other

PART II.B -- DENYING OFFICIALS

In accordance with 10 CFR 9.25(g) and 9.25(h) of the U.S. Nuclear Regulatory Commission regulations, the official(s) listed below have made the determination to withhold certain information responsive to your request.

DENYING OFFICIAL	TITLE/OFFICE	RECORDS DENIED	APPELLATE OFFICIAL	
			EDO	SECY
Stephanie A. Blaney	Acting FOIA Officer	distances/calculations	☑	☐
			☐	☐
			☐	☐

Appeals must be made in writing within 30 calendar days of the date of this response by sending a letter or email to the FOIA Officer, at U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, or FOIA.Resource@nrc.gov. Please be sure to include on your letter or email that it is a "FOIA Appeal."

Confirmatory Analysis of Allegation Concern Evaluation
Of
Existing Pipelines Rupture Impact
At Indian Point Energy Center (IPEC)

INTRODUCTION

The licensee, Entergy, provided a response to NRC Request for Information (RI-2015-A-0074). As a part of the staff's review and evaluation of the response and associated attachment and enclosure, the NRC staff performed independent confirmatory calculations to ascertain the reasonability of approach, assumptions and methodology that Entergy used in their evaluation of consequences for the consideration of resolving the concerns raised in this RI. The staff's confirmatory calculations include the determination of the distance to 1 psi overpressure due to potential release of natural gas and explosion at the source of release, due to vapor cloud explosion, and distance to potential heat flux of 12.6 kw/m² due to release of gas as a jet fire.

SUMMARY OF EVALUATION

Entergy evaluated the potential hazards to safety-related structures, systems, and components (SSCs) and also SSCs important to safety (SSC ITS) using the BREEZE computer model with reasonable approach and assumptions. The staff performed independent confirmatory calculations with conservative assumptions and rationale using RG 1.91 methodology for source explosion and also used the ALOHA computer model for vapor plume explosion. The staff used the ALOHA model to perform the confirmatory calculations to determine:

1) Distance to 1 psi overpressure due to release and potential at source (at pipe rupture),
2) Distance to 1 psi overpressure due to delayed vapor cloud explosion,
3) Distance to heat flux of 12.6 kw/m² from natural gas release as jet fire.

The staff's independent confirmatory calculation results are based on highly conservative assumption and rationale by modeling the gas release rate for the potential explosion at the source. The rupture of the pipeline is assumed to be located at the closest SSC. Since the pipeline is buried underground, an average release rate, as calculated using ALOHA to determine total amount of gas released over the time period to empty the pipeline, results in a calculated distance to 1 psi overpressure of (b)(7)(F) In general, the review criterion of 1 psi overpressure provides a margin to failure of safety related SSCs. The safety-related SSCs are designed to withstand overpressure of 3 psi or more without loss of their safety functions. In order to estimate the distance to potential 3 psi overpressure, using the same average release rate, the distance to 3 psi overpressure is calculated to be (b)(7)(F)

The staff's analysis of the distance to overpressure of 1 psi due to a delayed vapor cloud explosion assumed congestion in the area of release. The results extend the 1 psi overpressure to impact some safety-related SSCs and SSCs important to safety. However, the overpressure did not exceed 3 psi at any distance (to any SSCs). A sensitivity analysis, which,

more realistically, assumed no congestion in the area, resulted in no 1 psi overpressure at any distance due to vapor cloud explosion.

Using the ALOHA model, the staff calculated that the thermal radiation level of 12.6 kW/m² would extend to a distance of (b)(7)(F)

Based on the results of the confirmatory analysis, the staff concludes that the safety related SSCs, as well as SSCs important to safety, would potentially be exposed to 1 psi overpressure, and a few SSCs important to safety may be exposed to heat flux of 12.6 kw/m², which is comparable to the licensee's conclusions.

TECHNICAL EVALUATION

The staff performed an independent confirmatory analysis based on the rupture of the existing 30-inch natural gas pipeline, which consists of about 6 miles of pipeline between isolation valves. The analysis assumed that a rupture of the natural gas pipeline may result in an unconfined explosion or jet flame at the source or in a delayed vapor cloud explosion downwind. For the assessment of an unconfined explosion, the staff used RG 1.91 methodology to calculate the minimum safe distance due to the source explosion. For the jet flame and delayed vapor cloud explosion, the staff used the ALOHA chemical release modeling computer code to determine the hazard impact distances to compare with the actual distances to SSCs related to safety or SSC ITS, in order to assess the impact potential. The ALOHA code is used to calculate the amount of methane released for the scenario considered, using conservative meteorological conditions consisting of an assumed wind speed of 1 m/s in the direction of the SSC, F stability, 25 deg. C ambient temperature, cloud cover of 0.5 and relative humidity of 50%. Open country ground roughness conditions modeling assumptions were chosen as being appropriate for the location.

Explosion

The ALOHA code model for an explosion scenario conservatively estimated the gas release from a pipe rupture at the closest location to an SSC by considering the length of pipeline to be 6 miles, with the rupture creating a hole equivalent to the diameter of the pipe (30 inches diameter) at a maximum operating pressure of 674 psia. The calculation results give an estimated total methane release amount over time (to calculate the average release rate) based on the closure of the isolation valves following the rupture, assuming that the entire volume of gas in the pipeline section between the closed valves is being released.

Assuming the average release rate, and determining the TNT equivalent amount with a yield factor of 0.05 (WTNT) (equation given below), the minimum safe distance (d) to 1 psi overpressure is calculated by using RG 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 = Yield Factor (0.05)
and
$d = 45 * (w)^{1/3}$
where
d= minimum safe distance (ft.) to 1 psi overpressure
w= TNT equivalent mass in pounds

As the pipeline is buried underground, an average rate of gas release based on total amount of gas released over the time period to empty the pipeline, as calculated using ALOHA is assumed. Using this average gas release rate, the distance to 1 psi overpressure was calculated to be (b)(7)(F) Generally the safety-related SSCs are designed to withstand overpressure of 3 psi or more. In order to estimate the distance to potential 3 psi overpressure, using the same average release rate, the distance to 3 psi overpressure is calculated to be (b)(7)(F)

The staff's analysis of the distance to not exceed an overpressure of 1 psi due to delayed vapor cloud explosion assumed congestion in the area of release, which would represent dense forest or buildings which enhance gas accumulation due to potential confinement. The results extend the 1 psi overpressure distance to impact some safety-related SSCs and SSCs important to safety. However, the overpressure did not exceed 3 psi at any distance (for any SSCs). These results are comparable to that of the licensee's analysis results. A sensitivity analysis, which more realistically assumed no congestion in the area, resulted in no 1 psi overpressure at any distance due to vapor cloud explosion.

Jet Fire

The ALOHA code for jet fire scenarios was run conservatively for the pipe rupture at a location closest to an SSC by considering the length of the pipeline between isolation valves to be 6 miles, with rupture creating a hole equivalent to the diameter of the pipe (30 inches diameter) at a maximum operating pressure of 674 psia. Methane is assumed to be released from the ruptured pipe as a flammable gas and is assumed to be burning. The ALOHA calculation resulted in a maximum burn rate as well as an estimated total amount burned over time, based on closure of the isolation valves following the rupture. Based on the assumption that the entire volume of gas in the pipeline section between the closed valves is being released, the distances to thermal radiation levels of 31.5 kW/m^2, 12.6 kW/m^2, and 5.0 kW/m^2 calculated by ALOHA are (b)(7)(F) respectively. A few safety related SSCs and SSCs important to safety may be impacted. These results are consistent with the licensee's analysis results.

CONCLUSION

Based on the results of the staff's independent confirmatory analysis, the staff concludes that the safety-related SSCs as well as SSCs important to safety would potentially be exposed to 1 psi overpressure, and a few SSCs important to safety may be exposed to heat flux of 12.6 kw/m^2, which is comparable to the licensee's conclusion. Although the licensee's pipeline hazard impact evaluation used different models, assumptions, and methodology than the staff used in its independent confirmatory analyses, the staff's results and conclusions are consistent with the licensee's results and conclusions. Therefore, the staff considers the licensee's hazard impact evaluation to be reasonable and acceptable.