CHAIRMAN Resource

From: Paul <pmblanch@comcast.net>
Sent: Tuesday, March 03, 2020 10:22 AM
To: David Lochbaum
Cc: Raspa, Rossana; CHAIRMAN Resource; Doane, Margaret; Haagensen, Brian; Holian, Brian; Jessica Roff; William Freebairn; Amy Rosmarin; Susan Babdolden; Courtney M. Williams; Manna Jo Greene; Richard Kuprewicz; Pat Keegan; Ellen Weininger; Charles Langley; Nina Babiarz; Skeen, David; Tina Bongar; Amy Rosmarin
Subject: [External_Sender] Re: Official copy of letter to OIG

Fill in the blank "we really don't care about public safety"

Sent from my iPhone

On Mar 3, 2020, at 8:27 AM, David Lochbaum <davelochbaum@gmail.com> wrote:

Hello Paul:

The situation with the natural gas pipelines near Indian Point seems to show the bathtub curve in action.

The original pipeline passing near the plant approached the end of its service life, or the wear-out phase of the bathtub curve where the chance of failure increases.

It was replaced by the new AIM pipelines in the break-in phase of the bathtub curve where the chance of failure is initially high and then decreases.

Lo and behold, the new pipeline experiences a fault in its break-in phase requiring its use to be halted.

During the downtime of the new broken pipeline, the plan is to return to using the old, worn-out one. So, the hazard to the public is being managed by merely swapping between the high-risk ends of the bathtub curve?

Suppose the pipeline ruptured and caused a nuclear nightmare at Indian Point. How do you reckon the NRC would finish the answer to a question certain to be asked during the ensuing Congressional inquiry: "well Senator, the reason we tolerated this well-known and elevated risk is _____."

I'm not sure I could come up with a defensible full-in-the-blank response that would appease the Congress, or any survivors.

Thanks,
Dave Lochbaum
Safely living more than 600 miles from Indian Point

Sent from my iPhone

On Mar 2, 2020, at 3:21 PM, Paul <pmblanch@comcast.net> wrote:

Rossana

Please assure this gets the proper distribution

Thank you

Paul Blanch
135 Hyde Rd.
West Hartford, CT 06117
pmblanch@comcast.net
860-236-0326
Cell 860-922-3119
<20200302 LTR to OIG -.pdf>

Paul M. Blanch PE

Energy Consultant

Tuesday, March 3, 2020

Ms. Rossana Raspa

NRC Office of the Inspector General

U.S. Nuclear Regulatory Commission (NRC)

Washington, DC 20555-0001

Subject: Commission and EDO continue "Backward Engineering"

Dear Ms. Raspa

Your recent OIG CASE NO. 16-024 has identified numerous deficiencies in the manner the NRC staff responds to safety issues and the handling of 10 CFR 2.206 petitions.

One of many disturbing issues in the report was discussion of what "appeared to be backwards engineering to get a desired result." To the lay person this means that NRC management establishes the desired end result and subtlety "encourages" the NRC staff to develop a result that justifies the management's desired outcome.

An example in the OIG report is the manipulation of both probability and consequences of potential events such that the risks would be acceptable to the general population and the project could be approved. I firmly believe the "backwards engineering" described in the OIG report the result of management encouragement to get a desired result irrespective of the true risk and the truth.

One would logically believe that after this scathing report of potentially illegal and unethical practices, the NRC would go to the confessional and promise never to do this again. WRONG!

On February 24, 2020 the EDO, Ms. Margaret Doane wrote a letter to all Commissioners that directed Mr. David Skeen to refute the OIG report by stating the conclusion she desired by stating:

> *"This conclusion is based on the following summary findings that are explained in more detail in the attached enclosure:*
>
> - *There is no significant degradation to defense-in-depth at either unit.*
> - *There is no significant loss of safety margin at either unit.*
> - *There is no high-risk impact at either unit from internal or external events, as all risk metrics are under the prescribed thresholds."*

Not only is Ms. Doane ignoring the risk of a catastrophic accident to the reactor and the spent fuel pool, she is directing Mr. Skeen to "backward engineer" and justify an incorrect outcome by using "Handbook of Chemical Hazard Analysis Procedures, Appendix F" a document not approved by the NRC, not mentioned in Regulatory Guide 1.91, and more than 30 years outdated. Further, Ms. Doane quotes probabilities totally inconsistent with this handbook. I just looked at my calendar and it is not "Groundhog Day."

Ms. Doane also misuses this 31-year-old handbook to say everything is fine when PHMSA data indicates a significant increase in pipeline failure probabilities over the past 10 years. My calculations, bases on the same reference show a probability in the range of less than 10^{-3} per mile-year. This is unacceptable and requires immediate action.

On a somewhat related issue, I was informed there is a defect in the AIM pipeline that requires shutdown and the reuse of an idle 26" pipeline adjacent to the control and switchgear rooms. Failure of either of these will cause a total loss of all AC and DC power including the inability to use the FLEX systems. We all know the consequences of this occurrence of this event.

When I asked the OPA to confirm the existence of this alleged AIM pipe defect, I received the following email from Scott Burnell, the top person in the OPA office with no understanding of potential nuclear accidents:

> *Hello Paul;*
>
> *Questions regarding the current status of the pipeline located in the vicinity of Indian Point should be directed to the pipeline operator and/or the Federal Energy Regulatory Commission.*
>
> *Thank you.*
>
> *Scott Burnell*
>
> *Public Affairs Officer*
>
> *Nuclear Regulatory Commission*

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> *I understand the NRC has placed a "gag order" and won't allow anyone to speak.*
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>
> *They don't deal with nuclear safety concerns of a pipeline on the Indian Point property.*
>
> *If you want to stick your head in the sand, I have other avenues.*
>
> *Thank you for protecting us.*
>
> *Paul Blanch*

I am not please at the way nuclear safety is being addressed with such arrogance by the Commission, the EDO and the Office of Public Affairs.

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<clip_image001.jpg>

Paul M. Blanch

135 Hyde Rd.

West Hartford, CT 06117

Cc: The Commissioners

EDO

David Skeen

Congresswoman Lowey

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<clip_image007.jpg>
<clip_image009.jpg>
<clip_image011.jpg>
<clip_image013.jpg>
<clip_image015.jpg>

Failure data from Reference 1

<clip_image017.jpg>

Direct quote from OIG report

Copy enclosed

CHAIRMAN Resource

From: Paul <pmblanch@comcast.net>
Sent: Monday, March 02, 2020 7:04 PM
To: Raspa, Rossana; CHAIRMAN Resource; Doane, Margaret
Cc: Haagensen, Brian; Holian, Brian; David Lochbaum; Jessica Roff; William Freebairn; Amy Rosmarin; Susan Babdolden; Courtney M. Williams; Manna Jo Greene; Richard Kuprewicz; Pat Keegan; Ellen Weininger; Charles Langley; Nina Babiarz; Skeen, David; Tina Bongar; Amy Rosmarin
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U.S. Nuclear Regulatory Commission (NRC)

Washington, DC 20555-0001

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Subject: RE: Official copy of letter to OIG

Paul,

This will be provided to the OIG mangers, as appropriate.

Thank you.

Rossana Raspa
Senior Assistant for Investigative Operations
Office of the Inspector General
Nuclear Regulatory Commission
301-415-5954

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135 Hyde Rd.

West Hartford, CT 06117

Cc: The Commissioners

EDO

David Skeen

Congresswoman Lowey

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 26, 2020

MEMORANDUM TO: Chairman Svinicki
Commissioner Baran
Commissioner Caputo
Commissioner Wright

FROM: Margaret M. Doane /RA/
Executive Director for Operations

SUBJECT: CONCERNS PERTAINING TO GAS TRANSMISSION LINES AT THE INDIAN POINT NUCLEAR POWER PLANT: DETERMINATION NOT TO TAKE IMMEDIATE ACTION

This memorandum responds to the Chairman's February 24, 2020, direction to the Executive Director for Operations (EDO) to address matters raised in the Nuclear Regulatory Commission (NRC) Office of the Inspector General (OIG) report, Event Inquiry, "Concerns Pertaining to Gas Transmission Lines at the Indian Point Nuclear Power Plant" (Case No. 16-024). In that memorandum, the Chairman directed the prompt examination to determine if immediate regulatory action is needed based on information in the OIG report and to promptly inform the Commission of the results of that examination and what actions, if any, the staff plans to take. For the following reasons, I have determined that there is no need for immediate regulatory action.

In response to the Chairman's direction, I tasked Dr. Mirela Gavrilas to examine the information in the OIG report (advance copy) and evaluate promptly whether immediate action is warranted. Dr. Gavrilas was not involved in the matter in question in the OIG report. Dr. Gavrilas received her Ph.D. in nuclear engineering from the Massachusetts Institute of Technology and has decades of experience in nuclear power plant safety.

The determination on whether immediate action is needed was performed in accordance with the agency procedure used to respond to nuclear power plant emergent issues. This procedure is found in section 4.2.1 of LIC-504 Rev. 4 "Integrated Risk-Informed Decision-Making Process for Emergent Issues" (Agencywide Documents Access and Management System Accession No.: ML14035A143). After reviewing the findings in the OIG report and the technical aspects of the 42-inch gas line that traverses the Indian Point Energy Center property (IPEC), Dr. Gavrilas has determined that there is no safety issue warranting immediate regulatory action at either Unit 2 or Unit 3.

This conclusion is based on the following summary findings that are explained in more detail in the attached enclosure:

- There is no significant degradation to defense-in-depth at either unit.
- There is no significant loss of safety margin at either unit.
- There is no high-risk impact at either unit from internal or external events, as all risk metrics are under the prescribed thresholds.

I have assigned David Skeen to lead a team of experts to respond to the remaining issues in the Chairman's memorandum, including the direction to provide the Commission with the results of a staff review within 45 days of the date of the memorandum. Mr. Skeen has been a member of the Senior Executive Service for more than a decade, and previously served as the director of the Japan Lessons-Learned Directorate. In that capacity, he had a key role in evaluating the safety of the U.S. nuclear power plant fleet in response to the events at the Fukushima Daiichi nuclear power plant caused by the Great Tōhoku earthquake and tsunami. Mr. Skeen was not involved in the matters addressed in the OIG report.

As is contemplated under the procedure, LIC-504, during the course of the team's review, the team will be mindful of the need to assess any new emergent issues.

Enclosure:
Evaluation of Emergent Information
Pertaining to Gas Transmission Lines
at the Indian Point Nuclear Power Plant

cc: SECY
OGC
OIG
OPA
D. Skeen

SUBJECT: CONCERNS PERTAINING TO GAS TRANSMISSION LINES AT THE INDIAN POINT NUCLEAR POWER PLANT: DETERMINATION NOT TO TAKE IMMEDIATE ACTION DATED FEBRUARY 26, 2020

ADAMS Accession Number: ML20058D088

OFFICE	OEDO	NRR	OGC	EDO
NAME	DJackson	MGavrilas	MZobler	MDoane
DATE	2/26/2020	2/26/2020	2/26/2020	2/26/2020

OFFICIAL RECORD COPY

Evaluation of Emergent Information Pertaining to
Gas Transmission Lines at the Indian Point Nuclear Power Plant

This evaluation is in response to the Chairman's tasking of February 24, 2020, to determine if immediate regulatory action is necessary. This prompt evaluation was performed in accordance with Section 4.21 of Office of Nuclear Reactor Regulation (NRR) office instruction LIC-504 Rev. 4 "Integrated Risk-Informed Decision-Making Process for Emergent Issues" (Agencywide Documents Access and Management System (ADAMS) Accession No.: ML14035A143) within 24 hours of the request.

Defense-in-Depth

LIC-504 states that additional regulatory action may be required to place or maintain the plant in a safe condition if defense-in-depth is significantly degraded (e.g., multiple barriers are moderately to significantly degraded, functional redundancy or diversity is significantly compromised, or vulnerability to single failures is significantly increased).

While a pipe rupture could impact certain structures on the site (e.g., gas turbine fuel oil tanks, the switchyard, emergency operations facility, FLEX equipment storage building), the pipeline is located approximately 1500 ft (rev 2) from the nearest safety related structure and barriers to radioactive release (i.e., the fuel cladding, reactor coolant system pressure boundary, and containment) would be maintained. Impacts to nearby structures could affect the plant response measures or the probability of additional initiators. However, there are still multiple diverse barriers and mitigation measures in place to minimize the challenges to the plant, preventing events from progressing to core damage, containing the radioactive source term, and ensuring emergency preparedness capabilities. Impacts on structures in the proximity of the explosion do not significantly degrade defense in depth.

Safety Margins

LIC-504 states that additional regulatory action may be required to place or maintain the plant in a safe condition if there is significant loss of safety margin (e.g., the calculated ASME code structural factors for a component are equal to or less than 1). Regulatory Guide 1.174 also indicates that safety margins are adequate if (1) the codes and standards or their alternatives approved for use by the NRC are met and (2) licensing basis safety analysis acceptance criteria are met.

A pipe rupture does not affect the plant's compliance with codes and standards. Compliance with the plant's technical specifications ensures adequate margin is maintained against design basis accidents.

Risk Assessment

Assumptions and Inputs:

Appendix F in the Federal Emergency Management Agency (FEMA) "Handbook of Chemical Hazard Analysis Procedures" 1989-626-095-10575, 1989 (ref 1) identifies accident rates for pipelines with a diameter greater than 20 inches at 5E-4 accidents per year per pipeline mile The FEMA Handbook also states that only 20% of events constitute large pipe ruptures

Based on this probability, the frequency of pipeline rupture is calculated assuming 3935 ft of pipeline are near the site This is equal to (3935 ft / (5280 ft / mi)) = 0 745 mi of pipeline (ref 2) The frequency of pipeline ruptures is therefore:

Frequency of pipeline rupture = Failure rate • rupture percentage of failures • pipeline length
Frequency of pipeline rupture
= ($5 \cdot 10^{-4}$ failures/year/pipeline mile)(0.2 complete ruptures/failure)(0.745 pipeline miles)
Frequency of pipeline rupture = $7.45 \cdot 10^{-5}$

The values of risk to be compared against the risk action thresholds provided in LIC-504 are calculated by making three conservative assumptions

- All complete ruptures lead directly to core damage
- The "as is" condition exists for 45 days (the duration of the Chairman's tasking memo)
- Large early release probability is 0 1 of the core damage probability

Under these assumptions

- The conditional core damage frequency (CCDF) can be calculated as the frequency of a pipeline ruptures times the probability that a pipeline rupture leads to core damage, or
$$(7.45 \cdot 10^{-5}) \cdot (1) = 7.45 \cdot 10^{-5}$$
- The conditional large early release frequency (CLERF) is calculated as 0 1 of the conditional core damage probability or
$$(7.45 \cdot 10^{-5}) \cdot (0.1) = 7.45 \cdot 10^{-6}$$
- The incremental conditional core damage probability (ICCDP) in the 45-day window can be calculated by multiplying the conditional core damage probability, the initiating event frequency, and the duration of the condition, or:
$$(1) \cdot (7.45 \cdot 10^{-5} \text{ events/year}) \cdot (45 \text{ days}/365 \text{ days/year}) = 9.18 \cdot 10^{-6}$$
- The incremental large early release probability (ICLERP) can be calculated as 0 1 of the incremental conditional core damage probability, or
$$(9.18 \cdot 10^{-6}) \cdot (0.1) = 9.18 \cdot 10^{-7}$$

These values can be compared against the risk action thresholds in LIC-504:

Parameter	LIC-504 Risk Action Threshold	Calculated Value
CCDF	1E-3	7.45E-5*
CLERF	1E-4	7.45E-6
ICCDP	5E-5	9.18E-6
ICLERP	5E-6	9.18E-7

Discussion:

The numbers provided above represent median estimates of the conditional core damage probability and large early release probability. However, they were calculated assuming various conservatisms, some of which are enumerated in the table below

Source of Conservatism	Effect
Large pipe ruptures lead to deflagrations or detonations. The FEMA Handbook notes that "in the event that there is a failure in a pipeline, most often the outcome is a small leak."	1 order of magnitude
Assumptions on pipeline failure rates were structured around studies performed in the 1960s. Since then, codes and standards have improved and probabilities of failure would be less than those assumed. The probability of failure for this specific section of pipeline is reduced since it was constructed to specifications that exceed current code requirements and was covered with concrete planks to prevent inadvertent damage from digging.	1 order of magnitude (or greater)
The analysis assumes that pipeline failures lead directly to core damage. In reality, a pipeline explosion would not directly cause damage to the reactor core, though it could damage safety-related equipment that may be needed to prevent core damage if another initiating event were to occur at the same time.	3 orders of magnitude (or greater)

Thus, the calculated values for CCDF of 7.45E-5, CLERF of 7.45E-6, ICCDP of 9.18E-6, and ICLERP of 9.18E-7 represent upper bound estimates, and there are several orders of magnitude of conservatism separating these values from more realistic estimates

Conclusions

No significant degradation of defense in depth nor loss of safety margins were identified. The evaluation above shows that the CCDF, CLERF, ICCDP, and ICLERP values associated with pipeline explosions at IPEC are smaller than the LIC-504 risk action thresholds. Therefore, no immediate regulatory action is required to maintain the plant in a safe condition

* Note that this is a conservatively bounding value for a station blackout initiated by a pipeline explosion because it does not account for various factors, such as the limited line of sight between the explosion and the diesel generator buildings

-3-

References

1. Safety Evaluation Performed by Entergy Under 10 CFR 50.59 (ADAMS Accession No. ML14253A339), August 21, 2014
2. FEMA "Handbook of Chemical Hazard Analysis Procedures," Appendix F, 1989-626-095-10575, 1989

Failure data from Reference 1

For example, a large facility may be coarsely modelled as having storage operations, loading/unloading operations, and processing operations. These can respectively be represented by storage tank failures and leaks, hose failures, and piping and process vessel failures. The rates suggested for each of these are:

Storage tank - double walled	10^{-6}/tank-year
Storage tank - single walled	10^{-4}/tank-year
Pressure vessels	10^{-4}/vessel-year
Piping	1.5×10^{-6}/ft-year
Loading hoses	10^{-4}/operation or 10^{-3}/hose-year

---

[1] Direct quote from OIG report

[2] Copy enclosed

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Paul Blanch
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Paul M. Blanch PE

Energy Consultant

Monday, March 2, 2020

Ms. Rossana Raspa

NRC Office of the Inspector General

U.S. Nuclear Regulatory Commission (NRC)

Washington, DC 20555-0001

Subject: Commission and EDO continue "Backward Engineering"

Dear Ms. Raspa

Your recent OIG CASE NO. 16-024 has identified numerous deficiencies in the manner the NRC staff responds to safety issues and the handling of 10 CFR 2.206 petitions.

One of many disturbing issues in the report was discussion of what "appeared to be backwards engineering to get a desired result."[1] To the lay person this means that NRC management establishes the desired end result and subtlety "encourages" the NRC staff to develop a result that justifies the management's desired outcome.

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One would logically believe that after this scathing report of potentially illegal and unethical practices, the NRC would go to the confessional and promise never to do this again. WRONG!

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"This conclusion is based on the following summary findings that are explained in more detail in the attached enclosure:

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Not only is Ms. Doane ignoring the risk of a catastrophic accident to the reactor and the spent fuel pool, she is directing Mr. Skeen to "backward engineer" and justify an incorrect outcome by using "Handbook of Chemical Hazard Analysis Procedures, Appendix F" a document not approved by the NRC, not mentioned in Regulatory Guide 1.91, and more than 30 years outdated. Further, Ms. Doane quotes probabilities totally inconsistent with this handbook. I just looked at my calendar and it is not "Groundhog Day."

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This copy of this letter is notification to the Commissioners and the EDO to take immediately actions as required by 10 CFR 50 because Indian Point is operating in an unanalyzed condition.

I also request your office convey to the Commission that it appears that they have totally slapped the OIG in the face and will continue endorsing the clear violation of regulatory requirements.

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Cc: The Commissioners

EDO

David Skeen

Congresswoman Lowey

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 26, 2020

MEMORANDUM TO: Chairman Svinicki
Commissioner Baran
Commissioner Caputo
Commissioner Wright

FROM: Margaret M. Doane /RA/
Executive Director for Operations

SUBJECT: CONCERNS PERTAINING TO GAS TRANSMISSION LINES AT THE INDIAN POINT NUCLEAR POWER PLANT: DETERMINATION NOT TO TAKE IMMEDIATE ACTION

This memorandum responds to the Chairman's February 24, 2020, direction to the Executive Director for Operations (EDO) to address matters raised in the Nuclear Regulatory Commission (NRC) Office of the Inspector General (OIG) report, Event Inquiry, "Concerns Pertaining to Gas Transmission Lines at the Indian Point Nuclear Power Plant" (Case No. 16-024). In that memorandum, the Chairman directed the prompt examination to determine if immediate regulatory action is needed based on information in the OIG report and to promptly inform the Commission of the results of that examination and what actions, if any, the staff plans to take. For the following reasons, I have determined that there is no need for immediate regulatory action.

In response to the Chairman's direction, I tasked Dr. Mirela Gavrilas to examine the information in the OIG report (advance copy) and evaluate promptly whether immediate action is warranted. Dr. Gavrilas was not involved in the matter in question in the OIG report. Dr. Gavrilas received her Ph.D. in nuclear engineering from the Massachusetts Institute of Technology and has decades of experience in nuclear power plant safety.

The determination on whether immediate action is needed was performed in accordance with the agency procedure used to respond to nuclear power plant emergent issues. This procedure is found in section 4.2.1 of LIC-504 Rev. 4 "Integrated Risk-Informed Decision-Making Process for Emergent Issues" (Agencywide Documents Access and Management System Accession No. ML14035A143). After reviewing the findings in the OIG report and the technical aspects of the 42-inch gas line that traverses the Indian Point Energy Center property (IPEC), Dr. Gavrilas has determined that there is no safety issue warranting immediate regulatory action at either Unit 2 or Unit 3.

This conclusion is based on the following summary findings that are explained in more detail in the attached enclosure:

- There is no significant degradation to defense-in-depth at either unit.
- There is no significant loss of safety margin at either unit.
- There is no high-risk impact at either unit from internal or external events, as all risk metrics are under the prescribed thresholds.

I have assigned David Skeen to lead a team of experts to respond to the remaining issues in the Chairman's memorandum, including the direction to provide the Commission with the results of a staff review within 45 days of the date of the memorandum. Mr. Skeen has been a member of the Senior Executive Service for more than a decade, and previously served as the director of the Japan Lessons-Learned Directorate. In that capacity, he had a key role in evaluating the safety of the U.S. nuclear power plant fleet in response to the events at the Fukushima Daiichi nuclear power plant caused by the Great Tōhoku earthquake and tsunami. Mr. Skeen was not involved in the matters addressed in the OIG report.

As is contemplated under the procedure, LIC-504, during the course of the team's review, the team will be mindful of the need to assess any new emergent issues.

Enclosure:
Evaluation of Emergent Information
Pertaining to Gas Transmission Lines
at the Indian Point Nuclear Power Plant

cc: SECY
OGC
OIG
OPA
D. Skeen

SUBJECT: CONCERNS PERTAINING TO GAS TRANSMISSION LINES AT THE INDIAN POINT NUCLEAR POWER PLANT: DETERMINATION NOT TO TAKE IMMEDIATE ACTION DATED FEBRUARY 26, 2020

ADAMS Accession Number: ML20058D088

OFFICE	OEDO	NRR	OGC	EDO
NAME	DJackson	MGavrilas	MZobler	MDoane
DATE	2/26/2020	2/26/2020	2/26/2020	2/26/2020

OFFICIAL RECORD COPY

Evaluation of Emergent Information Pertaining to
Gas Transmission Lines at the Indian Point Nuclear Power Plant

This evaluation is in response to the Chairman's tasking of February 24, 2020, to determine if immediate regulatory action is necessary. This prompt evaluation was performed in accordance with Section 4.21 of Office of Nuclear Reactor Regulation (NRR) office instruction LIC-504 Rev. 4 "Integrated Risk-Informed Decision-Making Process for Emergent Issues" (Agencywide Documents Access and Management System (ADAMS) Accession No.: ML14035A143) within 24 hours of the request.

Defense-in-Depth

LIC-504 states that additional regulatory action may be required to place or maintain the plant in a safe condition if defense-in-depth is significantly degraded (e.g., multiple barriers are moderately to significantly degraded, functional redundancy or diversity is significantly compromised, or vulnerability to single failures is significantly increased).

While a pipe rupture could impact certain structures on the site (e.g., gas turbine fuel oil tanks, the switchyard, emergency operations facility, FLEX equipment storage building), the pipeline is located approximately 1500 ft (rev 2) from the nearest safety related structure and barriers to radioactive release (i.e., the fuel cladding, reactor coolant system pressure boundary, and containment) would be maintained. Impacts to nearby structures could affect the plant response measures or the probability of additional initiators. However, there are still multiple diverse barriers and mitigation measures in place to minimize the challenges to the plant, preventing events from progressing to core damage, containing the radioactive source term, and ensuring emergency preparedness capabilities. Impacts on structures in the proximity of the explosion do not significantly degrade defense in depth.

Safety Margins

LIC-504 states that additional regulatory action may be required to place or maintain the plant in a safe condition if there is significant loss of safety margin (e.g., the calculated ASME code structural factors for a component are equal to or less than 1). Regulatory Guide 1.174 also indicates that safety margins are adequate if (1) the codes and standards or their alternatives approved for use by the NRC are met and (2) licensing basis safety analysis acceptance criteria are met.

A pipe rupture does not affect the plant's compliance with codes and standards. Compliance with the plant's technical specifications ensures adequate margin is maintained against design basis accidents.

Risk Assessment

Assumptions and Inputs:

Appendix F in the Federal Emergency Management Agency (FEMA) "Handbook of Chemical Hazard Analysis Procedures" 1989-626-095-10575, 1989 (ref 1) identifies accident rates for pipelines with a diameter greater than 20 inches at 5E-4 accidents per year per pipeline mile The FEMA Handbook also states that only 20% of events constitute large pipe ruptures

Based on this probability, the frequency of pipeline rupture is calculated assuming 3935 ft of pipeline are near the site This is equal to (3935 ft / (5280 ft / mi)) = 0 745 mi of pipeline (ref 2) The frequency of pipeline ruptures is therefore:

Frequency of pipeline rupture = Failure rate • rupture percentage of failures • pipeline length
Frequency of pipeline rupture
= ($5 \cdot 10^{-4}$ failures/year/pipeline mile)(0.2 complete ruptures/failure)(0.745 pipeline miles)
Frequency of pipeline rupture = $7.45 \cdot 10^{-5}$

The values of risk to be compared against the risk action thresholds provided in LIC-504 are calculated by making three conservative assumptions

- All complete ruptures lead directly to core damage
- The "as is" condition exists for 45 days (the duration of the Chairman's tasking memo).
- Large early release probability is 0 1 of the core damage probability

Under these assumptions:

- The conditional core damage frequency (CCDF) can be calculated as the frequency of a pipeline ruptures times the probability that a pipeline rupture leads to core damage, or
  $$(7.45 \cdot 10^{-5}) \cdot (1) = 7.45 \cdot 10^{-5}$$
- The conditional large early release frequency (CLERF) is calculated as 0 1 of the conditional core damage probability or
  $$(7.45 \cdot 10^{-5}) \cdot (0.1) = 7.45 \cdot 10^{-6}$$
- The incremental conditional core damage probability (ICCDP) in the 45-day window can be calculated by multiplying the conditional core damage probability, the initiating event frequency, and the duration of the condition, or:
  $$(1) \cdot (7.45 \cdot 10^{-5} \text{ events/year}) \cdot (45 \text{ days}/365 \text{ days/year}) = 9.18 \cdot 10^{-6}$$
- The incremental large early release probability (ICLERP) can be calculated as 0 1 of the incremental conditional core damage probability, or
  $$(9.18 \cdot 10^{-6}) \cdot (0.1) = 9.18 \cdot 10^{-7}$$

These values can be compared against the risk action thresholds in LIC-504:

Parameter	LIC-504 Risk Action Threshold	Calculated Value
CCDF	1E-3	7.45E-5*
CLERF	1E-4	7.45E-6
ICCDP	5E-5	9.18E-6
ICLERP	5E-6	9.18E-7

Discussion:

The numbers provided above represent median estimates of the conditional core damage probability and large early release probability. However, they were calculated assuming various conservatisms, some of which are enumerated in the table below

Source of Conservatism	Effect
Large pipe ruptures lead to deflagrations or detonations. The FEMA Handbook notes that "in the event that there is a failure in a pipeline, most often the outcome is a small leak."	1 order of magnitude
Assumptions on pipeline failure rates were structured around studies performed in the 1980s. Since then, codes and standards have improved and probabilities of failure would be less than those assumed. The probability of failure for this specific section of pipeline is reduced since it was constructed to specifications that exceed current code requirements and was covered with concrete planks to prevent inadvertent damage from digging.	1 order of magnitude (or greater)
The analysis assumes that pipeline failures lead directly to core damage. In reality, a pipeline explosion would not directly cause damage to the reactor core, though it could damage safety-related equipment that may be needed to prevent core damage if another initiating event were to occur at the same time.	3 orders of magnitude (or greater)

Thus, the calculated values for CCDF of 7.45E-5, CLERF of 7.45E-6, ICCDP of 9.18E-6, and ICLERP of 9.18E-7 represent upper bound estimates, and there are several orders of magnitude of conservatism separating these values from more realistic estimates

Conclusions

No significant degradation of defense in depth nor loss of safety margins were identified. The evaluation above shows that the CCDF, CLERF, ICCDP, and ICLERP values associated with pipeline explosions at IPEC are smaller than the LIC-504 risk action thresholds. Therefore, no immediate regulatory action is required to maintain the plant in a safe condition

* Note that this is a conservatively bounding value for a station blackout initiated by a pipeline explosion because it does not account for various factors, such as the limited line of sight between the explosion and the diesel generator buildings

-3-

References

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For example, a large facility may be coarsely modelled as having storage operations, loading/unloading operations, and processing operations. These can respectively be represented by storage tank failures and leaks, hose failures, and piping and process vessel failures. The rates suggested for each of these are:

Storage tank - double walled	10^{-6}/tank-year
Storage tank - single walled	10^{-4}/tank-year
Pressure vessels	10^{-4}/vessel-year
Piping	1.5×10^{-4}/ft-year
Loading hoses	10^{-4}/operation or 10^{-3}/hose-year

[1] Direct quote from OIG report

[2] Copy enclosed

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Cc: The Commissioners
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ADAMS Accession Number: ML20058D088

OFFICE	OEDO	NRR	OGC	EDO
NAME	DJackson	MGavrilas	MZobler	MDoane
DATE	2/26/2020	2/26/2020	2/26/2020	2/26/2020

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A pipe rupture does not affect the plant's compliance with codes and standards. Compliance with the plant's technical specifications ensures adequate margin is maintained against design basis accidents.

Risk Assessment

Assumptions and Inputs:

Appendix F in the Federal Emergency Management Agency (FEMA) "Handbook of Chemical Hazard Analysis Procedures" 1989-626-095-10575, 1989 (ref 1) identifies accident rates for pipelines with a diameter greater than 20 inches at 5E-4 accidents per year per pipeline mile. The FEMA Handbook also states that only 20% of events constitute large pipe ruptures.

Based on this probability, the frequency of pipeline rupture is calculated assuming 3935 ft of pipeline are near the site. This is equal to (3935 ft / (5280 ft / mi)) = 0.745 mi of pipeline (ref 2). The frequency of pipeline ruptures is therefore:

$$\text{Frequency of pipeline rupture} = \text{Failure rate} * \text{rupture percentage of failures} * \text{pipeline length}$$

$$\text{Frequency of pipeline rupture}$$
$$= (5 * 10^{-4} \text{ failures/year/pipeline mile})(0.2 \text{ complete ruptures/failure})(0.745 \text{ pipeline miles})$$
$$\text{Frequency of pipeline rupture} = 7.45 * 10^{-5}$$

The values of risk to be compared against the risk action thresholds provided in LIC-504 are calculated by making three conservative assumptions:

- All complete ruptures lead directly to core damage.
- The "as-is" condition exists for 45 days (the duration of the Chairman's tasking memo).
- Large early release probability is 0.1 of the core damage probability.

Under these assumptions:

- The conditional core damage frequency (CCDF) can be calculated as the frequency of a pipeline ruptures times the probability that a pipeline rupture leads to core damage, or:
$$(7.45 * 10^{-5}) * (1) = 7.45 * 10^{-5}$$
- The conditional large early release frequency (CLERF) is calculated as 0.1 of the conditional core damage probability or:
$$(7.45 * 10^{-5}) * (0.1) = 7.45 * 10^{-6}$$
- The incremental conditional core damage probability (ICCDP) in the 45-day window can be calculated by multiplying the conditional core damage probability, the initiating event frequency, and the duration of the condition, or:
$$(1) * (7.45 * 10^{-5} \text{ events/year}) * (45 \text{ days}/365 \text{ days/year}) = 9.18 * 10^{-6}$$
- The incremental large early release probability (ICLERP) can be calculated as 0.1 of the incremental conditional core damage probability, or:
$$(9.18 * 10^{-6}) * (0.1) = 9.18 * 10^{-7}$$

These values can be compared against the risk action thresholds in LIC-504:

Parameter	LIC-504 Risk Action Threshold	Calculated Value
CCDF	1E-3	7.45E-5*
CLERF	1E-4	7.45E-6
ICCDP	5E-5	9.18E-6
ICLERP	5E-6	9.18E-7

Discussion:

The numbers provided above represent median estimates of the conditional core damage probability and large early release probability. However, they were calculated assuming various conservatisms, some of which are enumerated in the table below.

Source of Conservatism	Effect
Large pipe ruptures lead to deflagrations or detonations. The FEMA Handbook notes that "in the event that there is a failure in a pipeline, most often the outcome is a small leak."	1 order of magnitude
Assumptions on pipeline failure rates were structured around studies performed in the 1980s. Since then, codes and standards have improved and probabilities of failure would be less than those assumed. The probability of failure for this specific section of pipeline is reduced since it was constructed to specifications that exceed current code requirements and was covered with concrete planks to prevent inadvertent damage from digging.	1 order of magnitude (or greater)
The analysis assumes that pipeline failures lead directly to core damage. In reality, a pipeline explosion would not directly cause damage to the reactor core, though it could damage safety-related equipment that may be needed to prevent core damage if another initiating event were to occur at the same time.	3 orders of magnitude (or greater)

Thus, the calculated values for CCDF of 7.45E-5, CLERF of 7.45E-6, ICCDP of 9.18E-6, and ICLERP of 9.18E-7 represent upper bound estimates, and there are several orders of magnitude of conservatism separating these values from more realistic estimates.

Conclusions

No significant degradation of defense in depth nor loss of safety margins were identified. The evaluation above shows that the CCDF, CLERF, ICCDP, and ICLERP values associated with pipeline explosions at IPEC are smaller than the LIC-504 risk action thresholds. Therefore, no immediate regulatory action is required to maintain the plant in a safe condition.

* Note that this is a conservatively bounding value for a station blackout initiated by a pipeline explosion because it does not account for various factors, such as the limited line of sight between the explosion and the diesel generator buildings.

References

1. Safety Evaluation Performed by Entergy Under 10 CFR 50.59 (ADAMS Accession No. ML14253A339), August 21, 2014
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For example, a large facility may be coarsely modelled as having storage operations, loading/unloading operations, and processing operations. These can respectively be represented by storage tank failures and leaks, hose failures, and piping and process vessel failures. The rates suggested for each of these are:

Storage tank - double walled	**10^{-6}/tank-year**
Storage tank - single walled	**10^{-4}/tank-year**
Pressure vessels	**10^{-4}/vessel-year**
Piping	**1.5×10^{-6}/ft-year**
Loading hoses	**10^{-4}/operation or 10^{-2}/hose-year**