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May 20, 1980

ARTHUR E. LUNDVALL, JR.
VICE PRESIDENT
SUPPLY

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attn: Mr. Robert A. Clark, Chief
Operating Reactors Branch #3
Division of Licensing

Subject: Calvert Cliffs Nuclear Power Plant
Units Nos. 1 & 2, Dockets Nos. 50-317 & 50-318
LNG Contingency Plan

Reference: NRC letter dated 3/31/80 from R. W. Reid to
A. E. Lundvall, Jr., same subject.

Gentlemen:

The referenced letter, which was sent to us as a followup to meetings held on February 21, 1980 and February 27, 1980, requested us to provide specific information concerning the content and basis for our LNG Contingency Plan. The attachment to this letter contains the NRC's questions and our responses. Most of the responses refer to our revised LNG Contingency Plan, which is scheduled to be submitted to NRC as a part of the overall Site Emergency Plan in mid-June. We will, as agreed, provide you with a draft copy of the LNG Plan as soon as it's typed.

Very truly yours,

A. E. Lundvall, Jr.

cc: J. A. Biddison, Esquire
G. F. Trowbridge, Esquire
Mr. E. L. Conner, Jr.

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ADDITIONAL INFORMATION

CALVERT CLIFFS LNG CONTINGENCY PLAN

1. Discuss your continuing efforts in the area of LNG vapor cloud detection technology.

We will, on a continuing basis approximately every two years, conduct a survey of applicable sources to determine if a reliable early warning detection system is available at a reasonable cost which could be installed at Calvert Cliffs to detect methane clouds or LNG pools on the Bay.

2. Describe your experience with the monitoring of broadcast communication links with the Coast Guard. Discuss the status of progress of letters of agreement between the Coast Guard and Cove Point with respect to notifying the plant of any difficulty with LNG spills/handling.

We have determined, pursuant to many discussions with NRC, that the most acceptable means of monitoring broadcast communications concerning LNG is to be totally passive and not rely on any other agency to specifically notify us of LNG emergencies. We will monitor LNG control frequencies passively with our scanner located in the Control Room, and any LNG emergency broadcast tone will be immediately detected, and our Control Room watchstanders will take appropriate action in accordance with our revised LNG Contingency Plan, Section II.

3. a. Discuss your protective procedures assuming that an LNG spill with an ensuing fire exists.

   b. Discuss your protective procedures assuming that an LNG spill with ensuing liquid pool spread and LNG vapor generation occurs.

The revised LNG Contingency Plan, which will be submitted as a part of the revised Site Emergency Plan in mid-June 1980, discusses the protective procedures for LNG spills. Spills with ignition at or near the spill site are not expected to impact on Calvert Cliffs since such spill-site fires will be, by definition, on the Bay surface some distance from Calvert Cliffs. Fires which occur at the Calvert Cliffs site are not expected to cause any significant heat load damage to plant structures as discussed in our initial LNG hazards investigation report, "Report on Investigations and Literature Survey to Establish the Hazard Implications of LNG Spills at the Columbia LNG Corporation Receiving Terminal at Cove Point, MD, on the Calvert Cliffs Nuclear Power Plant", Wesson and Associates, Inc., March 12, 1976. Spills which result in an unignited methane cloud are also addressed in the revised Contingency Plan.

4. Assume an LNG vapor cloud on-site.

   a. Provide estimates of the duration of the plant's immersion in the cloud, and correlate those estimates with the proposed emergency actions.

If an LNG pool forms on the surface of the Bay with a wind blowing from the pool to Calvert Cliffs, the worst case assumption is that the methane gas cloud begins its travel toward Calvert Cliffs immediately upon evaporation initiation, and the length of the cloud is equal to the wind speed times the time it takes to evaporate the entire pool. Assuming the methane cloud moves at the speed of the wind, then, the residence time of the methane cloud over the plant cannot be any longer than the time it takes for the entire pool to evaporate. Please examine the following relationships.

Distance from pool site to plant = X mi
Wind speed = V mph
Time of start of evaporation = t_1
Time of completion of evaporation = t_2
Time to evaporate pool = $t_2 - t_1 = \Delta t$
Time of first methane molecule reaching Calvert Cliffs = t_3

then: $(t_3 - t_1)\text{hours} = (x \text{ miles}) \div (V \frac{\text{miles}}{\text{hour}})$

and the time of last methane molecule reaching Calvert Cliffs = t_4

$t_4 = t_2 + (X \text{ miles}) \div (V \frac{\text{miles}}{\text{hour}})$

so: $\boxed{\text{residence time} = t_4 - t_3}$

and: $t_3 = X/V + t_1$

and: $t_4 = t_2 + X/V$

so: $t_4 - t_3 = t_2 + X/V - X/V - t_1$

or: $\boxed{t_4 - t_3 = t_2 - t_1}$

where: $t_2 - t_1 \equiv$ time to evaporate pool

Therefore: $\boxed{\text{Residence Time} = \text{Evaporation Time}}$

Numerous studies done by Science Applications, Inc. have shown that the evaporation time for a 24,000 - 35,000 cu. meter spill on unconfined water is about 10-15 minutes. Using this range as an estimate of residence time, we can apply a factor of 2 to make the residence time = 30 minutes.

Hence we can estimate that the plant could be "immersed" in flammable methane for up to 30 minutes. This is a <u>very</u> conservative estimate since:

(1) It assumes the entire spill volume of LNG becomes $\geq$ 5% methane which all reaches Calvert Cliffs undissipated.

(2) We have included a "safety factor" of 2.

The revised Contingency Plan provides operator guidance for determining actions to be taken based on estimates of the time it will take for the cloud to reach the plant. Assuming a spill 5 miles away with a 5 mph wind, the cloud will arrive in 1 hour and reside for 30 minutes. Thus, if the station batteries were fully loaded at the 2-hour rate, there would still be 30 minutes of battery capacity remaining after the "conservative" cloud has fully dissipated and/or passed over the plant. This is sufficient time to either start the emergency diesel generators or bring the 69 kV line on service.

4. b. Discuss the basis and provide quantifiable decision criteria for inhibiting the diesel generators from starting.

The bases for inhibiting the diesels are discussed in the revised Contingency Plan. In general, they can be summarized as follows:

Any size spill which occurs closer than some designated initial distance from the plant will direct the plant operators to standby to inhibit the diesels. Likewise, a spill of any potential size greater than a given specified size at any distance from the plant will direct the operators to stand by to inhibit the diesels. These criteria are in graphic form in the revised Contingency Plan. The final decision to inhibit is based on an actual onsite methane concentration reading obtained by a portable detector hand-held at the intake structure.

4. c. Discuss the detection and means of purging the diesel rooms of vaporized LNG after the cloud disperses.

The diesel generator rooms are located on the landward side of the Auxiliary Building facing inland. The Auxiliary Building, both containments, and the Turbine Building all must be passed before a methane cloud can reach the diesel rooms. Additionally, the diesel room air intake louvers are located at approximately 50 feet or more above sea level. When the diesels are prevented from starting, there will be no forced suction of outside air (or methane) into the rooms. Natural convective and gravitational forces are the only means of possibly getting methane into the rooms. Even then, it must pass through the louvers. In the very unlikely event that the Calvert Cliffs Diesel Generator Rooms become full of 5% methane gas, we would simply open the doors and test for methane with a portable detector. If flammable concentrations exist, a portable air blower will be used to exhaust the rooms. The blower motor will be outside the rooms with a hose taking suction in the rooms and exhausting to atmosphere. All motors, etc. inside the rooms will be "sniffed" for methane.

4. d. Discuss means of protection of the battery and charger rooms from LNG vapor hazards.

The battery rooms are served by a closed ventilation system. If a battery charge is in progress, it will be secured as specified in the revised Plan and hydrogen buildup will be monitored if the ventilation system is secured. The chargers will not be charging the batteries if methane incursion is possible.

4. e. Discuss the criteria and procedures related to alternate power sources after the batteries are exhausted (including system/component sequencing).

As discussed in 4.a. we do not expect the batteries to be exhausted under the worst conditions. However, the revised Contingency Plan has provisions to align the 69 kV (SMECO) line for emergency power use well in advance of methane incursion to the site. The 69 kV line can serve all normal safe shutdown equipment for both units indefinitely. Sequencing, if necessary, will be done in accordance with existing plant procedures.

4. f. Explain the reason for the two hour duration availability of the D.C. (battery) power supply, and state why this is considered to be adequate.

Please refer to our response to 4.a.

4. g. Discuss the impact on the switchyard of detonation/deflagration of the LNG cloud.

Prior to methane arrival onsite, the plant will be divorced from offsite power. Damage resulting to the switchyard from a methane burn will not impact the maintenance of safe shutdown conditions. Specifically:

a) The batteries can be used fully loaded for at least 2 hours until:

b) The 69 kV line picks up the station loads or:

c) The diesel generators can be brought on line.

The 69 kV line is virtually all underground on the site and is thus, effectively immune to a methane burn.

4. h. Discuss the need for and availability of alternative access ways to the site if a cloud detonation/deflagration were to occur.

Normal site access is from Route 4, which is inland from the plant. The treeline setback from the access road is adequate to permit vehicle access even if the surrounding woods caught fire. Additionally, much of the access road passes through unwooded areas which would serve to break the fires that might develop. There are numerous available helicopter landing sites available, and seaward approaches will be available after burn/passage of the methane cloud.

5. Discuss the various options for storage and assembly locations for breathing apparatus and methane detection apparatus. State the number of people to be processed, the number of airpacks on hand, the time required to implement use of the airpacks, and the modes of use of the sniffing apparatus.

   Emergency equipment storage location and use is discussed in the revised Contingency Plan.

6. When addressing specific protective actions, reference the plant procedures necessary to implement such action, and the appropriate review, evaluation, and implementation of such plant procedures.

   All required procedures are specifically called out in the appropriate sections of the Emergency Plan and/or Contingency Plan. Procedure review, evaluation and implementation are conducted in accordance with approved plant procedures.