Duquesne Light

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October 24, 1984

U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Attn: Dr. Thomas E. Murley, Regional Administrator
Region 1
631 Park Avenue
King of Prussia, PA 19406

Reference: Beaver Valley Power Station, Unit No. 1
Docket No. 50-334, License No. DPR-66
IE Bulletin 84-03

Gentlemen:

This letter is forwarded in response to IE Bulletin 84-03 "Refueling Cavity Water Seal" dated August 24, 1984.

During the present refueling outage, Beaver Valley Power Station Unit 1 (BVPS) had planned to install a modified form of the current Haddam Neck inflatable seal. In light of the experience gained from the Haddam Neck incident, we do not anticipate completing the reviews of our inflatable seal design, necessary under 10CFR50.59, on a schedule which would support the use of the inflatable seal during our current outage. Therefore, we have elected to use our mechanical seal design, which does not contain any active i.e., pressurized components and a failure such as that described in the bulletin is not possible. This seal has been used for all previous refuelings of Beaver Valley and completely bridges the annular gap.

Notwithstanding the fact that this seal design is not subject to the concerns identified in IE Bulletin 84-03, an evaluation has been performed to determine the consequences of gross seal failure for an inflatable seal design to serve as a bases for providing procedures and reviewing facility design to demonstrate compliance to General Design Criterion 61.

Complete loss of an outer inflatable seal was evaluated in conjunction with a fuel handling accident. The evaluation assumed loss of water over a spent fuel assembly in the fuel building and a rupture of all fuel tubes in the assembly. It was found that resulting doses could exceed 10CFR100 criteria. This is primarily due to the loss of water over the spent fuel and the resultant increase (approx. 100 fold) in the iodine dose commitment due to the decrease in partitioning factors previously analyzed (Fuel Handling Accident) in accordance with Regulatory Guide 1.25 with 23' of water over the spent fuel. With conservative meteorlogical factors under this condition, the resultant dose commitment could reach approximately 3020 rem to the thyroid.

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In the FSAR analysis (Section 14.2.1) of the fuel-handling accident inside containment, no credit was given for isolation of the release by the automatic closure of the Purge and Exhaust Dampers on high radiation. Therefore, the offsite dose values are not realistic as operability and closure time of these dampers is assured through procedures and the Technical Specifications.

An attached Figure shows the dose rates on the manipulator bridge versus water height above the fuel. We do not consider this accident sequence credible (100% extrusion of the inflatable seal through the annulus gap) with the modifications already completed on this seal providing that the seal is properly designed, maintained and installed. Our review of the Haddam Neck event leads us to the conclusion that improper design margin was the principal contributor to the event.

We are taking the following additional actions to insure that uncovery of a spent fuel assembly will not occur and to maximize our ability to withstand high leakage rates regardless of the initiating event:

- monitoring seal leakage during and following fill of the Refueling Cavity
- prohibiting the use of the RCCA change fixture until a cofferdam is installed to insure complete fuel assembly submergence
- maintaining a LHSI pump available for injection to provide additional injection capability

A description of the mechanical seal and additional information are provided in the attachment. The installation procedure is also attached. Information relative to the Fuel Handling Accident and a description of the Fuel Pool Cooling and Purification Systems can be found in the Updated FSAR Sections 14.2.1 and 9.5 respectively.

During future refueling outages, the refueling cavity water seal which incorporates inflatable seals may be used. A description of the inflatable seals with additional information relative to the Bulletin will be forwarded to you prior to our use of an inflatable reactor cavity seal at Beaver Valley Power Station.

We intend to start refueling during the week of November 1, 1984. Please contact my office if there are any additional questions on this matter.

Very truly yours,

J. J. Carey

J. J. Carey
Vice President, Nuclear

Attachment

cc: Mr. W. M. Troskoski, Resident Inspector
U. S. Nuclear Regulatory Commission
Beaver Valley Power Station
Shippingport, PA 15077

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Washington, DC 20555

Director, Safety Evaluation & Control
Virginia Electric and Power Company
P.O. Box 26666
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Richmond, VA 23261

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF BEAVER)

On this 25th day of October, 1984, before me, Sheila M. Fattore, a Notary Public in and for said Commonwealth and County, personally appeared J. J. Carey, who being duly sworn, deposed, and said that (1) he is Vice President of Duquesne Light, (2) he is duly authorized to execute and file the foregoing Submittal on behalf of said Company, and (3) the statements set forth in the Submittal are true and correct to the best of his knowledge, information and belief.

Sheila M. Fattore

SHEILA M. FATTORE, NOTARY PUBLIC
SHIPPINGPORT BORO, BEAVER COUNTY
MY COMMISSION EXPIRES SEPT. 16, 1985
Member, Pennsylvania Association of Notaries

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ATTACHMENT

Action to Be Taken By Plants Prior To Beginning Refueling or Within 90 Days of Receipt of This Bulletin, Whichever Is Sooner

Evaluate the potential for and consequences of a refueling cavity water seal failure and provide a summary report of these actions.

Such evaluations should include consideration of: gross seal failure; maximum leak rate due to failure of active components such as inflated seals, makeup capacity, time to cladding damage without operator action, potential effect on stored fuel and fuel in transfer and emergency operating procedures.

Response

Seal Description

The refueling cavity water seal to be used during the current refueling outage at Beaver Valley Power Station, Unit No. 1 (BVPS-1) consists of a segmented annular steel plate and neoprene gaskets. The seal plate spans the annular gap between the embedment ring in the refueling cavity floor and the reactor vessel flange. Neoprene gaskets are used to seal the plate to the surfaces on both sides of the annular gap. (See attached Figures)

As the reactor cavity is filled, the column of water above the seal plate flattens the gaskets creating a water tight seal. The gaskets are held in place by the weight of the seal plate and the weight of the column of water above the seal plate.

Gross Seal Failure

Forces bearing down on the gasket, holding it in place, are much greater than forces pushing the gasket into the annular gap. In addition, the neoprene gasket material has no compressive failure modes. Therefore, it is considered unlikely that the current BVPS-1 seal will suffer a failure similar to the one described by IE Bulletin 84-03.

Maximum Leak Rate Due to Failure of Active Components Such as Inflated Seals

The refueling cavity seal to be used during the current refueling outage has no active components such as inflated seals that may fail.

Makeup Capacity

Makeup from a low-head safety injection pump (3200 gpm) will be available to the reactor cavity at all times during refueling. Other available makeup paths include charging/HHSI pumps (600 gpm), and Refueling Water Storage Tank (RWST) recirculation pumps (375 gpm).

Time to Cladding Damage Without Operator Action

Hand calculations were performed to determine the time to cladding melt based on the following assumptions:

- Fuel assembly is suspended in containment air
- Containment air temperature 105°
- Initial temperature of fuel pool 140°
- Decay heat load of 127.52×10^6 btu/hr at 150 hours after shutdown

The results of the hand calculations indicate a minimum of 60 minutes elapse before melting occurs with the assembly out of water.

Potential Effect on Stored Fuel

In the event of reactor cavity seal failure, loss of water through the transfer tube would lower water levels in the spent fuel pool to elevation 742'1". The stored spent fuel assemblies would remain covered by approximately 9 inches of water. It has been calculated that it would take several hours for the water above the spent fuel to evaporate. This calculation assumed that the postulated accident occurs after cycle 12 with an initial pool temperature of 140°and that no makeup water was added. At this time, we have completed cycle 4 operation.

Please refer to the enclosed drawing showing the elevations of the spent fuel and cavity seal.

Before the water remaining above the stored fuel could evaporate completely, makeup water could be provided from the Refueling Water Storage Tank Recirculation Pumps, Primary Grade Water Pumps (no boron) or in extreme emergencies with the River Water or Fire Protection Systems' Pumps. Design of the fuel racks would prevent criticality in the spent fuel pool under all conditions. In addition, the ventilation drains from the cooling unit return to the spent fuel pool. Makeup to the RWST is available through the CVCS System with 2000 ppm of borated water. A drawing has been enclosed to show the piping arrangement of the Fuel Pool Cooling connections.

Potential Effect on Fuel in Transfer

In the event of gross seal failure, resulting in leakrates greater than available makeup capacity, a fuel assembly in an upender (positioned vertically) or in the rod cluster control assembly (RCCA) change fixture would become partially exposed to air. Fuel in other parts of the transfer system, in the reactor vessel and in the spent fuel pool will remain submerged.

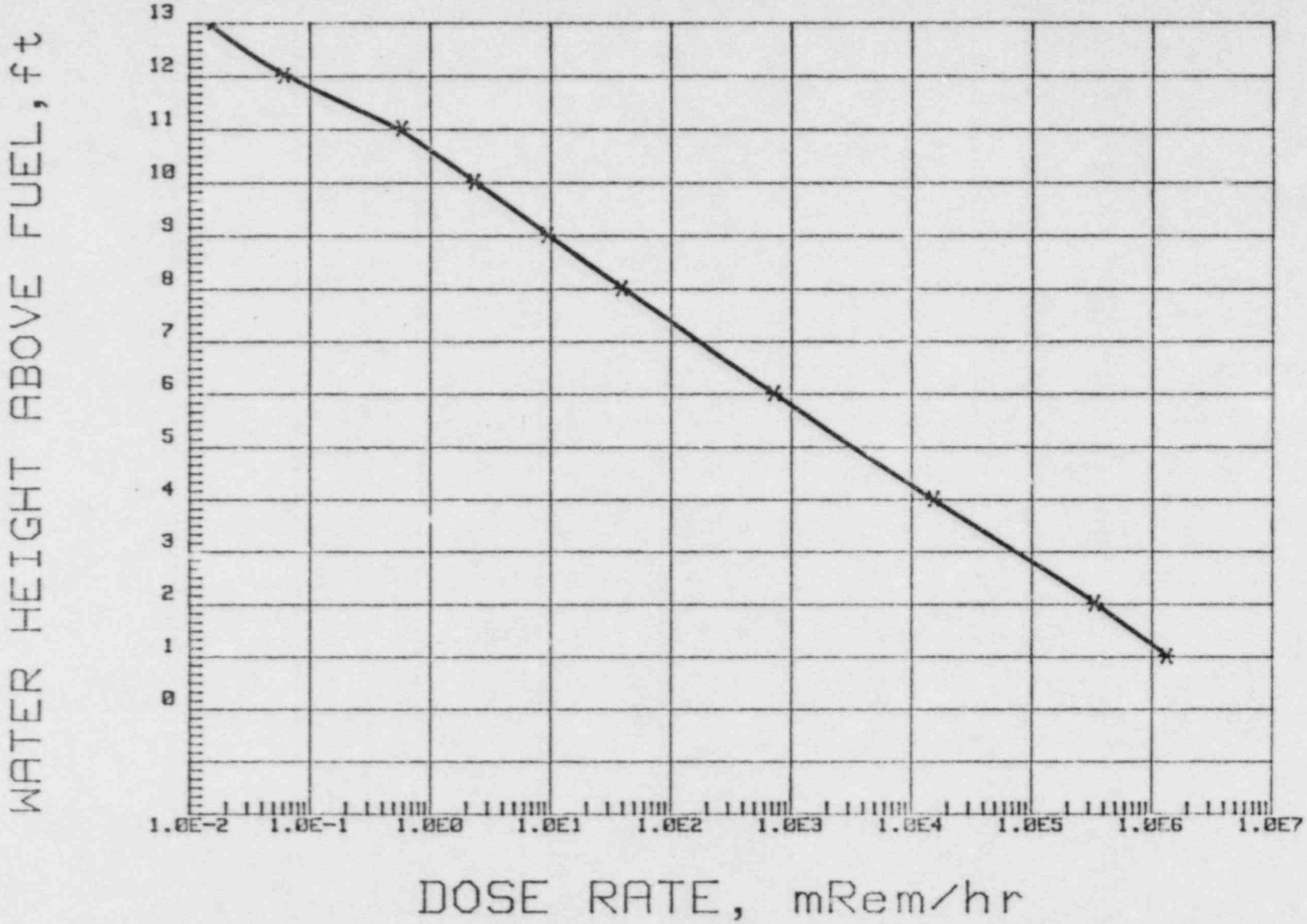
The RCCA change fixture will not be used during the current refueling outage and the fuel in the upender can be positioned horizontally to ensure cooling.

Emergency Operating Procedures

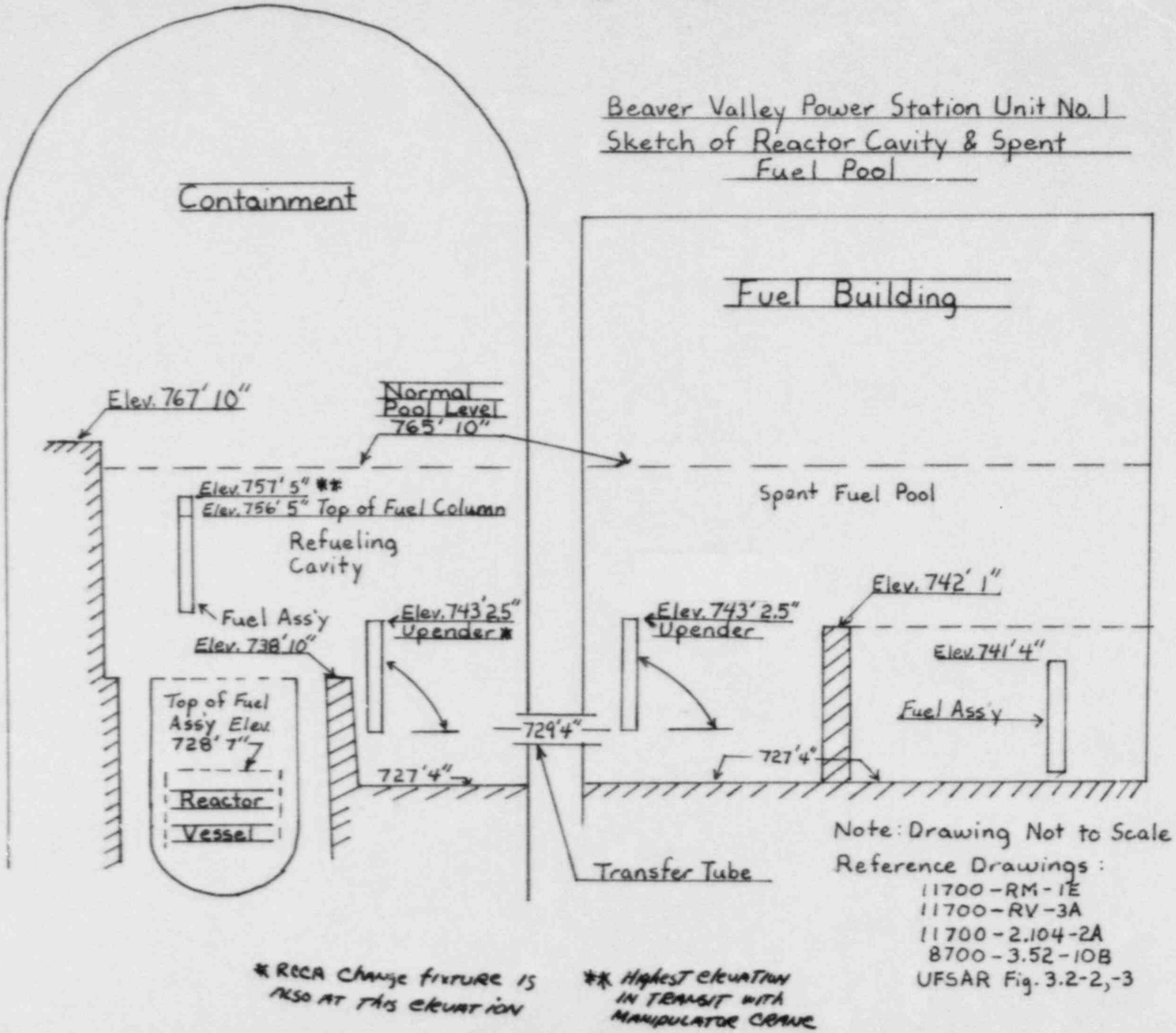
As a result of this IE Bulletin, an Abnormal Operating Procedure and Abnormal Refueling Procedure have been approved that address decreasing refueling cavity water level and decreasing spent fuel pool water level. The procedures are attached.

These procedures are presently undergoing review and will be approved prior to commencing refueling.

DOSE RATE ON MANIPULATOR BRIDGE



Beaver Valley Power Station Unit No. 1
Sketch of Reactor Cavity & Spent Fuel Pool



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