**Duquesne Light Company** Beaver Valley Power Station
P.O. Box 4
Shippingport, PA 15077-0004

SUSHIL C. JAIN
Senior Vice President
Nuclear Services
Nuclear Power Division

(412) 393-5512
Fax (724) 643-8069

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L-99-095

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

**Subject: Beaver Valley Power Station, Unit No. 1 and No. 2**
**BV-1 Docket No. 50-334, License No. DPR-66**
**BV-2 Docket No. 50-412, License No. NPF-73**
**Additional Information for License Amendment Request Nos. 262 and 135**

This letter provides additional information to support License Amendment Request (LAR) Nos. 262 and 135, submitted by letter L-98-238 dated December 24, 1998. This letter is in response to an NRC verbal request made on May 27, 1999. The proposed change in LAR 262 that prompted the NRC request was in regard to the deletion of the rod deviation limit alarm requirements from the technical specifications (TS). The DLC proposed change was based on the NRC approved changes to the Improved Standard TS (ISTS) in NUREG-1431. Due to the fact that the Beaver Valley Power Station (BVPS) Unit 1 rod position system is analog and that correspondence during early operating cycles had documented system inaccuracies, the NRC requested that DLC provide more information comparing the performance of the Unit 1 analog system to the Unit 2 digital system and describe the recent upgrades made to the Unit 1 system. The additional information requested by the NRC is included in the Attachment to this letter. The information contained within the Attachment describes the performance of the Unit 1 rod position indication system and provides some background information regarding the normal operation of the system. The information provided in the Attachment is historical in nature and does not represent a commitment regarding the future operation of BVPS.

A001

Sincerely,

Sushil C. Jain

DELIVERING QUALITY ENERGY

c: Mr. D. S. Collins, Project Manager
Mr. D. M. Kern, Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator
Mr. W. P. Dornsife, Director BRP/DEP
Mr. M. P. Murphy (BRP/DEP)

AFFIDAVIT FOR APPLICATION

OF AMENDMENT

COMMONWEALTH OF PENNSYLVANIA )
) SS:
COUNTY OF BEAVER )

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Before me, the undersigned notary public, in and for the County and Commonwealth aforesaid, this day personally appeared Sushil C. Jain, to me known, who being duly sworn according to law, deposes and says that he is Senior Vice President, Nuclear Services of the Nuclear Power Division, Duquesne Light Company, he is duly authorized to execute and file the foregoing submittal on behalf of said Company, and the statements set forth in the submittal are true and correct to the best of his knowledge, information and belief.

Sushil C. Jain

Subscribed and sworn to before me
on this 15th day of June, 1999

Tracey A Baczek
Notary Public

Notarial Seal
Tracey A. Baczek, Notary Public
Shippingport Boro, Beaver County
My Commission Expires Aug. 16, 2001
Member, Pennsylvania Association of Notaries

ATTACHMENT

Beaver Valley Power Station Unit 1 Rod Position Indication System

Although there was a significant amount of correspondence concerning the Unit 1 analog rod position (ARPI) accuracy in the past, much of this correspondence was in regard to the shutdown mode inaccuracy of the system as referenced in NRC correspondence (Amendment 52, Amendment 57, Amendment 68). However, the large system inaccuracy referred to in this correspondence was only applicable to rod position indication during reactor shutdown at reduced temperature (350° F) conditions. TS Amendment 68 removed all reference from the TS to ARPI operability with the reactor shutdown. Therefore, the significant inaccuracies referenced in much of the previous correspondence is not directly applicable to the current proposal to remove the rod deviation alarm from the Mode 1 and 2 TS requirements. Although previous correspondence had also documented the transient and steady state non-linear performance of the Unit 1 ARPI system detectors in Modes 1 and 2, subsequent tests and measurements allowed the steady state non-linear performance to be predicted and compensated for. In addition, a 1-hour soak time was incorporated in the TS to address the transient (during and immediately following rod movement) response of the system. It should be noted that the TS require the Unit 1 ARPI system to meet the same accuracy requirements as the Unit 2 digital system (± 12 steps). Utilizing custom meter scales and plant computer algorithm compensation, the ARPI system was calibrated to maintain the required ±12 steps accuracy (comparable to a digital system) during normal operating conditions with the exception of a short period during and immediately following rod movement. The thermal soak time provided by the TS is utilized to compensate for the system transient response and allows time for the position indication to stabilize.

Although the Unit 1 ARPI System is calibrated to maintain the required accuracy, due to the design of the system, maintaining the Unit 1 system within the specified calibration tolerance requires more time and effort than is necessary to maintain the Unit 2 digital system. System upgrades to improve the Unit 1 ARPI System have been implemented by a recent design change incorporated in 1997/1998. The design change replaced part of the Westinghouse ARPI system with a Combustion Engineering Rod Position Indication (CERPI) system. The electronic processing equipment was replaced with programmable logic controllers (PLCs). The detector design remained unchanged. The new PLCs are designed to compensate for several effects that influence the accuracy of the ARPIs. Some features of the design change that directly improve the accuracy of the ARPIs are discussed below:

1. The PLC algorithms correct for detector non-linearity, thereby eliminating the need for non-linear meter scales and plant computer algorithm compensation. The system output at operating temperatures is now essentially linear with rod position (consistent with a digital system).

2. The system is now able to compensate for detector temperature effects in the long term, such as those due to power level or Tavg changes. Short term compensation, such as compensation due to control rod drive shaft temperature changes during rod movement, is not available. However, the new long term temperature compensation capability acts to restore indication accuracy more quickly after rod movement than before.

3. A constant current is used to excite the detector primary winding to improve excitation stability. The original system "constant current" was derived from a constant voltage source across a 500 ohm resistor. Changes in detector primary impedance would result in a change in excitation current.

4. The primary excitation current is greatly reduced (by a factor of 5) and two excitation frequencies are used to reduce detector magnetic interaction.

After completion of the system upgrades described above, a substantial amount of testing was performed prior to operation of the unit with the new system. This testing was performed at hot, no-load temperature (547°F). Successful testing required that individual rod position indication at all demanded bank positions be maintained within the limits of the TS (± 12 steps of demand) throughout the entire range of rod motion for all control and shutdown rods. The testing consisted of comparing the individual rod position indication to the demand counter at approximately 10 different rod positions for each bank. As the testing was performed at less than 50% power the one-hour thermal soak time allowed by the TS was utilized to allow the indication to stabilize. During the post modification testing, the absolute maximum individual rod position indication deviation from the demand position for all data points obtained was 10 steps. The average maximum deviation of all data points was 6 steps. The results of the post modification testing show that:

1. Over the full length of rod travel the analog system average maximum deviation of 6 steps compares closely with the digital system accuracy of ± 4 steps, and

2. The maximum Unit 1 system deviation from the demand position (10 steps) is equal to the calibrated accuracy of the Unit 2 digital system when operating on one set of detector coils (± 10 steps).

In addition, recent operational data obtained for rod positions of Control Bank D (the controlling bank during slow movement from fully withdrawn to a range of 195 to 205 steps during power decreases and incore/excore instrument calibration flux maps) indicated a maximum deviation from demand position of 7 steps. As this data was taken at power levels greater than 50% no thermal soak time was applied.

The documented performance of the Unit 1 analog system exceeds the accuracy requirements specified in the TS and assumed in the safety analyses. The Unit 1 analog system effectively provides the same functional capability as the Unit 2 digital system to verify rod position is maintained within the alignment and insertion TS limits.

In summary, the design changes made to the Unit 1 rod position indication system improve the system steady state accuracy to that comparable with the digital rod position indication system used at Unit 2. The non-linear meter scales and third order plant computer algorithms previously used to compensate for detector non-linearity have been eliminated by the linearity correction within the system's electronic processing equipment. System accuracy during and immediately following rod movement continues to be addressed by the existing TS requirements that provide for a thermal soak time. In regard to the transient response of the system, it should be noted that rod movement is limited during full power operation. During normal operation near full power, all rods are parked at the fully withdrawn position. The rods are normally only moved for the freedom of movement surveillance (once per month), incore/excore instrument calibration flux maps (typically less than once per quarter), and for power decreases (typically less than once per quarter). In addition, during these evolutions, rod movement is closely monitored by the operators.