

**PHILADELPHIA ELECTRIC COMPANY**

NUCLEAR GROUP HEADQUARTERS

955-65 CHESTERBROOK BLVD.

WAYNE, PA 19087-5691

(215) 640-6000

April 25, 1990

Docket Nos. 50-277  
50-278  
50-352  
50-353

License Nos. DPR-44  
DPR-56  
NPF-39  
NPF-85

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

SUBJECT: Peach Bottom Atomic Power Station, Units 2 and 3  
Limerick Generating Station, Units 1 and 2  
Response to NRC Bulletin No. 90-02, "Loss of  
Thermal Margin Caused by Channel Box Bow"

Dear Sir:

NRC Bulletin (NRCB) No. 90-02, "Loss of Thermal Margin Caused by Channel Box Bow," was issued on March 20, 1990 and identified potential problems associated with excessive fuel channel box bow that could result in a loss of fuel thermal margin. NRCB No. 90-02 was received by the Philadelphia Electric Company (PECo) on March 26, 1990. The concern discussed in the Bulletin is that the channel box bow effect has not been taken into account in the critical power ratio (CPR) calculation for channel boxes being reused for a second fuel bundle lifetime of operation. This could result in non-compliance with the Technical Specifications (TS) minimum critical power ratio (MCPR) operating limits and safety limits, and lead to possible fuel failures.

NRCB No. 90-02 states that all Boiling Water Reactor (BWR) licensees are expected, in evaluation of the design and operation of reload cores, either to implement an approved methodology that takes the effects of channel box bow into account in the CPR calculations, or to implement an acceptable bounding value of delta-CPR, as needed, to assure compliance with TS MCPR limits.

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NRCB No. 90-02 requests that all BWR licensees that currently use channel boxes for a second fuel bundle lifetime verify that current TS MCPR operating and safety limits are met. Furthermore, NRCB No. 90-02 requires that, within 30 days of receipt of the Bulletin, BWR licensees that currently use channel boxes for a second fuel bundle lifetime advise the NRC of the number of such channel boxes and their disposition in the core, and to include in their response a description of the methods and associated data base used to account for the effects of channel box bow to ensure compliance with TS MCPR operating limits and safety limits.

Our response for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, and Limerick Generating Station (LGS), Units 1 and 2 is provided below.

#### RESPONSE

We have reviewed the use of channel boxes for a second fuel bundle lifetime of operation at both PBAPS and LGS. There are no channel boxes being reused for a second fuel bundle lifetime at PBAPS, Unit 3 or LGS, Units 1 and 2, and the current TS MCPR operating limits and safety limits for these units are being satisfied. The effects of channel box bow for channel boxes being used for a single fuel bundle lifetime will be taken into account in the next scheduled process computer data bank update, but no later than the next fuel reload for each of these units in accordance with NRCB No. 90-02.

There are, however, a total of fifty-nine (59) channel boxes being reused for a second fuel bundle lifetime in the reactor core at PBAPS, Unit 2, and their location in the core is shown on Figure 1 (attached). The reused channel boxes were installed on unirradiated Reload No. 6 fuel bundles which were loaded into the reactor core for use in operating cycle No. 7 at PBAPS, Unit 2. They are currently in the second cycle of their second fuel bundle lifetime (operating cycle No. 8). To ensure that TS MCPR operating limits and safety limits are satisfied throughout the remainder of PBAPS, Unit 2 operating cycle No. 8, an administrative control to limit the Maximum Fraction of Limiting CPR (MFLCPR) to less than or equal to 0.91 has been established for all four-bundle control blade cells containing reused channels. MFLCPR is defined as the ratio of the TS MCPR limit to the actual operating value of MCPR. Normally, as long as MFLCPR remains less than or equal to 1.0, the TS MCPR limit is not exceeded. In this case, however, an administrative limit of 0.91 for the MFLCPR has been established and was determined using the procedure described in Enclosure 1 to this letter.

A study was also performed to evaluate the potential impact of channel box bow on the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) for the PBAPS, Unit 2 fuel. MAPLHGR is the maximum value of the Average Planar Linear Heat Generation Rate (APLHGR) in the core. APLHGR is the sum of the Linear Heat Generation Rates (LHGRs) for all fuel rods in a specified fuel bundle at a specified height divided by the total number of fuel rods in the fuel bundle. APLHGR is determined for individual six inch segments of the fuel bundle called nodes. The LHGR is the heat generation per unit length of fuel rod. This study was performed since channel box bow increases the water gap width which leads to higher localized power peaking (due to increased neutron moderation) in the fuel rods adjacent to the increased water gap. The focus for this study was high power fuel bundles; therefore, only non-control cell locations were considered (control cells are low power cells in the interior of the core reserved for control blade insertion while at power). To ensure that the TS MAPLHGR operating limits are satisfied throughout the remainder of PBAPS, Unit 2 operating cycle No. 8, an administrative control to limit the Maximum Average Planar Linear Heat Generation Rate Ratio (MAPRAT) to less than or equal to 0.91 has been established. MAPRAT is defined as the ratio of the actual operating value of MAPLHGR to the TS MAPLHGR operating limit. Normally, as long as MAPRAT remains less than or equal to 1.0, the TS MAPLHGR operating limit is not exceeded. LHGR operating limits are incorporated within the MAPLHGR operating limits such that compliance with MAPRAT assures compliance with LHGR operating limits. In this case, however, an administrative limit of 0.91 for the MAPRAT has been established and was determined using the procedure described in Enclosure 1 to this letter.

We expect to incorporate the MCPR and MAPLHGR adjustments in the process computer data bank for fuel bundles in cells containing reused channel boxes. Once this is done, maintaining MFLCPR and MAPRAT less than or equal to 1.0 will once again assure that the TS MCPR and MAPLHGR operating limits are not exceeded for PBAPS, Unit 2 operating cycle No. 8.

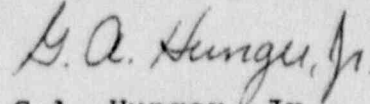
We are evaluating whether or not to continue reusing the 59 second fuel bundle lifetime channel boxes at PBAPS, Unit 2 for a third and last cycle of operation. If we decide to reuse these channel boxes, such use will be addressed as an unreviewed safety question in the reload core evaluation performed in accordance with 10 CFR 50.59 as specified in NRCB No. 90-02.



The enclosure to this letter contains information proprietary to GE, and GE requests that the document be withheld from public disclosure in accordance with 10 CFR 2.790(a)(4). An affidavit supporting this request in accordance with 10 CFR 2.790(b)(1) is provided in Enclosure 1 to this letter.

If you have any questions, please do not hesitate to contact us.

Very truly yours,



G.A. Hunger, Jr.  
Manager  
Licensing Section  
Nuclear Engineering and  
Services Department

GHS:clp

Enclosure

Attachment

cc: T. T. Martin, Administrator, Region I, USNRC  
T. J. Kenny, USNRC Senior Resident Inspector, LGS  
J. J. Lyash, USNRC Senior Resident Inspector, PBAPS

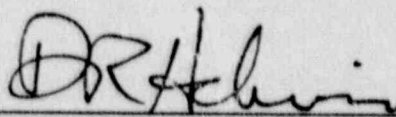
COMMONWEALTH OF PENNSYLVANIA :

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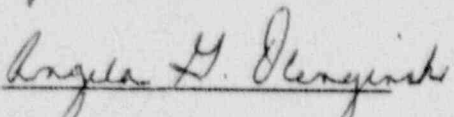
COUNTY OF CHESTER :

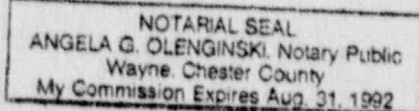
D. R. Helwig, being first duly sworn, deposes and says:

That he is Vice President of Philadelphia Electric Company; the Applicant herein; that he has read the foregoing response to NRC Bulletin No 90-02, "Loss of Thermal Margin Caused by Channel Box Bow," and knows the contents thereof; and that the statements and matters set forth therein are true and correct to the best of his knowledge, information and belief.

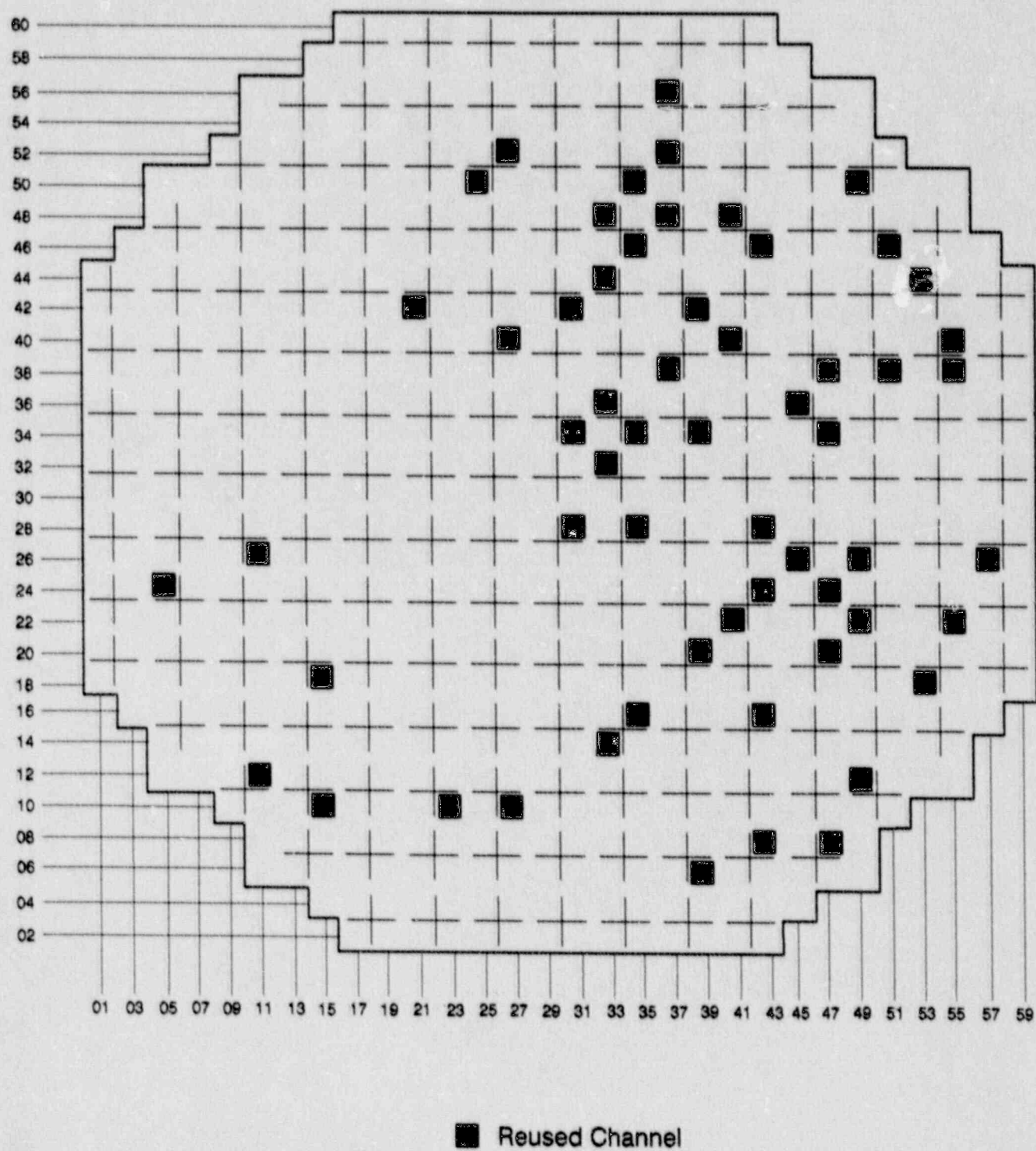
  
\_\_\_\_\_  
Vice President

Subscribed and sworn to  
before me this 25<sup>th</sup> day  
of April 1989.

  
\_\_\_\_\_  
Notary Public



**Figure 1**  
**Peach Bottom 2 Cycle 8**  
**Reused Channel Locations**



ENCLOSURE 1

to

Philadelphia Electric Company letter, "Response to NRC Bulletin  
No. 90-02, 'Loss of Thermal Margin Caused by Channel Box Bow',"  
dated April 25, 1990



## General Electric Company

### AFFIDAVIT

I, Janice S. Charnley, being duly sworn, depose and state as follows:

1. I am Manager, Fuel Licensing, General Electric Company, and have been delegated the function of reviewing the information described in paragraph 2 which is sought to be withheld from public disclosure and have been authorized to apply for its withholding.
2. The information sought to be withheld is the attached Safety Evaluation of the Reuse of Channels for a Second Bundle Lifetime in Peach Bottom 2, Cycle 8.
3. In designating material as proprietary, General Electric utilizes the definition of proprietary information and trade secrets set forth in the American Law Institute's Restatement of Torts, Section 757. This definition provides:

"A trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business and which gives him an opportunity to obtain an advantage over competitors who do not know or use it.... A substantial element of secrecy must exist, so that, except by the use of improper means, there would be difficulty in acquiring information.... Some factors to be considered in determining whether given information is one's trade secret are: (1) the extent to which the information is known outside of his business; (2) the extent to which it is known by employees and others involved in his business; (3) the extent of measures taken by him to guard the secrecy of the information; (4) the value of the information to him and to his competitors; (5) the amount of effort or money expended by him in developing the information; (6) the ease or difficulty with which the information could be properly acquired or duplicated by others."

4. Some examples of categories of information which fit into the definition of proprietary information are:
  - a. Information that disclosed a process, method or apparatus where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;
  - b. Information consisting of supporting data and analyses, including test data, relative to a process, method or apparatus, the application of which provide a competitive economic advantage, e.g., by optimization or improved marketability;
  - c. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality or licensing of a similar product;
  - d. Information which reveals cost or price information, production capacities, budget levels or commercial strategies of General Electric, its customers or suppliers;



## Affidavit

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- e. Information which reveals aspects of past, present or future General Electric customer-funded development plans and programs of potential commercial value to General Electric;
  - f. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection;
  - g. Information which General Electric must treat as proprietary according to agreements with other parties.
5. Initial approval of proprietary treatment of a document is typically made by the Subsection manager of the originating component, who is most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within the Company is limited on a "need to know" basis and such documents are clearly identified as proprietary.
6. The procedure for approval of external release of such a document typically requires review by the Subsection Manager, Project manager, Principal Scientist or other equivalent authority, by the Subsection Manager of the cognizant Marketing function (or delegate) and by the Legal Operation for technical content, competitive effect and determination of the accuracy of the proprietary designation in accordance with the standards enumerated above. Disclosures outside General Electric are generally limited to regulatory bodies, customers and potential customers and their agents, suppliers and licensees, and then only with appropriate protection by applicable regulatory provisions or proprietary agreements.
7. The document mentioned in paragraph 2 above has been evaluated in accordance with the above criteria and procedures and has been found to contain information which is proprietary and which is customarily held in confidence by General Electric.
8. The document mentioned in paragraph 2 above is classified as proprietary because it contains details concerning current General Electric fuel designs which were developed at considerable expense to General Electric, which are not available to other parties.
9. The information to the best of my knowledge and belief has consistently been held in confidence by the General Electric Company, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties have been made pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.
10. Public disclosure of the information sought to be withheld is likely to cause substantial harm to the competitive position of the General Electric Company and deprive or reduce the availability of profit making opportunities because it would provide other parties, including competitors, with valuable information regarding current General Electric fuel designs which were obtained at considerable cost to the General Electric Company. The manpower, computer and manufacturing resources expended by General Electric to develop the current fuel designs are valued at approximately \$8 million. In addition, the development of individual bundle and lattice designs required over 120 man-hours and approximately \$20,000 in computer resources.

Affidavit

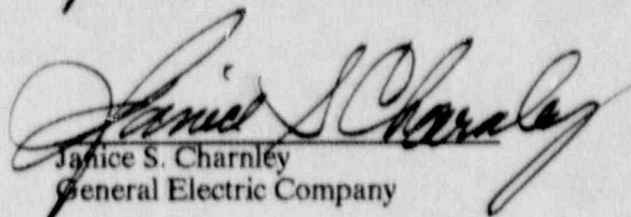
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STATE OF CALIFORNIA     }  
COUNTY OF SANTA CLARA   } ss:

Janice S. Charnley, being duly sworn, deposes and says:

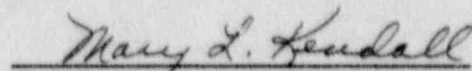
That she has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information, and belief.

Executed at San Jose, California, this 19<sup>th</sup> day of April 1990.

  
Janice S. Charnley  
General Electric Company

Subscribed and sworn before me this 19<sup>th</sup> day of April 1990.



  
Notary Public - California  
Santa Clara County