

---

---

# Closeout of IE Bulletin 79-26: Boron Loss from BWR Control Blades

---

---

Prepared by R. S. Dean, W. J. Foley, A. Hennick

PARAMETER, Inc.

Prepared for  
U.S. Nuclear Regulatory  
Commission

#### NOTICE

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, or any of their employees, makes any warranty, expressed or implied, or assumes any legal liability of responsibility for any third party's use, or the results of such use, of any information, apparatus, product or process disclosed in this report, or represents that its use by such third party would not infringe privately owned rights.

#### NOTICE

##### Availability of Reference Materials Cited in NRC Publications

Most documents cited in NRC publications will be available from one of the following sources:

1. The NRC Public Document Room, 1717 H Street, N.W.  
Washington, DC 20555
2. The Superintendent of Documents, U.S. Government Printing Office, Post Office Box 37082,  
Washington, DC 20013-7082
3. The National Technical Information Service, Springfield, VA 22161

Although the listing that follows represents the majority of documents cited in NRC publications, it is not intended to be exhaustive.

Referenced documents available for inspection and copying for a fee from the NRC Public Document Room include NRC correspondence and internal NRC memoranda; NRC Office of Inspection and Enforcement bulletins, circulars, information notices, inspection and investigation notices; Licensee Event Reports; vendor reports and correspondence, Commission papers; and applicant and licensee documents and correspondence.

The following documents in the NUREG series are available for purchase from the GPO Sales Program: formal NRC staff and contractor reports, NRC-sponsored conference proceedings, and NRC booklets and brochures. Also available are Regulatory Guides, NRC regulations in the *Code of Federal Regulations*, and *Nuclear Regulatory Commission Issuances*.

Documents available from the National Technical Information Service include NUREG series reports and technical reports prepared by other federal agencies and reports prepared by the Atomic Energy Commission, forerunner agency to the Nuclear Regulatory Commission.

Documents available from public and special technical libraries include all open literature items, such as books, journal and periodical articles, and transactions. *Federal Register* notices, federal and state legislation, and congressional reports can usually be obtained from these libraries.

Documents such as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings are available for purchase from the organization sponsoring the publication cited.

Single copies of NRC draft reports are available free, to the extent of supply, upon written request to the Division of Information Support Services, Distribution Section, U.S. Nuclear Regulatory Commission, Washington, DC 20555.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at the NRC Library, 7920 Norfolk Avenue, Bethesda, Maryland, and are available there for reference use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

---

# Closeout of IE Bulletin 79-26: Boron Loss from BWR Control Blades

---

Manuscript Completed: August 1988  
Date Published: August 1988

Prepared by  
R. S. Dean, W. J. Foley, A. Hennick

PARAMETER, Inc.  
13380 Watertown Plank Road  
Elm Grove, WI 53122

Prepared for  
Division of Operational Events Assessment  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555  
NRC FIN B8729

## ABSTRACT

Documentation is provided in this report for the closeout of IE Bulletin 79-26 on the safety-related subject of boron loss from boiling water reactor (BWR) control blades. Closeout is based on the implementation of the required actions by licensees for all 25 General Electric (GE) facilities to which the bulletin was issued for action. The bulletin was issued initially on November 20, 1979 and in slightly revised form on August 29, 1980. The NRC's concern was the safety impact of a loss of boron poison material from control blades on shutdown capability and scram reactivity. The failure mode had been identified and investigated by GE. After examination of GE's hot cell test results, calculations, assumptions and conclusions, the NRC required all BWR licensees to take five detailed actions, including submittal of written reports. On October 22, 1985, the NRC granted GE's request that "advanced longer-life control rods" (ALLCRs) be exempt from the requirements of the bulletin, except for tracking control rod life.

## TABLE OF CONTENTS

	<u>Page</u>	
Abstract	iii	
Introduction	1	
Summary	2	
Remaining Areas of Concern	2	
Criterion for Closeout of Bulletin	2	
Appendix A	Background Information and Required Actions	
	IE Bulletin 79-26 Revision 1	A-1
	Letter of 10-22-85 to J. F. Klapproth (GE) from C. O. Thomas (DL), with Enclosure	A-6
Appendix B	Documentation of Bulletin Closeout	
	Table B.1 Bulletin Closeout Status	B-1
	Reference	B-4
Appendix C	Abbreviations	C-1

CLOSEOUT OF IE BULLETIN 79-26:  
BORON LOSS FROM BWR CONTROL BLADES

INTRODUCTION

This report provides documentation for the closeout status of IE Bulletin 79-26 and its revision in accordance with the Statement of Work in Task Order 37 under NRC Contract 05-85-157-02. Documentation is based on the records obtained from the NRC Document Control System.

Bulletin 79-26 was issued on November 20, 1979 and in slightly revised form on August 29, 1980 because of the NRC's concern about a failure mode for control blades which could cause a loss of boron poison material. The safety significance of boron loss is its impact on shutdown capability and scram reactivity. Boron loss through cracks of tubular absorber rods contained within the perforated blades necessitates determination of shortened design life.

The bulletin required licensees of boiling water reactors (BWRs) to take five specific actions, including shutdown margin tests and destructive examination of the most highly exposed blade. The bulletin was forwarded for information only to all other licensees and all construction permit holders of facilities with power reactors.

The NRC's concern was based on evaluation of hot cell tests, calculations, assumptions and conclusions which had been reported by the General Electric Company (GE).

In order to extend the completion date, the bulletin was reissued as Revision 1 on August 29, 1980, only to facilities with operating BWRs. Per the letter of October 22, 1985 (see Page A-6), the NRC granted GE's request that "advanced longer-life control rods" (ALLCRs) be exempt from the requirements of the bulletin, except for tracking control rod life.

For background information and required actions, IE Bulletin 79-26 and the letter from the NRC to GE (referred to in the preceding paragraph) are included in Appendix A. Review of utility responses and NRC/Region inspection reports is documented in Appendix B for bulletin closeout. Closeout is on the basis of implementation of all five required actions as modified by the above mentioned letter. Abbreviations used in this report and associated documents are presented in Appendix C.

## SUMMARY

1. The bulletin has been closed out for all 25 facilities to which it was issued for action. These facilities are listed as follows:

Dig Rock Point 1	FitzPatrick	Peach Bottom 2,3
Browns Ferry 1,2,3	Hatch 1,2	Pilgrim 1
Brunswick 1,2	Millstone 1	Quad Cities 1,2
Cooper Station	Monticello	Susquehanna 1,2
Dresden 2,3	Nine Mile Point 1	Vermont Yankee 1
Duane Arnold	Oyster Creek 1	

Closeout for all plants listed is on the basis of implementation of bulletin requirements as verified by inspection reports (see Table B.1). The complete criterion for closeout is given below.

2. The following BWR facilities are excluded from Table B.1 of this report because they are shut down indefinitely or permanently:

Dresden 1	Humboldt Bay	La Crosse
-----------	--------------	-----------

## REMAINING AREAS OF CONCERN

There are no remaining areas of concern.

## CRITERION FOR CLOSEOUT OF BULLETIN

The bulletin is closed when the utility response and an NRC/Region inspection report for the facility indicate compliance with all five actions required by the bulletin (see pages A-3 through A-5). modified as follows:

According to the memorandum of 05-18-81 to the NRC regional directors from E. L. Jordan (NRC/HQ), "...the regions need only confirm licensee submittal of a report for satisfactory implementation of Item 4 of IEB 79-26 Revision 1 issued August 29, 1980". A specific report on Item 4 was submitted for Monticello; GE's report on destructive testing of a Vermont Yankee control blade was submitted by all other affected facilities. Technical review of the reports on Item 4 was performed by the Core Performance Branch of NRR.

## APPENDIX A

### Background Information and Required Actions

#### Notes:

1. See pages A-3 through A-5 for Revision 1 of the bulletin and required actions.
2. Only Revision 1 of the bulletin is necessary for completeness, because it contains just the following few changes from the initial issue of the bulletin:
  - a) the date of issue was changed from November 20, 1979 to August 29, 1980,
  - b) "evaluation" was changed to "elevation" in Item 4.b (see Page A-4) and
  - c) "...within one year of the date of issuance of this bulletin" was changed to "...no later than April 25, 1981" and "...the examination results provided within one calendar year of the removal of the blade " was added to the last sentence in Item 4 (see Page A-5).



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF INSPECTION AND ENFORCEMENT  
WASHINGTON, D.C. 20555

August 29, 1980

IE Bulletin No. 79-26 Rev. 1

BORON LOSS FROM BWR CONTROL BLADES

Description of Circumstances:

The General Electric Company (GE) has informed us of a failure mode for control blades which can cause a loss of boron poison material. Hot cell examinations of both foreign and domestic blades have revealed cracks near the upper end of stainless steel tubing and loss of boron from the tubes. The cracks and boron loss have so far been confined to locations in the poison tubes with more than 50 percent Boron-10 ( $B^{10}$ ) local depletion. Observed crack sizes range from a quarter to a half inch in length and from one to two mils in width.

GE has postulated that the cracking is due to stress corrosion induced by solidification of boron carbide ( $B_4C$ ) particles and swelling of the compacted  $B_4C$  as helium and lithium concentrations grow. Once primary coolant penetrates the cladding (i.e., the cracking has progressed through the cladding wall and the helium-lithium pressures are sufficient to open the crack), boron is leached out of the tube at locations with more than 50 percent  $B^{10}$  local depletion (local depletion is considered to be twice the average depletion). It was further found with similar cracking but with less than 50 percent local depletion of  $B^{10}$ , that leaching did not occur even though primary coolant had penetrated the cladding.

The cracking and boron loss shorten the design life of the control blade. According to the GE criteria the end of design life is reached when the reactivity worth of the blade is reduced by 10 percent, which corresponds to 42 percent  $B^{10}$  depletion averaged over the top quarter of the control blade. Because of the leaching mechanism, GE has reduced the allowance for  $B^{10}$  depletion averaged over the top quarter of the control blade from the 42 percent value to 34 percent.

The safety significance of boron loss is its impact on shutdown capability and scram reactivity. Although shutdown capability is demonstrated by shutdown margin tests after refueling, the calculated control blade worths used in the tests are based on the assumption that no boron loss has occurred. Reduction in scram reactivity due to boron loss could increase the severity of Critical Power Ratio (CPR) reductions during the plant transients and could increase the consequences of control rod drop accidents.

Because the locations of limiting Linear Heat Generation Rate (LHGR), CPR, and Average Planar LHGR (APLHGR) are not in controlled cells, local power limit monitoring is not affected by boron loss.

GE has evaluated the potential effect of boron loss on shutdown capability, CPR reduction and the consequences of control rod drop accidents. GE's evaluation is based on the hot cell result that no boron loss is observed until 50 percent local  $B^{10}$  depletion is attained. For each  $B_4C$  tube, complete loss of  $B_4C$  was assumed when the calculated  $B^{10}$  depletion exceeded 50 percent locally. For any blade expected to reach a  $B^{10}$  depletion greater than 34 percent during a cycle, GE assumed a  $B^{10}$  depletion distribution typical of blades at the previously defined end of design life.

Based on these evaluations GE arrived at the following conclusions:

- (a) Control rod drop accident consequences are not sufficiently sensitive to small reductions in scram reactivity to be affected by boron loss before the end of design life of the blades involved.
- (b) If no more than 26 percent of the control blades have experienced a 10 percent reduction in projected worth taking boron loss into consideration, there is a negligible effect on transient CPR reduction and MCPR limits.
- (c) If any control blades have experienced more than 10 percent reduction in projected worth, taking boron loss into consideration, the shutdown margin should be demonstrated to be at least the sum of the shutdown

margin required by Technical Specifications plus an increment sufficient to account for the potential for boron loss.

We have examined the bases for GE's conclusions, including the hot cell tests and the calculational assumptions. The preferred action is to replace all blades expected to have greater than 34 percent  $B^{10}$  depletion averaged over the upper one-fourth of the blade. However, based on our review we believe the relation between boron loss and  $B^{10}$  depletion (i.e., the observations to date show that boron loss does not occur until 50 percent local depletion of  $B^{10}$ ) is sufficiently understood to justify BWR operation on an interim basis provided the following actions have been taken by licensees.

Action to be taken by Licensees:

For all BWR power reactor facilities with an operating license:

1. The operating history of the reactor is to be reviewed to establish a record of the current  $B^{10}$  depletion averaged over the upper one-fourth of the blade for every control blade; the record is to be maintained on a continuing basis. This action is required on all reactors whether shut-down for refueling or operating.
2. Identify any control blades predicted to have greater than 34 percent  $B^{10}$  depletion averaged over the upper one-fourth of the blade by the next refueling outage.
  - a. Describe your plans for replacement of identified control blades.
  - b. Describe measures which you plan to take justifying continued operations until the next refueling specifically addressing (1) any blade with greater than 42 percent depletion averaged over the upper one-fourth of the blade; and (2) the condition where you find greater

than 26 percent of the control blades calculated to have greater than 34 percent depletion averaged over the upper one-fourth of the blade.

3. At the next cold shutdown or refueling outage, conduct shutdown margin tests to verify that:
  - a. full withdrawal of any control blade from the cold xenon-free core will not result in criticality; and
  - b. compliance with the shutdown margin requirement in a manner that accommodates the boron loss phenomenon (i.e., by including a plant specific increment in the shutdown margin that takes the potential loss of boron from control blades identified from evaluation of Item 1 into consideration).
  
4. Perform a destructive examination of the most highly exposed control blade at the end of the next cycle and provide results of the examination within one calendar year after removal of the blade. The results to be reported should include:
  - a. Tube number or identification.
  - b. The elevation of each crack in the tubing. R1
  - c. The calculated  $B^{10}$  depletion versus elevation for each tube.
  - d. The measured  $B^{10}$  loss versus elevation for each tube.
  - e. The maximum local depletion for tubes have no cracks.
  - f. The maximum local depletion for tubes having no loss of boron.

Alternately, the results of a destructive examination of a blade of similar fabrication and operational history may be provided no later than April 15, 1981. If the highest local B<sup>10</sup> depletion is less than 50 percent, this examination can be deferred until the next refueling and the examination results provided within one calendar year of the removal of the blade.

R1  
R1  
R1  
R1  
R1

5. Submit within 45 days of the date of issuance of this Bulletin, a written report of the findings as to Items (1) and (2). For facilities in a refueling outage, and all other facilities at their next refueling outage, submit the written report on Item (3) within 30 days after plant startup following the outage. A written report on Item (4) is requested within one year after removal of a control blade for destructive examination.

Reports should be submitted to the Director of the appropriate NRC Regional Office and a copy should be forwarded to the NRC Office of Inspection and Enforcement, Division of Reactor Operations Inspection, Washington, D.C. 20555

For all BWR facilities with a construction permit and all other power reactor facilities with an operating license or construction permit, this Bulletin is for information only no written response is required.

Approved by GAO, B180225 (R0072); clearance expires July 31, 1980. (Application for renewal pending before GAO.) Approval was given under a blanket clearance specifically for identified generic problems.



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

October 22, 1985

Mr. J. F. Klapproth  
Principal Licensing Engineer  
Nuclear Technologies and Fuel Division  
General Electric Company  
175 Curtner Avenue  
San Jose, California 95125

Dear Mr. Klapproth:

SUBJECT: ACCEPTANCE OF ADDENDUM TO LICENSING TOPICAL REPORT NEDE-22290,  
SUPPLEMENT 2, "ADVANCED LONGER-LIFE CONTROL ROD" (ALLCR)

On July 1, 1985 the NRC found the subject topical report to be acceptable for referencing in license applications to the extent specified and under the limitations delineated in the report and the associated NRC evaluation.

By letter dated July 31, 1985, the General Electric Company (GE), requested NRC's acceptance of its position that replacement of all-B<sub>4</sub>C control rod designs with controlled stainless steel tubing material are exempt from the requirements of IE Bulletin 79-26, with the exception of control rod life tracking. Such an exemption has been granted for the ALLCR assembly. The enclosed evaluation addendum defines the basis for our acceptance.

We do not intend to repeat our review of the matters described in the report and the addendum and found acceptable when the report and its addendum are referenced in license applications, except to assure that the material presented is applicable to the specific plant involved. Our acceptance applies only to the matters described in the report and the addendum.

In accordance with procedures established in NUPEG-0390, it is requested that GE publish accepted versions of this report, proprietary and non-proprietary, incorporating the addendum, within three months of receipt of this letter. The accepted versions shall incorporate this letter and the enclosed evaluation between the title page and the abstract. The accepted versions shall include an -A (designating accepted) following the report identification symbol.

Should our criteria or regulations change such that our conclusions as to the acceptability of the report are invalidated, GE and/or the applicants referencing the topical report will be expected to revise and resubmit their respective documentation, or submit justification for the continued effective applicability of the topical report without revision of their respective documentation.

Sincerely,

*Cecil O. Thomas*

Cecil O. Thomas, Chief  
Standardization and Special  
Projects Branch  
Division of Licensing

Enclosure:  
As stated

ADDENDUM TO ALLCR TOPICAL REPORT EVALUATION

IE Bulletin 79-26 was issued in response to instances of loss of boron from control rods due to tube cracking. It required that a record be kept of the current B-10 depletion averaged over the upper quarter of the rod for every control rod, that a program be established to replace control blades having greater than 34 percent B-10 depletion averaged over the upper quarter of the blade (including an allowance for boron loss), that shutdown margin measurements made at refueling outages should have an allowance for any predicted boron loss during the succeeding cycle, and that a destructive examination be performed of a highly exposed all-B<sub>4</sub>C rod.

In order to address the root cause of the boron loss phenomenon tube cracking GE performed an investigation and, as a result, has begun replacing the tubing in all-B<sub>4</sub>C rods with a high purity controlled stainless steel alloy which is not susceptible to cracking. They conclude that the requirements of bulletin 79-26 need no longer be met for all-B<sub>4</sub>C rods with the controlled stainless steel tubing. We concur with that conclusion. Our concurrence is based on the following:

1. The exposure of each control rod will still be tracked to determine when a 10 percent reduction in rod worth occurs.
2. Boron loss from the control blade due to cracked tubing is not expected to occur. An extensive surveillance program is being carried out on the B<sub>4</sub>C rods in GE Hybrid I control blades. These blades are being irradiated as part of a lead test program in the Peach Bottom reactor to monitor the susceptibility of these rods to cracking (see MEDE-22290-A for details and the staff's evaluation).
3. Shutdown margin determinations are required by plant Technical Specifications during startup after each refueling and will continue to be performed. However, allowance for boron loss will not be required. The requirement to replace rods before exceeding a 10 percent reduction in relative worth will assure adequate protection.
4. A long term surveillance program will be conducted on rods containing the new tubing. This will consist of a visual examination after the sixth year and for every other cycle after that. This will enhance the likelihood that incipient problems will be discovered.

APPENDIX B

Documentation of Bulletin Closeout



TABLE B.1 BULLETIN CLOSEOUT STATUS

Facility	Utility	Docket	Facility Status, 08-29-80	NRC Region	Utility Response Date	Inspection Report and Date	Closeout Status
Big Rock Point 1	CPC	50-155	OL	III	01-04-80 10-10-80	80-19(01-27-81)	Closed
Browns Ferry 1	TVA	50-259	OL	II	01-04-80 11-25-80	80-20(05-20-80)	Closed
Browns Ferry 2	TVA	50-260	OL	II	01-04-80 11-26-80	80-15(05-20-80)	Closed
Browns Ferry 3	TVA	50-296	OL	II	01-04-80 11-25-80	80-16(05-20-80)	Closed
Brunswick 1	CP&L	50-325	OL	II	01-03-80 09-25-80 04-13-81	84-08(05-17-84)	Closed
Brunswick 2	CP&L	50-324	OL	II	01-03-80 09-25-80 04-13-81	84-08(05-17-84)	Closed
Cooper Station	NPPD	50-298	OL	IV	01-08-80 07-02-81	80-09(07-09-80)	Closed
Dresden 2	CECO	50-237	OL	III	01-04-80 05-19-80 04-15-81	84-03(04-10-84)	Closed
Dresden 3	CECO	50-249	OL	III	01-04-80 05-19-80 04-15-81	84-02(04-10-84)	Closed

See notes at end of table.

TABLE B.1 (contd)

Facility	Utility	Docket	Facility Status 08-29-80	NRC Region	Utility Response Date	Inspection Report and Date	Closeout Status
Duane Arnold	IELPCO	50-331	OL	III	01-03-80 05-08-80 03-24-81 04-16-81	81-27(03-15-82)	Closed
FitzPatrick	PASNY (NYPA)	50-333	OL	I	01-02-80 04-14-81	81-09(05-27-81)	Closed
Hatch 1	GPC	50-321	OL	II	01-04-80 02-13-80 02-25-80	81-23(10-16-81)	Closed
Hatch 2	GPC	50-366	OL	II	01-04-80 02-13-80 02-25-80	81-23(10-16-81)	Closed
Monticello 1	NNECO	50-245	OL	I	01-02-80 10-14-80 04-15-81	80-17(10-27-80)	Closed
Monticello	NSP	50-263	OL	III	12-14-79 04-25-80 03-03-81 05-01-81 05-22-81	84-01(02-21-84)	Closed
Nine Mile Point 1	NMP	50-220	OL	I	12-17-79 05-02-80	82-19(11-12-82)	Closed
Oyster Creek 1	JCP&L/ GPUN	50-219	OL	I	01-04-80	80-07(03-20-80)	Closed

See notes at end of table.

TABLE B.1 (contd)

Facility	Utility	Docket	Facility Status 08-29-80	NRC Region	Utility Response Date	Inspection Report and Date	Closeout Status
Peach Bottom 2	PECO	50-277	OL	I	12-17-79 08-28-80 10-06-80	85-25(08-26-85)	Closed
Peach Bottom 3	PECO	50-278	OL	I	12-17-79 10-06-80 12-24-80	85-21(08-26-85)	Closed
Pilgrim 1	BECO	50-293	OL	I	01-04-80 04-21-81	82-19(08-12-82)	Closed
Quad Cities 1	CECO	50-254	OL	III	01-04-80 05-19-80 04-15-81	85-04(03-11-85)	Closed
Quad Cities 2	CECO	50-265	OL	III	01-04-80 05-19-80 04-15-81	85-04(03-11-85)	Closed
Susquehanna 1	PP&L	50-387	See Note 4	I	02-11-81 07-16-81 06-18-85	81-29(01-27-82)	Closed
Susquehanna 2	PP&L	50-388	See Note 4	I	02-11-81 07-16-81 11-21-86	50-387/81-29 (01-27-82)	Closed (Note 5)
Vermont Yankee 1	VYNP	50-271	OL	I	12-27-79	81-13(08-13-81)	Closed

See notes on following page.

Notes for Table B.1:

1. Facility Status is based on Reference 1 (see below).
2. For Facility Status, "OL" designates "Operating License".
3. Refer to Page 2 for the Bulletin Closeout Criterion.
4. Susquehanna 1,2 were added per the letter of 11-26-80 to N. W. Curtis (PP&L) from B. H. Grier (NRC/RI), in order to resolve licensing questions.
5. Inspection Report 50-387/81-19 applies specifically to Susquehanna Unit 1, only. It has been verified by telephone communication between the NRR technical monitor and the resident inspector that the IR applies to Unit 2 as well as Unit 1 in regard to the bulletin.

REFERENCE

1. United States Nuclear Regulatory Commission, Licensed Operating Reactors, Status Summary Report, Data as of 02-29-88, NUREG-0020, Volume 12, Number 3, March 1988.

## APPENDIX C

### Abbreviations

APLHGR	Average Planar Linear Heat Generation Rate
BECO	Boston Edison Company
BWR	Boiling Water Reactor
CECO	Commonwealth Edison Company
CPC	Consumers Power Company
CP&L	Carolina Power and Light Company
CPR	Critical Power Ratio
CR	Contractor Report
DL	Division of Licensing (NRC)
GAO	Government Accounting Office
GE	General Electric Company
GPC	Georgia Power Company
GPUN	GPU Nuclear Corporation
HQ	Headquarters
IE	(See NRC/IE)
IEB	Inspection and Enforcement Bulletin (NRC)
IELPCO	Iowa Electric Light and Power Company
IR	Inspection Report (NRC/IE)
JCP&L	Jersey Central Power and Light Company
LER	Licensee Event Report
LHGR	Linear Heat Generation Rate
MCPR	Minimum Critical Power Ratio
MAPLHGR	Maximum Planar Linear Heat Generation Rate
NMP	Niagara Mohawk Power Company
NNECO	Northeast Nuclear Energy Company
NPPD	Nebraska Public Power District
NRC/IE	Nuclear Regulatory Commission/ Office of Inspection & Enforcement
NRR	Office of Nuclear Reactor Regulation (NRC)
NSP	Northern States Power Company
NYPA(PASNY)	New York Power Authority
NU	Northeast Utilities
OL	Operating License
PASNY (NYPA)	Power Authority of the State of New York
PECO	Philadelphia Electric Company
PP&L	Pennsylvania Power & Light Company
R	Region (NRC)
RPV	Reactor Pressure Vessel
SDM	Shutdown Margin
TVA	Tennessee Valley Authority
VYNP	Vermont Yankee Nuclear Power Corporation

NRC FORM 335 (2-84) NRCM 1102 3201, 3202 <b>BIBLIOGRAPHIC DATA SHEET</b>		U.S. NUCLEAR REGULATORY COMMISSION 1. REPORT NUMBER (Assigned by U.S. Code Vol. No., if any) NUREG/CR-5189 PARAMETER IE-171	
2. TITLE AND SUBTITLE Closeout of IE Bulletin 79-26: Boron Loss from BWR Control Blades		3. LEAVE BLANK	
5. AUTHOR(S) R. S. Dean, W. J. Foley, A. Hennick		4. DATE REPORT COMPLETED MONTH: August      YEAR: 1988	
7. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) PARAMETER, Inc. 13380 Watertown Plank Road Elm Grove, Wisconsin 53122		6. DATE REPORT ISSUED MONTH: August      YEAR: 1988	
10. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code) Division of Operational Events Assessment Office of Nuclear Reactor Regulation U.S. Nuclear Regulatory Commission Washington, DC 20555		8. PROJECT/TASK/WORK UNIT NUMBER B8729	
12. SUPPLEMENTARY NOTES		11. TYPE OF REPORT Technical	
13. ABSTRACT (200 words or less) Documentation is provided in this report for the closeout of IE Bulletin 79-26 on the safety-related subject of boron loss from boiling water reactor (BWR) control blades. Closeout is based on the implementation of the required actions by licensees for all 25 General Electric (GE) facilities to which the bulletin was issued for action. The bulletin was issued initially on November 20, 1979 and in slightly revised form on August 29, 1980. The NRC's concern was the safety impact of a loss of boron poison material from control blades on shutdown capability and scram reactivity. The failure mode had been identified and investigated by GE. After examination of GE's hot cell test results, calculations, assumptions and conclusions, the NRC required all BWR licensees to take five detailed actions, including submittal of written reports. On October 22, 1985, the NRC granted GE's request that "advanced longer-life control rods" (ALLCRs) be exempt from the requirements of the bulletin, except for tracking control rod life.		9. FIN OR GRANT NUMBER B8729	
14. DOCUMENT ANALYSIS - KEYWORDS/DESCRIPTORS Closeout of IE Bulletin 79-26		15. AVAILABILITY STATEMENT Unlimited	
16. IDENTIFIERS/OPEN-ENDED TERMS		17. SECURITY CLASSIFICATION (This page) Unclassified (This report) Unclassified	
		18. NUMBER OF PAGES	
		19. PRICE	

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

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE, \$300

SPECIAL FOURTH CLASS RATE  
POSTAGE & FEES PAID  
USNRC  
PERMIT No. G-67

120555139217 1 1AN11S  
US NRC-OARM-ADM  
DIV FOIA & PUBLICATIONS SVCS  
RRRES-PDR NUREG  
P-210  
WASHINGTON DC 20555

NUREG/CR-5189

CLOSEOUT OF IE BULLETIN 79-26: BORON LOSS FROM BWR CONTROL BLADES

AUGUST 1988