

**Summary of the NUMARC Initiative  
To Address Substandard Non-Safety-Related  
Molded Case Circuit Breakers**

November 1990

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Washington, DC 20006-2496**

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To Address Substandard Non-Safety-Related  
Molded Case Circuit Breakers**

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## ABSTRACT

This report summarizes the activities, results and conclusions of the NUMARC initiative to address substandard non-safety-related (NSR) molded case circuit breakers (MCCBs).

Concerns regarding the use of substandard MCCBs were originally identified by a series of NRC information notices leading to issuance of NRC Bulletin 88-10, "Nonconforming MCCBs," on November 22, 1988, requiring utilities to address safety-related MCCBs. The nuclear power industry, through NUMARC, undertook the NSR MCCB initiative in recognition of the potential impact of substandard MCCBs on the balance-of-plant.

The NUMARC MCCB initiative has been completed by all operating and near-term nuclear plants. The objective to identify and isolate the largest practicable number of suspect MCCBs has been accomplished through implementation of the NUMARC initiative, and generic concerns regarding balance-of-plant MCCBs are resolved. This report presents the bases for this conclusion.

In addition, Appendix C to this report provides a summary assessment of NRC Bulletin 88-10 results. The completion by all utilities of the conservative actions requested by the Bulletin provides adequate assurance that MCCBs in and available for safety-related service are genuine and suitable for their intended service.

Significantly, as part of responding to both the NRC Bulletin and NUMARC initiative, all utilities have taken appropriate measures to protect against future ingress of MCCBs of uncertain origin.

The findings of the NUMARC initiative and, in our opinion, the NRC Bulletin do not substantiate the original concern that a significant number of substandard MCCBs were in service and stock at nuclear power plants. We conclude that the industry has achieved comprehensive resolution (SR and NSR) of substandard MCCB concerns.

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SUMMARY OF THE NUMARC INITIATIVE  
TO ADDRESS SUBSTANDARD NON-SAFETY-RELATED (NSR)  
MOLDED CASE CIRCUIT BREAKERS (MCCBs)

**BACKGROUND**

NRC Information Notice (IN) 88-46 (and Supplements 1-4)<sup>1</sup>, "Licensee Report of Defective Refurbished Circuit Breakers," identified concerns about the presence of substandard MCCBs at nuclear plants. On November 22, 1988, NRC issued Bulletin 88-10, "Nonconforming MCCBs," to address concerns related to safety-related (SR) MCCBs. On November 17, 1988, the NUMARC Board of Directors voted to participate in a coordinated effort to identify suspect MCCBs in the balance-of-plant (BOP), remove them from service and stock and protect against their future use at nuclear plants. The bases for pursuing the MCCB initiative included:

- o utility and NRC findings from IN 88-46 suggesting an indeterminate number of substandard MCCBs were present at nuclear plants,
- o a perception that the BOP, rather than SR systems, would be primarily impacted by substandard MCCBs,
- o acknowledgement of shared industry and NRC concerns regarding the potential failure of substandard NSR MCCBs causing challenges to plant safety systems, fire or personal injury, and
- o a desire to address BOP concerns separately from SR MCCBs, i.e., outside the framework of Bulletin 88-10.

The MCCB initiative was communicated to utilities under NUMARC letter dated December 20, 1988 and is provided for reference as Appendix A.

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<sup>1</sup> NRC Information Notice (IN) 88-46 was issued on July 8, 1988; IN 88-46, Supplement 1, was issued July 21, 1988; IN 88-46, Supplement 2, was issued December 30, 1988; IN 88-46, Supplement 3, was issued June 8, 1989; IN 88-46, Supplement 4, was issued September 11, 1989.

## NUMARC INITIATIVE FORMAT

The intent of the MCCB initiative was to identify and isolate the largest practicable number of suspect MCCBs without exhaustive levels of document review or unnecessarily assuming large numbers of MCCBs are suspect. The initiative was composed of five elements as follows:

1. Review for direct and indirect procurement activity with suppliers identified by the NRC in IN 88-46;
2. Inspect warehouse stock to identify suspect MCCBs;
3. Address installed MCCBs to the extent possible, if warranted based on Elements 1 and 2;
4. Implement procurement controls for future purchases of MCCBs; and
5. Follow-up actions by industry, as appropriate.

It was the underlying philosophy of the initiative that the nature of MCCBs installed in the BOP and the need for further actions would be inferred from the findings of the procurement review and warehouse inspection. Another important aspect of the initiative was to protect against reintroduction of substandard MCCBs in the future.

An ad hoc advisory committee was formed to assist in considering the appropriate industry response to issues related to substandard electrical equipment, including development of the MCCB initiative. The committee consisted of utility individuals with engineering, procurement and quality assurance expertise.

## IMPLEMENTATION

To support the consistent implementation of initiative activities, NUMARC held an industry workshop on April 10, 1989. Manufacturer experts

participated in the workshop to provide information on issues related to substandard MCCBs.

Guidelines were developed to support the warehouse inspection activity, with the assistance of the major MCCB manufacturers. Utilities were encouraged to discuss MCCB discrepancies with manufacturer contacts, and utility personnel made extensive use of this opportunity.

Information provided by each utility was compiled in order to assess overall industry results from the initiative. The results and conclusions from this assessment are presented in this report.

Utilities are in the process of dispositioning suspect MCCBs identified by the initiative. The major manufacturers are supporting the dispositioning activity (by accepting, evaluating and disposing of returned MCCBs) in order to assure that substandard MCCBs are not returned to the marketplace.

#### **MCCB INITIATIVE - OVERALL CONCLUSIONS**

The initiative has heightened industry awareness of issues related to the procurement and maintenance of MCCBs, independent of their safety classification. It is worth noting that response to concerns about substandard MCCBs has been comprehensive, including measures taken by utility users, distributors and manufacturers<sup>2</sup>. The major manufacturers have indicated that the nuclear power industry has been among the most aggressive in resolving substandard MCCB concerns.

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<sup>2</sup> Among the actions of the MCCB manufacturers has been the development of revised maintenance and testing guidance for MCCB users through the National Electrical Manufacturers Association (NEMA). NEMA Standards Publication AB4-199X, "Guidelines for Inspection and Preventative Maintenance of MCCBs Used in Commercial and Industrial Applications," is expected to be made available for use in 1991.

The overall conclusions of the initiative are as follows:

- o All nuclear utilities participated in consistent and coordinated fashion under the NUMARC MCCB initiative to effectively address concerns relative to substandard MCCBs in the BOP. The initiative isolated from stock and service the largest practicable number of suspect NSR MCCBs.
- o The results of the initiative did not substantiate the concern that a potentially large number of substandard MCCBs were in stock or installed in the BOP. Conservatively, only 3.2 percent of 36,597 stock NSR MCCBs were judged suspect. This percentage is expected to be even lower after completion of final utility and manufacturer evaluations. As a result of the initiative, utilities have a high degree of confidence that stock MCCBs available for service are genuine.

Figure 1 illustrates the distribution of NSR MCCB inventories among nuclear plant sites at the outset of the initiative. Figure 2 illustrates the findings of the warehouse inspection activity (Element 2) performed at all but one site. (At this one site, all stock MCCBs were treated within the scope of Bulletin 88-10 and so were not visually inspected.) The higher percentage findings indicated on Figure 2 for a small number of sites reflects either the small size of MCCB inventories, overly conservative warehouse inspections and/or the capture by the inspections of MCCBs previously used in the plant.

- o Of all MCCBs determined to have originated from NRC identified suppliers, over 90 percent are on hold or in known NSR service pending replacement/disposition. The balance, as a consequence of the less rigorous recordkeeping typical of BOP activities, are not specifically accounted for, i.e., the remaining MCCBs are in indeterminate NSR service or are no longer in use.

FIGURE 1

# NUMARC MCCB INITIATIVE NSR MCCB INVENTORIES

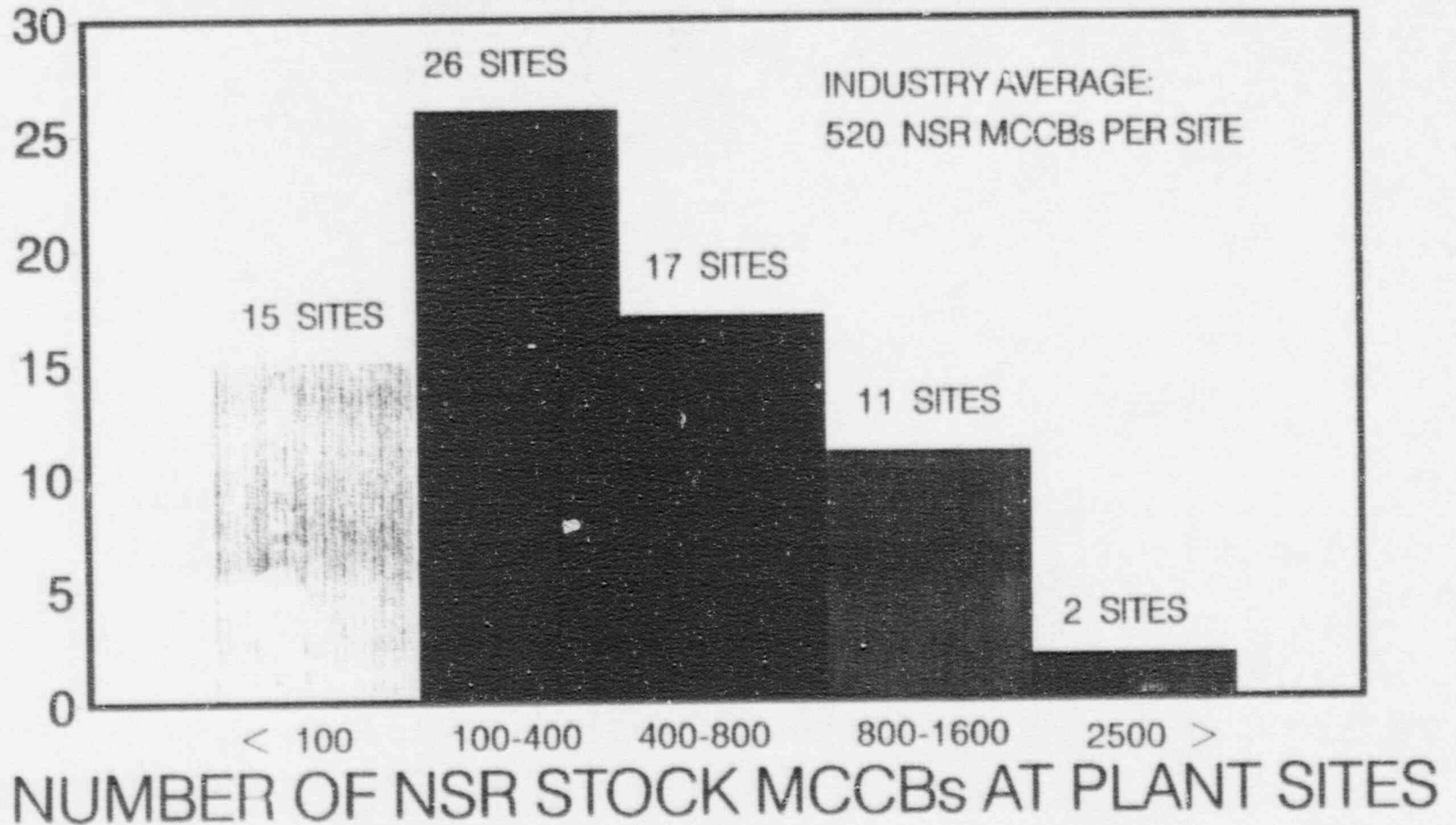
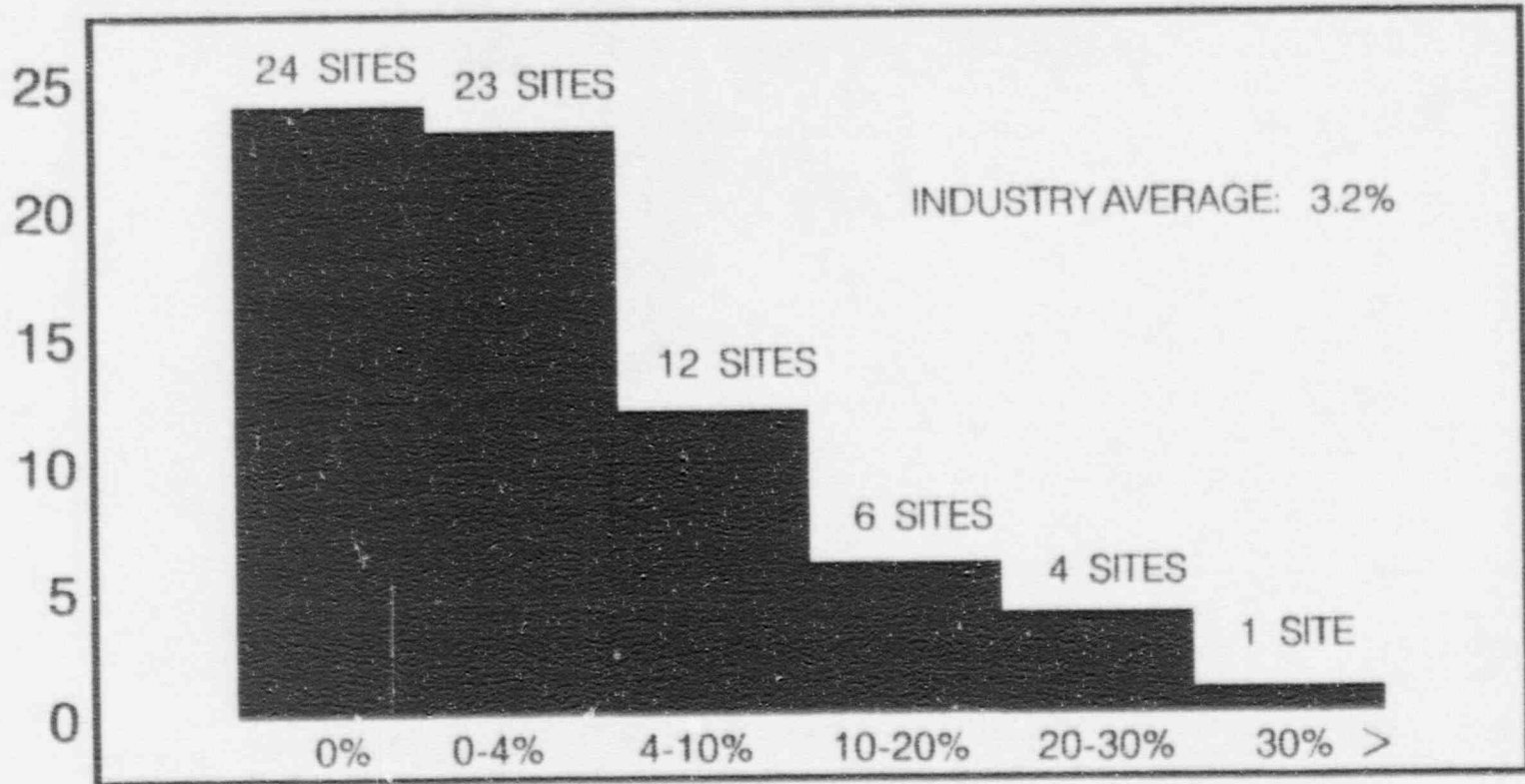




FIGURE 2

# NSR MARC NSR MCCB INITIATIVE WAREHOUSE INSPECTION FINDINGS



SUSPECT PERCENTAGE OF NSR MCCB STOCK



- o All utilities are implementing appropriate procurement controls to protect against future ingress of substandard MCCBs at nuclear plants.

## COMPREHENSIVE RESOLUTION (SR AND NSR) OF MCCB CONCERNS

NRC Bulletin 88-10 and the NUMARC MCCB initiative were implemented in parallel by utilities, assuring that MCCB concerns were comprehensively addressed. Appendix 3 to this report provides a summary assessment of Bulletin 88-10 results. The findings of the NRC Bulletin and NUMARC initiative do not substantiate the original concern that a significant number of substandard MCCBs were in service and stock at nuclear power plants.

With concerns related to installed, stock and future MCCBs effectively addressed by utility actions in response to the NRC Bulletin and NUMARC initiative, we conclude that the industry has achieved comprehensive resolution of substandard MCCB concerns.

## RESULTS AND CONCLUSIONS OF THE FIVE INITIATIVE ELEMENTS

### ELEMENT 1 - PROCUREMENT REVIEW

Utility personnel reviewed procurement records for the previous five years to identify any direct or indirect purchase activity with NRC-identified suppliers, including drop shipments. To accomplish the indirect review, utilities queried their primary electrical suppliers (distributors) regarding possible dealings with NRC-identified suppliers. While NRC-identified suppliers are known to have provided both proper and refurbished MCCBs, all MCCBs identified via Element 1 were conservatively considered suspect.

## Results

- o Utilities identified 1,114 MCCBs originating from NRC-identified suppliers based on review of direct and indirect procurement activity.
- o Virtually all procurement activity with NRC-identified suppliers was indirect, i.e., through distributors. The findings suggest this procurement activity may have peaked in the 1986-87 time frame.
- o The bulk of suspect MCCBs identified were concentrated at relatively few sites.
- o The vast majority of distributors reported no associations with NRC-identified suppliers.
- o Fifty (50) sites reported no direct or indirect procurement from NRC-identified suppliers; ten (10) more identified five or fewer MCCBs linked to NRC-identified suppliers.
- o Over 90 percent of MCCBs originating from NRC-identified suppliers were either:
  - isolated in the warehouse;
  - previously removed from service; or
  - accessible for replacement/disposition by the utility

The balance, as a consequence of the less rigorous recordkeeping typical of BOP activities, are not specifically accounted for, i.e., the remaining MCCBs are in indeterminate NSR service or are no longer in use.

## Conclusions

- o Results do not indicate that a significant percentage of MCCBs supplied to nuclear plants originated from NRC-identified suppliers.
- o Results indicate that MCCBs from NRC-identified suppliers were not evenly distributed among the industry. Rather, deliveries of suspect MCCBs were primarily via a small number of local suppliers and involved relatively few sites.
- o The overwhelming majority of MCCBs determined to have originated from NRC-identified suppliers are not in service or are accessible for appropriate disposition.

## ELEMENT 2 - WAREHOUSE INSPECTION

Utilities were provided generic and vendor specific guidance to facilitate external inspection of all NSR MCCBs in stock. This guidance, "Guidelines for the Identification of Suspect MCCBs," dated April 26, 1989, is provided for reference as Appendix B. To compensate for the uncertainty inherent in any such inspection process, utility personnel were conservative in their judgements of individual MCCBs, that is, if there was doubt about origin or condition, MCCBs were considered suspect and placed on hold pending additional information or disposition.

## Results

- o Of 36,597 individual MCCBs examined, 1,194 or 3.2 percent were judged suspect. These are in addition to MCCBs identified by Element 1. All suspect MCCBs are on hold. The number of MCCBs considered suspect has trended downward as minor discrepancies are resolved through follow-up inspections and manufacturer consultations. See also Figures 1 and 2.

- o Based on the conditions noted on Warehouse Inspection Data Sheets provided to NUMARC, it is estimated that fewer than one-third of MCCBs judged suspect may have actually been refurbished. The other two-thirds (estimated) were conservatively captured by the inspection process due to minor discrepancies (not indicative of tampering) or due to previous use in the plant.

### Conclusions

- o The warehouse inspection process was effective in identifying and isolating potentially substandard MCCBs.
- o High confidence has been restored that stock MCCBs available for NSR service are genuine.

### ELEMENT 3 - INSTALLED MCCBs

Where specific installed MCCBs were called into question based on findings from Elements 1 or 2, utility personnel are proceeding with locating, assessing and dispositioning them.

### Results

- o Assessment and disposition of installed MCCBs was initiated based primarily on findings from the procurement review, Element 1.
- o As indicated in the Element 1 results, this activity was concentrated at a few sites and was highly successful. Of 338 suspect MCCBs potentially in service, 268 (79 percent) were accessible for appropriate disposition<sup>3</sup>. The balance, as a consequence of the less rigorous recordkeeping typical of BOP

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<sup>3</sup> It is noteworthy that this high degree of traceability to installed locations was achieved despite the lack of rigorous recordkeeping requirements for BOP activities.

activities, are not specifically accounted for, i.e., the remaining MCCBs are in indeterminate NSR service or are no longer in use. In most cases, accessible MCCBs are being replaced. In a few cases, utilities plan additional evaluations of both the MCCB condition and application to determine proper dispositioning.

### Conclusions

- o Utility efforts were effective in determining the installed location of suspect MCCBs.
- o Suspect MCCBs identified in service are being replaced or properly dispositioned according to schedules determined by the utility.

### ELEMENT 4 - PROCUREMENT CONTROLS

Utilities were requested to establish effective procurement controls to ensure MCCBs received were genuine.

### Result

- o All utilities are implementing appropriate procurement controls for NSR MCCBs (e.g., specifying "new," improving receipt inspection<sup>4</sup>, assuring use of authorized suppliers, etc.).

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<sup>4</sup> Several utilities have incorporated certain aspects of the NUMARC MCCB Inspection Guidelines (Appendix 2) into receipt inspection activities. Due to the likelihood of routine production and style changes by MCCB manufacturers, receipt inspection should not focus on the full detail contained in the Guidelines. Rather, focus should be on gross indications of fraud such as shoddy packaging, photocopied labels, improper terminal hardware, etc. It is, of course, recommended that acceptance be contingent on review of shipping papers demonstrating traceability to the circuit breaker manufacturer.

## Conclusion

- o The industry has taken appropriate measures to protect against future ingress of substandard MCCBs at nuclear plants.

## ELEMENT 5 - FOLLOW-UP ACTIVITIES

Appropriate follow-up actions were recommended based on the outcome of the other initiative elements. Since the initiative findings did not substantiate widespread or generic concerns, the recommended follow-up actions (typically for further inspection of MCCBs initially judged suspect) were limited to a few specific sites. In most cases, more detailed inspection of suspect MCCBs was accomplished by phone consultations with manufacturers. In one case involving a large number of suspect MCCBs, arrangements were made for manufacturer representatives to visit the plant site to perform the additional MCCB evaluations.

NUMARC is facilitating the industry-wide return of suspect MCCBs to the original circuit breaker manufacturers in order to ensure proper disposal. The evaluation of suspect MCCBs is continuing in two phases as part of the MCCB return process. First, utility personnel have been encouraged to make final determinations on suspect MCCBs via manufacturer consultations in order to minimize the extent of returns. And second, manufacturers have indicated their intent to assess individual MCCBs as they are returned and advise NUMARC of their findings. The overall findings from these manufacturer evaluations are expected to be a useful measure of the effectiveness of industry MCCB inspections and the degree of conservatism therein. MCCB manufacturers will ensure proper disposal of substandard MCCBs returned by utilities.



## APPENDIX A

### INDUSTRY INITIATIVE TO ADDRESS CONCERNS REGARDING SUBSTANDARD NON-SAFETY-RELATED CIRCUIT BREAKERS AT NUCLEAR POWER PLANTS

#### INTRODUCTION

The following is an industry proposal that addresses shared industry and NRC concerns regarding the possibility that substandard molded case circuit breakers are in service or intended for service (in stock or on order) at nuclear power plants. The NRC has issued Bulletin 88-10, "Nonconforming Molded Case Circuit Breakers," that requires utilities to address concerns relating to safety-related applications. This initiative represents a coordinated industry program to address the concerns relating to the use of potentially substandard breakers in non-safety-related (NSR) service. These concerns include the potential for NSR circuit breaker failures causing fires, compromising personnel safety or propagating to and ultimately challenging safety-related systems. Emphasis will be placed on the identification and removal of suspect breakers from service and stock and initiation of improved procurement practices to ensure that only new and proper breakers are installed in the future.

NRC Information Notice 88-46 and its Supplement 1 described the activities of five California companies who may have supplied a significant number of improperly refurbished circuit breakers to the nuclear industry. (Five additional suppliers were recently identified by the NRC Staff as being similar to those named in IN 88-46.) The circumstances relating to one case involving receipt by a nuclear facility of clearly substandard molded case circuit breakers from one of the suspect suppliers are detailed in the Notice. In the course of NUMARC's inquiries into the extent and implications of IN 88-46, it became clear that suspect breakers were in NSR service or in NSR stock at nuclear facilities. NUMARC began at that stage to develop a program to appropriately address this issue.



The proposed initiative, detailed below, combines a review of procurement activity with known suspect suppliers with a warehouse inspection of NSR molded case circuit breaker stock. The result is an initiative which will most efficiently identify the largest number of questionable circuit breakers without exhaustive levels of document review or unnecessarily assuming that large number of circuit breakers are suspect. An equally important objective to be achieved by this initiative is the assurance that no further suspect circuit breakers will be introduced into service at nuclear facilities.

## DISCUSSION

This proposed initiative contains five primary elements:

1. Procurement document review for all direct or indirect NSR purchase activity with identified suspect suppliers in the last 5 years.
2. Inspection of warehouse stock based on industry criteria of all NSR molded case circuit breakers and removal from circulation any which appear used, tampered or from (1), above.
3. Plant walkdown to locate installed NSR breakers called into question by (1) and (2) above.
4. Initiation of procurement controls to ensure that all molded case circuit breakers accepted at nuclear plants in the future, including orders which are pending, are new.
5. Assessment and disposition of the suspect molded case circuit breaker population will be developed by NUMARC based on the nature and size of the population established through Elements 1, 2 and 3.

These five program elements are described further below. A flowchart depicting the process for this initiative is provided as Attachment 1.

Element 1. Procurement Document Review

The following suppliers, all of which were named in Information Notice 88-46 and its Supplement 1, have been identified as sources of substandard molded case circuit breakers:

- o General Circuit Breaker & Electric Supply, Inc.,
- o HLC Electric Supply Co., Inc.,
- o Pencon International, Inc., doing business as General Magnetics/Electric Wholesale,
- o California Breakers, Inc., and
- o Anti-Theft Systems, Inc., doing business as ATS Circuit Breakers and as AC Circuit Breaker-Electrical Supply.

NUMARC has been informed that the NRC is preparing a new information notice that will identify five more suppliers that should be considered in this group. The additional suppliers are:

- o Molded Case Circuit Breaker Inc.,
- o Rosen Electric Equipment,
- o Panelboard Specialties,
- o Luckow Circuit Breaker, and
- o Dan Luckow Electric.

All of the above are California companies. Utilities should add to this list any additional supplier who is known to have supplied or may have supplied refurbished molded case circuit breakers to their nuclear facility(s) and should provide such information to NUMARC.

Refurbished (suspect) circuit breakers may have been supplied to nuclear plants either directly through purchase orders placed with one of the identified suppliers or indirectly through local distributors. Utilities are requested to review their procurement records for the past 5 years to identify any direct or indirect purchase activity with the identified suppliers, including drop shipments (orders placed with a distributor but delivered directly from a third party).

A thorough utility review of indirect procurement activity with suspect suppliers is likely to require the cooperation of primary electrical distributors. Each nuclear facility should pose the following recommended questions to its electrical distributors:

1. Have you purchased or received items directly or indirectly from any of the suspect suppliers? If yes, continue with questions 2 and 3.
2. Have you supplied such items to my nuclear facility(s) in the past 5 years via drop shipment, from your warehouse or as part of a larger assembly?
3. Which items specifically (Purchase Order, make/model, quantities, etc.), and who was the original supplier of the items?

We suggest that utilities make these or equivalent inquiries to their five favored electrical suppliers including vendors who have supplied, for modifications in the past 5 years, NSR motor control centers, panelboards or other complete assemblies containing circuit breakers not of their own manufacture.

The result of these efforts will be the identification of any number of purchase orders directly or indirectly involving the suspect suppliers. Items delivered under these purchase orders are to be considered suspect with regard to their performance capability and should be removed from service and from stock.

## Element 2. Inspection of Warehouse Stock

Element 1 can be expected to identify a set of molded case circuit breakers which, by originating from a questionable source, have an increased likelihood of being remanufactured. However, it is recognized that additional steps are required to address concerns regarding as yet unidentified suppliers who may have supplied faulty breakers.

This program element calls for the careful external inspection of all NSR circuit breakers in nuclear plant warehouses or other holding areas for any indication of tampering or for indication that the breaker was assembled by other than the circuit breaker manufacturer (CBM). Expertise of the breaker manufacturers in the form of inspection guidance specific to their products will be provided by NUMARC and should be used to properly perform the inspections. Plant personnel unsure of the source or condition of a particular breaker based on the inspection criteria should conservatively consider that breaker questionable and place it on hold to prevent use pending ultimate disposition.

The supplier(s) of clearly altered, refurbished or otherwise nonstandard circuit breakers should be established if possible through review of procurement records. (It should be noted that multiple suppliers could have contributed to the questionable breakers in a given warehouse bin through multiple orders.) Breakers traceable to the CBM can be reinstated as active warehouse inventory. Should this process identify an additional supplier of suspect molded case circuit breakers to those considered in Element 1, consideration should be given to reviewing circuit breaker procurement activity with that supplier as suspect. Utilities should identify to NUMARC additional suspect suppliers identified during the conduct of Element 2.

## Summary of Elements 1 and 2

Elements 1 and 2 will identify a specific population of suspect breakers at each nuclear plant based on their (1) suspect point of origin; or (2) outward appearance of having been previously used or refurbished. This

approach can be expected to identify suspect breakers without calling into question a broad section of the general circuit breaker population and without disproportionate commitment of utility resources. These suspect circuit breakers should be placed on hold to prevent use pending ultimate disposition.

We are asking you to report to NUMARC, via the data sheets provided as Attachment 2, pertinent information regarding suspect circuit breakers following completion of the procurement review and warehouse inspection. NUMARC will compile this information from utilities and direct appropriate follow-up action based on the nature of the overall population of suspect breakers. This follow-up action will be coordinated with the identified manufacturers.

#### Element 3. Plant Walkdown

A prudent course of action, based on results from the procurement review and warehouse inspection, would be to locate those installed molded case circuit breakers called into question by those activities. It is understood that traceability of suspect NSR breakers to their installed location may not be possible in all cases. However, to the extent that suspect breakers have been installed as replacements to support plant operations in the last 5 years and can be located in specific NSR service as a result of Elements 1 and 2, NUMARC would suggest that such breakers be replaced and retained for possible future evaluation. In the event a proper replacement cannot readily be obtained, it may be possible for the utility to establish the proper working condition of the breaker by performing a series of additional evaluations with the participation of the breaker manufacturer. Utilities are asked to inform NUMARC in cases where such special manufacturer evaluations are pursued.

#### Element 4. Initiation of Procurement Controls

For future purchase orders, specification should be made that all breakers supplied shall be new, and utilities should ensure, to the extent possible, that items received have come from the circuit breaker manufacturer. Pending orders should be amended to reflect these requirements as well.

Several utilities have already taken such steps to ensure the acceptance of only new and proper devices on site; a key element of this initiative is that all nuclear facilities should take the necessary steps toward this goal. NUMARC will be meeting with industry organizations and vendors and will provide additional procurement guidance as appropriate.

#### Element 5. Population Assessment and Subsequent Action

Elements 1 through 4 will succeed in removing from service or potential service the largest reasonably achievable number of suspect circuit breakers and initiate controls to prevent future use of nonstandard breakers in nuclear facilities. An appropriate course for subsequent action with regard to the identified suspect breakers will be developed by NUMARC based on the size and nature of the population. Given a sufficiently large population, a coordinated sampling based inspection/test program, supported by the breaker manufacturers, may be recommended by NUMARC in an effort to assess the performance capabilities of the overall population. Assessment of such test results (including root cause failure analyses) would recognize and account for normal historical failure rates of new breakers and would form the basis for additional actions.

Identification of a relatively small population of suspect breakers would indicate that suspect breakers no longer represent a significant concern to the industry, and NUMARC would likely recommend that the population be discarded and no further actions be taken.

#### **IMPLEMENTATION**

Elements 1, 2, 3 and 5 are expected to be completed within six months of issuance of this program to the industry. Steps to implement Element 4 should be taken immediately.

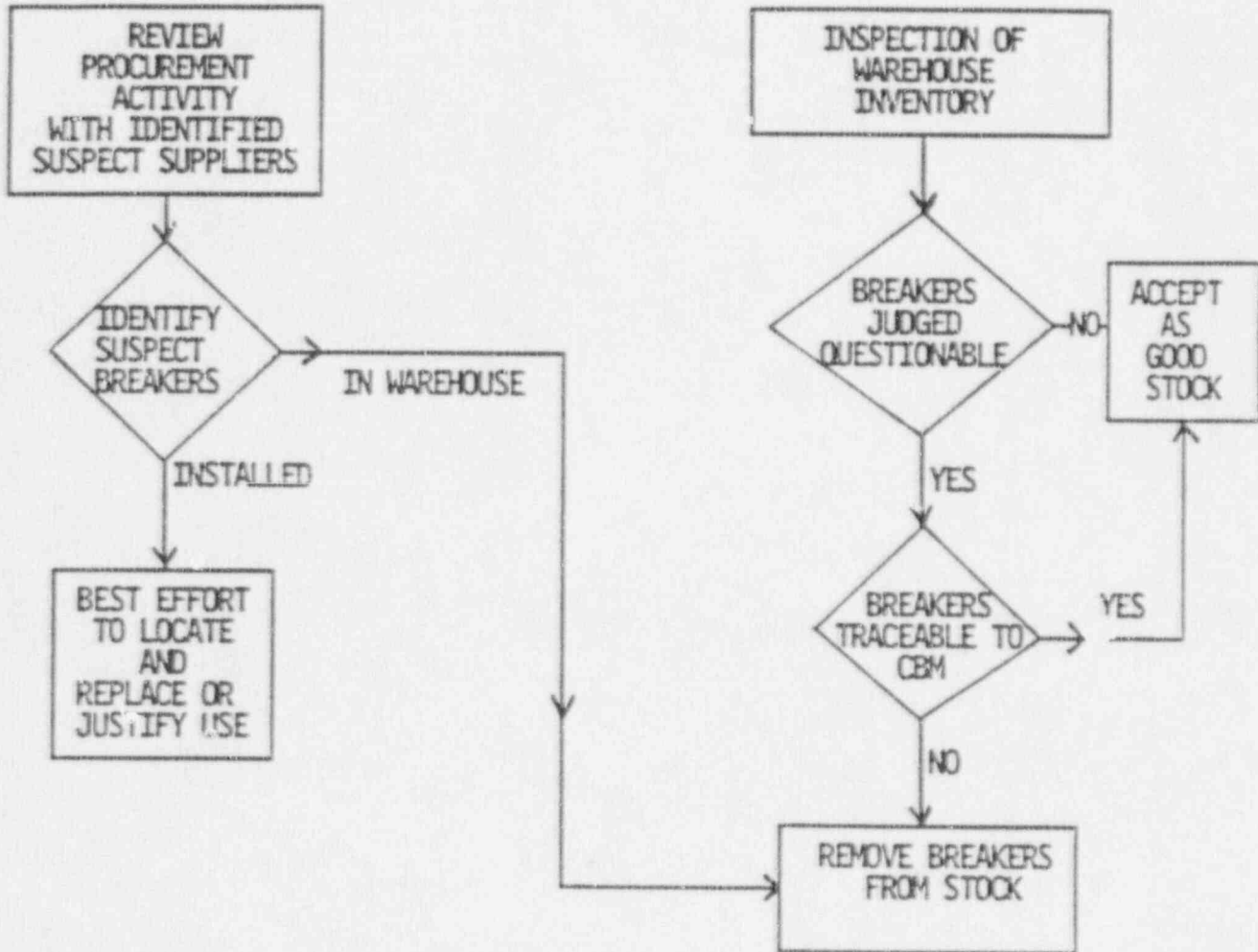
NUMARC will be the focal point for the industry during implementation of this initiative. Utilities are asked to inform NUMARC, by means of data

sheets provided in Attachment 2, of their progress in identifying and isolating suspect breakers through procurement reviews, warehouse inspections and plant walkdowns. NUMARC will compile this feedback by means of a data base and attempt to decipher trends in the reported data. NUMARC intends to quickly inform utilities via NUCIFAR NETWORK or direct mail of such trends (geographical or with regard to a particular breaker type or a recurring additional source of suspect breakers) and may direct appropriate shifts in emphasis for ongoing utility investigations. NUMARC will also periodically notify the NRC Staff of the status of the initiative and will attempt to factor into the effort, as appropriate, any new information which the Staff can provide.

Based on a review of all industry reports, NUMARC will propose appropriate additional actions or suggest that the concerns associated with refurbishment of molded case circuit breakers have been satisfactorily resolved. NUMARC will present the initiative results and conclusions in a final meeting with the NRC Staff.



FLOWCHART OF INDUSTRY INITIATIVE  
TO ADDRESS NON-SAFETY-RELATED  
MOLDED CASE CIRCUIT BREAKERS





## Instructions for Procurement

## Review Data Sheet

1. Provide as much as possible of the purchase order and source information requested for each make/model breaker on suspect purchase orders. Each make/model on a given order requires a separate line. Provide the current and voltage ratings for each.
2. If possible, provide the current status of the breakers on the suspect order and the quantity at each status. Use the status codes at the bottom of the table. For example, of 5 breakers of the same make/model on one suspect purchase order, 3 continue in some known NSR service pending disposition within this initiative and 2 are still in their warehouse bin. Enter under the "STATUS" column, "3/D, 2/E."

Attach additional sheets as necessary to describe the status of suspect breakers.

3. Although not provided for by the data sheets, it is suggested that utilities maintain a record of suspect breakers that are removed from service. (i.e., service dates, specific service description and results of any post installation testing that may have been performed)

4. Following completion of the procurement review, send the resulting data sheets to:

NUMARC  
Russell Bell  
1776 Eye Street, N.W. Suite 300  
Washington, D.C. 20006-2496

The submittal of preliminary or incomplete data sheets is encouraged. Final data sheets may follow at a later time. Please indicate when data sheet information should be considered preliminary.

PROCUREMENT REVIEW DATA SHEET - SUSPECT MOLDED CASE CIRCUIT BREAKERS  
 (Instructions on reverse)

UTILITY NAME \_\_\_\_\_ PLANT NAME \_\_\_\_\_ CONTACT NAME \_\_\_\_\_

DESCRIPTION		PURCHASE ORDER INFORMATION			SOURCE INFORMATION		QTY/STATUS
MANUFACTURER/MODEL	RATINGS	PO #	DATE	QTY	DISTRIBUTOR	SUPPLIER	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							

STATUS A = removed from service & retained; B = removed from service & discarded; C = installed in  
 CODES: undetermined NSR service; D = continuing in known NSR service pending disposition; E = NSR stock on hold

MOLDED CASE CIRCUIT BREAKER INVENTORY INSPECTION WORKSHEET

PLANT NAME \_\_\_\_\_ PREPARER \_\_\_\_\_ PHONE \_\_\_\_\_

For each warehouse bin location containing suspect MCCBs, the following condensed worksheet should be utilized for noting nonstandard conditions of MCCBs that cause their removal from stock. Forward completed worksheets to Russell Bell at NUMARC, 1776 I Street N.W., Washington D.C., 20006-2496.

Warehouse Location \_\_\_\_\_ Stock No. \_\_\_\_\_ Quantity on Hand \_\_\_\_\_

Make/Model \_\_\_\_\_ poles \_\_\_\_\_ Volts \_\_\_\_\_ Amps \_\_\_\_\_

Deficiency

Quantity Deficient

- 1. Additional (non-manufacturer) label present \_\_\_\_\_
- 2. Altered information on carton \_\_\_\_\_
- 3. Photocopied labels \_\_\_\_\_
- 4. Improper, missing or altered mfr or UL label \_\_\_\_\_
- 5. Missing or improper date code \_\_\_\_\_
- 6. Improper or inconsistent ratings \_\_\_\_\_
- 7. Missing, improper or inconsistent terminal hardware \_\_\_\_\_
- 8. Obviously used appearance \_\_\_\_\_
- 9. Missing seals (if applicable) \_\_\_\_\_
- 10. Other (briefly describe below) \_\_\_\_\_

Total # suspect/  
remv'd fm stock \_\_\_\_\_

Comments or Additional Information:

SOURCE INFORMATION (to be added following the inspection): To the extent possible, indicate below from left to right the chain of purchase of the above suspect MCCBs. If necessary, indicate multiple potential chains of purchase (e.g., two distinct POs contributing to one warehouse bin). Indicate "unknown" or "NA" where necessary.

\_\_\_\_\_ >>>> \_\_\_\_\_ >>>> \_\_\_\_\_ >>>> Nuclear  
suspect supplier intermediary(s) vendor on PO/date Plant



## APPENDIX B

### GUIDELINES FOR IDENTIFYING SUSPECT MOLDED CASE CIRCUIT BREAKERS

#### INDUSTRY INITIATIVE - ELEMENT 2

#### INTRODUCTION

The following guidance should be used in the conduct of Element 2, "Inspection of Warehouse Stock," of NUMARC's industry initiative on NSR molded case circuit breakers (MCCBs). The guidance provides considerations for determining whether circuit breakers in your stock might have been refurbished or previously used. Manufacturers have provided specific guidance relative to distinguishing features of their products when new, and NUMARC has integrated this information into the guideline that follows.

The warehouse inspection is intended to be a gross screening process to identify and remove from active stock those MCCBs of questionable nature, i.e., appearing previously used or refurbished. The suspect nature of MCCBs determined based on conservative application of this guideline can be confirmed or refuted following completion of the inspection through additional manufacturer guidance or by establishing traceability to the original manufacturer. Be advised that more detailed guidance is forthcoming from the circuit breaker manufacturers to be available by mid-April 1989. Guidance, which may be provided through an industry workshop, may be useful in making final determinations on the nature of MCCBs captured by this initial inspection.

#### USING THESE INSPECTION GUIDELINES

Before beginning the inspection of MCCBs in your warehouse facilities, the GENERAL CONSIDERATIONS that follow should be well understood. This guideline provides methodologies for identifying nonstandard MCCBs from each



of the four major manufacturers: Siemens, Square D, General Electric, and Westinghouse. A set of generic considerations is offered as well for making determinations for other MCCBs.

For each manufacturer and the generic case, one set of considerations is provided that should be cause for removal from active stock MCCBs failing one or more of these criteria. A second set of considerations is offered that may suggest that an MCCB is used or refurbished, and further evaluation may be warranted in such cases. As noted earlier, subsequent evaluation of MCCBs captured by this initial screening process will benefit from additional guidance forthcoming from the manufacturers and may result in the return to stock of some initially screened MCCBs.

Based on the following general and specific considerations, it is the overall judgement of the personnel performing the inspection that determines individual MCCBs may be proper or suspect.

## GENERAL CONSIDERATIONS

### Preparation for Inspection

1. According to the major manufacturers, there are no "authorized" refurbishers of MCCBs. When disassembly and modification of an MCCB has occurred, with or without fraudulent intent, proper functioning of the MCCB cannot be assured. It is the intent of Element 2 to remove from active stock used MCCBs and those suspected to have been refurbished.
2. Results of Element 1, "Procurement Review," may identify MCCBs in the warehouse originating from a suspect supplier with an increased likelihood of being used or refurbished. Careful examination of these may provide insights into characteristics of non-standard MCCBs in your inventory.
3. Personnel performing warehouse inspections are urged to be conservative in their judgements of MCCBs. It is again emphasized that this


screening process is intended as a gross effort to remove the largest number of questionable MCCBs from stock. It is recommended that when uncertain about an MCCB, it be set aside for further, more deliberate evaluation at a later time.

4. Utilities that routinely return MCCBs from service back into warehouse stock can retain these as active stock provided that (1) it can be determined that such MCCBs were "used" in the plant and not by a third party, and that (2) the MCCBs do not appear refurbished based on this inspection guidance.
5. Establish which MCCBs in your inventory are no longer produced by their manufacturer (obsolete). These are more likely to be previously used or to have been refurbished and warrant careful examination, especially if obtained recently. For example, General Electric reports that MCCB styles TEF and THEF were last produced in 1972 and style TF MCCBs were last produced in 1965. Siemens reports that the FJ frame was phased out in 1982 and E frames produced since 1984 are available only in a 480 volt rating vs. 600 volts prior to 1984. Obsolete Westinghouse frames include E, EA, EH, F and FA.
6. Collect catalog data on the products in your inventory for quick reference during the inspection.
7. If your utility chooses this effort as an opportunity to streamline its inventory of MCCBs (purge excess carried-over construction stock or MCCB styles not in use at your facility), such surplus items should be returned to the original manufacturer to ensure they do not improperly reenter the marketplace.

#### Conducting the Inspection

1. A key first step in examining a group of identical MCCBs, such as those within the same stock bin, is to look for differences within the lot. Comparison of the lot to an MCCB known to be genuine and of similar

vintage is recommended as discussed in item 2, below. Is the packaging similar? Are logos, labels and inks the same? Are date codes present in the same location and format? Differences among a group of identical MCCBs (especially if of similar vintage) may indicate that suspect MCCBs are present. Note, however, that for MCCBs of differing vintage, such differences could be the result of changes implemented at the factory.

2. It can be most useful, when examining a particular MCCB or group of MCCBs, if a proper MCCB of similar vintage is available for comparison. Such an MCCB known to be genuine may be available based on Bulletin 88-10 traceability review. Comparison of packaging, labeling and general appearance can then proceed with greater confidence. Note that MCCBs of the same frame size but with differing ratings should still have similar packaging, labeling and appearance.
3. MCCBs removed from stock in the course of Element 2 should be retained for possible further evaluation.
4. All MCCBs should contain proper Underwriters Laboratories (UL) information. Note that for magnetic trip only MCCBs, the appropriate UL symbol is the "reverse-RU," i.e., . The Canadian Standards Association (CSA) symbol may also be present.
5. The presence and condition of packaging is offered only as a preliminary consideration for approaching the inspection of individual MCCBs. In all cases, inspection of the MCCB itself, not just its packaging, is required.
6. Work performed or authorized by the manufacturer to add accessories (such as a bell alarm, shunt trip, etc.) to a standard MCCB product may cause certain of these inspection criteria to be violated. It is not the intent of this guidance to capture properly accessorized MCCBs. Properly modified MCCBs should retain their professional appearance, but the presence of additional labels, modified, typed or handwritten information, covered labels, etc., cannot be ruled out. Information,

such as a catalog number suffix, that reflects the accessorized condition should be present on the MCCB itself (or on the accessory). As with standard MCCBs, be wary of obsolete styles, missing date codes, missing UL certification, inconsistent information, photocopied labels, etc.

7. Single-pole MCCBs represent a special aspect of the overall MCCB issue. Since they are generally riveted and extremely low cost, 1-pole MCCBs are not believed to be refurbished, according to the major manufacturers. However, it is likely that used or surplus 1-pole MCCBs have been improperly resold as new to distributors and end users. Therefore, the inspection guidance emphasizes the identification of refurbished 2- and 3-pole MCCBs, and a more limited inspection of 1-pole MCCBs is appropriate.

Notwithstanding specific 1-pole criteria contained in this guidance, the following subset of generic considerations should be applied to the inspection of 1-pole MCCBs:

1. No additional (non-manufacturer) label should be present.
  2. UL information should be present.
  3. Labels should not have a photocopied appearance.
  4. There should be no altered manufacturer information.
  5. The MCCB, particularly at terminations, should not appear used.
  6. As always, be particularly cautious of obsolete MCCB styles.
8. An Inventory Inspection Worksheet (superceding the Inventory Inspection Data Sheet supplied with the industry initiative on December 20, 1988) is attached for your use during the inspection and for reporting inspection findings and available source information to NUMARC.

## CONSIDERATIONS FOR INSPECTION

### Generic

Any of the following conditions is cause for determining an MCCB suspect and removing it from active stock.

1. Presence of an additional label (generally on the side or back of the MCCB) indicating the MCCB has been "reconditioned" or any label not from the nameplate manufacturer.
2. Presence of altered information on the exterior of the MCCB carton.
3. "Grainy" or photocopied appearance of manufacturer or UL labels.
4. Missing or altered manufacturer or UL labels.
5. Absence of a date code anywhere on the MCCB. Note that some single-pole MCCBs (such as Westinghouse) are not date coded.
6. Inconsistent rating information between MCCB label(s) and handle.
7. Missing or improper terminal hardware inconsistent with purchase requirements or catalog information.
8. Inconsistent terminal hardware among poles.
9. Obviously used appearance where previous service is unknown.

The following conditions may suggest that an MCCB has been used or refurbished and that further evaluation (e.g., traceability review or consultation with the manufacturer) may be warranted.

1. Be suspicious of an MCCB from a carton in poor condition or one that has been opened and taped shut.

2. Be suspicious if an MCCB delivered under a recent purchase order is an obsolete model or has a date code that is several years old.
3. Generally, there should be a mixture of metallic finishes among various parts of the terminal lug, such as the screw, shell, nut, etc. A uniform appearance may suggest that the entire lug had been removed and replaced by refurbishers. GE is one exception to this; all GE terminals have an overall "silvery" appearance.
4. Excessive scratches or wear on terminal hardware or the presence of wire marks may suggest the MCCB has been previously used.

### Siemens - Gould - ITE

#### Product Line Information

Regarding evolution of their product line, Siemens provided the following information:

The FJ frame began to be phased out in 1982 and never bore either the Siemens-Allis or Siemens name.

Since 1984, the E frame has been available only with a 480 volt rating vs. 600 volts previously. E frames whose model numbers begin with "H" are gray; otherwise, the frame molding material is black.

Be suspicious that obsolete MCCBs obtained in recent years may have been previously used or refurbished.

#### Manufacturer Specific Considerations

1. Verify the presence of a four-digit date code stamped in ink on the front (2- and 3-pole) or side (1-pole). The first two digits of the

date code represent the year of the manufacture in reverse roughly prior to 1985. After 1985, the first two digits represent the year and may or may not be reversed. Note: QB and BQ (residential type) MCCBs do not have date codes on them.

2. Verify that E frame MCCBs produced since 1984 properly reflect their 480 volt rating, not 600 volts.
3. Generally, two diagonally opposite cover screws should be sealed with a black tar-like substance (in some cases, white seal material may be present). If one or none of the holes is sealed, examine the cover screw heads and screw channels for scratches that might indicate that the MCCB had been opened, and reevaluate other aspects of the MCCB.

Any of the following conditions is cause for determining Siemens/Gould/ITE MCCBs suspect and removing them from active stock.

1. Presence of an additional label (generally on the side or back of the MCCB) indicating the MCCB has been "reconditioned" or any non-manufacturer label.
2. Presence of altered information on the exterior of the MCCB carton.
3. "Grainy" or photocopied appearance of manufacturer or UL labels.
4. Missing or altered manufacturer or UL labels.
5. Absence of a date code on the front (2- and 3-pole) or side (1-pole) of each Siemens industrial use MCCB (frames E, FJ, etc.).
6. Inconsistent ratings information between MCCB label(s) and handle.
7. Missing or improper terminal hardware in conflict with purchase requirements or catalog information.



8. Inconsistent terminal hardware among poles or terminal hardware appears all of a single metallic finish.
9. Obviously used appearance where previous service is unknown.
- 10.\* Improper ratings, e.g., 600 volt E frame after 1984 vs. 480 volts.

The following conditions may suggest that an MCCB has been used or refurbished and that further evaluation (e.g., traceability review or consultation with the manufacturer) may be warranted.

1. Be suspicious of an MCCB from a carton in poor condition or one that has been opened and taped shut.
2. Be suspicious if an MCCB delivered under a recent purchase order is an obsolete model or has a date code that is several years old.
3. Excessive scratches or wear on terminal hardware or the presence of wire marks may suggest the MCCB has been previously used.
- 4.\* Absence of sealing compound over diagonally opposite cover screws (2- and 3-pole MCCBs).

\*Manufacturer-specific inspection criteria

#### Square D

##### Manufacturer Specific Considerations

1. If present, verify that the Square D carton has a white, yellow and blue label including manufacturer information and a yellow Square D logo on a blue background.
2. Prior to mid-1985, all Square D MCCBs included a yellow side label with a blue (not black) logo. Verify that this side label contains the

catalog number in "dot matrix" print (not typed) and a four or more digit ink stamped date code. [Note: for certain special order MCCBs (accessorized, EQ, etc.), the catalog number on the yellow side label may appear in other than dot matrix form, i.e., typed, stamped or handwritten.] Manufacturer information including the number of poles and UL information is contained on multiple faceplate labels.

3. After mid-1985, 2- and 3-pole Square D MCCBs included a large gray faceplate label containing all manufacturer information (except for UL which remained a separate label). Refurbishers have not been known to duplicate this gray label, so its presence is a strong indication that an MCCB is genuine.
4. With the advent of the gray label, the inclusion of the catalog number and date code on the yellow side label was phased out so that only the blue logo remained. A small number of MCCBs with gray labels were produced with yellow side labels still including the catalog number in "dot matrix" print (verify) and ink-stamped date code (verify).
5. Single-pole MCCBs, after mid-1985, could not accommodate the large gray label and so retained a small faceplate label and the yellow side label with the catalog number and date code. Miniature 1-pole MCCBs (residential type) do not get a yellow side label (or date code) at all.
6. Yellow side labels should appear precision cut with uniformly rounded corners and centered logo. Tearing of the side label should reveal that it is yellow ink on white paper, not yellow paper throughout.

Any of the following conditions is cause for determining Square D MCCBs suspect and removing them from active stock.

1. Presence of an additional label (generally on the side or back of the MCCB) indicating the MCCB has been "reconditioned" or any non-Square D label.

2. Presence of altered information or lack of a proper label on the exterior of the Square D carton.
3. "Grainy" or photocopied appearance of the manufacturer or UL labels.
- 4.\* Missing or altered manufacturer or UL information, e.g., the number of poles is not identified.
- 5.\* Inconsistent ratings information between the MCCB label(s) and handle. The rating on the handle should be in raised numerals.
6. Missing or improper terminal hardware inconsistent with purchase requirements or catalog information.
7. Inconsistent terminal hardware among poles or terminal hardware appears all of a single metallic finish.
8. Obviously used appearance where previous service is unknown.
- 9.\* Presence of a black (not blue) logo on the yellow side label, the side label is imprecisely cut, or the side label is yellow paper (not white paper with yellow ink).
- 10.\* Missing date code on MCCBs which do not have the large gray faceplate label.
- 11.\* Presence on standard Square D products of other than a "dot matrix" catalog number on the yellow side label.

\*Square D-specific criteria

The following conditions may suggest that an MCCB has been used or refurbished and that further evaluation (e.g., traceability review or consultation with the manufacturer) may be warranted.

1. Be suspicious of an MCCB from a box in poor condition or one that has been opened and taped shut.
2. Be suspicious if an MCCB delivered under a recent purchase order is an obsolete model or has a date code that is several years old.
3. Excessive scratches or wear on terminal hardware or the presence of wire marks may suggest the MCCB has been previously used.

### General Electric

#### Product Line Information

General Electric (GE) reports that MCCB styles TEF and THEF were last produced in 1972 and style TF MCCBs were last produced in 1965. Be suspicious that obsolete MCCBs obtained in recent years may have been previously used or refurbished.

#### Manufacturer Specific Considerations

1. GE advises that authentic GE rating labels are always printed complete. Verify that there is no typed or computer generated information on GE labels. Verify that GE labels include the complete company signature: "GENERAL (MONOGRAM) ELECTRIC."

GE labels are printed with white lettering on black background for the following catalog number series:

TQD, TEB, TEC, TED, THED, TFJ, TFK, THFK, TJJ, TJK, and THJK

Other catalog series may have either white or black lettering.

2. Verify the presence and proper format of GE date codes as follows:

All GE MCCBs produced since 1960 have a "Code Date" stamped with silver ink on the front of 2- and 3-pole MCCBs and on the front or side of 1-pole MCCBs. The code date consists of a letter, three numerals and a symbol. For example:

D	8	10	+
Manufacturing Location	Year	Week	Decade

For GE code dates, there are three possible decade symbols:

(-) 1960-1969; (\*) 1970-1979; (+) 1980-1989

and eight possible Manufacturing Location letters:

B, C, D, E, G, H, J, M

On rare occasions, a prefix or suffix letter may have been added by GE for internal control purposes.

Some GE MCCBs produced in the 1960s and early 1970s did not include the manufacturing location letter. The decade symbol was included before and after the three numerals in such cases as follows:

-810-

\*204\*

3. General Electric TQD, TEB, TEC, TED, THED, TFC, TJC, TJD, TJJ and TKC series MCCBs are sealed by filling one cover screw hole with a tar-like substance. Verify that the sealed cover screw is as follows:

3-pole, top left of four screws

2-pole, top of two screws

1-pole, top of two screws

On other GE MCCB series, cover screws are not sealed.

4. Except for miniature styles, MCCBs produced from approximately 1973 through mid-1987 should have been received bearing a yellow CAUTION label relating to the connection of aluminum conductors. The label should include the Drawing Number 192A7029P29. Note that MCCB installation may cause destruction or removal of this label.
5. Any non-miniature GE MCCB with a catalog number beginning with "TH" should have a red handle.

Any of the following conditions is cause for determining GE MCCBs suspect and removing them from active stock.

1. Presence of an additional label (generally on the side or back of the MCCB) indicating the MCCB has been "reconditioned" or any non-GE label.
2. Presence of altered information on the exterior of the GE carton.
3. "Grainy" or photocopied appearance of the manufacturer or UL labels.
4. Missing or altered manufacturer or UL labels.
- 5.\* Absence of a date code on the front of 2- and 3-pole MCCBs, on the side or front of 1-pole MCCBs, or on the side of GE miniature MCCBs.
6. Inconsistent rating information between the MCCB label(s) and handle.
7. Missing or improper terminal hardware inconsistent with purchase requirements or catalog information.
8. Inconsistent terminal hardware among poles.
9. Obviously used appearance where previous service is unknown.

- 10.\* Presence of typed or computer generated information on the GE label.
- 11.\* Missing GE monogram logo on faceplate label.
- 12.\* Missing cover screw seal on TQD, TEB, TEC, TED, THED, TFC, TJC, TJD, TJJ and TKC series MCCBs.

The following conditions may suggest that an MCCB has been used or refurbished and that further evaluation (e.g., traceability review or consultation with the manufacturer) may be warranted.

1. Be suspicious of an MCCB from a box in poor condition or one that has been opened and taped shut.
2. Be suspicious if an MCCB delivered under a recent purchase order is an obsolete model or has a date code that is several years old.
3. Excessive scratches or wear on terminal hardware or the presence of wire marks may suggest the MCCB has been previously used.
- 4.\* Be suspicious if the yellow CAUTION label relating to aluminum conductors is absent on MCCBs produced between 1973 and 1987.

\*GE-specific inspection criteria.

### Westinghouse

#### Product Line Information

Westinghouse (W) E, EA, EH, F and FA series MCCBs are obsolete and no longer produced. Be suspicious that obsolete MCCBs obtained in recent years may have been previously used or refurbished.



## Manufacturer Specific Considerations

1. If present, the original W box should have a blue and white W label (including logo) which fits easily on one end of the box, i.e., doesn't hang over or wrap around one side.
2. There should be no protective wrap on factory original W MCCBs.
3. Paper faceplate labels are generally used on 400 ampere and larger frames. Below 400A, W manufacturer information is generally stamped in white ink on the MCCB. If a paper faceplate label is present, verify that a separate, small UL label (5/8" rounded square) is affixed over it. Counterfeiters typically photocopy the original W label which then makes the UL label integral to it. NOTE: W FB and HFB magnetic only MCCBs are not UL listed, and therefore UL information does not appear on them.
4. Except for W series CA and DA MCCBs, there should be no typed-in or computer-generated information on W labels.
5. For paper labeled (generally 400A and up) 2- and 3-pole MCCBs, verify that an ink stamped date code is on the back. Ink stamped faceplate labels include the date code, and on these MCCBs, there may or may not be a date code on back. Single-pole W MCCBs do not have date codes.
6. MCCBs with an "alpha" date code are 12 or more years old. A straight forward numeric date code has been used since roughly 1977, i.e., 830714 would indicate a production date of 7/14/83.
7. Roughly prior to 1985, one of the top two cover screws on the front of 2- and 3-pole MCCBs was filled with a black sealant. Since roughly 1985, a circular W "factory sealed" sticker has been affixed over the side seam between base and cover. Single-pole MCCBs are riveted and have no such seals.

8. Verify that the W "circle-W" logo impressed in the molded case has just one (not two) circles around it.

Any of the following conditions is cause for determining W MCCBs suspect and removing them from active stock.

1. Presence of an additional label (generally on the side or back of the MCCB) indicating the MCCB has been "reconditioned" or any non-W label.
2. Presence of altered information on the exterior of the MCCB carton.
3. "Rainy" or photocopied appearance of the manufacturer or UL labels.
- 4.\* Missing or altered manufacturer or UL labels. NOTE: No UL information is required or expected on W FB and HFB magnetic only MCCBs.
- 5.\* Inconsistent rating information between the MCCB label(s) and handle. The rating on the handle should be indented.
6. Missing or improper terminal hardware inconsistent with purchase requirements or catalog information.
7. Obviously used appearance where previous service is unknown.
- 8.\* Inconsistent terminal hardware among poles or terminal hardware appears all of a single metallic finish.
- 9.\* Presence of integral, not separate, paper UL label indicating that the original paper label had been photocopied.
- 10.\* Missing date code on back of 2- and 3-pole MCCBs having a paper rating label.
- 11.\* Presence of a double circle around the W logo impressed in the molded case.

- 12.\* Presence of typed-in or computer generated information on W labels (except for series CA and DA).

\*W-specific inspection criteria

The following conditions may suggest that an MCCB has been used or refurbished and that further evaluation (e.g., traceability review or consultation with the manufacturer) may be warranted.

- 1.\* Be suspicious of an MCCB from a carton in poor condition, one that has been opened and taped shut or one that contains protective wrap around the MCCB. Also, if the label on the carton is not blue and white or it wraps around one side.
2. Be suspicious if an MCCB delivered under a recent purchase order is an obsolete model or has a date code that is several years old.
3. Excessive scratches or wear on terminal hardware or the presence of wire marks may suggest the MCCB has been previously used.
- 5.\* Absence of seals; black sealant over one of the top two MCCB cover screws (pre-1985) or "factory sealed" sticker over seam (post-1985).
- 6.\* Be suspicious if a paper label is present on MCCBs rated below 400A.

\*W-specific inspection criteria

## APPENDIX C

### SUMMARY ASSESSMENT OF NRC BULLETIN 88-10: NONCONFORMING MOLDED CASE CIRCUIT BREAKERS (MCCBs)

#### BACKGROUND

NRC Information Notice 88-46 (and Supplements 1-4)<sup>1</sup>, "Licensee Report of Defective Refurbished Circuit Breakers," raised concerns about the presence of substandard MCCBs at nuclear plants. On November 22, 1988, NRC issued Bulletin 88-10 to request utility actions to address safety-related (SR) MCCBs. The SR focus of the Bulletin reflected NUMARC's intention to take the lead on addressing non-safety-related MCCBs via the NUMARC MCCB initiative.

Based on preliminary review of utility responses, NRC issued Bulletin 88-10, Supplement 1, (dated August 3, 1989) to clarify areas of specific concern to the Staff. In particular, NRC clarified the concept of verifiable traceability.

#### BULLETIN 88-10 FORMAT

The criteria utilized for determining the acceptability of SR MCCBs was verifiable traceability to circuit breaker manufacturers. If inadequate traceability existed and non-traceable MCCBs could not be demonstrated acceptable by test<sup>2</sup>, utilities were requested to review the traceability of MCCBs purchased and installed in the five years preceding the Bulletin. Non-

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<sup>1</sup> NRC Information Notice (IN) 88-46 was issued on July 8, 1988; IN 88-46, Supplement 1, was issued July 21, 1988; IN 88-46, Supplement 2, was issued December 30, 1988; IN 88-46, Supplement 3, was issued June 8, 1989; IN 88-46, Supplement 4, was issued September 11, 1989.

<sup>2</sup> If traceability of SR stock MCCBs was between 80 and 100 percent, non-traceable MCCBs could be tested to demonstrate acceptability. If less than 90 percent of MCCBs tested successfully, Bulletin actions relative to installed MCCBs were requested.

traceable installed MCCBs were to be replaced or demonstrated acceptable by test. Supplement 1 clarified that utilities should also take corrective action on MCCBs installed prior to the original five year time frame if the MCCBs were determined to have been part of non-traceable purchase orders.

#### OVERVIEW OF BULLETIN 88-10 RESPONSES

Several utilities determined that 100 percent of SR MCCBs in stock were traceable to circuit breaker manufacturers and thus satisfied the Bulletin. Most utilities that established greater than 90 percent traceability utilized the clarification that NRC would consider the circumstances of utilities reporting only a very small number of non-traceable SR stock MCCBs. These utilities considered that concerns raised by the Bulletin had been resolved without fully implementing requested actions to address installed MCCBs. Other utilities, except those few successfully testing non-traceable MCCBs, committed to address installed MCCBs per the Bulletin. Many utilities opted not to test non-traceable MCCBs due to (1) concerns regarding the propriety of the tests as basis for acceptance, (2) the expectation that excessive failures would result due to inconsistency in test equipment and implementation, and (3) the expense associated with testing.

The following summary information is based on utility responses to Bulletin 88-10 obtained by NUMARC:

#### Approaches to implementing Bulletin 88-10:

The Bulletin was implemented for 112 operating or near-term units at 72 sites. Utility implementation was generally on a site basis, however at two two-unit sites, the Bulletin was implemented separately for each unit.

- o Thirty (30) units at twenty-three (23) sites established 90 to 100 percent traceability among stock MCCBs and considered bulletin activities complete.

- o Five (5) units at four (4) sites successfully tested non-traceable stock MCCBs such that further bulletin requested actions were not applicable<sup>3</sup>.
- o The remaining seventy-seven (77) units at forty-five (45) sites addressed installed MCCBs per the Bulletin based on insufficient traceability and/or unsuccessful testing of stock MCCBs. Activities to address installed MCCBs are either complete or are proceeding according to schedules provided to NRC.

Warehouse stock traceability reviews (all plant sites)<sup>4</sup>:

- o Of the 22,017 MCCBs in SR stock industry-wide, 17,289 (85 percent) were determined to be traceable to the circuit breaker manufacturer (CBM). Non-traceable MCCBs are no longer available for SR service. Refer also to Figure C-1 which illustrates the distribution of SR MCCB inventories among 67 nuclear sites (out of 72 total) providing this information in their Bulletin responses.

Actions to address installed MCCBs:

- o Forty-eight (48) sites addressed a total of 2,189 installed MCCBs and indicated each would be determined traceable, replaced or tested in accordance with the bulletin. Justifications for continued operation were established for installed non-traceable MCCBs pending disposition.

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<sup>3</sup>Industry-wide, 214 MCCBs were reported tested including 44 failures (21%).

<sup>4</sup>Several sites did not indicate their population of stock MCCBs or the specific results of traceability reviews and are therefore not reflected in these results.



MCCBs originating from NRC-identified suppliers:

- o Twelve (12) sites identified a total of 154 MCCBs (0.7 percent of industry-wide warehouse stock) traceable to the suppliers identified in IN 88-46. An additional 29 were identified installed; only one such MCCB was reported to have failed while in service (in 1985).

Current MCCB stock and future procurement:

- o As requested by the bulletin, all utilities have indicated that all MCCBs presently in stock and available for SR service are traceable to the CBM. Furthermore, all utilities have implemented appropriate controls to ensure that MCCBs procured in the future for SR service have verifiable traceability to the CBM.

**ASSESSMENT OF BULLETIN 88-10 ACTIVITIES**

The Bulletin's focus on verifiable traceability, as narrowly defined by the NRC staff, provided for considerable conservatism in utility assessment of stock and installed MCCBs. MCCBs were considered unsuitable for SR service solely on the basis of the unavailability of documentation. The high degree of utility success in verifying the proper origin of SR MCCBs (85 percent traceability to CBMs) suggests underlying confidence in historical utility procurement practices. Utilities achieved this success despite the following factors:

- o No regulatory position (prior to Bulletin 88-10) indicating that MCCB traceability be established and documentation maintained;
- o Narrow interpretation drawn by the staff on what constituted verifiable traceability;



- o Difficulty in locating necessary traceability documentation that might be several years old and often not under the direct control of the utility; and
- o MCCBs have historically been procured commercial grade, and such procurements generally feature reduced emphasis on chain of purchase documentation.

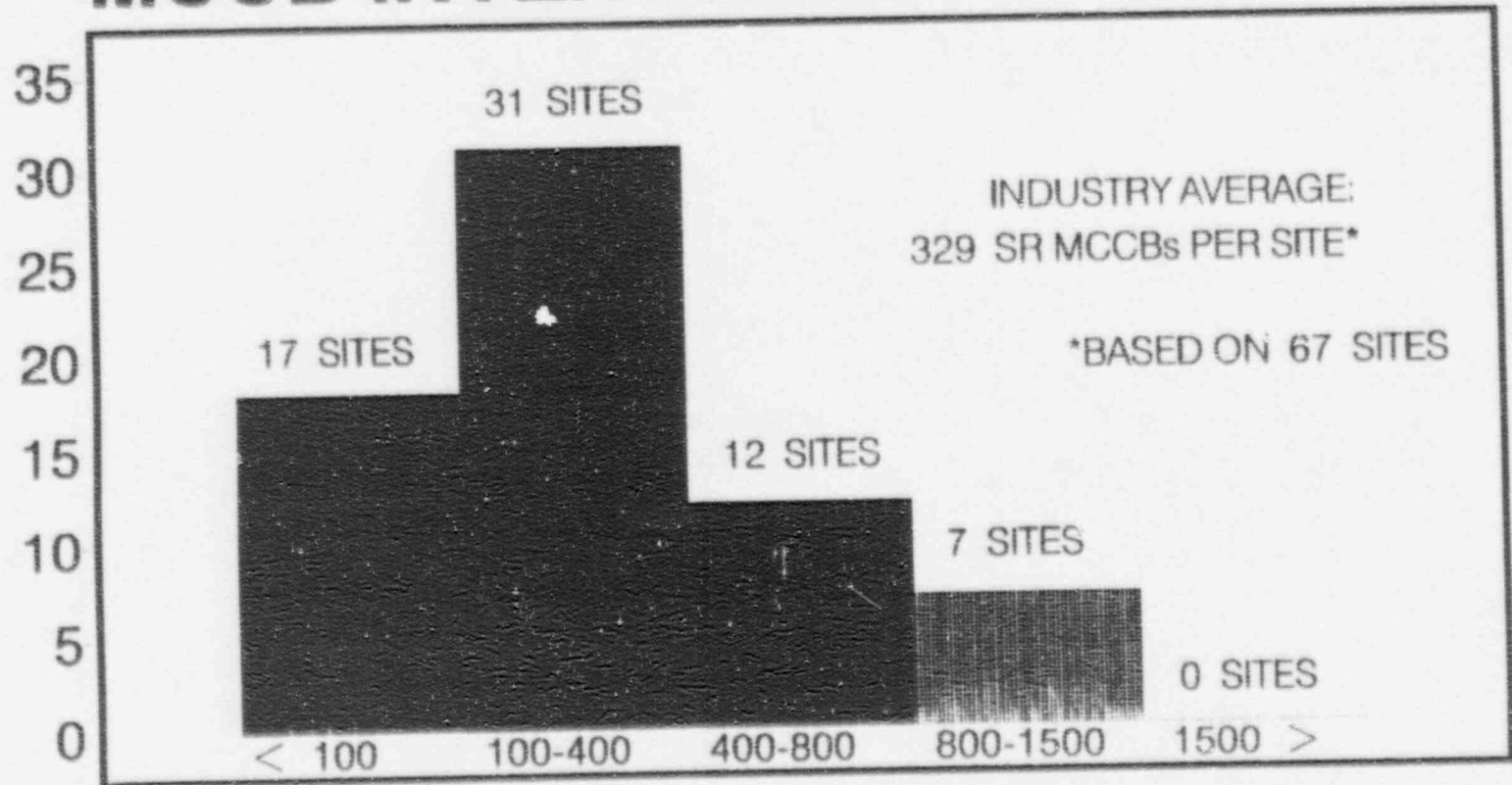
The determination that only 0.7 percent of stock MCCBs (industry-wide) originated from NRC-identified suppliers is an indication of the conservatism in the Bulletin's approach which rendered 15 percent of stock MCCBs unusable for SR service. Another indication of the conservatism in the Bulletin's approach is provided by the combined result of ten utilities that elected to perform a visual inspection of their non-traceable MCCBs. A total of 1025 MCCBs were evaluated against the NUMARC MCCB initiative inspection guidelines and only 36 (3.5%) were judged suspect. Due to conservatism inherent in the NUMARC inspection guidance, it is likely that only a fraction of these 39 are potentially refurbished.

The conservative approach of Bulletin 88-10 and the implementation of requested actions by utilities has provided assurance that MCCBs in and available for SR service are genuine and suitable for their intended service. In addition, the NUMARC MCCB initiative has provided similar assurance for balance-of-plant MCCBs. Significantly, both the NUMARC initiative and Bulletin 88-10 included provisions for improved procurement controls to protect against future use of substandard MCCBs.

FIGURE C-1

# NUCLEAR INDUSTRY SR MCCB INVENTORIES - NRCB 88-10

C-6



NUMBER OF SR STOCK MCCBs AT PLANT SITES