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ILLINOIS POWER

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L47-96(07 -04)LP
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July 4, 1996

Docket No. 50-461

Document Control Desk
Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Clinton Power Station Response to Request for Additional Information Related to Proposed Amendment of Facility Operating License No. NPF-62 (LS-94-004)

Dear Sir:

By letter dated February 22, 1996 (Illinois Power (IP) letter number U-602522), IP submitted an application for amendment of the Clinton Power Station (CPS) Operating License (License No. NPF-62) to incorporate a proposed change to the CPS Technical Specifications (Proposed Change No. LS-94-004). IP proposed to revise Technical Specification (TS) 3.3.4.1, "End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation," specifically to delete Surveillance Requirement (SR) 3.3.4.1.6 which requires the RPT breaker interruption time to be determined at least once per 60 months.

To support review of IP's application for amendment, the NRC has requested IP to provide additional information as requested within NRC letter, "Request For Additional Information Concerning Proposed Change Eliminating The End Of Cycle Recirculation Pump Trip Interruption Time Testing Requirements - Clinton Power Station, Unit No. 1 (TAC No. M94888)," from D. V. Pickett, Senior Project Manager, dated April 24, 1996. This letter is provided in response to that request. Therefore, please find in the attachment to this letter (as supported by the attached enclosures) IP's response to each of the questions contained in the NRC's request for additional information.

Due to the potential to reduce refueling outage complexity and/or duration, as well as the significant resource savings that can be realized by implementation of the proposed change to delete Surveillance Requirement (SR) 3.3.4.1.6, IP is requesting that the

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application for amendment, as supported by this letter, be reviewed on a schedule sufficient to support the sixth refueling outage currently scheduled to begin October 13, 1996.

Sincerely yours,

Michael W. Lyon
Director-Licensing

AJP/csm

Attachments

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety

By letter dated April 24, 1996 the NRC requested additional information related to Illinois Power's (IP's) February 26, 1996 request to amend the Operating License (Technical Specifications) for Clinton Power Station (CPS). The proposed change would eliminate the Surveillance Requirement for periodically measuring the breaker interruption time for the reactor recirculation pump motor breakers which are designed to be rapidly and automatically opened by the End-of-Cycle Recirculation Pump Trip (EOC-RPT) system (in conjunction with a reactor scram) to mitigate the effects of a pressurization type transient such as a turbine trip or generator load rejection. Information in response to each of the questions contained in the NRC's request for additional information is given below:

Questions and Responses

1. **"Please identify the breaker model and manufacture. This information is not stated in the request."**

Response: Each of the four EOC-RPT circuit breakers is a Westinghouse Class 1E, safety-related, type 75DVP500. Each of the two Reactor Recirculation Pumps at CPS has two such safety-related circuit breakers in series with pump power. (See Figure 1, Page 9 of 9 of this Attachment.) These circuit breakers are similar to the horizontal drawout magnetic-air type 75DHP500 breakers manufactured by Westinghouse; however, these circuit breakers differ in that they utilize vacuum interrupters instead of pole pieces. The DVP line of circuit breakers is a first generation vacuum type. The breakers are each equipped with a spring-stored, energy closing mechanism similar to that utilized in DHP circuit breakers.

2. **"Please provide a Failure Mode and Effects Analysis (FMEA) for the breaker for which this request is made. On page 4 of Attachment 2, second bullet, it is stated:**

> **The design of the breaker is such that there is seldom failure of the breaker to open within the vendor specified time limits that does not also result in a failure of the breaker to operate. Problems with the mechanism of the breaker would most likely cause mechanical failures, not a degradation of performance that would cause the breaker to open in a time greater than the vendor specified time limit. So, while degradation of the breaker mechanism that would impact the mechanical opening time of the breaker may be possible, the breaker mechanism would be expected to fail to operate rather than fail in a manner that**

would be difficult for operators and maintenance personnel to recognize.

A failure which seldom occurs will, in fact, occur. Since the failure mode determination has apparently been done by Illinois Power Co. (IP), the staff would like to review the failure modes. In addition, the staff would like a more definitive, preferably numerical probability of failure to open within specified time limits without failure to operate than 'seldom' or 'most likely'."

Response: The second bullet on page 4 of Attachment 2 of IP's submittal was a summary statement based on the vendor manual, past performance of maintenance, actual operating experience, and engineering judgment. A formal FMEA for the breakers was not provided by the vendor, but an analysis and discussion of breaker failure modes based on vendor information and IEEE 500-1984, "IEEE Guide to the Collection and Presentation of Electrical, Electronic, Sensing Component, and Mechanical Equipment Reliability Data for Nuclear-Power Generating Stations," is provided below.

Applicable failure modes that would render the DVP breakers inoperable (with respect to opening of the breaker on demand) are a catastrophic failure and a degraded type of failure:

(1) A catastrophic failure of the vacuum breaker to open on demand would be caused by failure of the operating mechanism or vacuum interrupters. To maintain high performance reliability with respect to these potential failure modes, maintenance is performed on the breakers in accordance with vendor recommendations. Preventive maintenance tasks include checking the interrupter for vacuum and contact wear gap, checking and adjusting the mechanism latches, lubrication, and testing that includes megger and ductor testing.

(2) Degraded failure of the vacuum breaker to open, i.e., a slow trip, would be caused by degradation of the operating mechanism. Again, proper maintenance (the preventive tasks described above) prevents such failures. Westinghouse instruction bulletin I.B. 32-253-3B includes a section on the mechanical timing of breakers which states, "The breakers are checked at the factory for contact speed and contact bounce. These values do not change appreciably during the mechanical life of the breaker and are not considered as a part of the regular inspection and maintenance program."

There is no failure probability data available specifically for the DVP-type breakers. Industry data is available for failure rates of the DHP metal-clad drawout type breakers. This data can provide some perspective on the reliability of the DVP breakers, considering that the DVP breakers can be expected to be more reliable. (The DVP breakers utilize fewer moving parts due to the vacuum technology employed. Further, although CPS is only in its sixth operating cycle, performance of the DVP breakers has been excellent as no failures or degradation has occurred to date.) The IEEE failure rate data for the DHP breakers includes catastrophic, degraded and incipient modes of failure, but does not include a failure mode specifically identified as "failure to open within specified time limits." Nevertheless, the data can serve to provide a gauge of reliability. Per IEEE 500-1984, the expected failure rate for the composite of all failure modes of metal clad drawout circuit breakers (rated at greater than 600 volts) is 0.4 failures per one million hours. The IEEE failure number is conservative as it includes data from Class-1E and Non-1E equipment, supplied from a multitude of manufacturers.

DHP breakers have notably good industry reliability. As specifically noted in EPRI/NMAC, *Circuit Breaker Maintenance*, Vol. 2, Part 3, April, 1994, the Nuclear Plant Reliability Data System listed a total of only 30 failures. The EPRI/NMAC report also notes that, based on a review of the Nuclear Regulatory Commission's Nuclear Document System (NUDOCS), no Information Event Bulletins (IEB's), Information Event Notices (IEN's), or Information Event Circulars (IEC's) have been issued against Westinghouse medium-voltage circuit breakers.

It should again be noted that due to redundancy in the EOC-RPT design (see Figure 1), failure of one DVP breaker would not result in a loss of tripping function. Based on redundant design, proper conservative maintenance and CPS history failure, reasonable assurance exists that the EOC-RPT breakers will perform their intended design function over the lifetime of the plant (without requiring periodic performance of a test to determine the breaker interruption time).

3. **"Please provide a copy of the manufacturer's recommended maintenance, including recommended maintenance intervals. In addition, please provide a copy of the Clinton Power Station required maintenance schedule. On page 2, it is stated:**

> **Discussions with the breaker manufacturer have confirmed that measurement of the arc suppression time is unnecessary and that actual arc suppression times are not subject to change for properly maintained**

breakers. The robust design of the breakers provides assurance of continued satisfactory performance. Further, any degradation of the breaker that could cause significant degradation of the arc suppression time is prevented or detected by performance of recommended preventive maintenance and/or other required testing.

This information will assist the staff in ensuring proper maintenance of the breakers."

Response: IP has provided Section 6 of Westinghouse DVP Circuit Breaker Manual I.F.32-253-3B, "Instructions for Porcel-line Type DVP Vacuum Circuit Breakers," as Enclosure 1. This document provides a basis for an acceptable maintenance program for the breakers, including guidance for routine inspection of the breakers.

It may be noted that Section 6.3.1, "Routine Inspection Interval Based on Time," has been revised to incorporate vendor information provided to CPS via Westinghouse Electric Corporation letter from Randy Faller, Assistant Sales Engineer, dated February 22, 1993, which is provided as Enclosure 2. This letter supported an evaluation performed in 1993 to justify making the inspection frequency for the DVP breakers to be the same as that for DHP breakers, i.e., once per three years.

Within the vendor's maintenance guidance provided in Enclosure 1, Subsection 6.6.2, "Mechanical Timing," states that the mechanical operating speed of the breaker should be satisfactory as received from the vendor. The breakers are checked at the vendor's facility prior to shipment for contact speed and contact bounce. These values do not change appreciably during the mechanical life of the breaker and are not considered part of the regular inspection and maintenance program. With respect to the arc suppression function, guidance for vacuum interrupter assembly inspection and maintenance is provided in Section 6.6.1. This guidance includes use of a procedure described in Section 3.2 of the vendor instruction, which is a high pot test. The guidance also requires verifying wear gap within the interrupter assembly. Nowhere within Section 6 of the vendor instruction is arc suppression time response testing recommended as part of the routine maintenance or testing.

In response to the NRC's request to provide a copy of the CPS maintenance schedule for the EOC-RPT breakers, IP has provided copies of the applicable CPS Preventive Maintenance (PM) Task Descriptions as

Enclosure 3. The PM Task Descriptions (one for each breaker) may be summarized as follows:

Job No.	Interval (period)	Task Description
PEMRRA001	3 years	Clean and Inspect
PEMRRA002	3 years	Clean and Inspect
PEMRRA003	3 years	Clean and Inspect
PEMRRA004	3 years	Clean and Inspect

These "clean and inspect" PMs trigger performance of CPS Electrical Maintenance Procedure No. 8410.07. Selected pages from this procedure are provided in Enclosure 4 to indicate the scope and type of testing and maintenance performed per the procedure, consistent with vendor recommendations.

4. **"Please provide a copy of past arc suppression time test results. On page 3 of the IP request, it is stated:**

> **1) A maximum time value of 95 milliseconds has been substantiated by IP during past surveillance testing at CPS, 2) The vendor specified breaker interruption time is 50 milliseconds, which is much less than the proposed assumed value, and 3) Testing of the circuit breaker during equipment qualification testing confirmed an actual breaker interruption time of 24 to 34 milliseconds.**

This information would lead the staff to conclude that during qualification testing, times of 24 to 34 milliseconds were found, but since, during surveillance testing, times of up to 95 milliseconds were recorded. As the vendor time requirement is stated as 50 milliseconds, a test result in excess of that time would lead to doubt about the test method, the vendor limit, or the breaker maintenance."

<u>Response</u>: The test results and dates for past arc suppression tests at CPS are given in Enclosure 5.

According to vendor information, the rated interrupt time of the DVP breaker is 3 cycles, which is inclusive of the contact separation time. For 60 Hz applications, 3 cycles is approximately 50 mSec. To date, IP has been unable to consistently obtain as low a response time as 50 milliseconds. This is due to the fact that the testing performed by IP is not equivalent to that originally performed by the manufacturer. The difference in test results is attributed to the difference in testing environment and the fact that the sensors and other test instrumentation used at CPS are not identical to those used by the manufacturer, as further explained below.

The purposes of the tests at CPS and those performed at the manufacturer's facility are different. The tests at the manufacturer's facility were performed to determine the precise capability characteristics of the breaker. The tests performed at CPS are for the purpose of confirming that the breaker performs within a given time limit. The equipment used at CPS to measure the arc suppression time is not as sophisticated as that used by the vendor, and limits the user's ability to precisely determine the arc suppression time. Nevertheless, the equipment is sufficient to determine a bounding time (with appropriate uncertainty/margin included) that is recorded as the "arc suppression time." Because the test methodology used at CPS is sufficient for demonstrating acceptable breaker performance to within a bounding time limit, the expense of doing more sophisticated or accurate testing comparable to that performed by the manufacturer has not been considered or required. Further description of the testing performed at CPS is given in the following paragraphs.

Arc Suppression time, for the purposes of the test, is defined as the time from trip coil actuation (energization) until cessation of the arc. Temporary switches are installed to initiate the transient (i.e., to energize the trip coil). The switch contacts are monitored to determine the event start. A transducer monitors the current in the 6900-volt reactor recirculation pump motor circuit to determine when current flow ceases.

The timed response can vary from test to test and will vary from pump to pump. Time delays that increase the measured response of the breakers include delays caused by the sensors, instruments and test connections. These time delays cause the overall test result to be conservative. For example, the transmission time from the temporary switch to the breaker trip coil is a source of test time delay that is not measured and does not get subtracted out of the result of the time response test. Another and significant source of test time delay is that pump coastdown induces some current into the circuit thereby artificially extending the measured time. The induced current in the circuit cannot be determined with installed plant equipment, and therefore, the associated delay time also does not get subtracted out of the result of the time response test. Further, some test time delay is introduced by the transducer. The transducer is a capacitive device that causes a time lag and for which the current may be assumed to reach zero in four to 4.6 time constants (somewhere between 95 and 98 percent of the total decay curve). This decay time has been measured at two to three times the expected arc suppression time. This transducer delay time can be separately measured and is therefore subtracted from the test result, but some margin must still be included to account for uncertainty in the measurement of the transducer delay time.

To repeat, although there are inaccuracies associated with IP's test method utilized to date, these inaccuracies are accounted for, and appropriate margin is included in the test results. Testing at IP has established that 95 milliseconds is a conservative maximum response time and that this time bounds the value determined by the vendor design and testing. Thus, the breaker is certain to respond within the 95 milliseconds that CPS proposes to assume as the EOC-RPT maximum response time.

5. "Please provide an analysis of the effect of an additional 5 seconds delay in the operation of the breaker on those transients or accidents where the EOC-RPT is required to mitigate the effect of the transient or accident."

Response: As emphasized in IP's submittal, it is expected that a properly maintained EOC-RPT circuit breaker will perform its intended function of interrupting the current (including suppression of the resultant arc) when opening on demand, in about 50 milliseconds or less. However, as a conservative measure based on the results of IP's test measurements performed to date, a bounding breaker interruption time of 95 milliseconds can be assumed. As already noted, a DVP breaker is not expected to fail in a manner that would cause the breaker to open and suppress the resultant arc "slowly." It is therefore unrealistic to consider a 5-second delay (or any prolonged delay) in the operation of the breaker.

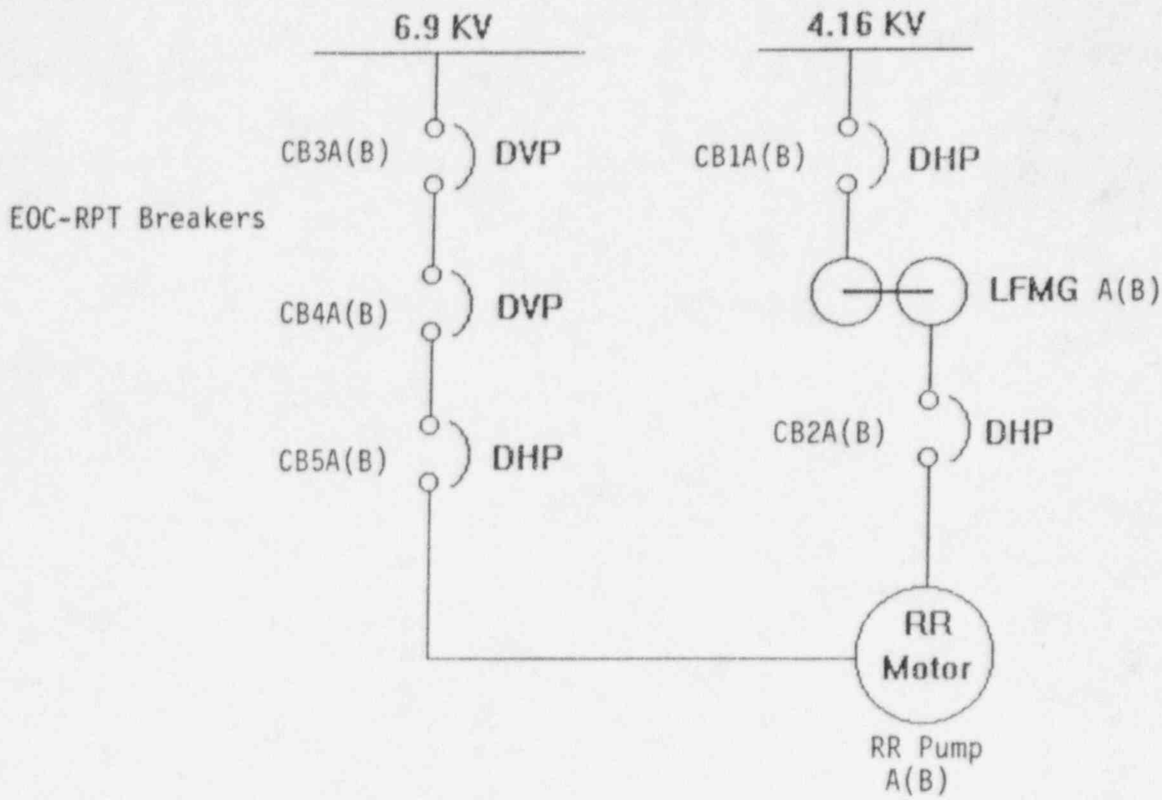
If a 5-second delay must be assumed, it should be noted that assuming such a delay time is equivalent to assuming no credit for the EOC-RPT function. The EOC-RPT breaker interruption time is a component of the total time delay involved in tripping the reactor recirculation pumps in response to pressurization-type transients, i.e., main generator load rejection and turbine trip events. The assumed maximum recirculation pump trip delay time is specified in Chapter 15 of the USAR, Table 15.0-2, "Input Parameters And Initial Conditions For Transients." The total time specified is equal to or less than 0.14 seconds (140 milliseconds).

As further described in the USAR, an automatic trip of the reactor recirculation pumps is designed to occur in conjunction with a reactor scram to mitigate the effects of a generator load rejection or a turbine trip. Tripping of the reactor recirculation pumps increases void content in the reactor coolant to offset the reactivity effects of void collapse, and thus ensures that the resultant MCPR remains above an acceptable MCPR limit for such events. The EOC-RPT function (of tripping the reactor recirculation pumps) is expected to occur well within the time frame that the scram is expected to occur. Since control rods are expected to be fully inserted within a time frame of less than two seconds, assuming a five-second delay in the EOC-RPT response time is tantamount to discounting the EOC-RPT function.

It is acknowledged that the EOC-RPT function is required to mitigate the effects of design basis events. However, as IP has noted, the proposed deletion of the surveillance requirement to periodically measure the breaker interruption time will not result in any significant increase in the probability of the EOC-RPT failing to perform its intended function. The breakers have not been shown, and are not expected to degrade in a manner that causes them to open and suppress the resultant arc in a slow manner.

Finally, it should again be noted that each reactor recirculation pump has two breakers in series. This further reduces the probability of a "slow" breaker affecting the overall EOC-RPT function, thus making any consideration of the effects of a 5-second delay in breaker operation even more unrealistic.

Figure 1



RR Pump Motor Breakers

Section 6 — Maintenance

This class of power circuit breaker is a protective device to prevent damage to more expensive apparatus and to maintain continuity of electric power service. To maintain greatest reliability the breaker should be inspected and given all indicated maintenance on a regular schedule. The Type DVP circuit breakers are designed to comply with standards performing switching operations based on maximum of 2000 operations or once a year whichever comes first.

Actual inspection and maintenance will depend upon individual application conditions. Some atmospheric conditions such as extremes of dust and moisture or corrosive gases might indicate inspection and maintenance at more frequent intervals than 2000 operations. Very clean and dry conditions combined with low switching duty will justify longer times between inspection and maintenance operations. With experience, each user can set an inspection and maintenance schedule which is most economical for the particular case.

These breakers are adjusted, inspected and tested at the factory in line with high standards of quality control and reliability. They should not require readjustments before placing in service. Do not change any adjustments, assemblies or parts unless there has been an obvious damage or incorrect adjustment. For instance, handling and transportation conditions could cause loss of adjustment or damage.

Therefore, some inspection should be done on the breaker immediately after receiving the breaker.

6.1 INSPECTION/MAINTENANCE PROGRAMS

In order to obtain the most effective use of this type of maintenance instructions, it is important for the user to establish an inspection program that will permit him to routinely examine each circuit breaker after regularly scheduled intervals of operation as well as at discrete times when conditions requiring particular maintenance procedures may be observed. Various suggestions are noted below to be used in setting up suitable inspection/maintenance programs.

6.2 INSPECTION/MAINTENANCE RECORDS

As a part of an ongoing inspection/maintenance program some form of recordkeeping is suggested. Records may consist of a simple diary whose primary purpose is to document that an established inspection/maintenance schedule is actually being followed. However, more completely detailed records will facilitate evaluation of a breaker's condition or its changing condition. Such records may include formal check lists, detailed descriptions of conditions found, notes on operating duty, tests performed, maintenance procedures undertaken, etc. Whether simple records or more complete records are kept is for the user to decide. Records can be very helpful in determining both the types and extent of maintenance which may be required and in determining whether inspections should be scheduled more or less frequently.

6.3 INSPECTION SCHEDULES

The schedule for routinely inspecting circuit breakers will depend on three inter-related factors.

1. Time since the last inspection.

2. Number of load switching operations since the last inspection.

3. Number of short circuit switching operations since the last inspection.

Whichever of these three factors comes up first is the factor which determines when an inspection should be made.

The routine inspection interval should be based either on Time or on the Number of Anticipated Load Current Switching Operations whichever comes first. Superimposed on this routine inspection schedule is the requirement that the breaker must be inspected after an accumulation of a number of short current switching operations if this occurs before the Time or Load Switching Operations interval is completed.

6.3.1 Routine Inspection Interval Based on Time

An initial inspection at the end of the first year in service is suggested because it provides an opportunity to evaluate conditions at an early point in the life of a circuit breaker. Based on conditions found, realistic decisions can be made concerning the length of time for succeeding inspection intervals. However, the interval ~~must~~ should not exceed ~~one~~ three years.

Westinghouse letter dated February 22, 1993

6.3.2 Routine Inspection Interval Based on Load Switching

The maximum number of load switching operations between scheduled inspections should not exceed the "Maximum Number of Operations Between Servicing" as shown in Table 4.

Table 4. Operations – Continuous Current Rating Basis

Circuit Breaker Type	Continuous Current Rating Amperes	Number of Operations: Max. No. Operations Between Servicing	No Load Mechanical Duty	Fault Operation: Full Load	Fault Operation: Inrush	Nonfault Duty: Full Load	Nonfault Duty: Inrush
All DVP Vacuum Breakers	1200 2000	2000 2000	10,000 10,000	1000 1000	750 750	5000 3000	3000 2000

The table lists recommended numbers of load switching operations. The different columns apply depending on whether the load switching duty includes inrush currents or not and whether it includes fault current switching or not.

6.3.3 Inspection Interval Based on Short Circuit Switching

Since the short circuit switching requirements for circuit breakers may vary widely from one installation to another, both in the number of short circuits which are switched and in the magnitude of the short circuit current to be interrupted, it is necessary to establish practical guidelines on which to determine how frequently a circuit breaker requires inspection to be certain that necessary maintenance is performed to keep the breaker in good operating condition.

Circuit breakers described in this instruction book have been required to demonstrate that each rating can endure an accumulation of short circuit interruptions totaling at least 400% of its respective maximum rated short circuit interrupting capability without maintenance being performed. By relating the actual short circuit interruptions performed by a circuit breaker in the field to the capability demonstrated in design tests, a practical basis for scheduling inspections and maintenance can be established. A key term which will be used here is the "most likely" short circuit which can occur. While recognizing that a circuit breaker is applied on the basis that it has the capability of interrupting the largest short circuit which can occur at its location in an electrical system, experience indicates that the probability is quite small that the largest possible fault will occur during the operating life of any given circuit breaker. Experience also shows that many circuit breakers are applied where lower level short circuits will probably occur during the life of the circuit breaker with some degree of regularity or predictability. By selecting inspection/maintenance intervals which are related to the possible occurrence of "most likely" short circuits and allowing for the contingency that a maximum system short circuit can occur at any time during the interval, a practical inspection/maintenance guide can be established.

The following chart lists the level of the "most likely" fault as a percentage "P" of the maximum short circuit interrupting rating of the breaker. Each percentage "P" is coupled with an interval number "N" which is a suggested number of "most likely" short circuit interruptions which the circuit breaker may be permitted to accumulate within an established maintenance interval before it is removed from service for inspection and possible maintenance.

Table 5. Suggested Inspection/Maintenance Interval

"Most Likely" Short Circuit (P)	Accumulated Short Circuit Interruptions (N)
Greater than 50%*	1*
50%	2
40%	3
35%	4
28.5%	6
24.5%	8
20% and less	12

**NOTE:* For a short circuit interruption at P greater than 50%, it is strongly recommended that inspection of the circuit breaker always be made immediately after a single interruption.

During the inspection following the accumulation of "N" interruptions, attention should be directed to the measurement of contact wear gaps. See Item 3.3. Insulating members as well as general physical and mechanical condition should also be checked. (Refer to appropriate maintenance instructions in this instruction book for guidance.) Several operations using control power are also advisable for checking mechanism operation. Whether maintenance is required or not, or whether maintenance procedures can be delayed until the next scheduled routine inspection/maintenance date, is a decision which must be made in each case on the basis of the conditions found and operating experience.

When a circuit breaker has accumulated 'a total of "N" ' short circuit interruptions or less at percentage "P" in any inspection interval, and after the circuit breaker has been inspected and maintained when necessary, the circuit breaker may be returned to service to begin a new inspection interval and a new accumulation of "N" "most likely" short circuit interruptions. Care should be exercised to keep the selected "P" and "N" characteristic for each circuit breaker up-to-date with system growth.

The maintenance interval chart is a suggested guide which has been developed on the basis of the demonstrated endurance capability of the circuit breakers. The number of operations given in the chart was conservatively chosen to reduce the level of periodic maintenance and to give a longer life before major maintenance is required.

6.3.4 Service Conditions

The time or number of operations indicated above are based on the usual service conditions of ambient temperatures in the range from plus 40°C to minus 30°C, altitudes below 3300 feet (1000 meters), and relatively clean and dry conditions.

Unusual service conditions such as exposure to damaging fumes and vapors, excessive or abrasive dust, explosive mixtures of dust or gases, steam, salt spray, and excessive moisture will usually reduce the time or number of switching operations between scheduled inspections. When unusual conditions prevail, this information may be referred to the nearest Westinghouse Sales Office for special inspection/maintenance recommendations.

The foregoing three inspection schedules cannot be discretely applied. Depending on the particular application, one of the three operating conditions will predominate. Whichever cycle is completed first, time in service, number of load current switching operations, or short circuit switching operations, will determine the completion of an inspection/maintenance interval. It will be necessary to remove the breaker from service for inspection and necessary maintenance as soon as practical.

6.3.5 Total Breaker Life

While operating duties are important considerations in establishing an inspection/maintenance program, it is equally important to consider factors which relate to the total life of a circuit breaker. Although it is usual to think in terms of years in service, breaker life in terms of total accumulated operations is a more definitive parameter. A breaker which has passed the mid-point of its operational life may reasonably require more frequent inspection and different levels of maintenance than a newer breaker.

As illustrated by the chart "Operations – Continuous Current Rating Basis", a breaker will have a longer mechanical life span than an electrical life span. Time allowed for maintenance may have to be extended to permit part replacements and more extensive maintenance procedures during later life. An inspection/maintenance program will take these life factors into account. Where the selection of an initial inspection interval is often arbitrarily and conservatively established primarily due to a lack of operating experience, later life inspection/maintenance scheduling can be more realistically determined based on the experience which has accumulated. It is at this point where the advantages of well kept inspection/maintenance records will become manifest.

6.3.6 Changing Duty Considerations

A further consideration in an on-going inspection/maintenance program can be generally categorized as "changing duty". For some applications changes may occur to increase breaker load current. For other applications changes may include more frequent switching or exposure to more short circuit switching operations. Dirt and dust may accumulate faster or may change in content. Damaging fumes or vapors may become more significant in their effects on breaker condition. The effect of these and other similar types of changes can be detected in an on-going inspection program and inspection/maintenance schedules originally developed may have to be modified from time to time as a result.

6.4 INSPECTION/MAINTENANCE PROGRAM REVIEWS

In order to keep an ongoing inspection/maintenance program up to date so that it reflects the experience accumulated, it is suggested that such programs be reviewed on a periodic basis through the life of the circuit breaker. The first review should be made following the initial inspection after a breaker is placed in service. Subsequent reviews will depend on the type of application. For breakers which accumulate operations slowly (100 or less per year), subsequent reviews are suggested at seven to ten year intervals. For breakers which accumulate operations more rapidly, reviews are suggested after approximately 25%, 50%, 75% and 100% of the number of operations shown in the chart "Operations – Continuous Current Rating Basis" under "No Load Mechanical Duty", have been accumulated.

6.5 ROUTINE INSPECTION

The maximum time between routine inspections as dictated by either time in service, load current switching operations, or short circuit switching should not be exceeded. Maintenance should include removal of the circuit breaker from its switchgear housing, an inspection to determine the condition of the circuit breaker, and cleaning to remove dust, dirt or other contaminants. Servicing may also include exercising operations of the circuit breaker, testing, adjusting, lubrication, tightening and other maintenance procedures as recommended in this instruction book.

6.5.1 Checking Contact Wear Gap

Check wear gap in accordance with procedure outlined in Item 3.3.

6.5.2 Mechanical Operation

Mechanically the circuit breaker should be quick, snappy and positive in operation. There should be no signs of sluggishness or hesitation. Should there be sluggishness indicated during an inspection, remove the barrier, and operate the circuit breaker slowly with the maintenance operating handle in order to identify the source of difficulty. Refer to the section on Maintenance Procedures for corrective actions to be taken. After maintenance has been performed, a few exercising operations using control power are advisable. Any excess lubricant should be wiped off to prevent the accumulation of dust and dirt on and near moving parts.

6.6 MAINTENANCE PROCEDURES

Following are recommendations for the maintenance of particular breaker components. These include vacuum interrupter assemblies, mechanisms, insulation and lubrication.

6.6.1 Vacuum Interrupter Assembly Inspection and Maintenance

Check the vacuum integrity of the interrupters every year, or more frequently when dictated by the accumulated switching frequencies shown in Table 5.

The procedure outlined in Item 3.2 should be used to check the vacuum integrity. It is unlikely to find that the vacuum integrity has been impaired. However, if it is impaired, the vacuum interrupter assembly should be replaced according to procedure in Item 6.7.1.

Check the wear gap according to procedure in Item 3.3. If the wear gap is less than .06", the vacuum interrupter must be replaced.

6.6.2 Mechanical Timing

The mechanical operating speed of the breaker should be satisfactory as received. The breakers are checked at the factory for contact speed and contact bounce. These values do not change appreciably during the mechanical life of the breaker and are not considered as part of the regular inspection and maintenance program.

The timing for contact part and close may be checked by monitoring control circuit current, and using no more than 6 volts DC and one ampere through the vacuum interrupter contacts to indicate closed or open condition.

Typical time ranges for nominal control voltages are:

a) Trip coil signal initiation to contact part: 24-34 milliseconds.

b) Close coil signal initiation to contact close: 40-65 milliseconds.

The speed of the vacuum interrupter contacts can be checked by using a potentiometer and an oscilloscope. The potentiometer must have 2 inches of linear travel. It is fastened between the frame of the breaker and the operating rod. The speed is then checked with an oscilloscope. The speeds should be in the following range: 2.5 ft/sec. to 3.5 ft/sec. closing, 5.0 ft/sec. to 7.5 ft/sec. opening.

6.6.3 Mechanism

Close the breaker by spring power and open by normal tripping action. Try charging the closing spring electrically and also by hand. In either case, at the completion of the charging operation there should be an audible "click" as the crank arm goes over center. With electrical charging, the motor should automatically cut off at the sound of the click. With hand charging, the handle will tend to run free as the click is heard.

In these operations, closing and opening should be snappy, without hesitation or sluggishness.

In addition to the above operational check, the following points should be checked:

1. With the breaker open and the closing spring charged, check for clearance between the tripping trigger and tripping latch roller. Refer to Fig. 10b. The trigger should not touch the roller. If adjustment is necessary see section on Adjustments.

2. With breaker closed and closing spring charged, check for clearance between the closing trigger and the closing latch roller. Refer to Fig. 9a. If adjustment is necessary see section on Adjustments.

3. Lubricate the mechanism sparingly as described under Lubrication.

6.6.4 Insulation

Insulation maintenance consists primarily of keeping the insulating surfaces clean. This can be done by wiping off the insulation each time the breaker is removed from the cell.

In case there is any tightly adhering dirt that will not come off by wiping, it can be removed with a mild solvent or water. Be sure to dry the insulation completely after this type of cleaning.

6.6.4.1 Cleaning Procedure for Porcelain Insulation

If the porcelain insulation or the ceramic surface of the vacuum interrupter requires cleaning, it is suggested that the surface to be cleaned be wiped with a dry lint free cloth or a dry paper towel. This surface can be washed with distilled water but be sure that the surface is completely dry before placing the breaker in service. If a solvent is required to cut the dirt, use Stoddards solvent Westinghouse 55812CA or commercial equivalent. Be sure the surface is completely dry before placing the breaker in service. Do not use any type of detergent to wash the surface of a porcelain insulator as detergents leave an electrical conducting residue as they dry.

6.6.5 LUBRICATION

6.6.5.1 Mechanism

The most reliable performance on the stored energy mechanism can be obtained by lubrication. All parts which require it are lubricated with a molybdenum disulphide grease, Westinghouse M. No. 53701 QB, when assembled. Some items should be lubricated at regular maintenance intervals. Other parts normally should require lubrication only after long periods of time. Otherwise, it should be done at any time the breaker is slow or sluggish in opening or closing or where bearings may be clogged with dirt.

After each interval of 2000 Operations, the following items should be lubricated with light machine oil applied sparingly:

1. Front and rear tripping latch rollers and pivot pin.
2. Tripping trigger pivot pin.
3. Spring release latch roller and pivot pin.
4. Spring release trigger and pivot pin.
5. Tripping cam pivot pin and restraining link pin.

6.6.5.2 Roller Bearings

On the stored energy mechanisms there are roller bearings on the main shaft, crank shaft, connecting rod, and closing cam follower.

These bearings are packed at the factory with a top grade slow oxidizing grease which normally should be effective for many years. They should not be disturbed unless there is definite evidence of sluggishness or dirt, or unless the parts are dismantled for some reason.

If it is necessary to disassemble the mechanism, the bearings and related parts should be thoroughly cleaned of old grease in a good grease solvent. DO NOT USE CARBON TETRACHLORIDE. They should then be washed in light machine oil until the cleaner is removed. After the oil has drained off they should be packed with grease, Westinghouse No. 53701QB.

6.6.5.3 Secondary Contacts

Use only a very light coating of petrolatum.

6.6.5.4 Drawout Disconnect Contact Fingers

Use only a very light coating of petrolatum.

6.7 REPAIR AND REPLACEMENT

6.7.1 Vacuum Interrupter Assembly Replacement

The following procedure should be used to replace a vacuum bottle and set the wear gaps. See Figs. 11 and 26.

1. Take breaker out of the cell.

2. Tilt back the barrier.

3. Remove "X" washers from operating rod pin at the top of operating rod.

4. Using maintenance handle, slowly close breaker until the wear gap starts to appear. At the point just before the gap starts to appear, the pin should be easily removed from the operating rod.

5. Remove the two nuts holding the bottom conductors to the insulators. Remove the upper nut on the front insulator stud.

6. Lift off the interrupter assembly.

7. Mount the new interrupter assembly by following the replacement procedure in reverse order.

At this point wear gaps may be set if necessary as follows:

8. Loosen the bottom nut on the bottom of the operating rod. After the nut is loose, turn the nut down an additional 1/2 inch.

9. Attach the operating rod to the vacuum interrupter with the pin and new "X" washers. The breaker can be partially closed with the maintenance handle so that the operating rod will reach the vacuum bottle to allow the pin to be inserted.

10. Slowly close the breaker with the maintenance handle while watching the wear gap. If the gap gets larger than .38" before the breaker latches close, do not continue closing with the handle, but reopen breaker and spin the upper nut on the end of the operating rod upward thereby shortening the operating rod. If no gap appears at all when the breaker is closed, the operating rods are too short and the upper nut should be turned down. Again slowly close the breaker with the maintenance handle until a gap of .31" appears when the breaker is closed. Then tighten the lower nut on the bottom of the operating rod. (See Fig. 13.) This results in a wear gap of about .25" when the locking washers are compressed. The lower nut should be very tight. The upper nut is not tightened.

6.7.2 Removal and Installation of Spring Charging Motor

The spring charging motor can be expected to last under normal conditions for the life of the breaker without requiring removal or replacement. However, if it does become necessary to remove the spring charging motor proceed as follows:

1. Discharge all springs.

2. Tilt back barrier and remove its support pan.

3. Place breaker on bench at convenient working height.

4. Disconnect motor leads.

5. Remove four nuts holding motor assembly to mechanism. DO NOT REMOVE THE BOLTS FROM THE MECHANISM BACK PLATE.

6. Remove motor assembly.

7. Remove motor crank, Fig. 39, by striking sharp blow with soft mallet. Threads are right hand.

8. Remove motor from mounting bracket.

9. Install new motor in reverse order. BE SURE MOTOR CRANK ROLLER IS UNDER DRIVING PLATE, Item 11, Fig. 9a.

6.7.3 Removal and Installation of Closing Spring

Under normal conditions it should not be necessary to change the closing spring during the useful life of the mechanism. If the spring does have to be changed, a Closing Spring Removal Tool 592C864G01 is available from Westinghouse.

To change the closing spring, refer to Figs. 34 and 35 and proceed as follows:

1. Close and trip breaker manually to be sure all springs are discharged.

2. Remove barrier.

3. Assemble nut, thrust bearing, thrust washer, collar and tube on stud. Items 9, 8, 7, 6, 5 and 10, Fig. 35.

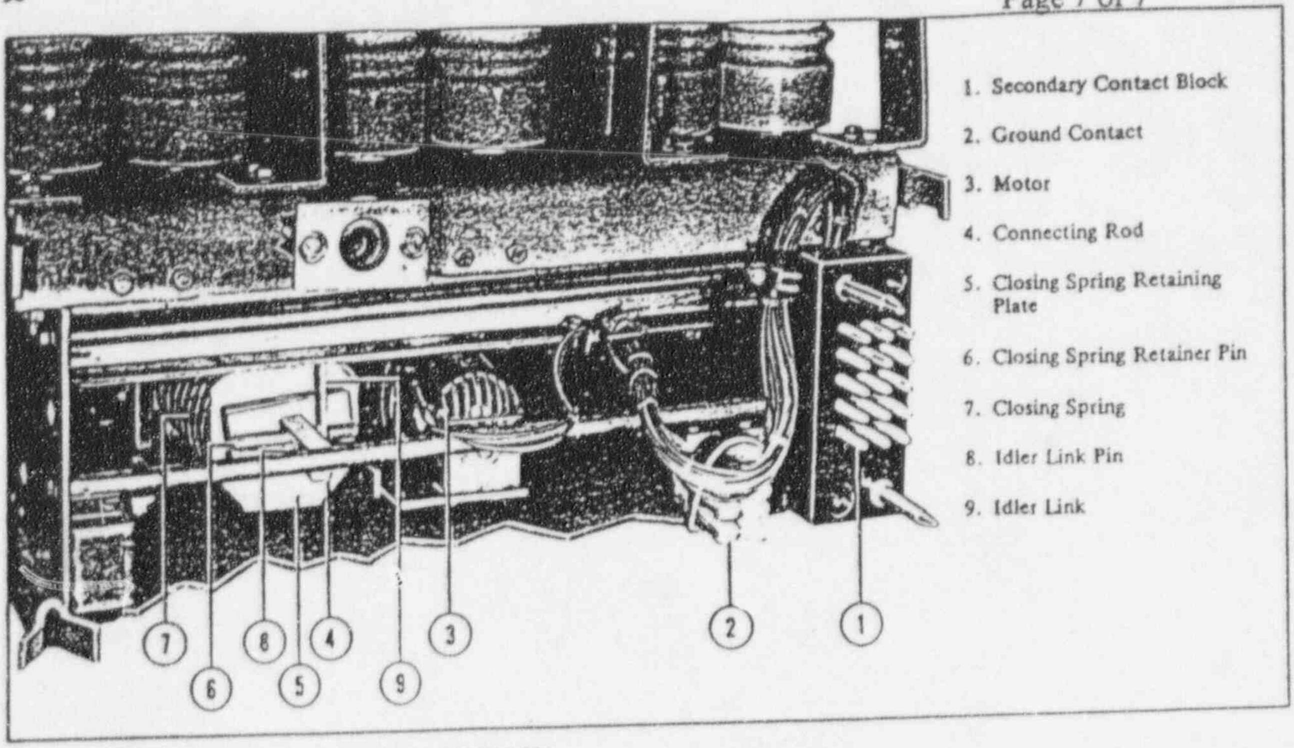


Fig. 34 *DVP Breaker Chassis: Rear View (396668)*

4. Screw stud, Item 10, into end of connecting rod, Item 1, as far as it will go, Fig. 35.

5. Hold stud firmly and remove idler link and pin. Items 8 and 9, Fig. 34.

NOTE: SPRING WILL MOVE EITHER UP OR DOWN WHEN IDLER LINK IS REMOVED.

6. Position the tube, Item 5, so that the slots straddle pin 4 thru the connecting rod 1, Fig. 35.

7. Tighten nut 9 so that spring retainer 2 is moved away from pin 4, Fig. 35.

8. Drive pin 4 out of hole in connecting rod 1, Fig. 35.

9. Hold end of stud 10 with a wrench to keep it from turning and unscrew nut 9 until closing spring 3 is completely free of tension, Fig. 35. Travel will be from 5 to 6.5 inches depending on breaker rating.

10. Remove tool and spring.

11. Reassemble in reverse order.

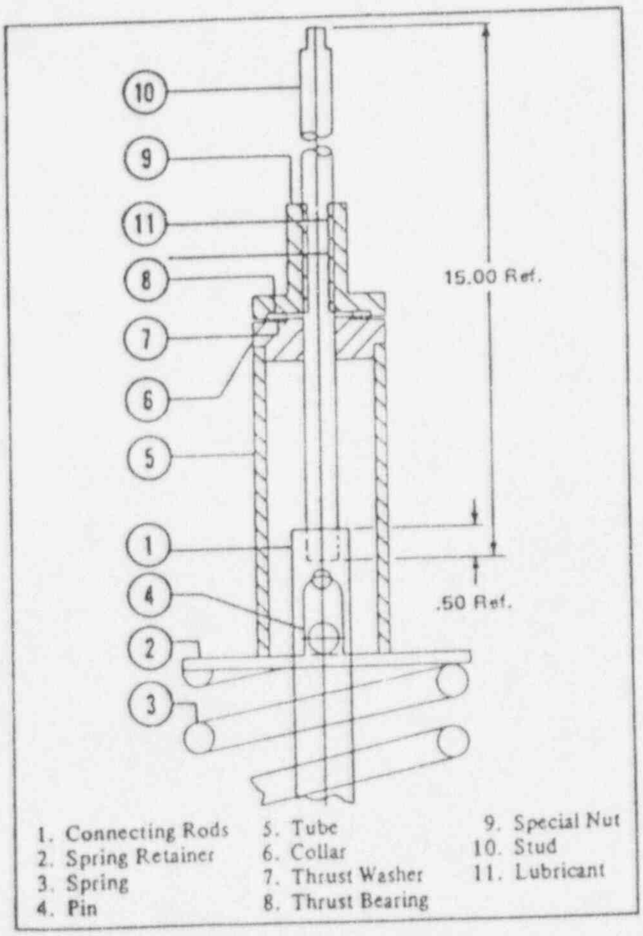


Fig. 35 *Closing Spring Removal Tool*

Westinghouse
Electric Corporation

7100 West Center Road RM445
Omaha Nebraska 68106

402-399-1935

February 22, 1993

Mr. George Kyle
Illinois Power Company
Clinton Station
P.O. Box 678
Clinton, IL 61727

Subject: DHP/DVP Breaker Inspections

Dear George,

This letter is in response to the Illinois Power inquiry regarding inspection intervals for the types DHP and DVP circuit breakers. Westinghouse's position, as spelled out in the existing instruction books, IB 32-253-4A & 4B/3B, is presented in the synopsis below.

> This class of power circuit breakers is a protective device to prevent damage to more expensive apparatus and to maintain continuity of electric power service. To maintain greater reliability the breaker should be inspected and given all indicated maintenance on a regular schedule.
>
> Type DHP and DVP circuit breakers are designed to have a long "in service" life with a minimum of maintenance when operating duty is fairly ordinary or average. Because these breakers are applied in a broad variety of applications under unique combinations of environmental conditions, each having operating duty requirements that can vary widely, it is virtually impossible to outline a specific maintenance schedule which would be universally appropriate for all ratings of circuit breakers in all types of applications.
>
> The instruction books provide general guidelines for establishing inspection schedules and for selecting specific maintenance procedures which are recommended to be used when particular conditions are observed. These guides are typified by a minimum number of rigid requirements to permit persons familiar with circuit breaker operation and maintenance a maximum amount of flexibility in developing a maintenance program consistent with good operating practices.
>
> Actual inspection and maintenance will depend upon individual application conditions. Some atmosphere conditions such as extremes of dust and moisture or corrosive gases might indicate inspection and maintenance at more frequent intervals. Very clean and dry conditions combined with low switching duty will justify longer times between inspection and maintenance operations. With experience, each user can set an inspection and maintenance schedule which is best for his particular case.

In order to obtain the most effective use of this type of maintenance instructions it is important for the user to establish an inspection program that will permit him to routinely examine each circuit breaker after regularly scheduled intervals of operation as well as at discrete times when conditions requiring particular maintenance procedures may be observed.

An initial inspection at the end of the first year in service is suggested because it provides an opportunity to evaluate conditions at an early point in the life of a circuit breaker. Based on conditions found, realistic decisions can be made concerning the length of time for succeeding inspection intervals.

As a part of an ongoing inspection/maintenance program some form of record keeping is suggested. Records may consist of a simple diary whose primary purpose is to document that an established inspection/maintenance schedule is actually being followed. However, more completely detailed records will facilitate evaluation of a breaker's condition or its changing condition. Such records may include formal check lists, detailed descriptions of conditions found, notes on operating duty, tests performed, maintenance procedures undertaken, etc. Whether simple records or more complete records are kept is for the user to decide. Records can be very helpful in determining both the types and extent of maintenance which may be required and in determining whether inspections should be scheduled more or less frequently.

The schedule for routinely inspecting circuit breakers will depend on three inter-related factors.

1. Time since the last inspection (per I.B. guidelines).

2. Number of load switching operations since the last inspection (Per I.B. guidelines).

3. Number of short circuit switching operations since the last inspection (Per I.B. guidelines).

Whichever of these three factors comes up first is the factor which determines when an inspection should be made.

The routine inspection interval should be based either on Time or on the Number of Anticipated Load Current Switching Operations whichever comes first. Superimposed on this routine inspection schedule is the requirement that the breaker must be inspection after an accumulation of a number of short current switching operations if this occurs before the Time or Load Switching Operations interval is completed.

As stated in the "DHP" breaker instruction book, IB 32-253-4A or 4B time intervals after the first initial inspection must not exceed three years. The instruction book, IB 32-253-3B, for the "DVP" breaker, states that this interval is one year. Illinois Power has asked if the one year interval for the DVP breaker can be extended to match the three year interval of the DHP. This would allow them to perform their inspections at the same time.

The guidelines given in the referenced Westinghouse instruction books (and summarized in the synopsis above) provide the user with the means to justify this extended interval based on his own recorded experiences, for his breakers. Assuming that Illinois Power has accumulated this actual experience, Westinghouse would not object to their extending the time interval of their DVP breakers to match that of their DHP breakers.

Sincerely,

Randy Faller

Randy Faller
Assistant Sales Engineer

cc- Joe Beck - St. Louis Office
cc- Jan Creighton - Forest Hills
cc- Tom Critchlow - Forest Hills

PPMMMPC PREVENTIVE MAINTENANCE DISPLAY MODE
STATION: CL TASK DESCRIPTION PAGE: T01
UNIT: 01 SYS: AP EIN: 1AP04EL TYPE: E JOB NO: PEMRRA001
PMDR #: __-____-_ CATEGORY: _ MWR/TAG NO: 000001 JOB STATUS: C
SD: RR REV NBR: 00 PM TYPE: R JOB PRIORITY: 00
EQUIP NAME: 1B33C001A RX RECIRC PUMP 1A
MFR NAME : WESTINGHOUSE ELECTRIC CORP. MODEL: 75DVP500
EQUIP LOC : 26-U---119---762
SAF: S IEEE: 1E SEIS: I CC: * QA: B PVOP: * LL: * MRS: S EQ: * UF: ___
TASK DESC : CLEAN & INSPECT RR BKR A1 (TYPE DVP)
HIST RET: R
CLEARANCE: Y COND REQD - EQUIP: __ SYS: __ UNIT: SD
REF DOC/REG REQ:
PLANNER REMARKS:

REVIEWED: Y LEAD RESP: EM ORIG DEPT: MP MAINT TYPE: ____
SCHEDULING MODE: I TASK FREQ: A INTERVAL: 003
DATES LAST DONE: LATE DATE: 070197 OUTPUT FORM: _
DATE DUE : 100196 PCT OVERRUN: 25 PM MODE ID: NONE
DATE SCHEDULED : ______ DEFERRAL CD: _ KEY EVENT: _
DATE ASSIGNED : ______ FOREMAN: __ FAILURE CODE: __
DATE COMPLETED : ______ RPRMN: ______ PP: _

PPMMMPC PREVENTIVE MAINTENANCE DISPLAY MODE
STATION: CL TASK DESCRIPTION PAGE: T01
UNIT: 01 SYS: AP EIN: 1AP05EA TYPE: E JOB NO: PEMRRA002
PMDR #: __-____-_ CATEGORY: _ MWR/TAG NO: 000001 JOB STATUS: C
SD: RR REV NBR: 00 PM TYPE: R JOB PRIORITY: 00
EQUIP NAME: 1B33C001B RX RECIRC PUMP 1B
MFR NAME : WESTINGHOUSE ELECTRIC CORP. MODEL: 75DVP500
EQUIP LOC : 26-V---105---762
SAF: S IEEE: 1E SEIS: I CC: * QA: B PVOP: * LL: * MRS: S EQ: * UF: ___
TASK DESC : CLEAN & INSPECT RR BKR B1 (TYPE DVP)
HIST RET: R
CLEARANCE: Y COND REQD - EQUIP: __ SYS: __ UNIT: SD
REF DOC/REG REQ:
PLANNER REMARKS:

REVIEWED: Y LEAD RESP: EM ORIG DEPT: MP MAINT TYPE: ____
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DATE DUE : 100196 PCT OVERRUN: 25 PM MODE ID: NONE
DATE SCHEDULED : ______ DEFERRAL CD: _ KEY EVENT: _
DATE ASSIGNED : ______ FOREMAN: __ FAILURE CODE: __
DATE COMPLETED : ______ RPRMN: ______ PP: _

PPMMMPC PREVENTIVE MAINTENANCE DISPLAY MODE
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PMDR #: __-____-_ CATEGORY: _ MWR/TAG NO: 000001 JOB STATUS: C
SD: RR REV NBR: 00 PM TYPE: R JOB PRIORITY: 00
EQUIP NAME: B33C1A4 6900V BUS RR1A BREAKER
MFR NAME : WESTINGHOUSE ELECTRIC CORP. MODEL: 75DVP500
EQUIP LOC : 28-AG---123---781
SAF: S IEEE: 1E SEIS: I CC: * QA: B PVOP: * LL: * MRS: S EQ: Y UF: ___
TASK DESC : CLEAN & INSPECT RR BKR A4 (TYPE DVP)
HIST RET: R
CLEARANCE: Y COND REQD - EQUIP: __ SYS: __ UNIT: SD
REF DOC/REG REQ:
PLANNER REMARKS:

REVIEWED: Y LEAD RESP: EM ORIG DEPT: MP MAINT TYPE: ____
SCHEDULING MODE: I TASK FREQ: A INTERVAL: 003
DATES LAST DONE: LATE DATE: 070197 OUTPUT FORM: _
DATE DUE : 100196 PCT OVERRUN: 25 PM MODE ID: NONE
DATE SCHEDULED : ______ DEFERRAL CD: _ KEY EVENT: _
DATE ASSIGNED : ______ FOREMAN: __ FAILURE CODE: __
DATE COMPLETED : ______ RPRMN: ______ PP: _

PPMMMPC PREVENTIVE MAINTENANCE DISPLAY MODE
STATION: CL TASK DESCRIPTION PAGE: T01
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PMDR #: _-___-_ CATEGORY: _ MWR/TAG NO: 000001 JOB STATUS: C
SD: RR REV NBR: 00 PM TYPE: R JOB PRIORITY: 00
EQUIP NAME: B33C1B4 6900V BUS RR1B BREAKER
MFR NAME : WESTINGHOUSE ELECTRIC CORP. MODEL: 75DVP500
EQUIP LOC : 28-AG--104--781
SAF: S IEEE: 1E SEIS: I CC: * QA: B PVOP: * LL: * MRS: S EQ: Y UF: ___
TASK DESC : CLEAN & INSPECT RR BKR B4 (TYPE DVP)
___ HIST RET: R
CLEARANCE: Y COND REQD - EQUIP: __ SYS: __ UNIT: SD
REF DOC/REG REQ:
___
PLANNER REMARKS:
___
___
REVIEWED: Y LEAD RESP: EM ORIG DEPT: MP MAINT TYPE: ____
SCHEDULING MODE: I TASK FREQ: A INTERVAL: 003
DATES LAST DONE: LATE DATE: 070197 OUTPUT FORM: _
DATE DUE : 100196 PCT OVERRUN: 25 PM MODE ID: NONE
DATE SCHEDULED : _____ DEFERRAL CD: _ KEY EVENT: _
DATE ASSIGNED : _____ FOREMAN: __ FAILURE CODE: ___
DATE COMPLETED : _____ RPRMN: ___ PP: _

CPS No. 8410.07

ILLINOIS POWER COMPANY
DOCUMENT CONTROL

DEC 2 8 1995

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CLINTON POWER STATION

CLINTON POWER STATION

PROCEDURE TITLE: REACTOR RECIRC 6900 VOLT VACUUM CIRCUIT BREAKER MAINTENANCE

SCOPE OF REVISION: New procedure for Reactor Recirc 6900 Volt Vacuum Circuit Breaker to address ORM requirements, this procedure was previously part of CPS No. 9383.06.

CLASS CODE: SNQD

ORIGINATED BY: Rich Slone

WORD PROCESSING BY: Mary Sloan

APPROVAL DATE: DEC 20 1995

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8.11 Lubrication

Preventive Maintenance lubrication, refer to Figures 5, 6, and 10.

8.11.1 (Initial) Lubricate following mechanism type items with light machine oil (Special No. 522B) applied sparingly:

8.11.1.1 Front and rear tripping latch rollers and pivot pin.

8.11.1.2 Tripping trigger pivot pin.

8.11.1.3 Spring release latch roller and pivot pin.

8.11.1.4 Spring release trigger and pivot pin.

8.11.1.5 Tripping cam pivot pin and restraining link pin.

8.11.2 (Initial) Apply a light coating of petrolatum to secondary contacts, and drawout disconnect fingers, when required.

8.11.3 Cycle breaker open and closed a few times to distribute lubricant

8.12 Testing

8.12.1 Megger circuit breaker using a test voltage of 1000 VDC per following steps. Megger readings shall be a minimum of 8 megohms.

8.12.1.1 (Record) With breaker OPEN measure resistance ϕA Line to ϕA Load, ϕB Line to ϕB Load and ϕC Line to ϕC Load recording lowest reading obtained.

8.12.1.2 Close breaker.

8.12.1.3 (Record) With breaker CLOSED measure resistance of ϕA to ϕB, ϕA to ϕC and ϕB to ϕC recording lowest reading obtained.

8.12.1.4 (Record) With breaker CLOSED measure resistance of ϕA to bkr. frame, ϕB to bkr. frame and ϕC to bkr. frame, recording lowest reading obtained.

c8.12.2 Ductor Testing

(QV WIT) (Record) For DVP breaker, close circuit breaker and perform ductor test on main contacts. Test leads shall be connected to upper and lower studs at points nearest their connections to pole unit assemblies. (The exact test point on each stud is an exposed ring of silver on the end opposite the finger cluster). All individual contact resistance readings shall be less than 68 microhms. Record readings on CPS No. 8410.07C001.

8.13 Restoration of Circuit Breaker

8.13.1 (Initial) Reassemble barrier, arc chutes as applicable, barrier mounting pan and any other hardware or components disassembled or removed.

8.13.2 (Initial) Manually operate circuit breaker to verify that breaker opens and closes satisfactory.

8.13.3 (Record) Record EIN and calibration due date of Measuring and Test Equipment used.

CAUTION

Ensure MOC switch is not engaged unless authorized by Operations to prevent any inadvertent system actuations.

8.13.4 (Initial) Have Operations rack breaker to TEST position. Electrically operate circuit breaker locally to verify breaker opens and closes satisfactory.

EOC-RPT Breaker Interruption Time Test Results*

Date	Bkr 3A	Bkr 3B	Bkr 4B	Bkr 4A
June 20, 1987	61 milliseconds	94 milliseconds	92 milliseconds	59 milliseconds
December 30, 1988	94 milliseconds	93 milliseconds	94 milliseconds	73 milliseconds
April 25, 1989	93 milliseconds	88 milliseconds	82 milliseconds	85 milliseconds
October 13, 1990	41 milliseconds	Not Required	Not Required	85 milliseconds
June 7, 1992	Not Required	47 milliseconds	83 milliseconds	Not Required

*Prior to 1990, all breakers were tested during each refueling outage even though the Technical Specifications (TS) allowed testing to be done on a staggered test basis such that all trip channels were required to be tested at least once per 36 months. IP's conservative interpretation of the TS was subsequently relaxed such that each breaker was then tested at a frequency of once per every other refueling outage (two per outage). In 1993, Amendment No. 74 to the CPS Operating License was issued which permitted IP to extend the test interval for the breaker arc suppression measurement test to 60 months (not including allowed overrun).