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November 9, 1998

**United States Nuclear Regulatory Commission**  
**Attention: Document Control Desk**  
**Washington, D.C. 20555**

**Subject:** Application for Amendment to Appendix A,  
Technical Specifications, to Facility Operating Licenses  
LaSalle County Nuclear Power Station, Units 1 and 2  
Facility Operating License NPF-11 and NPF-18  
NRC Docket Nos. 50-373 and 50-374

Proposed Change to the Technical Specification Requirements for the 4.16 kV  
Emergency Bus Undervoltage (Degraded Voltage) Emergency Core Cooling  
System Actuation Instrumentation Setpoints

**Reference:** W. T. Subalusky (ComEd) letter dated March 28, 1997, to USNRC transmitting  
supplemental response to the Electrical Distribution System Functional  
Inspection Reports 50-373/91019 and 50-374/91019

Pursuant to 10 CFR 50.90, Commonwealth Edison Company (ComEd) proposes to amend Appendix A, Technical Specifications, of Facility Operating Licenses NPF-11 and NPF-18, LaSalle County Station Units 1 and 2. The proposed amendment requests a change to the Technical Specifications to modify the degraded voltage second level undervoltage relay setpoint and allowable value. The affected Technical Specification is Technical Specification 3/4.3.3, ECCS System Actuation Instrumentation, and Technical Specification Table 3.3.3-2, ECCS System Actuation Instrumentation Setpoints. The proposed changes are supported by calculations that address known instrument errors and plant accident bus loading conditions. Submittal of this request for amendment fulfills a commitment made in the referenced letter from W. T. Subalusky to the USNRC.

ComEd requests approval of this amendment request prior to the start of the next refueling outage for Unit 1, L1R08, which is scheduled to start in November 1999. Implementation will be prior to startup from the next Unit 1 refueling, L1R08, and prior to startup from the next Unit 2 refueling outage, L2R08, currently scheduled for November 2000.

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November 10, 1998

Page 2,

U.S. Nuclear Regulatory Commission

This proposed amendment request is subdivided as follows:

1. Attachment A gives a description and safety analysis of the proposed changes in this amendment.
2. Attachment B includes the marked-up License/Technical Specification pages for LaSalle Units 1 and 2 with the requested changes indicated.
3. Attachment C describes ComEd's evaluation performed in accordance with 10 CFR 50.92 (c), which confirms that no significant hazard consideration is involved.
4. Attachment D provides an Environmental Assessment Applicability Review per 10 CFR 51.21.

This proposed amendment has been reviewed and approved by ComEd Onsite and Offsite Review in accordance with ComEd procedures.

In accordance with 10 CFR 50.91, ComEd is notifying the State of Illinois of this application for amendment by transmitting a copy of this letter and its attachments to the designated state official.


November 10, 1998

Page 3.

U.S. Nuclear Regulatory Commission

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

If there are any questions or comments concerning this letter, please refer them to Perry L. Barnes, Regulatory Assurance Manager, at (815) 357-6761, extension 2383.

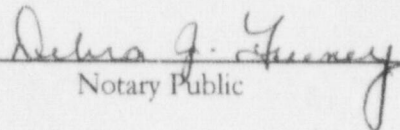
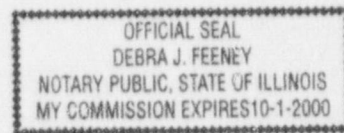


Fred R. Dacimo  
Site Vice President  
LaSalle County Station

Subscribed and sworn to before me, a Notary Public in and

for the State of Illinois, this 9<sup>th</sup> day of

November, 1998

  
Notary Public

Attachments

cc: J. L. Caldwell , Acting NRC Region III Administrator  
D. M. Skay, NRC Project Manger - NRR - LaSalle  
M. P. Huber, NRC Senior Resident Inspector - LaSalle  
Office of Nuclear Facility Safety, IDNS



## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

#### A. SUMMARY OF PROPOSED CHANGES

Pursuant to 10 CFR 50.90, Commonwealth Edison Company (ComEd) proposes to revise Appendix A, Technical Specifications of Facility Operating Licenses NPF-11 and NPF-18, LaSalle County Station Units 1 and 2. The proposed changes include changes to the Technical Specifications to modify the degraded voltage second level undervoltage relay setpoint and allowable values. The affected Technical Specification is Technical Specification 3/4.3.3, ECCS System Actuation Instrumentation, and Technical Specification Table 3.3.3-2, ECCS System Actuation Instrumentation Setpoints. The proposed changes are supported by calculations that address known instrument errors and plant accident bus loading conditions. This Technical Specification amendment requests a change in the Technical Specification Table 3.3.3-2 setpoint and allowable range for the degraded voltage secondary undervoltage relay from 3814 volts  $\pm 76V$  to  $\geq 3870$  volts for the setpoint and  $\geq 3814$  volts for the allowable value.

#### B. DESCRIPTION OF THE CURRENT REQUIREMENTS

Per Technical Specification Table 3.3.3-2, Trip Function D.2, the degraded voltage trip setpoint for the 4160 Volt Class 1E buses is 3814  $\pm 76$  volts, which is 91.7  $\pm 2.0\%$  of normal Class 1E bus voltage.

The Technical Specifications include limiting conditions for operation, surveillance requirements, trip setpoints with minimum and maximum limits and allowable values for the degraded voltage protection instrumentation.

#### C. BASES FOR THE CURRENT REQUIREMENTS

The offsite power system is the common source which normally supplies power to the redundant Class 1E buses. A sustained degradation of the offsite power system's voltage could result in the loss of capability of the redundant safety loads, their control circuitry, and the associated electrical components required for performing safety functions.

The purpose of the degraded voltage protection system is to monitor the voltages on the Class 1E buses and to trip the incoming feed circuit breakers to the Class 1E buses, if the undervoltage condition reaches the settings (i.e., trip voltage and time delay) of the undervoltage relay. This function is performed to prevent continuous operation of safety loads below the minimum voltages required for proper operation. With the

## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

offsite power degraded, the undervoltage relays initiate separation of the Class 1E buses from the offsite power source and load the Class 1E buses onto their respective emergency diesel generators (EDGs).

The Class 1E buses at LaSalle County Station consist of buses 141Y, 142Y, and 143 for Unit 1 and buses 241Y, 242Y, and 243 for Unit 2. These Class 1E buses are operated at 4160 volts and also are divided among three safety system Divisions (1, 2, and 3 for Unit 1 and 1, 2, and 3 for Unit 2), where each Division corresponds to bus 141Y, 142Y, and 143 for Unit 1, and 241Y, 242Y, and 243 for Unit 2, respectively. The trip voltage and the time delay current Technical Specification requirements of the degraded voltage relays at LaSalle County Station, Units 1 and 2, are  $3814 \pm 76$  Volts for  $5 \pm 0.5$  minutes without a LOCA signal, and  $10 \pm 1$  seconds with a LOCA signal.

The 4160 volt Class 1E buses have two levels of undervoltage protection. A loss of voltage scheme will promptly detect a loss of offsite power and will automatically connect the onsite sources, the Emergency Diesel Generators (EDGs), quickly enough to satisfy core cooling requirements for loss of coolant events independent of break size. The degraded voltage relay at each Divisional Class 1E Bus will be set low enough to assure that the EDG is not unnecessarily challenged by motor starting transients while assuring that the EDG will be available for core cooling as stated above. Degraded voltage protection is provided to assure adequate terminal voltage of electrical equipment required for accident mitigation when supplied by offsite sources (the transmission grid) with a sustained degraded voltage condition. The degraded voltage protection scheme is provided with two time delay functions. A short delay is provided to assure that the EDG is not unnecessarily challenged by motor starting transients. A longer time delay is provided to allow the operator to take corrective action to restore voltage before transferring to the EDG. This longer time delay is bypassed by the Emergency Core Cooling System (ECCS) initiation high drywell pressure/low reactor water level logic. The degraded voltage protection scheme is disabled when the EDG supplies power to the auxiliary power distribution system.

The maximum loading condition for the electrical distribution system is for the large break loss of coolant accident when offsite power sources are available. This design basis event results in the highest loading on the respective Class 1E bus, which causes the highest voltage drops in the transformers and cables feeding the safety-related loads. Further, the setpoint was evaluated against the voltage levels at the Class 1E buses under the minimum expected switchyard voltage condition combined with maximum credible auxiliary power loading to assure the availability of the preferred power supply. Accordingly, the TS requirements include a sufficient tolerance range to accommodate these types of loading and voltage considerations.

## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

The design basis of the degraded voltage relays are to:

- 1) Insure that safety-related loads have acceptable voltage for proper starting and operating.
- 2) Prevent electrical relay trip (relay dropout) when the preferred offsite power voltages are within the expected operating range as per the Updated Final Safety Analysis Report (UFSAR) Section 8.2.3.2 (a minimum of 354 kV, which is 102.6% of 345 kV).
- 3) Trip (relay dropout) before the sustained voltages at the loads (i.e., motor, etc.) are at a degraded level (i.e., below 3814 VAC Class 1E bus voltage as shown by a calculation).
- 4) Include a trip setpoint that should have sufficient difference between the relay tolerance and the Technical Specification Allowable Values to account for the uncertainties that occur during calibration.
- 5) Reset at a voltage below the offsite minimum steady state voltages.

#### D. NEED FOR REVISION OF THE REQUIREMENTS

During the 1991 LaSalle Electrical Distribution System Functional Inspection (EDSFI) (Reference I.3), it was identified that the TS degraded voltage relay setpoints may be non-conservative.

Calculations were performed to verify the adequacy of existing degraded voltage relay setpoint ( $3814 \pm 76V$ ) at the Divisional Class 1E Buses. The preliminary calculations indicated that the setpoint may be non-conservative, in that, with 4040 volts at the System Auxiliary Transformer (SAT), adequate voltage may not be available at the Divisional Class 1E Buses to start selected emergency loads, and that greater than 4040 volts may be required to ensure that motor control circuits will have adequate voltage. Accordingly, the following compensatory actions were implemented:

- Increase degraded voltage relay setpoints to 3885 volts.
- Increase undervoltage alarm setpoint to 4040 volts for Div. I/Div. II SAT winding.
- Declare the 4160 volt Class 1E bus inoperable in accordance with Technical Specification 3.8.2.1 when the associated Unit is in Operational Condition 1 or 2, if 4160 volt Class 1E bus voltages fall below 4040 volts.



## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

In accordance with compensatory actions taken for the degraded voltage issue, the degraded voltage relays are currently calibrated to trip at 3885V. Per ComEd's response to Unresolved Item 373/91019-06 and 374/91019-06, the setpoint for these relays will be revised as allowed by the setpoint calculations. The setpoint change cannot be implemented until the degraded voltage trip setpoint and allowable value specified in the Technical Specifications are revised.

The modifications that were required to resolve the motor control circuits with inadequate contactor terminal voltages on both units have been completed. In addition, modifications were also completed during Unit 2 Refuel Outage L2R05 (Fall of 1995), which replaced the degraded voltage relays and changed the 4160/480V transformer taps for the Unit 2 Class 1E Division 2 unit substations, 236X and 236Y to boost the secondary voltage by 2.5%. The replacement of the degraded voltage relays and changes to the Class 1E Division 2 transformer taps on Unit 1 were completed during Unit 1 Refuel Outage L1R05 (September 1992 to January 1993). The Unit 1 and Unit 2 Class 1E Division 1 transformer tap changes were completed during Unit 1 Refuel Outage L1R06 (Spring 1994) and Unit 2 Refuel Outage L2R06 (Spring 1995), respectively.

The degraded voltage concerns for the 480 VAC equipment (motors, heaters, battery chargers, etc.), except for the motor-operated valves (MOVs), were resolved by initiating modifications to change the 4160/480V transformer taps for the Class 1E Divisions 1 and 2 unit substations on both units to boost the secondary voltage by approximately 2.5%. No tap changes are required for the Class 1E Division 3 transformers, and no other design changes are required for Class 1E Division 3.

In addition, due to the tap changes to increase bus voltage for low voltage (480 volts or less) loads, the minimum loading condition for the buses was reviewed to assure that Class 1E loads are not subjected to an overvoltage condition that could damage the loads.

The modifications that were required to resolve MOV voltage concerns have been completed and are identified under the GL 89-10 program. The transformer boost modification resolved initial MOV voltage concerns and did not require any additional MOV modifications not already indicated for the GL 89-10 program.

If the transformer tap change modifications did not increase the starting and/or running voltage above the acceptance criteria used in the calculations for any Class 1E bus loads, either the original equipment vendors were contacted to obtain the actual minimum starting and running voltage requirements or an analysis was performed to determine the minimum voltage requirement. The low voltage concerns with motors and battery chargers were resolved by obtaining the minimum voltage requirements from the vendor; the voltage concerns with heaters were resolved by vendor information and analysis. If no vendor data was available, the acceptance criteria used in the calculations for minimum allowable terminal voltage for motors was 90% of rated for running and 85% of rated for starting. Reference

## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

I.1 discusses the basis for the minimum allowable terminal voltages for starting the loads in response to Deviation 373/91019-05A(DRS); 374/91019-05A(DRS). For battery chargers and heaters, the minimum allowable terminal voltage was 90% of rated. Per UFSAR section 8.2.3.2.2, the minimum voltage of 90% of rated voltage is based on the National Electric Manufacturers Association (NEMA) standards, which require that the maximum voltage should be limited to 110% of equipment rated voltage and the minimum voltage should be limited to 90% of equipment rated voltage.

Nine motor control circuits on each unit were determined to have inadequate voltage at the contactor to pick up at the original degraded voltage setpoint of 3814 volts. The corrective actions implemented for the motor control circuits with inadequate voltage at the degraded voltage setpoint consisted of adding an interposing relay between the contactor coil and control circuit. For the Class 1E Division 3 circuits, the design changes also replaced the existing 120 VAC coil in the contactor with a coil rated at 460 VAC  $\pm$  10%. The interposing relays (and new coils for Division 3) significantly reduced the conductor length and thus, the voltage drop, between the contactor coil and power supply. (Reference I.5)

The 120 VAC distribution circuits with inadequate voltage at the degraded voltage setpoint are identified in Reference I.6. The corrective actions that were implemented consisted of one or more of the following plant changes:

1. Tap changes of the associated 480: 120/208V distribution transformers to increase the voltage on the secondary side.
2. Increase in the size of the power supply cable to decrease the voltage drop between the bus and load.
3. Addition of voltage regulating transformers to the circuits.

The last of the modifications for the 120 VAC distribution circuits were completed during L2R07. The remaining open item for the degraded voltage issue is the setpoint change which is to be implemented on each unit prior to startup following the next refueling outage after approval of this Technical Specification amendment.

References 1 through 7 docketed the actions taken to date to resolve the degraded voltage issues at LaSalle. This request for a license amendment and the associated design change package to change the degraded voltage relay setpoints are the final steps required for closing the degraded voltage issue at LaSalle County Station.



## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

#### E. DESCRIPTION OF THE PROPOSED CHANGES

This Technical Specification amendment requests a change in the Technical Specification Table 3.3.3-2 setpoint and allowable range for the degraded voltage secondary undervoltage relay from 3814 volts  $\pm 76V$  to  $\geq 3870$  volts for the setpoint and  $\geq 3814$  volts for the allowable value.

#### F. SAFETY ANALYSIS OF THE PROPOSED CHANGES

In order to establish the upper and lower limits for the degraded voltage setpoint and allowable value, calculations were required to:

- Assure that at minimum switchyard voltage, the required Class 1E loads will continue to operate with the power from the preferred source, offsite power.
- Assure that Class 1E loads will have adequate voltage at the required load terminals when the associated 4.16 kV Class 1E bus voltage is at the lower analytical limit of 3814 kV Class 1E bus voltage.

The bases for these upper and lower limits is consistent with NUREG 0800, Standard Review Plan, Section 8, Appendix 8A, Branch Technical Position PSB-1, "Adequacy of Station Electric Distribution System Voltages", and are as follows:

1. Terminal voltage adequacy has been explicitly evaluated by calculations conforming to 10 CFR 50, Appendix B, and applicable Commonwealth Edison procedures governing calculation content, methodology, and quality. The voltage analysis was performed at the maximum expected loading (normal full power operation plus LOCA) on the auxiliary power system loads being supplied by the SAT.

The main purpose of the degraded voltage calculations is to ensure the safety-related electrical equipment will have sufficient terminal voltages at the analytical limit of 3814 volts. The following describes the bases for how loads were modeled for the related calculations:

- a. Continuous duty motors were modeled at nameplate horsepower rating unless specific loading information is known. Given this loading, the terminal voltage from a load flow was compared to the motor nameplate voltage rating. If the terminal voltage was greater than or equal to 90% of the rating for running and 85% of rated for starting, then terminal voltage adequacy is demonstrated and no further evaluation is required. If the running or starting terminal voltages were less than the criterion, actual motor vendor data was

## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

used or an analysis was performed to determine the minimum voltage requirements.

- b. Resistive heaters which have functions required for accident mitigation (such as the Standby Gas Treatment System and Control Room Emergency Filtration System) were modeled as constant impedance loads. The heater resistance was calculated using rated power and voltage. Given motor control center (MCC) voltage from the load flow, the heater terminal voltage was determined by subtracting the voltage drop in the feed cable from the MCC voltage under degraded voltage conditions. Terminal voltage is adequate if the heat generated ( $I^2R$ ) is greater than or equal to the heat required for the safety function (adequate reduction of relative humidity for maintaining filter performance in the case of the above examples).
- c. Battery chargers were modeled as constant current loads. The battery charger terminal voltages were calculated under degraded voltage conditions. The performance of the charger was verified by test or analysis under the calculated terminal voltage condition.
- d. Intermittent duty motors, such as motor-operated valves and HVAC dampers, need only be considered if they operate during accident conditions. If so, the inrush current will be accounted for. Otherwise, the brief voltage dip from random MOVs does not need to be included.

Terminal voltage adequacy of such loads was demonstrated in the GL 89-10 effort to assure that MOVs will perform their intended safety functions under design conditions.

- e. MCC contactors were evaluated using the MCC as a fixed source (infinite bus) at a voltage as calculated from the load flow. Circuit models for each size of contactor were developed to determine maximum acceptable control circuit impedances and the actual cable impedances were compared against this criteria.
- f. Distribution panels on the 120V level were modeled as constant impedance lumped loads on the 480V MCC. Three phase transformers (480: 120/208V) were modeled as three-phase balanced loads at transformer nameplate (preferred) or by using connected panel loads. Single phase transformers were handled in the same manner except that

## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

the load will be multiplied by square root of 3 to emulate a balanced three-phase load. Calculations were then performed to determine the component terminal voltages in the safety-related control circuits.

Based on the above calculations and associated design changes, if required, with actual 4.16 kV Class 1E bus voltage at the analytical limit of 3814 volts it is assured that Class 1E equipment will perform their intended safety functions.

2. The proposed change to the degraded voltage trip setpoint and allowable value will ensure that the Class 1E equipment will be capable of starting and operating during a design basis accident with minimum expected offsite grid voltage of 354 kV. Calculations were done to demonstrate that the degraded voltage relays will not actuate following a block start of the electrical loads that are automatically actuated by or as a consequence of the LOCA signal, if the grid voltage remains above 352 kV. The block start included full load plus accident loads on the 4 kV Class 1E Buses, for conservatism. The corresponding 4.16 kV Class 1E voltages at a minimum grid voltage of 352 kV are as follows:

Unit 1 Class 1E Division 1 Bus 141Y - 3956 Volts

Unit 1 Class 1E Division 2 Bus 142Y - 3957 Volts

Unit 1 Class 1E Division 3 Bus 143 - 3960 Volts

Unit 2 Class 1E Division 1 Bus 241Y - 3929 Volts

Unit 2 Class 1E Division 2 Bus 242Y - 3931 Volts

Unit 2 Class 1E Division 3 Bus 243 - 3933 Volts

If the grid voltage drops below 352 kV, then the analytical limit of 3814 volts for proper operation of class 1E loads connected to each 4.16 kV Class 1E bus is assured by transfer to the respective onsite power sources (Emergency Diesel Generators (EDGs)) by the degraded voltage logic.

Setpoint calculations which address known instrument errors were completed with a lower analytical limit of 3814V. The calibration setpoint was calculated to be 3870 volts (3870 volts  $\div$  4200:120V PT turns ratio = 110.58 volts sensed by the degraded voltage undervoltage relay). The relay setpoint was chosen such that the lowest possible voltage for relay operation, considering setpoint error, will be no lower than the analytical limit (3814 volts).



## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

These calculations show that there is sufficient margin (at least 59 volts) between the setpoint and the 4kV Class 1E bus voltage that occurs at the minimum assumed switchyard voltage of 352 kV to account for the instrument uncertainties and, thus, prevent unnecessary transfers to the diesel generators. Also, the maximum reset voltage of the ITE-27N undervoltage (degraded voltage) relay is less than the 4kV Class 1E bus voltage that occurs at the minimum assumed switchyard voltage of 352 kV. These calculations also show that a margin of approximately 1.5% (56 volts) is needed between the setpoint and analytical limit to account for instrument drift in the negative direction.

The circuit for Divisions 1, 2, and 3 consists of a 4200-120 volt potential transformer (PT) (turns ratio = 35) and an ABB/ITE-27N undervoltage relay. The 4200 volt side of the PT is connected to two phases of the 4160 volt source at the safety-related switchgear. The trip unit is connected to the 120 volt side of the PT. The trip unit is powered by a 125 volt dc source. The trip unit voltage corresponding to the 3814 volt analytical limit is  $3814V \div 35$  turns ratio = 108.97V.

The methodology used for determining the new setpoints is based on ComEd's design guides ENC-TID-E/I&C-10 and ENC-TID-E/I&C-20. The setpoint methodology is consistent with Regulatory Guide 1.105, Rev. 1, "Instrument Setpoints for Safety-Related Systems". The methodology considered the following items in determining the setpoint error of the Secondary Undervoltage relays:

- 1) Relay reference accuracy (defined by the manufacturer as repeatability at a constant temperature and control voltage).
- 2) Calibration instrument error (defined by the instrument manufacturer).
- 3) Temperature effect on relay setting during calibration and during plant operation (defined by the manufacturer as repeatability over a temperature range).
- 4) Control power voltage effect on relay setting (defined by the manufacturer as repeatability over the allowable DC control power range).
- 5) Relay setting tolerance.
- 6) Loop accuracy (e.g., potential transformer error).

The reference accuracy, calibration instrument error, and relay setting tolerance are considered random errors and were combined by the "square root of the sum of the squares" method.

## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

The temperature effect and the control voltage effect are non-random errors and are linear in nature. The total error is determined by adding the total random and non-random errors. In addition, the following items were evaluated for their effect on relay performance: humidity, seismic, pressure, radiation, and drift. Each of these were determined to have negligible effect on setpoint error, due to the mild environment where the relays are located.

Based on the above setpoint methodology, the approach used in the current Technical Specifications of specifying a nominal setpoint and a  $\pm$  tolerance has been changed. The degraded voltage relay nominal setpoints are conservative with respect to the analytical limits. Time delay setpoints and tolerances are unaffected by these new calculations.

#### G. IMPACT ON PREVIOUS SUBMITTALS

This submittal does not affect any requests for license amendments currently submitted to the NRC for review.

#### H. SCHEDULE REQUIREMENTS

ComEd requests approval of this amendment request prior to the start of the next refueling outage for Unit 1, L1R08, which is scheduled to start in November 1999. Implementation will be prior to startup from L1R08 for Unit 1 and prior to startup from the next Unit 2 refueling outage, L2R08, which is scheduled to start in September 2000.

#### I. REFERENCES

1. T. J. Kovach Letter to USNRC dated January 16, 1992, transmitting response to NRC Inspection Reports 50-373/91019 and 50-374/91019 regarding the Electrical Distribution System Functional Inspection (EDSFI) report.
2. T. J. Kovach letter to USNRC dated April 30, 1992, transmitting supplemental response to the subject unresolved item.
3. T. O. Martin (USNRC) letter to L. O. DelGeorge dated March 12, 1993, transmitting Inspection Report Nos. 50-373/93002 and 50-374/93002.
4. M. B. Depuydt (ComEd) letter dated June 22, 1993, to T. E. Murley (USNRC) transmitting supplemental response to the subject unresolved item.

## ATTACHMENT A

### DESCRIPTION OF SAFETY ANALYSIS FOR THE PROPOSED CHANGES

5. G. G. Benes (ComEd) letter dated January 27, 1994, to T. E. Murley (USNRC) transmitting supplemental response to the subject unresolved item.
6. R. E. Querio (ComEd) letter dated February 27, 1996, to USNRC transmitting supplemental response to the subject unresolved item.
7. W. T. Subalusky (ComEd) letter dated March 28, 1997, to USNRC transmitting supplemental response to the Electrical Distribution System Functional Inspection Reports 50-373/91019 and 50-374/91019.



ATTACHMENT B

MARKED-UP PAGES FOR PROPOSED CHANGES

REVISED PAGES

NPF-11

3/4 3-30\*

3/4 3-30a

NPF-18

3/4 3-30\*

3/4 3-30a

\* These pages are provided for continuity only and have no proposed changes.