February 11, 19~~ Amdt. 80 to DPR-16
See Correction letter of 3/21/85

Docket No. 50-219
LS05-85-02-003

Mr. P. B. Fiedler
Vice President and Director
Oyster Creek Nuclear Generating Station
Post Office Box 388
Forked River, New Jersey 08731

Dear Mr. Fiedler:

SUBJECT: DEGRADED GRID PROTECTION FOR CLASS IE POWER SYSTEMS

Re: Oyster Creek Nuclear Generating Station

DISTRIBUTION

Docket	ELJordan
NRC PDR	PFMcKee
Local PDR	ACRS (10)
ORB Reading	SEPB
NSIC	RDiggs (w/fee form)
JZwolinski	TBarnhart (4)
CJamerson	LJHarmon
PM	DBrinkman
OELD	WJones
EButcher	CMiles, OPA
	JEmami

The Commission has issued the enclosed Amendment No. 80 to Provisional Operating License No. DPR-16 for the Oyster Creek Nuclear Generating Station. This amendment consists of changes to the Technical Specifications in response to your application dated August 11, 1980 and supplemented October 18, 1982, December 5, 1983, February 9 and March 23, 1984.

The amendment authorizes changes to the Appendix A Technical Specifications relating to station electric distribution system voltages, and fulfills the requirements set forth in the safety evaluation dated October 16, 1981.

A Notice of Consideration of Issuance of Amendment to License and Proposed No Significant Hazards Consideration Determination and Opportunity for Hearing related to the requested action was published in the Federal Register on November 21, 1984 (49 FR 45952). No requests for hearing or comments were received.

A copy of our related Safety Evaluation is also enclosed. A notice of issuance pertaining to this action will appear in the Commission's next Monthly Notice publication in the Federal Register.

Sincerely,

Original signed by

John A. Zwolinski, Chief
Operating Reactors Branch #5
Division of Licensing

Enclosures:
1. Amendment No. 80 to License No. DPR-16
2. Safety Evaluation

cc w/enclosures:
See next page

SEO!
DSU USE 51

DL:ORB#5	DL:ORB#5	DL:ORB#5	OELD	DL	DSI:PSB
CJamerson:jb	JDonohew	JZwolinski		DCrutchfield	JEmami HE
12/5/84	12/7/84	2/1/85	2/1/84	2/8/85	12/17/84

8502140096 850211
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

GPU NUCLEAR CORPORATION

AND

JERSEY CENTRAL POWER AND LIGHT COMPANY

OYSTER CREEK NUCLEAR GENERATING STATION

AMENDMENT TO PROVISIONAL OPERATING LICENSE

Amendment No. 80
License No. DPR-16

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by GPU Nuclear Corporation and Jersey Central Power and Light Company (the licensees) dated August 11, 1980 and supplemented October 18, 1982, December 5, 1983, February 9 and March 23, 1984 complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and Paragraph 2.C(2) of Provisional Operating License No. DPR-16 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 80 , are hereby incorporated in the license. GPU Nuclear Corporation shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

John A. Zwolinski, Chief
Operating Reactors Branch #5
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: February 11, 1985.

ATTACHMENT TO LICENSE AMENDMENT NO. 80

PROVISIONAL OPERATING LICENSE NO. DPR-16

DOCKET NO. 50-206

Replace the following pages of the Appendix A Technical Specifications with the enclosed page. The revised pages are identified by the captioned amendment number and contain vertical lines indicating the area of change.

Remove Page	Replace Page
2.3-3	2.3-3
2.3-8	2.3-8
--	3.1-11b
3.1-14	3.1-14
3.7-1	3.7-1
4.1-6a	4.1-6a

	FUNCTION	LIMITING SAFETY SYSTEM SETTINGS
C.	Reactor High, Pressure, Scram	≤1060 psig
D.	Reactor High Pressure, Relief Valves Initiation	2 @ ≤ 1070 psig 3 @ ≤ 1090 psig
E.	Reactor High Pressure, Isolation Condenser Initiation	≤1060 psig with time delay ≤3 seconds
F.	Reactor High Pressure, Safety Valve Initiation	4 @ 1212 psig 4 @ 1221 psig ± 12 psi 4 @ 1230 psig 4 @ 1239 psig
G.	Low Pressure Main Steam Line, MSIV Closure	≥825 psig (initiated in IRM range 10)
H.	Main Steam Line Isolation Valve Closure, Scram	≤10% Valve Closure from full open
I.	Reactor Low Water Level, Scram	≥11'5" above the top of the active fuel as indicated under normal operating conditions
J.	Reactor Low-Low Water Level, Main Steam Line Isolation Valve Closure	≥7'2" above the top of the active fuel as indicated under normal operating conditions
K.	Reactor Low-Low Water Level, Core Spray Initiation	≥7'2" above the top of the active fuel
L.	Reactor Low-Low Water Level, Isolation Condenser Initiation	≥7'2" above the top of the active fuel with time delay ≤ 3 seconds
M.	Turbine Trip, Scram	10 percent turbine stop valves(s) closure from full open
N.	Generator Load Rejection, Scram	Initiate upon loss of oil pressure from turbine acceleration relay
O.	Recirculation Flow, Scram	≤ 71.4 Mlb/hr (117% of rated flow)
P.	Loss of Power	
	1) 4.16 KV Emergency Bus Undervoltage (Loss of Voltage)	0 volts with 3 seconds ± 0.5 seconds time delay
	2) 4.16 KV Emergency Bus Undervoltage (Degraded Voltage)	3671 ± 1% (36.7) volts 10 ± 10% (1.0) second time delay

During periods when the reactor is shut down, decay heat is present and adequate water level must be maintained to provide core cooling. Thus, the low-low level trip point of 7'2" above the core is provided to actuate the core spray system to provide cooling water should the level drop to this point. In addition, the normal reactor feedwater system and control rod drive hydraulic system provide protection for the water level safety limit both when the reactor is operating at power and in the shutdown condition.

The turbine stop valve(s) scram is provided to anticipate the pressure, neutron flux, and heat flux increase caused by the rapid closure of the turbine stop valve(s) and failure of the turbine bypass system.

The generator load rejection scram is provided to anticipate the rapid increase in pressure and neutron flux resulting from fast closure of the turbine control valves to a load rejection and failure of the turbine bypass system. This scram is initiated by the loss of turbine acceleration relay oil pressure. The timing for this scram is almost identical to the turbine trip.

The total recirculation flow scram is provided to terminate a flow increase transient. Flow transients are normally protected against by employing the k_f factor and using mechanical stops on the recirculation pumps. Oyster Creek does not have mechanical stops on its recirculation pumps and maximum flow is beyond the limit for which the k_f factor provides protection. The recirculation flow scram is set to the maximum flow level corresponding to the k_f curve to be used (Section 3.10).

The undervoltage protection system is a 2 out of 3 coincident logic relay system designated to shift emergency buses C and D to on site power should normal power be lost or degraded to an unacceptable level. The trip points and time delay settings have been selected to assure an adequate power source to emergency safeguards systems in the event of a total loss of normal power or degraded conditions which would adversely affect the functioning of engineered safety features connected to the plant emergency power distribution system.

References

(1) FDSAR, Volume I, Section VII-4.2.4.2
(2) FDSAR, Amendment 28, Item III.A-12
(3) FDSAR, Amendment 32, Question 13
(4) Letters, Peter A. Morris, Director, Division of Reactor Licensing, USAEC to John E. Logan, Vice President, Jersey Central Power and Light Company, dated November 22, 1967 and January 9, 1968
(5) FDSAR, Amendment 65, Section B.XI.
(6) FDSAR, Amendment 65, Section B.IX.

TABLE 3.1.1 PROTECTIVE INSTRUMENTATION REQUIREMENTS (CONTD)

Function	Trip Setting	Reactor Modes in which Function Must be Operable: Shutdown	Refuel	Startup	Run	Min. No. of Operable or Operating (Tripped) Trip Systems	Min. No. of Operable Instrument Channels Per Operable Trip Systems	Action Required*
N. Loss of Power								
a. 4.16KV Emergency Bus Undervoltage (Loss of Voltage)	**	X(ff)	X(ff)	X(ff)	X(ff)	2	1	
b. 4.16 KV Emergency Bus undervoltage (Degraded Voltage)	**	X(ff)	X(ff)	X(ff)	X (ff)	2	3	See Note ee

TABLE 3.1.1 (Cont'd)

v. These functions not required to be operable when the ADS is not required to be operable.

w. These functions must be operable only when irradiated fuel is in the fuel pool or reactor vessel and secondary containment integrity is required per specification 3.5.B.

y. The number of operable channels may be reduced to 2 per Specification 3.9-E and F.

z. The bypass function to permit scram reset in the shutdown or refuel mode with control rod block must be operable in this mode.

aa. Pump circuit breakers will be tripped in 10 seconds ± 15% during a LOCA by relays SK7A and SK8A.

bb. Pump circuit breakers will trip instantaneously during a LOCA.

cc. Only applicable during startup mode while operating in IRM range 10.

dd. If an isolation condenser inlet (steam side) isolation valve becomes or is made inoperable in the open position during the run mode comply with Specification 3.8.E. If an AC motor-operated outlet (condensate return) isolation valve becomes or is made inoperable in the open position during the run mode comply with Specification 3.6.F.

ee. With the number of operable channels one less than the Min. No. of Operable Instrument Channels per Operable Trip Systems, operation may proceed until performance of the next required Channel Functional Test provided the inoperable channel is placed in the tripped condition within 1 hour.

ff. This function is not required to be operable when the associated safety bus is not required to be energized or fully operable as per applicable sections of these technical specifications.

3.7 AUXILIARY ELECTRICAL POWER

Applicability: Applies to the operating status of the auxilary electrical power supply.

Objective: To assure the operability of the auxiliary electrical power supply.

Specification:

A. The reactor shall not be made critical unless all of the following requirements are satisfied:

1. The following buses or panels energized.

   a. 4160 volt buses 1C and 1D in the turbine building switchgear room.
   b. 460 volt buses 1A2, 1B2, 1A21, 1B21 vital MCC 1A2 and 1B2 in the reactor building switchgear room: 1A3 and 1B3 at the intake structure; 1A21A, 1B21A, 1A21B, and 1B21B and vital MCC 1AB2 on 23'6" elevation in the reactor building; 1A24 and 1B24 at the stack.
   c. 208/120 volt panels 3, 4, 4A, 4B, 4C and VACP-1 in the reactor building switchgear room.
   d. 120 volt protection panel 1 and 2 in the cable room.
   e. 125 volt DC distribution centers C and B, and panel D, Panel DC-F, isolation valve motor control center DC-1 and 125V DC motor control center DC-2.
   f. 24 volt D.C. power panels A and B in the cable room.

2. One 230 KV line is fully operational and switch gear and both startup transformers are energized to carry power to the station 4160 volt AC buses and carry power to or away from the plant.

3. An additional source of power consisting of one of the following is in service connected to feed the appropriate plant 4160 V bus or buses:

   a. A second 230 KV line fully operational.
   b. One 34.5 KV line fully operational.

4. The station batteries B and C are available for normal service and a battery charger is in service for each battery.

5. Bus tie breakers ED and EC are in the open position.

	Instrument Channel	Check	Calibrate	Test	Remarks (Applies to Test & Calibration)
19.	Manual Scram Buttons	N A	NA	1/3 mo	
20.	High Temperature Main Steamline Tunnel	N A	Each refueling outage	Each refueling outage	Using heat source box
21.	SRM	*	*	*	Using built-in calibration equipment
22.	Isolation Condenser High Flow ΔP (Steam and Water)	N A	1/3 mo	1/3 mo	By application of test pressure
23.	Turbine Trip Scram	N A		Every 3 months	
24.	Generator Load Rejection Scram	N A	Every 3 months	Every 3 months	
25.	Recirculation Loop Flow	N A	Each Refueling Outage	NA	By application of test pressure
26.	Low Reactor Pressure Core Spray Valve Permissive	N A	Every 3 months	Every 3 months	By application of test pressure
27.	Scram Discharge Volume (Rod Block)				
	a) Water level high	N A	Each Refueling Outage	Every 3 months	By varying level in switch column.
	b) Scram trip bypass	N A	N A	Each refueling outage	
28.	Loss of Power				
	a) 4.16 KV Emergency Bus Undervoltage (Loss of voltage)	Daily	1/18 mos.	1/mo.	
	b) 4.16 KV Emergency Bus Undervoltage (Degraded Voltage)	Daily	1/18 mos.	1/mo.	

*Calibrate prior to startup and normal shutdown and thereafter check 1/s and test 1/wk until no longer required.

Change No. 8, 1
Amendment No. 63, 80

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 80 TO PROVISIONAL OPERATING LICENSE NO. DPR-16

GPU NUCLEAR CORPORATION AND

JERSEY CENTRAL POWER AND LIGHT COMPANY

OYSTER CREEK NUCLEAR GENERATING STATION

DOCKET NO. 50-219

1.0 INTRODUCTION

By letter dated August 11, 1980 and supplemented October 18, 1982, December 5, 1983, February 9 and March 23, 1984, GPU Nuclear Corporation (GPU) (the licensee) requested an amendment to Provisional Operating License No. DPR-16 for the Oyster Creek Nuclear Generating Station. This amendment would add Appendix A Technical Specifications (TS) requirements for the previously approved design of the station electric distribution system voltages.

A Notice of Consideration of Issuance of Amendment to License and Proposed No Significant Hazards Consideration Determination and Opportunity for Hearing related to the requested action was published in the Federal Register on November 21, 1984 (49 FR 45952). No request for hearing or public comments were received.

2.0 DISCUSSION AND EVALUATION

The criteria and NRC staff positions regarding degraded grid voltage protection were sent to Jersey Central Power and Light Company (JCP&L), now GPU, on August 11, 1976 and on June 3, 1977. JCP&L responses were dated November 5, 1976, April 18, 1977, September 25, 1979, August 11, 1980, and April 30, 1981. In his letter dated August 11, 1980, the licensee proposed additional plant Technical Specification requirements for the plant degraded grid voltage protection. These requirements were (1) Limiting safety system settings for the 4.16 KV Emergency Bus in Section 2.3.P; (2) Limiting Conditions for Operation for the 4.16 KV Emergency Bus, items N.a and N.b, of Table 3.1.1; (3) Limiting Condition for Operation for bus tie breakers in Section 3.7.5; and (4) Surveillance Requirements for the 4.16 KV Emergency Bus, items 28.a and 28.b, in Table 4.1.1 of the Technical Specifications.

The results of this review are contained in the attached staff's Safety Evaluation (SE) entitled "Degraded Grid Protection for Class 1E Power Systems, Oyster Creek Nuclear Power Station," dated October 16, 1981. The staff concluded in the October 16, 1981, SE that the licensee's proposed changes to the Technical Specifications were acceptable and met the NRC requirements for degraded grid protection except for the following issues which are discussed below: 1) a typographical error in the licensee's proposed technical specifications explained in the licensee's March 23, 1984 letter and 2) the need for limiting conditions for operation on the use of the voltage regulators on the 4.16 KV Emergency Bus.

In the licensee's letter dated March 23, 1984, the licensee stated that the time delay for the 4.16 KV Emergency Bus Undervoltage (degraded voltage) in Technical Specification page 2.3-3 was 10 ± 10% (1.0) second time delay. The 10 ± 1% (0.1) second time delay given by the licensee in previous submittals, and reviewed in the technical evaluation by EG&G Idaho and approved by the staff was a typographical error. The staff has reviewed the 10 ± 10%(1.0) second time delay and concluded that it does not change the conclusion of the original evaluation that the proposed maximum time delay does not exceed the maximum time delay assumed in the FSAR analysis. The staff accepts the licensee's proposed time delay.

The October 16, 1981 SE stated that under the extreme grid voltage conditions it is necessary for the voltage regulators that are presently installed at the plant distribution station to be operational in order to prevent some Class 1E equipment from being exposed to over/under voltage and 460 V motor starters from being exposed to voltages below the minimum continuous rating of these starters. As a result, the staff recommended the inclusion of limiting conditions for operation (LCO) in the TS when the regulators are bypassed or under maintenance. The licensee stated in his letters dated October 18, 1982, December 5, 1983, and February 9, 1984, that control and operation of the voltage regulators are adequately addressed in the plant procedures and inclusion of an LCO in the TS is unnecessary and burdensome.

The licensee stated the following as additional justification for this position regarding the voltage regulators.

- The voltage analysis assumed a minimum grid voltage of 214.8 KV on the 230 KV grid. However, the lowest grid voltage experienced at Oyster Creek has been 217 KV. Under the assumed minimum grid voltage of 214.8 KV the analysis showed only control rod drive (CRD) feed pumps and fuel pool filter pumps were subjected to voltages below their minimum ratings. However, fuel pool filter pumps are not necessary for plant shutdown or cooldown and can be turned off for extended periods of time and run only when voltage conditions permit. CRD feed pumps are important for plant operation; however, they are not needed during accident conditions and no credit is taken for these pumps for any accident analysis.

- The operators are notified by an alarm in the control room activated by overvoltage relays when an overvoltage condition exists. The overvoltage can be corrected via addition of loads or changing of the 230-345 KV.transformers taps if regulators are unavailable.

- Availability of the 34.5 KV capacitors to improve voltage levels if necessary.

- The voltage analysis assumed a bus loading which included all safety and nonsafety loads including all reactor feed pumps. It is very unlikely that all of these loads will run concurrently.

As discussed above, the staff concurs that CRD feed pumps are not needed for plant safe shutdown and that these pumps are not necessary during accident conditions.

Based on the above, under a highly unlikely event that a degraded grid voltage could occur concurrent with the outage of the voltage regulators, no Class 1E equipment required for safe shutdown would be subjected to a voltage below its minimum rating. The present plant procedures and the use of capacitors, load tap changers and overvoltage alarms are sufficient to improve voltage to Class 1E equipment. The staff concurs with the licensee that inclusion of the Timiting conditions for operation for the voltage regulators in the TS are unnecessary.

The proposed amendment change request supports the design of the grid undervoltage protection system, and the mode of operation of the bus tie breakers previously approved in the October 16, 1981 SE and includes relay surveillance requirements setpoints and limits, and LCOs. The proposed amendment meets the staff's requirements and is acceptable.

3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes to surveillance requirements. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

4.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, and in the October 16, 1981, SE that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner; and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ACKNOWLEDGEMENT

This evaluation was prepared by S. Maskell and J. Emami.

Dated: February 11, 1985.

Attachment

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

October 16, 1981

Docket No. 50-219
LS05-81-10-023

Mr. I. R. Finfrock, Jr.
Vice President
Jersey Central Power & Light Company
Post Office Box 388
Forked River, New Jersey 08731

Dear Mr. Finfrock:

SUBJECT: DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS - OYSTER CREEK NUCLEAR GENERATING STATION

This letter transmits the Safety Evaluation for Degraded Grid Protection for Class 1E Power Systems. This evaluation was based on your submittals dated November 5, 1976, April 18, 1977, September 25, 1979, August 11, 1980 and April 30, 1981. We find your analysis to be acceptable.

As a result of your review, you have installed voltage regulators to minimize the possibility of degraded voltages occurring on the 1E busses - is an acceptable solution to the problem, however you must include the limiting conditions of operation to cover the use of the voltage regulators in the proposed amendment to the Technical Specifications. We request that you provide this information to us within 45 days of receipt of this letter.

Sincerely,

Thomas V. Wambach

for Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing

Enclosure:
Safety Evaluation Report
w/ Attachment (EGG-EA-5476)

cc w/enclosure:
See next page

~~ANO: 8111020595 6pp.~~

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SAFETY EVALUATION
OYSTER CREEK NUCLEAR POWER STATION UNIT 1
DOCKET NO.50-219
DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS

INTRODUCTION AND SUMMARY

Questions, criteria and staff positions regarding degraded grid voltage protection were sent to Jersey Central Power and Light Company (JCP&L) on August 11, 1976 and on June 3, 1977. Their responses were dated November 5, 1976; April 18, 1977; September 25, 1979; August 11, 1980; and April 30, 1981. EG&G Idaho under contract to NRC performed a detailed review and technical evaluation of the submittals. The results of this review are contained in EG&G's Technical Evaluation Report (TER) entitled "Degraded Grid Protection for Class 1E Power Systems, Oyster Creek Nuclear Power Station Unit 1," dated August 1981 and attached to this report. We have reviewed the TER and, except for two conclusions, concur with the findings.

DISCUSSION

The voltage analysis performed by the licensee over the range of normal grid voltages showed that without system modification, voltages below the pick-up rating of certain 460 volt starters and less than the minimum operating value of two motors could occur during normal low voltage excursions of the off-site grid. Possible system modifications which could alleviate the degraded voltage conditions at the 1E buses are the following: (1) adding voltage regulators, (2) raising the second-level trip setting, (3) raising the voltage to affected equipment by adding new transformers, or (4) replacing the affected equipment.

Option 2 would place the trip setting of the second level voltage protection relays on the 1E buses within the normal range of grid voltage variations. This would violate position 3 of the NRC generic letter dated August 8, 1977. Therefore, this option would not be acceptable.

Options 3 and 4 would correct for low grid voltage conditions, but would not correct for overvoltage conditions which may occur on the 1E buses during lightly-loaded grid conditions. Therefore, these options are less than optimum solutions.

Option 1, installation of voltage regulators, was chosen by the licensee and, in the staff's opinion, has the advantage of correcting the effects of both high and low grid voltage conditions. A minor problem with this arrangement is that the voltage regulators will only assure acceptable 1E bus voltages down to degraded grid conditions of -20%. At -22% of normal grid voltage, the second-level undervoltage relays will actuate, causing the on-site generators to start. However, between -20% and -22% of normal grid voltage, the 1E bus voltage could be below the operating point of certain motors and starters. This is not considered a serious problem because in this extremely degraded condition, the off-site grid will be unstable and either collapse completely, disintegrate, or cause grid load shedding. All of these outcomes will affect the voltage of the 1E bus and lead to activation of the onsite generation.

We therefore concur with the licensee that the installation of voltage regulators on the 34.5kv electrical systems provides acceptable voltage levels on the 1E buses within the cited range of grid voltages. This meets our regulatory position #1 and is acceptable. However, we require that the licensee include limiting conditions of operations in the proposed amendment to the technical specifications to cover situations when the regulators are out of service.

We disagree with EG&G's conclusion in the TER which disallows credit for the voltage regulators because of their limited range. As previously discussed, the voltage regulators will maintain acceptable 1E bus voltages throughout the normal sustainable range of off-site grid voltages and down to a degraded grid

level of -20% of normal. In the event grid voltages degrade further, it is the staff's opinion that the off-site grid would be extremely unstable and would collapse, disintegrate, or initiate grid load-shedding. These results would drop the grid voltage further causing the diesel generators to start at -22% of normal off-site voltage. The use of voltage regulators provides a means of maintaining acceptable voltages on the 1E buses. The staff concurs and gives credit for their use at this nuclear power station.

EVALUATION CRITERIA

The criteria used by EG&G in this technical evaluation of the analysis includes GDC 17 ("Electrical Power Systems") of Appendix A to 10CFR50, IEEE Standard 279-1971 ("Criteria for Protection Systems for Nuclear Power Generating Stations"), IEEE Standard 308-1974 ("Class 1E Power Systems for Nuclear Power Generating Stations"), ANSI Standard C84.1-1977 "Voltage Ratings for Electrical Power Systems and Equipment (60hz)", and staff positions as detailed in the generic letter sent to the licensee on June 3, 1977.

MODIFICATIONS

As a result of the NRC request, JCP&L has installed a second-level undervoltage scheme to protect safety-related equipment from a sustained degraded grid voltage condition. As previously discussed, the licensee has also installed 34.5 kv voltage regulators to maintain the secondary voltage of the start-up transformers in an acceptable range. Finally, the licensee has proposed changes to the plant's technical specifications including: relay surveillance requirements, setpoints and limits, and limiting conditions for operation.

CONCLUSIONS

1. We conclude that acceptable voltage and time setpoints have been selected by the licensee.
2. Acceptable coincident logic has been employed.
3. Acceptable time-delays have been selected.
4. Disconnection of off-site power on degraded grid conditions will be automatically initiated.
5. Voltage monitors meet IEEE standard 279-1971.
6. Technical specifications are not complete. The licensee's proposed amendment of technical specifications must include limiting conditions of operations when the voltage regulators are not in use.

EG&G Idaho, Inc.

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INTERIM REPORT

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DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS

OYSTER CREEK NUCLEAR STATION UNIT 1

Docket No. 50-219

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August 1981

TAC No. 10038

ABSTRACT

In June 1977, the NRC sent all operating reactors a letter outlining three positions the staff had taken in regard to the onsite emergency power systems. Jersey Central Power & Light Company (JCP&L) was to assess the susceptibility of the safety-related electrical equipment at the Oyster Creek Nuclear Station, Unit 1, to a sustained voltage degradation of the offsite source and interaction of the offsite and onsite emergency power systems. This report contains an evaluation of JCP&L's analysis, modifications, and technical specification changes to comply with these NRC positions. The evaluation has determined that JCP&L does not comply with one of the NRC positions.

FOREWORD

This report is supplied as part of the "Selected Operating Reactor Issues Program (III)" being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Licensing, by EG&G Idaho, Inc., Reliability and Statistics Branch.

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CONTENTS

TECHNICAL EVALUATION REPORT
DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS

OYSTER CREEK NUCLEAR STATION UNIT 1

1.0 INTRODUCTION

On June 2, 1977,[1] the NRC requested the Jersey Central Power & Light Company (JCP&L) to assess the susceptibility of the safety-related electrical equipment at the Oyster Creek Nuclear Station to a sustained voltage degradation of the offsite source and interaction of the offsite and onsite emergency power systems.[1] The letter contained three positions with which the current design of the plant was to be compared. After comparing the current design to the staff positions, JCP&L was required to either propose modifications to satisfy the positions and criteria or furnish an analysis to substantiate that the existing facility design has equivalent capabilities.

JCP&L responded to the NRC letter of June 2, 1977 with a submittal dated September 25, 1979.[2] This submittal and submittals of September 16, 1976,[3] October 14, 1976,[4] November 5, 1976,[5] February 1, 1977,[6] April 18, 1977,[7] August 15, 1977,[8], November 1, 1979,[9] January 18, 1980,[10] August 11, 1980,[11] April 30, 1981,[12] and the Oyster Creek Final Safety Analysis Report (FSAR)[13] complete the information reviewed for this report.

2.0 DESIGN BASE CRITERIA

The design base criteria that were applied in determining the acceptability of the system modifications to protect the safety-related equipment from a sustained degradation of the offsite grid are:

1. General Design Criterion 17 (GDC 17), "Electrical Power Systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," of 10 CFR 50[14]

2. IEEE Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations"[15]

3. IEEE Standard 308-1974, "Class 1E Power Systems for Nuclear Power Generating Stations"[16]

4. Staff positions as detailed in a letter sent to the licensee, dated June 2, 1977[1]

5. ANSI Standard C84.1-1977, "Voltage Ratings for Electrical Power Systems and Equipment (60 Hz)."[17]

3.0 EVALUATION

This section provides, in Subsection 3.1, a brief description of the existing undervoltage protection at Oyster Creek; in Subsection 3.2, a

description of the licensee's proposed modifications for the second-level undervoltage protection; and in Subsection 3.3, a discussion of how the proposed modifications meet the design base criteria.

3.1 Existing Undervoltage Protection. For loss-of-voltage protection, each of the safety-related 4160V buses 1C and 1D has a set of General Electric type 1AV53K under/overvoltage indication relays. The undervoltage trip setpoint for each relay is 68.8% (2864V). Each relay will operate in 3 seconds on total loss of power. The 68.8% on the 4160V buses will result in voltage of 317 (66%) and 297 (61.8%) for the 480V substations and motor control centers (MCC's), respectively. Operation of either relay will initiate isolation of the 4160V buses and loads, initiate load-shedding and start of the emergency diesel generators (DG's), energize the emergency buses with permanently connected loads and energize the automatically connected emergency loads through a load sequencer.

3.2 Modifications. As a result of the NRC request, JCP&L has installed a second-level undervoltage scheme to protect safety-related equipment from a sustained degraded grid. The scheme consists of the addition of independent undervoltage relays for buses 1C and 1D. The three relays on each bus are connected in a two-out-of-three coincident logic, with a setpoint of 3671V +1% (36.7V) and a time delay of 10 seconds +1% (0.1 sec). Either bus relay logic will initiate disconnection of the offsite power source whenever the voltage setpoint and time limits have been exceeded. With the offsite power disconnected, the existing loss-of-voltage relays on the emergency buses will operate as described in Section 3.1.

The licensee has proposed changes to the plant's technical specifications including: relay surveillance requirements, setpoints and limits, and limiting conditions for operation.

3.3 Discussion. The first position of the NRC staff letter[1] required that a second level of undervoltage protection for the onsite power system be provided. The letter stipulates other criteria that the undervoltage protection must meet. Each criterion is restated below followed by a discussion regarding the licensee's compliance with that criterion.

1. "The selection of voltage and time setpoints shall be determined from an analysis of the voltage requirements of the safety-related loads at all onsite system distribution levels."

   The licensee's proposed setpoint of 3671V (88.5% of 4160V) results in voltages of 88.5% at the 460V rated motor starters. The motor starters will pickup at 85% voltage and the control circuitry can withstand a lower voltage. This setpoint allows worst case terminal voltages of 91.6%, 85%, 87.5% and 90.5% for the corresponding safety-related 4000V, 480V, 460V, and 440 motors. The minimum rating is 90% for the 4000V motor, and 86.6% for the worst case 480V, 460V, and 440V motors

(which consider a 1.15 service factor). At the proposed setpoint all 4000V, 460V, and 440V safety-related equipment will operate at voltages above the minimum required. However the setpoint allows the 480V motors and some 460V motor starters to be operated continuously at voltages below their minimum rating. Therefore the proposed setpoint is not satisfactory.

The licenses submittal of April 30, 1981[12] points out that the analysis does not consider the automatic operation of newly installed voltage regulators which will maintain the 4160V bus at 4100V when the grid is at its minimum analyzed valve. However, credit cannot be given for the regulators since they have a limited voltage regulation (+10%) and there are no Technical Specifications Limiting Conditions for Operation (LCOs) regarding plant operation should the regulators be bypassed or out of operation.

2. "The voltage protection shall include coincident logic to preclude spurious trips of the offsite power sources."

   The proposed modification incorporates a two-out-of-three coincident logic scheme, thereby satisfying this criterion.

3. "The time delay selected shall be based on the following conditions:

   a. "The allowable time delay, including margin, shall not exceed the maximum time delay that is assumed in the FSAR accident analysis."

      The proposed maximum time delay of 10 seconds (±0.1 seconds) does not exceed this maximum time delay.[2]

   b. "The time delay shall minimize the effect of short-duration disturbances from reducing the unavailability of the offsite power source(s)."

      The licensee's proposed minimum time delay of 10 seconds is long enough to override any short, inconsequential grid disturbances and voltage dips caused from the starting of large motors.

   c. "The allowable time duration of a degraded voltage condition at all distribution system levels shall not result in failure of safety systems or components."

A review of the licensee's voltage analysis indicates that the time delay will not cause any failures of the safety-related equipment.[2]

4. "The voltage monitors shall automatically initiate the disconnection of offsite power sources whenever the voltage setpoint and time-delay limits have been exceeded."

   A review of the licensee's submittals confirms that this criterion is met.

5. The voltage monitors shall be designed to satisfy the requirements of IEEE Standard 279-1971."

   The licensee has stated in his proposal that the modifications are designed to meet or exceed IEEE Standard 279.

6. "The technical specifications shall include limiting conditions for operation (LCOs), surveillance requirements, trip setpoints with minimum and maximum limits, and allowable values for the second-level voltage protection monitors."

   The licensee's proposal for technical specification changes includes all the required items for the second-level protection monitors. However, there are no LCOs governing plant operations should the regulators be bypassed or out of service.

The second NRC staff position requires that the system design automatically prevent load-shedding of the emergency buses once the onsite sources are supplying power to all sequenced loads. The load-shedding must also be reinstated if the onsite breakers are tripped.

The existing undervoltage relaying scheme for the emergency buses already has these features incorporated. The second-level undervoltage protection will be blocked automatically when the emergency buses are being fed from the onsite sources.

The third NRC staff position requires that certain test requirements be added to the technical specifications. These tests were to demonstrate the full-functional operability and independence of the onsite power sources, and are to be performed at least once per 18 months during shutdown. The tests are to simulate loss of offsite power in conjunction with a safety-injection actuation signal, and to simulate interruption and subsequent reconnection of onsite power sources. These tests verify the proper operation of the load-shed system, the load-shed bypass when the emergency diesel generators are supplying power to their respective buses, and that there is no adverse interaction between the onsite and offsite power sources.

The testing procedures proposed by the licensee comply with the full intent of this position.[1] Load-shedding on offsite power trip is tested. Load-sequencing, once the diesel generator is supplying the safety buses, is tested. The time duration of the tests (equal to or greater than 5 minutes) will verify that the time delay is sufficient to avoid spurious trips and that the load-shed bypass circuit is functioning properly.

4.0 CONCLUSIONS

Based on the information provided by JCP&L, it has been determined that the installed modifications do not comply with NRC staff position 1. Certain 480V motors may operate at voltages below their minimum ratings at the present second-level undervoltage relay setpoint, when the offsite grid is at its minimum analyzed valve. Credit cannot be given for the installed voltage regulators as the regulators provide limited regulation (±10%) and there are no LCOs governing plant operations should the regulators be bypassed or out of service.

The existing load-shed circuitry complies with staff position 2 and will prevent adverse interaction of the offsite and onsite emergency power systems.

The proposed changes to the technical specifications adequately test the system modifications and comply with staff position 3. The surveillance requirements, limiting conditions for operation, minimum and maximum limits for the trip setpoint, and allowable values meet the intent of staff position 1.

It is therefore concluded that the setpoint of the installed second-level undervoltage relays is not acceptable. The proposed changes to the technical specifications are acceptable, except for the second-level undervoltage relay setpoint.

5.0 REFERENCES

1. NRC letter (R. W. Reid) to JCP&L, dated June 2, 1977.

2. JCP&L letter (I. R. Finfrock) to the Director, Nuclear Reactor Regulation, dated September 25, 1979.

3. JCP&L letter (I. R. Finfrock) to Mr. George Lear, Chief, Operating Reactors Branch No. 3, Division of Reactor Licensing, dated September 16, 1976.

4. JCP&L letter (I. R. Finfrock) to Mr. George Lear, Chief, Operating Reactors Branch No. 3, Division of Reactor Licensing, dated October 14, 1976.

5. JCP&L letter (I. R. Finfrock) to Mr. George Lear, Chief, Operating Reactors Branch No. 3, Division of Reactor Licensing, dated November 5, 1976.

6. JCP&L letter (I. R. Finfrock) to Mr. George Lear, Chief, Operating Reactors Branch No. 3, Division of Reactor Licensing, dated February 1, 1977.

7. JCP&L Tetter (I. R. Finfrock) to Mr. George Lear, Chief, Operating Reactors Branch No. 3, Division of Reactor Licensing, dated April 18, 1977.

8. JCP&L letter (I. R. Finfrock) to Mr. George Lear, Chief, Operating Reactors Branch No. 3, Division of Reactor Licensing, dated August 15, 1971.

9. JCP&L letter (I. R. Finfrock) to the Director of Nuclear Reactor Regulation, dated November 1, 1979.

10. JCP&L letter (I. R. Finfrock) to the Director of Nuclear Reactor Regulation, dated January 18, 1980.

11. JCP&L letter (I. R. Finfrock) to the Director of Nuclear Reactor Regulation, dated August 11, 1980.

12. JCP&L letter (I. R. Finfrock) to the Director of Nuclear Reactor Regulation, dated April 30, 1981.

13. Final Safety Analysis Report (FSAR) for the Oyster Creek Nuclear Station.

14. General Design Criterion 17, "Electric Power Systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

15. IEEE Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations."

16. IEEE Standard 308-1974, "Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations."

17. ANSI C84.1-1977, "Voltage Ratings for Electric Power Systems and Equipment (60 Hz)."

18. IEEE Standard 141-1976, "IEEE Recommended Practice for Electric Power Distribution for Industrial Plants."

19. NEMA Standard, NEMA MG1-1972, "Motors and Generators."