MAY 19 1970

Memo

P. A. Morris, Director
Division of Reactor Licensing

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC., INDIAN POINT NUCLEAR GENERATING UNIT NO. 2; DOCKET NO. 50-247

The enclosed report was prepared by the DRS Electrical Systems Branch for use in the DRL ACRS report concerning the Indian Point No. 2 plant.

The report covers the Protection Systems and the Auxiliary Electrical Power Systems. Review of several items within these systems by DRS is not complete. These items are as follows:

A. Items which have been resolved to our satisfaction in discussions with the applicant but which require documentation and review of agreed on changes. These items are listed in Enclosure B.

B. Items which are not resolved.

1. Operation with less than four loops in service.

2. Design of the engineered safety feature manual actuation panels.

Our report assumes satisfactory documentation will be received for all items listed in paragraph A. above and list B. 1. and 2. as unresolved items. Should our understanding of any of these items change, we will be prepared to report orally to the ACRS.

Several items which we have approved with some reluctance were discussed with the ACRS Subcommittee on April 25 and May 11, 1970. The Subcommittee requested that we discuss these items in detail in our report to the Committee providing the options available and the basis for our decisions. These items are:

1. Testing of the engineered safety feature initiating circuits
2. Single electrical cable tunnel
3. Single electrical penetration area
4. 480 volt switchgear room
5. Housing of the diesel generators

OFFICE ▶						
SURNAME ▶						
DATE ▶						

An additional item of concern was the lack of protection between engineered safety feature equipment. During our site visit we noted that the three safety injection pumps are located in a common area and the containment spray pumps are located in a separate, common area. There appears to have been no attempt to protect the redundancy of these equipment other than space. Thus a common event, pipe whip or electrical fire, could result in the failure of more than one pump.

Since this is a problem of the safety feature systems of which the electrical aspect is only a part, we suggest that DRL make recommendations for its resolution.

Original signed by
E. G. Case

ESB-30
DRS:ESB:ODP

Edson G. Case, Director
Division of Reactor Standards

Enclosures:
1. Indian Point #2 Report
2. Items which require documentation

cc w/encl:
R. C. DeYoung, DRL
D. Muller, DRL
K. Kniel, DRL

bcc: E. G. Case
V. Moore
O. Parr

Distribution:
Suppl.
DR Reading
DRS Reading
ESB Reading

OFFICE ▶	DRL:PWR B3	DRS:ESB	DRS:DIR			
SURNAME ▶	OParr:ese	VMoore	EGCase			
DATE ▶	5/18/70	5/18/70	5/18/70			

MAY 19 1970

ENCLOSURE A

INDIAN POINT #2

INSTRUMENTATION AND CONTROL

General

Our review encompassed the auxiliary electric power system and the protection system instrumentation and associated logic circuitry. IEEE 279 and the Commission's proposed General Design Criteria served, where applicable, as the bases for judging the adequacy of the protection system.

The applicant has stated in Supplement 2 to the FSAR and we have confirmed that the protection system is functionally identical to the one installed at the Ginna plant and meets IEEE 279. Since Ginna has been previously reviewed, our report discusses only those items which are unique to Indian Point #2 (IP #2), for which new information has been received, or which have remained as continuing areas of concern for this and similar plants. We visited the site on December 16-19, 1969, to review the installed instrumentation and electrical systems.

The following schematic diagrams were reviewed:

a. Reactor Trip System

b. Safety Injection System

c. Containment Spray System

d. Containment Fan Cooler System

e. Containment Isolation System

f. Feedwater Isolation System (that portion associated with safety injection)

g. Steamline Isolation System

h. Auxiliary Power

Testing of Engineered Safety Feature Initiating Circuits

In our Diablo Canyon Unit 2 report to the ACRS, we noted the limited capability for testing engineered safety feature (ESF) circuits during reactor operation. We have discussed this matter with the applicant and Westinghouse and understand that Westinghouse is studying the problem on a general basis for all its plants. For the IP #2 plant, Consolidated Edison stated that they must still rely on Ohmmeter tests of the master relay coils as the only method of routinely determining their operability. The circuits upstream of these relays can be partially tested during operation. During shutdown, the circuits can be completely tested by coincident tripping of instrument channels and the consequent operation of the master and slave relays and the entire downstream initiating system. In summary, this is what was originally proposed for Diablo Canyon Unit 2.

We have previously stated for plants receiving construction permits that the testing capability of Westinghouse-designed ESF circuits should

be improved such that a complete system test is possible during reactor operation. We have concluded, however, that the present design provides an acceptable, minimum level of testability for the IP #2 plant.

Operation With Less Than Four Loops In Service

The Overpower and Overtemperature channels measure primary loop ΔT and automatically vary the set points as a function of several other parameters (pressure and neutron flux). When the plant is operated with one loop out of service, the physical characteristics of the reactor system require set points which are more restrictive than for full flow if all other conditions are the same. The applicant proposes to make these instrument adjustments manually and states that only four adjustments are required.

We have studied the applicant's proposal and believe that if the more restrictive set points are, indeed, required for safety, the proposal violates Section 4.15 of IEEE 279 which requires a positive means of assuring that the more restrictive set points are used. Section 4.15 further requires that the devices used to prevent improper use of less restrictive set points shall be considered a part of the protection system and shall be designed in accordance with the single failure criterion.

In summary, we believe that the removal of a pump from service should automatically act on the protection system such that the more restrictive set points, if required, are placed in force. We have discussed this matter with the applicant and understand that they are

evaluating the need for automatic setdown. Pending receipt and review of additional information, we will not permit plant operation with fewer than four pumps in service.

Design of the Engineered Safety Feature Manual Actuation Panels

Panels SB-1 and SB-2 are located in the control room to provide the necessary controls (switches, lights) for manual actuation of the engineered safety features. Our visit to the site disclosed that the cables entering this panel, the wiring inside the panel and the location of the controls on the front of the panel do not comply with our interpretation of IEEE 279 in that the requirements for separation and independence are not met. Redundant cables were noted to enter the panel through common openings in the control room floor, redundant cables terminated on adjacent terminal boards, redundant connections from terminal boards to controls are bundled together, and the location of the controls on the panel provides minimum spacing.

We have discussed these panels at a number of meetings with Westinghouse and Consolidated Edison. They discussed a number of possible modifications but have made no firm proposal. Among the possible modifications discussed were:

a. The addition of isolation devices to preclude faults in the panels from disabling automatic actuation of engineered safety features.

No physical separation would be included to prevent faults from disabling the transfer from the injection to the recirculation mode of emergency core cooling.

b. The addition of physical protection features to prevent equipment used in the area such as floor polishers and hand tools from causing faults.

c. The installation of separate connection boxes for each of the redundant safety feature chains near the cable trays. Wires and cables for the redundant chains would be brought from the connection boxes through separate floor openings to the controls on the panel maintaining physical separation. The applicant felt that the lack of physical separation at several multi-function switches defeated the purpose of the added physical separation.

We have concluded that the panel should be modified to prevent faults resulting from localized mechanical damage, overheating in bundles, or localized fires from disabling automatic ECCS actuation or preventing the necessary manual functions within the time to mitigate the consequences of a design basis accident. Our concerns could be met by the utilization of the junction box arrangement described by the applicant coupled with further improvement in the area of the multifunction switches. Ganged switches are available which

provide better separation between stages or wafers. Another possibility is the addition of slave relays to minimize the congestion in the area of the switches.

During the discussions, Westinghouse made clear that no attempt had been made to include physical separation in the design of these panels. This raises the question of whether commitments made during the construction permit review were properly implemented. In the evaluation of the reliability of core cooling, the applicant stated in Supplement 5 to the PSAR (received July 28, 1966), "System effectiveness will exist in the event of loss of normal station auxiliary power coincident with the loss of coolant, and will be tolerant of failures of a single component or instrument channel to respond actively in each system." This statement was interpreted to be a commitment to meet the single failure criterion. We interpreted this to constitute a commitment to give some consideration to physical separation. However, whether one considers the modification to be required to meet the construction permit commitment or as an item of backfit, we believe that the modification should be made, but not necessarily before initial plant startup. In our opinion, it would be acceptable to make the modification at the first refueling outage if necessary to prevent delay.

Manual Actuation of Containment Spray

The FSAR states that containment spray is actuated automatically by a coincidence of high-high containment pressure and safety injection

signals and manually by coincident operation of two switches. Review of the schematic diagrams disclosed that a safety injection signal (SIS) was required for both manual and automatic actuation and that actuation by either means was available for only 40 seconds following receipt of the SIS. Consolidated Edison has proposed to revise the control circuits so that the manual actuation is independent of the automatic circuitry. We conclude that the proposed design change meets the intent of Section 4.17 of IEEE 279 and is acceptable.

Seismic Design Bases for the Protection Systems

The seismic design bases for the protection system equipment are that, for the design basis earthquake, the equipment will not lose its capability to perform its design objective and, if a seismic disturbance occurs subsequent to an accident, emergency core cooling will not be interrupted. We consider these design bases to be acceptable.

The applicant stated that the evaluation of equipment for its ability to meet the seismic design bases was accomplished by actual vibration tests. Typical equipment was selected for testing to the design bases stated above. Documentation of the test results are contained in a Westinghouse proprietary document, WCAP 7397-L, "Seismic Testing of Electrical and Control Equipment."

We have completed a preliminary review of WCAP 7397-L, and have found that it does not consider all electrical equipment necessary to the operation of the protection systems. We have asked the applicant

to investigate the information available on seismic verification of additional equipment such as motor control centers, containment fan coolers, and circuit breakers. Our investigation of this will be completed prior to the Committee meeting.

Common Mode Failures

The applicant stated that the Westinghouse report "Reactor Protection System Diversity in Westinghouse Pressurized Water Reactors," WCAP-7306, is applicable to IP #2. Since this report applies to all Westinghouse plants, we plan to review it independent of a specific application. We will consider the applicability of the results of our study to IP #2 when the study is completed.

Environmental Testing

The applicant has identified the electrical equipment required to be operable during and subsequent to a loss-of-coolant accident or a steam line break accident. We have reviewed the documented description of the environmental qualification testing and consider it satisfactory.

ELECTRICAL SYSTEMS

General

The Commission's General Design Criterion 39 served as the basis for judging the acceptability of the emergency power system.

Offsite Power

Two 138 kV lines connect the Buchanan switchyard to the Millwood switching station which in turn is connected to the Consolidated Edison grid and the Niagara Mohawk and Connecticut Light and Power Systems. These two lines are on the same row of towers. Two additional 138 kV lines, using a separate route from the first two lines, connect the switchyard to the Orange and Rockland Tie. One of these lines is overhead and one is underground. The overhead line is normally energized.

The applicant stated that an analysis of the transmission system has indicated that the system is stable for the loss of any generating unit including IP #2.

A single 138 kV line connects the Buchanan switchyard to IP #2. In addition three 13 kV lines connect the switchyard to IP #1. Three 138/13 kV transformers in the switchyard feed these three 13 kV lines. One of the 13 kV lines is underground and the other two are overhead. Prior to IP #2 operation all three 13 kV lines will be underground. While the 138 kV system is the normal supply for the auxiliary load associated with plant engineered safety features, one of the three IP #1 13 kV lines is available to provide power to IP #2 through a 13/6.9 kV transformer. By switching circuit breakers in IP #1, the other two 13 kV lines can also be made available to provide power to IP #2.

The Buchanan switchyard is supplied with two batteries, each in its own room and with its own charger. The ventilation systems for these rooms utilize natural circulation. All d-c loads in the switchyard are connected to both batteries through automatic switching. The switchyard is remotely controlled from New York City. The control makes use of two separately routed above ground telephone lines.

Initially our review of the offsite power indicated that the design might not meet the single failure requirement of Criterion 39 in that, upon failure of the 138 kV supply to the station there was no provision for automatic switching to the 13/6.9 kV supply. Subsequently, Supplement 3 to the FSAR indicated that the switching would be automatic. Following our review of the drawings, the applicant found that the 13/6.9 kV supply is not capable of carrying the total plant auxiliary load and that design changes would be required. Specifically, the main coolant pumps and the circulating water pumps must be tripped off before the supplies may be switched.

We conclude that the 13/6.9 kV supply provides an adequate second source of power for the ESF and safe shutdown loads and that the offsite power meets our interpretation of Criterion 39.

Onsite Power

Three diesel generator sets provide 480 volt essential power for IP #2. The applicant stated that the diesel generators are each rated

at 1750 kW (2200 HP) continuous and 1950 kW (2460 HP) for 2000 hours. Two units have the capacity to provide power for the minimum ESF loads or safe shutdown loads. The design safety injection phase loads for the three units are 1813, 2210 and 2353 HP and change to 2438, 2235, and 2043 HP for the recirculation phase. While these loads are well into the 2000 hour rating of the machines, we consider that exceeding the continuous rating of the machines is acceptable in the context of an operating license review. Further, certain loads for the recirculation phase are brought on manually thus allowing the operator time to monitor the diesel's operation as it is being loaded.

The housing of the three diesel generators in a common sheet metal, steel framed building has been an item of concern to us and is discussed in detail at the end of this section.

Each diesel generator is started automatically on a safety injection signal or upon undervoltage. The sensing of the undervoltage and the closing of the diesel generator breakers onto the essential buses is also an item of concern to us and is discussed in detail at the end of this section. The auxiliary power bus design utilizes the split-bus concept. The three diesel generators supply power to three separate and independent 480 volt essential buses. The three essential buses supply power to the ESF or safe shutdown loads such that two diesels operating provide minimum ESF loads.

Sufficient onsite diesel fuel is available in the diesel tanks to allow two diesels to carry their rated loads for 80 hours. The applicant has agreed to increase the supply to seven days by restricting the use of the gas turbine fuel and making the gas turbine fuel available for the diesel generators. This will be a technical specification item.

Our review of the a-c auxiliary power system has disclosed that there is minimum physical and electrical separation. Three areas which appear to be designed to minimum requirements are discussed at the end of this section:

1. Single electrical cable tunnel
2. Single electrical penetration area
3. 480 volt switchgear room

The 125 d-c system consists of two individually housed batteries. The d-c system is divided into two buses with a battery and a battery charger per bus. Each of the two station batteries has been sized to carry its expected loads for a period of two hours following a plant trip and a loss of all a-c power.

We conclude that the onsite emergency power system satisfies Criterion 39 and is acceptable.

Housing of the Diesel Generators

The three diesel generators are housed in a common sheet metal, steel framed building. This installation represents the only application recently reviewed or being reviewed which houses the redundant onsite electrical power sources in a common room. Further,

the controls for the three diesel generators are housed in a common, control panel which is located at one end of the diesel building.

Upon questioning the applicant stated, Supplement 3 to the FSAR, that the diesel building is by virtue of its location protected from tornados and major missiles generated by them. The Supplement further stated that the protection between machines is not considered necessary on the basis of the engine manufacturers' case histories of engine failures. Lastly, the Supplement stated that reliance in the case of a tornado is placed on power supply redundancy, not solely on the diesel installation.

Should a tornado strike the site, it could damage the diesels by producing missiles (e.g., blowing down the Indian Point 1 plant stack). Also it is not clear to us that all missiles produced by one of the diesel generators would be retained inside the machine. Should a missile be produced by one of the machines, it could damage a second unit or damage the control panel. Further, all three diesel generators are vulnerable to a fire in the diesel building. Our review of the applicant's electrical drawings supplemented by a site visit has not disclosed any special features of the auxiliary power system which might affect our evaluation of the electrical system other than the fact that a gas turbine generator is located at the site. This machine is a manually actuated, slow start unit. The applicant has stated that the

gas turbine can be activated on tornado alerts. The fact that the gas turbine is located on the opposite side of the Indian Point 1 reactor building from the diesel building reduces the probability of simultaneous loss of the gas turbine and the diesels to a tornado.

We requested Consolidated Edison to provide additional assurance of onsite electrical power source availability. This additional assurance could take the form of hardening of the present diesel generator installation and providing barriers between the diesel generators, the construction of additional diesel generator enclosures, making power available from the Indian Point #3 diesel generators to Indian Point #2 or other schemes which the applicant might devise.

Consolidated Edison responded to our concern as follows:

a. Missile Protection Between Machines

Field case histories of the Alco Model 251 engines have disclosed a complete absence of damage to the engine environs as a result of engine component failure.

b. Fire Protection

The area below each diesel generator is segregated by a curb which is provided to localize and provide separate drains for fuel oil leakage. Each diesel unit has its own fire detection and protection system.

c. Control Panel Protection

A concrete shield wall will be provided between the diesel generators and the control panel to protect the panel from missiles which might originate from one of the machines.

d. Connecting to the IP #3 Diesel Generators

IP #2 is not designed to accept power from the IP #3 generators. Consolidated Edison questions whether modifications to permit cross feed are technically feasible.

We have evaluated the applicant's responses to our concern and have concluded that the answers are acceptable in the areas outlined above. Further, we have concluded that the diesel generators are no more vulnerable to tornado damage than other parts of the plant such as the control room. The applicant has agreed to energize the gas turbine on a tornado watch. This additional source of power provides assurance that power will be available should a tornado cause damage to the diesel generator building.

Since our conclusion is partially based on the vulnerability of other areas of the plant to tornado damage, we should re-evaluate the diesel generator arrangement if major changes are required in the other vulnerable areas.

Diesel Generator Control Circuits

Loss of voltage for starting the diesel generators is sensed on the 6.9 kV buses rather than the 480 volt essential buses to signal automatic start of the diesel engines. Further, a signal from the 6.9 kV buses is used with the diesel breaker control circuits. With the proposed design it is possible to lose voltage to the emergency buses without it being detected by the automatic circuitry or proper circuit breaker action occurring. This could occur as the result of opening of circuit breakers, transformer failures, and cable problems. Our concerns were identified to the applicant early in the review. We consider this item to be in violation of long established criteria and not a backfit item.

Consolidated Edison subsequently proposed changes to diesel generator control circuits which we consider eliminate our concerns. The diesel start signals will be sensed on the essential buses. We conclude that this modification is satisfactory.

Single Electrical Cable Tunnel

A single electrical tunnel consisting of a square concrete conduit having inside dimensions of approximately ten feet wide by eight feet high carries the electrical cables from the electrical penetration area to the control building. This tunnel carries all

of the electrical cables except the power cables for the reactor coolant pumps, the pressurizer heater cables and the rod control cables. The cables in the tunnel are arrayed on either side of a three foot aisle in trays or ladders. Separation is provided for in the form of distance, metal separators or transite barriers. The electrical tunnel is not designed to contain any bolted or spliced cable connections. Therefore, the probability of heat production and a resulting fire are reduced. Further, fire detection and an automatically operated water spray system are provided in the tunnel. Tunnel cooling is provided for by redundant cooling fans.

The electrical tunnel provides only minimal electrical separation and would not meet present day construction permit requirements. Alternatives to this design were considered by the staff such as the addition of concrete, metal or transite barriers inside the existing tunnel; removing all power loads from the tunnel and installing them in underground cable ducts as was done for the reactor coolant pump, pressurizer heater and rod control cables; and the building of additional tunnels.

While each of these alternatives would reduce thesusceptability of the redundant protection channels to a common failure, they could in no way improve the susceptability of other critical areas of the plant to a common event (e.g., the cable spreading area or the electrical penetration area). We, therefore, consider that the single electrical tunnel

design for Indian Point #2 is acceptable. We believe that this is in keeping with our acceptance of the Dresden 2/3 application which also contained a single electrical tunnel.

Single Electrical Penetration Area

Indian Point #2 represents only the second application recently reviewed or being reviewed which utilizes a single electrical penetration area. Oconee 1, 2, and 3, the other application, is presently being reviewed. Sixty electrical penetrations are provided in a single electrical penetration area to provide for entry of signal, control and power cables into containment. The penetrations are located on three-foot centers, both horizontally and vertically. The penetrations are of the hermetically sealed type which are excellent from a containment leakage standpoint but which results in terminating all cables both outside and inside containment. These terminations are made by bolting or splicing the cables either of which are more subject to undesired heat production and possible fires than continuous runs of cables. There appears to have been no attempt, however, to provide protections between penetrations or between bundles of spliced cables against fire damage.

Following meetings between the applicant and the staff, the applicant presented drawings of proposed changes to the electrical penetration arrangement for our review. These drawings indicate that fire barriers in the form of 1/4-inch thick transite sheets will be added to

separate the power cable penetrations from the instrument and control cable penetrations. The applicant further stated that a general rework of the cabling is under way to shorten the cable runs and to eliminate the use of cable loops.

We have reviewed these drawings and have concluded that while this installation would not meet our present day criteria, the resulting segregation of the power cables and the shortening of the cable runs should reduce the possibility of fire propagation between penetrations. We therefore reluctantly consider it acceptable.

480 Volt Switchgear Room

The 480 volt switchgear room contains all the switchgear for the essential buses which provide power to the engineered safety feature loads. Consolidated Edison early in the construction of the plant identified the fact that steam lines, fire mains, and instrument air lines were designed to pass through the 480 volt switchgear room. The steam lines were subsequently rerouted. The fire mains were stubbed off at one side of the room. During our visit to the site Consolidated Edison agreed to add a partial wall and door to separate the fire mains from the switchgear. No changes, however, were considered for the instrument air lines or the accompanying compressors.

The 2-inch instrument line (approximately 100 psig) passes in

close proximity to the electrical cables which connect to the switchgear. A pipe whip in this area could damage portions of the cables to one-half of the switchgear.

The applicant subsequently performed an analysis of the instrument air line. While the analysis indicated that pipe whip might occur, Consolidated Edison did not pursue the analysis in sufficient depth to determine the degree of damage which could result but elected to add additional pipe restraints to eliminate the problem. Further, they proposed to add a concrete wall between the compressor and the switchgear to shield the switchgear and cables from missiles which might originate from the compressor. We conclude that these modifications provide reasonable protection to the switchgear and cables and are acceptable.

Cable Installation

A review of the cable installation criteria has been made based on the information contained in the FSAR and its amendments: We conclude that if the criteria are followed, the probability of loss of redundant channels of protection from a single cause such as fire will be adequately low within the reservations expressed elsewhere in this document.

Our field review of the electrical installation disclosed four areas of concern:

a. The AE construction drawings (United Engineers) do not specify how cables are to enter or exit wireways, enter or exit nodes, or change wireways or direction. The protection of redundancy (separation) at these points is left to the trades. There are many violations of acceptable cable separation at these points - control room floor slots are not identified.

b. The conduit and cable schedule is a computer printout. The computer was not programmed to identify redundant protection system cables in the same wireways. Further, the use of the computer was discontinued, except inside containment, when the cable trays reached 70% fill.

c. The identification of protection system cables is minimal. The cable markers being installed do not uniquely identify protection system cables. While we underatand that individual conductor markers are to be added, none were in place during our visit. Westinghouse stated that the nuclear instrumentation conduits would be color coded.

d. The field checking of cable installation appears to be a check of "as built" cables versus construction drawings. It appears that no one has actually checked the Westinghouse/United Engineers design of cable runs as to redundancy (separation). We understand that the applicant plans to expand his electrical inspection to include a check to assure cable separation.

We have alerted Compliance to each of the above items and they have stated that they will follow these items.

MAY 19 1970

ENCLOSURE B

CONSOLIDATED EDISON COMPANY OF NEW YORK, INC., INDIAN POINT NUCLEAR GENERATING UNIT NO. 2, DOCKET NO. 50-247

A. Items which have been resolved to our satisfaction in discussions with the applicant but which require documentation and review of agreed on changes.

1. Consolidated Edison agreed to submit schematic diagrams of the BIT (boron injection tank) level instruments when available. The partial valve control schematics presently available do not support the conclusion that the circuitry meets the single failure criterion.

2. Test procedures have not been received for the testing of the ESF. We believe that they will be the same as for Point Beach 1 and 2. We have reviewed that plant's procedures and have reluctantly accepted them. The IP #2 procedure should be submitted for our review.

3. Table 7.2-2 and Page 7.2-25 of the FSAR do not agree with respect to the P-7 interlock. We believe Table 7.2-2 should be corrected.

4. Consolidated Edison has agreed that opening of a Reactor Protection System cabinet door should be annunciated in

control room by individual annunciators. This should be documented and the answer to question 7.12 should be changed.

5. Consolidated Edison has agreed that scram breaker "position" lights will be added in the control room to alert the operator as to the position of the scram breakers. This should be documented.

6. The response to question 7.1 indicates that the reactor trip on turbine trip and the turbine runback circuits meet IEEE 279. It was subsequently determined that these circuits do not meet IEEE 279 and that they need not meet it since they are anticipatory signals and are not required for reactor safety. The response to question 7.1 should be amended.

7. Page 8.2-14 of the FSAR should be amended to delete the mention of automatic switching of the bus tie breakers between vital buses.

8. Page 8.2-12 of the FSAR should be amended to correct the onsite diesel generator fuel storage (54 hours) to agree with the technical specification statement of 80 hours. Further a statement should be added to add the commitment made concerning the use of the gas turbine fuel.

9. The answer to question 8.1 should be amended to indicate that load stripping is required when switching to the IP #1 13 kV feeder.

10. Consolidated Edison should be requested to complete the documentation of the seismic testing of protection equipment. WCAP 7397-L "Seismic Testing of Electrical and Control Equipment" does not include all electrical equipment necessary to the operation of the protection systems.

11. The load shedding and SI loading sequence circuitry (U.E. & C Dwg. Nos. 9321-LL-3117 and 9321-LL-3118) indicated two redundant, but not independent, sequencing circuits are provided. The circuits do not appear to be readily testable due to the interconnections. Consolidated Edison stated that the testing procedures have not been developed. (This item does not require further documentation, but is included to remind the applicant of our intention to follow up on the testing).

12. The FSAR should be amended to add a statement concerning the analysis performed to determine that additional restraints were required for the instrument air line which passes near the 480 volt essential switchgear. Further, a statement should be added with regard to the concrete wall which will be installed to shield the switchgear and cables from missiles originating in the air compressor.

13. The FSAR should be amended to add a description of the additional work being performed in the electrical penetration area to provide added assurance of cable protection.

14. The FSAR should be amended to add a statement with regard to the concrete wall which will be installed to shield the diesel generator control panel from missiles originating from the diesel generators. Further, a statement should be added as to the technical feasibility of taking emergency power from the IP #3 diesel generators.

15. The FSAR should be amended to add a statement concerning sensing of undervoltage for starting the diesel generators from the essential buses.

16. A statement should be made concerning the commitment to make the manual actuation of the containment spray independent of the automatic portion of the circuit.