Update Report LICENSEE EVENT REPORT Previous Report Date 1/15/81

CONTROL BLOCK: | | | | | | | (1) (PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)

0 1	N Y I P S 2 (2)	0 0 - 0 0 0 0 0 - 0 0 (3)	4 1 1 1 1 (4)	(5)
7 8	9 LICENSEE CODE 14	15 LICENSE NUMBER 25	26 LICENSE TYPE 30	57 CAT 58

CON'T

0 1	REPORT SOURCE L (6)	0 5 0 0 0 2 4 7 (7)	0 1 0 6 8 1 (8)	0 3 2 0 8 1 (9)
7 8	60	61 DOCKET NUMBER 68	69 EVENT DATE 74	75 REPORT DATE 80

EVENT DESCRIPTION AND PROBABLE CONSEQUENCES (10)

0 2 During cycle 4/5 fuel shuffle operations, grid strap damage in the form

0 3 of torn or missing corners was observed on a number of fuel assemblies.

0 4 No damage to the fuel cladding has been identified that would be attribu-

0 5 table to the grid strap problem. Evaluation of the grid strap damage

0 6 indicates that there will be no adverse effects on Cycle 5 normal

0 7 operation or posulated accident conditions.

0 8

	SYSTEM CODE	CAUSE CODE	CAUSE SUBCODE	COMPONENT CODE	COMP. SUBCODE	VALVE SUBCODE
0 9	R C (11)	E (12)	B (13)	F U E L X X (14)	Z (15)	Z (16)

(17) LER/RO REPORT NUMBER	EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE	REPORT TYPE		REVISION NO.
	8 1	—	0 0 2	/	9 9	X	—	1

ACTION TAKEN	FUTURE ACTION	EFFECT ON PLANT	SHUTDOWN METHOD	HOURS (22)	ATTACHMENT SUBMITTED	NPRD-4 FORM SUB.	PRIME COMP. SUPPLIER	COMPONENT MANUFACTURER
X (18)	Z (19)	Z (20)	Z (21)	0 0 0 0	Y (23)	N (24)	N (25)	W 1 2 0 (26)

CAUSE DESCRIPTION AND CORRECTIVE ACTIONS (27)

1 0 Grid strap damage was caused by corner-to-corner interaction between ad-

1 1 jacent assemblies during fuel handling operations. The core was com-

1 2 petely discharged and all assemblies were visually inspected. Following

1 3 evaluation, the core was reloaded using modified refueling procedures

1 4 that minimize corner interaction between adjacent assemblies.

	FACILITY STATUS	% POWER	OTHER STATUS (30)	METHOD OF DISCOVERY	DISCOVERY DESCRIPTION (32)
1 5	H (28)	0 0 0 (29)	N/A	C (31)	Visual Fuel Inspection

	ACTIVITY RELEASED	CONTENT OF RELEASE	AMOUNT OF ACTIVITY (35)	LOCATION OF RELEASE (36)
1 6	Z (33)	Z (34)	N/A	N/A

PERSONNEL EXPOSURES

	NUMBER	TYPE	DESCRIPTION (39)
1 7	0 0 0 (37)	Z (38)	N/A

PERSONNEL INJURIES

	NUMBER	DESCRIPTION (41)
1 8	0 0 0 (40)	N/A

LOSS OF OR DAMAGE TO FACILITY (43)

	TYPE	DESCRIPTION
1 9	Z (42)	N/A

PUBLICITY

	ISSUED	DESCRIPTION (45)	NRC USE ONLY
2 0	Z (44)	N/A	

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ATTACHMENT

Docket No. 50-247
LER-81-002/99X-1

Consolidated Edison Company of N.Y., Inc.
Indian Point Unit No. 2

DISCUSSION

Cycle 4/5 fuel shuffle operations started on December 30, 1980. During fuel handling, apparent grid damage was observed on assembly F-65. When inspected, assembly F-65 was found to have a damaged grid strap at one corner. Among the adjacent assemblies inspected, assembly F-19 was found to have sustained similar damage at one of its corners. As shuffle operations continued, some assemblies experienced handling difficulties and therefore all the interacting assemblies in problem areas were inspected for damage. Some of these assemblies were also discovered to have damaged grid corners.

As a result of these findings, a decision was made to completely discharge the reactor core and visually inspect all assemblies belonging to Regions 4,5,6 and 7*. This involved all 193 assemblies used in Cycle 4, 58 new Region 7 fuel assemblies, and 7 additional Region 4 assemblies discharged from third cycle. Videotapes of this inspection were reviewed and grid damage was evaluated. Subsequently, Cycle 5 was redesigned and a revised loading pattern was developed. Cycle 5 core was reloaded using special handling instructions. The reloading of the core was concluded on 2/21/81.

FUEL INSPECTION RESULTS

Using an underwater TV camera and the videotaping system, 258 assemblies were visually examined. The grid straps in 106 assemblies were found damaged (mostly at corners). Following review and evaluation of videotapes, the damaged assemblies were categorized as follows:

Category	Assemblies	Assembly Reuse Status
1	24	Accepted as is.
2	39	Conditionally accepted with special handling instructions.
3	10	Conditionally accepted with special handling instructions for one more cycle only. Then evaluate for clad wear.
4	9	Not used in Cycle 5 pending further evaluation or repairs.

Because of lower priority (i.e., fuel not used in Cycle 5), 24 assemblies with damaged grid straps are yet to be categorized. If these assemblies are considered for use in the future, they will then be evaluated as to their acceptability.

Where the grid strap damage was minor and inconsequential (i.e, small chipping of strap edges), the assemblies were accepted for further use (Category 1). There were 24 assemblies in this Category and 10 of these assemblies were loaded into the core for Cycle 5.

For the Category 2 assemblies, grid damage was still minor and continued to satisfy the clad wear criteria. However, the nature of the grid material damage was such that the damage could propagate to the interacting assemblies during handling operations. For

*14 assemblies of new Region 7 were not handled and therefore were not inspected.

the 39 assemblies in this Category, reuse was considered acceptable only on the basis of special handling to preclude deterioration of existing damage or propagation of damage to other assemblies through interactions. All thirty nine of the Category 2 assemblies were loaded in Cycle 5.

For Category 3 assemblies, damage was such that the rod support was affected but the fretting wear was calculated to be within acceptance criteria and not result in clad failure. These assemblies are to be re-examined after each cycle of operation to determine acceptability for duty beyond one additional cycle. Under this condition, ten (10) assemblies were accepted and loaded in Cycle 5. Moreover, special handling similar to those imposed for the Category 2 assemblies would also apply for this Category.

When grid damage was such that the rod support was affected and the clad wear was calculated to be large enough to potentially cause clad failure, the assembly was considered to require further evaluation and/or repair prior to reuse. Nine (9) such assemblies placed in this Category 4 were not used in Cycle 5.

Thus, in the Cycle 5 core, there are 59 assemblies with damaged grids as mentioned above. The remaining 134 assemblies contain no damage.

EVALUATION OF POTENTIAL IMPACT OF GRID DAMAGE

Grid damage was considered both as regards normal operation and accident conditions. The areas addressed include:

1. Potential propagation or worsening of existing damage due to assembly-to-assembly interactions.

2. Lessened structural integrity and potential for additional fuel rod wear.

3. Thermal/hydraulic consideration due to local flow blockage caused by unrecovered grid strap material.

4. Possible mechanical binding of control rods (RCCAs) due to unrecovered grid strap debris.

Additionally, it should be noted that grid damage observed is small and localized and that, the more basic structural aspects of the fuel assemblies are unaffected. The following is a summary of the evaluations performed to determine the impact of fuel grid damage:

1. As discussed earlier, special handling instructions have been, and will be, used for those cases where the damaged grid may cause adjacent assembly grid-to-grid interactions when inserting or removing assemblies. Thus, existing damage will be precluded from progressing.

2. As discussed earlier, the effect of the loss of grid material on the structural integrity of the assembly is limited to the effect on the fuel rod support. Inadequate rod support (spring-dimple) could cause additional rod vibration and clad fretting/wear. A fretting analysis was done on a case by case basis, when the rod support was affected. On the basis of the fretting analysis results, assemblies were categorized for reuse as previously discussed.

It should be noted that these analyses, and the resultant categorization of fuel assemblies are considered to be very conservative; in particular, for Westinghouse PWR cores no known incident of fuel rod failure has been traced to grid damage, even in documented instances where assemblies have operated for one or more cycles with large missing sections of outer grid straps.

3. Due to the missing chips from the damaged grids, the potential for local flow blockage (due to unaccounted for chips) was considered. This assessment includes both DNB and LOCA. From the videotapes of the inspection it was estimated that the area of the pieces torn from the outer straps of the damaged grids was 17.7 sq. in. Of the loose pieces retrieved following core unloading, chips with an estimated area of 5.97 sq. in. were identified as grid material. This left approximately 11.7 sq. in. of grid material unaccounted for.

Flow blockage potential was considered for material that could become entrapped at the fuel assembly bottom nozzles and material that could be carried upward through the bottom nozzles and then through the grids(s) with the potential of being entrapped in the core. For analysis, the unrecovered pieces were assumed to accumulate either at the bottom nozzle or be randomly distributed in the core. Since interaction between assemblies had no core-wide pattern, material torn from the grids was either entrapped in the interacting assemblies or fell to the lower core plate in a random distribution. If unrecovered material in the latter case was later flushed into the core by coolant flow, the distribution would still be random. THINC-IV analysis for the first condition (partial blockage at nozzles) showed a full flow recovery in less than 30 inches downstream and in this region of the core DNB and LOCA are not limiting.

For the second condition the potential for material reaching higher elevations in the core was considered. Of the inventory of material unaccounted for, the maximum area of the largest piece capable of passing through the nozzle and grids is 0.29 square inches. This is equivalent to 0.8% local assembly blockage. For this second condition, where material could move upward in the fuel, analysis and tests on open lattice assemblies show that large local blockage (~41%) is acceptable. The blockage has little effect on subchannel enthalpy rise and, in reality, the blockage is expected to promote turbulence with no effect at all on DNB. Thus, the effect of potential blockage on DNB is not a concern.

LOCA analysis indicates that the effect of local blockage on peak clad temperature occurs during the steam cooling phase of core reflood. A conservative evaluation of the assembly blockage was carried out to address the steam cooling phase. It showed that the effect of the blockage would be to increase the PCT (peak clad temperature) by only 1°F. This is an insignificant temperature rise and therefore the effect on LOCA is not a concern.

4. Possible binding of RCCAs due to the unrecovered grid strap debris was considered. The analysis concluded that there was a low likelihood of

this problem. In past instances at other facilities, grid damage or debris in the reactor core has never resulted in operational problems. The existing technical specification requirement of stepping of the control rods every 2 weeks will provide the necessary safeguard against RCCA binding.

CONCLUSION

Grid damage was caused primarily by corner-to-corner interactions during assembly handling. The refueling procedures were revised such that corner interactions between assemblies were minimized. Assemblies with damaged grid straps were loaded with special handling instructions so that the existing damage was not aggravated further or propagated to adjacent assemblies.

Based on the evaluations performed, it has been concluded that safe Cycle 5 operation will not be affected by the grid damage and the assumed presence of unrecovered grid strap material. Also, during Cycle 5 operation, the required routine monitoring of coolant activity and stepping of control rods will provide a check against fuel rod cladding leakage or RCCA binding.