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January 7, 1991

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Document Control Desk

Subject: LaSalle County Nuclear Power Station Unit 1
Fuel Channel Evaluation for
LaSalle Unit 1 Cycle 5
NRC Docket No. 50-373

References: (a) M. Richter (CECo) letter to U.S. NRC, dated April 26, 1990.

(b) Conference Call on November 26, 1990 between CECo (M. Richter et al.) and NRR (B. Siegel, L. Phillips, A. Attard).

Dr. Murley:

NRC Bulletin 90-02 (Bulletin) requested that all Boiling Water Reactor (BWR) licensees address the effect of fuel channel bow on thermal margins in BWRs, particularly the bow of channels that are being reused for a second bundle lifetime. Reference (a) provided Commonwealth Edison Company's (CECo) response to the Bulletin for LaSalle County Station (LaSalle). The response indicated that although CECo no longer places irradiated channels on new/fresh fuel assemblies, previous channel management practices included the reuse of channels. Consequently, LaSalle Unit 1 Cycle 5 (presently scheduled to begin on April 28, 1991) will utilize some fuel channels which had been previously installed on other fuel bundles (for a single operating cycle). In a recent teleconference with the NRR Reactor Systems Branch (Reference (b)), CECo committed to provide additional information regarding the actions that were being taken to account for the impact of those residual reused channels during Cycle 5.

Enclosure 1 to this letter presents the evaluation performed by CECo to address the thermal margin impact of the residual reused channels during Cycle 5. This evaluation was supported by the conservative, cycle-specific channel bow analysis in Enclosure 2 which was performed by General Electric Company. Although the channel bow analysis is conservative, CECo has taken additional measures (discussed in Enclosure 1) to provide assurance that the residual reused channels will have no impact on safety margins. CECo believes these measures are responsive to concerns expressed by your staff in the Reference (b) teleconference. One of the measures being taken is the replacement of the four reused channels in the cell with the highest projected cell average bow.

It should be noted that the information in Enclosure 2 is considered to be proprietary information to General Electric Company, and is supported by an affidavit signed by General Electric Company, the owner of the information. Enclosure 3 contains the affidavit that sets forth the basis on which the information may be withheld from public disclosure by the NRC and addresses the considerations listed in paragraph (b) (4) of 10 CFR 2.790 of the NRC's regulations. Accordingly, CECo requests that the information contained in Enclosure 2 be withheld from public disclosure in accordance with 10 CFR 2.790.

Please direct any questions or comments on this letter to this office.

Respectfully,

Milton H. Richter

M.H. Richter
Nuclear Licensing Administrator

Enclosures: 1 - Evaluation of Residual Reused Channels on Thermal Margins for LaSalle 1 Cycle 5

2 - General Electric Evaluation of the Critical Power Impact of Reused Channels for LaSalle 1 Cycle 5

3 - General Electric Company Affidavit

cc: A.B. Davis - Regional Administrator, Region III
J.B. Hickman - Project Manager, NRR
L.E. Phillips - Reactor Systems Branch, NRR
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MR:lmw
ZNLD652/16

ENCLOSURE 1

EVALUATION OF RESIDUAL REUSED CHANNELS ON THERMAL MARGINS

FOR LASALLE 1 CYCLE 5

ENCLOSURE 1

Evaluation of Residual Reused Channels on Thermal Margins
for LaSalle 1 Cycle 5

BACKGROUND

Reference 1, which presented Commonwealth Edison's (Edison) response to NRC Bulletin 90-02 for its Boiling Water Reactor stations, indicated that although Edison no longer places irradiated fuel channels on new/fresh fuel assemblies, previous channel management practices included the reuse of channels. As a result, the channels from the LaSalle County Station initial cycle discharge batch were placed on the fresh fuel assemblies that were loaded in LaSalle 1 Cycle 3 (as discussed in Reference 1). These channels had received a single cycle of irradiation, yielding channel exposures from 4 to 12 GWD/STU, prior to their placement on the LaSalle 1 Cycle 3 reload fuel. Although these residual reused channels will accumulate their fourth cycle of irradiation during Cycle 5, LaSalle County Station is a C-lattice plant, with uniform water gaps around the assemblies; therefore, there is less channel bow as a function of exposure and a smaller impact on local peaking (and hence critical power margins) as a result of channel bow relative to comparable D-lattice plants.

The projected LaSalle 1 Cycle 5 core configuration is shown in Figure 1. This figure shows the location of the reused channels, the end of Cycle 5 projected channel exposure, and the end of Cycle 5 projected fuel assembly exposure. The fuel assemblies with the reused channels will be on their third cycle of irradiation and hence are scattered throughout the core. The Cycle 5 exposure projections shown in Figure 1 are based on the nominal projected LaSalle 1 Cycle 4 exposure. LaSalle 1 has been operating at a higher capacity factor than was assumed in the calculation of the nominal Cycle 4 exposure; therefore, the end of Cycle 5 exposure may be slightly greater than that assumed in the Cycle 5 channel bow analysis. This small exposure increment (approximately 0.5 GWD/STU) will have a negligible impact on the results.

CHANNEL BOW ANALYSIS METHOD

Due to the presence of the residual reused channels, Edison is not incorporating General Electric's (GE) generic channel bow methodology (Reference 2) for determining R-factor adjustments for LaSalle 1 Cycle 5. GE's generic methodology utilizes an average channel bow for all assemblies in the core and determines an appropriate R-factor adjustment based on that average bow. Rather than use the core average approach, Edison requested GE to more specifically evaluate the additional impact of the incremental exposure which the residual reused channels received during their initial cycle of irradiation on thermal margins for LaSalle 1 Cycle 5. The results of this analysis, which determined the average channel bow in various four-bundle cells for LaSalle 1 Cycle 5, are presented in Enclosure 2. This approach is more representative than the GE generic methodology as it accurately reflects the operating history of each channel in the four-bundle cell throughout its residence in the core and calculates the resulting bow in each cell.

The following are key aspects of the GE analysis for LaSalle 1 Cycle 5 (Enclosure 2).

1) The average channel bow in an individual cell can be used to determine the impact on local peaking to the fuel pins in the assemblies in that cell.

2) The GE channel bow predictor model has been adequately v idated for channel exposures expected in LaSalle 1 Cycle 5.

3) It is conservatively assumed that the limiting Minimum Critical Power Ratio (MCPR) for the cycle occurs at the same time as maximum channel exposure.

These key aspects are discussed in greater detail in the following paragraphs.

CELL AVERAGE BOW

Channel bow perturbs the water gap sizes between assemblies, thereby affecting the local peaking of the peripheral pins. A larger water gap will increase thermalization, thereby increasing local pin peaking; a smaller water gap will have the opposite effect. Therefore, if the water gap size outside the channel is correctly modeled, the local peaking of the pin will be correctly predicted. The bow of the individual channels in the cell is not as critical as the cumulative bow of all the channels in the cell, as the water gap spacing is determined by the displacement of two or more channels. Therefore, the average bow of a cell can be used to determine the impact on local peaking of the peripheral pins in an assembly since the change in the water gap sizes is adequately modeled.

BOW PREDICTOR MODEL

The GE evaluation is dependent on the accuracy of the channel bow predictor model used to calculate the bow of each channel. This model has been previously presented to the NRC by GE and is summarized in Attachment A of Enclosure 2. The predictor model has been validated by GE using channel exposures up to 57 GWD/MTU, and has been shown to adequately predict the mean of the bow throughout this exposure range for both C-lattice and D-lattice plants. Since the maximum projected channel exposure for LaSalle 1 Cycle 5 is approximately 48 GWD/MTU, the database used by GE in the derivation of the model envelopes the expected maximum exposure, and is therefore applicable to the LaSalle 1 Cycle 5 core configuration.

EXPOSURE ASSUMPTION

An inherent and conservative assumption in the analysis is that the limiting MCPR in the core occurs at the same cycle exposure as the maximum channel exposure. The minimum margin to the MCPR Operating Limit occurs at mid-cycle, while the maximum channel exposure occurs at end of cycle. Applying the impact of the maximum channel exposure to all cycle exposures is therefore conservative.

For this cycle-specific analysis, GE examined the LaSalle 1 Cycle 5 octant symmetric core confirguration and selected 29 four-bundle cells, based on individual reused channel exposures, for evaluation using their channel bow predictor model. The selection process ensured that those cells which contained reused channels and which could potentially become limiting during Cycle 5 were evaluated, either directly or by evaluation of a representative octant symmetric cell (see Figure 1). Cells near the core periphery were not included due to the large degree of margin in these low power regions. These cells have at least 30% margin to the MCPR Operating Limit at the most limiting point in the cycle.

To determine the cells to be evaluated using the channel bow predictor model, GE examined the range of exposures for the reused channels in each octant symmetric cell containing one or more reused channels. If the exposures of the reused channels in the octant symmetric cells were comparable, such that channel bow values would be similar, only one representative cell was chosen for evaluation. Where the exposures of the reused channels in the octant symmetric cells were not comparable, each unique cell was evaluated, ensuring that the effects of reused channels with high and low exposures were taken into account. This method of choosing the cells to be evaluated will bound the bow due to differential irradiation growth since the fluence and fluence gradient effects existing in the reused channels will be taken into account. Since fluence accumulates in proportion to exposure, the fluence effect is bounded by the consideration of the reused channels with higher exposure; whereas, the fluence gradient effect is bounded by the consideration of the reused channels with lower exposure, since the lower exposure is indicative of an operating history in a low power, peripheral core location where the fluence gradient is large.

CHANNEL EXPOSURE HISTORY AND CHANNEL BOW ANALYSIS RESULTS

For the 29 four-bundle cell locations, the exposure history of the channels in each cell was evaluated to determine the end of Cycle 5 cell average bow using GE's channel bow predictor model. Sixteen (16) of the cells were non-control-cell locations, while thirteen (13) of the cells were control cell locations. The average bow for each of the 29 four-bundle cells is shown in Table 1 of Enclosure 2. The non-control-cell locations have an average bow of 26 mils away from the control blade, and the control cell locations have an average bow of 52 mils away from the control blade.

NON-CONTROL-CELL LOCATIONS

The projected channel bow for the evaluated non-control-cell locations are shown in Table 1 of Enclosure 2. The GE evaluation recommended the use of a 35 mil bow for the calculation of R-factors for the non-control-cell locations. Two (2) of the evaluated cells, (25,7) and (11,25), have a projected end of Cycle 5 cell average bow which slightly exceeds the recommended bow value for R-factor adjustment. The non-control-cell at location (25,7) has a cell average bow of 38 mils; however, this cell is near the core periphery, and thus will not become limiting throughout the cycle due to its relative low radial power. The most limiting assembly in this cell has a minimum margin of 35% to the MCPR Operating Limit and a minimum margin of 23% to the Linear Heat Generation Rate (LHGR) Limit projected for Cycle 5. The non-control-cell at location (11,25) is projected to have an end of Cycle 5 cell average bow of 36 mils; however, this location is also near the core periphery, and has a minimum margin of 25% to the MCPR Operating Limit, and a minimum margin of 17% to the LHGR Limit. The remaining, potentially limiting non-control-cell locations have end of Cycle 5 predicted channel bows ranging from 13 to 32 mils. Therefore, the use of a 35 mil bow for the calculation of the R-factors for the non-control-cell locations will adequately account for channel bow during Cycle 5.

CONTROL CELL LOCATIONS

As shown on Table 1 of Enclosure 2, the control cell locations result in a slightly higher degree of channel bow by the end of Cycle 5 than the non-control-cell locations. This result is expected since the channels in a control cell location will be exposed to an increased flux gradient due to the insertion of the control blade during normal cycle operation. Although the control cell locations have a slightly higher average channel bow, these cells also demonstrate greater margin to the MCPR limit than do non-control-cell locations, since four relatively high exposure (and hence low power) bundles are loaded in these cells (as part of the Control Cell Core fuel management strategy to allow mono-sequence operation). The minimum margin to the MCPR Operating Limit for all control cell locations (including those located in the central, high powered region of the core) during Cycle 5 is 16%, and the minimum margin to the LHGR Limit is 20%.

The GE evaluation, Enclosure 2, recommended the use of a 55 mil bow for the calculation of R-factors for the control cell locations to account for channel bow during Cycle 5; however, Edison proposes to use a value which bounds the projected bow values to add further conservatism. For Cycle 5, the control cells will be modeled assuming an end of cycle bow of 65 mils. This approach will bound the projected channel bows for all control cells except for control cell location (15,15), which has a projected average channel bow of 81 mils. To address control cell location (15,15), the fuel bundles which will reside in that control cell during Cycle 5 will receive new channels during the Spring 1991 refueling outage (prior to Cycle 5 operation).

MCPR SAFETY LIMIT EVALUATION

Another potential impact of channel bow is an increase in the MCPR Safety Limit due to increased measurement uncertainties. GE has evaluated the spread in the calculated bow data shown in Table 1 of Enclosure 2 and has stated that this spread is within the tolerances used in the generic methodology, Reference 2. The Reference 2 data was used to determine the potential impact of the increased measurement uncertainties which result from channel bow on the MCPR Safety Limit. Since the standard deviation calculated for LaSalle 1 Cycle 5 is within the Reference 2 database, no adjustment to the MCPR Safety Limit is required to ensure fuel cladding integrity.

CONCLUSION

To summarize, the single previous cycle of exposure on the channels used for the LaSalle 1 Cycle 3 reload batch will be adequately accounted for by an adjustment of the R-factors for the assemblies in Cycle 5. The R-factor adjustment will be calculated assuming a 65 mil bow for the control cell assemblies and a 35 mil bow for the non-control-cell assemblies. With the replacement of the four fuel channels in control cell location (15,15), the 65 mil bow R-factor adjustment will bound the projected end of Cycle 5 channel bow for the control cells. A 35 mil bow R-factor adjustment will bound the projected end of Cycle 5 channel bow for all non-control-cell locations except for two octant symmetric, low power locations, which have been shown to have substantial margin to limits throughout the cycle.

Based on the conservative, cycle specific channel bow analysis (Enclosure 2), coupled with the additional measures taken by Edison as previously discussed, the remaining residual reused channels in LaSalle 1 Cycle 5 do not present a challenge to either the MCPR Safety Limit or the design LHGR Limit. As indicated in the Reference 1 response to NRC Bulletin 90-02, Edison has discontinued the previous practice of channeling fresh fuel with previously irradiated channels and is committed to assuring that any residual reused channels will have no impact on safety.

References:

1. Letter, M.H. Richter to U.S. Nuclear Regulatory Commission, "Dresden Station Units 2 and 3, Quad Cities Station Units 1 and 2, LaSalle County Station Units 1 and 2 - Response to NRC Bulletin 90-02, NRC Docket Nos. 50-237/249, 50-254/265, 50-373/374", April 26, 1990.

2. Letter, P.W. Marriott (GE) to T.E. Murley (NRC), "Fuel Channel Bow", August 22, 1989.

FIGURE 1

LaSalle 1 Cycle 5 End of Cycle Exposure Projections

The attached figure shows the location of reused channels in LaSalle 1 Cycle 5. Control cell locations are identified for reference purposes.

The information included for each reused channel is as follows:

!YJ553 - Assembly Identification
42. - Channel Projected End of Cycle Exposure, GWD/MTU
29. - Fuel Assembly Projected End of Cycle Exposure, GWD/MTU

The calculated average channel bow for each cell is indicated in the center of the four bundle cell, if analyzed. The bow is expressed in mils, and a negative bow indicates that the channels are bowed away from the control blade.

If the designation S(x,y) appears in the center of the cell, the bow of the cell is bounded by Location (x,y) and was not explicitly modeled.

Figure 1, continued

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1									NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED
2								NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED
3						NOT REUSED	NOT REUSED	NOT REUSED	LYJ553 42. 29.	LYJ557 41. 28.	LYJ608 44. 30.	LYJ635 33. 28.	LYJ626 32. 28.	NOT REUSED	NOT REUSED
4						NOT REUSED	NOT REUSED	LYJ604 42. 28.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ542 35. 30.	NOT REUSED	NOT REUSED	LYJ698 45. 32.
5					NOT REUSED	NOT REUSED	LYJ549 31. 28.	NOT REUSED	LYJ536 33. 29.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED
							S(25, 7)		S(9,25)		S(11,25)		S(25,17)		
6			NOT REUSED	NOT REUSED	NOT REUSED	LYJ603 31. 29.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ577 45. 31.	NOT REUSED	NOT REUSED	LYJ658 48. 34.	NOT REUSED
7			NOT REUSED	NOT REUSED	LYJ564 32. 28.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ732 44. 30.	LYJ733 42. 29.	NOT REUSED	NOT REUSED	LYJ704 43. 29.
					S(25, 7)		-57		S(9,23)		S(19,23)				S(23,15)
8		NOT REUSED	NOT REUSED	LYJ602 42. 28.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ619 45. 32.	NOT REUSED	LYJ653 33. 30.	LYJ647 33. 29.	LYJ710 36. 31.	NOT REUSED	NOT REUSED	LYJ726 43. 29.
9	NOT REUSED	NOT REUSED	LYJ579 42. 29.	NOT REUSED	LYJ571 42. 29.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ578 46. 33.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ735 48. 35.	NOT REUSED	NOT REUSED
					-29		S(9,23)		-31		S(11,21)		S(13,21)		
10	NOT REUSED	NOT REUSED	LYJ601 42. 28.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ671 34. 30.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ705 38. 33.	NOT REUSED	NOT REUSED	NOT REUSED
11	NOT REUSED	NOT REUSED	LYJ540 43. 30.	NOT REUSED	NOT REUSED	LYJ607 45. [illegible]1.	LYJ745 44. 30.	LYJ662 34. 29.	NOT REUSED	NOT REUSED	LYJ528 37. 32.	LYJ646 43. 30.	NOT REUSED	NOT REUSED	LYJ664 35. 31.
					S(11,25)		S(19,23)		S(19,21)		S(11,19)				S(19,15)
12	NOT REUSED	NOT REUSED	LYJ584 31. 28.	LYJ531 32. 30.	NOT REUSED	NOT REUSED	LYJ637 42. 29.	LYJ663 34. 31.	NOT REUSED	LYJ681 46. 32.	LYJ648 43. 30.	LYJ580 46. 33.	NOT REUSED	NOT REUSED	LYJ534 33. 29.
13	NOT REUSED	NOT REUSED	LYJ612 32. 28.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ717 47. 35.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ655 36. 32.	NOT REUSED	NOT REUSED
					S(13,25)				S(13,21)				S(17,17)		
14	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ688 39. 34.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ706 34. 32.	NOT REUSED
15	NOT REUSED	NOT REUSED	NOT REUSED	LYJ724 45. 32.	NOT REUSED	NOT REUSED	LYJ652 33. 29.	LYJ695 43. 29.	NOT REUSED	NOT REUSED	LYJ670 35. 31.	LYJ629 33. 28.	NOT REUSED	NOT REUSED	LYJ606 33. 30.
							S(15,23)				S(19,15)				-81

Figure 1, continued

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED								
2	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED							
3	NOT REUSED	NOT REUSED	LYJ539 41. 28.	LYJ631 42. 28.	LYJ568 44. 30.	LYJ552 42. 28.	LYJ596 42. 29.	NOT REUSED	NOT REUSED	NOT REUSED					
4	LYJ636 45. 32.	NOT REUSED	NOT REUSED	LYJ585 34. 30.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ610 42. 28.	NOT REUSED	NOT REUSED					
5	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ538 32. 29.	NOT REUSED	LYJ546 31. 28.	NOT REUSED	NOT REUSED				
		S(13,25)		S(11,25)		S(9,25)		S(25, 7)							
6	NOT REUSED	LYJ651 39. 34.	NOT REUSED	NOT REUSED	LYJ567 45. 31.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ587 42. 29.	NOT REUSED	NOT REUSED	NOT REUSED		
7	LYJ659 33. 29.	NOT REUSED	NOT REUSED	LYJ728 42. 29.	LYJ736 44. 30.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ525 32. 28.	NOT REUSED	NOT REUSED		
	S(23,15)			S(23,11)		S(23, 9)		-50			-38				
8	LYJ649 43. 29.	NOT REUSED	NOT REUSED	LYJ674 35. 31.	LYJ645 42. 29.	LYJ654 43. 30.	NOT REUSED	LYJ562 45. 32.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ609 42. 28.	NOT REUSED	NOT REUSED	
9	NOT REUSED	NOT REUSED	LYJ734 48. 35.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ617 38. 33.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ524 34. 29.	NOT REUSED	LYJ529 42. 29.	NOT REUSED	NOT REUSED
		S(13,21)		S(19,21)		S(9,21)		-25		S(9,25)					
10	NOT REUSED	NOT REUSED	NOT REUSED	LYJ676 46. 33.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ644 43. 30.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ563 42. 28.	NOT REUSED	NOT REUSED
11	LYJ650 44. 31.	NOT REUSED	NOT REUSED	LYJ669 43. 30.	LYJ547 37. 32.	NOT REUSED	NOT REUSED	LYJ720 42. 29.	LYJ692 44. 30.	LYJ543 45. 31.	NOT REUSED	NOT REUSED	LYJ589 44. 30.	NOT REUSED	NOT REUSED
	S(19,15)			S(11,15)		S(19,21)		-64		S(11,25)					
12	LYJ633 31. 29.	NOT REUSED	NOT REUSED	LYJ611 46. 33.	LYJ701 43. 30.	LYJ744 46. 33.	NOT REUSED	LYJ689 35. 31.	LYJ675 42. 29.	NOT REUSED	NOT REUSED	LYJ605 34. 30.	LYJ623 42. 28.	NOT REUSED	NOT REUSED
13	NOT REUSED	NOT REUSED	LYJ682 37. 32.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ708 48. 35.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ625 41. 28.	NOT REUSED	NOT REUSED
		S(17,17)				S(13,21)				S(13,25)					
14	NOT REUSED	LYJ672 34. 32.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ731 38. 34.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED
15	LYJ556 43. 30.	NOT REUSED	NOT REUSED	LYJ574 33. 28.	LYJ723 44. 31.	NOT REUSED	NOT REUSED	LYJ685 43. 29.	LYJ729 33. 29.	NOT REUSED	NOT REUSED	LYJ738 46. 32.	NOT REUSED	NOT REUSED	NOT REUSED
	-81			-31				-63							

Figure 1, continued

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	NOT REUSED	NOT REUSED	NOT REUSED	LYJ640 45. 32.	NOT REUSED	NOT REUSED	S(15,23) LYJ712 33. 29.	LYJ696 43. 29.	NOT REUSED	NOT REUSED	S(19,15) LYJ713 35. 31.	LYJ590 42. 28.	NOT REUSED	NOT REUSED	-81 LYJ620 33. 30.
17	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ667 39. 34.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ684 45. 32.	NOT REUSED
18	NOT REUSED	NOT REUSED	LYJ628 32. 28.	NOT REUSED	S(13,25) NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	S(13,21) LYJ721 48. 35.	NOT REUSED	NOT REUSED	NOT REUSED	-32 LYJ690 45. 32.	NOT REUSED	NOT REUSED
19	NOT REUSED	NOT REUSED	LYJ627 31. 28.	LYJ593 43. 30.	NOT REUSED	NOT REUSED	LYJ711 42. 29.	LYJ691 44. 31.	NOT REUSED	LYJ683 37. 33.	LYJ661 43. 30.	LYJ588 46. 33.	NOT REUSED	NOT REUSED	LYJ570 42. 29.
20	NOT REUSED	NOT REUSED	LYJ561 44. 30.	NOT REUSED	S(11,25) NOT REUSED	LYJ618 45. 31.	-47 LYJ730 44. 30.	LYJ643 43. 29.	S(11,21) NOT REUSED	NOT REUSED	-63 LYJ532 37. 32.	LYJ737 43. 30.	NOT REUSED	NOT REUSED	S(19,15) LYJ719 34. 31.
21	NOT REUSED	NOT REUSED	LYJ598 42. 28.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ714 34. 30.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ742 37. 33.	NOT REUSED	NOT REUSED	NOT REUSED
22	NOT REUSED	NOT REUSED	LYJ600 42. 29.	NOT REUSED	S(9,25) LYJ535 32. 29.	NOT REUSED	S(9,23) NOT REUSED	NOT REUSED	-25 LYJ533 37. 33.	NOT REUSED	-18 NOT REUSED	NOT REUSED	-24 LYJ703 48. 35.	NOT REUSED	NOT REUSED
23		NOT REUSED	NOT REUSED	LYJ586 42. 28.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ616 45. 32.	NOT REUSED	LYJ715 34. 30.	LYJ743 42. 29.	LYJ686 44. 31.	NOT REUSED	NOT REUSED	LYJ673 43. 29.
24			NOT REUSED	NOT REUSED	-23 LYJ624 41. 28.	NOT REUSED	-47 NOT REUSED	NOT REUSED	-16 NOT REUSED	NOT REUSED	S(7,19) LYJ709 44. 30.	LYJ716 42. 29.	NOT REUSED	NOT REUSED	-50 LYJ718 32. 29.
25			NOT REUSED	NOT REUSED	NOT REUSED	LYJ541 32. 29.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ583 45. 31.	NOT REUSED	NOT REUSED	LYJ741 38. 34.	NOT REUSED
26					NOT REUSED	NOT REUSED	S(5,23) LYJ592 41. 28.	NOT REUSED	-23 LYJ551 33. 29.	NOT REUSED	-36 NOT REUSED	NOT REUSED	-20 NOT REUSED	NOT REUSED	NOT REUSED
27						NOT REUSED	NOT REUSED	LYJ545 42. 28.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ594 43. 30.	NOT REUSED	NOT REUSED	LYJ746 45. 32.
28						NOT REUSED	NOT REUSED	NOT REUSED	LYJ555 42. 29.	LYJ621 42. 28.	LYJ572 44. 30.	LYJ632 33. 28.	LYJ630 33. 28.	NOT REUSED	NOT REUSED
29								NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED
30									NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED

Figure 1, continued

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16	-81 LYJ559 34. 30.	NOT REUSED	NOT REUSED	-31 LYJ573 33. 28.	LYJ697 35. 31.	NOT REUSED	NOT REUSED	-63 LYJ702 43. 29.	LYJ747 43. 29.	NOT REUSED	NOT REUSED	LYJ725 46. 32.	NOT REUSED	NOT REUSED	NOT REUSED
17	NOT REUSED	LYJ693 36. 32.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ722 46. 34.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED
18	NOT REUSED	-13 NOT REUSED	LYJ660 36. 32.	NOT REUSED	NOT REUSED	S(13,21) NOT REUSED	LYJ678 48. 35.	NOT REUSED	NOT REUSED	-32 NOT REUSED	NOT REUSED	NOT REUSED	LYJ576 32. 28.	NOT REUSED	NOT REUSED
19	LYJ565 32. 29.	NOT REUSED	NOT REUSED	LYJ614 46. 33.	LYJ677 43. 30.	LYJ700 37. 33.	NOT REUSED	LYJ668 36. 31.	LYJ727 42. 29.	NOT REUSED	NOT REUSED	LYJ544 34. 30.	LYJ575 33. 28.	NOT REUSED	NOT REUSED
20	S(19,15) LYJ642 35. 31.	NOT REUSED	NOT REUSED	-44 LYJ656 43. 30.	LYJ569 46. 32.	S(11,21) NOT REUSED	NOT REUSED	S(19,23) LYJ638 33. 29.	LYJ679 44. 30.	S(11,25) LYJ558 45. 31.	NOT REUSED	NOT REUSED	LYJ550 44. 30.	NOT REUSED	NOT REUSED
21	NOT REUSED	NOT REUSED	NOT REUSED	LYJ657 46. 33.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ694 34. 30.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ581 42. 28.	NOT REUSED	NOT REUSED
22	NOT REUSED	S(13,21) NOT REUSED	LYJ680 48. 35.	-23 NOT REUSED	NOT REUSED	S(9,21) NOT REUSED	LYJ548 36. 33.	S(9,23) NOT REUSED	NOT REUSED	S(9,25) NOT REUSED	LYJ526 34. 29.	NOT REUSED	LYJ599 42. 29.	NOT REUSED	NOT REUSED
23	LYJ665 43. 29.	NOT REUSED	NOT REUSED	LYJ687 36. 31.	LYJ639 33. 29.	LYJ699 33. 30.	NOT REUSED	LYJ597 45. 32.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ615 42. 28.	NOT REUSED	NOT REUSED	
24	-50 LYJ707 33. 29.	NOT REUSED	NOT REUSED	-33 LYJ739 42. 29.	LYJ666 44. 30.	S(9,23) NOT REUSED	NOT REUSED	-47 NOT REUSED	NOT REUSED	S(25, 7) NOT REUSED	LYJ527 33. 28.	NOT REUSED	NOT REUSED		
25	NOT REUSED	LYJ641 39. 34.	NOT REUSED	NOT REUSED	LYJ622 45. 31.	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	LYJ560 31. 29.	NOT REUSED	NOT REUSED	NOT REUSED		
26	NOT REUSED	S(13,25) NOT REUSED	NOT REUSED	S(11,25) NOT REUSED	NOT REUSED	S(5, 9) NOT REUSED	LYJ591 42. 29.	S(25, 7) NOT REUSED	LYJ537 32. 28.	NOT REUSED	NOT REUSED				
27	LYJ740 45. 32.	NOT REUSED	NOT REUSED	LYJ530 34. 30.	NOT REUSED	NOT REUSED	NOT REUSED	LYJ613 42. 28.	NOT REUSED	NOT REUSED					
28	NOT REUSED	NOT REUSED	LYJ566 32. 28.	LYJ634 33. 28.	LYJ554 44. 30.	LYJ582 42. 28.	LYJ595 42. 29.	NOT REUSED	NOT REUSED	NOT REUSED					
29	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED							
30	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED	NOT REUSED								

ENCLOSURE 2

GENERAL ELECTRIC EVALUATION OF THE

CRITICAL POWER IMPACT OF REUSED CHANNELS

FOR LASALLE 1 CYCLE 5