Commonwealth Edison
Byron Nuclear Station
4450 North German Church Road
Byron, Illinois 61010

August 5, 1988

Mr. Thomas E. Murley
Director of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Dear Mr. Murley:

Subject: Byron Station Units 1 and 2
Loss of Offsite Power - Request
for Additional Information

Reference: June 27, 1988 Letter From L. Olshan to H. Bliss

The referenced letter requested additional information concerning the design of the electrical distribution system at Byron Station. The attachment to this letter provides the requested information.

Sincerely yours,

F. G. Lentine

F. G. Lentine
PWR Licensing Supervisor

Attachment

cc: Byron Resident Inspector
L. N. Olshan - NRR

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ENGINEERS
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ATTACHMENT "A"

Byron/Braidwood Units 1 & 2
NRC Letter Dated June 27, 1988
Loss of Offsite Power Followup Request for Additional Information

The enclosure in the subject NRC letter states that "both units normally operate from their unit auxiliary transformers. One of two offsite sources feeding through each unit's SAT serves as the normal immediate access feed to the ESF divisions of that unit; each unit's SAT then can provide the second source of power for the other unit through its ESF buses by operator action (delayed access)."

The above NRC statement indicates a misunderstanding of the Byron/Braidwood Auxiliary Power System configuration and design (e.g., the Class 1E buses do not normally operate from the unit auxiliary transformers but from the system auxiliary transformers). Therefore, in the interest of clarifying the Byron/Braidwood design prior to addressing the concerns raised by the NRC, we are first providing a brief description of the 4160V Class 1E Auxiliary Power System followed by the requested information regarding the ratings of the Class 1E 4160V buses and main breakers.

1. Description of 4160V Class 1E Auxiliary Power System

Figure 1 is a simplified single line diagram of the 4160V Auxiliary Power System installed at Byron/Braidwood Stations, Units 1 & 2. There is no provision for feeding a Class 1E 4160V bus from a Unit Auxiliary Transformer (UAT). The controls for the tie breakers between the Class 1E and non-Class 1E buses (i.e., breakers 1411, 1421, 2411, and 2421 in Figure 1) are interlocked so that they may be manually closed (to provide diesel-generator power to selected non-1E loads) only when (a) the UAT and SAT breakers of the non-1E bus are open, and (b) the Class 1E bus unit cross-tie breakers are open (e.g., breakers 1431, 1432, and 1414, must all be open in order to close Breaker 1411).

In each case, power is supplied to the 4160V Class 1E bus either (normally) by the associated System Auxiliary Transformer (SAT) of the unit, by automatic transfer to the diesel-generator upon loss of the SAT, or by manual transfer to the second source of offsite power (i.e., the associated SAT of the other unit) through the 4160V Class 1E switchgear cross-tie breakers.

Each pair of SATs is sized to provide the total auxiliary power for one unit, plus the Class 1E auxiliary power for the other unit. In addition, each of the two SATs is available (through the 4160V Class 1E switchgear cross-tie breakers) to all safety-related loads of one division for both units and, therefore, serves as the second source of offsite power to the other unit.

The Byron and Braidwood Class 1E Auxiliary Power System design meets the requirements of General Design Criterion 17.

2. 4160V Switchgear Bus and Breaker Ratings

The continuous current rating of each 4160V switchgear bus/breaker is 1200 amperes. This rating is sufficient to carry the total coincidental load imposed on that bus by one unit in a normal full load operating mode, plus the total coincidental Class 1E load imposed on that bus by the other unit in a normal, accident or safe shutdown mode.

The worst case Load Condition for the scenario described in the NRC letter would be represented by a Loss of Coolant Accident (LOCA) on Unit 1 (Bus 141) and a "Winter" Full Load Condition on Unit 2 (Bus 241) at Byron Station. Based on the Byron Station Electrical Load Monitoring System (ELMS), the following is the Load Summary for this Load Condition (reference Figure 2, Pages 1, 2, and 3):

A. 4160V Switchgear Bus 141 - Condition #5 (LOCA)

Equipment No.	Load Description	Maximum Brake HP or kVA	PF (%)	Eff. (%)	Full Load Current (Amperes)
1SX01PA-M	Essential Service Water Pump 1A	1143 HP	90.0	95.0	138A
1SI01PA	Safety Injection Pump 1A	405 HP	93.0	93.0	48A
1CV01PA	Centrifugal Charging Pump 1A	660 HP	92.0	94.0	79A
1CS01PA-M	Containment Spray Pump 1A	507 HP	93.0	93.0	61A
1AF01PA-M	Auxiliary Feedwater Pump 1A	1165 HP	89.0	94.0	144A
0VA01CA	Auxiliary Building Ventilation System Supply Fan 0A	291 HP	85.0	94.0	38A
1RH01PA	Residual Heat Removal Pump 1A	400 HP	92.0	85.0	53A
1CC01PA	Component Cooling Pump 1A	390 HP	92.0	93.0	47A
0VA02CA	Auxiliary Building Ventilation System Exhaust Fan 0A	429 HP	92.0	92.0	52A

A. 4160V Switchgear Bus 141 - Condition #5 (LOCA) (continued)

Equipment No.	Load Description	Maximum Brake HP or kVA	PF (%)	Eff. (%)	Full Load Current (Amperes)
OWØ01CA	Control Room Refrigeration Unit OA	345 HP	89.0	94.0	43A
--	480V Bus 131X	752 kVA	--	--	104A
--	480V Bus 131Z	431 kVA	--	--	60A
			Total Amperes =		867A

B. 4160V Switchgear Bus 241 - Condition #3 (Full Load Winter)

Equipment No.	Load Description	Brake HP or kVA	PF (%)	Eff. (%)	Full Load Current (Amperes)
OVA01CC	Auxiliary Building Ventilation System Supply Fan OC	291 HP	85.0	94.0	38A
2CC01PA	Component Cooling Pump 2A	390 HP	92.0	93.0	47A
OVA02CC	Auxiliary Building Ventilation System Exhaust Fan OC	429 HP	92.0	92.0	52A
--	480V Bus 231X	548 kVA	--	--	76A
--	480V Bus 231Z	338 kVA	--	--	47A
			Total Amperes =		260A

Based on the above, the maximum continuous load that will be seen by the 4160V Class 1E switchgear (Bus 241) and main breaker (2412) under this operating condition is 867A + 260A = 1,127 amperes. This is below the switchgear bus and breaker continuous current rating of 1200A. Therefore, "each ESF bus and the breaker feeding to the ESF bus from the startup transformer are also rated to carry the auxiliary loads of one unit and the ESF loads of the other units."

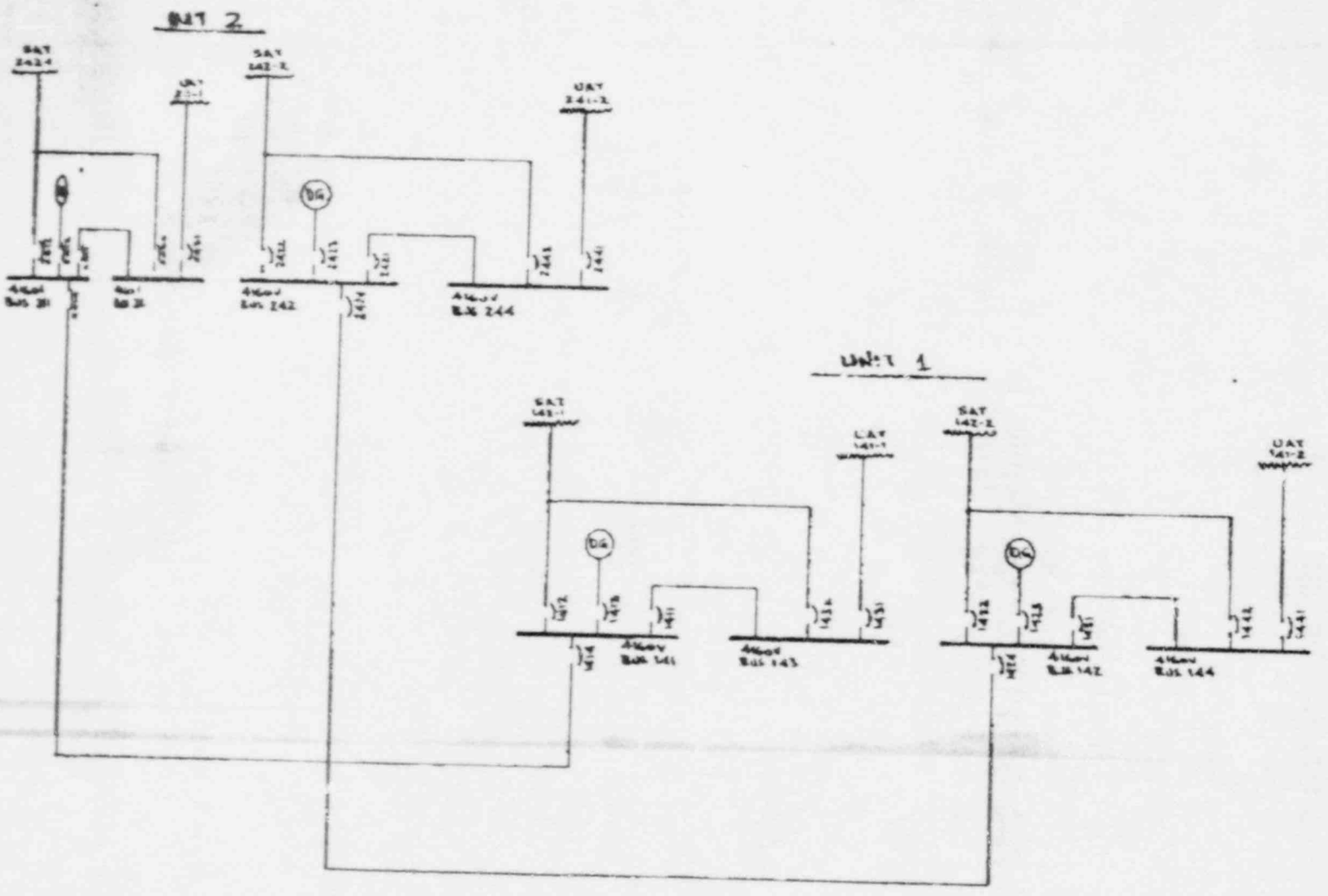

FIGURE 1
BYRON/BRAIDWOOD UNITS 1 & 2

CLASS 1E BUSES: 14, 142, 241, 242

NON-1E BUSES: 148, 144, 143, 244

AC Electrical Load Monitoring System Ver 1.20

Date : 11-25-88 — Sargent & Lundy Engineers, Chicago, Ill. —

***** Load Summary by Bus *****

Utility : Commonwealth Edison Company
Station : Byron
Proj. No. : 7344-31
Unit : 1
Bus Name : BUS 141
Rated Voltage : 4160.0 volts
Source : 2, SWITCHYARD

Load or Bus No.	** Equip. No. / Load Name or Bus Name **	Rated hp/kW kVA	Max. Design hp/kW/kVA for Condition * 1	2	3	4	5	PF (%)	EFF (%)	LRC (%)	Speed RPM	SCTC (sec)
38 1D601KA	DIESEL GENERATOR 1A	5500.0	.0	.0	.0	.0	1.0	80.0	97.0	18.6	600	.000
Status : E	Load type : Generator	KW	KW	KW	KW	KW	KW	*** Safety - Related ***				
39 1SI01PA-M	ESS SERV WTR PUMP 1A	1250.0	1143.0	.0	.0	.0	1143.0	90.0	95.0	575.0	900	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
40 1SI01PA	SAFETY INJECTIONPUMP 1A	400.0	405.0	.0	.0	.0	405.0	93.0	93.0	640.0	3600	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
41 1CV01PA	CENTRIFUGAL CHARGING PU	600.0	660.0	.0	.0	.0	660.0	92.0	94.0	635.0	1800	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
42 1CS01PA-M	CONTAINMENT SPRAY PUMP	600.0	507.0	.0	.0	.0	507.0	93.0	93.0	580.0	1800	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
43 1AF01PA-M	AUX FEED WATER PUMP	1250.0	1165.0	.0	.0	.0	1165.0	89.0	94.0	592.0	3600	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
44 0VA01CA	AUX BLDG VENT SYS SUPPLY	350.0	291.0	291.0	291.0	291.0	291.0	85.0	94.0	588.0	1800	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
45 1RH01PA	RESIDUAL HEAT REMOVAL PUMP	400.0	400.0	.0	.0	.0	400.0	92.0	85.0	648.0	1800	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
46 1CC01PA	COMPONENT COOLING PUM	450.0	390.0	390.0	390.0	390.0	390.0	92.0	93.0	579.0	1800	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
47 0VA02CA	AUX BLDG VENT SYS EXH FAN	500.0	429.0	429.0	429.0	429.0	429.0	92.0	92.0	703.0	1200	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
48 0AC01CA	CONTROL ROOM REFRIG UNIT	321.0	345.0	345.0	345.0	345.0	345.0	89.0	94.0	580.0	3600	.000
Status : E	Load type : Induction	HP	HP	HP	HP	HP	HP	*** Safety - Related ***				
21 Bus name : BUS 131X			1149.	689.	663.	711.	752.					
Connection rating :	1000.0 kVA		kVA	kVA	kVA	kVA	kVA					
30 Bus name : BUS 131Z			432.	398.	431.	327.	431.					
Connection rating :	750.0 kVA		kVA	kVA	kVA	kVA	kVA					
	Total kVA input :		6645.	2382.	2394.	2333.	6250.					

*See page 3 of 3 for explanation of load conditions.

Figure 3

Date : 04-05-87

AC Electrical Load Monitoring System Ver 1.20
Sargent & Lundy Engineers
Chicago, Ill.

***** Load Summary by Bus *****

Utility : Commonwealth Edison Company
Station : BYRON

Proj. No. : 4392-64
Unit : 2

Bus Name : BUS 241
Rated Voltage : 4160.0 volts
Source : 2, SWITCHYARD

Load or Bus No.	** Equip. No. / Load Name or Bus Name **	Rated hp/kW kVA	Max. Design hp/kW/kVA for Condition* 1	2	3	4	5	PF (%)	EFF (%)	LRC (%)	Speed RPM	SCTC (sec)
85 2D60IKA Status : E	DIESEL GENERATOR 2A Load type : Generator	5500.0 KW	.0 KW	.0 KW	.0 KW	.0 KW	1.0 KW	80.0	97.0	18.6	600	.0000
								*** Safety - Related ***				
86 2SX01PA-M Status : E	ESS SERV WTR PUMP 2A Load type : Induction	1250.0 HP	1143.0 HP	.0 HP	.0 HP	.0 HP	1143.0 HP	90.0	95.0	575.0	900	.0000
87 2SI01PA Status : E	SAFETY INJECTION PUMP 2A Load type : Induction	400.0 HP	405.0 HP	.0 HP	.0 HP	.0 HP	405.0 HP	93.0	93.0	640.0	3600	.0000
88 2CV01PA Status : E	CENTRIFUGAL CHARGING PUMP Load type : Induction	600.0 HP	660.0 HP	.0 HP	.0 HP	.0 HP	660.0 HP	92.0	94.0	635.0	1800	.0000
								*** Safety - Related ***				
89 2CS01PA-M Status : E	CONTAINMENT SPRAY PUMP Load type : Induction	600.0 HP	587.0 HP	.0 HP	.0 HP	.0 HP	587.0 HP	93.0	93.0	580.0	1800	.0000
								*** Safety - Related ***				
90 2AF01PA-M Status : E	AUX FEED WATER PUMP Load type : Induction	1250.0 HP	1087.0 HP	.0 HP	.0 HP	.0 HP	1087.0 HP	89.0	94.9	592.0	3600	.0000
								*** Safety - Related ***				
91 0VX01CC Status : E	AUX BLDG VENT SYS SUPPLY Load type : Induction	350.0 HP	291.0 HP	291.0 HP	291.0 HP	291.0 HP	291.0 HP	85.0	94.0	588.0	1800	.0000
								*** Safety - Related ***				
92 2RH01PA Status : E	RESIDUAL HEAT REMOVAL PUMP Load type : Induction	400.0 HP	400.0 HP	.0 HP	.0 HP	.0 HP	400.0 HP	92.0	85.0	640.0	1800	.0000
93 2CC01PA Status : E	COMPONENT COOLING PUMP Load type : Induction	450.0 HP	390.0 HP	390.0 HP	390.0 HP	390.0 HP	390.0 HP	92.0	93.0	579.0	1800	.0000
								*** Safety - Related ***				
94 0VX02CC Status : E	AUX BLDG VENT SYS EXH FAN Load type : Induction	500.0 HP	429.0 HP	429.0 HP	429.0 HP	429.0 HP	429.0 HP	92.0	92.0	703.0	1200	.0000
								*** Safety - Related ***				
21 Bus name : BUS 231X Connection rating : 1000.0 kVA			878. kVA	554. kVA	548. kVA	551. kVA	598. kVA					
38 Bus name : BUS 231Z Connection rating : 750.0 kVA			339. kVA	385. kVA	338. kVA	338. kVA	338. kVA					
Total kVA input :			5906.	1846.	1473.	1876.	3618.					

*See page 3 of 3 for explanation of load conditions.

Figure 2

Byron/Braidwood Units 1 & 2

* - Explanation of Load Conditions Used on EIMS

Load Condition 1 = Connected Continuous Load

Load Condition 2 = Full Load (Summer)

Load Condition 3 = Full Load (Winter)

Load Condition 4 = Start Up

Load Condition 5 = LOCA

Figure 2