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SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards addl info re Div I & II standby diesel generators. Matl provides clarification of 840123 ltr re 300 diesel generator start tests.

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NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

April 26, 1984
(NMP2L 0040)

Mr. A. Schwencer
Licensing Branch No. 2
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Schwencer:

Attached is additional information relating to the Nine Mile Point Unit 2 Division I and II Standby Diesel Generators. This material provides clarification to our January 23, 1984 letter concerning the 300 Diesel Generator Start Tests.

Very truly yours,

C. V. Mangan
Vice President
Nuclear Engineering & Licensing

CVM:ja
Attachment

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ENCLOSURE

ADDITIONAL INFORMATION REGARDING NINE MILE POINT UNIT 2
DIVISION I AND II
STANDBY DIESEL GENERATORS

The Nine Mile Point Unit 2, Susquehanna and Zion diesel generator units all utilize a Cooper Energy KSV-16-T diesel engine which has an inherent design capability to produce an output equivalent to 250 Brake Mean Effective Pressure (BMEP). The Susquehanna and Zion units have a continuous rating of 4,000 kW (194.5 Brake Mean Effective Pressure), whereas the Nine Mile Point Unit 2 units are continuously rated at 4,400 kW (214.3 Brake Mean Effective Pressure). The Brake Mean Effective Pressure difference for Nine Mile Point Unit 2 is derived from additional fuel input without any engine modification. All of the basic engine parts for the three units are identical; crankshaft, connecting rods, pistons, cam shaft, valves and turbocharger. Thus, all engines share a common WK^2 (rotational moment of inertia). For the 300-start qualification test, the Brake Mean Effective Pressure of the Nine Mile Point Unit 2, Susquehanna and Zion units are identical because they are not fully loaded.

The modifications to provide the higher kilowatt output for Nine Mile Point Unit 2 involve changes to the auxiliary skids associated with the engine. The auxiliary skids contain the engine cooling water heat exchanger to reject the additional waste heat.

The nameplate rating of the units is a contractual difference as to what the purchaser required per the specification and not an interent design capability of the engine.

Engine starting for all of the units employs the same starting position of the identical fuel racks. Combustion air after starting is supplied by the exhaust driven turbocharger, which provides a nominal 3:1 boost in pressure from atmospheric, while delivering a nominal 200 percent stoichiometric air requirement.

With reference to the difference in the WK^2 in the various generators, the Nine Mile Point Unit 2 and Susquehanna units both employ an Electric Products generator, while Zion utilizes an Ideal generator. For purposes of comparison, the Nine Mile Point Unit 2 and Susquehanna units are more nearly similar; however, the Susquehanna unit utilizes the next larger frame size machine because its specified transient electrical requirements are more restrictive than Nine Mile Point Unit 2's. This is true even though the Susquehanna steady-state load nameplate rating is lower. Consequently, the WK^2 of the two units is different with Nine Mile Point Unit 2's having the lower value. Therefore, since there is no design difference between the two engines, the starting capability of the Nine Mile Point Unit 2 units is enhanced due to the lower WK^2.

Since there is a difference in the generators, verification of the Nine Mile Point Unit 2 excitation system was done during shop testing. This was accomplished by connecting a fully loaded 2,000 hp motor as a load on the generator under various conditions. The fully loaded motor was applied to the generator, both with 0 load on the machine and with a load in excess of 2,000 kW previously loaded on the machine. In each case, the voltage and frequency stabilized as tabulated below:

Data From Shop Testing of Diesel Generators

2EGS*EG1

Load Acceptance Test

	Test Results			
Description	Time for Voltage to Stabilize	Maximum Voltage Deviation	Time for Frequency to Stabilize	Maximum Frequency Deviation
Start a fully loaded 2,000 hp motor during diesel generator acceleration (@ 57.1 Hertz)	4 seconds	+3.4% - 11.1%	3 seconds	+5.5% - 2%
After reaching rated frequency, add a 2,000 kW resistive load; then, after voltage and frequency stabilize, add a fully loaded 2,000 hp motor	4 seconds	+5.8% - 15.9%	6 seconds	+3.5% - 6.8%

2EGS*EG3

Load Acceptance Test

	Test Results			
Description	Time for Voltage to Stabilize	Maximum Voltage Deviation	Time for Frequency to Stabilize	Maximum Frequency Deviation
Start a fully loaded 2,000 hp motor during diesel generator acceleration (@ 57.1 Hertz)	5 seconds	+3.4% - 12.2%	6 seconds	+6% - 1.3%
After reaching rated frequency, add a 2,000 kW resistive load; then, after voltage and frequency stabilize, add a fully loaded 2,000 hp motor	5 seconds	+4.6% - 15.9%	7 seconds	+3.8% - 7.1%

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The single largest step load at Nine Mile Point Unit 2 is caused by starting the 1,500 hp, low-pressure core spray pump motor (2CSL*P1) which is supplied from diesel generator 2EGS*EG1. This motor is directly coupled to a centrifugal pump. The pump and motor unit is designed to accelerate to rated speed in 3.5 seconds with the motor at 80 percent of its nameplate voltage. During acceleration of the low pressure core spray pump, the 1500 hp motor torque requirement is less than 100 percent of its full load torque. During the step load testing of the diesel generator, a fully loaded 2,000 hp motor was utilized to provide adequate margin during testing. Since the 2,000 hp motor was loaded at approximately its NEMA ratings during these tests, the output torque during acceleration of this motor was considerably greater than 150 percent of its full load torque.

Cooper Energy Services LSV-12, 16 and 20 diesel engines are widely used in many applications outside the nuclear industry. There are approximately 475 LSV units in service. The LSV-16 engine is a slower speed predecessor of the KSV-16-T model used at Nine Mile Point Unit 2; however, it is very similar to the KSV-16-T model in overall design. The LSV break horsepower is slightly higher, break mean effective pressure is slightly lower, the bore and stroke are larger and engine speed is slower. However, the overall basic LSV and KSV engine designs are very similar.

The Cooper Energy Services KSV-16-T and KSV-20-T diesel generators are used extensively as standby units in the nuclear industry. Attached is a tabulation of Cooper Energy Services KSV units in service in industrial and nuclear applications.

Based on the above information, the margin qualification test dictated by Regulatory Guide 1.9, Revision 2, for the addition of the single largest step load plus 10 percent has been demonstrated.

COOPER ENERGY SERVICES KSV DIESEL INSTALLATIONS

Model	BHP	RPM	BMEP	Application	Customer	Location	Order Date
KSV-16-GDT	4176	514	170	Standby Gen. 3000 KW	City of Shelby	Shelby, Ohio	8/62
KSV-12-GDT	3220	514	175	Base Load Gen. 2500 KW	City of Colby	Colby, Kansas	10/62
KSV-12-GDT/SG	5375	600	250	CB Development Laboratory	Cooper-Bessemer Company	Mt. Vernon, Ohio	10/63
KSV-16-T	4400	500	185	Diesel Electric Ferry	Canada Dept. of Transport	Newfoundland, Nova Scotia	9/64
KSV-16-T	4400	500	185	Diesel Electric Ferry	Canada Dept. of Transport	Newfoundland, Nova Scotia	9/64
KSV-16-T	4400	500	185	Diesel Electric Ferry	Canada Dept. of Transport	Newfoundland, Nova Scotia	9/64
KSV-16-T	4400	500	185	Diesel Electric Ferry	Canada Dept. of Transport	Newfoundland, Nova Scotia	9/64
KSV-16-T	4400	500	185	Diesel Electric Ferry	Canada Dept. of Transport	Newfoundland, Nova Scotia	9/64
KSV-12-GDT	4179	600	195	Base Load Gen. 3000 KW	Town of Wilton Junction	Wilton Junction, Iowa	1/69
KSV-16-T	5560	600	194.2	Emergency Nuclear Gen. Zion Station No. 1	Commonwealth Edison Co. Through Sargent & Lundy	Zion, Illinois	6/69
KSV-16-T	5560	600	194.2	Emergency Nuclear Gen. Zion Station No. 1	Commonwealth Edison Co. Through Sargent & Lundy	Zion, Illinois	6/69
KSV-16-T	5560	600	194.2	Emergency Nuclear Gen. Zion Station No. 1	Commonwealth Edison Co. Through Sargent & Lundy	Zion, Illinois	6/69
KSV-16-T	5560	600	194.2	Emergency Nuclear Gen. Zion Station No. 2	Commonwealth Edison Co. Through Sargent & Lundy	Zion, Illinois	6/69
KSV-16-T	5560	600	194.2	Emergency Nuclear Gen. Zion Station No. 2	Commonwealth Edison Co. Through Sargent & Lundy	Zion, Illinois	6/69
KSV-16-T	5560	600	194.2	Emergency Nuclear Gen. Cooper Nuclear Plant	Nebraska Public Power District Through Burns & Roe	Brownville, Nebraska	12/69

Model	BHP	RPM	BMEP	Application	Customer	Location	Order Date
KSV-16-T	5560	600	194.2	Emergency Nuclear Gen. Cooper Nuclear Plant	Nebraska Public Power District Through Burns & Roe	Brownville, Nebraska	12/69
KSV-12-GDT	3679	514	200	Base Load Gen. 2670 KW	City of Sumner	Sumner, Iowa	7/71
KSV-12-GDT	4294	600	200	Base Load Gen. 3080 KW	City of Arcadia	Arcadia, Wisconsin	8/71
KSV-16-T	5560	600	194.9	Emergency Nuclear Gen 4000 KW Susquehanna Station	Pennsylvania Power & Light Through Bechtel-San Francisco	Berwick, Pennsylvania	3/74
KSV-16-T	5560	600	194.9	Emergency Nuclear Gen 4000 KW Susquehanna Station	Pennsylvania Power & Light Through Bechtel-San Francisco	Berwick, Pennsylvania	3/74
KSV-16-T	5560	600	194.9	Emergency Nuclear Gen 4000 KW Susquehanna Station	Pennsylvania Power & Light Through Bechtel-San Francisco	Berwick, Pennsylvania	3/74
KSV-16-T	5560	600	194.9	Emergency Nuclear Gen 4000 KW Susquehanna Station	Pennsylvania Power & Light Through Bechtel-San Francisco	Berwick, Pennsylvania	3/74
KSV-16-T	6135	600	214.3	Emergency Standby Gen 4400 KW	Louisiana Power & Light Waterford Station Unit 3 Through EBASCO	Taft, Louisiana	10/74
KSV-16-T	6135	600	214.3	Emergency Standby Gen 4400 KW	Louisiana Power & Light Waterford Station Unit 3 Through EBASCO	Taft, Louisiana	10/74
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Commonwealth Edison Through Sargent and Lundy	Byron and Braidwood Stations, Illinois	12/75
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Commonwealth Edison Through Sargent and Lundy	Byron and Braidwood Stations, Illinois	12/75
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Commonwealth Edison Through Sargent and Lundy	Byron and Braidwood Stations, Illinois	12/75
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Commonwealth Edison Through Sargent and Lundy	Byron and Braidwood Stations, Illinois	12/75
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Commonwealth Edison Through Sargent and Lundy	Byron and Braidwood Stations, Illinois	12/75

Model	BHP	RPM	BMEP	Application	Customer	Location	Order Date
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Commonwealth Edison Through Sargent and Lundy	Byron and Braidwood Stations, Illinois	12/75
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Commonwealth Edison Through Sargent and Lundy	Byron and Braidwood Stations, Illinois	12/75
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Commonwealth Edison Through Sargent and Lundy	Byron and Braidwood Stations, Illinois	12/75
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Arizona Public Service Through Bechtel-Los Angeles	Palo Verde, Arizona	9/76
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Arizona Public Service Through Bechtel-Los Angeles	Palo Verde, Arizona	9/76
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Arizona Public Service Through Bechtel-Los Angeles	Palo Verde, Arizona	9/76
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Arizona Public Service Through Bechtel-Los Angeles	Palo Verde, Arizona	9/76
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Arizona Public Service Through Bechtel-Los Angeles	Palo Verde, Arizona	9/76
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Arizona Public Service Through Bechtel-Los Angeles	Palo Verde, Arizona	9/76
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Houston Lighting & Power Through Bechtel-Houston	South Texas Project	1/77
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Houston Lighting & Power Through Bechtel-Houston	South Texas Project	1/77
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Houston Lighting & Power Through Bechtel-Houston	South Texas Project	1/77
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Houston Lighting & Power Through Bechtel-Houston	South Texas Project	1/77

Model	BHP	RPM	BMEP	Application	Customer	Location	Order Date
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Houston Lighting & Power Through Bechtel-Houston	South Texas Project	1/77
KSV-20-T	7670	600	214.3	Emergency Standby Gen 5500 KW	Houston Lighting & Power Through Bechtel-Houston	South Texas Project	1/77