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September 30, 1983
5211-83-260

Office of Nuclear Reactor Regulation
Attn: J. F. Stolz, Chief
Operating Reactors Branch No. 4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Degraded Grid Voltage Test

The NRC Staff safety evaluation for Amendment 70 to the TMI-1 Technical Specifications dated July 29, 1981, documented a Met-Ed commitment to provide measured bus IT after testing the onsite safety related electrical distribution system. The measured bus voltages for the safety related motor control centers and 480 volt safety bus voltages were identified by the staff as being needed to verify the accuracy of the analyzed voltage drops between the previously verified busses and those that were not provided in Met-Ed letter dated May 23, 1980 (Ref. 1).

The distribution system test was conducted on September 5, 1981. It was performed with and without loss of offsite power on engineered safeguards (ES) red channel 'A'. ES Channel 'B' was assumed to be unavailable for the purpose of this test. Current and potential circuits were run through test blocks, transducers and signal conditioners to both magnetic and strip chart recorders. During the test, class-IE electrical power system received power from primary 230kv electrical power system. The engineered safeguards signal was manually activated from the control room which initiated safeguards block loading.

The following parameters were recorded during the test:

- (I) Kilowatt, voltage and current recorders on the following buses:
 - a. 1D-ES 4160V switchgear bus
 - b. 1P-ES 480V switchgear bus
- (II) Voltage and current recorders were connected on the following engineered safeguards buses:

- a. 1A-ES 480V motor control center
- b. 1A-ES 480V valve control center
- c. 1C-ES 480V valve control center
- d. 1A-ES (SH) 480V motor control center

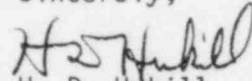
On June 10, 1983, GPUN representatives contacted the NRC concerning the test (TP-622/1) and informed them that bus 1T was not included in the test because the bus is not fed from the red channel, channel 'A'. The NRC then requested that instead of supplying the information referred to in the staff SER supporting Amendment 70, GPUN should supply a comparison of branch Technical Position PSB-1, Rev. 1 July 1981, "Adequacy of Station Electric Distribution System Voltages", with the test performed at TMI-1. This comparison is provided in Table 1 (attached).

Finally, the following three cases have been reviewed for comparing the analyzed and measured bus voltage (Table 2, attached).

- a. Offsite power available, starting ES block 1.
- b. Offsite power available, running ES block 1.
- c. Offsite power available, running one full ES train.

The results of the test support the previous analysis submitted by Ref. 1. The acceptability of the voltage conditions and the undervoltage relay setting on the TMI-1 safety electric distribution system has been reconfirmed by the actual test where the variation between measured and calculated voltage was well within the PSB-1 stated limits.

Sincerely,


H. D. Hukill
Director, TMI-1

HDH:LWH:vjf

Reference 1: Met-Ed letter dated May 15, 1980 (TLL 224)

cc: R. Conte
J. Van Vliet

Table 1
Comparison of BTP-PSB1 Recommendations and
TMI-1 Test Conditions

<u>BTP-PSB-1 Recommendations</u>	<u>TMI-1 Test Conditions</u>
a) loading the station distribution buses, including all class 1E buses down to the 120/208V level, to at least 30%;	a) The station class 1E buses were loaded from 68.4% to 100% of the analytical load values (TDR 185). All non-1E buses were not loaded to 30% of their bus rating. The plant was in cold shutdown mode during this test. No class 1E 120V AC buses comparison has been made. Normal loads were on the 120/208V buses during the test.
b) recording the existing grid and class 1E bus voltage and bus loading down to the 120/208V level at steady state conditions and during the starting of both a large class 1E and non-class 1E motor (not concurrently)	b) The test recorded the effect of starting a large class-1E motor. The grid voltage during the test was recorded. No large non-class 1E motor was started.
c) using the analytical techniques and assumptions of the previous voltage analysis, and the measured existing grid voltage and bus loading conditions recorded during conduct of the test, calculate new set of voltages for all the class 1E buses down to the 120/208V level;	c) Using the analytical techniques of the previous voltage analysis (Ref. 1), a new set of voltages for all the class 1E buses down to 480 Volt level were calculated.
d) compare the analytical derived voltage values against the test results	d) ES buses voltages during the test were not more than 1.1% lower than the analytical results which were obtained by using the same computer program as previously used in Ref. 1.
The test results should not be more than 3% lower than the analytical results; however, the difference between the two when subtracted from the voltage levels determined in the original analysis should never be less than the class 1E equipment rated voltages.	

Table 2

Case 1 - Offsite Power Available, starting
ES Block 1

ITEM	DESCRIPTION (BUS)	ANALYZED BUS VOLTAGE (A)	RECORDED BUS VOLTAGE (B)	% ERROR $\Delta = \frac{A-B}{B} \times 100$
1	BUS 1D (4160V SWGR.)	3963.3	3920	+ 1.1%
2	BUS 1R (480V SWGR.)	452.3	448	+ 1.0%
3	BUS 1P (480V SWGR.)	441.9	448	- 1.4%
4	1A SH (MCC)	452.2	448	+ .9%
5	1A ES VCC	439.9	448	- 1.8%
6	1A ES MCC	441.2	448	- 1.5%
7	1C VCC	440.6	448	- 1.7%

Case 2 - Offsite Power Available, running
ES Block 1

ITEM	DESCRIPTION (BUS)	ANALYZED BUS VOLTAGE (A)	RECORDED BUS VOLTAGE (B)	% ERROR $\Delta = \frac{A-B}{B} \times 100$
1	BUS 1D (4160V SWGR.)	4018	4018	0. %
2	BUS 1R (480V SWGR.)	458.6	459	- 0.1%
3	BUS 1P (480V SWGR.)	448.2	460	- 2.6%
4	1A SH (MCC)	458.6	459	- 0.1%
5	1A ES VCC	446.2	453	- 1.5%
6	1A ES MCC	447.6	454	- 1.4%
7	1C VCC	446.9	448	- 0.2%

Table 2 (Continued)

Case 3 - Offsite Power Available, running
one full ES train.

ITEM	DESCRIPTION (BUS)	ANALYZED BUS VOLTAGE (A)	RECORDED BUS VOLTAGE (B)	% ERROR $\Delta = \frac{A-B}{B} \times 100$
1	BUS 1D (4160V SWGR.)	3991.3	4018	- .7%
2	BUS 1R (480V SWGR.)	450.3	459	- 1.9%
3	BUS 1P (480V SWGR.)	442.0	460	- 3.9%
4	1A SH (MCC)	450.3	459	- 1.9%
5	1A ES VCC	440.0	453	- 2.9%
6	1A ES MCC	441.4	454	- 2.8%
7	1C VCC	440.7	448	- 1.6%