

NRC DISTRIBUTION FOR PART 50 DOCKET MATERIAL

FILE NUMBER

TO:
Mr. Don K. Davis

FROM:
Florida Power & Light Company
Miami, Florida
Robert E. Uhrig

DATE OF DOCUMENT
5/31/77

DATE RECEIVED
6/3/77

LETTER
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 UNCLASSIFIED

PROP

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NUMBER OF COPIES RECEIVED
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DESCRIPTION

DISTRIBUTION OF MATERIAL CONCERNING DIESEL ALARM CIRCUITRY FOR DEESEL GENERATORS.

PLANT NAME: St. Lucie Unit No. 1

RJL (1-P)

ENCLOSURE

Consists of requested information providing additional justification to applicant's proposed tech spec amdt. of 11/8/76 concerning automatic sequencing of diesel generator loads.....notorized 5/31/77.....

DO NOT REMOVE

ACKNOWLEDGED

40 encl.

SAFETY	FOR ACTION/INFORMATION	ENVIRO
ASSIGNED AD:		ASSIGNED AD:
BRANCH CHIEF: (S) <i>ZIEMANN</i>		BRANCH CHIEF:
PROJECT MANAGER: <i>Reeves</i>		PROJECT MANAGER:
LIC. ASST.: <i>01665</i>		LIC. ASST.:

INTERNAL DISTRIBUTION			
<input checked="" type="checkbox"/> RES FILE	SYSTEMS SAFETY	PLANT SYSTEMS	SITE SAFETY &
<input checked="" type="checkbox"/> NRC PDR	HEINEMAN	TEDESCO	ENVIRO ANALYSIS
<input checked="" type="checkbox"/> I & E (2)	SCHROEDER	BENAROYA	DENTON & MULLER
<input checked="" type="checkbox"/> OELD		LAINAS	
<input checked="" type="checkbox"/> GOSSICK & STAFF	ENGINEERING	IPPOLITO	ENVIRO TECH.
<input checked="" type="checkbox"/> MIPC	MACCARRY	KIRKWOOD	ERNST
<input checked="" type="checkbox"/> CASE	KNIGHT		BALLARD
<input checked="" type="checkbox"/> HANAUER	SINWEIL	OPERATING REACTORS	SPANGLER
<input checked="" type="checkbox"/> HARLESS	PAWLICKI	STELLO	
			SITE TECH.
PROJECT MANAGEMENT	REACTOR SAFETY	OPERATING TECH.	GAMMILL
BOYD	ROSS	EISENHUT	STEFF
P. COLLINS	NOVAK	SHAO	HULMAN
HOUSTON	ROSZTOCZY	BAER	
PETERSON	CHECK	BUTLER	SITE ANALYSIS
MEITZ		CRIMES	VOLLNER
HEITMES	AT & I	F. ROSA	BUNCH
SKOVHOLT	SALTZMAN	T. WAMBACH	J. COLLINS
	RUTBERG		KREGER

EXTERNAL DISTRIBUTION			CONTROL NUMBER
<input checked="" type="checkbox"/> I.PDR: <i>FT. PIERCE FLA</i>	NAT LAB:	BROOKHAVEN, NAT LAB	771570223
<input checked="" type="checkbox"/> TIC:	REG. VIE	ULRIKSON (ORNL)	
<input checked="" type="checkbox"/> NSIC:	LA PDR		
<input checked="" type="checkbox"/> ASLB:	CONSULTANTS		
<input checked="" type="checkbox"/> ACRS 16 CYS / <i>LAKHAYAKO/EN</i>	AS CAT. "B"		

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Regulatory Docket File

May 31, 1977
L-77-163

Office of Nuclear Reactor Regulation
Attention: Mr. Don K. Davis, Acting Director
Operating Reactors Branch #2
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Davis:

Re: St. Lucie Unit 1
Docket No. 50-335
Diesel Generator Sequencing



The attached information is forwarded in response to a verbal request from your staff. It provides additional justification of our proposed technical specification amendment dated November 8, 1976 (L-76-386), on the subject of automatic sequencing of diesel generator loads.

Very truly yours,

A handwritten signature in cursive script, appearing to read "Robert E. Uhrig". The signature is written in dark ink and is positioned above the typed name.

Robert E. Uhrig
Vice President

REU:MAS:ms

Attachment

cc: Norman C. Moseley, Region II
Robert Lowenstein, Esquire

ATTACHMENT

Re: St. Lucie Unit 1
Docket No. 50-335
Diesel Generator Sequencing

- References:
1. Appendix A to St. Lucie Unit 1 Operating License DPR-67 (Technical Specifications)
 2. PSL FSAR Chapter 8, Section 8.3.1.1.7 "Stand-by Power Supply - Diesel Generator Sets"
 3. PSL Diesel Generator Technical Manual (NY 422253 P.O.) Ebasco 8770-6699 Rev. 0
 4. PSL-1 Preoperational Test 0400080 Rev. 2 "Integrated Test of ENGINEERED SAFETY FEATURES"
 5. Ebasco ECCS Flow Test / Diesel Generator Loading Engineering Analysis (Appendix B to this Attachment)
 6. Diesel Generator 1B loading sequence voltage and frequency response graphs (Appendix C to this Attachment).
 7. FPL Letter L-76-386 of November 8, 1976 "Proposed Amendment to Facility Operating License DPR-67" (Appendix A to this Attachment)

Introduction:

This evaluation provides additional justification of our proposed technical specification amendment dated November 8, 1976. (See Appendix A)

Discussion:

The ECCS preoperational test for St. Lucie Unit 1 was written in March of 1975. At that time there were no tolerances in the FSAR or Technical Specifications on diesel generator load sequencing. (By March 1975, the Technical Specifications had been issued for comment.) The FPL (Power Resources) Electrical Startup Group then requested that Ebasco review the diesel generator technical manual and associated specifications in order to establish acceptable load sequencing tolerances.

ATTACHMENT
Diesel Generator Sequencing
Page Two

The primary reason for developing such a specification was to prevent an overload and/or excessive voltage drop during the loading sequence. This would ensure that the diesel generator powered motors receive the required voltage to accelerate their loads to rated speed within specified time frames.

The diesel generator specifications (see Appendix B) require recovery from loading transients within one (1) second to a value of 90% of rated voltage. It was demonstrated during testing (see Appendix C, figure 2) that for the largest single load, with all other loads running, the voltage does not decrease to less than 91% of rated voltage and recovers to 100% of rated voltage within 0.7 seconds. This is considered the worst case demand on diesel generator performance. Under these conditions, frequency did not go below 59.8 Hz, which is 99.66% rated frequency, and recovered to 100% rated frequency also within 0.7 seconds.

The largest single load is also the longest timed load group. Thus, we have demonstrated that if the largest load group is energized at the latest time (specification plus 1 second), the diesel generator can recover to full voltage and frequency before the next load group occurs, even if it is at the earliest time (specification minus 1 second).

It should be noted that Safety Guide #9 specifies minimum allowed voltage and frequency during loading and also specifies the recovery time, but does not specify any required loading intervals as long as the voltage and frequency requirements are met. It should also be noted that we exceed these requirements even if the load group intervals are assumed to be one (1) second as in the postulated worst case described above.

From the above mentioned criteria and testing data, we conclude that as long as we maintain one (1) second between the loading of two successive load groups, we will maintain proper diesel generator performance and load sequencing. A technical specification load sequencing tolerance of \pm one (1) second of the desired loading time will accomplish this objective.

Conclusions:

Based on the above considerations and on those stated in our letter of November 8, 1976 (L-76-386), (1) the proposed change does not increase the probability or consequences of accidents or malfunctions of equipment important to safety and does not reduce the margin of safety as defined in the basis for any

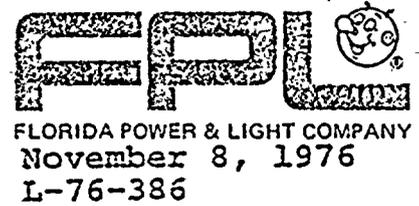
ATTACHMENT
Diesel Generator Sequencing
Page Three

technical specification, therefore, the change does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

APPENDIX A

[Faint, illegible text, possibly bleed-through from the reverse side of the page]

THE
MIDDLE
CLASS



Director of Nuclear Reactor Regulation
Attention: Mr. Victor Stello, Director
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Stello:

Re: St. Lucie Unit 1
Docket No. 50-335
Proposed Amendment to
Facility Operating License DPR-67

In accordance with 10 CFR 50.30, Florida Power & Light Company submits herewith three (3) signed originals and forty (40) copies of a request to amend Appendix A of Facility Operating License DPR-67.

The proposed amendment is described below and is shown on the attached Technical Specification pages bearing the date of this letter in the lower right hand corner.

Page 3/4 8-4

Specification 4.8.1.1.2.c.6 is revised such that the acceptance criteria used to verify operability of the automatic sequence timers is changed from $\pm 10\%$ to ± 1 second.

The proposed amendment has been reviewed by the St. Lucie Plant Facility Review Group and the Florida Power & Light Company Nuclear Review Board. They have concluded that the proposal does not involve a significant hazards consideration and, therefore, does not require prenoticing pursuant to 10 CFR 2.105. A written safety evaluation is attached.

Very truly yours,

Robert E. Uhrig
Robert E. Uhrig
Vice President

REU/MAS/cpc

Attachment

cc: Mr. Norman C. Moseley, Region II
Robert Lowenstein, Esquire

ELECTRICAL POWER SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

the auto-connected emergency loads through the load sequencing system and operate for ≥ 5 minutes while the generator is loaded with the emergency loads.

c) Verifying that on the safety injection actuation signal, all diesel generator trips, except engine overspeed and generator differential, are automatically bypassed.

4. Verifying the diesel generator set operates for ≥ 60 minutes while loaded to ≥ 3500 kw.
5. Verifying that the auto-connected loads to each diesel generator set do not exceed the 2000 hour rating of 3730 kw.
6. Verifying that the automatic sequence timers are OPERABLE with each load sequence time within ± 1 second of its required value.

d. At least once per 18 months by verifying that each fuel transfer pump transfers fuel from each fuel storage tank to the engine mounted fuel tanks on each diesel via the installed cross connection lines.

4.8.1.1.3 The Class 1E underground cable system shall be demonstrated OPERABLE:

- a. Within 30 days after the movement of any loads in excess of 80% of the ground surface design basis load over the cable ducts by pulling a mandrel with a diameter of at least 80% of the duct's inside diameter through a duct exposed to the maximum loading (duct nearest the ground's surface) and verifying that the duct has not been damaged.
- b. At least once per 18 months, during shutdown, by:
 1. Selecting on a rotating basis at least 3 (one each in the ducts between the diesel generators and the switchgear, between the switchgear and the component cooling water pump motors, and between the switchgear and the intake cooling water pump motors) Class 1E 5000 volt underground cables and megger testing the selected cables at a minimum test

SAFETY EVALUATION

Introduction

This safety evaluation supports a proposed change to St. Lucie Unit 1 Technical Specification 4.8.1.1.2.c.6 such that the acceptance criteria used to verify the operability of the automatic sequence timers may be changed from $\pm 10\%$ to ± 1 second.

Discussion

The current specification requires verification that automatic sequence timers are operable with each load sequence within $\pm 10\%$ of its required value. However, in the cases where required values are less than 10 seconds, this means verification down to fractions of a second, and such verification is not assurable.

In addition, for values over 10 seconds the $\pm 10\%$ specification allows load blocks to occur simultaneously or even in reverse sequence. For instance, with the $\pm 10\%$ tolerance, the 15 second load group could occur as late as 16.5 seconds while the 18 second load group could occur as early as 16.2 seconds. This could reverse the two groups (which is undesirable) or allow two load groups, both within present specification tolerances, to be loaded onto a diesel generator simultaneously (which is unacceptable). It is proposed that the acceptance criteria be changed to ± 1 second to provide a meaningful, repeatable surveillance which ensures proper separation of load groups.

The proposed amendment does not involve any physical change to the facility.

Conclusions

Based on these considerations, (1) the proposed change does not increase the probability or consequences of accidents or malfunctions of equipment important to safety and does not reduce the margin of safety as defined in the basis for any technical specification, therefore, the change does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

APPENDIX B

THE
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MEMORANDUM

CDIC-473

→ TO: Gil Boissy - FP&L cc: G. E. Crowell - FP&L
 FROM: T. A. Tarte *TAT* N. Wallach/V. Oniunas
 DATE: November 10, 1975 L. T. Skoblar
 SUBJECT: ST. LUCIE PLANT D. D. Fiore
 1975 - 890 MW INSTALLATION - UNIT 1 G. N. Lemmon
ECCS FLOW TEST/D-G LOADING L. P. Gradin
 T. A. Tarte

REFERENCE: D-G Specification FLO-8770.305

Pursuant to your request, I am giving you the engineering criteria for D-G loading which may be used to evaluate the ECCS flow test.

When evaluating the acceptable tolerance in loading times for the D-G, the primary concern is the time for the D-G to recover from load transients. This recovery time is stipulated in the reference specification, paragraph 10.2, to be not more than one (1) second. Using this criteria, we can deduce simply that, as long as we maintain one second between the loading of two successive load groups, we will maintain a safe loading sequence.

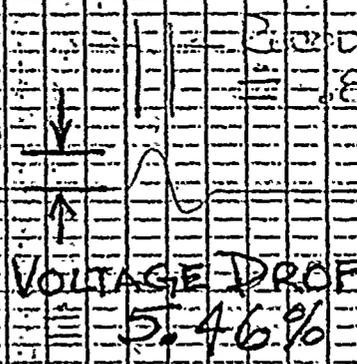
To formulate a more useful tolerance band, we note that all loading for the D-G occurs at three (3) second intervals, except for the 30 second load group. The 30 second load group is of such small magnitude (103 KVA) and long loading interval time that, for purposes of this calculation, it will not be considered. Using the three (3) second loading interval time and the one (1) second D-G recovery time, we calculate the maximum allowable deviation from D-G loading time to be ± 1 second.

In support of this conclusion, we offer that the D-G recovery time is for recovery to a value of 90 per cent of rated voltage. During testing, it has been shown that, for the largest possible load, with all other loads running, the voltage does not drop to less than 95 per cent of rated voltage and recovers to 100 per cent of rated voltage in 0.8 seconds. (See figure 1, attached) Also, the probability of two successive loads starting at their respective end and beginning of the tolerance band, is minimal.

To assure an even more conservative margin of safety, it is our recommendation that every effort be exerted to bring the loading times to within the ± 5 % repeatability accuracy of the timers. The loading times are designed to be a non-cumulative type timing error; therefore, the ± 5 % repeatability accuracy will apply to all load groups. However, we do recognize that the system response time (relay response time, breaker closing time, etc.) may vary slightly. Therefore, we maintain that the maximum allowable deviation from D-G loading time without consequence to the system is ± 1 second.

TAT/mem

1 Encl - a/s



"A" $\frac{V}{S}$

FIGURE 1
ALL LOADS RUNNING EXCEPT
START ICW (INTAKE COOLING
WATER PUMP)

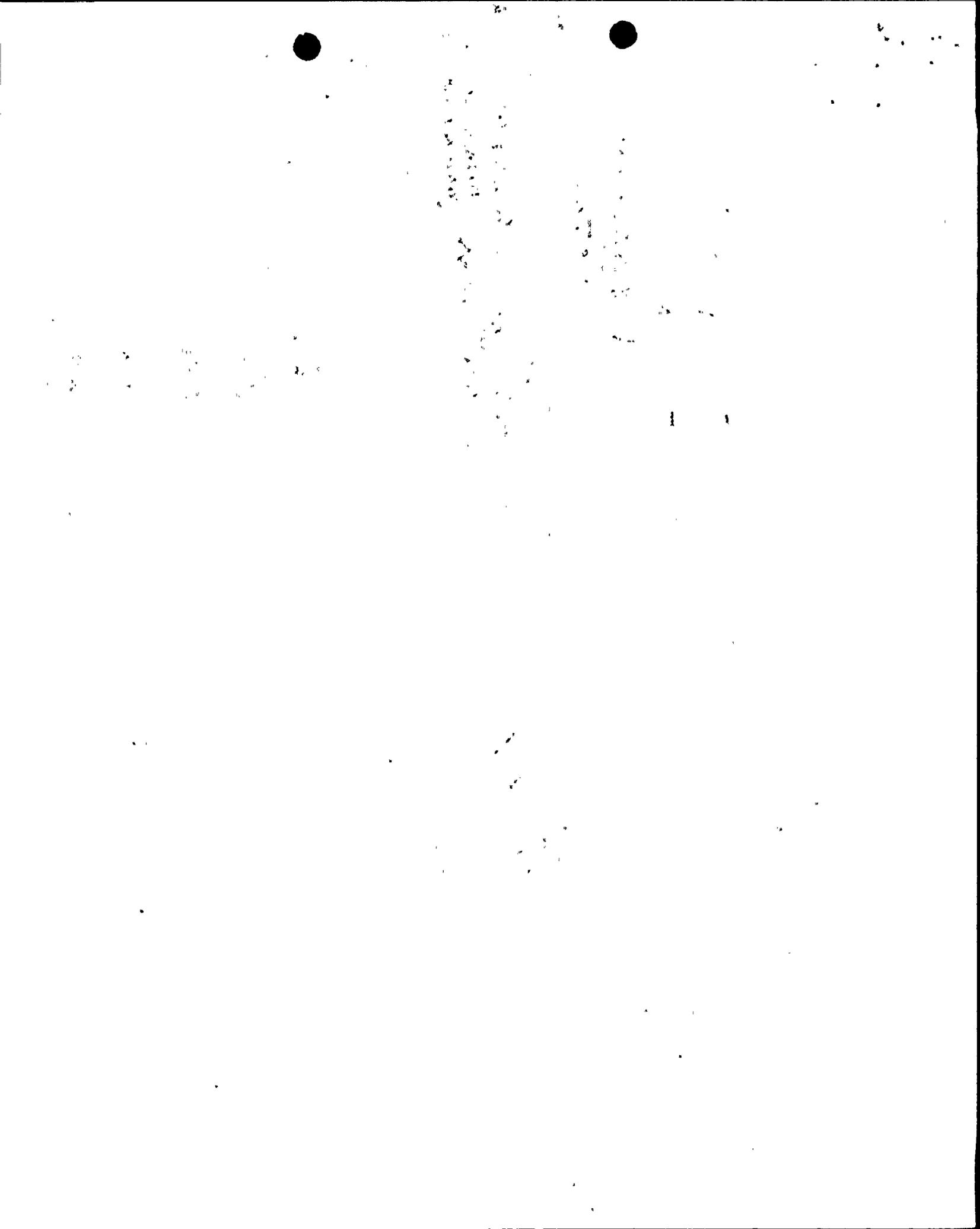
- 58 Hz
- 59 Hz
- 60 Hz
- 61 Hz
- 62 Hz

LOAD

C₂ 9

14 15 16 17 18 19

0 1 2 3 4 5 6 7 8



EBASCO SPECIFICATION
FOR
EMERGENCY DIESEL ENGINE-GENERATOR
SET AND ACCESSORIES

Purchaser's Identification

No. FLO-8770-305
Issue Date: January 30, 1970
Rev 1: August 5, 1970
Rev 2: May 20, 1971

9.13 Intake filter silencer, at recommended maximum velocity and pressure drop to prevent excessive pressure drop. The filter silencer shall be skid mounted and shall be sufficient to quiet the intake to an acceptable sound level.

ENGINE
AUXILIARIES
(Cont'd)
✓ R2

.14 Exhaust muffler, skid mounted, at recommended maximum velocity and pressure drop to prevent excessive back pressure and yet reduce sound to a noise level not more than 85 decibels within a radius of 10 ft from the muffler when background noise level is not more than 70 decibels.

✓ R2

.15 Expansion joints or flexible connectors for exhaust and intake piping to protect engine piping and equipment from forces due to thermal expansion or vibration stresses.

.16 Vibration dampeners for control panel(s).

✓ R2

.17 A set of stainless steel shims sufficient for alignment of the set.

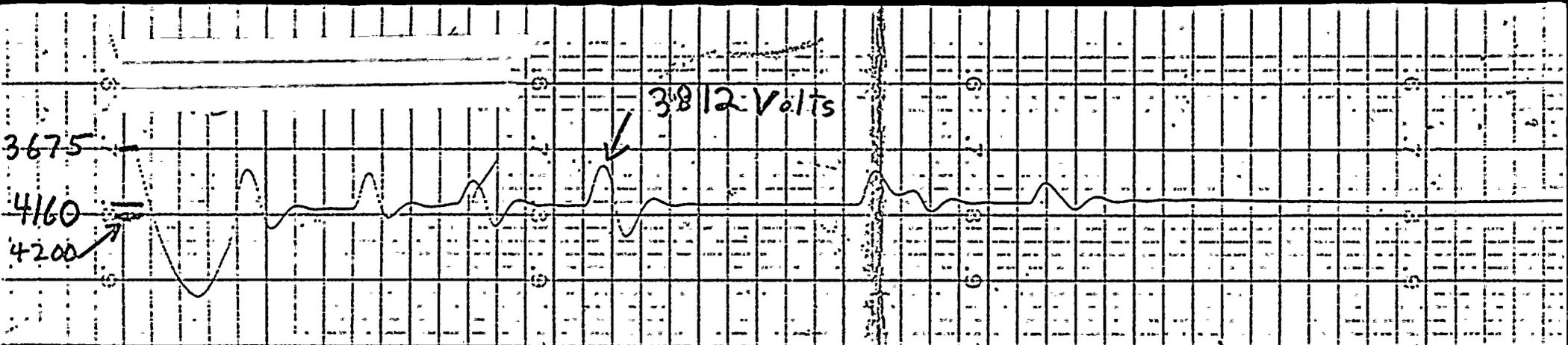
.18 Mechanical engine hour meter.

10.1 Generator shall be 4,160 volt, 3 phase, 60 Hz, 3500 kw, 4125 kva, .85 PF, wye connected, open, self-ventilated, Class B 80°C rise by embedded detector, synchronous revolving field, engine type and shall conform with provisions of standard ANSI C-50.1. Both stator and rotor shall be completely assembled and tested in the factory.

GENERATOR
✓ R2

.2 The generator shall be voltage regulated such that the steady state output voltage regulation shall be no more than 0.5 percent from no load to full load at rated power factor. The momentary voltage drop under the conditions of load application described in Paragraph 5, shall not exceed 20 percent. For these transients, the voltage shall recover to not less than 90 percent in not more than 1 second.

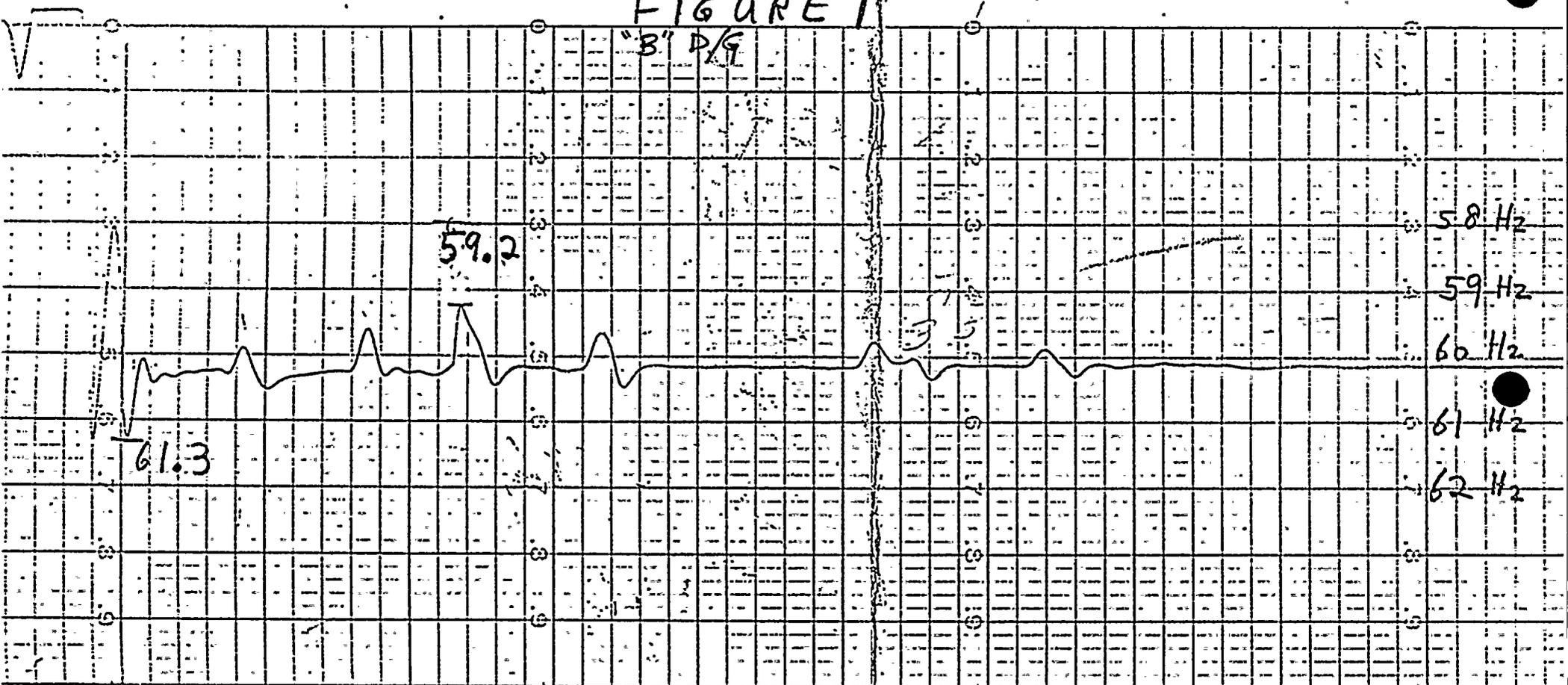
APPENDIX C

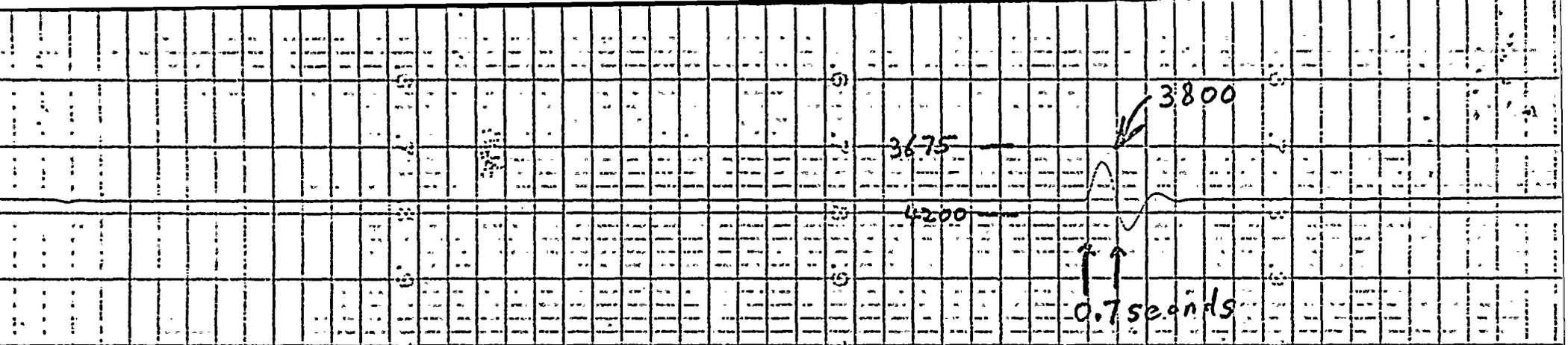


Voltage Vs. Time (1.3 divisions/second)

FIGURE 1

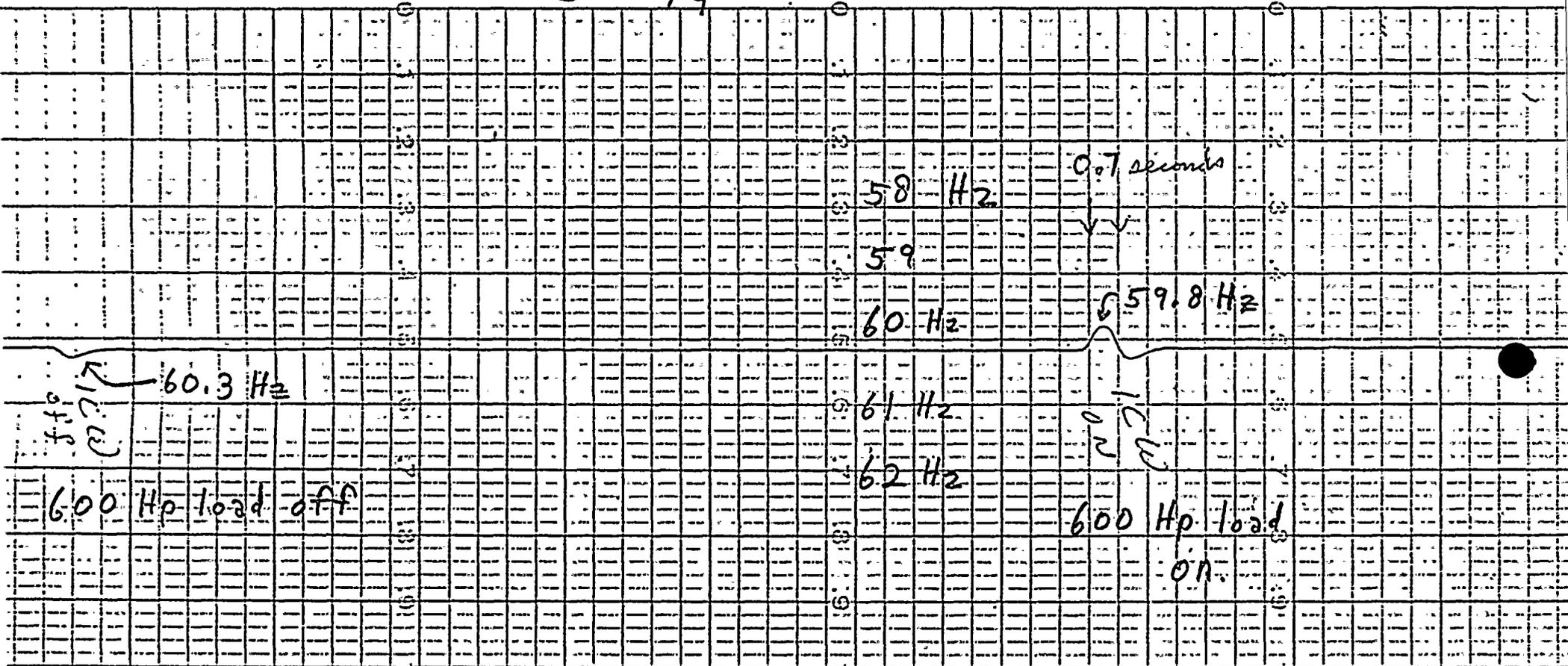
"B" D/G





↑ Voltage vs Time → (1.3 divisions/second)
 (volts)

FIGURE 2
 "B" D/G



60.3 Hz
 600 Hp load off

0.7 seconds
 59.8 Hz
 600 Hp load on

↑ FREQUENCY vs Time → (1.3 divisions/second)
 (Hz)

STATE OF FLORIDA)
) SS.
COUNTY OF DADE)

Robert E. Uhrig, being first duly sworn, deposes and says:

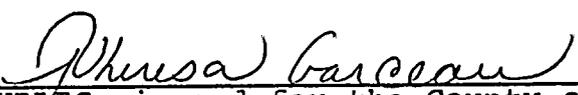
That he is a Vice President of Florida Power & Light Company,
the Licensee herein;

That he has executed the foregoing document; that the state-
ments made in this said document are true and correct to the
best of his knowledge, information, and belief, and that he
is authorized to execute the document on behalf of said
Licensee.


Robert E. Uhrig

Subscribed and sworn to before me this
31 day of March, 1977




NOTARY PUBLIC, in and for the County of Dade,
State of Florida

My commission expires: _____
NOTARY PUBLIC STATE OF FLORIDA AT LARGE
MY COMMISSION EXPIRES JAN. 26, 1979
BONDED THRU GENERAL INSURANCE UNDERWRITERS

