NRC FORM 195 (2-76)

U.S. NUCLEAR REGULATORY COMMISSION

DOCKET NUMBER 50-438/439

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Mr. Oland D. Parr	TVA Chattanooga, Tenn. 37401 J. E. Gilleland	09/06/77
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RE their HR L-30810-5-76

DESCRIPTION: Furnishing information concerning conduction of a fuel surveillance program at both Bellefonte units and asking reconsideration that TVA conduct the fuel surveillanc program at both units if they are the first two units to use the new fuel...

2p

ENCLOSURE

DO NOT REMOVE

ACKNOWLEDGED

PLANT NAME: BELLEFONTE UNITS 1 & 2

jcm 09/12/77

FOR ACTION/INFORMATION

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SEP 6 1977

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Regulatory

Director of Nuclear Reactor Regulation
Attention: Mr. Olan D. Parr, Chief
Light Water Reactors, Branch No. 3
Division of Project Management
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Parr:

In the Matter of the Application of	)	Docket Nos. 50-438
Tennessee Valley Authority	)	50-439

My letters dated June 30 and October 5, 1976, stated that TVA would conduct a fuel surveillance program at the Bellefonte Nuclear Plant if it was the first to utilize the Babcock & Wilcox (B&W) Mark C 17 x 17 fuel. Your letter to Godwin Williams, Jr., dated November 2, 1976, stated that you "will require that TVA commit to an NRC approved fuel surveillance program for both Bellefonte units if they are the first two units or either unit that is among the first two units to use the new Mark C 17 x 17 fuel." It is our position that this requirement imposes an unnecessary burden on TVA.

The strong dependence of fuel behavior upon plant operating philosophy, power generating history, and water chemistry would indicate that different utilities should be chosen for any specific fuel surveillance program required on two or more units. Such action provides assurance that anomalous fuel behavior, should any occur, is not tied to a particular utility dependent operational characteristic. The projected fuel load dates for the first several units to use the Mark C fuel are not so far apart that a significant schedular benefit would result from requiring that the special surveillance program be conducted on both Bellefonte units if they are the first two to utilize the Mark C 17 x 17 fuel.

As you are aware, B&W is conducting an extensive Mark C 17 x 17 demonstration program which includes the insertion of Mark C fuel assemblies into at least one unit at the Oconee Nuclear Plant. This program should provide early verification of the adequacy of the Mark C fuel design.

Your plans to include the fuel surveillance requirement in Regulatory Guide 1.70 and the Standard Review Plan will also provide additional verification of the adequacy of the fuel design on all units using Mark C fuel.

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Mr. Olan D. Parr

SEP 6 1977

For the aforementioned reasons, we reaffirm our commitment, as stated in my June 30 and October 5, 1976, letters, that TVA would conduct a fuel surveillance program at one Bellefonte unit if it is one of the first two units to use the new Mark C 17 x 17 fuel.

We would appreciate your reconsidering your position that TVA conduct the fuel surveillance program at both units if they are the first two units to use the new fuel.

Very truly yours,

J. E. Gilleland
Assistant Manager of Power

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DOCKET FILE

AUG 24 1977

Docket Nos. 50-438/439

Tennessee Valley Authority
ATTN: Mr. Godwin Williams, Jr.
Manager of Power
830 Power Building
Chattanooga, Tennessee 37401

Gentlemen:

SUBJECT: DIESEL GENERATOR 300 TEST QUALIFICATION PROGRAM FOR GRAND GULF UNITS 1 & 2 (50-416/417, AND ACCEPTABILITY OF THIS PROGRAM FOR QUALIFICATION OF THE BELLEFONTE UNITS 1 & 2 (50-438/439) DIESEL GENERATORS

We have reviewed the information submitted by letter from J. E. Gilleland to O. D. Parr dated May 16, 1977, supporting qualification testing of the diesel generators for the Bellefonte plant. The basis of a portion of the Bellefonte diesel qualification is testing performed on similar diesel generator units for Grand Gulf. The information submitted consisted of:

(1) complete documentation of the 300 start and load tests performed on the Grand Gulf diesel generators,

(2) a comparison of the specifications of the Bellefonte and Grand Gulf diesel generators, and

(3) an evaluation of the effect that the minor design differences noted would have on the acceleration of the Bellefonte diesel generator unit to design speed.

On the basis of our review, we conclude that:

a. The 300 start and load test program performed on the Grand Gulf diesel generators is an acceptable demonstration of conformance to Items 2 and 3 of Branch Technical Position EICSB 2 "Diesel Generator Reliability Qualification Testing" for the Grand Gulf diesel generators.

b. Because of the similarity of the Bellefonte and Grand Gulf diesel generators, the test program of Item (a) above is also acceptable for the Bellefonte diesel generators.

A detailed report of our evaluation is attached.

It should be noted that the above cited qualification test program does not include the margin tests required to demonstrate conformance with Item 1 of Branch Technical Positions EICSB 2. Therefore, conformance

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with the margin testing requirement remains an item which will be resolved in the FSAR stage of review for both Grand Gulf and Bellefonte.

Sincerely,

Olan D. Parr, Chief
Light Water Reactors Branch No. 3
Division of Project Management

Enclosure:
As Stated

cc:
See next page

AUG 24 1977

cc: Herbert S. Sanger, Jr., Esq.
General Counsel
Tennessee Valley Authority
629 New Sprankle Building
Knoxville, Tennessee 37902

Mr. E. G. Beasley
Tennessee Valley Authority
400 Commerce Avenue, W9C 165
Knoxville, Tennessee 37902

Mr. T. Spink
Licensing Engineer
Tennessee Valley Authority
303 Power Building
Chattanooga, Tennessee 37401

DIESEL GENERATOR 300 TEST QUALIFICATION PROGRAM FOR GRAND GULF UNITS 1 & 2 (50-416/417, AND ACCEPTABILITY OF THIS PROGRAM FOR QUALIFICATION OF THE BELLEFONTE UNITS 1 & 2 (50-438/439) DIESEL GENERATORS

The Nuclear Regulatory Commission has reviewed the information submitted by letter from J. E. Gilleland to O. D. Parr dated May 16, 1977, supporting qualification of the diesel generators for the Bellefonte plant on the basis of the qualification testing performed on similar diesel generator units for Grand Gulf. This information consisted of:

(1) complete documentation of the 300 start and load tests performed on the Grand Gulf diesel generators (Attachment 1 - sample data sheet),

(2) a comparison of the specifications of the Bellefonte and Grand Gulf diesel generators (Attachment 2), and

(3) an analysis of the effect that the minor design differences noted would have on the acceleration of the Bellefonte diesel generator unit to design speed (Attachment 3).

We conclude the 300 start and load qualification test program performed by Delaval on the 7000 kw diesel generator unit to be installed at the Grand Gulf Nuclear Plant is acceptable. The basis for this conclusion is that the results of this testing demonstrate that the diesel generator unit has met or exceeded requirements 2 and 3 of Branch Technical Position EICSB 2 "Diesel Generator Reliability Qualification Testing."

Because of the similarity of the Bellefonte and Grand Gulf diesel generator units, Tennessee Valley Authority has referenced the Grand Gulf 300 start qualification test in lieu of repeating this portion of the qualification test program for the Bellefonte diesel generators. The diesel generator units for Grand Gulf and Bellefonte Nuclear Plants are identical (see Attachment 2) in capacity and other features, except for the following: (1) the generator voltage for the Bellefonte unit is 6900 V as compared with 4160 V for the Grand Gulf units, and 2) the capacity of the jacket water cooler for the Bellefonte diesel generator unit is approximately 3% greater than the Grand Gulf unit.

The larger voltage output for the Bellefonte diesel generator unit results in a slightly larger generator and consequently in a larger generator system rotational inertia value. The diesel engine system rotational inertia value remains unchanged since the engines are identical and produce the same torque. The larger generator system rotational inertia for the Bellefonte diesel generator units will result in about a 10% increase in acceleration starting time, i.e. 0 to 450 rpm. The acceleration starting times for either the Bellefonte and Grand Gulf diesel generator units should be well within the allowable 10 second interval. Also the shop load qualification tests which will be performed on the Bellefonte diesel generator units prior to delivery will verify the capability for starting and reaching 450 rpm within 10 seconds, and taking on the load block as required. The results of this testing will be evaluated during the OL review.

We have reviewed the Delaval analysis (Attachment 3) on the expected differences in starting times between the Grand Gulf and Bellefonte diesel generator units and concur with the conclusion that the difference in starting time will not be more than 10%, and that the 10 second start requirement will be met by the Bellefonte units.

On the basis of our review, we conclude that:

a. The 300 start and load test program performed on the Grand Gulf diesel generators is an acceptable demonstration of conformance to Items 2 and 3 of Branch Technical Position EICSB 2 "Diesel Generator Reliability Qualification Testing" for the Grand Gulf diesel generators.

b. Because of the similarity of the Bellefonte and Grand Gulf diesel generators, the test program of Item (a) above is also acceptable for the Bellefonte diesel generators.

It should be noted that the above cited qualification test program does not include the margin tests required to demonstrate conformance with Item 1 of Branch Technical Positions EICSB 2. Therefore, conformance with the margin testing requirement remains an item which will be resolved in the FSAR stage of review for both Grand Gulf and Bellefonte.

2.6.5 300 START TEST

PURPOSE

To perform tests as outlined in Qualification Test Procedure, Rev. 2, dated November 30, 1976 for the above engine under Test Method 2.6.1.1.

INSTRUMENTATION

Temperature Recorder, Foxboro S/N 1652300

Frequency Meter, Weston Model 339, S/N 1572

Watt Meter, Weston Model 329, S/N 2851

Voltmeter, Weston Model 341, S/N 25619

Ammeter, Weston Model 370, S/N 8932

Visicorder, Honeywell Model 1508A, S/N 0305J/J71

Transducers

IPAC Series 750, Frequency Transducer

Transdata Inc. Model 10P5101, Voltage Transducer

Transdata Inc. Model 10C5101, Current Transducer

Transdata Inc. Model 20W5101, Kilowatt Transducer

DESCRIPTION OF TEST

Prior to the official start of testing, the engine was run to establish a load of 1750 KW on rheostat "A" and 1750 KW on rheostat "B". Throughout the test these rheostats were kept equal to or greater than 1750 KW. Appropriate test panel timers were then adjusted to achieve the required time for load pickup. The engine was also run for a period of time to establish normal operating temperatures.

A "forced cooling" system was used in cooling the engine back to the standby temperatures after each run. The system circulated engine jacket water through its cooler and engine lube oil through an additional cooler and the engine.

The start number, standby and operating temperatures, the starting air pressure before and after the test, and the generator parameters were recorded on data sheet E-236.

The engine lube oil and jacket water out of the engine were recorded on a temperature recorder to show the engine at standby temperature, its rise to normal operating temperature, and its return to standby temperature for each official start.

The visicorder strip charts show that from the time of the start initiation signal until the engine was up to synchronous speed and the 3500 KW load was picked up was no more than seven seconds. The first 270 starts were conducted from the standby keep-warm temperature and the engine was run until the normal operating temperatures of the lube oil and jacket water were reached. This took approximately ten minutes. The engine was then stopped and the lube oil and jacket water were cooled back to their standby keep-warm conditions. This took approximately 15 minutes. Starts No. 270 through 300 were conducted from the normal half-load temperatures of lube oil and jacket water. These starts were conducted on approximately an eleven-minute cycle.

2.6.5 300 START TEST
(Cont.)

The 300 start test proceeded on a 24-hour-per-day schedule.

Although the engine successfully started, run #299 was voided because the engine did not reach frequency within the required time. This was because the operator tried to start the unit before the engine shutdown mechanism had had time to reset itself.

Minor maintenance work was done on the air compressor after start 55 and routine engine maintenance was performed after starts #130, 244 and 275.

A total of 305 official starts were made during the test without any failures after initiation of the start signal.

The test as outlined in the Qualification Test Procedure, Rev. 2, dated November 30, 1976 for Test Method 2.6.5 was completed without any failures.

The test was observed, logged and signed by:

H. Henricks, De Laval Senior Research Engineer

H. Schilling, De Laval Senior Research Engineer

D. Reid, De Laval Research Engineer

D. Garton, De Laval Quality Control Engineer

R. Reinsch, Representing Bechtel Corp.

A. G. Watson, Representing Bechtel Corp.

ENCLOSURES

A. Data sheets for 2.6.1.1 - Starts #1 to #305 dated 12/11/76 to 12/16/76

B. Visicorder strip chart recordings - Starts #1 to #305 dated from 12/11/76 to 12/16/76.

C. Temperature recorder charts - Starts #1 to #305 dated from 12/11/76 to 12/16/76

MFGR. De Laval
MODEL DSRV-16-4
SERIAL NO. 7[illegible]33
RATING 7000 KW
@ 450 RPM
CONTRACT or ORDER NO. 9645-M-018.0

DELAVAL TURBINE INC.
ENGINE & COMPRESSOR DIVISION
300 START TEST SCHEDULE

Middle South Energy - Unit #1

TEST NUMBER 2.6.5
METHOD NO. 2.6.5.1
DATE 12-11-76
TESTED BY [illegible signatures]
WITNESS

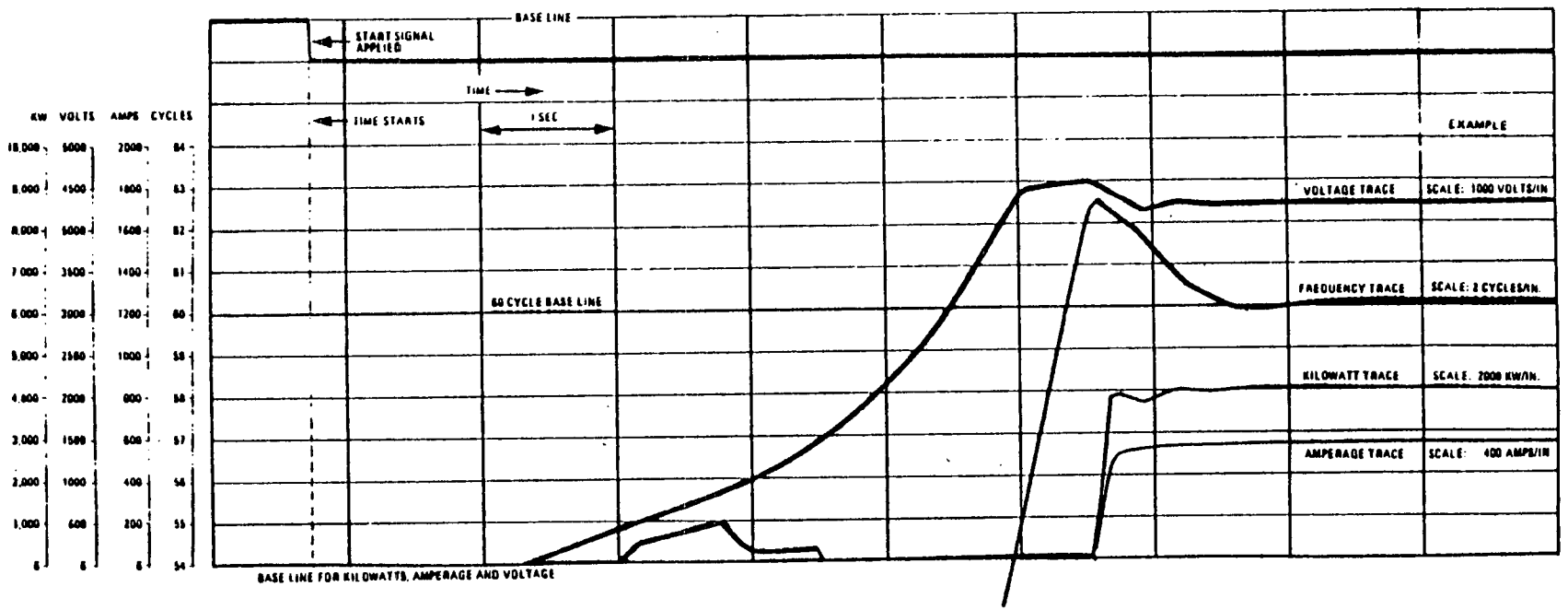
TEST NO.	TIME	KW	FREQ.	VOLTS	AMPS	LUBE OIL TEMP. °F IN	LUBE OIL TEMP. °F OUT	JACKET WATER TEMP. °F IN	JACKET WATER TEMP. °F OUT	START AIR - PSI TEST START	START AIR - PSI TEST STOP	ΔP		AMB. TEMP.
	15[illegible]0						160		160	215	185			72
1	1540	3950	60	4160	520	159	160	158	162	215	185	30		
	1608					149	160	143	160				ADJUSTED RHEOSTATS	72
2	1618	3900	60	4160	520	166	175	153	172	244	215	29		
	1631					146	160	141	157					72
3	1641	3800	60	4160	520	166	175	153	172	244	215	29		
	1651					148	160	143	158	244	215	29		71
4	1706	3800	60	4160	520	166	175	154	172	244	215	29		
	1722					149	160	142	160					71
5	1732	3800	60	4160	520	167	175	154	170	244	215	29		
	1746					149	160	141	160					70
6	1756	3800	60	4160	520	167	175	155	170	244	215	29		
	1812					150	160	142	160					70
7	1822	3800	60	4160	520	167	175	155	170	244	215	29		
	1836					143	160	142	160					69
8	1846	3800	60	4160	520	167	175	155	170	244	215	29		
	1901					149	160	142	160					68
9	1911	3800	60	4160	520	167	175	155	170	244	215	29		
	1926					149	160	142	160					6[illegible]
10	1936	3800	60	4160	520	167	175	155	170	244	215	29		
	1950					151	160	141	160					67
11	2000	3850	60	4160	525	167	175	155	170	244	315	29		
						~~167~~	~~175~~	~~155~~	~~170~~					67
	2017					150	160	142	160	244	215	29	CHECKED [illegible]	67
12	2027	3850	60	4160	525	167	175	155	170	244	215	29		
	2044					157	160	142	160					665
13	2055	3850	60	4160	520	168	175	156	170	220	190	30		
	2111					149	160	142	160					

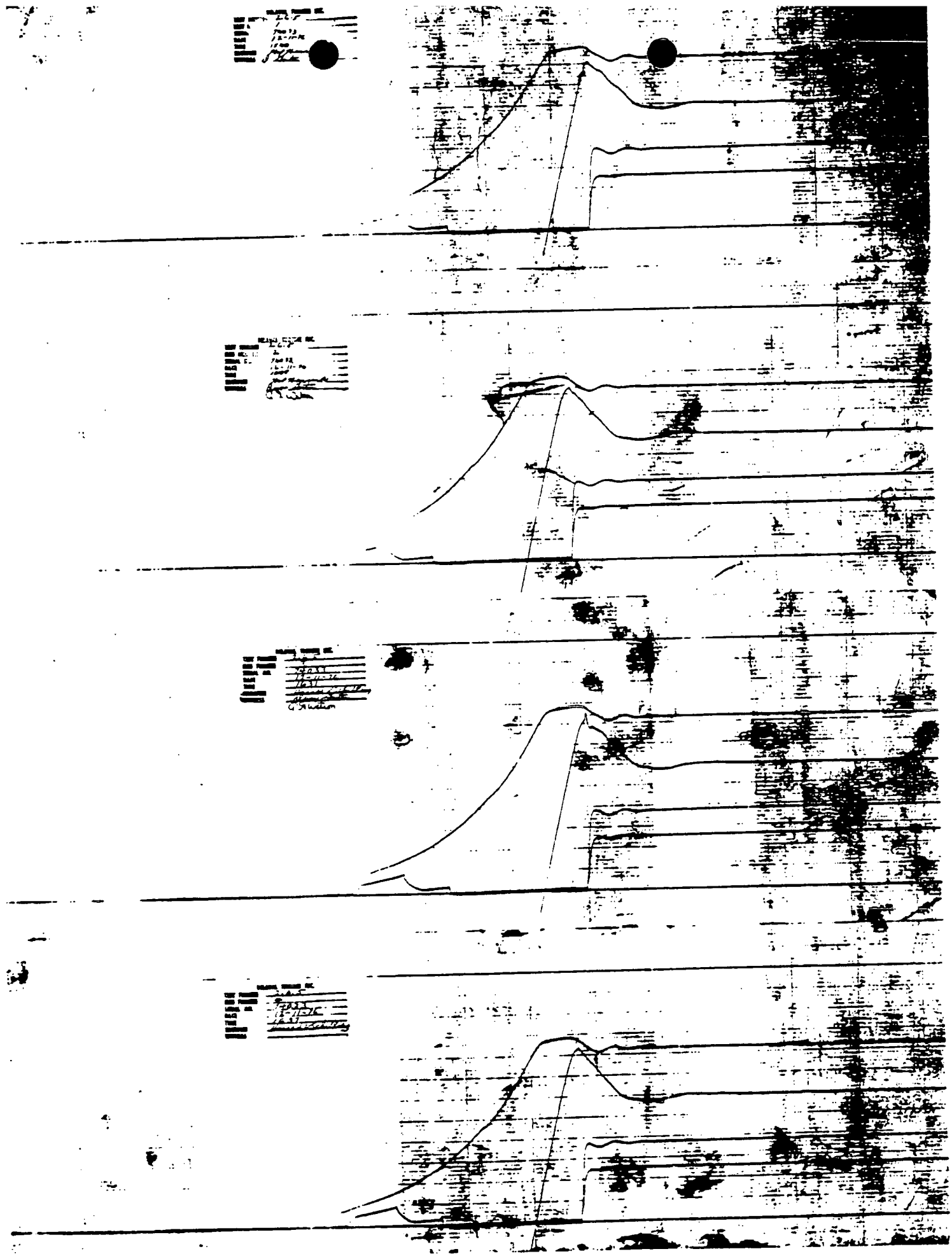
REMARKS
Witnessed # 1-3 starts H. Duane [illegible], OE
Witnessed # 2 & 3 starts C. A. Walton Bechtel Corp

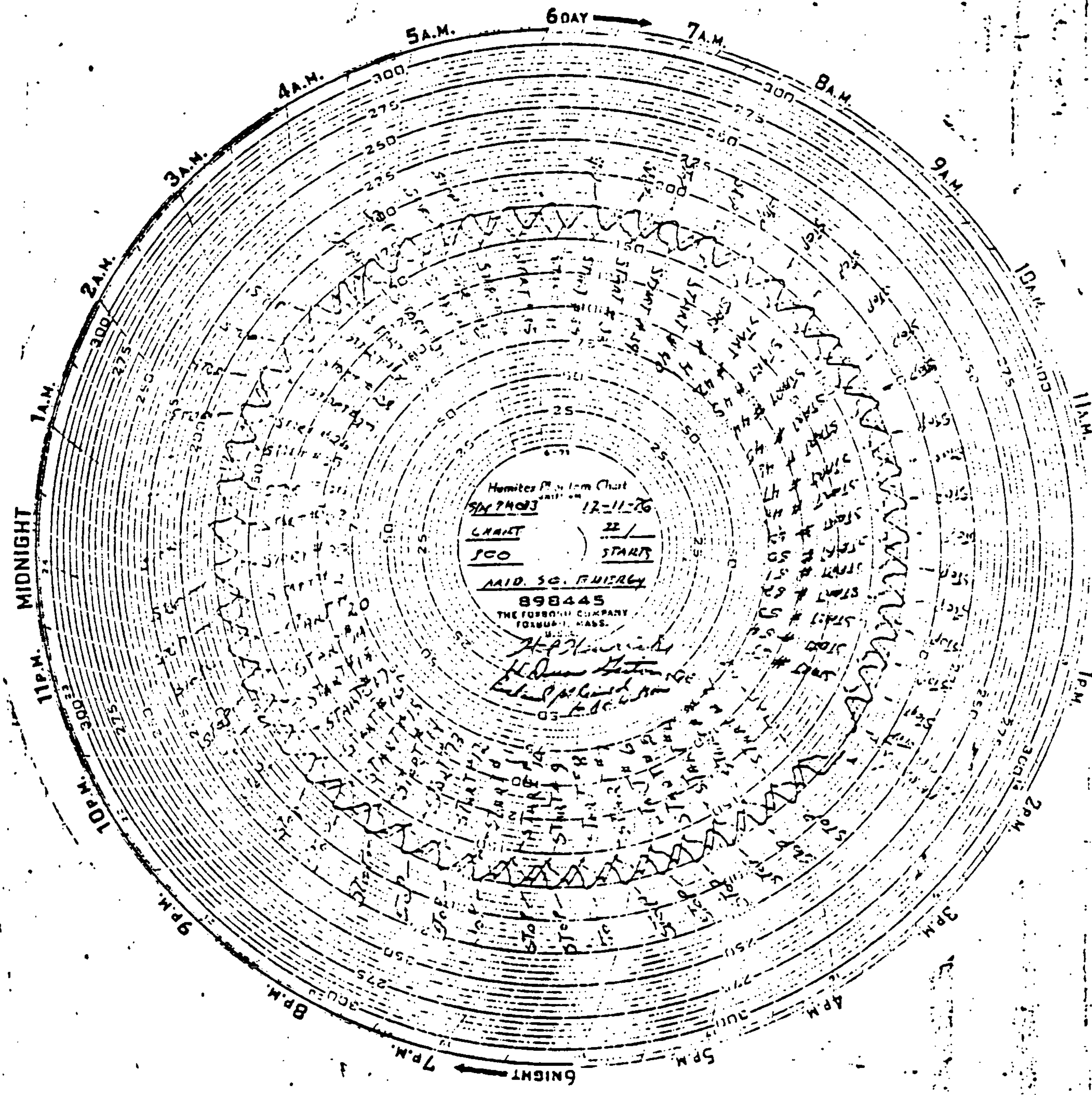
SHEET 7 OF 33

FORM E-236

STRIP CHART SCALE IDENTIFICATION






6 DAY
5 A.M.
7 A.M.
4 A.M.
8 A.M.
3 A.M.
9 A.M.
2 A.M.
10 A.M.
1 A.M.
11 A.M.
MIDNIGHT
NOON
11 P.M.
1 P.M.
10 P.M.
2 P.M.
9 P.M.
3 P.M.
8 P.M.
4 P.M.
7 P.M.
5 P.M.
6 NIGHT
898445
CHART
STARTS
MID. SO. ENERGY
12-11-76

ATTACHMENT 2

Comparison of Bellefonte Nuclear Plant and Grand Gulf Diesel Generators

	BLN	Grand Gulf
Engine Model No.	DSRV-16-4	DSRV-16-4
BHP	9758	9758
BMEP	225	225
RPM	450	450
No. of Cycles	4	4
Cylinders	16	16
Bore	17"	17"
Stroke	21"	21"
Piston speed	1575 FPM	1575 FPM
Govenor	Woodward EGB-35	Woodward EGB-35
Generator	Electric Prod.	Electric Prod.
KW	7000	7000
Voltage	6900, 60 HZ	4160, 60 HZ
PF	0.8	0.8
Excitation	E.P. Portec	E.P. Portec
Type	Static (SVS)	Static (SVS)
Jacket Water Cooler	Thermxchanger	Thermxchanger
Heat Exchanged	24,500,000 btu/hr	23,748,000 btu/hr
Flow (thru engine)	1800 GPM	1800 GPM
Lube Oil Cooler	Thermxchanger	Thermxchanger
Heat Exchanged	3,219,900 btu/hr	3,219,900 btu/hr
Oil Flow	500 GPM	500 GPM
Auxiliary Motors	Allis Chalmers 3ph, 60hz, 460V Westinghouse 120 V.D.C.	Allis Chalmers 3ph, 60hz, 460V Westinghouse 125 V.D.C.
Auxiliary Fuel Oil Pump	IMO Model GG3DBS-187	IMO Model G3DBS-187
Auxiliary Lube Oil Pump	IMO Model A324AAX-412	IMO Model A324AAX-412
L.O. Keepwarm Pump	IMO Model GG3CHS-250	IMO Model A324AAS-250
Jacket Water Keepwarm Pump	Crane Chempump 50 GPM	Crane Chempump 50 GPM

	BLN	Grand Gulf
Lube Oil Filter Type	Commercial Pleated Paper	Commercial Pleated Paper
Prelube Filter Type	Commercial Pleated Paper	Commercial Pleated Paper
Generator Control Panel	Delta Switchboard	Delta Switchboard
Air Compressor	IR Mod. H25BX30 2 Stage-Type 40	IR Mod. H25BX30 2 Stage-Type 40
Air Receiver	Thermxchanger 305 cu. ft.	Thermxchanger 305 cu. ft.

Evaluation of the Effect on Acceleration to Rated Speed of the Greater Rotational Inertia of the BLN Diesel Generator Unit

The Grand Gulf DSRV-16-4 engine generators (S/N 74033/36)$_2$ are rated at 7000 KW at 450 RPM. The total system inertia value or WK^2 is 332,340 lb. ft.^{2} with 291,800 lb. ft.^{2} in the E.P. generator rotor.

The BLN DSRV-16-4 engine generators (S/N 75080/83) are rated also at 7000 KW at 450 RPM. Due to different loading characteristics, the E.P. generator rotor has 326,125 lb. ft.^{2} with identical engine and flywheel as Grand Gulf; the total system inertia value is 366,668 lb. ft.^{2}.

With identical speed governing devices, air starting system, engine rating and type, the starting time would be increased for BLN over that of Grand Gulf by the percentage difference between the system WK^2 values.

$$\text{Ratio} = \frac{366,668}{332,340} = 1.1033$$

The energy required to accelerate a system from N_1 RPM to N_2 RPM may be expressed as:

$$E = 1/2\ IW^2$$
$$= \frac{\pi^2\ WK^2}{1800\ g}\ (N_2^2 - N_1^2)$$

Since the energy available for starting is identical for BLN and Grand Gulf and both have to accelerate from 0 to 450 RPM, the above equation may be written as:

$$E = WK^2 \times C$$

$$HP = \frac{\text{Energy}}{\text{Time}}$$

$$\text{or } \left(\frac{\text{Energy}}{\text{Time}}\right)_{BLN} = \left(\frac{\text{Energy}}{\text{time}}\right)_{GG}$$

$$\frac{WK^2\ BLN \times C}{\text{Time BLN}} = \frac{WK^2\ GG \times C}{\text{Time GG}}$$

$$\frac{WK^2\ BLN}{WK^2\ GG} = 1.1033 = \frac{\text{Time BLN}}{\text{Time GG}}$$

Time GG was between 5-1/2 to 6 seconds.

Time BLN would therefore be 1.1033 x 6, or 6.6 seconds.

We can safely conclude that BLN can be started in less than seven seconds or 70% of the allowable time. The shop test will be utilized to prove the capability and repeatability of starting within ten seconds and take on the load block as required.