

TERRY

Part of worldwide Ingersoll-Rand

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Publicly Available
Steam Turbine Division

Terry Corporation
P.O. Box 555 Lamberton Road
Windsor, Ct. 06095
(203) 688-6211 Telex 99-4495
Cable Terrysteam

DCS
R/9/9/85
T129
July 23, 1985

U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Washington, D.C. 20555

Attention: Roger W. Woodruff

Reference: Terry Type GS
Auxiliary Feed Pump Drivers
Structural Bolting Requirements

Gentlemen:

We attach hereto a copy of a letter with attachments. This letter was dated July 15, 1985 and was sent to all plants on the attached listing.

We trust that the enclosed is self explanatory; however, if we can be of further assistance, please do not hesitate to contact us.

Very truly yours,

TERRY CORPORATION

Robert R. Theroux
Robert R. Theroux
Service Manager

RRT/mem
Att.

cc: R. Hebert - Windsor
K. Wheeler - Windsor
R. Fellenz - Windsor

(0461)

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Steam Turbine Division

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Attention:

Reference:

Gentlemen:

Terry Corporation has recently completed a detailed seismic analysis of the type GS turbine. This analysis is in accordance with the latest requirements of ASME, Section III, Division 1, and NRC Regulatory Guide 1.89, IEEE 344-75 and 627-80. The analysis consisted of a frequency response and subsequent response spectrum analysis per a generic RRS shown in figure 1. A finite element model was used of the turbine and its appurtenances.

Specific response spectra vary from site to site; therefore, the following information may apply in varying degrees. It is recommended that recipients review the following information for applicability to their facility and, if appropriate, implement the attached procedures at the next scheduled maintenance period or prior to initial commissioning.

The results of the analysis indicate that the pedestal to casing bolting and coupling end pedestal to base plate bolting may require replacement and/or preloading to specific levels.

If requested, Terry Corporation can provide specific site analysis. Information regarding this service can be obtained by contacting R. T. Hebert, Nuclear Products Mgr. at the above address.

Very truly yours,
TERRY CORPORATION

Robert R. Theroux
Service Manager

RRT/mem
Att.
(0348)

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Steam Turbine Division

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K-13525

DESIGN IMPROVEMENT

DI 14

FILE NUMBER: _____

SERIAL NUMBER _____

TYPE GS-N

SITE _____

SERVICE AUX. FEED PUMP DRIVE

Description

Design improvement to ensure structural integrity of the type GS-N turbine when subjected to a generic seismic response spectra for the majority of Nuclear Power Plants in the United States.

Purpose

It is recommended that this design improvement be implemented to ensure structural integrity during a seismic event and improve equipment reliability and safety.

Control

It is requested that page two of this DI be returned to TERRY Corporation, P.O. Box 555 Windsor, CT 06095, c/o Service Manager upon completion of this improvement.

SIGNATURES

DATE

ORIGINATOR: _____

PRODUCT ENGR: _____

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Steam Turbine Division

Terry Corporation
P.O. Box 555 Lamberton Road
Windsor, Ct. 06095
(203) 688-6211 Telex 99-4495
Cable Terrysteam

K-13525

DESIGN IMPROVEMENT

DI 14

DESCRIPTION:

FILE NUMBER _____

SERIAL NUMBER _____

TYPE GS-N

SITE _____

SERVICE AUX. FEED PUMP DRIVE

THE FOLLOWING INFORMATION MUST BE PROVIDED PER INSTRUCTIONS ON
PAGE 1.

RETURN TO:

Terry Corporation
P.O. Box 555
Windsor, Connecticut 06095
ATTN: Service Manager

DATE DI INSTRUCTIONS AND/OR MATERIAL RECEIVED: _____

DATE DI SATISFACTORILY COMPLETED _____

AUTHORIZED SIGNATURE: _____ POSITION: _____

COMMENTS:

DI-14

Type GS-1N & GS-2N Structural Bolting Requirements

Forward

Seismic analysis of the type GS-N turbine to the generic response spectrum shown in Figure 1 indicates three areas requiring higher than normal bolting preload to develop adequate joint clamping forces. This design improvement defines the requirements for this bolting and provides procedures for obtaining the required preloads to develop the necessary joint clamping forces.

Prior to commencement of work attention must be given to safety precautions. All systems connected with the turbine function must be isolated to prevent inadvertent initiation. Steam supply valve to the turbine must be closed and tagged out of service. It is recommended that this work be performed during a routine maintenance outage.

Discussion:

The analysis indicates three areas requiring specific minimum bolting preload; the governor end bearing pedestal to case joint (5 bolts), the coupling end bearing pedestal to case joint (7 bolts) and the coupling end bearing pedestal to baseplate joint (2 bolts). The locations of these joints are shown in Section A and Section B of drawing 131324B (attached).

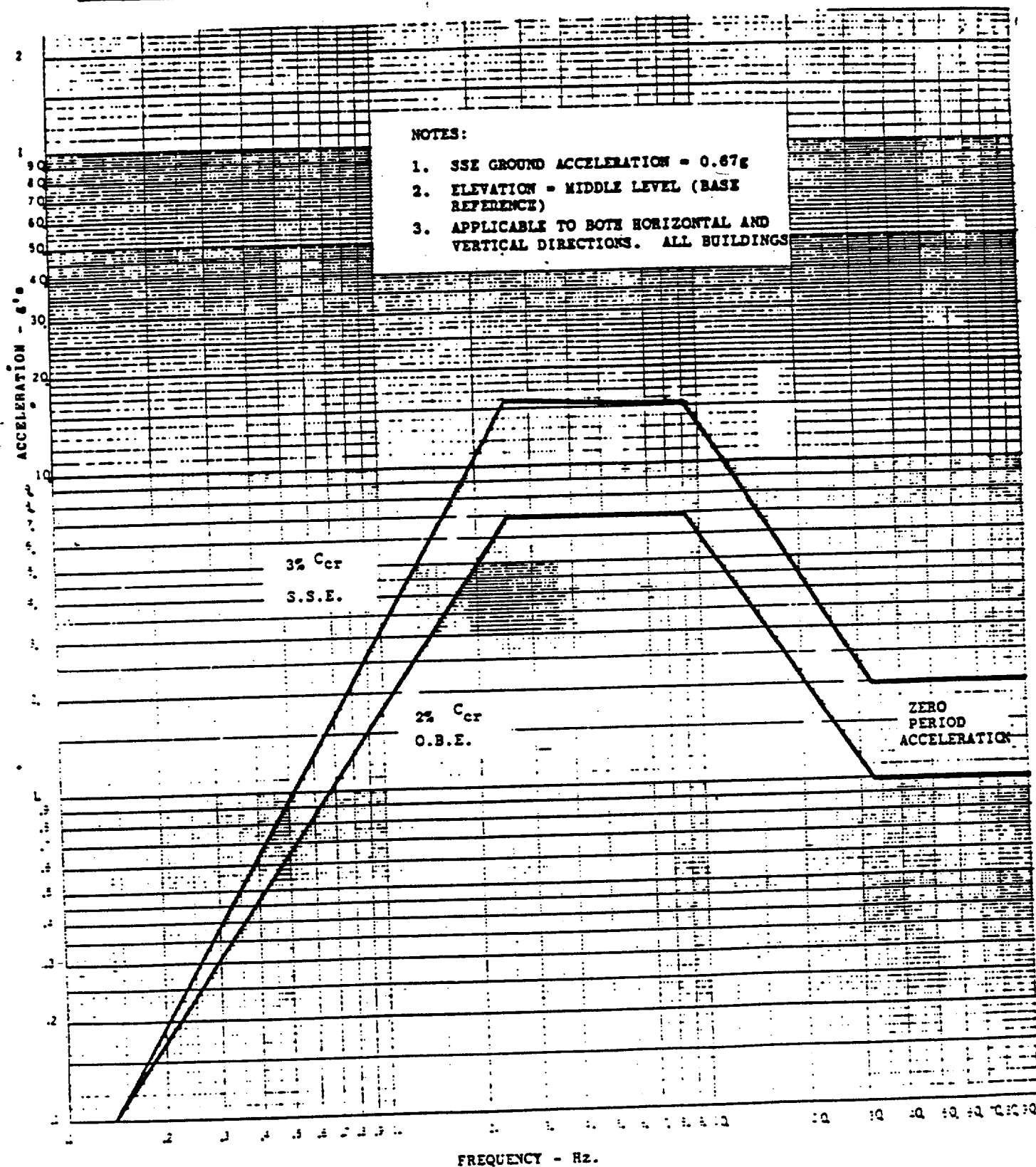
The imposed bolt preload requires that the bolting material have a minimum strength equivalent to ASTM A193 Grade B-7. Some units may have been supplied with bolting materials not meeting this minimum strength and will require replacement of the bolting.

Bolt material meeting the minimum requirements will have B-7 or B7 stamped on the ends of the studs or heads of the capscrews. Any other marking such as SAE grade 6 or higher, A490 or other material meeting the minimum strength requirements of ASTM A193 grade B-7 is acceptable. Most replacement bolting can be procured locally or obtained from TST if desired.

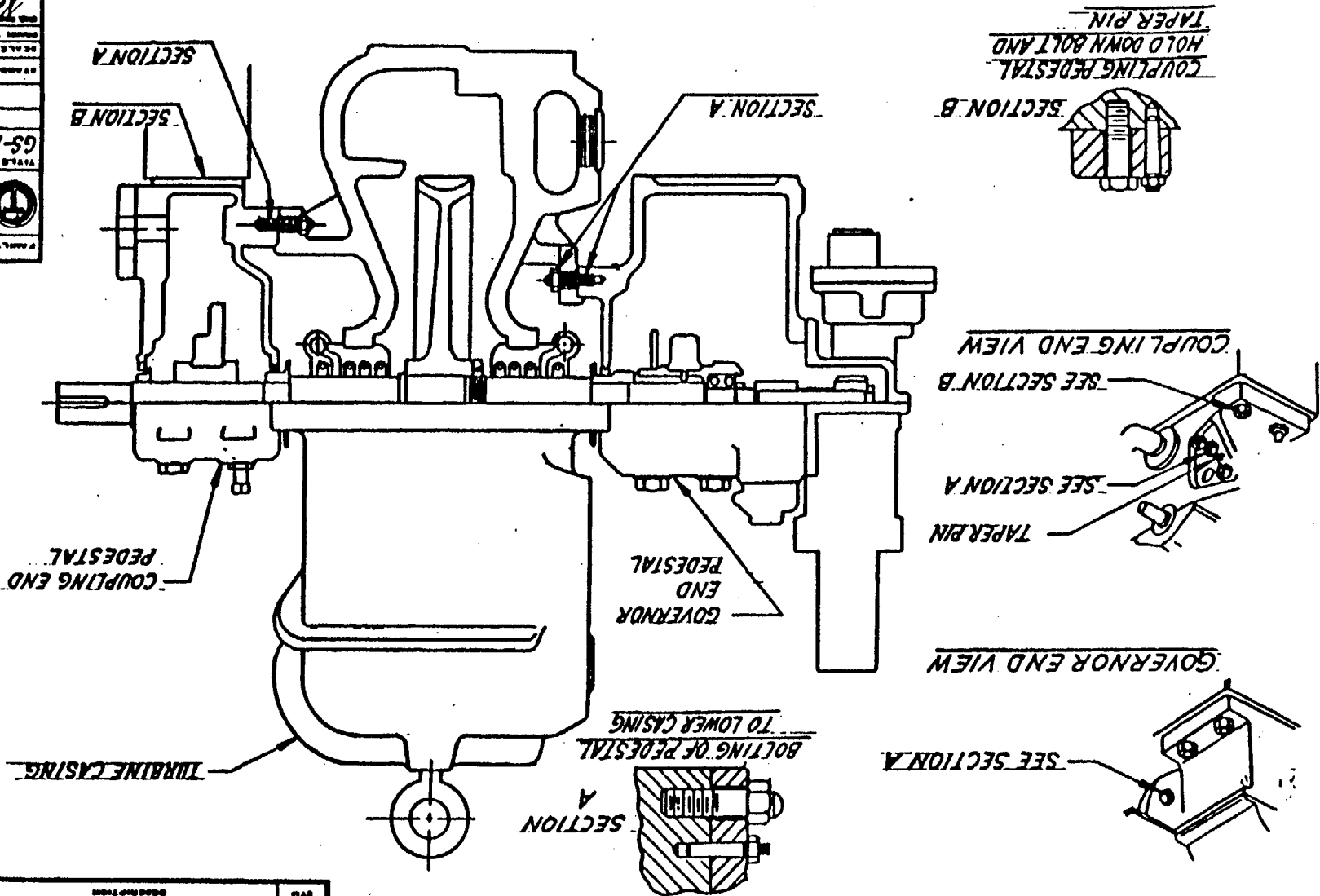
The tightening or torquing of bolts is very important and must be done with care. The angle of turn method (turn of the nut) is specified for case to turbine pedestal joint. Turbine pedestal hold down bolts can be torqued to specified torque value.

TERRY CORPORATION

FIGURE 1:
REQUIRED RESPONSE SPECTRUM (RRS) FOR CONTROL SYSTEM PURPOSES FOR THE
MAJORITY OF NUCLEAR POWER PLANT LOCATIONS IN THE CONTINENTAL UNITED STATES



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TABULATION OF STRUCTURAL BOLTING AND TORQUE VALUES

TYPE GS-2N TURBINE

<u>PC. NO.</u>	<u>LOCATION</u>	<u>QTY.</u>	<u>MATERIAL</u>	<u>SIZE</u>	<u>FT-LBS</u>	<u>DESCRIPTION</u>
19314	GOV END PED TURBINE CASE	3	ASTM A 193 GRADE B7	5/8"-11 x 3-1/4	*	STUD
4435	" " "	2	ASTM A 193 GRADE B7	5/8"-11 x 3-3/4	*	STUD
75139A07	" " "	5	ASTM A 194 GRADE 2H	5/8"-11	N/A	FINISHED HEX NUT
20394	COUP END PED TURBINE CASE	7	ASTM A 193 GRADE B7	5/8"-11 x 3-1/2	*	STUD
75139A07	" " "	7	ASTM A 194 GRADE 2H	5/8"-11	N/A	FINISHED HEX NUT
890049A01	COUP END PED TO BASE	2	ASME SA-193 GRADE B7	1"-8 x 4	730-750	CAP SCREW
19905	GOV END PED TO BASE	4	ASTM A 108 GR-11170	3/4"-10 x 3-1/2	120-150	SHOULDER BOLT

*See separate procedure for turbine pedestal to case bolts.

PROCEDURE FOR TIGHTENING BEARING PEDESTAL
TO CASE BOLTING

The following procedure is to be used to ensure adequate clamping loads between bearing pedestals and exhaust case. Removal of upper half exhaust case and turbine rotor assembly is necessary to gain access to three (3) bolts on the governor end pedestal. Refer to turbine instruction manual for additional information.

1. Proceed one nut at a time. Leave all others tight as found.
2. Loosen nut making sure that nut is turning on stud and that stud stays securely seated in its tapped hole.
3. Using wrench, retighten nut to snug position (approximately 10 lb-ft torque).
4. Tighten nut the additional angle of turn required for each location.
5. Proceed to next location and repeat steps 1 to 4 until all five (5) governor end and seven (7) coupling end locations are tightened.

NOTES

1. IF STUD TURNS WITH NUT THE STUD MUST BE REMOVED. THE NUT MUST BE FREED UP ON THE STUD AND THE STUD RESET INTO ITS TAPPED HOLE USING LOCTITE 277.

<u>LOCATION</u>	<u>ANGLE OF TURN</u> (MIN. - MAX.)
Governor end, two studs near horizontal centerline accessible from outside of bearing box.	47° - 52°
Governor end, three studs approximately 6 inches below horizontal centerline accessible below gland case.	19° - 21°
Coupling end, six studs visible from coupling end of turbine.	47° - 52°
Coupling end, one stud bottom center accessible from under turbine	19° - 21°

Alabama Power Company
Farley 1 & 2
Dothan
AL
36302
George Hairston, Plant Manager
GS-2(N)
T-37858A,B
Auxiliary Feed Pump Drivers

Arizona Public Service Company
Palo Verde 1, 2 & 3
Palo Verde
AZ
85208
Carl Andognini, V.P. Nuclear Operations
GS-2(N)
T-40568A,B,C
Auxiliary Feed Pump Drivers

Arkansas Power and Light
Arkansas Nuclear One - 1 & 2
Russellville
AR
72801
James M. Levine, General Manager
GS-2(N)
T-37665A, T-42264A
Auxiliary Feed Pump Driver

Baltimore Gas & Electric Company
Calvert Cliffs 1 & 2
Lusby
MD
20657
J. A. Tiernan, Plant Manager
GS-2(N)
T-36674A,B,C,D
Auxiliary Feed Pump Driver

Carolina Power and Light Company
Shearon Harris 1 & 2
Raleigh
NC
27601
J. L. Willis, Plant Manager
GS-2(N)
T-41056A, T-41057A
Auxiliary Feed Pump Drivers

Central Nuclear de Asco
Asco 1 & 2
Tarragona
Spain
J. Casellas, Plant Manager
GS-2(N)
T-39623A,B
Auxiliary Feed Pump Drivers

Commonwealth Edison Company
Zion 1 & 2
Zion
IL
60099
K. L. Graessner, Superintendent
GS-2(N)
T-36727A,B
Auxiliary Feed Pump Drivers

Consumers Power Company
Midland 1 & 2
Midland
NC
48640
Gerald B. Slade, Manager
GS-2(N)
T-40225A,B
Auxiliary Feed Pump Drivers

Duke Power Company
McGuire 1 & 2
Cornelius
NC
28031
M. D. McIntosh, Plant Manager
GS-2(N)
T-37948A,B
Auxiliary Feed Pump Drivers

Duke Power Company
Catawba 1 & 2
Rock Hill
SC
29731
James Hampton, Plant Manager
GS-2(N)
T-40096A,B
Auxiliary Feed Pump Drivers

EBES N.V.
Doel III & IV
Beveren, Oost-Vlaanderen
Belgium
H. Bosquet, Director
GS-2(N)
T-40593A, T-41170A
Auxiliary Feed Pump Driver

Electricite de France
Fessenheim 1 & 2
Haut-Rhin
France
Plant Manager
GS-2(N)
T-38117A,B
Auxiliary Feed Pump Driver

Electricite de France
Bugey 2 & 3
Villebois, Ain
France
Plant Manager
GS-2(N)
T-38498A,B
Auxiliary Feed Pump Drivers

Electricite de France
Bugey 4 & 5
Villebois, Ain
France
Plant Manager
GS-2(N)
T-38880A,B
Auxiliary Feed Pump Drivers

Florida Power Corporation
Crystal River 3
Crystal River
FL
32629
E. Morris Howard, Plant Manager
GS-2(N)
T-37009A
Auxiliary Feed Pump Driver

Florida Power and Light Company
St. Lucie 1 & 2
Hutchinson Island
FL
33454

D. Sager, Plant Manager
GS-2(N)
T-37549A, T-40230A
Auxiliary Feed Pump Driver

Furnas Centrais Electricas
Almirante Alvaro Alberto 1
Rio de Janerio
Brazil

Engineer Pedro J. D. Figueiredo, Plant
Manager
GS-2(N)
T-38848A
Auxiliary Feed Pump Driver

Georgia Power Company
Plant Vogtle 1 & 2
Waynesboro
GA

30830
Tom Latislaw, Nuclear Operations
GS-2(N)
T-41173A,B
Auxiliary Feed Pump Drivers

Hidroelectrica Espanola SA
Almaraz 1 & 2
Caceres
Spain

Jose M. Fernandez Mesa, Plant Manager
GS-2(N)
T-38467A,B
Auxiliary Feed Pump Drivers

Hispano-Francesa De Energia Nuclear SA
Vandellos

L'Hospitalet de L'Infant
Tarrangona, Spain
Carlos Fenandez Palomero, Plant Manger
GS-2(N)
T-41925A
Auxiliary Feed Pump Driver

Houston Light and Power Company
South Texas 1 & 2
Matagorda County
TX
77483
Plant Manager
GS-2(N)
T-40749A,B
Auxiliary Feed Pump Drivers

Indiana and Michigan Electric Company
D. C. Cook 1 & 2
Bridgeman
MI
49106
W. G. Smith, Jr.; Plant Manager
GS-2(N)
T-36700A,B
Auxiliary Feed Pump Drivers

Intercom
Tihange II & III
Huy, Liege
Belgium,
Louis Maesen, Plant Manager
GS-2(N)
T-40814A, & T-42006A
Auxiliary Feed Pump Driver

Kansas Gas and Electric Company
Wolf Creek
Burlington
KS
66839
Forrest Rhodes, Superintendent
GS-2(N)
T-40177A
Auxiliary Feed Pump Driver

Korea Electric Company
Korea Nuclear, Unit 2, 5 & 6
Kyung Sang Nam-Do
Korea
Kyung Shick Min, Site Director
GS-2(N)
T-41171A, T-41482A,B
Auxiliary Feed Pump Driver

Korea Electric Company
Korea 7 & 8
Young Kwang-Kun
South Korea
Plant Manager
GS-2(N)
T-41930A,B
Auxiliary Feed Pump Drivers

Louisiana Power and Light Company
Waterford 3
Killona
LA
70066
R. P. Barkhurst, Plant Manager
GS-2(N)
T-38280A
Auxiliary Feed Pump Driver

National Power Corporation
PNPP 1
Morong, Bataan
Phillipine Islands
Antonio T. Corpuz, Plant Manager
GS-2(N)
T-41172A
Auxiliary Feed Pump Driver

Northeast Utilities
Millstone 2
Waterford
CT
06385
J. J. Kelley, Jr., Manager - Unit 2
GS-2(N)
T-37273A
Auxiliary Feed Pump Driver

Northeast Utilities
Millstone 3
Waterford
CT
06385
J. O. Crockett, Manager Unit - 3
GS-2(N)
T-38587A
Auxiliary Feed Pump Driver

Nuklearna Elektrana Krsko
Krsko 1
Slovenia 68270
Yugoslavia
Dr. Janez Dular, Plant Manager
GS-2(N)
T-40366A
Auxiliary Feed Pump Driver

Pacific Gas & Electric Company
Diablo Canyon 1 & 2
Avila Beach
CA
93424
R. C. Thornberry, Plant Manager
GS-2(N)
T-36565, T-36566
Auxiliary Feed Pump Driver

Portland General Electric Company
Trojan
Rainier
OR
97048
C. P. Yundt, General Manager
GS-2(N)
T-37470A
Auxiliary Feed Pump Driver

Public Service Electric and Gas Company
Salem 1 & 2
Hancocks Bridge
NJ
08038
John Zupko, General Manager, Operations
GS-2(N)
T-36988A,B
Auxiliary Feed Pump Drivers

Public Service of New Hampshire
Seabrook 1
Seabrook
NH
03874
Donald E. Moody, Station Manager
GS-2(N)
T-41062A,
Auxiliary Feed Pump Drivers

Public Service of New Hampshire
Seabrook 2
Seabrook
NH
03874
Donald E. Moody, Station Manager
GS-2(N)
T-41063A
Auxiliary Feed Pump Drivers

Sacramento Municipal Utility District
Rancho Seco Nuclear Generating Station
Herald
CA
95638
Ronald J. Rodriguez, Plant Manager
GS-2(N)
T-37168A
Auxiliary Feed Pump Driver

South Carolina Electric and Gas Company
Summer 1
Jenkinsville
SC
29065
O. S. Bradham, Station Manager
GS-2(N)
T-38765A
Auxiliary Feed Pump Driver

Southern California Edison
San Onofre 2 & 3
San Clemente
CA
92672
Harold Ray, Plant Manager
GS-2(N)
T-40101A,B
Auxiliary Feed Pump Drivers

Taiwan Power
Maanshan 1 & 2
Heng Chun
Ping Tung Hsien, Taiwan
C. Y. Chow, Superintendent
GS-2(N)
T-40893A,B
Auxiliary Feed Pump Drivers

Tennessee Valley Authority
Sequoia 1 & 2
Soddy-Daisy
TN
37379
C. C. Mason, Plant Superintendent
GS-2(N)
T-37480A,B
Auxiliary Feed Pump Drivers

Tennessee Valley Authority
Watts Bar 1 & 2
Spring City
TN
37381
W.T. Cottle, Plant Superintendent
GS-2(N)
T-38677A,B
Auxiliary Feed Pump Drivers

Texas Utilities Generating Company
Comanche Peak 1 & 2
Glen Rose
TN
76043
R. A. Jones, Manager Plant Operations
GS-2(N)
T-39622A,B
Auxiliary Feed Pump Drivers

Toledo Edison Company
Davis Besse 1
Oak Harbor
Ohio
43449
Terry D. Murray, Plant Superintendent
GS-2(N)
T-37686A,B
Auxiliary Feed Pump Drivers

Union Electric Company
Callaway 1
Fulton
MO
65251
W. H. Weber, Plant Manager
GS-2(N)
T-40176A
Auxiliary Feed Pump Driver

Virginia Electric & Power Company
Surry 1 & 2
Surry
VA
23883
J. L. Wilson, Station Manager
GS-2(N)
36318, 36319, 36320, 36321
Containment Spray Pump Driver

Virginia Electric and Power Company
North Anna 3 & 4
Mineral
VA
23117
W. R. Cartwright, Station Manager
GS-2(N)
T-38;32A,B
Auxiliary Feed Pump Drivers

Washington Public Power Supply System
WPPSS 1 & 4
Richland
WA
99352
D. W. Mazur, Station Manager
GS-2(N)
T-40349A,B
Auxiliary Feed Pump Drivers

Washington Public Power Supply System
WPPSS 3
Satsop
WA
98583
Plant Manager
GS-2(N)
T-40809A,B
Auxiliary Feed Pump Driver

Washington Public Power Supply System
WPPSS 5
Satsop
WA
98583
Plant Manager
GS-2(N)
T-40809C,D
Auxiliary Feed Pump Drivers