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Power

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1973 PLANT DESIGN ISSUE

Southern Methodist University

**Energy Conservation
Awards**

**Annual Plant
Design Report**

**Equipment and
Design Aids Roundup**

PROJECT	COMPANY	PLANT NAME	LOCATION	CONSULTING ENGINEER	Unit number	Unit capacity, MW	Year of first commercial operation	Steam flow, 1000 lb/hr	Superheater outlet pressure, psi	BOX LEADS
1	Pennsylvania Power Co ⁷⁴	Mansfield	Shippingport, PA	Commonwealth Associates Inc	2	900 ²	76	6415	3785	
2	New England Power Co	North Shore		Stone & Webster Engrg Corp	1	385 ²	78	6300	2806	
3	Georgia Power Co	Wansley	Carrollton, GA	Southern Services Inc	1	380 ²	76	6467	3625	
4	Niagara Mohawk Power Corp	Oswego	Oswego, NY	Stone & Webster Engineering Corp	6	850 ²	76	6300	2400	
5	Detroit Edison Co	Greenwood	Avoca, MI	Bectel Corp	1	800 ²	76	5500	2613	
6	Detroit Edison Co	Monroe	Monroe, MI	Self	3	750 ²	73	5718	3800	
7	Nebraska Public Power District	Gentleman	Vic of Sutherland, NE	Stearns-Roger Corp	1	650 ²	77	4700	2620	
8	Baltimore Gas & Electric Co	Brandon Shores	Anne Arundel Cnty, MD	Gibbs & Hill Inc	1	800 ³⁴	77	4425	2620	
9	Central Illinois Public Service	Newton	Newton, IL	Sargent & Lundy	1	900 ²	77	4159	2620	
10	Dallas Power & Light Co	Monticello	Titus Cnty, TX	Ebasco Services Inc	2	575 ²	75	4025	3825	
11	Oklahoma Gas & Electric Co	Muskogee	Muskogee, OK	Burns & Roe Inc	4	550 ²	77	3824	2620	
12	Indianapolis Power & Light Co	Petersburg	Petersburg, IN	Gibbs & Hill Inc	3	532 ²	77	4150	2620	
13	Iowa Public Service Co ⁷²	Neal	Sioux City, IA	Ebasco Services Inc	3	520 ²	76	3805	2620	
14	Hydro-Electric Power Commn of Ontario	Lennox	Kingston, Ont., Canada	Self	2	513 ²	75	3600	2500	
15	Commonwealth Edison Co	Collins	Grundy County, IL	Sargent & Lundy	3	500 ³⁴	76	4000	2410	
16	Mississippi Power Co	Jackson	Escatawpa, MS	Southern Services Inc	1	500 ²	76	3611	2500	
17	Hydro-Electric Power Commn of Ontario	Nanticoke	Port Dover, Ont., Canada	Self	3	500 ²	73	3600	2450	
18	Puerto Rico Water Resources Auth	Aguirre	Guayama, PR	United Engineers & Constructors Inc	2	450 ²	75	3170	2400	
19	Puerto Rico Water Resources Auth	South Coast	Guayama, PR	United Engineers & Constructors Inc	6	450 ²	73	2970	2400	
20	Texas Electric Service Co	Handley	Fort Worth, TX	Gibbs & Hill Inc	4	430 ³⁴	75	3200	2044	
21	Louisville Gas & Electric Co	Mill Creek	Kosmosdale, KY	Pioneer Service & Engineering Co	3	425 ²	77	3132	2600	
22	Philadelphia Electric Co	Eddystone	Eddystone, PA	United Engineers & Constructors Inc	4	400 ³⁴	75	2850	1980	
23	Montana Power Co ¹	Colstrip	Colstrip, MT	Bectel Corp	2	350 ²	76	2520	2537	
24	San Diego Gas & Electric Co	Encina	Carlsbad, CA	Pioneer Service & Engineering Co	5	299 ²	75	2350	1890	
25	Arizona Public Service Co	Cholla	Joseph City, AZ	Ebasco Services Inc	2	250 ²	76	2015	1990	
26	Central Power & Light Co	Laredo	Laredo, TX	Sargent & Lundy	3	105 ²	75	830	2225	
COMBINED CYCLE INSTALLATIONS										
27	Vermont Electric Power Co Inc	NAV	NAV	NAV	1	260 ⁷⁷	77	441 ⁷⁶	1242	
28	El Paso Electric Co	Newman	Newman, TX	Stone & Webster Engineering Corp	4	240 ⁷⁷	75	420 ⁷⁶	1156	
29	Southern California Edison Co	Huntington Beach	Huntington Beach, CA	Not yet selected	6, 7, 8	236 ^{77, 82}	77, 81	390 ⁷⁶	1200	
30	Ohio Edison Co	West Loran	Loran, OH	Commonwealth Associates Inc	1	228 ⁷⁹	74, 94	390 ⁷⁶	1250	
31	Louisiana Power & Light Co	Sterlington	Sterlington, LA	Brown & Root Inc	7	200 ⁷⁹	74	394 ⁷⁶	1320	
MUNICIPAL AND COOPERATIVE INSTALLATIONS										
32	Colorado Ute Electric Assn Inc ¹	Hayden	Hayden, CO	Stearns-Roger Corp	2	350 ²	76	1754	1885	
33	Gariand Light & Power Co	Olinger	Copeville, TX	Robert & Gee	3	146 ²	75	1115	1563	
34	Capin Electric Power Coop Inc	Big Capin	New Roads, LA	Burns & McDonnell Engrg Co	1, 2	115 ²	72	800	1885	
35	Dover Munic Power Plant	McKee Run	Dover, DE	Laramore, Douglass & Popham	3	110 ²	74	786	1890	
36	Gainesville Utilities Dept	Oerhaven	Gainesville, FL	Ebaugh & Goethe Inc	1	81 ²	72	860	1260	
37	Cedar Falls Municipal Utilities	Streeter	Cedar Falls, IA	Pfeifer & Shultz Inc	7	40 ²	73	350	1360	
38	Pella Municipal Power & Light Dept	Municipal	Pella, IA	Brown Engineering Co	6	27 ²	72	271	890	
39	Natchitoches Municipal Electric Light & Water Dept		Natchitoches, LA	Beard Engineering Inc	10	26 ²	72	253	893	

MANUFACTURERS

AC - Allis-Chalmers Manufacturing Co
 ACP - Allis-Chalmers Power Systems Inc
 AHE - Abbott Heat Exchanger Inc
 APC - Air Preheater Co Inc
 AS - American Standard Inc
 BB - Brown Boveri Corp
 BJ - Byron Jackson Pump Div, Borg-Warner Corp
 BLH - Baldwin-Hamilton Co
 BM - Bailey Meter Co
 BPC - Bingham Pump Co
 BRP - Bruce Peebles & Co Ltd
 BW - Babcock & Wilcox Co
 BWL - Babcock & Wilcox Ltd
 CAP - C A Parsons Ltd
 CE - Combustion Engineering Inc
 CES - Combustion Engineering Superheater Co Ltd
 CF - Clarage Fan Co
 CHM - Chicago Heater Co
 CIR - Canadian Ingersoll-Rand Co Inc
 COC - Cochran Div, Crane Co
 CV - Copes Vulcan Inc
 DL - DeLaval Turbine Inc
 DP - Diamond Power Specialty Corp
 EL - Ecdyne Ltd
 EM - Electric Machinery Manufacturing Co
 F - Foxboro Co
 FIS - Fischer & Porter Co
 FO - Forney Engineering Co
 FW - Foster Wheeler Corp
 GDI - Gulf Degreasing Inc
 GE - General Electric Co
 GF - Green Fuel Economizer Co
 GW - Graver Water Conditioning Co
 HAP - James Howden & Parsons of Canada Ltd
 HCC - Computer & Instrumentation Div,

HIT - Westinghouse Electric Corp
 HITL - Hitachi Ltd
 HOW - Howell Instruments Inc
 IBM - International Business Machines Corp
 IN - Inflico Products Co
 IPE - Industrial Process Engineers Inc
 IR - Ingersoll-Rand Co
 IW - Illinois Water Treatment Co
 KKK - Kuhnle, Koop & Kausch AG
 LAW - LA/Water Treatment Div, Chromalloy American Co
 LN - Leeds & Northrup Co
 MLW - MLW Worthington Ltd
 MR - Milton Roy Co
 MS - Maryland Shipbuilding & Drydock Co
 NOV - Novenco Inc
 PM - Permutit Co
 PP - Pacific Pumps Div, Dresser Industries Inc
 RA - Raymond Div, Combustion Engineering Inc
 RE - Reliance Electric & Engineering Co
 RS - Riley Stoker Corp
 SIE - Siemens AG
 STW - Struthers-Wells Corp
 SW - Sturtevant Div, Westinghouse Electric Corp
 SWE - Southwestern Engineering Co
 VOM - Varian Data Machines Inc
 WE - Westinghouse Electric Corp
 WES - Westronics Inc
 WO - Worthington Corp
 YU - Yuba Heat Transfer Corp
 ZU - Erie City Energy Div, Zurn Industries Inc

SYMBOLS

Ad - Admiralty brass

Adl - Admiralty, inhibited
 AIB - Aluminum brass
 ANC - Analog computer
 Art - Attenuator
 BA - Bladed airfoil
 Bal - Balanced
 BC - Backward-curved blades
 BD - Balanced draft
 C - Coal, bituminous
 Cr - Circular
 Cr - Crude oil
 Cla - Clarification
 CuN - Coppernickel
 D - Damper
 DB - Dry bottom
 De - Demineralization
 DIC - Digital computer
 Dis - Distillate oil
 Eva - Evaporation
 Fe - Full control
 FI - Flare type
 FIE - Flash evaporation
 Fs - Fuel in storage
 Fub - Fuel at burner
 Ful - Fuel-oil line
 G - Gas
 GR - Flue-gas recirculation
 HF - Horizontal flare burner
 HI - Horizontal inter-vane burner
 Hyb - Hybrid
 Hyc - Hydraulic coupling
 J - Steam jet ejector
 L - Lignite
 M - Motor
 MAN - Monitoring and analysis
 MAP - Monitoring, analysis and partial control

MC - Magnetic compass
 MgO - Magnesium oxide
 Mon - Monitoring unit
 N - None
 NAV - Not available
 Pdx - Powdered material
 Prd - Pressurized
 Reg - Regulator
 Ro - Rotary pump
 RO - Reverse osmosis
 RP - Recirculating pump
 RSD - Residual oil
 S - Speed control
 SF - Separator
 So - Softener
 SST - Stainless steel
 St - Slag tap
 ST - Steam
 T - Turbine
 TB - Tilting mechanism
 V - Vane control

FOOTNOTES

- 1 - Jointly owned with Agricultural Insurance
- 2 - Base load
- 3 - One fan rated 200,000 lb/hr
- 4 - One fan rated 200,000 lb/hr
- 5 - 1.3-million lb/hr
- 6 - Total dynamic head
- 7 - Semi-outdoor unit
- 8 - Outdoor unit
- 9 - Tandem-compressor cylinder

BOILERS										FURNACE										FORCED DRAFT FANS										PROJECT										
Surface 1000 sq ft										Burners										Pulverizers											Drive									
Boiler and materials	Superheaters	Reheaters	Economizers	Air heaters	Pressure, in H ₂ O	Volume 1000 cu ft	Combustion rate 1000 Btu/cu ft	Type	Number per boiler	Type	Manufacturer	Number per boiler	Capacity of each, tons/hr	Manufacturer	Number per boiler	Capacity of each 1000 cfm	Wheel type	Flow control	Manufacturer	Type	Number per boiler	Hp of each	Manufacturer	Type	Number per boiler	Hp of each	Manufacturer	Type	Number per boiler		Hp of each	Manufacturer								
111	156	194	238	1022	-0.1	174	10.2	BD	32	HI	FW	8	55	FW	2	1250	BA	V	SW	M	2	7000	WE	1																
49	52	167	208	496	-0.1	412	20.4	BD	32	HI	FW	8	55	FW	2	1000	BA	V	SW	M	2	5000	HIT	2																
NAV	92	110	515	396	-0.1	603	15.7	Pid	32	TB	CE	7	72	RA	2	1200	BA	V	SD	SW	T	2	10,000	GE	3															
47	136	166	206	620	-0.1	464	19.6	BD	32	HI	FW	8	55	FW	2	866	BC	V	APC	M	2	8000	NAV	4																
38	143	163	276	789	-0.1	360	NAV	BD	32	HI	FW	8	55	FW	2	895	BC	V	AS	M	2	5200	NAV	5																
39	226	206	282	1815	-0.1	459	15	BD	28	PC	BW	7	50	BW	2	1062	BA	V	GF	M	2	2500	AC	6																
47	124	123	191	1227	NAV	548	13.2	BD DB	32	HI	FW	8	NAV	NAV	2	641	BA	D	NAV	V	2	3000	GE	7																
36	197	180	103	441	0.5	485	12.6	BD	40	CW	BW	N			3	588	BA	V	NAV	M	3	3000	NAV	8																
97	92	52	366	378	-0.1	517	10.6	BD DB	24	TS	CE	6	56	RA	2	607	BA	V	SW	M	2	2500	WE	9																
NAV	116	135	65	695	-0.15	512	11.1	BD DB	64	TS	CE	8	72	RA	2	455	BA	V	SW	M	2	1250	WE	10																
74	124	64	173	476	NAV	433	11.7	BD ST	24	TB	CE	6	NAV	RA	2	NAV	NAV	V	NAV	M	2	NAV	NAV	11																
113	113	51	392	570	-0.15	517	10.7	BD DB	24	TB	CE	6	56	RA	2	615	BC	V	NAV	M	2	NAV	NAV	12																
76	76	119	183	755	0	334	15	SD DB	24	H	FW	6	48	FW	2	575	BA	V	AS	M	2	3500	GE	13																
30	160	77	138	402	-0.15	157	30.7	BD	32	TB	CE	N			2	534	BA	V	NOV	M	2	2300	NAV	14																
26	72	110	96	456	-0.1	264	25	BD	24	CW	BW	N			2	652	BA	V	SW	M	2	3000	NAV	15																
NAV	75	106	205	462	26	370	12.1	Pid	16	TB	CE	N			2	447	BA	V	SW	M	2	4655	WE	16																
51	122	126	151	464	0.1	257	19.9	BD DB	40	CW	BW	5		BWL	2	528	NAV	V	HAP	M	2	1450	SIE	17																
32	100	166	86	369	-0.15	240	17.4	BD DB	16	TS	CE	N			2	559	NAV	V	SW	M	2	1750	AC	18																
32	115	151	100	369	-0.15	240	16.5	BD DB	16	TS	CE	N			2	559	NAV	V	SW	M	2	1750	AC	19																
16	31	21	189	N	15.6	144	29.1	Pid	20	HI	FW	N			2	729	BC	V	SW	M	2	6000	AC	20																
35	172	74	110	387	-0.1	338	14.4	BD DB	40	CW	BW	4	65	BW	2	638	BA	V	NAV	M	2	1750	NAV	21																
43	43	22	238	1016	NAV	159	26.5	BD DB	16	TS	CE	N			2	476	BA	V	SW	M	2	2000	WE	22																
45	48	29	142	250	-0.1	236	14.3	BD DB	20	TB	CE	5	53	RA	2	626	BA	V	D	SW	M	2	2500	WE	23															
17	58	24	81	219	25	108	NAV	Pid	24	CW	BW	N			2	462	BA	V	NAV	M	2	NAV	NAV	24																
22	85	29	126	165	0.1	229	12.6	BD	24	TB	CE	5	48.3	RA	2	350	NAV	V	NAV	M	2	1935	NAV	25																
16	28	12	19	62	23	46	NAV	Pid	6		BW	N			1	159	BA	V	SW	M	1	2500	WE	26																
174	66	N	268	N	NAV	NAV	NAV	Pid	NAV	NAV	NAV	N			N																									
174	67	N	252	N	NAV	NAV	NAV	Pid	NAV	NAV	NAV	N			N																									
174	67	N	252	N	NAV	NAV	NAV	Pid	NAV	NAV	NAV	N			N																									
139	41	N	252	N	10.5	NAV	NAV	Pid	24		GE	N			N																									
139	41	N	256	N	NAV	NAV	NAV	Pid	1		CDE	N			N																									
31	65	24	145	229	36	177	14	BD	20	TB	CE	5	39	RA	2	113	BA	V	SW	M	2	2000	WE	32																
26	11	34	129	36	48.5	21.6		Pid	9	CW	BW	N			1	373	NAV	V	SW	M	1	2500	AC	33																
25	10	25	111	16	30	34		Pid	8	FI	RS	N			2	141		V	CF	M	2	1000	AC	34																
17	6	23	122	0.25	26	39.6		BD	8	HF	RS	N			2	122	BA	V	D	SW	M	2	500	WE	35															
11	21	N	7	98	-0.1	36	28	BD	5		FO	N			2	555		MC	EM	M	2	400	WE	36																
16	16	N	N	41	-0.2	17.7	22	BD	4	CW	BW	2	14	BW	1	126	BA	D	CF	M	1	300	WE	37																
26	6	N	18	N	-0.2			BD DB	4			N			1	63	BA	C	ZU	M	1	75	WE	38																
16	4	N	N	43	10	5	36.5	Pid	4	CW	BW	N			1	70	BA	V	WE	M	1																			

- removal section

3.5 in. Ho abs, inlet steam conditions are 2400/1005/1005 and valves are wide open

Steam generator unless

34 Two turbine-driven and one motor-driven units

35 Turbine-driven pump capacity, motor-driven pump rated 3300 gpm

indoor units unless

36 Primary steam source for the condensing turbine is the p/p crossover, secondary source, main steam

oil, 139,000 Btu/lb

37 Primary steam source for the condensing turbine is extraction steam, secondary source, main steam

oil, 18,400 Btu/lb

with an automated system

oil, 18,400 Btu/lb

most water induction

oil, 18,400 Btu/lb

38 Cycling unit

39 Dual-pressure condenser

40 Primary steam source for the condensing turbine is the crossover, secondary source, main steam

oil, 18,400 Btu/lb

41 Two trains of two 1-p heaters each, one train of two 1-p heaters

42 Boiler is designed for 100% capacity when firing oil or coal, or oil and coal

43 pH control with hydrazine

44 Distillate oil, 18,500 Btu/lb, natural gas, 1040 Btu/cu ft

45 Oil firing 9790 Btu/kWh gas firing 10,123

46 Two half capacity turbine-driven pumps, plus one motor-driven startup pump. Data presented are for the turbine-driven units

47 Radiant section has 49,700 sq ft convection section, 72,906

48 Primary section has 120,800 sq ft, secondary section, 1,106,400

49 Primary steam source for the condensing turbine is main-unit 1-p extraction, secondary source, main steam

50 Approximate

51 Single-cylinder unit

52 Coal, 8700 Btu/lb, gas, 1000 Btu/cu ft
- 53 - 3% on a 10,000-Btu/lb basis

54 - One main and one startup pump. Data presented in tabulation are for the main unit. Startup pump is rated 1700 gpm at 2960 psig and has a 4000-hp motor drive

55 - Net rating

56 - Part of the main-unit control system

57 - pH control with cyclohexylamine

58 - Oil ranges from 18,300 to 19,500 Btu/lb, gas, 1000 Btu/cu ft

59 - Oil firing, 9677 Btu/kWh (net), gas, 10,086

60 - Unit also has a motor-driven boiler feedpump for startup service

61 - Oil, 19,500 Btu/lb, gas, 1000 Btu/cu ft

62 - Turbine-driven pumps, 2.1 million lb/hr, motor-driven pump, 1.05 million

63 - One 1-p heater train, two 1-p trains

64 - Copper/nickel impingement tubes

65 - Coal is transported via five unit trains, comprised of a total of 22 locomotives and 600 pondola cars

66 - Jointly owned with Texas Electric Service Co and Texas Power & Light Co

67 - Water spray in emergency

68 - Steam-coil air heater

69 - Primary steam source for the condensing turbine is extraction steam, secondary source, auxiliary boiler

70 - Data are for the main feedpump. Standby pump, manufactured by DL, is rated 4500 gpm. It is driven by a 10,000-hp motor

71 - Steam source for the condensing turbine is the boiler reheater

72 - Jointly owned with Iowa Power & Light Co, Iowa Southern Utilities Co and Iowa-Illinois Gas & Electric Co

73 - Control firing rate
- 74 - Acting on its own behalf and as agent for Cleveland Electric Illuminating Co, Duquesne Light Co, Ohio Edison Co, Toledo Edison Co and Pennsylvania Power Co

75 - Two h-p heater trains, three 1-p trains

76 - Data are for each of two boilers

77 - Steam turbine generates 107 MW of this total, remainder is generated by two WE Model 501 gas turbines. For data on these units, turn to the gas-turbine survey

78 - Higher heating value

79 - Steam turbine generates 100 MW of this total, remainder is generated by two GE MS-7001 gas turbines. For data on these units, turn to the gas-turbine survey

80 - Oil, 18,500 Btu/lb, gas, 1005 Btu/cu ft

81 - Gas turbines will be installed by the end of 1975

82 - Rating of each unit

83 - One full-size pump for normal operation, one pump for hot standby application

84 - Gas turbines will be installed this year

85 - Data are for each of two condensers

86 - Oil, 18,500 Btu/lb (LHV), gas 1000 Btu/cu ft

87 - Boiler data reflect the total output of two steam generators

88 - Data are for one boiler. No data were given for the companion unit, which is not a duplicate

89 - Coal, 9200 Btu/lb, oil, 19,000

90 - Gross rating

91 - Data are for the main feedpump. There also are two 35%-capacity pumps, each with 5300-hp motor drives manufactured by SIE

92 - Axial flow fan

93 - Variable-pitch fan blades



BOILER FEED PUMPS										FEEDWATER HEATERS										FUEL AND EXHAUST										PROJECT	
Number per boiler	Capacity of each pump	Discharge pressure, psig	Manufacturer	Flow control	Type	Hgt. of each	Manufacturer	Number of heater trains	Number of closed heaters per train	Final feedwater temp. F	Manufacturer	Type	Caloric value, 1000 Btu/cu ft	Design heat rate Btu/kWh	Maximum sulfur content, %	Combustion additive	Additive introduction	Working fluid	Sootblower												
																			Manufacturer												
1	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	1											
2	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	2											
3	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	3											
4	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	4											
5	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	5											
6	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	6											
7	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	7											
8	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	8											
9	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	9											
10	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	10											
11	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	11											
12	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	12											
13	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	13											
14	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	14											
15	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	15											
16	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	16											
17	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	17											
18	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	18											
19	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	19											
20	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	20											
21	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	21											
22	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	22											
23	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	23											
24	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	24											
25	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	25											
26	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	26											
27	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	27											
28	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	28											
29	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	29											
30	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	30											
31	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	31											
32	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	32											
33	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	33											
34	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	34											
35	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	35											
36	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	36											
37	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	37											
38	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	38											
39	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	39											
40	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	40											
41	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	41											
42	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	42											
43	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	43											
44	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	44											
45	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	45											
46	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	46											
47	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	47											
48	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	48											
49	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	49											
50	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	50											
51	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	51											
52	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	52											
53	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	53											
54	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	54											
55	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	55											
56	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	56											
57	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	57											
58	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	58											
59	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	59											
60	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	60											
61	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	61											
62	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	62											
63	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	63											
64	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	64											
65	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	65											
66	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	66											
67	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	67											
68	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	68											
69	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	69											
70	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	70											
71	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	71											
72	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	72											
73	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	73											
74	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	74											
75	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	75											
76	7900	4550	NA	S	T	27,500	DL	2	3/4	546	YU	C	11.9	8400	4.3	N		Air	CV	76											

PROJECT	COMPANY	EQUIPMENT LOCATION	Manufacturer	Model	Units ordered	6/1/72 5/31/73	Primary application	Black plant installation?	Method of remote operation	RATING AND CONDITIONS									
										Normal power, MW	Normal power, 1000 hp	Standard elevation ft	Ambient temp, F	Maximum power, MW	Maximum power, 1000 hp	Ambient temp for max power at std elevation F	Normal starting	Fast startup	Emergency backup
1	Jacksonville Electric Authority	Jacksonville, FL	WE	W 501	2	32	PP	No	Sov	28	0	59	37	59	30	20	18		
2	The Swedish State Power Board	Trollhattan, Sweden	STA	GT 120 C	2		PP	Yes	Sov	63.5	0	59	70	41	10	5			
3	Philadelpha Electric Co.	Crofton Station	GE	MS 7001	310		PP	No	Dw	57.4	0	59	52.8	59	50				
4	Southern California Edison Co.	Long Beach, CA	TD	GT 55	7		31/PP	No	Dw	55	1000	30	32	30	20				
5	Long Island Lighting Co.		TP	TP 42 LF	530		PP	Yes	Sov	52.2	0	59	59.5	30	9	33			
6	Long Island Lighting Co.		TP	TP 42 (C1) LF	529		PP	Yes	Sov	50.5	90	59	57.1	30	3	33			
7	Israel Electric Corp Ltd.		TP	TP 42 (A11) LF	4		PP	Yes	Sov	41.8	1000	80	44.9	30	3	33			
8	The Swedish State Power Board	Vallingby, Sweden	STA	PPD 4	2		PP	Yes	Sov	25	0	59	40	59	2.5				
9	Cleveland Electric Illuminating Co.	Cleveland, OH	NE	W 251	1231		PP	Yes	Sov	33	0	59	28	59	20	10	5		
10	Glendale Public Service Dept.	Glendale, CA	CW	MOD POD 30	230		PP	Yes	Dw	30	0	59	32.3	59	4	3	2		
11	New Ulm Public Utilities Comm.	New Ulm, MN	TP	FT 40 1LF	138		PP	Yes	Dw	25.4	834	30	29.6	30	8	33			
12	Imperial Irrigation District	Coachella, CA	GE	MS 5001	313		PP	Yes	Sov	24.2	0	59	25.1	59	10	5			
13	CAGAFE		TP	MT 1A 110F	2		PP	Yes	N	20.4	1000	30	21.7	30	3	33			
14	Barbados Light & Power Co Ltd.	Barbados, West Indies	CW	MOD POD 20	1		PP	Yes	Dw	19.7	0	59	22.8	59	4	3	2		
15	Arabian American Oil Co.		GE	MS 5002	317		Bl, MD	No	Dw	26.2	0	59		10					
16	Imatran Voima Oy	Lovisa, Finland	STA	PPA	2		PP	Yes	Sov	17.5	0	59	20	59	2.0				
17	Union Carbide Corp		GE	MS 500114	1		Bl	No	N	25	0	59		10					
18	Brown & Root Inc.		TP	FT 4A 3LF	2		25	No	N	19.8	0	90							
19	Union Gas of Canada Ltd.		CBC	Coberra 182	14		Gh	No	Sov	18.2	0	59							
20	States of Guernsey Electricity Board	Guernsey, Channel Is, UK	STA	GT 35 B	1		PP	Yes	Dw	11.2	0	59	13	53	3	4			
21	Alberta Gas Trunk Line Co Ltd.	MacLeod, Alta, Canada	CBC	Coberra 154	12		Gh	No	Sov	15.4	0	59							
22	Humble Oil & Refining Co.	Jav Field, FL	GE	MS 3002	212		MD	No	Sov	13.1	0	59							
23	Creole Petroleum Corp.	Lake Maracaibo, Venezuela	CBC	Coberra 125	39		Gh	No	Sov	12.5	1000	30							
24	Phillips Petroleum Co.	North Sea	GE	MS 1002	1		MD	No	N	5.0	0	59							
25	Mene Grande Oil Co.	Maracaibo, Venezuela	IR	GT 40	921		Gh	Yes	Sov	4.0	0	59	5.5	60	4	4	4		
26	Pacific Telephone & Telegraph Co.	Santa Clara, CA	ALN	S01 K1519	418		SP	Yes	Dw	2.5	0	50	3	90	1	1	1		
27	Alberta Govt Telephone Comm.	Calgary, Alta, Canada	SO	GSE 3000	242		SP	Yes	Dw	2.5	0	59							
28	Shell Oil Co.	Qatar	SO	MD 3000	137		MD	Yes	Dw	3.5	0	53							
29	Soviet Union Ministry of Gas		SO	CS 3000	3845		Gh	Yes	Dw	3.5	0	53							
30	ELF Gabon	Offshore Gabon	SO	GSC 3000	214		TE	Yes		2.3	0	59							
31	P.N.P. Sriwijaya		NAT	Viking CGG	213		91	Yes	Dw	1	1.8	59							
32	Bankers Trust Co.	New York, NY	SO	GSE 1000	641		SP	Yes	Dw	0.9	0	30							
33	Mid-America Pipeline Co.		SO	MD 1200	949		PD	Yes	Sov	1.2	0	59							
34	Petroleos Mexicanos		SO	CS 1200	1247		Gh	Yes	Dw	1.2	0	59							
35	Hudson & Bay Oil & Gas Co Ltd.		SO	GSC 1000	240		Bl	Yes	Dw	0.8	0	30							
36	American Telephone & Telegraph Co.	Kansas City, MO	SO	KS 1000	643		SP	Yes	Dw	0.8	0	30							

MANUFACTURERS (Domestic)

ALN	Detroit Diesel Allison Div.
GE	General Motors Corp.
CBC	Cooper-Bessemer Co.
CW	Curtiss-Wright Corp. Power Systems
GE	General Electric Co.
IR	Ingersoll Rand Co.
NAT	North American Turbine Corp.
PW	Pratt & Whitney Aircraft Div.
RR	Rolls Royce (1971) Ltd.
SO	Solar Div. International Harvester Co.
STA	Stat Laval Turbin AB
TD	Turbodyne Corp.
TP	Turbo Power & Marine Systems Inc.
WE	Westinghouse Electric Corp.

SYMBOLS

Ac	Annular combustor
Bc	Bearing cap
Bt	Base load
BpT	Blade path temperature
CaC	Canannular combustor
Cmb	Combination, combined cycle
CrD	Crude oil
Cv	Compressor bleed valves
DF	Dual fuel
DiO	Distillate oil
Dw	Direct wire
E	Electronic
EH	Electrohydraulic
EM	Electromagnetic
EP	Electropneumatic
G	Natural gas
Gh	Gas handling
HvD	Hybrid (relav-solid state)
ISI	Inlet silencer
Int	Integrated
Mag	Magnetic pickup

MD	Mechanical drive
N	None
NAP	Not applicable
OC	Open cycle
PD	Pump drive
PP	Peaking power and standby
ReC	Recovery cycle with exhaust to boiler
Rel	Relative motion between bearing cap and shaft
Rv	Relay
Sep	Separate
Sk	Stack (manifold)
Sol	Solid state
SP	Standby power only
SPt	Speed/time
Sov	Supervisory (telemetry)
Ta	Turbine exhaust
TE	Turbine inlet
Ts	True shaft
VeC	Vertical combustor
Vig	Variable inlet guide vanes

FOOTNOTES (Domestic)

- Also exhaust silencer and soundproof building
- Variations of this machine ordered as compressor drives by Trans-Canada Pipe Lines Ltd. various locations in Ont., Canada (3 units) and Shell International Petroleum Co. Ltd. North Sea (2). One machine also ordered as a hot gas generator (no driven equipment) by El Paso Natural Gas Co., Odessa TX
- Undisclosed location in Ont., Canada
- Variations of this machine ordered as compressor drives by Trans-Canada Pipe Line Ltd. undisclosed location in Ont., Canada (1 unit) and undisclosed location in Sask., Canada (1)
- Variations of this machine ordered as compressor drives by an undisclosed company

in the United Kingdom (4 units) and an undisclosed company in West Germany (2)

- High pressure/low pressure
- Two free turbines per unit
- One double flow unit
- Also exhaust silencer
- Variations of this machine ordered as generator drives by Public Service Electric & Gas Co., Bayonne, NJ (1 unit), Florida Power & Light Co., Ft. Myers, FL (12), Houston Lighting & Power Co., Wharton Station (2), Nevada Power Co., Clark Station (1), Tucson Gas & Electric Co., undisclosed location (1); Salt River Project Agricultural Improvement & Power Dist., undisclosed location (4); Public Service Electric & Gas Co., Bayonne Station (3); Public Service Co. of Colorado, undisclosed location (1); Southern California Edison Co., undisclosed location (15); Arizona Public Service Co., Yucca, AZ (1); Jacksonville Electric Auth., Northside Station (4); Portland General Electric Co., undisclosed location (6); Arkansas-Missouri Power Co., Blytheville, AR (3); Union Electric Co., undisclosed location (2)
- Exhaust is used to heat combustion air
- Variations of this machine ordered as mechanical drives by Dubai Petroleum Co., undisclosed location (5 units); Tennessee Gas Pipeline Co., Leeville, LA (1); Phillips Petroleum Co., North Sea (9); Exxon Australia Ltd., Sale, Australia (2); Midwestern Gas Transmission Co., Bicknell, IN (1); Columbia LNG Corp and Consolidated System LNG Co., Cove Point, MD (3)
- Variations of this machine ordered as generator drives by Comision Federal de Electricidad, undisclosed location in Mexico (4 units); Companhia Portuguesa de Electricidade, undisclosed location in Portugal (2); Delmarva Power & Light Co., Christence Station (2); CA Energie de Barausmeto, undisclosed location in Venezuela (1); Upper Peninsula Power Co., Houghton, MI (1). Undisclosed

- This machine varies in a few respects from the units described in the entry above despite having the same model number. An air-extraction plant in an undisclosed location
- Variations of this machine ordered as compressor drives by Arabian American Oil Co., undisclosed locations in Saudi Arabia (3 units); Phillips Petroleum Co., undisclosed location (1); BP Oil Corp., Prudhoe Bay, Alaska (2)
- Three additional machines sold to Telephone & Telegraph Co. as generator drives for service in Oakland, San Francisco and Fresno, CA (1 each location)
- ALN offers five versions of its S01 K5, K13 and K16A burn natural gas, K16A burn liquid fuel. K5 and K13 in performance, have base-load ratings of 4000 shaft hp under the following

ENGINEERING INFORMATION FOR THE DESIGN OF GAS TURBINE GENERATORS

GAS GENERATOR				FREE TURBINE		COMBUSTORS		FUEL		INSTRUMENTATION AND CONTROL														PROJECT
Manufacturer	Number of shafts per generator	Number of compressor stages	Number of turbine stages	Turbine speed, rpm	Number of shafts	Number of turbines	Number of stages per turbine	Type	Type	Switch fuel automatically under load?	Type of soundproofing	Speed of driven equipment, rpm	Type of control system logic/analog	Method of measuring turbine speed	Location of cycle temperature monitor	Stripout power control?	Method of controlling turbine surge	Method of controlling turbine acceleration	Method of measuring turbine vibration	Exhaust temperature control?	Turbine and generator controls			
WE	1	12	4	3600	N	N	16	Ac	DF	Yes	IS-1	3600	Sol/EH	E	Te Sk	Yes	Cv	SpT	Bc	Yes	Itg	1		
STA	2	12	4	3600/3600	N	N	16	VeC	DxO	Yes	IS-1	3000	Sol/EH	E	Ti	Yes	Cv	SpT	Bc	No	Itg	2		
GE	1	12	4	3600	N	N	10	CaC	DxO CrO	Yes	IS-1	3600	Sol/EH	E	Te	Yes	Vig	BoT, SpT	Rel	Yes	Itc	3		
TO	1	12	4	3600	N	N	10	VeC	DxO	Yes	IS-1	3600	Hyb/EH	E	Ti	Yes	Cv	SpT	Rel	Yes	Itg	4		
PN	2	12	4	4490-6535	N	N	8	CaC	DxO	No	IS-1	3600	Hyb/EH	E	Ti	Yes	Cv	SpT	Rel	Yes	Itg	5		
PN	2	12	4	3600-6465	N	N	8	CaC	DxO	No	IS-1	3600	Hyb/EH	No	Ti	Yes	Cv	SpT	Rel	Yes	Itg	6		
PN	2	12	4	3940-6620	N	N	8	CaC	DxO	No	IS-1	3000	Sol/EH	E	Ti	Yes	Cv	SpT	Bc	Yes	Itg	7		
PN	2	12	4	3000-6000	N	N	8	CaC	DxO	No	IS-1	3000	Sol/EH	E	Te	Yes	Cv	SpT	Bc	No	Itg	8		
WE	1	12	4	4490	N	N	8	Ac	DF	Yes	IS-1	3600	Sol/EP	E	Te Sk	Yes	Cv	SpT	Rel	Yes	Itg	9		
PN	2	12	4	3500-6600	N	N	8	CaC	DF	Yes	IS-1	3600	Hyb/EH	E	Te	No	Cv	SpT	Bc	Yes	Itg	10		
PN	2	12	4	3475-6545	N	N	8	CaC	DxO	No	IS-1	3600	Hyb/EH	E	Ti	Yes	Cv	SpT	Bc	Yes	Itg	11		
GE	1	12	4	5100	N	N	10	CaC	DxO, G	Yes	IS-1	3600	Sol/EH	Mag	Sk	Yes	Cv	SpT	Bc	Yes	Itg	12		
PN	2	12	4	3445-6625	N	N	8	CaC	DxO, G	Yes	IS-1	3600	Hyb/EH	E	Ti	Yes	Cv	SpT	Bc	Yes	Itg	13		
RR	2	12	4	3100-6370	N	N	8	Ac	DxO	No	IS-1	3000	Fy/EH	E	Te	No	Cv	SpT	Bc	Yes	Itg	14		
GE	1	15	4	5100	N	N	12	CaC	DF	No	IS-1	4000	Sol/EH	EM	Sk	Yes	Cv	SpT	Bc	Yes	NAP	15		
PN	2	12	4	3000-6000	N	N	8	CaC	DxO	No	IS-1	3000	Sol/EH	E	Te	Yes	Cv	SpT	Bc	No	Itg	16		
GE	1	12	4	4460	N	N	10	CaC	DxO, G	Yes	IS-1	4800	Sol/EH	E	Sk	Yes	N	SpT	Bc	Yes	Itg	17		
PN	2	12	4	3450-6550	N	N	8	CaC	DxO, G	No	IS-1	3500	Hyb/EH	E	Te	Yes	Cv	SpT	Bc	Yes	Itg	18		
RR	2	12	4	3500	N	N	8	CaC	G	No	IS-1	5200	Hyb/EH	Mag	Te	Yes	Cv	SpT	Bc	Yes	Itg	19		
STA	2	10-10	4	7000-5700	N	N	8	CaC	DxO	No	IS-1	3000	Sol/EH	E	Te	Yes	Cv	SpT	Bc	No	Itg	20		
RR	1	12	4	7500	N	N	8	CaC	G	No	IS-1	5000	Hyb/EP	Mag	Te	Yes	Cv	SpT	Bc	Yes	Itg	21		
GE	1	15	4	6900	N	N	10	CaC	G	No	IS-1	6500	Sol/EH	EM	Sk	Yes	N	SpT	Bc	Yes	NAP	22		
RR	1	15	4	7500	N	N	8	CaC	G	No	IS-1	5000	Hyb/EP	Mag	Te	Yes	Cv	SpT	Bc	Yes	Itg	23		
GE	1	15	4	11,140	N	N	10	CaC	G	No	IS-1	10,290	Sol/EH	EM	Sk	Yes	Cv	SpT	Bc	Yes	Itg	24		
ALN	1	14	4	13,800	N	N	6	CaC	G	NAP	IS-1	13,800	Sol/EP	EM	Ti	Yes	Cv	SpT	Rel	Yes	NAP	25		
ALN	1	14	4	13,800	N	N	6	CaC	DxO	No	IS-1	1200	Rv/EI	Mag	Ti	No	Cv	SpT	Rel	No	Sep	26		
SD	1	11	3	14,300	N	N	1	Ac	DF	No	IS-1	1800	Hyb/...	Mag	Ti, Sk	Yes	Vig	SpT	Ts	Yes	Itg	27		
SD	1	11	3	14,300	N	N	1	Ac	G	No	IS-1	6000	Hyb/...	Mag	Ti, Sk	Yes	Vig	SpT	Ts	Yes	NAP	28		
SD	1	11	3	14,300	N	N	1	Ac	G	No	N	1800	Hyb/...	Mag	Ti, Sk	Yes	Vig	SpT	Ts	Yes	N	29		
SD	1	11	3	14,300	N	N	1	Ac	G	No	N	1800	Hyb/...	Mag	Ti, Sk	Yes	Vig	SpT	Ts	Yes	Itg	30		
EV	1	6	3	17,100	N	N	1	VeC	G	No	IS-1	1500	Rv/EH	N	EM	No	Cv	SpT	Bc	Yes	Sep	31		
EV	1	6	3	22,300	N	N	1	Ac	DxO	No	IS-1	1800	Rv/E	Mag	Sk	No	Cv	SpT	...	Yes	Itg	32		
EV	1	6	3	22,300	N	N	1	Ac	G	No	IS-1	6000	Hyb/...	Mag	Sk	Yes	Cv	SpT	...	Yes	Itg	33		
EV	1	6	3	22,300	N	N	1	Ac	G	No	IS-1	22,300	Hyb/...	Mag	Sk	Yes	Cv	SpT	...	Yes	Itg	34		
EV	1	6	3	22,300	N	N	1	Ac	G	No	IS-1	1800	Hyb/...	Mag	Sk	Yes	Cv	SpT	...	Yes	Itg	35		
EV	1	6	3	22,300	N	N	1	Ac	DxO	No	IS-1	1200	Rv/E	...	Sk	No	Cv	SpT	...	Yes	Itg	36		

...ent temperature, sea-level elevation
...turbine inlet temperature and 13,820
...speed K13 and K15, also similar
...ence, have air-cooled first stage
...anes to permit higher gas
...at the turbine inlet. Hence,
...increased about 15% over the K5 and
...K15A is comparable in performance
...except for a free turbine which
...tional speed flexibility. It is
...ertain just how many ALN gas
...s sold during the 5:1, 7:1, 5:1, 7:1
...and because of a change in market
...ALN now offers its industrial gas
...ines to qualified OEM and Detroit
...and distributor; OEM accounts
...nroll Rand Co. DeLaval Turbine
...stern Electric Co. Seven distributors
...ized to represent ALN, including
...Stevenson Services Inc (Houston, TX),
...Detroit Diesel (City of Industry, CA),
...Lane Inc (Berkeley, CA), Emerson
...Inc (Seattle, WA), Bruce GM Diesel
...Mount, NC), Onlv Williams & Lane
...Laval Turbine responded to the
...ines mailed for the 1973 survey
...sold a total of seven machines to
...Telephone & Telegraph Co. including
...in the tabulation above and in
...28), plus 12 units to the U.S. Navy
...ported the sale of three units to
...Natural Gas Co. and one to the Gulf
...of this machine ordered as generator
...Burbank Public Service Dept. Burbank
...of this machine ordered as
...drives by Gaz de France, Paris,
...nity, Alberta Gas Trunk Lines
...Canada (11), Peoples Natural
...disclosed location in Illinois
...Mountain Gas Co. Nampa, ID (11);
...Co., undisclosed location in

Texas (4), Impexmin, undisclosed location in
Rumania (5), Petroleos Mexicanos, undisclosed
location in Mexico (5)
22 - Undisclosed location in Venezuela
23 - Also soundproof building
24 - Radial case vibration
25 - Units are installed on an ocean-going barge
to drive water pumps used for hydraulic
trenching of the ocean floor
26 - Undisclosed location in Israel
27 - Two variable prediction of incipient
shaft region
28 - Variations of this machine ordered as
generator drives by San Diego Gas & Electric
Co. San Diego, CA (1 unit) and Washington
Water Power Co. Othello, WA (1)
29 - Variations of this machine ordered as
generator drives by San Diego Gas & Electric
Co. San Diego, CA (2 units) and Brownsville
Public Utilities Board, Brownsville, TX (1)
30 - Variations of this machine ordered as
generator drives by Pacific Gas & Electric
Co. San Francisco, CA (2 units) and Public
Service Electric & Gas Co. Burlington, NJ (4)
31 - Variations of this machine ordered as
generator drives by Detroit Public Lighting
Commission, Detroit, MI (1 unit), Companhia
Brasileira de Energia Electrica, undisclosed
locations in Brazil (5), undisclosed company
and location in Indonesia (1), Anchorage
Municipal Light & Power Dept., Anchorage, AK
(1), Tucson Gas & Electric Co., Tucson, AZ (2),
Pinnac Electric Power Co., Chalk Point, MD (1)
32 - Variations of this machine ordered as
generator drives by Iowa Power & Light Co.,
undisclosed location (2 units), Salt River
Project Agricultural Improvement & Power Dist.,
undisclosed location (3); Kansas Power & Light
Co. undisclosed location (1), Carolina Power
& Light Co., undisclosed locations (11),
Atlantic City Electric Co., undisclosed location
(1), Florida Power & Light Co., undisclosed
location (2), Taiwan Power Co., undisclosed

location (4), Corporacion Dominicana de
Electricidad, undisclosed location in Dominican
Republic (1); Kansas Electric Power Co. Inc.,
undisclosed locations in Japan (4); Arabian
American Oil Co., undisclosed locations in
Saudi Arabia (11)
33 - Variations of this machine ordered as
generator drives by Dubai Petroleum Co., Abu
Dubai (7 units); Phillips Petroleum Co.,
North Sea (12); Independent Indonesian
American Petroleum Co., undisclosed locations
in Indonesia (5)
34 - Undisclosed location in Indonesia
35 - Ratio of absolute compressor-discharge
pressure to absolute compressor-inlet pressure
36 - In some gas-turbine packages, turbine driving
the external load—compressor, pump or generator,
for example—is mounted on a shaft separate
from the gas generator's compressor and turbine
shaft. Typically, this machine is called the
free (or power) turbine. Packages without a
free turbine develop power to drive both the
external load and gas-generator compressor
with the turbine described under the "Gas
generator" subheadings
37 - Variations of this machine ordered as drives
for waterload pumps, crude-oil pumps or
compressors by Occidental Petroleum Corp.,
undisclosed location in Libya (2 units); Home
Oil Co. Ltd., undisclosed location in Canada
(1); Shell Oil Co., undisclosed location in
Louisiana (1); AGIP SpA, undisclosed location
in Nigeria (2); Venezuelan Sun Oil Co.,
undisclosed location in Venezuela (2);
Southern Pacific Pipe Lines Inc., undisclosed
location in California (2); Imperial Oil Ltd.,
Alberta, Canada (1); Petroleos Mexicanos,
various locations in Mexico (4); ELF Congo,
Pointe Noire, Congo (2)
38 - Variation of this machine ordered as
generator drive by Independent
Indonesian American Petroleum Co. (3 units)
39 - Undisclosed location in Canada

40 - Variations of this machine ordered as
generator drives by Communication
Satellite Corp., Andover, ME (1 unit);
U.S. Air Force, mobile units (22);
Petroleos Mexicanos, undisclosed
location in Mexico (2); Union Oil Co.,
undisclosed location (1); Undisclosed
company and location (1); Shell Oil
Co., offshore Louisiana (2); Atlantic
Richfield Co., offshore Louisiana (2);
Asiatic Petroleum Co., North Sea (4);
Pan American International Oil Co.,
undisclosed location in Iran (6)
41 - Variations of this machine ordered as
generator drives by Bell Telephone Co.
Canada, various locations in Canada (2);
General Tel Co. of Indiana Inc.,
undisclosed location (1); Los Angeles
Cnty Dept of Sanitation, Los Angeles,
CA (1); Mountain States Telephone &
Telegraph Co., various undisclosed
locations (3); Saskatchewan
Telecommunications Co., undisclosed
location in Sask., Canada (1); Port
of NY Authority, East River Tunnel (2);
Southern New England Telephone Co.,
undisclosed location (1); City of
Buffalo, Buffalo, NY (12); City of
Schenectady, Schenectady, NY (11);
City of Chicago, Chicago, IL (1);
General Telephone Co., undisclosed
location (1); Standard Oil Co.,
offshore Louisiana (1); Five
undisclosed companies (total of
7 units)
42 - Variations of this machine ordered
as generator drives by Hydro-Electric
Power Commission of Ontario,
undisclosed location in Ont., Canada
(2 units) and Los Angeles Cnty., Los
Angeles, CA (1)

(Continued on p S-12)

PROJECT	COMPANY	EQUIPMENT LOCATION	Manufacturer	Model	Units ordered 6/1/72-5/31/73	Primary application	Black plant installation?	Method of remote operation	RATING AND CONDITIONS										Minutes to normal power
									Normal power, MW	Normal power, 1000 hp	Standard elevation, ft	Ambient temp, F	Maximum power MW	Maximum power, 1000 hp	Ambient temp for max power at std elevation, F	Normal start-up	Fast start-up		
1	Interbrabant S.A.	Brussels, Belgium	ACE	W 1101	1	PP	No	Dw, Spv	89.6	0	59	96.8	59	30	20				
2	Berliner Kraft und Licht AG	Berlin, W Germany	ALS	9001 B	3	PP, TE	No	Dw	82.2	0	59	94	59	20	12				
3	JS		BBS	13	1	PP			79.4	0	60	84.4		20					
4	Kraftwerke Mainz Wiesbaden AG	Mainz, W Germany	BBS	13	135	31			71.0	0	60	77.1		18					
5	Aramco Overseas Co		MHI	MW 501 G	7	31	No	Dw	63.9	0	59	81.0	3	20					
6	Swedish State Power Board		GEG	DEA 2	4	PP	Yes	Dw, Spv	61.5	0	50	65.5	14	3					
7	Central Electricity Generating Board	Leicester, United Kingdom	GEG	EM 610 B	2	31, PP	Yes	N	51	0	59	58	59	15	9				
8	Stadtwerke Duisburg AG	Duisburg, W Germany	KWU	V 82	1	31	Yes	Dw, Spv	35.5	0	59	42.6	10	6	4				
9	SONEF	Loareno Marques, Mozambique	BBS	Type 11	133	PP	No	N	35.3	0	60	38.5		15					
10	ALUAR Aluminio Argentino SA	Puerto Madryn, Argentina	FIA	TG 20	224	31	No	N	27.3	0	59			20	10				
11		Bochum, W Germany	BBS	Type 9	1	31	Yes	N	27.0	0	60	29.2		16					
12	Dow Chemical International NV	Terneuzen, Neth	THO	PG 5341	128	31	Yes	Dw	24.5	0	59	29.4		10					
13	Instituto Costarricense de Electricidad	San Jose, Costa Rica	AKT	G 5341	2	31	Yes	Dw	24.2	0	59	26.0		59	10	6.5			
14	Iranian Electric Power Generation & Transmission Co		ALS	PG 5341	823	PP	Yes	Dw	23.8	0	59	25.6		59	3				
15	Technische Werke der Stadt Stuttgart AG	Stuttgart, W Germany	AKT	PG 5341	33	PP	Yes	Dw	23.8	0	59	25.6		59	10	6.5			
16	Iranian Electric Power Generation & Transmission Co		HIT	PG 5341	340	31	Yes	Dw	23.7	0	59	29.1		32	10	6.5			
17	CA Electricidad de Caracas	Caracas, Venezuela	BBS	Type 9	436	31	No	Dw	22.7	0	60	24.8		15					
18	General Petroleum Co		AKT	PG 5301	55	31	No	N	21.7	0	59	27.5	3	10	6.5				
19	Government of Qatar	Doha, Qatar	THO	PG 5331	1	31	Yes	Dw	21.2	0	120	29.4		10					
20	Altos Hornos de Mexico SA	Monclova, Mexico	BBS	NC 110 II	1	31	No	N	19.1	0	60			15					
21	Abu Dhabi Petroleum Co Ltd		GEG	EA 2	216	31		N	18.114	300	110	24.814	40	2					
22	Ente Nazionale per l'Energia Elettrica	Elba, Italy	FIA	TG 16	126	31	Yes	N	17.8	0	59	19.5		20	15				
23	Mobil Oil Francaise		ALS	5001 M	1	31	Yes	Dw	17	0	59	18		59	3				
24	Companhia de Electricidade de Macao	Macao	MHI	MW 191 G	3	PP	Yes	Dw	16.4	0	90	19.5		48	25	15			
25	P.N. Pupuk Sriwidjaja		HIT	PG 5251	1	31	Yes	Dw	15	0	95	19.1		50.8	10				
26		Curacao	THO	PG 5211	1	31	Yes	Dw	15	0	59	19		10					
27	Direccion de la Energia de la Provincia de Buenos Aires	Mar de Ajo, Argentina	AKT	PG 5211	1	PP	Yes	Dw	14.7	1000	80	16.7		80	13	8.5			
28	Philips Petroleum Co	North Sea	NP	M 3142	341	31			14.6	0	59								
29	Ruhrigas AG	Werne, W Germany	AKT	M 3132 R	1	31	No	Spv	13.5	0	59	15.7	0						
30	Distrigaz AG	Weelde, Belgium	THO	M 3132 R	1	31	No	Spv	13.5	0	59	16.7		10					
31			BBS	S 7	2	31	Yes	Dw		12.4	0	60			5.5				
32	China National Techno-Import Corp.		ORE	OTF 2100/4	2	31	Yes	N	9	0	59								
33	Abu Dhabi Petroleum Co		GEG	EAS 1	618	31	No	N	8.414	300	110	11.714	40	2					
34	British Petroleum Co Ltd		ORE	OTF 390	28	31	No	Spv	10.5	0	59	N							
35	British Petroleum Co Ltd	North Sea	HS	THM 1203	2	31		N	6	0	65			12	5				
36	B.P. Trading Ltd		BBS	S 1	4	31	No	Spv	5.7	0	60			4					
37	Philips Petroleum Co	North Sea	NP	M 1002	142	31			5.1	0	59								
38	AGIP SpA	Dimiti Oil Center, Libya	BBS	Type 1	2	31	Yes	N	3.7	0	60			4					
39	Productos de Vidrio SA		ORE	OTC 5	1	31	No	N	1.5	0	59			3					

(Domestic footnotes continued from p S-11)

- 43 Variations of this machine ordered as generator drives by Northwest Bell Telephone Co (4 units); Pacific Telephone & Telegraph Co (91); Southwestern Bell Telephone Co (3); Michigan Bell Telephone Co (2); Ohio Bell Telephone Co (1); Chesapeake & Potomac Telephone Co (3); Michigan Bell Telephone Co (1); South Central Bell Telephone Co (2); Southern Bell Telephone & Telegraph Co (17); Mountain States Bell Telephone Co (1); New England Telephone & Telegraph Co (3); Northwest Bell Telephone Co (1); Southeastern Bell Telephone Co (1); Wisconsin Telephone Co (1); New York Telephone Co (3); Bell Telephone Co of Pennsylvania (4); General Telephone Co of Florida (1) for various locations; variations of this machine ordered as compressor drives by Gaz de France (5 units); Texas Oil & Gas Corp. (undisclosed location in Texas (1)); Odessa Natural Gasoline Co. Eastland, TX (2); Northern Illinois Gas Co. Chicago (1); Columbia Gas Transmission Corp. (undisclosed location (1)); Standard Oil Co. Keweenaw, TX (1); Egyptian General Petroleum Corp. and Amoco International, offshore Egypt (5); East Ohio Gas Co. Robinson, OH (1); Shell Oil Co. offshore

- Louisiana (2); Trunkline Gas Co. offshore Louisiana (5); Washington Natural Gas Co. Jackson Prairie, WA (1); El Paso Natural Gas Co. various undisclosed locations (4); Colorado Interstate Gas Co. Wamsutter, WY (1); Atlantic Richfield Co. offshore Louisiana (4); East Ohio Gas Co. undisclosed location (1); Imperial Oil Ltd, Alta, Canada (1); Laclede Gas Co. undisclosed location (1); Various undisclosed locations in Mexico (48); Variations of this machine ordered as compressor drives by Continental Oil Co. offshore Louisiana (3 units); Canadian Industrial Gas & Oil Ltd. undisclosed locations in Alta, Canada (2); Texas Eastern Transmission Corp. undisclosed location in Texas (3); Gulf Oil Corp. undisclosed locations (2); Egyptian General Petroleum Corp. and Amoco International, offshore Egypt (5); Dorchester Gas Co. undisclosed location (2); Australian Oil & Gas Corp. Ltd. undisclosed location in Western Australia (2); Union Oil Co. Gulf of Mexico (2); Dubai Petroleum Co. offshore Abu Dhabi (2); Gas del Estado, undisclosed location in Argentina (2); Southern Union Production Co. undisclosed location (2); Cabinda Gulf Oil Co. undisclosed location (3); Exxon Australia, offshore Australia (1); Montana Dakota Utilities Co. undisclosed location (1); Amoco Production Co. offshore Louisiana (3); Atlantic Richfield Co. offshore Louisiana (2); Citizens Gas &

- Coke Utility, Indianapolis, IN (1); Sun Oil Co. offshore Louisiana (1); El Paso Natural Gas Co. undisclosed location (1); East Ohio Gas Co. undisclosed locations in Ohio (3); Colorado Interstate Gas Co. undisclosed location (1); Imperial Oil Ltd, Alta, Canada (2); Inland Natural Gas Co. Ltd, Alta, Canada (1); Louisville Gas & Electric Co. undisclosed location in Kentucky (2); Pioneer Natural Gas Co. Turkey, Basin, TX (1); Socal Oil & Gas Co. undisclosed location (2); Various undisclosed locations (48); Variations of this machine ordered as drives for waterflood pumps, natural gas compressors, refrigeration compressors, LNG pumps or crude oil pumps by Continental Oil Co. offshore Louisiana (1 unit) and an undisclosed location (1); Sun Oil Co. Snyder, TX (2) and an undisclosed location in Venezuela (1); Chevron Oil Co. undisclosed location (3); Metropolitan District Commn, Boston, MA (1); Imperial Oil Ltd, Alta, Canada (2); Atlantic Richfield Co. offshore Louisiana (1); Marathon Oil Co. Indian Basin, NM (1); Petroleum Mexicans, various locations in Mexico (19); Shell Oil Co. offshore Louisiana (4); Exxon Australia, offshore Australia (1); an undisclosed company in Pasadena, CA (3); an undisclosed company in the US (5); an undisclosed company in Australia (1); Amoco Production Co. various undisclosed locations in Texas

- (2); National Iranian Oil Co. location in Iran (3); Iranian Oil Services Ltd, undisclosed location in Iran (2); Peace River Oil Pipeline Ltd, Alta, Canada (1); Tenneco Minerals Ltd, Alta, Canada (1); Oil Co. Snyder, TX (1); Standard offshore Louisiana (1)

MANUFACTURERS (Foreign)

- ACE Ateliers de Constructions Elctriques de Charleroi
AKT AEG-Kanis Turbinenfabrik
ALS Societe Generale de Constructeurs Electriques et Mechaniques (ALS)
BBS Brown Boveri Sulzer Turbo
FIA Fiat SpA, Divisione Macchine
GEG GEG Gas Turbines Ltd
HIT Hitachi Ltd
HS Hispano-Suiza Div de SNECMA
KWU Kraftwerk Union AG
MHI Mitsubishi Heavy Industries
NP Nuovo Pignone SpA
ORE Orenda Ltd
RR Rolls Royce (1971) Ltd
THO NV Motorenfabriek, Thome

SYMBOLS

- Ac Annular combustor
Bc Bearing cap
Bl Base load
BoT Blade path temperature

INSTRUMENTATION AND CONTROL

1973