PLAINTIFF'S EXHIBIT
GE-127

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Power

The magazine of power generation and plant utilities engineering

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	BOILERS: Steam flow, 1000 lb/hr	BOILERS: Superheater outlet pressure, psig	BOILERS:
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	885[2]	78	6300	2606	
3	Georgia Power Co	Wansley	Carrollton, GA	Southern Services Inc	1	880[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	Bechtel 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	Gilbert Associates Inc	1	600[36]	77	4425	2620	
9	Central Illinois Public Service	Newton	Newton, IL	Sargent & Lundy	1	600[2]	77	4159	2620	
10	Dallas Power & Light Co[66]	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[36]	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	Guavama, PR	United Engineers & Constructors Inc	2	450[2]	75	3170	2400	
19	Puerto Rico Water Resources Auth	South Coast	Guavanilla, 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[36]	75	3200	2048	
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[36]	75	2850	1980	
23	Montana Power Co[1]	Colstrip	Colstrip, MT	Bechtel Corp	2	350[2]	76	2520	2597	
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	4417[6]	1242	
28	El Paso Electric Co	Newman	Newman, TX	Stone & Webster Engineering Corp	4	240[77]	75	4207[6]	1156	
29	Southern California Edison Co	Huntington Beach	Huntington Beach, CA	Not yet selected	6,7,8	237[77,82]	7781	3907[6]	1200	
30	Ohio Edison Co	West Lorain	Lorain, OH	Commonwealth Associates Inc	1	228[79]	74[84]	3907[6]	1350	
31	Louisiana Power & Light Co	Sterlington	Sterlington, LA	Brown & Root Inc	7	200[79]	74	3947[6]	1328	
MUNICIPAL AND COOPERATIVE INSTALLATIONS										
32	Colorado Ute Electric Assn Inc[1]	Hayden	Hayden, CO	Stearns-Roger Corp	2	250[2]	76	1754	1885	
33	Garland Light & Power Co	Olinger	Copeville, TX	Tippett & Gee	3	146[2]	75	1115	1963	
34	Cajun Electric Power Coop Inc	Big Cajun	New Roads, LA	Burns & McDonnell Engrg Co	1,2	115[2]	72	800	1585	
35	Dover Munic Power Plant	McKee Run	Dover, DE	Laramore, Douglass & Popham	3	110[2]	74	786	1880	
36	Gainesville Utilities Dept	Deerhaven	Gainesville, FL	Ebaugh & Goetha Inc	1	81[2]	72	860	1268	
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	....[67]	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
CHH - Chicago Heater Co
CIR - Canadian Ingersoll-Rand Co Inc
COC - Cochrane Div, Crane Co
CV - Copes Vulcan Inc
DL - DeLaval Turbine Inc
DP - Diamond Power Specialty Corp
EL - Ecodyne Ltd
EM - Electric Machinery Manufacturing Co
F - Foxboro Co
FIS - Fischer & Porter Co
FD - Forney Engineering Co
FW - Foster Wheeler Corp
GDI - Gulf Degremont 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, Westinghouse Electric Corp
HIT - Hitachi Ltd
HOW - Howell Instruments Inc
IBM - International Business Machines Corp
IN - Infilco Products Co
IPE - Industrial Process Engineers Inc
IR - Ingersoll-Rand Co
IW - Illinois Water Treatment Co
KKK - Kuhnle, Kopp & 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
VDM - 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
AlB - Aluminum brass
AnC - Analog computer
Att - Attemperator
BA - Bladed airfoil
Bal - Balanced
BC - Backward-curved blades
BD - Balanced draft
C - Coal, bituminous
Cir - Circular
Cr - Crude oil
Cla - Clarification
CuN - Copper/nickel
D - Damper
DB - Dry bottom
De - Demineralization
DiC - Digital computer
DsO - Distillate oil
Eva - Evaporation
Fc - Full control
Fl - Flare type
FlE - 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 intervane 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
MgO - Magnesium
Mon - Monitoring
N - None
NAv - Not available
Pdx - Powdered
Prd - Pressurized
Reg - Regulator
Ro - Rotary
RO - Reverse
RP - Reciprocating
RsO - Residual oil
S - Speed control
SF - Separate
So - Softener
SSt - Stainless
ST - Slag tap
St - Steam
T - Turbine
TB - Tilting
V - Vane

FOOTNOTES

1 - Jointly owned
Agricultural
2 - Base load
3 - One fan rated
4 - One fan rated
5 - 1.3-million lb/hr
6 - Total dynamic
7 - Semi-outdoor
8 - Outdoor unit
9 - Tandem-compound
cylinder

Nuclear Central Stations (Projects 65, 129 cont'd)

... its promised role in contributi

PROJECT	Fuel: Chemical form	Fuel: Physical form	Fuel: Max burnup, equilibrium cycle, MW days/metric ton	Fuel: Enrichment by zones, percent	Fuel: Avg power density, kW/kg fuel	Fuel: Avg heat flux, equilibrium cycle, 1000 Btu/hr-sq ft	Fuel: Avg clad surf temp, F	Fuel: Number per unit	Fuel: Ultimate Capacity each, MW	Turbine: Type	Turbine: Number of extractions	Turbine: Number of bleed points	Turbine: Exhaust pressure, in Hg abs	Condensers: Manufacturer	Condensers: Surface area, 1000 sq ft	Condensers: Number of water passes	Condensers: Tube material	Condensers: Manufacturer	Condensers: Air removal	Feedwater: Makeup treatment	Feedwater: Manufacturer	Feedwater: Condensate treatment	Feedwater: Manufacturer	Source	Plant design survey
														WE	592		SS	WE	Ro	Dem	ND	/			
														WE											
									1200	cr				GE	616			WE		Dem	ND	Dem	ND		
										cr				GE	600			WE	Ro	Dem	PM	Dem	LAW		
										cr				WE	510		SS	WE		Dem	CDC	Dem Am			
		Pel												GE	733		CuN			Dem	HT	Dem	WT		
		Pel												WE				R		DO	ND	DBS /			
		Pel								cr				WE	616			R	Ro	Dem	LAW	DBS Am	LAW		
		Pel								cr				GE	726			R		Dem		PH	CC		
		Pel							960	cr				WE	600		CuN	WE	Ro	Dem		Dem /			
														AC											
		Pel								cr				GE	36, 6			SWE	Ro	Dem	SWC	Hy	MR		
														AC						FE Dem					
		Pel												WE	600			R		FE Dem	ME	PID /	SWC		
		Pel								cr				WE	918			WE		FE Dem		Dem Mo	MR		
		Pel							1022					WE	918		Al	WE		FE Dem	WE	PID Cr			
		Pel								cr				GE	680					FE, Dem Ft		DBS /			
		Pel								cr				WE	720			FW		Dem So		/			
		Pel								cr				GE	600			BLH		Dem	WT	Dem	SWC		
		Pel												WE	483		CuN	MS	Ro	Dem	SWC	PID Am	CC		
		Pel							938	cr				WE	1016			WE	Ro	Dem	HT	Dem	LAW		
		Pel							861	cr				WE	640			WE		Dem	SWC	Dem /			
		Pel							880					GE	430		CuN	WE		Dem		Dem			
		Pel							860					GE	470			WE		Dem	CDC	Dem	CDC		
		Pel							860	cr				GE	381		CuN	R		Dem	CPL	PID ESd	SWC		
		Pel							865					GE	360		SS Al	FW	Ro	Dem		Dem			
		Pel							880	cr				WE	420			R	Ro	Dem	ND	M.C	ND		
		Pel							876	cr				WE	546		Al Br	WE		Dem	WT	/			
		Pel							870	cr				GE	560		SS Al	FW	Ro	Dem	SWC	PID			
		Pel							858					GE	592			FW		Dem	NC	DBS	PM		
									890	cr				WE	600		CuN	FW	Ro	Dem So	CDC	Dem Am	SWC		
		Pel							860					NE	550		CuN	WE		Dem	PM	M.C			
		Pel							845					GE	550		SS	R	Ro	Dem	LAW	Dem	SWC		
		Pel							810					GE	550		SS	R	Ro	Dem	LAW	DBS	SWC		
		Pel							830					WE	400		Al B CuN	R		FE, Dem	ND FW	/			
		Pel							800					GE	678		SS	R	Ro	Dem	PX	Dem Am	WT		
		Pel							865	cr				WE	580		CuN	R		FE, Dem Ft		Dem Cr			
		Pel							801	cr				WE	465		SS	MS		Dem	NC	Dem			
		Pel							870	cr				GE	930		Al	WE		Dem		Dem Mo	SWC		
		Pel							760	cr				WE	450		Al	WE	Ro	Dem		Dem	MR		
		Pel							760	cr				WE	584			FW		Dem So	CDC	/			
		Pel		var					815					WE	511		CuN	R		Dem Mo	CDC	Dem	LAW		
		Pel							850					GE	420		Al CuN	WC		Dem		Dem	WT		
		Pel							860					GE	441		Al CuN	R	Ro	Dem		Dem			
		Pel							865					GE	600		Al	WE		Dem		PID			
		Pel							880	cr				GE	799		Al	WC	Ro	Dem	PM	PID	SWC		
		Pel							886					WE	700		Al	FW		Dem	LAW				
		Pel							870	cr				GE	450		Al	WC		Dem	SCC	Dem	SCC		
		Pel							860					WE	745			R		Dem	WT	Dem			
		Pel							869	cr				GE	440		SS	FW		Dem		Dem			
		Pel							901					GE	715		Al	WC		Dem		Dem	SWC		
		Pel							860					GE	520		CuN	WE		Dem	PM	Dem	WT		
		Pel							860					WE	560			WE		Dem	SCC	/			
		Pel							860					WE	560			WE		Dem	WT				
		Pel							860					WE	560			WE		Dem					
		Pel							906	cr				GE	624			R		Dem	NC	DBS	PM		
		Pel							860					GE	550			R	Ro	Dem Ft	WT				
		Pel							860					WE	700			WE		FE	ME	Dem	WT		
		Pel							860					GE	550			R	Ro	Dem		Dem Am			
																				Dem Ft	CDC	Dem Am			
		Pel							860					WE	550			R		FE Dem		PID DS			
		Pel							886					GE	550			WC		Dem	SWC	DBS	ND		
		Pel							870					WE	550			WE		Dem So Ft		/			
		Pel							860					GE	550			WE		Dem	MR	DBS			
		Pel							860					GE	550			WE		Dem	WT	Dem	WT AC		
		Pel							860					WE	550			WE		Dem		Dem			

Mo — Monolithic
N — None
NaC — Natural circulation
Ocn — Ocean
Per — Pressed
Pel — Pellet through
Pel — Pellets of zircaloy or steel tubes
PPV — Prod. pressurizer per vessel
Pres — Pressurizer
PWR — Pressurized water reactor
Rec — Recycle
Reg — Regulator control
Ret — Retaining pond or lake
R — River or stream
Ro — Rotary pump or blower
S — Sieved particle
Sat — Saturation temperature
Scr — Screen
SCH — Sodium hypochlorite
Sw — Sewer outfall
Sp — Sprinkler
SCo — Semi-outdoor
SDC — Spray canal
SS — Stainless steel
Sep — Separate turbine
T — Main turbine
TC — Tandem compound
Th — Thorium
Ti — Titanium
TSE — Treated sewage effluent
U — Uranium
UH — Urea formaldehyde
UO2 — Uranium dioxide
Var — Various
V — Variable control valve or pin
Vbl — Variable
Vlv — Valve
VO — Vacuum pump
VU — Vertical U-tube
WW — Well water
Wt — Extruded evaporite

FOOTNOTES
See U.S. list for manufacturers

1 — Circulating or SS except as noted
2 — Operated by Mississippi P & L Co
3 — Jointly with Associated Elec Coop and Central Iowa Power Co
4 — Jointly with Cleveland Elec Illuminating Co, Ohio Edison Co, Toledo Edison Co, Duquesne Light Co, Pennsylvania Power & Light Co
5 — First "floating" nuclear station
6 — Jointly with Kansas G & E Co
7 — Also Sargent & Lundy, Nuclear Nuclear Projects, Inc
8 — Under reevaluation, Unit 2 delayed indefinitely
9 — Also temporarily suspended
10 — Also Gilbert Commonwealth Nuclear Projects, Inc
11 — Project status or reevaluation
12 — Replicate of Braidwood and Byron stations
13 — Unit 2 capacity 33 MW higher
14 — Jointly with Texas P & L Co and Texas Elec Service Co
15 — Jointly with San Diego Gas & Electric Co
16 — Jointly with Philadelphia Elec Co, Delmarva P & L Co, Atlantic City Elec Co
17 — Jointly with Atlantic City Elec Co
18 — Jointly with Jersey Central P & L Co, Pennsylvania Elec Co
19 — Jointly with Wisconsin Public Service Corp, Wisconsin P & L Co, Madison Gas & Electric Co
20 — Duplicate stations planned, Wood Cr and Haven, Wisconsin
21 — With Chicago Edison Co and Commonwealth Edison Co, Pennsylvania P & L Co
22 — Also Southern Co Services
23 — Jointly with Oglethorpe Power Corp, Municipal Elec Authority of Georgia, Municipal Elec Authority of Georgia
24 — Jointly with Columbus & Southern Ohio Elec Co and Dayton Pwr & Light Co
25 — Nuclear supply system furnished by ERDA

...ration's projected electrical needs

Cooling	Treatment of gases	Gas treatment mfr	Treatment of liquids	Liquids treatment mfr	Volume reduction	Manufacturer	Solidification	Manufacturer	Voltage kV	Rating each, MVA	Stator cooling	Rotor cooling	Reactor controls	Major plant controls	Core performance computer	Plant performance computer	PLANT NAME	PROJECT
																	Zion	
																	Surry	
																	Susquehanna	
													GE	BW		H	River Bend	
																	Oconee	
						AMF							BW	BW	BW	BW	Rancho Seco	
													BW	BW	BW SEL	BW SEL	Arkansas Nuclear One	
													BW	BW	BW	BW CE	North Anna	
													BW	BW	BW	BW CE	Three Mile Island	
													BW	BW	BW	BW	Davis Besse	
													WE	WE	WE	WE	Harris	
													WE	WE	WE	WE	Summer	
													WE	WE	WE		Koshkonong ?	
													WE	WE	WE	WE	North Anna	
													WE		WE	WE	Indian Point	
															WE	WE	Indian Point	
													BW	BW	BW	BW F	Surry	
													WE	WE	WE	WE	Beaver Valley	
													BW	BW	GE	GE	Oconee	
						AMF							CE	FS	WE	WE SEL	Calvert Cliffs	
														BW	BW SEL	BW SEL	Arkansas Nuclear One	
																	Fermi	
																	Millstone	
																	Fitzpatrick	
																	Brunswick	
																	Hatch	
																	Shoreham	
																	St Lucie	
																	Hatch	
																	Midland	
																	Crystal River	
																	Zimmer	
																	Quad Cities	
																	Dresden	
																	Maine Yankee	
																	Three Mile Island	
													WE	WE	WE	WE	Surry	
													GE	BW	GE	GE	Cooper	
													BW	GE	GE	DE	NRE	
													WE	WE	WE	WE	Robinson	
													WE				Turkey Pt	
																	Fansades	
																	Pilgrim	
																	Millstone	
																	Barrie	
																	Monticello	
													WE	F	BW	WE	Newaukee	
															TRW	TRW	Oyster Creek	
																	Prairie Island	
																	Arnold	
																	Vermont Yankee	
																	Nine Mile Point	
																	Point Beach	
																	Ginna	
																	Hadaam Neck	
																	Midland	
																	Ft Calhoun	
																	Bar Crinte	
																	Zion Fuel Breeder	
																	Ft St Vrain	
																	Indian Point	
																	Oconee	
																	Farley	
																	Millstone	
																	Fitzpatrick	
																	Brunswick	
																	Hatch	
																	Shoreham	
																	St Lucie	
																	Hatch	
																	Midland	
																	Crystal River	
																	Zimmer	
																	Quad Cities	
																	Dresden	
																	Maine Yankee	
																	Three Mile Island	
																	Surry	
																	Cooper	
																	NRE	
																	Robinson	
																	Turkey Pt	
																	Fansades	
																	Pilgrim	
																	Millstone	
																	Barrie	
																	Monticello	
																	Newaukee	
																	Oyster Creek	
																	Prairie Island	
																	Arnold	
																	Vermont Yankee	
																	Nine Mile Point	
																	Point Beach	
																	Ginna	
																	Hadaam Neck	
																	Midland	
																	Ft Calhoun	
																	Bar Crinte	
																	Zion Fuel Breeder	
																	Ft St Vrain	
																	Indian Point	
																	Oconee	
																	Farley	
																	Millstone	
																	Fitzpatrick	
																	Brunswick	
																	Hatch	
																	Shoreham	
																	St Lucie	
																	Hatch	
																	Midland	
																	Crystal River	
																	Zimmer	
																	Quad Cities	
																	Dresden	
																	Maine Yankee	
																	Three Mile Island	
																	Surry	100
																	Cooper	101
																	NRE	102
																	Robinson	103
																	Turkey Pt	104
																	Fansades	105
																	Pilgrim	106
																	Millstone	107
																	Barrie	108
																	Monticello	109
																	Newaukee	110
																	Oyster Creek	111
																	Prairie Island	112
																	Arnold	113
																	Vermont Yankee	114
																	Nine Mile Point	115
																	Point Beach	116
																	Ginna	117
																	Hadaam Neck	118
																	Midland	119
																	Ft Calhoun	120
																	Bar Crinte	121
																	Zion Fuel Breeder	122
																	Ft St Vrain	123
																	Indian Point	124
																	Oconee	125
																	Farley	126
																	Millstone	127
																	Fitzpatrick	128
																	Brunswick	129
																	Hatch	130
																	Shoreham	131
																	St Lucie	132
																	Hatch	133
																	Midland	134
																	Crystal River	135
																	Zimmer	136
																	Quad Cities	137
																	Dresden	138
																	Maine Yankee	139
																	Three Mile Island	140

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Capability of largest single-

PROJECT	COMPANY	EQUIPMENT LOCATION	Manufacturer	Model	Units ordered 6/1/75 5/31/76	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	Minutes to reach normal power: Normal startup	Minutes to reach normal power: Fast startup	Minutes to reach normal power: Emergency startup	Gas temp at turbine inlet, F	Pressure ratio
1	[illegible] Saudi Arabian Chemical	Ras Tanura, Saudi Arabia	BBC	Type 13	[illegible]	GI	No	N	38		0	85	125			25				12
2	Petrobras	Brazil	BBC	Type 13	[illegible]	GI			[illegible]		0	60	80.7			18		11	1770	9.6
3	Pan American Power Co	Mount Clemens	GE	MS 5001	[illegible]	GI	No	Dw	[illegible]		0	59								
4	[illegible] Electric Co	Wilmington	GE	MS 7001	[illegible]	GI	No		[illegible]		0	59	64.6		59	20		10		9.5
5	Pacific Gas & Electric Co	Oakland, Calif.	GE	PG 6541 (SB)	[illegible]	GI	Yes		38.5		0	59	53		59	5	3.3			
6	[illegible] Petroleum Co	[illegible], Saudi Arabia	BBC	Type 13	[illegible]	GI	No	Dw	39.5		0	60	45.5			16		9	1580	7.5
7	[illegible] Petroleum	Medina, Saudi Arabia	BBC	Type 9	[illegible]	GI	Yes	Dw	30.9		0	60	33.4			22		13	1750	8.6
8	[illegible] Petroleum	Hutchinson, Kans.	DW	WGT-800-25	3	GI	Yes	N	[illegible]		0	59	27.6		59	9	4	5	1402	10
9	[illegible] Electric Co	Jacksonville, Fla.	GE	MS 5001-P	[illegible]	GI	Yes	Stv	[illegible]		0	90	25.6		59	10		6		8
10	[illegible] Kuwait	Kuwait	GE	MS 6001-A	3+	GI	No	N		25.0	0	59				10				6.7
11	[illegible] Mexicana de Electricidad	Durango, Mexico	GE	MS 6001-B	[illegible]	GI	No	N		25	0	59		32	59	10				7.6
12	[illegible] Petroleum Co	El Aguila, La	GE	MS 5001-P	[illegible]	GI	No	N		25	0	59				10				
13	[illegible] Electric Service Co	Wichita	BBC	Type 13	[illegible]	GI	No	Stv		38.8	1,500	40		16.6	-26	10		8	795	8.5
14	[illegible] Petroleos de Venezuela	Maracaibo, Venezuela	BBC	[illegible]	[illegible]	GI	No	[illegible]	30.6		0	90				16.6			1695	7.5
15	[illegible] Oil Services Co	Ingalls, Miss.	BBC	[illegible]	[illegible]	GI	No	N		32.5	0	60				16.6			1170	7.5
16	Pacific Alaska Inc	Kenai, Alaska	GE	MS-3002	[illegible]	GI		N		12.9	0	59		13.7	59	10				7.1
17	[illegible] Petroleum Co	Abu Rudeis, Egypt	BBC	[illegible]	[illegible]	GI	No	N	36.6		0	90				12		11	1610	6.5
18	[illegible]	El Burma, Algeria	BBC	[illegible]	[illegible]	GI	No	N		33.6	0	90				12		8	1075	6.5
19	[illegible] Electric Co	Ada, Okla.	A	[illegible]	[illegible]	GI	No	Stv		43.0	0	59				[illegible]			1600	8.5
20	Bank of America	Dominguez, Calif.	ALCO	[illegible]	[illegible]	GI			31.0		0	59	36.5			[illegible]	0.8		1600	10
21	Copper Valley Electric Co	Valdez, Alaska	GE	GSE 4000	[illegible]	GI	Yes	Dw Stv	[illegible]		0	59				2			1730	9
22	[illegible]	W Germany	AV	Sucer TF 40	[illegible]	GI	Yes	Dw	[illegible]		0	59	34		59	[illegible]	0.8	0.5		8.4
23	[illegible] Services Co	Iran	GE	DST 4000	33*	GI	Yes	Dw Stv		38.8	0	59				[illegible]			1600	8
24	Gas & Fuel Co	Australia	GE	DSS 4000	[illegible]	GI	No	Dw Stv		38.8	0	59				[illegible]			1600	8
25	[illegible] Services Co	Marion, Iran	GE	MEG 4000	[illegible]	GI	Yes	Dw		38.8	0	59				[illegible]			1145	8
26	Shingara Pipeline Co	Offshore Louisiana	GE	GSS-3000R	2	GI	No	Dw Stv		27.7	0	59				30		1	1600	8
27	American Telephone & Telegraph Co	Piscataway, NJ	NAT	Waukesha	[illegible]	GI	Yes	Dw	28		0	59	32		25	[illegible]			1560	6.3
28	[illegible] Services Co	Iran	GE	DSG 4000	[illegible]	GI	[illegible]	Dw Stv	27		0	59				2			1600	9
29	[illegible]	[illegible]	AV	Sucer TF 35	[illegible]	GI	Yes	Dw		36	0	59		4.1	59	[illegible]	0.8	0.5		7.6
30	Gulf of Saudi Arabia	Dhahran Airport, Saudi Arabia	AV	Sucer TF 25	[illegible]	GI	Yes	Dw	19		0	59	22		59	[illegible]	0.8	0.5		6.5
31	[illegible] Petroleum Co	Fateh Field, Dubai	NAT	Waukesha	[illegible]	GI		Dw		[illegible]	0	59		2.2	48	0.8			1500	3.9
32	American Exploration	Port Lyautey, Morocco	NAT	Waukesha	[illegible]	GI	Yes	Dw	14		0	59	16		48	[illegible]			1500	3.9
33	American International Oil Co	Offshore Trinidad	GE	DS 3200	[illegible]	GI	No	Dw Stv		12.0	0	59				[illegible]			1450	6.5
34	Alberta Gas Trunkline Company	Edmonton Alta. Canada	GE	GSE 1000	[illegible]	GI	Yes	Dw Stv	0.9		120	59				[illegible]			1150	6.5
35	Northwestern Bell Telephone Co	Bismarck, ND	GE	MS 1000	[illegible]	GI	Yes	Dw Stv	0.9		0	59				[illegible]			1150	6.5
36	Alaska Gas Co	Nome, Alaska	GE	GSC 1200	2*	GI	Yes	Dw Stv	0.8		0	59				[illegible]			1150	6.5
37	American Production Co	Cook Platform, Alaska	GE	MDG-1200	[illegible]	MD	No	Dw Stv		1.1	0	59				[illegible]			1150	6.2

MANUFACTURERS

ALCO - General Motors Corp., Detroit Diesel Allison Div.
AV - Avco Corp., Lycoming Div.
BBC - Brown Boveri & Co., Switzerland
CEC - Cooper Industries, Inc., Cooper Energy Services (formerly, Cooper-Bessemer Co.)
DW - Dresser Worthington, Power Systems
GE - General Electric Co.
MS - MAN-Ghh
P - Pratt & Whitney Aircraft Co.
RR - Rolls-Royce (1971) Ltd.
SLZ - Sulzer Brothers Ltd., Switzerland
SOL - International Harvester Co., Solar Div.
TO - Turbodyne Corp., Gas Turbine Div.
UTC - United Technologies, Inc., Power Systems Div. (formerly, United Power & Marine Systems, Inc.)
WE - Westinghouse Electric Corp.

SYMBOLS

AC - Axial-flow compressor
BC - Centrifugal
BH - Base, hot
BOT - Blade-path temperature
CAN - Canann-type combustor
CMB - Combination type of simple and combined cycle
DW - Double shaft
EV - Compressor bleed valves
FP - Full-power shaft
FWC - Free-power
HP - Electronic
HYD - Hydromechanical
MV - Inlet guide vanes
NG - Natural Gas
OC - Once-through

HP - Hydraulic pneumatic
SI - Inlet silencer
INT - Integrated
Mag - Magnetic pickup
MD - Mechanical drive
N - None
NAD - Not-load cable
OSC - Open cycle
PD - Pump drive
PGS - Process gas
PP - Peaking power
RC - Radial case
RHO - Recovery cycle with exhaust to boiler
REH - Reheat unit or between bearing load and shaft
RGC - Regenerative cycle
RV - Relay
SEP - Separate
SG - Surge
SM - Stack, manifold
SST - Solid state
STP - Standby power only
SYN - Synchronizer
TEL - Telemetering
TH - Turbine exhaust
TE - Thermal energy
TI - Turbine inlet
TS - Tube shaft
WC - Vertical combustor
VG - Variable inlet guide vanes

FOOTNOTES

[illegible] - [illegible] ordered
[illegible] - [illegible] similar sets
[illegible] - Dresser-Clark, Williams & Carter, Inc.
[illegible] - Iranian Electric Power Generation & Transmission Co.
[illegible] - Pertamina Eksploitasi Sekayu, Mark 4B
[illegible] - [illegible] similar machine ordered as generator drive
[illegible] - by Empire District Electric Co., Joplin, Mo. (1 unit); [illegible] installation; [illegible] and [illegible] ordered
[illegible] - Manufactured by BBC, location in Mannheim, Germany

9 - Similar machines ordered as generator drives by National Electricity Admin., Khor Al Zubair, Iraq (4 units)
10 - At shaft
11 - Approximate number
12 - Also exhaust silencer
13 - Similar machine ordered as generator drive by Missouri Basin Municipal Power Agency, Watertown, SD (1 unit)
14 - Inductor alternator frequency measurement
15 - Similar machines ordered as generator drives by Saudi National Co., Jiddah, Saudi Arabia (4 units); Kansas City Board of Public Utilities, Quindaro, Kans. (1); Missouri Southern Services, Inc., undisclosed locations (1); Golden Valley Electric Assn., Inc., North Pole, Alaska (1); Tri-State Generation & Transmission Assn., Inc., Burlington, Colo. (2); Kansas City Power & Light Co., Kansas City, Mo. (2)
16 - Base-load rating for site conditions
17 - Peak rating
18 - High pressure-low pressure
19 - Also solid state
20 - Pulse counter with digital conversion
21 - Power turbine inlet
22 - Two variable prediction of impinent stall region
23 - Similar machines ordered as generator drives by Glendale Public Service Dept., Glendale, Calif. (3 units); Union Electric Co., undisclosed locations (12); Comision Federal de Electricidad, undisclosed locations in Mexico (8); Dubai Electricity Co., Dubai (Trucial States) (4); Empresa Electrica del Ecuador, Inc. (EMELEC), undisclosed location in Ecuador (1); Instituto Nacional de Electrificacion (INDE), undisclosed locations in Guatemala (2)
24 - Similar machines ordered as generator drives by Ciba-Geigy SA, Wormley, Switzerland (2 units); Saudi National Electric Co., Tarif (2) and Wecaa (2), Saudi Arabia; Societe Mixte Algerienne de Gaz SOMIGAZ, undisclosed location in Algeria (4)
25 - Similar machines ordered as generator drives by CADAFE, undisclosed location in Venezuela (2 units); CA Energia Electrica de Venezuela (CAEE), Urdaneta, Venezuela (2); Bacia Indonesia Utama PT, Jakarata, Indonesia (3); Black Hills Power & Light Co., Rapid City, SD (2); Northwestern Public Service Co., Aberdeen, SD (1); Caltex Petroleum Corp., Minas, Sumatra, Indonesia (1); Fayetteville Public Works Comm., Fayetteville, NC (2); Govt. of Saudi Arabia,

shaft machines up slightly; unit sales off

PROJECT	GAS GENERATOR: Type of cycle	Number per unit	Manufacturer	Number of shafts per gas generator	Number of compressor stages	Number of turbine stages	Turbine speed, rpm	FREE TURBINE: Number of shafts	Number of rotors	Number of stages per rotor	Number	COMBUSTORS: Type	FUEL: Type	Switch fuel auto matically under load?	Type of soundproofing	Speed of driven equipment, rpm	INSTRUMENTATION AND CONTROL: Type of control system, logic, analog	Method of monitoring turbine speed	Location of cycle temperature monitor	Setpoint power control?	Method of controlling turbine surge	Method of controlling turbine acceleration	Method of measuring turbine vibration	Exhaust temperature control?	Turbine and generator controls

IN-PLANT GENERATION

Many industrial companies are interested in producing their own electricity, but the high rate of return they typically require for ancillary investments militates against the installation of in-plant generation facilities. Also, the generally negative attitude of electric utilities toward industrial generation, together with a legal and regulatory environment that is not conducive to either industry or utility ownership of in-plant generators, increases industry's unwillingness to produce its own power. These are some of the conclusions of a recent study on in-plant generating facilities in the chemical, petroleum-refining, and pulp-and-paper industries, by Thermo Electron Corp, Boston, Mass, for the Federal Energy Administration.

The reluctance of industry to buy steam turbine/generators is evidenced by the limited number of domestic orders placed with manufacturers during 1974 and 1975 (table).

A major objective of the Thermo Electron study was to determine what effect in-plant generation has on national goals in the areas of energy conservation and of decreased dependence on foreign oil. Results indicate that, by 1985, steam-turbine topping cycles, using coal as the primary fuel, can economically supply nearly 70% of the electricity needed by the three industries studied, with attendant fuel savings of about 500,000 bbl/day of oil equivalent. Today, these industries produce about 30% of the power they require.

Reason for the huge savings: Industrial power plants are about twice as efficient as utility central stations, because much of the heat in their turbine exhaust steam is captured by a process stream, and is not discharged to the environment. Even greater fuel savings can be achieved by gas-turbine and diesel topping cycles, because these facilities generate more electricity (at a lower heat rate than utilities) per pound of steam produced. However, they must burn premium fuels.

To accelerate the expansion of in-plant generating facilities, Thermo Electron recommends a program of federally guaranteed loans, for up to 50% of the necessary investment, at current market interest rates. Smaller incentives are suggested for utilities, to encourage them to invest in industrial plants.

PROJECT	PLANT OWNER	LOCATION	Type of industry	STEAM TURBINE: Number of units	Manufacturer	Year of initial operation	Capacity, kW	Speed, rpm	Throttle pressure, psig	Throttle temperature F	Extraction points	Extraction pressure, psig	Extraction and exhaust steam use	Unit type	Back pressure, in Hg abs (condensing), psia (noncondensing)	GENERATOR: Manufacturer	Coolant	Main steam conditions
	Union Camp Corp	Franklin, Va	Pa	1	GE	77	42,500	3600	650	825	3	150	Pr,FWH	Ncn	15	GE	H2	
	Great Lakes Paper Co	Thunder Bay, Ont, Can	Pa	1	STA	76	38,000	3600	825	900	1	60	Pr	Ncn	15	ASE	Air	
	Town of Braintree	Braintree, Mass	Dev	1	GE	76	23,539	3600	600	825	2			Con	1.5	GM	Air	
	Chesapeake Corp of Virginia	West Point, Va	Pa	1	GE	77	15,300	3600	1,200	900	2	150	Pr,FWH	Ncn	15	GE	Air	
	Alyeska Pipeline Service Co	Valdez, Alaska	Pet	1	GE	76	12,500	3600	600	750	2			Con	1	GM	Air	
	Honokaa Sugar Co	Pauuau, Hawaii	Sug	1	NAv	NAv	10,200	3600	325	675	1			Con	2	NAv	NAv	
	Sugar Cane Growers Coop	Belle Glade, Fla	Sug	1	GE	76	7,500	5000	250	345	2			Ncn	3.0	GE	Air	
	Exxon Co, USA	Hawkins Field, Tex	Pet	2	GE	76	7,500	5000	600	900	2			Ncn	3.0	GE	Air	
	Imperial Sugar Co	Gramercy, La	Sug	1	GE	76	6,800	4,500	250	415	2			Ncn	3.0	GE	Air	
	Standard Oil of California	El Segundo, Calif	Pet	1	GE	76	6,875	6700	45	733	2			Con	1	GM	Air	
	Rhode Island Hospital	Providence, RI	hs	1	GE	76	1,750	6300	225	495	1			Ncn	4.0	GM	Air	
	Rhode Island Hospital	Providence, RI	hs	1	GE	76	1,750	6300	225	495	1	12	SH	Con	4.0	GM	Air	
	[illegible]	[illegible], NY	hs	1	GE	76	1,750	4,800	185	470	1			Ncn	4.0	GE	Air	
	Dartmouth Mines Ltd	Elmhurst, Ont, Canada	Min	1	GE	76	1,600	3,445	250	590	1			Ncn	3.0	GE	Air	
	Kamyr Inc	Glens Falls, NY	Che	1	GE	NAv	1,500	6400	600	750	1			Ncn	3.0	GM	Air	
	Atlantic Sugar Assn	Belle Glade, Fla	Sug	1	GE	75	1,500	4985	230	500	1			Ncn	3.5	GE	Air	
	[illegible]	New York, NY	hs	1	GE	75	1,250	5000	185	540	2			Ncn	3.0	GM	Air	
	[illegible]	Orange, New, Tex	Pet	1	GE	75	1,000	5,600	600	900	1			Ncn	3.0	GM	Air	
	[illegible]	Panama, Pan	uPr	1	GE	75	1,000	6000	600	750	1			Ncn	3.0	GM	Air	
	[illegible]	Orangeburg, SC	hs	1	GE	NAv	1,000	6000	125	367	1			Ncn	3.0	GM	Air	
	[illegible]	Belle Glade, Fla	Min	1	GE	NAv	700	5600	225	575	1			Ncn	4.0	GE	Air	
	[illegible]	Penn Yan, NY	Che	1	GE	NAv	700	6400	125	364	1			Ncn	3.0	GE	Air	
	[illegible]	Pascagoula, Miss	Sug	1	GE	76	650	6500	125	364	1			Ncn	3.0	GM	Air	
	Texas State Hospital	Rosebud, Mass	hs	1	GE	76	600	6000	600	750	1			Ncn	3.0	GM	Air	
	[illegible]	Dona Ana, NM	Che	1	GE	76	550	5000	600	750	1			Ncn	3.0	GM	Air	
	Union Texas Co	Dance Bayou, Tex	Che	1	GE	NAv	450	6400	600	750	1			Ncn	3.0	GE	Air	
	Monsanto Co	Texas City, Tex	Che	1	GE	NAv	450	6400	600	750	1			Ncn	3.0	GE	Air	
	[illegible]	[illegible], Utah	Pet	1	GE	76	400	6500	600	750	1			Ncn	3.0	GE	Air	
	[illegible]	Dona Ana, NM	NAv	1	GE	NAv	[illegible]	NAv	600	750	1			Ncn	3.0	GE	Air	
	[illegible]	Belvidere, NJ	Pet	1	GE	NAv	[illegible]	NAv	600	750	1			Ncn	3.0	GE	NAv	
	[illegible]	[illegible]	Pet	1	GE	NAv	[illegible]	NAv	600	750	1			Ncn	3.0	GE	Air	
	[illegible]	[illegible]	Pet	1	GE	NAv	[illegible]	NAv	600	750	1			Ncn	3.0	GE	NAv	
	[illegible]	[illegible]	Pet	1	GE	NAv	[illegible]	NAv	600	750	1			Ncn	3.0	GE	Air	
	[illegible]	[illegible]	Pet	1	GE	NAv	[illegible]	NAv	600	750	1			Ncn	3.0	GE	NAv	

MANUFACTURERS

- ASE — [illegible]
- [illegible] — [illegible]
- [illegible]
- GM — Electro-Motive Manufacturing Co
- GE — General Electric Co
- [illegible] — [illegible] & Manufacturing Co
- [illegible] — [illegible] Co
- [illegible] — [illegible] Electric Products Div
- STA — Stal-Laval Turbin AB
- [illegible] — [illegible] Corp
- [illegible] — Terry Corp
- [illegible] — Penn Co, Murray Div

SYMBOLS

- Che — Chemical
- [illegible] — Engineering
- FWH — Feedwater heating
- Gov — Government
- GPr — Gas processing
- hs — Institution
- Min — Mining
- Ncn — None
- NAv — Not available
- Ncn — Noncondensing
- Pa — Pulp and paper
- Pet — Petroleum
- Sat — Saturated
- SH — Superheat
- Sug — Sugar

FOOTNOTES

- And 600 psig at 750 F
- At 20 F