PLAINTIFF'S EXHIBIT

WH-1068

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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

Utility fluidized-bed steam generating plants

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: Combustion modes
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	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[38]	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 Comm 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[38]	76	4000	2410	
16	Mississippi Power Co	Jackson	Escatawpa, MS	Southern Services Inc	1	500[2]	76	3611	2500	
17	Hydro-Electric Power Comm 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	Guayanilla, 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[38]	75	3200	2040	
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[38]	75	2850	1980	
23	Montana Power Co	*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	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	235[77,82]	7781	390[76]	1200	
30	Ohio Edison Co	West Lorain	Lorain, OH	Commonwealth Associates Inc	1	228[79]	7484	390[76]	1350	
31	Louisiana Power & Light Co	Sterlington	Sterlington, LA	Brown & Root Inc	7	200[79]	74	394[76]	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	1985	
35	Dover Munic Power Plant	McKee Run	Dover, DE	Laramore, Douglass & Popham	3	110[2]	74	786	1888	
36	Gainesville Utilities Dept	Deerhaven	*Gainesville, FL*	*Ebaugh & Goethe Inc*	1	81[2]	72	860	1268	
37	Cedar Falls Municipal Utilities	Streeter	Cedar Falls, IA	Pfeifer & Shultz Inc	7	40[2]	73	350	1368	
38	Pella Municipal Power & Light Dept	Municipal	Pella, IA	Brown Engineering Co	6	27[2]	72	[57]	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
FO - 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 co
MgO - Magnesium
Mon - Monitoring
N - None
NAv - Not available
Pdx - Powdered
Prd - Pressurized
Reg - Regulator
Ro - Rotary pump
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 control

FOOTNOTES

1 - Jointly owned with Agricultural
2 - Base load
3 - One fan rated
4 - One fan rated
5 - 1.0-million lb/hr
6 - Total dynamic
7 - Semi-outdoor
8 - Outdoor unit
9 - Tandem-compound cylinder

Nuclear Central Stations (Projects 65, 249 cont'd)

... its promised role in contributi...

PROJECT	Fuel: Chemical form	Fuel: Physical form	Fuel: Mat'l through 1 equilibrium cycle / MW days per metric ton	Fuel: Enrichment by zones, percent	Fuel: Avg power density, kW/kg fuel	Fuel: Avg heat transmitted (1 cycle) 1000 Btu/sq ft	Fuel: Avg clad surface temp F	Turbine: Number per unit	Turbine: Ultimate Capacity each, MW	Turbine: Type	Turbine: Number of exhausts	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	Cooling: Source	Cooling: Flow, M gpm
														WE											
														WE											
									1,000	Cr				GE											
									1,000	Cr				GE											
									1,000	Cr				WE											
		Pel												GE	715					Dem	HT	Dem	WT		
		Pel							340					WE						Dem	IND	Dem	IND		
		Pel												WE					Ro	Dem	DAW	DBO Am	DAW		
		Pel												WE	456					Dem		BD	DC		
		Pel							360	Cr			1.83 4.05	WE	650					Dem		Dem V			
		Pel												GE	2616					Dem	GWC	—	MR		
		Pel												AC						Fl Dem		V			
		Pel												WE	600					FE Dem	ME	FeD V	GWC		
		Pel							1,068	Cr				WE	1018			WE		FE Dem		Dem Mo	MR		
		Pel							1,068					WE	1018			WE		FE Dem	WE	FeD Cl			
		Pel												GE	680					FE Dem Ft		DBO V			
		Pel												WE	720			FW		Dem So		V			
		Pel												GE	440			BLH		Dem	WT	Dem	GWC		
		Pel												WE	433			WE	Ro	Dem	GWC	FeD Am	DC		
		Pel							938	Cr			1.5	WE	1016			WE	Ro	Dem	HT	Dem	DAW		
		Pel												WE	940			WE		Dem	GWC	Dem V			
		Pel							980					GE	1430			WE		Dem		Dem			
		Pel							1,000					GE	1500			WE		Dem	CDC	Dem	CDC		
		Pel							860					GE	1681			FW		Dem	GPC	FeD DBO	GWC		
		Pel							860	Cr			1.5	GE	1660			FW	Ro	Dem		Dem			
		Pel							1,000					GE	1420			FW	Ro	Dem	ND	MnD	ND		
		Pel							1,000	Cr				WE	1446			WE		Dem	WT	V			
		Pel							1,000					GE	1360			FW	Ro	Dem	GWC	FeD			
		Pel							1,000					GE	1382			FW		Dem	IND	DBO	PM		
		Pel							1,000	Cr				WE	1600			FW	Ro	Dem So	CDC	Dem Am	GWC		
		Pel							840	Cr			2.5	WE	1550			WE		Dem	PM	MnD			
		Pel							1,000					GE	1550			FW	Ro	Dem	DAW	Dem	GWC		
		Pel							1,000					GE	1550			FW	Ro	Dem	DAW	DSO	GWC		
		Pel							1,000					WE	1600			WE SUN		Fl Dem	IND FW				
		Pel							1,000	Cr			1.2 1.8 3.6	GE	1578			FW	Ro	Dem	PM	PeD Am	WT		
		Pel							860	Cr			2.5	WE	1560			WE		FE Dem Ft		Dem CV			
		Pel							821	Cr			2.5	WE	1465			FW		Dem	NC	Dem			
		Pel							1,000	Cr			1.5	GE	1500			WE		Dem		Dem Mo	GWC		
		Pel							1,000	Cr			1.5	WE	1450			FW	Ro	Dem		Dem	MR		
		Pel							1,000	Cr			2.5	WE	1584			FW		Dem So	CDC	V			
		Pel							1,000					GE	1500			FW		Dem Mo	CDC	Dem	DAW		
		Pel							1,000					GE	1500			FW		Dem		Dem	WT		
		Pel							1,000					GE	1500			FW		Dem		Dem			
		Pel							1,000					GE	1500			FW	Ro	Dem	PM	FeD	GWC		
		Pel							1,000					WE	1500			FW		Dem		DAW	MR		
		Pel							1,000					GE	1500			FW		Dem		Dem	CDC		
		Pel							1,000					GE	1500			FW		Dem		Dem			
		Pel							1,000					GE	1500			FW		Dem		Dem	DAC		
		Pel							1,000					GE	1500			FW		Dem		Dem			
		Pel							1,000					GE	1500			FW		Dem	PM	Dem	WT		
		Pel							1,000					WE	1500			FW		Dem	CDC				
		Pel							1,000					WE	1500			FW		Dem	WT				
		Pel							1,000					WE	1500			FW		Dem			AE		
		Pel							1,000					WE	1500			FW	Ro	Dem		Air	PM		
		Pel							1,000					GE	1500			FW		Dem	ND	DBO			
		Pel							1,000					GE	1500			FW	Ro	Dem					
		Pel							1,000					GE	1500			FW		Dem			MT		
		Pel							1,000					WE	1500			FW	Ro	Dem		Air			
		Pel							1,000					GE	1500			FW		Dem		Dem Am			
		Pel							1,000					GE	1500			FW		Dem	CDC	Dem Am			
		Pel							1,000					WE	1500			FW		Fl Dem		FeD Cl			
		Pel							1,000					GE	1500			FW		Dem			ND		
		Pel							1,000					WE	1500			FW		Dem		Dem			
		Pel							1,000					GE	1500			FW		Dem		Dem			
		Pel							1,000					GE	1500			FW		Dem		Dem			
		Pel							1,000					GE	1500			FW		Dem		Dem			

Mp — Manopnoure
N — None
NaC — Natural circulation
Ocn — Ocean
Pr — Pressure
OT — Once through
Pel — Pellets, principally of steel tubes
PP — Precipitator, mar gemfish per
Pr — Propeller
Pres — Pressure
PWR — Pressurized water reactor
Rec — Recycle
Reg — Regulator control
Res — Retaining pond or lake
Riv — River or stream
Ro — Rotary pump or blower
S — Speed control
Sat — Saturation temperature
Scr — Screen
SCH — Sodium hypochlorite
Sil — Silver nitrate
So — Softener
SOC — Semi-outdoor
SOC — Spray canal
SS — Stainless steel
STG — Separate turbine
T — Water turbine
TC — Tangent-compound
Ti — Titanium
* — Titanium
TSE — Treated sewage effluent
U — Uranium
UF4 — Urea formaldehyde
UO2 — Uranium dioxide
Var — Various
* — Various control system

Vbl — Variable
Vlv — Valve
VP — Vacuum pump
VU — Vertical U-tube
W/W — Well water
XT — Extruded evaporate

FOOTNOTES
(See Q & R for manufacturers.)

1 — Duration of SS except as noted.
2 — Operated by Mississippi P & L Co
3 — Jointly with Assocd Elec Coop and Central Iowa Power Co
4 — Jointly with Cleveland Elec Ill Co, Ohio Edison Co, Toledo Ed Co, Duquesne Light Co, Pennsyl Pwr & Light Co
5 — First coal-fueling nuclear station
6 — Jointly with Kansas G & E Co
7 — Also Sargent & Lundy Nuclear Nuc Par Projects, Inc
8 — Under reevaluation. Unit 2 delayed indefinitely
9 — Work temporarily suspended
10 — Also Gilbert Commonwealth Nuclear Projects, Inc
11 — Project status in reevaluation
12 — Applicant of Braidwood and Byron stations
13 — Unit 3 Dresden 3 is 873 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 Phila El Co Delaware P & L Co, Atlantic City Elec Co
17 — Jointly with Atlantic City Elec Co
18 — Jointly with Jersey Central P & L Co, Pennsyl Elec Co
19 — Jointly with Wisconsin P & L Corp, Wisconsin Gas & Electric Co, Madison Gas & Electric Co
20 — Duplicate stations planned, Woodward Haven, MI
21 — With Ohio Edison Co and Pennsyl P & L Co
22 — Also Southern Co Services
23 — Jointly with Cleethorpes Membership Corp
24 — Jointly with Columbus & Southern Ohio El Co and Pwr & Light Co
25 — Nuclear supply system by ERDA

...nation's projected electrical needs

Water	Control of Radwaste							Generators			Controls Mtrs				PLANT NAME	PROJECT
Cooling	Treatment of gases	Gas treatment unit	Treatment of liquids	Liquids treatment unit	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		

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 start/up	Fast start/up	Emergency start/up	Gas temp at turbine inlet, F	Pressure ratio
	[illegible]	Point Lisas, Trinidad	WE	W-RD-[illegible]			No	N	88							25				22
	[illegible]	[illegible]	BBC*	Type [illegible]					[illegible]							18		11	1770*	9.6*
	Pepco Electric Power Corp	Mount Zephyr		[illegible]					[illegible]											
	[illegible]	Alaska		MS 5001			No	DW	24.6							20		10		9.5
	Pacific Gas & Electric Co	Oakland, Calif		PG-[illegible]			Yes		68*				68			5	3.3			
	[illegible]	[illegible], Saudi Arabia	BBC	Type [illegible]			No	DW	[illegible]							25		9	1680*	7.5*
	[illegible]	[illegible], Saudi Arabia	BBC	Type [illegible]			Yes	DW	[illegible]							30		13	1750*	8.6*
	[illegible]	[illegible], Libya	[illegible]	MGT 5001 DS			Yes	DW	[illegible]							25	4	13	1402	10
	Public Service Electric & Gas Co	[illegible], N.J.	GE	MS 5001 P			Yes	SDV	60				66			10		6		8
	[illegible]	Kuwait	GE	MS 5001-A			No		47				59			10				6.7
	Mississippi Power & Light Co	Gulf of Mexico	GE	MS 5001-B			No	N		28	0	59				10				
	[illegible] Chemical Co	[illegible], La.	GE	MS 5001-[illegible]			No	N		28	0	59				10				7.6
	[illegible] Electric Co	Indiana	GE	Type [illegible]			No	SDV		17.9	1,500	40			16.5	10		3	795	8.5
	Corpoven Ltda [illegible] Petroleos	Maracaibo, Venezuela	GE	[illegible]			No	N	10.6*		0	80				15			1695	7.5*
	[illegible]	Afghanistan	GE	S-7			No	N		12.6*	0	80				15			1170*	7.5*
	Public Service Co	Kenai, Alaska	GE	MS-3002J				N		32.9	0	59			13.7	59	10			7.1
	General Portland Inc	Lone Rubidoux, Calif	GE	[illegible]			No	N	3.95*			80						3	1510*	4.5*
	[illegible] Oil	El Borma, Algeria	GE	[illegible]			No	N		4.5*	0	80				4		3	1075*	4.5*
	[illegible] Petroleum Services Co	Abu Dhabi	GE	[illegible]			No	SDV		4.5*	0	59							1600	8.5
	Burns & Roe Inc	Oradell, N.J.	ALCO	[illegible]					2.1		0	59	3.6			1	0.8		1600	10
	Doyon Drilling Co	Kenai, Alaska	GE	DSE 4000			Yes	DW SDV	3.3		0	59				2			1730	9
	[illegible]	Germany	KK	Super [illegible] 40			Yes	DW	3.3			59	3.4		59	1	0.8	0.8	1600	8.4
	[illegible]	Iran	GE	DSF 4000			Yes	DW SDV				59							1600	8
	Delta Pipeline Co	Australia	GE	DSS-4000			No	DW SDV			0	59							1600	8
	El Paso Gas Co	Wyoming	GE	MGS 4000			Yes	DW			0	59							1145	8
	Chicago Pipeline Co	Elmore, Louisiana	GE	DSS-3000R			No	DW SDV			0	59							1600	8
	American Telegraph & Telegraph Co	Piscataway, N.J.	NAT	Viking [illegible]			Yes	DW	2.8		0	59	3.2		25	30			1660	6.3
	El Paso Gas Co	Iran	GE	DSC 4000				SDV	2.7		0	59							1600	9
	[illegible]	[illegible]	KK	Super [illegible] 25			Yes	DW		3.5	0	59			4.1	59	0.8	0.5		7.6
	Gulf of Saudi Arabia	Dhahran Airport, Saudi Arabia	KK	Super [illegible] 25				DW	1.8		0	59	2.2			59	0.5	0.5		6.2
	Getty Petroleum Co	Fateh Field, Dubai	NAT	Viking [illegible]				DW		2	0	59			2.2	48	0.8		1500	3.9
	American Gas & Oil Co	Fort Lauderdale, Fla	NAT	Viking [illegible]			Yes	DW	1.4		0	59	1.6			48			1500	3.9
	Amoco International Oil Co	Ghandira, Ferry Boat	SC	GS-1200			No	DW SDV		1.8	0	59							1450	6.5
	Alberta Gas Trunk Line Co Ltd	Edmonton, Alta., Canada	SD	DSE-3000			Yes	DW SDV	0.9		0	59							1450	6.5
	Northwestern Public Service Co	Scotland, S.D.	SC	ASI-200			Yes	DW SDV	0.9		0	59							1450	6.5
	Phillips Gas Co	Nome, Alaska	SD	SSC-1200				DW SDV	2.8		0	59							1450	6.5
	Amoco Production Co	Nome Platform, Alaska	SC	MGG-1200			No	DW SDV		1.1	0	59							1450	6.2

MANUFACTURERS

AGM - General Motors Corp, Detroit Diesel Allison Div
AI - Avco Lycoming Div
BBC - Brown Boveri & Cie, Switzerland
CED - Cooper Industries Inc, Cooper Energy Services Worthington Compressors Inc
DW - Dresser Waukesha Div, Power Systems
GE - General Electric Co
HS - Hall-Scott
KK - Kawasaki Heavy Ind
MAN - MAN Maschinenfabrik Augsburg-Nürnberg AG
NAT - North American Rockwell Corp
PW - United Technologies Inc, Pratt & Whitney Aircraft Div Industrial Products Group
RR - Rolls Royce (1971) Ltd
SBC - Sulzer Brothers Ltd, Switzerland
SOL - International Harvester Co, Solar Div
TC - Turbodyne Corp, Gas Turbine Div
WH - United Technologies Inc, Power Systems Div Formerly Turbo Power & Marine Systems Inc
WE - Westinghouse Electric Corp

SYMBOLS

AC - Air cooler, aftercooler
BC - Base, skid
BV - Base, V
BAC - Brayton cycle, aftercooler
CAC - Centrifugal compressor
CHP - Combined heat & power, cogeneration cycle
CC - Close-coupled
CD - Compressor discharge
CR - Cold rolled steel
DSC - Double shaft
DW - Dual waste heat
E - Electric
EM - Electric motor
EG - Electric generator
EW - Electric welded
EP - Explosion proof
G - Natural Gas
GT - Gas turbine
HP - Hydraulic, pneumatic
IS - Inlet silencer
Ig - Integrated
Mag - Magnetic pickup
MD - Mechanical drive
N - None
NAG - Non-skid cable
OC - Open cycle
P - Pump drive
PG - Process gas
PS - Peaking power
Pp - Pipeline
RHD - Recovery cycle with exhaust to boiler
Rel - Relief valve on between bearing cap and shaft
RC - Regenerative cycle
Rv - Reverse
Sep - Separate
Sg - Surge
St - Stack, manifold
SS - Solid state
SP - Standby power only
SCT - Steel C.R.
Tel - Telemetry, sonic (telemetry)
Te - Turbine exhaust
TE - Turbine inlet
Ti - Turbine shaft
WD - Water cooled combustor
WE - Variable inlet guide vanes

FOOTNOTES

1 - Also used, dual fuel
2 - Combination of machines
3 - Dist. Supply, Alliance & Lafayette
4 - Italian Electric Power Generation & Transmission Co
5 - Communities Service Co, Kansas, Water Co
6 - Similar machine ordered as a generator drive by Electricite de France (EDF), Paris, France (4 units)
7 - Exhaust temperature and ambient conditions
8 - Wartsila, licensed by BBC, 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 a 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, Dhahran, Saudi Arabia (4 units), Kansas City Board of Public Utilities, Quindaro, Kans. (1), Middle South Services Inc, undisclosed locations (7), 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 incipient 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 Electric Cy 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, Monthey, Switzerland (1 unit), Saudi National Electric Co, Taif (2), and Mecca (2), Saudi Arabia, Societe Miniere Algerienne de Saz, SOMASAZ, undisclosed location in Algeria (4)
25 - Similar machines ordered as generator drives by CADAFE, undisclosed location in Venezuela (2 units), CA Electricidad Electrica de Venezuela (CADAFE), undisclosed, Venezuela (2), Bacua, Indonesia, Utama PT, Jakarta, 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 Commn, Fayetteville, NC (2), Govt of Saudi Arabia,

shaft machines up slightly; unit sales off

GAS GENERATOR | FREE TURBINE | COMBUSTORS | FUEL | INSTRUMENTATION AND CONTROL

PROJECT	Type of cycle	Number per unit	Model number	Number of shafts per gas generator	Number of compressor stages	Number of turbine stages	Turbine speed, rpm	Number of shafts	Number of rotors	Number of stages per rotor	Number	Type	Type	Switch fuel with motor idle, shutdown	Type of sound conditioning	Speed of driven equipment, rpm	Type of control system (dig/C-analog	Method of governing turbine speed	Cut-out 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
1	S	1	AE 83[illegible]	1	9	2	7200	1	NA	NA	NA	1	DAC	[illegible]	[illegible]	[illegible]	3600	S/D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	PE	Yes	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
32	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
33	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
34	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
36	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
37	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Yes	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1 - Civil Aviation Dept (International Airport), Dhahran, Saudi Arabia
2 - BP Alaska Inc, Prudhoe Bay, Alaska
3 - Similar machines ordered as compressor drives by Pacific Alaska Energy Corp, Kenai, Alaska
4 - Similar machines ordered as compressor drives by the Govt of Kuwait, for dispersed locations in Kuwait (6 units), Pacific Alaska Energy, Kenai, Alaska
5 - Speed disc
6 - Similar machine ordered as a generator drive by an undisclosed company in Libya
7 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
8 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
9 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
10 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
11 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
12 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
13 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
14 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
15 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
16 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
17 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
18 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
19 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
20 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
21 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
22 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
23 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
24 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
25 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations
26 - Similar machines ordered as compressor drives by Pacific Alaska Energy Corp, Kenai, Alaska (2 units)
27 - Similar machines ordered as compressor drives by the Govt of Kuwait, for dispersed locations in Kuwait (6 units), Pacific Alaska Energy, Kenai, Alaska (2)
28 - Speed disc
29 - Similar machine ordered as a generator drive by an undisclosed company in Libya (1 unit)
30 - Similar machines ordered as compressor drives by Yacimientos Petroliferos Fiscales Bolivianos (YPFB), Bolivia, for Gas Operations. [illegible] Pacific Alaska Energy, Kenai, Alaska (2 units) [illegible] [illegible] drives by Mexicana, Kenai, Alaska (2), for Mexico and offshore, Italy
31 - Similar machines ordered as compressor drives by unnamed oil and gas company in Libya (2 units)
32 - Los Angeles Dept of Water and Power, Scattergood Steam Generating Station, Los Angeles, Calif
33 - Gas turbine manufactured by AiResearch Manufacturing Co, Torrance, Calif, a division of The Garrett Corp, is available in a wide range of sizes. GEN accounts for most of the gas turbine generator sets in operation in North America. Gas turbine generator sets are distributed worldwide by Solar, San Diego, Calif, a subsidiary of International Harvester Co, Chicago, Ill; Kato Engineering Co, Mankato, Minn; Kraft Power Corp, Kenosha, Wis; Lewis & Lewis Inc, Houston, Tex; Lewis & Lewis Inc, Dallas, Tex; Lewis & Lewis Inc, Austin, Tex; Williams & Lewis Inc, Oklahoma City, Okla; Lewis & Lewis Inc, Albuquerque, NM; Lewis & Lewis Inc, El Paso, Tex; Lewis & Lewis Inc, Midland, Tex; Lewis & Lewis Inc, Odessa, Tex; Lewis & Lewis Inc, Corpus Christi, Tex; Lewis & Lewis Inc, Harlingen, Tex; Lewis & Lewis Inc, San Antonio, Tex; Lewis & Lewis Inc, Victoria, Tex; Lewis & Lewis Inc, Seattle, Wash; Morrison-Knudsen Co Power Systems Div, Boise, Idaho; Mercer Machinery Co, Provo, Utah; Mercer Machinery Co, Salt Lake City, Utah; Mercer Machinery Co,

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.

PRODUCT	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), psig (noncondensing)	GENERATOR: Manufacturer	Coolant	Notes bearing footnote
	[illegible] Sugar Corp	Franklin, La	Pa	1	GE	'47	42,500	3600	650	825	1	150	Pr Exh		125	GE	Air	
	Great Lakes Paper Co	Thunder Bay, Ont, Can	Pa	1	STA	'76	28,000	3600	825	900	1	150	Pr Exh		150	STA	Air	
	Champion Papers Inc	Bogalusa, La	Pa	1	[illegible]	'76	20,000	3600	900	825	1	[illegible]	[illegible]		[illegible]	[illegible]	Air	
	Consolidated Cigar Co	Jacksonville, Fla	Pa	1	[illegible]	'76	20,000	3600	900	825	1	[illegible]	[illegible]		[illegible]	[illegible]	Air	
	Consolidated Cigar Co	West Point, Va	Pa	1	[illegible]	'76	20,000	3600	900	825	1	[illegible]	[illegible]		[illegible]	[illegible]	Air	
	Municipal Service Co	Valdez, Alaska	Par	1	[illegible]	'76	12,500	3600	600	750	1	150	Pr Exh	Con	[illegible]	[illegible]	Air	
	Hawaiian Sugar Co	Puunene, Hawaii	Sug	1	NAv	NAv	10,000	3600	225	650	1	[illegible]	[illegible]	Con	[illegible]	NAv	NAv	
	Sugar Cane Growers Coop	Belle Glade, Fla	Sug	1	[illegible]	[illegible]	7500	6000	250	650	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	Exxon Co, USA	Houma, Fed, Tex	Par	2	[illegible]	[illegible]	5000	5000	600	750	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	Gulf Sugar Co	Sugarland, La	Sug	1	[illegible]	'76	5000	4500	250	650	1	[illegible]	[illegible]	Con	[illegible]	[illegible]	Air	
	Standard Oil of California	El Segundo, Calif	Pet	1	[illegible]	'76	4375	3720	45	725	1	[illegible]	[illegible]	Con	[illegible]	[illegible]	Air	
	[illegible] Memorial	Providence, Ri	Hs	1	[illegible]	'75	1750	3600	600	825	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible] Memorial	Providence, Ri	Hs	1	[illegible]	'75	1750	3600	600	825	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	[illegible], Ny	Hs	1	[illegible]	'76	1750	3600	600	825	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	Dairyland Power Co	Eau Claire, Wis, Genoa	Utl	1	[illegible]	'76	1400	3600	1450	1000	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Lamplighter, Okla	Ore	1	[illegible]	NAv	1300	8477	825	750	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	Atlantic Sugar Assn	Belle Glade, Fla	Sug	1	[illegible]	'75	1500	4985	220	650	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	[illegible], Ny	Hs	1	[illegible]	'75	1250	5000	600	825	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Channelview, Tex	Pet	1	[illegible]	[illegible]	1200	3600	600	750	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Orlando, Fla	Utl	1	[illegible]	[illegible]	1200	5000	600	750	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Brainerd, Minn	Hs	1	[illegible]	[illegible]	1000	5000	125	650	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Salt Lake City, Utah	Min	1	[illegible]	NAv	900	3600	225	725	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Fort Lauderdale, Fla	Ore	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Belle Glade, Fla	Sug	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Tewksbury, Mass	Hs	1	[illegible]	[illegible]	850	5000	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Johnsonburg, Pa	Pap	1	[illegible]	[illegible]	850	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Chocolate Bayou, Tex	Che	1	[illegible]	NAv	825	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Texas City, Tex	Che	1	[illegible]	NAv	825	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	Lake Charles, La	Pet	1	[illegible]	[illegible]	[illegible]	3600	600	750	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	[illegible], Ny	NAv	1	[illegible]	NAv	800	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NAv	
	[illegible]	[illegible], Wash	Utl	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NAv	
	[illegible]	[illegible]	Par	1	[illegible]	NAv	750	3600	600	750	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	[illegible], Ny	Che	1	[illegible]	NAv	750	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NAv	
	[illegible]	[illegible]	Che	1	[illegible]	NAv	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Air	
	[illegible]	[illegible]	Par	1	[illegible]	NAv	[illegible]	[illegible]	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NAv	

MANUFACTURERS

ABB — ABB Inc
[illegible] — [illegible] Engineering Corp
[illegible] — [illegible] Co
[illegible] — [illegible] Machinery Manufacturing Co
[illegible] — [illegible] Electric Co
[illegible] — [illegible] & Manufacturing Co
[illegible] — [illegible] Co
[illegible] — [illegible] Electric Products Div
STA — Stal-Laval Turbin AB
[illegible] — Turbodyne Corp
[illegible] — Terry Corp
[illegible] — Tra-el Co, Murray Div

SYMBOLS

Che — Chemicals
[illegible] — [illegible]ing

Exh — Feedwater heating
Gov — Government
Gpr — Gas processing
Hs — Institution
Min — Mining
None
NAv — Not available
Noncondensing
Pap — Pulp and paper
Pet — Petroleum

Sat — Saturated
Sup — Superheated
Utl — Utility

FOOTNOTES

[illegible] and 600 psig
[illegible] at 200