

Power

A McGraw-Hill Publication • \$3.00 • October 1969

PLAINTIFF'S EXHIBIT

RS-307

1969 ENERGY SYSTEMS DESIGN ISSUE

RECEIVED
SCIENCE LIBRARY
OCT 3 1969
Southern Methodist University

Carlsbad, NM	4400	327	162	6
Adak, Alaska	4228	327	154	1
Katy, Texas	4200	360	139.1	4
Douglas, Ariz	4200	360	139.1	4
Tyrone, N.H.	3900	514	146.5	4
Houston, Texas	3900	514	146.5	4
St. Francis, Mo.	3900	514	146.5	4
Superior, Wis.	3900	514	146.5	4
Clendenin, W. Va.	3000	336	144.5	2
Ames, Ind.	3000	336	144.5	2
Superior, Wis.	2495	514	200.2	1
Nashville, Tenn.	2400	900	85	1
Vanderbilt, Mich.	2160	514	176.1	1
Silver Springs, Fla.	2000	336	144.5	2
Ely, Minn.	1550	1700	133	1
Harvey, La.	1500	900	133	2
Calif.	1500	900	133	1
Venice, Calif.	1500	900	133	1
St. Paul, Minn.	1500	900	133	1
Lake Charles, La.	1500	900	133	2
McClellan Air Force Base	1470	450	176.1	10
Lincoln, Neb.	1285	360	143	3
Port Arthur, Texas	1200	900	85	5
Deer Park, Texas	1145	793	116	1
Can.	1100	900	133	2
Rosenberg, Texas	1100	900	147	1
Wyo.	1100	900	147	1
La.	1100	900	147	1
Crockett County, Texas	1100	900	147	1
Bell Creek, Mont.	1100	900	133	4
Okla.	1100	900	147	7
Okla.	1100	900	146	1
Okla.	1100	900	147	6
Lowell, Mass.	1100	900	147	4
N.M.	1100	900	146	3
Yocum County, Texas	1100	900	147	5
Morgan City, La.	1100	900	147	2
Sioux Falls, SD	1080	900	144	4
Wilburton, Okla.	1080	900	143	1
La.	1000	900	160	1
Phoenix, Ariz.	1000	1200	133	1
Venice, La.	1000	900	133	2
Powell, Texas	1000	900	133	1
N.M.	1000	900	133	1
Snyder, Texas	1000	900	133	2
Omaha, Neb.	1000	1200	133	2
Crockett County, Texas	1000	900	133	1
Gal. Creek, Wis.	1000	900	133	1
Corpus Christi, Texas	1000	900	133	1
Venice, La.	1000	900	133	1
Elmwood, Okla.	1000	900	133	1
Greensboro, N.C.	960	120	85	2
Morgan City, La.	950	900	126.7	4
Phoenix, Ariz.	930	1200	133	1
Wyo.	930	900	144	4

Man and his Environment:
Eight critical problems

A 48-page survey of design
trends in energy systems

Annual roundup of selected
equipment and design aids

1 FOSSIL-FUELED CENTRAL STATIONS

Each project listing covers 4 pages

Majority of stations take st

PROJECT	COMPANY	PLANT NAME	LOCATION	CONSULTING ENGINEER	Unit number, new unit	Date first operation	Unit capacity, MW	BOILER			
								Capacity, 1000 lb/hr	Throttle pressure, psig	Throttle	Steam temp
1	Commercia Edison Co	Conemaugh	Huff, Pa	Gilbert Associates, Inc	1,2	70-71	900	6350	3500	1000	
2	Pennsylvania Power & Light Co	Powerton	Pekin, Ill	Sargent & Lundy	5	72	893	6014	2400	1000	
3	Texas Power & Light Co	Monter	Washingtonville, Pa	Brown & Root, Inc	2	71	818.9	3850	3675	1000	
4	Georgia Power Co	Tradinghouse Creek	Waco, Texas	Southern Services, Inc	2	71	799	5458	3850	1000	
5	Alabama Power Co	Etowah	Stilesboro, Ga		2	71	700	5030	3500	1000	
6	Pacific P & L Co, Washington Ste Pwr Co	Gorges	Gorges, Ala	Southern Services, Inc	10	72	700	4690	3500	1000	
7	Illinois Power Co	Camata	Camata, Wash	Bechtel Corp	1,2	71,72	657.5	5258	2520	1000	
8	Illinois Power Co	Eastlake	Vicinity of St. Louis, Mo	Sargent & Lundy	2	73	635	4200	2400	1000	
9	Illinois Power Co	Eastlake	Eastlake, Ohio	Gilbert Associates, Inc	2	72	625	4628	3675	1000	
10	Illinois Power Co	Roseton	Roseton, N.Y.	Burns & Roe, Inc	1,2	72	570	4200	2520	1000	
11	Virginia Electric & Power Co	Mount Storm	Grant County, W. Va	Stone & Webster Engineering Corp	3	73	560	3826	2520	1000	
12	Central Illinois Public Service Co	Corteen	Corteen, Ill	Sargent & Lundy	2	72	550	4158	2520	1000	
13	Gulf States Utilities Co	Willow Glen	St. Gabriel, La	Stone & Webster Engineering Corp	4	71	542	3980	3650	1005	
14	Public Service Co of Indiana, Inc	Cayuga	Cayuga, Ind	Charles T. Main, Inc	2	72	500	3550	2400	1000	
15	New England Power Co	Salem Harbor	Salem, Mass		4	72	460	3250	1890	950	
16	Los Angeles Dept of Water & Power	Scattergood	Playa Del Rey, Calif	Self	3	72	460	2982	3500	1000	
17	Indianapolis Power & Light Co	Elmer W Stout	Marion County, Ind	Stone & Webster Engineering Corp	4	73	420	3200	2520	1000	
18	Florida Power & Light Co	Sanford	Sanford, Fla	Mid-Valley, Inc	4	72	420	2640	2500	1005	
19	South Carolina Electric & Gas Co	Waterloo	Eastover, S.C.	Gilbert Associates, Inc	1,2	70-71	355	2567	3500	1000	
20	Southern Electric Power Co	Wilkes	Jefferson, Texas	Sargent & Lundy	3	72	352	2390	2000	1000	
21	Louisville Gas & Electric Co	Mill Creek	Kosmosdale, Ky	Pioneer Service & Engineering Co	1	72	350	2326	2520	1000	
22	Illinois Public Service Co	George Neal	Vic of Sioux City, Iowa	Elasco Services Inc	2	72	325	2320	2400	1005	
23	Central Illinois Public Service Co	E D Edwards	Vic of Bartonville, Ill	Commonwealth Associates, Inc	3	72	322	2625	2400	1000,1005	
24	Central Power & Light Co	E S Joshi	Powell Comfort, Texas	Sargent & Lundy	1	71	258	1600	2000	1000	
25	San Diego Gas & Electric Co	South Bay	Chula Vista, Calif	Pioneer Service & Engineering Co	4	71	215	1568	1800	950	
26	El Paso Electric Co	Rio Grande	El Paso, Texas	Stone & Webster Engineering Corp	8	72	167	1132	1890	1000	
27	Delaware Power & Light Co	Vienna	Vienna, Md	United Engineers & Constructors, Inc	8	71	150	1160	1800	950	
28	Central Power & Light Co	La Palma	San Benito, Texas	Sargent & Lundy	6	70	150	1100	1800	1000	
MUNICIPAL AND COOPERATIVE INSTALLATIONS											
29	City of New Madrid	New Madrid	New Madrid, Mo	Burns & McDonnell	1	72	600	4350	2520	1000	
30	Jacksonville Electric Authority	Northside	Jacksonville, Fla	Reynolds, Smith & Hills	2	71	300	1990	2520	1000	
31	East Kentucky Rural Electric Cooperative	Cooper	Burnside, Ky	Stanley Consultants, Inc	2	69	220.8	1550	1800	1000	
32	Big Rivers Rural Electric Cooperative Corp	Kenneth C Coleman	Vic of Havesville, Ky	The Ralph M Parsons Co	1	71	160	1160	1800	1000	
33	City of Garland	Ray Dillinger	Garland, Texas	Tropett & Gee	2	70	128	870	1523	1000	
34	City of Lakeland	Plant No 3	Lakeland, Fla	Bechtel Corp	1	70	90	634	1800	1000	
35	City of Tallahassee	Arvay B Hopkins	McCam, Fla	Big Bend Engineering Co, Inc	1	71	81	750	1260	955	
36	City of Vero Beach	Vero Beach Municipal	Vero Beach, Fla	Black & Veatch	3	71	33	355	850	900	
37	City of Lake Worth	Lake Worth Municipal	Lake Worth, Fla	Reynolds, Smith & Hills	4	70	32.6	300	850	900	
OVERSEAS INSTALLATIONS											
38	Central Electricity Generating Board	Drax	Yorkshire, England	W S Atkins Ltd	1,2,3	71,72	660	4450	2400	1055	
39	Tokyo Electric Power Co, Inc	Araigasaki	Chiba Pref, Japan		3	71	600	4300	3500	1000	
40	Tokyo Electric Power Co, Inc	Kashima	Baragi Pref, Japan	Mitsubishi Electric Corp, Hitachi Ltd	1	71	600	4298	3500	1000	
41	South of Scotland Electricity Board	Longannet	Kincardine, Scotland	Merz & McLellan	2,3,4	69-71	600	4000	2350	1050	
42	Chubu Electric Power Co, Inc	Atsugi	Aichi Pref, Japan	Tokyo Shibaura, Mitsubishi EI Corps	1	71	500	3748	3500	1000	
43	Central Electricity Generating Board	Pembroke	Pembrokeshire, S. Wales		1	69	500	3550	2400	1055	
44	Central Electricity Generating Board	Fiddlers Ferry	Lancashire, England	Merz & McLellan	1	69	500	3450	2400	1055	
45	Central Electricity Generating Board	Didcot	Berkshire, England		1,2,3,4	70,71	500	3350	2400	1055	
46	Taiwan Power Co	Linshui	Taiwan, China	Burns & Roe, Inc	2	71	350	2500	2525	1005	
47	Kumita Joint Power Co, Ltd	Kumita	Chiba Pref, Japan		3	70	350	2492	2400	1050	
48	Chugoku Electric Power Co, Inc	Yamaguchi	Yamaguchi Pref, Japan		2	71	350	2490	2400	1050	
49	Kansai Electric Power Co, Inc	Saigaku	Osaka, Japan		7	70	250	1890	2400	1050	
50	Korea Electric Co	Inchon	Inchon, Korea		1,2	70,72	250	1830	2400	1050	
51	Israel Electric Corp, Ltd	Reading D	Tel Aviv, Israel	Sargent & Lundy	3	69	214	1450	2000	1000	
52	Wakayama Joint Thermal Power Co, Ltd	Wakayama	Wakayama Pref, Japan		3	70	156	1120	2400	1050	

MANUFACTURERS

ABO - Abercrombie Engineering Ltd
AC - Airco-Chalmers Mfg Co
AEI - Associated Electrical Industries Ltd
A/T - Atton Industries Ltd
APD - The Air Preheater Co
AS - American Standard Industrial Div
AT - Aerotec Industries Div of Universal Oil Products Co
BB - Brown Boveri Corp
BCL - Belco-Canada Ltd
BF - Buffalo Forge Co
BJ - Byron-Jackson Pumps, Inc

BLH - Baldwin-Lima-Hamilton Corp
BM - Bailey Meter Co
BMH - Beckman Instruments, Inc
BOB - Am Boy & Co Ltd
BU - Buell Engineering Co, Inc
BW - Babcock & Wilcox Co
CAP - C A Parsons, Ltd
CE - Combustion Engineering, Inc
CHB - Chicago Boiler Corp, div of Chicago Converter Corp
CHM - Chicago Heater Co
CLC - Clarke, Chapman & Co, Ltd
C/L - Clyde Bowers Ltd, Scotland
COC - Cochran Div, Crane Co

CRA - Crane Co
CV - Copps-Vulcan Div, Blaw-Knox Co
D - Davidson & Co, Ltd
DAV - Davis Engineering Co
DEC - Diamond Electric Corp
DL - De Laval Turbine Inc
OP - On-Sound Power Specialty Corp
EE - English Electric Co Ltd
EM - Electric Machinery Mfg Co, Sub of Worthington Corp
EMC - Ebara Mfg Co
EPA - Elliott Process Automation, Ltd
F - The Fawcett Co
FIS - Fischer & Porter Co

FW - Foster Wheeler Corp
FWJ - Foster Wheeler, Joint Land Boilers, Ltd
GE - General Electric Co
GF - Green Fuel Economy
G/J - G & J Wren, Ltd
GW - George Kent & Co, Ltd
GPL - General Water Conditioning
HAP - Hawdon-Apco
HCC - Hagans Controls Corp
HCC - Westinghouse Elec Co
HF - Hopkinson-Parsons
HH - Hick Hargreaves & Co

imed at soundproofing their equipment

	BOILER					FURNACE				FIRING		F-D FANS					I-D FANS					PROJECT			
	Reheat control	SURFACE, 1000 SQ FT				Pressure, in. water	Volume, 1000 cu ft	Heat release, 1000 Btu/cu ft hr	Number of burners	Type	Pulverizers per boiler	Pulverizer manufacturer	Number per boiler	Capacity ea, 1000 cfm	Manufacturer	Flow control	DRIVE		Number per boiler	Capacity ea, 1000 cfm	Manufacturer		Flow control	DRIVE	
		Boiler and waterwalls	Superheater	Reheater	Economizer												Air heater	Hy, each motor						Manufacturer	Hy, each motor	Manufacturer	Hy, each motor	Manufacturer
WS, TB	91	110	160	318	699	20	538	71	64	Pid, DB	8	RA	3	735	SW	V	5000	AC	N	.....	.....	.....	.....	.....	1
AUI, GR	.....	.....	.....	.....	.....	.....	285.4	.....	10	Bal, ST	N	N	2	522	BF	V	.....	.....	2	826	BF	HyC	.....	.....	2
WS, TB	23.4	143.5	174.4	255.3	.....	17	463	14.7	48	Pid, DB	6	RA	2	775	SW	V	5500	GE	.....	.....	.....	.....	.....	.....	3
EA	11.29	156.6	66.82	127.0	502.0	37.5	222.5	28.8	24	Pid	N	N	2	830	HOW	T	13,500	DL	N	.....	.....	.....	.....	.....	4
WS, TB	36	116	146	370	707	24	386	17	48	Pid	6	CE	2	948	SW	.....	7000	GE	N	.....	.....	.....	.....	.....	5
TB	58	95	135	260	544	14.5	334	18	48	Pid, DB	6	CE	2	748	GF	V	7000	GE	N	.....	.....	.....	.....	.....	6
TB	41.5	115	53	93	931	.....	527	12.8	64	Bal, DB	8	RA	2	615	SW	V	1750	AC	2	1392	HOW	V	4500	AC	7
AUI, GR	57	159	146	116	1290	.....	435	13	14	Bal, ST	.....	.....	.....	455	.....	V	1500	.....	3	720	.....	S, D	3000	.....	8
WS, GR	22.1	136.3	152.6	186.5	872.2	13.2	390	14.29	48	Pid, DB	6	BW	2	850	SW	V	6000	WE	N	N	N	N	N	N	9
GR, TB	.....	100	160	170	352.5	0	211.5	20	20	Bal	N	N	2	500	GF	V	2500	.....	2	745.7	GF	D	7000	.....	10
TB	37	135	55	316	256	-0.15	313	15.7	48	Bal	6	CE	2	.....	.....	V	.....	.....	2	.....	.....	V	.....	.....	11
AUI, GR	175.5	176.5	161.3	91.0	1072	0.5	1072	13.5	14	Bal, ST	74	BW	2	662	GF	V	7000	AC	2	1109	GF	HyC	6000	AC	12
EA	2	118	54	119	371	40	146	51.4	16	Pid	N	N	2	600	WE	V	4500	AC	.....	.....	.....	.....	.....	.....	13
WS, TB	31.6	190	61	150	793.8	25.0	343	13.6	24	Pid, DB	6	RA	2	646	HAP	V	5000	EM	N	.....	.....	.....	.....	.....	14
AUI	43.15	69.95	26.70	155.0	180.0	18	143.2	32	24	Pid	N	N	2	500	SW	V	350	GE	N	N	N	N	N	N	15
GR, EA	18.36	44.91	48.5	146	385	20	113.5	34.5	12	Pid, DB	N	N	2	440	.....	V	3500	.....	N	.....	.....	.....	.....	.....	16
WS, TB	29.5	103	38.5	174	671	0.15	310	15.3	20	Bal, DB	5	RA	2	545	.....	V	1500	.....	2	800	.....	V	3000	.....	17
WS, D	29.7	81.5	84.9	82.5	302	-0.15	154	20.8	18	Bal	N	N	2	485	AS	HyC, D	1699	.....	2	750	AS	HyC, D	3906	.....	18
WS, PD	50.87	68	17.9	10.9	266.2	-0.25	195	15.6	24	Bal, DB	3	RS	2	465	AS	V, D	1750	GE	2	662	AS	V, D	3000	GE	19
WS	17.3	65.3	24.3	49.0	350	14.3	64	.....	18	Pid	N	N	2	362	WE	V	3000	GE	N	.....	.....	.....	.....	.....	20
WS, TB	25.8	119.4	26.0	70.0	158.8	.....	219.0	14.1	16	Bal, DB	4	CE	2	485	AS	V	1500	AC	2	690	AS	HyC	2500	AC	21
WS, D, B	21	67	69	92	454	15.65	158	19.5	15	Pid	4	FW	2	280	GF	V	2500	GE	.....	.....	.....	.....	.....	.....	22
WS	24.05	24.67	.....	.....	418	17.6	16.75	17.45	20	Pid, DB	5	CE	2	508	SW	V	3500	GE	.....	.....	.....	.....	.....	.....	23
AUI	12.75	41.24	15.44	25.88	471.2	35	59.98	37.8	12	Pid	N	N	2	250	WE	V	2250	WE	.....	.....	.....	.....	.....	.....	24
TB	19.5	20	10	135	.....	29.5	64.5	29	12	Pid	N	N	2	735	AS	HyC, D	2250	AC	.....	.....	.....	.....	.....	.....	25
AUI	18.22	18.27	8.26	36	191.7	15.7	48.47	31.8	10	Pid	N	N	1	438	GF	V	2500	LA	.....	.....	.....	.....	.....	.....	26
WS, TB	15.7	19	5.2	64	.....	27	48.8	33.0	12	Pid, DB	N	N	2	275	.....	V	1500	.....	.....	.....	.....	.....	.....	.....	27
AUI	17.9	23.07	10.84	26.27	303	18	55.4	38	10	Pid	N	N	2	170	WE	V	1250	WE	.....	.....	.....	.....	.....	.....	28
AUI, GR	61	159	146	75	1180	20	252	22	14	Pid, ST	.....	.....	3	530	WE	V	7000	GE	N	.....	.....	.....	.....	.....	29
D	16.18	40.2	47.5	56.3	266.4	0	67	38	16	Bal, DB	N	N	2	288	CHB	V	800	.....	2	415	GF	HyC	1500	.....	30
WS	25.5	93.7	30.6	40.1	716.9	24.9	115.9	16	18	Pid, DB	6	BW	2	294	GF	HyC, V	2000	WE	.....	.....	.....	.....	.....	.....	31
WS	25.64	36.00	37.15	40	147	10.65	100	15.8	8	Pid, DB	2	RS	2	260	BF	V	1500	EM	N	.....	.....	.....	.....	.....	32
WS, GR	12.3	14.04	5.92	24.27	103.6	9.4	13.67	35.9	9	Pid	N	N	2	151	GF	V	1000	AC	N	.....	.....	.....	.....	.....	33
AUI	5.4	15.9	6.6	30.6	146.6	22	25.1	33.1	6	Pid	N	N	2	116	GF	V	700	LA	N	.....	.....	.....	.....	.....	34
WS	37.28	19.6	.....	15.35	54.2	-0.10	33.0	28.36	6	Bal	N	N	2	118	SW	V	250	GE	2	166	SW	D	400	GE	35
WS	15.6	5.1	.....	16.8	.....	11	29.0	4	4	Pid	N	N	1	106	GF	MC	800	IE	.....	.....	.....	.....	.....	.....	36
WS	16.32	5.83	.....	36.9	36.6	5.5	40.4	4	4	Pid	N	N	1	457	.....	V	560	.....	N	.....	.....	.....	.....	.....	37
WS, AUI, PD	66.3	252.7	219.8	402.9	564.3	-0.10	452.1	.....	60	Bal, DB	10	BW	2	731.5	BW, YA	V, S	1530, 2000	CAP	2	1015	BW	V, S	2170, 3180	CAP	38
WS, GR	40.25	177.5	167.5	108.4	62.06	16.3	222	24.23	16	Pid, DB	N	N	2	614	HIT	V	4962	HIT	N	.....	.....	.....	.....	.....	39
WS	6.40	67.91	200.6	157.4	480.1	.....	151.1	3.46	40	Pid, VB	N	N	3	561.7	MHI	P, D	3290	MEL	.....	.....	.....	.....	.....	.....	40
WS, PD	36.9	106.2	238.7	461	669.1	-0.2	436	11.1	32	Bal, DB	6	FW	2	652	HOW	V	1620	AEI	2	920	HOW	V	3190	AEI	41
WS, GR, TB	54.8	95.2	160.0	152.5	556.3	25.2	167.7	24.2	41	Pid, DB	N	N	2	530	MHI	.....	3250	MEL	.....	.....	.....	.....	.....	.....	42
WS, Bv	30	177	96	247	50	.....	178	27	32	Bal	N	N	2	428	D	S	2280	LSE	2	640	D	S	3140	LSE	43
WS, AUI, TB	24	167.7	11.8	484	356	.....	227	26.2	48	Bal	6	IC	2	462.5	D	V	1300	AEI	2	800	D	V, S	1740, 2600	AEI	44
WS	77	202	216	197	684	-0.1	122.4	15.5	46	Bal, DB	8	BW	2	550	HOW	V	1630	EE	2	790	HOW	V, S	2290	EE	45
WS, GP, TB	40	57	93	44	234	20	131	30	20	Pid	N	N	2	215	MHI	V, D	1850	MHI	N	.....	.....	.....	.....	.....	46
WS, GR, TB	31.6	125.4	69.6	124.2	687.0	-0.4	135.6	23.6	32	Bal, DB	N	N	2	353	MEL	V	736	MEL	2	.....	MEL	D	2355	MEL	47
WS, GR, TB	31.5	95.5	109.0	100.2	456.0	.....	127.2	22.3	30	Pid, VB	N	N	2	327	MEL	D	2100	MEL	.....	.....	.....	.....	.....	.....	48
WS, GR, TB	32.6	104.8	76.1	75.1	.....	14	95.5	10.9	32	Pid, VB	N	N	2	278	MEL	V	1450	WE	.....	.....	.....	.....	.....	.....	49
D	12.1	61.1	55.2	50.5	280	12.6	116	11.5	27	Pid	N	N	2	265	MEL	V	1800	TOS	N	.....	.....	.....	.....	.....	50
GR	12.1	61.1	55.2	50.5	280	12.6	116	11.5	27	Pid	N	N	2	265	BF	V	1750	GE	N	N	N	N	N	N	51
WS, GR, TP	11.5	44.8	12.1	130	137	1.5	64	25.7	40	Bal, DB	N	.....	.....	170	NAK	V	700	MEL	2	400	NAK	D	1940	MEL	52

Aichi Ltd.
 Ames Howard Co.
 Bedford & Terry Inc.
 International Combustion Ltd.
 Borden Electric & Mfg. Co.
 Kawasaki Harima Heavy Inds. Ltd.
 Alco Inc. Div. Gen. Amer. Trans. Co.
 Foster-Rand Co.
 Jones Water Treatment Co.
 Thompson-Rate Turb. Pumps Ltd.
 Jones Co. Ltd.
 J. B. Manufacturing Co.
 Davis Air Flow, Inc.
 Hughes Water Conditioning, Inc.

Lee Steel Works Co.
 Leeds & Northrup Co.
 Lawrence Scott Electronics
 The Lummus Co.
 Marlow Ltd.
 Mission Electric Mfg. Co.
 Mission Heavy Industries Ltd.
 Wayne & Plank Ltd.
 M. J. P. Co.
 Marx and Shropshire & Givens Co.
 Nacoma Mfg. Co.
 N. S. G. Co. Ltd.
 The Nest Engineering Co.

Permuto Co. Div. Paudler Permuto, Inc.
 Pacific Pumps, Inc.
 Div. Dresser Industries, Inc.
 Raymond Div. of GE
 Research-Gottlieb Inc.
 Republic Div. Rockwell Mfg. Co.
 R. W. Stoker Corp.
 Richardson-Westgarth Ltd.
 Smith's-Air & Gas
 Sizer Bros. Ltd.
 Sutcliffe Div. Westinghouse Elec. Corp.

SWECO, Inc.
 Toshiba Machine Co.
 Tokai Shindai Electric Co. Ltd.
 Universal Div. Products Co.
 Western Blower Co.
 W. C. Holmes, Ltd.
 Westinghouse Electric Corp.
 Worthington Corp.
 Western Precipitation Div. Jov Mfg. Co.
 Yarwood Africa Pty. Ltd.
 Yuasa Heat Transfer Corp.

SYMBOLS AND FOOTNOTES FOLLOW ON PAGES 46 AND 57

1 FOSSIL-FUELED CENTRAL STATIONS

In addition to a dust collector

PROJECT	TURBINE					CONDENSER					FEEDWATER					GENERATOR					CONTROLS				
	Type	Exhaust, in. Hg	Number of blades/pieces	Number of exhausts	Manufacturer	Surface, 1000 sq ft	Number of water pieces	Tube material	Air removal	Manufacturer	Makeup treatment	Condensate treatment	System manufacturer	Voltage, kV	Rating, MVA	Cooling, rate/gal/hr	Combustion, mb	Feedwater, mb	Closed-circuit TV, mb	Data logger, mb	Manufacturer	COMPL			
1	CC	2.6	8	4	GE	269	1	SS	Ro	WE	De	De, SF, Pdx, pH	COC, GW	22	946	H ₂ , Li	LN	LN	GPL	LN	LN	LN			
2	TC	3.5	7	4	GE	450	1	SS	Ro	....	De	De	....	25	992	H ₂ , Li	....	....	....	....	....	....			
3	TC	2.38	8	4	GE	270	2	SS	Ro	JR	De	De	HT, COC	24	910	H ₂ , Li	LN	LN	....	LN	LN	LN			
4	TC	3.5	7	4	GE	....	1	SS	Ro	NSH	De	Pdx	HT, GW	24	388	H ₂ , H ₂ , Li	BM	BM	N	N	N	N			
5	TC	3.5	7	4	GE	360	2	Ad	Ro	WE	De	De, pH	GW, COC	25	928	H ₂ , Li	HCC	HCC	N	F	....	....			
6	TC	....	7	4	GE	360	2	SS	Ro	BLH	De	Pdx, pH	GW	26	328	H ₂ , Li	LN	LN	....	F	....	....			
7	TC	3.5	7	4	WE	300	2	Ad	J	WE	De	pH, Hyd	IW	20	811.5	H ₂ , H ₂	HCC	HCC	OP	....	....	....			
8	TC	3.5	7	4	WE	210	1	SS, Ad	Ro	....	De	Pdx	LAW, GW	20	133	H ₂ , H ₂	....	....	N	N	....	....			
9	TC	2.58	8	4	GE	201	1	Ad, CuN	Ro	IR	De, Fi	De, SF, Pdx	COC, IN, GW	24	756	H ₂ , Li	BM	BM	OP	....	....	....			
10	TC	3.5	7	4	GE	215	1	Ad	Ro	IR	De	De	....	24	690	H ₂ , Li	....	....	....	....	....	....			
11	TC	3.5	7	2	BB	....	1	SS	J	....	Eva	Pdx	....	24	580	H ₂ , Li	....	....	....	....	N	....			
12	TC	3.5	7	4	GE	330	2	SS, Ad	Ro	WO	De	pH	COC	24	585	H ₂ , Li	BM	BM	N	....	....	....			
13	TC	3	7	4	GE	250	1	Ad	Ro	NSH	Eva	De, pH	WE, IW	24	590	H ₂ , Li	HCC	HCC	OP	WE	WE	WE			
14	TC	3.5	7	4	WE	317	2	SS	Ro	FW	De, So	pH	LAW	18	590	H ₂ , H ₂	F	F	....	BM	BM	BM			
15	TC	3.5	5	4	GE	125	1	AIB, CuN	Ro, J	FW	De	pH	....	22	528	H ₂ , Li	....	....	OP	....	....	....			
16	TC	, 3.5	7	4	BB	237	1	CuN	Ro	HIT	Eva, So, Fi	De, pH	LU	24	552	H ₂ , Li	....	....	....	....	....	....			
17	TC	3.5	7	4	GE	240	2	SS	Ro	....	De	Pdx, pH	....	22	554	H ₂ , Li	....	....	OP	....	....	....			
18	TC	3.5	7	2	WE	210	1	AIB	J	....	De	pH	....	24	490	H ₂ , H ₂	....	....	OP	N	N	N			
19	TC	3.5	8	4	GE	89.5	2	SS	Ro	WO	De	De, pH, Hyd	COC	22	454	H ₂ , Li	BM	BM	OP	BM	BM	BM			
20	TC	3.0	6	2	GE	155	2	Ad	Ro	WE	De	....	....	22	390	H ₂ , Li	F	F	N	....	....	....			
21	TC	3.5	7	2	GE	170	2	Ad	....	WE	De	pH	....	22	395	H ₂ , Li	HCC	HCC	OP	....	....	....			
22	TC	3.5	8	1	GE	150	2	Ad	Ro	FW	De	Pdx	GW	20	388	H ₂ , Li	....	....	....	....	....	....			
23	TC	3.5	7	4	GE	195	2	SS, Ad	Ro	FW	De	pH	....	22	478	H ₂ , Li	LN	LN	OP	....	....	....			
24	TC	3.5	6	2	WE	136	1	AIB	Ro	WE	De	De	IW	22	290	H ₂ , H ₂	....	....	N	N	N	N			
25	TC	3.5	3	1	WE	96	1	CuN	Ro	WE	Eva	....	....	20	267	H ₂ , H ₂	HCC	HCC	....	....	....	....			
26	TC	3.5	4	1	WE	65	2	Ad	Ro	WE	Eva	pH	....	18	185	H ₂ , H ₂	....	....	....	....	....	....			
27	TC	3.5	3	1	WE	50	1	CuN	Ro	....	De	pH	....	18	180	H ₂ , H ₂	....	....	N	N	N	N			
28	TC	3.0	6	2	GE	85	2	SS	Ro	WE	De	De	LAW	18	192	H ₂ , H ₂	F	F	N	N	N	N			
29	TC	2.5	7	2	BB	270	1	Ad	Ro	NSH	De	Pdx	GW	22	722	H ₂ , Li	BM	....	N	....	....	....			
30	TC	3.5	5	2	GE	188	2	AIB	RP	BLH	De, So	De	COC	20	350	H ₂ , Li	....	....	OP	....	....	....			
31	TC	3.5	7	2	GE	112	2	SS, Ad	J	WE	Eva, So	pH	FW, IW, MR	20	256	H ₂ , Li	HCC	HCC	N	N	N	N			
32	TC	2	5	1	GE	85	2	....	Ro	NSH	De	pH	HT, WO	18	192	H ₂ , H ₂	HCC	HCC	N	N	N	N			
33	TC	3.5	5	2	GE	70	2	Ad	Ro	DL	De	....	IN	13.8	123	H ₂ , H ₂	FIS	FIS	N	N	N	N			
34	SC	3	5	1	GE	60	1	SS, Ad	Ro	SWE	De	pH	PM, MR	13.8	115	H ₂ , H ₂	F	F	OP	N	N	N			
35	SC	3	5	1	WE	63	2	AIB	Ro	DL	De	pH	COC	13.2	88.2	H ₂	BM	BM	DEC	....	....	....			
36	SC	3.5	4	1	GE	28	1	CuN	Ro	DL	De	pH	PM	13.8	59.5	H ₂ , H ₂	HCC	HCC	....	....	....	....			
37	SC	2.5	4	1	GE	27.5	2	SS, Ad	J	DL	De	De	....	13.2	38.4	H ₂ , H ₂	BM	BM	....	....	....	....			
38	TC	1.6	6	5	CAP	295	1	70/30 Br	Ro	CAP	Eva, De, So	pH	AIT, JT	23.5	776	H ₂ , Li	EPA	EPA	M	EE	EE	EE			
39	CC	1.5	5	4	TSE	360	1	AIB	Ro	TSE	....	De, pH	....	18	350P	H ₂ , Li	BM	BM	....	TSE	TSE	TSE			
40	CC	1.5	8	4	HIT	360	1	AIB	Ro	HIT	De	De, pH	....	18	350P	H ₂ , Li	LN	LN	....	....	....	....			
41	CC	0.9	9	3	EE	450	1	AIB	Ro	GJW	De	De, hyd, pH	PM	17	706	H ₂ , Li	BM	BM	OP	BM	BM	BM			
42	TC	1.5	3	4	TSE	252.5	1	AIB	Ro	TSE	....	....	....	22	525	H ₂ , Li	LN	LN	MEL	TSE	TSE	TSE			
43	TC	1.1	8	6	CAP	300	1	AIB	Ro	NSH	De	SF, Pdx	PM	22	588	H ₂ , Li	EPA	EPA	EE	EE	EE	EE			
44	TC	1.3	8	6	EE	300	2	70/30 Br	Ro, WJ	EE	De	pH	BOB, EE	22	588	H ₂ , Li	GK	GK	M	N	N	N			
45	TC	1.1	3	6	CAP	300	1	Ad	Ro	HM	De	pH, Pol	PM	23.5	588	H ₂ , Li	BM	BM	M	N	N	N			
46	TC	1.1	4	4	EE	213	1	AIB	Ro	EE	De	De	....	2.4	412	H ₂ , H ₂ , Li	....	....	....	....	....	....			
47	CC	1.5	5	4	HIT	233	1	AIB	Ro	HIT	....	....	....	15	224	H ₂ , H ₂	BM	BM	MEL	N	N	N			
48	TC	1.5	3	2	MHI	224	2	AIB	J	MHI	De	pH	NPD	6	390	H ₂ , H ₂	BM	BM	MEL	MEL	MEL	MEL			
49	TC	1.5	3	4	MHI	198.3	1	AIB	J	MHI	De	pH	NPD	19	290	H ₂ , H ₂	BMN	BMN	MEL	....	....	....			
50	TC	1.5	3	4	TDS	156	3	AIB, CuN	J	TSE	De	pH	NPD	17	200	H ₂ , H ₂	BM	BM	N	N	N	N			
51	TC	1.5	3	2	GE	159	3	AIB	Ro, J	IR	De	N	....	13	287	H ₂ , Li	BM	BM	OP	N	N	N			
52	TC	1.5	3	2	MHI	153	2	AIB	J	MHI	De	pH	KUR	17	184	H ₂ , H ₂	RO	RO	N	N	N	N			

MANUFACTURER'S APPEAR IN PROJECT 4 AND 5

ABBREVIATIONS

- AC - Air Cooled
- AD - Air Dryer
- AE - Air Ejector
- AF - Air Filter
- AG - Air Gas
- AH - Air Heater
- AI - Air Inlet
- AL - Air Line
- AM - Air Motor
- AN - Air Nozzle
- AO - Air Outlet
- AP - Air Pump
- AQ - Air Quench
- AR - Air Receiver
- AS - Air Separator
- AT - Air Tank
- AV - Air Valve
- AW - Air Water
- AX - Air X-ray
- AY - Air Yoke
- AZ - Air Zirconium

- BA - Backflow
- BB - Backflow
- BC - Backflow
- BD - Backflow
- BE - Backflow
- BF - Backflow
- BG - Backflow
- BH - Backflow
- BI - Backflow
- BJ - Backflow
- BK - Backflow
- BL - Backflow
- BM - Backflow
- BN - Backflow
- BO - Backflow
- BP - Backflow
- BQ - Backflow
- BR - Backflow
- BS - Backflow
- BT - Backflow
- BU - Backflow

- CA - Carbon
- CB - Carbon
- CC - Carbon
- CD - Carbon
- CE - Carbon
- CF - Carbon
- CG - Carbon
- CH - Carbon
- CI - Carbon
- CJ - Carbon
- CK - Carbon
- CL - Carbon
- CM - Carbon
- CN - Carbon
- CO - Carbon
- CP - Carbon
- CQ - Carbon
- CR - Carbon
- CS - Carbon
- CT - Carbon
- CU - Carbon

- HC - Hydraulic Coupling
- HD - Hydrazine
- JE - Steam Jet
- LI - Liquid
- MI - Motor
- MA - Monitoring and Analysis
- MA - Main and Auxiliary Control
- MC - Magnetic Coupling
- ME - Mechanical
- MO - Magnesium Oxide
- MON - Monitoring
- MT - Main Turbine Shaft
- NI - None

- NH - Nitrogen
- OP - Operator
- PD - Pressure
- Pdx - Pdx
- PH - Phosphate
- PI - Pressure
- PL - Pressure
- PM - Pressure
- PN - Pressure
- PO - Pressure
- PP - Pressure
- PT - Pressure
- PU - Pressure
- PV - Pressure
- PW - Pressure
- PX - Pressure
- PY - Pressure
- PZ - Pressure

Many plants use combustion additives

Capacity, gpm	BOILER FEED PUMPS				HEATERS				FUEL AND EXHAUST DATA												PROJECT
	Discharge pressure, psig	Manufacturer	Flow control	Drive type	Hy. each motor or turbine	Manufacturer	Number	Feedwater exit temp., F	Max. deaerating pressure, psig	Manufacturer	Fuel type	Flow rate, gpm	Flow rate, gpm	Flow rate, gpm	Flow rate, gpm	Flow rate, gpm	Flow rate, gpm	Flow rate, gpm	Flow rate, gpm	Flow rate, gpm	
1700	4850	WO	S,HyC	MTS,T	24,000	GE	15	550	175	FW,BLM,GW	C	11.5	8500	2.75	N	Ret,Air	CV	EI	BU	1000	1
2100	3530	...	S	T	17,500	GE	11	484	97.6	YU	C	10.48	8000	4.71	N	Ret,Air	DP	EI	BP	950	2
2708	4500	WO	S	T	20,800	DL	8	553	80	CHH,FW	C	12.3	8850	1	N	Ret,Air	CV	EI	WP	800	3
12,650	4700	DL	...	T	43,000	DL	7	499	150	CHH	C	12.02	9400	0	N	Ret,Air	CV	EI	RC	1000	4
6650	4650	BJ	S	T	21,575	WE	7	500	150	GW	C	12	...	...	N	Ret,Air	CV	EI	RC	1000	5
6650	4470	BJ	S	T	21,575	GE	7	495	...	SWE,YU	C	12	...	...	N	Ret,Air	CV	EI	BP	750	6
6780	2840	PP	S	T	14,485	WE	7	510	59.4	WE	C	8.1	9700	0.8	N	Ret,Air	DP	EI	RC	470	7
5100	3575	PP	S	T	15,000	WE	7	165	479	YU,CHH	C	10.46	9203	1.54	N	Ret,Air	DP	EI	RC	605	8
6080	4480	WO	S	T	18,750	GE	8	543	170	FW,CHH	C	12.1	8750	...	N	Ret,Air	DP	EI	RC	600	9
2570	3080	DL	...	T	...	DL	7	475	65.7	YU,CHH	C	12.15	9100	1.5	N	Ret,Air	DP	EI	RC	550	10
...	...	...	S,HyC	T,M	...	BB	7	499	193	...	C	11.5	...	...	N	Ret,Air	DP	EI	RC	...	11
3652	4900	PP	Reg,S	T,M	12,500/9000	GE,AC	7	408	176.5	YU	C	10.0	9384	1.5	N	Ret,Air	CV	EI	BP	500	12
4762	3140	DL	S	T	9344	WE	7	503	174	WE	C	10.05	9250	...	N	Ret,Air	CV	EI	BP	500	13
4000	2300	IR	S	T	12,000	GE	5	494	100	YU,CHH	C	10.15	9300	2.24	N	Ret,Air	CV	EI	BP	500	14
...	...	...	...	...	...	...	...	...	...	...	C	10.15	9300	2.24	N	Ret,Air	CV	EI	BP	500	15
23000	4043	...	S	T	...	BB	7	500	48.5	...	C	10.7	8800	2.5	N	Ret,Air	DP	EI	RC	334	16
4185	2964	...	S,HyC	MTS,M	9000	...	7	485	145	...	C	11.1	8115	...	N	Ret,Air	DP	EI	RC	345	17
...	...	...	...	...	...	...	7	470	...	...	C	12.2	9281	2.75	N	Ret,Air	DP	EI	RC	400	18
23310	4700	DL	Reg,S	T,M	10,960/5000	GE	8	533	108.2	STW,WO,FW	C	12	8780	...	N	Ret,Air	DP	EI	RC	300	19
2513	2513	PP	S,HyC	T,M	4900/9150	GE	6	465	150	YU,CHH	C	10.4	9370	...	N	Ret,Air	DP	EI	RC	362	20
...	...	...	...	...	...	...	...	...	...	...	C	11.3	9300	...	N	Ret,Air	CV	EI	RC	600	21
...	...	...	...	...	...	...	...	...	...	...	C	10.6	9100	1.2	N	Ret,Air	CV	EI	RC	300	22
...	...	...	...	...	...	...	...	...	...	...	C	10.67	7754	4.0	N	Ret,Air	DP	EI	WP	700	23
...	...	...	...	...	...	...	...	...	...	...	C	10.4	...	...	N	Ret,Air	DP	EI	WP	700	24
...	...	...	...	...	...	...	...	...	...	...	C	10.08	9120	...	N	Ret,Air	CV	EI	...	187	25
...	...	...	...	...	...	...	...	...	...	...	C	10.9	981	...	N	Ret,Air	DP	EI	...	...	26
...	...	...	...	...	...	...	...	...	...	...	C	10.4	9516	...	N	Ret,Air	DP	EI	...	149.5	27
...	...	...	...	...	...	...	...	...	...	...	C	10.2	8500	...	N	Ret,Air	DP	EI	...	...	28
...	...	...	...	...	...	...	...	...	...	...	C	10.3	8611	2	N	Ret,Air	DP	EI	...	...	29
...	...	...	...	...	...	...	...	...	...	...	C	11.6	10,400	4.5	N	Ret,Air	DP	EI	AT	250	30
...	...	...	...	...	...	...	...	...	...	...	C	11.2	9600	6.1	N	Ret,Air	CV	EI	RC	...	31
...	...	...	...	...	...	...	...	...	...	...	C	1.0	9900	...	N	Ret,Air	DP	EI	...	120	32
...	...	...	...	...	...	...	...	...	...	...	C	10.2	8500	...	N	Ret,Air	CV	EI	...	150	33
...	...	...	...	...	...	...	...	...	...	...	C	10.6	10,200	1	N	Ret,Air	CV	EI	...	200	34
...	...	...	...	...	...	...	...	...	...	...	C	10.5	107	2.3	N	Ret,Air	DP	EI	...	200	35
...	...	...	...	...	...	...	...	...	...	...	C	1.03	12,570	...	N	Ret,Air	DP	EI	...	...	36
...	...	...	...	...	...	...	...	...	...	...	C	10.5	...	3.5	N	Ret,Air	HF	EI	WCH	850	37
...	...	...	...	...	...	...	...	...	...	...	C	10.36	...	2.0	NH ₃	Ret,Air	DP	EI	MHI	656	38
...	...	...	...	...	...	...	...	...	...	...	C	10.36	...	2.2	NH ₃	Ret,Air	DP	EI	MHI	656.2	39
...	...	...	...	...	...	...	...	...	...	...	C	9.14	7630	2.7	N	Ret,Air	CLY	EI	HOW	600	40
...	...	...	...	...	...	...	...	...	...	...	C	10.7/15.1	...	3.0/2.75	N	Ret,Air	MHI	EI	...	...	41
...	...	...	...	...	...	...	...	...	...	...	C	10.5	...	4.5	N	Ret,Air	CLY	Me	HOW	700	42
...	...	...	...	...	...	...	...	...	...	...	C	10.5	...	4	N	Ret,Air	CLY	Me	D.L.C	650	43
...	...	...	...	...	...	...	...	...	...	...	C	10.5	8250	4	N	Ret,Air	HF	EI	HOW	650	44
...	...	...	...	...	...	...	...	...	...	...	C	10.0	9400	2.5	N	Ret,Air	MHI	EI	...	300	45
...	...	...	...	...	...	...	...	...	...	...	C	10.0	9100	3.5	N	Ret,Air	MHI	EI	...	...	46
...	...	...	...	...	...	...	...	...	...	...	C	10.6	7600	3.0	N	Ret,Air	MHI	Me	MHI	490	47
...	...	...	...	...	...	...	...	...	...	...	C	10.54	...	3.5	N	Ret,Air	MHI	Me	MHI	590	48
...	...	...	...	...	...	...	...	...	...	...	C	10	...	3.0	N	Ret,Air	MHI	...	...	246	49
...	...	...	...	...	...	...	...	...	...	...	C	10.5	9397	...	N	Ret,Air	DP	N	...	394	50
...	...	...	...	...	...	...	...	...	...	...	C	10.8,10.085	8770	3	N	Ret,Air	MHI	...	...	394	51

Single cylinder
Steam jet
Softener
Stainless steel
Slag tap
Steam
Turbine
Fitting burners
Add-on compound
Flare control
Bottom
Water jet
Water spray

FOOTNOTES

- Joint ownership: Baltimore Gas & Electric Co., Delmarva Power & Light Co., United Gas Improvement Co., Metropolitan Edison Co., Pennsylvania Power & Light Co., Philadelphia Electric Co., Potomac Electric Power Co., Public Service Electric & Gas Co., Atlantic City Electric Co.
- Data refers to each unit.
- Outdoor.
- Total from two boilers.

- Joint ownership: Central Hudson Gas & Electric Corp. Consolidated Edison Co. of N.Y., Niagara Mohawk Power Corp.
- Turbine speed control.
- Two-motor tandem drive.
- Also, fuel feedwater ratio control.
- Variable-position rack blade control.
- Also, nickel-plated air cooler tubes.
- Residuals crude oil.
- Plans call for Me(OH)₂ additive to be introduced in fuel at burner.
- Joint ownership: Cleveland Electric Illuminating Co., Duquesne Light Co.

- Me(OH)₂ and NH₃.
- And two spare motors, 3500 hp each.
- Gas main fuel; can also burn oil.
- Oil main fuel; can also burn gas.
- Added in line at air heater outlet.
- Oil: 16,400 Blu/b; come over gas: 500 Blu/b; blast furnace gas: 80 Blu/b.
- NH₃ added at gas duct.
- For makeup system, Condensate system by Canusa Seisaku Co., Ltd.
- Tide additive not reported.

2 NUCLEAR-POWERED CENTRAL STATIONS

750-MW BWR is largest reactor

PROJECT	COMPANY	PLANT NAME	LOCATION	CONSULTING ENGINEER	Unit number	Date commercial operation	Initial net capacity, MW	Initial gross capacity, MW
UNITED STATES								
1	Detroit Edison Co.	Enrico Fermi	Monroe, Mich.	Self and Sargent & Lundy	1	2-74	1127	1153
2	Consolidated Edison Co. of N.Y., Inc.	Verplank	Verplank, N.Y.	None	1	1973	1115	1148
3	Portland General Electric Co.	Trojan	Prescott, Ore.	Bechtel Corp.	1	9-74	1106	1151
4	Consolidated Edison Co. of N.Y., Inc.	Indian Point	Bucchanan, N.Y.	Westinghouse Electric Corp. (unkey)	3	1971	965	1058
5	Toledo Edison Co., Cleveland Electric Illuminating Co.	Davis-Besse	Oak Harbor, Ohio	Bechtel Corp.	1	12-74	872	906
6	Alabama Power Co.	SEALA	Vic of Dothan, Ala.	Southern Services, Inc. Bechtel Corp.	1	1975	929	961
7	Public Service Co. of NH; United Illuminating Co.	Seabrook	Seabrook, N.H.	Esasco Services, Inc.	1	10-74	860	860
8	Carolina Power & Light Co.	Brunswick	Southport, N.C.	United Engineers & Constructors, Inc.	1, 2	7-73	822	849
9	Power Authority of the State of N.Y.	FitzPatrick	Oswego, N.Y.	Stone & Webster Engrg Corp.	1	5-73	821	850
10	Long Island Lighting Co.	Shoreham	Brookhaven, N.Y.	Stone & Webster Engrg Corp.	1	5-75	519	849
11	Consumers Public Power District	Cooper	Brownville, Neb.	Burns & Roe, Inc.	1	4-72	301	836
12	Metropolitan Edison Co.	Three Mile Island	Lancaster, Pa.	Burns & Roe, Inc.	2	1973	300	845
13	Florida Power & Light Co.	Hutchinson Island	Hutchinson Island, Fla.	Esasco Services, Inc.	1	5-73	522	550
14	Iowa Electric Light & Power Co.	Duane Arnold	Pyro, Iowa	Bechtel Corp.	1	12-73	522	550
15	Omaha Public Power District	Fort Calhoun	Fort Calhoun, Neb.	Gibbs, Hill, Dunham & Richardson, Inc.	1	5-71	457	481
WESTERN EUROPE								
16	Swedish State Power Board	Ringsås	Varo, Sweden	British Nuclear Des & Constr Ltd.	1	1973	750	790
17	Central Electricity Generating Board	Hartlepool	Durham County, England	British Nuclear Des & Constr Ltd.	1, 2	10-73, 7-74	625	660
18	Central Electricity Generating Board	Hinkley Point B	Somerset, England	The Nuclear Power Group Ltd.	3, 4	1972	625	660
19	South of Scotland Electricity Board	Hunterston B	West Kilbridge, Scotland	The Nuclear Power Group Ltd.	3, 4	1972	625	660
20	Central Electricity Generating Board	Wylfa	Anglesey, England	British Nuclear Des & Constr Ltd.	1, 2	2-70, 5-70	590	669
21	Svenska Kraftföretaget	Barsebäck	Vic of Malmö, Sweden	Self	1	1975	580	600
22	Central Electricity Generating Board	Dungeness A	Dungeness, England	The Nuclear Power Group Ltd.	1, 2	12-65	550	571
23	Electricité de France	Bugey	Bugey, France	Self	1	1971	545	560
24	Oskarshamn Kraftverk AB (OKG)	Oskarshamn	Simpevarp, Sweden	Self	2	1974	530	550
25	Electricité de France	St. Laurent	St. Laurent des Aux, France	Self	2	1970	516	530
26	Electricité de France	St. Laurent	St. Laurent des Aux, France	Self	1	3-69	487	500
27	Electricité de France	Chinon	Chinon, France	Self	3	10-67	480	500
28	Oskarshamn Kraftverk AB (OKG)	Oskarshamn	Simpevarp, Sweden	Self	1	1970	440	460
29	Nordostschweizerische Kraftwerke (NOK)	Beznau	Beznau Island, Switzerland	Gibbs & Hill, Inc.	1	11-69	350	365
30	Central Electricity Generating Board	Oldbury	Gloucestershire, England	The Nuclear Power Group Ltd.	1, 2	8-67, 12-67	300	313
31	Central Electricity Generating Board	Sizewell A	Suffolk, England	British Nuclear Des & Constr Ltd.	2	12-66	290	324
32	Central Electricity Generating Board	Berkely	Gloucestershire, England	The Nuclear Power Group Ltd.	1, 2	11-62	276	320
33	United Kingdom Atomic Energy Authority	PF4	Dumfries, Scotland	The Nuclear Power Group Ltd.	1	1972	254	270
34	Central Electricity Generating Board	Hinkley Point A	Somerset, England	British Nuclear Des & Constr Ltd.	2	5-65	250	276
35	Société d'Énergie Nucléaire Franco-Belge des Ardennes	Chooz	Chooz, France	Self	1	4-67	245	262
36	Ente Nazionale per l'Energia Elettrica	Latina	Latina, Italy	The Nuclear Power Group Ltd.	1	1-64	200	210
37	Electricité de France	Chinon	Chinon, France	Self and Commissariat à l'Énergie Atomique	2	1965	200	230
38	South of Scotland Electricity Board	Hunterston A	Ayrshire, Scotland	General Electric Co. of Eng; Simon-Carves Ltd	1, 2	2-64, 11-64	162	184
39	Union Electrica Magdalena	Jose Cabrera	Zorita, Spain	Gibbs & Hill, Inc.	1	4-69	153	160
40	Swedish State Power Board	Marviken	Marviken, Sweden	Self	1	1970	132	133
41	United Kingdom Atomic Energy Authority	SGHWR	Winfrith, England	Self	1	1-68	91	100
42	Electricité de France	Chinon	Chinon, France	Self and Commissariat à l'Énergie Atomique	2	5-63	50	70
43	Kernkraftwerk Bielefeld (KWB)	MZFR	Leopoldsdalen, Germany	Self	1	12-66	51	58
44	United Kingdom Atomic Energy Authority	C Calder Hall	Cumberland, Eng and	None	1	10-56	40	45
45	United Kingdom Atomic Energy Authority	Chattercross	Annan, Scotland	Mez & McGelehan	1	1959	40	45
46	United Kingdom Atomic Energy Authority	Windscale AGR	Windscale, England	Self	1	2-63	27	33
47	Swedish State Power Board	Agesta	Stockholm, Sweden	Self	1	1964	9	10

MANUFACTURERS

ACE - Ateliers de Constructions
Electriques de Charleroi
AE - Altmann-Svenska Elektriska AB
AEI - Associated Electrical Industries Ltd
ALS - Societe Astrom
AWL - Societe Ansaldo Loria & Cie
BAZ - Empresa Nacional Bazan de
Construções Navais Militares
SA, Buzini
BBL - Brown Boveri & Co. Ltd
BGE - General Electric Co. Ltd
BJ - Byron-Jackson Pumps, Inc.
BM - Bailey Meter Co.
BNO - British Nuclear Design & Con-
struction Ltd
BOB - Wm. Boby & Co. Ltd

BPC - Bingham Pump Co.
BW - Babcock & Wilcox Co.
BWF - Babcock & Wilcox France
BWL - Babcock & Wilcox Ltd
CAP - C. A. Parsons, Ltd
CCD - Compagnie Centrale D'Etudes
Industrielles
CE - Combustion Engineering, Inc.
CIT - Compagnie Industrielle des Tele-
communications
CLC - Clarke Chapman & Co. Ltd
CN - Constructora Nacional de Maquinaria
Electrica SA (Cenemesa)
COC - Cochran Div., Crane Co.
DEL - Societe des Condenseurs Delas
OGG - Degremont Cottrell, Inc.
OGE - Cie Degremont
DIG - Digital Equipment Corp.

DL - De Laval Turbine Inc.
EDF - Electricite de France
EE - English Electric Co. Ltd
EEM - Etablissements de la Cie Electro-
Mecanique
F - The Foxboro Co.
FA - Faurey Engineering Ltd
FAC - Forges de Ateliers de Construction
Electrique de Jumont
FER - Ferranti, Ltd
FW - Foster Wheeler Corp.
GE - General Electric Co.
GEE - The General Electric and English
Electric Companies Ltd
/General Electric Co. Ltd, English
Electric Co. Ltd and Associated
Electrical Industries Ltd
GEL - Gelman Instrument Co., Inc.

GH - Gutehoffnungshütte
GIW - G. & J. Weir, Ltd.
GPC - Grube Parsons & Co.
GSN - Groupeement des Societes
GUI - Etablissements P. Gu
GW - Gravel Water Corp.
H - Honeywell Inc.
HE - Harland Engineering
HH - Hick Hargreaves & Co.
HON - James Howden & Co.
HT - Hungerford & Taylor
HTL - Hayward-Tyler & Co.
IC - International Combustion
IR - Ingersoll-Rand Co.
JT - John Thompson Works
KSB - Klem, Schanzle & Co.
LAW - Los Angeles Valley
LDC - Lancashire Dynam

GE
GE
VE
VE
BN
VE
BN
GE
GE

2 AE
 3 CE
 4 CE
 5 CE
 6 CE
 7 CE
 8 CE
 9 CE
 10 CE
 11 CE
 12 CE
 13 CE
 14 CE
 15 CE
 16 CE
 17 CE
 18 CE
 19 CE
 20 CE
 21 CE
 22 CE
 23 CE
 24 CE
 25 CE
 26 CE
 27 CE
 28 CE
 29 CE
 30 CE
 31 CE
 32 CE
 33 CE
 34 CE
 35 CE
 36 CE
 37 CE
 38 CE
 39 CE
 40 CE
 41 CE
 42 CE
 43 CE
 44 CE
 45 CE
 46 CE
 47 CE
 48 CE
 49 CE
 50 CE
 51 CE
 52 CE
 53 CE
 54 CE
 55 CE
 56 CE
 57 CE
 58 CE
 59 CE
 60 CE
 61 CE
 62 CE
 63 CE
 64 CE
 65 CE
 66 CE
 67 CE
 68 CE
 69 CE
 70 CE
 71 CE
 72 CE
 73 CE
 74 CE
 75 CE
 76 CE
 77 CE
 78 CE
 79 CE
 80 CE
 81 CE
 82 CE
 83 CE
 84 CE
 85 CE
 86 CE
 87 CE
 88 CE
 89 CE
 90 CE
 91 CE
 92 CE
 93 CE
 94 CE
 95 CE
 96 CE
 97 CE
 98 CE
 99 CE
 100 CE
 101 CE
 102 CE
 103 CE
 104 CE
 105 CE
 106 CE
 107 CE
 108 CE
 109 CE
 110 CE
 111 CE
 112 CE
 113 CE
 114 CE
 115 CE
 116 CE
 117 CE
 118 CE
 119 CE
 120 CE
 121 CE
 122 CE
 123 CE
 124 CE
 125 CE
 126 CE
 127 CE
 128 CE
 129 CE
 130 CE
 131 CE
 132 CE
 133 CE
 134 CE
 135 CE
 136 CE
 137 CE
 138 CE
 139 CE
 140 CE
 141 CE
 142 CE
 143 CE
 144 CE
 145 CE
 146 CE
 147 CE
 148 CE
 149 CE
 150 CE
 151 CE
 152 CE
 153 CE
 154 CE
 155 CE
 156 CE
 157 CE
 158 CE
 159 CE
 160 CE
 161 CE
 162 CE
 163 CE
 164 CE
 165 CE
 166 CE
 167 CE
 168 CE
 169 CE
 170 CE
 171 CE
 172 CE
 173 CE
 174 CE
 175 CE
 176 CE
 177 CE
 178 CE
 179 CE
 180 CE
 181 CE
 182 CE
 183 CE
 184 CE
 185 CE
 186 CE
 187 CE
 188 CE
 189 CE
 190 CE
 191 CE
 192 CE
 193 CE
 194 CE
 195 CE
 196 CE
 197 CE
 198 CE
 199 CE
 200 CE
 201 CE
 202 CE
 203 CE
 204 CE
 205 CE
 206 CE
 207 CE
 208 CE
 209 CE
 210 CE
 211 CE
 212 CE
 213 CE
 214 CE
 215 CE
 216 CE
 217 CE
 218 CE
 219 CE
 220 CE
 221 CE
 222 CE
 223 CE
 224 CE
 225 CE
 226 CE
 227 CE
 228 CE
 229 CE
 230 CE
 231 CE
 232 CE
 233 CE
 234 CE
 235 CE
 236 CE
 237 CE
 238 CE
 239 CE
 240 CE
 241 CE
 242 CE
 243 CE
 244 CE
 245 CE
 246 CE
 247 CE
 248 CE
 249 CE
 250 CE
 251 CE
 252 CE
 253 CE
 254 CE
 255 CE
 256 CE
 257 CE
 258 CE
 259 CE
 260 CE
 261 CE
 262 CE
 263 CE
 264 CE
 265 CE
 266 CE
 267 CE
 268 CE
 269 CE
 270 CE
 271 CE
 272 CE
 273 CE
 274 CE
 275 CE
 276 CE
 277 CE
 278 CE
 279 CE
 280 CE
 281 CE
 282 CE
 283 CE
 284 CE
 285 CE
 286 CE
 287 CE
 288 CE
 289 CE
 290 CE
 291 CE
 292 CE
 293 CE
 294 CE
 295 CE
 296 CE
 297 CE
 298 CE
 299 CE
 300 CE
 301 CE
 302 CE
 303 CE
 304 CE
 305 CE
 306 CE
 307 CE
 308 CE
 309 CE
 310 CE
 311 CE
 312 CE
 313 CE
 314 CE
 315 CE
 316 CE
 317 CE
 318 CE
 319 CE
 320 CE
 321 CE
 322 CE
 323 CE
 324 CE
 325 CE
 326 CE
 327 CE
 328 CE
 329 CE
 330 CE
 331 CE
 332 CE
 333 CE
 334 CE
 335 CE
 336 CE
 337 CE
 338 CE
 339 CE
 340 CE
 341 CE
 342 CE
 343 CE
 344 CE
 345 CE
 346 CE
 347 CE
 348 CE
 349 CE
 350 CE
 351 CE
 352 CE
 353 CE
 354 CE
 355 CE
 356 CE
 357 CE
 358 CE
 359 CE
 360 CE
 361 CE
 362 CE
 363 CE
 364 CE
 365 CE
 366 CE
 367 CE
 368 CE
 369 CE
 370 CE
 371 CE
 372 CE
 373 CE
 374 CE
 375 CE
 376 CE
 377 CE
 378 CE
 379 CE
 380 CE
 381 CE
 382 CE
 383 CE
 384 CE
 385 CE
 386 CE
 387 CE
 388 CE
 389 CE
 390 CE
 391 CE
 392 CE
 393 CE
 394 CE
 395 CE
 396 CE
 397 CE
 398 CE
 399 CE
 400 CE
 401 CE
 402 CE
 403 CE
 404 CE
 405 CE
 406 CE
 407 CE
 408 CE
 409 CE
 410 CE
 411 CE
 412 CE
 413 CE
 414 CE
 415 CE
 416 CE
 417 CE
 418 CE
 419 CE
 420 CE
 421 CE
 422 CE
 423 CE
 424 CE
 425 CE
 426 CE
 427 CE
 428 CE
 429 CE
 430 CE
 431 CE
 432 CE
 433 CE
 434 CE
 435 CE
 436 CE
 437 CE
 438 CE
 439 CE
 440 CE
 441 CE
 442 CE
 443 CE
 444 CE
 445 CE
 446 CE
 447 CE
 448 CE
 449 CE
 450 CE
 451 CE
 452 CE
 453 CE
 454 CE
 455 CE
 456 CE
 457 CE
 458 CE
 459 CE
 460 CE
 461 CE
 462 CE
 463 CE
 464 CE
 465 CE
 466 CE
 467 CE
 468

SYMBOLS USED ABOVE

ACo	Air cooled
Ad	Admiralty brass
Adl	Admiralty, admiralty
AGR	Advanced gas cooled reactor
Ag	Silver
Al	Aluminium
Am	Amure
Bay	Bay or estuary
BW	Boiling water reactor
By	By pass flow (dilatant)
C	Canal system
CC	Cross compound
CC	Cross flow

Hcp	Vertical coil pad heater
Hdp	Holding
Hnc	Hydraulic coupling
Hpd	Hydrazine
Hyp	Hypnotic
Iai	Indoor
Int	Intermittent
Iex	Ion exchange
Ios	Inlet-outlet separation
Jst	Steam jet
Lfb	Land burial
Lw	Leak
M	Motor
Mfl	Mechanical filtration
Mg	Magnesium
Mt	Metal
Mst	Steam heating steel
Nv	Noise

THE UNIVERSITY OF CHICAGO

2 NUCLEAR-POWERED CENTRAL STATIONS

Thermal effects draw gre

PROJECT	FUEL							TURBINES							CONDENSERS				FEED WATER	CONDENSATE	COOLING					
	Chemical form	Physical form	Max burnup, MW days/metric ton	Max clad surface temp, F	Enrichment by isotope, percent	Avg power density, kW/kg fuel	Avg heat flow, 1000 Btu/hr/sq ft	Cladding material	Number per unit	Capacity each, MW	Type	Number of exhausts	Number of bleed points	Exhaust pressure, in. Hg abs	Manufacturer	Surface, 1000 sq ft	Number of water passes	Tube material	Air receiver	Manufacturer	Makeup treatment	Manufacturer	Type of treatment	Manufacturer	Source	Mo effect on flushing
UNITED STATES																										
1	UO ₂	Pel	24,300	558	2.25 ¹²	20.0	163	Zry-2	1	1292	TC,ldr	3	7	1.5	EE	725	2	Ad	J	De	De	De	De	De	Pon	Yes
2	UO ₂	Pel	27,550	558	2.20 ¹²	22	163	Zry-2	1	1148	TC	5	6	2	AEI	725	1	Ad	J	De	FIE	De	De	Riv	Yes	
3	UO ₂	Pel	31,300	657	2.04,2.58,3.20	39.1	217	Zry	1	1151	TC,ldr	4	7	1.5	WE	918	1	Ad	J	De	FIE	De	De	Riv	Yes	
4	UO ₂	Pel	31,300	657	2.2,2.7,3.2	35	193	Zry-4	1	1068	TC	6	6	1.5	WE	918	1	Ad	J	WE	FIE	De	De	Riv	Yes	
5	UO ₂	Pel	27,300	558	2.32,2.32,2.58	31.8	176	Zry-4	1	915	TC,ldr	4	6	1.5	GE	918	1	Ad	J	De	De	De	De	Pon	Yes	
6	UO ₂	Pel	33,300	657	2.3,2.5,3.2	39.1	208	Zry-4	1	961	TC,ldr	4	6	1.5	WE	918	1	Ad	J	De	De	De	De	Riv	Yes	
7	UO ₂	Pel	33,300	657	2.25 ¹²	35	165	Zry-2	1	972	TC,ldr	2	6	2	WE	918	1	Ad	J	De	De	De	De	Riv	Yes	
8	UO ₂	Pel	33,300	657	2.25 ¹²	35	165	Zry-2	1	949	TC,ldr	4	6	1.5	GE	918	1	Ad	J	De	De	De	De	Riv	Yes	
9	UO ₂	Pel	25,300	558	2.3 ¹²	20.2	165	Zry-2	1	984	TC	2	6	1.5	GE	420	1	CuM	J	De	De	De	De	Riv	Yes	
10	UO ₂	Pel	25,300	558	2.3 ¹²	20.2	165	Zry-2	1	984	TC	2	6	1.5	GE	420	1	CuM	J	De	De	De	De	Riv	Yes	
11	UO ₂	Pel	20,950	558	2.15,2.58,2.52	22.3	165	Zry-2	1	836	TC	4	5	2	WE	465	1	SS	J	MS	De	DGC	Pdx	SW	Riv	Yes
12	UO ₂	Pel	29,200	654	2.29,2.64,2.90	28.8	168	Zry	1	965	TC,ldr	4	6	2	WE	610	1	SS	J	MS	De	DGC	Pdx	SW	Riv	Yes
13	UO ₂	Pel	29,200	654	1.30,1.48,2.33	25	170	Zry-4	1	853	TC,ldr	4	5	2.5	WE	610	1	SS	J	MS	De	DGC	Pdx	SW	Riv	Yes
14	UO ₂	Pel	18,350	558	2.25 ¹²	22.2	164	Zry-2	1	597	TC,ldr	2	6	1.5	GE	390	1	SS	J	MS	De	DGC	Pdx	SW	Riv	Yes
15	UO ₂	Pel	27,300	648	1.6,2.10,2.95	28.1	164	Zry-4	1	901	TC	1	6	1.5	GE	350	2	SS	J	MS	De	DGC	Pdx	SW	Riv	Yes
WESTERN EUROPE																										
16	UO ₂	Pel	17,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
17	UO ₂	Pel	17,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
18	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
19	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
20	U	CuR	3125	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
21	UO ₂	Pel	17,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
22	UO ₂	Pel	17,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
23	UO ₂	Pel	17,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
24	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
25	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
26	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
27	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
28	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
29	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
30	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
31	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
32	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
33	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
34	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
35	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
36	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
37	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
38	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
39	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
40	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
41	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
42	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
43	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
44	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
45	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
46	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes
47	UO ₂	Pel	18,300	558	1.7,2.5,3.0	17.3	120	Zry	2	390	TC,ldr	6	4	1	EE	390	1	AIB	Ro	J	STA	De	De	Pdx	Ocn	Yes

N	None	Riv	Stream or river
Na	Sodium	Ro	Rotary pump or blower
NaK	Natural circulation	S	Speed control
NaK	Sodium-potassium alloy	SB	Sea burial
Nat	Natural uranium	SC	Single cylinder
NiO	Niobium	SF	Sea air filter
Ocn	Ocean	SGR	Steam-generating heavy-water reactor
Odr	Outdoor	SH	Shell and tube
Onc	Once through	SMA	Semi-annually
OSS	On-site shipment	SDR	Semi-outdoor
Pdx	Pressure-on exchange	SR	Solid rod
Pel	Pellet	SSI	Stainless steel
PFI	Precoat filtration	Stg	Storage
Pon	Lake or pond, retaining pond	T	Turbine
POO	Post-operational	TC	Tandem-compound
PRO	Pre-operational	U	Uranium
PWR	Pressurized water reactor	UO ₂	Uranium dioxide
Reg	Regulator control	Var	Various

Vig	Variable inlet guide vanes	10	Also
VU	Vertical U-tube	11	Also
WdL	Ward-Leonard drive	12	Also
Zr	Zirconium	13	Also
Zry	Zircaloy	14	Also

1	Average burnup (equilibrium cycle)	16	Also
2	Average fuel surface temperature	17	Also
3	Each double flow	18	Also
4	Also holdup, filtration, dilution	19	Also
5	Also evaporation, dilution	20	Also
6	Data refer to each loop	21	Also
7	Dual pressure	22	Also
8	Wm. integral moisture separators		
9	Also holdup, charcoal, dilution		

Attention in U. S., little in Europe

WATER		CONTROL OF RADIOACTIVITY										GENERATORS		CONTROLS MFRS							PLANT NAME	PROJECT
Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study	Thermal effluent study		
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Enrico Fermi	1
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Verplanck	2
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Trojan	3
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Indian Point	4
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Davis-Besse	5
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	SEALA	6
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Seabrook	7
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Brunswick	8
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	FitzPatrick	9
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Shoreham	10
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Coores	11
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Three Mile Island	12
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Hutchinson Island	13
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Duane Arnold	14
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Fort Calhoun	15
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Ringhals	16
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Hälsjö	17
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Hinkley Point B	18
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Hunterston B	19
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Wylfa	20
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Baseback	21
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Dungeness A	22
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Bugey	23
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Oskarshamn	24
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	St. Laurent	25
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	St. Laurent	26
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Chinnon	27
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Oskarshamn	28
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Beznau	29
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Oldbury	30
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Sizewell A	31
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Berkeley	32
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	PFR	33
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Hinkley Point A	34
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Chooz	35
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Latina	36
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Chinnon	37
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Hunterston A	38
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Jose Cabrera	39
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Marviken	40
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	SGHWR	41
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Chinnon	42
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	MZFR	43
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Calder Hall	44
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Chapelcross	45
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Winoseale AGR	46
Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Agesta	47

38	Morpholine injection, phosphate	50	Two pumps turbine driven, two	63	Also holdup, filtration
39	dosing	51	motor driven	64	Also hydrazine, ammonia
40	Also ion exchange, drumming	52	Shutted	65	By canal from the Mediterranean Sea
41	Also precoat filtration, resin beds,	53	Under ground reservoir fed by springs	66	Spectral brass: Solis 71
42	diamaceous earth	54	Plus exponential fuel	67	Also delivery to Gesellschaft fuer
43	Also precipitation, dilution	55	Shut in concentric tubes	68	Kernforschung control treatment
44	Denaturation and evaporation	56	2 1/2 x 2 3/4 x 1.98	69	Boiled
45	70/30 brass	57	Striped shell, triple pressure	70	Flatbed/wellhead zones
46	Release from submerged ports	58	Condenser, surface areas by	71	Also holdup, diaphragm
47	Oxygen storage	59	section: 333/194/304	72	Also evaporation, filtration
48	No continuous monitors	60	Divided water boxes, series pro-	73	Also separate filters, two-stage
49	Also separate filters, and hyd-	61	ducting water flow	74	Two-stage
50	Also mechanical filtration	62	30/10 copper-nickel tubes in air		
			removal section		
			Diffusion outlet pipe		

4 GAS TURBINES

Many utility gas turbines

Table 1 United States and Canadian utilities and industrial plants

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Manufacturer	Number of units	Year of initial operation	RATING						Inlet temperature, °F
							MW, normal	1000 hp, normal	Air temperature, normal, °F	MW, maximum	1000 hp, maximum	Air temperature, for maximum, °F	
UNITED STATES AND CANADA, ELECTRIC UTILITIES													
1	Boston Edison Co.	Boston, Mass.		EE	3	70	59	....	50	73	....	30	170
2	Long Island Lighting Co.	Shoreham, N.Y.		GE	1	71	48	....	80	63	....	0	170
3	Consumers Power Co.	Flint, Mich.		WD	4	59-70	36	....	90	40	....	....	100
4	Duke Power Co.	Mount Holly, N.C.		WD	4	59	32	....	80	36	....	....	150
5	Duke Power Co.	Dan River, N.C.		WE	1	59	29	....	....	30	....	....	172
6	Virginia Electric & Power Co.	Portsmouth, Va.		WE	4	59	25	....	....	....	....	....	172
7	Consolidated Edison Co.	Astoria, N.Y.		PW	16	70	22.1	....	80	27	....	....	172
8	Atlantic City Electric Co.	Atlantic City, N.J.		PW	3	58	21.3	....	80	24	....	....	172
9	Cincinnati Gas & Electric Co.	Monroe, Ohio		WD	2	59	21.3	....	80	25	....	....	100
10	South Carolina Electric & Gas Co.	Uquhart, S.C.		WE	2	59	21	....	....	....	....	....	172
11	Wisconsin Electric Power Co.	Port Washington, Wis.		WE	1	59	21	....	....	....	....	....	172
12	Oklahoma Gas & Electric Co.	Seminole, Okla.		GE	1	70	19.3	....	80	27.3	....	0	172
13	Kentucky Utilities Co.	Roeding, Ky.		GE	3	70	17.8	....	80	22	....	0	172
14	Public Service Electric & Gas Co.	Kearny, N.J.		WD	15	59	17.5	....	80	....	....	....	172
15	Southern California Edison Co.	Onard, Calif.		WD	8	70	17.5	....	80	....	....	....	172
16	Commonwealth Edison Co.	Chicago, Ill.	Pioneer Service & Engineering Co.	GE	12	59	17.4	....	90	18	....	0	172
17	Wisconsin Power & Light Co.	Turtle Station, Wis.		GE	1	58	17	....	90	19.6	....	0	172
18	San Diego Gas & Electric Co.	San Diego, Calif.	Pioneer Service & Engineering Co.	GE	5	59	17	....	90	20	....	50	172
19	Virginia Electric & Power Co.	Portsmouth, Va.		WE	3	59	15	....	....	....	....	....	172
20	Philadelphia Electric Co.	Delaware Station, Pa.		PW	3	59	15.3	....	80	....	....	....	172
21	Public Service Electric & Gas Co.	National Park, N.J.		PW	1	58	15.8	....	90	....	....	....	172
22	Western Massachusetts Electric Co.	Lee, Mass.		PW	1	59	15.3	....	80	....	....	....	172
23	Chugach Electric Association, Inc.	Alaska	Tipsett & Gee	GE	2	59	15.6	....	40	17.45	....	40	172
24	Boston Edison Co.	Various		EE	6	59	13	....	90	14.8	....	....	172
25	Consolidated Edison Co.	Various		EE	2	59	12	....	80	13.6	....	....	172
26	Detroit Lakes Public Utilities Dept.	Detroit Lakes, Minn.	Pfeiffer & Shultz	WD	1	58	11.7	....	30	....	....	....	172
UNITED STATES AND CANADA, INDUSTRIAL PLANTS													
27	Dow Chemical Co.	Freeport, Texas		WE	5	59	38	....	90	44	....	....	172
28	Parish of Calcasieu	Lake Charles, La.		WD	3	70	16	....	80	17.5	....	....	172
29	Humble Oil & Refining Co.	Savannah, Texas		GE	1	59	15	....	80	19.4	....	0	172
30	Modell Oil Corp.	Texas (various)	Hudson Engineering	WE	2	59	....	21	....	....	....	....	172
31	Columbia Gulf Co.	Haltville, Texas		CBC	1	58	....	16	....	....	....	....	172
32	El Paso Natural Gas Co.	Blanco, N.M.		GE	1	59	....	15	30	....	20.4	0	172
33	Pacific Gas Transmission Co.	Various		CBC	4	59	....	12.1	80	....	15.5	25	172
34	Northern Illinois Gas Co.	Troy Grove, Ill.		CBC	1	59	....	12	80	....	15.2	40	172
35	Natural Gas Pipeline Co. of America	Various		CLA	3	59	....	12	90	....	....	....	172
36	Natural Gas Pipeline Co. of America	Various		IR	2	59	....	12	90	....	....	....	172
37	Texas Eastern Transmission Co.	Huntsville, Texas		GE	1	59	....	11.1	80	....	14.9	0	172
38	Columbia Gulf Co.	Hamshire, Texas		CBC	1	58	....	10.5	30	....	....	....	172
39	Michigan-Wisconsin Pipeline Co.	Delhi, La.		GE	1	59	....	7.5	90	....	10.7	0	172
40	Kansas-Nebraska Natural Gas Pipeline Co., Inc.	Scott City, Kan.		YM	1	59	....	5.6	90	....	7	26	172
41	Union Hospital	Terre Haute, Ind.	Swanichy Engineering Co.	AIR	9	59	....	4.5	80	....	4.95	....	172
42	Falcon Seaboard Co.	Gulf of Mexico		AIR	1	59	....	3.5	80	....	3.85	....	172
43	Atlantic Richfield Co.	Cook Inlet, Alaska		YM	2	58-59	3.25	....	30	4.07	....	26	172
44	Illinois Bell Telephone Co.	Chicago, Ill.	Holabird & Root	ALN	1	70	2.5	....	90	....	....	....	172
45	Western Electric Co.	Cleveland, Ohio		ALN	1	59	2.1	....	90	....	....	....	172
46	New York Telephone Co.	New York, N.Y.	Pope, Evans & Robbins	SO	4	59	0.82	....	80	....	....	....	172

MANUFACTURERS

AIR - Air Research Mfg. Co. Div. of Garrett Corp.
 ALN - Allison Div. General Motors Corp.
 BBS - Brown Boveri-Sulzer Turbomachinery Ltd.
 BRN - First Brno Engineering Works
 CBC - Cooper-Bessner Co.
 CLA - Clark Bros. Co.
 EE - English Electric-AEI Turbogenerators Ltd.

ESW - Escher Wyss Ltd.
 GE - General Electric Co.
 HIT - Hitachi Ltd.
 IR - Ingersoll-Rand Co.
 MHI - Mitsubishi Heavy Industries Ltd.
 NM - Nordberg Mfg. Co.
 PW - Pratt & Whitney Div. of United Aircraft Corp.
 RR - Rolls-Royce Ltd.

SO - Sulzer
 SSI - Solar Direct International
 STV - Sulzer-Widlo Corp.
 TSE - Tokyo Shibaura Electric Co. Ltd.
 WE - Westinghouse Electric Corp.
 WM - Westinghouse

4 GAS TURBINES

Some gas turbines will supply

Table 2 Overseas utilities and industrial plants

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Manufacturer	Number of units	Year of initial operation	RATING					
							MW, normal	1000 hp, normal	Air temperature, normal, F	MW, maximum	1000 hp, maximum	Air temperature, for maximum, F
OVERSEAS ELECTRIC UTILITIES												
47	Energieversorgung Schwaben	Marbach, Germany		BB	1	70	77.4	60				160
48	Svekraft AB	Malmö, Sweden		KU	2	70-71	56.5	41	60		29	147
49	Shikoku Electric Power Co.	Shikoku, Japan		MHI	1	70	34	41	35		32	145
50	Tokyo Electric Power Co.	Tokyo, Japan		MHI	1	69	30	68				150
51	Vienna Municipal Council	Vienna, Austria		BB	1	71	25.5		30			133
52	Hokkaido Electric Power Co.	Hokkaido, Japan		MHI	2	69	20	32				147
53	Hokkaido Electric Power Co.	Takigawa, Japan		HIT	1	69	19	50	20		32	177
54	Central Electricity Generating Board	Harlepool, England	Nuclear Design & Construction	RR	4	71	17.5	59			32	163
55	Electricity Generating Authority	Bangkok, Thailand	Black & Veatch International	HIT	4	69	16	100	20		32	177
56	Tsurusaki Ayodo Denkyoku	Tsurusaki, Japan		HIT	1	58	15.7	59	17		39	165
57	N.V. P.N.E.M. Brabant	Utrecht, Netherlands		BB	1	70	15.5	60				135
58	Bermuda Electric Light Co.	Bermuda		BB	1	70	14.6	80				135
59	Korea Electric Co.	Ulsan, Korea		TSE	6	68	14.5	80	15.3			140
60	Ryukyu Electric Power Co.	Okinawa, Japan		MHI	2	69	14.5	80				145
61	Kansai Electric Power Co.	Himeji, Japan		MHI	1	59	13	95				150
62	Kansai Electric Power Co.	Wakayama, Japan		MHI	1	70	13	95				150
63	U.S. Government	Philippines	Rogers Engineering	WO	1	69	10	80	13			100
64	Water & Power District Authority	West Pakistan	Electroconsult, Milan	BRN	1	70	9		10			130
65	Kansai Electric Power Co.	Osaka, Japan		TSE	1	68	8	95				145
66	Tokyo Electric Power Co.	Tokyo, Japan		MHI	1	58	7.5	59	9.3			145
OVERSEAS INDUSTRIAL PLANTS												
67	Occidental Petroleum Co.	Benghazi, Libya	Bechtel Corp.	WO	3	69		35	120		40	100
68	Emorosa Nacional del Petrol Magallanes	Punta Arenas, Chile	Fluor Corp.	BB	1	70		27	50			
69	Nihon Light Metal Co.	Hokkaido, Japan		MHI	1	69	20		32			
70	Maruzumi Paper Co.	Kawagoe, Japan		MHI	1	68	15.5		68			
71	Comision Federal de Electricidad	Mexico		WE	1	69	16					
72	Altos Hornos SA	Mexico		BB	2	70	15.5		68			
73	Oasis Oil Co.	Libya		GE	1	69	15		30			
74	Arabian Oil Co.	Saudi Arabia		HIT	1	69	15		30			
75	Research Institute	Prague, Czechoslovakia		BRN	1	69	15		17.5			
76	Anglo-American Corp. of South Africa, Ltd.	South Africa		EE	1	69	11.8		60	14.3		26
77	Casumie Netherlands	Netherlands		CBC	9	69-70		12.5	30		16	23
78	Ruhrgas AG	Essen, Germany		KU	1	70	9		32			
79	Tokyo Gas Co.	Yokohama, Japan		TSE	1	70	7.5		50			
80	Chemical Rubber Works	Puchov, Czechoslovakia	Chemoprojekt	BRN	1	71	7		8		12.25	0
81	Esso	Australia		GE	4	68		9.3	30			
82	The Gas Council	London, England		EE	1	70		3.15	60		10	20
83	Mashinostroy USSR	Moscow, U.S.S.R.		BRN	5	70	5					
84	Sumitomo Light Metal Ltd.	Nagoya, Japan		TSE	1	68	6		68			
85	Iraq Petroleum Co. Ltd.	Iraq		EE	2	69		6.7	115		9.6	30
86	Ruhrgas AG, Essen	Port, Germany		BB	1	69	3.74		32			
87	Societe Franco-Italienne de Petrole	Iran	SNAM Progetti	BB	3	70		4.17	30			
88	B.P. Trading, Ltd.	Libya		BB	1	69		3.9	120			
89	Occidental Petroleum Corp.	Libya	Bechtel Corp.	BB	2	69		3.65	110			
90	Phillips Petroleum Co.	North Sea		AIR	2	69		1				

MANUFACTURERS

AIR - AirResearch Mfg Co Div of Garrett Corp
 ALN - Allison Div, General Motors Corp
 BBS - Brown Boveri-Sulzer Turbomachinery Ltd
 BRN - First Bmo Engineering Works
 CBC - Cooper-Bessemer Co
 CLA - Clark-Boss Co
 EE - English Electric-AEI Turbogenerators Ltd

ESW - Escher Wyss Ltd
 GE - General Electric Co
 HIT - Hitachi Ltd
 IR - Ingersoll-Rand Co
 MHI - Mitsubishi Heavy Industries Ltd
 NM - Nordberg Mfg Co
 PR - Pratt & Whitney Div of United Aircraft Corp
 RR - Rolls-Royce Ltd

SD - Solar Div of International Harvester Co
 STW - Sushiro-Wells Corp
 TSE - Tokyo Shibaura Electric Co, Ltd
 WE - Westinghouse Electric Corp
 WO - Worthington Corp

SYN - Siemens AG
 CAC - Caterpillar Inc
 COY - Cooper Industries Inc
 CFB - Combustion Engineering Inc
 OF - Oerlikon Ltd
 ESI - Escher Wyss Ltd

base load during transition periods

Pressure ratio	Cycle type	GAS GENERATOR						POWER TURBINE			COMBUSTORS			Type of soundproofing	Speed of drive equipment, rpm	Application	PROJECT
		Number per unit	Manufacturer	Number of shafts per generator	Number of compressor stages	Number of generator turbine stages	Generator turbine speed, rpm	Number of shafts	Number of rotors	Number of stages per rotor	Number	Type	Fuel				
10	OoC	6	RR	2	17	3	7900	1	1	3	48	HoC	O	ISI,ESI	3000	PP	47
8.5	OoC		SIE		17	N	3000	1	1	4	2	VeC	O	ISI,ESI	3000	PP	48
7	OoC		MHI		15	N	3600	1	1	4	12	CaC	PIG	ISI	3600	BI	49
6.8	OoC		MHI		15	N	3600	1	1	4	12	CaC	O	ISI,ESI,SdB	3600	PP	50
6.3	ReC		ESN		8 4/9	5	6500	1	1	3	2	VeC	FO	....	3000	PP	51
7	OoC		MHI		15	N	4850	1	1	5	6	CaC	O	ISI,ESI,SdB	3000	PP	52
7.5	OoC		HIT		16	N	5100	1	1	2	10	CaC	O	ISI,ESI,SdB	3000	PP	53
10.2	OoC		RR		12	2		1	1	2	8	CaC	O	ISI	3000	PP	54
7.5	OoC		HIT		16	N	5100	1	1	2	10	CaC	O	ISI,ESI,SdB	3000	PP	55
7.5	OoC		HIT		16	N	5100	1	1	2	10	CaC	O	ISI,ESI,SdB	3600	PP	56
7	ReC		BB		19	N	3670	1	1	7	1	HoC	O,G	ISI,ESI,SdB	3600	PP	57
7	OoC		BB		19	N	3600	1	1	7	1	HoC	O	ISI,ESI,SdB	3600	PP	58
7	OoC		TSE		19	N	3670	1	1	7	1	CaC	O	ISI,ESI,SdB	3600	PP	59
7.2	OoC		MHI		15	N	4850	1	1	5	6	CaC	O	ISI,ESI,SdB	3600	BI	60
14.6	OoC		PW		8/7	2/1	....	1	1	2	8	CaC	O	ISI,ESI,SdB	3600	PP	61
14.6	OoC		PW		8/7	2/1	....	1	1	2	8	CaC	O	ISI,ESI,SdB	3600	PP	62
2.4	OoC										8	CaC	O	SdB	3600	PP	63
4.6	OoC		BRN		14	N	3000	1	1	3	1	CaC	O,G	ISI,ESI,SdB	3000	PP	64
11.6	OoC		TSE		17	3 1	3600	1	1	3	10	CaC	O	ISI,ESI	3600	PP	65
6.9	OoC		MHI		16	N	6000	1	1	5	6	CaC	O,FO	ISI,ESI,SdB	1000	PP	66
2.2	OoC										8	CaC	G	SdB	10,000	Gh	67
7.25	OoC		SUL		16	N	3600	1	1	6	1	VeC	G	ISI,ESI,SdB	9750	Gh	68
7	OoC		MHI		15	N	4850	1	1	5	6	CaC	O	ISI,ESI,SdB	3000	BI	69
7.4	OoC		MHI		15	N	4850	1	1	5	6	CaC	O,FO	ISI	3600	BI	70
7.1	OoC		WE		15	N	4912	1	1	5	6	CaC	O,G	....	900	PP	71
7	OoC		BB		19	N	3600	1	1	7	2	VeC	G	ISI,ESI	3600	BI	72
7.5	OoC		GE		16	N	5100	1	1	2	10	CaC	G	ISI,ESI	3600	Gh	73
7.5	OoC		HIT		16	N	5100	1	1	2	10	CaC	O,G	SdB	3600	BI	74
10	ReC		RR		8	3	4700	1	1	1	....	....	O	ISI,ESI	Var	Gh	75
10	OoC		RR		17	3	7900	1	1	1	8	CaC	O	ISI,ESI,SdB	1500	PP	76
10	OoC		RR		17	3	7500	1	1	2	8	CaC	G	ISI,ESI,SdB	....	Gh	77
6	OoC		SIE		15	N	6200	1	1	4	1	VeC	G	ISI,ESI	6200	Gh	78
5.4	ReC		TSE		14	N	3000	1	1	5	1	CaC	G	ISI	3000	BI	79
4.5	ReC		BRN		15	N	....	....	....	5	1	....	FO	ISI,ESI	3000	PO,SH	80
5.9	OoC		GE		14	N	6000	1	1	1	6	CaC	G	....	Var	Gh	81
6	OoC		EE		12	2	5100	1	2	2	1	VeC	G	ISI,ESI,SdB	6000	Gh	82
4.6	ReC		BRN		12	2	5200	2	....	2 1	2	....	G	ISI	Var	Gh	83
4	ReC		TSE		16	N	3600	1	1	7	1	CaC	FO	ISI	3000	BI	84
6	OoC		EE		12	2	5100	1	2	2	1	VeC	G	ISI	3300	Gh	85
4.65	ReC		SUL		10	N	7200	1	1	2	2	VeC	G	ISI,SdB	11,200	Gh	86
4.65	OoC		SUL		10	N	7200	1	1	2	2	VeC	O,G	....	1400	ME	87
4.65	OoC		SUL		10	N	7200	1	1	2	2	VeC	O,G	....	Var	PO,Gh	88
4.65	OoC		SUL		10	N	7200	1	1	2	2	VeC	G	....	6950	Gh	89
4.65	OoC		AIR		2	N	15,000	1	1	3	1	CaC	G	ISI,SdB	1800	MD	90

FO	Residual oil	PP	Peaking power and standby	FOOTNOTES	5	NEMA E soundproofing
Ca	Natural gas	Pr	Process		6	Representative of 7 units
Ca	Gas handling	PIG	Process gas			Representative of 14 units
Ca	Horizontal combustor	ReC	Recovery cycle, with exhaust to boiler			Gas generator supplied by U.S.S.R.
Ca	Intake silencer	Sb	Standby only			
Ca	Mechanical drive	SdB	Soundproofed building			
Ca	Distillate oil	SH	Space heating			
Ca	Open cycle, with exhaust to atmosphere	TE	Total energy			
Ca	Power	VeC	Vertical combustor			

6 STEAM-TURBINE IN-PLANT ELECTRIC GENERATION

U. S. paper industry leads in use of extraction turbines

Tabulation, below, gives close approximation of steam turbines installed or ordered in the past twelve months for in-plant generation of electricity. In the U. S. and Canada, number is about the same as in 1968. Overseas, in-plant gener-

By René J Bender, Consulting Editor

ation turbines were installed in increasing number and listing represents but a small sampling of the units sold by foreign manufacturers. Steam pressures and temperatures tend to be higher abroad, but proportion of condensing (37%) versus noncondensing (63%) machines is virtually the same as here. List shows Japanese units with four extraction points.

PROJECT	COMPANY	LOCATION	Type of industry	Number of turbines	Turbine manufacturer	Year of initial operation	Capacity, kW	Equipment speed, rpm	Throttle pressure, psig	Throttle temperature, F	Turbine type	Number of extraction points	Extraction pressure, psig	Back pressure, lb. Hg or psia	Use for extracted steam	Condenser type	Condenser manufacturer	Generator manufacturer	Cooling	Power factor, %
UNITED STATES AND CANADA																				
1	Container Corp. of America	Ferrandina Beach, Fla.	Pa	1	GE	70	30,300	3600	850	325	Con	2	170-50	2.5	Pr	....	GE	H ₂	0.85	
2	Mobile Oil Corp.	Beaumont, Texas	Pet	1	GE	70	25,000	3600	1450	325	Nc	1	175	150	Pr	....	GE	H ₂	0.85	
3	The Mead Corp.	Escanaba, Mich.	Pa	1	GE	70	20,000	3600	1450	325	Nc	1	175	50	Pr	....	GE	Air	0.85	
4	Union Carbide Corp.	Franklin, Va.	Pa	1	GE	69	20,300	3600	600	750	Con	2	160-70	2	Pr	....	GE	H ₂	0.85	
5	Cannon Mills, Inc.	Hannapolis, N.C.	Tex	1	GE	70	15,000	3600	1250	300	Nc	2	155	55	N	....	GE	Air	0.8	
6	Phelps Dodge Corp.	Morencio, Ariz.	Min	1	GE	70	15,000	3600	650	325	Con	4	N	25	Pr	....	GE	Air	0.8	
7	Hammert Mill Paper Co.	Erie, Pa.	Pa	2	GE	70	14,100	3600	619	325	Nc	4	N	35	N	....	GE	Air	0.8	
8	Ketchikan Pulp Co.	Ketchikan, Alaska	Pa	1	GE	70	12,500	3600	350	325	Con	2	80-70	20	Pr	....	GE	Air	0.8	
9	PPG Industries, Inc.	Puerto Rico	Che	1	GE	69	12,500	3600	340	750	Nc	1	155	2	Pr	....	GE	Air	0.8	
10	Tennessee Eastman Co.	Kingsport, Tenn.	Pa	1	GE	70	10,380	3600	1450	350	Nc	4	N	600	N	....	GE	Air	0.8	
11	White Pine Copper Co.	White Pine, Mich.	Min	1	WE	70	7500	3600	600	650	Con	1	20	3.5	Pr	....	WE	Air	0.8	
12	Sosa Texaco SA	Louisiana, La.	Che	1	BB	70	7200	3600	350	300	Nc	4	N	140	N	....	BB	Air	0.8	
13	Shenango Steel Co.	Pittsburgh, Pa.	MEL	1	GE	70	5000	3600	225	580	Con	4	N	3	N	....	GE	Air	0.8	
14	Giffette Co.	Boston, Mass.	Dos	1	GE	70	5000	3600	850	1000	Con	1	12	1.5	Pr	....	GE	Air	0.8	
15	Giffette Co.	Boston, Mass.	Dos	1	GE	70	5000	3600	850	325	Nc	1	190	12	Pr	....	GE	Air	0.8	
16	International Salt Co.	Watkins Glen, N.Y.	Che	1	GE	69	5000	3600	400	500	Nc	4	N	35	N	....	GE	Air	0.8	
17	Dominion Bank Bldg.	Toronto, Ont., Can.	Chl	1	TE	69	650	4000	350	500	Nc	4	N	5	SH	....	GE	Air	0.8	
18	Shell Chemical Co.	Deer Park, Texas	Che	1	TE	69	500	1800	180	500	Nc	4	N	60	Pr	....	....	Air	0.8	
19	Stone Container Corp.	Franklin, Ohio	Pa	1	TE	69	200	3600	120	500	Nc	4	N	35	Pr	....	SEM	Air	0.8	
MEXICO AND OVERSEAS																				
20	Kaiser Mitsunishi	Mitsunishi, Japan	Che	1	MHI	70	10,000	3600	1700	1000	Nc	1	470	215	Pr	....	MEL	H ₂	0.8	
21	Sosha Mitsunishi	Osaka, Japan	Che	1	MHI	69	68,000	3900	1900	1000	Con	2	498,242	100	Pr	....	MEL	H ₂	0.8	
22	Kobe Steel Mfg. Co., Ltd.	Kagawa, Hyogo Pref., Japan	MEL	1	MHI	70	55,000	3600	1435	1000	Con	4	155,155	1.5	Pr	....	MEL	H ₂	0.8	
23	Soc. Minera Siderurgica	Buenos Aires, Argentina	MEL	1	WE	70	75,500	3000	850	900	Con	4	N	2	....	WE	H ₂	0.8		
24	Fujitsu & Steel Co., Ltd.	Muroran, Hokkaido Pref., Japan	MEL	1	MHI	69	25,000	3000	896	854	Con	4	253,184	11.13-92	....	MHI	MEL	Air	0.8	
25	Siemens AG	Austria	Pa	1	SIE	70	22,500	3000	564	986	Con	1	64	2	Pr	....	ELI	Air	0.8	
26	Sueddeutsche Chemiefaser AG	Kerlin, Germany	Che	1	MAN	70	19,930	3000	995	950	Nc	4	N	54	Pr	....	SIE	Air	0.8	
27	Kobe Steel Mfg. Co., Ltd.	Sendai, Japan	Pa	1	MHI	68	15,300	3600	980	980	Nc	1	162	44	Pr	....	WEC	Air	0.8	
28	Government of Qatar	Ras Abu Abdul	MAN	1	MAN	70	15,000	000	600	650	Con	1	12	2.5	Pr		MAN	SIE	Air	0.8
29	IOB Floreffe	Tubize, Belgium	Che	1	SIE	70	12,300	500	1052	896	Nc	4	N	35	Pr	....	ACE	....	0.8	
30	CFR Lorraine	France	Che	1	SIE	69	10,350	500	805	856	Nc	1	242	55	Pr	....	ALS	Air	0.8	
31	Chung Hwa Pulp Corp.	Taipei, Taiwan	Pa	1	KHI	69	10,300	600	340	340	Nc	2	150	36	Pr	....	WEC	Air	0.8	
32	Geigy Chemical Co.	Grenzach, Germany	Che	1	SIE	70	9600	500	1066	941	Con	1	35	2.6	Pr	....	SIE	Air	0.8	
33	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
34	Hammert Mill Paper Co.	Switzerland	Che	1	BB	70	1430	3000	1140	932	Nc	4	N	92	Pr	....	MFO	Air	0.8	
35	Polytechnic Co., Ltd.	Fuji, Shizuoka Pref., Japan	Che	1	KHI	70	2000	6910	715	800	Nc	1	750	60	Pr	....	WEC	Air	0.8	
36	SA de Refinasas P. Materazzi	Braz	Pa	1	BB	70	1400	3600	260	660	Nc	1	140	90	Pr	....	BB	Air	0.8	
37	Nippon Petroleum Refg. Co., Ltd.	Yokohama, Japan	Pet	1	MHI	68	6200	3000	1223	1111	Nc	1	341	341	Pr	....	MEL	Air	0.8	
38	Indemex	Mexico City, Mexico	Pa	2	TE	69	5000	3600	600	750	Con	1	...	17	Pr	....	GE	Air	0.8	
39	Pirassua de Navarra SA	Spain	Che	2	ESW	69	4400	3000	600	750	Nc	4	N	50	Pr	....	GE	Air	0.8	
40	Soc. Industrielle Agric. de Valenciennes	France	Sug	1	ALS	68	4200	1500	640	750	Nc	4	N	29.4	Pr	....	ALS	Air	0.8	
41	Nacional de Cacao	Peru	Sug	1	BB	69	4000	3600	270	518	Con	1	30	1.8	Pr	....	BB	Air	0.8	
42	San Alejandro SA	Bolivia	Sug	1	SIE	68	3500	2500	222	572	Nc	4	N	36	Pr	....	ELI	Air	0.8	
43	Nippon Denka Co., Ltd.	Takara, Yamagata Pref., Japan	Che	1	KHI	69	1400	3920	370	890	Nc	1	100	47	Pr	....	WEC	Air	0.8	
44	Petroleo Brasileiro SA	Braz	Pet	1	BB	70	1,25	3600	450	600	Con	1	60	0.66	Pr	....	BB	Air	0.8	
45	Societe de Ben Melit	Mexico	Sug	2	ACE	69	3000	9000	480	716	Nc	4	N	52.5	Pr	....	ACE	Air	0.8	
46	FEED	Switzerland	BB	70	2740	3000	555	734	510	510	Con	1	107	1.7	Pr	....	BB	Air	0.8	
47	Industria de Azucar	Dominican Republic	Sug	1	TE	69	1250	1752	275	510	Nc	4	N	20	Pr	....	TE	Air	0.8	
48	Societe de Nippon	Japan	Sug	2	ACE	69	290	5360	480	752	Nc	4	N	45	Pr	....	ACE	Air	0.8	
MAX, PAUL, FERG																				
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con	2	150,125	3	Pr	....	BB	Air	0.8	
ACE	Alston-Brown Distilleries & Breweries	Jamaica	MEL	2	BB	70	15,000	3600	650	750	Con									

5 STEAM SYSTEMS

Large-capacity packaged boilers

Table 1 United States and Canadian systems

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Year of initial operation	New or existing plant	Principal steam use	BOILERS						FUEL	POLLUTION CONTROL			
							No. and type of new units	Manufacturer	Capacity each 1000 lb. hr. or MBtu	Operating pressure, psig	Operating temp., F	Heating surface, 1000 sq. ft. incl. boiler, waterwall and superheater	Type	Max. sulfur in fuel, %	Fuel additive	Interdustion point	Dust collector type	Dust collector manufacturer
UNITED STATES AND CANADIAN INDUSTRIAL STEAM SYSTEMS																	
1	Puerto Rico Steels Co.	Penuelas, Puerto Rico		70	New	Pr	1 Fi	CE	650	1500	870	31.6	O	2	N	N	N
2	Hill Chemicals Inc.	Borger, Texas		69	New	Po, Pr	1 Fi	MMK	580	1500	825		PG		N	N	N
3	Washington Corp.	Wellsville, N.Y.	Burns & Roe, Inc.	69	Ex	Pr	1 Pk	CE	120	1500	1050	10.4	O, G		N	N	N
4	Bethlehem Steel Co.	Burns Harbor, Ind.	Gilbert Associates, Inc.	70	Ex	Po, Pr	2 Pk	CE	475	900	225	20.8	O, G		N	N	N
5	Gillette Co.	Boston, Mass.	J. E. Sirrine Co.	70	New	Po, Pr	1 Pk	CE	120	875	825	7.9	O, G	2.4	N	N	N
6	Wabash Power Equipment Co.	Chicago, Ill.		69		Pr ²	3 Pk	CE	125	800	750	9.8	O, G		N	N	N
7	Dress Industries, Inc.	Tombawke, Wis.		59	Ex	Po, Pr	1 Pk	CE	100	650	720		O, G		N	N	N
8	The Standard Oil Co. (Ohio)	Lima, Ohio	Schmidt & Assoc.	59	Ex	Pr	1 Pk	RS	225	545	725	21	G ⁴	1	N	N	N
9	U.S. Naval Air Station	Pensacola, Fla.	Pope, Evans & Robbins	71	Ex	Po	1 Fi		200	640	825		O, G		N	N	N
10	Texas Technological College	Lubbock, Texas	Zumwalt & Vinther, Inc.	68	New	SH	2 Fi	VO	200	625	750		G		N	N	N
11	Milwaukee County Institutions	Wauwatosa, Wis.	Pfeifer & Shultz, Inc.	70	Ex	Po, Pr, SH	1 Pk	CE	125	625	750	3.3	O, G		N	N	N
12	Milwaukee County Institutions	Milwaukee, Wis.	Pfeifer & Shultz, Inc.	70	Ex	Po, Pr, SH	1 Pk	CE	125	515	750		O, G		N	N	N
13	Westvaco Corp.	Corvinton, Va.		69	Ex	Pr	1 Pk	CE	240	600	750	13	O, G		N	N	N
14	Anacosta Co. Anac Forest Prods Div.	Bonmar, Mont.		70	New	Po, Pr, SH	1 Pk	RS	200	600	750	55	BK, SD, WD		N	N	N
15	St. Joe Paper Co.	Port St. Joe, Fla.		69	Ex	Po, Pr	2 Pk	CE	200	600	760	11.6	O		N	N	N
16	Geigy Chemical Corp.	St. Gabriel, La.		70	New	Pr	3 Pk	UR	135	600	600	19	G	3	N	N	N
17	Merck & Co.	Osceola, Mich.	Cummins & Barnard, Inc.	69	Ex	Po, Pr	1 Fi	UR	130	600	750	22	C		N	N	N
18	Diamond Crystal Salt Co.	Akron, Ohio	Cummins & Barnard, Inc.	59	Ex	Po, Pr	1 Pk	CE	100	600	720		G		N	N	N
19	Tennessee Gas Pipeline Co.	Morehead, Ky.		69	Ex	Po	1 Pk	CE	40	475	755		G		N	N	N
20	C. & H. Jaguar Co.	Crockett, Calif.	Bechtel Corp.	69	Ex	Po, Pr	1 Pk	CE	235	450	700	12.5	O, G	1	N	N	N
21	Blain Paper Corp.	Grand Rapids, Minn.	Helmeck & Lutz Co.	69	Ex	Pr	2 Fi	BW	250	430	700		G		N	N	N
22	Eastman Kodak Co.	Rochester, N.Y.	Metcalf & Eddy	70	New	Po, Pr, SH	1 Fi	CE	150	400	428	5	O ⁴		N	N	N
23	Boise Cascade Corp.	Fort Bragg, Calif.		69	Ex	Po, Pr	1 Fi	UR	125	400	725	17.5	O ²		N	N	N
24	Frederickson Corp.	New Orleans, La.		69	Ex	Pr	1 Pk	BW	100	400	500	6.7	G		N	N	N
25	Stone Container Corp.	Franklin, Ohio		69	Ex	Pr	1 Pk	BW	90	400	650	6	O, G	1.75	N	N	N
26	Uniflow, Inc.	Doelika, Ala.	Rust Engineering Co.	69	Ex	Pr	2 Pk	MW	66	350	425		O, G		N	N	N
27	American Dynamite Co.	Hannibal, Mo.		69	Ex	Pr	1 Pk	MW	60	350	435		G		N	N	N
28	Johnson Corp.	Clifton, N.J.	PEM Engineering Consultants	59	Ex	Pr	1 Pk	BW	100	300	421	7.2	O		N	N	N
29	Koppers Co. Inc.	Monroeville, Pa.		69	Ex	SH	1 Pk	MW	30	300	421		G		N	N	N
30	Queen's University	Kingston, Ont., Can.	H. G. Acres & Co. Ltd.	69	Ex	Pr, SH	1 Pk	CVL	150	275	Sat	12.7	O, G		N	N	N
31	York University	Toronto, Ont., Can.	H. G. Acres & Co. Ltd.	70	Ex	Pr, SH	1 Pk		150	275	Sat	12.74	O, G		N	N	N
32	Sundow, Inc.	Florence, Ky.		69	New	Pr	2 Pk	CE	25	250	409		O, G		N	N	N
33	Chicago Northwest Incinerator	Chicago, Ill.	Metcalf & Eddy	70	New	Pr ¹⁰	4 Fi	IBW	135	250	Sat	24.7			N	N	N
34	National Gypsum Co.	Buffalo, N.Y.		69	New	Pr	1 Fi	BW	125	250	406	9.1	O		N	N	N
35	Western Kraft Corp.	Hawesville, Ky.	Sandwell International Inc.	69	New	Pr	1 Pk	CE	120	250	Sat	8.7	G		N	N	N
36	Western Kraft Corp.	Hawesville, Ky.	Sandwell International Inc.	69	New	Pr	1 Fi	BW	93.2	250	535	16.5	BK, G		N	N	N
37	Firestone Tire & Rubber Co.	Albany, Ga.		68	New	Pr	4 Pk	BW	60	250	400	5	O, G		N	N	N
38	Goodyear Tire & Rubber Co.	Akron, Ohio		69	New	Pr, SH	2 Pk	UR	60	250	Sat	5.7	O, G		N	N	N
39	St. Lawrence Starch Co. Ltd.	Parl Credit, Ont., Can.	H. G. Acres & Co. Ltd.	69	Ex	Po, Pr, SH	1 Fi	BWC	50	250	506	1.34	O		N	N	N
40	Goodyear Tire & Rubber Co.	Gadsden, Ala.		69	Ex	Pr	1 Pk	UR	125	235	Sat	9.4	O, G	1.16	N	N	N
41	Union Carbide Corp.	Bishop, Calif.	H. G. Acres & Co. Ltd.	69	Ex	Pr, SH	1 Pk	BWC	60	225	Sat	4.98	O		N	N	N
42	Great Lakes Chemical Corp.	Magnolia, Ark.	Cummins & Barnard, Inc.	69	New	Pr	2 Pk	CE	200	200	Sat	13	G		N	N	N
43	Michigan Sugar Co.	Carrollton, Mich.		69	Ex	Pr	1 Pk	UR	150	200	Sat	19	G		N	N	N
44	The Kendall Co.	Athens, Ga.		69	Ex	Pr, SH	1 Fi	CE	25	200	Sat		O, G		N	N	N
45	Chevrolet Div., Gen Motors Corp.	Muncie, Ind.		69	Ex	Pr, SH	1 Pk	UR	70	195	379	6.3	O, G		N	N	N
46	Certain-Seed Products Corp.	East St. Louis, Ill.		69	New	Pr, SH	2 Pk	MW	60	180	Sat	8	O, G		N	N	N
47	Central Sova Co.	Decatur, Ind.		59	Ex	Pr	1 Pk	MW	85	175	Sat		G		N	N	N
48	Cummins Refining Co.	Natchez, Miss.		69	New	Pr	1 Pk	EC	58	175	Sat	3.3	G		N	N	N
49	Cummins Refining Co.	Natchez, Miss.		69	New	Pr	1 Pk	CE	45	175	Sat	3.4	G		N	N	N
50	IBM Corp.	Rochester, Minn.		69	Ex	SH	1 Pk	MW	70	160	Sat		O, G		N	N	N
51	Wilson & Co.	Hereford, Texas		69	New	Pr	2 Pk	MW	40	155	Sat		G		N	N	N
52	Chrysler Corp.	Hamtramck, Mich.	John G. Hoag & Associates	70	Ex	Pr, SH	4 Pk	BW	150	150	Sat	12	O, G		N	N	N
53	General Electric Co.	Mount Vernon, Ind.	United Engineers & Constructors Inc.	69	Ex	Pr	1 Pk	UR	150	150	Sat	10.1	G		N	N	N
54	North American Rockwell Corp.	Columbus, Ohio	Pope, Evans & Robbins	69	Ex	SH	1 Pk	UR	150	150	Sat	16.9	O, G		N	N	N
55	Chevrolet Div., Gen Motors Corp.	Flint, Mich.	Benjamin, Woodhouse & Guenther	69	Ex	SH	1 Fi	CE	100	150	Sat	11.2	C, O	1.5	N	N	N
56	Humble Oil & Refining Co.	Baton Rouge, La.		69	Ex	Pr	1 Pk	MW	100	150	Sat		G		N	N	N
57	Amoco Chemical Co.	Chicago, Ill.		68	Ex	Pr	1 Pk	CE	100	150	Sat		O, G		N	N	N
58	Poss Laboratories	Columbus, Ohio		69	Ex	Pr	1 Pk	MW	88	150	Sat		O, G		N	N	N
59	Cargill, Inc.	Des Moines, Iowa		59	Ex	Pr	1 Pk	MW	85	150	Sat		O, G		N	N	N
60	Standard Brands, Inc.	Peekskill, N.Y.		69	New		3 Pk	UR	80	150	466	7.2	O, G		N	N	N

are often of modular construction

FURNACE		FIRING EQUIPMENT				AIR HEATER		F-D FANS		I-D FANS		BOILER FEED SYSTEM				COMBUSTION CONTROL		PROJECT		
Safeguard type	Safeguard manufacturer	Stoker or pulverizer		Burner		Type	Manufacturer	Number per boiler	Manufacturer	Drive type and power required ^{2,3}	Number per boiler	Manufacturer	Drive type and power required ^{2,3}	Number of pumps	Manufacturer	Drive type and power required ^{2,3}	Feedwater treatment		Type	Control manufacturer
		Type and number per boiler	Manufacturer	Type and number per boiler	Manufacturer															
Uv	.....	N	N	8 Ta	CE	Re	APC	2	CF	M,T 1100	N	N	N	3	PP	M,T 2500	MiD	Pn	F	1
Me	.....	N	N	4	CE	Re	APC	1	APC	N	N	FAA	T	2	PP	T	Ca,In	Co	.....	2
TV	GE	N	N	4 Ta	CE	Tu	CE	2	CF	M.T 300	2	CF	M,T 1000	1	WO	T 650	MuO	Co	CE	3
Uv	.....	N	N	2 SA	CE	Re	APC	1	CF	M 250	N	N	N	1	IR	T 1250	Fi,So,Z,in	Co	BM	4
Uv	.....	N	N	2 SA	CE	Re	APC	1	CF	M 250	N	N	N	1	BPC	M,T 600	MuO,in	Pn	.....	5
Uv	ECA	N	N	1 SA	CE	N	N	1	CF	.....	N	N	N	N	N	N	.....	Pn	BM	6
Uv	.....	N	N	1 SA	CE	Re	APC	1	CF	T 200	N	N	N	2	.....	M,T 300	Ca,Fi,Z,So,in	Co	BM	7
Uv	.....	N	N	4	RS	N	N	1	BF	T 400	N	N	N	2	.....	M,T 450	Ca,Fi,Z,in	Pn	.....	8
Uv	ECA	N	N	4 SA	.....	Re	APC	1	M	.....	N	N	N	2	.....	M.T.	MuO,in	Pn	.....	9
Uv	ECA	N	N	4 SA	ZI	N	N	1	BF	M,T 200	N	N	N	2	AC	M,T 150 ³	MuO,in	Pn	BM	10
Uv	ECA	N	N	1 SA	CE	N	N	1	BF	T 300	N	N	N	1	WO	T 300	Z,Da,in	Pn	BM	11
Uv	ECA	N	N	1 SA	CE	Re	APC	1	BF	T 300	N	N	N	2	WO	T 300	Z,Da,in	Pn	BM	12
Uv	CE	N	N	1 SA	CE	N	N	1	WE	Da 600	N	N	N	1	IR	M.T. 500	Fi,MuO,in	Co	BM	13
Me	.....	SS	RS	4 AA	RS	Tu	RS	1	WE	T 168	1	WE	T 468	2	IR	Da 300	So,Z,MuO	Pn	F	14
Uv	.....	N	N	3 SA	CE	N	N	1	FAA	M 450	N	N	N	2	IR	.....	Fi,MuO	Co	BM	15
.....	.....	SS	DSC	1	PEC	N	N	1	CHB	Da 200	N	N	N	1	WO	Da 200	Ca,Fi,MuO,in	Pn	F	16
.....	.....	N	N	1	N	N	N	1	CF	M 60	1	CF	M 200	2	WO	M.T. 250	Z,So	E	HAY	17
.....	.....	N	N	1	CE	N	N	1	CHB	M 100	N	N	N	2	WO	T 200	Z	Pn	BM	18
.....	.....	N	N	1 SA	CE	N	N	1	RV	M 20	N	N	N	1	.....	M 125	Z,in	Co	BM	19
Uv	.....	N	N	1 SA	CE	N	N	1	CF	Da 450	N	N	N	3	IR	T 450	So,Fi,Z,in	E	FIS	20
Uv	ME	N	N	5	BW	Re	BW	1	CF	M 300	1	CF	M 500	2	IR	M.T. 350	So,in	E	LN	21
Uv	CE	N	N	10 ³	CE	Tu	CE	1	CF	M 150	1	CF	M 150	2	WO	M.T. 125	Z	Co	CE, BM	22
Uv	.....	N	N	3 SA ⁷	TS	Tu	UR	1	SW	M 75	1	SW	M 200	1	WO	M 200	Z,in	Pn	BM	23
Uv	ECA	N	N	1	BW	N	N	1	CF	M 100	N	N	N	3	DL	T 350	So,Z,in	Pn	.....	24
Uv	ECA	N	N	1 SA	COE	Re	APC	1	AL	Da 125	N	N	N	2	AC	M.T. 75	Z,Da,in	E	COE	25
Uv	ECA	N	N	1 Me	PEC	N	N	1	CF	M 50	N	N	N	1	WO	M.T. 60	Z,Da	E	HAY	26
Uv	ECA	N	N	1	ZI	N	N	1	CF	M 30	N	N	N	2	PE	M.T. 80	So,Fi,Z,in	Pn	BM	27
Uv	ECA	N	N	1 SA	COE	Re	APC	1	CF	T 125	N	N	N	2	IR	T 75	Z,in	Co	BM	28
Uv	ECA	N	N	1	ZI	N	N	1	CF	M 20	N	N	N	2	BJ	M.T. 50	Z,in	E	CCI	29
Uv	ECA	N	N	2 SA	COE	Re	HOP	1	SHD	M.T.	N	N	N	1	WO	M.T.	So,Z,in	Pn	BM	30
.....	.....	N	N	2 SA	.....	Re	HOP	1	.....	M	N	N	N	1	.....	M	Ex	Pn	BM	31
.....	.....	N	N	2	CE	N	N	1	CHB	M 35	N	N	N	1	GP	M 60	Z,MuO,in	Pn	OPC	32
.....	OF	N	N	2	TS	N	N	1	CHB	M.T. 300	1	CHB	M.T. 250	1	IR	M.T. 150	Z,in	Co	BMN	33
Uv	.....	N	N	4 SA	BW	Re	APC	1	CF	M 200	N	N	N	2	WO	M.T.	Z,in	Pn	BM	34
Uv	ECA	N	N	1	CE	N	N	1	CF	M 150	N	N	N	2 ¹⁰	WO	M.T. 210	Z,in	Pn	BM	35
Me	.....	N	N	2 SA	BW	Si	.....	1	SW	M 150	1	SW	T 1000	2 ¹⁰	WO	M.T. 210	Z,in	Pn	BM	36
Uv	ECA	N	N	1 SA	COE	N	N	1	.....	Da 75	N	N	N	3	IR	M.T. 100	Z	Co	BM	37
Uv	.....	N	N	1	BWC	Tu	BWC	1	SHD	M	N	N	N	1	IR	M	Ex	Pn	BM	38
Uv	ECA	N	N	1 SA	COE	N	N	1	CF	M 125	N	N	N	1 ¹¹	.....	M.T. 150	So,Fi,Z,in	Pn	HCC	39
Uv	.....	N	N	1	COE	N	N	1	CF	M	N	N	N	1	BJ	M	In	Pn	BM	40
Uv	ECA	N	N	1	CE	N	N	1	CHB	M 300	N	N	N	1	GP	Da 150	.....	Pn	BM	41
Uv	ECA	N	N	1	COE	N	N	1	CHB	M 200	N	N	N	2	IR	M.T. 125	In	Pn	HCC	42
Uv	.....	N	N	1 SA	CE	N	N	1	.....	M	.....	.....	.....	1	IR	M	In	E	CE	43
Uv	ECA	N	N	1 SA	TS	Si	APC	1	BF	M.T. 100	N	N	N	1	WO	M 87.5	So,Fi,Z,in	Pn	BMN	44
Uv	.....	N	N	1 SA	ZI	N	N	1	CF	M 30	N	N	N	2	.....	M 75	Z,in	E	CCI	45
Uv	ECA	N	N	1	COE	N	N	1	AL	M 60	N	N	N	1 ¹⁴	IR	M 60	Ca,So,Fi,Z,in	E	COE	46
Uv	ECA	N	N	1	EC	N	N	1	CHB	M 40	N	N	N	1 ¹⁴	IR	M 75	Z,in	E	CCI	47
Uv	ECA	N	N	1 SA	CE	N	N	1	CHB	M 25	N	N	N	3 ¹⁷	DL	M.T. 75	Z,Da,in	Pn	BM	48
Uv	.....	N	N	1 SA	ZI	N	N	1	CF	M 40	N	N	N	1	DL	M.T. 75	Z,Da,in	Pn	BM	49
Uv	ECA	N	N	1	ZI	N	N	1	CF	M.T. 30	N	N	N	1	PE	M.T. 40	Z,So	E	HAY	51
Uv	ECA	N	N	1	BW	N	N	1	CF	M 200	N	N	N	6 ¹⁶	IR	M.T. 150	So,in	Pn	BM	52
Uv	.....	N	N	1	PEC	N	N	1	.....	.....	N	N	N	2	GP	M.T. 125	Z,in	Pn	BMN	53
Uv	.....	N	N	2 SA	PEC	N	N	1	CHB	M 200	N	N	N	2	.....	M.T. 125	Z,in	Pn	BMN	54
Uv	SS	RS	1 SA	COE	N	N	N	1	WE	M 40	1	WE	M 200	3 (Ex)	DL	M.T.	Z,Da,in	Pn	HAY	55
Uv	ECA	N	N	1 SA	COE	N	N	1	AL	M 75	N	N	N	2	UP	M	Ex	E	COE	56
Uv	.....	N	N	1 SA	CE	N	N	1	NBY	T 100	N	N	N	.....	.....	.....	Z,Da	Pn	BM	57
Uv	ECA	N	N	1 SA	COE	N	N	1	CF	M 50	N	N	N	2	WPM	M.T. 75	Z,in	Pn	HCC	58
Uv	ECA	N	N	1 SA	COE	N	N	1	AL	M 50	N	N	N	2	IR	M 40	Z,in	Pn	BM	59
Uv	ECA	N	N	1 SA	TS	Re	APC	1	CF	M 125	N	N	N	1	PE	M 60	Z,in	Pn	.....	60

SHD	Sheldom Engineering Ltd, Canada	WBL	W N Best Combustion Equipment Co	9	Also 1 black liquor burner
SIE	Siemens AG	WO	Westinghouse Corp	10	2 pumps for 2 boilers
SPC	Swiss Power Co	WP	Western Precipitation Div, Joy Mfg Co	11	1 pump for 4 boilers
SUL	Swiss Bros, Ltd	WPM	Westinghouse Pump Mfg Co	12	3 pumps for 4 boilers
SW	Starviant Div, Westinghouse Electric Corp	WS	Watson-Snyder Works, U S Steel Corp	13	2 pumps for 3 boilers
TOH	Toho Suisan Sho	YEW	Yokogawa Electric Works Ltd	14	1 spare pump for 2 boilers
TOR	Toshiba Pump Mfg Co Ltd	ZI	John Zink Co	15	Machinery drive
TS	Todd Shipyards Corp, Products Div			16	6 pumps for 4 boilers
UOP	Universal Oil Products Co			17	3 pumps for 3 boilers
UR	Union Iron Works, Sub of Riley Stoker Corp			18	This is a refuse incinerator-boiler
VO	Henry Voigt Machine Co			19	High temperature water, nitrogen-pressurized
VOL	Volcano Co Ltd			20	Also a 1-million Btu standby
WAT	Watson Mfg Co Ltd			21	4 pumps for 3 boilers
WE	Westinghouse Electric Corp			22	Approximate hp is for
WEB	Webster Engrg Div, Midland-Ross Corp			23	each motor or turbine
WEM	Wense, Minsky				accounted from ground level
WHC	The Wheelabrator Corp				(See page 5-30 for symbols)

5 STEAM SYSTEMS

Steam-generating refuse burner

Table 2 HTW and overseas systems

PROJECT	COMPANY	LOCATION	CONSULTING ENGINEER	Year of initial operation	New or existing plant	Principal steam use	BOILERS						FUEL	POLLUTION CONTROL			
							No. and type of new units	Manufacturer	Capacity each, 1000 lb/hr at 15 psi	Operating pressure, psi	Operating temp., F	Heating surface, 1000 sq ft incl boiler, waterwall and superheater		Type	Flue gases to heat exchanger	Flue additive	Flue gas collector
61	Rheingold Breweries, Inc.	Brooklyn, N.Y.	Lockwood-Greene Engineers, Inc.	70	New	Pr	3 Pk CE	77	150	Sat	4.9	O.G.					
62	Hoover Co.	North Canton, Ohio	Cummins & Barnard, Inc.	69	Ex	Pr	1 F1 EC	75	150	Sat	9.3	G					
63	Dierks Forests, Inc.	Wright City, Okla.		69	Ex	Po, Pr	1 Pk CE	60	150	Sat	4.75	G					
64	The Dow Chemical Co.	Midland, Mich.	Stanley Consultants	69	Ex	SH	1 Pk CE	60	150	Sat	5.8	O.G.					
65	Corgate-Palmolive Co.	Kansas City, Kan.	Burns & McDonnell	69	Ex	Pr	1 Pk MW	55	150	Sat	....	O.G.					
66	Fairfax Hospital	Falls Church, Va.	Henry Adams Inc.	69	New	Pr, SH	3 Pk BW	50	150	Sat	....	O.G.					
67	The Kendall Co.	Athens, Ga.		69	New	Pr, SH	1 Pk CE	50	150	Sat	3.8	O.G.					
68	University of Texas	Arlington, Texas	Cowan, Love & Jackson	69	Ex	SH	1 Pk CE	50	150	Sat	....	O.G.					
69	The Ansco Co.	Marquette, Wis.		69	Ex	Pr, SH	1 Pk MW	40	150	Sat	1.7	O.G.					
70	Georgia-Pacific Corp.	Augusta, Ga.		69	New	Pr	1 F1 BW	40	150	Sat	6.4	BK, SH					
71	Kraftco Corp.	Lowville, N.Y.		69	New	Pr, SH	2 Pk MW	40	150	Sat	....	O					
72	Leonard Refineries, Inc.	Alma, Mich.		69	Ex	Pr	1 Pk CE	40	150	Sat	2.8	O					
73	Baptist Memorial Hospital	Jacksonville, Fla.		69	New	SH	2 Pk CE	32	150	Sat	....	O.G.					
74	Canastota Co.	Hillsboro, Ore.		68	Ex	Pr	1 Pk CE	25	150	Sat	....	O.G.					
75	Montefiore Hospital	Bronx, N.Y.	Caretsky & Assoc.	69	Ex	Pr, SH	1 Pk BW	60	140	Sat	4.9	O					
76	Ovaltine Food Products	Chicago, Ill.	Brooke & Choponis	69	Ex	Pr	2 Pk BW	40	140	Sat	3.8	G					
77	Community Hospital Services	Saginaw, Mich.		69	New	Pr	1 Pk CE	30	135	Sat	3.4	G					
78	University of Montana	Missoula, Mont.	R. L. Prussing	69	Ex	SH	1 F1 KEE	70	125	Sat	....	G					
79	Bacardi Corp.	San Juan, P.R.		70	Ex	Pr	1 Pk BW	60	125	Sat	....	O					
80	Geigy Chemical Corp.	Ardley, N.Y.	Stocum & Fuller	69	Ex	Po, SH	1 Pk BW	50	125	Sat	4.4	O.G.					
81	Rensselaer Polytechnic Institute	Troy, N.Y.		69	Ex	Pr	1 Pk BW	50	125	Sat	....	O					
82	Whiting Field U.S. Naval Air Station	Whiting, Fla.	Early Services, Inc.	69	Ex	SH	1 Pk MW	50	125	Sat	....	O.G.					
83	J. H. Williams & Co.	Buffalo, N.Y.	United Engineers & Constructors, Inc.	69	Ex	Pr, SH	3 Pk UR	50	125	Sat	4.8	O					
84	Ellis Hospital	Schenectady, N.Y.	Harold H. Friedman Assoc.	69	New	SH	3 Pk MW	35	125	Sat	....	O.G.					
85	Quaker Oats Co.	Marion, Ohio		68	Ex	Pr	1 Pk BW	30	125	Sat	3.3	O.G.					
86	Fisher Body Div., Gen Motors Corp.	Grand Rapids, Mich.		69	Ex	SH	1 Pk CE	25	125	Sat	2.45	O.G.					
87	The Brooklyn Hospital	Brooklyn, N.Y.	Jansen & Rogan	....	SH	2 UR	20	125	Sat	3.5	O.G.						
88	Coley Dickinson Hospital	Northampton, Mass.	Robert W. Hall	69	Ex	Pr, SH	1 Pk UR	20	125	Sat	2.1	O.G.					
89	Merck & Co., Inc.	West Point, Pa.	Gilbert Associates, Inc.	69	Ex	Pr, SH	1 Pk BW	80	120	Sat	5.9	O					
90	Metropolitan General Hospital	Cleveland, Ohio		69	Ex	Pr, SH	1 Pk BW	70	120	Sat	....	O.G.					
91	KIMM Chemical Research Center	Lexington, Ky.		68	New	SH	3 Pk BW	40	120	Sat	3.8	O.G.					
92	Swedish Medical Center	Englewood, Cal.		69	New	Pr, SH	2 Pk CE	35	100	Sat	....	O.G.					
HIGH TEMPERATURE WATER SYSTEMS																	
93	IBM Corp.	White Plains, N.Y.		70	Ex	Pr, SH	4 BW	1001 ⁹	300	400	....	O.G.					
94	IBM Corp.	East Fishkill, N.Y.	Gustav Gettel Assoc.	70	Ex	Pr, SH	1 Pk BW	901 ⁹	450	400	756	O					
95	University of Illinois	Chicago, Ill.	Sargent & Lundy	69	Ex	SH	1 Pk BW	751 ⁹	400	400	7.2	O.G.					
96	NY State University	Old Westbury, N.Y.	Segner & Dalton	70	New	SH	2 Pk BW	501 ⁹	500	400	5.1	O.G.					
97	Univocal, Inc.	Middlebury, Conn.	Meyer, Strong & Jones	70	New	SH	2 Pk BW	501 ⁹	400	400	5	O.G.					
98	IBM Corp.	Burlington, Vt.	J.R. Loring	70	Ex	Pr, SH	1 Pk BW	501 ⁹	300	400	5.1	O.G.					
99	Rutgers University	Newark, N.J.	Segner & Dalton	70	New	SH	2 Pk BW	301 ⁹	400	400	2.12	O.G.					
100	Wilton State School	Wilton, N.Y.	Caretsky & Assoc.	70	New	SH	2 Pk BW	241 ⁹	400	450	2.1	O					
OVERSEAS INDUSTRIAL STEAM SYSTEMS																	
101	Asahi Chemical Industry Co., Ltd.	Nobeoka, Miyaz. Pref., Jap.		68	Ex	Po, Pr	1 F1 KHI	309	2250	1000	46	O					
102	Asahi Chemical Industry Co., Ltd.	Mizushima, Japan		70	New	Po, Pr	1 F1 KHI	530	1835	1000	47.6	O, PrG					
103	Kasei Mizushima, Ltd.	Kurashima, Ok. Pref., Japan		70	Ex	Po, Pr	1 F1 MHI	1320	1763	1005	71	O, PrG					
104	Onoda Cement Co. Ltd.	Tokyo, Japan		70	Ex	Po	1 F1 KHI	213	1490	970	17.5	O					
105	Nippon Petroleum Refining Co. Ltd.	Yokohama, Japan		68	New	Po, Pr	3 F1 MHI	198	1280	932	40	O, PrG					
106	Habermas AG	Heine, Germany		70	Ex	SH	2 F1 KSG	132	1280	960	13	An					
107	Hoffmann-La Roche & Co. AG	Sisseln, Switzerland		70	New	Po, Pr	1 F1 SUL	141	1200	952	....	O					
108	Chung Hwa Pulp Corp.	Taipei, Taiwan		69	New	Po, Pr	1 F1 KHI	154	1000	860	15	O					
109	Churetsu Pulp Co., Ltd.	Sensu, Kyoto Pref., Japan		69	Ex	Po	1 F1 KHI	350	985	900	24	O					
110	Fuji Iron & Steel Co., Ltd.	Muroran, Niigata Pref., Japan		69	Ex	Po	1 F1 MHI	397	925	904	43	O, PrG					
111	Nissan Denka Co., Ltd.	Sakata, Yamag. Pref., Japan		69	New	Po, Pr	1 F1 KHI	70	910	900	6	O					
112	Ciba SA	Montevy, Switzerland		69	Ex	Pr	1 F1 SUL	177	795	332	....	O					
113	Polyplastic Co., Ltd.	Fuji, Shizu Pref., Japan		70	New	Po, Pr	2 F1 KHI	233	765	800	16	O					
114	NECOPH	Hinwil, Switzerland		70	New	Po	1 F1 SUL	27.6	584	752	....	O					
115	Oji Paper Co.	Kasugai, Aichi Pref., Japan		69	Ex	Po, Pr	1 F1 MHI	220	570	752	....	BL					

SYMBOLS

(See page 128 for manufacturers)

- AW - Air-washing
- AD - Adsorbent
- AC - Acoustical
- B - Bark
- BL - Black liquor
- CO - Coal, biomass
- CG - Coking
- CP - Combined pneumatic and electronic
- DB - Desulfurizer

- DD - Dual drive
- E - Electrical or electronic
- EL - Electrostatic
- EX - Existing
- FI - Field erected
- FT - Filtered, filtration
- FO - Additive in fuel in storage
- FU - Additive injected into furnace
- G - Gas
- HM - Hammer mill
- IN - Internal water treatment

- I - Infrared
- M - Motor
- ME - Mechanical
- MD - Mixed-bed demineralizer
- MUO - Multibed demineralizer
- N - None
- NEW - New
- O - Oil
- OF - Overfire (stoker)
- PA - Pulp and paper industry
- PK - Packaged

make first appearance in this survey

VACE	FIRING EQUIPMENT				AIR HEATER		F-D FANS		I-D FANS		BOILER FEED SYSTEM				COMBUSTION CONTROL		PROJECT				
	Safeguard type	Safeguard manufacturer	Stoker or pulverizer		Burner		Type	Manufacturer	Number per boiler	Manufacturer	Drive type and power required ²²	Number per boiler	Manufacturer	Drive type and power required ²²	Number of pumps	Manufacturer		Drive type and power required ²²	Feedwater treatment	Type	Control manufacturer
			Type and number per boiler	Manufacturer	Type and number per boiler	Manufacturer															
W	W	W	N	N	1 SA	ENG	Re, St	APC	1	CF	M 100	N	N	N	2	IR	M, T	So	Co	HCC	61
W	W	W	N	N	1	COE	N	N	1	FAA	M 50	N	N	N	2	Ex	....	Z, So, in	Co	BM	62
W	W	W	N	N	1	CE	N	N	1	CHB	M 30	N	N	N	3	WO	M 60	In	Pn	BM	63
W	W	W	N	N	1 SA	CE	Tu	CE	1	CHB	M 75	N	N	N	2	IR	M 24	M, D, in	Pn	BM	64
W	W	W	N	N	1 SA	ZI	N	N	1	CF	M 25	N	N	N	1	EL	T	So	Pn	BM	65
W	W	W	N	N	1 SA	PEC	N	N	1	AMB	M	N	N	N	3	WO	M	Z	Pn	....	66
W	W	W	N	N	1 SA	CE	N	N	1	....	M	N	N	N	1	IR	M	Z, in	E	CCA	67
W	W	W	N	N	1 SA	COE	N	N	1	AL	M 7.5	N	N	N	1	PP	M 30	Z, in	Co	COE	68
W	W	W	N	N	1 SA	MW	N	N	1	CF	M 30	N	N	N	3	PE, GP	M, T 50, 32	So, Fl, Z, in	Pn	BM	69
W	W	W	SS	PSC	....	....	N	N	1	FAA	M 15	1	FAA	M 100	2	PE	M, T 40	In	E	HAY	70
W	W	W	N	N	1 SA	ZI	N	N	1	CF	M 20	N	N	N	1	....	M 25	Z	E	CCI	71
W	W	W	N	N	1 SA	CE	N	N	1	CHB	Dd 25	N	N	N	1	DHP	M, T 75	Z, in	Pn	BM	72
W	W	W	N	N	1 SA	CE	N	N	1	CHB	M 25	N	N	N	1	....	M 15	Da, in	Co	CE	73
W	W	W	N	N	1 SA	CE	N	N	1	CF	M	N	N	N	1	....	M	In	E	....	74
W	W	W	N	N	2 SA	BW	N	N	1	CF	M 40	N	N	N	1	WO	T	Z, in	Pn	BM	75
W	W	W	N	N	2	BW	N	N	....	....	....	N	N	N	Ex	....	M, T	Fl, Z, M, D	Pn	BM	76
W	W	W	N	N	1	CE	N	N	1	....	M 15	N	N	N	....	....	Z	....	....	....	77
W	W	W	N	N	4	WEB	N	N	1	AS	M 15	1	AS	M 40	1	DHP	M, T 75	Z, in	Co	BM	78
W	W	W	N	N	2 SA	BW	N	N	1	....	M 50	N	N	N	2	IR	M 40	Z	Pn	BM	79
W	W	W	N	N	1 SA	BW	N	N	1	....	M 30	N	N	N	3	SHA	M	Z, in	Pn	BM	80
W	W	W	N	N	1 SA	BW	N	N	1	CF	M 30	N	N	N	1	WO	M 50	Z, in	Pn	BM	81
W	W	W	N	N	1 SA	TS	N	N	1	CF	M 30	N	N	N	1	DL	M, T 75	In	E	CCI	82
W	W	W	N	N	1 SA	COE	N	N	1	COE	M	N	N	N	1	COC	M 25	Z, in	Pn	BM	83
W	W	W	N	N	1 SA	ZI	N	N	1	CF	M 15	N	N	N	1	JS	M 25	Z, Da, in	Pn	HCC	84
W	W	W	N	N	1 SA	BW	N	N	1	CF	M 20	N	N	N	1	IR	M 25	Z, in	Pn	BM	85
W	W	W	N	N	1 SA	CE	N	N	1	CHB	M 30	N	N	N	1	WO	M 15	Z, Da, in	Co	H	86
W	W	W	N	N	1	ENG	N	N	1	....	M 7.5	N	N	N	1	SPC	M 25	In	E	OPC	87
W	W	W	N	N	1	PEC	N	N	1	CF	M 10	N	N	N	....	....	In	Pn	BM	88	
W	W	W	N	N	1 Me	BW	N	N	1	CF	M 75	N	N	N	Ex	....	M, T	M, D, in	Pn	....	89
W	W	W	N	N	1	COE	N	N	1	COE	M	N	N	N	....	COP	....	Z, in	Pn	....	90
W	W	W	N	N	1 SA	BW	N	N	1	CF	M 25	N	N	N	2 ¹³	SHA	M 20	Z, in	Pn	BM	91
W	W	W	N	N	2 SA	CE	N	N	1	....	M 40	N	N	N	2	AC	M 30	Z, in	E	....	92
W	W	W	N	N	1 UH	TS	N	N	1	CF	M 40	N	N	N	Ex	SHA	M	So, Fl, in	Co	CCI	93
W	W	W	N	N	1 Me	WNB	N	N	1	CHB	M 40	N	N	N	1	....	....	Z, in	Pn	HCC	94
W	W	W	N	N	2 Me	....	N	N	1	JOY	M 10	N	N	N	....	RER	M 20	In	Pn	RD	95
W	W	W	N	N	2 AA	CEQ	N	N	2	TS	M 10	N	N	N	1	WO	M 100	Z, in	Co	CEQ	96
W	W	W	N	N	2 AA	CEQ	N	N	2	....	M 10	N	N	N	1	....	....	Z, in	Pn	CEQ	97
W	W	W	N	N	2 SA	WNB	N	N	1	CF	M 30	N	N	N	Ex	....	....	....	E	CCI	98
W	W	W	N	N	1 Me	FLA	N	N	1	CF	M 20	N	N	N	1	RER	M 15	Z, in	Co	CEA	99
W	W	W	N	N	1 Me	WNB	N	N	1	N	N	N	N	N	1	WS	....	....	E	WNB	100
W	W	W	N	N	9 SA	OPE	St	KHI	1	EBA	M 563	N	N	N	2	TOR	M 1000	Fl, M, D, in	Co	....	101
W	W	W	N	N	9 SA	OPE	St	KHI	1	NAF	M 1100	N	N	N	2	EBA	M 3020	Fl, M, D, in	Co	....	102
W	W	W	N	N	20 SA	MHI	St, Re	GDL	2	MHI	M 1430	N	N	N	3	MHI	M, T 3400	Ca, Fl, M, D, in	Pn	BM	103
W	W	W	N	N	4 SA	VOL	N	N	1	....	M 338	N	N	N	2	....	M 905	....	Co	FD	104
W	W	W	N	N	4 SA	MHI, VOL	N	N	1	WAT	Dd 295	N	N	N	2 ¹	MHI	M, T 700	Fl, M, D, in	Pn	H	105
W	W	W	N	N	4 Me	KSG	Re	KAH	1	ROM	M 310	1	ROM	M 175	1	KSB	M 500	Fl, M, D, in	E	SIE	106
W	W	W	N	N	3 Me	SUL	St, Tu	ORT	1	....	M 223	N	N	N	2	WEM	M 507	M, D, in	E	SUL	107
W	W	W	N	N	4 SA	OPE	St, Re	GDL	1	NAF	M 250	N	N	N	2	EBA	M, T 290	M, D, in	Co	WOK	108
W	W	W	N	N	8 SA, Ac	KHI	Re	GDL	1	NAF	M 560	N	N	N	2	TOR	M 1150	M, D, in	Co	FD	109
W	W	W	N	N	6.6 SA, Ta	MHI	Re	MHI	1	NAF	M 435	1	NAF	M 1330	2	TOR	M 680	Ca, Fl, M, D, in	E	YEW	110
W	W	W	N	N	2 SA	KHI	Re	GDL	1	NAF	M 110	N	N	N	2	TOR	M 280	M, D, in	Co	FD	111
W	W	W	N	N	3 Me	SUL	St, Re	GDL	1	CLE	M 304	N	N	N	2	SUL	M 456	M, D, in	E	SUL	112
W	W	W	N	N	6 SA	KHI	Re	GDL	1	NAF	M 290	N	N	N	2	EBA	M 530	M, D, in	Co	YEW	113
W	W	W	N	N	1 SA	ORT	St	CLE	1	SUL	M 100	1	SUL	M 70	2	SUL	M, T 120	Da, in	E	SUL	114
W	W	W	N	N	4 SA	MHI	St	....	1	NAF	M 280	1	NAF	M 2230	1	MHI	M 550	Ca, M, D, in	Co	YEW	115

FOOTNOTES

- 1 - For steam turbine testing
- 2 - Boilers for rent
- 3 - 1-150 hp motor each pump
- 4 - 1-150 hp turbine for both
- 5 - Natural gas and refinery gas
- 6 - Also 2 Chandler hog mills
- 7 - 6 guns per burner unit
- 8 - Also sander dust fuel - 1 burner
- 9 - Sludge and shredded refuse - 6 burners
- 10 - Also 1 black liquor burner

- 11 - 2 pumps for 2 boilers
- 12 - 1 pump for 4 boilers
- 13 - 3 pumps for 4 boilers
- 14 - 2 pumps for 3 boilers
- 15 - 1 spare pump for 2 boilers
- 16 - Machinery drive
- 17 - 6 pumps for 4 boilers
- 18 - 3 pumps for 3 boilers
- 19 - This is a refuse incinerator-boiler
- 20 - High temperature water, nitrogen-pressurized
- 21 - Also a 1-million Btu standby

- 22 - 4 pumps for 3 boilers
- 23 - Approximate hp is for each motor or turbine
- 24 - Heights above 100 ft are counted from ground level
- 25 - Kehrntschverbrunn Zuercher Oberland, joint central refuse and incineration plant for 20 villages; also produces electric power
- 26 - N₂ at chimney