

partly to: (1) an operator training program (2) thorough checking of variables as each was completed before turbine completion (3) careful timing of controls, miscellaneous drips and drains (4) detailed schedule preparation of equipment checked, lubricated, tested, etc (5) complete cooperation between company and consultants.

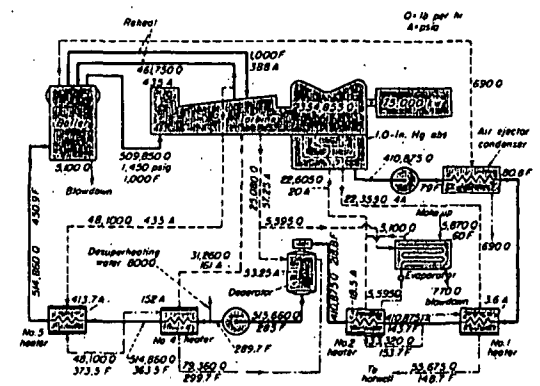
Acceptance tests showed that the equipment is within guarantee in respect to heat rate. Design heat rate for the new unit are:

Generator load, kw	Turbine heat rate, Btu/kwhr	Station net heat rate, Btu/kwhr	Boiler eff, %
15,000	9,980	12,039	89.7
30,000	8,790	10,610	89.5
45,000	8,340	10,075	89.5
60,000	8,165	9,876	89.4
75,000	8,175	9,906	89.3

burners use the tilting feature to control final reheat temperature. Some of the features of the new steam generator include furnace television, remote-controlled burner ignition and air-conditioned control rooms.

The main condenser has divided waterboxes and two water passes. Motor-operated reversing valves help keep the tube sheet clean. In the feed heating system the two high-pressure heater drains cascade to the deaerator while the two low-pressure heater drains cascade back to the main condenser.

The generator is designed to run as a synchronous condenser when disconnected from the turbine. Two turning gear motors, one at 3 rpm and the other at 30 rpm, connect to the generator end of the shaft at the coupling. They assist in bringing up generator speed in preparation for condenser operation. The only changes needed to convert to this type of operation is to remove the coupling and insert a thrust bearing at this point. A 225-kw motor-generator set supplies excitation when the generator is used as a synchronous condenser.



—PRINCIPAL POWER-PLANT EQUIPMENT

Turbine-generator, 1. 1. Waukegan/White Electric Co.
Tandem compound, double flow, 60,000/75,000 kw, 1435-pole 1000-P
throat steam, 1000-P reheat, 2 in. hg. steam exhaust, 3500 rpm,
bleed points, 1 blanked off, 30-pole Hg pressure
Condenser, 1. 1. Foster-Wheeler Corp.
Horizontal, shell and tube, 17130 areal, 17130 areal
advisory tubes, 1/4-in. OD, No. 18 BWG, 76 ft long, Muntz metal
tube sheets
Circulating-water pumps, 2. 1. Foster-Wheeler Corp.
Horizontal, centrifugal, single-stage, double-entry, 30,000 gpm at 93 P,
37-ft total head
Circulating pump drives, 2. 1. Allis-Chalmers Manufacturing Co.
250-hp motor, 582 rpm, 3-phase, 60-cyc/sec, 2200-V
Horizontal, centrifugal, single-stage, double-entry, 30,000 gpm at 93 P,
37-ft total head
Vertical, centrifugal, single-stage, double-entry, 30,000 gpm at 93 P,
37-ft total head

Refrigeration equipment:

Evaporator 1 _____ Lummus Co.
Bubble tray type, 100 U-tubes, 70-30 Cu-Ni, 3/4-in. OD, N6 18 BWG,
18 ft long, 432 sq ft surface

Evaporator level control, 1 _____ Climax Controls Div.,
Black, Sivalls & Bryson, Inc.

Evaporator condenser, 1 _____ Lummus Co.
Refrigerant, 46 U-tubes, arsenical copper, 3/4-in. OD, N6 18 BWG,
18 ft long, 432 sq ft heat transfer surface

Evaporator blowdown heat exchanger, 1 _____ Graham Mfg Co.
No. 1 heater, 1 _____ Westinghouse Electric Corp.
Closed, horizontal, 4 pass, 486 U-tubes, admiralty, 5/8 in. OD, 18
ft long, 200-psi test pressure, 30-psi shell, drain cooler, 15 ft 3/8 in.
active length of tubes

No. 2 heater, 1 _____ Westinghouse Electric Corp.
Jacketed, horizontal, 2 pass, 486 U-tubes, admiralty, 5/8 in. OD, 18
ft long, 200-psi test pressure, 30-psi shell, drain cooler, 15 ft 3/8 in.
active length of tubes

No. 3 generating heater, 1 _____ Cochran Co.
Jacketed, horizontal, 2 pass, 486 U-tubes, admiralty, 5/8 in. OD, 18
ft long, 200-psi test pressure, 30-psi shell, drain cooler, 15 ft 3/8 in.
active length of tubes

No. 4 heater, 1 _____ Westinghouse Electric Corp.
Closed, horizontal, 2 pass, 486 U-tubes, admiralty, 5/8 in. OD, 18
ft long, 200-psi test pressure, 30-psi shell, drain cooler, 15 ft 3/8 in.
active length of tubes

No. 5 heater, 1 _____ Westinghouse Electric Corp.
Closed, horizontal, 2 pass, 486 U-tubes, admiralty, 5/8 in. OD, 18
ft long, 200-psi test pressure, 30-psi shell, drain cooler, 15 ft 3/8 in.
active length of tubes

Refrigerant level control, 1 _____ Climax Controls Div.,
Black, Sivalls & Bryson, Inc.

Boiler feed pumps, 2 Ingersoll-Rand
Horizontal, 10-stage barrel type, 630,000 lb per hr at 350 F, 1
psig, 3460 rpm
Feed-pump hydraulic couplings, 2 American Blower
Boiler feed pump drives, 2 Westinghouse Electric Co
2000-hp, 3-phase, 48-circuit, 2400-v motor

TEAM-GENERATING EQUIPMENT

Coller, 1 Combustion Engineering-Superheater
150,000 lb per hr steam, wet-cooled, 150,000 lb per hr
1465 psig, 100% F at superheater and reheater outlets, furnace wall
of 44,600 cu ft, 70,210 sq ft waterwall surface
Stage, 1 Combustion Engineering-Superheater
150,000 lb per hr steam, wet-cooled, 150,000 lb per hr
steam, economizer water temperature
Reheater, 1 Combustion Engineering-Superheater
Single stage, 8000 sq ft heating surface, spray tempering
Economiser, 1 Combustion Engineering-Superheater
150,000 lb per hr steam, wet-cooled, 150,000 lb per hr
Air preheaters, 2 Combustion Engineering-Superheater
Ljungstrom regenerative, vertical shaft, 110,000 sq ft
Perce-draft fans, 2 Westinghouse Electric Corp (Sturtevant)
14-in. dia., 110 in. wg static press., vane control, 2800
F-d fan motor drive, 3
230 hp, 3 phase, 60 cycle, 2300 v
Induced-draft fans, 2 Westinghouse Electric Corp (Sturtevant)
14-in. dia., 110 in. wg static press., vane control, 2800
1-fan driver, 3
600 hp, 3 phase, 60 cycle, 2300 v
Pulverisers, 4 Combustion Engineering-Superheater
21,000 lb per hr bowl type, integral exhausters, grids 60 hard
blowdown
Pulveriser drives, 4 Allis-Chalmers Mfg Co
230 hp, 3 phase, 60 cycle, 2300 v
Burners, coal-fired, 1 Combustion Engineering-Superheater
Tilting burner, 1
burner oil Combustion Engineering-Superheater
12 air-stomizing ignition torches, 4 air-stomizing warm-up torches
provisions for 12 mechanical stomizing torches to generate steam
5600 lb per hr
Electrostatic precipitator Research Corp
6 fpm gas velocity, 2.93 sec treatment time, 32-34 kw power
consumption at 233,000 cfm, 99% collection efficiency
Soot blowers, 1 Dresser Power Specialty
Sequential control, 16 shoot and 10 long retractable blowers, spaced
6 mo long retractable blowers, steam at 400 psig and 700 F, 90
low-pressure section of station
Coal conveyor system United Conveyor Corp
Coal conveying equipment The Jeffrey Manufacturing Co

Mix burner oil pump, 2	DeLaval Steam Turbine Co.
Motor pump, 1600 gph at 200 psi	The Lewis Allis Co.
Burner pump drives, 2	The Lewis Allis Co.
7-1/2 hp, 3 phase, 60 cya, 220 v, 1710 rpm	The Lewis Allis Co.
Oil pressure pump, 1	DeLaval Steam Turbine Co.
Yoke pump, 400 gph, 200 psi	The Lewis Allis Co.
Oil burner pump, 1	DeLaval Steam Turbine Co.
Yoke pump, 100 gph, 35 psig, 3/4 hp motor drive	The Lewis Allis Co.
Centrifugal pump, 800 gpm, double suction, 30-ft tdk, 15-hp motor drive	Allis-Chalmers Manufacturing Co.
Centrifugal, single stage, 400 gpm, 30-ft tdk, 10-hp motor drive	Allis-Chalmers Manufacturing Co.
Hydrogen & oil cooler pump, 1	Pennsylvania Pump & Compressor Co.
Single stage, double suction, 600 gpm, 30-ft tdk, 10-hp motor drive	Pennsylvania Pump & Compressor Co.
Transfer pump, 1	Viking Pump Co.
150 gpm, 30 psig, 7-1/2 hp motor drive—The Lewis Allis Co.	The Lewis Allis Co.
Condensate return unit, 1	Gould Pumps, Inc.
Condensate return, 50 gpm at 240-ft tdk, 7-1/2 hp motor drive—Allis-Chalmers Manufacturing Co.	Allis-Chalmers Manufacturing Co.
Condensate-transfer pump, 1	Gould Pumps, Inc.
Centrifugal, 2 stage, 400 gpm, 100 P, 240-ft tdk	Gould Pumps, Inc.
Transfer pump drive, 1	Allis-Chalmers Manufacturing Co.
40-1/2 hp, 3 phase, 60 cya, 220 v, 1710 rpm	Allis-Chalmers Manufacturing Co.
Pump, 2	The La Bour Co., Inc.
Horizontal, centrifugal, oil-priming, 300 gpm, 50-ft tdk, 15-hp motor drive, 220 v	The La Bour Co., Inc.
Vertical, centrifugal, oil-priming, 300 gpm, 50-ft tdk, 15-hp motor drive, 220 v	The La Bour Co., Inc.
Water service pump, 1	Pennsylvania Pump & Compressor Co.
Single stage, double suction, 800 gpm, 150-ft tdk	Pennsylvania Pump & Compressor Co.
Boiler-service pump drive, 1	Allis-Chalmers Manufacturing Co.
Booster pump drive, 1 phase, 60 cya, 220 v	Allis-Chalmers Manufacturing Co.
Extraction boiler pump, 1	Warren Pump Co.
Recirculation + 10 gpm at 55-ft tdk, 3/4-hp motor drive	Warren Pump Co.
Cy-air booster pump, 1	Gould Pumps, Inc.
Boiler pump, 1	Gould Pumps, Inc.
Double suction, 400 gpm, 32-psig boost	Gould Pumps, Inc.
Booster pump drive, 1	Allis-Chalmers Manufacturing Co.
20 hp, 1 phase, 60 cya, 220 v	Allis-Chalmers Manufacturing Co.
Oil-pressure chemical feed pumps, 2	Orlich Brothers
Oil pump, 900 gph, 2500 gal, 90-9 solution	Orlich Brothers
Boiler pump, 1	Gould Pumps, Inc.
Centrifugal, 4 gpm, 30-ft tdk, 1/2 hp motor drive—General Electric	General Electric

Combustion control	Leads & Northrup Co.
Recorders	Leads & Northrup Co.
CO ₂ conductivity, temperature, boiler temperatures, steam temperature, feedwater and condensate temperature, condenser temperature, bearing oil temperature	

Multipoint draft gage Hays Corp.
Flowermeters Bailey Meter Co.
Boiler air and steam, feedwater, condensate, feed pump flow and re-
circulation, boiler-water level Hays Corp.
Pressure gauges Ashcroft-Manning, Maxwell & Moore, Inc.
Level controls, gland water tank, evaporator coil drain
..... Climax Controls Div. Black, Silvals & Bryson, Inc.
Control air compressor Pennsylvania Pump & Compressor Co.
74-cfm free air, 100 psig, single stage, double acting, 70-hp motor
drive, 1800 rpm

Station air compressor, 100 hp.	Phenoxylene Pump & Compressor Co.
Station air, 100 cu. ft. double acting, 210 cfm free air, 100 psi, 1000, rpm	Phenoxylene Pump & Compressor Co.
75-hp motor drive	Phenoxylene Pump & Compressor Co.
High-pressure valves above 2 in.	Grane Co.
High-pressure valves below 2 in.	Manning, Maxwell & Moore, Inc.
High-pressure drain valves, steam traps	Valvair-Walsh Co.
Iron body valves	R P & C Valve Div., American Chain & Cable Co.
Brass body valves	Walworth
Reverse current valves	Atwood & Morrill
Circulating water butterfly valves	Henry Pratt
Carbon steel valves	Walworth
Miscellaneous valves	Chapman Valve & Mfg. Co.
Softener and pressure filter	Nordstrom Valve Div., Rockwell Mfg. Co.
Pud-oil strainers, 3 in.	Cum Engineering Corp.
Pud-oil meters, 3 in.	Buffalo Meter Co.
Desuperheater control valves	Copey-Vulkan Div.,
	Grain Processing Machinery & Machine Co.
Bowl mill dismantling crane, 10 ton	Loomis Machinery Co.
Electric vibrator	Symton
Electric oil purifier, 450 gpm	Delaval
Butter	M W Kellogg
Structural-steel fabrication, erection	American Bridge Co.
Equipment insulation	Johns-Manville
Refining steel	William Edm.
Breaching, ducts, hoppers, circulating piping	

Steel gratings	Cooney Construction Co
Roof ventilators	Kerrigan Iron Works
Unit ventilators	H H Robertson
Unit heaters	Trans
	Buffalo Forge
	O C Breidert
	Trans

CONSULTING ENGINEERS.....Gilbert Associates Inc.