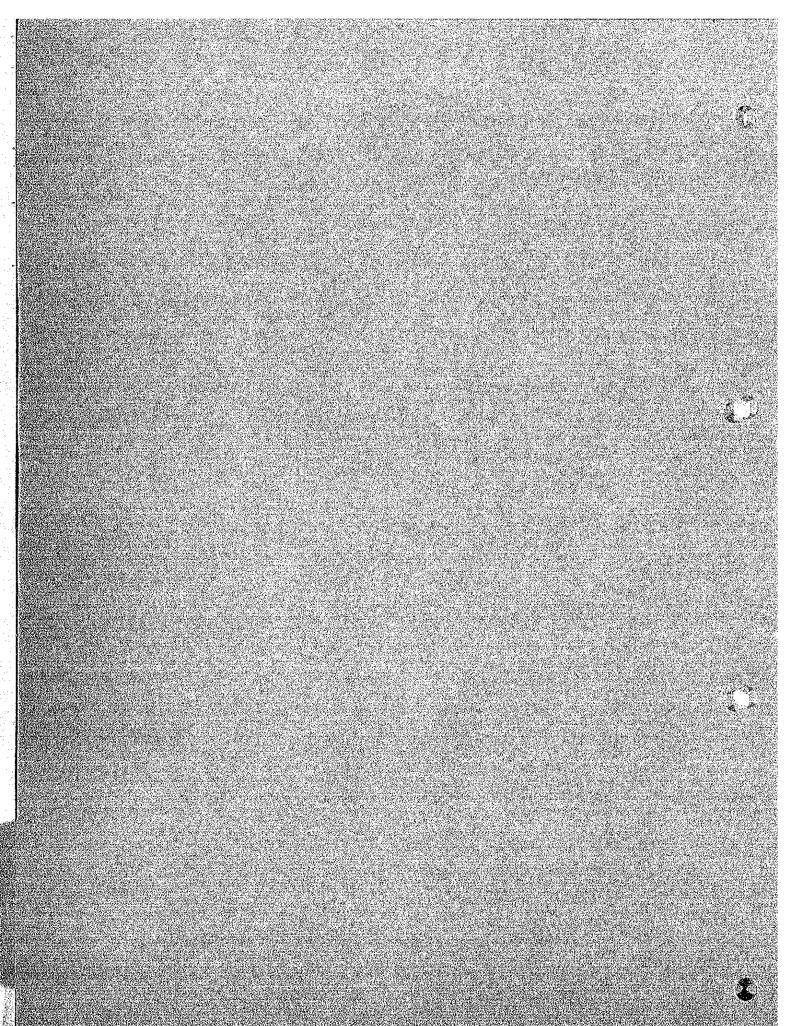
5. 発電所のリハビリテーション



## 5. 発電所のリハビリテーション

## 5.1 発電所設備の仕様

## 5.1.1 カードナー発電設備

## 1) Boiler Equipment

## a. Boiler Proper

		Unit No.	1	Unit No.	<u>2</u>
• Type		Drum		Once-Thro	ugh
				Benson Ty	pe
Steam pressure					
*Design pressure	psig(kg/cm <sup>2</sup> g)	2,180	(153.27)	3,425	(240.8)
*Final Superheater	psig(kg/cm <sup>2</sup> g)	1,800	(126.56)	2,770	(194.76)
outlet					
*Reheater outlet	psig(kg/cm <sup>2</sup> g)	530	(37.26)	544.	3 ( 38.27)
Steam temperature					
*Rating temperature	°F (°C)	1,005	(540.5)	1,005	(540.5)
*Economizer inlet	°F (°C)	451	(232.8)	481	(249.4)
*Reheater inlet	°F (°C)	645	(340.55)		
*Reheater Outlet	°F (°C)	1,005	(540.5)	1,005	(540.5)
*Superheater outlet	°F (°C)	1,005	(540.5)	1,005	(540.5)
Evaporation					
*Boiler MCR	1b/h (t/h)	1,065,000	(483.07)	1,675,485	(760.0)
*Unit 4/4 load	1b/h (t/h)	978,194	(443.70)	1,494,270	(677.8)
Superheater					
*Primary Superheate	r				
Type		Convection	n Ho	orizontal C	ontinuous
			Τι	ibe Type	
Heating surface	$ft^2 (m^2)$	31,500	(2,920.4)		

		Unit No. 1	Unit No. 2
Top and Roof superhe	ater		
Type Heating surface	ft <sup>2</sup> (m <sup>2</sup> )		Tangent type
*Secondary superheate	er		
Type		Radiant type	Pendant type
Heating surface	ft <sup>2</sup> (m <sup>2</sup> )	6,400 (594.6)	
*Superheater materia	ls		STPT - 49
			STBA-12,22,23,24
Reheater			
*Type		Horizontal conti-	Horizontal and
		nuous tube type	pendant continu-
			ous tube
*Surface area	ft <sup>2</sup> (m <sup>2</sup> )	13,300 (1,235.6)	44,800 (4,162.0
*Material			STBA-12,22,24
			STB-35
Economizer			
*Material (tube)			JIS STBA-42
			(ASTM A210A-1)
*Surface area	ft <sup>2</sup> (m <sup>2</sup> )	26,200 (2,434.06)	30,200 (2,805.7)
*In/outlet	°F	451/540	481/545
temperature	(°C)	(232.8/282.2)	(249.4/285.0)

		Unit No. 1	Unit No. 2
Furnace			
*Volume	ft <sup>3</sup> (m <sup>3</sup> )		79,750 (2,258.2)
*Construction of		Water walls are	Horizontal
water wall		2-1/2 and 2-31/32	menader
		OD carbon steel	
		tubes. The lower	
		heater offront rea	
		and side wall are	
		fed from two 22" O	
		downcomers	
*Manufacturer/erecto	<b>r</b>	Babcock - Hitachi	Babcock - Hitachi
b. Air P	reheater		
Regenerative air hea	<u>ter</u>		
*Type		Ljungstrom Hori-	Horizontal re-
		zontal type	generative type
*Heating area	ft <sup>2</sup> (m <sup>2</sup> )	78,850	98,070
		(7,325.4)/Heater	(9,111)/Heater
*In/outlet air	°F (°C)	135/565	160/555
temperature		(57.2/296.1)	(71.1/290.5)
*Manufacturer/erecto	ï	Gadelius	Gadelius
Steam coil air heate	er		
*Type		HDI-2V5-17-96	21-450M4V-5TI-FE3
(Heating area	ft <sup>2</sup> (m <sup>2</sup> )		18,510 (1,719.6)

Gardner		
	Unit No. 1	Unit No. 2
c. <u>Sootblower</u>		
*Type/units number	RSB53 rack type	RSB-53A retract-
	retractable lance	able rack
	24 units	22 units
*Manufacturer/erector	Babcock - Hitachi	Babcock - Hitachi
d. Boiler Automatic Co	ontrol	
Combustion control		
*Type	Pneumatic	Pneumatic
*Manufacturer/erector	Bailey	Bailey
Temperature control		
*Type	Pneumatic	Electropneumatic
*Manufacturer/erector	Bailey	Siemens
Feedwater control		andrasia Projektija projektija i projektija
*Type	Pneumatic	Pneumatic
*Manufacturer/erector	Bailey	Bailey/Siemens
e. <u>Fuel Supply &amp; Firi</u>	ng System	
Heavy oil storage tank		
*Type	Common use for Gl,	G2, S1, and S2
*Capacity m <sup>3</sup> x number	Floating roof type	
*Manufacturer/erector	Tank No. 1 8,	751.6
	Tank No. 2 8,	751.6
	Tank No. 3 23,	550.0
	Tank No. 4 23,	550.0
Light Oil Storage Tank		
*Type	Cylindorical : L-l	2'-00" W-12'-00"
*Capacity x number gal (m <sup>3</sup> )	11,720 (44.36) x J	. set
	-4	

Gardner		
Galdner		
	Unit No. 1	Unit No. 2
*Manufacturer/erector		
Heavy oil service tank	None	None
*Type		
*Capacity, number of tank		
*Manufacturer/erector		
Heavy oil burner		
*Type	Return flow	Wide range return
	mechanical	flow mechanical
	atomizing	atomizing
*Capacity, number of g/h (1/h)	722.0 (2,732) x	1,280 (4,845) x
burner	16 sets	18 sets
*Manufacturer/erector	Babcock & Wilcox	Babcock & Wilcox
Light oil burner		
*Type		
*Capacity	<del>-</del>	
Number of burner	16 sets	18 sets
Main fuel oil pump		and the first of the second
*Type	No. A6DH - 400	IMO-Screw-type
	Rotary, Screw	Spindle pump
*Discharge pressure psig(kg/cm <sup>2</sup> g	3) 765 (53.8) x	720 (50.6)
Capacity gal/min(m <sup>3</sup> /l	n) 264 (59.95)	380 (74.9)
& number of pump	2 sets	
*Manufacturer/erector	IMO - DeLaval	Siemens

Unit No. 1 Unit No. 2

\*Driver - Type G.E. explosion

proof motor coupled

by a falk type

coupling

- Capacity 200 HP (149.2 kW), 250 kW, 1800 rpm

1200 rpm 440 V, 60 herz

Constant differential fuel oil pump

\*Type Centrifugal, vertical

2 stages

\*Capacity & number

of pump  $ga1/min(m^3/h)$  215 (48.82) x 1 set

\*Discharge pressure psig(kg/m<sup>2</sup>g) 915 (64.33)

\*Suction pressure  $psig(kg/m^2g)$  740 (52.03)

Light fuel oil pump

\*Type No. A6DB-137 SCREW

\*In/outlet pressure, psig(kg/m<sup>2</sup>g) 17 in Hg/259(0.59/18.2)

capacity & number  $gal/min(m^3/h)$  27.8 (6.31) x 2 sets

of pump

\*Manufacturer/erector IMO - DE LAVAL

\*Driver - Type G.E. explosion Induction motor

proof motor

- Capacity HP (kW) 7.5 (5.6) 7.5 (5.6)

\*Manufacturer/erector General Electric

Unit No. 1 Unit No. 2 Main fuel oil heater \*Type OWS 14-96-2F MESCO 2EV13-162F thermofilm  $gal/min(m^3/h)$  100 (22.7) x ᡮCapacity & number 135 (30.7) xof heater 3 sets 3 sets \*Manufacturer/erector Old Dominion Iron The Engineer Co. and Steel Corporation Boiler Draughting Equipments Forced draught fan \*Type No. 560 Series 120 Axial flow, 2 C-Dll with inlet stage horizontal, vanes and connecwith oil hydraution of combustion lic motor blade control adjustment \*Capacity & number ft<sup>3</sup>/min 178,410 (5,052.6) 232 lb/sec(105.2 kg/sec)  $(m^3/min)$ x 2 sets x 2 sets \*Pressure in wg (mmwg) 37 (940) 45 (1143) \*Revolution speed 1,180 rpm 1,750 \*Manufacturer/erector American Standard Dinzler \*Driver - Type Squirrel cage, horizontal

> x number 2 sets - Manufacturer/ General Electric Siemens

1,250 (932.5) x

2,250 (1680) x

2 sets

HP (kW)

erector

- Capacity

Gardner	
	Unit No. 1 Unit No. 2
Gas recirculation fan	
*Type	- 6600 DT - CH
*Capacity x number ft <sup>3</sup> /min	250,800 (7,101.6)
(m <sup>3</sup> /min)	x l set
*Pressure mmAq	
*Revolution speed rpm	885
*Manufacture/erector	
*Driver - Type	EFUP 3 Ø Motor Drive
- Capacity kW	Induction motor
x number	400 x 1 set 475 x 1 set
- Manufacturer/	Hitachi, Ltd.
erector <u>Stack</u>	
*Construction	Constructed of welded steel plate,
	insulated with 2' thick magnesia
	and gunitelined with 2" thick
	mixture of sand and "Lunirite"
	cement.
*Top outside diameter	25'-6" (4.725m)
*Height	301'-63/4" (91.906m)
*Number	One stack for Unit 1 and Unit 2
*Manufacturer/erector	Pacific Engineering

Gardner		
	<u>Unit No. 1</u>	Unit No. 2
g. <u>Boile</u>	r Feed Water Pump	
Turbine driven feed v	water pump	
*Type & number of sta	age None	HDGr 7S, 7 stage
		centrifugal
*Capaclty	lbs/h(T/h)	1,863,000 (845)
& number of pump		x 1 set
*Total head &	psi (m) None	3,545 (2,492.5)
revolution	rpm	4600
*Manufacturer/erecto		KS & B
Turbine for BFP		
*Type	None	Axial reaction,
		single cylinder
		condensing type
*Capacity & number	kW	14,200 x 1 set
of turbine		and remains
*Manufacturer/erecto		Siemens
T-BFP booster pump		
*Type	None	YNK N 400/300,
		doubt suction,
		single stage
*Capacity & number	lbs/h (t/h)	1,863,000 (845.0
of pump		x 1 set
*Total head &	psi (m) None	96 (67.5)
revolution	rpm	1,500
*Driver (pump input)	kW	200
*Manufacturer/erecto		KSB
	5 – 9	

Gardner			
		Unit No. 1	Unit No. 2
Motor driven feed wat	er pump		
*Type & number of sta	ge	8" HH-BFI, hori-	HDGr 55S/7 stage
		zontal barrel type	centrifugal,
		9 stages	motor drive
*Capacity & number	g/m(m <sup>3</sup> /h)	1,328 (301.6)	1,631 (370.5)
of pump		x 2 sets	x 2 sets
*Total head &	psi (m)/rpm	3,025 (2,134)	3,585 (2,520)
revolution	rpm	3570	4870
*Manufacturer/erector		Pacific Pumps	KSB
*Driver - Type			Totally enclosed
			fan cooled
- Capacity &	kW	3,100 x 2 sets	4,400 x 2 sets
number of m	otor		
- Manufacture	r/		Siemens
erector			
	ater Heaters I	Guipment	
No. 1 LP feed water h			
*Type		Horizontal U-tube	Vavl 115.4/470,
		L.P. size 34-35B	horizontal U-
		H.I. SIZE 34-33B	
*Heating surface area	f+2 (m2)	5 056 (//60 7)	tube, 4 pass
& number of heater	TC (m.)	5.056 (469.7)	4,740 (440.3)
	and the second s	l set	1 set
*Material of heating		Admiralty	St. 35.8 Seamless
tube			Steel was the second
	5-1	0	

		Unit No. 1	Unit No. 2
*Heating steam in/	°F (°C)	242/114	177/172
drain outlet		(116.7/45.6)	(80.6/77.8)
temperature			
*Feed water flow	lbs/h	894,300	1,117,700
	(kg/h)	(405,654)	(506,988)
*Manufacturer/erector		Yuba Heat Transfer	Atlas - Mak
		Corp.	Maschinenbau -
			GmbH
No. 2 LP feed water h	<u>eater</u>		
*Type		Horizontal U-tube	Vval 1.2.4/490,
		L.P. size 32-319	horizontal U-
			tube, 4-pass
*Heating surface area	ft <sup>2</sup> (m <sup>2</sup> )	3,240 (301.0)	4,850 (450.6)
*Number of heater		l set	1 set
*Material of heating	tube	Admiralty	S+ 35.8 Seamless
			steel
*Heating steam in/	°F (°C)	458/200	275/172
drain outlet		(236.7/93.3)	(135.0/80.6)
temperature			
*Feedwater in/outlet	°F (°C)	190/257	167/208
temperature		(87.94/125.0)	(75.0/97.8)
*Feed water flow	1b/h (kg/h)	896,510	1,117,672
		(406,657)	(506,976)
*Manufacturer/erector		Yuba Heat Transfer	Atlas - Mak
		Corp.	Maschnenbau -
			GmbH

Gardner		
	Unit No. 1	Unit No. 2
No. 3 LP Feed Water Heater		
*Type	Horizontal U-tube,	Vwal 12.4/580,
	L.P. size 30-298	horizontal
		U-tube 4-pass
*Heating surface area $ft^2$ ( $m^2$ )	2,280 (211.8)	5,814 (540.1)
& number of heater	1 set	1 set
*Material of heating tube	Admiralty	St. 35.8 Seamless
		Stee1
*Heating steam in/ °F (°C)	574/267	502/218
drain outlet	(301.1/130.5)	(261.1/103.3)
temperature		
*Feed water in/outlet °F (°C)	257/294	208/289
temperature	(125.0/145.5)	(97.8/142.7)
*Feed water flow 1bs/h (kg/h)	896,510	1,117,672
	(406,657)	(506,976)
*Manufacturer/erector	Yuba Heat Transfer	Atlas - Mak
	Corp.	Maschinenbau -
		GmbH
Deaerator		
*Type	Direct contact,	Spray type,
	spray tray mounted,	mounted on hori-
	on horizontal	zontal storage
	storage tank	tank
*Deaerator Capacity 1bs/h (kg/h)		en de la Region de la Section de la Region de
*Condensate to lbs/h (kg/h)		
deaerator		

Gardner	Unit No. 1	Unit No. 2
*Outlet feed water lbs/h (kg/h)	1,161,490	1,494,270
flow	(526,852)	(677,800)
*Storage tank ft <sup>3</sup> (m <sup>3</sup> )	5,620 (159.1)	5,124 (145.1)
capacity - respectively assets		
*Deaerator pressure psig(kg/cm <sup>2</sup> g)	) 120 (8.44)	142.3 (10.0)
*Manufacturer/erector	Worthington Corp.	Atlas - Mak
		Maschinenbau -
		GmbH
*Heating steam inlet °F (°C)	<del></del>	663 (350.5)
temperature		
*Dissolved oxygen cc/1	0.005	0.005
guarantee value		
No. 5 HP feed water heater		
*Type	U-type multilok,	VU Way 95.2/400
	Horizontal, HP	horizontal U-tu
	size 34-274	2-pass
*Heating surface area ft <sup>2</sup> (m <sup>2</sup> )	3,350 (311.2)	3,660 (340.0)
& number of heater	1 set	2 sets
*Material of heating tube	70-3-Cu-Ni	St 35.8 Seamles
	(PHelps Dodge	Steel
	Cuffenloy 30)	
*Heating steam in/ °F (°C)	830/356.8	820/369
drain outlet	(443.3/180.4)	(437.8/187.2)
temperature		
*Feed water in/outlet °F (°C)	346.8/383.5	359.4/408.7
temperature	(174.9/195.3)	(181.9/209.3)

Gardner		
	Unit No. 1	Unit No. 2
*Feed water flow lbs/h (kg/		1,358,425
	(478,962.37)	(616,181.6)
*Manufacturer/erector	Yuba Heat Transfer	Atlas - Mak
	Corp.	Maschinenbau -
		GmbH
No. 6 HP Feed water heater		
*Type	U-tube multi lok,	VU Way 95.2/420
	horizontal, HP	horizontal U-tube
	size 39-332	2-pass
*Heating surface area °F (°C)	5,752 (534.4)	3,770 (350.2)
& number of heater	1 set	2 sets
*Material of heating tube	70-30 Cu-Ni	St 45.8 III
	(Phelps Dodge	Seamless Steel
	Cuffenloy 30)	
*Heating steam in/ °F (°C)	650/393.4	629/418.8
drain outlet	(343.3/200.8)	(331.7/214.9)
temperature		
*Feed water in/outlet °F (°C)	383.5/457.9	408.7/481.5
temperature	(195.3/236.6)	(209.3/249.7)
*Feed water flow lbs/h (kg/	h) 1,055,930	1,358.425
	(478,961.4)	(616,181.6)
*Manufacturer/erector	Yuba Heat Transfer	Atlas - Mak
	Corporation	Maschinenbau -
		GmbH

<u>Gardner</u>

2) Turbine and Auxiliary		and American Section (1997) Section (1994)
a. <u>Turbine</u>		
*Type	Tanden-compound	Tanden-compound
	reheat, condensing	single reheat
	unit	
*Rating output kW	150,000	200,000
*Throttle steam psig(kg/cm <sup>2</sup> g)	1,804 (126.8)	2,706 (190.2)
pressure at MSV inlet		and the second second
*Throttle steam °F (°C)	1,000/1,000	1,000/1,000
temperature (main	(537.8/537.8)	(537.8/537.8)
steam/hot reheat)		
*Exhaust vacuum inHg (mmHg)	3.5 (88.9)	3.5 (88.9)
*Number of bled steam	6	6
estages and the control of the contr		
*Manufacturer/erector	General Electric	Siemens
	Company	
b. <u>Condenser</u>		
*Type	107E - RBT - 30	Surface rectangu-
	two-pass vertical-	lar single shell
	ly divided condense	e <b>r</b>
	with reflushing	
	deaerating hotwell	
*Circulating water gal/m (m³/h)	<b></b>	
*Tube cleanliness %		
factor		
*Condensate flow 1bs/h (t/h)	820,000 (371.94)	971,100 (440.48)

Unit No. 1

Unit No. 2

Gardner		
OGLATICAL.	Unit No. 1	Unit No. 2
*Cooling water design °F (°C)	85 (29.4)	85 (29.4)
temperature		
*Cooling water outlet °F (°C)		
design temperature		
그는 함께 됐다. 현소에는 근무에 가는 것으로 모르는	7.0 (2.134)	6.7 (2.042)
inside flow velocity		
*Tube material of	Arserical Admiralt	y Admiralty
condensing zone	ing the second s	
*Tube dimensions of	1" OD 18 BWG	1" OD #18
condensing zone		
*Effective tube length		
*Tube material of air	nt <del>i</del> riyaya kiri	
cooling zone		
*Cooling surface $ft^2 (m^2)$	115,060 (10,689)	130,300 (12,150)
*Material of tube plate	Steel	Steel with
		tarset coating
*Material of water box	Steel	Steel with
		tarset coating
*Cathodic protection -		
system type		
*Manufacturer/erector	Ingersoll - Rand	Siemens
	Company	

	Unit No. 1	Unit No. 2
c. Circulating Water Pu	mp	
*Type	Vertical, single	Vertical shaft,
	stage mixed flow	mixed flow single
	size 40A PMA, non-	stage with vari-
	pullout	able pitch pro-
		peller blades
*Capacity x head x number	55,555 g/m x 30'	102,900 g/m x 25'
	$(12,616 \text{ m}^3/\text{h} \text{ x})$	$(23,368 \text{ m}^3/\text{h} \text{ x})$
	9.14 m) x 2 sets	7.62 m x 2 sets
*Manufacturer/erector	Ingersoll - Rand	Siemens
	Company	
*Driver - Type		
- Capacity kW x rpm	373 x 500	650 x 1,785
d. <u>Air Ejector Equipme</u>	<u>it</u>	
*Type	JS 200, twin ele-	Roman 1/25, twin
	ment, two stage,	elements, two
	steam hot with	stage steam jet
	combined surface	
	inter-after	
	condenser	
*Capacity x number	- x 2 sets	45 1bs/h
		(20.4 kg/h)
		x 2 sets
*Suction pressure inHg (mmHg)	1.0 (25.4)	2.5 (63.5)

Gardner		
	Unit No. 1	Unit No. 2
*Working steam con- lbs/h (kg/h)	827 (375.1)	960 (435.5)
sumption (in case of		
steam jet ejector)		
*Driver capacity kW		
x rpm (in case of		
mechanical ejector)		
*Manufacturer/erector	Ingersoll - Rand	Siemens
	Company	
e. Condensate Pump		
*Type	Vertical, 6 stages	WKT 250 vertical
	size 20 APKC - 6	5 stage, 14"x12"
		ring sectional
		design with
		barrels
+On-raider one or boad	1850 ann y 605 fr	
*Capacity gpm x head	1850 gpm x 605 ft	2880 gpm x 820 ft
ft x number	x 2 sets	x 2 sets
	$(420 \text{ m}^3/\text{h}) \text{ x}$	$(654 \text{ m}^3/\text{h}) \text{ x}$
	(184.4 m)	(250 m)
*Manufacturer/erector	Ingersoll - Rand	Siemens
	Company	
*Driver - Type		
- Capacity kW x rpm	298.4 x 1,180	610 x 1,180
	(400 HP)	

		Unit No. 1	Unit No. 2
3) <u>Generator</u>	and Auxiliary		
a. Gener	ator		
*Type		Totally enclosed	Totally enclosed
	the second second	hydrogen cooled	hydrogen cooled
		GE Type ATB	FTHD.540/62-2/60
*Rating capacity	kVA	188,000 (30 psig)	245,000
*Power factor		0.9	0.9
*Voltage	<b>V</b>	18,000	14,400
*Frequency	Нz	60	60
*Revolution	rpm	3,600	3,600
*Cooling type - Stat	ior	Hydrogen cooled	Hydrogen cooled
- Roto	or		
*Hydrogen pressure	psig(kg/cm <sup>2</sup> g)	30 (2.113)	45 (3.164)
*Connection		Star	Double Star
*Exciting system		Static Type	Brushless Type
*Short circuit ratio	on	0.604	0.596
*Neutral grounding	system	Transformer 75 kVA	Transformer 50kVA
		14,400/240 V,	10,000/220 V,
		resistance,	resistance,
		0.63 ohm, 300A	0.804 ohm, 220A
*Manufacturer/erect	or	General Electric	Siemens
b. <u>Exci</u>	<u>ter</u>		
*Туре		Static Type	3 phase, 6 pole
			revolving arma-
			ture type with
			silicon rectifier

		Unit No. 1	Unit No. 2
*Capacity	kW	Rectifier 846A DC	1,870 (main
		2 sets	exciter)
		C.T. 6,030A 3 phase	940 (rectifier)
*Voltage	V	lry P.T. 116 kVA	570(main exciter)
		18,000/120 V	
		2ry P.T. 340 kVA	410 (rectifier)
		18,000/256 V	
*Revolution speed	rpm		3,600
(if rotating type)			
*Number	2 1	1 set	1 set
*Manufacturer/erect	or	General Electric	Siemens
*Kind of driver			Directly coupled
(if rotating type)			to generator

011-immersed (OA/FA) 011-immersed outdoor type (FOD) outdoor type  *Capacity kVA 130,000 a 55°C 232,000 Rise, OA  173,000 a 55°C Rise, FA  193,760 a 65°CV Rise, FA  *Primary voltage V 17,500 14,400  *Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-ground  *Cooling system Air cooled Forced oil coo Forced air coo  *Number 1 set 1 set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer				
### Unit No. 1 Unit No. 2  4) Transformers  a. Main Transformer  *Type				
4) Transformers  a. Main Transformer  *Type  G.E. "Atmoseal" KFUM 1985N/130E  Oil-immersed(OA/FA) Oil-immersed outdoor type (FOD) outdoor type  *Capacity kVA 130,000 a 55°C 232,000  Rise, OA  173,000 a 55°C Rise, FA  193,760 a 65°CV Rise, FA  193,760 a 65°CV Rise, FA  *Primary voltage V 17,500 14,400  *Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly	<u>Gardner</u>			
a. Main Transformer  *Type			<u>Unit No. 1</u>	Unit No. 2
*Type G.E. "Atmoseal" KFUM 1985N/130E  011-immersed(OA/FA) 011-immersed  outdoor type (FOD) outdoor  type  *Capacity kVA 130,000 a 55°C 232,000  Rise, OA  173,000 a 55°C Rise, FA  193,760 a 65°CV Rise, FA  193,760 a 65°CV Rise, FA  *Primary voltage V 17,500 14,400  *Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cool  *Number I set I set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type 0il immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400	4) Transforme	ers		
Oil-immersed(OA/FA) Oil-immersed outdoor type (FOD) outdoor type  *Capacity kVA 130,000 a 55°C 232,000  Rise, OA  173,000 a 55°C Rise, FA  193,760 a 65°CV Rise, FA  193,760 a 65°CV Rise, FA  *Primary voltage V 17,500 14,400  *Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cooled *Cooling system Forced air cooled *Cooling System Solidly-grounded Solidly-grounded *Cooling System Air cooled *Cooling System Solidly-grounded Solidly-grounded *Cooling System Air cooled *Cooling System Solidly-grounded Solidly-grounded *Cooling System Air cooled *Cooling System Solidly-grounded Solidly-grounded Solidly-grounded *Cooling System Air cooled *Cooling System Solidly-grounded Solidly-grounded *Cooling System Air cooled *Cooling System Solidly-grounded Solidly-grounded Solidly-grounded *Cooling System Air cooled *Cooling System Solidly-grounded Solidly-grounded Solidly-grounded *Cooling System Air cooled *Cooling System Air cooled *Cooling System Solidly-grounded Solidly-grounded Solidly-grounded *Cooling System Air cooled *Cooling System *Cooling Sy	a. Main T	Transformer		
outdoor type (FOD) outdoor type  *Capacity kVA 130,000 a 55°C 232,000 Rise, OA  173,000 a 55°C Rise, FA  193,760 a 65°CV Rise, FA  *Primary voltage V 17,500 14,400  *Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10,7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cooled *Forced air cooled *Forced air cooled *Secondary cooled *Secon	*Type		G.E. "Atmoseal"	KFUM 1985N/130E
*Capacity kVA 130,000 a 55°C 232,000  Rise, OA  173,000 a 55°C Rise, FA  193,760 a 65°CV Rise, FA  *Primary voltage V 17,500 14,400  *Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cool  *Number 1 set 1 set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type 0il immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400			Oil-immersed(OA/FA	) Oil-immersed
*Capacity kVA 130,000 a 55°C 232,000  Rise, OA  173,000 a 55°C Rise, FA  193,760 a 65°CV Rise, FA  *Primary voltage V 17,500 14,400  *Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cooled Forced air cooled Forced air cooled *Cooling System Station Service Transformer  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400			outdoor type	(FOD) outdoor
Rise, OA				type
173,000 a 55°C Rise, FA   193,760 a 65°CV Rise, FA   193,760 a 65°CV Rise, FA   *Primary voltage V   17,500   14,400   *Secondary voltage V   115,000   115,000   115,000   *Phase   3   3   3   *Impedance voltage %   7.13   10.7   *Connection   Delta - WYE   Delta - WYE   *Neutral (HV side)   Solidly-grounded   Solidly-grounded   *Cooling system   Air cooled   Forced oil cool	*Capacity	kVA	130,000 a 55°C	232,000
*Primary voltage V 17,500 14,400  *Secondary voltage V 115,000 115,000  *Phase 3 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cool  *Forced air cool  *Number 1 set 1 set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400			Rise, OA	
*Primary voltage V 17,500 14,400  *Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cool Forced air cool  *Number 1 set 1 set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400		ett og skrivet i det etter og skrivet i d Det etter og skrivet i det etter og skriv	173,000 a 55°C Ris	e, FA
*Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cool  *Number 1 set 1 set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400			193,760 a 65°CV Ri	se, FA
*Secondary voltage V 115,000 115,000  *Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cool  *Forced air cool  *Number 1 set 1 set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400	*Primary voltage	V	17,500	14,400
*Phase 3 3  *Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded *Cooling system Air cooled Forced oil cool  *Number 1 set 1 set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400		<b>V</b>		115,000
*Impedance voltage % 7.13 10.7  *Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded  *Cooling system Air cooled Forced oil cool  Forced air cool  *Number I set I set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2  ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400				
*Connection Delta - WYE Delta - WYE  *Neutral (HV side) Solidly-grounded Solidly-grounded  *Cooling system Air cooled Forced oil cool  Forced air cool  *Number 1 set 1 set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2  ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400		<b>%</b>		10.7
*Neutral (HV side)  *Cooling system  Air cooled  Forced oil coo  *Number  1 set  *Manufacturer/erector  6 General Electric  5 iemens  b. Station Service Transformer  *Type  0il immersed, seal- KOUM, 1425 n/2  ed air, (OA)  *Capacity  kVA  10,000  17,000  *Primary voltage  V  18,000  14,400				
*Cooling system Air cooled Forced oil cooled Forced air cooled Station Service Transformer  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400				
*Number 1 set 1 set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2  ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400				
*Number l set ! set  *Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2  ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400	OOOTING BYOCK			
*Manufacturer/erector General Electric Siemens  b. Station Service Transformer  *Type Oil immersed, seal- KOUM, 1425 n/2  ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400	*Number		l set	
b. Station Service Transformer  *Type				
*Type Oil immersed, seal- KOUM, 1425 n/2 ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400				
ed air, (OA) (OA)  *Capacity kVA 10,000 17,000  *Primary voltage V 18,000 14,400		on service ii		- KOUM 1425 n/2
*Capacity kVA 10,000 17,000 *Primary voltage V 18,000 14,400	^1ype			
*Primary voltage V 18,000 14,400				
**Secondary voltage			医乳头性畸形 医生物 斯拉	
	*Secondary voltage	<b>V</b>	4,100	4,100

Gardner *Phase		Unit No. 1	Unit No. 2
*Impedance voltage	%	5.5 Delta - WYE	
*Connection  *Neutral (L.V. side)		Solidly grounded	
*Cooling system		Oil air self cooled	l oil air self
*Number	ing sa	1 set	1 set
 *Manufacturer/erector		General Electric	Siemens

# c. Emergency Station Service Transformer

*Type		Common Use
		Oil immersed (OA)
		Out door, type
*Capacity	kVA	12,000
*Primary Voltage	<b>V</b>	115,000
*Secondary voltage		4,160
*Phase		3
*Impedance voltage	%	6.0
*Connection		Delta-Zigzag
*Neutral (L.V. side)		Solidly grounded
*Cooling system		Oil, air, self cooled
*Number		1, set
*Manufacturer/erector		G.E.
	5-22	

And and the second second		Unit No. 1
5) Water	Treatment System	<u>n</u>
a. R	aw Water	Common Use
*Kind		Deepwell water
*Total hardness	(CaCO <sub>3</sub> ) ppm	95
*рН		6.9
*Silica (SiO <sub>2</sub> )	ppm	70
*Turbidity	degree	
b. Raw Water Ta	<u>nk</u>	
*Type		
*Capacity $m^3 \times n$	umber	
*Manufacturer/er	ector	
c. Sedimentation	on System	
*Type		
*Applied chemica	a1	
*Manufacturer/e	rector	
<pre>d. Filtering Sy *Type</pre>	ystem	
*Applied chemica	<b>a1</b>	
*Capacity t/day	x number	
*Manufacturer/e	rector	
e. Filtering S	ystem	
*Type		
*Capacity t/day	x number	
*Type of revers	e washing	
*Filter materia	1	
*Manufacturer/e	rector	

Unit No. 1 Unit No. 2

## f. Water Dimineralizing Equipment

\*Type Graver

\*Capacity  $GPM(m^3/H)$  x number of 50 (11.4) x 3

train Mixed Bed 76 (17.3) x 2

\*Capacity per 1 cycle Cation 90500 (286)

service gal(m<sup>3</sup>) Anion 71000 (269)

Mixed Bed 1,000,000 (3785)

\*Type of resin x resin Cation RE-3 108 (3058)

filling capacity ft<sup>3</sup> Anion AE-61 96 (2718)

Mixed Bed Cation RE-6 17 (481)

Anion AE-61 11 (311)

## g. Condensate Demineralizer

\*Pre-filter Type None None

\*Condensate Demineralizer None 1400 (318) x 3

Capacity x number GPM(m<sup>3</sup>/H)

\*Regeneration Equipment 2 sets in GSTP

1) <u>Boiler</u>			
a. Boiler	Proper		
		Unit No. 1	Unit No. 2
Type		Meander Waterwall	Meander Waterwal
of safe, and five and five and the safe of		radiant type	radiant type
Steam Pressure at 100	% load		
*Design pressure	psig(kg/cm <sup>2</sup> g)	3,425 (240.8)	3,425 (240.8)
*Final superheater	psig(kg/cm <sup>2</sup> g)	2,770 (194.76)	2,770 (194.76)
outlet			
*Reheater outlet	psig(kg/cm <sup>2</sup> g)	544.3 (38.27)	544.3 (38.27)
Steam temperature at	100 % load		
*Rating temperature	°F (°C)	1,005 (540.5)	1,005 (540.5)
Economizer inlet	°F (°C)	481 (249.4)	481 (249.4)
Reheater inlet	°F (°C)	, <del>-</del>	627 (330.5)
Reheater outlet	°F (°C)	1,005 (540.5)	1,005 (540.5)
Superheater outlet	°F (°C)	1,005 (540.5)	1,005 (540.5)
Evaporation			
*Boiler MCR	1bs/h (t/h)	1,675,485	2,274,227
		(760)	(1,031.6)
*Unit 4/4 load	1bs/h (t/h)	1,494,270	2,028,507
		(677.8)	(920.1)
Superheater			
*Primary superheater			
Туре		horizontal conti-	horizontal cont
		nuous tube	nuous tube type
Heating surface	ft <sup>2</sup> (m <sup>2</sup> )	(S.H. Total)	52,560 (4,883)
		57,360 (5328.9)	

		Unit No. 1	Unit No. 2
*Top and Roof SH			Ollic No. 2
Type		Tangent type	Tangent type
Heating surface	ft <sup>2</sup> (m <sup>2</sup> )	Tangent type	9,860 (916)
*Secondary Superheat			3,000 (320)
Type			Pendant conti-
			nuous tube type
Heating surface	ft <sup>2</sup> (m <sup>2</sup> )		26,570 (2,468.4)
Superheater materi		STPT-49	
		STBA-12, 22, 23, 24	
Reheater			
*Type		Horizontal & pen-	Horizontal & pe
		dant continuous	dant continuous
		tube	tube
*Heating surface	ft <sup>2</sup> (m <sup>2</sup> )	44,810 (4163.0)	41,900 (3,985.5
*Materials		STBA-12,22,24	STBA-12,23,24,
		STB-34	STB-35
		SUS-27 HTB	
Economizer			
*Material		STB 42	STB 42
		(ASTM A210 A-1)	
*heating surface	ft <sup>2</sup> (m <sup>2</sup> )	30,200 (2,805.7)	54,600 (5,072.5
*In/outlet	°F (°C)	481/545	481/564
temperatue		(249.4/285.0)	(249.4/295.5)
Furnace		Berending of the State of the S	
*Volume	fr <sup>3</sup> (m <sup>3</sup> )	79,750 (2,258.2)	120,000 (3,398)

		Unit No. 1	Unit No. 2
*Construction of water		Horizontal meander	Meander construc-
wa11			tion
*Manufacturer/erector		Babcock - Hitachi	Babcock - Hitachi
b. Air Pre	heater		
Regenerative air heate	er.		
*Type		Horizontal regene-	Ljungstrom hori-
		rative type	zontal regenera-
			tive type
*Heating area	ft <sup>2</sup> (m <sup>2</sup> )	98,070 (9,111)/	(149,210 (13,862)
The second secon		heater	
*In/outlet air	°F (°C)	160/555	137/559
temperature		(71.1/290.5)	(58.3/292.8)
*Manufacturer/erector		Ljungstrom Gadelius	Ljungstrom
			Gadelius
Steam air heater			
*Type		21-450M4V-ETI-FE 31	21-530H5V-ETI-FE
			41
*Heating area	ft <sup>2</sup> (m <sup>2</sup> )	18,510 (1,719.6)	27,835 (2,586)
*In/outlet air	°F (°C)	136/160	100/134
temperature		(57.8/71.1)	(37.8/56.7)
*Manufacturer/erector		GEA Luftkunkler-	GEA Luftkunkler-
o e en e		gestllschaft Bothum	gesellschaft
			Bothum

*Manufacturer/erector Babcock - Hitachi Babcock - Hitachi d. Boiler Automatic Control  *Combustion control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  *Temperature control  *Type Electropneumatic Electropneumatic  *Manufacturer/erector Bailey & Siemens Bailey & Siemens  *Feed water control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³		Unit No. 1	Unit No. 2
able rack 22 units able rack type  18 sets swing type 2 s  *Manufacturer/erector  d. Boiler Automatic Control  Combustion control  *Type Electronic  *Manufacturer/erector Siemens  *Manufacturer/erector  *Type Electropneumatic  *Manufacturer/erector  Bailey & Siemens  Bailey & Siemens  Bailey & Siemens  Feed water control  *Type Electronic  *Type Electronic  *Alexandra Siemens  Bailey & Siemens  Bailey & Siemens  Bailey & Siemens  Fleetronic  *Type Floating roof type  *Capacity m³ x number  Tank No. 1  8752 m³  Tank No. 2  8752 m³  Tank No. 3  23550 m³  Tank No. 3  Tank No. 3  Tank No. 4  23550 m³  Tank No. 4	c. <u>Sootblower</u>		
*Manufacturer/erector Babcock - Hitachi Babcock - Hitachi d. Boiler Automatic Control  *Combustion control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  *Temperature control  *Type Electropneumatic Electropneumatic  *Manufacturer/erector Bailey & Siemens Bailey & Siemens  *Feed water control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³	*Type/units number	RSB-53A Retract-	RSB-53A retrac
*Manufacturer/erector Babcock - Hitachi Babcock - Hitachi d. Boiler Automatic Control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  *Manufacturer/erector Bailey & Siemens Bailey & Siemen  *Manufacturer/erector Bailey & Siemens Bailey & Siemens  *Electronic Electronic  *Manufacturer/erector Siemens Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³		able rack 22 units	able rack type
*Manufacturer/erector Babcock - Hitachi Babcock - Hitachi d. Boiler Automatic Control  Combustion control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  Temperature control  *Type Electropneumatic Electropneumatic  *Manufacturer/erector Bailey & Siemens Bailey & Siemens  Feed water control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³			18 sets
d. Boiler Automatic Control  Combustion control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  Temperature control  *Type Electropneumatic Electropneumatic  *Manufacturer/erector Bailey & Siemens Bailey & Siemens  Feed water control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³			swing type 2 s
*Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  Temperature control  *Type Electropneumatic Electropneumatic  *Manufacturer/erector Bailey & Siemens Bailey & Siemens  Feed water control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³	*Manufacturer/erector	Babcock - Hitachi	Babcock - Hita
*Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  Temperature control  *Type Electropneumatic Electropneumatic  *Manufacturer/erector Bailey & Siemens Bailey & Siemens  Feed water control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³	d. Boiler Automatic Co	ontrol	
*Manufacturer/erector Siemens Siemens  Temperature control  *Type Electropneumatic Electropneumatic *Manufacturer/erector Bailey & Siemens Bailey & Siemens  Feed water control  *Type Electronic Electronic *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³  Tank No. 4 23550 m³	Combustion control		
Temperature control  *Type	*Type	Electronic	Electronic
*Type Electropneumatic Electropneumatic  *Manufacturer/erector Bailey & Siemens Bailey & Siemens  Feed water control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³	*Manufacturer/erector	Siemens	Siemens
*Manufacturer/erector Bailey & Siemens Bailey & Siemens  Feed water control  *Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³	Temperature control		
*Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³	*Type	Electropneumatic	Electropneumat
*Type Electronic Electronic  *Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³	*Manufacturer/erector	Bailey & Siemens	Bailey & Sieme
*Manufacturer/erector Siemens Siemens  e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³	Feed water control		
e. Fuel Supply & Firing System  Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³	*Type	Electronic	Electronic
Heavy oil storage tank  *Type Floating roof type  *Capacity m³ x number Tank No. 1 8752 m³  Tank No. 2 8752 m³  Tank No. 3 23550 m³  Tank No. 4 23550 m³	*Manufacturer/erector	Siemens	Siemens
*Type Floating roof type  *Capacity m <sup>3</sup> x number Tank No. 1 8752 m <sup>3</sup> Tank No. 2 8752 m <sup>3</sup> Tank No. 3 23550 m <sup>3</sup> Tank No. 4 23550 m <sup>3</sup>	e. <u>Fuel Supply &amp; Firi</u>	ng System	
*Capacity m <sup>3</sup> x number  Tank No. 1 8752 m <sup>3</sup> Tank No. 2 8752 m <sup>3</sup> Tank No. 3 23550 m <sup>3</sup> Tank No. 4 23550 m <sup>3</sup>	Heavy oil storage tank		
Tank No. 2 $8752 \text{ m}^3$ Tank No. 3 $23550 \text{ m}^3$ Tank No. 4 $23550 \text{ m}^3$	*Type	Floating roof	суре
Tank No. 3 23550 m <sup>3</sup> Tank No. 4 23550 m <sup>3</sup>	*Capacity m x number	Tank No. 1	8752 m <sup>3</sup>
Tank No. 4 23550 m <sup>3</sup>		Tank No. 2	8752 m <sup>3</sup>
Tank No. 4 23550 m <sup>3</sup>		Tank No. 3	23550 m <sup>3</sup>
		Tank No. 4	
"Hallitacturer / erector	*Manufacturer/erector		

Unit No. 1 Unit No. 2 Light oil tank Common use for G1, G2, S1 and S2 \*Type gal (m<sup>3</sup>) 11,720 (44.36 ) x 1 set \*Capacity x number \*Manufacturer/erector Heavy oil service tank None \*Type \*Capacity, Number of tank \*Manufacturer/erector Heavy oil burner Wide range mecha-Mechanical ato-\*Type nical atomizing mizing type 1,280  $(4,845) \times 18 972 (3,679) \times 24$ \*Capacity, Number of g/h (1/h) burner Babcock & Wilcox Babcock & Wilcox \*Manufacturer/erector Light oil burner B & W standard B & W standard \*Type pressure and atopressure and atomizing with remizing placeable sprayer plate /24 pcs 440 (199.6)/18 pcs \*Capacity, number of 1b/h (kg/h) burner Babcock & Wilcox Babcock & Wilcox \*Manufacturer/erector

and the second s			
Courdon			
<u>Snyder</u>		Unit No. 1	Unit No. 2
Mate fuel oil numn		The state of the s	
Main fuel oil pump		IMO-Saren type	IMO-Screw type
*Type		spindle pump	ALG-110-4B
		aprilate pamp	spindle pump
	mada (ka/am <sup>2</sup> a)	720 (50 6)	900 (63.3)
*Discharge pressure,	bara(katem a)	720 (30.0)	700 (03.3)
capacity & number	g/m (m <sup>3</sup> /h)	220 (74 0)	380 (86.3) x
of pump	g/m (m /n)	330 (74.9)	
		2 sets	2 sets
*Manufacturer/erector		Siemens	Steinmeller
		- <b>7</b>	1MJ5428 - 4F
- Capacity		250	250
Constant differential	fuel oil pump		
*Type	3		81, HSZ-5321
*Capacity	g/m (m <sup>3</sup> /h)		430 (97.7)
*Suction pressure	psig(kg/cm <sup>2</sup> g)		730 (51.3)
*Discharge pressure	psig(kg/cm <sup>2</sup> g)		900 (63.3)
Light fuel oil pump			
*Type		De Laval - IMO	4800-Gear pump
*Discharge pressure	psig(kg/cm <sup>2</sup> g)		250 (17.6)
Capacity & number	g/m (m <sup>3</sup> /h)	2 sets	86 (19.5) x 1 set
of pump			
*Manufacturer/erector			The Engineering
			Co.
*Driver - Type		AC motor	AC motor
- Capacity	HP (kW)	7.5 (5.6)	25 (18.65)
*Manufacturer/erecto		General Electric	Westing House
	5-3	0 *	

bliyder			
		Unit No. 1	Unit No. 2
Main fuel oil heater			
*Type		MESCO 2 EV 13 -	MESCO 2 EU15-168-F
		1625	Triplex fuel
			oil heater
*Capacity & number	g/m (m <sup>3</sup> /h)	135 (30.7) ×	190 (43.2) x
of heater		3 sets	3 sets
*Manufacturer/erector		The Engineering	The Engineering
		Co.	Co.
f. <u>Boiler</u>	Draughting E	quipment	
Forced Draught Fan			
*Type		Axial Flow, 2 stag	e Model FAF 22.4/
		horizontal, with	12.5-2 axial flow
		oil hydraulic roto	or 2 stage horizon-
		blade adjustment	tal, with oil
			hydraulic rotor
			blade
*Capacity & number	ft <sup>3</sup> /min	232 lb/sec	380,000 (10,760)
	(m <sup>3</sup> /min)	(105.2 kg/sec)	x 2 sets
*Pressure	inwg (mmwg)	45 (1,143)	43 (1,092.2)
*Revolution speed	rpm	1,750	1,150
(Manufacturer/erecto	e i de la companya di salah d	Dingler	Dingler
*Driver - Type		AC motor	AC motor
		squirrel cage,	1, RN3, 352-LHE-
		horizontal	90 <b>Z</b>
- Capacity HP	(KW)		2,250 (1,680) x 3,300 (2
Japacit, in	North Action Control of the Control		

x number

Unit No. 1 Unit No. 2 - Manufacturer/ Siemens Siemens erector Gas Recirculation Fan Double suction turbo 6600 POT - CH \*Type fan NV - 1CO #16 -1/2  $ft^3(m^3/min)$ 250,800 (7,101.6) 416,400 (11,790.8) \*Capacity & number x 1 set x l set inwg (mmwq) \*Pressure 12.2 (309.9) \*Revolution speed 900 870 rpm \*Manufacturer/erector \*Driver - Type AC motor AC motor ETA-KK weather protected NEMA type II - Capacity KW x number 475 x 1 set 930 x 1 set - Manufacturer/ erector Stack - handles flue gas from S1 and S2 Welded steel plate and gunitelined \*Construction with 2.5" thick mixture of sand 17'6" (5.34m) \*Top inside diameter m 284' (86.6m) \*Height One stack for S1 and S2 \*Number \*Manufacturer/erector Pacific Engineering

g. <u>Boiler</u>	Feed Water Pu	mp_	
Turbine driven feed wa	iter pump		
*Type & number of stag	r geveller som for te ge	HDGR 75, 7 stage	HDR8S, 6 stage
		centrifugal	centrifugal
*Capacity	1bs/h (t/h)	1,863,000 (845)	2,600,000 (1,179.4)
& number of pump		x 1 set	x 1 set
*Total head	psi (m)/rpm	3,545 (2492.5)/	3,804 (2,674.6)/
& revolution		4600	5000
*Manufacturer/erector		KSB	KSB
Turbine for BFP			
*Type		Axial reaction	Axial reaction
		single cylinder	single cylinder,
		condensing type	condensing type
*Capacity & number	kW	14,200 x 1 set	12,214 x 1 set
of turbine			
*Manufacturer/erector		Siemens	Siemens
T-BFP booster pump			
*Type		YNK N 400/300,	YNKN 400/300,
	e Pizziki e Pezziki Geografia	double suction,	double suction
		single stage	single stage
*Capacity & number	lbs/h (t/h)	1,863,000	2,600,000
		(845.0) x 1 set	(1,179.4) x 1 set
*Total head &	psi m/rpm	96 (67.5)/1,500	96 (67.5)/1,630
revolution			
*Driver (pump input)	kW	200	420
*Manufacturer/erector		KSB	KSB

Unit No. 1

Unit No. 2

Snyder	Unit No. 1	Unit No. 2
Motor driven feed water pump	Offic No. 1	UNITE NO.
	NDC= 555.17 atoms	UDC 55n 11 grace
*Type & number of stage	HDGr 555/7 stage	HDG 55n, 11 stage
	centrifugal, motor	
	driven	motor driven
*Capacity & number lbs/h (t/h)	706,470 (320.4) x	760,000 (344.7) x
of pump	2 sets	1 set
*Total head & psi (m) rpm	3,585 (2,520)/4870	2,950 (2,074.1)/
revolution		3,570
*Manufacturer/erector	KSB	KSB
*Driver - Type	Totally enclosed	ITC 2929-3 EPOI-Z
en de la companya de La companya de la co	fan cooled	
- Capacity kW	4,400 x 1 set	3,120 x 1 set
& number of motor		
- Manufacturer/	Siemens	Siemens
erector		
h. Feed Water Heaters	Equipment	
No. 1 LP feed water heater		
*Type	Vwakl 115.4/470	Vwakl 115.2/750,
	horizontal U-tube	horizontal U-tube
	4 pass	2 pass low pres-
		sure, 4 separate
그리는 이 등에 가는 것이 되는 것이 되었다. 사용하는 사용을 하고 있는 이 등을 보니다.		drain cooler
*Heating surface $ft^2 (m^2)$	4,740 (440.3)	7,410 (688.4)
& number of heater	l set	1 set
*Material of heating tube	St 35.8 seamless	St 35.8
	stee1	

	Unit No. 1	Unit No. 2
*Heating steam in/ °F (°C)	177/172	182.5/176.5
drain outlet	(80.6/77.8)	(83.6/80.3)
temperature		
*Feed water in/outlet °F (°C)	112/167	113.4/170.1
temperature	(44.4/75.0)	(45.2/76.7)
*Feed water flow lbs/h (kg/h)	1,117,690	1,863,526
	(506,975)	(845.295)
*Manufacturer/erector	Atlas - Mak	Atlas - Mak
	Maschinenbau GmbH	Maschinenbau -
		GmbH
No. 2 LP feed water heater		
*Type	Vwak1 12.4/490	Vwakl 115.2/750,
	horizontal U-tube	horizontal U-tube
	4 pass	design, 2 pass
		low press. with
		internal drain
		cooler
*Heating surface $ft^2 (m^2)$	4,850 (450.6)	7,410 (688.4)
& number of heater		
a number of Heater	1 set	1 set
*Material of heating tube	1 set St 35.8	1 set St 35.8
*Material of heating tube	St 35.8	St 35.8
*Material of heating tube  *Heating steam in/ °F (°C)	St 35.8 275/172	St 35.8 266.6/182.5
*Material of heating tube  *Heating steam in/ °F (°C)  drain outlet	St 35.8 275/172	St 35.8 266.6/182.5
*Material of heating tube  *Heating steam in/ °F (°C)  drain outlet  temperature	St 35.8 275/172 (135/80.6)	St 35.8 266.6/182.5 (130.3/83.6)
*Material of heating tube  *Heating steam in/ °F (°C)  drain outlet  temperature  *Feed water in/outlet °F (°C)	St 35.8 275/172 (135/80.6) 167/208	St 35.8 266.6/182.5 (130.3/83.6) 170.1/214
*Material of heating tube  *Heating steam in/ °F (°C)  drain outlet  temperature  *Feed water in/outlet °F (°C)  temperature	St 35.8 275/172 (135/80.6) 167/208 (75.0/97.8)	St 35.8 266.6/182.5 (130.3/83.6) 170.1/214
*Material of heating tube  *Heating steam in/ °F (°C)  drain outlet  temperature  *Feed water in/outlet °F (°C)	St 35.8 275/172 (135/80.6) 167/208 (75.0/97.8)	St 35.8 266.6/182.5 (130.3/83.6) 170.1/214
*Material of heating tube  *Heating steam in/ °F (°C)  drain outlet  temperature  *Feed water in/outlet °F (°C)  temperature	St 35.8 275/172 (135/80.6) 167/208 (75.0/97.8)	St 35.8 266.6/182.5 (130.3/83.6) 170.1/214

(祖)。 (Anna Landard Anna Anna Anna Anna Anna Anna Anna Ann		
Snyder		
	Unit No. 1	Unit No. 2
*Feed water flow lbs/h (kg/h)	1,117,672	1,863,526
	(506,976)	(845,295)
*Manufacturer/erector	Atlas-Mak Mas-	Atlas-Mak Mas-
	chinenbau - GmbH	chinenbau - GmbH
No. 3 LP feed water heater		
*Type	Vwak1-12.4/580	Vwak1 125.2/900
	horizontal U-tube	horizontal U-tube
	4 pass	2 pass low press.
		and with inter-
		nal drain cooler
*Heating surface ft <sup>2</sup> (m <sup>2</sup> )	5,814 (540.1)	8,880 (825.0)
& number of heater	1 set	1 set
*Material of heating tube	St 35.8 seamless	St 35.8
	steel	
*Heating steam in/ °F (°C)	502/218	499/226.6
drain outlet	(261.1/103.3)	(259.4/108.1)
temperature	(201.1,103.3)	(23).47 200.17
	200/200	214/299.3
*Feed water in/outlet °F (°C)	208/289	
temperature	(97.8/142.7)	(101.1/148.5)
*Feedwater flow lbs/h (kg/h)	1,117,672	1,863,526
	(506,976)	(845,295)
*Manufacturer/erector	Atlas-Mak Mas-	Atlas-Mak Mas-
	chinenbau GmbH	chinenbau GmbH
5-36		

		Unit No. 1	Unit No. 2
Deaerator			
*Type		Spray type mounted	spray deaerator
		on horizontal	mounted on hori-
		storage tank	zontal storage
			tank
*Deaerating capacity	lbs/h (kg/h)		2,425,600
			(1,100,252)
*Condensate to	lbs/h (kg/h)		1,674,262
deaerator			(759,445)
*Outlet feed water	lbs/h (kg/h)	1,494,270	2,028,507
flow		(677,800)	(920,130.8)
*Heating steam inlet	°F (°C)	663 (350.5)	642 (338.9)
temperature	All Section 1995		
*Storage tank	Cu.ft.(m <sup>3</sup> )	5,124 (145.1)	6,762.8 (191.5)
capacity			
*Design pressure	psig(kg/cm <sup>2</sup> g)	) 142.3 (10.0)	171 (12.0)
*Dissolved oxygen	cc/1	0.005	0.005
guarantee value			
*Manufacturer/erector		Atlas-Mak Mas-	Atlas-Mak Mas-
		chinenbau GmbH	chinenbau GmbH
No. 5 HP feed water h	neater		
*Туре		VU way 95.2/400	VU way 110.2/530
		horizontal U-tube	horizontal U-tube
		2 pass	2 pass high pres-
			sure with inter-
			nal drain cooler

Snyder			
		Unit No. 1	Unit No. 2
*Heating surface	$ft^2 (m^2)$	3,660 (340.0) x	4,990 (463.6) x
& number of heater		2 sets	2 sets
*Material of heating	ube	St 35.8 seamless	15 MO3
		steel	
*Heating steam in/	°F (°C)	820/369	432.9/375
drain outlet		(437.8/187.2)	(222.7/190.5)
temperature			
*Feed water in/outlet	°F (°C)	359.4/408.7	(362.7/420
temperature		(181.9/209.3)	(183.7/215.5)
*Feed water flow	lbs/h (kg/h)	1,358,448	2,274,199
(both heaters)		(616,181.6)	(1,031,559.3)
*Manufacturer/erector		Atlas-Mak Mas-	Atlas-Mak Mas-
		chinenbau GmbH	chinenbau GmbH
No. 6 HP feed water h	eater		in in production of the second
*Type		VU way 95.2/420	VU way 110.2/560
		horizontal U-tube	horizontal U-tube
		2 pass	2 pass, high
			press. with
			internal drain
			cooler
*Heating surface	ft <sup>2</sup> (m <sup>2</sup> )	3,770 (350.2) x	5,280 (490.5) x
& number of heater		2 sets	2 sets
*Material of heating	tube	St 45.8 III	13 CrMo44
		seamless steel	
	5-38	3	

		<u>Unit No. 1</u>	Unit No. 2
*Heating steam in/	°F (°C)	629/418.8	647/432.9
drain outlet		(331.7/214.9)	(341.7/222.7)
temperature			
*Feed water in/outlet	°F (°C)	408.7/481.5	420.3/492.3
temperature		(209.3/249.7)	(215.7/255.7)
*Feed water flow	lbs/h (kg/h)	1,358,448	2,274,199
(both heaters)		(616,181.6)	(1,031,559.3)
*Manufacturer/erector	r	Atlas-Mak Mas-	Atlas-Mak Mas-
		chinenbau GmbH	chinenbau GmbH

# <u>Snyder</u>

and the second s			
Snyder			
		Unit No. 1	Unit No. 2
2) Turbine and	i Auxiliary		
a. Turbine			
*Type	<del></del>	Tanden compound	Tanden compound
		single reheat	reheat retraction
			condensing type
*Rating output	kW	200,000	300,000
*Throttle steam pres-		and the first that the second	2,700 (189.8)
sure at MSV inlet			
	°F (°C)	1,000/1,000	1,000/1,000
temperature (main		(537.8/537.8)	(537.8/537.8)
steam/hot reheat)			
*Exhaust vacuum	inHg (mmHg)	3.5 (88.9)	3.5 (88.9)
*Number of bled steam		6	6
stages			
*Manufacturer/erector		Siemens	siemens
b. Conden			o Tellerio
*Type		Surface, rectan-	Surface rectan-
197 <b>.</b>		gular single	gular single
		shell	shell
*Circulating water	gal/min (m <sup>3</sup> /h		222,200 (50,462)
*Tube cleanliness	gai/min (m / n		85
factor	76		
*Condensate flow	lbs/h (t/h)	971 100	1,335,893
"Contacts 110w	105/11 (C/11)	(440.48)	(605.95)
*Cooling water design	°E (°C)	85 (29.4)	85 (29.4)
*Cooling water design		O3 (42.H)	(42.4)
remperature			
	5-40		

# <u>Snyder</u>

	Unit No. 1	Unit No. 2
*Cooling water outlet °F (°C)		
design temperature		
*Design point tube ft/s (m/s)	6.8 (2.072)	6.4 (1.95)
inside flow velocity		
*Tube material of	Admiralty metal	SOMS, 76 (AL-
condensing zone		Bross)
*Tube dimensions of	1' OD #18	1"0D 25"
condensing zone		
*Effective tube length		25', 11-3/64"
		(7,900.6 m/m)
*Tube material of air		90 - 10 Cu - Ni
cooling zone		
*Cooling surface $ft^2 (m^2)$	130,300 (12,105)	236,000 (21,925)
*Material of tube plate	Steel with tarset	Steel with epoxy
	coating	coating
*Material of water box	Steel with tarset	Steel with tarset
	coating	coating
*Chathodic protection		
system type		
*Manufacturer/erector	Siemens	Kraftwerke Union,
		West Germany

<u>Snyder</u>	and the second s	
	Unit No. 1	Unit No. 2
c. <u>Circulating water p</u>	ump	
*Type	Vertical shaft,	PEZ-1600, verti-
	mixed flow, single	cal shaft mixed
	case with variable	flow single phase
	pitch propeller	with variable
	blades	pitch propeller
		blade
*Capacity x head x number	102,900 g/m x 25'	128,480 g/m x
	$(23,368 \text{ m}^3/\text{h} \text{ x})$	30.1 ft (29,178
	7.62 m) x 2 sets	$m^3/h \times 9.17 m$
		x 2 sets
*Manufacturer/erector	Siemens	Pump KSB Drive-
		draftwerke Union
		(Siemens)
*Driver - Type	Siemens	
- Capacity kW x rpm	650 x 1,785	1,100 x 1,190
d. Air ejector equipment		
*Type	Roman I/2E, twin	Roman I/2E, twin
	element, two stage,	element, two
	steam jet	stage steam jet
		with combined
		surface inter
		and after conden-
		ser
*Capacity (dry air) x number	45 lbs/h(20.4 kg/h)	33 lbs/h(15 kg/h)
	x 2 sets	x 2 sets
7-1 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		

Snyder			
bliyuer		Unit No. 1	Unit No. 2
*Suction pressure	inHg (mmHg)	2.5 (63.5)	2 (50.8)
*Working steam consumption	lbs/h (kg/h)	960 (435.4)	868 (393.7)
*Inter Condenser	ft <sup>2</sup> (m <sup>2</sup> )		77.5 (7.2)
surface			
*After condenser surface	ft <sup>2</sup> (m <sup>2</sup> )		50.6 (4.7)
*Manufacturer/erecto	or	Siemens	Siemens
e. Condensate pump			
*Type		WKT-250 vertical	WKT-300 vertic
		5 stage 14" x 12"	4 stage, 16" x
		ring sectional	14" ring secti
		design with barrel	s al design with
			barrels equipp
			pellers
*Capacity x head x r	number	2880 gpm x 820 ft	2,100,000 1b/h
		x 2 sets	355 psi x 2 se
		$(654.0 \text{ m}^3/\text{h}) \text{ x}$	(952.56 t/h x
		(250 m)	$(24.96 \text{ kg/m}^2)$
*Manufacturer/erecto	or	Siemens	Pump - KSB
			Drive - Kraft-
			werte Union
*Driver - Type			
		and the second of the second o	

	Snyder			
			Unit No. 1	Unit No. 2
÷	3) Generator	and Auviliary	M. S. C. C. S. C. W. C. C. W. C.	
	a. Genera	IFOT		
:	*Туре		Totally enclosed	Totally enclosed
			Hydrogen cooled	hydrogen cooled
				FTHDD 540/66-2/60
	*Rating capacity	kVA	245,000	370,000 (45 psig
				Hz)
	*Power factor		0.9	0.9
	*Voltage	V	14,400	21,000
	*Frequency	Hz	60	60
.*	*Revolution	rpm	3,600	3,600
	*Cooling type - State	or v	Hydrogen cooled	Direct cooling
-, ·	- Roto		Hydrogen cooled	Direct cooling
	*Hydrogen pressure	.psig(kg/cm <sup>2</sup> g)	45 (3.164)	45 (3.164)
				60 (4.219)
	*Connection		Double Star	Double Star
	*Exciting system		Brushless type	Brushless type
	*Short circuit ration	1	0.596	0.62
	*Neutral grounding sy	stem	Transformer 50 kVA	Transformer 175
			10,000/220 V	kBS 21,000/240 V,
		en de la companya.	Resistance 0.804ohm	0.198 ohm 730 A
			220 A	
				SLIV-CC
	*Manufacturer/erecto	r	Siemens	Siemens
1				
er Energe		5-44		

		Unit No. 1	Unit No. 2
b. Excit	<u>er</u>		
*Type		3 phase, 6 pole	3 phase, 6 pole
		revolving arm type	revolving arma-
		with silicon rec-	ture type
		tifier	F 340 - 32 - 6
*Capacity	kW		
Main Exciter		1,870	1,880
Rectifier		940	1,665
*Voltage	V		
Main exciter		570	415
Rectifier		410	520
*Revolution speed	rpm	3,600	3,600
(if rotating type			
*Number		1 sët	1 set
*Manufacturer/erecto	<b>T</b>	Siemens	Siemens
*Kind of driver		Directly coupled	Directly coupled
(if rotating type)		with generator	with generator
		shaft	shaft

Snyder			
		Unit No. 1	<u>Unit No. 2</u>
4) Transfor	mers		
a. <u>Mai</u> n	Transformer		
*Type		011 immersed	AFOC - 3NY5CP,
		(FOA) outdoor type	oil immersed,
			(FOA) outdoor
			type
*Capacity	kVA	232,000	370,000
*Primary voltage	٧	14,400	21,000
*Secondary voltage	v	115,000	115,000
*Phase	turi V		
	<b></b>	3 phase	3 phase
*Impedance voltage	%	11.0	14.97
*Connection		Delta - WYE	Delta - WYE
*Neutral (HV side)		Solidly grounded	Solidly grounded
*Cooling system		Forced oil cooled	Forced oil,
		forced air cooled	forced air cooled
		(FOA)	(FOA)
*Number		l set	1 set
*Manufacturer/erect	or	Siemens	Hitachi Ltd.
b. Stat	ion Service	Transformer	
*Type			Oil immersed (OA/
		outdoor type	FA) outdoor type
			having 2 LV wind-
			ings
*Capacity	kVA	17,000	HV-18,750/25,000
			LV-9,375/12,500
*Primary voltage	<b>v</b>	14,400	21,000
		5-46	

S	ny	d	e	r

	<u>Unit No. 1</u>	Unit No. 2
*Secondary voltage V	4,160	4,160/4,160
*Phase	3 phase	3 phase
*Impedence voltage %	9.7	HV-LV <sub>1</sub> 8.59
		HV-LV <sub>2</sub> 8.67
		LV <sub>1</sub> -LV <sub>2</sub> 16.04
		12.5 MVA, Base
*Connection	Delta - WYE	Delta - WYE
*Neutral (LV side)	Solidly grounded	249 ohm, 10 A,
		grounding resis-
		tor
*Cooling system	0il, air self	Oil, air, self
	cooled	cooled
*Number	l set	l set
*Manufacturer/erector	Siemens	Hitachi

# c. Emergency station service transformer

		Common Use
*Туре		Oil immersed (OA)
		outdoor type
*Capacity	kVA	30,000 - 15,000/15,000
*Primary voltage	<b>.V</b>	34,500
*Secondary voltage	V	4.160/4.160
*Phase		3 phase
*Impedance voltage	%	HV-LV <sub>1</sub> 7.63
		HV-LV <sub>2</sub> 7.19
		HV-LV <sub>2</sub> 16.63
		15 MVA base

	+ + + + + + + + + + + + + + + + + + + +	Unit No. 1	Unit No. 2
*Connection	*	Delta - WYE	
*Cooling system		Self cooled	
*Number		l set	The season of the
*Manufacturer/erector		Mitsubishi	

.5) Water Treatment System Raw water Deepwell water \*Kind 95 \*Total hardness (CaCO<sub>3</sub>) 6.9 \*pH Silica (SiO<sub>3</sub>) 70 ppm degree \*Turbidity b. Raw water tank Cylindrical \*Type  $gal(m^3)$  $300,000 (1,135.5) \times 1$ \*Capacity x number (Manufacturer/erector c. Sedimentation system \*Type \*Applied chemical \*Capacity t/day x number \*Manufacturer/erector Filtering system Reverse Osmosis \*Type 5167/cycle (cation) \*Capacity t/day x number \*Type of reverse washing \*Filter material \*Manufacturer/erector

Unit No. 1

Unit No. 2

Unit No. 1

Unit No. 2

# e. Water Demineralizing Equipment

\*Type

Permutit

\*Capacity GPM (m<sup>3</sup>/h)

100 (22.7) x 2

x number of train

Mixed Bed 100 (22.7) x 2

\*Capacity per 1 cycle

Cation 136400 (516)

service gal (m<sup>3</sup>)

Anion 125,600 (475)

Mixed Bed 514000 (1946)

\*Type of resin x resin

Cation IR-120 172

filling capacity ft<sup>3</sup> (1)

Anion IRA-402 102 (2888)

Mixed Bed Cation IR-120 28 (793)

Anion IRA-402 24 (679)

## f. Condensate Demineralizer

\*Pre-filter type

None

None

\*Condensate demineralizer

1400 (318) x 3

1400 (318) x 4

capacity x number

GPM  $(m^3/H)$ 

\*Regeneration Equipment

2 sets in GSTP

5.1.3 マラヤ発電設	備		
		Unit No. 1	Unit No. 2
l) <u>Boiler Equ</u>	ipment		
a. <u>Boiler</u>	Proper		
*Туре		Meander Waterwall	Single drum, E
		radiant type	pass, radiant
			type
Steam Pressure at 100	% load		
*Design pressure	psig(kg/cm <sup>2</sup> )	3,425 (240.8)	2,910 (204.6)
*Final superheater	psig(kg/cm <sup>2</sup> )	2,770 (194.76)	2,471 (173.8)
outlet			
*Reheater outlet	psig(kg/cm <sup>2</sup> )	544.3 (38.27)	465 (32.7)
Steam temperature at	100% load		indigate substitution in the second s
*Rating temperature	°F (°C)	1,005 (540.5)	1,005 (541)
*Economizer inlet	°F (°C)	481 (249.4)	518.4 (270.2)
*Reheater inlet	°F (°C)	627 (330.5)	606 (318.9)
*Reheater outlet	°F (°C)	1,005 (540.5)	1,005 (541)
*Final superheater	°F (°C)	1,005 (540.5)	1,005 (541)
outlet			
<u>Evaporation</u>			
*Boiler MCR	lbs/h (t/h)	2,278,780	2,657,500
		(1,033.636)	(1,305.423)
*Unit 4/4 load	t/h	erin da en	
Heating surface area			
*Contact heat	ft <sup>2</sup> (m <sup>2</sup> )	186,600 (17,335)	321,850 (29,90
transfer area			
*Radiant heat	$ft^2 (m^2)$	11,330 (1,052.5)	17,300 (1,610)

Malaya   Unit No. 1   Unit No. 2				
Superheater  *Primary superheater  Type	Malaya			
*Primary superheater  Type			Unit No. 1	Unit No. 2
Type Horizontal continuous multi-loop tube, drainable type  Heating surface ft² (m²) 52,560 (4,883.0) 107,700 (10,010)  *Top and Roof Superheater  Type Tangent type - Heating surface ft² (m²) 9,860 (916.0) -  *Secondary Superheater  Type Pendant continuous Horizontal continuous tube type nuous multi-loop type, drainable type  Heating surface ft² (m²) 26,570 (2,468.4) 25,530 (2,370)  *Materials Austenitic Alloy STBA 12, 22, 24  Steel tubes SUS 321 HTB  *Reheater  *Type Horizontal & pendant continuous multi-dant continuous drop drainable tube type  *Heating surface ft² (m²h) 42,900 (3,985.5) 36,330 (3,380)  *Materials STBA 35, 123, 23, STB 35	Superheater			
Ous tube type nuous multi-loop tube, drainable type  Heating surface ft² (m²) 52,560 (4,883.0) 107,700 (10,010)  *Top and Roof Superheater  Type Tangent type -  Heating surface ft² (m²) 9,860 (916.0) -  *Secondary Superheater  Type Pendant continuous Horizontal continuous tube type nuous multi-loop type, drainable type  Heating surface ft² (m²) 26,570 (2,468.4) 25,530 (2,370)  *Materials Austenitic Alloy STBA 12, 22, 24  Steel tubes SUS 321 HTB  *Reheater  *Type Horizontal & pendant continuous multidant continuous drop drainable tube type  *Heating surface ft² (m²h) 42,900 (3,985.5) 36,330 (3,380)  *Materials STBA 35, 123, 23, STB 35	*Primary superheater			
ous tube type nuous multi-loop tube, drainable type  Heating surface ft² (m²) 52,560 (4,883.0) 107,700 (10,010)  *Top and Roof Superheater  Type Tangent type - Heating surface ft² (m²) 9,860 (916.0) -  *Secondary Superheater  Type Pendant continuous Horizontal continuous tube type nuous multi-loop type, drainable type  Heating surface ft² (m²) 26,570 (2,468.4) 25,530 (2,370)  *Materials Austenitic Alloy STBA 12, 22, 24  Steel tubes SUS 321 HTB   Reheater  *Type Horizontal & pendant continuous multidant continuous drop drainable tube type  *Heating surface ft² (m²h) 42,900 (3,985.5) 36,330 (3,380)  *Materials STBA 35, 123, 23, STB 35	Type		Horizontal continu-	Horizontal conti-
Heating surface   ft   (m2)   52,560 (4,883.0)   107,700 (10,010)     *Top and Roof Superheater   Type	en di Principale di Serie di Serie di Serie di Se		ous tube type	nuous multi-loop
Heating surface   ft   (m2)   52,560 (4,883.0)   107,700 (10,010)     *Top and Roof Superheater   Type				tube, drainable
*Top and Roof Superheater  Type				type
Type  Heating surface  ft² (m²)  9,860 (916.0)  *Secondary Superheater  Type  Pendant continuous  Horizontal continuous multi-loop  type, drainable  type  Heating surface  ft² (m²)  26,570 (2,468.4)  25,530 (2,370)  *Materials  Austenitic Alloy  STBA 12, 22, 24  Steel tubes  SUS 321 HTB  Reheater  *Type  Horizontal & pen- dant continuous multi- dant continuous drop drainable  tube  tube  *Heating surface  ft² (m²h)  42,900 (3,985.5)  36,330 (3,380)  *Materials  STBA 35, 123, 23, STB 35	Heating surface	$ft^2 (m^2)$	52,560 (4,883.0)	107,700 (10,010)
Heating surface ft <sup>2</sup> (m <sup>2</sup> ) 9,860 (916.0) -  *Secondary Superheater  Type Pendant continuous Horizontal continuous multi-loop type, drainable type  Heating surface ft <sup>2</sup> (m <sup>2</sup> ) 26,570 (2,468.4) 25,530 (2,370)  *Materials Austenitic Alloy STBA 12, 22, 24  Steel tubes SUS 321 HTB  *Reheater  *Type Horizontal & pendant continuous multidant continuous drop drainable tube type  *Heating surface ft <sup>2</sup> (m <sup>2</sup> h) 42,900 (3,985.5) 36,330 (3,380)  *Materials STBA 35, 123, 23, STB 35	*Top and Roof Superh	eater		en et de la companya de la companya Recordor
Heating surface ft <sup>2</sup> (m <sup>2</sup> ) 9,860 (916.0) -  *Secondary Superheater  Type Pendant continuous Horizontal continuous multi-loop type, drainable type  Heating surface ft <sup>2</sup> (m <sup>2</sup> ) 26,570 (2,468.4) 25,530 (2,370)  *Materials Austenitic Alloy STBA 12, 22, 24  Steel tubes SUS 321 HTB  *Reheater  *Type Horizontal & pendant continuous multidant continuous drop drainable tube type  *Heating surface ft <sup>2</sup> (m <sup>2</sup> h) 42,900 (3,985.5) 36,330 (3,380)  *Materials STBA 35, 123, 23, STB 35	Туре		Tangent type	
*Secondary Superheater  Type  Pendant continuous  tube type  nuous multi-loop  type, drainable  type  Heating surface  ft² (m²)  *Materials  Austenitic Alloy  Stel tubes  SUS 321 HTB  Reheater  *Type  Horizontal & pendant continuous  drop drainable  tube  tube  type  *Heating surface  ft² (m²h)  *Ze, 570 (2,468.4)  Stel tubes  SUS 321 HTB  Reheater  *Type  #Horizontal & pendant continuous  drop drainable  tube  type  *Heating surface  ft² (m²h)  42,900 (3,985.5)  36,330 (3,380)  *Materials  STBA 35, 123, 23, STB 35	Heating surface	ft <sup>2</sup> (m <sup>2</sup> )	9,860 (916.0)	
tube type  nuous multi-loop  type, drainable  type  Heating surface  ft² (m²)  Austenitic Alloy  STBA 12, 22, 24  Steel tubes  SUS 321 HTB  Reheater  *Type  Horizontal & pen- dant continuous drop drainable  tube  type  *Heating surface  ft² (m²h)  42,900 (3,985.5)  36,330 (3,380)  *Materials  STBA 35, 123, 23, STB 35		er		
type, drainable type  Heating surface ft <sup>2</sup> (m <sup>2</sup> ) 26,570 (2,468.4) 25,530 (2,370)  *Materials Austenitic Alloy STBA 12, 22, 24  Steel tubes SUS 321 HTB  Reheater  *Type Horizontal & pen- Continuous multi- dant continuous drop drainable tube type  *Heating surface ft <sup>2</sup> (m <sup>2</sup> h) 42,900 (3,985.5) 36,330 (3,380)  *Materials STBA 35, 123, 23, STB 35			Pendant continuous	Horizontal conti-
### type  Heating surface ft <sup>2</sup> (m <sup>2</sup> ) 26,570 (2,468.4) 25,530 (2,370)  *Materials Austenitic Alloy STBA 12, 22, 24  Steel tubes SUS 321 HTB  *###################################			tube type	nuous multi-loop
Heating surface       ft² (m²)       26,570 (2,468.4)       25,530 (2,370)         *Materials       Austenitic Alloy       STBA 12, 22, 24         Steel tubes       SUS 321 HTB         Reheater         *Type       Horizontal & pen- Continuous multidant continuous         dant continuous       drop drainable         tube       type         *Heating surface       ft² (m²h)       42,900 (3,985.5)       36,330 (3,380)         *Materials       STBA 35, 123, 23, STB 35         24				type, drainable
*Materials  Austenitic Alloy STBA 12, 22, 24  Steel tubes  SUS 321 HTB  Reheater  *Type  Horizontal & pen- Continuous multidant continuous drop drainable tube  tube  tube  type  *Heating surface  ft² (m²h)  *Materials  STBA 35, 123, 23, STB 35				type
Steel tubes   SUS 321 HTB	Heating surface	$ft^2 (m^2)$	26,570 (2,468.4)	25,530 (2,370)
Reheater         *Type         Horizontal & pen- Continuous multi- dant continuous         Continuous multi- dant continuous         drop drainable tube         type           *Heating surface         ft² (m²h)         42,900 (3,985.5)         36,330 (3,380)           *Materials         STBA 35, 123, 23, STB 35           24	*Materials		Austenitic Alloy	STBA 12, 22, 24
*Type			Steel tubes	SUS 321 HTB
*Type	Reheater	and the state of t		
tube type  *Heating surface ft <sup>2</sup> (m <sup>2</sup> h) 42,900 (3,985.5) 36,330 (3,380)  *Materials STBA 35, 123, 23, STB 35  24			Horizontal & pen-	Continuous multi-
*Heating surface ft <sup>2</sup> (m <sup>2</sup> h) 42,900 (3,985.5) 36,330 (3,380)  *Materials STBA 35, 123, 23, STB 35  24			dant continuous	drop drainable
*Materials STBA 35, 123, 23, STB 35			tube	type
	*Heating surface	ft <sup>2</sup> (m <sup>2</sup> h)	42,900 (3,985.5)	36,330 (3,380)
	*Materials		STBA 35, 123, 23,	STB 35
SUS 27 HTB			24 s	
			SUS 27 HTB	
人名马纳 化二氯化物 计通讯系统 医乳腺 美国自己的 经租赁帐间 医多种间的 医克里特氏病 化二氯甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基甲基				

Economizer	Unit No. 1	Unit No. 2
*Material	STB 42	STB 42
*Heating surface ft <sup>2</sup> (m <sup>2</sup> )	54,600 (5,072.5)	44,550 (4,140)
<u>Furnace</u>		
*Volume $fr^3$ (m <sup>3</sup> )	116,400 (3,295.9)	148,700 (4,210.6)
*Construction of water	Horizontal meander	Ribbed membrane
wall the state of		wall
*Manufacturer/erector	Babcock - Hitachi	Babcock - HItachi
b. <u>Air Preheater</u>		
Regenerative air heater		
*Type	Horizontal	Vertical
*Heating area $ft^2 (m^2)$	149,210 (13,862)	172,000 (15,990)
*In/outlet air °F (°C)	137/559	137/560
temperature	(58.3/292.8)	(58/293)
*Manufacturer/erector	Ljungstrom/	Ljungstrom/
*Manufacturer/erector	Ljungstrom/ Gadelius	Ljungstrom/ Gadelius
*Manufacturer/erector  Steam air heater		그리구 14 시 기가 있는 사람이 있습니다. 그리고 기가 있는 것 같습니다.
		그리구 14 시 기가 있는 사람이 있습니다. 그리고 기가 있는 것 같습니다.
Steam air heater	Gadelius	Gadelius
Steam air heater	Gadelius	Gadelius Helically fined
<pre>Steam air heater *Type</pre>	Gadelius Finned	Gadelius Helically fined double U-tube
Steam air heater  *Type  *Heating area ft <sup>2</sup> (m <sup>2</sup> )	Gadelius Finned 27,835 (2,586)	Gadelius  Helically fined double U-tube 24,335 (2260.7)
Steam air heater  *Type  *Heating area ft <sup>2</sup> (m <sup>2</sup> )  *In/outlet air °F (°C)	Gadelius Finned 27,835 (2,586) 100/134	Gadelius  Helically fined double U-tube 24,335 (2260.7) 80/201 (26.7/93.9)
Steam air heater  *Type  *Heating area ft <sup>2</sup> (m <sup>2</sup> )  *In/outlet air °F (°C)  temperature	Gadelius  Finned  27,835 (2,586)  100/134  (37.8/56.7)	Gadelius  Helically fined double U-tube 24,335 (2260.7) 80/201 (26.7/93.9)
Steam air heater  *Type  *Heating area ft <sup>2</sup> (m <sup>2</sup> )  *In/outlet air °F (°C)  temperature  *Manufacturer/erector	Gadelius  Finned  27,835 (2,586)  100/134  (37.8/56.7)	Gadelius  Helically fined double U-tube 24,335 (2260.7) 80/201 (26.7/93.9)
<pre>Steam air heater  *Type  *Heating area ft<sup>2</sup> (m<sup>2</sup>)  *In/outlet air °F (°C)  temperature  *Manufacturer/erector  c. Sootblower</pre>	Gadelius  Finned  27,835 (2,586)  100/134  (37.8/56.7)  GEA Luftkunklekgese	Gadelius  Helically fined double U-tube 24,335 (2260.7) 80/201 (26.7/93.9)

Unit No. 1

Unit No. 2

\*Manufacturer/erector

Babcock - Hitachi

Babcock - Hitachi

d. Boiler Automatic Control

Combustion control

\*Type

Electronic

Pneumatic

\*Manufacturer/erector

Siemens

Bailey

Temperature control

\*Type

Pneumatic

Pneumatic/

electronic

\*Manufacturer/erector

Hitachi

Bailey

Feedwater control

\*Type

Electronic

Pneumatic/

electronic

\*Manufacturer/erector

Siemens

Bailey

e. Fuel Supply & Firing System

Heavy oil storage tank

\*Type

Pontoon type

Floating roof

\*Capacity, bb1, (m<sup>3</sup>) x number

193,400 (30,750) x 3 sets

\*Manufacturer/erector

ECCO - ASIA

Light oil tank

\*Type

Fixed cone roof

\*Capacity m<sup>3</sup> x number

\*Manufacturer/erector

ECCO - ASIA

Heavy oil service tank

\*Type

None

None

	Unit No. 1	Unit No. 2
*Capacity, number of m <sup>3</sup>		
tank		
*Manufacturer/erector		
Heavy oil burner		
*Type	Baw Return flow	Baw return f
	atomizer	atomizer
*Capacity, lb/h (kg/h)	7,300 (3,310)	8,500 (3,855)
number of burner	24	(24 nozzles)
*Manufacturer/erector	Babcock, Hitachi	Babcock, Hita
Light oil burner		
*Type	Band w/air ope-	Band w/oil f
	equipped with ele-	electrically
	ctrode for sparked	ignited ligh
	ignition	
*Capacity, g/h (1/h)	1,585 (6,000) x 24	400 lbs/h (1
number of burner		kg/h) x 12 s
*Manufacturer/erector	Babcock, Hitachi	Babcock, Hit
Main fuel oil pump		
*Type	Screw 1	Screw-rotary
*Discharge pressure psig(kg/cm <sup>2</sup> g)	765 (53.87)	821 (57.7)
Capacity g/m (m <sup>3</sup> /g)	395 (89.7) x 2 sets	436 (99.03)
& number of pump		
*Manufacturer/erector	De Laval IMO	Sier - Bath
*Driver - Type	TEFC - XP	Explosion -
- Capacity HP (kW)	300 (223.8)	350 (261.1)
5-5		

	Malaya			
			Unit No. 1	Unit No. 2
	Light fuel oil pump			
 	*Type		Gear	Same as Ml
	*In/outlet pressure p	osig(kg/cm <sup>2</sup> g)	0/230 (0/16.2)	
		•	50 (11.4) x 2 sets	
-	of pump			
	*Manufacturer/erector		Northern Ord	
	*Driver - Type		AC motor	
. •			(TEFC _ XP)	
	- Capacity HP (	(kW)	15 (11.19)	
	*Manufacturer/erector		Westinghouse	
	Constant Differential f	uel oil pump		
	*Type		Horizontal SVC type	Horizontal type,
				centrifugal pump
	*Capacity g	3/m (m <sup>3</sup> /h)	400 (90.8)	480 (109.02)
	*Suction pressure p	osig(kg/cm <sup>2</sup> g)	755 (53.1)	725 (50.97)
	*Discharge pressure p	sig(kg/cm <sup>2</sup> g)	925 (65.0)	901 (53.35)
	Heavy oil heater			
1	*Type		Horizontal	Horizontal
	*Capacity & number g	/m (m <sup>3</sup> /h)	195 (44.3) x	205 (46.5) x
	of heater		3 sets	3 sets
	*Manufacturer/erector		MESCO	WELDON
	f. <u>Boiler D</u>	raughting Equ	ipment	
		5-56		

Malaya		
	Unit No. 1	Unit No. 2
Forced Draught Fan		
*Type	Axial flow, 2 stat	e Horizontal cen-
	horizontal	trifugal type
		F-29B, 80-75, A <sub>3</sub>
		DWDI BX-VIV
*Capacity & number ft <sup>3</sup> /m (	$m^3/m)$ 380,000 (10,760)	394,000 (11,160)
	x 2 sets	x 2 sets
*Pressure inwg (m	mwg) 43 (1,092.2)	53.5 (1,105)
*Revolution speed rpm	1,150	1,183
*Manufacturer/erector	KWU	Honden Parson/
		Babcock-Hitachi
*Driver - Type	AC motor	AC motor
	Siemens RN5 634-	
	6не90-х	
- Capacity kW x numbe		2,600 x 2 sets
- Capacity kW x number - Manufacturer/		2,600 x 2 sets Babcock - Hitachi
	er 2,460 x 2 sets	
- Manufacturer/	er 2,460 x 2 sets	
- Manufacturer/	er 2,460 x 2 sets	
- Manufacturer/ erector  Gas recirculation	er 2,460 x 2 sets Siemens	Babcock - Hitachi
- Manufacturer/ erector  Gas recirculation	er 2,460 x 2 sets Siemens  Double suction	Babcock - Hitachi  Double suction
- Manufacturer/ erector  Gas recirculation	er 2,460 x 2 sets Siemens  Double suction turbo-fan NV1CD,	Babcock - Hitachi  Double suction  with backward-
- Manufacturer/ erector  Gas recirculation	Pouble suction turbo-fan NV1CD,	Babcock - Hitachi  Double suction  with backward-  curved air foil  type blades
- Manufacturer/ erector  Gas recirculation *Type	Pouble suction turbo-fan NV1CD,	Babcock - Hitachi  Double suction  with backward-  curved air foil  type blades
- Manufacturer/ erector  Gas recirculation *Type	2,460 x 2 sets Siemens  Double suction turbo-fan NV1CD, 16-1/2 (m <sup>3</sup> /m) 416,400 (11,790.8) x 1 set	Double suction with backward- curved air foil type blades 464,600 (13,160)

\*Manufacturer/erector

\*Manufacturer/erector

\*Makashima

\*BC Hitachi K.K.

\*Driver - Type

AC Motor EFA-KK

\*AC motor

NEMA type II

- Capacity kW x number

930 x 1 set

930 x 1 set

Babcock - Hitachi

. 1

Stack

erector

\*Construction Tower supported Consists of 2 structure anchored sections conston a girder ructed one on top of the other \*Top inside diameter ft (m) 15 (4.57) 17'-3/12" (5.25) \*Height ft (m) 220 (67.06) 220 (67.06) (Base of stuck elevation ft (m))

\*Number one

\*Manufacturer/erector Pacific Engineering/ ECCO ASIA

PECCO

one

# g. Boiler Feed Water Pump

### Turbine driven feed water pump

\*Type & number of stage HDR8S, centrifugal Impulse type
6 stage single flow condensing turbine
5 stage

Malaya			
		Unit No. 1	Unit No. 2
*Capacity & number	$1bs/m (m^3/hr)$	2,600,000 (1,179.4)	6,850 g/m
of pump		x 1 set	$(1,555.64m^3/h) \times$
			1 set
*Total head &	psig(m)	3,804 (1,674.6)	3,260 *2,292.1)
revolution	rpm	5,000	5,060
*Manufacturer/erector		Siemens	Hitachi
Turbine for BFP			
*Type		Axial, reaction,	
		single cylinder,	
		condensing type	
*Capacity & number	kW	12,214 x 1 set	
of turbine			
*Manufacturer/erector		Siemens	
T-BFP booster pump			
*Type		YNKN 400/300	Horizontal type
		double suction	
		single stage	
*Capacity & number	lbs/m (t/h)	2,600,000 (1,179.4)	6.850 g/m
of pump		x l set	(1,555.64)m <sup>3</sup> /h x
			1 set
*Total head &	psig(m)	96 (67.5)	125.2 (88)
revolution	rpm	1630	1,765
*Driver	kW	420	505
*Manufacturer/erector		KSB	Hitachi
Motor driven feed wate	er pump		
*Type & number of stag		HDG h/11 - 11	Horizontal
	•		

Ma	ъ.		_
n n	1 23	v	4
		,	•••

lalaya			
		Unit No. 1	Unit No. 2
Capacity & Number	lbs/h (t/h)	760,000 (344.7)	3,425 g/m
of pump		x 1 set	(777.8 m <sup>3</sup> /h)
			x 2 sets
Total head &	psi (m)	2,950 (2,074.1)	3,220 (2,264)
revolution	rpm	3,570	5,300
Manufacturer/erector		Kelin, Achanzlin &	Becker Hitachi Ltd
Driver - Type		Motor driven	Motor driven
- Capacity &	kW	3,120 x 1 set	3,050 x 2 sets
number of mo	otor		
- Manufacture	r/	Siemens	Hitachi, Ltd.
erector			
M-BFP booster pump			
*T <b>y</b> pe		None	Horizontal type
*Capacity & Number	g/m(m <sup>3</sup> /h)		3,425 (777.8) x
of pump			2 sets
*Total head &	psig (m)/rpm	edika di Kabupatèn K Kabupatèn Kabupatèn	100 (70.3)/1800
revolution			
*Manufacturer/erector			Hitachi, Ltd.
*Drive - Type			FWP, Direct
h. Feed W	ater Heaters 1	Equipment_	
No. 1 LP Feed water h	<u>eater</u>		
*Type		Horizontal U-tube	Horizontal U-tube
*Heating surface are	$ft^2(m^2)$	7,410 (688.4) x	5,597 (519.98) x
& number of heater		1 set	2 sets
*Material of heating	tube	St 35.8	SUS 304 TB

# Malavo

lalaya			
		Unit No. 1	Unit No. 2
Heating steam in/	°F (°C)	182.5/176.5	193.9/177.4
drain outlet	Market Market St.	(83.6/80.3)	(89.94/80.8)
temperature			
Condensate in/	°F (°C)	113.4/170.1	117.9/172.4
outlet temperature	en e	(45.2/76.7)	(47.72/78.0)
Condensate flow	lbs/h (kg/h)	1,863,520	1,859,101
		(845,295)	(845,045.9)
Manufacturer/erector	in the second	Atlas-Mak Mas-	Hitachi, Ltd.
		chinenbau GmbH	
lo. 2 LP feed water he	eater_		
Туре		Vwakl 115.2/750	Horizontal U-tube
		Horizontal U-tube	2 pass
		2 pass low pres-	
		sure	
Heating surface area	ft <sup>2</sup> (m <sup>2</sup> )	6,954 (646.0)	8,810 (818.5)
& number of heater		x 1 set	x l set
Material of heating t	ruhe	St 35.8	0.5 M. Cs
			STBA 12
Heating steam in/	°F (°C)	266.6/182.5	382.5/182.4
drain outlet	r ( C)		
		(130.3/83.6)	(194.7/83,5)
temperature			
Condensate in/outlet	F (°C)	170.1/214	172.4/238.1
temperature		(76.7/101.1)	(78/114.5)
Condensate flow	lbs/m (kg/h)	1,863,520	1,859,101
		(845,295)	(845,045.9)

Malaya		
	Unit No. 1	Unit No. 2
*Manufacturer/erector	Atlas-Mas Mas	Hitachi, Ltd.
	chinenbau GmbH	
No. 3 LP feed water heater		
*Type	Vwak1 125.2/900	Horizontal U-tube
	Horizontal U-tube	
	2 pass low pressure	
*Heating surface are ft <sup>2</sup> (m <sup>2</sup> )	8,880 (825.0)	5,904 (548.5)
& number of heater	x 1 set	x 1 set
*Material of heating tube	s. 35.8	0.5 M. CS
		STBA 12
*Heating steam in/ °F (°C)	499/226.6	485/248.1
drain outlet	(259.44/108.1)	(251.7/120.1)
temperature		
*Condensate in/outlet °F (°C)	214/299.3	238.1/270.8
temperature	(101.1/148.5)	(114.5/132.7)
*Condensate flow lbs/m (kg/h)	1,863,526	1,859,101
	(845,295)	(845,045.9)
*Manufacturer.erector	Atlas-Mak Maschi-	Hitachi, Ltd.
	nenbau GmbH	
Deaerator		
*Type	Spray, deaerator	Spray deaerator
and the state of t	mounted on hori-	
	zontal storage tank	
*Outlet feed water lbs/h (t/h)	2,279,000	2,421,957
flow	(1,033.7)	(1,100.9)
경취 및 요리 이 등 보다 하는 것 같습니다. 기본의 기준을 보고 있습니다. 기본	(1,035.7)	(1,100.9)
5-6		<b>全国的</b> 企业的观点

Malaya			
		Unit No. 1	Unit No. 2
*Dissolved oxygen	cc/1	0.005	0.005
guarantee value			
*Storage tank	gal (m <sup>3</sup> )	50,635 (191.6)	38,300 gal (1
capacity			
*Deaerator pressure	psig(kg/cm <sup>2</sup> g)	150 (10.5)	160 (11.3)
*Manufacturer/erector		Atlas-Mak Maschi-	Hitachi, Ltd.
		nenbau GmbH	
*Heating steam inlet	°F (°C)	640 (337.8)	
temperature			
No. 5 HP feed water he	eater		
*Туре		VU way 110.2/530	Horizontal U-
		Horizontal U-tube	
		2 pass, high	
		pressure	
*Heating surface area	ft (m <sup>2</sup> )	4,990 (463.6) x	11,733 (1,090
& number of heater		2 sets	x l set
*Material of heating t	ube	15 MO <sub>3</sub>	SA - 556 GR.
*Heating steam in/	°F (°C)	432.9/375	839.4/352.2
drain outlet		(222.7/190.5)	(448.6/177.9)
temperature			
*Feed water in/outlet	°F (°C)	362.7/420	342/393.5
temperature		(183.7/215.5)	(172.2/200.8)
*Feed water flow	1bs/h (t/h)	2,274,199	2,421,957
		(1,031.6)	(1,100.9)
*Manufacturer/erector		Atlas-Mak Maschi-	Hitachi, Ltd.
		nenban GmbH	

Malaya		
	Unit No. 1	Unit No. 2
No. 6 HP feed water heater		
*Type	VU way 110.23/560	Horizontal U-tube
	Horizontal U-tube	
	2 pass high	
	pressure	
*Heating surface area ft <sup>2</sup> (m <sup>2</sup> )	5,280 (490.5)	16,288 (1,513.2)
& number of heater	x 2 sets	x 1 set
*Material of heating tube	13CrMo 44	SA-556 GR. C2
*Heating steam in/ °F (°C)	647/432.9	604.7/403.5
drain outlet	(341.7/222.7)	(318.2/206.4)
temperature		
*Feed water in/outlet °F (°C)	420.3/492.3	393.5/464.3
temperature	(215.7/255.7)	(200,8/240.2)
*Feed water flow lbs/h (T/h)	2,274,199	2,421,957
	(1,031.6)	(1,100.9)
*Manufacturer/erector	Atlas-Mak Maschi-	Hitachi, Ltd.
	nenban GmbH	
No. 7 HP feed water heater		
*Type	None	Horizontal U-type
*Heating surface area $\operatorname{ft}^2$ (m <sup>2</sup>		15,535 (1,443.25)
& number of heater		x 1 set
*Material of heating tube		SA-556 GR C2
*Heating steam in/ °F (°C)		719.6/474.3
drain outlet		(382.0/245.7)
temperature		

		Unit No. 1	Unit No. 2
*Feed water in/outlet	°F (°C)		464.3/518.4
temperature			(240.2/270.2)
*Feed warer flow	1bs/h (T/h)		2,421,957
		er en	(1,100.9)
*Manufacturer/erector			Hitachi, Ltd.

Malaya			
		Unit No. 1	Unit No. 2
2) <u>Turbine an</u>	d Auxiliary		ta jaringa paga sajar
a. <u>Turbin</u>	<u>e</u>		
*Type		Tandem-compound,	TC4F-26 reheat,
		single reheat ex-	tandem compound,
		traction, condens-	four flow, ex-
		ing	traction
*Rating output	kW	330,000	350,000
*Throttle steam	psig(kg/cm <sup>2</sup> g)	2,700 (189.8)	2,400 (168.7)
pressure at MSV inle	t		
*Throttle steam	°F (°C)	1,000/1,000	1,000/1,000
temperature main		(537.7/537.7)	(537.7/537.7)
steam/hot reheat			
*Exhaust vacuum	inHg (nmHg)	2 (50.8)	2.4 (60.9)
*Number of bled		<b>.6</b>	7
steam stages			
*Manufacturer/erector		Siemens	Hitachi, Ltd.
b. <u>Conden</u>	ser		
*Type		Surface, rectangu-	Single pass,
		lar single shell	divided water box
			surface type
*Circulating water	g/m (m3/h)	222,200 (50,462)	318,775 (72,400)
*Tube cleanliness	%	85	85
factor			
*Condensate flow	g/m (m <sup>3</sup> /h)	1,335,893	1,859,101 1b/h
		(605.96)	(845.045 T/h)

	Unit No. 1	Unit No. 2
*Cooling water design °F (°C)	85 (29.4)	87 (30.6)
temperature		
*Cooling water outlet °F (°C)		96.6 (35.9)
design temperature		
*Design point tube ft/s (m/	s) 6.4 (1.95)	7.5 (2.286)
inside flow velocity		
*Tube material of	CuZnZo A1	SUS 316
condensing zone	(Al-bras)	
*Tube dimensions of in (mm)	1" OD - #18 SWG	1" OD. BWG #22
condensing zone		(25.4)
*Effective tube ft (mm)	25'-11 3/64"(7,900)	40 (12,192)
length		
*Tube material of air	90-10 Cu-Ni	
cooling zone		
*Inner tube surface $ft^2(m^2)$	236,000 (21,925)	209,900 (19,500)
*Outer tube surface $ft^2(m^2)$		
*Material of tube plate	Steel with tarset	Naval Brass
	coating	
*Material of water box	Steel with tarset	Tar epoxy
	coating	
*Chemical dosing in	NONE	NONE
cooling waer		
*Ball cleaning equipment	NONE	Not on service
*Chathodic protection	Impressed current	Impressed curren
system type		
*Manufacturer/erector	KWU - West Germany	Hitachi, Ltd.

		Unit No. 1	Unit No. 2
c. <u>Circu</u>	lating water pu	ımp	
*Type		Vertical shaft	Vertical
		mixed flow type	
*Capacity x head x	g/m (m <sup>3</sup> /h)	128,480 x 30.1 ft	163,400 x 33.0 ft
number		(29,178 x 9.17 m)	(37,112 x 10.06m)
		x 2 sets	x 2 sets
*Manufacturer/erecto		KSB	Hitachi, Ltd.
*Driver - Type		AC Motor	Motor driven
- Capacity	kW x rpm	1,100 x 1,190	1,350 x 276
d. <u>Air e</u>	jector equipmer	<u>1</u>	
*Type		Roman 1/2 E Twin	Single element,
		element, 2 stage	two stage steam
		steam jet with	jet and ejector
		inter & after	with combined
		condenser	surface type
			inter & after
			condensers on a
			single shell
			2 sets
*Capacity (dry air)	lbs/h (kg/h)	33 (15.0) x 2 sets	15 cfm (25.49m <sup>3</sup> /h)
x number			
*Suction pressure	inHg (mmHg)	2.0 (50.8)	1.0 (25.4)
*Working steam	lbs/h (t/h)	868 (0.394)	1,430 (0.649)
consumption			
(in case of steam			
jet ejector)			
	5+6		

		Unit No. 1	Unit No. 2
*Inter condenser	$ft^2 (m^2)$	77.5 (7.2)	409 (37.947)
surface			
*Outer condenser	ft <sup>2</sup> (m <sup>2</sup> )	50.6 (4.7)	
*Manufacturer/erecto	r	Siemens AG	Hitachi, Ltd.
e. <u>Conde</u>	nsate Pump		
*Type		WKTN 300	Single suction,
		Barrel type	vertical type
			6-stage diffuser
			pump
*Capacity x head x	lbs/h (t/h)	2,100,000	4,440 g/m
number		(952.56)	(1,008.3 m <sup>3</sup> /h)
	psi $(kg/m^2)$	355 (24.96)	
		x 2 sets	
*Manufacturer/erecto	<b>)r</b>		Hitachi, Ltd.
*Driver - Type		Motor driven	Motor driven
- Capacity	kW x rpm	900 x 1,180	870 x 900

Malaya			
		Unit No. 1	Unit No. 2
3) Generator a	nd Auxiliary		er en
a. Generat	or		
*Type		Totally enclosed	Totally enclosed
	ikan di Kabupatèn Barangan Kabupatèn Barangan	Hydrogen cooled	hydrogen cooled
		FTHDD 540/66-2/60	Hitachi type-
			form TFLQQ-KD
*Rating capacity	kVA	370,000	438,000
		(45 psig H <sub>2</sub> )	(45 psig H <sub>2</sub> )
*Power factor		0.9	0.9
*Voltage	<b>V</b>	21,000	21,000
*Frequency	Hz	60	60
*Revolution	rpm	3,600	3,600
*Cooling type - Stator		Direct hydrogen	Water cooled
		cooled	
- Rotor		Direct hydrogen	Direct hydrogen
		cooled	cooled
*Hydrogen pressure	psig(kg/cm <sup>2</sup> g)	45 (3.169)	45 (3.169)
		60 (4.219)	
*Connection		Double star	Double star
*Exciting system		Brushes type	Sttic(with brush)
*Short circuit ratio		0.58 guaranteed	0.619
*Neutral grounding		Non-flammable oil	Mineral oil fill-
		immensed trans-	ed transformer
		former 175 kV,	21,000/210 V
		21,000/240 V	Resistor
		Resistor	0.15 ohm 808 A
		0.19 ohm 730 A	
	5-71		

Malaya			
		Unit No. 1	Unit No. 2
*Manufacturer/erecto	o <b>r</b>	Siemens	Hitachi, Ltd.
b. Excite	<b>ir</b> 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	6-pole 3-phase	Static excitation
		revolving armature	
			ristor converter
			and power trans-
			former
*Capacity	kVA	1,880 (Main exciter)	2,600 (Transform
eren jaron de de la Millon. Majoria	kW	1,665 (Rectifier)	1,550 (Thyristor
*Voltage	V	415 (Main exciter)	) 450 (Transformer
		520 (Rectifier)	390 (Thyristor)
*Revolution speed	rpm	3,600	
(if rotating type)			
*Number	Paragraphy (1947)	one	one
*Manufacturer/erecto	o <b>r</b>	Siemens	Hitachi, Ltd.
*Kind of driver		Two-rectifier	
(if rotating type)	et likyter is	wheels	

Unit No	$\circ$ . $1$	Unit	No.	2

# 4) <u>Transformers</u>

## a. Main transformer

*Type	AFOC-3AMN/Y5CP,	AFOC-3AMN/Y5CP
	oil immensed, (FOA)	oil-immensed (FOA)
	auto transformer	auto transformer
	outdoor type	outdoor type
*Capacity kVA	370,000	442,000
*Primary voltage (PV) kV	21	21
*Secondary voltage kV	230/117.3	230/117.3
(HV/LV)		
*Phase	3 phase	3 phase
*Impedance voltage %	23.0 (HV-PV)	24.83 (HV-PV)
	11.5 (LV-PV)	13.40 (LV-PV)
	10.5 (HV-LV)	10.25 (HV-LV)
그는 그들의 말라는 사람이 크린스트이 그는 기술에 들어 그림을 가면서 가르셨다.	370 MVA Base	442 MVA Base
*Connection	Delta - WYE/WYE	Delta - WYE/WYE
	auto transformer	auto transformer
*Neutral (HV side)	Solidly grounded	Solidly grounded
*Cooling system	Forced oil, forced	Forced oi, forced
	air cooled (FOA)	air cooled (FOA)
*Number	1 set	1 set
*Manufacturer/erector	Hitachi, Ltd.	Hitachi, Ltd.

			Unit No. 1	Unit No. 2
b. Stati	on serv	ice tran	sformer	
*Type			SAOCR-3MC, oil im-	SAOCR-3MC, oil
			mersed (OA/FA)	immersed (OA/FA)
			outdoor type hav-	outdoor type hav-
		e Karrina.	ing two LV windings	ing 2 LV windings
Capacity	kVA	HV;	18,750/25,000	26,200/35,000
			(OA/FA)	(OA/FA)
		LV;	9,350/12,500	13,200/17,500
			(OA/FA)	(OA/FA)
*Primary voltage	v		21,000	21,000
*Secondary voltage	V		4,160/4,160	4,160/4,160
*Phase			3 phase	3 phase
*Impedance voltage	%		8.58 (HV-LV1)	9.89 (HV-LV1)
			8.52 (HV-LV2)	10.03 (HV-LV2)
			16.10 (LV1-LV2)	11.11 (LV1-LV2)
			12.5 MVA Base	17.5 MVA Base
*Connection			Delta - WYE/WYE	Delta WYE/WYE
*Neutral (LV side)			Grounding resis-	Grounding resis-
			tance, 96 ohm 25 A	tance 96 ohm 25A
*Cooling system			Self cooled/forced	Self cooled/forc-
			air cooled (OA/FA)	ed air cooled(OA/FA)
*Number			l set	l set
*Manufacturer/erecto	r		Hitachi, Ltd.	Hitachi, Ltd.

#### Unit No. 1

Unit No. 2

c. Emergency station service transformer

\*Type Oil immersed, (OA/FA)

outdoor type with

4 windings

\*Capacity (55°C rise) kVA HV 20,000/26,667(OA/FA)

LV  $10,000/13,333(OA/FA) \times 2$ 

TV 7,000/9,333 (OA/FA)

\*Primary voltage (HV) V 115,000

\*Secondary voltage V 4,160/4,160

(LV)

\*Tertiary voltage 4,800 (Stabilize winding)

\*Phase 3 phase

\*Impedance voltage % 5.8 (HV-TV) 7.5 (TV-LV1)

(10 MVA, Base) 7.75 (HV-LV1) 7.5 (TV-LV2)

7.65 (HV-LV2) 15.5 (LV1-LV2)

\*Connection WYE-WYE x 2 - Delta

\*Neutral (LV side) Grounding resistor

(commonly) 96 ohm, 25 A

\*Cooling system Self cooled/forced

air cooled (OA/FA)

\*Number 1 set

\*Manufacturer/erector McGraw Edison Systems

Division

Unit No. 1 Unit No. 2 5) Water Treatment System Raw water \*Kind Deepwell \*Total hardness ppm (CACo<sub>3</sub>) \*pH 8.3 \*Silica (SiO<sub>2</sub>) 86 ppm \*Turbidity degree clear Raw water tank \*Type Cylindrical tank (FWP) gal (m<sup>3</sup>) \*Capacity x number 5,500 (20.83) \*Manufacturer/erector ECCO ASIA Sedimentation system \*Type None \*Applied chemical \*Capacity t/day x number \*Erector d. Filtering system \*Type AVGF \*Capacity t/day x number \*Type of reverse washing Automatic back-Automatic backwashing washing \*Filter material Anthracite sand \*Manufacturer/erector Permutit Co.

Unit No. 1 Unit No. 2

e. Water demineralizing equipment

\*Type Permutit

\*Capacity  $GPM(m^3/H)$  100(22.7) x 2

x number of train Mixed Bed 100 (22.7) x 2

\*Capacity per 1 cycle Cation 136,400 (516)

service gal (m<sup>3</sup>) Anion 125,600 (475)

Mixed Bed 514,000 (1946)

\*Regenerating hour per 1 cycle Cation 2 Hr 55 min.

Anion 2 Hr 45 min.

\*Type of resin x resin Cation IR-120 172 (4870)

filling capacity ft<sup>3</sup>(1) Anion IRA-402 102 (2888)

Mixed Bed CationIR-120 28 (793)

Anion IRA-402 24 (679)

f. Condensate Demineralizer

\*Pre-filter type None None

\*Condensate demineralizer 1400 (318) x 4 None

capacity x number  $GPM(m^3/H)$ 

\*Regeneration Equipment 1 set

g. Chemical dosing system

Feedwater

\*Kind of chemical  $N_2H_{\Lambda}$  &  $NH_{\Lambda}OH$ 

\*Pump capacity x number 0.0028/0.29 1/min

\*Tank capacity 1159.25/1159.25 liter

\*Manufacturer/erector ECCO Asia

	Unit No. 1 Unit No. 2
Auxiliary cooling water	
*Kind of chemical	N <sub>2</sub> H <sub>4</sub> (demi water is being used)
*Pump capacity x number	58390.88 1/min x 2 sets
*Tank capacity	783.94 liter
*Manufacturer/erector	Siemens
Chlorination for circulating water	
*Kind of circulating water	Lake water
*Type	Program control & vacuum type
*Chlorination capacity	151.5 kg/hr chlorine gas
kg/h x number	
*Manufacturer/erector	Columbiana Boiler Company

# 5.2 発電所の現状

		ガードナー 1 号	ガードナー 2 号
過	と 器		過熱器管全数(6 0 パネル)を 19
			年6月26日からの定期修理中に取
			(1982年6月26日)
再	製 器		吊下げ型再熱器管の 200 ループを
i Nga			回の定期修理中に取替えた。 なお、
			期修理中の水圧試験で発見された7
			の横置型再熱器はスペアパーツが得
			れないためパッチ当溶接で修理した
			これはポイラのウイークポイントで
	· 		3.0 m
炉	篭 管	1979年の定期修理時に炉壁管を部分	管列の乱れや管内面にピッチングコ
		的に取替えているo	- ジョンの発生している管は、198
		破孔、或いは膨出した11本の炉壁	年の定期修理期間中にはスペアーチ
		管は1982年1月13日から同年3	- プやバネルの数量不足のため十分
		月5日の間に行われた定期修理期間	管取替が出来ていない。
		に発見されたもので、炉壁管はこの	
		ボイラのウイークポイントである。	
		定期修理完了後、3本の管は1982	
		年6月11日から20日の間に取替	
		又は修理をしている。	
バッフル	レウォール	ポイラバッフルウォールチューブの	特別な問題はない。
		全数は1982年1月13日から同年	
		3月5日までの定期修理期間中に取	
		替えている。	

	カードナー 1号	ガードナー 2号
ポイラ, ケーシンゲ	ポイラケーシングからのガス漏洩が	ポイラケーシングからのガス漏洩は、
	非常に多い。	定期修理期間に修繕が行われている。
		(1982年6月26日~ )
バーナ		定期修理期間中に点検、検査を実施し
		ている。
		(1982年6月26日~ )
節 炭 器		ポイラ給水系統で節炭器とNa 6高圧給
		水加熱器の間に逆止弁が設置されてい
		ない <sub>o</sub>
		<b>建</b> 多数 医皮肤 医皮肤

ボイラー補機		
	ガードナー 1号	ガードナー 2 段
押込通風機	A-押込通風機	B一押込通風機
	バビットメタルの剝離とベアリン	1982年1月10日、激しい震動を
	ゲハウシングに損傷があった。	起したので障害となる翼を同年る月
	(1981年5月20日)	11日取替0
	B-押込通風機	
	ファンローターのアンバランスと	
	アライメント不良による激しい震	
	動を却している。	
	押込通風機の容量不足の懸念があ	
	る。 (1982年6月、7月)	
ガス再循環ファン	特別な問題はないo	
空 気 予 熱 器	部分的にエレメントの取替。	A側のホットエンドバスケットの取替
	(1981年11月11/9)	(1981年4月17日)
蒸気式空気予熱器	温度制御装置は作動していない。	今回の定期修理中に点検と不良品の取
		替を実施o
燃料油ポンプ	定差圧燃料油ポンプは稼働していな	
	ho	
灰処理装置	灰搬出ラインがつまっていて稼働し	左記に同じ
	ていない。	
補助蒸気	補助蒸気配管の保温脱落個所が非常	補助蒸気配管の保温、脱落個所は修理
	化多いo	中である。
	また、蒸気量制御弁は作動していな	
	No.	

	カードナー 1号	ガード ナー 2号
配管及び弁類	配管及び弁類の保温状況は悪い <sub>o</sub> ま	配管及び弁類の保温修理中。
	た、配管識別はなされておらず、弁	
	名称の標示もない。	
煙 風 道	煙道からのガス漏洩が非常に多い。	   現在修理中 <sub>0</sub>
	保温の状況は悪いo	
燃料貯油槽		
薬 品 注 入 装 置		
	[1] [1] [1] [2] [4] [4] [4] [4] [4] [4] [4] [4] [4] [4	
	· 建建一层建筑工作。	

	ガードナー 1 号	ガードナー 2号
ターピン翼	1) タービン翼の欠損はない。	1982年3月30日、タービン側低圧最
	2) 1981年11月26日に再熱蒸気	終段6枚の異を異端から140mm切断
	側のクロスオーバーパイプからの	している。
	蒸気漏洩事故があるo	
	3) 1981年12月5日、再熱蒸気側	
	のクロスオーバーバイブの伸縮接	
	手をスペアパーツと収替o	
弁 類		問題のあった弁は現在定期修理中で検
		査及び修理中である。
調速機		現在、点検、検査中である。
潤滑油系統	潤滑油配管からの漏油が見られる。	左記に同じ。
1.44		
	5-82	
	그리면 얼마를 당했다는 그는 한다.	

	カードナー 1号	ガードナー 2号
主復水器	プラグチューブは1979年6月15日	プラグチュープは1982年8月24日
	で、 549 本、チュープ総数 14,748	で 2 6 6 本、チューブ総数 2 4,400
	本でプラク率は3.72%である。	本で、フラク率は1.09%である。
	1979年10月24日から1980年	
	1月12日までの定期修理期間中に	
	チュープ全数を材質キュープロニッ	
	   ケルの新管と取替え。取替え前のチ	
	ュープ材質はアドミラルティであっ	
	to	
	[1] [1] 아니라 그 아니다 아니다	
<b>低圧給水加熱器</b>	No. 1 低圧給水加熱器	No. 1 低圧給水加熱器
	1980年3月23日付でプラクチュー	プラグチューブはない。
	ブ数2本、チューブ総数 509 本で	
	ブラク率は 0.39%である <sub>0</sub>	No. 2 低圧給水加熱器
	なお、上記日付から今日までチュー	1980年8月17日付でプラグチュー
	ブリークはない。	ブは 3本、チューブ総数 539 本でブ
		ラク率は0.55%である。
	No.3 低圧給水加熱器	No.3 低圧給水加熱器
	1982年1月22日付でプラクチュー	1982年7月21日付でプラクチュー
	<b>1</b>	プ 5 9 本、チュープ総数 50 4 本、プ
	ブラク率 6.98%。	ラグ率10.9%。
	2 2 2 3 4 0 7 0 70 0	77410.7700

高圧給水加熱器	No. 5 高圧給水加熱器	Na.5 A 高圧給水加熱器
		1982年7月10日付でプラクチュー
	ブ数59本、チューブ総数 440 本、	
	プラグ率13.4% <sub>0</sub>	グ率 0.16%。
	No. 6 高圧給水加熱器	No.5 B 高圧給水加熱器
	プラグチュープなし。	1982年8月付でプラグチューフ数
		本、チューブ総数 633 本、ブラク
		0. 1 5 % o
		Ma 6 A 高圧給水加熱器
		1982年3月31日付でプラグチュー
		数 4 6本、チューブ総数 633 本、
		ラク率 6.33%。
		No.6 B 高圧給水加熱器
		1982年8月4日付でプラグチュー
		数94本、チュープ総数 633 本、
		ラグ率14.8%。
脱 気 器		
<i>2</i> 1		
復水ポンプ	B-復水ポンプサクションストレー	サクションストレーナ前後の圧力計
	ナ後の圧力計は設備されていない。	今回の定期修理中に取付けられた。
   復水器循環水	1981年1月1日、B-循環水ポン	1982年3月12日、 B - 循環水ポ
ポンプ	プ吐出管の仰縮接手からの漏水が激	プの上部軸受の振動が3~4ミルに
	しく同ポンプを停止するという事故	し、同ポンプを分解点検しなければ
	があった。	らない事故が発生している。

	カードナー 1号	ガードナー 2 号
塩素処理装置	塩素処理装置は全然使用されておら	左に同じ
及びボールクリ	ず、陳腐化設備となっている。なお	
ーニング装置	ボールクリーニング装置の設備はな	
	$\mathfrak{b}_{\mathbf{o}}$	
機器軸受冷却水	付属介の漏洩が多い。熱交換器のブ	左に同じ
装置	ラグチューブ数は、	熱交換器のプラグチューブ数は、
	A - 熱交換器:29本、チューブ総	A-熱交換器: 110本、 チューブ総
	数 1 6 1 8 木、プラグ率 1.7 9 %	数 1840本、プラグ率 5.97%
	B - 熱交換器:261本、チューブ総	B-熱交換器:92本、チューブ総数
	数1618本、プラグ率16.13%	1840本、プラグ率5%となってレ
	となっている。	30
原水ポンプ		
深井戸ポンプ		
取水口機器		<u> </u>
その他	コンデンサービット、復水ポンプビ	七度同じ
	ットなどその他 1階 オペレーテング	21, (C.P.) U.
	フロアーの排水が非常に悪い。	
	2 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	5-85	

Part and the same of the same		
	ガードナー 1号	ガードナー 2号
発電機	1982年3月9日~同年5月11日	1978年10月25日、多量の水素ガス
	の定期修理中に発電機集電環端部の	   漏洩を経験しているo
	シール・リングに故障が発見され、	  現在、1日に約1本の水素ボンベ消費
	水素ガスの漏洩が見つけられた。水	している。
	素ガス漏洩は現在も止っていず、1	
	日に6本の水素ポンペを消費してい	
	\$o	
励 磁 機		過去2回主励磁機事故を起しており、
		1982年の定期修理で新品と取替られ
		ている。
スイッチギア及び	1) ポイラ・コントロール・センタ	1) 左に同じ
モーター・コン	- を除いてメタル・クラッド・ス	
トロール・センタ	イッチギア及びモーター・コント	
	ロール・センターは発電所構内レ	
	ベルより低い1階面に設置されて	
	いる。	
	2) 雑用コントロール・センターの	2)
	基礎より湖水が湧水しており、高	
	湿度により絶縁破壊もありうる。	
	3) スイッチギア及びコントロール	3) 左に同じ
	センター内の電磁接触器及び補助	
	リレーは開放形であり、環境が悪	
	いため上記リレーは非常にほこり	
	がしている。	
	4) ケーブル・マーク及び配線番号	同 左
	等がないo	
	5) 多くの運転表示灯が故障中であ	同左
	30	

	ガードナー 1号	ガードナー 2号
直流電源	いくつかの新しい蓄電池を除いて寿	ガードナー 1 号との共用設備
	命が来ている。	
非常用ディーゼル	補機への動力ケーブルが布設されて	ガードナー/スナイダー発電所の共用
発 電 機	おらず、自動起動の回路もないo	設備
	(建設時試運転よりの運転時間積算	
	は36時間となっている。)	
変 圧 器	特に問題はないo	定期修理期間中、主変圧器の絶縁油の
		入れ替えがMELARCO によって実施
		されていた。
変 電 所	115kV 送電線 5 回線、非常用電源	ガードナー/スナイダー発電所の共用
	供給母線2回線及び4台の発電機し	設備
	断器がMELARCO によって保守さ	
	れている。	
保護継電器	1) 発電機接地保護継電器及び4.16	1) 同 左
	kV 電動機用過電流保護継電器の	
	設定値は見直しが必要。	
	2) 周波数継電器は使用されていな	2) 向 左
	ho.	
その他	1) 保修及び修理作業用電源箱が充	1) 同 左
	分設置されていない。 特にポイラ	ガードナー 2 号の定期修理作業用
	ャードが少ない。	電源は通常運転中の他ユニットから
		供給されている。
	2) ポイラヤードの照明が充分でな	2) 同 左
	No.	

	The second secon		
		ガードナー 1号	ガードナー 2号
		3) ガス吸引ポンプを含めた可燃性	3) 同一左
		ガス警報盤上の表示灯はすべて故	
		障している。	
1			4) ガードナー/スナイター発電所の
. :		掃がされていない。	
		1111 W. G 10 C A. W A. O	共用施設。
:			
:			
•			
i			
•			
:		医多次性多性病 医多种	
٠.			
1			
1			

	ガードナー 1号	ガードナー 2号
and a far-wise consequence of the consequence of th		
燃料油制御	自動運転中	流量発信器故障のため手動運転。オー
		バル・タイプ燃料油流量計による制御
		信号の変更を計画中。
給水流量制御	自動運転中	給水流量調節器の信号遅れのため手動
		運転中o
		(タービン駆動ポイラ給水ポンプ)
		給水流量調節弁の漏洩が大きい。
		(電動機駆動ポイラ給水ポンプ)
蒸気温度制御	  蒸気温度検出器故障のため手動運転	定期修理以前も手動運転中。現在調整
	中o	中o
空気流量制御	と   空気予熱器閉塞のため手動運転中 <sub>の</sub>	空気流量信号ハンチングのため手動運
		転中。
起動バイパス	設備なし	信号発信器故障及び制御器の応答遅れ
制御御		(CV-101, CV-103及びCV-
		107)のため手動運転中 <sub>0</sub>
		電動弁 (MV-3, MV-4 及びMV-5)
		は設計不備のため手動運転中o
		フラッシュ・タンク圧力、水位制御は
		自動運転中。
		Market TPA I U
インターロック	ポイラ・トリップ・インターロック	
	に使われている高低圧給水加熱器ド	周波数低継電器用の配線がされている
	レンレベル・スイッチは全て壊れて	いo ボイラの減圧運転のため "節炭器
	いる。	
	¥1∕₩ O	入口給水圧力低"インターロックが使
		用されていない。

ı		NEXAMENTAL CONTRACTOR OF THE ARCHITECTURE OF T	
		カードナー 1号	ガードナー 2 号
	計器及び記録計	下記の計器が使用されていない。	定期修理のため調整中である。下記の
		水 節炭器出口 O 。 記録計	計器は使用されていない。
		* pH 記錄計	* 節炭器出口0: 記録計
		* 減温器出口温度計ハンチング	* pH 記錄計
			* 導電率計
	ローカル制御	ほとんど全ての制御装置が使用され	同左
		ておらず(故障のため)、制御弁の	
		バイパス弁を使って手動運転中であ	
		る。特に下記に述べる重要な制御装	
		置が故障している <sub>0</sub>	
		1) 高低圧給水加熱器ドレンレベル	
		制御	
		2) 補助蒸気圧力制御	
		3) 蒸気式空気予熱器温度制御	
		4) 脱気器スピルオーバー、オーバ	
		ーフロー制御	
	計装用空気系統	2台の空気圧縮機は連続ローディン	1 台のみの空気圧縮機が設置され、連
		クしており、アンローディング圧力	続ローディングである。ガードナー1
		設定(90 psi)迄圧力が上がらない。	号側よりのバックアップがある。
		雑用空気ラインよりのバックアップ	
		系統に逆止弁及びフィルターがない。	
• : .			
	中央制御室及び	ケーブル処理室があるため、中央制	ガードナー1号との共用設備。
	リレー室	御室は比較的良好な状態である。中	
		央制御室内温度は 7 6°F (2 4.4℃)	
		である。	