SECTION 10

UTILITIES

All utilities needed for the operation of the Oil/Gas complex are generated onsite utilizing a portion of the coal feed to the plant and energy recovered within the process units. A significant amount of water is consumed.

10.1 UTILITY DISTRIBUTION

Saturated steam at four pressure levels is used in the complex: 1,200, 600, and 150 psig and low pressure (less than 50 psig). In the turbine generator and the turbine drivers, steam is used at 1,200 psig and 950°F and 600 psig and 758°F, respectively. Electrical requirements are generated at 13.8 kV and 60 Hz, stepped up to 69 kV for efficient distribution, and utilized at 13.8 and 4.16 kV and 440 and 120/240 V. Cooling water at 86°F is produced in a cooling tower and distributed throughout the complex. Boiler feedwater is distributed to deaerators near the point of use.

10.2 UTILITY SUMMARY

The utility summary presented in Table 10-1 tabulates the nominal utility requirements and generation.

As shown in Table 10-1, steam at various pressure levels is produced and recovered in the process. Approximately 45% of the total steam required is produced in Unit 32, Power and Steam Generation. In some process units condensate is produced by the condensation of turbine exhaust or heating steam. This condensate is returned to the boiler feedwater system.

10.3 UTILITY GENERATION

Steam boilers located in the power plant produce 1,250-psig steam used to drive the electric turbine generators and further to drive some of the high-horsepower drivers in the process plant. Some 1,250-psig steam is produced in the process plant at 569°F. This steam is superheated in a gasfired steam superheater to 950°F and added to the steam produced in the boilers. Excess 600- and 150-psig steam from the process plant is returned to power plant heat exchangers and to the deaerator, where it is used to preheat the boiler feedwater to 484°F.

Makeup for cooling water, boiler feed water, and process water is derived from river water. This water is suitably treated in Unit 31, Raw Water Treating, as described in Section 5.21.

Energy required to fire the process heaters, the Power Plant boilers, and the 1,200-psig steam superheater is supplied by Unit 24 using dry filter cake and coal as feed.

Table 10-1 - Utilities Balance

Unit Number	Unit Description	Power kW	Steam, lb/h				Fuel Gas MM Btu/h	Cooling Water gal/min	Quench Water gal/min	Sour Water gal/min	Condensate (BFW) gal/min
			1,200 psig	600 psig	150 psig	Low Pressure					
9	Mine	(12,600)									
10	Coal Preparation	(13,500)									
11	Coal Crushing and Drying	(12,600)			(400,000)						
12	Slurrying and Dissolving	(43,500)		251,200		58,600	(630)	(3,300)		90	(640)
13	Filtration and Filter Cake Drying	(9,600)			87,400	(16,000) 23,300				10	(230)
14	Distillation	(3,400)	(62,900)	116,000	83,600	51,000	(270)			240	(520)
16	Naphtha Hydrogenation	(1,600)						(100)		40	(20)
17	Dissolver Acid Gas Removal	(2,400)			(8,100)	(190,300)					380
18	SNG and LPG Production	(1,100)	(224,900) 143,700	(112,200)			(10)	(44,000)			(300) 80
19	Methanation										
20	Process Gasifier	(10,100)							(600)		
21	Shift Conversion	(700)	(368,900)		636,900	596,400		(1,700)		250	(2,910)
22	Gasifier Acid Gas Removal	(9,900)		(108,100)	(91,400)			(28,900)			(70) 180
23	Oxygen Plant	(2,300)	(753,000)					(65,900)			
24	Fuel-Gas Gasifier	(1,200)	(341,200) 641,800		159,300	87,200	4,790	(29,900)	(140)	130	(1,840)
25	Fuel-Gas Sulfur Removal	(22,400)			(58,300)						(350)
26	Sour-Water Treating	(900)		(94,000)		(59,300)		(7,100)		(760)	310
27	Sulfur Plant	(4,100)			91,400	95,800	(40)				(400)
29	Storage	(2,800)					(70)				
30	Instrument and Plant Air	(3,900)									

(Continued)

Table 10-1 (Contd)

Unit Number	Unit Description	Power kW	Steam, lb/h				Fuel Gas MM Btu/h	Cooling Water gal/min	Quench Water gal/min	Sour Water gal/min	Condensate (BFW) gal/min
			1,200 psig	600 psig	150 psig	Low Pressure					
31	Raw-Water Treating	(800)						14,500[b]			2,930[d]
32	Power and Steam Generation	(13,700) 209,200	(1,905,700) 2,871,100	(264,300) 211,400	(500,800)		(3,770)	(138,600)			(5,970) 8,070
34	Effluent Water Treatment	(100)							740		
35	General Facilities	(36,000)				(646,700)		(14,500)[c] 319,500			1,300
Total Produced and Consumed (Balance = 0)		209,200	3,656,600	578,600	1,058,600	912,300	4,790	334,000	740	760	13,250

Note: [a]Quantities in brackets indicate consumption.
Quantities without brackets indicate production.
[b]Make-up to cooling tower.
[c]Losses due to evaporation, windage and blowdown.
[d]Make-up to BFW-Condensate system (blowdown).
[e]Stripped sour water consumed in Unit 20, Process Gasifier.