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THE WORLD BANK

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OFD SPECIAL STUDIES

85035--003

*Power - Comparative Review, First Manuscript
July 1971*

 **Archives**
A1994-141 Other #: 11 205083B
Power - Comparative Review - First Manuscript - July 1971



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WBG Archives

	60	61	62	63	64	65	66	67	68	69	70	
H	3.2	3.2	3.2	53.2	109.9	111.2	111.2	111.2	265.4	265.4	265.4	MA
-	-	-	-	300	600	900	900	900	1,100	1950	2090	BR
-	-	-	-	-	-	588	588	588	588	588	588	GH
-	?	50.2	50.2	50.2	50.2	50.2	50.2	81.7	81.7	81.7	81.7	ET

Total 3.2 53.4 53.4 403.4 760.1 1649.4 1649.4 1640.9 2035.1 2885.1 3025.1

T	-122.5	132.5	120	140	130	140	150	240	240	360	360	MA
-	-	-	-	-	-	-	-	80	160	204	204	BR
-	150	150	175	197	197	317	437	437	437	557	617	SI
-	?	5.0	5.0	5.0	5	5	5	5	5	5	5	ET
-	693	833	720	1359	1429	1454	1372	1433	1573	1573	1840	BR

Total -965.5 1120.5 1020 1701 1761 1916 1964 2195 2415 2699 3026
 (Total +71.8 (ET))

D	26.8	23.3	35.2	38.1	45	49.6	49.7	30.8	37.6	37.1	40.6	MA
-	27	27	27	27	27	27	27	27	27	27	27	SI
-	?	4.8	8.5	7.9	16.4	17	20.9	25.9	26.8	27.4	32	ET

Total 53.8 60.1 70.7 73 88.4 93.6 97.6 83.7 91.4 91.5 99.6
 TOTAL (1054.3) 1234 1144.1 2177.4 2609.5 3659 3711 3959.6 4541.5 5675.6 6150.7

Peak	-94	95	107	121	133	156	175	229	278	292	363	MA
-	-	-	-	889	555	570	620	828	1285	1710	2069	BR
-	118	128	139	151	169	192	223	248	283	320	377	SI
-	-	-	-	-	-	73	92	317	329	359	378	GH
-	10.3	19.2	21.9	25.5	27.1	33	33	39.6	43.3	45.8	49.6	ET
-	528.4	661.8	888.2	940.8	1049	1169	1235	1316	1394	1547	1697	BR

Total 751 903 1156 1526 1983 2193 2378 2978 3612 4274 4934

	1962	1963	1964	Total 62-64	1968	1969	1970	Total 68-70	
Nica. Dam Contrib:	31.59	22.75	14.75	69.20	51.45	37.03	27.87	116.35	185.60
private sector		6.05	3.56	9.65	2.30	2.47	3.58	8.40	18.05
public : corp - XCF.	99.76	10.17	10.70	54.65	-	0.20	-	0.40	55.05
Total	39.76	10.17	10.70	54.65		0.43	0.24	0.64	0.64
Total	99.76	16.21	14.3	64.30	2.30	3.29	3.82	9.44	55.69
Foreign borrow :									73.74
Suppl. credits	53.47	8.25	6.27	68.30	6.89	6.64	4.72	18.33	86.63
Foreign bond issues	4.11		10.91	15.02				10.59	15.00
Private investment	15.69						10.80	10.59	10.54
IBRD	47.48	48.51	22.07	88.40	9.44	30.56	18.68	57.69	146.09
Total	75.1	56.86	39.7	171.70	16.32	37.20	33.00	86.61	258.31
Total Sources	140.5	95.9	68.8	305.20	70.08	77.50	64.69	212.45	517.65
Investment	122.05	82.82	80.72	285.60	54.23	77.71	64.86	196.92	482.52
Acash.	16.57	13.00	11.89	19.60	15.85	-0.13	-0.17	15.53	35.13
Total App.	140.4	95.82	68.74	305.20	70.08	77.50	64.69	212.45	517.65
	138.62								
	31.6	22.8	14.3	18.4	51.5	37.0	27.90		
	93.8	16.2	39.7	19.1	2.3	3.3			
	75.1	56.9	14.9	31.5	16.4	37.20	3.84		
	140.5	95.9	69.8	11.9	70.2	77.50	39.01		
				9.6			64.75		

1.129
.328
.849
2.304

6.130
5.46
.67

10.541
~~11.02~~
~~8.25~~
19.77

16.21
9.43

17.64
10.59
4.93
33.01

19.56
18.91
.65

15.90
77
15.53

Sales:	NEB	MA	Sub.	9	15	1961	%	1962	%	1963	%	1964	%	1965	%	1966	%	1967	%	1968	%	1969	%	1970	%	
	MA	Sub.	9	15	632.8	16	709.8	16	803.4	15	918.7	10	1073.1	12	1222.7	11	1373.2	10	1768.5	10	1938.7	9	2177.6	9	MA	
	BR			X		X		X		X		X		X		X		X		X		X		X		BR
	BR	578	16		637	16	691	15	730	13	828	9	912	10	1075	10	1238	9	1447	9	1653	7	1942	8	SI	
	AGH									X		X		X		X		X		X		X		X		GH
	ET	42.9	1		59.5	2	82.5	2	99.1	2	124.6	1	152.3	2	166.3	1	197.9	1	221.1	1	227.1	1	245.9	1	ET	
AR	SEGA	2385	67		2544	66	3094	67	3485	63	3916	44	4270	46	4602	41	4875	36	5429	32	6160	27	6861	30	AR	
Total		3551	100		3873	100	4577		5512	100	9002	100	9186	100	11234	100	13564	100	17071	100	22590	100	23288	100		

Customers:																									
	MA	180.6	197.6	217.2	242.4	293.2	319.9	X	344.9	X	362.4	X	392.6	X	432.2	469.2	MA								
	BR	63.3	508.9	427.3	583.4	707.7	880.3	1493.5	1360*	267.6	218.8	246.6	267.6	112.6	1871	96.0	BR								
	SI	99.2	106.5	119.7	133.1	146.5	169.3	186	202.3	218.8	246.6	267.6	112.6	1871	96.0	SI									
	ET	32.4	37.9	44.2	53.4	60.2	66.6	75.0	85.6	94.1	102.8	112.6	1871	96.0	ET										
	AR	862	886	1331	1388	1431	1489	1559	1661	1726	1795	1871	1871	96.0	AR										
	GH						19.5*	70.3	77.9	82.3	90.9	96.0	96.0	96.0	96.0	GH									
Total		1173.2	1228	1711.1	1880.2	2439.8	2491.6	2818.6	3077.9	3400.1	4158.8	4176.4	4176.4	4176.4	4176.4										

Sent/amt:																	
	MA	2810	3069	3979	4308	4799	5245	5507	5875	6404	7284	7994	7994				
	BR	610	706	794	900	1028	1192	1365	1527	1950	2141	2411	2411				
	SI				412	3416	2837	3936	4609	5983	10457	9731	9731				
	ET	50	66	95	114	143	172	187	224	249	260	281	281				
	AR	624	684	749	784	870	993	1166	1346	1553	1774	2077	2077				
	GH						102	476	1493	2521	2726	2879	2879				
Total		4094	4525	5617	6518	10256	10541	12637	15074	18660	24642	25373	25373				

Classes:													
	MA	543	652	1040	1006	1254	1355	1403	1530	1589	2052	2085	2085
%	13.3	14.4	18.5	15.4	12.2	12.9	12.9	11.1	10.2	8.5	8.3	8.2	8.2

		60	61	62	63	64	65	66	67	68	69	70
Self fin. rate	GH											
	SI	83.2	87.3	67.7	92.4	32.7	28.8	23.5	45.7	35.5	57.9	38.0
	ET					57.0	37.5	19.0	36.4	40.2	50.8	42.5
	BR					23.4	23.4	52.1	16.4	25.2	29.6	47.0
	MA	33.3	31.8	24.5	21.5	26.8	29.8	16.5	25.9	39.0	45.9	77.3
	AR			22.5	23.7	22.1	27.1	40.4	50.0	73.4	47.8	43.1
		58.3	59.6	38.2	45.9	32.4	29.3	30.3	34.9	42.7	46.4	49.6

Debt Service	GH							0.4	0.9	1.2	1.2	1.3	
	SI	1.8	2.0	2.3	2.9	2.8	1.8	2.1	2.0	2.1	2.3	2.1	
	ET	does not include Ethiopia (too high)									9.1	5.4	5.0
	BR					2.1	1.2	2.5	2.8	1.8	1.6	2.3	
	MA	2.7	2.6	3.2	3.3	2.1	2.4	1.8	3.0	2.6	2.5	2.6	
	AR				2.9	2.0	1.3	1.9	1.9	2.1	2.0	1.7	

Capacity	GH	2.3	2.5	2.8	3.0	2.3	1.7	1.7	2.1	2.1	2.4	2.0	2.1	2.2	2.2
	SI	13.1	9.4	10.3	12.2	8.4	7.6	11.0	24.9	15.5	20.7	18.8			
	ET						12.2	3.5	0.6	1.0	2.7	2.6			
	BR				6.9	3.3	16.7	19.1	14.3	4.0	5.7	7.9			
	AR			5.8	2.5	13.0	14.2	11.4	8.7	4.7	6.4	5.4			
		13.1	9.4	9.1	7.2	8.2	12.7	9.9	13.1	6.5	8.0	8.5			

Distribution in % to:

AR		8.2	23.7	37.3	69.0	75.3	73.6	53.6	54.9	54.3	
SI					45.5	57.0	41.7	52.3	34.2	55.2	65.7
MA	30.8	27.1	18.7	25.8	28.4	22.1	15.9	19.2	23.0	35.4	44.2
	30.8	28.1	18.5	24.8	37.1	49.4	44.3	48.4	36.9	48.5	54.7

	BR	AR	MA	SI	GH	ET	TOTAL
Total	693.38	517.65	296.90	171.87	136.93	34.84	1851.57
Nicq.	151.60	185.60	101.40	68.56		12.20	519.36
D.C. : private	5.07	18.05	16.50	4.32		0.54	44.48
public: capital	39.01	55.05	43.20		57.18		194.44
loans	318.72	0.64	26.40	25.29			371.05
Total.	357.73	55.69	69.60	25.29	57.18		565.49
Total.	362.80	73.74	86.10	29.61	57.18	0.54	609.97
F.B. = Total	178.98	258.31	109.40	73.70	79.75	22.10	722.24
Suppliers credits		86.63		22.33	8.27	0.04	117.27
Foreignland issues		15.00					15.00
Private loans		10.59					10.59
Bilateral donor	51.56		1.4		24.82	0.73	78.51
IBRD	126.61	146.09	108.0	51.37	46.66	21.33	500.06
IDB	.81						0.81

POWER SECTOR REVIEW

	Range of R	1	2	3	4	5	6	7	8	9	10	11	12	13						
1	DEMAND	-620	-619.01																	
2		-280	-270.01																	
3		-150	-140.01																	
4		-140	-130.01																	
5		-80	-70.01																	
6		-40	-30.01																	
7		10	19.99																	
8		20	29.99																	
9		30	39.99																	
10		40	49.99	45	1															
11		50	59.99																	
12		60	69.99	69	1															
13		70	79.99																	
14		80	89.99	80	1															
15		90	99.99	94	1															
16		100	109.99	100 105	2	104	1													
17		110	119.99	117	1															
18		120	129.99																	
19		130	139.99	135	1	133 131	2	139	1											
20		140	149.99																	
21		150	159.99																	
22		160	169.99																	
23		170	179.99	178	1															
24		180	189.99	185	1															
25		260	269.99																	
26		420	429.99																	
27		680	689.99																	
28		850	859.99																	
29																				
30	Total	1110	10 217	9	650	9	1715	9	164	7	264	5	313	3	105	2	850	1	4011	54
31	R	111	24		72		191		23		53		104		53		850		74	
32	Σ						1028	8												

(959) 6
(90)

(946) 52
76

~~850~~ 1

~~850~~ 1

POWER SECTOR REVIEW

FIVE
7

	Range of R:	1	2	3	4	5	6	7	8	9	10	11	12	13											
1	DEMAND 50 - 59.99 ✓																								
2	60 - 69.99 ✓									64				1											
3	70 - 79.99 ✓					73		1		78				1											
4	80 - 89.99 ✓		80		1		87		1	82				7											
5	90 - 99.99 ✓	98	98	2	95 99 98	98	4	95 93 96	95	3	93			15											
6	100 - 109.99 ✓	103 108 101 100	5		100 106 106	107	3	100	106	2	103			15											
7	110 - 119.99 ✓	111 113 117 111	3	116 113 117	114	4	111	114 113 117	117	3				11											
8	120 - 129.99 ✓			120	125	1		125 129 130	129	2				7											
9	130 - 139.99 ✓						131 130	2		1				4											
10	140 - 149.99 ✓								136	1				2											
11	150 - 159.99 ✓								148	1		149		1											
12									150	1	152	1	153	1											
13	TOTAL	1052	10	1059	10	1079	10	991	9	960	9	735	7	605	5	426	4	305	3	X 1	X 1	X 1	7212	67	
14	R	105		106		108		110		107		105		121		107		102						107.6	
15	SALES 50 - 59.99		6.3		10.3		12		14.3		18.6		25		26.8		28.2		53 35.4	1			57	X 1	1
16	60 - 69.99									61			1	69		1	64						62	X 1	3
17	70 - 79.99								76	1	75 78		2	71		1									4
18	80 - 89.99					88	1	87 89	86	2	85 86		3	83		1	86		84 80		2	86		1	11
19	90 - 99.99	98 99 99 96	4	95 97 97 99 99 91	6	99 96 98 99 93	5	92 95 99	95	3	91		1	91		1						99	X 1		20
20	100 - 109.99	101 103 107 101	4	101	1	100 102 102	3	101 101 101	101	2	101 100		2												12
21	110 - 119.99			118 110 110	2	115	1	114 112	114	2	110		1	110		1									7
22	120 - 129.99	121	1	121	1				123	1									129		1				4
23	130 - 139.99								134 137		2														2
24	140 - 149.99	145	1								143		1												2
25	150 - 159.99													154		1									1
26	160 - 169.99																								
27	170 - 179.99									172		1													1
28																									
29																									
30	TOTAL	1076	10	1023	10	1001	10	889	9	857	9	764	8	541	5	382	4	261	3	X 1	X 1	X 1	100		68
31	R	108		102		100		99		95		96		108		96		89							100

-280)	100
-78	625
-133	850
84	166
72	178
48	168
54	148
65	157

$-280 - 270.01$
 $-140 - 130.01$
 $-80 - 70.01$

 $110 \rightarrow 130$
 $110 \quad 130 \quad 150$

- 62 3
 - 280
 - 145
 - 140
 - 133
 - 78
 - 75
 - 39
 - 38

178
 157
 154
 151
 139
 135
 128
 115
 111
 101
 84
 81
 80
 72
 67

45

28
18

Nls de années.
Taille des Cus.
Expériences Banques: nls de loans.

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	X ET (1964) (1 loan)													
2	Demand	111 x	95 x	111 x	114 x	125 x	136 x	148 x						
3	Sales	101 x	90 x	109 x	114 x	123 x	134 x	143 x						
4														
5	X GH (1962) (1 loan)													
6	Demand					93 x	82 x	102 x	93 x	92 x				
7	Sales					85 x	61 x	71 x	84 x	86 x				
8	X SI (1963) (1 loan)													
9	Demand	103 x	98 x	95 x	87 x	96 x	88 x							
10	Sales	107 x	99 x	99 x	92 x	101 x	91 x							
11	SI (1966) (2 loans)													
12	Demand	108 x	116 x	127 x	131 x	128 x								
13	Sales	98 x	97 x	99 x	101 x	96 x								
14	SI (1967) 3 loans													
15	Demand	113 x	117 x	120 x	117 x									
16	Sales	99 x	101 x	102 x	98 x									
17	X BR (1958) 1 loan													
18	Demand	117 x	120 x	125 x	130 x	139 x	150 x	152 x	153 x	149 x	153	157	150	
19	Sales					(554)	137 x	172 x	154 x	129 x	89	57	62	
20	BR (1965) 2 loans													
21	Sales	145 x	121 x	102 x	87 x	76 x	83 x							
22	X MA (1958) 1 loan													
23	Demand	103 x	89 x	100 x	100 x	94 x	89 x	82 x	78 x	64 x				
24	Sales	109 x	99 x	96 x	95 x	80 x	75 x	69 x	64 x	53 x				
25	MA (1963) 2 loans													
26	Demand	98 x	99 x	93 x	93 x	79 x	87 x	121 x	102 x					
27	Sales	99 x	97 x	93 x	89 x	86 x	73 x	86 x	80 x					
28	MA (1966) 3 loans													
29	Demand	100 x	113 x	106 x	113 x	100 x								
30	Sales	101 x	110 x	98 x	101 x	100 x								
31	AR (1962) 1 loan													
32	Demand	98 x	114 x	107 x	106 x	106 x	103 x							
	Sales	121 x	118 x	115 x	112 x	110 x	110 x							

P.T.O.

AR (1968): 2 loans
Demand
Sales

101 X	98 X	95 X
96 X	91 X	88 X

A B E

PROJECTS IMPLEMENTATION

	1	2	3	4	5		6	7	8	9	10	11	12	13
	<u>Construction Period</u>	<u>Project</u>	<u>Scope</u>		<u>CONSTRUCTION COST</u> <small>US\$ million</small>			<u>COST/KW</u> <small>US\$</small>						
					<u>L.C.</u>	<u>F.Y. TOTAL</u>								
BRAZIL		Hydroelectric Plants												
		- Furnas plant												
		- Itaipu plant												
ETHIOPIA														

~~RESERVE CAPACITY~~

1 2 3 4 5 6 7 8 9 TOTAL

ACCURACY OF RESERVE CAPACITY FORECASTS.

Average accuracy including observations only in the range -400, +400)	111	24	72	129	23	90	104	53	76
Average accuracy (including data above 400 or below -400)	111	24	72	191	23	-53	104	53	74

POWER SECTOR REVIEW

TABLE II.A.

FREQUENCY DISTRIBUTION OF LOAD AND SALES FORECASTS ACCURACY^{a)}

		FORECASTS INTERVAL (YEARS AHEAD)									TOTAL	
		1	2	3	4	5	6	7	8	9		
ACCURACY OF LOAD FORECASTS												
Range (%)	60-69									1	1	
	70-79					1			1		2	
	80-89		1		1		4	1			7	
	90-99	2	4	3	1	3		1	1	1	15	
	100-109	5		3	2	2	1	1	1		15	
	110-119	3	4	1	3						11	
	120-129		1	3		2		1			7	
	130-139				2	1	1				4	
	140-149							1		1	2	
	150-159						1	1			3	
	TOTAL	<u>10</u>	<u>10</u>	<u>10</u>	<u>9</u>	<u>9</u>	<u>7</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>67</u>	
	Average Accuracy	105	106	108	110	107	105	121	107	102	108	
	Standard Deviation											
ACCURACY OF SALES FORECASTS												
Range (%)	50-59									1	1	
	60-69						1	1	1		3	
	70-79					1	2	1			4	
	80-89			1	2	3	1	1	2	1	11	
	90-99	4	6	5	3	1	1				20	
	100-109	4	1	3	2	2					12	
	110-119		2	1	2	1	1				7	
	120-129	1	1			1				1	4	
	130-139						2				2	
	140-149	1						1			2	
	150-159								1		1	
	160-169											
	170-179							1			1	
	TOTAL	<u>10</u>	<u>10</u>	<u>10</u>	<u>9</u>	<u>9</u>	<u>8</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>68</u>	
	Average Accuracy	108	102	100	99	95	96	108	96	89	100	
	Standard Deviation											

a) Forecast accuracy being defined by $\frac{\text{Forecast}}{\text{Actual}} \times 100, \%$.

