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OED SPECIAL STUDIES

85035--003

Power-Comparative Review

1971



 **Archives**
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Power - Comparative Review - 1971

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Indicators Reflecting Efficiency of the Management:

(Argentina)

⊖ System loss as % of total energy sent out	14.4%
- Average thermal efficiency of plants	30.5%
⊖ Average revenue per kWh sold to all consumers	US\$ 2.8
✓ Average revenue per kWh sold to residential consumers	US\$ 3.1
_____ industrial consumers	US\$ 2.5
⊖ Average overall O and M expenses per kWh sold	US\$ 1.6
Operating ratio	70%
⊖ Return on average net plant in service	8.2%
⊖ Net internal cash generation as % of capital expenditure	49.8%
- Consumers per employee	89
✓ Energy sales per employee ('000)	255



Record Removal Notice



File Title Power - Comparative Review - 1971		Barcode No. 30248169		
Document Date February 11, 1971	Document Type Board Record			
Correspondents / Participants				
Subject / Title SecM71-85 Operations Evaluation Unit - statement by Christopher Willoughby at the meeting of the Executive Directors on February 9, 1971				
Exception(s)				
Additional Comments Declassification review of this record may be initiated upon request.		The item(s) identified above has/have been removed in accordance with The World Bank Policy on Access to Information or other disclosure policies of the World Bank Group.		
		<table border="1"><tr><td>Withdrawn by Sherrine M. Thompson</td><td>Date April 26, 2023</td></tr></table>	Withdrawn by Sherrine M. Thompson	Date April 26, 2023
Withdrawn by Sherrine M. Thompson	Date April 26, 2023			

FORM NO. 75
(2-60)

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL FINANCE
CORPORATION

INTERNATIONAL DEVELOPMENT
ASSOCIATION

ROUTING SLIP		Date
NAME		ROOM NO.
Mr. C. Willoughby		D 636
To Handle		Note and File
Appropriate Disposition		Note and Return
Approval		Prepare Reply
Comment	✓	Per Our Conversation
Full Report		Recommendation
Information		Signature
Initial		Send On
REMARKS		
Grateful for comments from you & others in P&B.		
For info. I also include Telecome table prepared by them.		
From Anders Ljung x 4284		

COMPARATIVE SECTOR TABLE: TELECOMMUNICATIONS

COUNTRY	COUNTRY DATA						SECTOR DATA																				
	SECTOR IN ECONOMY						SERVICE									PRICE		PERFORMANCE									
	PART OF GDP %	INVESTMENT ANNUAL million US \$	PART OF GROSS %	GOV'T OPERATED PART OF SECTOR %	EMPLOYMENT		TELEPHONES			POPULATION SERVED					INTERNATIONAL CONNECTIONS			ANNUAL REVENUE PER CONNECTION US \$	GOV'T SUBSIDY %	INVESTMENT COST PER CONNECTION US \$	IMPORT COMPONENT OF INVESTMENT %	CURRENT ANNUAL COST PER CONNECTION US \$	FINANCIAL RETURN ON NET FIXED ASSETS %	FINANCIAL RETURN ON LAST BANK PROJECT %	EMPLOYEES PER CONNECTION NO.	QUALITY OF DATA	LAST UP-DATING DATE
					OF LABOR FORCE %	000's	TOTAL NO. 000's	GROWTH %	PER CAPITA no.	OF TOTAL %	OF URBAN %	BUSINESS %	RESIDENTIAL %	CONNECTION BACKLOG MO.	ACCESS TO CABLE, SATELL.	SIMULTANEOUS INT'L CONNECT. 000's	CONNECTED COUNTRIES no.											TELEX SUBSCRIBERS no.

Use standard C-pattern but differs between AL 9/14/70 creation & expansion on STD etc.

no. of families, households, etc. + public call boxes?

100

faults data time to attract, ch?

Quality!

long distance omitted!

minutes traffic or revenues

main telephone omitted!

STD manual.

minutes traffic or revenues

Why interest of user national?

Direct/indirect copper, etc.

Export earnings

log

+

+

Dickinson in Telecom

When? marginal or av.

low interest loan, reduced import duties, etc.

100-200

400-500

100

100

	Argentina	-	SEGBA	-	three loans.
	Brazil	-	CEMIG		3
			Sao Paulo		3
			Furnas		5
	Ceylon	-			4
✓	Chile	-	Endesa		5
	Costa Rica		ICE		3
	Cyprus	-	EAC		3
✗	El Salvador	-	Rio Hembra		4
✓	Ethiopia	-	EELP		2
	Ghana	-	VRA		2
	Honduras	-	ENEE		4
✓	Malaysia	-	NEB		5
✓	Mexico	-	CFE		9
	Nicaragua	-	ENLF		5
✓	Pakistan	-	KESC		4
	Peru	-	EEA		4
	Philippines	-	NPC		4
	Portugal	-	Douro		2
		-	ETP		3
✓	Sierra Leone	-	SLEC		2
	Singapore	-	PUB		3 + 1 under UK.
✓	Tanzania	-	TESCO		1
✓	Thailand	-	EGAT		4
	Venezuela	-	Caroni		3
	Bolivia	-	EMDE		2

loads at least 5 yrs before & 5 after loan

fact out
Generation (net of generation plants out of service)

1970.

Sales

subject util
installed
cap.

Losses

other util
cap.
gas plant
~~plant~~ cap.

Sales Revenue

Total Cap.

Avg price per kWh

Avg cost per kWh

Actual
Months

Peak capacity

Peak D.

Reserves

Closing date: CD extensions.

Comments: Cost per kW expected - actual. Size of plant

hydro, nuclear,
gas, coal etc

Other major cost -
affecting factors - spare boilers

Good to take
some bilateral loans
immediately

in fact suggested a ~~a~~ several cross-country
scheme to run concurrently w. our Colombian
effort & to produce results e. may designed.
to answer the q. Has the money been wasted?

A good man
prepare questionnaire
fill in to extent poss.
compile questions.
Visit

Investment Program

planned financing shares actual shares

Internal cash generation

Dom borrowing

Foreign borrowing

Government
Private Sources

possibly
tie in
w/
SPM
missors

WBID

Regional dev. Bks -
supplier credits

Foreign bond issues

Bilateral ODA

Disbursements

rate of return

condition agreed
- agreed w WBID

forecast
actual

(K-cost per kw added?)

borrower/beneficiary

Audit Ag.
Tariff Ag. Condition

% Disburse
sales

price: average rev / kw² trends } in dom currency x
Average cost per kw² trends } fx

Disbursement forecast

actual

(hydro
thermal
nuclear)

Utility installed capacity

depreciation % - adequate!

Integrated
Systems

?
Regal

debt-equity

current ratio

interest coverage

debt service coverage

load factor

Wessels

Electricity % of total energy

major issues - eg. frequency and phase

COMPARATIVE SECTOR TABLE: ELECTRIC POWER SECTOR AND MAJOR SYSTEMS IN SELECTED COUNTRIES

Country/ System	Installed Generating Capacity				Peak Demand	Power Production						Consumer Categories			Investment					Financial Performance						
	Total	Hydro	Thermal	For Public Use		Total	Hydro	Thermal	Average Annual Growth	Total per Capita	For Public Use	Government Industry and Commerce	Agriculture	Households	Investment 1964-68			Investment cost of new capacity 1964-68		Revenue from power sales		Average cost of power sold	Financial return on net fixed assets	Financing of investment from internal cash generation		
	1968	1968	1968	1968		1968	1968	1968	1968	1968	1968	1968	1968	1968	Average Annual	Part of gross investment	Average Annual Growth	Total	Import component	Total	From households	1968	1968	1968	1964-68	1964-68
	MW	MW	MW	%		MW	GWh	GWh	%	kWh	%	%	%	%	US\$M	%	%	US\$/kW	%	US\$/kWh	US\$/kWh	US\$/kWh	%	%	%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)		
Malaysia NEB	912 664	.. 265	.. 399	.. 100	.. 292	3076 2953	.. ..	.. ..	12.5 13.0	296 ..	.. 100	.. 87	.. ..	.. 13	.. ..	.. ..	.. ..	.. ..	.. ..	2.6 ..	.. ..	1.8 ..	9.4 ..	.. ..	
Zambia CAPC ^{b/}	.. 1284	.. 1773	.. 511	.. 100	.. ..	3300 ..	.. ..	.. ..	.. 7.5	.. ..	100 ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	1.4 ..	.. ..	1.2 ..	6.4-8.1 ..	50 ..
Honduras EENE	82 ^a 54	.. 31	.. 23	100 100	48 ..	225 ^a 194	.. ..	.. ..	.. ..	93 ..	.. 100	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	3.6 ..	.. ..	2.2 ..	8.3-14.2 ..	.. ..	
Liberia PUA	188 66	38 34	150 32	35 100	.. 34	.. 240	.. 230	.. 10	.. 20	.. ..	.. 100	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	2.7 ..	.. ..	2.4 ..	5.4 ⁸ ..	.. ..	
Colombia ISA	1940 1258	.. ..	.. ..	.. ..	915 ..	8100 6500	4800 ..	1700 ..	.. 11	404 ..	.. 100	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..
Cyprus EAC ^g	179	..	179	94	102	454 ^a	..	454 ^a	9.6	..	100	72	3	25	..	..	..	..	..	2.4	..	1.7	8.5 ⁸	..
Argentina SEGBA	5770 ^g 1573 ^g	.. ..	.. 1573 ⁹	71 100	.. 1394	13500 6792 ^c	1300 ..	12200 6792	6 ^d 5	572 ..	.. 100	.. 58	.. ..	42 ..	.. ..	.. ..	.. ..	.. ..	.. ..	3.5 3.8	3.8 2.8	2.8 ..	12.5 ⁸ ..	.. ..	
Ethiopia EELPA	.. 151	.. 125	.. 26	.. 100	.. ..	361 ..	.. ..	.. ..	15.3 18 ^e	15 ..	.. 100	.. 50	.. ..	.. 50	.. ..	.. ..	.. ..	.. ..	.. ..	3.6 ^f ..	5.4 ^f ..	3.0 ^f ..	8.7-9.3 ..	.. ..	

NOTES

Numbers 0-9 denote last digit in year (0 = 1960, 1 = 1961, etc.).
 .. Data is not available.
 MW Megawatt, million watts.
 GWh Gigawatt hour, million kilowatt hours.
 kWh Kilowatt hour, thousand watt hours.
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a Captive plant excluded.
 b Includes capacity owned jointly with S. Rhodesia.
 c Includes purchases from other systems.
 d Last 17 years.
 e Growth of sales, not of production.
 f Interconnected system only.
 g EAC is sole supplier.

SOURCES

Bank appraisal reports

DEFINITIONS

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18-19. Investment cost of new capacity 1964-68. Total investment in the period in relation to total increase in generating capacity in US\$/kW (18). Direct investment component of total investment, in percent (19).
 20-21. Revenue from power sold. Average revenue per unit of power sold in 1968, in US cents per kilowatt hour. Total (20) and for power sold to households (21).
 22. Average cost 1968. Operating cost, including depreciation and interest but excluding taxes, of power sold, in US cents per kilowatt hour.
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 24. Financing of investment from internal cash generation. Percentage of investment during period 1964-68 covered by funds generated as operating surplus.

ELECTRIC POWER: SYSTEM EXPANSION PLANS AND BANK/IDA FINANCING IN SELECTED COUNTRIES

Country	System/ Project	Plan/Project Time Period			Investment cost of planned expansion			Financing of Investment			Composition of investment					Financial performance			
		Years	Forecast average annual growth of power generation	Planned addition to generating capacity	Total	Import component	Unit cost of new capacity	Bank/IDA		Other Sources	Hydro plant and civil works	Thermal plant and civil works	Transmis- sion	Distri- bution	Other	Average revenue from power sold	Average total cost of power sold	Financial return on net fixed assets	Financing from internal cash generation
								Total	Local cost financing										
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Malaysia	NEB system NEB project	70-78 70-76	14 14	800 360	888 59	.. 47	.. 145	.. 20.0	- -	.. 27	.. ..	.. ..	94	..	..	2.3 2.3	1.5 1.5	8-10 8-9	.. 55
Zambia	CAPC system Kariba project	69-76 70-76	8.5 8.5	600 600	99 57	.. 40	165 80	.. 40.0	- -	.. -	48 100	- -	51	-	1	....	.8 .8	8-11 8-11	.. 50
Honduras	ENEE system 4th project	70-74 70-72	21 21	.. 15	54 15	.. 11	.. ..	11.0	-	..	..	..	10	68	..	3.2 3.4	2.0 2.0	11-14 11-12	....
Liberia	PUA system Expansion project	70-74 70-73	17 17	.. 32	21 10	15 7	.. 303	7.4 7.4	-	8	..	..	4	..	..	2.5 2.4	1.6 1.9	7-11 7-11	.. 30
Colombia	ISA system Chivor project	70-76 70-75	10 10	.. 500	173 138	.. 75	.. 228	52.3	-	..	..	..	3	..	..	.. ..	1.2 1.2	9-11 9-11	.. 20
Cyprus	EAC system 3rd project	70-74 70-72	10 b 10 b	90 30	31 6	21 5	340 210	5.0 5.0	-	..	-	43 50	14	38	5	2.4 2.4	2.0 2.0	.. 9-10	.. 55
Argentina	SEGBA system) Power project)	70-72	8 b	90	247	80	..	60	-	20	-	7	78	..	15	3.5	2.5	8	50
Ethiopia	EELPA system Finchaa project	69-74 69-73	15.2 b 15.8 ab	.. 100	51 34	.. 23	.. 240	23.1	-	19	3.3 3.4	2.6 2.7	9-10 9-10	76 ..

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DEFINITIONS

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2. Forecast average annual growth of power generation, in percent, during plan/project periods.
3. Planned addition to generating capacity of the system, in megawatts, during plan/project period.
- 4-5. Investment cost, total for the time period in (1) and the direct import component of that cost in millions of US\$.
6. Investment cost per unit of additional capacity added, in US\$/kW. Different cost concepts makes strict comparison of these figures impossible.
- 7-8. Bank/IDA financing of system and project investment. Total financing and local cost financing, in millions of US\$.
9. Financing from other sources included in sector/project plan, in millions of US\$.
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15. Average revenue from power sold at the end of the plan/project period, in US cents per kilowatt hour.
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17. Financial return (operating income) as percentage of average net fixed assets in operation, for initial and terminal years of plan/project period.
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Malaysia	NEB system NEB project	70-78 70-76	14 14	800 360	888 59	.. 47	.. 145	.. 20.0	- -	.. 27	.. -	.. 94	.. -	.. -	.. 6	2.3 2.3	1.5 1.5	8-10 8-9	.. 55
Zambia	CAPC system Kariba project	69-76 70-76	8.5 8.5	600 600	99 57	.. 40	165 80	.. 40.0	- -	.. -	48 100	- -	51 -	- -	1 -8 .8	8-11 8-11	.. 50
Honduras	ENEE system 4th project	70-74 70-72	21 21	.. 15	54 15	.. 11 11.0	- -	.. -	.. 11	.. 10	.. 68	.. -	.. 22	3.2 3.4	2.0 2.0	11-14 11-12
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Cyprus	EAC system 3rd project	70-74 70-72	10 b 10 b	90 30	31 6	21 5	340 210	5.0 5.0	- -	.. -	- -	43 50	14 39	38 -	5 11	2.4 2.4	2.0 2.0	.. 9-10	.. 55
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	1968 MW	1968 MW	1968 MW	1968 %		1968 MW	1968 GWh	1968 GWh	1968 GWh	1964-68 %	1968 kWh	1968 %	1968 %	1968 %	1968 %	Average Annual	Part of gross investment	Average Annual Growth	Total	Import component	1968 US¢/kWh	1968 US¢/kWh	1968 US¢/kWh	1964-68 %
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Malaysia	912	3076	12.5	296	87	2.6	..	1.8	9.4	..
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Honduras	82 ^a	100	48	225 ^a	93	3.6	..	2.2	8.3-14.2	..
ENE	54	31	23	100	..	194	100
Liberia	188	38	150	35
PJA	66	34	32	100	34	240	230	10	20	..	100	2.7	..	2.4	5.4 ⁸	..
Colombia	1940	8100	404
ISA	1258	915	6500	4800	1700	11	..	100
Cyprus	179	..	179	94	102	454 ^a	..	454 ^a	9.6	..	100	72	3	25	2.4	..	1.7	8.5 ⁸	..
EAC ^g
Argentina	5770 ⁹	71	..	13500	1300	12200	6 ^d	572	3.5	3.8	2.8	12.5 ⁸	..
SEGBA	1573 ⁹	..	1573 ⁹	100	1394	6792 ^c	..	6792	5	..	100	58	..	42
Ethiopia	361	15.3	15	3.6 ^f	5.4 ^f	3.0 ^f	8.7-9.3	..
EELPA	151	125	26	100	18 ^e	..	100	50	..	50

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A. Ljungh - October 1970

Net Internal Cash Generation

- + Net Operating Revenues (net of indirect
 - + Special Revenue (reduction in ^{taxes} construction inventories)
 - Operating Costs
 - Salaries
 - Fuel
 - Purchased Power
 - Taxes
 - Other Expenses
 - Debt Service
 - Bonus for Personnel
 - Fees
 - Dividends
-

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

INTERNATIONAL DEVELOPMENT
ASSOCIATION

INTERNATIONAL FINANCE
CORPORATION