

CHAPTER VI.

ELECTRIC POWER.

The Cauvery falls: their situation.

THE Cauvery falls are situated on the Cauvery river in latitude 12—16'—47" to latitude 12—17'—36" and longitude 77—12'—30" to longitude 77—13'—33." As regards the origin, etc., of the Cauvery river, reference may be made to Volume IV, Mysore District. It may, however, be stated here that the river Cauvery, after flowing from Karrigal in a generally south-easterly direction for about 150 miles, divides into two branches forming the island of Sivasamudram, and it is across these branches that the falls are situated, one on the eastern or British side, called the Bar Chukki, and the one on the western or Mysore side, the Gagana Chukki. This is divided into two by the small island of Ettikur. About 1½ miles below the falls, the two branches unite. Thus the Cauvery river at and for some distance about the falls is partly in British and partly in Mysore territory.

Origin of the Cauvery Power Scheme.

In 1894, Mr. Edmund Carrington, an Electrical Engineer, applied for a concession of the water-power at the falls. He was connected with Mr. Holmes of Madras, one of the pioneers of Electric lighting in India. These gentlemen and Colonel Henderson, the then British Resident in Mysore, who took a keen interest in the scheme, recognised that long distance transmission of power might be carried out. Mr. Holmes even suggested the supply of power to the Kolar Gold Mines.

Then the Mysore Government considered it advisable to investigate the practicability of generating power at the falls, and obtained the loan from the Madras Government,

of the services of Colonel Pennyquick, R.E., then Chief Engineer at Madras, for the purpose. In his report, he took a most favourable view of the capabilities of the falls.

In June 1899, Captain A. J. DeLotbiniere, R.E., Deputy Chief Engineer of Mysore, after studying the account of the installation at the Niagara Falls, conceived the idea of working the machinery at the Kolar Gold Mines with electricity generated by the power of the Cauvery Falls, and this scheme received the hearty support of Sir K. Seshadri Iyer, the then Dewan of Mysore, and Colonel D. McNeil Campbell, the Chief Engineer. Messrs. Taylor and Sons of London, who have the general management of the mines in the Kolar Gold Fields, also supported the scheme.

Government decided in 1899 to utilize the Falls for the production of electric power and its transmission for the service of industrial undertakings in different parts of the State, including the Kolar Gold Mines. In embarking upon this great undertaking, the Government were influenced wholly by the consideration that the supply of a cheap motive power of the kind and on the scale proposed, was likely to greatly foster private industrial enterprise throughout the State and thus to indirectly increase the wealth and general prosperity of the country. Captain A. J. DeLotbiniere, Deputy Chief Engineer, was deputed to Europe and America to investigate and mature the project in consultation with experts and to arrange details.

Further
progress and
completion of
the scheme.

The Mysore Government acquired from the Government of Madras, the right to utilize the whole of the water-power at the Falls under certain conditions.

Captain Lotbiniere returned to India in February 1900, and the sanction of Government of India for the various details, such as the concession from the Government

of Madras, the agreement with Messrs. J. Taylor & Sons and the individual Mines, entering into a contract with the General Electric Company of Schenectady, United States, America, and Messrs. Escher, Wyss & Co., Zurich, was received in March 1900. In June 1900, the agreement with Messrs. Taylor & Sons was signed and Captain Lotbiniere again left for England and America in July 1900. Arrangements were made with the General Electric Company of New York for electrical plant and Messrs. Escher, Wyss & Co., Zurich, for hydraulic plant, the former taking the entire responsibility for installing the plant and working for a period of one year. The works were completed by 1902 and on the 30th June of that year, the current (30,000 volts) was successfully transmitted for the first time to the Kolar Gold Fields.

Quantity of
power.

The power developed by the first installation was 6,000 E.H.P., but owing to the increased demand for power at the Gold Fields and in Bangalore (including the Civil and Military Station) and Mysore Cities for both power and lighting, the Generating Station was extended by the 2nd installation in 1903, the 3rd installation in 1907, the 4th installation in 1914-15, the 5th installation in 1918 and the 6th installation sanctioned in 1919. A seventh installation costing about Rs. 3½ lakhs was sanctioned in January 1925. The total power generable was raised by the sixth installation to 34,000 H.P. The seventh installation provides for an extra 14,000 H.P., thus making the total power generated under the seven installations reach the total of 48,000 H.P.

The Head
works.

The head works at Sivasamudram are located at a point approximately two miles above the Cauvery Falls and the water is diverted by a masonry dam about 9'

high by 2,400' long across the river, the flow of water being controlled (completed in 1924) by suitable gates into the channels.

Two parallel channels each 3.375 miles in length have been constructed for supply of water to the forebay above the Generating Station where are located the control gates for the regulation of flow of water through the penstock or pipe lines connected to the water wheels in the Generating Station. The channels.

The head under which the turbines operate is 423' between water level in the Forebay and Tail race. The total head.

There are 10 turbines, six of 5,600 B.H.P. Bowing & Coy's Francis turbines each direct connected to 3,530 K.V.A. 3 phase alternators, one of 5,600 B.H.P. Escher Wyss Francis turbines direct connected to 3,530 K.V.A. alternator, three of 2,700 B.H.P. Escher Wyss impulse turbines each direct connected to 1,760 K.V.A. alternators. All the generators are of the International General Electric Company's manufacture of New York, the speed regulation and penstock pressure rises being controlled by suitable automatic governors and relief valves. Water turbines.

The excitation for the generators is obtained from two Turbine driven and two motor driven exciters, each of 250 K.W. capacity at 110 Volts. Excitation.

The power from the generators is conducted by cable to the busses and connected to the step-up Transformer station situated at the Generating Station and the voltage is stepped up by means of transformers to 78,000 volts for transmission to Kolar, distant 92 miles, and to 35,000 volts for transmission to Bangalore, distant 60 Electrical supply.

miles, and to 35,000 volts for transmission to Mysore, distant 37 miles.

Transmission circuits.

The transmission lines to each of these places are in duplicate and to Kolar each line is on separate posts.

Supply to Kolar Gold Fields.

Energy received in the Government Transformer Station on the field is reduced from the line pressure to 2,300 volts at which pressure it is supplied to the Mines over their own distribution system for operating the several classes of mining, milling, pumping, etc., motors.

Supply to Bangalore.

Current is similarly received in the Main Sub-Station at Bangalore City and reduced to 2,300 volts, for distribution for power and street lighting. For Bangalore lighting, Motor Generator sets are installed in the first and two additional Transformer stations, where the frequency is raised from 25 to 60 cycles.

Supply to Mysore.

A step-down Transformer station at Mysore is installed for receiving energy and distributing the same for power and street lighting and similar Motor Generator sets are installed and operated for supplying the bungalow lighting.

Miscellaneous.

Penstock pipes in the Krishnarajasagara Dam to generate electric power to serve as a reserve for the Mysore power supply and for other purposes have been fixed.

The experimental installation for pumping water by means of electric power established on the banks of the Arkavati near Kankanhalli having proved successful, the question of establishment of such installations by private enterprise along the valley has been taken up for consideration.

Power and Plant.

The total quantity of power generated at Sivasamudram during the year 1924-25 was 166,244,452 Units. Of

the power generated, 122,537,800 units were supplied to the Mining Companies at the Kolar Gold Fields, 30,291,808 units to Bangalore including Civil and Military Station, 8,091,720 units to Mysore City, the balance being Station and Local consumption.

At the end of the year 1924-25, there were 271 power service installations in all, exclusive of those at the Mining Companies in the Kolar Gold Fields. Of these, 197 were in Bangalore including Civil and Military Station, 65 in Mysore City, and 9 in the Kolar Gold Fields. The total number of interior lighting installations was 8,286. Of these, 6,480 were in Bangalore including Civil and Military Station, 1,627 in Mysore City and 179 in the Kolar Gold Fields. The total number of street lights were as follows:—

Lighting and
Power
Installations.

In Bangalore, including Civil and Military Station	...	...	...	2,955
In Mysore City	...	...	...	2,049
In Kolar Gold Fields	...	...	...	233

There were 20 additional power installations of which 14 were in Bangalore, 2 in Mysore City and 4 in Kolar Gold Fields during the year 1924-25.

The aggregate outlay on the Cauvery Power Scheme from the beginning to the close of 1924-25 was Rs. 1,82,37,636. The gross earning from the scheme amounted to Rs. 5,52,55,362. Of this, a sum of Rs. 21,06,717 represents the interest charged at 4 per cent on the depreciation fund deposited with Government. Deducting from these gross earnings, a sum of Rs. 3,73,82,251, of which Rs. 2,02,38,134 represented the working expenses, Rs. 77,98,356 Depreciation Fund set apart and Rs. 93,45,761 the interest at 4 per cent on Capital outlay, the net profit realized from the Scheme for the 23 years was Rs. 1,78,73,111 or an average of Rs. 7,77,092 per year.

Financial
results.

Statistical
Tables.

In the appendices to this Section will be found statistical information bearing on the works as a State venture worked out on a commercial basis.

Appendices.

Statements I to VI.

STATEMENT I.

STATEMENT OF CAPITAL CHARGES, GROSS AND NET REVENUES AND NET RESULTS FROM THE COMMENCEMENT OF THE DEPARTMENT TO END OF 1923-24.

YEAR	Capital charges	REVENUE		
		Gross Revenue	Expenditure including the amount credited to K. R. S. works and Depreciation charges	Net Revenue
1	2	3	4	5
	Rs.	Rs.	Rs.	Rs.
1900-01 ...	28,961,79	...	33,420	-33,420
1901-02 ...	21,50,228	...	1,28,815	-1,28,815
1902-03 ...	1,89,227	7,95,608	2,76,198	4,59,420
1903-04 ...	4,23,177	11,33,893	1,09,061	10,24,832
1904-05 ...	9,55,379	11,45,014	2,16,630	9,28,384
1905-06 ...	1,08,188	19,09,454	2,41,413	16,68,041
1906-07 ...	3,36,049	20,11,554	2,88,661	17,51,893
1907-08 ...	13,56,359	17,58,346	2,35,600	16,01,666
1908-09 ...	1,47,455	17,46,295	13,03,732	4,12,563
1909-10 ...	2,81,602	19,49,282	10,18,709	9,69,674
1910-11 ...	32,32,860	15,99,179	6,29,505	9,69,674
1911-12 ...	50,221	16,65,692	6,31,094	10,34,598
1912-13 ...	80,817	17,05,781	6,43,693	10,62,088
1913-14 ...	9,37,234	17,08,888	7,30,397	9,78,491
1914-15 ...	10,70,701	17,44,349	7,05,889	10,38,460
1915-16 ...	3,96,221	20,07,632	8,63,369	11,54,263
1916-17 ...	3,30,708	19,59,907	7,27,829	12,32,081
1917-18 ...	5,82,745	22,83,521	8,76,599	14,06,922
1918-19 ...	3,74,579	23,32,529	9,89,019	13,43,510
1919-20 ...	10,12,769	19,49,161	10,90,561	8,58,600
1920-21 ...	12,23,984	26,12,456	12,53,366	13,59,090
1921-22 ...	25,19,310	32,39,080	12,75,026	19,64,054
1922-23 ...	3,66,012	35,11,708	14,00,847	21,10,861
1923-24 ...	3,76,927	44,83,113	14,46,773	30,35,340

STATEMENT I.—*concl.*

YEAR	Interest at 4 per cent on capital outlay less interest on Depreciation Fund	NET RESULTS INCLUDING INTEREST		
		Of excess Revenue	Of excess expenditure	Rate per cent excluding interest
	6	7	8	9
	Rs.	Rs.	Rs.	Rs.
1900-01 ...	45,723	...	80,143	-6.83
1901-02 ...	1,36,451	...	2,60,266	-7.63
1902-03 ...	1,83,241	2,76,179	...	-6.08
1903-04 ...	1,95,489	2,29,343	...	16.97
1904-05 ...	2,23,060	7,05,324	...	12.65
1905-06 ...	2,44,231	14,23,810	...	23.32
1906-07 ...	2,33,016	14,96,377	...	23.69
1907-08 ...	2,86,864	12,14,802	...	16.94
1908-09 ...	3,16,940	1,25,623	...	1.58
1909-10 ...	2,34,288	6,46,285	...	7.97
1910-11 ...	2,61,866	7,07,808	...	8.57
1911-12 ...	2,62,168	7,82,430	...	8.41
1912-13 ...	2,42,433	9,19,655	...	9.62
1913-14 ...	2,49,975	7,23,516	...	8.21
1914-15 ..	2,78,598	7,59,562	...	7.84
1915-16 ...	2,97,117	8,57,146	...	7.97
1916-17 ...	3,01,167	9,30,614	...	8.40
1917-18 ...	3,09,468	10,97,454	...	9.41
1918-19 ...	3,17,308	10,26,202	...	8.52
1919-20 ...	3,42,091	5,16,509	..	3.95
1920-21 ...	3,90,441	9,68,549	...	6.73
1921-22 ...	4,90,591	14,73,463	...	8.76
1922-23 ...	6,35,947	14,74,914	...	8.59
1923-24 ...	6,63,312	23,72,028	...	12.90

STATEMENT II.

STATEMENT SHOWING REVENUE AND EXPENDITURE FOR
AND UP TO END OF THE YEAR 1923-24.

ACCOUNT HEADS	FOR THE YEAR 1923-24		
	Final Grant	Revenue demand	Gross receipts and expenditure
1	2	3	4
Gross Receipts—	Rs.	Rs.	Rs.
Sivasamudram-Kolar Section ...	28,36,000	28,31,637	27,96,340
Bangalore Section	11,15,000	11,78,620	11,57,057
Mysore City Section	5,16,000	5,05,385	4,88,716
Total ...	44,67,000	45,15,642	44,82,113
Working Expenses—			
Sivasamudram-Kolar Section ...	9,66,000	...	9,40,781
Bangalore Section	3,35,200	...	3,44,679
Mysore City Section	1,66,000	...	1,62,313
Total ...	14,67,200	...	14,52,758
Capital Account—			
Sivasamudram-Kolar Section Works Net Stores Credit and other Suspense.	5,02,500	...	{ 3,36,836 -13,902
Bangalore Section Works Net Stores Credit and other Suspense.	1,86,500	...	{ 91,614 -34,923
Mysore City Section Works Net Stores Credit and other Suspense.	80,000	...	{ 49,772 -52,460
Net Stores Credit	-50,000	...	...
Total ...	7,19,000	...	3,76,937
Grand Capital and Working Expenses.	21,86,200	...	18,24,710

STATEMENT II—concl'd.

ACCOUNT HEADS	TO END OF THE YEAR 1923-24		Arrears revenue at end of the year
	Revenue demand	Gross receipts and expenditure	
	5	6	7
Gross Receipts—	Rs.	Rs.	Rs.
Sivasamudram-Kolar Section ...	3,89,66,759	3,86,61,321	3,05,438
Bangalore Section ...	72,35,905	72,25,353	10,522
Mysore City Section ...	27,84,876	27,53,204	31,663
Total ...	4,89,87,580	4,86,39,878	3,47,653
Working expenses—			
Sivasamudram-Kolar Section ...	...	1,38,08,147	...
Bangalore Section ...	...	34,96,208	...
Mysore City Section ...	...	14,66,079	...
Total ...	...	1,87,70,434	...
Capital Account—			
Sivasamudram-Kolar Section Works Net Stores Credit and other Suspense.	...	1,35,70,936	...
Bangalore Section Works Net Stores Credit and other Sus- pense.	...	27,31,971	...
Mysore City Section Works Net Stores Credit and other Sus- pense.	...	12,43,586	...
Net Stores Credit ...	...	...	...
Total ...	...	1,75,46,793	...
Grand Capital and Working Expenses.	...	3,63,17,227	...

STATEMENT III.

GENERAL BALANCE SHEET FOR THE YEAR 1923-24.

LIABILITIES.	Rs.	Rs.
1. Capital outlay as per Appendix XI ...	...	1,75,46,798
2. Depreciation Fund ...	...	45,67,499
3. Outstanding Liabilities—		
(1) On materials ...	1,15,539	...
(2) Demands payable ...	950	1,16,497
4. Sundry Creditors—		
(1) Deposits payable ...	45,821	...
(2) Miscellaneous advances as per contra ...	371	46,192
5. Excess assets over liabilities ...	...	3,47,653
		<hr/>
Total ...	...	2,26,24,634
		<hr/>

ASSETS.	Rs.	Rs.
1. As per Appendix XI—		
(1) On works ...	1,59,80,270	...
(2) Stores on hand ...	13,96,848	...
(3) Sales ...	4,845	...
(4) Miscellaneous Advance (Capital). ...	2,15,830	1,75,46,798
2. Sundry Debtors—		
(1) Miscellaneous Advance (Revenue). ...	371	...
(2) Due for current supplied ...	3,47,653	...
(3) Other suspense as per contra ...	1,16,497	4,64,521
3. Balance with Government—		
(1) Depreciation Fund ...	45,67,499	...
(2) Other deposits ...	45,821	46,13,320
		<hr/>
Total ...	...	2,26,24,634
		<hr/>

STATEMENT IV.

DEPRECIATION FUND ACCOUNT.

Sections	Total balance at commencement of the year	Depreciation charges for the year 1923-24	Total including the balance	Payments made on works during the year
1	2	3	4	5
	Rs.	Rs.	Rs.	Rs.
Sivasamudram-Kolar.	30,53,591	4,75,161	35,28,752	1,86,549
Bangalore ...	7,90,780	1,03,696	8,94,476	24,196
Mysore City ...	3,10,134	48,064	3,58,198	2,171
Total ...	41,54,505	6,26,921	47,81,426	2,12,916
Sections	Total balance at credit of the fund at end of the year	Interest at 7 per cent on the balance at commencement of the year and 4 per cent at end of 1919-20	Total interest on depreciation fund Account to end of the year	Total depreciation charges set apart since the commencement to end of the year
	6	7	8	9
	Rs.	Rs.	Rs.	Rs.
Sivasamudram-Kolar.	33,42,208	1,05,750	...	57,16,182
Bangalore ...	8,70,280	39,642	...	10,27,385
Mysore City ...	3,67,027	14,591	...	4,06,936
Total ...	45,69,510	1,53,983	19,17,751	71,50,503

STATEMENT V.

STATEMENT OF GROSS AND NET REVENUE OF THE DEPARTMENT FOR 1923-24 AFTER TAKING INTO ACCOUNT DEPRECIATION AND INTEREST ON CAPITAL AND DEPRECIATION FUND.

Sections	Gross Revenue Demand from Mining Cos. and Power and Lighting Installations	Gross Revenue Receipts from Mining Cos. and Power and Lighting Installations	Interest at 7 per cent on the balance at credit of Depreciation Fund Account at end of 1922-23	Total	Deduct Working Expenses including depreciation charges set apart, etc
1	2	3	4	5	6
	Rs.	Rs.	Rs.	Rs.	Rs.
Sivasamudram-Kolar	28,31,637	27,96,340	1,05,750	29,02,090	9,40,781
Bangalore	11,78,620	11,98,057	39,642	12,37,699	3,44,679
Mysore City	5,05,385	4,88,716	14,591	5,03,307	1,62,313
Total Results of the whole Scheme.	45,15,642	44,83,113	1,59,983	46,43,096	14,47,773
Sections	Net Revenue	Deduct Interest at 7 per cent on capital outlay during the year	Net Profit	Capital outlay to end of the year 1923-24	Rate per cent on capital outlay
	7	8	9	10	11
	Rs.	Rs.	Rs.	Rs.	Rs.
Sivasamudram-Kolar	13,61,309	6,44,699	13,16,610	1,35,70,936	...
Bangalore	8,93,020	1,19,400	7,73,620	27,31,971	...
Mysore City	3,40,194	59,196	2,81,798	12,43,886	...
Total Results of the whole Scheme	31,95,323	8,23,295	23,72,028	1,75,46,793	13'48

(a) Calculated at 4 per cent on the accumulated amount at end of 1919-20 and at 7 per cent on the subsequent net additions to the Fund year after year.

(b) This net return is arrived at by taking only the Capital outlay of Rs. 1,75,46,793 on the Cauvery Power Works. The expenditure on the Krishnaraja Sagara Reservoir is not considered in this connection. Under G. O. No. P. W. 115-126—K. S. S. 723-24, dated 1st September 1924, the Capital and Revenue accounts of the Electrical Works and the Krishnarajasagara Scheme have been directed to be combined for purposes of judging the financial results on account of their intimate and almost inseparable association with each other. The combined Capital outlay on the Cauvery Power and Krishnarajasagara up to end of 1923-24 is about Rs. 409½ lakhs. Deducting the working expenses, the net revenue realized during the year under review on the investment amounted to Rs. 30,29,000, which gives a return of 7.39 per cent on the combined capital investment of Rs. 409½ lakhs.

STATEMENT VI.

INTEREST ON CAPITAL OUTLAY.

Sections	Capital outlay			Interest at 7 per cent for the year and 4 per cent at end of 1919-20	Total interest on the capital outlay at end of the year
	Capital outlay at the end of 1922-23	Half of the outlay during the year 1923-24	Total		
	Rs.	Rs.	Rs.	Rs.	Rs.
Sivasamudram-Kolar	1,32,48,384	1,57,701	1,34,06,085	6,44,706	...
Bangalore ...	26,74,797	28,345	27,03,142	1,19,418	...
Mysore City ...	12,46,574	1,344	12,45,230	59,196	...
Total ...	1,71,69,755	1,84,702	1,73,54,457	8,23,310	84,84,617

BIBLIOGRAPHY.

Dewan's Address to the Representative Assembly, 1899 to 1925.
Mysore General Administration Reports, 1917-18 to 1923-24.
