Chapter 10
Power

10.1 Present status of power development in Andhra Pradesh

The total installed capacity of power in the state of Andhra Pradesh as on 31.3.1998 is 6380 MW and the share of the State from Central Sector is 897 MW. The category wise break-up of installed capacity of power is given in Table 10.1. Total annual energy generation in the State from various sources during 1997-98 is about 36892.305 MU.

Table 10.1
Category-wise break-up of installed capacity in Andhra Pradesh

Unit: MW

Sl. No	Category	State Sector	Joint Sector	Private Sector	Central share	Total
1	Thermal	2953	-	-	857	3810.00
2	Hydel	2650	-	-	-	2650.00
3	Mini hydel	7	-	15.75	-	22.75
4	Gas	-	272.5	423.90	-	696.40
5	Wind	2	-	52.74	-	54.74
6	Co-generation	-	-	2.75	-	2.75
7	Atomic	-	-	-	40	40.00
	Total	5612	272.5	495.14	897	7276.64

Source: APSEB - Power Development in AP (Statistics), 1997-98

10.1.1 Present status of utilisation of power produced in Andhra Pradesh

The present share of various uses as percentage of total consumption for 1997-98 is furnished in Table 10.2.

Table 10.2
Present share of various uses of power

Sl.No	Use	Percent
1	Domestic	19.20
2	Non-domestic	3.93
3	Agriculture	39.54
4	Industrial including cottage industries	5.85
5	HT industries	29.56
6	Others	1.92
	Total	**100.00**

Source: APSEB - Power Development in AP (Statistics), 1997-98.

10.1.2 Schemes under construction as on 31.3.1998

Various generating schemes under execution as on 31.3.1998 in Andhra Pradesh state are given in Table 10.3.

Table 10.3
Schemes under construction as on 31.3.1998

Sl. No	Scheme	Capacity (MW)	Date/Expected Date of commissioning
A	**Thermal**		
1	KTPS stage-V	2 x 250	2/98
B	**Hydel**		
1	Srisailam left bank	6 x 150	10/99
2	Singur HES	2 x 7.5	5/99
3	AP Power House at Balimela	2 x 30	--
4	Mini hydel schemes	5.15	3/99
C	**Gas Based (Private Sector)**		
1	Jegurupadu CCPP	216	6/97
2	Godavari CCPP	208	3/98
3	APGPCL CCPP	172.5	12/97

Source: APSEB – Power Development in AP (Statistics), 1997-98.

10.1.3 Exports / Imports of power

The total exports and imports of energy in the State of Andhra Pradesh during 1997-98 are as under:

Import including purchases	=	11881 MU
Export to other States	=	27.61 MU

10.1.4 Future plans for power development in the state

Various schemes are likely to be taken up in future for power development in the state of Andhra Pradesh. The likely addition in power generation capacity by these schemes is about 11008 MW. The category wise capacity addition in the hydropower generation by future schemes is given in Table 10.4.

Table 10.4
Proposed schemes and installed capacity

Sl. No.	**Name of the Scheme**	**Capacity (MW)**
1.	Thermal	4526
2	Hydel	2451
3	Gas Based	3931
4	Wind Based	370
5	**Total**	**11008**

Source: APSEB - Power Development in AP (Statistics), 1997-98.

10.2 Power generation at Nagarjunasagar dam

10.2.1 Existing powerhouse

The present power generation at Nagarjunasagar dam is mainly through the following 3 powerhouses:

1) The main powerhouse at the dam toe with an installed capacity of 810 MW comprising of 1 conventional unit of 110 MW and 7 reversible units of 100 MW each. The actual average annual power production for the period from 1977-78 to 1998-99 is 2015 MU. The water after power generation from this powerhouse is let into the Krishna River to flow to the Prakasam Barrage and beyond.

2) The left canal powerhouse has an installed capacity of 60 MW with 2 units of 30 MW each. The water after power generation from the powerhouse flows through the left canal to be utilised for irrigation in the command of NSLBC and the power generation is regulated according to the irrigation requirements of the command area.

3) The right canal powerhouse has an installed capacity of 90 MW with 3 units of 30 MW each. Here too, the power generation is regulated according to the irrigation demands of the command of NSRBC and the water after power generation is let into the NSRBC for irrigation.

The actual annual power generation at these powerhouses of Nagarjunasagar project for the period from 1992-93 to 1998-1999 collected from the APSEB are furnished in Table 10.5.

Table 10.5
The actual annual power generation at Nagarjunasagar Project

Unit: Million units

Year	Main dam toe power house	Left canal power house	Right canal power house	Total
1992-93	2611.47	65.25	230.58	2907.30
1993-94	3511.77	95.22	224.27	3831.26
1994-95	3724.91	134.35	265.21	4124.37
1995-96	1083.99	9.08	49.04	1142.11
1996-97	2212.06	125.81	238.29	2576.16
1997-98	2277.63	90.32	197.78	2565.73
1998-99	2383.10	105.70	254.02	2742.82
Total	17804.93	625.73	1459.19	19889.85
Average	2543.55	89.39	208.46	2841.40

The actual average power production of these three units works out to be about 2841 MU per annum.

10.2.2 Proposed power house on the link canal

As the Nagarjunasagar – Somasila link canal is proposed to off-take from the Nagarjunasagar at the same off-take level as that of NSRBC, it is proposed to construct a power house on the link canal similar to the existing one on NSRBC. The water to be drawn into link canal would be guided through the powerhouse. It is proposed to install 4 units of 30 MW each including one standby unit. The effective installed capacity of the powerhouse would be 90 MW. The head regulator of the link canal is proposed to be similar to that of the existing one on the NSRBC but with 8 vents of same size of 3.05 m x 4.575 m with a sill level of 149.05 m. A power block of length 70 m with 4 Nos. of penstocks and dam toe power house of size 67m x 39 m is proposed on the right side of the existing similar structures of NSRBC. The water after power generation using the available head would be guided to the link canal through 130 m long tailrace channel. Suitable modifications to the right embankment of Nagarjunasagar dam are proposed to be carried out for accommodating the proposed head regulator, power block with penstocks etc., leading to the proposed power house on the link canal. The following civil and electrical works would be required to be undertaken for the proposed powerhouse.

Civil works

(i) 4 Nos. of trash rack structures
(ii) Power house civil works
(iii) 4 Nos. of penstocks of 6 m dia and 133 m long
(iv) Intake gate shafts
(v) Power house pit to accommodate 4 Nos. of turbines and generating units
(vi) Draft tube gate shaft to connect the runner to the tail race
(vii) Switch yard
(viii) Tail race pool and tailrace channel to join the link canal

Electrical works

(i) Power station, generating and control equipment
(ii) Power station auxiliaries
(iii) Power station transformer and outdoor equipment.

10.2.3 Average annual power generation

The simulation studies of the Nagarjunasagar reservoir considering the scenario of the proposed diversion through the Nagarjunasagar link were carried out for the period of 30 years from 1951-52 to 1980-81. Under these simulation studies, the possible quantum of power generation through each of the existing 3 power houses and the proposed link canal power house were also computed for each of the 30 years. From these figures, the 30 year average power production of each of the above sources was worked out and the same are presented in Table 10.6.

Table 10.6
Average annual power production at Nagarjunasagar

Sl. No	Source	30 years average (1951-52 to1980-81) power generation (Million units)
1	Main dam toe power house (existing)	
	i) Firm power	204
	ii) Secondary power	1233
2	LBC Power house (existing)	103
3	RBC Power house (existing)	183
4	Proposed link canal power house	377
	Total	**2100**

The above average annual power generation of 2100 MU does not include the peaking power, that could be generated by making use of the 7 reversible units of 100 MW each, available in the main dam toe power house.

Peaking power

A tail pond is proposed to be constructed at 21.065 km downstream of Nagarjunasagar dam by the Government of Andhra Pradesh to facilitate peaking power generation by the seven reversible units of the dam toe powerhouse. It is considered that these seven units of 100 MW each would be used as turbines for generation of peaking power for six hours in a day and in the remaining time they would function as pumps to pump back the water collected at the tail pond into the main reservoir. Such reversible function may not be required during the months of August, September and partly in October, when the reservoir generally spills and the continuous power generation by these units during the above months is already accounted for as secondary power.

The average annual power generation of 2100 MU as worked out above, closely corresponds to the year 1974-75. The reservoir fluctuations of this year have been considered to estimate the possible quantum of peaking power that could be generated by the reversible units. It is estimated that about 565 MU of peaking power could be generated by the reversible units. The details of estimation of the peaking power are shown in Table 10.7.

Table 10.7
Estimation of peaking power generation at Nagarjunasagar

Sl No	Month	Days of Power genera-tion	Reservoir level	Head (m)	Discharge (cumec)	Peaking Power	
						MW	Million Units
1	June	30	173.48	97.98	625.16	480.71	86.5
2	July	31	174.55	99.05	662.26	514.80	95.8
3	Aug	Nil					
4	Sept	Nil					
5	Oct	13	179.83	104.33	845.34	692.15	54.0
6	Nov	30	178.00	102.50	781.89	628.97	113.2
7	Dec	31	173.00	97.50	608.52	465.63	86.6
8	Jan	31	166.78	91.28	392.83	281.40	52.3
9	Feb	28	161.23	85.73	200.41	134.84	22.7
10	Mar	31	157.66	82.16	76.63	49.41	9.2
11	April	30	156.63	81.13	40.91	26.05	4.7
12	May	31	156.84	81.34	336.68	214.92	40.0
	Total						565.0

Moreover, there is a possibility to have a toe powerhouse at tail pond dam for producing the power from the releases of Nagarjunasagar for Prakasam Barrage and beyond.

10.2.4 Effect of diversion of water through Nagarjunasagar – Somasila link on the power generation at Nagarjunasagar

The present power generation at Nagarjunasagar is mainly through the power house at the dam toe, left canal power house and right canal power house with installed capacities of 810 MW, 60 MW, and 90 MW respectively. The actual average annual power production at these three units for the period from 1992-93 to 1998-99 is about 2841 MU. The power generation at Nagarjunasagar will get reduced at the ultimate stage of development of the basin as the inflows in to Nagarjunasagar will come down due to the full development of Almatti project and the completion of other projects proposed upstream of Nagarjunasagar dam.

In the case of left and right canal powerhouses the water after power generation flows through these canals for irrigation use. In the case of main power house at the dam toe too, the water after power

generation is being released at present into the river to flow to the Prakasam Barrage and beyond.

However, the Govt. of Andhra Pradesh has a proposal to divert 2265 Mm^3 (80 TMC) of water from Polavaram reservoir on Godavari to Prakasam Barrage (on river Krishna) to substitute the releases from Nagarjunasagar for the Krishna delta. The Polavaram – Vijayawada link, formulated by NWDA making use of the Polavaram Right Bank Canal, proposes to transfer 3501 Mm^3 of water from Polavaram to Prakasam barrage. In such a case, only limited releases of the order of 522 Mm^3 will be required from Nagarjunasagar for the Krishna delta. These limited releases could be provided through the firm power generation releases. It is assessed by simulation studies that a maximum of 944 Mm^3 could be released annually to Prakasam Barrage from Nagarjunasagar dam and a firm power generation of 25 MW would be possible from the main dam powerhouse.

Keeping such contingency of limited releases from Nagarjunasagar for the Krishna delta in view, the Govt. of Andhra Pradesh has plans to construct a tail pond below Nagarjunasagar dam by constructing a tail pond dam at 21.065 km downstream of the main dam to facilitate the peaking power generation by the seven reversible units of the main dam toe power house. As per simulation studies at Nagarjunasagar, it is estimated that about 2100 MU of power can be generated annually from the main dam toe powerhouse, left and right canal powerhouses and proposed link canal powerhouse. Further, about 565 MU of peaking power could be generated by reversible units after constructing the tail pond reservoir. Moreover, there is a possibility to generate power by constructing a toe powerhouse at the tail pond dam from the releases of Nagarjunasagar. As such, the power generation at Nagarjunasagar dam will not be affected very significantly by the proposed diversion through the Nagarjunasagar – Somasila link.

The new powerhouse of 90 MW installed capacity proposed to be constructed on the Nagarjunasagar – Somasila link canal is estimated to generate additional power of 380 million units annually on an average.