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 31.03.2002 is 9206.90 MW in which the share of the State from central Sector is 1500 MW. The category wise break-up of installed capacity of power is given in Table 10.1.

Table 10.1
Category-wise Break-up of Installed Capacity in Andhra Pradesh

Unit: MW

Sl. No	Category	AP Genco	Joint Sector	Private Sector	Central Share	Total
1	Hydel	3131.21	-	-	-	3131.21
2	Thermal	2952.50	-	-	1357	4309.50
3	Gas	-	272	918.90	-	1190.90
4	Mini Hydel	-	-	76.95	-	76.95
5	Wind	2.00	-	92.43	-	94.43
6	Co-generation	-	-	120.70	-	120.70
7	Mini Power plants	-	-	78.11	-	78.11
8	Others	-	-	62.10	-	62.10
9	Atomic	-	-	-	143	143.00
	Total	6085.71	272	1349.19	1500	9206.90

Source: APTRANSCO- Power Development in AP (Statistics), 2001-02.

10.1.1 Available Generating Capacity in the State from Different Sources – Category-wise as on 31.03.2002

Available generating capacity and energy available in Andhra Pradesh state from different sources is given in Table 10.2.

Table 10.2
Source-wise Generating Capacity and Energy Available

Sl. No	Name of the Power House	No. of Units X Capacity (MW)	Installed capacity (MW)	Generation during 2001-02 (MU)
A.	**A.P. GENCO**			
I	**HYDEL**			
1	Machkund	3 x 17	* 84	448.30
		3 x 23		
2	TBHES	4 x 9	* 57.60	116.07
	(T.B.Dam & Hampi)	4 x 9		
3	Nizam Sugar	2 x 5	10	3.49
4	Upper Sileru	4 x 60	240	447.33
5	Donkarayi	1 x 25	25	83.85
6	Lower Sileru	4 x 115	460	1056.37
7	Srisailam RBHS	7 x 110	770	1942.25
8	Srisailam LBHS	3 x 150	450	381.91
9	Singur	2 x 7.5	15	5.15
10	Nagarjunasagar RC PH	3 x 30	90	61.02
11	Nagarjunasagar	1 x 110	815.61	1067.22
		7 x 100.8		
12	Nagarjunasagar LC PH	2 x 30	60	23.82
13	Pochampad	3 x 9	27	102.70
14	Penna Ahobilam	2 x 10	20	5.05
15	Mini Hydro	7	7	12.56
	Aux. Consumption			- 28.87
	Sub Total		**3131.21**	**5727.78**
II	**THERMAL**			
1	Kothagudem 'A'	4 x 60	240	1753.26
2	Kothagudem 'B'	2 x 110	220	1064.37
3	Kothagudem 'C'	2 x 110	220	1354.51
4	Kothagudem 'D'	2 x 250	500	3862.49
5	Vijayawada – I	2 x 210	420	3352.37
6	Vijayawada – II	2 x 210	420	3498.86
7	Vijayawada – III	2 x 210	420	3376.84
8	R.T.P.P	2 x 210	420	3400.81
9	RTS – B	1 x 62.5	62.50	425.40
10	NTS	1 x 30	30	156.09

Sl. No	Name of the Power House	No. of Units X Capacity (MW)	Installed capacity (MW)	Generation during 2001-02 (MU)
	Aux. Consumption			- 2000.38
	Sub Total		**2952.50**	**20244.62**
III	**WIND ENERGY**			
1.	Ramagiri	10 x 0.2	2	0.44
B	**Joint Sector**			
1	**Gas Based**			
	a)VGTS – I	(2x33) + (1.34)	100	739.15
	b) VGTS-II	(1x112) +(1x60)	172	1212.20
	Aux. Consumption			- 31.82
	Sub Total		**272**	**1919.53**
C	**Central Projects**			
1	NTPC		1080	
2	M.A.P.P. & Kaiga		143	8037.16
3	NLC-2MC		277	
	Sub Total		**1500**	
D	**Private sector Generation**		1349.19	5237.66
E	**Purchases from other states / Regions**			3722.85
	Grand Total		**9206.90**	**44890.04**

* Share of Andhra Pradesh State

Source: APTRANSCO- Power Development in AP (Statistics),2001-02

10.1.2 Present Status of Utilization of Power Produced in Andhra Pradesh

The present share of various uses as percentage of total consumption for 2001-02 is furnished in Table 10.3.

Table 10.3
Present share of various uses of Power

Sl.No.	Use	Percent
1	Domestic	22.89
2	Non-Domestic	4.78
3	Agricultural	41.54
4	Industry	20.94@
5	Railway Traction	3.28
6	Others	6.57
	Total	**100.00**

@ includes LT Industrial & Cottage Industrial and H.T. industrial Cat –I, cat-II & Power Intensive

Note: Only sales with in the state are considered

Source: APTRANSCO – Power Development in AP (Statistic), 2001-02

10.1.3 Schemes under Construction as on 31.03.2002

Various generating schemes under execution as on 31.03.2002 in A.P. state are given in Table 10.4.

Table 10.4
Schemes under Construction as on 31.3.2002

Sl. no	Scheme	Capacity (MW)	Date/Expected date of commissioning
A	Hydel 1. Srisailam Left Bank PH	6 x 150	3 units are commissioned in 2001-02 Balance units by August, 2003

Source: APTRANSCO – Power Development in A.P (Statistics), 2001-02

10.1.4 Exports / Imports of Power

The total exports and imports of energy in the State of A.P. during 2001-02 are as under:

Import including purchases	=	16319.08 MU
Export to Other States	=	Nil

10.1.5 Future Plans for Power Development in the State

Various schemes likely to be taken up in future for power development in the state of Andhra Pradesh are listed in Table 10.5.

Table 10.5
Capacity Additions Programme for 10th plan
(2002-2007) as per APERC'S Approval

(Gross capacities in MW)

S.No	Name of the project	2002-03	2003-04	2004-05	2005-06	2006-07
I	State Sector					
1	Rayalaseema stage –II					420
II	Central sector					
2	NTPC Simhadri	500				
III	Private sector					
3	GVK Extn – I				220	
4	Vemagiri Stage – I				370	
5	Gautami Stage – I				464	
6	BSES. Andhra	80				
7	Konaseema			445.00		
8	BPL Ramagundam					520
IV	Other projects					
9	Mini Power plants			60.00		
10	Non Conventional (NEDCAP)	47	47			
11	Share from Ramagundam Extn				148	
12	Share from Talcher TPs		106.25	212.50	106.25	
	Total	627	153.25	717.50	1308.25	940
	Grand Total			3746.00		

Source: APTRANSCO- Power Development in AP(Statistic),2001-02

10.2 Power Generation at Inchampalli Dam

10.2.1 Proposed Dam Power House

A power complex has been planned in the original proposal of Inchampalli joint project, Govt. of Andhra Pradesh to install 975 MW (13 Nos. x 75 MW) of hydroelectric power to meet peak demand. The

annual energy generation at 10 hours per day will be around 3559 MU. Since, a major quantity of surplus water is proposed to be diverted to the Nagarjunasagar and Pulichintala reservoirs through NWDA link proposals, a provision for necessary arrangements is kept in the Inchampalli - Nagarjunasagar link project to generate the above power as originally contemplated in the Inchampalli project report as a pumped-storage scheme with reversible turbines and downstream storage arrangements.

10.3 Proposed Power House on the Link Canal

A 300 km long Inchampalli - Nagarjunasagar link canal, on its way outfalls into the existing Musi balancing reservoir at RD 199.150 km with FSL 197.520 m. The FRL of Musi reservoir is 197.000 m. The link canal further off takes from the Musi reservoir with FSL of 187.300 m. The head available at Musi reservoir is about 9.70 m which is adequate for generation of power in the form of mini hydel scheme (canal power house). Hence, a canal powerhouse has been proposed at the canal offtake from Musi reservoir for generation of power by utilising the head of about 9.700 m, available between the reservoir FRL and the canal FSL. The water to be drawn from the Musi reservoir for onward transmission to the link canal will be guided through this power house to generate power. It is proposed to install 15 units of 5 MW bulb turbines with one standby unit. The effective installed capacity of the powerhouse will be 70 MW. An approach channel of 3 km long from the reservoir to the powerhouse is proposed to suit the topography at the Musi head works. The water after power generation will be released to the main canal through a tailrace channel. A bypass channel with regulatory arrangements has also been proposed to control the water supplies when the powerhouse is not in operation. The following civil and electrical works will be required to be undertaken for the proposed canal powerhouse at Musi reservoir.

Civil Works

i) An approach channel of 3 km long with a forebay
ii) Control structures such as head regulator
iii) Powerhouse civil works
iv) Draft - tube gate shafts to connect the runner to the tailrace
v) Switch yard
vi) Tail race pool and channel to join the link canal
vii) Head regulator and bypass channel to route the flows when the powerhouse is not in operation etc.

Electrical Works

i) Power station generating and control equipment
ii) Power station auxiliaries
iii) Power station transformers and outdoor equipment.

10.4 Power Generation at Nagarjunasagar Dam

10.4.1 Existing Power House

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

1) The main powerhouse at the dam toe with an installed capacity of 810 MW comprises of 1 conventional unit of 110 MW and 7 reversible units of 100.8 MW each. The actual average annual power production for the period from 1992-93 to 1998-99 is 2543.55 MU. The water after power generation from this powerhouse is let into the Krishna river to flow to the Prakasam Barrage.

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 also, 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 the main powerhouse at the dam toe, left and right canal powerhouses of Nagarjunasagar project for the period from 1992-93 to 1998-1999 collected from the APSEB are furnished in Table 10.6.

Table 10.6
The Actual Annual Power Generation at Nagarjunasagar Project

Unit: Million units

Year	Maindam toe powerhouse	Left canal powerhouse	Right canal powerhouse	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.

10.4.2 Proposed Power House at the Off-take of the link Canal at Nagarjunasagar Dam

A canal power house of size 67 m x 39 m, similar to the existing one on NSRBC has been proposed at the off-take of Nagarjunasagar - Somasila link canal. It is proposed to install 4 units of 30 MW each of which one will be standby unit. The effective installed capacity of the power house would be 90 MW.

10.4.3 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 a period of 30 years from 1951-52 to 1980-81. The possible quantum of power generation through each of the existing three power houses and the proposed link canal powerhouse in the changed scenario were also computed for each of the 30 years. The 30 year average power production of each of the above sources was worked out and is presented in Table 10.7.

Table 10.7
Average Annual Power Production at Nagarjunasagar

Sl.No	Source	30 years average (1951-52 to 1980-81) power generation (Million units)
1	Main dam toe power house	
	i) Firm power	204
	ii) Secondary power	1233
2	LBC Power house	103
3	RBC Power house	183
4	Proposed N-S 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 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 utilising the seven reversible units of the dam toe powerhouse. It is considered that these seven units of 100.8 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 in the tail pond to 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 10.8.

Table 10.8
Estimation of Peaking Power Generation at Nagarjunasagar

Sl. No	Month	Days of Power gene-ration	Reservoir level	Head	Discha-rge	Peaking Power	
			(m)	(m)	(cumec)	MW	MU
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	August	Nil					
4	September	Nil					
5	October	13	179.83	104.33	845.34	692.15	54.0
6	November	30	178.00	102.50	781.89	628.97	113.2
7	December	31	173.00	97.50	608.52	465.63	86.6
8	January	31	166.78	91.28	392.83	281.40	52.3
9	February	28	161.23	85.73	200.41	134.84	22.7
10	March	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 of having a toe powerhouse at tail pond dam for generating power from the releases to Prakasam Barrage.

10.5 Effect of Diversion of Water through Inchampalli - Nagarjunasagar Link on the Proposed Power Generation by the State Government at Inchampalli Dam

As explained earlier in the Inchampalli joint project report proposed by the State Government, a power complex of length 371 m is contemplated to install 13 units of 75 MW each for power generation to meet peak demand.

Since, surplus waters available at Inchampalli are proposed to be diverted to Nagarjunasagar and Pulichintala reservoirs through the NWDA proposals, the power generation in the originally contemplated power complex of the Inchampalli joint project will suffer.

To compensate for this, now in the Inchampalli – Nagarjunasagar link canal proposal, it is planned to utilize the above power complex by installing reversible turbines instead of conventional ones and by creation of needful storage in the downstream of the dam for operation of turbines as pumps during off-peak hours to pump back water and to generate peaking power for ten hours. The discharge through each penstock is 258 cumec and the total storage required for discharge through all power units is 120.744 Mm^3 (4.2 TMC). Considering the capacity – elevation curve and average bed level at the dam site, a small dam of 18.50 m height with a length of 1075 m between river flanks has been proposed in the downstream of the dam to impound the above storage. However, the exact location of small dam will be firmed up in future. The power required for this pumped-storage scheme will be met from nearby National-grid. As such, the proposed powerhouse at Inchampalli dam will be essentially a peaking station. The details of pump-houses proposed in the link canal and command area and corresponding energy requirement are given in Table 10.9.

Table 10.9
Energy Requirement for Lifting Water into the Link Canal

Stage	**Location RD in km**	**No. of units x cap. (MW)**	**Energy required (MU)**
I (Main canal)	0.000	8 x 68 = 544	2272
II (Main canal)	18.000	8 x 84 = 672	2777
III (Main canal)	26.500	8 x 55 = 440	1831
IV (Main canal)	60.500	8 x 38 = 304	1262
I (Lead canal)	0.000	3 x 5 = 15	42
II (Lead canal)	21.000	2 x 3 = 6	14
Total		**1981**	**8198**

Power required to the above proposed pump-houses for lifting water into the link canal and for enroute irrigation will be met from nearby National-grid.