Chapter 5
Water resources and hydrology

5.1 General

Planning of water resources development in a basin requires careful assessment of the available water resources and reasonable needs of the basin in foreseeable future for various purposes such as drinking, irrigation, hydro-power, industries, navigation etc. Hydrological studies were carried out to assess the available quantity of water in a given basin. This chapter deals with the assessment of water balance in the Godavari basin upto the proposed Inchampalli dam site, in the basins lying enroute the link alignment, and in the Krishna basin upto the proposed Pulichintala dam site.

5.2 Hydrological analysis

NWDA has prepared water balance study reports of Godavari basin, at Inchampalli dam site, Krishna basin at Pulichintala dam site and of the basins lying enroute the link alignment. The methodology adopted by NWDA for computing the water balance of a sub-basin is discussed in the following paragraphs.

5.2.1 Surface water availability

Observed flow data at the terminal G&D site and the rainfall observed at various rain gauge stations in and around the catchment of a sub-basin are collected. To these observed flows, year-wise upstream utilizations are added to get virgin yields. Weighted rainfall for the catchment upto the G&D site and for the whole sub-basin is worked out. Using these virgin flows and weighted rainfall upto the G&D site, a rainfall - runoff relationship (linear/non-linear) is developed by statistical methods. Using the best fit equation and weighted rainfall for the entire sub-basin, monsoon yields are computed. To the monsoon yields, non-monsoon yields are added for arriving at annual gross yields for the entire sub-basin. The annual gross yields thus arrived at are arranged in descending order, from which 50% and 75% dependable annual gross yields are obtained.

The overall surface water available in a sub-basin is arrived at by summing up the yield (at 50% and 75% dependabilities separately), imports and by deducting the exports, if any, from the sub-basin.

5.2.2 Water requirement

The requirements of water at the ultimate stage for various uses viz. irrigation, domestic, industrial and hydro-power are worked out as follows:

Irrigation needs: The requirements for irrigation are worked out for all the existing, ongoing and proposed major, medium and minor projects in a sub-basin. For this purpose, all the projects planned by the states as per their master plans are considered. The designed annual utilisation is considered for the existing and ongoing projects. The requirements for future projects are determined by adopting intensities of irrigation as 150%, 125% and 100% for major, medium and minor projects respectively. For assessing the crop water requirements by climatological approach, the potential evapotranspiration values for various stations as given in the IMD scientific report No.136 (1971) are adopted. In case of a deficit basin, if the ultimate annual irrigation considering all the existing, ongoing and future major, medium and minor projects works out to less than 30% of the maximum culturable area of the sub-basin, the requirements are calculated by increasing the annual irrigation to 30% of the maximum culturable area of the sub-basin. In case of a surplus basin, the annual irrigation at the ultimate stage is increased to 60% of the maximum culturable area. 50% of such increased annual irrigation is considered to be under future medium projects and the remaining 50% under future minor schemes.

Domestic needs: The requirement of water for domestic consumption by the rural and urban human population and for the livestock is estimated by projecting the rural, urban human population and the livestock of the catchment to 2025 AD using the available census data. Per capita per day water requirement of 70 litres, 200 litres and 50 litres is considered for the rural and urban human population and livestock population respectively as per the recommendations of the Ministry of Works and Housing in their manual “Water Supply and Treatment”. The requirement of 50% of the rural human population and of the entire livestock is considered to be met from groundwater and the requirement for the remaining 50% of rural population and the entire urban population is considered to be met from surface water. However, in the water balance reports being revised now, the population projections are made to 2050 AD instead of 2025 AD.

Industrial needs: In the absence of relevant data to estimate precisely the industrial water needs, industrial requirement is taken to be

equivalent to the total domestic requirement for human population and livestock. The entire industrial requirement is considered to be met from surface water.

Hydro-power needs: Requirement for the hydro-power is taken to be the evaporation losses at the reservoirs with hydro-power production. Wherever the evaporation data of the projects is available, the same is made use of and wherever the data is not available, the same is worked out from the surface area of water in the reservoir, assuming suitable evaporation values.

5.2.3 Regeneration

The regeneration is considered as (a) 10% of the net utilisation for irrigation from all the existing, ongoing and future identified major and medium projects, and (b) 80% of the domestic and industrial uses to be met from the surface water.

5.2.4 Water balance

The total water requirement of a sub-basin, worked out on the methodology outlined above, is deducted from the overall surface water availability at 75% and 50% dependabilities to determine the water balances (surplus/deficit) at those dependabilities respectively.

5.3 Hydrological and water balance studies of the Godavari basin upto Inchampalli dam site

The Inchampalli dam is proposed on Godavari just downstream of the confluence of Indravati River with the Godavari River. The water balance studies in respect of different sub-basins of the Godavari basin upto Sriramsagar dam have revealed that the water available in the Godavari basin upstream of the existing Sriramsagar project is not fully sufficient to bring the available culturable area in that part of the basin under irrigation. Further, it is observed that the yield available below Sriramsagar project is such that it gives rise to sizeable surplus water after meeting all the surface water requirements. Transfer of this surplus water available in the lower reaches of the Godavari to the water-short areas in its upper reaches may not be economically viable. Hence for the purpose of the water balance studies at Inchampalli, the Sriram Sagar project it self is considered as the starting point of the Godavari basin for computation purpose.

The catchment area of river Godavari between the Sriramsagar and the Inchampalli dam site is 177249 km^2. The catchment includes Middle Godavari sub-basin below Sriramsagar project, Maner, Penganga, Wardha, Pranhita, Indravati and small part of the lower Godavari sub-basin upto the Inchampalli dam site. The areas of each of these sub-basins are mentioned in Table – 5.1 below:

Table – 5.1

Area of sub-basins between Sriramsagar project and Inchampalli dam site in Godavari basin.

Sub-basin	**Area in km^2**	**Remarks**
Middle Godavari below the Sriramsagar project	11916	Part
Maner	13106	Full
Penganga	23898	Full
Wardha	24087	Full
Pranhita	61094	Full
Indravati	41665	Full
Lower Godavari upto the Inchampalli dam site	1483	Part
Total	**177249**	

The detailed hydrological studies for individual sub-basins were carried out and furnished in respective water balance study reports.

The annual yield series of the above sub-basin has been developed for the period 1951-52 to 1981-82 by adding the year wise monsoon and non-monsoon yields of each sub-basin.

The gross annual yield series for the period from 1951-52 to 1981-82 of each of the sub-basins as estimated above are added to arrive at the gross annual yield series of the Godavari basin between the Sriramsagar project and the Inchampalli dam sites. From this the 75% and 50% dependable annual yields have been worked out and found to be 66193 Mm^3 and 76185 Mm^3 respectively.

There are existing imports of 1692 Mm^3 to the Maner sub-basin and 1206 Mm^3 to the lower reaches of the Middle Godavari sub-basin from the upper reaches of the Middle Godavari sub-basin through the existing Sri Ram Sagar Project Stage – I. A quantity of 652 Mm^3 of water is proposed to be diverted from the Sabari sub-basin to the Indravati sub-basin through the ongoing upper Kolab major project. There are proposals for importing 234 Mm^3 of water to the Pranhita sub-basin and 338 Mm^3 of water to the lower reach of Middle Godavari sub-basin from the Sri ram Sagar Project Stager – II through the Saraswati canal system

and 418 Mm^3 to the lower reaches of the Middle Godavari through the stabilization of Kaddam project of Sri Ram Sagar Project Stage – II. Hence, the total import of water into the basin works out to 4540 Mm^3.

There is no existing export of water form any project to outside the basin. It is proposed to export 3136 Mm^3 of water from the Indravati sub-basin to Tel sub-basin of Mahanadi basin and 655 Mm^3 of water from the Penganga sub-basin to Upper Godavari sub-basin of the Godavari basin. Thus the total export considered in the present study is 3791 Mm^3. In addition to this there is a natural export of 1499 Mm^3 and 1831 Mm^3 at 75% and 50% dependability respectively from Indravati sub-basin to the Sabari sub-basin of the Godavari basin through Jaurana. This natural export is also considered.

Surface water needs for irrigation have been assessed by considering the ultimate annual irrigation. The surface water requirement for irrigation from all the existing, ongoing and future major, medium and minor projects are given in Table 5.2.

Table 5.2
Surface water requirement for ultimate irrigation in catchment of Godavari basin between Sriramsagar project and Inchampalli dam site

State	Project category	Annual irrigation (ha)	Annual utilisation (Mm^3)
Maharashtra	Existing	347947	2018
	Ongoing	854809	6204
	Proposed	1717577	11424
	Sub-total	**2920333**	**19646**
Andhra Pradesh	Existing	641999	5842
	Ongoing	37222	265
	Proposed	298956	2229
	Sub-total	**978177**	**8336**
Madhya Pradesh	Existing	135806	904
	Ongoing	342992	2424
	Proposed	1059709	7654
	Sub-total	**1538507**	**10982**
Orissa	Existing	6704	68
	Ongoing	86048	656
	Proposed	134743	1035
	Sub-total	**227495**	**1759**
Total	Existing	1132456	8832
	Ongoing	1321071	9549
	Proposed by NWDA	3210985	22342
Grand total		**5664512**	**40723**

The requirement of water for domestic consumption computed by projecting the rural and urban human population and the livestock by 2025 AD are given in Table 5.3. The domestic requirement for the entire urban population and 50% of the rural population to be met from surface water sources works out to 1753 Mm^3.

Table 5.3
Domestic water requirement in Godavari basin between Sriramsagar project and Inchampalli dam site by 2025 AD

Category	Population ('000')	Daily needs per capita (litres)	Water requirement (Mm^3)
Rural	36051	70	921
Urban	17708	200	1293
Livestock	27623	50	504
Total			**2718**

In the absence of relevant data on the industrial water needs, the industrial needs by 2025 AD have been assumed to be of the same order as that of domestic water requirement, which is 2718 Mm^3. This is proposed to be met in full from surface water resources.

The regeneration from irrigation uses at 10% of net water utilisation from all the existing, ongoing and identified future major and medium projects and from all imports excluding evaporation losses from the storages is worked out to 2715 Mm^3.

The regeneration at 80% of the domestic and industrial water uses to be met from surface water resources are 1402 Mm3 and 2174 Mm^3 respectively.

The total evaporation losses of all the hydel projects have been taken as hydro power needs which is worked out to be 3387 Mm^3.

The water balance has then been worked out by deducting the ultimate water requirements for various uses like irrigation, industrial, domestic and others from the sum of regeneration and overall availability. Thus, the computations of surface water balance of the Godavari basin between Sriramsagar project and Inchampalli dam site is given in Table 5.4.

Table 5.4
Surface water balance at Inchampalli dam site

Units: Mm^3

1.	**Availability**			
	(a)	Gross annual yield		
	i)	At 75% dependability		66193
	ii)	At 50% dependability		76185
	(b)	Surface water import (+)		4540
	(c)	Surface water export (-)		3791
	(d)	Surface water export through jauranala (-)		
	i)	At 75% dependability		1499
	ii)	At 50% dependability		1831
	e)	Overall availability		
	i)	At 75% dependability		**65443**
	ii)	At 50% dependability		**75103**
2.	**Surface water requirement for**			
	i)	Irrigation	40723	
	ii)	Domestic	1753	
	iii)	Industrial use	2718	
	iv)	Hydro-power needs	3387	
	v)	Consumptive use from Inchampalli project	2826	
		Sub-total	**51407**	**51407**
3.	**Regeneration (+)**			
	i)	Irrigation	2715	
	ii)	Domestic	1402	
	iii)	Industrial use	2174	
		Sub-total	**6291**	**6291**
4.	**Surface water balance**			
	i)	At 75% dependability		**(+)20327**
	ii)	At 50% dependability		**(+)29987**

Source: Technical Study No. WB/99 prepared by NWDA

The water balance at the Inchampalli dam site shows a net surplus of 20327 Mm^3 at 75% dependability.

5.4 Hydrological and water balance studies of enroute basins

The link canal traverses through Muneru, Palleru and Musi sub-basins of Krishna basin before out falling into Pulichintala reservoir. The water balance studies conducted by the NWDA indicate the sub-basins are found to be surplus in limited quantities. The abstract of the details of water balance studies of the above en route sub-basins are furnished in Tables 5.5, 5.6 and 5.7.

Table 5.5
Surface water balance in Muneru sub-basin

Units: Mm^3

1.	**Availability**			
	(a)	Gross annual yield		
	i)	At 75% dependability		1271
	ii)	At 50% dependability		2092
	(b)	Surface water import (+)		2789
	(c)	Surface water export (-)		-
	d)	Overall availability		
	i)	At 75% dependability		**4060**
	ii)	At 50% dependability		**4881**
2.	**Surface water requirement for**			
	i)	Irrigation by in basin and imported water	3817	
	ii)	Domestic use	161	
	iii)	Industrial use	281	
	iv)	Hydro-power needs	-	
		Sub-total	**4259**	**4259**
3.	**Regeneration (+)**			
	i)	Domestic use	129	
	ii)	Industrial use Domestic	225	
	iii)	Irrigation use	250	
		Sub-total	**604**	**604**
4.	**Surface water balance**			
	i)	At 75% dependability		**(+) 405**
	ii)	At 50% dependability		**(+) 1226**

Source: Technical Study No. WB/ 26 prepared by NWDA

Table 5.6
Surface water balance in Palleru sub-basin

Units: Mm^3

1.	**Availability**			
	(a)	Gross annual yield		
	i)	At 75% dependability		449
	ii)	At 50% dependability		602
	(b)	Surface water import (+)		2546
	(c)	Surface water export (-)		-
	d)	Overall availability		
	i)	At 75% dependability		**2995**
	ii)	At 50% dependability		**3148**
2.	**Surface water requirement for**			
	i)	Irrigation by in basin and imported water	2861	
	ii)	Domestic use	37	
	iii)	Industrial use	62	
	iv)	Hydro-power needs	-	
		Sub-total	**2960**	**2960**
3.	**Regeneration (+)**			
	i)	Domestic use	30	
	ii)	Industrial use	50	
	iii)	Irrigation use	221	
		Sub-total	**301**	**301**
4.	**Surface water balance**			
	i)	At 75% dependability		**(+) 336**
	ii)	At 50% dependability		**(+) 489**

Source: Technical Study No. WB/ 9 prepared by NWDA

Table 5.7
Surface water balance in Musi sub-basin

Units: Mm^3

1.	**Availability**			
	(a)	Gross annual yield		
	i)	At 75% dependability		854
	ii)	At 50% dependability		1197
	(b)	Surface water import (+)		1440
	(c)	Surface water export (-)		-
	d)	Overall availability		
	i)	At 75% dependability		**2294**
	ii)	At 50% dependability		**2637**
2.	**Surface water requirement for**			
	i)	Irrigation by in basin and imported water	2228	
	ii)	Domestic use	687	
	iii)	Industrial use	789	
	iv)	Hydro-power needs	-	
		Sub-total	**3704**	**3704**
3.	**Regeneration (+)**			
	i)	Domestic use	550	
	ii)	Industrial use	631	
	iii)	Irrigation use	127	
		Sub-total	**1308**	**1308**
4.	**Surface water balance**			
	i)	At 75% dependability		**(-) 102**
	ii)	At 50% dependability		**(+) 241**

Source: Technical Study No. WB/ 25 prepared by NWDA

5.5 Hydrological and water balance studies of the Krishna basin upto Pulichintala dam site

The catchment area of the Krishna river from its source upto the Pulichintala dam site includes the independent catchments of 9 upper sub-basins i.e., Upper Krishna, Middle Krishna, Ghataprabha, Malaprabha, Upper Bhima, Lower Bhima, Tungabhadra, Vedavathi, Musi and part of the Lower Krishna sub-basin upto Pulichintala dam site. The catchment extends over an area of 240733 km^2 which works out to 93% of the total catchment area of the Krishna basin and lies in the states of Maharashtra (69425 km^2), Karnataka (113272 km^2) and Andhra Pradesh (58036 km^2). The hydrological studies in respect of all the above sub-

basins have been carried out by NWDA and the annual yield series of each sub-basin have been developed. The annual gross yield series of the catchment of Krishna basin upto Pulichintala dam site for the period from 1951-52 to 1983-84 have been arrived at by summing up the annual yield series of the Lower Krishna sub-basin upto Pulichintala dam site to the annual yield series of the 9 upstream sub-basins. From this series, the 75% and 50% dependable annual gross yields are determined to be 60353 Mm^3 and 69889 Mm^3 respectively.

Surface water needs for irrigation have been assessed by considering the ultimate annual irrigation. The surface water requirement for irrigation from all the existing, ongoing and future major, medium and minor projects are given in Table 5.8.

Table 5.8
Surface water requirement for ultimate irrigation in the catchment of Krishna basin upto Pulichintala dam site

State	Project category	Annual Irrigation (ha)	Annual utilisation (Mm^3)
Maharashtra	Existing	441320	3917
	Ongoing	646974	6007
	Proposed	507713	3219
	Additional area	209499	1260
	Sub-total	**1805506**	**14403**
Karnataka	Existing	1363649	12043
	Ongoing	946962	7032
	Proposed	497360	3921
	Additional area	153645	1155
	Sub-total	**2961616**	**24151**
Andhra Pradesh	Existing	883356	7433
	Ongoing	253956	1916
	Proposed	132273	1136
	Additional area	182616	1360
	Sub-total	**1452201**	**11845**
Total	Existing	2688325	23393
	Ongoing	1847892	14955
	Proposed	1137346	8276
	Additional area	545760	3775
	Grand total	**6219323**	**50399**

The requirement of water for domestic consumption computed by projecting the rural and urban human population and the livestock to 2025 AD are given in Table 5.9. The domestic requirement for the entire urban population and 50% of the rural population to be met from surface water sources works out to 4182 Mm3.

Table 5.9
Domestic water requirement in Krishna basin upto Pulichintala dam site by 2025 AD

Category	Population ('000')	Daily needs per capita (litres)	Water requirement (Mm^3)
Rural	68113	70	1743
Urban	45360	200	3310
Livestock	41788	50	762
Total			**5815**

In the absence of relevant data on the industrial water needs, the industrial needs by 2025 AD have been assumed to be of the same order as that of domestic water requirement which is 5815 Mm3.

The regeneration from irrigation uses at 10% of net water utilisation from all the existing, ongoing and identified future major and medium projects having designed annual utilisation of 85 Mm^3 or more is worked out to 3200 Mm^3.

The regeneration at 80% of the domestic and industrial water uses to be met from surface water resources are 3346 Mm3 and 4652 Mm3 respectively.

The total evaporation losses of all the hydel projects have been taken as hydro power needs which is worked out to be 1154 Mm^3.

The water balance has then been worked out by deducting the ultimate water requirements for various uses like irrigation, industrial, domestic and others from the overall availability duly considering the regeneration, import and export. Thus, the computation of surface water balance of the Krishna basin upto Pulichintala dam site is given in Table 5.10.

Table 5.10
Surface water balance at Pulichintala dam site

Units: Mm^3

1.	**Availability**			
	(a)	Gross annual yield		
	i)	At 75% dependability		60353
	ii)	At 50% dependability		69889
	(b)	Surface water import (+)		1074
	(c)	Surface water export (-)		11746
	d)	Overall availability		
	i)	At 75% dependability		**49681**
	ii)	At 50% dependability		**59217**
2.	**Surface water requirement for**			
	i)	Irrigation	50399	
	ii)	Domestic use	4182	
	iii)	Industrial use	5815	
	iv)	Hydro-power needs	1154	
		Sub-total	**61550**	**61550**
3.	**Regeneration (+)**			
	i)	Irrigation use	3200	
	ii)	Domestic use	3346	
	iii)	Industrial use	4652	
		Sub-total	**11198**	**11198**
4.	**Surface water balance**			
	i)	At 75% dependability		**(-) 671**
	ii)	At 50% dependability		**(+) 8865**

5.6 Diversion of surplus Godavari waters from Inchampalli reservoir through the proposed Inchampalli - Pulichintala link canal

The Godavari (Inchampalli) - Krishna (Pulichintala) link canal as proposed by NWDA envisages to divert annually 4370 Mm3 of surplus Godavari waters available at Inchampalli dam site. This link canal will serve the commands under IRBC, NSLBC and NSRBC utilizing 3665 Mm^3 for irrigation and 413 Mm^3 for municipal and industrial uses. The balance 292 Mm^3 would be lost in transmission. In order to divert maximum quantum water from Godavari, through Inchampalli – Nagarjunasagar and Inchampalli – Pulichintla link project, the Bhopalpatnam H.E. project located on Indravati river has been integrated with Inchampalli reservoir and a multi reservoir simulation study has been carried out. From the

study, it is seen that the combination of Bhopalpatnam and Inchampalli reservoir could meet the link demand at 76.1 success rate.

5.7 Reservoir simulation studies

5.7.1 Computation of net annual yields/inflows into Bhopalpatnam and Inchampalli reservoirs

The Bhopalpatnam hydroelectric project was proposed by the Government of Chhattisgarh on Indravati River just before its confluence with Godavari River. This project is planned for producing 235 MW of firm power. The gross annual yields at Bhopalpatnam for the period from 1951-52 to 1980-81 have been estimated on pro-rata basis considering the catchment areas of the entire Indravati sub-basin and that up to Bhopalpatnam. Net annual inflows into Bhopalpatnam reservoir have been worked out by deducting the net surface water requirements of the Indravati sub-basin up to Bhopalpatnam from the gross annual yields available at Bhopalpatnam.

The monthly inflows at Bhopalpatnam are worked out from the net annual inflows by using the monthly runoff data of Pathagudem G&D site (maintained by CWC) situated on Indravati downstream of the project.

The Inchampalli dam is proposed on Godavari just downstream of the confluence of Indravati with the Godavari. To develop the yield series of the Godavari basin below SRSP upto Inchampalli, the gross annual yields of the part catchment of Middle Godavari sub-basin below SRSP, Maner, Penganga, Wardha, Pranhita, part catchment of Indravati sub-basin below Bhopalpatnam and part catchment of Lower Godavari sub-basin upto Inchampalli dam site, have been added for each year for the period from 1951-52 to 1980-81. The requirements between SRSP and Inchampalli consists of the requirements of Middle Godavari sub-basin below SRSP, Maner, Penganga, Wardha, Pranhita, Indravati sub-basin below Bhopalpatnam and Lower Godavari sub-basin upto Inchampalli dam site. The net annual yields/inflows at Inchampalli have been worked out by deducting the ultimate annual requirements of all the above catchments. The annual inflows thus assessed at Inchampalli are then divided into monthly flows based on the flow data at Perur G&D site located just downstream of the Inchampalli dam site.

5.7.2 Demands from Inchampalli reservoir

5.7.2.1 Demands of Inchampalli left and right bank canals

The Inchampalli reservoir as planned by Government of Andhra Pradesh is to meet the irrigation needs of the commands under Inchampalli left bank canal (ILBC) and Inchampalli right bank canal (IRBC). The designed annual utilizations for irrigation under Inchampalli LBC and Inchampalli RBC as per the studies of NWDA are:

1. Inchampalli LBC 150 Mm3
2. Inchampalli RBC 470 Mm3

5.7.2 .2 Demands of Inchampalli – Pulichintala link

The Godavari (Inchampalli) – Krishna (Pulichintala) link proposes to divert 4370 Mm^3 of water from the Godavari for the benefit of areas in Godavari and Krishna basins. It envisages to provide irrigation to areas under the commands of Inchampalli and Nagarjunasagar projects as detailed below:

i) 506 Mm^3 (including transmission less) for irrigation of the proposed command area en route the link under Inchampalli right bank canal.
ii) 413 Mm^3 towards the domestic and industrial water requirements of the areas en route the link canal.
iii) 3451 Mm^3 for irrigation of existing part command under NSLBC and NSRBC.

The computation of all the above demands is dealt in detail in Chapter on “Water and Irrigation planning”.

5.7.2.3 Demands of Inchampalli – Nagarjunasagar link

Inchampalli – Nagarjunasagar link envisages to carry 16426 Mm^3 of water annually to meet the demands of SRSP and SLBC commands besides transferring of 14200 Mm^3 to Nagarjunasagar reservoir for further use.

5.7.2.4 Downstream commitment of Inchampalli dam

The studies carried out by the NWDA reveals that the water requirements of all the projects, existing and identified down stream of Inchampalli dam site could be met by the waters available from the

catchment between Inchampalli and Dowlaiswaram barrage and with the surplus waters of Mahanadi river proposed to be diverted to the Godavari river through the Mahanadi (Manibhadra) – Godavari (Dowlaiswaram) link canal. Hence it is not proposed to release any water from Inchampalli project to meet downstream requirements and all the surplus water available at Inchampalli is considered for diversion.

5.7.3 Simulation studies of Bhopalpatnam and Inchampalli reservoirs

The Bhopalpatnam reservoir on Indravati is located just upstream of Inchampalli and as such the releases from Bhopalpatnam is to be accounted properly for simulation of Inchampalli reservoir. For meeting the link project demands some excess water has to be released from Bhopalpatnam reservoir whenever, the Inchampalli reservoir experiences shortfall which could be possible only through multi reservoir simulation by integrating Bhopalpatnam with Inchampalli. Accordingly multi reservoir simulation study has been carried for Bhopalpatnam and Inchampalli projects for a period of 30 years from 1951-52 to 1980-81 considering the monthly inflows from various sources and the monthly demands to be met from respective reservoirs.

The monthly demands to be met from Inchampalli reservoir are considered in the following order of priority.

i) Irrigation demand of ILBC and IRBC.
ii) Domestic and industrial uses of Inchampalli - Pulichintala link.
iii) Irrigation demands of other commands proposed in the link project.
iv) Diversion to Nagarjunasagar for further transmission.

Initial condition of reservoir, storage at half full has been considered for the simulation. The reservoir evaporation losses have been duly considered. The success rate of each demand is computed by dividing the number of years in which a minimum of 95% of requirement is met by the total number of years of simulation i.e. 30 years. The results of simulation of Inchampalli reservoir for the period of 30 years from 1951-52 to 1980-81 in terms of success rate are presented in Table 5.11.

Table 5.11
Results of simulation of Inchampalli reservoir for the period from 1951-52 to 1980-81 (30 years)

Sl. No.	Component	Full demand (Mm^3)	No. of years in which full demand is met	Success rate
1.	Inchampalli LBC	150	24	80%
2.	Inchampalli - Pulichintala link diversion including Inchampalli RBC	4370	23	76%
3.	Inchampalli – Nagarjunasagar link diversion	16426	23	76%

5.7.4 Releases for power generation at Inchampalli dam

The effective installed capacity of power house at Inchampalli project as proposed by the State Government is 825 MW. The requirement of water for the above dam toe power house has not been accounted in simulation study. In order to meet the peak hour energy requirements, it is proposed to keep the same installed capacity as specified. However it will be operated as pumped storage scheme. The power house will have reversible turbines of 13 units of 75 MW capacity each including two as stand by.

The water is proposed to be released for power generation during peak hour demand and pumped pack to reservoir during non-peak hours. It is also proposed to generate power from the spills, by routing through the power house.

The spills available from the simulation study augmented with the pumping arrangements made, it is found that the average annual peak power generation of 1807 MU and 1087 MU from spills could be generated from the Inchampalli dam toe power house.