Chapter 7
Reservoirs

7.1 General

The Mahanadi(Barmul) – Godavari (Dowlaiswaram) link canal off-takes from Barmul reservoir on river Mahanadi near Barmul village in Nayagarh district. Water Resources and hydrology, show that with the proposed FRL of 80.0 m all the link canal demand could be met successfully except a small marginal deficit which will be fulfilled by the available spills.

Enroute of the link canal, the existing Salia reservoir is used as balancing reservoir. The link canal out falls into the reservoir at RD 160.90 km and takes off from the right bank of the reservoir.

The details regarding the storages, levels and the criteria adopted for fixing the same for Barmul are furnished in the following paragraphs.

7.2 Controlling levels and storages

7.2.1 Barmul reservoir

Barmul is the proposed multipurpose reservoir on river Mahanadi. The reservoir storages and levels have been fixed by the NIH at FRL 80m with a gross storage of 1835 MCM to fulfill the above needs.

7.2.2 Salia reservoir

The Salia reservoir is the biggest existing medium irrigation project located on Salia river in Khurda district of Odisha. The principal levels and storages of the Salia reservoir are given in **Table 7.1**

Table 7.1
Principal levels and storages of Salia reservoir

	Level (m)	**Storage (**MCM**)**
MWL	61.26	--
FRL	58.52	59.868
MDDL	48.82	7.788
DSL	48.82	7.788

The FRL of the Salia reservoir is proposed to be raised to 62.320 m to facilitate taking off of Mahanadi-Godavari link from the reservoir with a FSL of 61.820 m

7.3 Sedimentation studies and life of reservoirs

7.3.1 Barmul reservoir

Silt observations on Mahanadi river are being made systematically for a long time. They show that the Mahanadi river carries less silt compared to many other rivers of our country. The Hirakud reservoir, situated upstream of Barmul dam site, is having the storage capacity of 2318 MCM upto MDDL and the useful life of the reservoir is estimated to be more than 300 years by the Odisha State Irrigation authorities. As the Barmul reservoir is having a dead storage capacity of 251 MCM upto MDDL and is located downstream of Hirakud reservoir, the useful life of the reservoir would be still higher. Further, due to the construction of large number of reservoirs in the upper reaches of the Mahanadi and its tributaries, the silt is likely to be trapped in those reservoirs and relatively silt free water would flow into the Barmul reservoir.

7.3.2 Effect of link proposal on the life of existing Salia reservoir

As the silt carried by the Mahanadi river will be trapped to the large extent in the Barmul reservoir itself, relatively silt free water will flow through the link canal. And, as such, there may not be any effects on the life of the Salia reservoir due to these inter basin transfer proposals.

7.3.3 Salia reservoir

The average annual evaporation losses from Salia reservoir are assessed as 16 MCM.

7.4 Submergence area

7.4.1 Barmul reservoir

The area under submergence of the proposed Barmul reservoir is 21262 ha at FRL 80.0 m. The number of fully affected villages are 93 and population likely to be effected are about 58000.

7.4.2 Salia reservoir

Salia project is an existing reservoir with FRL 58.52 m and MWL 61.28 m located enroute the Mahanadi-Godavari link at RD 160.90 km. The area of submergence at FRL is 984 ha. The existing FRL of the reservoir is to be raised to 62.320 m to operate the dropping and taking off of the flows of Mahanadi – Rushikulya – Godavari link canal as per the requirements. The additional submergence area due to raising of FRL from 58.52m to 62.320 m is about 250 ha. About 44 families comprising 300 people would be affected by the additional submergence that would take place due to the proposed rise in the FRL of the reservoir.

7.5 Other Projects proposed to integrate with M-G Link

7.5.1 Ong Project

Ong dam is a storage scheme across Ong river, proposed by Odisha Govt. for providing irrigation to ayacut lying in Bargarh and Bolangir districts of Odisha state**.** The catchment area at dam site is 2321 Sq.km. Submergence area is 5100ha at FRL of 219m, Gross storage at FRL is 330 MCM. The Culturable Command Area (CCA) under this project is 30000 ha.

7.5.2 Tel Integrated Project

Tel Integrated Project is a multipurpose project across Tel River proposed by Odisha Govt. in Nabarangapur district. The length of the dam is 3682m. FRL of the dam is 500m, Gross storage at FRL is 2.39 MCM. Submergence area at FRL is 1330ha.The submergence falls extremely in forest area where there is no habitation and hence no population is affected. The Culturable Command Area (CCA) under this project is 18246 ha. The installed capacity proposed by State Government of this project is 18 MW (42.5 MU).

7.5.3 Upper Udanti irrigation Project

Upper Udanti irrigation Project is proposed by Odisha Govt. in Nuapada district in Tel basin of Mahanadi Basin. The FRL of the dam is 300 m, Gross storage at FRL is 151.13 MCM. The submergence area at FRL is 1788 ha and no population is affected as it falls in forest area. The Culturable Command Area (CCA) under this project is 35000 ha.

7.5.4 Uttei Roul Project

Uttei Roul Project is proposed by Odisha Govt. in Tel sub basin of Mahanadi Basin. The project envisages construction of two dams across Uttei and Budha and one diversion weir across river Roul respectively. The FRL of the dam is 270 m, Gross storage at FRL is 99.18 MCM. The submergence area at FRL is 854 ha and no population is affected. The Culturable Command Area (CCA) under this project is 60000 ha.

7.5.5 Khadaga Hydropower Project

Khadaga hydropower project involves an earthen dam across Khadaga river, tributary of Tel river in Mahanadi basin. The project located in Balliguda block of Kandhamal district of Odisha. The catchment area up to the dam site is 1804 Sq.km. The FRL of the dam is 177 m. The submergence area at FRL is 45 ha and no population is affected and storage capacity is insignificant. The Culturable Command Area (CCA) under this project is 37140 ha. The installed capacity proposed by State Government of this project is 57 MW (275 MU).

7.5.6 Salki Hydropower Project

Salki is a hydropower project on Salki river, tributary of Mahanadi river, located in Kandhamal district of Odisha. The free catchment area of the project up at dam site is 1285 sq.km. The FRL of the dam is 460 m and Gross storage at FRL is 185 MCM. The submergence area at FRL is 981 ha and 1572 people are affected. The Culturable Command Area (CCA) under this project is 1614 ha. The installed capacity proposed by State Government of this project is 165 MW (840 MU).

The CCA and Area under submergence of these six projects are shown in the **Table : 7.2**

Table 7.2
CCA and Area under submergence of six projects

Unit:ha

S. No.	Name of project	CCA	Area under submergence
1	Ong	30000	5100
2	Tel integrated	18246	1330
3	Upper Udanti	35000	1788
4	Uttei Roul	60000	854
5	Khadaga	37140	45
6	Salki	1614	981
	Total	**182000**	**10098**

Source : Salient Features of State Govt. Reports

7.6 Potential Power generation at Barmul dam site

The feasibility of power generation using the available heads at Barmul dam site for releases into the link canal and down-stream releases has been examined and the details are given below:

i) Considering the releases into link canal the power generation at Barmul dam site is about 153 MW. The details are given in **Table 7.3.**

Table 7.3
Power generation at Barmul dam site (releases into link canal)

Month	Discharge		Power Generation	Energy
	MCM	Cumec	(MW)	(MU)
June	702	271	10.63	7.66
July	1859	717	28.14	20.26
August	1609	621	24.37	17.54
September	1376	531	20.84	15.00
October	1044	403	15.81	11.39

November	776	299	11.73	8.45
December	786	303	11.89	8.56
January	618	238	9.34	6.72
February	447	172	6.75	4.86
March	445	172	6.75	4.86
April	304	117	4.59	3.31
May	139	54	2.12	1.53
Total	10105		**152.96**	**110.14**

Source : NIH Report Table 6.9 (page 72)

The head available for generation is (FRL-FSL)(80-75) is 5.0 m. The annual power generation is 152.96 MW and energy produced is 110.14 MU. 7 units of 5 MW are to be installed for power generation.

Installed capacity including stand by unit 7 x 5 MW i.e. = 35 MW
Head available for power generation (FRL-FSL) (80-75) = 5.0 m
Annual Power Generation = 152.96 MW
say 153 MW
Total energy = 110.14 MU

ii) Considering the down stream releases the power generation at Barmul dam site is about 770 MW. Thee details are given in **Table 7.4.**

Table 7.4
Power generation at Barmul dam site(D/s releases into river)

Month	**Discharge**		**Power Generation**	**Energy**
	MCM	**Cumec**	**(MW)**	**(MU)**
June	706	272	53.37	38.42
July	1871	722	141.66	101.99
August	1619	625	122.63	88.29
September	1385	534	104.77	75.43
October	1051	405	79.46	57.21
November	781	301	59.06	42.52
December	790	305	59.84	43.09
January	622	240	47.09	33.90
February	450	174	34.14	24.58
March	448	173	33.94	24.44
April	306	118	23.15	16.67
May	140	54	10.59	7.63
Total	10169		**769.70**	**554.17**

Source : NIH Report Table 6.9 (page 72)

The head available for generation is (Maximum height of dam) is 25.0 m. The annual power generation is 769.70 MW and energy produced is 554.17 MU. 7 units of 25 MW are to be installed for power generation.

Installed capacity including stand by unit 7 x 25 MW i.e.	=	175 MW
Head available for power generation (Maximum height of dam)	=	25.0 m
Annual Power Generation	=	769.70 MW say 770 MW
Total energy	=	554.17 MU

The total installed capacity of both the power houses at Barmul Dam site is 210 MW (35 + 175 MW). The total energy produced of both the power houses at Barmul Dam site is 664.31 MU (110.14 + 554.17 MU)

Note : 1) The overall efficiency of the powerhouse is considered at 80% (As adopted in FR of G-D-S link)