SARDAR SAROVAR PROJECT

THE NARMADA RIVER,

The Narmada, a west flowing river, rises near Amarkantak in the Shahdol district of Madhya Pradesh and travels about 1,312 km. before joining the Gulf of Cambay in the Arabian Sea. It's First 1,077 km length is in Madhya Pradesh and the last 161 km. is in Gujarat. Of the remaining length, 35 km forms a common boundary between Madhya Pradesh and Maharashtra and another 39 km between Gujarat and Maharashtra. The total length of the river from origin upto the Sardar Sarovar Dam is 1163 km. The river has 22 tributaries on its left bank and 19 on the right bank. The important tributaries include Burhner, Banjar, Sher, Tawa, Chhota Tawa, Kundi, Hiran, Orsang and Karjan.

Out of the total catchment area of the river of 97410 sq. km, 85858 sq. km. is in Madhya Pradesh 1658 sq. km. in Maharashtra and 9894 sq. km. in Gujarat. The drainage area upto Sardar Sarovar Project (SSP) dam site is 88000 sq. km. The average annual rainfall in the basin is 112 cm. The maximum recorded flood at the dam site was 70847 Cumecs (25 lacs Cusecs) on the 7th Sept. 1994.

1.2 THE NARMADA WATER DISPUTES TRIBUNAL

The Narmada Water Disputes Tribunal (NWDT) was constituted in October 1969 to adjudicate upon the dispute regarding sharing of the Narmada waters amongst the States of Madhya Pradesh, Maharashtra, Gujarat and Rajasthan. The NWDT gave its Award in December 1979. The Tribunal assessed the utilizable quantum of the Narmada water at the SSP Dam site at 75% dependability as 28 Million Acre Feet (34537.44 Mm3.) and gave its decision regarding apportionment of water among the party States, as shown below :-

Madhya-Pradesh	18.25 MAF (22,511.01 M.cu.m.)
Gujarat	9.00 MAF (11,101.42 M.cu.m.)
Rajasthan	0.50 MAF (616.74 M.cu.m.)
Maharashtra	0.25 MAF (308.37 M.cu.m.)
	28.00MAF (34,537.44 M.cu.m.)

The above apportionment relates to actual withdrawals by party States and not consumptive use. It was also decided that within their share of water, each

party State is free to make changes in the pattern of water use and in the areas to be benefited within or outside the Narmada basin in its territory. As per the basin planning recommended by the NWDT, 30 major dams are to be constructed in Narmada basin up to SSP apart from a number of medium and minor schemes. The major project to be constructed in Gujarat is the SSP as the terminal dam on the river Narmada. The Full Reservoir Level (FRL) of the dam has been fixed by the NWDT at EL 455.0 ft. (138.68 m).

As per NWDT award, Project cost chargeable to power component and benefit of power generated by 6 x 200 MW River Bed Power House (RBPH) & 5 x 50 MW Canal Head Power House (CHPH) at SSP (1450 MW) will be shared by M.P., Maharashtra and Gujarat is the ratio of 57:27:16. The power generated at SSP will be integrated in common switchyard. MP will be entitled to get 57% of the power available at bus bar in the switchyard after allowing for station auxiliaries. The above entitlement applies both to availability of machine capacity for peak loads and to the total energy produced in any day.

As per NWDT award, the amount towards 57 % of the capital cost of the power portion of the Sardar Sarovar head-works shall be paid by Madhya Pradesh to Gujarat in annual installments until the capital works are completed. In addition to above payments, Madhya Pradesh shall also pay to Gujarat 57 % of the operation and maintenance cost of the SSP Complex each year based on budgeted figures at the commencement of each financial year and adjusted against actual cost at the end of the year.

1.3 THE SARDAR SAROVAR PROJECT

In accordance with the directions contained in the NWDT Award, the Govt. of Gujarat formulated the Interstate, multi-purpose Sardar Sarovar Project, which is now under construction by it's company promoted under the Company Act, 1956 namely Sardar Sarovar Narmada Nigam Ltd (SSNNL). The Project envisages construction of:

Unit-I (DAM & APPURTENANT WORKS): Comprising a 1210 m long and 163 m high (from deepest foundation) concrete gravity dam across the main Narmada River along with its appurtenant works near village Kevadia of Distt, Baroda,

Unit-II (CANALS): Comprising 458 km long Narmada Main Canal (NMC) in Gujarat & 74Km in Rajasthan, 44 branch canals with gross length of

2500 km, 5500 km distributaries, nearly 30,000 km minors and sub-minors. The vast network of distribution system, including field channels, will have an aggregate length of about 75,000 km. with CCA of 18.419 lakh ha in Gujarat, and

Unit-III (HYDRO POWER): Total Power Generation capacity of 1450 MW comprising an underground River Bed Power House (RBPH) with six units each of 200 MW reversible type Francis turbine, a surface Canal Head Power House (CHPH) with five units each of 50 MW conventional type Kaplan turbine, a GIS switch yard complex, and the 400 KV power transmission network up to MP-Gujarat and Maharashtra -Gujarat borders in Gujarat.

The reservoir formed by the main dam will have a gross storage capacity of 0.95 million hectare meters (7.70 MAF) and. a live storage of 0.58 million hectare meters (4.73 MAF) to provide irrigation to about 1.80 million hectares in about 3400 villages in Gujarat and in the arid areas of the Barmer and Jallore districts of Rajasthan, apart from providing drinking water to about 8215 villages and 135 urban centers of Gujarat. The annual power generation at the project is estimated at 5469 GWH in initial years.

At full reservation level (EL138.68m) the submergence will effect 193 Villages of Madhya Pradesh, 33 villages of Maharashtra and 19 villages of Gujarat; likely total submergence of land will be of 37,533 ha which includes 13,385 ha of forest land. The number of families likely to be effected due to submergence, based upon 1991 census, are estimated as 40,727; out of these 33,014 are of Madhya Pradesh. Gujarat will be required to resettle 14124 families of Madhya Pradesh in the command area of the project in Gujarat. Remaining 18890 families will be resettled in Madhya Pradesh.

The total cost of the project estimated at the 1986-87-price level is Rs. 6406.04 crore and it has been tentatively estimated as Rs. 28,613 crores at 2000-01 price level. Dam was constructed upto 110.64 m in June 2004 and is constructed upto 121.92 m in the year 2006-07. All the five units each of 50 MW of CHPH commissioned during Aug. 04 to Dec.04 and all the six units each of 200 MW of RBPH commissioned during Feb. 05 to Nov. 06. Therefore total capacity of SSP as 1450 MW is now installed and GoMP's 57 % share capacity thereof i.e. 826.5 MW is added into the Grid of MPSEB/ MPPTCL in M.P. State.

Details of Yearly drawl of GoMP's 57 % share of power generated in MU w.e.f. Aug. 2004 by MPSEB/MPPT is as follows :-

2004-05	2005-06	2006-07
145.514	1081.831	2016.951

The salient features of the Sardar Sarovar Project are given at Annexure - I.

For other detailed information and current status of the Project, please visit the SSSSL's Web site -www.sardarsarovardam.org and SSCAC's website –www.sscac.gov.in.

Annexure.-I

SALIENT FEATURES OF SARDAR SAROVAR PROJECT

I. LOCATION		
State	Gujarat	
District	Narmada	
Taluka	Rajpipla (Nandod)	
River	Narmada	
II. HYDROLOGY		
Watershed area of the river above dam site.	88000 sq. km.	
	(33970 sq.mile)	
Mean annual rainfall	1 120mm (44.10 inch.)	
Annual run-off at dam site		
at 50% dependability	4.10 Mha m (33.20 MAF)	
at 75% dependability	3.36 Mha m (27.22 MAF)	
at 90% dependability	2.44 Mha m (19.77 MAF)	
Designed flood (1 in 1000 years)	87000 Cumecs	
	(30.7 lakh cusecs)	
III. RESERVOIR		
Full Reservoir Level *(FRL)*	138.68 m (455 ft)	
Maximum Water Level (MWL)	140.21 m (460 ft)	
Minimum Draw Down Level (MDDL)	110.64 m (363 ft)	
Nonnal tail Water Level (NTWL)	25.91 m (85 ft)	
Gross Storage Capacity	0.95 Million ha m	
	(7.70 MAF)	
Dead Storage Capacity	0.37 Million ha m	
	2.97 MAF	
Live Storage Capacity	0.58 Million ha m	
	(4.73 MAF)	
Annual evaporation	0.06 Million ha m	
	(0.5 MAF)	
Submergence at FRL 138.68m(455 ft)	37533 ha	
No. of villages affected	Full	Partial
Madhya Pradesh	1	192
Maharashtra	-	33
Gujarat	3	19
Total	4	244

No. of families affected	
Madhya Pradesh	33104
Maharashtra	3698
Gujarat	4728
Total	41440
IV. DAM	
Type	Concrete Gravity
Length	1210.02 m
Maximum height	163.00 m
Top of dam	EL 146.50 m
Crest	EL 121.92 m
Spillways	
Service spillway	23 bays
	60 ft (18.30 m) each
Auxiliary spillway	7 bays
	60 ft (18.30 m) each
Crest gates	
Type	Radial
Size	18.30 mx 16.76 m (23 Nos.)
	18.30 mx 18.30 m (7 Nos)
Constructiun siuices at EL. i8.0m	2.10 m x 2.74 m (10 Nos)
	Closed in Feb 94
River sluices at EL. 53.00m	2.5m x 3.6 m (4 Nos.)
V. POWER INSTALLATION (CHPH)	
General	
Location	Right bank
No. of units	5
Rated capacity of each unit	50 MW
Installed capacity	250MW
Type of turbines	Kaplan (Conventional)
Type of Power House	Surface
Turbine	
Rated speed	136.4 RPM
Dia. of runner	4.7 m
Max. head race level	138.20 m
Min. head race level	110.18 m
Max. tail water level	95.10 m
Min. tail water level	92.07 m
Output at 46.13 m head (Max.)	56.4 MW
Output at 36 m head (Design)	51.265 MW
Output at 18.12 m head (Min.)	18.575 MW
Discharge at 46.13 m head (Max.)	135.5 Cumecs
Discharge at 36 m head (Design)	157.6 Cumecs
Discharge at 18.12 m head (Min.)	118.5 Cumecs

Generator		
	Generator rated output	50.556 MVA (50MW)
	Max. cant. output	61.111 MVA (55 MW)
	Line voltage	11.0 ± 5% KV
	Power Factor	0.9 (lag)
	Frequency	50(±3%) Hz
VI. POWER INSTALLATION (RBPH)		
General		
	Location	Right Bank
	No. of units	6
	Rated capacity of each unit	200 MW
	Installed capacity	1200 MW
	Type of turbines	Francis (Reversible)
	Type of Power House	Underground
Turbine		
	Rated speed	136.36 RPM
	Dia of runner	5.7 m
	Max. head race level	138.68 m (FRL)
	Min. head race level	110.64 m (MDDL)
	Max. tail water level	25.91 m
	Mill. tail water level	20.80 m
Turbine Mode		
	Output at 116.6.6 m head (Max.)	224.4 MW
	Output at 100 head (Design)	204 MW
	Output at 75 m head (Min.)	138 MW
	Discharge at 116.6 m head (Max.)	212.3 Cumecs
	Discharge at 100 m head (Design)	227.5 Cumecs
	Discharge at 75 m head (Min.)	219.1 Cumecs
Pumping Mode		
	Input at 114 m head (Max.)	204.5 MW
	Input at 100 m head (Design)	209.2 MW
	Input at 81 m head (Min.)	207.5 MW
	Discharge at 114 m head (Max.)	168.4 Cumecs
	Discharge at 100 m head (Design)	197.5 Cumecs
	Discharge at 81 m head (Min.)	233.4 Cumecs
Generator		
	Generator rated output	222.22 MVA
	Line voltage	13.8 ± 10% KV
	Power Factor (Generating Mode)	0.9 (lag)
	Power Factor (Motoring Mode)	0.95 (lead)
	Frequency	50 (±3% Hz)

VII. CANAL SYSTEM				
	FSL at head regilator of main Canal	91.45 m (300ft)		
	Type of Canal	Lined contour canal		
	Length	458 Km upto Rajasthan border and 74 Km in Rajasthan		
	Base width in head reach	73.1 m		
	FSD in head treach	7.6 m		
	Discharge capacity in head reach	1132.68 cumecs (40000 cusecs)		
	Gross Command Area (GCA)	34.286 lakh ha		
	Cuturable Command Area (CCA)	21.190 lakh ha		
	Annual Irrigation	17.92 lakh ha		
VIII. Cost (Rs. Crore)				
Price Level				
		1986-87*	**1996-97****	**2000-01*****
Unit -1	(Dam & Appurtenant works)	1019.45	4473.75	6036.78^
Unit-II	Main Canal	1588.54	4410.00	5216.35
Unit-III	Hydro Power Works	979.95	2184.75	2728.07
Group-IV	Branches & Dist. System	2818.10	11850.00	14578.17
	Total Cost of the Project	6406.04	22918.50	28613.37

Notes: * Full estimated cost at 1986-87 price level has been approved by the planning commission.

**** Only the Unit-I estimate (partly) and Unit-III estimate at 1996-97 price level has approved by the SSCAC.**

***** (a) Unit-I includes share cost of Narmada Sagar Project in Madhya-Pradesh.**
(b) Revised Estimate at 2000-01 price level (furnished by Govt. of Gujarat) are approved by the SSCAC in its 71st meeting held on 8th September 2004.

^ Unit-I cost includes Rs. 3000.57 crores approved by SSCAC and tentatively estimate of R&R fro Rs. 3033.21 crores.

Unit-I includes share of Indira Sagar Project (M.P.) Rs. 464.51 crores ((@17.63% unit-1 of Indira Sagar amounting to Rs. 2634.77 crores).

Break up of Unit-I cost

Unit-I (excluding B-land) approved by SSCAC Rs. 3003.57 crores
B-land (R&R) cost Rs. 3033.21 crores
Total: Rs. 6036.78 crores