

# Ken-Betwa link project

## SALIENT FEATURES

<b>1.0</b>	<b>Name of the project</b>	Ken-Betwa link project	
<b>2.0</b>	<b>General</b>		
<b>2.1</b>	River basin(s)		
	(a) Name	Ken and Betwa river basins	
	(b) Located in states	Madhya Pradesh and Uttar Pradesh	
<b>2.2</b>	Name of		
	(a) Rivers	Ken and Betwa	
	(b) States	Madhya Pradesh and Uttar Pradesh	
	(c) Districts		
	(i) Reservoir	Panna and Chhatarpur of Madhya Pradesh	
	(ii) Head works	Chhatarpur	
	(iii) Command area	Chhatarpur & Tikamgarh of Madhya Pradesh and Jhansi & Hamirpur of Uttar Pradesh	
	(iv) Power houses	Chhatarpur	
	(d) Tehsils		
	(i) Reservoir	Bijawar of Chhatarpur district and Panna of Panna district	
	(ii) Head works	Bijawar of Chhatarpur district	
	(iii) Power house	Bijawar of Chhatarpur district	
	(iv) Command area	Chhatarpur & Nowgong of Chhatarpur district, Jatara & Tikamgarh of Tikamgarh district, and Mahoba of Hamirpur district and Mauranipur of Jhansi District	
	(e) Village near the head works	Daudhan	
<b>2.3</b>	Access to the project	Name	Distance from project site
	(a) Air port	Khajuraho	31 km (by road)
	(b) Railway station	Satna	110 km (by road)
	(c) Road	Chhatarpur- Panna State Highway	19 km (W.B.M.road)
<b>2.4</b>	Estimated life of the project	100 years	

<b>3.0</b>	<b>Type of the project</b>	Multipurpose
<b>3.1</b>	<b>Irrigation</b>	
	(a) Culturable Command Area	I Enroute command 0.47 lakh ha
		ii Ken command 2.41 lakh ha
		iii Betwa command 1.02 lakh ha
	(b) Annual irrigation	I Enroute command 0.47 lakh ha
		ii Ken command 3.23 lakh ha
		iii Betwa command 1.27 lakh ha
<b>3.2</b>	<b>Power (Generation)</b>	
	(a) Installed capacity (MW)	I 3x20=60 MW in PH-1 (one unit standby)
		ii 2x6=12 MW in PH-2
	(b) Firm power	25 MW at 60% load factor
	I Annual energy (MKwh)	i) Firm – 18 Mkwh (Mu)
		ii) Total – 191.67 Mkwh (Mu)
	(d) Cost of Power per Kw installed capacity	Rs. 7,044.83
<b>4.0</b>	<b>Hydrology</b>	
<b>4.1</b>	Catchment area upto dam site	19,534 Sq Km
<b>4.2</b>	Precipitation	
<b>4.2.1</b>	In the catchment area	Period from 1901 to 1983
	(a) Normal	1,174.07 mm (annual)
	(b) Maximum	1,662.10 mm (annual)
	I Minimum	660.00 mm (annual)
<b>4.2.2</b>	In the command area	Period from 1987 to 1991
	(a) Average annual	950 mm
	(b) Average monsoon	1,100 mm
	I Average non-monsoon	20 mm
<b>4.3</b>	Annual yield at Daudhan dam	6,188 Mm <sup>3</sup> at 75% dependability
<b>4.4</b>	Climatic data	
<b>4.4.1</b>	(a) Project area	
	(i) Temperature	44° C (Max.) & 6.7 °C (Min.)
	(ii) Humidity	95% in monsoon & 9% in non-monsoon
	(iii) Wind speed	16.1 km/hr (Max.) & 1.0 km/hr (Min.)
	(b) Command area	
	(i) Temperature	47.3 °C (Max.) & 4.0 °C (Min.)
	(ii) Humidity	95% (Max.) & 9% (Min.)
	(iii) Wind speed	4.2 km/hr (Av.)

<b>4.5</b>	Utilization of water			
<b>4.5.1</b>	From Daudhan reservoir			
	(a) For direct irrigation			
	(i) In M.P	1,375.00 Mm <sup>3</sup>		
	(ii) In U.P.	850.00 Mm <sup>3</sup>		
	(b) For irrigation through link canal			
	(i) In Enroute command	312.00 Mm <sup>3</sup>		
	(ii) In Betwa command	659.00 Mm <sup>3</sup>		
	(c) For drinking purpose in the vicinity of link (MP & UP)			
	11.75 Mm <sup>3</sup>			
	(d) Transmission losses			
	37.25 Mm <sup>3</sup>			
	Total			
	3,245.00 Mm <sup>3</sup>			
<b>4.5.2</b>	Committed utilization in upstream projects	Major (Mm <sup>3</sup> )	Medium (Mm <sup>3</sup> )	Minor (Mm <sup>3</sup> )
	(i) Existing	-	42.31	162.54
	(ii) Ongoing	-	-	69.10
	(iii) Proposed	1,099.95	402.66	340.09
<b>4.6</b>	Design flood for spillway	45,104 cumec		
<b>5.0</b>	<b>Reservoir/ Weir</b>			
<b>A</b>	Daudhan reservoir			
	(i) Water levels			
	(a) F.R.L.	287 m		
	(b) M.D.D.L.	268 m		
	(c) Dead storage level	238 m		
	(ii) Free board	4.0 m		
	(iii) Wave height	3.01 m (Max.)		
	(iv) Live storage	2,752.69 Mm <sup>3</sup>		
	(v) Capacity at			
	(a) F.R.L.	2,775 Mm <sup>3</sup>		
	(b) M.D.D.L.	1,390 Mm <sup>3</sup>		
	(c) D.S.L.	22.31 Mm <sup>3</sup>		
	(vi) Accumulated sedimentation after	50 years	100 years	
	(a) pto new zero elevation	25.0 Mm <sup>3</sup>	75.0 Mm <sup>3</sup>	
	(b) Above new zero elevation	199.73 Mm <sup>3</sup>	311.76 Mm <sup>3</sup>	
	(vii) Evaporation losses			
		Av. Annual	152.93 mm	
		Av. Non-monsoon	165.15 mm	
		Av. Monsoon	135.89 mm	

<b>B</b>	Weir at Gangau	
	(i) Water levels	
	(a) Storage level	234.90 m
	(b) River bed level	219.30 m
	(c) Live storage capacity	56.40 Mm <sup>3</sup>
<b>6.0</b>	<b>Submergence under Daudhan dam</b>	
<b>6.1</b>	Land and property submerged	
<b>A</b>	Area submerged At FRL	
	(i) Forest area	6,400 ha
	(ii) Culturable area	2,171 ha
	(iii) Unculturable area	79 ha
	Total	8,650 ha
<b>B</b>	Property affected at FRL	
	(a) Village affected	10 Nos.
	(a) Building/houses	750 Nos.
	(c) Wells	50 Nos.
	(d) Road/rails (Km)	No major roads and railway lines
<b>6.2</b>	Number of families affected	900 (approx.)
<b>6.3</b>	Number of persons affected	8,550 (approx.) (The detailed study on survey and investigation for rehabilitation & resettlement of families would be carried out and incorporated at the time of preparation of the detailed project report.)
<b>7.0</b>	<b>Head works</b>	
<b>7.1</b>	Dam	
<b>7.1.1</b>	Earth/ rock fill dam	
	(a) Type of dam	Earthfill
	(b) Length of the dam at top	
	(i) Right flank	1,224 m
	(ii) Left flank	244 m
	(c) Top width	8 m
	(d) Maximum height above(foundation level)	
	(i) Right flank	73.80 m
	(ii) Left flank	19.95 m

<b>7.2</b>	<b>Masonry/concrete dam</b>	
	(a) Type of dam	Concrete
	(b) Elevation at top	291.0 m
	(c) Elevation of deepest foundation	232.0 m
	(d) Length at top	247.0 m (considering both sides of spillway)
	(e) Width at the top	8 m
	(f) Maximum height above foundation	55 m
<b>7.3</b>	<b>Spillway</b>	
	(a) Type of spillway	Side channel
	(b) M.W.L.	288 m
	(c) Length	326 m
	(d) Max. height above deepest foundation	28 m
	(e) Crest level	269 m
	(f) No. of gates	15 nos.
	(g) Type of gates	Radial
	(h) Size of gates	18 m x 18 m
	(i) Design discharge	44,000 cumecs
	(j) Tail water level	234.75 m
	(k) Type of energy dissipation	Ski-jump bucket type device
<b>8.0</b>	<b>Canal system</b>	
<b>8.1</b>	<b>Canal system</b>	
	(a) Purpose of the canal	Irrigation
	(b) Type of flow	Gravity flow
	(c) Type of lining	P.C.C.
	(d) Length of the main canal	231.45 km (including 2 km long tunnel)
	(e) FSL at head	259.0 m
	(f) FSL at end	220.62 m
	(g) Bed width at head	12 m
	(h) Side slope	1.5:1
	(i) Bed slope	1:10,000
	(j) Discharge capacity	72 cumecs upto 134 km , 62 cumecs from 134 km to 195 km& 57 cumecs from 195 km to terminal point at Barwa Sagar
	(k) Total number of canal structures on main canal	59
	(l) Total assumed head losses across the structure	6.725 m

	(m) Gross command area	51,500 ha	
	(n) Culturable command area	47,000 ha	
	(o) Annual irrigation	47,000 ha Enroute & 1.27 lakh Ha. In Betwa command	
<b>8.2</b>	Branch canals		
	(a) Number	28 Nos.	
	(b) Total length	140 km	
<b>9.0</b>	<b>Power (Components)</b>		
<b>9.1</b>	Surge shaft		
	(a) Type	Simple	
	(b) Size	23.5 m dia	
	(c) Height above Foundation level	32.55 m	
	(d) Elevation at top	292.552 m	
	(e) Capacity	3,92,869 Mm <sup>3</sup>	
	(f) Surge level	Max. -291.052 m, Min. -282.928 m	
<b>9.2</b>	Penstocks	for PH-1	for PH-2
	(a) Number	3	2
	(b) Diameter	4.0 m	3.7 m
	(c) Length	33.0 m	19.0 m
<b>9.3</b>	<b>Power house</b>		
	(a) Type	Underground for PH-1 and surface for PH-2	
	(b) Head	PH-1	PH-2
		Max.=52.25 m Min.=33.25 m	Max.=28.00 m Min. = 9.00 m
	(c) Dimension	33m x 18 m	19m x 12.5 m
	(d) Installed capacity	3x20 MW	2x6 MW
	(e) Turbines		
	(i) Types	Francis vertical shaft (reversible)	Francis Vertical shaft
	(ii) Number	3	2
	(iii) Capacity (H.P.)	26,820	8,046
	(f) Number of standby units	1x20 MW (Power House-1)	
	(g) Cost of power component	Rs. 5,071.86 lakh	

<b>9.4</b>	<b>Tailrace</b>	<b>PH-1</b>	<b>PH-2</b>
	(a) Type	a tail race tunnel, which outfalls in the pool between the existing Gangau weir and proposed Daudhan dam	a channel leading to K-B link canal
	(b) Water level	Max. - 235 m Min. - 225 m	Max. - 259 m Min. - 255.4 m
	(c) Size of draft tube gate	2.5m x 8.2 m	2.1 m x 7.0 m
<b>9.5</b>	<b>Cost (1994-95 price level)</b>		
	Cost of K-B link project		
	Unit – I Head Works	Rs. 36,791.63 lakh	
	Unit – II Canals(Link and Enroute command)	Rs. 57,243.77 lakh	
	Unit – III Power	Rs. 5,071.86 lakh	
	<b>Sub-total</b>	<b>Rs.99,107.26 lakh</b>	
	(b) Ken command : Canal system	Rs.55,411.32 lakh	
	(c) Betwa command : Upper Betwa projects	Rs.44,355.50 lakh	
	<b>Total cost</b>	<b>Rs.1,98,874.08 lakh</b>	
	(d) B.C. Ratio for the K-B link project as a whole	1.87	
	(e) Internal rate of return	13.00%	
	(f) Cost of irrigation	Rs. 40,000 per ha	
	(g) Cost of generation of power	54 Paise per Kwh	