OPTIMISATION OF POWER GENERATION FROM SRISAILAM HYDROELECTRIC POWER STATION.

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Of late electricity generation to meet the peak load demand is highly lucrative when this power generation capability is available during summer months (April to July months). AP DisComs have been purchasing peaking power at a price exceeding five (5) rupees per unit during these months to avert energy crisis. It is also possible to sell the surplus power at these prices to other state electricity utilities to neutralize the financial burden of high cost electricity purchases. This can be achieved by proper planning for maximizing the hydropower generation during summer months from Srisailam Hydroelectric Power Station (HPS).

Srisailam HPS is installed near the tow of the Srisailam dam with an installed capacity of 1760 MW, which is one of the biggest HPS in India. This HPS releases the water in to downstream Nagarjuna Sagar (NS) reservoir after harnessing the water energy for electricity generation. The left bank HPS units (900 MW) also have reversible turbine features, which can be used to pump water from NS reservoir to upstream Srisailam reservoir. This HPS can release nearly 72,000 cusecs of water in to NS reservoir at its full generation capacity.

Srisailam and NS are the two major water storage reservoirs across the Krishna river in Andhra Pradesh. Both the reservoirs can store 460 Thousand Million Cubic feet (TMC) of the river water with combined gross storage capacity of 672 TMC. Most of the water inflow in to NS reservoir is contributed from Srisailam reservoir, as the water inflows from the catchment area directly under NS reservoir are only 10% of its storage capacity. Krishna Delta canals and NS irrigation canals with an irrigation component of 3.3 million acres depend mainly on the NS and Srisailam reservoirs as water source. The firm water allocation for these irrigation schemes from the dependable river water is 440 TMC. Srisailam reservoir also serve as floodwater diversion point to meet irrigation requirement in Pennar river basin such as Telugu Ganga, Srisailam Right Bank Canal, KC Canal and Chennai Drinking Water Supply schemes with dependable water allocation of 75 TMC from the Krishna river.

The monthly water inflows received in last ten (10) years period in to Srisailam reservoir is shown in Table –1. Nearly 45% (404.5 TMC) of total inflows is taking place in the month of August when the river starts flooding continuously. Another 14% (127 TMC) inflows are received during June & July months before the onset of flooding. The ongoing practice is to store all the inflows during June & July months in Srisailam reservoir till comfortable reservoir level (860 feet) is reached. By storing the initial flow of monsoon in the upstream reservoir, this water is (nearly 120 TMC) not available for power generation during the acute peaking and energy shortage period throughout the country. During the month of August the continuous flood flows fill the rest of reservoir within few days and overflows in to NS reservoir. Had the initial monsoon flows are promptly used for power generation by Srisailam HPS by letting water in to NS reservoir, it would have generated the badly needed electricity during acute shortage period. There is no wastage of available river water as it is stored in NS reservoir for future irrigation needs. The Srisailam reservoir water level should be maintained near 740 feet till the continuous floodwater is received during the month of August or earlier. This optimum power generation planning would achieve nearly 750 million units (worth of RS 4 billions) of badly needed peaking power by using 120 TMC of water additionally by the HPS. Table-2 indicates the data of water levels and storages in Srisailam and NS reservoirs at the time of on set of river flooding for last four years. This data clearly shows that Srisailam HPS could have used 120, 82, 176 & 200 TMC water additionally in the years 2007, 2006, 2005 & 2004 respectively. This

peaking power generation of 900 million units per year on average is worth of 4.8 billion rupees in a year.

With the above pattern of water usage from Srisailam reservoir, there may be apprehension that adequate reservoir level could not be achieved for the timely water supply to flood flow/ irrigation canals of Srisailam reservoir. It can also be observed from Table – 2 data, the flood flows in the first weeks duration itself is sufficient to build up the required water level in Srisailam reservoir for its irrigation needs. There can also be apprehension whether adequate reservoir level can be attained to supply water to flood canals during bad monsoon when the initial monsoon flows are let in to NS reservoir. This possibility will occur when the total yearly inflows in Srisailam reservoir are less than 200 TMC whose probability is one in ten year's period. This possibility can be fairly anticipated twenty days in advance by analyzing the available upstream storages in the reservoirs of Karnataka and Maharashtra across the Krishna river. In case of unexpected circumstances, Srisailam left bank HPS could be used in pumping mode to build up the required level in Srisailam reservoir. More over there is also possibility to divert the available Tungabhadra river inflows from Sunkesula barrage to KC canal. Also water from Tungabhadra reservoir could be diverted to Pennar river in case of acute shortage.

Every year, the endeavor should be to minimize water overflow from Srisailam dam in to NS reservoir by maximizing the water usage in Srisailam HPS. There is ample scope to maximize the power generation from Srisailam HPS without affecting the irrigation benefits. This can be achieved by operating the Srisailam HPS in run off the river basis before the onset of floodwater inflows or till the water released from Srisailam HPS fills up NS reservoir. The power supply companies in the state are spending nearly eight (8) billion rupees towards power purchases from PTC etc at a price exceeding five (5) rupees per unit to avert the energy crisis. The additional power generation from the Srisailam HPS by better usage of available monsoon water before the onset of river flooding will obviate the high cost electricity purchases or improve the financial health of power utilities in the state.

A 290 MW capacity HPS is installed at the base of Almatti dam in Karnataka. If the power generation maximization plan is also implemented in this HPS by using monsoon inflows before the on set of flood flows, it will generate the badly needed additional electricity during shortage period and also improves water availability for power generation in Srisailam HPS and upcoming Jurala HPS which is a joint project of AP and Karnataka. It would be better to achieve maximum benefits from the available river water by not impounding first 100 TMC initial monsoon water flows in Almatti reservoir and released to downstream for irrigation and power generation.

References: "Krishna river water sharing accord" by N. Sasidhar.
Refer http://groups.google.co.in/group/irrigation-power-energy?hl=en

TABLE – 1: SRISAILAM RESERVOIR MONTHLY INFLOWS (in TMC ft) Source: *http://www.apgenco.com*

Year	April	May	June	July	August	September	October	November	December	January	February	March	Total
2006-07	0.9	0	10.25	288.31	1026.24	233.49	22.98	25.79	5.64	4.75	3.94	0	1622.29
2005-06	0	0.67	1.55	164.39	977.38	503.72	149.9	18.24	5.56	4.39	1.39	4.37	1831.56
2004-05	1.3	10.02	7.29	3.75	340.48	61.87	72.51	1.96	2.96	1.82	1.29	0	505.25
2003-04	2.01	2.79	1.21	1.5	40.8	34.21	8.85	0.74	2.79	2.91	3.58	2.68	104.07
2002-03	0	1.4	5.37	0.14	109.59	12.61	50.49	0.68	5.24	3.96	4.83	5.72	200.03
2001-02	2.58	3.47	2.93	23.94	110.24	98.20	239.08	7.12	7.39	2.74	1.40	0.24	499.33
2000-01	0	2.2	21.82	128.11	93.39	121.62	178.03	10.13	5.14	2.02	1.22	0.81	564.49
1999-00	11.7	9.61	15.08	275.57	309.17	48.29	192.61	19.58	4.50	4.29	2.15	2.10	894.65
1998-99	5.01	3.38	14.46	137.73	241.87	412.52	787.49	71.60	12.26	4.22	6.80	5.40	1702.74
1997-98	4.85	7.62	11.45	164.42	685.06	194.52	35.66	45.36	17.14	7.13	6.29	6.31	1185.82
Average	2.84	4.12	9.14	118.75	404.50	172.10	173.76	20.12	6.86	3.82	3.29	2.76	911.02
Average (%)	0.31	0.45	1.00	13.03	44.40	18.89	19.07	2.21	0.75	0.42	0.36	0.30	100

Calendar year	Srisailam Reservoir (Gross storage is 263.634 TMC (ft) at 885 feet Full Reservoir Level)					Nagarjuna Sagar Reservoir (Gross storage is 408.237 TMC (ft) at 590 feet Full Reservoir Level)			Srisailam Reservoir (Minimum level for power generation is 740 feet at 25 TMC gross storage)		
	Date of overflow	Reservoir level (Feet) #	Gross storage (TMC)	Dam overflow for next seven days (TMC)	Excessive storage @ on overflow date (TMC)	Water level (Feet)	Available storage (TMC)	Unfilled storage (TMC) before receiving flood flows	Date of minimum level / gross storage	Minimum reservoir level (Feet)	Minimum gross storage (TMC)
1	2	3	4	5	6	7	8	9	10	11	12
2007	08/7/07	881.7	244.07	134.95	120.04	547.2	288.20	120.04	07/6/07	806.8	54.57
2006	01/8/06	879.4	236.59	260.95	82.23	561.9	326.01	82.23	11/6/06	807.1	54.83
2005	02/8/05	873.7	204.03	338.05	175.99	509.8	205.38	202.86	25/6/05	760.0	28.04
2004	19/8/04	881.2	242.35	66.90	199.60	511.4	208.64	199.60	8/5/04	741.3	25.57

#The dam gates were opened to pass floodwater before reaching FRL to prevent flooding in upstream river stretch and for flood control. @ This value is difference of values in ‘column 4’ and ‘column 12’ or value in ‘column 9’ whichever is less. Source of data: *http://www.irrigation.ap.gov.in*

TABLE – 2: SRISAILAM AND NAGARJUNA SAGAR RESERVOIRS YEARLY WATER STORAGE DATA AT THE TIME OF FIRST OVERFLOWING AND YEARLY LOW LEVEL