

Results of Run R04-Term91¹

Executive Summary

SMUD utilized its Water Balance Model to analyze the UARP system as requested by EDCWA. This involved assessing the impact on the UARP of forcing certain additional volumes of water to Folsom Lake, above what SMUD would have delivered in the course of its normal operations.

One application of this analysis is to evaluate the potential of UARP reoperation to improve El Dorado's water supply when SWRCB "Term 91" mandated curtailments are in effect.

Results

The Water Balance Model showed that the UARP could be re-operated to provide the requested volume of water in most months. Providing this water would change the month-by-month UARP power generation.

How the study was done

We modified the UARP CHEOPS Water Balance Model as directed by EDCWA. We then ran the model in two steps to simulate UARP operation for the period of record, 1975-2001.

Results from this model run were compared to the "Base Case" model run done previously. In this analysis, costs are provided in terms of changes in UARP generation as compared to the Base Case.

Analysis Description

SMUD utilized its UARP CHEOPS Water Balance Model (Version 5.5.0.0 dated 2 April 2004) to perform the model run requested by EDCWA, which was labeled "Re-Operation EID Analysis 2." Results from Model Run Re-Operation EID Analysis 2 were compared to the Base Case (dated 3 April 2004) to "...determine if UARP operation affects such constraints and whether re-operation could improve the situation, and at what cost."

In this analysis, costs are provided in terms of changes in UARP generation as compared to the Base Case.

Note that all studies have been performed using the recent hydrology including flows depicting the proposed Project 184 operation.

Analysis Model Runs

There are three model runs required for the analysis:

Step 1: Develop a study that creates simulated "base case" flows past Chili Bar Reservoir. These flows (and UARP system performance) will represent the UARP's operation without mitigating for Term 91 diversion limitations. This base case will be used to evaluate potential impacts caused by a hypothetical re-operation of the UARP for EDCWA. This run is SMUD's Base Case study.

Step 2: The second study is based on the assumption that the UARP would need to store additional water to mitigate potential Term 91 limitations upon EDCWA's diversion rights (Table 1). This study will be referred to as Re-operation EID Analysis 1. During the driest hydrologic period for which EDCWA requests modeling (1976-77), the modeling shows the UARP fully depleting its storage within the Base Case. To be able to mitigate for Term 91 through additional releases to Folsom Lake, the study assumes the UARP would need to store an estimated additional 23,000 acre-feet of water during this critical period for the specific purpose of incrementally increasing releases (Re-operation EID Analysis 1). Stated conceptually, CHEOPS would model a modified operation of the UARP to protect the availability of the 23,000 acre-feet during 1976-77 (likely by crafting an operation that leaves system storage at the end of 1977 about 23,000 acre-feet higher than the results found for the Base Case study). This modified operation would likely affect system performance during other

¹ Please note the CHEOPS Model includes SMUD's water rights and certain basecase operational assumptions. To the extent any model run made at the request of third parties contains a modification(s) to SMUD's water rights or the basecase operational assumptions, results may differ. The fact that SMUD conducts such model runs for third parties does not mean SMUD endorses the legal, operational, or other assumptions included in , or the results of, any such third party CHEOPS model run.

years. The results of this study run (Re-operation EID Analysis 1) will provide revised base case flows past the Chili Bar Project.

Step 3: The third study, Re-operation EID Analysis 2, would impose an incremental release requirement (equal to the values provided by EDCWA in Table 1) upon the Step 2 operation each month that Term 91 is assumed to be controlling (periods also provided by EDCWA). This step is accomplished by making the total release past the Chili Bar Project (discharge, release and spill) from the Step 2 study a required flow (possibly by making it a diversion within CHEOPS) at the Chili Bar Project, and adding the incremental release requirement to the demands at that location. This approach will make the release from the Chili Bar Project equal to the Re-operation EID Analysis 1 plus the incremental release (Table 1). The demands at the Chili Bar Project become a required release from upstream UARP facilities.

Evaluation of model runs

During the critical drought period, the results should show the UARP providing an additional release, with the system reaching minimum operation storage (34,600 acre-feet) at the end of the critical drought (SMUD has now released the reserved water of Step 2 for EDCWA). Impacts during other years will vary and will also be assessed. During months of Term 91 non-control, the UARP system will eventually react to recover in accordance with the rest of the CHEOPS logic. Step 3 (Re-operation EID Analysis 2) results will be compared to Step 2 (Re-operation EID Analysis 1) results as a theoretical measure of Term 91 compliance, and Step 3 (Re-operation EID Analysis 2) results will be compared to Step 1 (Base Case) results to discover the impact of re-operation on SMUD storage and generation.

Model Run: Re-operation EID Analysis 1

The purpose of this run was to re-operate the UARP with sufficient water in storage in the UARP reservoirs to meet the water demand in EDCWA's Table 1. This run was accomplished by reducing the "Monthly Energy Reliability Objective" to create additional storage to meet EDCWA's objective.

The total volume past Chili Bar Reservoir (powerhouse release, spill, releases) for "*Re-operation EID Analysis 1*" is summed for each day of the analysis. A daily demand past Chili Bar Reservoir is created from this information as follows:

- For days with a "ZERO" El Dorado flow requirement, the flow requirement past Chili Bar Reservoir is set equal to the Chili Bar Reservoir minimum instream release.
- For a "non-zero demand day" (within months when the El Dorado release requirement from UARP is greater than zero, from Table 1 above), the El Dorado demand is added to the total volume past Chili Bar Reservoir from the "*Re-operation EID Analysis 1*".

The "daily demand" file is a string of daily data for the 26-year-long UARP Relicensing Hydrologic Period of Record (Calendar Year 1975 through 2000). This file is used to create a demand at Chili Bar Reservoir for "*Re-operation EID Analysis 2*" where:

- For months with a "ZERO" El Dorado flow requirement, the flow requirement past Chili Bar Reservoir is the minimum of either the Chili Bar Reservoir minimum instream release or the computed flow past Chili Bar Reservoir.
- For "non-zero demand months", the flow past Chili Bar Reservoir is EQUAL to the El Dorado demand plus the total volume past Chili Bar Reservoir computed in the "*Re-operation EID Analysis 1*".

Water in the UARP reservoirs is re-regulated from the "*Re-operation EID Analysis 1*" run to provide more water past Chili Bar Reservoir during "non-zero demand months" and less water past Chili Bar Reservoir during some or all of the remaining months. The minimum UARP storage for the "*Re-operation EID Analysis 2*" is equal to about 34,800 acre-feet

Model Run: Re-operation EID Analysis 2

The purpose of this run was to re-operate the UARP as done under "*Re-operation EID Analysis 1*," and including the "daily demand" at Chili Bar Reservoir. Additional modifications made for the analysis are summarized below:

- Switch on the Chili Bar Link: The Chili Bar link needs to be on so the “daily demand” at Chili Bar Reservoir is supported by the UARP.
- Put Chili Bar Powerhouse on Maintenance Year Round: The purpose of the run is to create a monthly volume objective past Chili Bar Reservoir. To avoid potential modeling assumption conflicts, the Chili Bar Powerhouse is put on maintenance.
- Turn Off Rafting below Chili Bar Reservoir: The purpose of the run is to create a monthly volume objective past Chili Bar Reservoir. To avoid potential modeling assumption conflicts, the rafting requirement is set to zero.
- To determine that the flow objective past Chili Bar Reservoir was met, the total releases below Chili Bar Reservoir (instream release, spill, powerhouse discharge and consumptive withdrawal) for the “*Re-operation EID Analysis 2*” was subtracted from “*Re-operation EID Analysis 1*” (Table 7). The difference between these two files should provide the additional flow past Chili Bar Reservoir as requested by EID in Table 1 of the Request for Water Balance Model Run.

To evaluate the impact to the UARP, results from “*Re-operation EID Analysis 2*” will be compared with the Base Case.

Summary of Results

“*Re-operation EID Analysis 2*” represents the final run, or Run 1. “*Re-operation EID Analysis 1*” is an intermediate study required to evaluate the flow past Chili Bar Reservoir. Summary tables have been provided summarizing:

- Table 2: Base Case UARP Generation
- Table 3: Re-operation EID Analysis 2 (Run 1) UARP Generation
- Table 4: UARP Generation Reduction (Base Case minus Run 1)
- Table 5: UARP Generation Reduction (Base Case minus Run 1) by existing water year type
- Table 6: UARP Generation Reduction (Base Case minus Run 1) by proposed water year type
- Table 7: Additional releases below Chili Bar Reservoir, (Re-operation EID Analysis 2 minus Re-operation EID Analysis 1) **Note:** Conditions were met or exceeded in all years with the exception of July 1983 (highlighted in pink). It appears we could not force any additional water through the units.
- Table 8: Base Case UARP System Storage (UV, IH, LL)
- Table 9: Run 1 UARP System Storage
- Table 10: UARP Reduction in System Storage (Base Case minus Run 1)

Detailed Results

Complete daily and 15-minute time series data output from the Water Balance Model are available on CD-ROM.

Table 2: Base Case UARP System Generation

System Generation		Base Case												
MWh	CY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	229,158	208,691	113,838	65,316	156,022	265,913	180,727	218,741	207,341	86,906	90,027	77,169	1,899,849	
1976	90,426	26,094	31,886	35,370	36,862	84,882	82,914	86,840	76,084	47,418	63,844	65,945	728,565	
1977	82,867	20,654	21,304	25,257	28,717	87,960	101,495	99,058	69,421	47,168	63,138	87,562	734,600	
1978	155,446	73,213	139,365	189,725	127,371	199,731	171,093	226,240	222,559	59,640	68,509	68,750	1,701,641	
1979	165,469	79,488	110,784	137,557	149,615	135,103	124,887	212,271	202,331	63,825	78,504	81,437	1,541,271	
1980	299,852	335,536	286,943	204,798	134,548	182,290	242,622	219,847	207,066	72,976	66,770	70,897	2,324,146	
1981	101,180	46,850	57,738	69,715	60,435	92,851	86,858	94,517	89,487	60,881	176,300	278,507	1,215,319	
1982	345,189	331,647	372,003	367,490	377,135	226,874	166,971	224,424	212,441	154,023	122,406	218,551	3,119,155	
1983	304,431	331,479	349,399	269,059	226,674	386,398	397,673	267,247	216,168	126,098	229,614	281,334	3,385,572	
1984	360,536	291,996	255,591	132,202	113,126	149,664	139,640	216,813	204,804	56,726	103,149	91,819	2,116,067	
1985	126,218	38,528	45,086	165,167	79,656	99,272	92,866	107,755	207,959	59,805	71,898	94,753	1,188,961	
1986	269,690	284,242	380,596	355,373	174,577	154,730	145,557	219,496	209,253	61,880	66,404	66,954	2,388,752	
1987	84,031	36,525	50,188	53,232	43,349	87,286	82,676	92,916	76,998	47,663	66,299	75,208	796,370	
1988	101,048	29,900	36,443	36,090	37,628	89,318	84,161	89,403	75,309	46,399	74,144	72,516	772,360	
1989	98,383	45,345	235,149	287,314	121,990	112,185	96,259	100,472	190,009	64,815	72,904	71,893	1,496,717	
1990	107,945	31,050	57,520	65,372	48,210	98,417	86,759	95,101	170,611	54,663	64,407	66,995	947,050	
1991	89,500	24,679	60,219	62,873	68,919	117,934	95,596	99,278	162,826	57,916	71,348	70,301	981,389	
1992	87,004	51,679	51,954	57,605	35,929	85,961	83,829	88,785	76,621	45,530	65,656	83,239	813,792	
1993	195,105	224,950	271,206	285,692	277,541	247,480	183,042	224,832	206,958	68,709	67,626	72,075	2,325,215	
1994	88,384	28,465	49,173	45,996	44,448	88,905	87,523	94,353	76,735	47,736	71,633	87,175	810,526	
1995	255,393	289,748	360,119	306,238	342,809	322,506	377,062	249,131	212,895	119,582	72,532	101,411	3,009,426	
1996	241,480	343,142	339,193	285,345	310,376	164,243	116,639	182,403	207,035	55,483	103,916	240,719	2,589,974	
1997	377,253	344,255	259,990	181,530	121,657	159,347	126,338	217,284	205,414	59,633	70,742	76,998	2,200,442	
1998	233,925	303,257	281,377	277,201	287,994	309,996	341,447	227,474	214,500	112,748	80,434	97,056	2,767,409	
1999	255,227	296,544	251,914	241,254	177,889	261,820	172,734	220,328	207,051	67,290	70,487	70,455	2,292,992	
2000	185,730	250,598	234,598	227,642	112,526	117,955	98,156	114,186	205,027	53,798	69,410	73,028	1,742,654	
Min	82,867	20,654	21,304	25,257	28,717	84,882	82,676	86,840	69,421	45,530	63,138	65,945	728,565	
Med	175,599	144,089	186,981	173,349	121,824	142,384	120,763	197,337	205,221	59,723	71,491	77,083	1,722,147	
Max	377,253	344,255	380,596	367,490	377,135	386,398	397,673	267,247	222,559	154,023	229,614	281,334	3,385,572	
Ave	189,649	168,021	180,907	170,400	142,154	166,501	152,520	164,969	169,727	69,204	85,465	105,490	1,765,008	

Table 3: Run 1 (Re-operation EID Analysis 2) UARP System Generation

System Generation		Run 1: EID Analysis 2												
MWh	CY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	229,221	208,376	113,449	64,331	155,672	266,251	183,929	221,491	210,795	76,449	86,337	75,056	1,891,356	
1976	86,947	23,651	28,976	32,446	36,471	90,338	89,152	79,491	74,767	46,595	62,730	64,772	716,338	
1977	81,481	19,686	19,247	22,343	26,822	94,918	106,539	91,526	67,896	46,643	61,846	86,296	725,245	
1978	153,993	72,926	135,244	188,418	126,740	199,259	173,161	224,876	222,343	58,056	66,406	66,116	1,687,541	
1979	168,382	78,270	110,430	137,650	149,515	137,785	124,073	210,735	201,888	62,982	77,294	79,329	1,538,334	
1980	301,433	336,030	286,785	206,535	136,477	183,639	244,653	218,198	206,855	71,637	64,840	68,362	2,325,446	
1981	98,252	44,679	56,389	68,905	60,678	96,381	93,931	86,892	87,858	60,022	176,732	279,682	1,210,402	
1982	345,282	331,869	372,281	368,429	376,264	227,534	169,958	222,931	212,284	152,917	119,288	217,957	3,116,994	
1983	309,374	331,137	349,898	269,339	230,259	386,744	397,996	266,290	215,940	125,285	228,567	281,609	3,392,435	
1984	360,743	292,003	255,542	133,204	113,392	151,634	139,652	214,453	206,556	55,555	105,433	89,009	2,117,176	
1985	126,520	35,869	42,592	165,833	79,183	99,155	93,928	104,284	205,142	62,391	70,720	92,312	1,177,928	
1986	269,799	288,214	381,057	355,491	174,376	154,120	149,070	217,948	209,141	61,292	65,267	64,361	2,390,134	
1987	80,819	34,485	48,531	51,889	42,672	90,204	89,345	85,902	75,693	46,814	65,030	72,757	784,142	
1988	97,790	27,214	33,673	33,385	36,321	92,792	88,909	82,510	74,042	45,472	72,869	70,242	755,219	
1989	95,174	42,978	239,385	286,526	125,755	117,244	99,065	93,689	177,853	64,180	71,985	69,344	1,483,178	
1990	105,282	28,494	56,135	64,911	47,814	102,307	95,527	88,327	166,180	53,811	63,187	64,812	936,787	
1991	86,661	23,088	58,403	62,278	70,161	121,188	105,806	92,172	158,683	57,106	70,215	67,647	973,407	
1992	83,856	50,000	50,337	56,594	34,585	89,051	91,220	80,738	75,294	44,682	64,305	81,365	802,027	
1993	195,683	223,531	273,067	285,395	281,595	243,000	182,928	218,721	206,598	70,223	65,464	69,589	2,315,792	
1994	85,549	26,042	47,068	43,907	43,905	91,540	92,892	87,291	75,450	46,996	70,313	84,619	795,572	
1995	254,686	293,294	361,815	303,018	340,680	321,288	379,113	247,967	212,679	119,094	69,746	100,039	3,003,418	
1996	243,904	343,725	338,810	286,397	311,803	166,370	117,984	179,246	206,958	54,771	102,479	239,691	2,592,136	
1997	377,712	344,453	259,836	181,623	121,523	162,796	125,564	214,697	206,459	55,700	69,634	74,751	2,194,748	
1998	235,872	303,351	282,301	277,456	282,020	311,354	342,604	226,170	214,277	112,512	79,138	95,303	2,762,358	
1999	253,850	299,293	254,265	240,840	177,206	261,928	175,682	220,351	206,864	64,918	69,220	67,680	2,292,097	
2000	187,739	250,422	234,976	227,352	112,876	120,247	100,010	110,172	205,138	53,318	68,149	70,594	1,740,993	
Min	80,819	19,686	19,247	22,343	26,822	89,051	88,909	79,491	67,896	44,682	61,846	64,361	716,338	
Med	178,061	143,323	185,110	173,728	123,639	144,709	121,029	194,990	205,800	59,039	69,980	74,904	1,714,267	
Max	377,712	344,453	381,057	368,429	376,264	386,744	397,996	266,290	222,343	152,917	228,567	281,609	3,392,435	
Ave	189,077	167,426	180,404	169,788	142,106	168,426	155,873	161,041	168,601	68,055	84,123	103,588	1,758,508	

Table 4: UARP System Generation, Difference Base Case minus Run 1 (Re-operation EID Analysis 2)

System Generation MWh	Difference BaseCase minus Run 1 (EID Analysis 2)												Total
CY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1975	-62	315	389	985	350	-337	-3,201	-2,750	-3,454	10,457	3,689	2,113	8,493
1976	3,479	2,442	2,910	2,924	390	-5,456	-6,238	7,349	1,317	823	1,115	1,173	12,227
1977	1,386	967	2,057	2,914	1,896	-6,959	-5,045	7,532	1,525	525	1,291	1,266	9,355
1978	1,452	286	4,120	1,307	631	471	-2,068	1,365	215	1,584	2,103	2,634	14,100
1979	-2,914	1,218	354	-93	100	-2,681	814	1,536	443	843	1,210	2,108	2,937
1980	-1,581	-494	158	-1,738	-1,929	-1,350	-2,031	1,648	211	1,339	1,930	2,535	-1,300
1981	2,928	2,171	1,349	810	-243	-3,530	-7,072	7,625	1,628	859	-432	-1,176	4,917
1982	-93	-222	-278	-939	871	-660	-2,987	1,493	158	1,106	3,117	594	2,161
1983	-4,943	342	-499	-281	-3,585	-346	-323	957	228	813	1,047	-275	-6,863
1984	-208	-6	49	-1,002	-266	-1,969	-11	2,359	-1,752	1,171	-2,284	2,810	-1,109
1985	-303	2,659	2,494	-666	473	118	-1,062	3,471	2,817	-2,587	1,178	2,441	11,033
1986	-108	-3,972	-461	-118	201	610	-3,513	1,548	112	588	1,137	2,594	-1,383
1987	3,212	2,039	1,658	1,343	676	-2,918	-6,668	7,013	1,304	849	1,269	2,450	12,227
1988	3,258	2,686	2,770	2,705	1,308	-3,474	-4,748	6,893	1,266	927	1,276	2,274	17,140
1989	3,209	2,367	-4,237	788	-3,764	-5,059	-2,807	6,783	12,155	634	919	2,550	13,539
1990	2,663	2,556	1,385	462	396	-3,890	-8,767	6,774	4,430	852	1,220	2,183	10,263
1991	2,839	1,590	1,815	595	-1,242	-3,254	-10,210	7,107	4,143	810	1,134	2,654	7,981
1992	3,148	1,679	1,617	1,011	1,345	-3,090	-7,391	8,047	1,327	847	1,351	1,874	11,764
1993	-578	1,419	-1,861	298	-4,054	4,480	113	6,112	359	-1,514	2,163	2,485	9,423
1994	2,835	2,423	2,105	2,089	544	-2,635	-5,369	7,061	1,285	739	1,320	2,556	14,954
1995	706	-3,545	-1,696	3,220	2,129	1,218	-2,051	1,164	216	488	2,787	1,372	6,008
1996	-2,424	-582	384	-1,052	-1,427	-2,127	-1,345	3,157	77	712	1,437	1,028	-2,162
1997	-459	-199	154	-93	135	-3,448	774	2,587	-1,045	3,933	1,108	2,247	5,694
1998	-1,947	-93	-924	-255	5,975	-1,358	-1,157	1,304	223	236	1,296	1,753	5,051
1999	1,376	-2,749	-2,351	414	682	-108	-2,949	-24	187	2,372	1,267	2,775	895
2000	-2,009	177	-379	290	-350	-2,293	-1,854	4,014	-111	480	1,261	2,434	1,661
Min	-4,943	-3,972	-4,237	-1,738	-4,054	-6,959	-10,210	-2,750	-3,454	-2,587	-2,284	-1,176	-6,863
Med	322	655	369	438	370	-2,210	-2,878	3,314	294	833	1,268	2,260	6,995
Max	3,479	2,686	4,120	3,220	5,975	4,480	814	8,047	12,155	10,457	3,689	2,810	17,140
Ave	572	595	503	612	48	-1,925	-3,353	3,928	1,126	1,150	1,343	1,902	6,500

In this table:

- A positive number indicates that more system generation would occur under the base case scenario.
- A negative number indicates that more system generation would occur under the re-operation scenario

Table 5: Difference in UARP System Generation Base Case minus Run 1(Re-operation EID Analysis 2) Rank Ordered by Wetness and Existing Water Year Types

Difference BaseCase minus Run 1							
System Generation							
MWh	Rank Ordered by Existing Wetness and Existing FERC						
CY	Q1	Q2	Q3	Q4	Annual Total		
1983	-5,099	-4,211	862	1,585	-6,863	6300	D
1982	-593	-728	-1,336	4,818	2,161	5970	D
1995	-4,534	6,567	-671	4,647	6,008	5280	D
1997	-504	-3,406	2,316	7,288	5,694	4890	D
1986	-4,542	694	-1,853	4,318	-1,383	4790	D
1980	-1,917	-5,017	-171	5,805	-1,300	4040	D
1998	-2,965	4,362	370	3,284	5,051	4020	D
1984	-165	-3,237	596	1,697	-1,109	3890	D
1978	5,859	2,409	-488	6,321	14,100	3605	D
1996	-2,623	-4,606	1,889	3,177	-2,162	3460	D
1993	-1,020	724	6,585	3,135	9,423	3440	D
1999	-3,724	989	-2,785	6,415	895	3380	D
1975	642	998	-9,406	16,259	8,493	2730	D
2000	-2,211	-2,352	2,049	4,175	1,661	2660	D
1989	1,339	-8,035	16,132	4,103	13,539	2280	D
1979	-1,343	-2,675	2,793	4,161	2,937	1975	C
1985	4,849	-74	5,225	1,033	11,033	1660	C
1981	6,448	-2,963	2,181	-749	4,917	1210	B
1991	6,245	-3,901	1,040	4,598	7,981	1120	B
1990	6,604	-3,032	2,437	4,254	10,263	1030	B
1992	6,443	-734	1,982	4,072	11,764	1020	B
1987	6,909	-899	1,649	4,568	12,227	860	A
1994	7,363	-1	2,977	4,616	14,954	850	A
1988	8,714	538	3,412	4,476	17,140	825	A
1976	8,831	-2,142	2,428	3,110	12,227	700	A
1977	4,410	-2,149	4,012	3,082	9,355	300	A
Ave D	-1,470	-990	939	5,135	3,614		
Ave C	1,753	-1,375	4,009	2,597	6,985		
Ave B	6,435	-2,657	1,910	3,044	8,731		
Ave A	7,245	-931	2,896	3,971	13,181		
Average	1,670	-1,265	1,701	4,394	6,500		

In this table:

- A positive number indicates that more system generation would occur under the base case scenario.
- A negative number indicates that more system generation would occur under the re-operation scenario

Table 6: Difference in UARP System Generation Base Case minus Run 1(Re-operation EID Analysis 2) Rank Ordered by Wetness and Proposed Water Year Types

Difference BaseCase minus Run 1							
System Generation							
MWh	Rank Ordered by 5-Year Type Classification						
CY	Q1	Q2	Q3	Q4	Annual Total		
1983	-5,099	-4,211	862	1,585	-6,863	6300	E
1982	-593	-728	-1,336	4,818	2,161	5970	E
1995	-4,534	6,567	-671	4,647	6,008	5280	E
1997	-504	-3,406	2,316	7,288	5,694	4890	E
1986	-4,542	694	-1,853	4,318	-1,383	4790	E
1980	-1,917	-5,017	-171	5,805	-1,300	4040	E
1998	-2,965	4,362	370	3,284	5,051	4020	E
1984	-165	-3,237	596	1,697	-1,109	3890	E
1978	5,859	2,409	-488	6,321	14,100	3605	E
1996	-2,623	-4,606	1,889	3,177	-2,162	3460	D
1993	-1,020	724	6,585	3,135	9,423	3440	D
1999	-3,724	989	-2,785	6,415	895	3380	D
1975	642	998	-9,406	16,259	8,493	2730	D
2000	-2,211	-2,352	2,049	4,175	1,661	2660	D
1989	1,339	-8,035	16,132	4,103	13,539	2280	C
1979	-1,343	-2,675	2,793	4,161	2,937	1975	C
1985	4,849	-74	5,225	1,033	11,033	1660	B
1981	6,448	-2,963	2,181	-749	4,917	1210	B
1991	6,245	-3,901	1,040	4,598	7,981	1120	B
1990	6,604	-3,032	2,437	4,254	10,263	1030	B
1992	6,443	-734	1,982	4,072	11,764	1020	B
1987	6,909	-899	1,649	4,568	12,227	860	A
1994	7,363	-1	2,977	4,616	14,954	850	A
1988	8,714	538	3,412	4,476	17,140	825	A
1976	8,831	-2,142	2,428	3,110	12,227	700	A
1977	4,410	-2,149	4,012	3,082	9,355	300	A
Ave E	-1,607	-285	-42	4,418	2,484		
Ave D	-1,787	-850	-334	6,632	3,662		
Ave C	-2	-5,355	9,462	4,132	8,238		
Ave B	6,118	-2,141	2,573	2,642	9,192		
Ave A	7,245	-931	2,896	3,971	13,181		
Average	1,670	-1,265	1,701	4,394	6,500		

In this table:

- A positive number indicates that more system generation would occur under the base case scenario.
- A negative number indicates that more system generation would occur under the re-operation scenario

Table 7: Comparison of Flow below Chili Bar Reservoir

Year Type	Comparison of Flow Below Chili Bar Acre-feet												Total
	CY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
4 1975	15	38	322	1	1	1	1,840	-2,797	233	196	329	12	192
1 1976	1	459	486	729	2,497	3,609	4,054	-7,744	62	197	653	-1,129	3,875
1 1977	1,007	459	486	729	2,497	3,609	4,054	-7,788	-163	492	735	-609	5,508
4 1978	-318	-25	-5,055	-3,956	-56	-823	2,684	-2,305	-335	1,080	125	2	-8,982
3 1979	84	1	1	1	1	3,609	1,840	-6,947	821	-717	1,351	1	46
4 1980	359	116	1	1	1	1	1,840	-3,179	165	551	75	51	-17
2 1981	1	1	1	1	2,497	3,609	4,054	-7,235	-3,974	-160	1,071	318	185
4 1982	1	188	1	-41	-106	1	1,840	-3,224	284	948	231	-105	19
4 1983	152	54	-40	1	-232	72	1,497	-2,058	-557	1,105	155	-28	120
3 1984	1	1	1	1	1	3,609	1,840	-6,227	154	-1,057	1,489	2	-185
3 1985	1	1	1	1	1	3,609	1,840	-5,821	-1,081	254	1,100	52	-41
4 1986	1	186	63	1	1	1	1,840	-2,397	-733	383	525	6	-123
2 1987	1	1	1	1	2,497	3,609	4,054	-7,216	-248	282	954	283	4,219
2 1988	1	1	1	1	2,497	3,609	4,054	-7,799	-221	572	728	130	3,574
3 1989	1	1	-301	1	1	3,609	1,840	-6,091	-7,557	-273	1,323	1	-7,445
2 1990	1	1	1	1	2,497	3,609	4,054	-6,663	-3,937	-1,010	1,301	116	-29
2 1991	1	1	14	1	2,497	3,609	4,054	-5,939	-5,519	456	742	151	68
2 1992	1	1	1	1	2,497	3,609	4,054	-7,028	-156	267	820	140	4,207
4 1993	104	137	-1,616	66	166	-2,729	2,193	-2,627	-501	708	90	7	-4,001
2 1994	1	1	1	1	2,497	3,609	4,054	-7,734	-105	536	526	328	3,715
4 1995	-568	-3,658	70	90	-14	-6	2,193	-3,105	504	1,183	1	1	-3,308
3 1996	1	-169	1	1	27	3,609	1,840	-6,328	-710	42	1,337	-63	-413
3 1997	283	1	1	1	1	3,609	1,840	-6,458	-74	-151	1,001	1	55
4 1998	104	211	-18	1	3	-135	1,840	-3,286	699	145	402	82	48
4 1999	61	550	1	1	1	1	1,840	-3,296	-50	256	472	1	-163
3 2000	189	304	1	1	1	3,609	1,840	-7,210	97	428	729	4	-8
Min	-568	-3,658	-5,055	-3,956	-232	-2,729	1,497	-7,799	-7,557	-1,057	1	-1,129	-8,982
Med	1	1	1	1	1	3,609	1,840	-6,159	-160	274	728	5	33
Max	1,007	550	486	729	2,497	3,609	4,054	-2,058	821	1,183	1,489	328	5,508
Ave	57	-44	-214	-91	857	2,082	2,653	-5,327	-881	258	702	-9	43

In this table:

- A positive number indicates that more system generation would occur under the base case scenario.
- A negative number indicates that more system generation would occur under the re-operation scenario
- Highlighted cells indicate months when Term 91 constraints are imposed

Table 8: Base Case System Storage (Union Valley Reservoir, Loon Lake and Ice House Reservoir)

UV, IH, LL Storage		Base Case											
AF	CY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1975	165,815	129,467	142,533	165,820	306,696	372,189	347,894	287,123	228,030	222,694	215,826	205,678
	1976	194,614	198,992	213,424	239,626	273,824	252,380	225,540	200,416	180,723	167,513	148,689	130,373
	1977	113,850	114,409	116,540	134,927	156,944	145,663	119,626	93,116	73,034	59,425	41,730	52,452
	1978	69,285	86,191	142,137	185,325	303,878	366,476	347,640	284,750	225,151	208,883	190,678	174,649
	1979	163,499	165,234	183,204	232,627	362,250	377,260	347,908	284,510	223,914	213,161	206,852	200,624
	1980	255,748	228,179	197,112	237,354	333,918	378,921	352,223	292,122	232,374	210,763	192,628	179,206
	1981	166,978	184,492	205,135	267,505	318,779	303,562	276,608	249,295	223,966	211,788	261,419	282,648
	1982	222,836	236,394	206,740	218,301	300,624	356,285	347,818	290,885	246,003	234,459	240,546	235,088
	1983	195,530	159,088	162,406	172,378	306,008	384,896	360,099	312,306	259,259	228,698	285,806	291,584
	1984	243,710	197,257	196,230	230,867	336,701	367,660	345,740	282,389	222,564	211,162	220,137	212,469
	1985	196,781	205,683	224,731	289,384	350,969	342,401	315,209	284,445	224,094	210,031	197,863	202,504
	1986	208,083	287,325	286,408	270,461	342,249	375,346	347,769	284,394	224,706	212,169	194,021	177,262
	1987	161,965	173,460	194,275	253,449	288,139	268,179	241,868	214,934	194,517	181,247	163,784	156,738
	1988	153,370	164,024	188,018	219,011	243,552	229,601	203,341	176,516	156,104	142,467	134,961	125,036
	1989	113,440	124,347	199,523	250,100	311,878	330,976	308,400	280,941	224,744	213,360	200,303	187,985
	1990	185,298	191,232	224,707	287,867	326,789	325,564	301,264	274,242	223,996	208,898	190,155	171,881
	1991	154,159	152,884	184,068	226,301	301,395	319,611	298,335	271,732	223,936	210,731	197,281	181,771
	1992	166,487	182,860	211,726	267,895	285,457	264,812	239,519	212,466	192,062	179,403	162,921	153,920
	1993	158,682	132,887	175,931	221,424	330,851	371,644	347,833	287,884	229,149	210,433	191,601	176,647
	1994	163,020	165,988	192,106	236,705	281,171	264,128	237,338	210,250	189,679	176,196	165,041	156,783
	1995	185,940	160,104	181,250	219,811	294,748	376,741	359,798	311,423	256,134	218,883	199,841	199,906
	1996	185,815	196,775	189,901	236,880	322,265	348,888	333,094	282,410	222,887	208,056	219,314	270,927
	1997	292,355	241,130	242,743	290,619	367,748	376,872	347,957	284,498	224,778	209,342	195,238	183,630
	1998	195,568	157,617	167,146	191,696	261,727	377,132	359,233	304,308	247,946	216,301	209,295	209,054
	1999	196,350	175,008	168,387	192,908	324,816	372,730	347,831	287,625	228,905	210,689	195,594	180,001
	2000	183,897	184,556	184,525	232,775	332,685	337,623	314,552	282,280	222,840	208,285	191,455	177,493
Min		69,285	86,191	116,540	134,927	156,944	145,663	119,626	93,116	73,034	59,425	41,730	52,452
Med		184,598	174,234	191,004	232,701	309,287	352,587	339,417	283,402	224,045	210,561	195,416	180,886
Max		292,355	287,325	286,408	290,619	367,748	384,896	360,099	312,306	259,259	234,459	285,806	291,584
Ave		180,503	176,753	191,573	229,693	306,387	330,290	306,709	262,587	215,442	199,425	192,807	187,550

Table 9: Run 1(Re-operation EID Analysis 2) System Storage (Union Valley Reservoir, Loon Lake and Ice House Reservoir)

LL, IH, UV Storage		Run 1: EID Analysis 2											
Acre-feet	CY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1975	165,817	129,470	142,606	165,994	306,967	372,502	347,894	284,526	223,951	221,320	215,910	206,160
	1976	195,497	199,980	214,511	240,814	275,105	252,030	222,629	198,022	178,736	165,799	147,376	129,463
	1977	113,340	113,998	116,229	134,719	156,835	144,085	115,558	89,570	69,901	56,565	39,271	50,393
	1978	67,625	84,633	141,761	185,326	303,981	366,693	347,640	284,749	225,151	209,111	191,304	175,675
	1979	163,500	165,263	183,203	232,628	362,322	377,478	347,910	284,509	223,915	213,409	207,503	201,675
	1980	256,451	228,930	197,711	237,355	333,999	378,924	352,223	292,101	232,368	210,958	193,216	180,200
	1981	168,373	185,985	206,728	269,195	320,570	305,263	275,554	248,743	223,960	212,038	261,741	282,458
	1982	222,653	236,213	206,564	217,855	301,587	357,040	347,820	291,289	246,363	234,785	241,103	236,737
	1983	194,818	158,277	163,567	173,540	306,149	384,898	360,099	312,304	259,252	228,704	285,958	291,739
	1984	243,862	197,411	196,381	230,878	336,810	368,268	345,741	282,389	222,566	211,403	220,138	212,707
	1985	196,781	205,772	224,923	289,384	351,054	342,987	315,815	284,472	225,126	210,653	198,886	203,929
	1986	209,094	287,257	286,407	270,458	342,308	375,909	347,769	284,395	224,706	212,401	194,652	178,291
	1987	163,393	174,984	195,895	255,171	289,951	269,728	240,592	214,161	194,144	181,147	164,085	157,440
	1988	154,470	165,234	189,323	220,412	245,051	230,890	202,109	175,785	155,775	142,412	135,307	125,782
	1989	114,585	125,590	199,528	250,131	310,308	328,117	304,057	277,115	224,745	213,598	200,941	189,021
	1990	186,731	192,769	226,336	289,597	328,617	327,155	299,481	272,965	223,996	209,152	190,812	172,938
	1991	155,618	154,440	185,719	228,048	303,235	320,948	296,529	270,430	223,936	210,975	197,926	182,816
	1992	167,932	184,404	213,367	269,638	287,297	266,234	238,126	211,574	191,574	179,186	163,107	154,504
	1993	158,990	133,238	175,878	221,345	329,388	371,066	347,831	289,255	230,520	211,191	192,756	178,202
	1994	164,976	168,044	194,257	238,951	283,517	266,540	237,130	210,538	190,363	177,148	166,393	158,536
	1995	187,887	159,555	180,356	220,778	295,538	377,317	359,789	311,423	256,142	218,912	200,271	200,732
	1996	186,031	196,988	189,820	236,815	322,565	349,384	333,679	282,409	222,887	208,296	219,625	270,845
	1997	292,355	241,130	242,748	290,620	367,780	376,875	347,956	284,498	223,777	209,330	195,625	184,413
	1998	195,768	157,813	167,336	191,886	263,801	377,154	359,232	304,310	247,941	216,379	209,776	209,938
	1999	197,735	174,871	168,247	192,928	324,857	372,845	347,831	286,677	227,947	210,665	195,977	180,788
	2000	183,986	184,635	184,525	232,776	332,789	338,221	314,903	282,286	222,841	208,529	192,097	178,539
Min		67,625	84,633	116,229	134,719	156,835	144,085	115,558	89,570	69,901	56,565	39,271	50,393
Med		185,009	174,927	192,038	232,702	308,638	353,212	339,710	283,402	223,955	210,812	195,801	181,802
Max		292,355	287,257	286,407	290,620	367,780	384,898	360,099	312,304	259,252	234,785	285,958	291,739
Ave		181,087	177,188	192,074	230,279	307,015	330,713	305,996	261,942	215,099	199,387	193,144	188,228

Table 10: System Storage (Union Valley Reservoir, Loon Lake and Ice House Reservoir), Difference Base Case minus Run 1 (Re-operation EID Analysis 2)

LL, IH, UV Storage Acre-feet		Difference BaseCase minus Run 1 (EID Analysis 2)										
CY	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1975	-2	-2	-73	-174	-271	-313	0	2,597	4,079	1,374	-84	-482
1976	-883	-988	-1,087	-1,188	-1,281	350	2,912	2,394	1,987	1,714	1,312	910
1977	510	411	311	208	109	1,579	4,068	3,546	3,133	2,860	2,459	2,059
1978	1,660	1,558	376	-1	-104	-218	0	1	0	-228	-626	-1,026
1979	-1	-29	1	-1	-73	-218	-1	1	-1	-248	-651	-1,051
1980	-703	-751	-599	-1	-81	-3	0	21	6	-195	-588	-993
1981	-1,395	-1,493	-1,593	-1,690	-1,791	-1,700	1,054	552	6	-249	-323	190
1982	183	181	176	446	-963	-755	-1	-404	-360	-326	-557	-1,649
1983	712	810	-1,160	-1,162	-142	-1	0	3	8	-6	-153	-156
1984	-152	-154	-151	-12	-109	-609	-1	0	-2	-241	-1	-238
1985	0	-88	-192	0	-85	-586	-605	-27	-1,032	-622	-1,023	-1,425
1986	-1,011	68	1	3	-60	-562	0	-1	0	-232	-630	-1,030
1987	-1,427	-1,524	-1,621	-1,723	-1,812	-1,549	1,276	774	373	100	-300	-701
1988	-1,100	-1,210	-1,306	-1,402	-1,499	-1,289	1,232	731	329	56	-346	-745
1989	-1,145	-1,243	-5	-31	1,569	2,859	4,343	3,826	-1	-238	-638	-1,036
1990	-1,432	-1,537	-1,630	-1,730	-1,829	-1,591	1,783	1,277	0	-254	-657	-1,057
1991	-1,459	-1,556	-1,651	-1,746	-1,840	-1,337	1,806	1,301	0	-244	-645	-1,045
1992	-1,445	-1,544	-1,640	-1,742	-1,839	-1,422	1,394	892	487	217	-187	-585
1993	-308	-351	53	79	1,463	578	1	-1,371	-1,370	-758	-1,155	-1,555
1994	-1,956	-2,055	-2,150	-2,246	-2,346	-2,413	208	-289	-684	-952	-1,353	-1,753
1995	-1,947	550	894	-967	-790	-576	8	0	-9	-29	-430	-827
1996	-216	-213	82	65	-300	-496	-585	1	0	-241	-312	82
1997	0	0	-5	-1	-31	-3	1	0	1,000	12	-387	-783
1998	-200	-196	-190	-189	-2,074	-22	1	-3	4	-78	-481	-884
1999	-1,385	137	140	-21	-41	-115	0	948	958	23	-382	-786
2000	-89	-79	0	-1	-104	-598	-351	-6	-1	-245	-643	-1,045
Min	-1,956	-2,055	-2,150	-2,246	-2,346	-2,413	-605	-1,371	-1,370	-952	-1,353	-1,753
Med	-506	-175	-112	-26	-206	-529	1	2	0	-230	-455	-855
Max	1,660	1,558	894	446	1,569	2,859	4,343	3,826	4,079	2,860	2,459	2,059
Ave	-584	-435	-501	-586	-628	-423	713	645	343	37	-338	-677

In this table:

- A positive number indicates that system storage would be greater under the base case scenario.
- A negative number indicates that system storage would be greater under the re-operation scenario