BATTLE CREEK HYDROELECTRIC PROJECT

FERC NO. 1121

LICENSE AMENDMENT APPLICATION

EXHIBIT B

STATEMENT OF PROJECT OPERATON

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The Project Operation information that follows is based on historical operation and anticipated characteristics following implementation of the modifications associated with Phase 1A of the Salmon and Steelhead Restoration Project (Restoration Project).

B.1 PROJECT STRUCTURES

The Hydroelectric Project consists of five developments that divert water from the North and South Forks of Battle Creek and a number of tributaries and springs for power generation at Volta, Volta 2, South, Inskip, and Coleman powerhouses. Project facilities include the Volta Development, Volta 2 Development, South Development, Inskip Development, and Coleman Development.

The Volta Development consists of North Battle Creek Feeder Diversion Dam and Reservoir, Macumber Dam and Reservoir, Loomis Mill Diversion Dam, Shingle Creek Diversion Dam, Al Smith Diversion Dam, Lower Mill Creek Diversion Dam, Keswick Diversion Dam, and approximately 12.5 miles of canals conveying water to two separate forebays (Lake Grace and Lake Nora) leading to a powerhouse with a single generator with a capacity of 9.0 MW and heads of 1,264 feet and 1,216 feet provided by the independent penstocks from the forebays.

The Volta 2 Development consists of approximately 0.6 mile of canal leading to a powerhouse with a single generator with a capacity of 0.9 MW and head of 125 feet.

The South Development consists of North Battle Creek Feeder Diversion Dam, South Diversion Dam, Soap Creek Diversion Dam, Bramlett-Bristol-Benton Diversion Dam (Digger Creek Feeder), and Upper Ripley Creek Diversion Dam. There are approximately 11 miles of canals leading to a powerhouse with a single generator with a capacity of 7.0 MW and a head of 516 feet. New fish screens and fish ladder modifications will be completed at North Battle Creek Feeder Diversion Dam.

The Inskip Development consists of Inskip Diversion Dam, Eagle Canyon Diversion Dam, and Lower Ripley Creek Diversion Dam. There are approximately 7 miles of canal and tunnels leading to a powerhouse with a single generator with a capacity of 8.0 MW and a head of 383 feet. New fish screens and fish ladder modifications will be completed at Eagle Canyon Diversion Dam. A section of the Eagle Canyon Canal will be abandoned in place and replaced with a 4,500-foot buried pipeline.

The Coleman Development consists of Coleman Diversion Dam, Wildcat Diversion Dam, Pacific Power Diversion Dam, Asbury Diversion Dam, Coleman Forebay Dam and Reservoir, and approximately 12.8 miles of canal, tunnels, and pipelines conveying water to a forebay leading to a powerhouse with a single generator with a capacity of 13.0 MW and a head of 482 feet. Wildcat Diversion Dam, and approximately 1.9 miles of pipe and

canals, will be decommissioned as part of the Phase 1A Restoration Project. A total of 10.9 miles of canals will remain after the Phase 1A Restoration Project facility modifications are completed.

While numerous modifications are proposed to be made to Hydroelectric Project dams, water conveyance facilities, and minimum instream flow requirements, this license amendment application does not contemplate any physical modification or relocation of the powerhouses. All five powerhouses have semiautomatic operation with automatic shutdown and manual start-up capabilities, and are base-loaded, run-of-river/canal facilities. Approximate annual plant factors for the historical conditions and following implementation of the Phase 1A Restoration Project modifications are shown in Table B-1.

TABLE B-1 HISTORICAL AND POST–PHASE 1A ANNUAL PLANT FACTORS

Powerhouse	Historical Annual Plant Factor, Percent	Proposed Phase 1A Annual Plant Factor, Percent
Volta	67	67
Volta 2	70	70
South	72	54
Inskip	71	50
Coleman	69	62[1]
Total Project	70	59

Note 1: Reduction in Annual Plant Factor shown is the result of an increase to the minimum instream release made at this location under the Interim Flow Agreement (agreement between PG&E and Reclamation) as part of the Restoration Project.

During adverse, mean, and high water years, the Hydroelectric Project is operated run-of-river using available water in excess of instream flow requirements, up to the capacity of the conveyance system, for energy production. In high water and average years,

streamflows commonly exceed powerhouse hydraulic capacities for several months during the spring runoff. Even during below-average water years, streamflows in excess of the hydraulic capacities of the powerhouses are not uncommon. Powerhouse spills do not normally occur during extreme dry years.

B.2 PROJECT DEPENDABLE CAPACITY AND AVERAGE ANNUAL ENERGY

Table B-2 illustrates the historical and anticipated average annual energy and dependable capacity for the five developments based on the No Action Alternative and following implementation of the Phase 1A Restoration Project modifications.

TABLE B-2 VOLTA, VOLTA 2, SOUTH, INSKIP, AND COLEMAN GENERATION SUMMARY

	Average Annual Energy, GWh		Dependable Capacity, MW	
Powerhouse	No Action Alternative	Proposed Phase 1A	No Action Alternative	Proposed Phase 1A
Volta	53.2	53.2	3.2	3.2
Volta 2	5.5	5.5	0.3	0.3
South	44.4	33.3	2.5	1.9
Inskip	50.1	35.1	2.8	2.0
Coleman	78.2	70.4	4.6	4.1
Total	231.4	197.5	13.5	11.5

Dependable capacity is the load-carrying ability of a hydroelectric plant under adverse hydrologic conditions for the specified time interval and period of a particular electric system load. The dependable capacity for this Hydroelectric Project is based on its load-carrying ability during a representative dry year (e.g., 1994) coincident with the

Licensee's peak electric system load. Currently, the peak system load occurs during summer heat storms, typically in July or August in the Licensee's service territory.

Streamflow Data: The historical minimum, mean, and maximum recorded flows in the Hydroelectric Project watershed, in cfs, are shown in the flow records at the end of this section. They include the historical USGS 11376550 Battle Creek below Coleman Fish Hatchery near Cottonwood, California, gage records. This gage represents the total available watershed flows. A flow duration curve is also provided.

Project Impoundment Data. Exhibit Drawings L-1, L-2, L-3, L-4, and L-11 show the area-capacity curves for the reservoirs the Licensee proposes to continue operating: North Battle Creek Reservoir, Macumber Reservoir, Lake Grace, Lake Nora, and Coleman Forebay, respectively. The diversion dams to be decommissioned have no significant storage capacity. North Battle Creek Reservoir provides a gross and usable storage of 1,090 acre-feet. Macumber Reservoir provides a gross and usable storage of 430 acre-feet. Lake Grace has a gross and usable storage of 46.5 acre-feet. Lake Nora has a gross and usable storage of 14.9 acre-feet. These reservoirs provide storage for all downstream Project powerhouses. Coleman Forebay has a gross and usable storage of 76.4 acre-feet for Coleman Powerhouse.

Project Hydraulic Capacity. The normal maximum flow through Volta Powerhouse is estimated to be 115 cfs; Volta 2 is estimated to be 115 cfs; South is estimated to be 190

cfs; Inskip is estimated to be 270 cfs; and Coleman is estimated to be 340 cfs. During high-flow events, the maximum flow through all five powerhouses can temporarily exceed these values.

Project Tailwater Rating Curve. There are no tailwater effects affecting any of the five Hydroelectric Project powerhouses under normal operating conditions.

Project Capability Verses Head. Water surface elevations at the powerhouse intakes vary within an operating range of only a few inches. Consequently, the capability vs. head is virtually constant. The capability of each powerhouse at its normal maximum flow vs. its associated gross head is shown in Table B-3 below.

TABLE B-3 PLANT CAPABILITY VERSES HEAD

Powerhouse	**Head** (feet)	**Output** (MW)
Volta	1,264[1]/1,216[2]	9.0
Volta 2	125	0.9
South	516	7.0
Inskip	383	8.0
Coleman	482	13.0
Total		37.9

Notes:
1 From Lake Grace
2 From Lake Nora

B.3 PROJECT UTILIZATION

The Licensee historically has had responsibility for generating, purchasing, transmitting and distributing electricity to its customers. Beginning in 1998, the California Independent System Operator (ISO) took responsibility for operating the transmission system throughout California to provide reliable electricity service at minimum cost. The Hydroelectric Project is operated in conjunction with the Licensee's other generating resources to help meet the electricity demands of its customers.

B.4 PROPOSED FUTURE DEVELOPMENTS

The Licensee is continuing its ongoing evaluation of hydroelectric projects, and if further development appears feasible, the Licensee will amend the Hydroelectric Project license accordingly. At this time, no new hydroelectric projects are anticipated.

TABLE B-4 MEAN OF DAILY MEAN VALUES (40 YEAR RECORD)

Main Stem Battle Creek Flows Below Coleman National Fish Hatchery (USGS 11-765.50) in CFS												
Day Of Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	530	744	873	702	678	599	398	285	258	269	302	554
2	457	709	807	667	647	575	393	282	256	268	301	510
3	508	753	793	627	630	562	390	281	254	272	306	558
4	540	688	817	619	618	558	381	280	252	270	309	534
5	601	653	818	620	616	563	376	278	253	269	317	458
6	524	693	729	723	612	553	372	277	253	270	324	419
7	550	712	684	712	614	550	367	274	252	278	340	428
8	573	658	826	677	625	533	365	273	256	277	334	442
9	764	699	894	655	673	526	363	272	258	275	379	454
10	745	638	848	650	635	533	356	270	256	282	420	526
11	620	628	888	693	624	561	347	270	255	305	478	525
12	696	721	789	645	618	523	343	270	256	385	447	551
13	891	850	810	635	604	509	340	267	258	346	404	486
14	956	929	748	665	601	497	338	265	260	317	414	497
15	979	866	699	643	599	501	334	265	262	300	403	531
16	1344	772	719	636	629	494	335	265	264	300	549	457
17	875	888	721	631	629	481	332	263	268	295	467	605
18	817	879	673	636	631	476	329	264	286	286	466	487
19	822	929	669	632	632	468	325	268	269	285	400	558
20	861	835	658	617	613	457	321	269	270	286	413	526
21	900	840	649	607	618	448	318	268	265	289	383	629
22	769	734	687	599	628	439	314	266	264	290	392	704
23	878	730	666	599	610	431	309	264	268	320	497	659
24	957	664	737	619	615	425	306	261	270	309	506	766
25	687	656	772	625	624	419	302	260	272	332	428	694
26	838	628	717	610	615	421	299	259	274	330	415	602
27	862	676	677	610	615	418	296	259	277	304	418	544
28	718	730	662	607	643	410	294	258	273	318	505	524
29	713	901	679	736	617	415	293	257	269	313	515	556
30	744		714	639	594	402	289	256	269	324	499	555
31	722		686		612		286	259		310		513

1 -- Available period of record may be less than value shown for certain days of the year.

TABLE B-5 HISTORICAL MONTHLY MEAN STREAMFLOW VALUES

Mainstem Battle Creek Flows below Coleman National Fish Hatchery (USGS 11-765.50) in cfs

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1961										229	278	501
1962	335	741	490	504	473	386	244	195	190	589	337	600
1963	468	801	447	1081	758	461	305	242	245	295	438	311
1964	445	336	318	380	375	317	220	188	205	221	419	1299
1965	1144	635	529	894	633	506	346	292	276	276	395	335
1966	403	448	441	515	432	295	237	210	216	222	448	574
1967	788	548	640	717	964	785	448	281	261	275	276	349
1968	730	912	632	451	396	308	242	250	252	264	342	792
1969	1679	1151	734	906	1008	671	384	305	294	321	366	1041
1970	2434	919	841	605	595	521	394	291	295	307	765	1017
1971	864	556	741	693	744	641	405	291	287	296	339	410
1972	411	508	734	529	462	380	271	238	276	362	467	548
1973	960	939	833	653	750	448	314	236	246	327	1040	946
1974	1808	700	1321	1108	811	679	545	396	358	392	423	462
1975	458	963	850	729	851	739	438	325	283	363	397	405
1976	350	400	491	441	386	297	252	253	254	250	255	242
1977	269	260	266	231	266	223	201	191	207	205	262	463
1978	1054	766	1110	962	656	514	371	248	240	221	263	259
1979	345	708	557	483	663	367	254	230	234	318	415	583
1980	1187	1072	768	542	584	449	339	247	248	272	259	368
1981	523	535	593	476	388	292	222	210	218	322	1058	1063
1982	791	986	879	1135	799	549	420	295	300	391	535	757
1983	983	1275	1802	1020	1070	1074	666	461	423	424	878	1602
1984	831	671	676	609	651	548	397	348	322	365	597	538
1985	399	391	413	504	426	341	265	253	279	311	451	425
1986	579	1919	1301	659	628	489	352	322	382	359	353	344

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1987	456	538	749	436	357	263	250	217	216	231	263	490
1988	645	385	345	333	331	300	222	205	203	203	319	294
1989	392	343	1380	803	495	379	270	229	277	330	295	271
1990	455	340	426	325	323	317	216	199	194	196	244	237
1991	234	273	540	413	352	304	224	186	177	224	214	224
1992	270	509	343	343	269	207	168	160	154	139	205	318
1993	973	845	908	817	817	775	404	291	231	277	270	392
1994	334	531	427	335	364	273	202	175	185	200	252	432
1995	1768	916	1661	1160	1306	937	574	403	336	314	300	563
1996	767	1128	780	791	921	535	351	277	272	295		
1997					447		282	248	254	282	321	430
1998	1444	1791	1086	986	1578	1453	817	540	449	438	636	683
1999	550	1049	887	722	705	557	381	321	312	345	409	364
2000	599	959	805	615	534	415	309	260	267	317	310	318
2001	364	443	454	356	358	269	234	206	216			
Mean	**756**	**748**	**749**	**648**	**623**	**493**	**336**	**268**	**263**	**299**	**413**	**545**

TABLE B-6 ANNUAL MEAN STREAMFLOW VALUES

Mainstem Battle Creek Flows below Coleman National Fish Hatchery (USGS 11-765.50)

Year	Annual Mean Streamflow, cfs	Year	Annual Mean Streamflow, cfs	Year	Annual Mean Streamflow, cfs	Year	Annual Mean Streamflow, cfs
1962	422	**1972**	432	**1982**	650	**1992**	256
1963	484	**1973**	639	**1983**	972	**1993**	582
1964	395	**1974**	752	**1984**	546	**1994**	308
1965	521	**1975**	564	**1985**	371	**1995**	854
1966	369	**1976**	322	**1986**	632	**1998**	986
1967	528	**1977**	254	**1987**	372	**1999**	547
1968	463	**1978**	554	**1988**	315	**2000**	474
1969	737	**1979**	428	**1989**	456		
1970	750	**1980**	527	**1990**	289		
1971	522	**1981**	491	**1991**	281		

FIGURE B-1 HISTORICAL FLOW DURATION CURVE

Mainstem Battle Creek Flows below Coleman National Fish Hatchery (USGS 11-765.50)