Docket No. E-100, Sub 179

William E. Powers on Behalf of NC WARN et al.

Exhibit 1 (Part 2 of 2)

EXHIBIT B:

CAISO Response to PCF Data Request

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Oversee the Resource Adequacy Program, Consider Program Refinements, and Establish Forward Resource Adequacy Procurement Obligations	Rulemaking 19-11-009 (Filed November 7, 2019)

RESPONSE OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION TO DATA REQUEST NUMBER PCF-CAISO-2020RA-02 BY PROTECT OUR COMMUNITIES FOUNDATION

Request Date: **10/12/2020**
Response Date: **11/16/2020**

Below are the California Independent System Operator Corporation's (CAISO) responses to Protect Our Communities Foundation (PCF) Data Request – *PCF-CAISO-2020RA-02*.

General Objections

The CAISO objects to PCF's data request because it is unduly burdensome and intrusive. PCF's data request relates to resource performance from August 14, 2020 through August 26, 2020 and September 5, 2020 through September 7, 2020. Furthermore, the CAISO objects to the extent any questions call for information that is privileged, attorney-client work product, or otherwise confidential.

In addition, to the extent possible, the CAISO provides responses to PCF's specific questions below.

PCF Request No. 1

Please provide the megawatt output for each of the following OTC units for August 14-26 and Sept 5-7 from during the hours ending (HE) 13 to 24.

1.1. Huntington Beach 2
1.2. Alamitos 3
1.3. Alamitos 4
1.4. Alamitos 5
1.5. Redondo Beach 5

1.6. Redondo Beach 6
1.7. Redondo Beach 8
1.8. Ormond Beach 1
1.9. Ormond Beach 2

The attached spreadsheet is provided for ease of response.

CAISO Response to Request No. 1

PCF Request No. 1 is unduly burdensome, overly broad, intrusive, and not reasonably calculated to lead to the discovery of admissible evidence in the resource adequacy (RA) proceeding. Specific generation outage details, as opposed to aggregate data, are not directly relevant to RA Program.

Notwithstanding the objections above, the CAISO provides its response in the attached Excel spreadsheet.

File: MW-Output-of-OTC_Aug14-26-Sept5-7

Day/hour output (MW) of SoCal OTC boiler plants proposed for extended operation, August 14-26, Sept 5-7, 2020 heat wave

Date/hour	Huntington Beach 2 (215 MW)	Alamitos 3 (320 MW)	Alamitos 4 (320 MW)	Alamitos 5 (480 MW)	Redondo Beach 5 (175 MW)	Redondo Beach 6 (175 MW)	Redondo Beach 8 (480 MW)	Ormond Beach 1 (806 MW)	Ormond Beach 2 (806 MW)
13-Aug-20									
HE13	0	86	0	0	75	41	131	0	400
HE14	0	87	0	0	75	34	132	0	398
HE15	0	134	0	0	77	11	132	1	706
HE16	0	283	0	2	80	10	228	0	704
HE17	0	291	0	4	75	10	378	0	704
HE18	0	289	0	6	80	10	401	0	704
HE19	0	291	0	20	0	39	450	0	705
HE20	0	290	0	63	0	10	453	0	704
HE21	0	314	0	71	0	10	459	0	705
HE22	0	192	0	71	0	10	455	1	656
HE23	12	120	0	71	0	10	209	-1	407
HE24	24	50	0	151	0	10	132	0	406
14-Aug-20									
HE13	204	267	0	240	0	10	241	8	404
HE14	208	315	0	239	0	15	251	12	492
HE15	220	312	0	240	0	108	363	17	686
HE16	220	315	0	400	0	147	430	21	713
HE17	220	313	0	448	0	140	430	21	713
HE18	220	312	0	472	0	140	435	21	715
HE19	220	314	0	476	0	140	462	20	720
HE20	222	314	0	477	0	140	459	40	721
HE21	220	313	0	476	0	140	455	102	723
HE22	190	315	0	476	0	137	231	99	726
HE23	64	313	0	328	0	15	196	104	712
HE24	66	313	0	183	0	21	181	105	699
15-Aug-20									
HE13	65	189	0	275	0	21	270	429	407
HE14	222	314	0	468	0	137	382	703	693
HE15	221	313	0	473	0	140	438	710	703
HE16	223	314	0	472	0	140	441	710	702
HE17	222	314	0	472	0	139	441	709	701
HE18	221	313	0	472	0	140	459	706	703
HE19	224	315	0	472	0	141	460	707	702
HE20	222	315	0	473	0	140	461	708	702
HE21	211	226	0	405	0	134	437	607	601
HE22	111	201	0	349	0	21	299	696	698
HE23	65	181	0	198	0	21	181	695	700
HE24	0	116	0	184	0	21	181	499	700
16-Aug-20									
HE13	65	189	0	244	0	21	241	419	411
HE14	221	311	0	462	0	138	441	700	700
HE15	221	315	0	471	0	141	446	702	706
HE16	220	315	0	471	0	141	445	703	705
HE17	222	316	0	471	0	141	447	703	707
HE18	219	313	0	470	0	142	449	701	707
HE19	216	315	0	470	0	141	450	706	707
HE20	213	256	0	412	0	92	377	706	709
HE21	80	135	0	231	10	21	181	707	710
HE22	65	72	0	180	9	20	181	707	710
HE23	66	21	0	179	8	21	181	705	709
HE24	65	20	0	179	10	21	181	409	404
17-Aug-20									
HE13	66	264	58	470	9	21	453	656	687

HE14	217	309	21	472	42	140	439	657	686
HE15	213	311	21	472	85	142	441	654	693
HE16	195	311	22	472	106	141	441	654	693
HE17	193	309	39	473	107	141	440	656	692
HE18	0	309	70	472	107	140	452	652	689
HE19	0	306	68	473	106	141	449	652	689
HE20	0	306	69	473	105	140	452	651	688
HE21	0	289	52	472	68	141	449	652	689
HE22	0	234	21	473	0	109	441	650	689
HE23	0	190	18	374	0	21	209	652	689
HE24	0	129	21	210	0	21	181	651	691
18-Aug-20									
HE13	0	311	320	472	0	141	442	657	697
HE14	0	312	320	473	0	141	440	653	697
HE15	0	312	320	474	0	141	441	658	700
HE16	0	311	318	471	0	142	440	660	700
HE17	0	311	317	472	0	140	415	662	702
HE18	0	313	319	472	4	140	441	662	700
HE19	0	311	318	471	10	140	440	660	699
HE20	0	312	321	471	52	140	441	650	693
HE21	0	312	319	471	52	140	440	660	696
HE22	0	312	317	460	11	137	440	657	697
HE23	0	158	316	460	10	21	440	587	674
HE24	0	84	170	262	10	20	227	401	400
19-Aug-20									
HE13	0	56	61	472	51	21	440	653	696
HE14	0	155	155	472	50	21	441	653	698
HE15	0	312	320	473	51	76	440	653	699
HE16	0	312	320	473	50	140	442	655	699
HE17	0	314	321	472	44	140	440	656	700
HE18	0	313	320	473	11	140	440	655	698
HE19	0	314	316	473	10	140	441	654	700
HE20	0	314	319	473	10	135	453	648	697
HE21	0	182	243	317	10	21	214	410	408
HE22	0	120	168	223	10	20	211	485	423
HE23	0	49	103	179	10	21	181	413	410
HE24	0	21	35	161	11	21	180	411	410
20-Aug-20									
HE13	22	255	239	219	23	32	224	591	655
HE14	65	312	303	372	50	58	211	634	681
HE15	205	314	318	467	10	21	366	642	669
HE16	215	312	321	465	83	94	441	653	694
HE17	206	314	322	466	105	140	441	602	495
HE18	174	314	319	466	105	141	440	631	639
HE19	65	310	295	466	105	140	441	406	410
HE20	21	246	127	360	100	134	367	404	411
HE21	20	236	90	213	10	21	281	403	414
HE22	21	154	37	179	10	20	181	403	410
HE23	21	85	22	180	10	21	181	361	355
HE24	21	21	21	152	10	20	181	208	256
21-Aug-20									
HE13	86	40	40	221	10	23	272	520	464
HE14	113	26	28	242	10	21	425	543	641
HE15	176	95	95	219	10	20	440	543	639
HE16	206	195	195	371	103	140	440	427	413
HE17	195	192	194	466	105	140	441	549	506
HE18	190	202	213	466	104	140	441	493	464
HE19	190	192	198	467	104	140	336	399	406
HE20	191	190	196	410	104	119	240	400	425
HE21	143	190	193	237	104	76	198	404	404
HE22	66	121	125	222	11	21	181	385	406
HE23	65	51	58	179	10	21	180	201	399

HE24	0	22	18	181	10	0	187	104	255
22-Aug-20									
HE13	66	21	19	152	10	0	131	104	54
HE14	119	99	97	176	20	0	190	328	326
HE15	140	191	191	186	31	0	292	604	600
HE16	63	189	194	152	105	0	300	424	412
HE17	64	313	319	242	105	0	301	410	404
HE18	65	313	320	228	105	0	301	414	413
HE19	66	311	283	251	105	0	303	413	414
HE20	65	262	218	250	105	0	300	413	414
HE21	65	191	193	250	100	0	288	411	414
HE22	65	119	125	180	10	0	181	203	380
HE23	65	50	58	180	10	0	187	103	108
HE24	65	21	21	203	11	0	137	107	56
23-Aug-20									
HE13	65	22	21	180	10	0	181	104	54
HE14	65	92	93	215	104	0	225	196	237
HE15	66	189	190	251	105	0	342	415	409
HE16	115	187	195	250	105	0	438	410	411
HE17	195	186	194	251	105	0	439	419	414
HE18	61	191	193	250	105	0	439	421	416
HE19	0	189	193	250	105	0	439	421	414
HE20	0	195	194	251	105	0	439	415	414
HE21	0	191	193	251	105	0	430	414	412
HE22	0	120	126	180	10	0	211	411	421
HE23	0	52	59	179	11	0	181	205	383
HE24	0	20	19	181	10	0	181	198	255
24-Aug-20									
HE13	0	190	194	181	10	0	205	413	407
HE14	0	243	232	242	10	1	242	655	695
HE15	0	311	320	373	43	10	440	655	701
HE16	0	311	321	464	10	10	440	657	703
HE17	0	310	320	464	10	10	441	655	706
HE18	0	310	318	466	27	10	431	657	705
HE19	0	310	306	464	10	0	431	655	706
HE20	0	309	309	466	10	0	431	656	705
HE21	0	310	310	464	10	0	432	657	705
HE22	0	309	308	463	10	0	425	656	701
HE23	0	152	161	273	9	0	227	402	401
HE24	0	85	96	178	0	0	181	403	400
25-Aug-20									
HE13	0	94	93	330	10	0	181	309	408
HE14	0	192	193	466	10	0	240	422	408
HE15	0	278	260	466	10	0	417	424	411
HE16	0	312	319	466	10	0	430	654	680
HE17	0	311	320	466	10	0	431	656	699
HE18	0	312	317	466	10	0	435	654	698
HE19	0	312	321	466	10	0	432	655	701
HE20	0	312	265	466	10	0	312	655	700
HE21	0	284	193	375	10	0	253	657	701
HE22	1	189	193	241	11	0	226	637	688
HE23	11	132	137	181	11	0	181	401	401
HE24	21	67	77	152	10	0	181	402	402
26-Aug-20									
HE13	66	23	25	189	10	0	181	211	253
HE14	94	98	100	230	10	0	363	233	296
HE15	133	188	193	242	10	0	380	411	305
HE16	207	313	320	438	10	0	271	475	308
HE17	219	311	319	466	10	0	270	653	304
HE18	0	311	320	465	10	0	271	655	306
HE19	0	312	322	466	103	0	271	654	305

HE20	0	262	256	466	30	0	271	655	303
HE21	0	192	197	466	10	0	260	654	304
HE22	0	193	195	465	10	0	229	655	306
HE23	0	122	126	275	10	0	181	357	301
HE24	0	54	61	180	10	0	181	120	257
5-Sep-20									
HE13	65	190	193	223	10	20	239	413	411
HE14	108	240	246	305	10	39	241	651	680
HE15	174	249	243	347	10	20	279	655	696
HE16	176	313	319	471	85	80	341	657	697
HE17	175	314	321	471	110	80	413	656	697
HE18	175	314	323	469	110	80	439	655	698
HE19	174	315	319	469	110	80	446	657	697
HE20	175	311	295	405	110	31	455	655	697
HE21	131	200	195	244	111	20	455	655	698
HE22	67	125	127	241	97	20	448	477	698
HE23	60	56	60	241	11	20	216	401	388
HE24	21	21	23	185	10	20	131	385	254
6-Sep-20									
HE13	176	293	291	348	109	80	412	489	507
HE14	174	315	322	474	110	81	441	655	690
HE15	175	314	318	472	110	81	440	654	694
HE16	175	315	319	472	109	81	440	658	699
HE17	175	315	318	472	109	81	440	659	702
HE18	174	314	320	474	110	80	439	656	704
HE19	175	316	320	472	110	81	441	652	701
HE20	177	312	319	472	110	81	450	656	702
HE21	176	314	317	472	110	80	441	656	706
HE22	167	316	323	472	12	20	429	655	706
HE23	60	152	173	333	10	20	189	389	383
HE24	21	87	110	203	10	20	188	214	259
7-Sep-20									
HE13	66	193	195	242	10	20	241	405	405
HE14	66	187	193	241	10	20	240	655	695
HE15	66	192	193	241	10	20	240	655	701
HE16	64	192	191	255	10	20	240	656	700
HE17	65	191	193	263	39	30	240	656	700
HE18	65	190	193	266	77	80	240	659	700
HE19	65	191	194	241	110	80	240	659	702
HE20	65	192	195	241	109	80	240	658	704
HE21	65	191	195	240	108	70	241	657	703
HE22	65	190	194	241	11	20	233	422	702
HE23	59	161	159	182	10	20	181	170	376
HE24	22	94	101	178	10	20	181	107	100

EXHIBIT C:

T. Popik – Foundation for Resilient Socieities, *August 2020 Blackouts in CAISO,* PowerPoint

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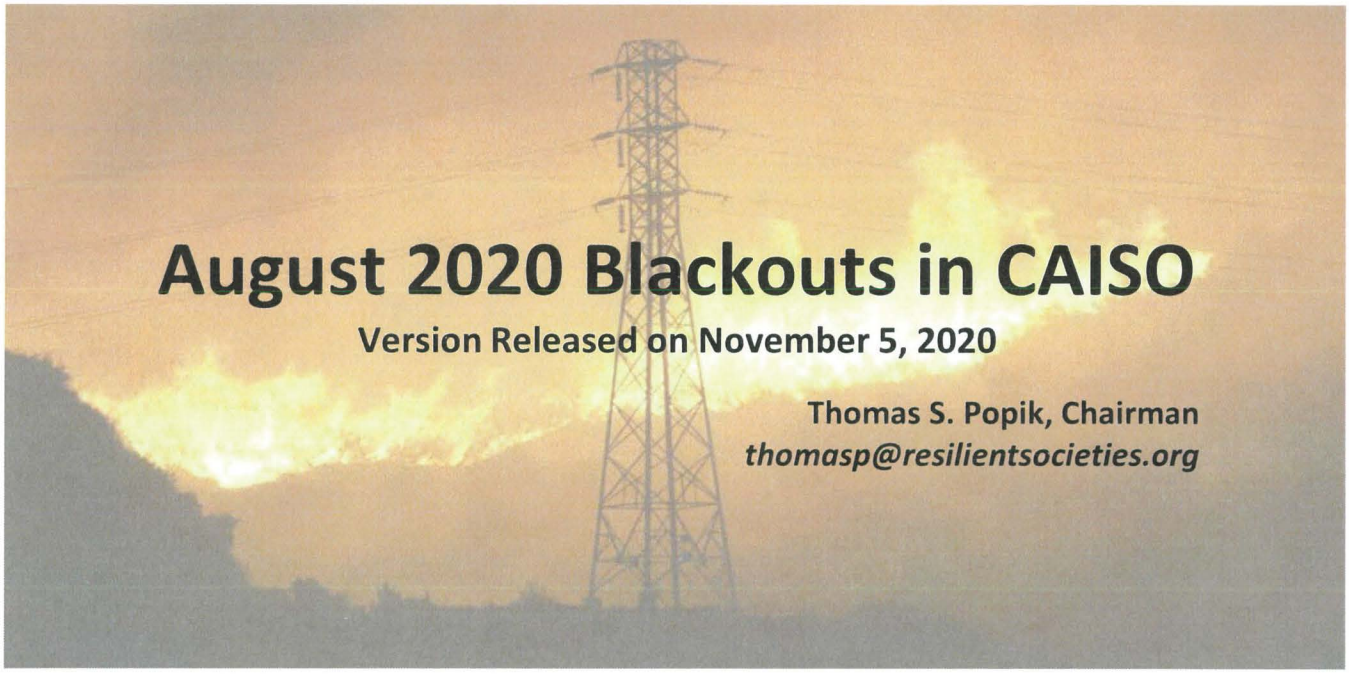
William E. Powers on Behalf of NC WARN et al.
Exhibit 1

Foundation for
Resilient Societies



August 2020 Blackouts in CAISO

Version Released on November 5, 2020

Thomas S. Popik, Chairman
thomasp@resilientsocieties.org

Image Credit: Gene Blevins/Reuters

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William E. Powers on Behalf of NC WARN et al.
Exhibit 1

Foundation for
Resilient Societies

Agenda

- California ISO (CAISO) System Characteristics
  - Geographic Configuration and Interties
  - Seasonal Loads
  - Capacity by Energy Sources
  - Imports
- Blackouts (aka "Load Sheds") in August 2020
  - "CAISO 2020 Summer Loads and Resources Assessment"
  - Sequence of Events
  - Realized Operating Reserves
  - Estimated Resource Adequacy
- Restoration Challenges After System Collapse
  - Secondary Fuel Sources for Gas-Fired Generators
  - Electric-Gas Interdependence
  - Essential Reliability Services
- Data-Based Observations

Foundation for
Resilient Societies

CAISO System Characteristics

Foundation for
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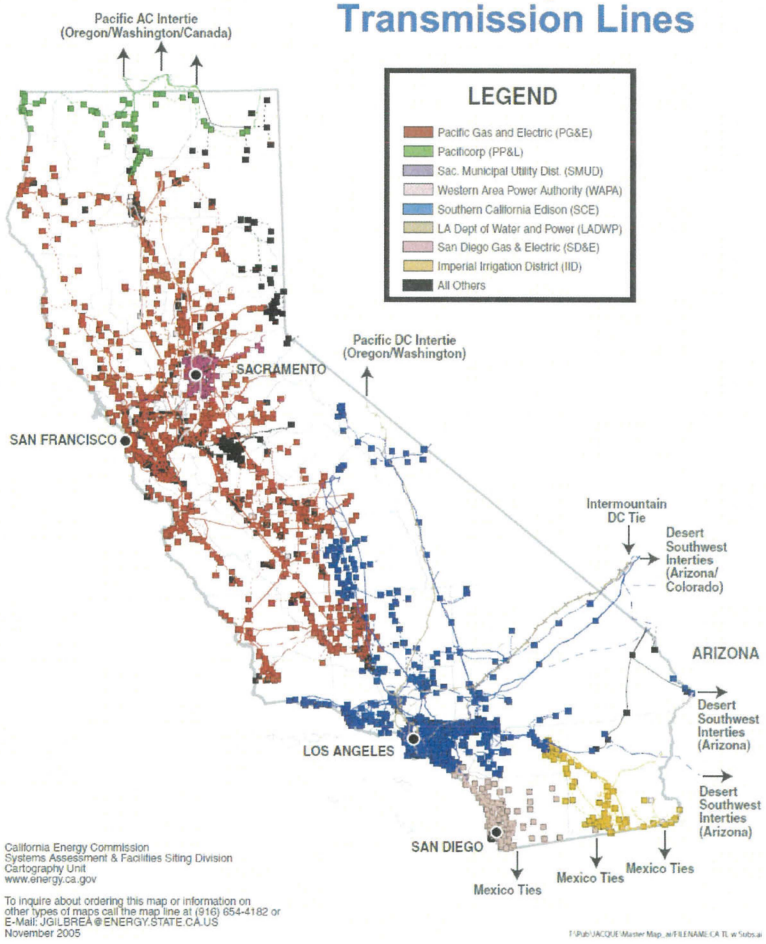
California's Major Electric Transmission Lines



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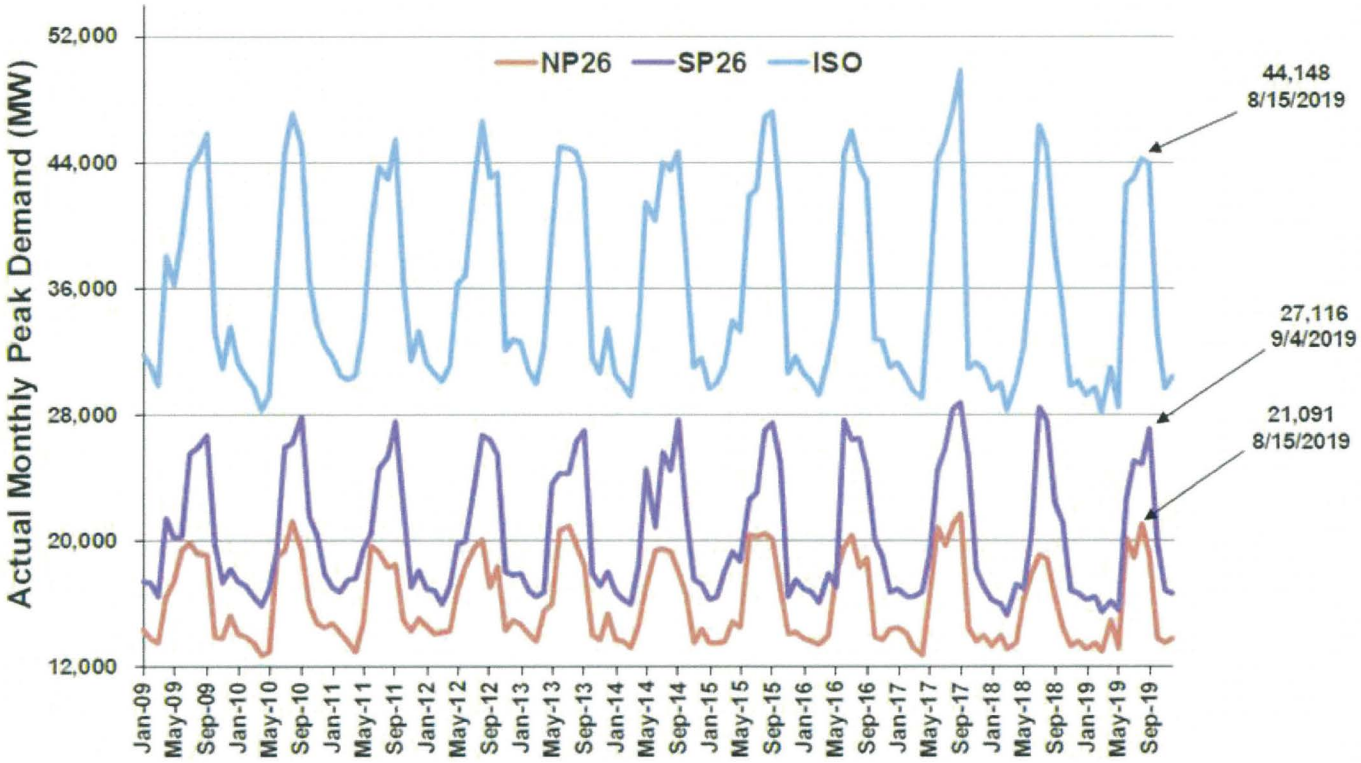
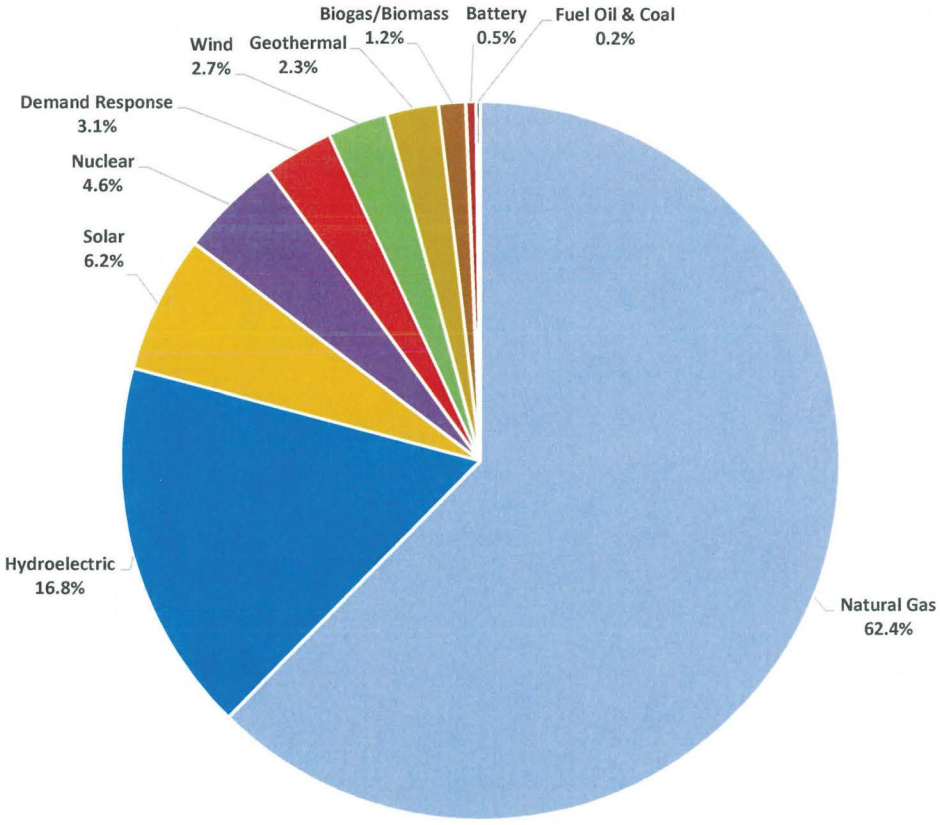
CAISO, North California (NP), and South California (SP) Load Profiles



Source: CAISO 2020 Summer Loads and Resources Assessment

Foundation for
Resilient Societies

CAISO Net Qualified Capacity for August 2020—49.2 GW



Source: CAISO 2020 NQC List, Foundation for Resilient Societies Analysis

CAISO Imports Often Below 7 GW During Peak Loads

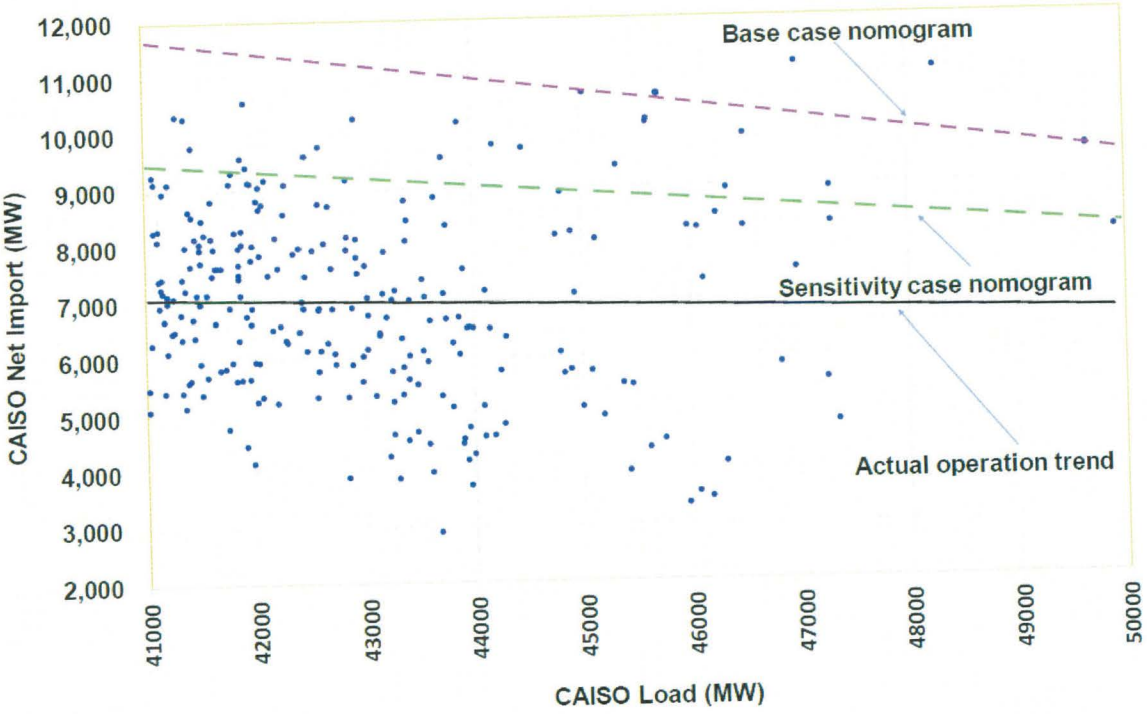


Figure 1 shows CAISO net imports at time of daily peaks above 41,000 MW vs. CAISO load from 2017 to 2019.

Source: CAISO 2020 Summer Loads and Resources Assessment

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Key Points on CAISO System

- "Northern Path" Is Principally PG&E
- "Southern Path" Is Principally Southern California Edison and San Diego Gas & Electric
- CAISO Has Critical Interties With Grids in Other States
- Big Difference Between Summer Peak Load and Other Times of Year
- 62.4% of CAISO Capacity Is Gas-Fired
- Solar (6.2%), Wind (2.7%), and Hydro (16.8%) Capacity Not Always Available
- CASIO Imports Historically Less When Peak Load Is High

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Blackouts in August 2020

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CAISO 2020 Summer Loads and Resources Assessment

- "The base case results show that the CAISO has a low probability of experiencing operating conditions that would lead to shedding firm load in summer 2020."
- "[I]f a heat wave occurs that impacts a broader area than the CAISO, the availability of surplus energy to import into the CAISO could be diminished."
- "While the CAISO has a low probability of a system capacity shortfall, there is a material risk of shortfalls in load following up capacity, particularly in the late afternoon when solar generation is near or at zero and net imports diminish from neighboring BAs while system demand is increasing."

Sequence of events Friday August 14

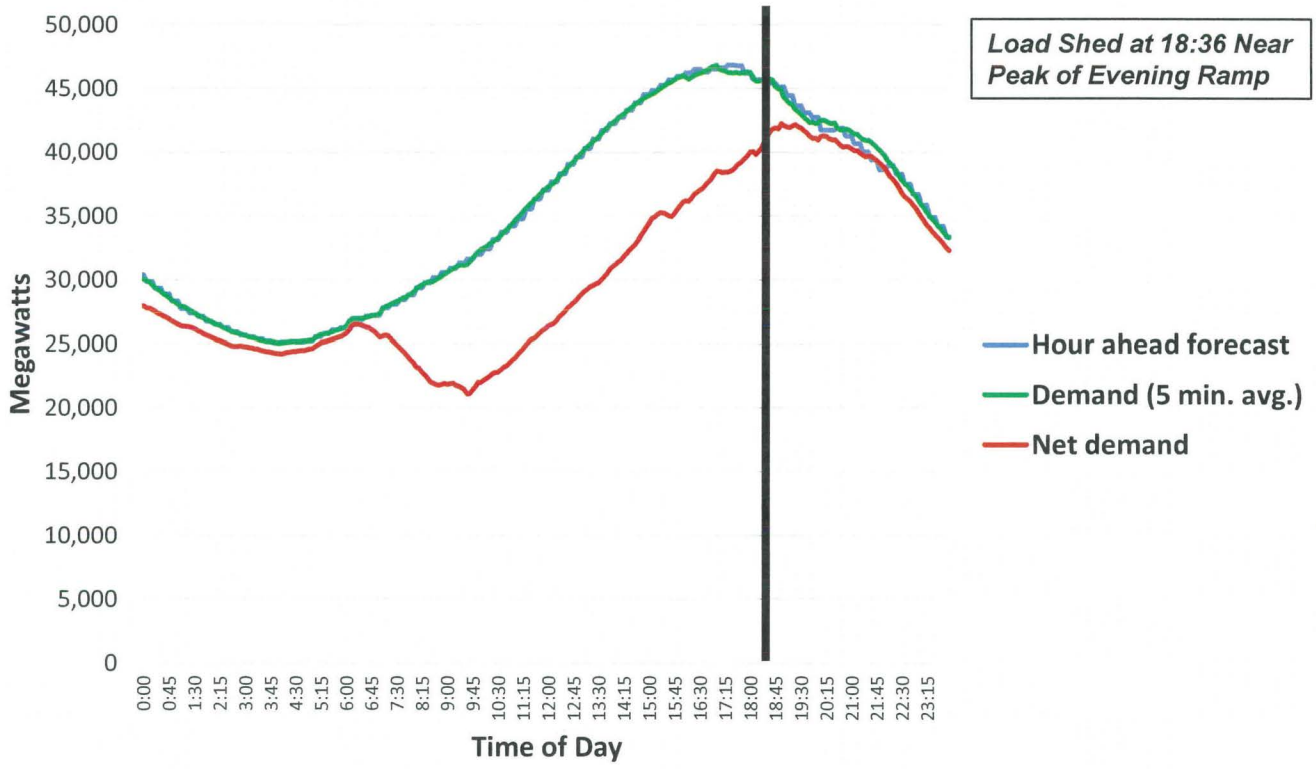
12:00 p.m.	Unable to secure additional energy, a Warning was issued effective 12:00 p.m. through midnight
2:56 p.m.	Loss of generation – 475 MW
2:58 p.m.	Dispatched contingency reserves to recover
3:20 p.m.	Forecasting a shortage of energy for next few hours - Declared CAISO Stage 2 Emergency, began procuring Emergency Assistance from external entities
5:15 p.m.	Dispatched approximately 800 MW of demand response to maintain load and resource balance
6:36 p.m.	Unable to maintain load and contingency reserve obligation – ordered 500 MW of load shed pro-rata to CAISO Utility Distribution Companies (UDC's) – Stage 3 Emergency declared
6:46 p.m.	Ordered an additional 500 MW of load shed pro-rata to CAISO UDC's
7:56 p.m.	Load decreased and resources were adequate to meet CAISO load and contingency reserve obligations. Ordered all load to be restored.

Sequence of events Saturday August 15

4:10 p.m. to 5:10 p.m.	Total wind output increased quickly requiring other generation to ramp down quickly
5:10 p.m. to 6:05 p.m.	Total wind decreased quickly requiring other generation to ramp up quickly. CAISO ACE was -1421 MW.
6:13 p.m.	While recovering our ACE, a generator ramped down quickly from 400 MW.
6:25 p.m.	Ordered 470 MW of load shed pro-rat from UDC's
6:47 p.m.	Received Emergency Assistance, wind ramped back up, load began to trend down, additional resources available. Ordered all load be restored.

Foundation for
Resilient Societies

CAISO Demand on August 14, 2020



Source: CAISO website; https://www.caiso.com/TodaysOutlook/Pages/demand.html

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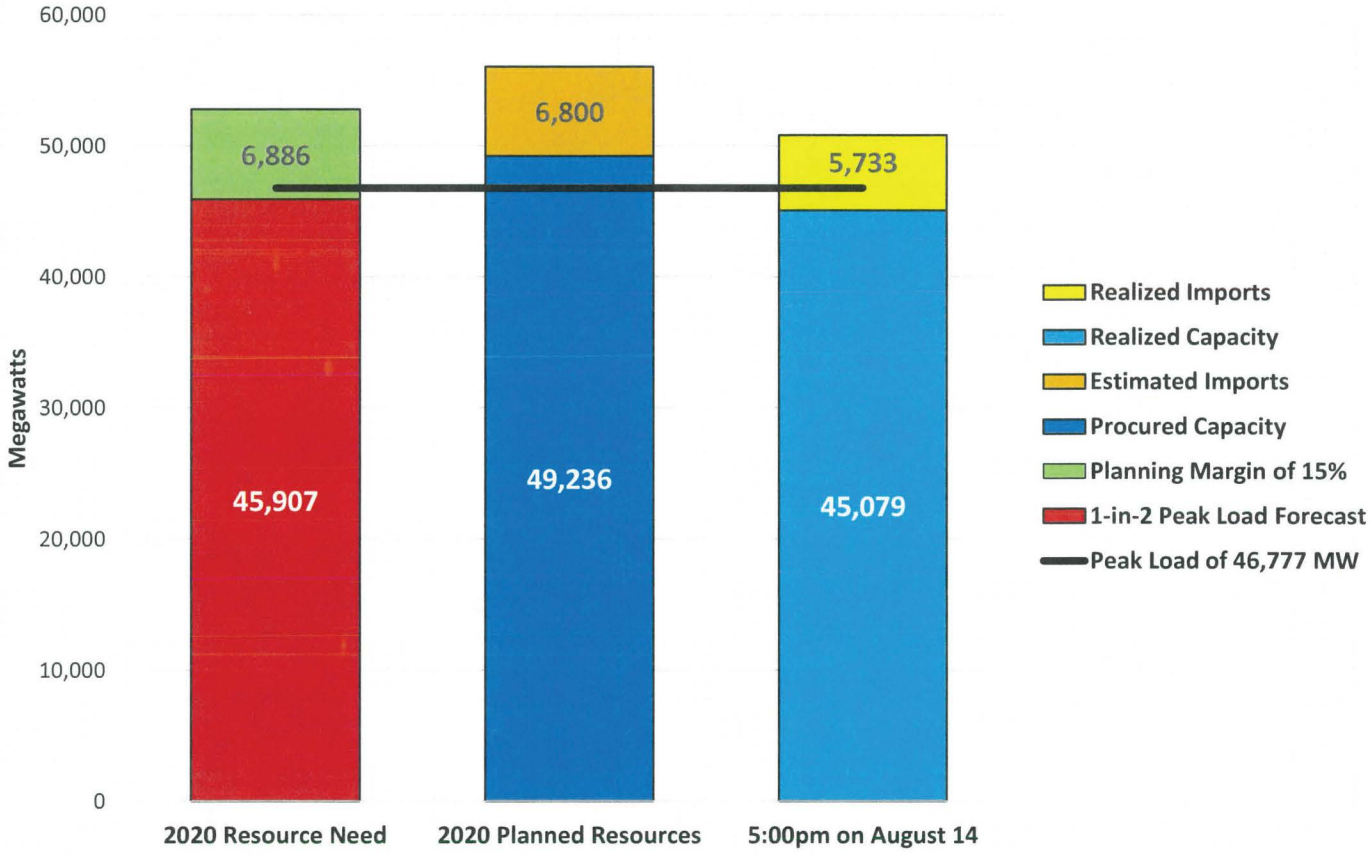
Exhibit 1

Peak Load at 5:00pm on August 14, 2020 Compared to Resources



CAISO Summer Loads & Resources Assessment, CAISO 2020 NQC List, CAISO Outage List, Foundation for Resilient Societies Analysis

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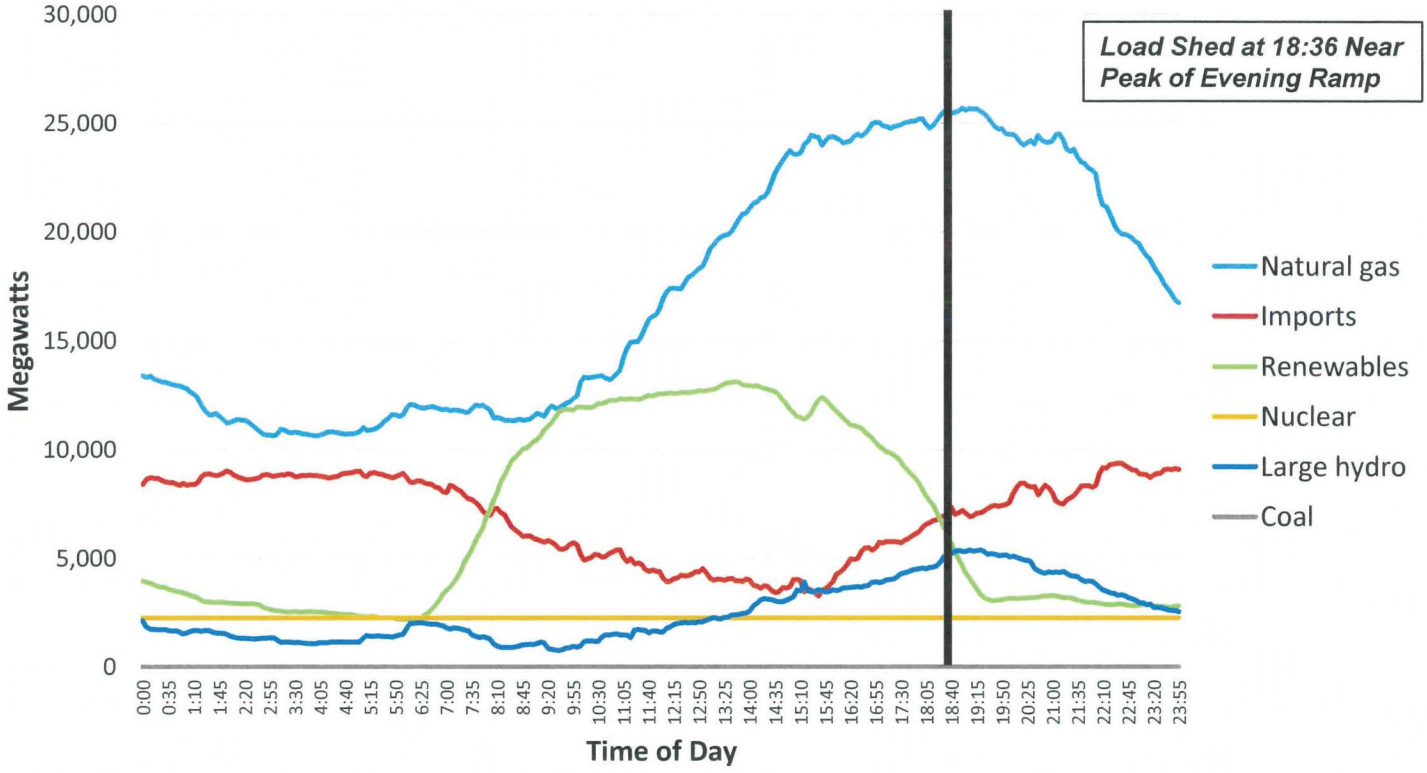
Exhibit 1

CAISO Supply on August 14, 2020



Source: CAISO website: https://www.caiso.com/TodaysOutlook/Pages/supply.html

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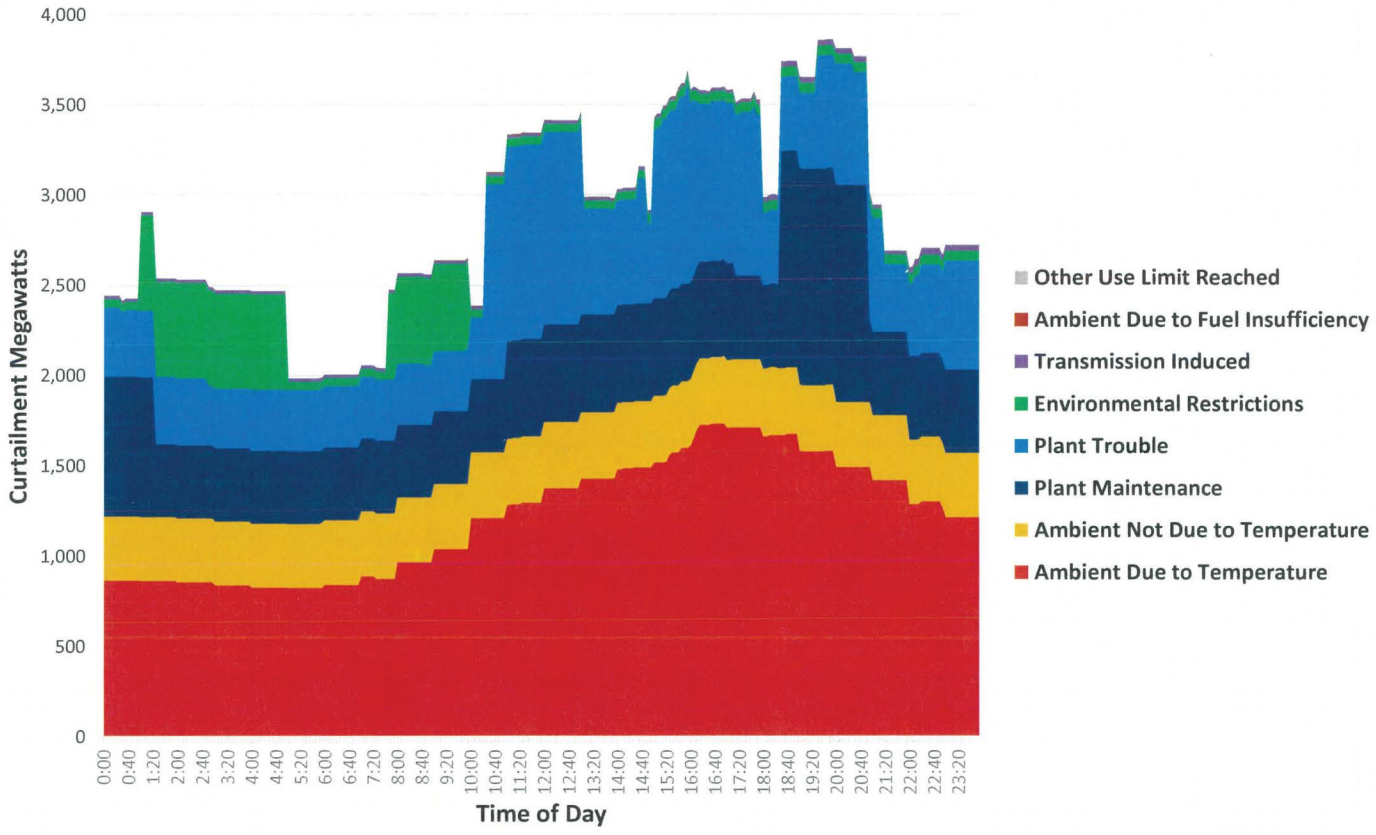
Foundation for
Resilient Societies

Forced Thermal Plant Outages in CAISO on August 14, 2020



Source: CAISO "Aug13-16-2020-CAISO-Balancing-Authority-Area-Resource-Outages," Foundation for Resilient Societies Analysis

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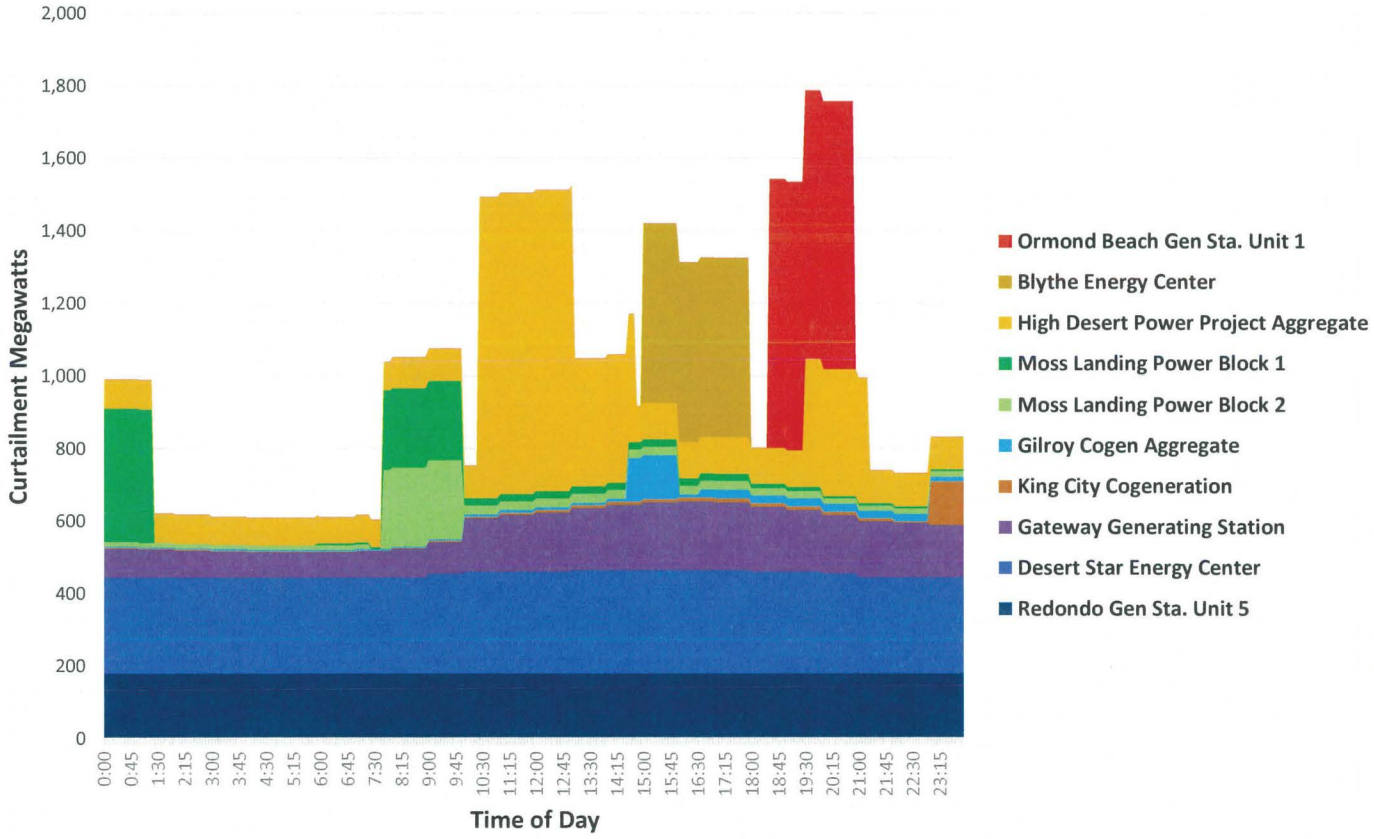
Exhibit 1

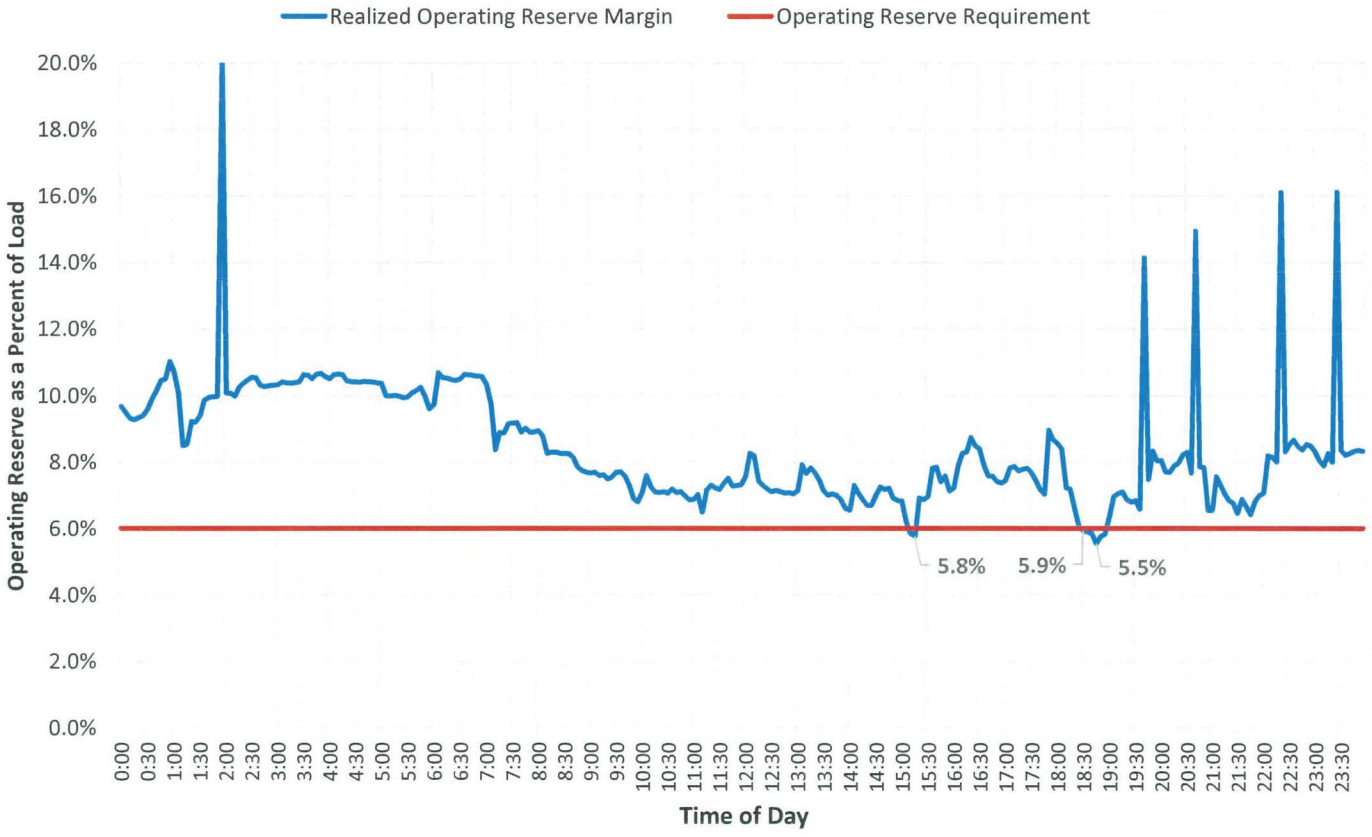
Sequence of Major Forced Outages in CAISO on August 14, 2020



Source: CAISO "Aug13-16-2020-CAISO-Balancing-Authority-Area-Resource-Outages," Foundation for Resilient Societies Analysis

Foundation for Resilient Societies

CAISO Operating Reserves on August 14, 2020



Source: CAISO OASIS

Foundation for Resilient Societies

Alternative Estimate of CAISO Resource Adequacy on August 14, 2020

	Megawatts		
	6:25pm	**6:30pm**	**7:30pm**
Net Qualified Capacity Excluding Solar, Wind, Hydro	36,573	36,573	36,573
Planned Outages Excluding Solar, Wind, Hydro, Imports	(388)	(388)	(388)
Forced Outages Excluding Solar, Wind, Hydro, Imports	(2,997)	(3,739)	(3,859)
Deployed Demand Response	(800)	(800)	(800)
Total Firm Capacity	32,387	31,646	31,526
Solar Generation	3,798	3,460	195
Wind Generation	1,058	1,050	990
Hydroelectric	5,194	5,440	5,528
Imports	6,873	6,920	7,270
Total Non-Firm Capacity & Imports	16,923	16,870	13,983
Total Capacity & Imports	49,310	48,516	45,509
Total Demand (Net of Demand Response and Load Sheds)	(45,743)	(45,857)	(42,941)
Operating Reserve	3,567	2,659	2,568
Operating Reserve (Percent)	7.8%	5.8%	6.0%
Largest Contingency (Diablo Canyon Nuclear Plant)	2,264	2,265	2,266
Operating Reserve Less Largest Contingency	1,303	394	302

Source: Foundation for Resilient Societies analysis. Unit commitments and realized generation not available from CAISO for this estimate.

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Key Points on Blackouts In August 2020

- CAISO Predicted Risk (But Not Probability) of Load Sheds/Blackouts During Summer Heatwaves
- Imports Were Constrained
- Hydroelectric Constrained Because of Reservoir Levels
- Large Forced Outages at Gas-Fired Plants
- Solar Generation Rapidly Fell During Evening Hours
- Wind Generation Variable and Unpredictable
- Committed Generator Capacity Less Than Realized Need

CAISO Grid Operator Ordered Rolling Blackouts

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Restoration Challenges After System Collapse

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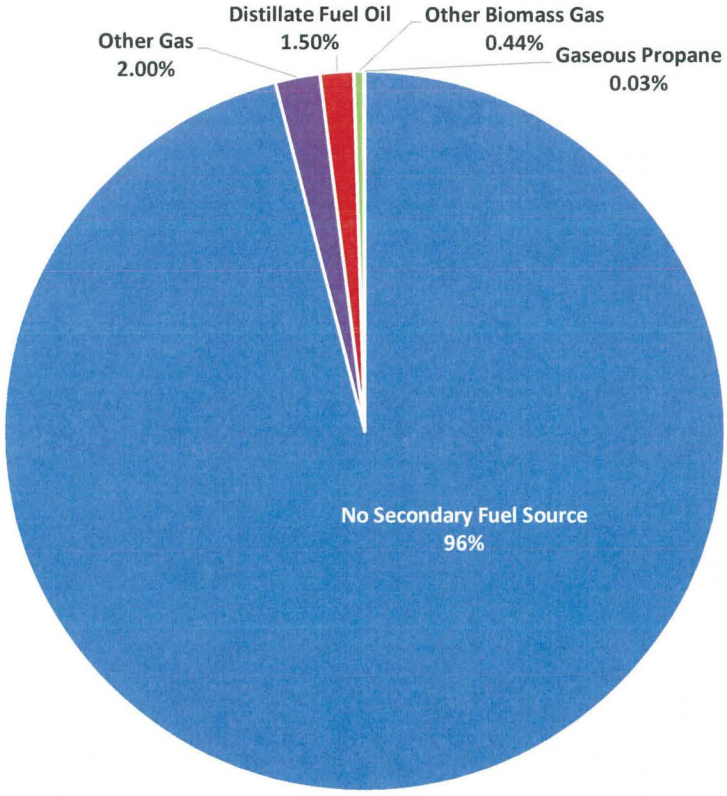
Secondary Fuel Sources for CAISO Gas-Fired Plants



Source: EIA Form 860 for 2019, Foundation for Resilient Societies Analysis

2020 California Gas Report

- "If core supplies are insufficient to meet core demand, PG&E can divert gas from noncore customers, including [Electric Generation] EG customers, to meet it."
- "Since little, if any, alternate fuel-burn capability exists today, supply diversions from the noncore would necessitate those noncore customers to curtail operations."
- "The implication for the future is that under supply-shortfall conditions—such as an [Abnormal Peak Day] APD—a significant portion of [Electric Generation] EG customers could be shut down with the impact on electric system reliability left as an uncertainty."

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August 2020 Blackouts in CAISO

- **Northern California Generators Are Dependent on PG&E Natural Gas Pipelines**
- **At the Delevan Compressor Station, 2 Out of 3 Compressors Are Electric-Drive**
- **At the Bethany Compressor Station, Both Compressors Are Electric-Drive**
- **These Electric-Drive Compressors Are In Turn Dependent on the PG&E Transmission System**

Adapted from PG&E "California Pipeline/Storage Facilities" on www.pge.com

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2020 California Gas Report

- "Aliso Canyon directly supplies 17 gas-fired power plants with a combined total 9,800 MW of electric generation in the Los Angeles basin and indirectly impacts 48 plants with a combined total 20,120 MW of electric generation across Southern California."
- "There are limitations in attempting to shift power supply from resources affected by Aliso Canyon to resources that are not affected because of certain factors, such as local generation requirements, transmission constraints and other resource availability issues."

Docket No. E-100, Sub 179
William E. Powers on Behalf of NC WARN et al.
Exhibit 1

Foundation for Resilient Societies

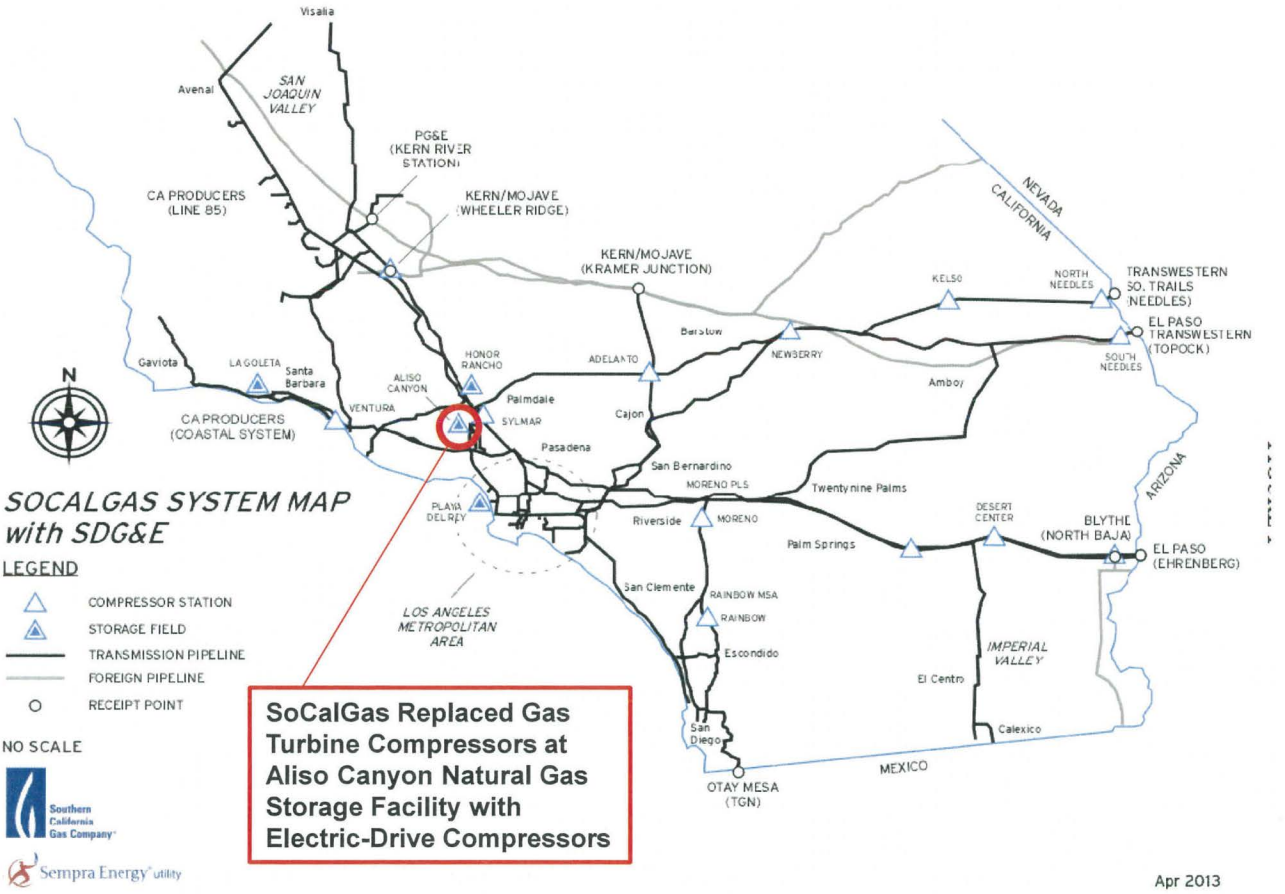

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Exhibit 1

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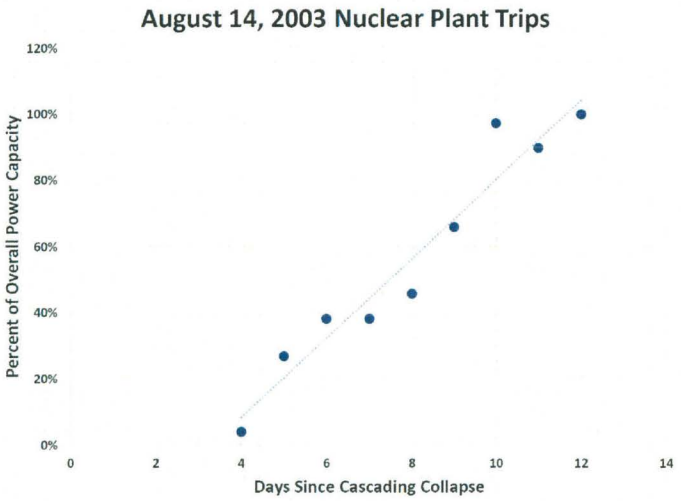
Diablo Canyon Nuclear Plant

2,256 MW Dual-Unit Plant Provides Reactive Power & Frequency Response

Image Credit: Tracy Adams

Diablo Canyon Forced Outage Expected After System Collapse Causes Plant Trip



Source: U.S. Nuclear Regulatory Commission, Foundation for Resilient Societies Analysis

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Key Points on CAISO System Restoration

- 96% of CAISO Gas-Fired Capacity Has No Backup Energy Source and Is Dependent on "Just-In-Time" Fuel
- Electric-Gas Interdependence
  - PG&E Pipeline in North
  - Aliso Canyon Natural Gas Storage Facility In South
- Diablo Canyon Nuclear Plant Likely Not Available for System Restoration

Data-Based Observations

- Stress on CAISO System Occurred Near Sunset
  - Rapidly Falling Solar Generation
- Dispatchable Capacity Had Large Forced Outages
- Imports Not Sufficient To Replace Local Capacity
- Result: Operating Reserves Dipped Below Planning Margin
- Blackouts Occurred in CAISO Two Days in a Row
  - Recent Experience Shows This Is Not a "Low Probability"
  - Root Causes Not Clear From Data Available From CAISO
- System Restoration Risks
  - Lack of Dual-Fuel Plants
  - Electric-Gas Interdependence
  - Reactive Power and Frequency Response

About the Foundation for Resilient Societies

- Thank you for your attention to the important issue of electric reliability for the state of California.
- The Foundation for Resilient Societies is a non-profit organization engaged in scientific research and education with the goal of protecting technologically-advanced societies from infrequently occurring natural and man-made disasters.
- Learn more about us on our website: www.resilientsocieties.org
- For any updates or enhancements to this presentation, please visit our Home and/or Research web pages.

EXHIBIT D:

Calculation of ORM During August 15, 2020 Rolling Blackout, D. Marcus

Docket No. E-100, Sub 179
William E. Powers on Behalf of NC WARN et al.
Exhibit 1

ISO data for 8/15/20

load	available generation[1]	reserves	time	ISO alert level	solar MW	wind MW
		>12%	1800	Warning	4188	1306
		>11%	1805	Warning	3788	1254
		>11%	1810	Warning	3396	1226
		>10%	1815	Warning	3065	1227
		>10%	1820	Warning	2804	1240
44505	48774	9.59%	1825	Stage 2	2326	1270
43960	47872	8.90%	1830	Stage 3	2057	1321
43572	47976	10.11%	1835	Stage 3	1903	1428
43522	47835	9.91%	1840	Stage 3	1664	1534
43435	47759	9.96%	1845	Stage 3	1502	1669
43529	47803	9.82%	1850	Stage 2	1345	1830
43457	48080	10.64%	1855	Stage 2	1192	1929
43363	47973	10.63%	1900	Stage 2	1054	1997
43149	47569	10.24%	1905	Stage 2	913	2047
42970	47368	10.24%	1910	Stage 2	787	2071

Sources:

Load and available resources: http://www.caiso.com/TodaysOutlook/Pages/default.aspx (non-archived #s from top of page, not graphs)

Wind and solar generation: http://www.caiso.com/TodaysOutlook/Pages/supply.aspx (note that generation data is archived)

1) Load and "available generation" values recorded in real-time at 5-minute intervals from CAISO Today's Outlook "Demand" web page

D. Marcus, 9/22/20