

Docket No. A.19-11-019

Exh. No. AECA-2

Date: April 1, 2021 (Errata)

Witness: Richard McCann, Ph.D.

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA**

Application of Pacific Gas and Electric	)	
Company to Revise Its Electric Marginal	)	A.19-11-019
Costs, Revenue Allocation, and Rate Design.	)	

**PREPARED REBUTTAL TESTIMONY OF
RICHARD McCANN, PH.D.
ON MARGINAL COSTS, REVENUE ALLOCATION, AND RATE DESIGN
ISSUES ON BEHALF OF
THE AGRICULTURAL ENERGY CONSUMERS ASSOCIATION**

~~February 26~~ April 1, 2021 Errata

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1 **1. Introduction**

2 Given substantial uncertainties associated with the rapidly evolving electricity sector as
3 described further below, the Agricultural Energy Consumers Association (AECA) recommends
4 that the California Public Utilities Commission (Commission or CPUC) adopt AECA's marginal
5 cost proposals on an interim basis and defer decisions about durable marginal cost standards to a
6 subsequent investigative proceeding. AECA timely submits this rebuttal testimony in accordance
7 with Administrative Law Judge Doherty's February 22, 2021 email granting an extension of the
8 due date to February 26, 2021.

9 The electricity market is in flux, due to technology innovation, changing utility-customer
10 relationships, and the growing impacts of climate change on the grid. The proposals made by the
11 various parties in this proceeding, as detailed below, do not reflect these changes, nor how the
12 conventional marginal cost methods are not as applicable for the future. It is not the appropriate
13 time for the Commission to adopt durable marginal cost methods and outcomes in this General
14 Rate Case (GRC) after not doing so for the past quarter century.

15 Key cost decisions driving such important issues as establishing a new solar net energy
16 metering rate (NEM 3.0) are being made in other dockets. Wildfire management expenditures
17 loom as the single biggest liability over the next decade, not traditional generation and
18 distribution investments. Locking in costing concepts during this dynamic period would be ill-
19 advised and lead to significant marginal cost distortions before too long.

20 A harbinger of the uncertainty in the current marginal cost approach, lack of robust
21 empiricism, and alarming acceleration in revenue responsibility (mis)allocated to the agricultural

1 class emerged earlier this month in a report issued by the Commission¹ that showed that
2 agricultural rates rose by 17% compared to other customer classes since the 2017 GRC despite a
3 settlement agreement that fixed revenue responsibility allocations until this GRC.² The CPUC
4 report shows how Pacific Gas and Electric Company's (PG&E) cost allocation method has
5 gotten out of line with those being used by the state's other two utilities, leading to unjustified
6 distortions in agricultural rates.

7 AECA proposed a comprehensive set of marginal cost metrics in its direct testimony that
8 is suitable for use to assign customer class-specific revenue allocations. AECA's analyses
9 demonstrates that the agricultural classes' revenue allocation share is basically unchanged or
10 even reduced from what is in present rates presented by PG&E.³

¹ CPUC, *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates and Equity Issues Pursuant to P.U. Code Section 913.1*, https://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Reports_and_White_Papers/Feb%202021%20Utility%20Costs%20and%20Affordability%20of%20the%20Grid%20of%20the%20Future.pdf, February 2021.

² Based on reported average rates in PG&E's 2017 and 2020 GRC revenue allocation workpapers, it appears that PG&E may have underestimated the magnitude of the impact of the rate changes requested in this case. It also is unclear whether PG&E has adhered to previously settled revenue allocation formulas from the 2017 GRC. As stated in the "Motion for Adoption of Settlement Agreement on Marginal Cost and Revenue Allocation in Phase II of Pacific Gas and Electric Company's 2017 General Rate Case" filed October 2017 and adopted in Decision (D.) 18-08-013:

*After rates are implemented pursuant to the Commission's final decision on marginal costs, revenue allocation and most rate design issues in this proceeding, the MC/RA Settling Parties agree that future changes in rates to reflect changes to the revenue requirement will also be made in the manner set forth in the MC/RA Settlement Agreement. Specifically, each customer group will be allocated the average percentage change in functional revenue necessary to collect the functional revenue requirement. Except as specifically noted in the MC/RA Settlement Agreement, **this will be accomplished by implementing changes to the revenue requirement for each component by applying to each rate schedule the same percentage change to rates by component required to collect the revenue requirement for that component.** (Emphasis added.)*

It appears that agricultural rates were not adjusted in the interim period using this prescribed formula.

³ Issues regarding PG&E's implementation of the 2017 GRC Settlement in setting rates in the interim leaves open the question as to whether this is the appropriate starting benchmark in the first place.

1 Against the background summarized above, AECA recommends that the Commission
2 either (1) endorse a revenue allocation approach based on AECA’s marginal cost proposals as
3 interim methods for this GRC only and issue an order instituting rulemaking (OIR) on
4 establishing marginal cost methods as it did three decades ago, (2) adopt a settlement agreement
5 without ruling on marginal cost issues, or (3) maintain current revenue allocations after
6 correcting for the substantial increases in PG&E’s agricultural rates since the 2017 GRC.

7 The electricity landscape has changed dramatically since 1990. The Commission should
8 take the proper time, outside the pressures of a GRC, to update its revenue allocation standards to
9 reflect these changes.

10 **2. Parties Have Offered Obsolete, Conflicting and Theoretically Inconsistent** 11 **Evidence for Their Marginal Cost Principles and Methods**

12 In reviewing parties’ direct testimonies, AECA was struck by the lack of
13 acknowledgement of ongoing changes that are occurring in the utility sector which are altering or
14 will substantially alter cost of services, underlying marginal costs, and concomitant class-specific
15 revenue allocation. In general, as discussed below, parties appear to rely on their traditional
16 positions predicated on past investment patterns as a means to advance favorable revenue
17 responsibility allocation for their respective class rather than focus on how revenue allocation
18 and rate designs need to change alongside the technological ecosystem.

19 In this case, at least three new methods have been introduced by several parties including
20 PG&E to calculate marginal costs used to determine revenue allocation:

- 1 • To value capacity used to meet reliability needs, replacing the costs to install

2 natural gas fueled combustion turbines (CTs)⁴ as a proxy with either battery

3 storage⁵ or a short-term market price benchmark derived from a partial set of

4 resource adequacy (RA) transactions.⁶
- 5 • Adding a “green price adder” to the marginal generation energy cost to reflect

6 renewable portfolio standard (RPS) requirements that are in addition to acquiring

7 energy through California Independent System Operator (CAISO) energy

8 markets.⁷
- 9 • Distinguishing between NEM and non-NEM customers in allocating distribution

10 system costs.⁸

⁴ Used in PG&E’s 2017 GRC and supported by “[Direct Testimony Of Catherine E. Yap and Paul D. Nelson on Behalf of the California Large Energy Consumers Association \(CLECA\)](#),” [Schedules of Maurice Brubaker](#),” [The Federal Executive Agencies \(FEA\)](#), November 20, 2020, Section IV.

⁵ As proposed in PG&E’s “Cost of Service,” Exhibit (PG&E-2), July Errata, July 16, 2020, Chapter 3; and “Direct Testimony of William Perea Marcus: Marginal Cost, Revenue Allocation, and Rate Design,” Submitted on Behalf of The Utility Reform Network (TURN), November 20, 2020, Section III; “Direct Testimony of James R. Dauphinais,” On behalf of Energy Producers & Users Coalition (EPUC), November 20, 2020, Section II; “[Direct Testimony of Catherine E. Yap and Schedules of Maurice Brubaker](#),” [The Federal Executive Agencies \(FEA\)](#), [Paul D. Nelson on Behalf of the California Large Energy Consumers Association \(CLECA\)](#),” November 20, 2020, Section IV.

⁶ As proposed in “Direct Testimony of Richard McCann, Ph.D. on Marginal Costs, Revenue Allocation, and Rate Design Issues on Behalf of the Agricultural Energy Consumers Association” (AECA), November 20, 2020, Section 3; and Public Advocates Office (CalAdvocates), “Prepared Testimony On Pacific Gas & Electric Company’s 2020 General Rate Case,” October 23, 2020, Chapter 3. An additional method was introduced in the “Direct Testimony of William A. Monsen and Carlo Bencomo-Jasso on Behalf of The California Farm Bureau Federation Concerning Revenue Allocation and Agricultural Rate Design in Application 19-11-019” (CFBF) that is similar to the RA transactions, instead using the CAISO’s capacity purchase mechanism (CPM) prices, which serve as the ceiling for backstop short term and reliability must-run contracts.

⁷ As proposed by AECA; and “Prepared Direct Testimony Of Andrew J. Reger On Behalf Of The Joint Community Choice Aggregators” (Joint CCAs) November 20, 2020, Section II. PG&E has stated that it will add this in its rebuttal testimony. (PG&E, “Re: PG&E’s MGCC and MEC Testimony and Errata in A.19-11-019,” To Parties on the Service List for A.19-11-019, December 30, 2020.)

⁸ As proposed in Exhibit (PG&E-2), Chapter 8, and reviewed by CalAdvocates.

1 Further, an important revelation from the rolling blackouts in August 2020 and the freeze
2 in Texas was that the standard single-hour measure of RA likely is no longer valid as a reliability
3 measurement in the changing electricity grid. The CAISO system problems occurred outside the
4 highest peaks for reasons other than just the simple unavailability of installed capacity, such as
5 operational failures⁹ and lax enforcement of market rules.¹⁰ No alternative method has been
6 proposed in this case to calculate a different reliability or resilience economic metric.

7 Diablo Canyon Power Plant Units 1 and 2 will be retired in 2024 and 2025, within the
8 time horizon used by PG&E to estimate marginal costs in this proceeding.¹¹ Bundled generation
9 rates will fall dramatically after these units are removed from system costs. Dropping 2,200
10 megawatts of baseload generation will affect both the resource mix that sets the market clearing
11 price in the CAISO markets and how RA will be met. No party has directly addressed how the
12 power situation will change, with PG&E melding together the 2021 to 2027 period in its capacity
13 cost modeling analysis while ignoring this effect in its time of use evaluation.¹² There could be a
14 discontinuity in the timing and magnitude of market prices between 2023 and 2026 that would
15 affect both marginal costs and rate design parameters, but no party has presented analysis of
16 what impact this will have on revenue allocation and rate design over that period.

⁹ California Independent System Operator, California Public Utilities Commission, California Energy Commission. 2021. "Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave." Folsom, California. <http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf>.

¹⁰ California Independent System Operator Department of Market Monitoring. 2020. "Report on system and market conditions, issues and performance: August and September 2020." Folsom, California. <http://www.caiso.com/Documents/ReportonMarketConditionsIssuesandPerformanceAugustandSeptember2020-Nov242020.pdf>; and Clean Coalition. 2021. "What CAISO didn't tell you about the August 2020 blackouts." Presentation. https://clean-coalition.org/wp-content/uploads/2021/01/What-CAISO-didnt-tell-you-about-the-August-blackouts-02_rf-28-Jan-2021.pdf;

¹¹ Exhibit (PG&E-2), p.1-12.

¹² Ibid.

1 AECA introduced a method to account for differences in customer growth rates and
2 characteristics in measuring both generation capacity and distribution system marginal costs. The
3 other parties have not generally proposed to differentiate by customer class growth rates to date.
4 The Commission's directive of nearly three decades calls for methods to reflect differences in
5 customer class growth for allocating generation capacity costs based on differing values of
6 service, differentiating distribution costs based on how customers are distributed geographically,
7 and weighting customer costs by vintage.¹³

8 As in prior GRCs, parties remain at loggerheads over how to appropriately set customer
9 service costs, either by using the real economic carrying cost (RECC)¹⁴ or rental cost versus the
10 new customer only (NCO) method.¹⁵ Here also, AECA has presented a growth-based approach
11 that uses RECC for new customers and the replacement cost new less depreciation (RCNLD) for
12 existing customers, which addresses the concerns of both the other methods.¹⁶

13 If the Commission adopts specific methods for computing marginal costs in this
14 proceeding, it will not have the opportunity to examine the cumulative consequences to class-
15 specific rates, and risks imposing large increases on classes in a GRC period in which overall
16 bills are expected to jump substantially as PG&E is approved to recover wildfire-related costs.
17 Given these substantial uncertainties, the Commission should not attempt to remake the entire
18 analytic map, with associated unanticipated consequences. Instead, the Commission should adopt
19 AECA's proposals on an interim basis as they both cause the least shift in customer class

¹³ D.92-12-057.

¹⁴ CLECA, Section VII; FEA, Section II; EPUC, Section III.

¹⁵ TURN, Section II; CalAdvocates, Chapter 1.

¹⁶ AECA, Section 3.3.

allocations of any of the proposals and best capture the theoretical and regulatory principles adopted to date.

2.1. The Electricity Landscape Is Changing Before Our Eyes

The principles guiding cost allocation have largely been static for fifty years.¹⁷ Those now-quaint doctrines held that marginal costs reflecting market values could be captured entirely in the average incremental energy cost or market clearing price and the cost of new generation capacity to meet the single highest peak load hour of demand. The belief was that marginal generation costs could be reflected simply as a supply-side matter represented through two proxy measures. That uncomplicated world may have held for a period but is no longer a reality. Yet, all other parties submitting full revenue allocation recommendations rely on that approach, as will be discussed below.

The electricity sector has changed profoundly, particularly in the last 25 years. Hourly electricity markets have not delivered on their envisioned promises; they do not economically incent necessary new capacity addition without regulatory intervention and have not incorporated environmental costs sufficiently to drive clean energy investments alone. Large-scale fossil fuel generation is being replaced by more dispersed renewables, storage, and distributed energy resources (DER), driven by the imperative to reduce greenhouse gas emissions as much as to meet new loads, and even those new loads are principally deployed to displace fossil fuel use in transportation and buildings. New technologies enable customers to

¹⁷ Alfred E. Kahn, 1988, *The Economics of Regulation: Principles and Institutions*, Cambridge, Massachusetts; London, England: MIT Press; National Economic Research Associates, 1977, “A Framework for Marginal Cost-Based Time-Differentiated Pricing in the United States,” Prepared for EPRI Rate Design Study.

1 produce their own energy and to substantially or fully escape reliance on the centralized utility
2 grid.

3 This year, electricity systems have experienced four types of major multi-hour outages in
4 California and Texas for reasons other than a failure to have sufficient installed capacity to meet
5 the single highest peak load: (1) rolling blackouts in August in the area served by CAISO due to
6 a mix of market actions during a 1-in-35 year weather event while several thousand megawatts
7 of capacity remained available;¹⁸ (2) public safety power shutoffs (PSPS) to mitigate potential
8 wildfire hazards in PG&E's and Southern California Edison Company's (SCE) service areas;¹⁹
9 (3) localized weather-caused outages in several counties in PG&E's and Sacramento Municipal
10 Utility District's service areas;²⁰ and (4) widespread rolling outages in Texas caused by extreme
11 freezing weather.²¹

12 This emerging energy era, in which mostly climate-related challenges will increasingly
13 be met with decarbonized, resilient, reliable resources merits a fundamental reconsideration of
14 cost allocation principles.

15 In its Opening Testimony, AECA offered methods that can be used as bridges to the
16 future, including retreating from the obsolete CT capacity proxy to a technology-agnostic short-

¹⁸ CAISO et al. (2021). CAISO Department of Market Monitoring (2020); Clean Coalition (2021); and "California begins rolling blackouts after first Stage 3 emergency since 2001," *Los Angeles Times*, <https://www.latimes.com/california/story/2020-08-14/la-me-statewide-power-outages-warning>, August 14, 2020.

¹⁹ "Nearly half a million PG&E customers to lose power amid planned fire-safety shut-offs Sunday," *San Francisco Chronicle*, <https://www.sfchronicle.com/bayarea/article/Lafayette-Orinda-Moraga-brace-for-PG-E-outages-15670411.php>, October 24, 2020.

²⁰ "Hundreds of PG&E Crews Working to Restore Service as One of the Strongest Winter Storms in Years Hit," *PG&E News Release*, https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20210127_hundreds_of_pge_crews_working_to_restore_service_as_one_of_the_strongest_winter_storms_in_years_hit, January 27, 2021.

²¹ "We're in it alone': Power outages leave millions of Texans desperate for heat and safety," *The Texas Tribune*, February 16, 2021.

1 term market value stand-in already in use to set rates for departed customers; adopting a short-
2 run measure of the added cost of renewable energy; implementing a compromise method to
3 calculate marginal customer costs that relies on a Commission endorsed approach to value
4 distribution assets; and advancing a technique to account for differences in customer class
5 growth rates in generation and distribution, not just customer service connections. AECA, and in
6 some cases other parties,²² have demonstrated that these recommendations merit serious
7 Commission consideration.

8 AECA acknowledges that these analytical improvements are being presented in the
9 context of the old paradigm and, therefore, do not adequately capture the marginal cost
10 consequences of new and emerging challenges, such as the many different dimensions of
11 reliability revealed over the last year, as well as the advent of bilateral transactions. The
12 Commission should avoid committing to a set of methodologies that will have to be soon cast
13 aside as part of California's embrace of a more environmentally and economically sound future.
14 An OIR, rather than a GRC, is a more suitable proceeding in which to debate these issues
15 without the immediate pressures associated with determining class-specific revenue allocations.

16 **2.2. The Commission Does Not Have Sufficient Information to Determine What** 17 **Proxy Should be Used as the Basis for Reliability Costs**

18 The first profound conflict the Commission needs to address to rebuild a set of marginal
19 cost methods for the new energy era is which technology will be the best proxy for meeting
20 reliability, resilience and RA needs. On one hand, the California Large Energy Consumers
21 Association (CLECA)²³ argues for continued reliance on a CT as the proxy cost, even though no

²² Each party's position is identified in the relevant sections below.

²³ ~~CLECA~~ FEA, Section IV.

1 CTs have been deployed in California in a decade and quite a few have been cancelled for
2 various reasons.²⁴ On the other hand, PG&E,²⁵ Energy Producers and Users Coalition (EPUC),²⁶
3 Federal Energy Agencies (FEA),²⁷ and TURN²⁸ propose to use battery storage as the proxy.²⁹
4 Both sets of parties' assumptions about storage financing and cost improvements over the next
5 half dozen years are largely speculative.³⁰ The trajectory of battery cost reductions cannot be
6 easily predicted; shifts could significantly change the marginal capacity cost metric under
7 PG&E's and TURN's approaches.

8 AECA³¹ and CalAdvocates³² offer positions in the middle, arguing for use of the same
9 metric applied to set the power cost indifference adjustment (PCIA) rate charged departing
10 community choice aggregators' (CCA) and direct access energy service providers' customers:
11 the RA market price benchmark (MPB). While the RA MPB is agnostic on technology, it is not
12 possible to produce a forecast beyond a few years for the same reasons that the Commission
13 cannot rely on estimates of CT and storage costs.

14 While storage is *likely* the technology of the future, not enough is known today to simply
15 adopt batteries as the proxy in perpetuity. Instead, the RA price benchmark offers an interim

²⁴ California Energy Commission, "Alphabetical List of Power Plant Projects,"
https://www2.energy.ca.gov/sitingcases/alphabetical_cms.html, retrieved February 21, 2021.

²⁵ Exhibit (PG&E-2), Chapter 2, Section A.

²⁶ EPUC, Section II.

²⁷ ~~FEA~~ CLECA, Section IV.

²⁸ TURN, Section III.

²⁹ PG&E made a serious calculation error initially in revenue requirements for its proxy technology but issued a correction at a late date on January 15, 2021. ("Pacific Gas and Electric Company 2020 General Rate Case Phase II Exhibit (PG&E-2) Cost of Service January 2021 Updated Testimony," January 15, 2021.)

³⁰ PG&E and TURN offer battery cost projections over the next five years that are remarkable, though not inconsistent with the decline in solar photovoltaic costs a little more than a decade ago.

³¹ AECA, Section 3.1.2.

³² CalAdvocates, Chapter 3.

1 bridge, at least for this case, until a broader set of marginal cost standards can be properly
2 examined. Rather than prematurely choosing a method to compute marginal capacity costs based
3 on an outmoded concept or speculative formulation of a new method, the Commission should
4 spend the necessary time and evaluate sufficient data to render a determination that matches with
5 the ambitions it holds for our energy future.

6 **2.3. Including a Green Adder Is Consistent with Setting the PCIA but More Data**
7 **Is Needed to Develop a Durable Marginal Cost Benchmark**

8 AECA³³ and the Joint Community Choice Aggregators (Joint CCAs)³⁴ propose that
9 marginal generation energy costs include the same “green adder” used to calculate the portfolio
10 market value reflected in the PCIA rate.³⁵ After its initial filing, PG&E notified parties about an
11 error in its marginal cost calculations and its desire to include the renewable energy credit (REC)
12 adder in its next round of testimony, to be released coincidentally with this rebuttal.³⁶ No other
13 party has included this factor that best reflects the composition of PG&E’s future energy
14 portfolio. If adopted, such an adder will better reflect the responsibilities of load-serving entities
15 to meet their RPS responsibilities. No other party has offered a means of incorporating the costs
16 of adding renewables to meet marginal generation needs.

17 Again, AECA has offered an interim solution to correctly calculate marginal costs. The
18 preferred method requires first that the share of the marginal energy cost represented by the REC
19 be adjusted for rising RPS requirements from 2021 to 2027, which correspond with PG&E’s
20 marginal cost. The required share in 2021 is ~~34.7~~35.8% and 52% by 2027 based on the 60% goal

³³ AECA, Section 3.1.1.

³⁴ Joint CCAs, Section II.C.i.

³⁵ D.18-10-009.

³⁶ PG&E, December 30, 2020.

1 set out in state law.³⁷ These shares need to be adjusted for PG&E's expected resource
2 acquisitions over that period based on confidential resource data not included in this case. For
3 this reason, the Commission can no longer rely on a single-year estimate of marginal energy
4 costs—the relative shares of components that are time-differentiated versus constant will change
5 dramatically over the GRC cycle. This implies that revenue allocations could be very different in
6 the first year versus the last year.

7 Second, no REC price forecasts have been entered into this proceeding's record with
8 opportunities for examination and potential proposed modifications. Given the increasing
9 importance of the REC price between 2021 to 2027, this element could have a profound effect on
10 estimated marginal energy costs used for revenue allocation.

11 In this situation, the best course of action would be to defer a deeper analysis to establish
12 a more durable benchmark to other proceedings and the next GRC. In the interim, the
13 Commission can use AECA's proposal as necessary for a marginal cost metric.

14 **2.4. PG&E Has Introduced a New Method to Distinguish Costs between NEM**
15 **and Non-NEM Customers in a Framework that Cannot Be Accessed by**
16 **Other Parties**

17 PG&E introduced an analysis of the differences in costs to serve NEM versus non-NEM
18 customers.³⁸ The model has 83 million data points in a file that is too large for any party without
19 substantial computing resources to effectively evaluate and manipulate. CalAdvocates described
20 this problem in its initial testimony, and other parties either faced the same dilemma or ignored

³⁷ Public Utilities Code § 399.15(b)(2)(B).

³⁸ Exhibit (PG&E-2), Chapter 8.

1 the proposal due to its complexity.³⁹ This situation is just another illustration of the new, untried
2 cost allocation approaches being pushed in this proceeding.

3 Without an ability to examine PG&E's analysis, the Commission is limited to the utility's
4 assurance of its accuracy. Yet PG&E has filed two significant corrections to its testimony in this
5 proceeding, one of them in response to an error uncovered by another party, the other as late as
6 January 15, 2021.⁴⁰ As complexity rises, so too does the probability of error.

7 An important question is how prices for bidirectional transactions should be determined
8 as this activity takes hold in the future. The NEM 3.0 proceeding could include consideration of
9 rate designs that accommodate bidirectional transactions.⁴¹ However, the important implications
10 of this new element will not be known at least until 2022, making PG&E's proposal premature.
11 Other important energy management concepts, such as virtual load aggregation and
12 geographically targeted siting of storage resources, will also emerge during the period in which
13 marginal costs adopted in this proceeding would prevail.

14 The Commission should not make a premature decision about how to calculate marginal
15 costs using an untested approach just because it is the only one presented in this proceeding.
16 Rather, the Commission should defer this decision and direct what the next step should be for the
17 purpose of allocating costs between traditional customers and those that are engaged in bilateral
18 transactions with the utility. Locking in a set of obsolete costing concepts during this dynamic
19 period would be ill-advised and prompt the need for them to be unraveled before too long. The

³⁹ CalAdvocates, p. 4-5, and "Prepared Direct Testimony of R. Thomas Beach on behalf of the Solar Energy Industries Association," November 20, 2020, Section IV.

⁴⁰ PG&E issued substantially corrected testimony and workpapers on July 10, 2020, and again on January 15, 2021.

⁴¹ Rulemaking 20-08-020.

proceeding in which NEM 3.0 is being considered is the appropriate docket to address this issue across all utilities.

2.5. The Debate Over Marginal Customer Costs Has Remained Largely Static in the Face of a Changing Utility Landscape, Except for AECA's Proposal

Parties have lined up on each side of the debate over marginal customer costs as expected based on past GRCs, with those representing residential customers (i.e., TURN⁴² and CalAdvocates⁴³) arguing for NCO, which disperses a small amount of costs over a large customer base, and those representing large customers (i.e., CLECA⁴⁴ and FEA⁴⁵) arguing for RECC, which places an individual cost on each customer. Both arguments are unworkable in their extremes, as AECA addressed in its opening testimony. The key problems with the contrasting positions can be seen through these two observations:

- Contrary to the assertion in the NCO method, customers' service connections still have value after they have been installed, in a similar fashion as other attributes in a house, such as added bedrooms, a garage and a pool.
- Contrary to the premise of the RECC method, older connections already installed have a diminished value compared to a new connection, in terms of services delivered (e.g., reliability) and the remaining life of the investment.

AECA's proposal combines these insights to value new and existing connections within each rate class and could effectively be adopted as an interim approach. Better, however, would

⁴² TURN, Section II.

⁴³ CalAdvocates, Section II.

⁴⁴ CLECA, Section VII.

⁴⁵ FEA, Section II.

1 be for the Commission to rule that neither the RECC or NCO method is valid and order parties to
2 convene a set of workshops to develop a more coherent and consistent approach.

3 **2.6. Distribution System Costs Also Should Reflect Differences in Growth** 4 **Rates**

5 As discussed previously, the Commission ordered three decades ago that marginal costs
6 must include adjustments for differences in customer class growth rates.⁴⁶ This imperative has
7 been largely ignored and fought over in the one functional area where it is considered at all.
8 Where this aspect has been considered in this proceeding, parties have focused solely on
9 customer access costs, ignoring differences in responsibilities for generation and distribution
10 costs.

11 AECA alone has proposed a comprehensive set of new methods that comply with the
12 Commission's directive. The Commission should either adopt AECA's recommendations on an
13 interim basis or include consideration of the means to properly incorporate its longstanding
14 requirement to account for growth differentials for all functional components in the
15 recommended OIR.

⁴⁶ D.92-12-057.

1 **3. Recently Released Commission Report Reveals that PG&E’s Revenue**
2 **Allocation Using Marginal Costs Is Out of Line Compared to Other**
3 **Utilities**

4 The Commission released a report on February 16, 2021⁴⁷ in anticipation of an *en banc*
5 hearing on Electric and Gas Rates and Costs on February 24, 2021.⁴⁸ The report displays three
6 figures at pages 15 and 16 that compare system average rates for PG&E, SCE and San Diego
7 Gas & Electric Company (SDG&E) to class averages.⁴⁹ Unique among the three utilities,
8 PG&E’s agricultural class average rose above the system average in 2019 and 2020.

9 The Agricultural Parties had agreed to an average rate that was below the system average
10 by 3.3% in PG&E’s 2017 GRC settlement⁵⁰ with an annual relative increase of 0.7%⁵¹ and
11 expected that this relationship would remain until the next GRC. Instead, agricultural rates rose
12 by 17.0% by 2020, which exceeds the allowed increase in the Settlement by 14.6% without any
13 obvious explanation in the standard advice letters (e.g., Annual Electric True Up or March 1 rate
14 updates) or related proceedings (e.g., ERRRA) over that period.⁵² As a result, it appears that

⁴⁷ CPUC, *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates and Equity Issues Pursuant to P.U. Code Section 913.1*, https://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Reports_and_White_Papers/Feb%202021%20Utility%20Costs%20and%20Affordability%20of%20the%20Grid%20of%20the%20Future.pdf, February 2021.

⁴⁸ See Commission meeting notice at <https://www.cpuc.ca.gov/General.aspx?id=6442467418>.

⁴⁹ CPUC (2021), Figures 4 (PG&E), 5 (SCE) and 6 (SDG&E).

⁵⁰ As shown in the Settlement Workpapers, file “CONF_Proposed Rate Revenue_GRC.xlsx”, sheet “OUT_Bdld Revenue.” Columns BC-BD, and “.CONF_RA_Rev Alloc_GRC.xlsx”, sheet “OUT_RA_Result”, Column X.

⁵¹ 2017 GRC Motion for Settlement of Marginal Cost and Revenue Allocation Issues.

⁵² The Commission should order PG&E to fully explain why agricultural rates rose so dramatically in the previous period, both in comparison to other PG&E customers and in relationship to the agricultural rates for the other two utilities. AECA is not aware of any significant change in agriculture’s situation between 2017 and 2020 nor of any relevant difference that has emerged between PG&E compared to SCE and SDG&E.

PG&E is actually asking for a rate increase of 19.8%,⁵³ not 4.5%, in its 2020 GRC over previously approved 2017 GRC rates.

That the relationship of agricultural rates to system average rates for PG&E differs so much from SCE and SDG&E illustrates the lack of substantiation behind PG&E's application of marginal costs. The Commission should be circumspect of adopting any marginal cost principles beyond this case, if at all, until this discrepancy can be explored and explained.

4. Any Allocation of Wildfire Costs Must Be on an Interim Basis

The need to manage and respond to wildfire risks and damages has emerged as one of the most pressing issues facing the electricity system. There is a profound difference between the short-term answers being proposed and implemented by utilities and visions for long-term solutions that focus on local resilience and sustainability proffered by the Commission and various parties in other proceedings. In the near term, costs are being incurred for vegetation management, distribution system fixes and fossil-fueled portable and other generation, none of which is likely sustainable but may be necessary to avoid adverse events this summer. In the future, reliance on the distribution system will likely need to be reduced, through a shift to microgrids and other technologies and a retreat from wildlands.

The question is how should short-term costs be allocated today while developing more profound insights into how to share future costs? CalAdvocates,⁵⁴ TURN,⁵⁵ CLECA,⁵⁶ and

⁵³ The 19.8% increase is the geometric sum of the apparent 14.6% increase in excess of the allowed increase under the 2017 GRC Settlement and the 4.5% increase proposed by PG&E in the 2020 GRC.

⁵⁴ CalAdvocates, Chapter 6, Section II.D.

⁵⁵ TURN, Section V.B.

⁵⁶ CLECA, Section VIII.D.

FEA⁵⁷ have all weighed in on how to allocate these costs, but the methods are either pragmatic mixes of allocation factors or theoretical constructs with little explanation of how the approach is derived and supported other than by assertion. It would be risky for the Commission to prematurely rule on cost allocation methods in this realm, particularly if these are likely to be derived from obsolete concepts. Instead, the Commission should either accept a settlement or choose a pragmatic method for this GRC and move to explore more deeply a durable method in a broader proceeding.

5. The Commission Should Adopt the Principle of Gradualism and Chart a Path Going Forward

The Commission should adopt the profound advice of those who have set out widely applied ratemaking principles, and as often cited in Commission proceedings.⁵⁸ These sages advise “gradualism” in any changes so that customers are able to invest with certainty when California and the United States set out policy objectives. Serious errors have been made when gradualism has been ignored, the most salient example being the restructuring begun in 1998, from which the state is still recovering.

The Commission should lead the parties towards a productive pathway to determine how cost allocation, perhaps not only among ratepayers, should be done in a world that has changed profoundly over the past 40 years. An OIR comprehensively examining cost allocation methods would be vastly preferable to reacting to piecemeal proposals.

In the meantime, in this proceeding the Commission should order PG&E to leave its current revenue allocations unchanged or use AECA’s proposed approach for this proceeding.

⁵⁷ FEA, Section III.

⁵⁸ James C. Bonbright, 1961, *Principles of Public Utility Rates*, New York City: Columbia University Press.; Kahn (1988).

ATTACHMENTS

Agricultural Energy Consumers Association

Attachments

Footnote 9

California Independent System Operator, California Public Utilities Commission, California Energy Commission. 2021. "Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave." Folsom, California. <http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf>.

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FINAL

Root Cause Analysis

Mid-August 2020 Extreme Heat Wave

January 13, 2021



Prepared by:
California Independent System Operator
California Public Utilities Commission
California Energy Commission

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California ISO



January 13, 2021

The Honorable Gavin Newsom
Governor, State of California
State Capitol
Sacramento, CA 95814

Dear Governor Newsom:

In response to your August 17, 2020 letter, the California Independent System Operator (CAISO), California Public Utilities Commission (CPUC), and California Energy Commission (CEC) are pleased to provide you the attached Final Root Cause Analysis (Final Analysis) of the two rotating outages in the CAISO footprint on August 14 and 15, 2020. This Final Analysis builds on the Preliminary Root Cause Analysis report published on October 6, 2020 and provides updates on the progress made on a number of the recommendations identified in the preliminary analysis. It also incorporates data that was not available when the preliminary analysis was developed, information from the Labor Day weekend heat wave and updated analysis of resource performance.

We recognize our shared responsibility for the power outages many Californians unnecessarily endured. The findings of the Final Analysis underscore this shared responsibility and give greater definition to actions that can be taken to avoid or minimize the impacts to those we serve.

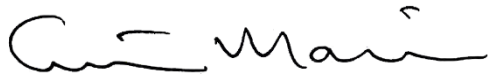
The Final Analysis confirms there was no single root cause of the August outages, but rather, finds that the three major causal factors contributing to the outages were related to extreme weather conditions, resource adequacy and planning processes, and market practices. Although this combination of factors led to an extraordinary situation, our responsibility and commitment going forward is to be better prepared for extreme climate change-induced weather events and other operational challenges facing our evolving power system.

The Final Analysis provides recommendations for immediate, near and longer-term improvements to our resource planning, procurement, and market practices, many of which are underway. These actions are intended to ensure that California's transition to a reliable, clean, and affordable energy system is sustained and accelerated. This is an imperative – for our citizens, communities, economy, and environment. Implementation of these recommendations will involve processes within state agencies and the CAISO, partnership with the state Legislature, and collaboration and input from stakeholders within California and across the western United States.

This Final Analysis has served as an important step in learning from the events of August 14 and 15, as well as a clear reminder of the importance of effective communication and coordination.

We remain committed to meeting California's clean energy and climate goals and value your personal engagement on these issues and your unequivocal commitment and leadership on addressing climate change.

Regards,

A handwritten signature in black ink, appearing to read "Elliot Mainzer".

Elliot Mainzer
President and Chief Executive Officer
California Independent System Operator

A handwritten signature in blue ink, appearing to read "Marybel Batjer".

Marybel Batjer
President
California Public Utilities Commission

A handwritten signature in black ink, appearing to read "David Hochschild".

David Hochschild
Chair
California Energy Commission

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GLOSSARY OF ACRONYMS

ACRONYM	DEFINITION
AAEE	Additional Achievable Energy Efficiency
AB	Assembly Bill
A/S	Ancillary Services
AWE	Alerts, Warnings, and Emergencies
BA	Balancing Authority
BAA	Balancing Authority Area
BPM	Business Practice Manual
CAISO	California Independent System Operator Corporation
CARB	California Air Resources Board
CCA	Community Choice Aggregator
CDWR	California Department of Water and Power
CEC	California Energy Commission
CHP	Combined Heat and Power
COI	California Oregon Intertie
CPM	Capacity Procurement Mechanism
CPUC	California Public Utilities Commission
DMM	CAISO Department of Market Monitoring
EIM	Energy Imbalance Market
ELCC	Effective Load Carrying Capability
ESP	Energy Service Provider
FERC	Federal Energy Regulatory Commission
GHG	Greenhouse Gas
HASP	Hour-Ahead Scheduling Process
IEPR	Integrated Energy Policy Report
IFM	Integrated Forward Market
IOU	Investor Owned Utility
IRP	Integrated Resource Planning
JASC	Joint Agency Steering Committee
LADWP	Los Angeles Department of Water and Power
LMS	Load Management Standards
LOLE	Loss of Load Expectation
LRA	Local Regulatory Authority
LSE	Load Serving Entity
MW	Megawatt
MWD	Metropolitan Water District
NCPA	Northern California Power Agency
NERC	North American Electric Reliability Corporation

ACRONYM	DEFINITION
NOB	Nevada Oregon Border
NQC	Net Qualifying Capacity
NWS	National Weather Service
PDCI	Pacific DC Intertie
PDR	Proxy Demand Resource
PGE	Portland General Electric
PG&E	Pacific Gas and Electric
PIME	Price Inconsistency Market Enhancements
POU	Publicly Owned Utility
PRM	Planning Reserve Margin
QC	Qualifying Capacity
RA	Resource Adequacy
RAAIM	Resource Adequacy Availability Incentive Mechanism
RDRR	Reliability Demand Response Resource
RMO	Restricted Maintenance Operations
RMR	Reliability Must Run
RUC	Residual Unit Commitment
SB	Senate Bill
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric
SMUD	Sacramento Municipal Utility District
TAC	Transmission Access Charge
TOU	Time of Use
WAPA	Western Area Power Administration
WECC	Western Electric Coordinating Council

Executive Summary

On August 14 and 15, 2020, the California Independent System Operator Corporation (CAISO) was forced to institute rotating electricity outages in California in the midst of a West-wide extreme heat wave. Following these emergency events, Governor Gavin Newsom requested that, after taking actions to minimize further outages, the CAISO, the California Public Utilities Commission (CPUC), and the California Energy Commission (CEC) report on the root causes of the events leading to the August outages.

The CAISO, CPUC, and CEC produced a Preliminary Root Cause Analysis (Preliminary Analysis) on October 6, 2020, and have since continued their analysis to confirm and supplement their findings. This Final Root Cause Analysis (Final Analysis) incorporates additional data analyses that were not available when the Preliminary Analysis was published, but does not substantively change earlier findings and confirms that the three major causal factors contributing to the August outages were related to extreme weather conditions, resource adequacy and planning processes, and market practices. In summary, these factors were the following:

1. The climate change-induced extreme heat wave across the western United States resulted in demand for electricity exceeding existing electricity resource adequacy (RA) and planning targets.
2. In transitioning to a reliable, clean, and affordable resource mix, resource planning targets have not kept pace to ensure sufficient resources that can be relied upon to meet demand in the early evening hours. This made balancing demand and supply more challenging during the extreme heat wave.
3. Some practices in the day-ahead energy market exacerbated the supply challenges under highly stressed conditions.

Although August 14 and 15 are the primary focus of this Final Analysis because the rotating outages occurred during those days, August 17 through 19 were projected to have much higher supply shortfalls. If not for the leadership of the Governor's office to mobilize a statewide mitigation effort and significant consumer conservation, California was also at risk of further rotating outages on those days.

ES.1 Current Actions to Prepare for Summer 2021

The CAISO, CPUC, and CEC have already taken several actions and are continuing their efforts to prepare California for extreme heat waves next summer without having to resort to rotating outages. These actions include the following:

- 1) The CPUC opened an Emergency Reliability rulemaking (R.20-11-003) to procure additional resources to meet California's electricity demand in summer 2021. Through this proceeding, the CPUC has already directed the state's three large investor-owned utilities to seek contracts for additional supply-side capacity and has requested proposals for additional demand-side resources that can be available during the net demand peak period (i.e., the hours past the gross peak when solar production is very low or zero) for summer 2021 and summer 2022. The CPUC and parties to the proceeding, including the CAISO, will continue to evaluate proposals and procurement targets for both supply-side and demand-side resources.
- 2) The CAISO is continuing to perform analysis supporting an increase to the CPUC's RA program procurement targets. Based on the analysis to date, the CAISO recommends that the targets apply to both the gross peak and the critical hour of the net demand peak period during the months of June through October 2021.
- 3) The CAISO is expediting a stakeholder process to consider market rule and practice changes by June 2021 that will ensure the CAISO's market mechanisms accurately reflect the actual balance of supply and demand during stressed operating conditions. This initiative will consider changes that incentivize accurate scheduling in the day-ahead market, appropriate prioritization of export schedules, and evaluate performance incentives and penalties for the RA fleet. The CAISO is also working with stakeholders to ensure the efficient and reliable operation of battery storage resources given the significant amount of new storage that will be on the system next summer and beyond. Through a stakeholder process, the CAISO will pursue changes to its planned outage rules.
- 4) The CPUC is tracking progress on generation and battery storage projects that are currently under construction in California to ensure there are no CPUC-related regulatory barriers that would prevent them from being completed by their targeted online dates. The CAISO will continue to work with developers to address interconnection issues as they arise.
- 5) The CAISO and CEC will coordinate with non-CPUC-jurisdictional entities to encourage additional necessary procurement by such entities.
- 6) The CEC is conducting probabilistic studies that evaluate the loss of load expectation on the California system to determine the amount of capacity that needs to be installed to meet the desired service reliability targets.
- 7) The CAISO, CPUC, and CEC are planning to enhance the efficacy of Flex Alerts to maximize consumer conservation and other demand side efforts during extreme heat events.

- 8) Preparations by the CAISO, CPUC, and CEC are underway to improve advance coordination for contingencies, including communication protocols and development of a contingency plan. The contingency plan will draw from actions taken statewide under the leadership of the Governor's Office to mitigate the anticipated shortfall from August 17 through 19, 2020.

In the mid-term, for 2022 through 2025, the CAISO, CPUC, and CEC will continue to work toward: (1) planning and operational improvements for the performance of different resource types (such as batteries, imports, demand response, and so forth); (2) improvements to accelerate the deployment and integration of demand side resources; and (3) consideration of generation and transmission buildouts to evaluate options and constraints under the SB 100 scenarios. This planning will also account for the pending retirements of some existing natural gas units and the Diablo Canyon nuclear power plant.

For the longer term, 2025 and beyond, the CAISO, CPUC, and CEC are working closely together and with other regional stakeholders to establish a modernized, integrated approach to forecasting, resource planning and RA targets. The enhanced collaboration and alignment are to more fully anticipate events like last summer's climate change-induced extreme heat wave and better plan and account for the transitioning electricity resource mix necessary to meet clean energy goals. This is a statewide concern that requires assessing resource sufficiency and reliability for all of California. As such, building on the CEC's statewide statutory responsibilities, the CAISO, CPUC, and CEC will define and develop necessary assessments as part of the *Integrated Energy Policy Report (IEPR)*, to create improved understanding into statewide, and WECC-wide resource sufficiency.

To provide complete transparency into the various summer 2021 preparedness efforts underway, the CAISO, CPUC, and CEC will continue to report monthly to the California State Legislature as requested by the Chair of the Assembly Committee on Utilities and Energy, Chris Holden. In addition, the CAISO is holding monthly open stakeholder calls to discuss progress toward ensuring its readiness for next summer's high heat events.

Information and updates on these efforts can be found at:

<http://www.caiso.com/about/Pages/News/SummerReadiness.aspx>

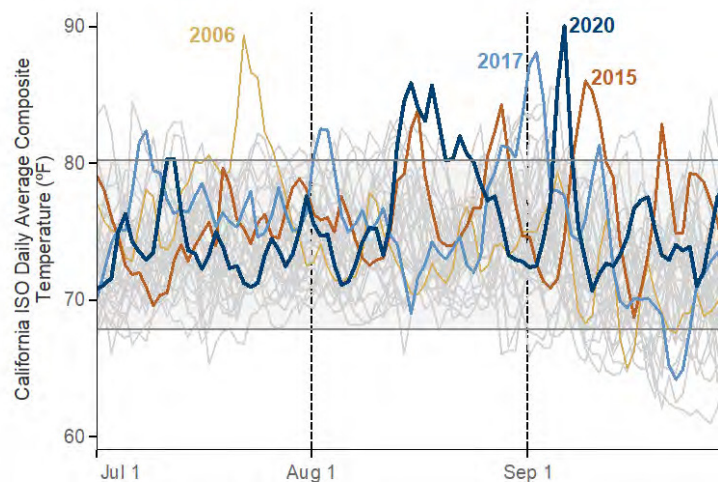
<https://www.cpuc.ca.gov/summerreadiness/>

ES.2 Three Major Factors that Led to Rotating Outages

1. *The climate change-induced extreme heat wave across the western United States resulted in demand for electricity exceeding existing electricity resource adequacy (RA) and planning targets*

Taking into account 35 years of weather data, the extreme heat wave experienced in August was a 1-in-30 year weather event in California. In addition, this climate change-induced extreme heat wave extended across the western United States. The resulting demand for electricity exceeded the existing electricity resource planning targets and resources in neighboring areas were also strained. As Figure ES.1 below shows this demand was the result of a historic West-wide heat wave.

Figure ES.1: July, August, and September Temperatures 1985 - 2020



Source: CEC Weather Data/CEC Analysis

2. *In transitioning to a reliable, clean, and affordable resource mix, resource planning targets have not kept pace to ensure sufficient resources that can be relied upon to meet demand in the early evening hours. This made balancing demand and supply more challenging during the extreme heat wave.*

The rotating outages both occurred after the period of gross peak demand, during the “net demand peak,” which is the peak of demand *net of solar and wind generation* resources. With today’s new resource mix, behind-the-meter and front-of-meter (utility-scale) solar generation declines in the late afternoon at a faster rate than demand decreases. This is because air conditioning and other load previously being served by solar comes back on the bulk electric system. These changes in the resource mix and the timing of the net peak have increased the challenge of maintaining system reliability, and this challenge is amplified during an extreme heat wave.

Since 2016, the CAISO, CPUC, and CEC have worked to examine the impacts of significant renewable penetration on the grid. By performing modeling that simulates each hour of the day, not just the gross peak, the RA program has adjusted for this change in resource mix by identifying reliability problems now seen later in the day

during the net demand peak. However, additional work is needed to ensure that sufficient resources are available to serve load during the net peak period and other potential periods of system strain.

3. *Some practices in the day-ahead energy market exacerbated the supply challenges under highly stressed conditions.*

A subset of energy market practices contributed to the inability to obtain or prioritize energy to serve CAISO load in the day-ahead market that could have otherwise relieved the strained conditions on the CAISO grid on August 14 and 15. The practices which obscured the tight physical supply conditions included under-scheduling of demand in the day-ahead market by load serving entities or their scheduling coordinators, and convergence bidding, a form of financial energy trading used to converge day-ahead and real-time pricing. In addition, the CAISO implemented a market enhancement in prior years. In combination with real-time scheduling priority rules, this enhancement inadvertently caused the CAISO's day-ahead Residual Unit Commitment process to fail to detect and respond to the obscuring effects of under-scheduling and convergence bidding during August's stressed operating conditions. Although the CAISO is now actively developing solutions to these market design issues, most of the day-ahead supply challenges encountered were addressed in the real-time market as a result of additional cleared market imports, energy imbalance market transfers and other emergency purchases.

ES.3 Summary of Performance of Different Types of Resources

Since the Preliminary Analysis was published, the CAISO, CPUC and CEC completed their analysis of how specific resource types performed during the August and September extreme heat waves. The additional analysis and potential improvements are provided below for each resource type.

- Natural gas – Under very high temperatures, ambient derates are not uncommon for the natural gas fleet, and high temperatures reduce the efficiency of these resources. The CEC hosted a workshop to explore potential technology options for increasing the efficiency and flexibility of the existing natural gas power plant fleet to help meet near-term electric system reliability and the longer-term transition to renewable and zero-carbon resources.¹ Subsequently, the CPUC issued a ruling intended to get the most out the existing

¹ See: <https://www.energy.ca.gov/event/workshop/2020-12/morning-session-technology-improvements-and-process-modifications-lead> and <https://www.energy.ca.gov/event/workshop/2020-12/afternoon-session-finance-and-governance-lead-commissioner-workshop>

gas fleet in its recently opened procurement rulemaking focused on summer 2021 resources.² All reasonable efforts should be made to increase the efficiency of the existing fleet.

- Imports – In total, import bids received in the day-ahead market were between 40 to 50% higher than imports under RA obligations, which indicates that the CAISO was relying on imports that did not have a contract based obligation to offer into the market. In addition to the rule changes the CPUC made to the RA program with regard to imports for RA year 2021, the CPUC may consider additional changes to current import requirements.
- Hydro and pumped storage – RA hydro resources provided above their RA amounts and various hydro resources across the state managed their pumping and usage schedules to improve grid reliability. There should be increased coordination by communicating as early as possible the need for additional energy or active pump management ahead of stressed grid conditions and leverage existing plans for efficiency upgrades to improve electric reliability.
- Solar and wind – The CPUC has improved the methods for estimating the reliability megawatt (MW) value of solar and wind over the years, but the reliability value of intermittent resources is still over-estimated during the net peak hour. Improvements to the RA program should account for time-dependent capabilities of intermittent resources.
- Demand response – While a significant portion of emergency demand response programs (reliability demand response resources or RDRR) provided load reductions when emergencies were called, the total amount did not approach the amount of demand response credited against RA requirements and shown as RA to the CAISO. Some, but not all of this difference, is the result of the credited amounts including a “gross up” that the CPUC applies to demand response resources consisting of approximately 10% for avoiding transmission and distribution losses, and 15% for avoided planning reserve margin procurement for customers who agree to drop load in grid emergencies. Additional analysis and stakeholder engagement are needed to understand the discrepancy between credited and shown RA amounts, the amount of resources bid into the day-ahead and real-time markets, and performance of dispatched demand response.
- Battery storage – During the mid-August events and in early September, there were approximately 200 MW of RA battery storage resources in the CAISO market. It is difficult to draw specific conclusions about fleet performance from such a small sample size. The CAISO will continue to track and understand the

² CPUC, R.20-11-003, December 11, 2020 Ruling.

collective behavior of the battery storage fleet and work with storage providers to effectively incentivize and align storage charge and discharge behavior with the reliability needs of the system.

ES.4 Analyses Conducted Since the Preliminary Analysis

As mentioned, this final root cause analysis incorporates additional data analysis that was not available when the preliminary root cause analysis was published. Specifically, the following updates were made:

- Additional information and discussion of the Labor Day weekend extreme heat wave
- Updated temperature analysis (Section 4)
- Updated information on gas fleet resource forced outages during the extreme heat wave (Section 4)
- Discussion on performance of resources credited against RA requirements by CPUC and non-CPUC jurisdictional entities (Section 4 and Appendix B)
- Updated analysis of performance of demand response resources based on available settlement quality metered data (Section 4 and Appendix B)
- Updated analysis of load under-scheduling based on available settlement quality metered data and a survey of load scheduling entities, with recommendations (Section 4 and Appendix B)
- Updated recommendations on communications to utility distribution companies to ensure appropriate load reduction response during future critical reliability events and grid needs (Section 3)
- Discussion of performance of resources during the extreme heat wave (Section 4 and Appendix B)
- Update to discussion and Figures 4.2 and B.1 for actual metered load drop from demand response resources
- Additional analysis on net import position during August 14 and 15 (Appendix B)
- Corrections and clarifications:
 - Figures 4.4, B.16, B.17, B.18, and B.19 were all corrected because of a copy-and-paste error that repeated day-ahead awards data for each of these charts comparing real-time awards data. This change does not affect the shown RA amounts or actual generation data.

- The cause of a major transmission line outage in the Pacific Northwest was a storm in May 2020. The line remained derated through the mid-August extreme heat wave.
- Table 5.1 was amended with the correct forecast and peak numbers, and additional September dates were added.

In addition, since the publication of Preliminary Analysis, on November 24, 2020, the CAISO's Department of Market Monitoring (DMM) released its independent review of system conditions and performance of the CAISO's day-ahead and real-time markets from mid-August to September 7, 2020, and some of the findings in the DMM report are incorporated into this Final Analysis.³ Notably, the DMM concurred with many of the key findings and recommendations of the Preliminary Analysis and confirmed that there was no single root cause but a series of factors that contributed to the emergencies. The DMM also confirmed that "[c]ontrary to some suggestions in the media, DMM has found no evidence that market results on these days were the result of market manipulation."⁴

ES.5 Conclusion

This Final Analysis provides a comprehensive look at the causes of the rotating outages on August 14 and 15, assesses how resources performed during those periods, and sets forth important recommendations and actions that are being addressed by the CAISO, CPUC and CEC. All three organizations have committed to working expeditiously and collaboratively, with the valuable input and engagement of critical partners and stakeholders, to position California for success in reliably meeting its climate and energy goals.

³ Department of Market Monitoring, California ISO, *Report on system and market conditions, issues and performance: August and September 2020*, November 24, 2020. Available at: <http://www.caiso.com/Documents/ReportonMarketConditionsIssuesandPerformanceAugustandSeptember2020-Nov242020.pdf>

⁴ Department of Market Monitoring, California ISO, *Report on system and market conditions, issues and performance: August and September 2020*, November 24, 2020, p. 3.



California Independent System Operator Corporation

California ISO

**Report on system and market conditions,
issues and performance:**

August and September 2020

November 24, 2020

Department of Market Monitoring

1 Summary

1.1 Background

This report reviews system conditions and performance of the CAISO's day-ahead and real-time markets from mid-August to September 7, 2020. During this period, regional high temperatures led to a high demand heat wave across the entire western region. On August 14 and 15, CAISO grid operators called upon load serving entities to curtail load due to system-wide conditions for the first time since 2001. In the following days and weeks, CAISO loads remained high but were well below forecasted levels, due largely to voluntary conservation efforts. Prices in the CAISO, Western Energy Imbalance Market and bilateral markets reached record levels on August 17-19, but no further load curtailments occurred.

This report was prepared by the CAISO's Department of Market Monitoring (DMM) which serves as the independent market monitor for the CAISO and Western Energy Imbalance markets. A prior report, prepared by the CAISO, CPUC and CEC, focuses on the root causes of the load shedding events occurring on August 14-15.¹ The CAISO/CPUC/CEC report includes more detailed background information on issues such as the state's resource adequacy program, CAISO market rules and operational practices, and weather and system conditions during this period.

DMM has reviewed the CAISO/CPUC/CEC report and has worked with the CAISO to understand and resolve differences in key metrics appearing in that report and analysis in DMM's report. DMM concurs with many of the key findings and recommendations in the CAISO/CPUC/CEC report, including the reports main conclusion that "there was no single root cause of the outages, but rather, a series of factors that all contributed to the emergency."²

This report provides additional analysis and some recommendations based on DMM's own independent analysis. This report also covers periods through September 7, during which CAISO energy demand was forecast to be higher than August 14 and 15, but further load curtailments were avoided due to a combination of different market conditions and steps taken by the CAISO and other entities.

1.2 Key findings

Key findings in this report are consistent with findings in the joint CAISO/CPUC/CEC report, which found that there was no single root cause of the load shedding events occurring on August 14-15. These load outages resulted from the combined effect of a series of factors, which include the following:

- **Extreme temperatures and energy demand** across the entire western region, which resulted in demand for electricity well in excess of current resource planning targets.

¹ *Preliminary Root Cause Analysis: Mid-August 2020 Heat Storm*, October 6, 2020, prepared by the California Independent system Operator, California Public Utilities Commission and California Energy Commission.
<http://www.caiso.com/Documents/Preliminary-Root-Cause-Analysis-Rotating-Outages-August-2020.pdf>. CAISO/CPUC/CEC report

² CAISO/CPUC/CEC report, cover letter, p. 1 of 3.

- **California state resource adequacy requirements** based on 1-in-2 year loads plus a 15 percent planning reserve margin, which are insufficient to reflect actual system conditions during this period.
- **Counting rules for resource adequacy capacity** which overestimate the actual capacity that is available from many resources during the early evening hours, when solar production is very low and demand is still very high.
- **Residual unit commitment (RUC) process and related real-time bid processing design.** The CAISO/CPUC/CEC report explains that “a prior market enhancement was unintentionally causing the CAISO’s RUC process to mask the load under-scheduling and convergence bidding supply effects, reinforcing the signal that more exports were supportable.”³ This report provides a detailed discussion of this issue, along with changes that were subsequently made to address this issue.
- **Transmission capacity from the Pacific Northwest was de-rated by about 650 MW** as a result of a weather-related forced outage which prevented additional available supply – including some resource adequacy imports -- from being imported into the CAISO.
- **The sudden loss of several large gas fired units** contributed to triggering the load curtailment events on both August 14 and 15. Although the overall level of gas capacity on outage was not unusually high on these days, this sudden loss of a significant amount of gas capacity came at a time when the amount of excess supply was very low due to a combination of other factors.
- **Self-scheduling of relatively large volumes of exports** in the day-ahead market that were not backed by imports being wheeled through or contracts with capacity within the CAISO. This increased the overall demand that had to be met in both the CAISO day-ahead and real-time markets because exports not supported by physical supply were passed from the residual unit commitment process into the real-time market at this time. These export schedules were not subsequently curtailed in real-time during hours when the CAISO was curtailed.

The most significant and actionable of these factors involve California’s resource adequacy program. To limit the potential for similar conditions in future years, system level resource adequacy requirements should be modified to ensure more capacity is available during net load peak hours. In addition, capacity counting rules for different resource types should be modified to more accurately reflect the actual availability of these resources during the net load peak hours. These recommendations are discussed in more detail in this report.

Additional findings highlighted in this report include the following:

- **The overall availability of resource adequacy capacity shown on supply plans during the most critical days and hours from mid-August to early September was not unusually low.** Of the 51,000 MW of capacity counted towards August resource adequacy requirements, about 6,100 to 8,200 MW (or 10 to 15 percent) was not bid or self-scheduled in the real-time market during the peak net load hours.
- **Solar and wind resources accounted for a significant portion of resource adequacy capacity that was not available in the real-time market during hours of load curtailments.** For August, solar and wind resources, including pseudo-tie resources, had a combined resource adequacy rating of 4,300 MW. Output from these resources averaged about 2,490 MW (57 percent) below this resource

³ CAISO/CPUC/CEC report, pp. 13-14.

adequacy rating during hours 19-20 on August 14-15. The output from these resources is predictably lower in these evening hours when net loads are highest, compared to the output of these resources in hours with highest gross load which are used to determine their resource adequacy rating.

- **Gas units accounted for about 1,870 MW of resource adequacy capacity unavailable in real-time during hours of load curtailments.** This represented about 6.7 percent of the 27,743 MW of gas-fired resource adequacy capacity. Almost half of this unavailable capacity (or about 3 percent of total resource adequacy capacity from gas units) was due to ambient de-rates which occur in very hot weather – when the total output from gas units falls below their normal rated capacity due to ambient temperature. This is an example of one of the types of factors that should be factored in resource adequacy counting rules.
- **Demand response resources accounted for about 650 MW of resource adequacy capacity that was unavailable in real-time during hours of load curtailment on August 14. Demand response accounted for about 820 MW of resource adequacy was unavailable in real-time during hours of load curtailment on August 15.** This represents over one-third of the 1,847 MW of resource adequacy capacity requirement that was met by demand response in August. The actual performance of demand response resources that were dispatched has not yet been fully evaluated.
- **Imports and hydro units combined account for about 1,436 MW of resource adequacy capacity that was unavailable in real-time during hours of curtailment.** About 9 percent of non-resource specific resource adequacy imports was unavailable (664 MW), with much of this capacity being unavailable due to transmission limitations. About 9 percent of resource adequacy capacity from hydro was unavailable (572 MW).
- **The Western energy imbalance market functioned well and helped facilitate transfers of available capacity in real-time across the west.** The CAISO was the largest net importer in the energy imbalance market during the most critical evening ramping hours of the summer 2020 heat wave. During curtailment intervals on August 14-15, the energy imbalance market provided an average of 1,346 MW and 530 MW respectively into the CAISO system.
- **The CAISO market was structurally uncompetitive during the high load days in August.** Although prices were very high during the high load days in August, analysis using the CAISO's day-ahead market software indicates that system wide mitigation of imports and gas-fired resources during this period would not have lowered prices. This reflects the fact that gas-fired and other resources that may be subject to mitigation were generally infra-marginal in re-runs of the day-ahead market using cost-based bids, and that high prices were set by demand response and other resources not subject to mitigation.
- **DMM has carefully reviewed major outages which occurred on August 14-15.** Based on its data analysis and conversations with plant operators, DMM has found no indication that outages were falsely declared at strategic times in order to allow generation owners to profit from higher prices (e.g. from output of other generating units under their control or virtual demand positions taken in the day-ahead market).
- **DMM closely monitored and reviewed market behavior during the August 14-15 heatwave.** Contrary to some suggestions in the media, DMM has found no evidence that market results on these days were the result of market manipulation.

1.3 Recommendations

DMM agrees with many of the key recommendations related to resource adequacy in the CAISO/CPUC/CEC report and supports the coordinated efforts by the CAISO, CPUC and stakeholders to make the various planning, market design and operational enhancements identified in that report. The most significant and actionable of these recommendations involve California's resource adequacy program. To limit the potential for similar resource shortages in future years, a high priority should be placed on the following two recommendations:

- ***Increase resource adequacy requirements to more accurately reflect increasing risk of extreme weather events*** (e.g. beyond the 1-in-2 year load forecast and 15 percent planning reserve margin currently used to set system resource adequacy targets). Prior to this summer, CAISO peak load fell under the 1-in-2 years forecast four of the last five years.⁴ However, summer 2020 illustrates that higher reliability will require that resource adequacy requirements be based on load forecasts which reflect the high likelihood of much higher load conditions than are reflected in the 1-in-2 year forecast.
- ***Continue to work with stakeholders to clarify and revise the resource adequacy capacity counting rules***, especially as they apply to hydro resources, demand response resources, renewable resources, imports and other use limited resources. Counting rules should specifically take into account the availability of different resource types during the net load peak. Beginning in 2019, DMM has provided analysis and expressed concern in reports and CPUC filings about the cumulative impacts of various energy-limited or availability-limited resources which are being relied upon to meet an increasing portion of resource adequacy requirements.⁵ This report includes additional analysis of the availability of different resource types during the peak net load hour in which load was curtailed in August, and highlights a variety of specific factors which could be incorporated into the resource adequacy ratings of these resources to better reflect their actual availability during the most critical net load peak hours.

In addition, DMM provides the following recommendation regarding the issue of exports.

- ***DMM recommends that further changes and clarifications in the rules and processes for limiting or curtailing exports be discussed and pursued by the CAISO in conjunction with other balancing areas.***

The CAISO/CPUC/CEC report includes the following recommendation regarding curtailment of exports:

Ensure that market processes appropriately curtail lower priority exports that are not supported by non-resource adequacy resources to minimize the export of capacity that could be related to RA resources during reliability events.⁶

⁴ 2019 Annual Report on Market Issues and Performance, Department of Market Monitoring, June 2020, pp.34-35.
<http://www.caiso.com/Documents/2019AnnualReportonMarketIssuesandPerformance.pdf>

⁵ 2019 Annual Report on Market Issues and Performance, pp. 26-27, 299-302.

Reply Comments of the Department of Market Monitoring, Rulemaking 16-02-007, August 12, 2019,

<http://www.caiso.com/Documents/CPUC-DMMReplyCommentsonRulingInitiatingProcurementTrackandSeekingCommentonPotentialReliabilityIssues-Aug122019.pdf>

⁶ CAISO/CPUC/CEC Report, p. 66.

Just prior to the Labor Day weekend heatwave, the ISO made important enhancements to RUC and the real-time scheduling priority of day-ahead energy market export schedules that do not receive RUC awards. DMM supported these changes and believes that these changes played a key role in helping to improve real-time supply conditions on September 5 to 7.

DMM's understanding is that CAISO's current policy is still to prioritize exports that receive RUC awards over native CAISO balancing area load in real-time. DMM appreciates that curtailment of exports should be avoided when possible, given the potentially detrimental direct and indirect impacts of export curtailment on other balancing areas and the CAISO itself, as discussed in the CAISO/CPUC/CEC report.⁷ However, DMM believes that additional changes and clarifications to the residual unit commitment rules and other market processes are needed to address the issue of exports.

The rules and processes for limiting or curtailing exports used by the CAISO and other balancing areas should be reviewed, clarified, and potentially modified -- with a goal of establishing equal treatment and expectations of exports by all balancing areas. CAISO and other WECC balancing areas' ultimate policy on the priority of exports relative to native load will be a critical factor in CPUC resource adequacy reforms and many major CAISO market design initiatives. These include the extended day-ahead market, day-ahead market enhancements, system market power mitigation phase 2, resource adequacy enhancements, scarcity pricing, and refinements to export bidding rules. Further discussion of the need to clarify and potentially refine how CAISO and other balancing areas treat exports is provided in the final section of this report.

Finally, DMM provides the following recommendation regarding the demand response.

- ***DMM recommends that steps be taken to ensure a higher portion of demand response used to meet resource adequacy requirements is available during critical net load hours.***

Analysis in this report indicates that less than two thirds of the 1,847 MW of resource adequacy capacity requirements that were met by demand response were available for dispatch in real-time during the hours of load curtailment on August 14 and August 15. The actual performance of demand response resources that were dispatched has not yet been fully evaluated based on retail customer meter data. However, even if performance of demand response is high relative to the amount dispatched in the CAISO market, the amount of demand response that was available relative to the amount of resource adequacy capacity requirements met by demand response was relatively low.

DMM recommends that steps be taken to ensure the availability of these resources. These steps include (1) re-examining demand response counting methodologies, (2) adopting the ISO's recommendation to remove the planning reserve margin adder applied to demand response capacity counted towards system resource adequacy requirements under the CPUC jurisdiction, and (3) adopting a process to manually dispatch available demand response shown on resource adequacy supply plans before issuing exceptional dispatches to non-resource adequacy capacity and curtailing firm load. DMM recommends that these steps be taken before expanding reliance on demand response capacity.

A more detailed discussion of recommendations relating to demand response is provided in Section 3.13 of this report.

⁷ CAISO/CPUC/CEC Report, pp. 106-107.

2 Chronological summary

This section provides a short chronological summary of key events, conditions and findings for three distinct periods from mid-August to early September 2020. As summarized below, these three periods represent a series of different heat waves marked by different system and market conditions. In addition, a variety of different actions were taken by the CAISO, state agencies, market participants, and end use consumers which had a significant impact on system and market outcomes in these different periods.

August 14 and 15

- On Friday August 14, peak load was forecasted to be just over 45,750 MW in the day-ahead market, close to the one-in-two year peak used in setting resource adequacy requirements. Actual system loads on August 14 reached about 46,750 MW, about 1,000 more than the day-ahead forecast. Peak load on Saturday August 15 reached about 45,000 MW, similar to the day-ahead forecast.
- Regionally, the heat wave led to record levels of load across the EIM and the WECC.
- Load serving entities within the CAISO continued to submit self-schedules or very high bids to purchase energy in the day-ahead market on these days. Total physical load clearing the day-ahead market on these two days during hours 16 to 21 averaged about 95 percent of forecasted load.
- DMM's analysis indicates that the amount of resource adequacy capacity scheduled or offered in the day-ahead market was slightly above the day-ahead load forecast on August 14 and 15.
- On these days additional demand was placed on the CAISO system by exports that were purchased in the day-ahead market. Most of these exports were self-scheduled (indicating a willingness to export at any market clearing price), with some additional exports clearing at very high bid prices to buy energy.
- The CAISO curtailed a very limited amount of export energy after the day-ahead energy market or in real-time, about 90 MW on August 14 and 30 MW on August 15. Thus, the remaining cleared exports added thousands of MW of additional demand to total CAISO area demand in both the day-ahead and real-time markets.
- On these two days, virtual supply bids clearing the day-ahead market at relatively high prices allowed additional export schedules and bids to clear the day-ahead market. About 2,900 MW of exports were scheduled out of the day-ahead market on interties connecting the CAISO with adjacent balancing areas in the southwest (NEVP, APS, SRP).⁸
- Most of the 4,500 MW of non-resource specific resource adequacy import capacity bid into the day-ahead market cleared (85 percent). Almost all of the capacity which did not clear (99 percent) was bid on interties from the Pacific Northwest, where congestion lowered prices below bids and limited the quantity available to import.

⁸ Exports cited here are the average during hours 17-22 on August 14 and 15 on ITCs in the southwest, including: CFE_ITC, NORTHGILA500_ITC, PALOVRDE_ITC, ELDORADO_ITC, MEAD_ITC, IPPUTAH_ITC, ADLANTO-SP_ITC, ADLANTOVICTVL-SP_ITC, WSTWGMEAD_ITC, VICTVL_ITC, and LAUGHLIN_ITC.

- With the exception of a single gas resource which was returning from an outage, all available gas-fired capacity was committed to be in operation through the day-ahead residual unit commitment process or exceptional dispatch commitments.
- The overall amount of capacity on outage on these days was not abnormally high, but a few large gas-fired units had sudden outages. These created sudden changes in available generation and appear to have increased uncertainty about real-time supply at critical times.
- On August 14, the ISO manually dispatched about 800 MW of utility reliability demand response (RDRR) to reduce load during net peak load hours. On August 15, the ISO manually dispatched almost 900 MW of utility reliability demand response to reduce load during net peak load hours.
- Operating reserve levels were short of requirements for multiple intervals during peak hours in both the day-ahead and real-time markets and during load shedding.
- Both load shed events on August 14 and August 15 began in hour ending 19 when CAISO grid operators called upon all utility distribution companies within the CAISO system to curtail a total of about 1,000 MW and 500 MW of load respectively.⁹ The August 14 event began load restoration in about an hour while on August 15 this process began after approximately 20 minutes.
- Actual load curtailments were implemented by utility distribution companies. The actual amount of load curtailed cannot be precisely quantified, but may be higher than called upon by CAISO operators.
- During the peak ramping hours, net transfers into the CAISO system from the rest of the energy imbalance market averaged about 1,500 MW on August 14 and 550 MW on August 15. Most of these transfers were from adjacent balancing areas in the southwest (NEVP, APS, SRP). Thus, these transfers offset a significant portion of the additional CAISO area demand that was created by exports to these balancing areas made through the day-ahead markets.
- During a few 15-minute intervals on these two days, the CAISO balancing area failed the resource sufficiency test applied to all balancing areas in the Western energy imbalance market. Balancing areas failing this test have their net import limit capped for subsequent 15-minute intervals. This limitation is designed to deter balancing areas from leaning excessively or systematically on the energy imbalance market to meet their resource and ramping energy requirements. However, DMM's analysis indicates that this limitation had little or no impact on net transfers from the energy imbalance market into the ISO during these intervals. EIM transfers were, however, limited by the total available greenhouse gas import supply in some intervals on both of these days.

August 17 to August 19

- During this three day period, CAISO system loads were projected to reach record levels. However, actual demand during these days was significantly lower than the day-ahead forecast. The lower-than-expected loads on these days appear to be due in large part to an extraordinary response by

⁹ CAISO/CPUC/CEC Report, pp. 41-42.

consumers to efforts by the Governor’s office, state agencies and CAISO to promote reduced energy usage during the peak afternoon and early evening hours.

- Regionally, the RC West reported historical peak load levels reaching 127,631 MW on August 17, 2020 in the 6 pm hour.¹⁰
- On the evening of August 16, the ISO announced the suspension of virtual bidding effective in the day-ahead market occurring on August 17 for operating day August 18. The ISO also informed scheduling coordinators with scheduled day-ahead exports for August 17 that if conditions warranted curtailing load, export schedules could be curtailed as well.
- This suspension was designed in part to prevent virtual supply bids from allowing additional exports from being scheduled in the day-ahead market which would ultimately need to be met by physical supply from within the CAISO system. At this time, RUC was not identifying exports with IFM schedules that could not be supported by physical supply capacity. Analysis by DMM suggests that, given this RUC implementation issue, the suspension of virtual bidding did have a significant impact on reducing exports from the CAISO system scheduled in the day-ahead market.
- On these days, DMM’s analysis indicates available resource adequacy capacity would not have been sufficient to meet the day-ahead load forecast of system loads during the peak ramping hours.
- On these days, the state of California and other entities took a variety of actions to allow additional supplies of energy to be made available to the CAISO grid and to reduce behind-the-meter loads.¹¹
- On August 17 to 19, load within the CAISO system was not curtailed and, on August 18, the ISO market curtailed exports from the CAISO system.
- The ISO reinstated virtual bidding in the day ahead market for August 22. Despite the ISO not having yet fixed the underlying RUC export and real-time schedule processing issue, by this time system and market conditions had changed so that virtual bidding was again viewed as providing market benefits without presenting a risk to system reliability. DMM concurred with the decision to reinstate virtual bidding based on its analysis of the change in market and system conditions which had occurred by that time.
- As discussed below, the CAISO took other actions prior to the next heat wave in early September to help mitigate the risk to real-time system reliability that could be created by a high level of exports from the CAISO’s day-ahead market.

¹⁰ September 24, 2020. California ISO: Board of Governors Memorandum <http://www.caiso.com/Documents/CEOReport-Sep2020.pdf>.

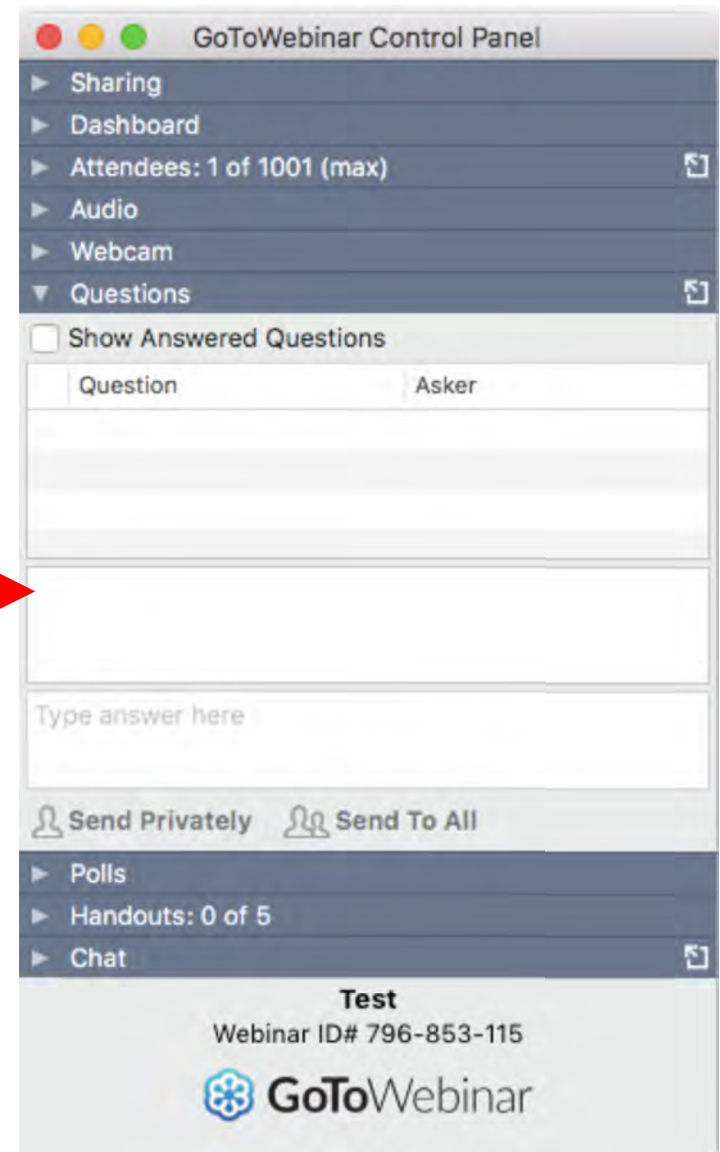
¹¹ CAISO/CPUC/CEC Report, pp. 38 - 40.



What CAISO didn't tell you about the August 2020 blackouts



- Webinar recording and slides will be sent to registered attendees within two business days.
- All webinars are archived on clean-coalition.org, under Events.
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- Questions will be answered during the Q&A portion of the webinar.
- For other questions, contact Rosana Francescato: rosana@clean-coalition.org

A screenshot of the GoToWebinar Control Panel interface. The title bar says "GoToWebinar Control Panel". The main menu includes: Sharing, Dashboard, Attendees: 1 of 1001 (max), Audio, Webcam, and Questions (expanded). Under Questions, there is a checkbox for "Show Answered Questions". Below this is a table with columns "Question" and "Asker". There is a large text input field for asking a question, followed by a "Type answer here" field. At the bottom of the question section are buttons for "Send Privately" and "Send To All". The bottom of the panel shows "Polls", "Handouts: 0 of 5", and "Chat". At the very bottom, it says "Test", "Webinar ID# 796-853-115", and the GoToWebinar logo.

Former California Public Utilities Commission President Loretta Lynch is a lawyer, writer, and progressive political activist.

Richard (Rick) Humphreys studies issues associated with the US electric grid following a 35+ year career in the defense industry.

Thomas S. Popik is chairman, president, and co-founder of the Foundation for Resilient Societies, a nonprofit think tank focused on critical infrastructure protection.

Bill Powers is a registered professional mechanical engineer in California and Missouri with over 35 years of experience in energy and environmental engineering.

Bill Julian is a retired public interest lawyer with over 40 years of experience in utility regulation.

Rosana Francescato is the Clean Coalition's Communications Director and leads the Transmission Access Charges (TAC) Campaign.

Mission

To accelerate the transition to renewable energy and a modern grid through technical, policy, and project development expertise.

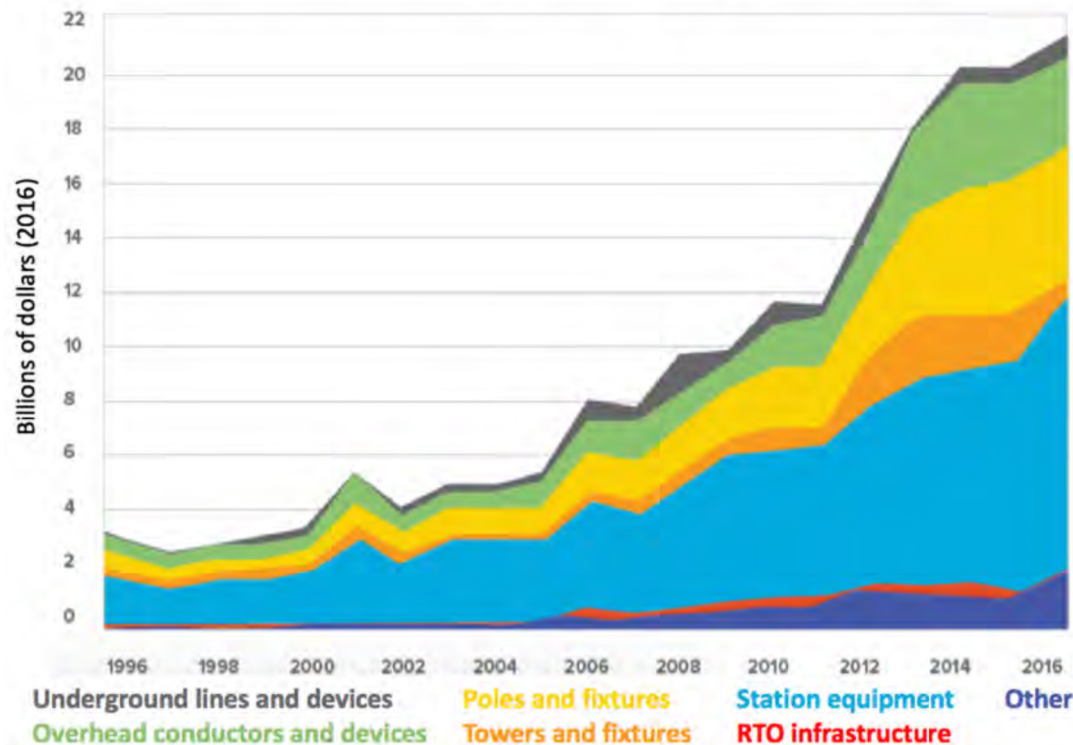
100% renewable energy end-game

- 25% local, interconnected within the distribution grid and facilitating resilience without dependence on the transmission grid.
- 75% remote, dependent on the transmission grid for serving loads.

Transmission costs are fastest-growing component of electricity costs

- Transmission costs are the fastest-growing component of your electricity bill.
- Guaranteed 12% return-on-equity (ROE) for transmission investments leads to [conflicts of interest](#) and perverse market outcomes — like [Transmission Access Charges \(TAC\)](#) market distortion.

The explosion in transmission spending by major utilities, 1996 - 2016



Transmission costs are bigger than they seem due to O&M driving ~10x increase to upfront costs

- Capital costs of transmission infrastructure represent a fraction of total transmission costs.
- Operations and maintenance (O&M) and ROE drive up transmission costs significantly over asset lifetime, with those excessive costs borne by ratepayers.

Nominal costs

Asset value capital cost (\$100 base)	\$100
Return	\$197
O&M	\$631
Total nominal ratepayer cost per \$100 investment (50 years)	\$928

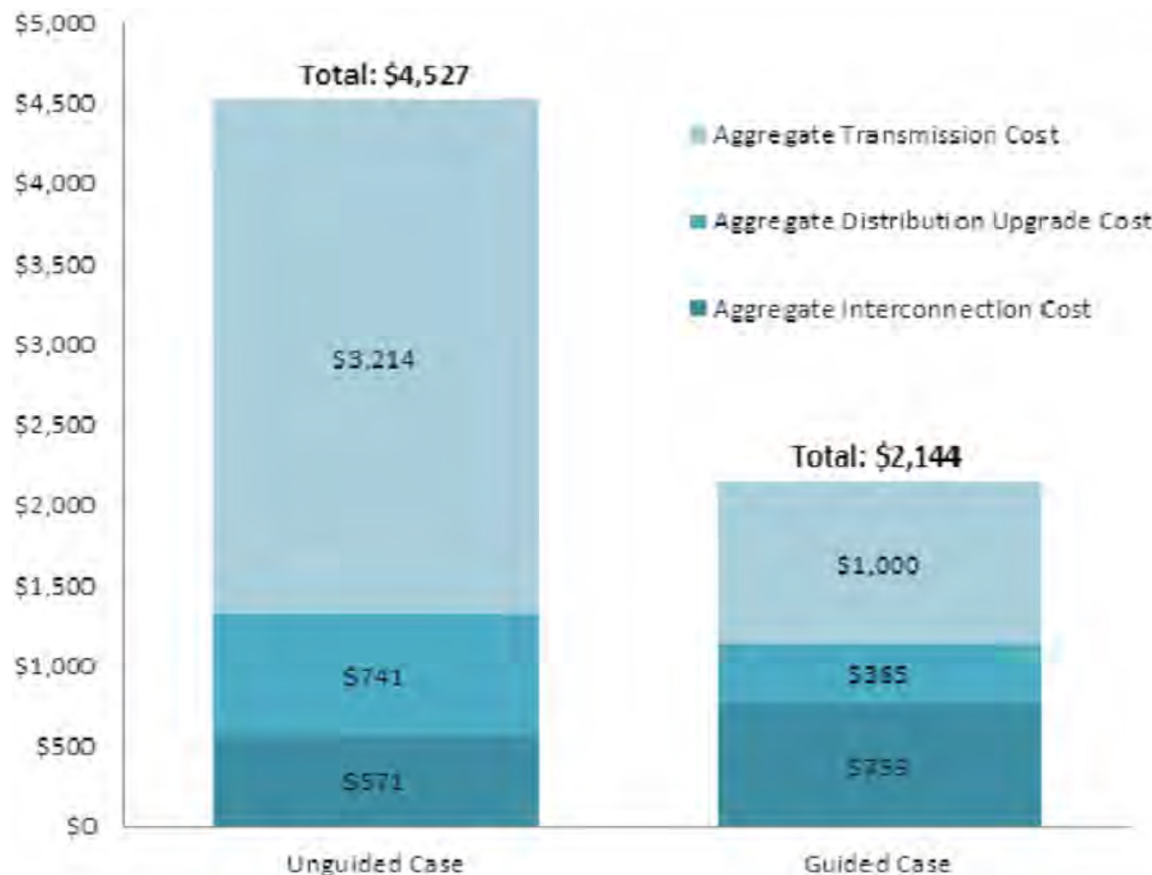
Real costs, discounted for inflation

Discount rate	2.19%
Asset value capital cost (\$100 base)	\$100
Return, discounted	\$140
O&M, discounted	\$296
Total discounted (real) ratepayer cost per \$100 investment (50 years)	\$536

In nominal dollars, total lifetime ratepayer cost is nearly 10x the initial capital cost; O&M accounts for 68% of this because it increases much faster than inflation. In real dollars (constant value dollars, accounting for inflation), the total lifetime cost is 5x the initial capital cost, and O&M accounts for 55% of this.

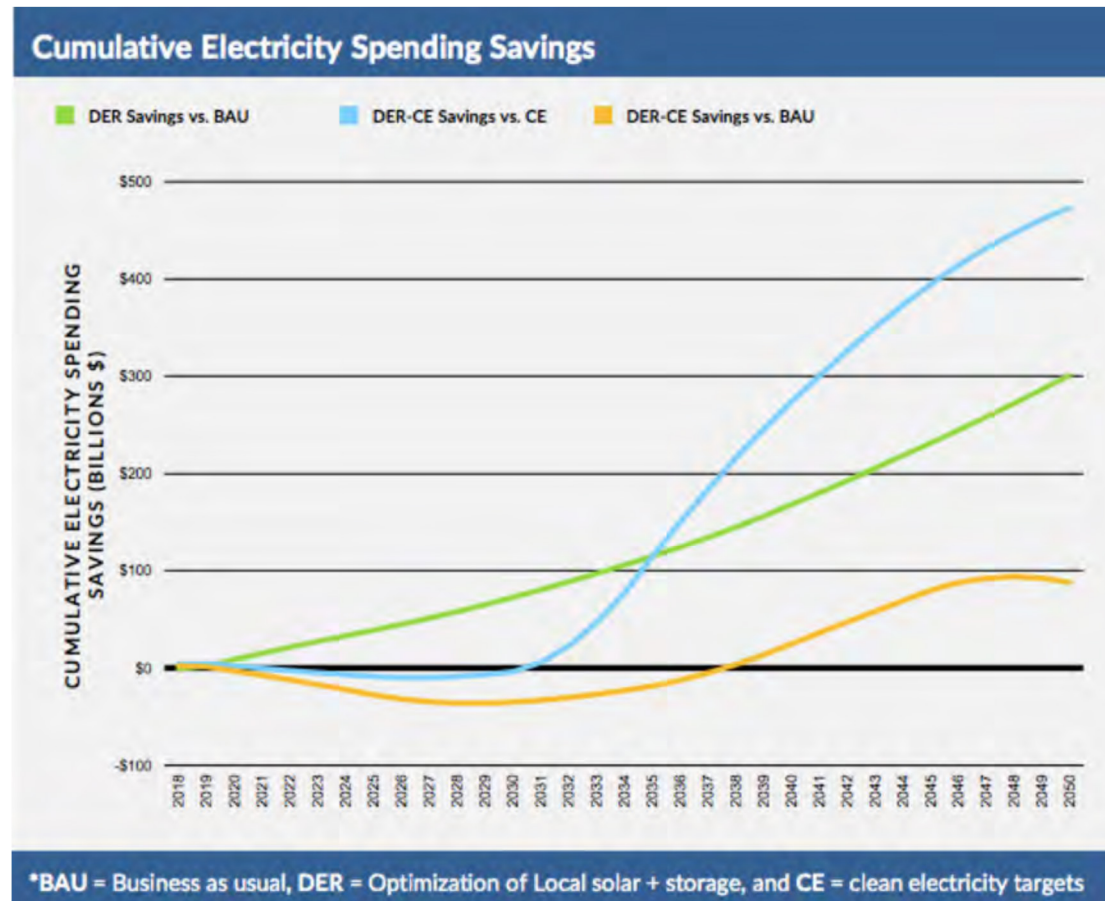
Local solar+storage optimize the grid for ratepayer savings

- Intelligently siting 4 GW of local solar would preempt over **\$2.2 billion** in new transmission infrastructure investments — about **\$20 billion** in ratepayer savings when considering O&M. (Southern California Edison study)
- Transmission costs are always borne by ratepayers, while distribution & interconnection costs are borne by solar project developers.



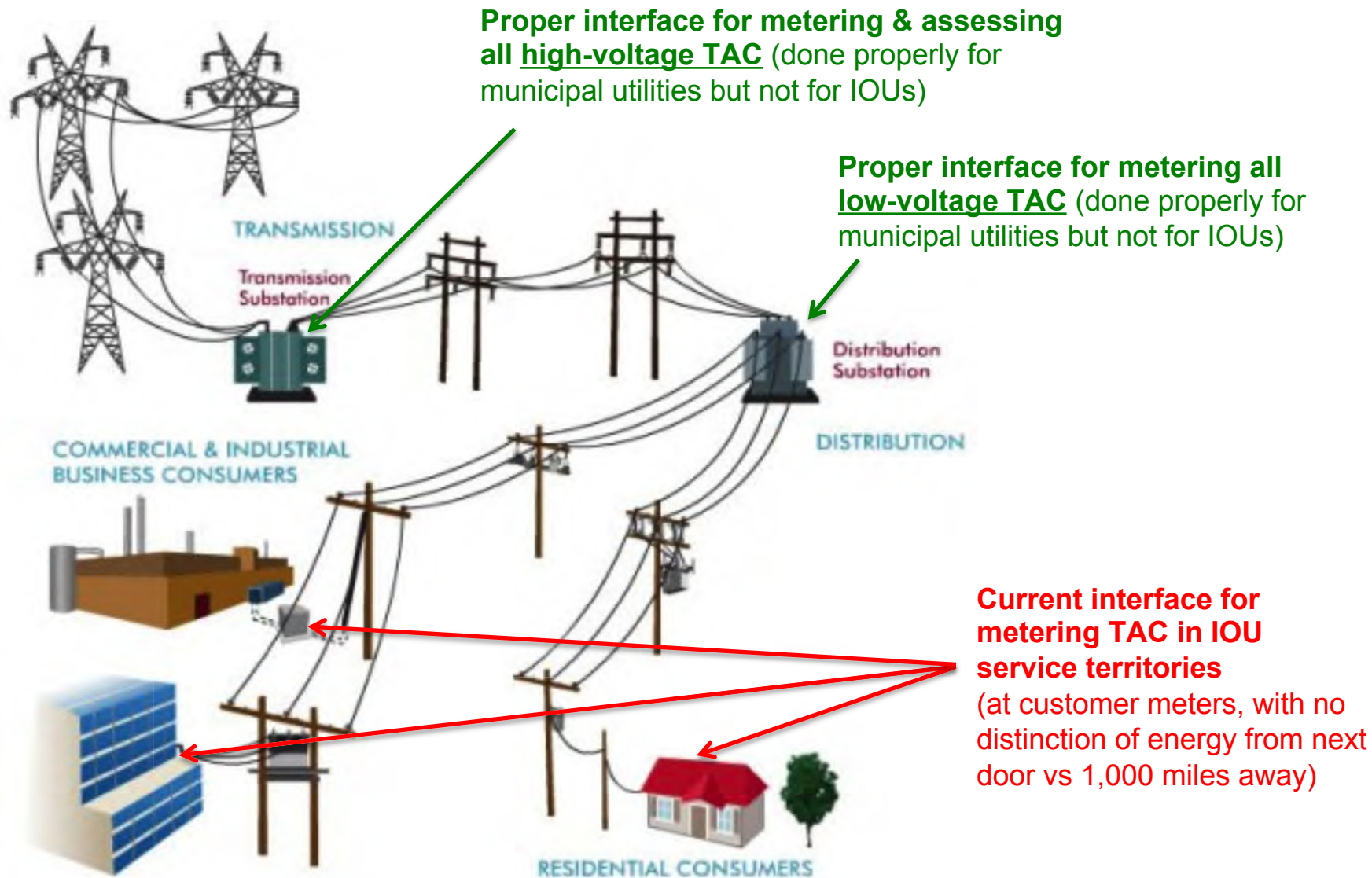
Local solar+storage optimize the grid for ratepayer savings

- Deploying enough large solar and wind farms to decrease CO2 emissions by 95% by 2050 would **cost Americans \$385 billion more** for power over the next 30 years.
- Scaling up local solar+storage in coordination with utility-scale renewables, we can achieve the same clean-energy goals while **saving \$473 billion**.



Source:
[Vibrant Clean Energy](#)

TAC cause massive California market distortions

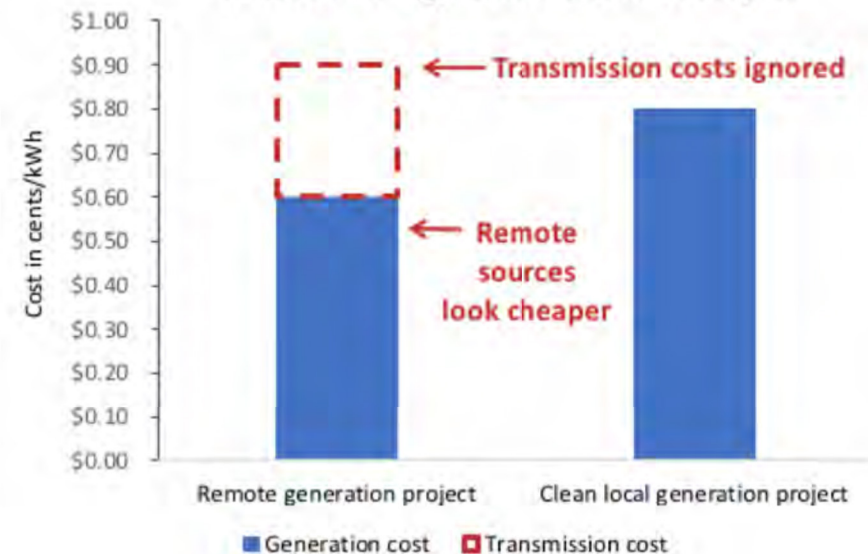


- [Transmission Access Charges \(TAC\)](#) in California's IOU service territories are metered and assessed incorrectly, at the customer meter.
- That's like paying extra shipping & handling fees for something you pick up next door, or paying a toll if you don't cross a bridge.

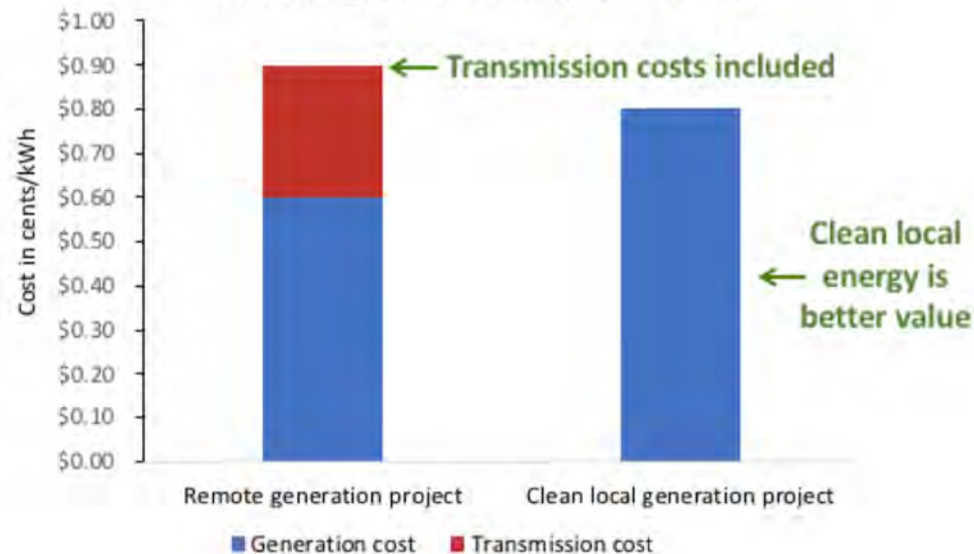


- 3¢/kWh is being stolen from local renewables, making them look more expensive.
- Stealing funds from DER-driven Community Microgrids that deliver [community resilience](#).

**When transmission costs are invisible,
remote energy sources look cheaper**

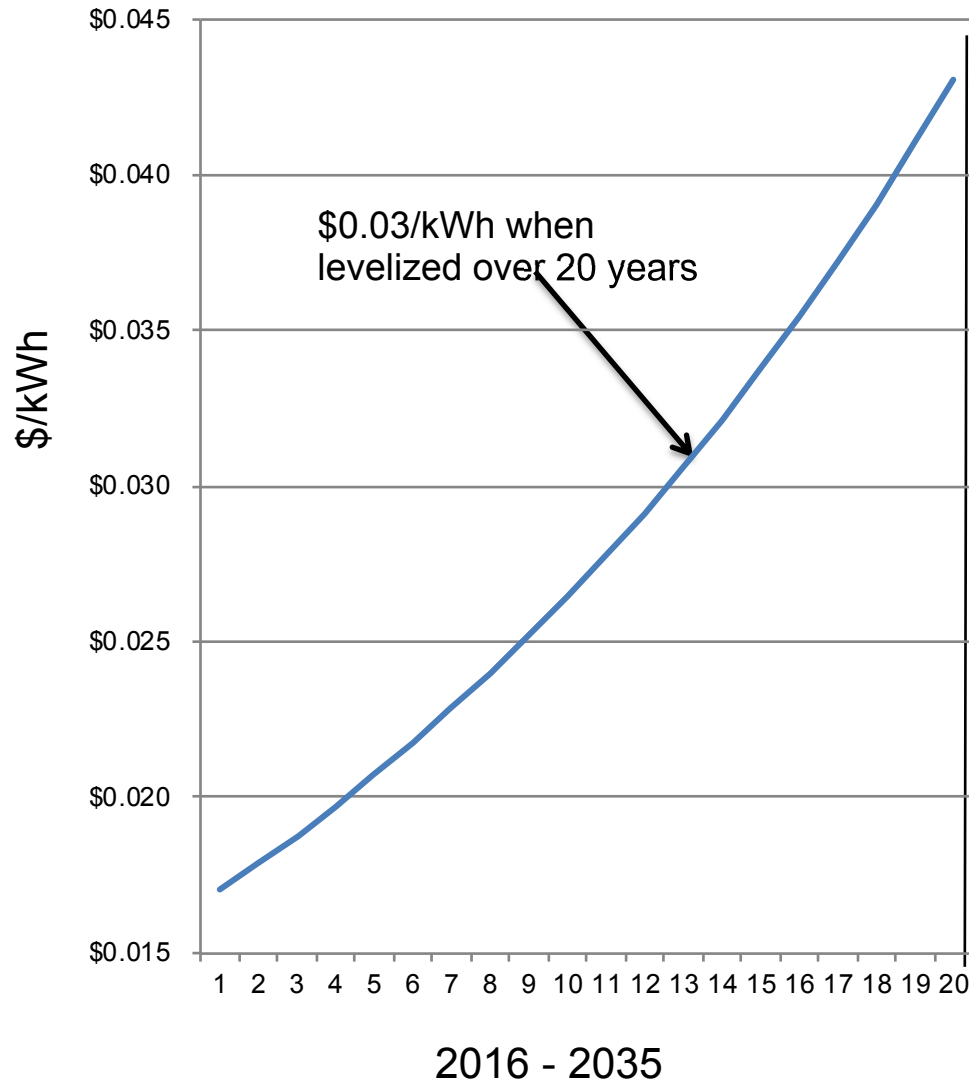


**When transmission costs are visible,
local energy sources may be cheaper**



TAC are growing fast to ~4.5 cents/kWh over 20 years (levelized 3 cents/kWh)

Forecasted PG&E Total TAC Rate

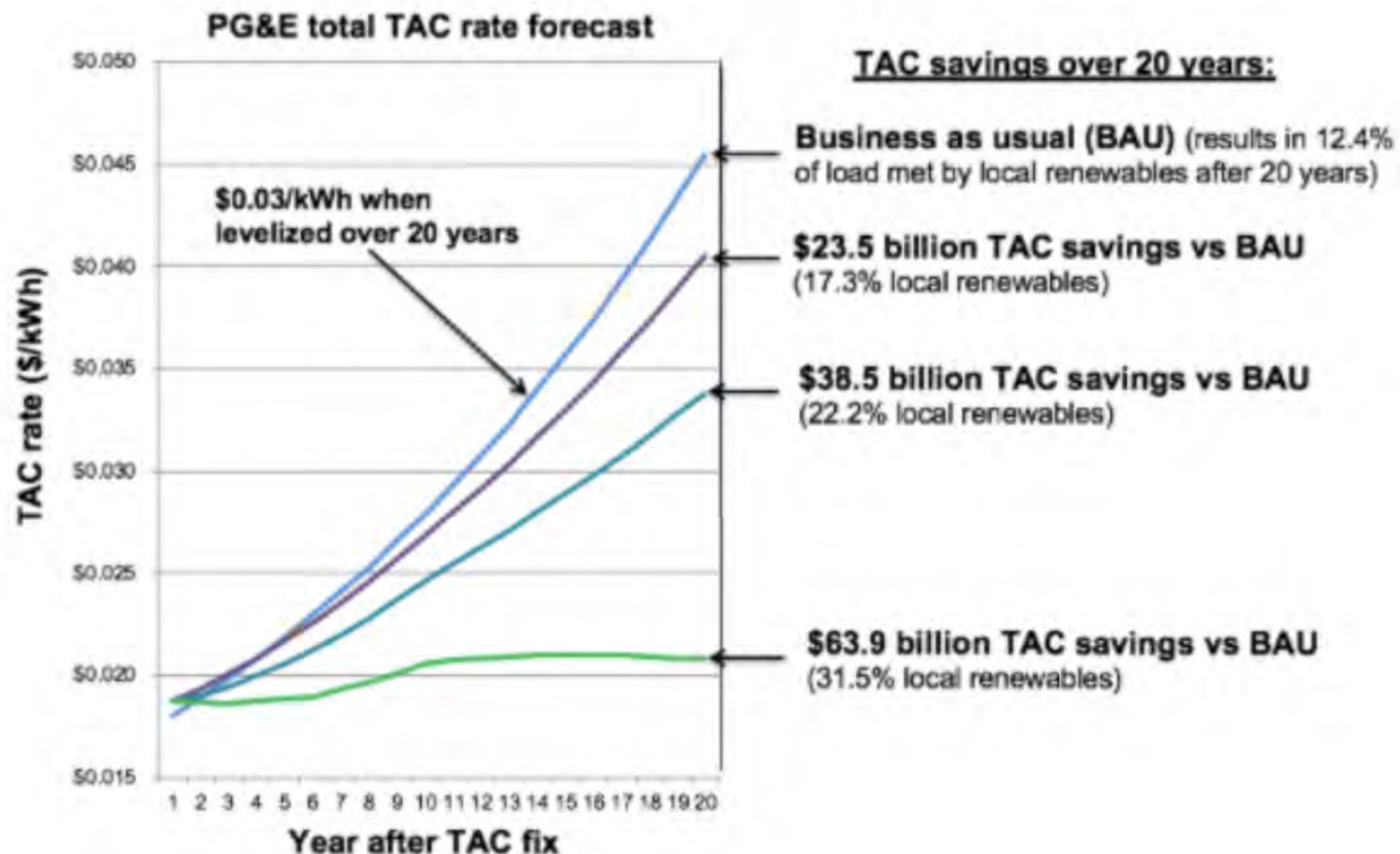


— Business As Usual (BAU)

The 20-year levelized TAC is about 3 cents/kWh, which is roughly 50% of the average wholesale cost of electricity in California!

Not fixing TAC could cost Californians \$60 billion over the next two decades

- Generating energy closer to where we use it = less expensive transmission infrastructure, which lowers costs for ratepayers.
- Continuing with business as usual could cost Californians ~\$60 billion in avoidable transmission costs over 20 years.



Proposed TAC reform and supporters

1. Only charge transmission fees for energy delivered through the transmission system.
2. Have procurement reflect both the energy purchase price and the delivery charges.

80+ organizations supporting, including CALSSA, Sunrun, Vote Solar, Sierra Club California, The Climate Center, 350 Bay Area, 350 San Diego, Enphase, Microgrid Resources Coalition, California Alliance for Community Energy, California Consumers Alliance, Californians for Energy Choice, Center for Biological Diversity, Center for Sustainable Energy, Climate Action Campaign, East Bay Power Alliance, Environment California Local, Fossil Free California, San Diego Energy District — and many more.



- CAISO has agreed that TAC reform is needed but said the CPUC would need to take action.
- CPUC staff have agreed the issue should be taken up.
- We need legislation to compel CAISO and the CPUC to take action.
- Various California state legislators are considering authoring a TAC Reform bill.
- For more, see: <https://clean-coalition.org/policy/transmission-access-charges>
- Join us / sign on: Contact rosana@clean-coalition.org



What CAISO Didn't Tell You About the August Blackouts

Loretta Lynch, Former California Public Utilities Commission President

- **Poorly Regulated Electricity Markets Cause Blackouts**

Rick Humphreys, Retired Program Manager

- **REAL Root Cause Analysis of August 2020 Blackouts**

Bill Powers, Registered Professional Mechanical Engineer

- **Mismanagement of Ample Supplies Caused August Blackouts**

Thomas Popik, Chairman, Foundation for Resilient Societies

- **Badly-Timed Outages of Key Generation Plants in CAISO**

Bill Julian, Retired Public Interest Lawyer

- **Potential Fixes to Prevent Future Blackouts and Overcharging**



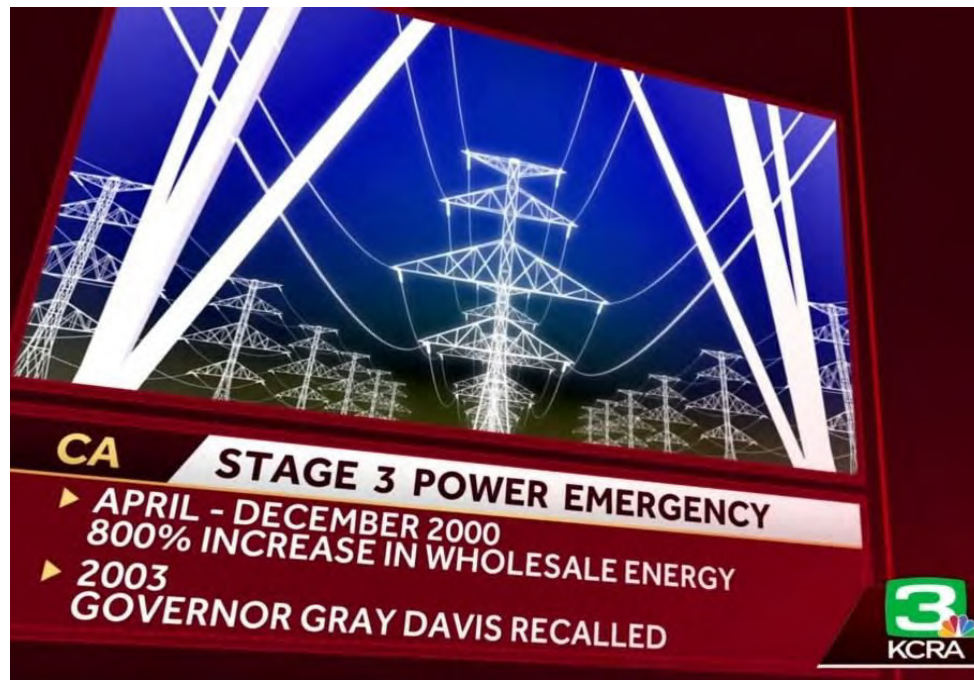
Loretta Lynch

Former California Public Utilities Commission President



Persistent Issues With CA Electricity Markets & Reliability: Why Can't CA Keep the Lights On?

2000-2001 ELECTRICITY CRISIS



AUGUST 2020 CAISO BLACKOUTS



The New York Times

Rolling Blackouts in California Have Power Experts Stumped

Managers of the electric system argue that a lack of power prompted the decision to enact blackouts, though demand this weekend fell short of the state's peak years.



What CAISO Claims Caused the August 2020 Blackouts – extreme hot weather, inadequate planning for transition to clean energy and market practices

The ISO found no single root cause, but identified 3 causal factors:

1. The climate-change induced extreme heat wave across the Western United States resulted in demand for electricity exceeding existing Electricity Resource Adequacy (RA) and planning targets.
2. In transitioning to a reliable, clean, and affordable resource mix, resource planning targets have not kept pace to ensure sufficient resources can be relied upon to meet demand in the early evening hours.
3. Some practices in the day-ahead market exacerbated the supply challenges under highly stressed conditions.



Aug 2020: Blackouts for CAISO but not for Other Western States

Other States Kept their Lights on During the Heat Wave



NO NEIGHBORING STATES REPORTED CONSTRAINED POWER SUPPLIES OR BLACKOUTS

AZ, NV & OR did not even call for conservation on 8/14 or 8/15, while CAISO called rolling blackouts

In wake of CA blackouts, AZ & NV public utility commissions initiated proceedings to assess blackouts and implications for grid reliability in their states.

Other states maintained their power supplies & plant operations during what CAISO pointed to as the “extreme heat wave across the Western United States”



August 2020: Blackouts for CAISO but not for CA's Public Power Systems

CALIFORNIA'S PUBLIC POWER SYSTEMS KEPT THE LIGHTS ON

California's municipal utilities faced the same heat and demand conditions but they never had blackouts or price spikes

- Retained the power they bought for their customers to serve their customers, not energy traders
- Ensured that their power plants were maintained and running to serve their customers



Rick Humphreys

Expert in Root Cause Analysis



REAL Root Cause Analysis of August 2020 Blackouts

- **Why Should I care?**
- **What is Root Cause Analysis (RCA)?**
- **Deconstructing CAISO “Root Cause Analysis”**
- **What the REAL Root Cause Analysis Reveals**

"Failure to determine the root cause assures that you will be treating the symptoms of the problem instead of its cause, in which case, the waste/issue will return, and you will continue to experience the same problems over and over again."

<https://www.calhr.ca.gov/Documents/Root-Cause-Analysis.pdf>



Energy price spikes

Figure 3.5 CAISO day-ahead and real time peak hour prices (August 14-21)

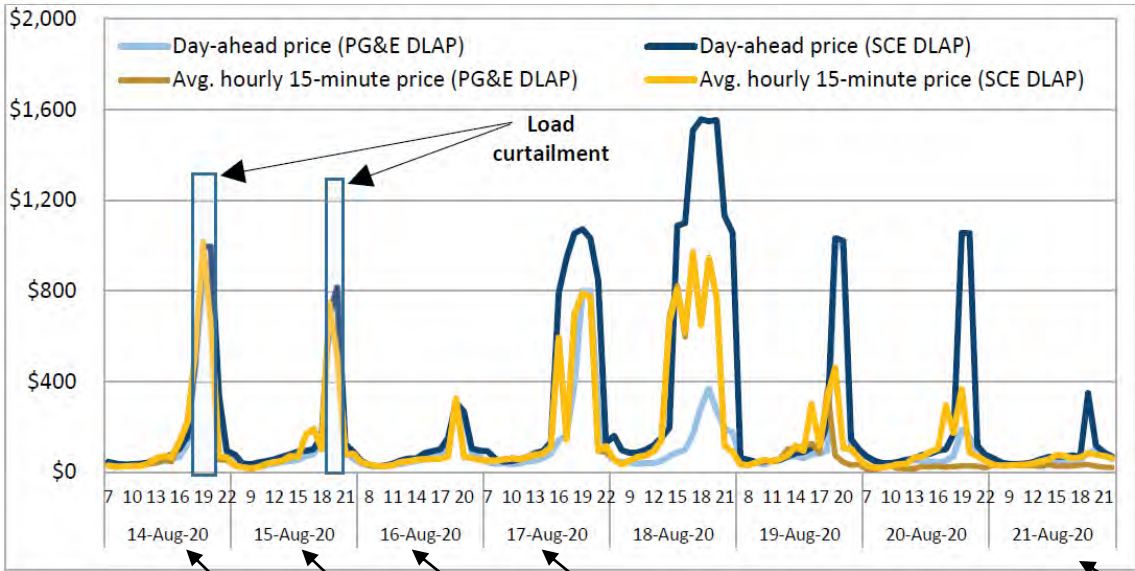
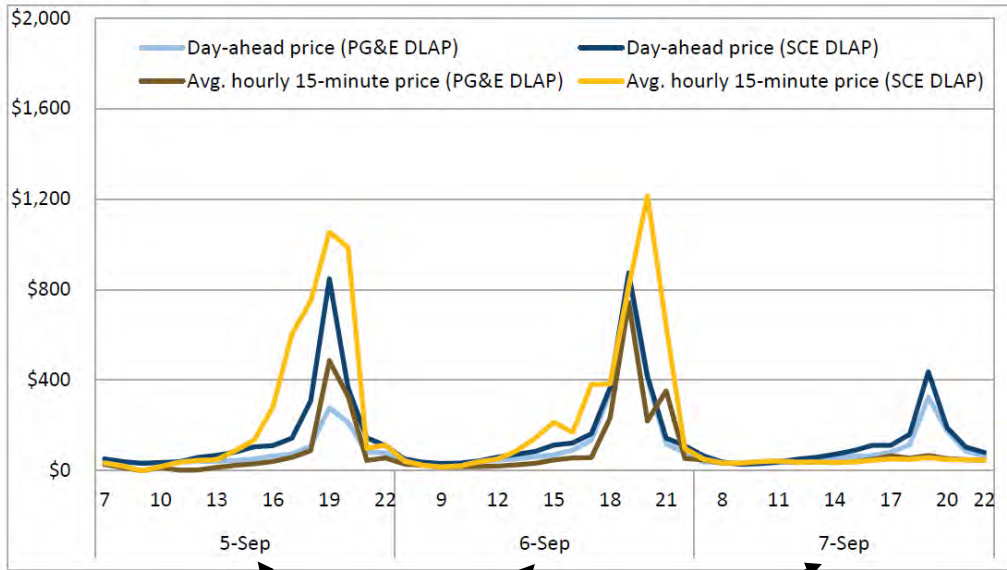


Figure 3.6 CAISO day-ahead and real time peak hour prices (September 5-7)



Source: CAISO Market Monitor Report 11/24/20

Excess (\$M)	13-Aug-20	14-Aug-20	15-Aug-20	16-Aug-20	17-Aug-20	18-Aug-20	19-Aug-20	20-Aug-20	21-Aug-20	Aug 22-28	4-Sep-20	5-Sep-20	6-Sep-20	7-Sep-20	8-Sep-20	TOTAL
Direct	\$ 19.5	\$ 131.1	\$ 90.6	\$ 45.4	\$ 206.9				\$ 14.8	\$ 134.0	\$ 19.5	\$ 62.1	\$ 95.3	\$ 41.9	\$ 30.8	\$ 891.9
Indirect						\$ 286.0	\$ 115.0	\$ 64.8								\$ 465.8
																\$ 1,357.7

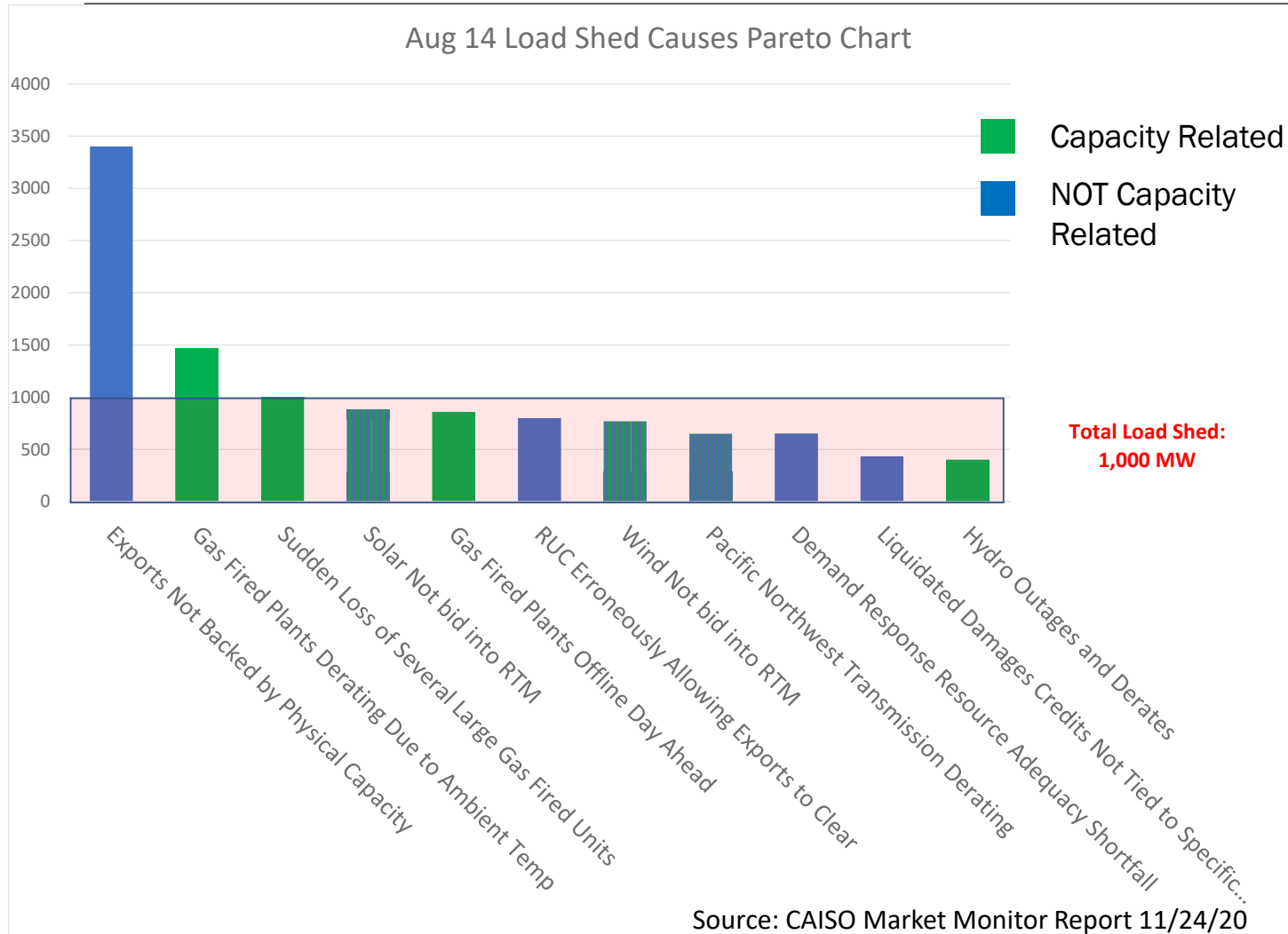
Direct = OASIS Day Ahead Market Summary (Date, Cleared Supply SS + Cleared Supply EB + Cleared Imports) – OASIS Day Ahead Market Summary (Baseline, Cleared Supply SS + Cleared Supply EB + Cleared Imports)

Baseline = Aug 12 or Sep 3

Source: OASIS Data



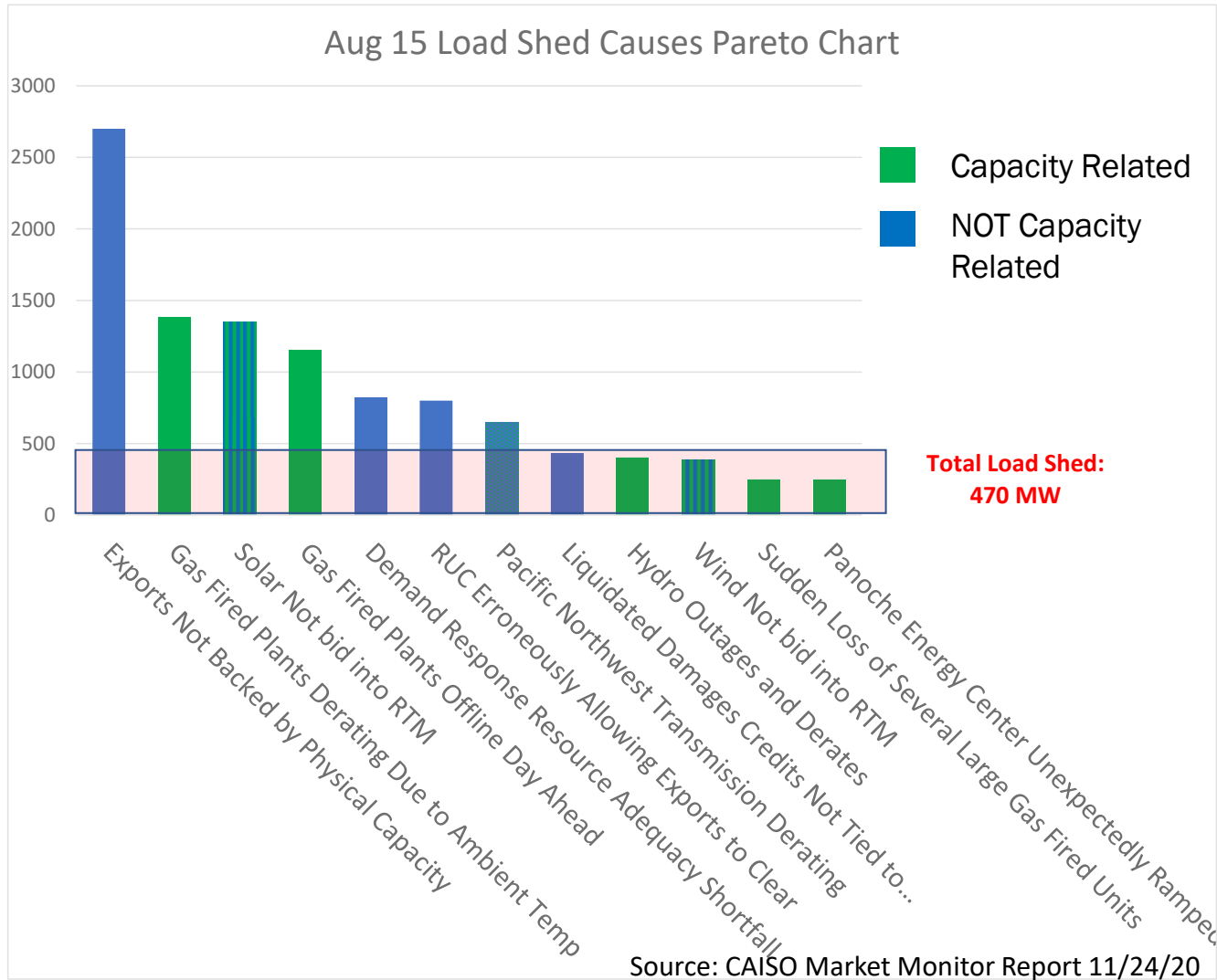
Market Monitor Data Shows Three Causes Individually Could Have Caused Aug 14 Blackouts



- Exports Not Backed by Physical Capacity
- Gas Fired Plants Derated
- Sudden Loss of Gas Fired Units



Market Monitor Data Shows Seven Causes Individually Could Have Caused Aug 15 Blackouts

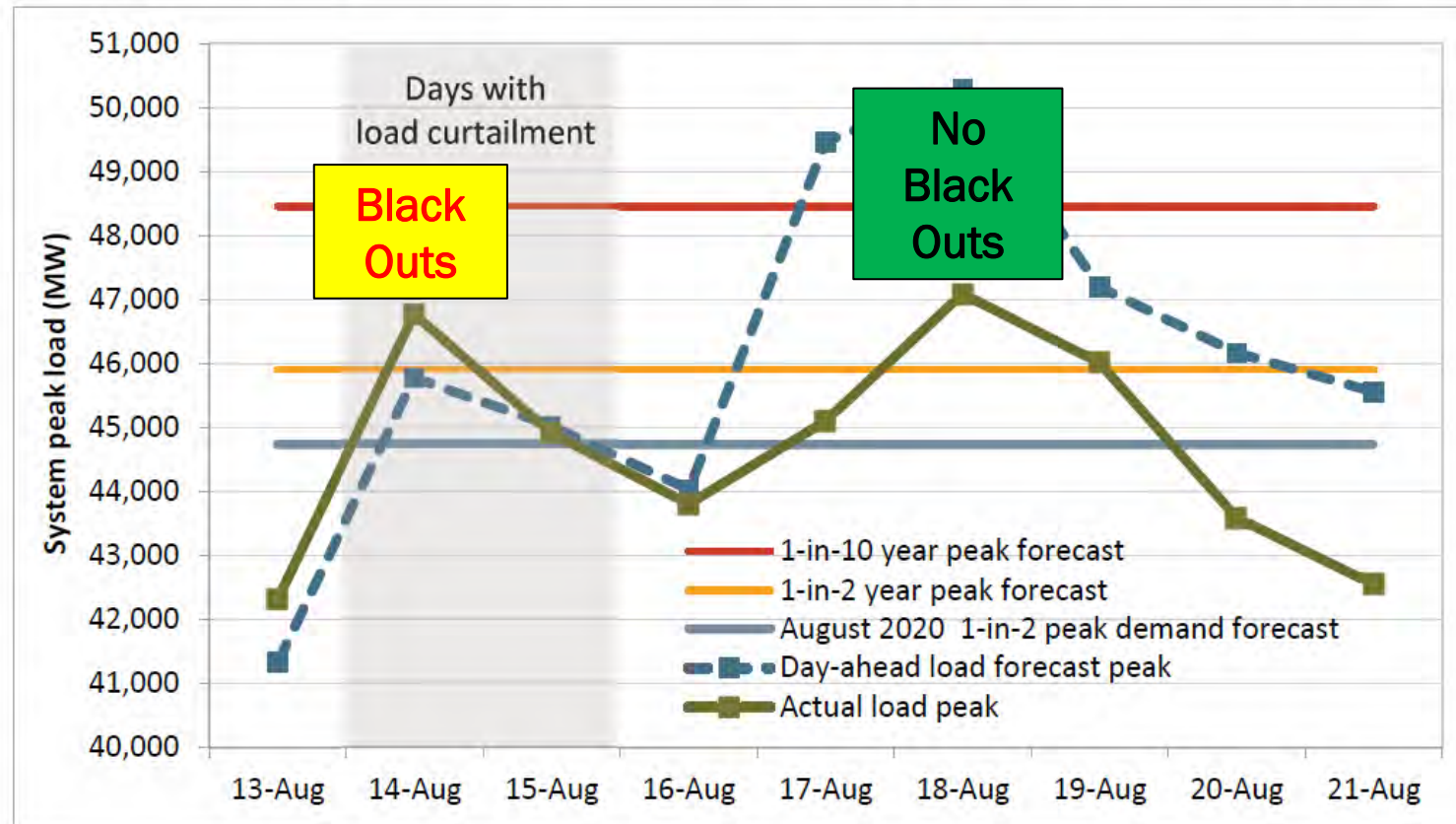


- Exports Not Backed by Physical Capacity
- Gas Fired Plants Derated
- Solar Not Bid Into RTM
- Gas Fired Plants Offline
- Demand Response Shortfall
- RUC Erroneously Allowing Exports
- PNW Transmission Derating



Unpacking the ISO's first “cause”: If there Weren't Enough Resources, Why Were there No Blackouts on Aug 18th Which Had Higher Load?

Figure 3.1 Actual peak load in the ISO compared to day-ahead forecast peaks (August 13 – 21)



CAISO Composite Temp

8/14 84.5 °F

8/15 85.8 °F

8/16 84 °F

8/17 83 °F

8/18 85.5 °F

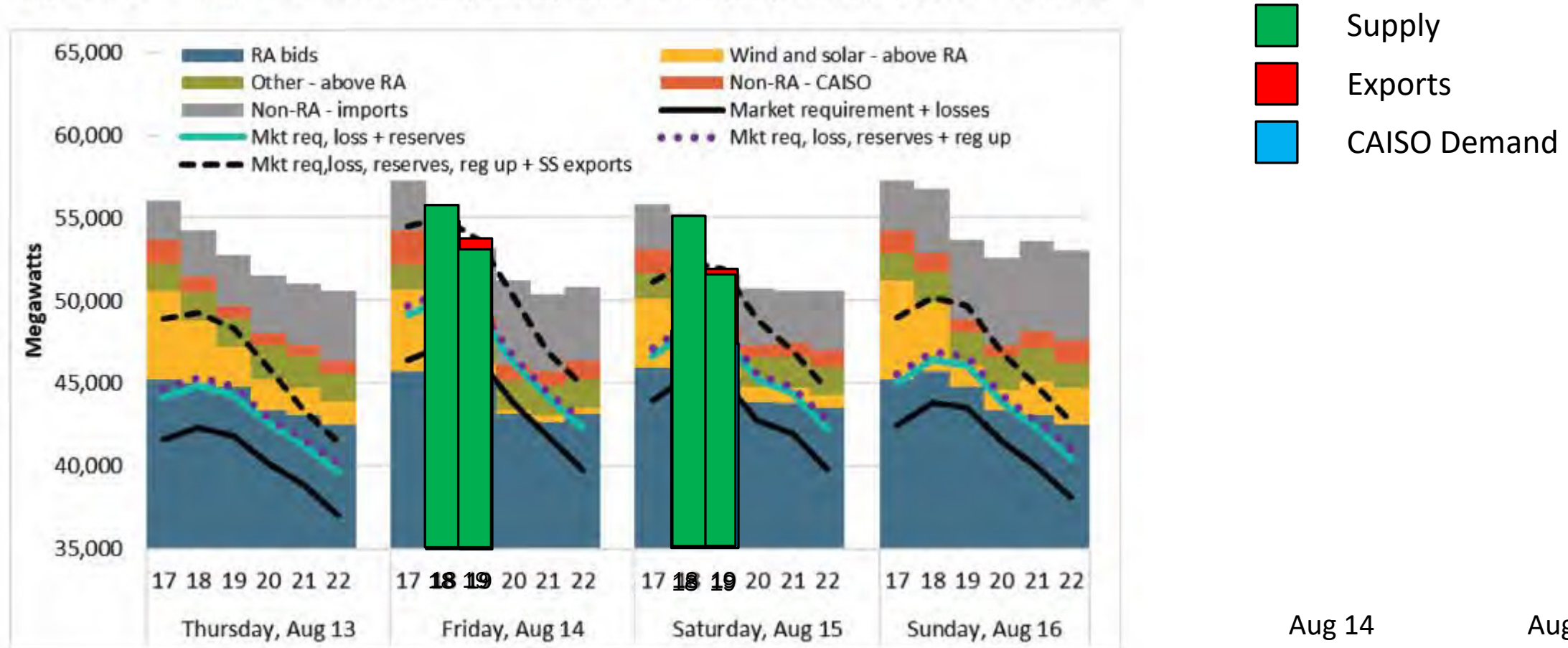
Source: CAISO Preliminary RCA 10/6/20

Source: CAISO Market Monitor Report 11/24/20



Unpacking the Second Cause: The Data Show That CA Started With Sufficient Supply to Meet the August 2020 Demand, And Then . . .

Figure 3.21 Real-time market hourly bids by resource adequacy status (August 13 - 16, 2020)



Source: CAISO Market Monitor Report 11/24/20

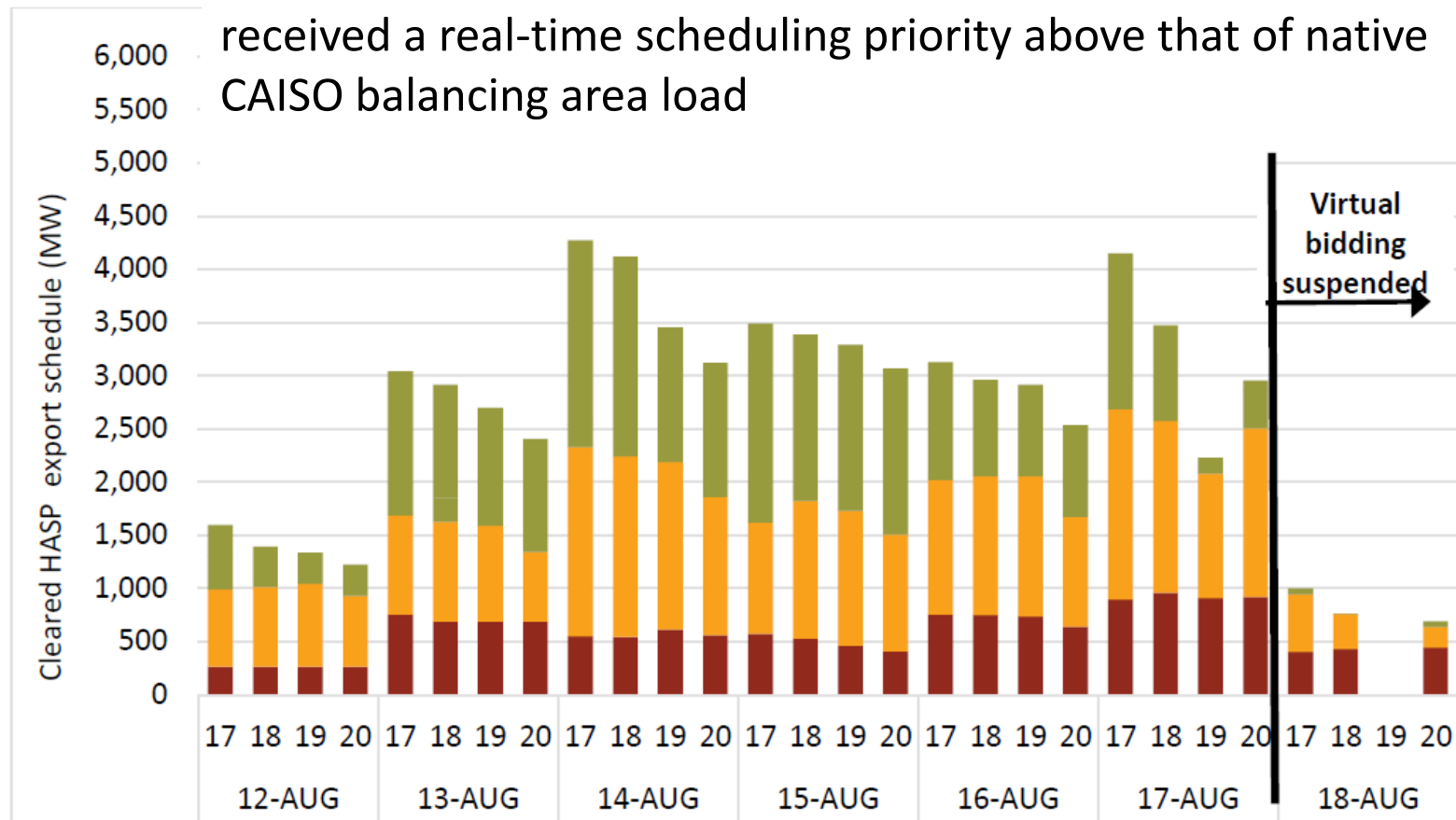




Virtual Bidding Led to Over 3,000 MW of Exports on 8/14-15 Not Backed by Capacity Contracts

Suspending Virtual Bidding Reduced Exports Below 1,000 MW

Figure 3.38 In each of the three hours when load was shed, there was over 3,000 MW of exports not backed by capacity contracts that received a real-time scheduling priority above that of native CAISO balancing area load

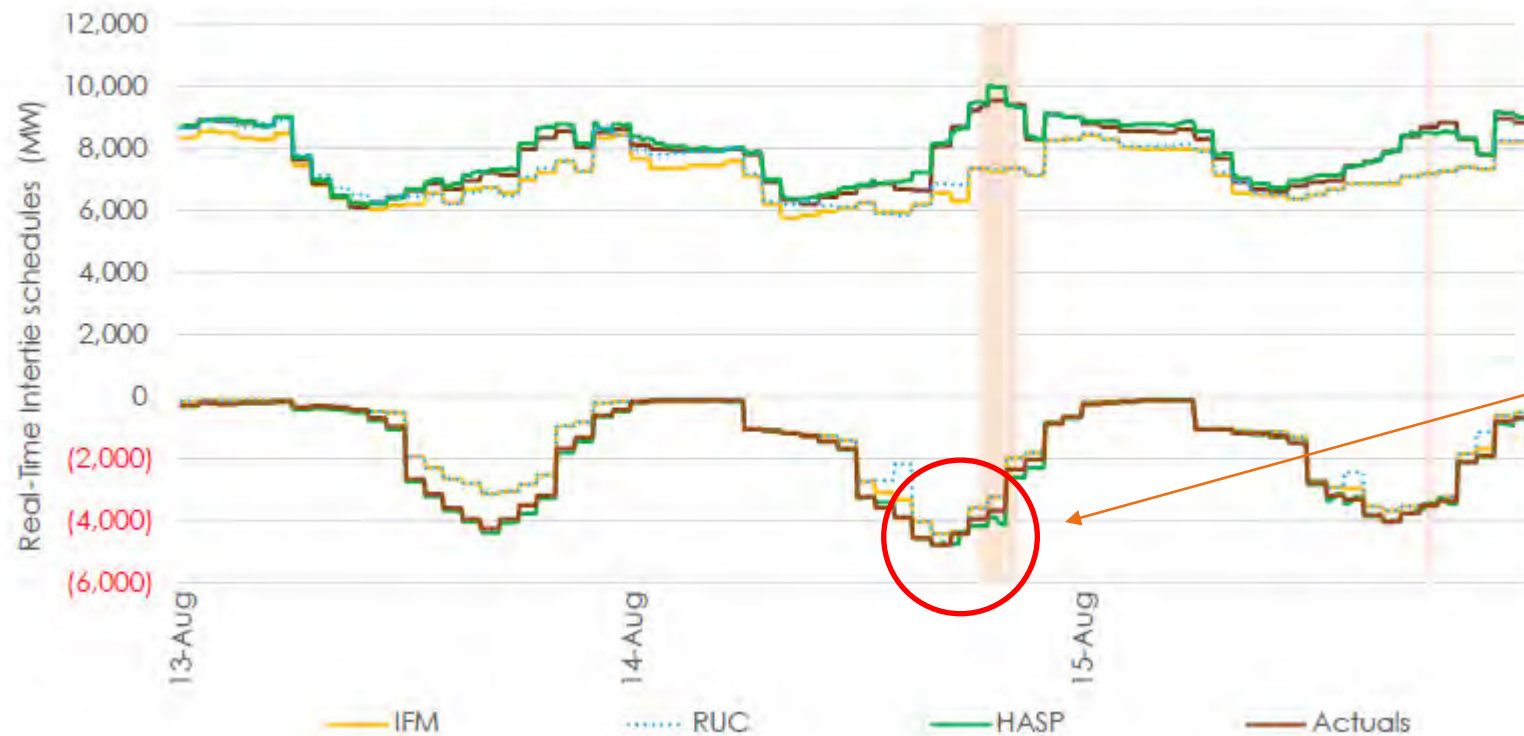


Source: CAISO Market Monitor Report 11/24/20



Exports Peak Late Afternoon at Over 4,000 MW and Only Marginally Decrease at Net Peak Demand

Figure B.37: Day-Ahead and Real-Time Imports and Exports During August 13-15



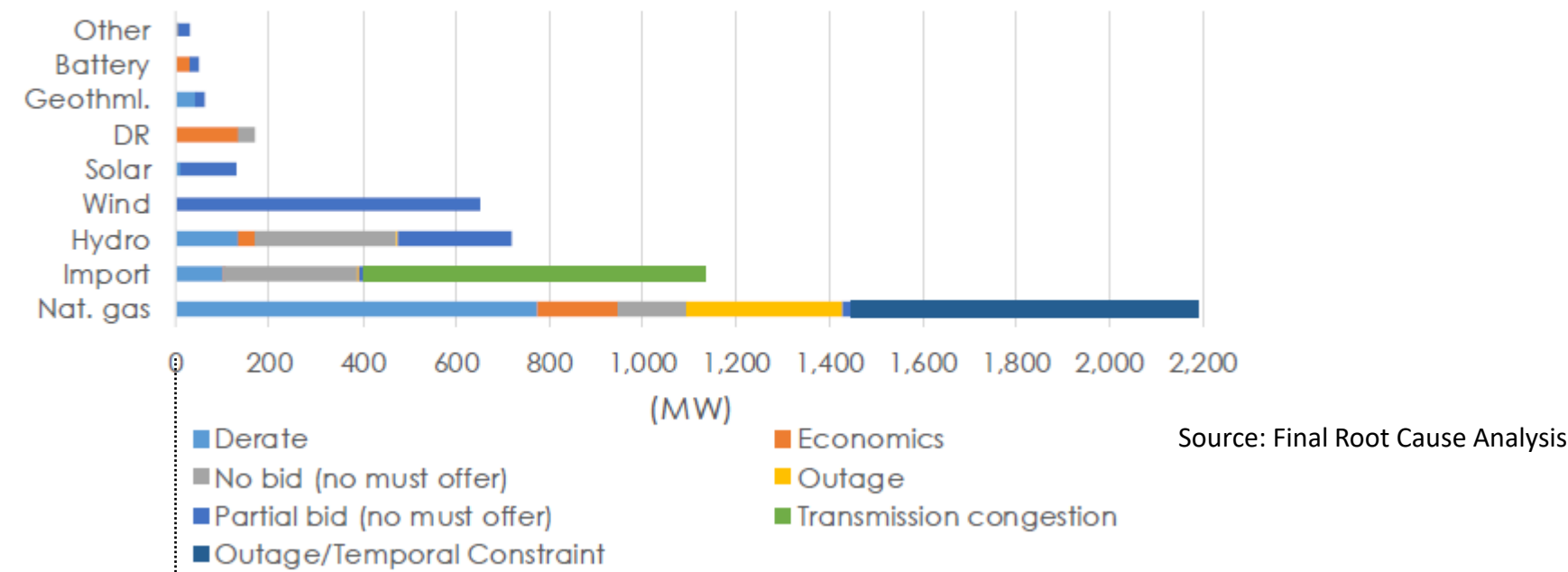
Exports, already high, increased from the Day Ahead Market

Source: Final Root Cause Analysis



The Data Show that Exports Dwarfed Other Resources' Underperformance During the Heat Wave

Figure B.4: August 14 Peak (4:56 p.m.) Unused RA Capacity by Resource Type



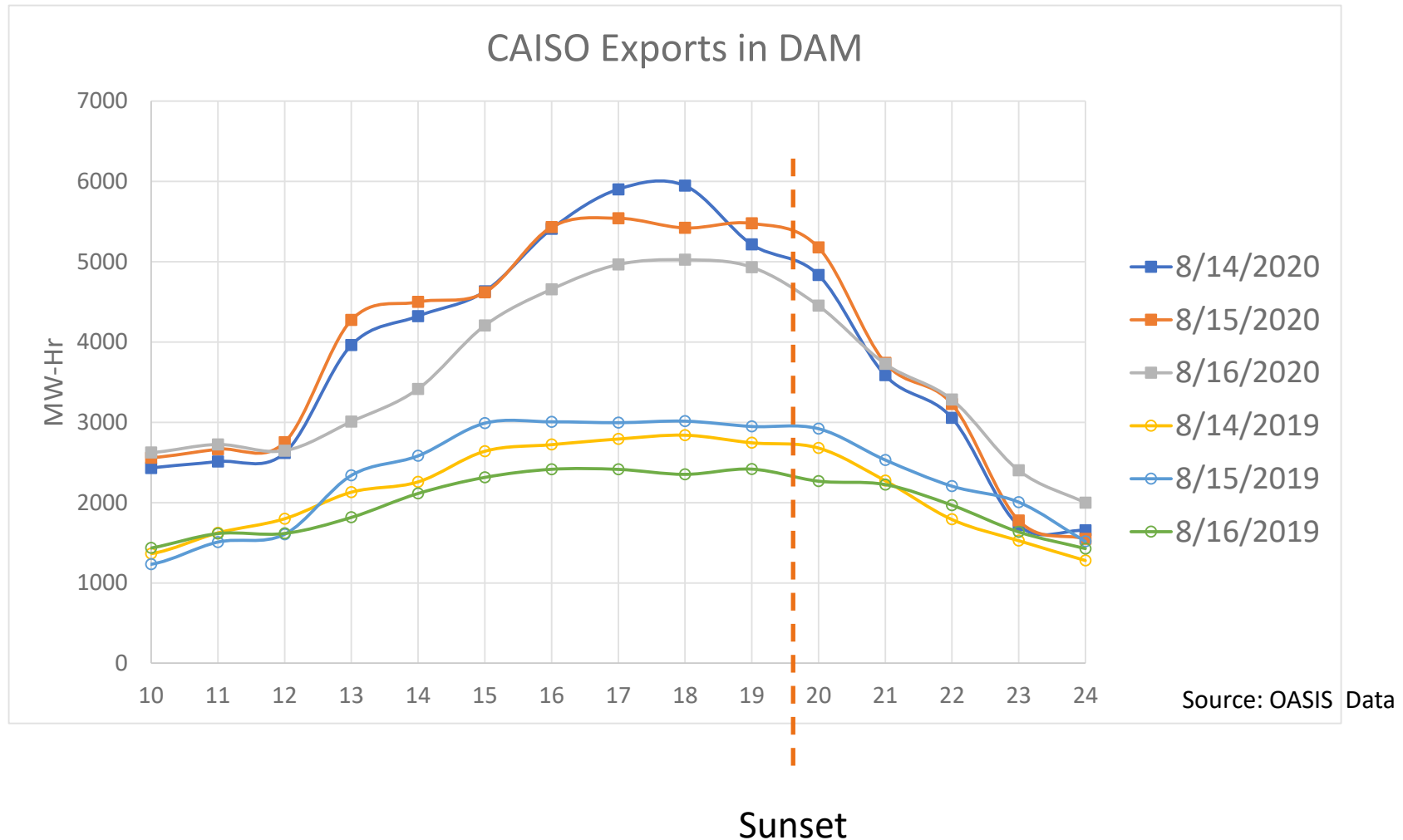
Exports



Capacity is NOT The Problem!

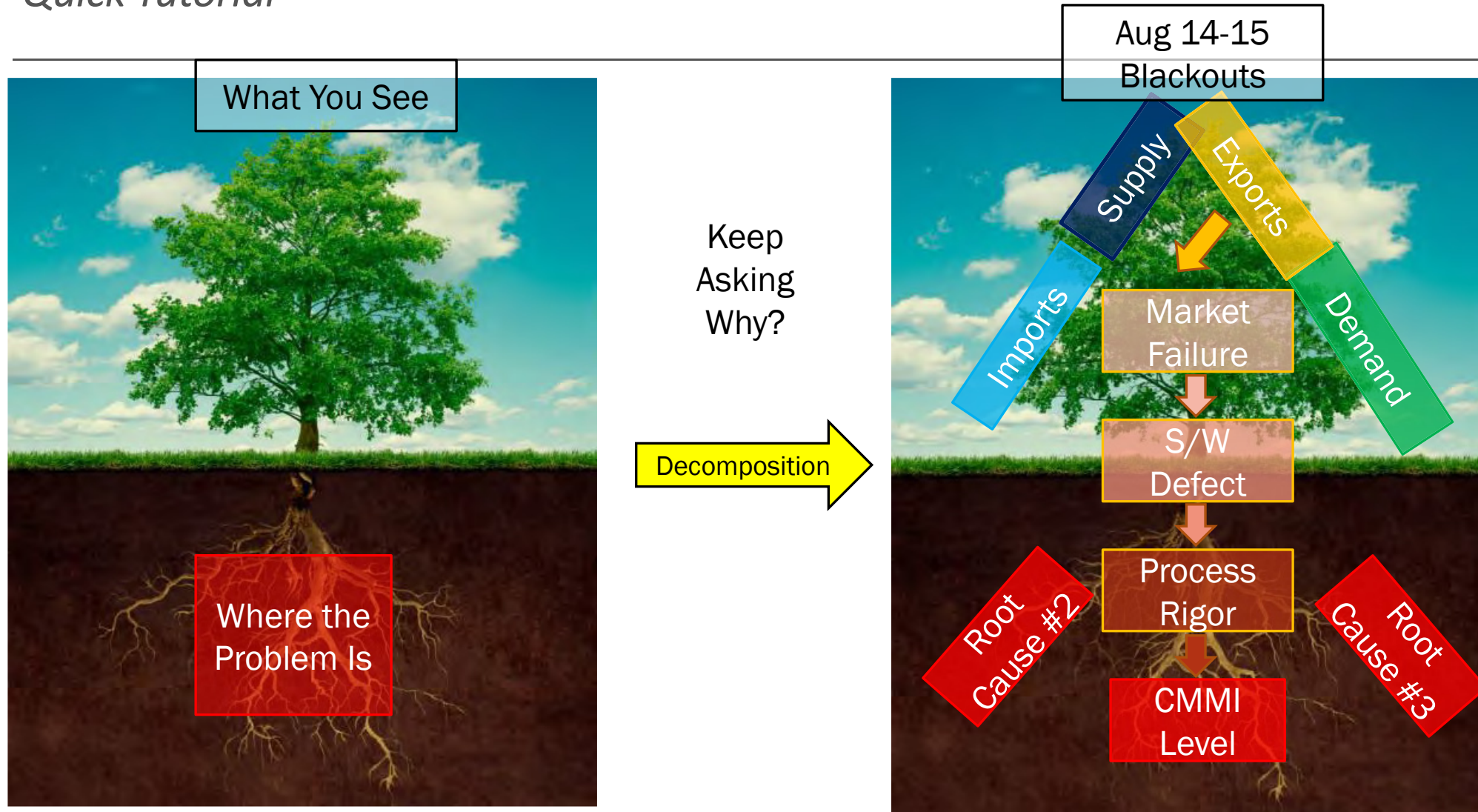


CAISO 2020 Exports Doubled During Critical Twilight Hours Compared to 2019



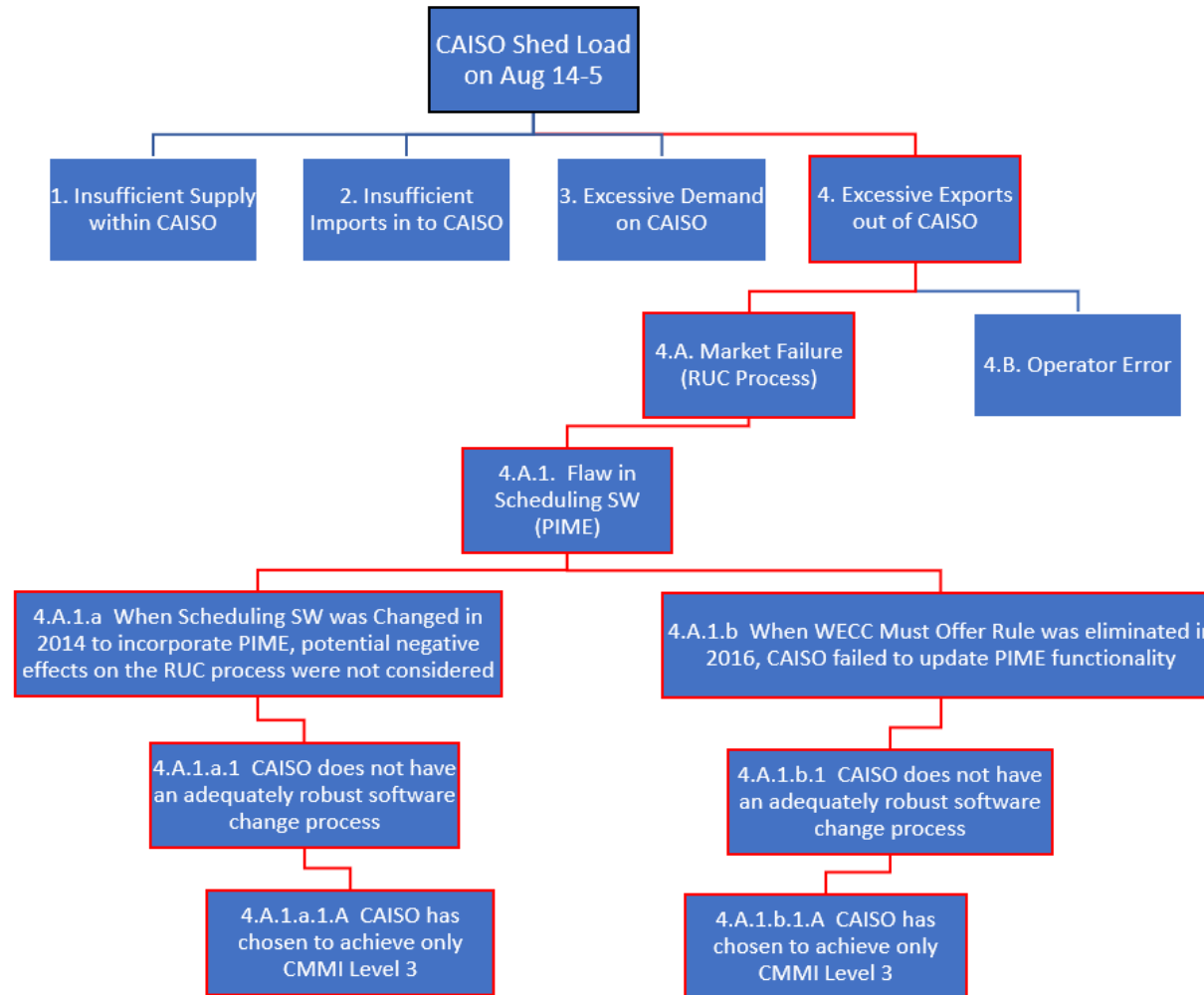
Root Cause (Fault Tree) Analysis

Quick Tutorial



A REAL Root Cause Analysis Highlights Fundamental Issues

“Good Enough” Scheduling Software Rigor Failed Under Stress



- Capability Maturity Model Integration (CMMI) is a widely used standard to grade the rigor with which an organization develops and maintains software.
- CMMI has 5 levels, with 1 being the lowest level of rigor and 5 being the highest.
- Causal Analysis and Resolution is only achieved at Level 5



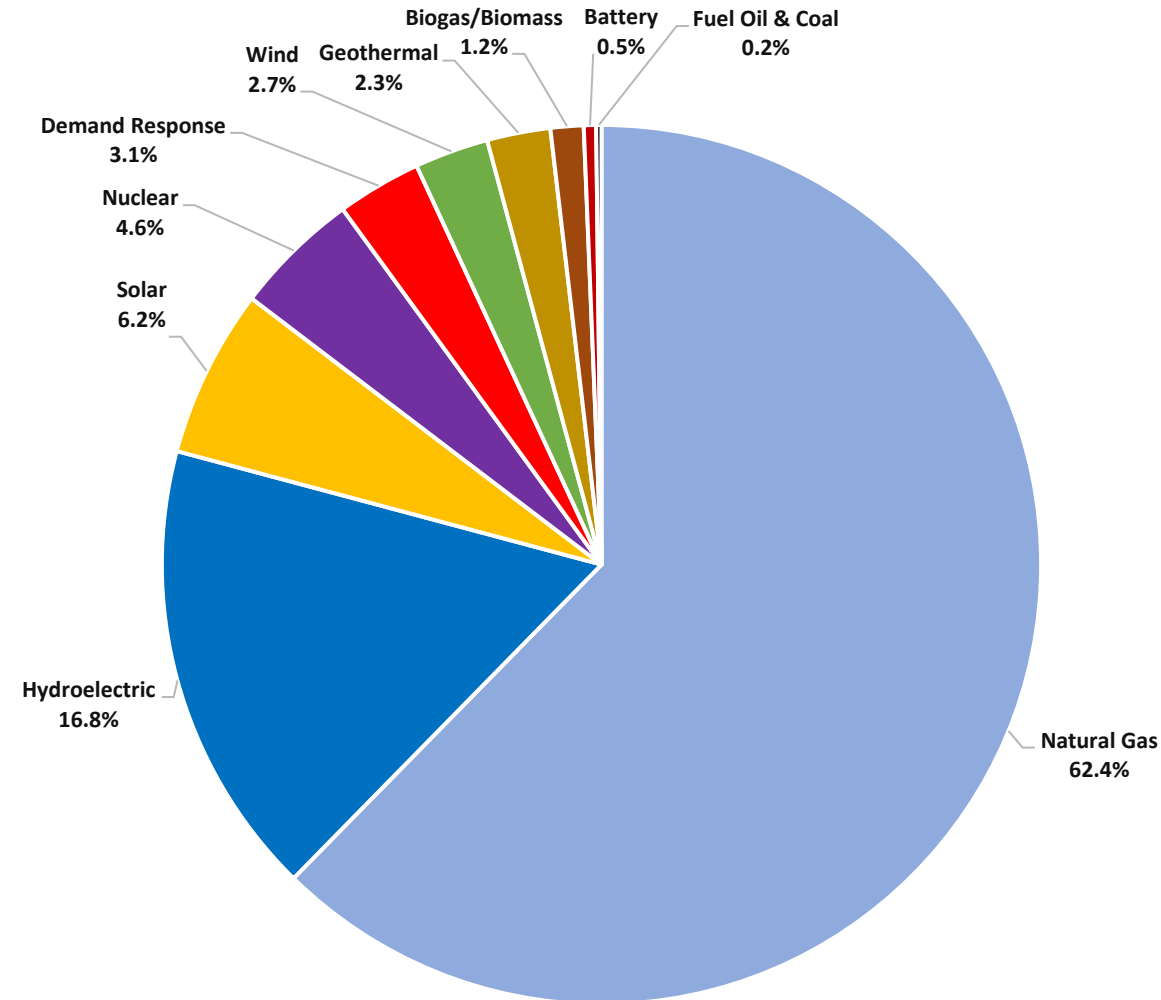
Thomas Popik

Chairman, Foundation for Resilient Societies



CAISO Net Qualified Capacity for August 2020—49.2 GW

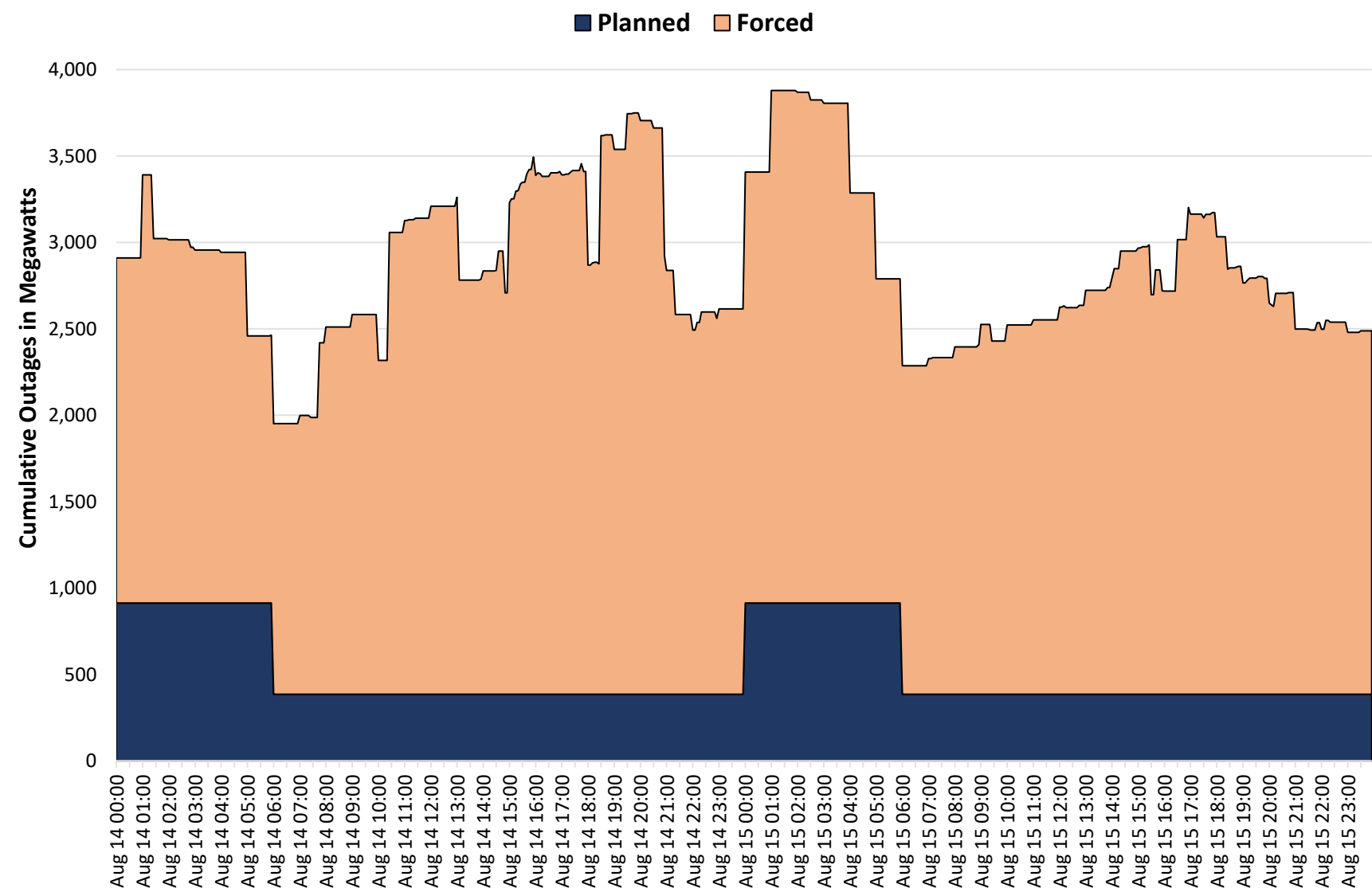
NQC does not include planned imports in CAISO Summer Forecast



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



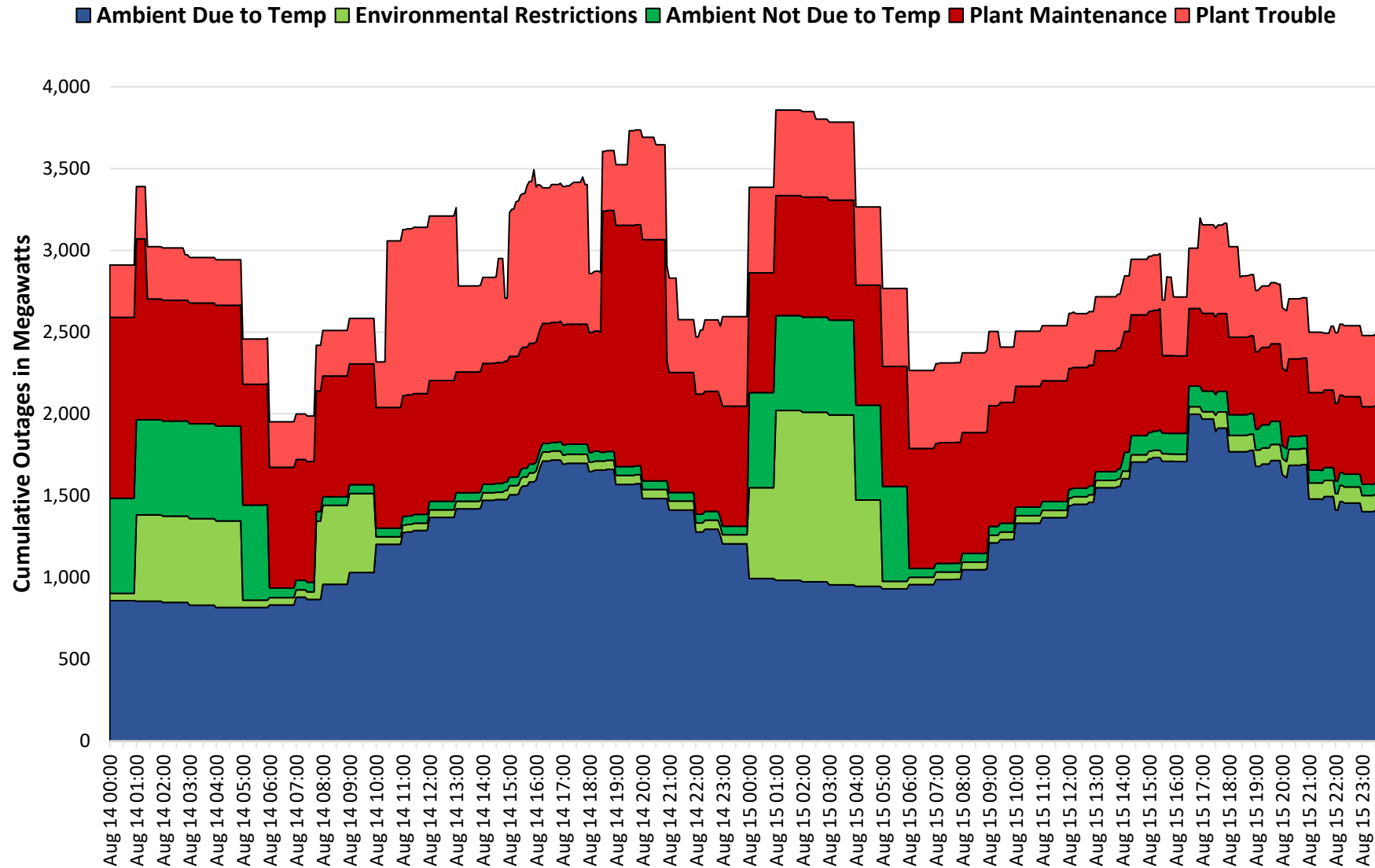
August 14-15 Outages at CAISO Gas-Fired Plants



Source: CASIO Outage Data for August 13-16, Foundation for Resilient Societies Analysis



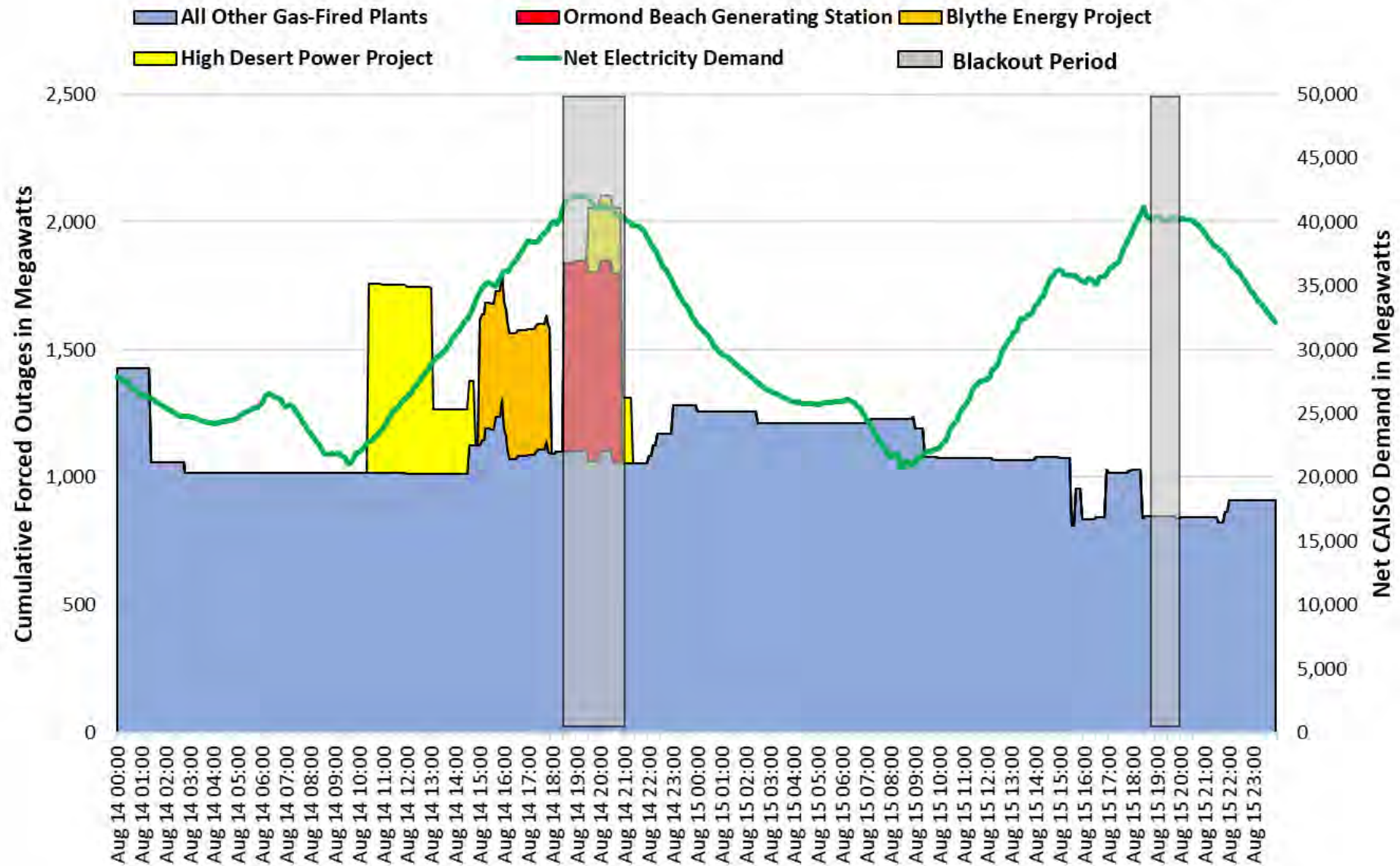
August 14-15 Outages at CAISO Gas-Fired Plants



Source: CAISO Outage Data for August 13-16, Foundation for Resilient Societies Analysis



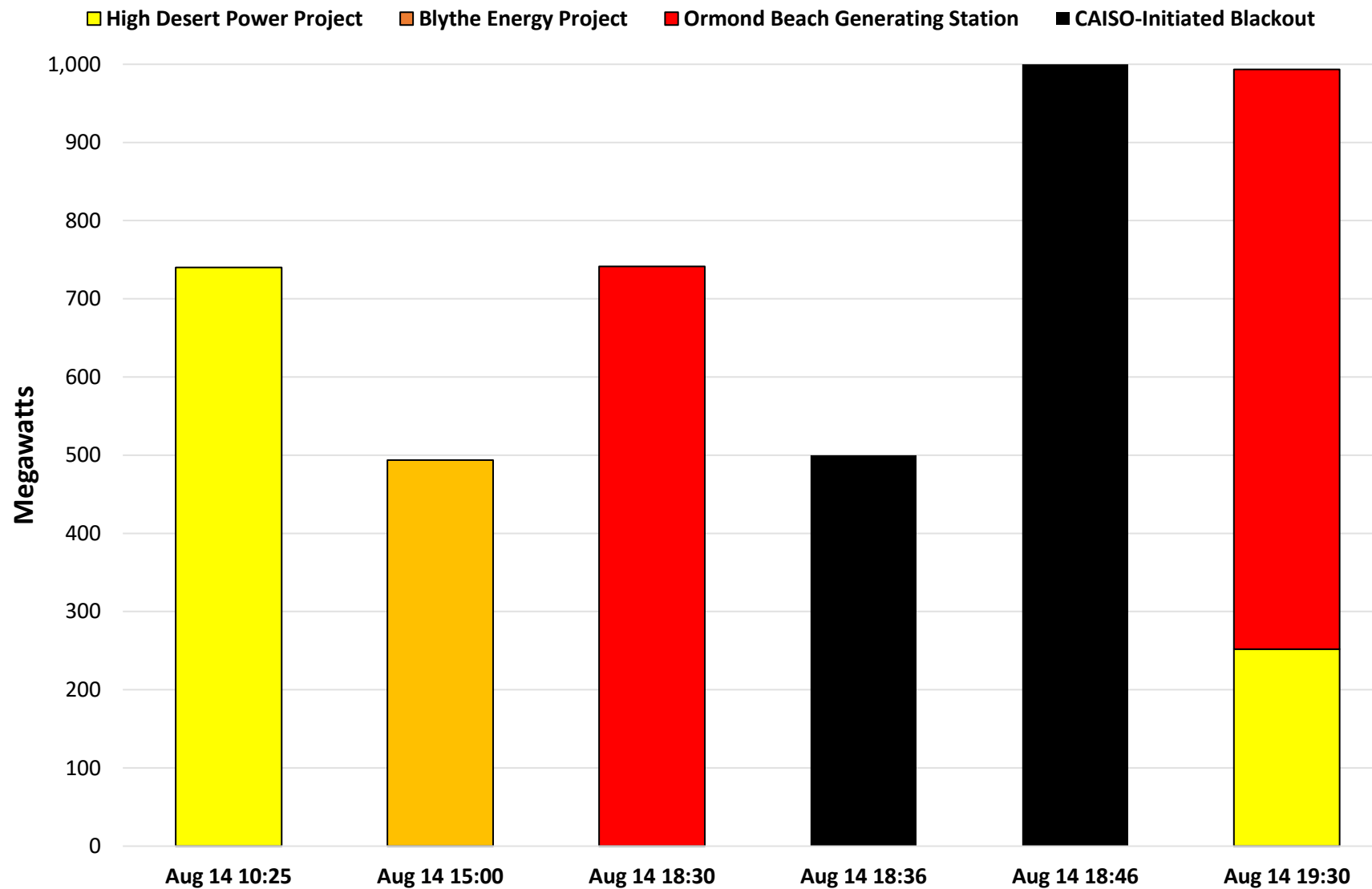
August 14-15 Forced Outages Due to Maintenance/Trouble at CAISO Gas-Fired Plants



Source: CASIO Outage Data for August 13-16, CAISO Net Demand, CAISO Final Root Cause Analysis, Foundation for Resilient Societies Analysis



Forced Outages Due to Plant Maintenance/Trouble vs. CAISO-Initiated Blackout



Source: CASIO Outage Data for August 13-16, CAISO Net Demand, CAISO Final Root Cause Analysis, Foundation for Resilient Societies Analysis



California Consumers Pay for NQC Generators To Be Available



On August 14 Outages Peaked at 12% of Net Qualified Capacity for CAISO Gas-Fired Plants, Despite Large Capacity Payments

Financial Terms of Utility Contracts with Generation Plants Are Withheld from Public
At Peak, 90% of Plant Outages Were “Forced” (Same Day Notification to CAISO)



Factors in Gas-Fired Outages Were Ambient Conditions, Environmental Restrictions, Plant Maintenance, and Plant Trouble



3 Large Plants Had Forced Outages Due to “Plant Maintenance/Trouble” as Net Electricity Demand Ramped on August 14

Role of Ormond Beach and High Desert Outages Not In CAISO Final Root Cause Analysis
Blackout Initiated at 18:36, Six Minutes After Forced Outage at Ormond Beach Plant
Ormond Beach Outage Overlaps Blackout Period



Cause of Major Forced Outages During August Blackouts Needs Investigation

Are California Consumers Getting Value for The Money They Are Paying to NQC Generators?
Results of Investigation Should Be Made Public



Bill Powers

Registered Professional Mechanical Engineer



High outage rates on August 14th and 15th : coastal boiler plants and utility gas plants



3 of 9 coastal units entirely unavailable on August 14th 336 MW in planned outage
920 MW in forced outage



Nearly 40% of coastal boiler plant capacity, ~1,400 MW of 3,700 MW, was unavailable at time of blackout on August 14th



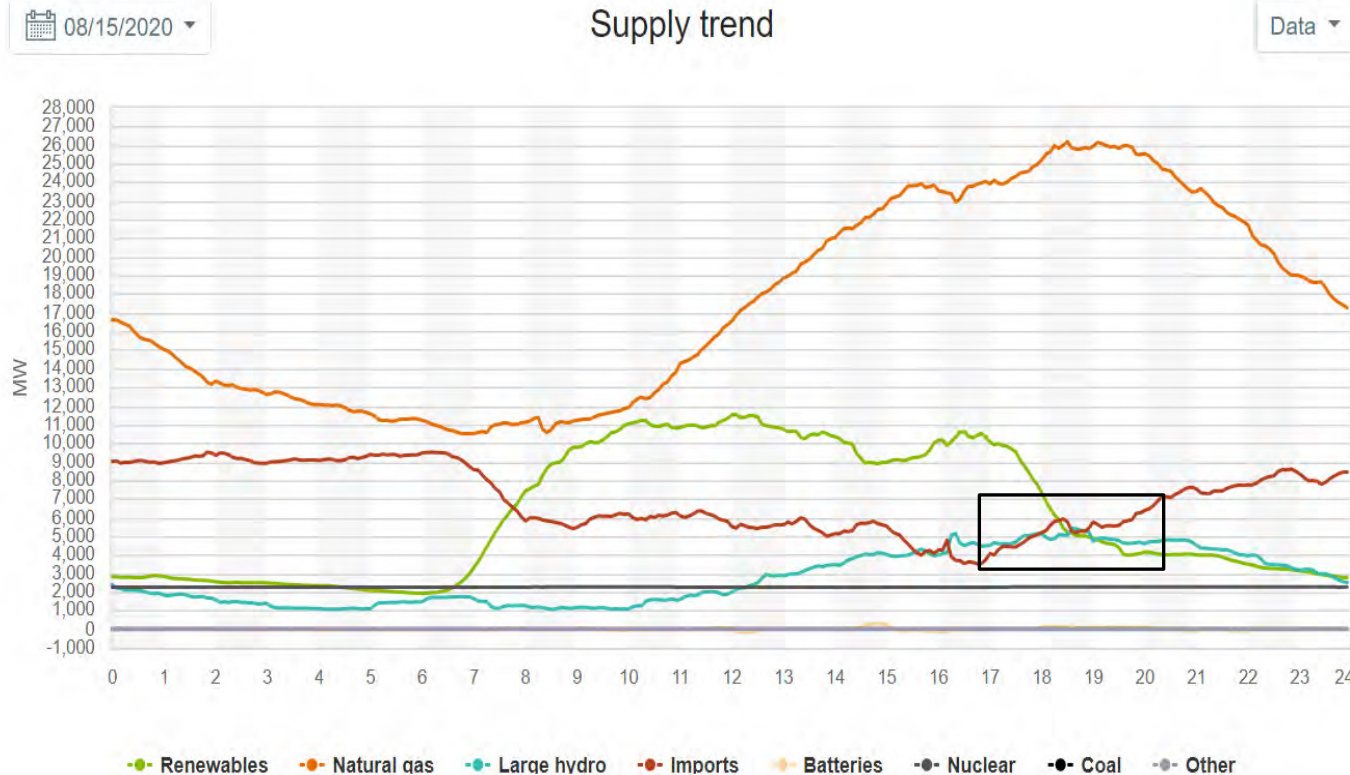
2 of 5 utility gas plants, August 14th partial curtailments late afternoon Gateway (PG&E), 180 MW curtailed
Desert Star (SDG&E), 280 MW curtailed



Partial curtailments continue on August 15th into late afternoon Gateway (PG&E), 164 MW curtailed
Desert Star (SDG&E), 130 MW curtailed



Sharp decline in imports as August 15th blackout initiated

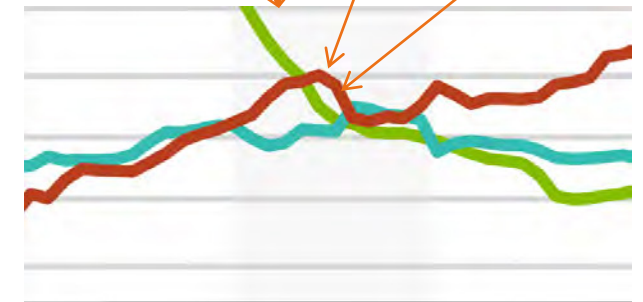


Panoche,
-248 MW
6:13 pm

Stage 2
declared
6:15 pm

Imports drop
~700 MW,
6:25–6:35 pm

Blackout,
6:28 pm



Demand was at average summer peak levels when blackouts were initiated on Aug. 14-15

Date	Demand, MW	CAISO Action
2020 peak forecast + 15%	52,793	45,907+15% required reserves
August 14, 2020, 17:00	46,777	Stage 2 emergency
August 14, 2020, 18:36	45,716	Rolling blackouts 1,000 MW
August 15, 2020, 18:00	44,913	None (Stage 2 issued at 18:15)
August 15, 2020, 18:28	44,662	Rolling blackouts 470 MW
August 18, 2020, 16:00	47,067	Stage 2 emergency
September 6, 2020, 16:40	46,864	Stage 2 emergency
September 1, 2017, 15:58	50,116	Flex Alert only



Did CAISO initiate blackouts prematurely? Or was contracted capacity not available when needed?

references: CAISO, 2020 Summer Loads and Resources Assessment, Figure 5, p. 11; CAISO, 2020 Summer Readiness – Fast Facts, p. 2; CAISO OASIS.

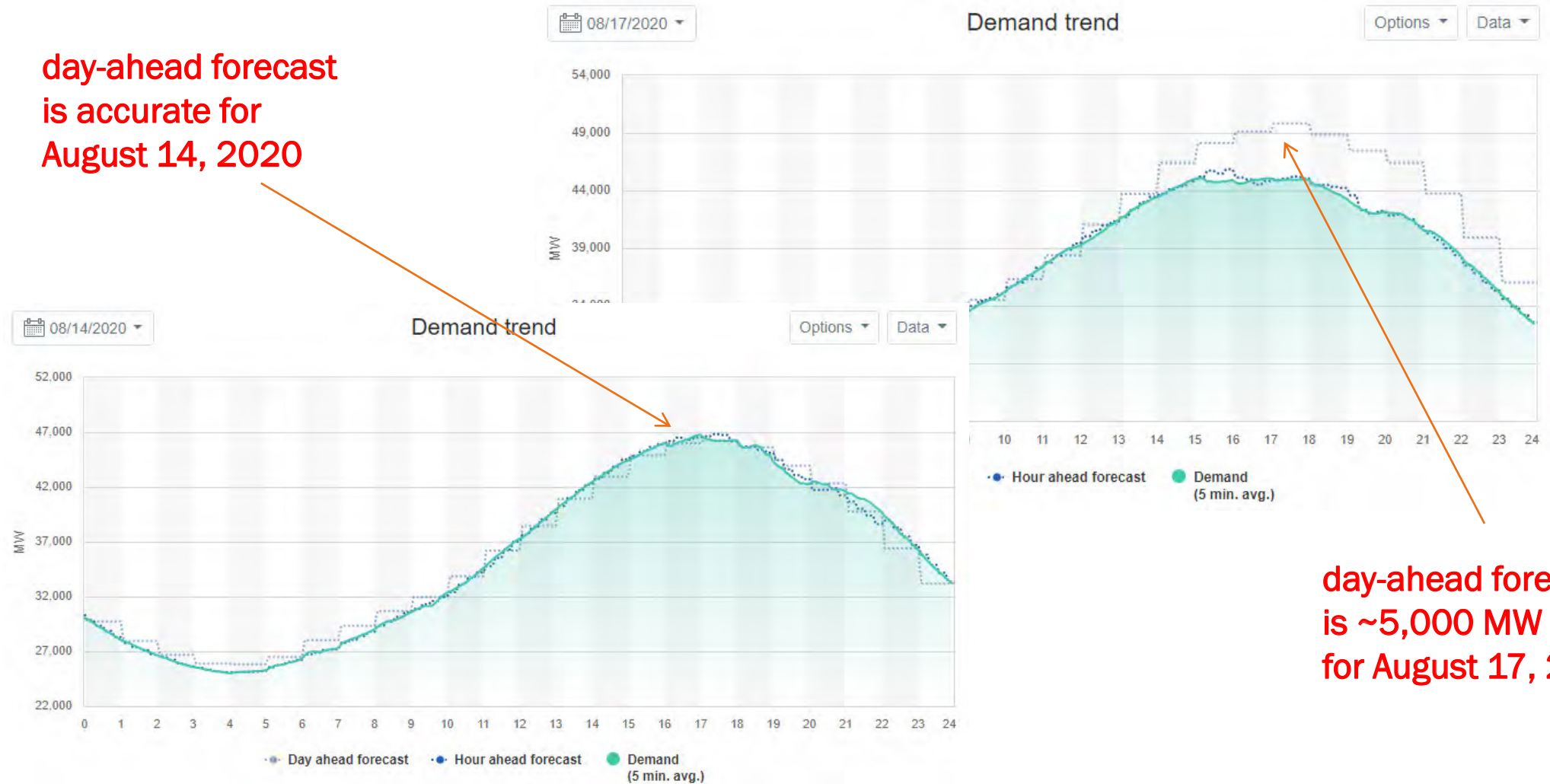
	Stage 1 Emergency	Stage 2 Emergency	Stage 3 Emergency
Reserve margin range	10% → 6%	6% → 3%	< 3%
Action triggered	Conservation	Allowable for up to 60 minutes following event, order power plants online to regain 6% reserve margin.	shed load (blackout)
August 14 th , 6:36 pm		Reserve margin = 5.92% Action = rolling blackouts	
August 15 th , 6:28 pm		Reserve margin = 6.04% Action = rolling blackouts	

Real-time “available capacity” value on CAISO website showed reserves at ~9 percent when blackouts initiated on August 14th and 15th.



Did the ISO try over-forecasting to counter under-scheduling?

Graphics: CAISO day-ahead forecast versus actual demand, August 14, 2020 and August 17, 2020. First day of heat wave, accurate. Fourth day of heat wave – and subsequent days – day-ahead forecast is thousands of MW high.



Lessons Unlearned: April 2010 SDG&E blackout

Date	Impact	Cause
2010 April	250,000 customers lose power in San Diego	• Improper action by CAISO operators, ordering SDG&E to shed 290 MW. • FERC: inadequate training and lack of documented operating procedure. • CAISO admits to violations of NERC reliability standards. • Paid civil penalty of \$200,000 to the U.S. Treasury.



Lessons Unlearned: September 2011 SDG&E blackout

Date	Impact	Cause
2011 Sept	Regional blackout: SDG&E, Imperial Irrigation District, Baja California	• Insufficient local generation online on highest demand day of year. • Most of SDG&E demand being met with imported power when 500 kV transmission line tripped offline. • Largest coastal boiler plant (1,000 MW) and combined cycle plant (600 MW) in San Diego area not producing power when transmission line goes down. • Led to trip of 2,200 MW San Onofre Nuclear and regional blackout.



Lessons Unlearned from 2010 & 2011 blackouts

- Lack of awareness of plant(s) being in forced outage and unavailable for dispatch.
- Resorting to load shedding when adequate reserves were available to meet NERC/WECC reliability criteria.
- Over-reliance on imported power, with major local plants available but idle on highest demand day of year.
- Failure to prioritize reliability during heat waves.



Bill Julian

Retired Public Interest Lawyer / Former CPUC Legislative Director and Legal Adviser



Aug. 2020 Blackouts and Excess Charges: ReCap of Proximate Causes

CAISO Market Trading Policies & Computer Programs Allowed Over 3,000+ MW of Exports During Hot Weather & System Stress

Forced Outages and Power Plant Unavailability Strained Supplies & Requires Investigation

These Problems Led to Blackouts and Excess Charges





In 2001-02 California Fought Back Against Enron & the Others

Pressured FERC to impose rules to stop price gouging, profiteering and Enron-style trading practices

Eliminated electricity shortages by reinstating obligation to serve & establishing procurement mechanisms & rules

Prevented physical withholding of power through power plant operations & maintenance oversight & rules

Strengthened state laws on electricity grid management by controlling CAISO Board & mandating power priority to serve Californians, not marketers

Ended utility power plant sales to energy traders





The ISO's Lax Market Rules, Misplaced Priorities & Expired FERC Protections Put California at Risk Again



FERC Abandoned all Protections Adopted During CA Energy Crisis

- **No Must Offer Obligation; No Cost-Based Price Caps; No Just & Reasonable Enforcement**

No Effective External Oversight

No Meaningful Public Access to ISO Decision Making

- **No Consumer & Limited Market Monitor Presence At Stakeholder & Insider Meetings**

Weak/Non-Existent Control of Power Plant Operations & Maintenance

Marginalizing the Market Monitor Recommendations

Regulatory Capture of ISO By Marketers and Sellers ?



CA MUST REINSTATE ELECTRICITY GRID & MARKET PROTECTIONS

California Must Act to:

PRIORITIZE STRENGTHENING CAISO GRID MANAGEMENT

REINSTITUTE STATE OVERSIGHT & ACCOUNTABILITY TO CALIFORNIA CUSTOMERS

REAFFIRM PRIMARY OBLIGATIONS TO CALIFORNIA CUSTOMERS

ENHANCE INDEPENDENCE & EFFECTIVENESS OF MARKET MONITOR

REQUIRE GREATER TRANSPARENCY IN PROCESS AND DATA

REQUIRE PARTICIPATION BY CONSUMER ADVOCATES IN STAKEHOLDER PROCESSES

CA Must Achieve Stronger Market Protections At FERC:

REDUCE PRICE GOUGING/PROFITEERING BY LINKING TO GENERATOR COST

REDUCE OPPORTUNITIES TO CREATE APPEARANCE OF SHORTAGE

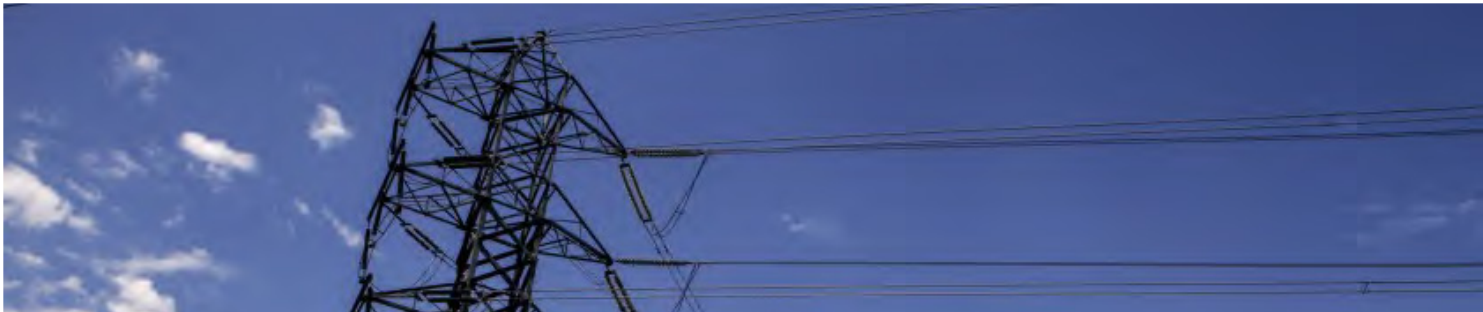
RECONSIDER VIRTUAL BIDDING (BIDS NOT BACKED BY REAL RESOURCES AND LOADS)



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CALIFORNIA

California begins rolling blackouts after first Stage 3 emergency since 2001



Los Angeles Times

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A West Coast Perspective.

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Electricity distribution lines are seen at Southern California Edison's grid control cen

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By LEILA MILLER | STAFF WRITER

AUG. 14, 2020 UPDATED 8:18 PM PT



The body that runs the electric grid for most of California declared a statewide Stage 3 emergency Friday evening for the first time since 2001 due to excessive heat driving up electricity use and ordered utilities to implement power disruption programs.

The California Independent System Operator had issued a statewide flex alert earlier Friday, asking residents to conserve electricity between 3 p.m. and 10 p.m. That alert asked consumers to set air conditioner thermostats to 78 degrees or higher, turn off unnecessary lights and not use major appliances.

We “were monitoring the flex alert to see if consumers would answer the call to lower the energy use so we wouldn’t have to go into Stage 3,” said Anne Gonzales, a public information officer for the corporation. “We are in Stage 3 now and hopefully demand will keep going down.”

In the wake of the decision, there were a scattering of power interruptions in Southern California, but it was unclear how widespread they were. The emergency notice was issued at 6:36 p.m. and lifted at 8:54 p.m. One thousand megawatts of electricity were taken out of service, the corporation said.

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The power shortage is being driven by what officials say is one of the worst statewide heat waves in years. The broiling conditions that [began Friday](#) in California [may rival the deadly seven-day heat event of July 2006](#), the National Weather Service said.

The valleys, mountains and deserts of Southern California are likely to see daytime and nighttime temperatures challenge records through at least Thursday, and humidity will make conditions feel 2 to 5 degrees warmer during the day.

Air quality officials also issued an advisory Friday warning that the heat wave is pushing lung-damaging ozone pollution to “very unhealthy” levels and that much of Southern California will experience elevated smog through Monday. On Friday afternoon, ozone pollution in some areas reached its highest levels in a decade as a result of high temperatures and wildfires, according to the South Coast Air Quality Management District.

David Song, a public information officer for Southern California Edison, said that approximately 132,000 of the utility’s 5 million customers were without power as of 7:30 p.m. because of rotating power outages it had put in place. The outages were scattered throughout Southern California Edison’s service area and were set to last about one hour for each outage group. These groups include customers from a cross section of cities so that an entire city is not affected, he said.

Song urged customers to take steps as simple as turning off the lights in a room once they leave in order to save power, emphasizing that “every little bit helps.”

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mindful to customers and what they're going through right in
home."

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The Los Angeles Department of Water and Power said its customers were not affected by the declared emergency because it generates and imports its own electricity and was able to meet the city's demand.

Spokesman Joe Ramallo said the DWP had in fact provided excess power Friday evening to the California Independent System Operator. The DWP, he said, has never had to institute rotating outages due to not having enough power to meet demand.

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Times staff writers Tony Barboza and Sammy Roth contributed to this report.

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Leila Miller is a reporter for the Los Angeles Times. Before joining the newspaper in 2018, she was a reporting fellow at PBS's "Frontline." Originally from Los Angeles, Miller is a graduate of Oberlin College and Columbia University's School of Journalism. She is fluent in Spanish.

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LOCAL

Nearly half a million PG&E customers to lose power amid planned fire-safety shut-offs Sunday



Shwanika Narayan

Updated: Oct. 24, 2020 11:31 a.m.



A customer purchases picnic supplies at the Spanish Flat Country Store and Deli where extension cords from a gas generator provides limited power in Lake Berryessa, Calif. on Saturday, June 8, 2019.

Paul Chinn/The Chronicle

PG&E revealed Friday that planned power shut-offs to take place Sunday would place nearly half a million homes and businesses or roughly 1.5 million people in the dark in 38 counties across Northern and Central California.

Nearly a third of those potentially affected, or 143,726 customers, are in the Bay Area, where every county except San Francisco would see some outages under the utility's plan.



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We're not out of the woods, but health reporter Erin Allday says the Bay Area is turning the corner on the pandemic. Plus: Business...

00:00:00



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23 min

PG&E routinely shuts off distribution and transmission lines to prevent more wildfires from starting amid highly dangerous wind conditions. The fast, dry winds expected beginning Sunday night elevate the risk of damage to PG&E lines, from tree branches and other wind-whipped hazards.

Earlier Friday, PG&E had upgraded the outage probability for the Bay Area and most other parts of its service territory from “elevated” to “watch” for Sunday, Monday and Tuesday.

Some communities, including Lafayette, Moraga and Orinda, received early indications from the utility that power will be shut off locally and are informing residents.

More for you

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Extreme fire danger, ahead of 'strongest of the year'...

BY NORA MISHANEC

LOCAL

California fires live updates: North Complex Fire claims...

BY NORA MISHANEC AND AIDIN VAZIRI

“Electrical power will be shut off beginning Sunday at 4 p.m. and will be off until Wednesday morning,” the [Nixle alert](#) from Moraga police said. It was not immediately clear what proportion of homes in Lafayette, Moraga and Orinda would be affected.

More than 16,000 homes and businesses in those cities could be affected, a PG&E database showed.

Oakland could see the greatest number of customers out of power, with 23,949 potentially losing power, followed by Santa Rosa with 15,053 and Orinda with 7,642. Thousands in unincorporated parts of Sonoma and Napa counties are also slated

for outages.

The strongest winds of the year are expected to hit the region this weekend, heightening concerns for widespread damage and wildfire risk.

The National Weather Service issued a [red flag warning for the entire Bay Area](#) beginning Sunday morning or evening, depending on the location. Meteorologists say that the fire conditions could be the worst of the season, since extremely low humidity is combining with the high winds. The weather service says that winds of up to 70 mph are expected at elevations above 1,000 feet in the North Bay, East Bay and Santa Cruz mountains. Urban parts of the Bay Area, including San Francisco, could see gusty winds too at around 35 mph.

**Not surprising that @PGE4Me has hoisted a PSPS Watch for most zones between Sunday-Tuesday. My hunch is this power shutoff will impact a large segment of Bay Area customers, so plan accordingly. #cawx #CAFire
pic.twitter.com/nDtYq3ZEhr**

— Jeff Beamish (@jeffbeamish) October 23, 2020

COVID Resources

Coronavirus Map

Tracking COVID-19 cases across the Bay Area and California.

Residents and businesses are bracing for the power outages. Claudio Cravero, the director of operations at Tutu's Food and Drink, a restaurant and market in Lafayette, said he was hoping despite the Nixle alert that power would stay on. Tutu's bought a generator in June and will use it to keep food storage running if the power goes out, but it will have to close to customers if PG&E cuts power, Cravero said.

"We'll lose money if we're without power for two or three days, and employees will miss out on income," said Cravero, noting that Tutu's employs 75 people. "Not a great situation."

.

PG&E outages target high-risk areas and typically affect only parts of counties.

Earlier this week, PG&E canceled fire-prevention power outages for the Bay Area, though other parts of Northern California were affected.

Shwanika Narayan is a San Francisco Chronicle staff writer. Email:

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Written By

Shwanika Narayan

Reach Shwanika on

Shwanika Narayan is a business reporter at The San Francisco Chronicle, covering the economic impact of the coronavirus pandemic on small business, retail, and the sector's workforce. She was previously a reporter with the Los Angeles Business Journal, covering manufacturing and trade. Prior to that, she worked as a video news producer at AJ+, and freelanced with NBC News, Quartz, and Hyphen magazine, writing about Asian American identity. Shwanika has a master's degree in journalism from Columbia Journalism School and a bachelor's degree in political science from UCLA.

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Top of the News

California may not reach herd immunity for years

Getting to herd immunity against the coronavirus will be fraught and may even be impossible, but there are reasons to hope along the way.

BY ERIN ALLDAY

Oakley parents push for class reopenings after school board resigns

BY STEVE RUBENSTEIN

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BY HEATHER KNIGHT

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Hundreds of PG&E Crews Working to Restore Service as One of the Strongest Winter Storms in Years Hit

Approximately 75 Percent of Residences and Businesses That Lost Power Due to Wind, Rain and Snow Have Had Their Service Restored; With Hazardous Conditions Remaining, PG&E Reminds Customers to Stay Safe, Be Prepared and Have an Emergency Plan

Release Date: January 27, 2021
Contact: PG&E External Communications (415) 973-5930

SAN FRANCISCO, Calif. — Pacific Gas and Electric Company (PG&E) crews today began assessing damage, making repairs and restoring electric service to residential and business customers after one of the strongest winter storms in years hit California.

High winds, heavy rains and snow in many places led to power outages, and crews continue to deal with those conditions and the aftermath of the storm as they work to restore customers. More than 400 crews and nearly 500 electric troublemen and inspectors are working on restoration. In some locations, PG&E has been using snowcats, truck-size tracked vehicles, to gain access to infrastructure in locations where snow is the deepest.

Hazardous conditions exist in many locations within PG&E's service area. We urge our customers to be safe and prepare for weather-related power outages.

Since the storm started at midnight Tuesday through 4 p.m. today, about 575,000 PG&E customers have lost power due to the winds, rain and snow. Of those, 434,000 (or 75%) have been restored with approximately 141,000 customers still out of power.

The hardest-hit areas with the most remaining outages are in the Sacramento and Stockton regions as well as in Humboldt and Mendocino counties. About 16,000 customers in the Bay Area were still being affected by storm outages.

Customers can find the latest information on [outages](#) on PG&E's website. Visit PG&E's Safety Action Center website for [preparedness tips](#) and more.

PG&E's in-house meteorologists reported that maximum wind gusts during the storm included 80 mph gusts recorded at weather stations on Mount Diablo in Contra Costa County and Pelato Peak in Kern County. Overnight rainfall totals were recorded at 4.2 inches at Lake Elsman in the Santa Cruz Mountains and 5.5 inches on Rocky Butte on the southern Central Coast.

As this storm is predicted to be the first of a series of storms through this weekend, PG&E reminds its customers to stay safe, be prepared and have an emergency plan.

Storm Safety Tips:

Never touch downed wires: If you see a downed power line, assume it is energized and extremely dangerous. Do not touch or try to move it—and keep children and animals away. Report

Media Contact Info

For Media Inquiries Only:
415-973-5930
[Media Inquiry Form](#)

Customer Service Questions :
1-800-743-5000

Winter Storm Kit

- [Company Profile](#) (PDF, 245 KB)
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- [Storm and Outage Safety](#) (PDF, 244 KB)
- [Notification of Power Outages](#) (PDF, 242 KB)
- [Call 811 Before Digging](#) (PDF, 220 KB)

About PG&E

Pacific Gas and Electric Company, a subsidiary of PG&E Corporation (NYSE:PCG), is one of the largest combined natural gas and electric utilities in the United States.

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Energy Facts

By going solar, you can offset more than a pound of CO₂ each solar kilowatt hour.

downed power lines immediately by calling 911 and by calling PG&E at [1-800-743-5002](tel:1-800-743-5002).

Use flashlights, not candles: During a power outage, use battery-operated flashlights, and not candles, due to the risk of fire. If you must use candles, please keep them away from drapes, lampshades, animals and small children. Do not leave candles unattended.

Have a backup phone: If you have a telephone system that requires electricity to work, such as a cordless phone or answering machine, plan to have a standard telephone or cellular phone ready as a backup.

Have fresh drinking water, ice: Freeze plastic containers filled with water to make blocks of ice that can be placed in your refrigerator/freezer during an outage to prevent foods from spoiling. Blue Ice from your picnic cooler also works well in the freezer.

Secure outdoor furniture: Deck furniture, lightweight yard structures and decorative lawn items should be secured as they can be blown by high winds and damage overhead power lines and property.

Use generators safely: Customers with standby electric generators should make sure they are properly installed by a licensed electrician in a well-ventilated area. Improperly installed generators pose a significant danger to customers, as well as crews working on power lines. If using portable generators, be sure they are in a well-ventilated area.

Turn off appliances: If you experience an outage, unplug or turn off all electrical appliances to avoid overloading circuits and to prevent fire hazards when power is restored. Simply leave a single lamp on to alert you when power returns. Turn your appliances back on one at a time when conditions return to normal.

Safely clean up: After the storm has passed, be sure to safely clean up. Never touch downed wires and always call 811 or visit 811express.com at least two full business days before digging to have all underground utilities safely marked.

About PG&E

Pacific Gas and Electric Company, a subsidiary of [PG&E Corporation](#) (NYSE:PCG), is one of the largest combined natural gas and electric utilities in the United States. Based in San Francisco, with more than 24,000 employees, the company delivers some of the nation's cleanest energy to nearly 16 million people in Northern and Central California. For more information, visit www.pge.com/ and www.pge.com/en/about/newsroom/index.page.

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WINTER STORM 2021

“We’re in it alone”: Power outages leave millions of Texans desperate for heat and safety

Texas residents said the storm — and ensuing partial collapse of the state's power system — sapped what mental reserves they had left after eleven months of a global health crisis that has cost thousands of jobs and claimed more than 40,000 lives in the state.

BY [SHANNON NAJMABADI](#) AND [MARISSA MARTINEZ](#) FEB. 16, 2021 8 PM

[COPY LINK](#)

The Blanco Vista neighborhood of San Marcos was blanketed with several inches of snow as a massive winter weather system caused power outages across Texas. As Texas utility operators and politicians squabbled over responsibility for "load shedding" and "rolling blackouts" Tuesday, many residents scrambled simply to stay warm and alive. 📷 Jordan Vonderhaar for The Texas Tribune

Winter Storm 2021

*As Texas faced record-low temperatures this February and snow and ice made roads impassable, the state's electric grid operator lost control of the power supply, [leaving millions without access to electricity](#). As the blackouts extended from hours to days, [top state lawmakers called for investigations into the Electric Reliability Council of Texas](#), and Texans demanded accountability for the disaster. We have [compiled a list of resources for Texans who are seeking help](#), or places to get warm. To get updates sent straight to your phone, text "hello" to 512-967-6919 or [visit this page to sign up](#). **MORE IN THIS SERIES →***

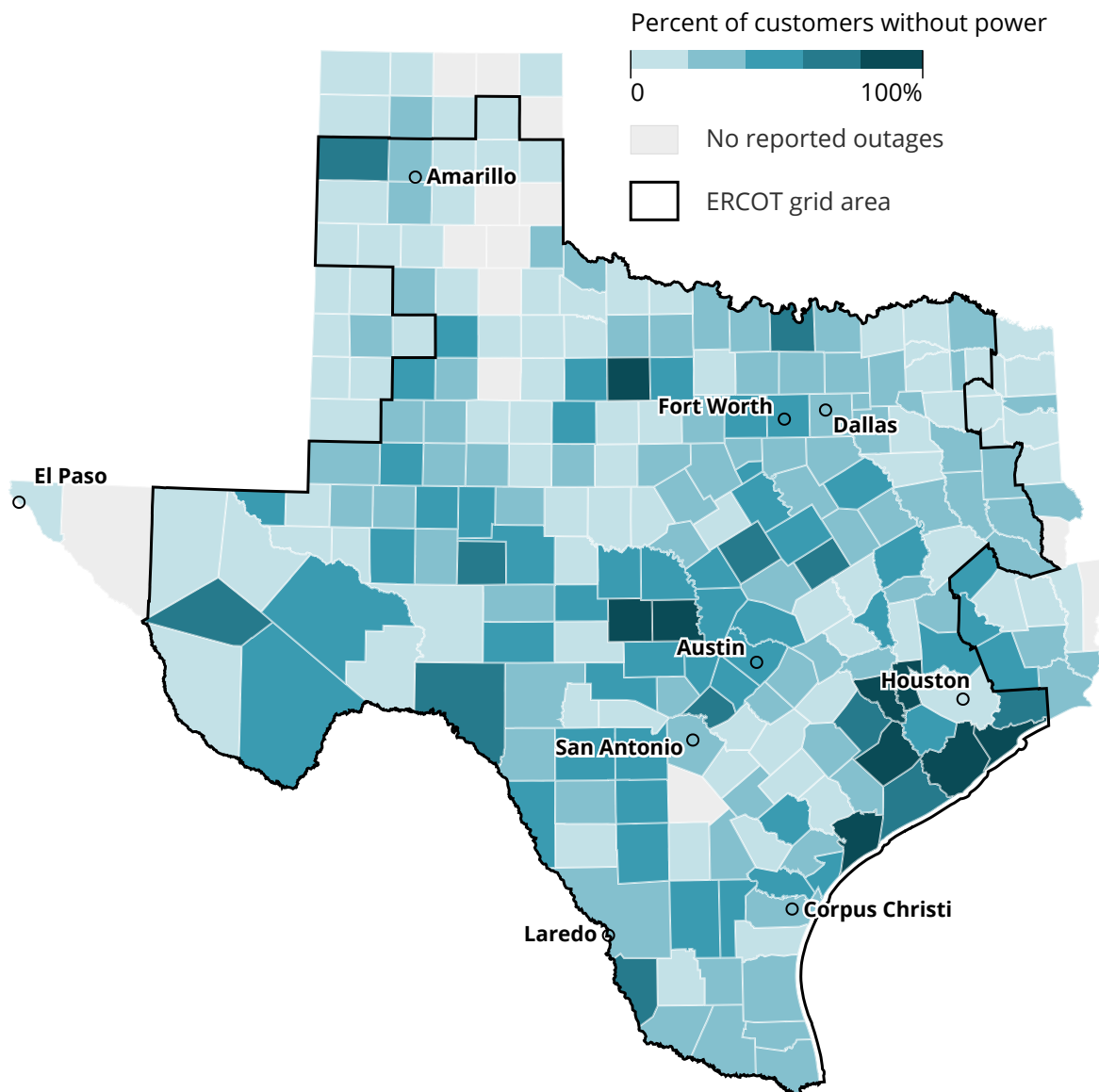
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A grandmother slept in her car. Parents who ran out of firewood burned belongings to keep their children warm. A Richardson resident watched the battery level of her partner's oxygen machine drain away and desperately sought help to have it recharged.

As Texas utility operators and politicians squabbled over responsibility for "load shedding" and "rolling blackouts" Tuesday, many residents scrambled simply to stay warm and alive.

On Feb. 16, at least 4.5 million customers in Texas were without power

The operator of Texas' power grid is under investigation after a massive winter storm caused millions of residents in the state to lose power for days. Here's where Texans were most impacted during the worst of the outages between 10 and 11 a.m. Feb. 16.



Note: PowerOutage.us gathers data from companies covering about 99% of utility customers in Texas. Data in some areas is incomplete, including the number of customers served.

Source: PowerOutage.us and the Electric Reliability Council of Texas

Credit: Chris Essig and Ren Larson

Millions suffered through Monday night without power as a massive winter blitz sent temperatures plunging, shuttered grocery stores and caused widespread outages. With little certainty of when power would be restored — and politicians angrily blaming the state's grid operator — thousands were left facing another night in brutal, potentially life-threatening conditions. At least ten deaths have

been linked to the disaster, and hundreds of people who live on the streets are being directed to seek life-saving refuge at [shelters](#).

Texas residents said the storm — and ensuing partial collapse of the state's power system — sapped what mental reserves they had left after eleven months of a global health crisis that has cost thousands of jobs and claimed more than 40,000 lives in the state.

February Winter Storm 2021

When will my water come back? How can I get water in the meantime?	▶
Will I get a large energy bill?	▶
How can I get updates?	▶
I was without power for more than a day. Why are people calling these rolling outages?	▶
Wait, we have our own power grid? Why?	▶
I read online that wind turbines are the reason we lost power. Is that true?	▶
How can I stay warm? How can I help others?	▶

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“To go through all of that and then also to have stuff like this happen, it's like, ‘One more historical event, and I'm going to develop PTSD,’” said Brianna Blake, 31, a mother of two sons. “I cannot do this.”

Blake's family moved to Texas from Ohio this summer after her husband was laid off due to the pandemic, and a tornado hit their home, destroying nearly “everything.”

They tried to stock up on water and firewood after they lost power Monday, but the shelves of local gas stations were cleared out and grocery stores were closed. They couldn't find a room at hotels in nearby Mathis and Beeville, Blake said.



After losing power Monday, Brianna Blake's family slept in front of their fireplace. 📷 Courtesy of Brianna Blake

Instead, they nestled a futon mattress and every comforter they owned near the fireplace, and slept in a pile until 3 a.m. when the couple noticed the fire was dying down. In desperation, Blake pulled a piece of canvas artwork off the wall of their Portland home and snapped it. There was “no alternative” to keep the heat going, she said.

It was the “most helpless feeling as a mom” watching her 4-year-old and 7-year-old sons sleep, “blissfully unaware” of what their parents were doing, Blake said.

“The bare minimum is providing them with shelter and warmth and food — that’s our bare minimum job” as parents, she said, growing emotional. “It was just heartbreaking to know that ... these boys were going ... to wake up freezing, that they were going to wake up cold, I would have broken every belonging that belonged to me to prevent that from happening.”

In East Texas, Lisa Blevins worried the freezing temperatures could hurt her 41-year-old daughter, who has an auto-immune disease that makes her susceptible to becoming severely ill. Blevins, 58, said she couldn’t take her daughter anywhere if she got ill; they don’t want to risk her being infected with the coronavirus.

Blevins’ household — including her husband, daughter, teenage stepdaughter and the stepdaughter’s friend — piled into a family car last night along with one of the family’s three dogs and two cats for a respite from the cold. But they returned to the house and covered themselves with blankets after a few hours, to avoid keeping the car going too long and running out of gas.

“I didn’t even have a clue that there was a chance our electric could go off,” said Blevins, who blames state leadership for the “poor planning.”

“You could have had a generator, you could have thought to do those things. Those things just don’t happen in Texas, so no one is prepared for it.”

Meanwhile, her 34-year-old son huddled his son and wife in front of the gas fireplace to weather the freezing temperatures. His wife has started to get symptoms of a cold.

The power outages have proved particularly disruptive for those who need to charge medical devices.

Ashlynn Hoffner, in Richardson, called emergency responders around 4:30 a.m. as her partner’s oxygen machine ran low on battery.

The machine, which must be charged every few hours, kicked into a backup mode after the power at Ashlynn Hoffner's apartment went down earlier this week. She called the power company, was placed on a lengthy hold and later called 911.

After guiding two first responders through the darkened apartment with flashlights, Ashlynn Hoffner helped load her partner onto a wheelchair. They were taken to a nearby hospital, and then to a dialysis center where the machine was charged.

Ashlynn Hoffner picked KD Hoffner, 31, up from the center and the couple went to a friend's house where they were greeted with heating, spicy pasta and power strips.

"I am angry about the whole thing," KD Hoffner said in a text message. The blackouts happened "in the middle of a snowstorm" without "any thought to how it would affect disabled people (nothing new there). We're also going to have to throw out food because our fridge hasn't been on for 2 days. I am lucky to have my partner and my friends. Not everyone is that lucky."

The couple will drive to Plano tomorrow so KD Hoffner can get dialysis needed for chronic kidney and heart issues.

"Nobody had anything for us really," Ashlynn Hoffner said of the government's response. "So we ended up having to fend for ourselves, which was really frustrating."

Many faulted the government for not warning them power could be out for days while the state was swept by freezing temperatures. While most houses in Texas are girded for the sweltering summers, they're not always insulated to protect against cold weather. Plows and salt used in states that routinely get snow are not common in Texas.

Blake, the mother of the 4-year-old and 7-year-old sons, said the past few days have been a "white knuckle, hang-on-tight" ordeal.

"Fear" was the only word that could describe what the family was feeling, she said in a written message.

 Inline article image

Brianna Blake, with husband Marcus Zeigler and their two sons, said it was the “most helpless feeling as a mom” to watch her 4-year-old and 7-year-old boys sleep while the family ran low on firewood. 📷 Courtesy of Brianna Blake

“My husband and I are fearful that we may endure another night with no power and we've run out of options,” she wrote. “When I was in school I remember talking about the Great Depression and seeing a picture of people burning money to stay warm in our history books. At this point I wish I had the \$400 on average I spend a month on my [electricity] bill to burn. At least I would be able to keep my children warm.”

On Tuesday, the family tried to get gas, but found snaking lines outside two stations. At one Valero they pulled up to around 10 a.m., they neared the front of

the queue only to watch a woman place a plastic bag over the pump and say “we’re out,” Blake said.

Blake said the local community has pulled together in what has felt like an absence of communication from officials, who initially warned of rolling blackouts lasting just an hour or so at a time.

“This was poorly managed,” she said. “It was clarifying, to be honest with you, because now we know when things hit the fan, we’re in it alone.”

Their power was restored Tuesday afternoon.

Other Texas residents said they felt relatively lucky to have a roof over their heads and food to eat, even if they were freezing without heat or electricity.

Sarra Rushing said she and her family lost power in Channelview at 4 a.m. Tuesday and did not have it back by afternoon. They have sufficient food and water, but limited heat — the only reliable source of heat is their gas stove, but it's too risky to leave it on, she said.

Besides an aunt, who is legally blind and lives alone, Rushing isn’t as worried for her family as she is for those who don’t have similar resources. The local government could have done a better job preparing residents for the storm, she said.

“Everyone knows that some sort of natural disaster is bound to happen every couple of years, and yet every hurricane, flood and falling of snow somehow puts more Texans in terrible circumstances,” Rushing told The Tribune in written messages.

Sergio Tristan said the power went out in his Austin neighborhood in the early hours of Monday. Though his family had prepared by buying food and covering pipes, they were expecting minimal power outages — not the 38 hours without electricity he and other residents had experienced by Tuesday evening. He said his family has recharged its phones in their car every 25 minutes.

After almost four days of bad weather, Tristan said the novelty of icy weather has begun to wear off, and now the biggest concern is warmth. He said his two small kids, aged seven and two, are wearing three layers of clothes, and the family is trying to move to stay warm while buckled down in one room.

"I can literally see my breath in my house now. We've got to be in the 40s inside my house, easily," Tristan said.

"But we're the lucky ones, right?" he added. "We're lucky we have a home to be inside, we have some food that we prepped a little bit. I think there's just a whole community of people who are not being serviced properly."

Disclosure: Valero has been a financial supporter of The Texas Tribune, a nonprofit, nonpartisan news organization that is funded in part by donations from members, foundations and corporate sponsors. Financial supporters play no role in the Tribune's journalism. [Find a complete list of them here.](#)

Help us cover coronavirus in 2021

The Texas Tribune newsroom is reporting on how the new coronavirus is affecting Texans. From testing to health care interactions to economic impacts, we want to hear from you.

Tell us your story below or share additional tips with us confidentially here:

<https://www.texastribune.org/about/tips/>

Are you one of these...

- ☐ Medical professional
- ☐ College student
- ☐ Parent
- ☐ Other

Did you lose power in the winter storm of Feb. 2021?

- ☐ Yes
- ☐ No

How has the February winter storm affected you or your loved ones?

The Texas Tribune has launched a texting service to make it easy for audiences who are relying on their cellular phones to get the latest and most important news in the aftermath of the February winter storm that has left millions without power and even more without reliable water access.

To sign up, text "hello" to 512-967-6919 or [visit this page](#). Learn more about the text service [here](#).

Have you been able to get a COVID-19 vaccine?

- ☐ Yes
- ☐ No

☐ NO

Do you work for a home health care agency? Or are you/a family member a client of one?

☐ Yes

☐ No

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☐ Yes

☐ No

Have you been summoned to court during the pandemic for any of these reasons?

☐ Eviction

☐ Truancy

☐ Debt

☐ Other

Have you experienced homelessness during the pandemic?

☐ Yes

☐ No

Have you filed for unemployment?

☐ Yes

☐ No

Do you know a close friend or family member who has died because of the coronavirus?

☐ Yes

☐ No

Do you have health insurance?

☐ Yes

☐ No

Do you have another story to tell about the new coronavirus that we should be considering?

ABOUT YOU

Your first name:

Your last name:

What city do you live in?

If you live outside of Texas, please also include your state (or country).

Your email address:

Phone number:

If you cannot provide a phone number or email address, please give us another way to get in touch with you *

Thank you for sharing your story with us. We ask for the following information to learn more about who we are reaching and who else we should try to include. It's completely optional.

How do you identify your race/ethnicity?

- ☐ Asian or Asian American
- ☐ Black
- ☐ Hispanic or Latino/a
- ☐ Middle Eastern or North African
- ☐ Native American or Indigenous American
- ☐ Native Hawaiian/Pacific Islander
- ☐ White
- ☐ Other

How old are you?

- ☐ Under 18
- ☐ 18-25
- ☐ 26-29
- ☐ 30-34
- ☐ 35-40
- ☐ 41-50
- ☐ 51-60

☐ 61-69☐ 70+

We've heard from a lot of Texans who have struggled — either with rent, food or their mental health — because of the coronavirus pandemic. [We have a resource guide here on how to get help if you need it.](#)

By submitting this information, you are agreeing to our [terms of service](#).

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Alphabetical List of Power Plant Projects

Application for Certification, and Compliance documents are listed on the individual project pages.

In Review, Under Construction, In Compliance, and Operational Projects

Documents for older power plant projects are no longer available online. Search the [Energy Commission's main proceedings list](#) or contact the webmaster@energy.ca.gov.

- [AES Placerita](#)
 - [Alamitos Energy Center - AES Southland Development, LLC](#)
 - [Alliance Century Energy Facility - Alliance Colton](#)
 - [Alliance Drews Energy Facility - Alliance Colton](#)
 - [Almond 2 Power Plant - Turlock Irrigation District](#)
 - [Blythe Energy Project - Blythe Energy, LLC](#)
 - [Blythe Solar Power Project - NextEra Blythe Solar Energy Center, LLC](#)
 - [Blythe Transmission Line - Blythe Energy, LLC](#)
 - [Border Project - CalPeak Power, LLC](#)
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 - [Calistoga Geothermal Power Plant - Geysers L.L.C.](#)
 - [Campbell Cogeneration Project - Sacramento Power Authority](#)
 - [Canyon Power Plant - Southern CA Public Power Authority](#)
 - [Carlsbad Energy Center Project - Carlsbad Energy Center LLC](#)
 - [Carson Ice-Gen - Carson Energy Group](#)
 - [Chevron El Segundo - Chevron Oil Company](#)
 - [Chevron Richmond - Chevron Oil Company](#)
 - [Colusa Generating Station - CPV/PG&E](#)
 - [Coso Navy 2 \(China Lake Joint Venture\) - China Lake Joint Venture](#)
 - [Cosumnes Power Plant - SMUD](#)
 - [CPV Sentinel Energy Project - Competitive Power Ventures](#)
 - [Crockett Cogeneration - Pacific Thermonetics](#)
 - [Delta Energy Center - Calpine](#)
- [Magnolia - Southern CA Public Power Authority](#)
 - [Malaga Power Plant - MRP CalPeak Holdings, LLC](#)
 - [Malburg Generating Station - City of Vernon](#)
 - [Mariposa Energy Project - Mariposa Energy, LLC](#)
 - [Marsh Landing Generating Station - Marsh Landing, LLC](#)
 - [McLaren Backup Generating Facility - Vantage Data Centers](#)
 - [Metcalf Energy Center - Calpine](#)
 - [MID Ripon Simple Cycle - Modesto Irrigation District](#)
 - [MID Woodland Generation Station II - Modesto Irrigation District](#)
 - [Midway Peaking Project \(formerly Starwood Power\) - Starwood Power - Midway LLC](#)
 - [Midway Sunset Cogeneration Project - Midway Sunset Cogeneration Company](#)
 - [Mission College Data Center - Oppidan](#)
 - [Mission Energy Champlin - Mission Energy](#)
 - [Mojave Cogeneration - Mojave Cogeneration Company](#)
 - [Mojave Solar Project - Abengoa Solar Inc.](#)
 - [Moss Landing Power Plant - VistaEnergy, Inc](#)
 - [Mountainview Generating Station - Southern California Edison](#)
 - [NCPA #1 Geothermal \(formerly NCPA #2\) - Northern California Power Agency](#)
 - [NCPA #2 Geothermal \(formerly NCPA #3\) - Northern California Power Agency](#)
 - [NCPA Roseville](#)
 - [Niland Peaker - Imperial Irrigation District](#)
 - [Orange Grove Energy Center - Orange Grove Energy, L.P.](#)
 - [Otay Mesa - Otay Mesa Energy Center, LLC/Calpine](#)

- [Donald Von Raesfeld \(Formerly Pico Power\) - Silicon Valley Power](#)
- [DWR South Geysers - Department of Water Resources](#)
- [El Centro Generating Station Unit 3 Repower - Imperial Irrigation District](#)
- [El Segundo Energy Center - El Segundo Energy Center LLC](#)
- [Elk Hills Power Project - Elk Hills Power LLC](#)
- [Enterprise - CalPeak Power, LLC](#)
- [Gateway Generating Station \(formerly Contra Costa Power Plant Unit 8\) - Mirant Corporation](#)
- [Genesis Solar Energy Projects - NextEra™ Energy Resources LLC](#)
- [Gilroy Backup Generating Facility - Amazon Data Services](#)
- [Gilroy Cogeneration Project - Gilroy Energy Company](#)
- [Gilroy Energy Center - Calpine](#)
- [Grant \(formerly PG&E Geysers 20\) - Geysers L.L.C.](#)
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- [Henrietta Peaker - GWF Energy](#)
- [High Desert Power Project - High Desert Power Trust](#)
- [Humboldt Bay Generating Station Repowering - Pacific Gas and Electric Company](#)
- [Huntington Beach Energy Project \(HBEP\) - AES Southland](#)
- [Huntington Beach Generating Station - AES](#)
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- [Inland Empire Energy Center - Inland Empire Energy Center LLC](#)
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- [LADWP Alameda Steam - Los Angeles Department of Water and Power](#)
- [Lafayette Backup Generating Facility - Digital Realty](#)
- [Lake View Geothermal \(formerly PG&E Geysers 17\) - Geysers L.L.C.](#)
- [Larkspur Energy Facility - Wildflower Energy](#)
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- [Los Esteros 1 - Calpine](#)
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- [Los Medanos \(Pittsburg\) - Pittsburg District Energy/Calpine](#)
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- [Rice Solar Energy Project - Rice Solar Energy LLC](#)
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- [SEGS III-VII Kramer Junction - NextEra Energy Resources](#)
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- [Shell Cogeneration - Shell Oil Company](#)
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- [SMUD Cogeneration Pipeline Project - SMUD](#)
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- [Sonoma Geothermal \(formerly PG&E #3 & SMUDGE #1\) - Geysers L.C.C.](#)
- [South Bay Repower](#)
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- [Watson Cogeneration Project - Watson Cogeneration Company](#)

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- [American Cogeneration Tech. Spreckels Power](#)
- [Argus Cogeneration Expansion \(ACE\) Project - ACE Cogeneration Company](#)
- [Avenal Energy Center - Avenal Power Center LLC](#)
- [Barge-Mounted Emergency Generator - PG&E](#)
- [Bay Area Resource Recovery Project - Combustion Engineering, Inc](#)
- [Beacon Solar Energy Project - Beacon Solar LLC](#)
- [Black Rock 1 2 3 Geothermal Power Project \[Formerly Salton Sea Geothermal\] - Cal Energy](#)
- [Blythe Energy Project Phase II \[Sonoran Energy Project Petition to Amend Withdrawn\] - AltaGas Sonoran Energy, Inc.](#)
- [Bullard Energy Center - Energy Investors Fund, LLC](#)
- [Calico Solar - SES Solar One LLC](#)
- [Carrizo Energy Solar Farm - Carrizo Energy LLC / Ausra](#)
- [CCPA #1 Coldwater Creek](#)
- [CENCO Electric Peaker Project - CENCO Electric Company](#)
- [Chevron Replacement - Chevron Oil Company](#)
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- Watson Cogeneration Steam and Electric Reliability Project - Watson Cogeneration Company
- [Western Midway Sunset Project - Midway Sunset Cogeneration Company](#)
- [Willow Pass Generating Station - Mirant Corporation](#)

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