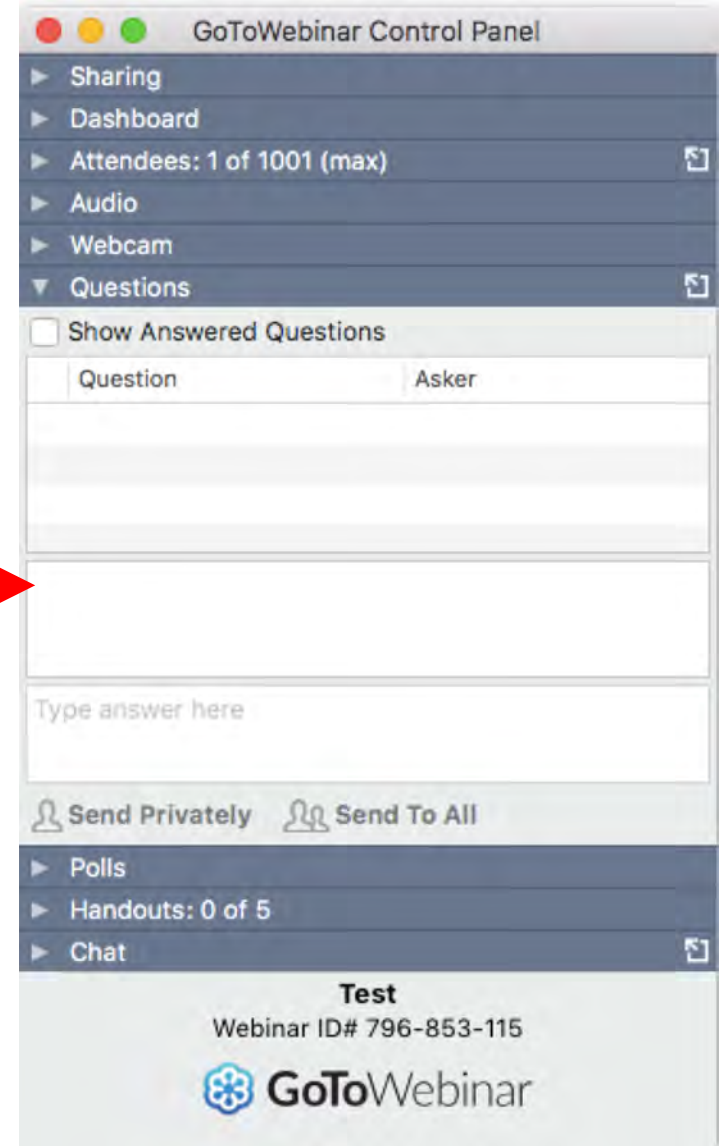




# **What CAISO didn't tell you about the August 2020 blackouts**



- Webinar recording and slides will be sent to registered attendees within two business days.
- All webinars are archived on [clean-coalition.org](http://clean-coalition.org), under Events.
- Submit questions in the Question pane at any time during the webinar.
  - View varies by operating system and browser.
- Questions will be answered during the Q&A portion of the webinar.
- For other questions, contact Rosana Francescato: [rosana@clean-coalition.org](mailto:rosana@clean-coalition.org)

A screenshot of the GoToWebinar Control Panel interface. The panel has a title bar with three colored buttons (red, yellow, green) and the text "GoToWebinar Control Panel". Below the title bar is a list of menu items: "Sharing", "Dashboard", "Attendees: 1 of 1001 (max)", "Audio", "Webcam", and "Questions" (which is expanded). Under "Questions", there is a checkbox for "Show Answered Questions" and a table with two columns: "Question" and "Asker". Below the table is a large text input field for asking a question. Below the input field is a button labeled "Type answer here". At the bottom of the question section are two buttons: "Send Privately" and "Send To All". Below these buttons are more menu items: "Polls", "Handouts: 0 of 5", and "Chat". At the very bottom, there is a section labeled "Test" with the text "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.

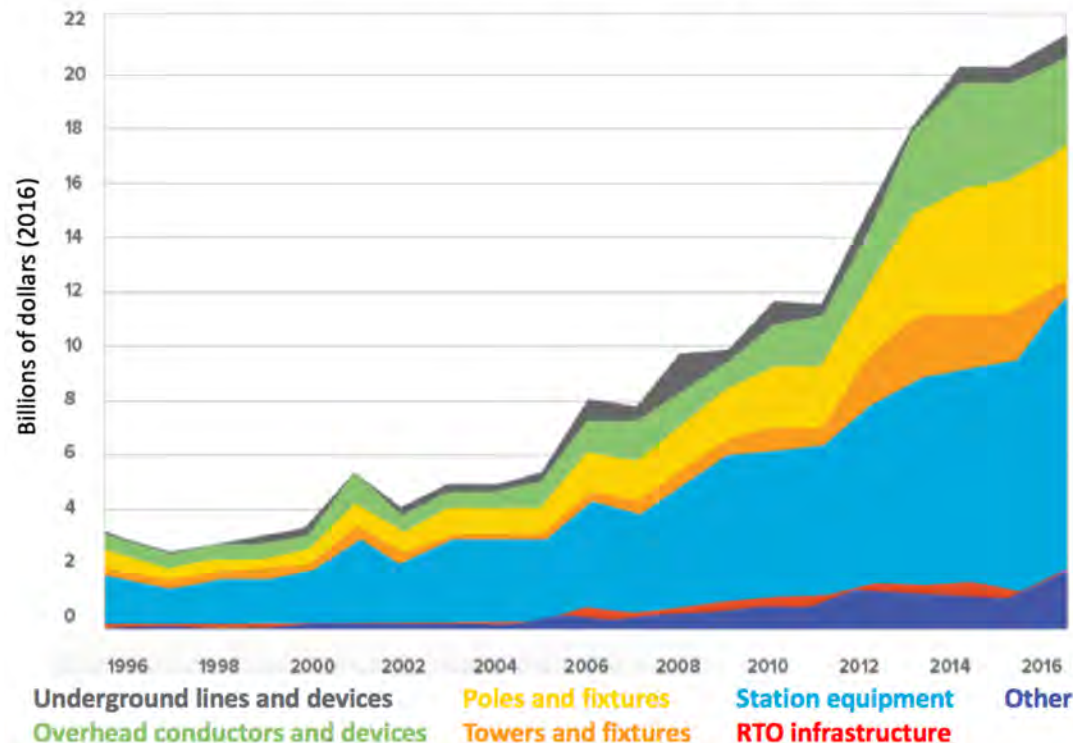
## **100% renewable energy end-game**

- 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
<b>Total nominal ratepayer cost per \$100 investment (50 years)</b>	<b>\$928</b>

## Real costs, discounted for inflation

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

*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.*

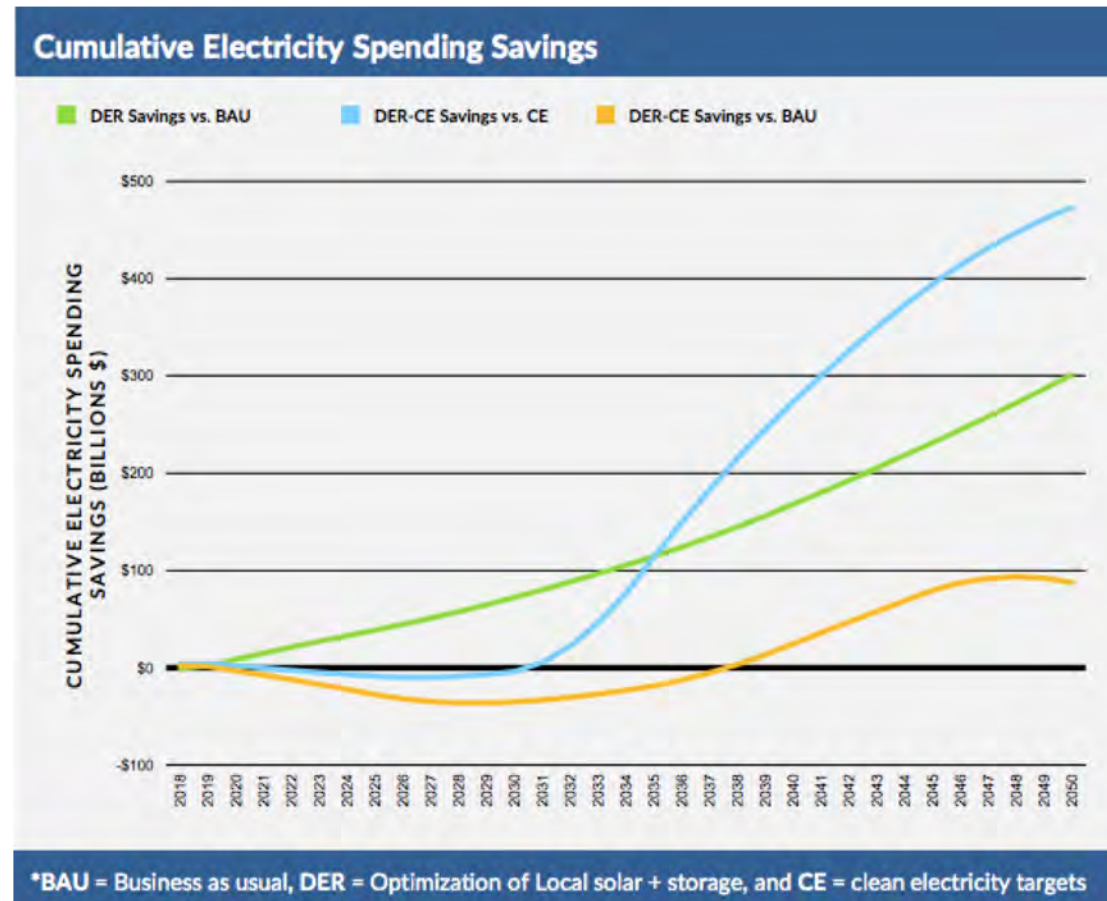
# Local solar+storage optimize the grid for ratepayer savings

- 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

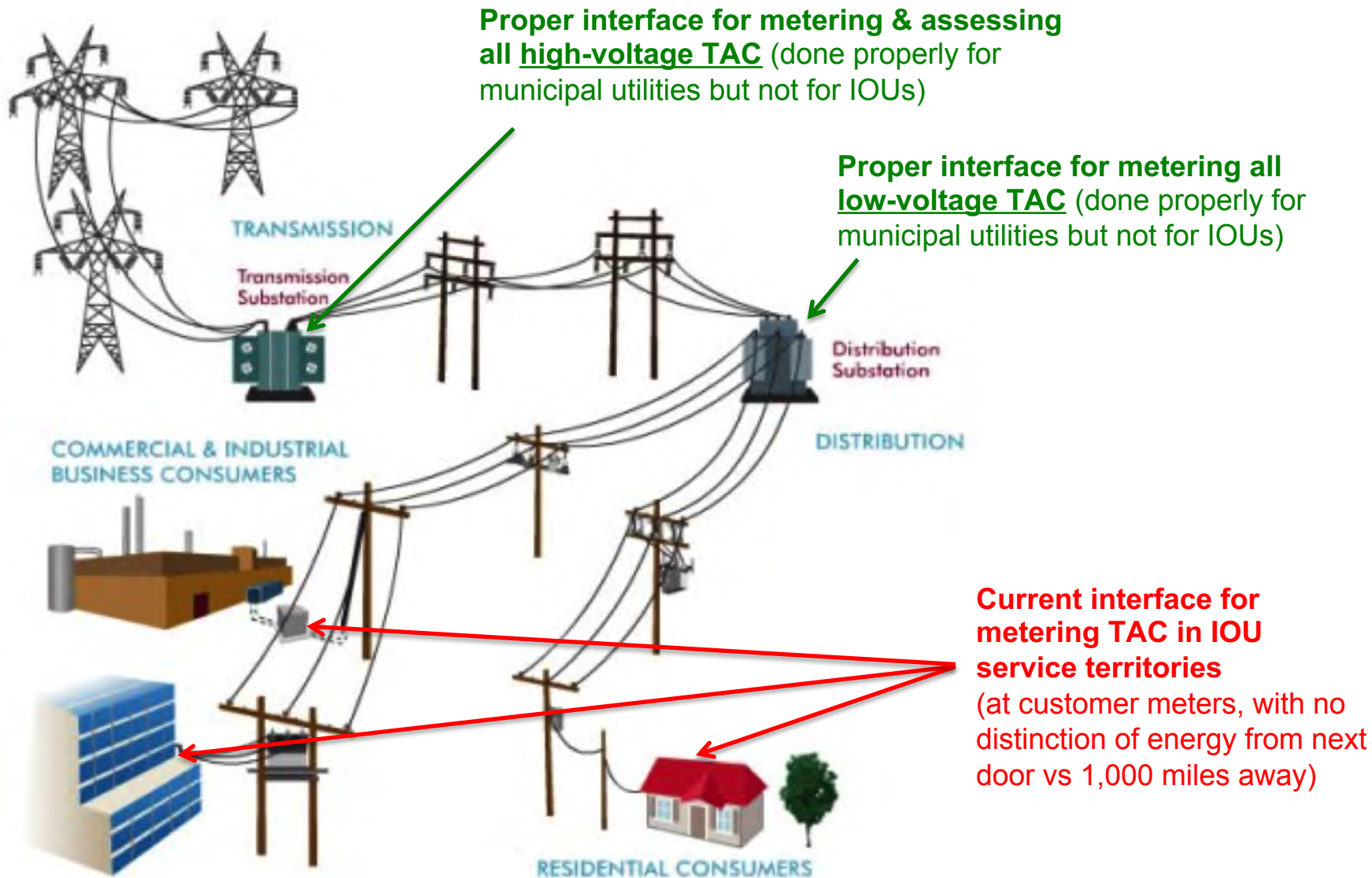
- Deploying enough large solar and wind farms to decrease CO2 emissions by 95% by 2050 would **cost Americans \$385 billion more** for power over the next 30 years.
- Scaling up local solar+storage in coordination with utility-scale renewables, we can achieve the same clean-energy goals while **saving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



Source:  
[Vibrant Clean Energy](#)



# TAC cause massive California market distortions

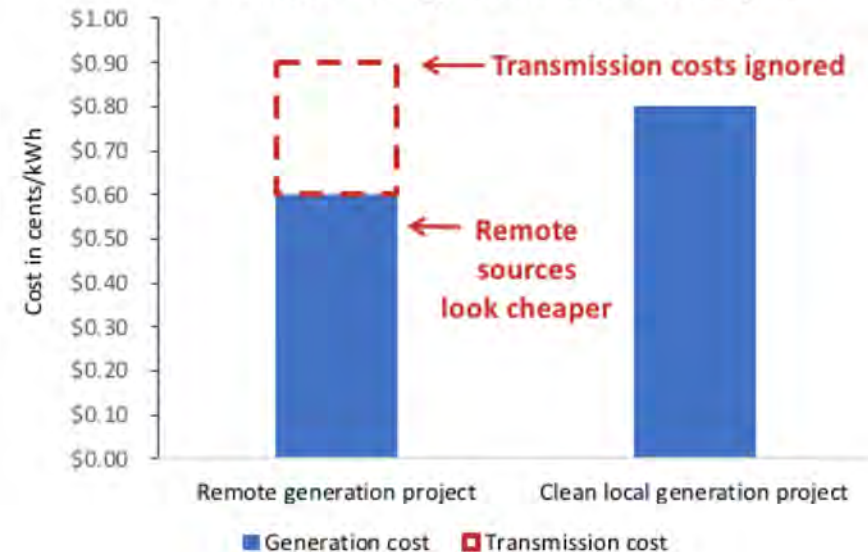


- [Transmission Access Charges \(TAC\)](#) in California's IOU service territories are metered and assessed incorrectly, at the customer meter.
- That's like paying extra shipping & handling fees for something you pick up next door, or paying a toll if you don't cross a bridge.

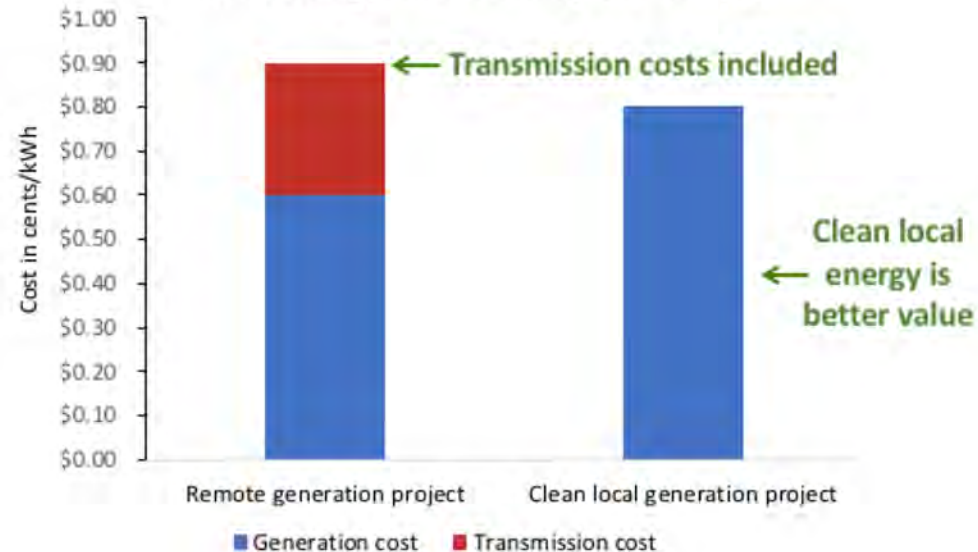


- 3¢/kWh is being stolen from local renewables, making them look more expensive.
- Stealing funds from DER-driven Community Microgrids that deliver [community resilience](#).

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

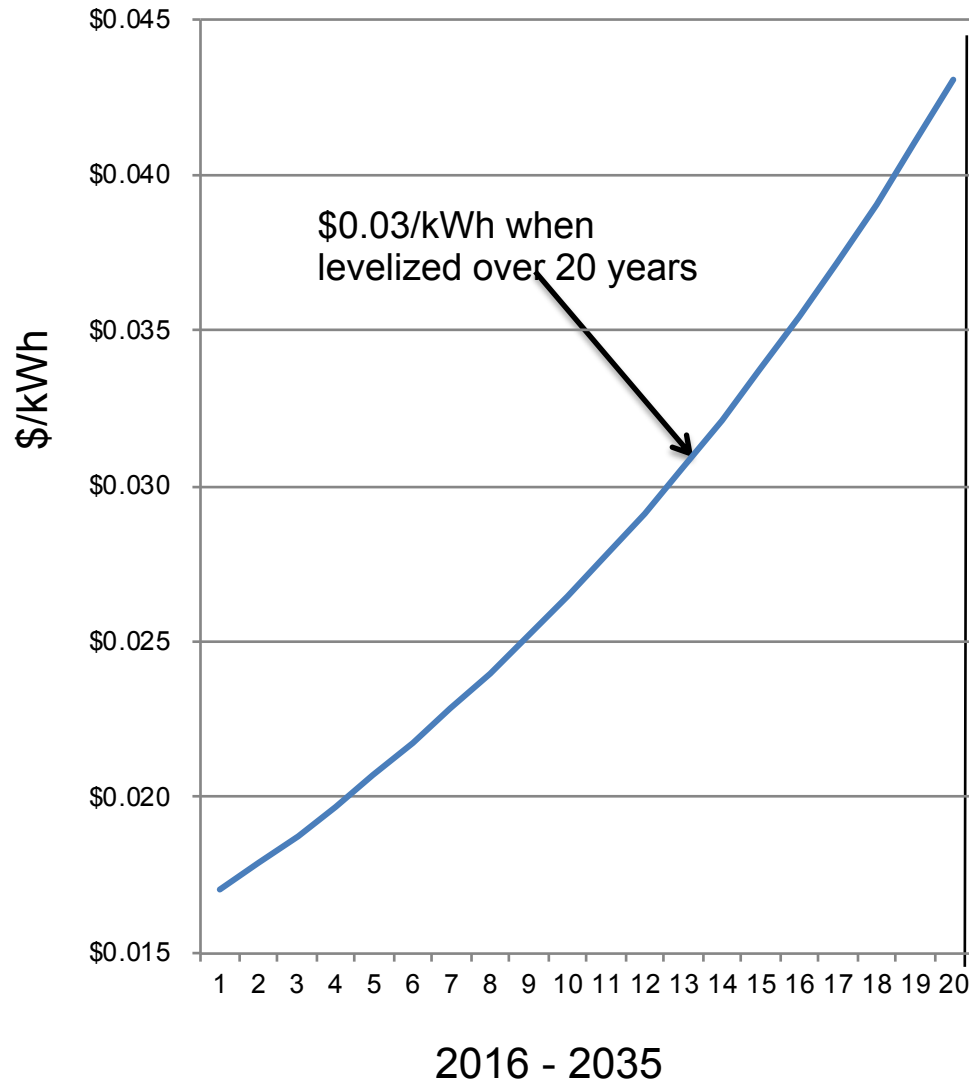


**When transmission costs are visible,  
local energy sources may be cheaper**



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

**Forecasted PG&E Total TAC Rate**



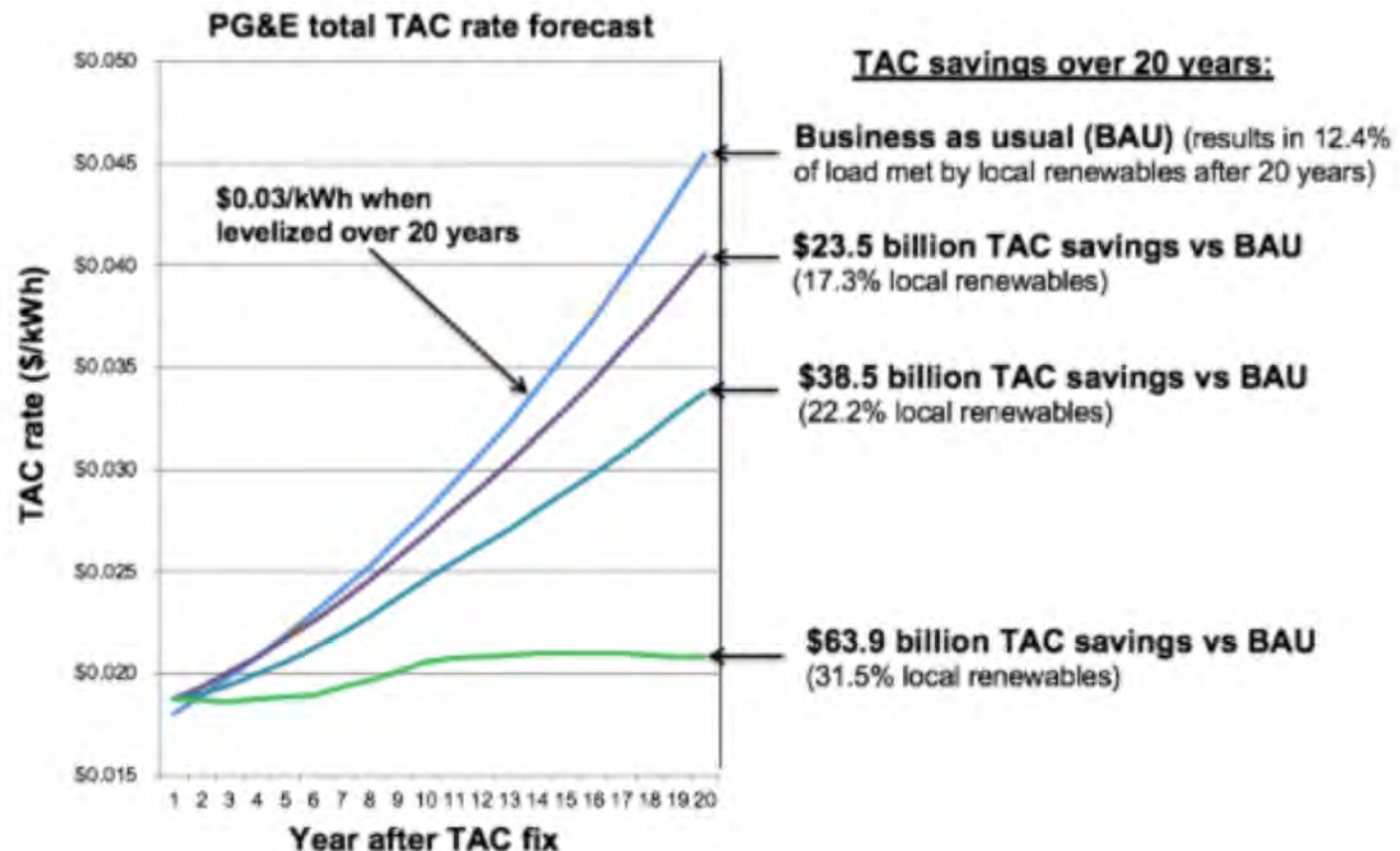
— Business As Usual (BAU)

**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](mailto:rosana@clean-coalition.org)



# What CAISO Didn't Tell You About the August Blackouts

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**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**



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# Loretta Lynch

*Former California Public Utilities Commission President*

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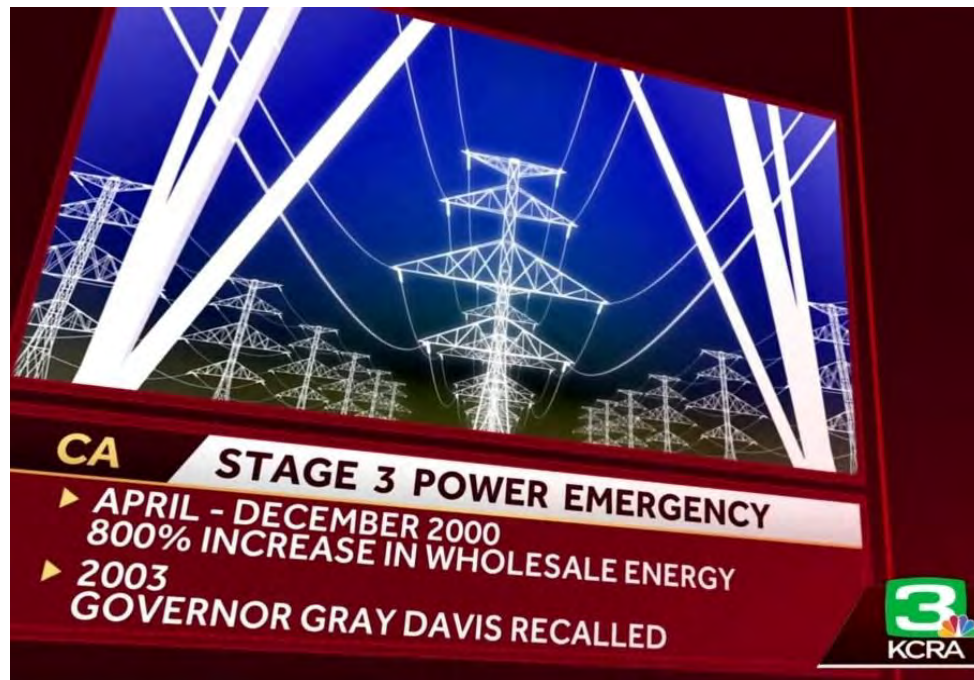




# Persistent Issues With CA Electricity Markets & Reliability: Why Can't CA Keep the Lights On?

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## 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

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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

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### **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”

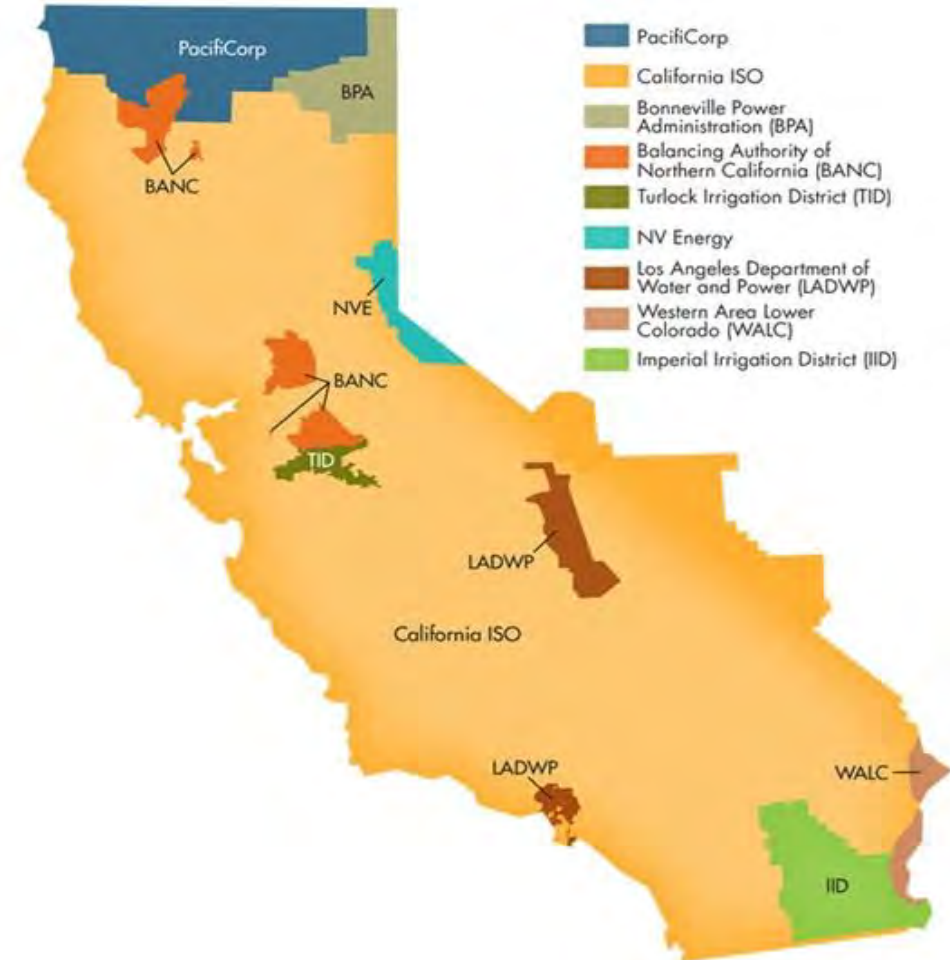


# August 2020: Blackouts for CAISO but not for CA's Public Power Systems

## 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



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# Rick Humphreys

*Expert in Root Cause Analysis*

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# 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)

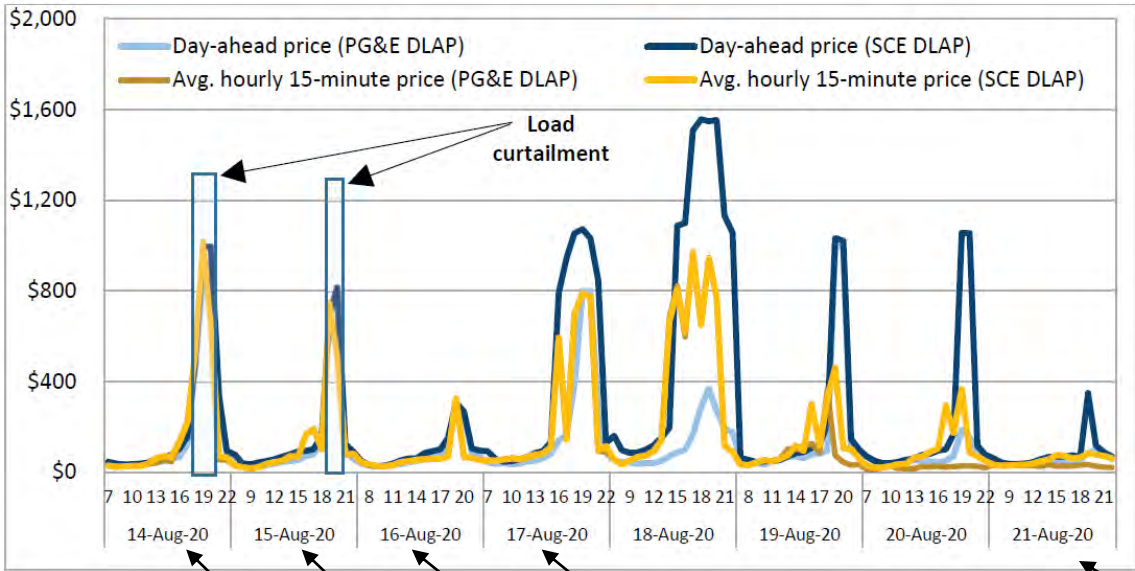
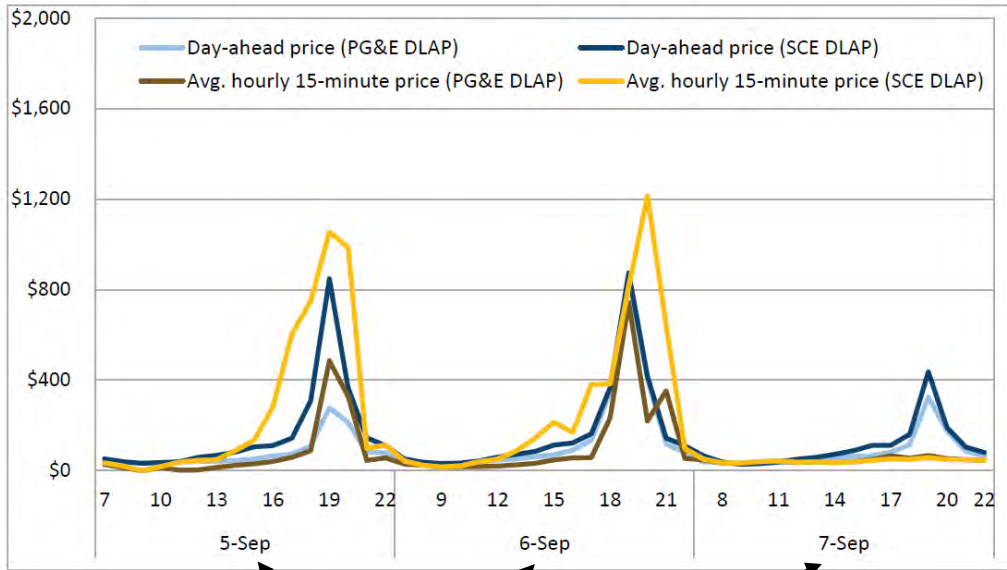


Figure 3.6 CAISO day-ahead and real time peak hour prices (September 5-7)



Source: CAISO Market Monitor Report 11/24/20

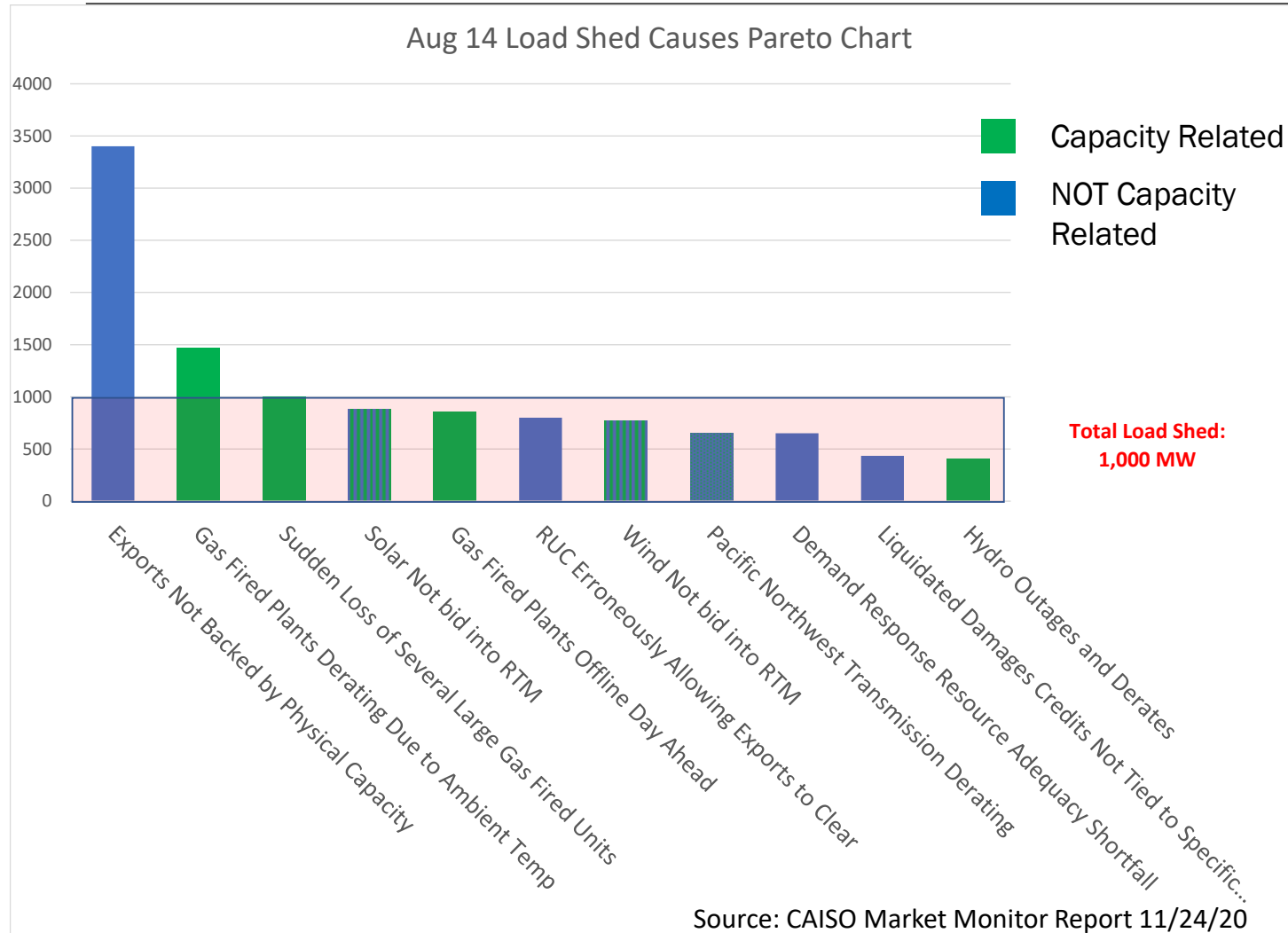
Excess (\$M)	13-Aug-20	14-Aug-20	15-Aug-20	16-Aug-20	17-Aug-20	18-Aug-20	19-Aug-20	20-Aug-20	21-Aug-20	Aug 22-28	4-Sep-20	5-Sep-20	6-Sep-20	7-Sep-20	8-Sep-20	TOTAL
Direct	\$ 19.5	\$ 131.1	\$ 90.6	\$ 45.4	\$ 206.9				\$ 14.8	\$ 134.0	\$ 19.5	\$ 62.1	\$ 95.3	\$ 41.9	\$ 30.8	\$ 891.9
Indirect						\$ 286.0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



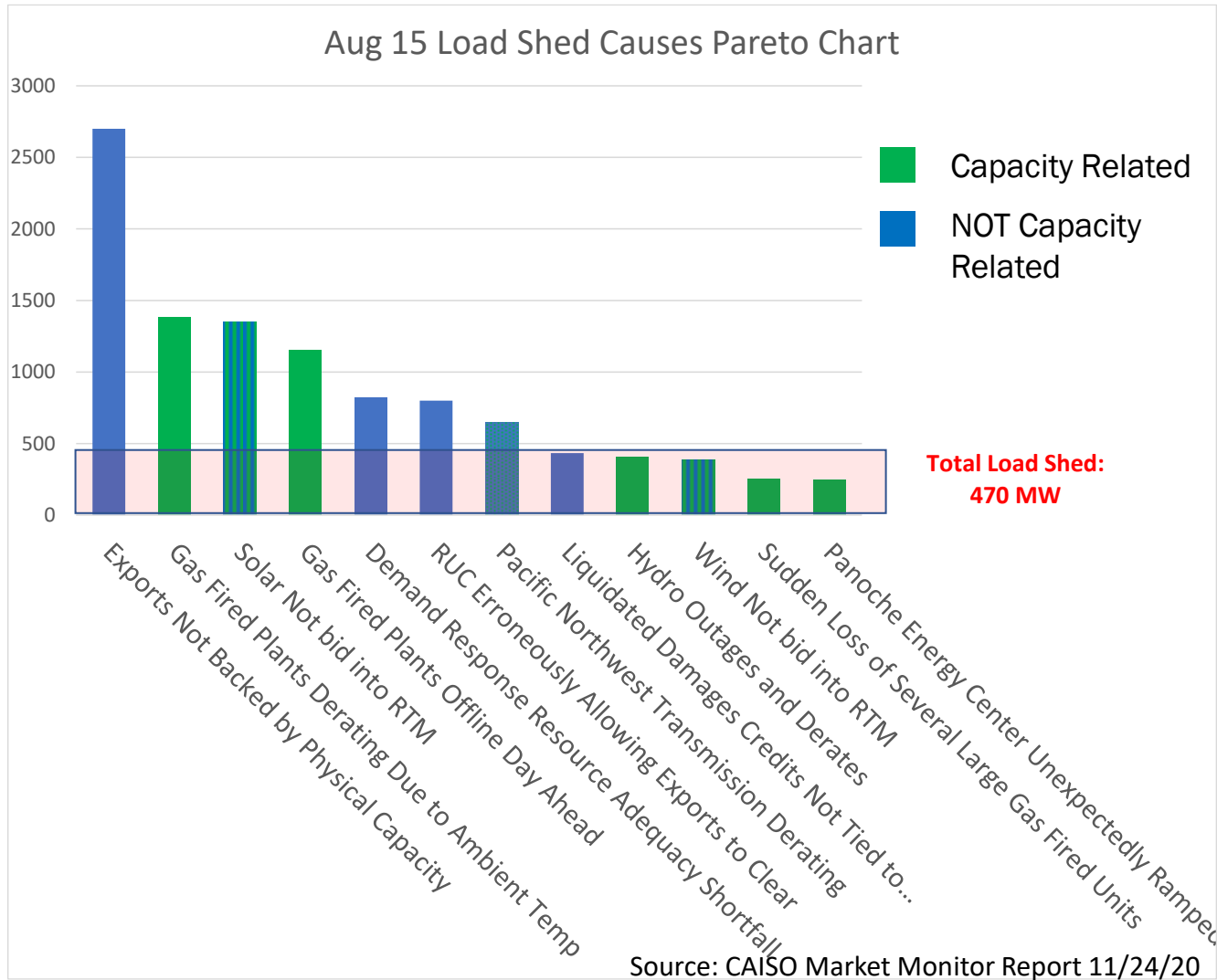
# Market Monitor Data Shows Three Causes Individually Could Have Caused Aug 14 Blackouts



- 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

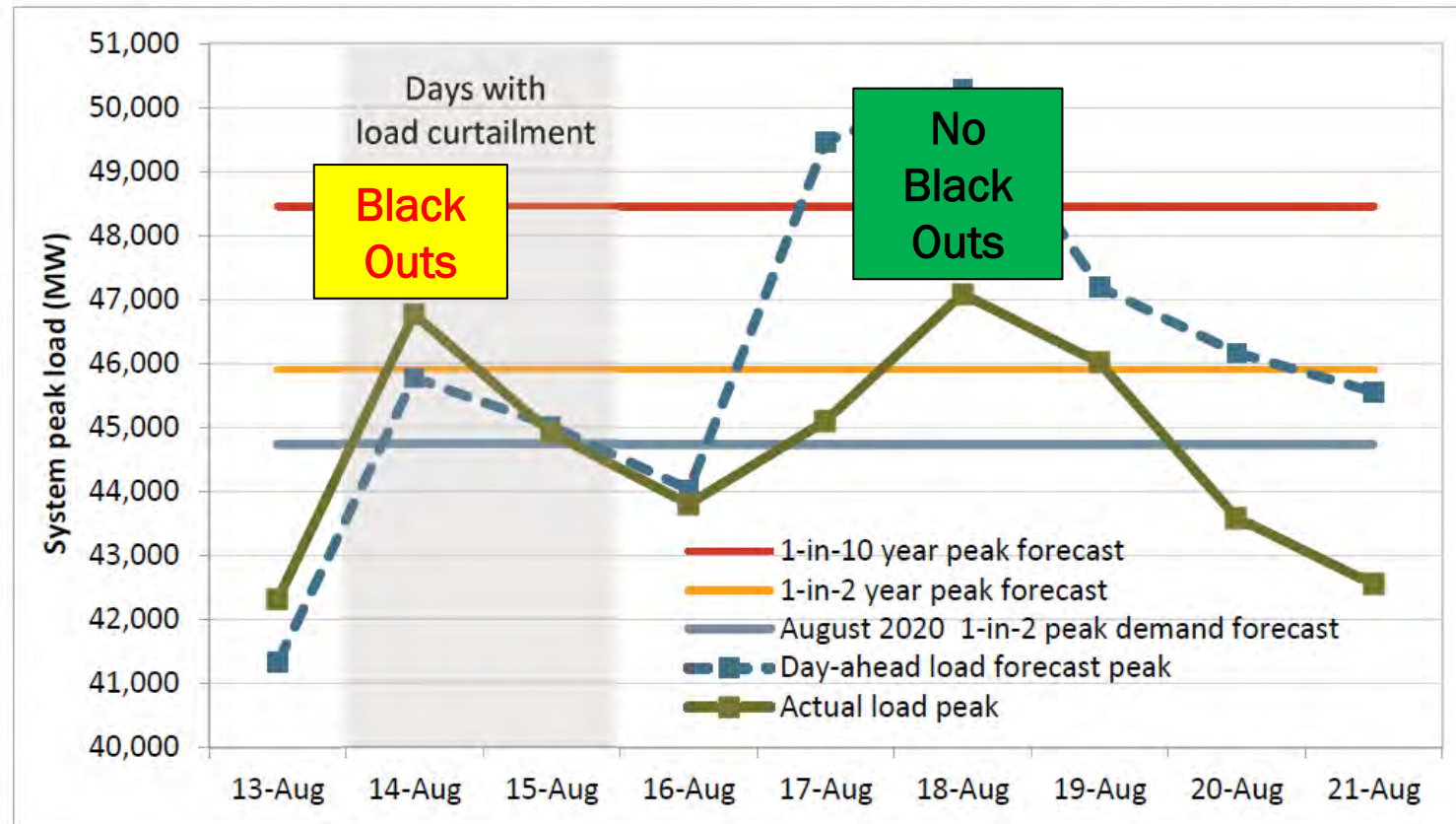


- Exports Not Backed by Physical Capacity
- Gas Fired Plants Derated
- Solar Not Bid Into RTM
- Gas Fired Plants Offline
- Demand Response Shortfall
- RUC Erroneously Allowing Exports
- PNW Transmission Derating



# Unpacking the ISO's first “cause”: If there Weren't Enough Resources, Why Were there No Blackouts on Aug 18<sup>th</sup> 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

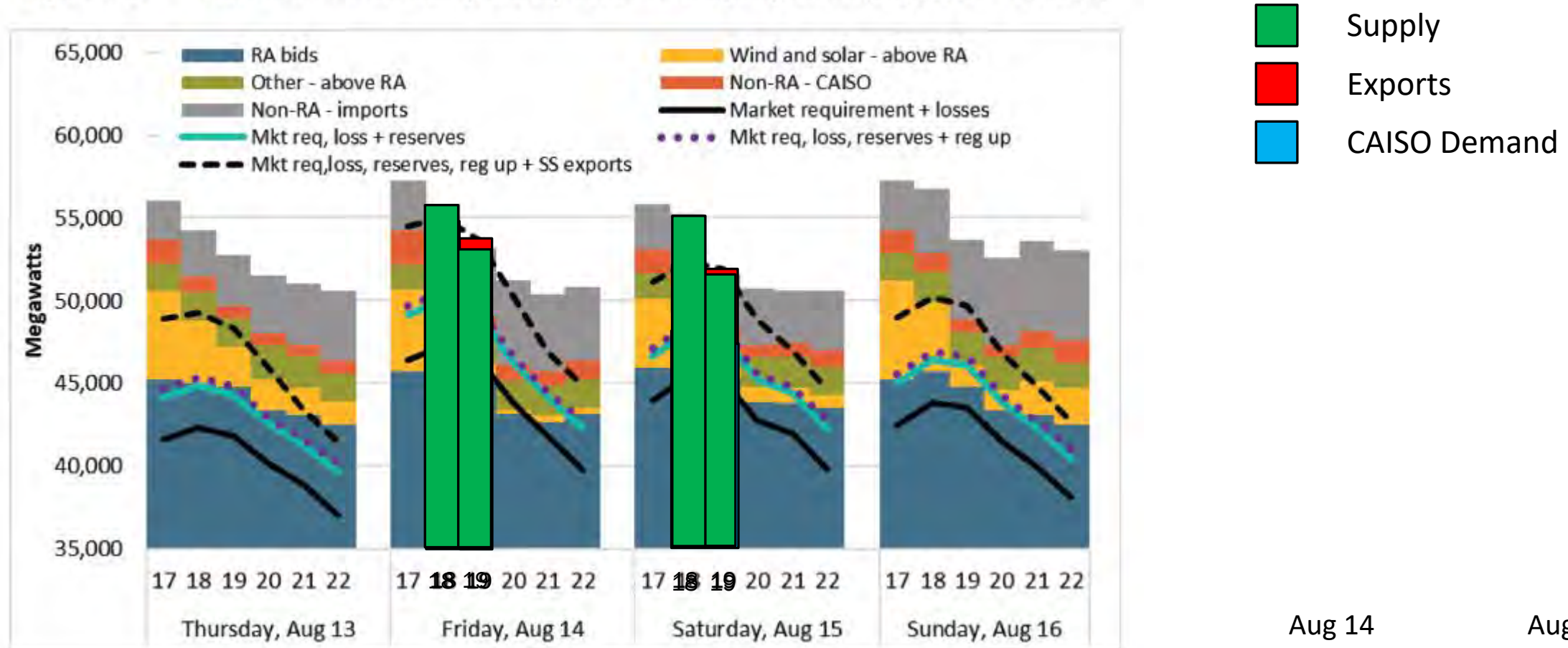
Source: CAISO Market Monitor Report 11/24/20





# 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



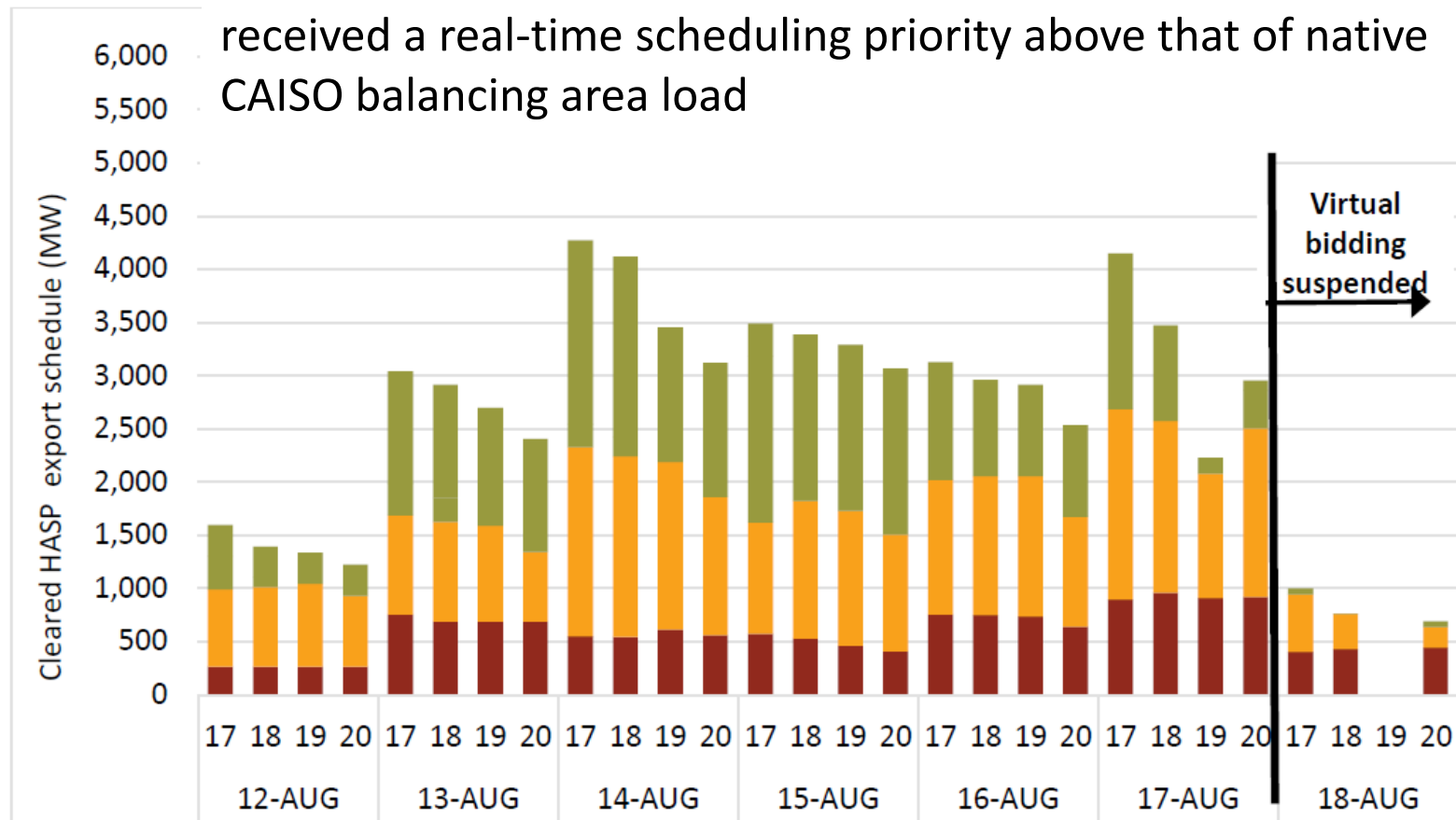




# Virtual Bidding Led to Over 3,000 MW of Exports on 8/14-15 Not Backed by Capacity Contracts

*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

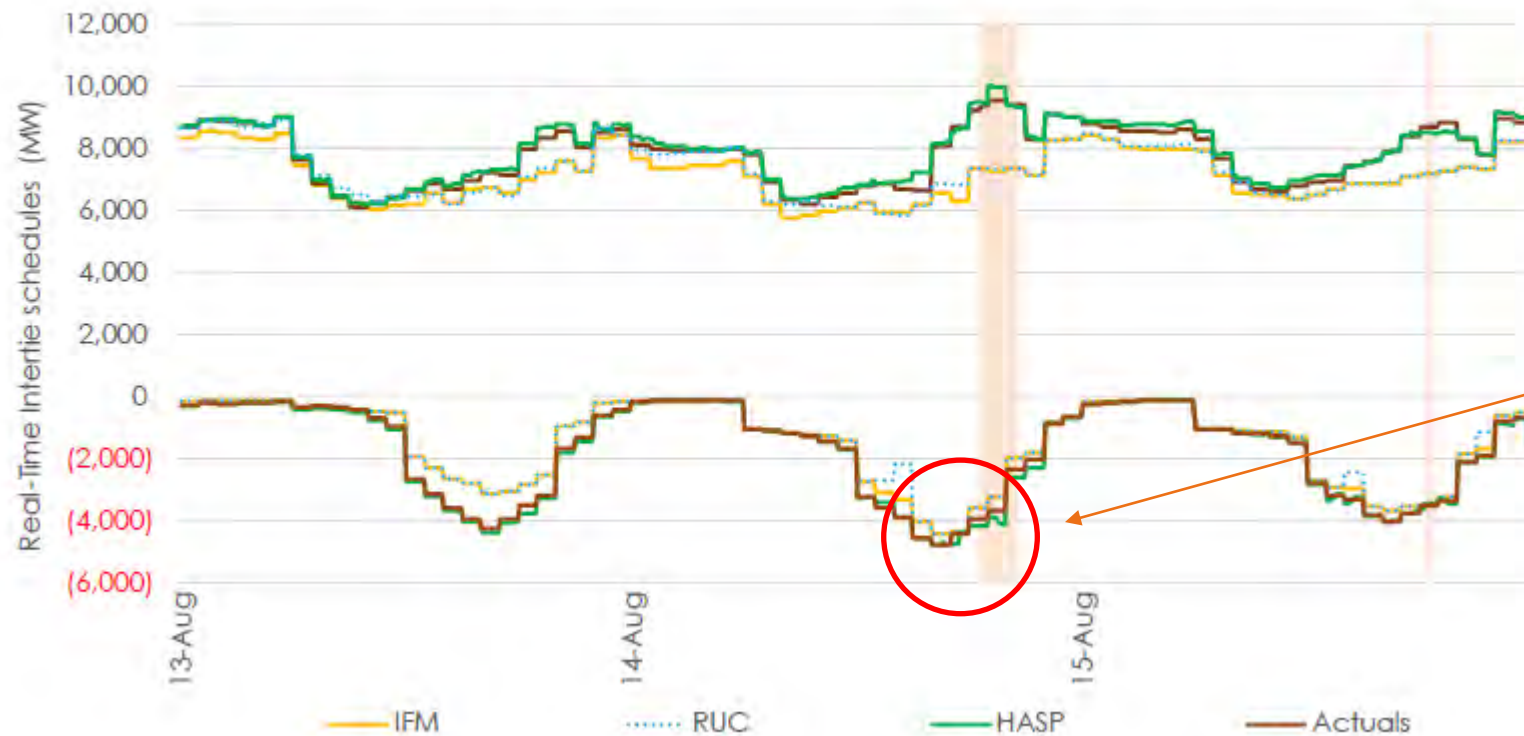


Source: CAISO Market Monitor Report 11/24/20



# 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



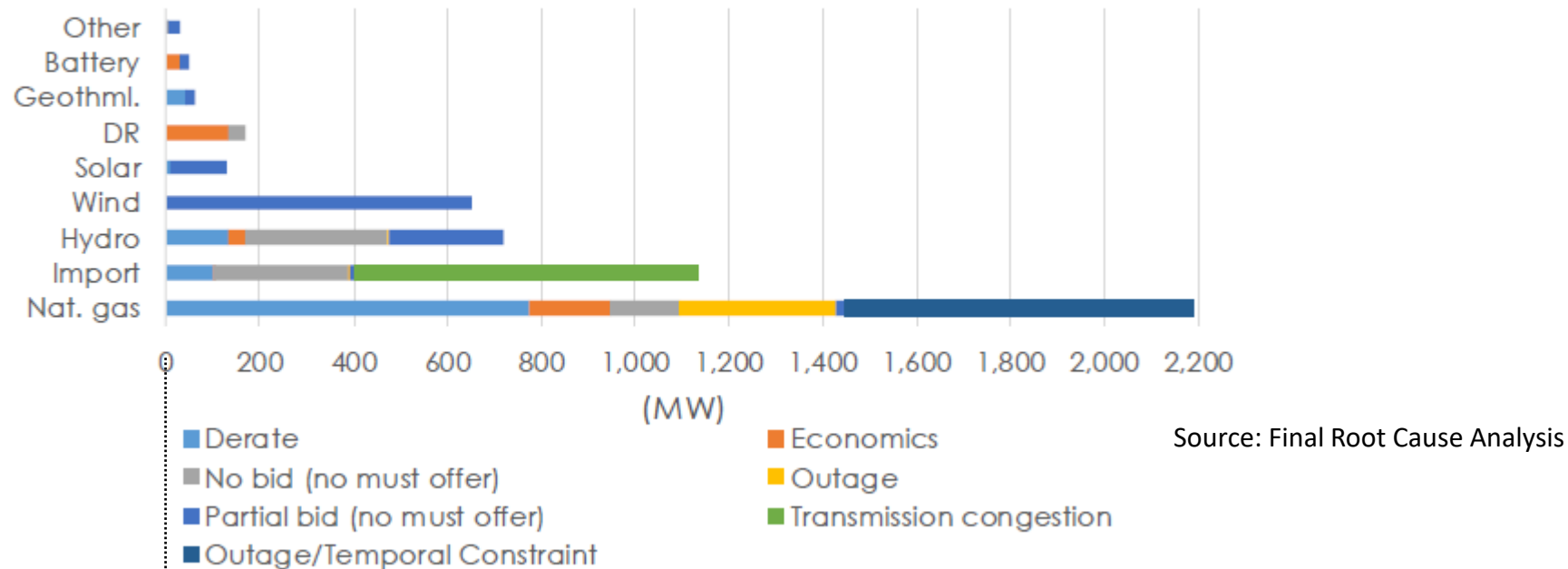
Exports, already high, increased from the Day Ahead Market

Source: Final Root Cause Analysis

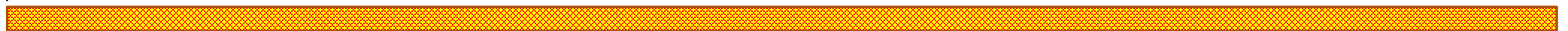


# The Data Show that Exports Dwarfed Other Resources' Underperformance During the Heat Wave

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



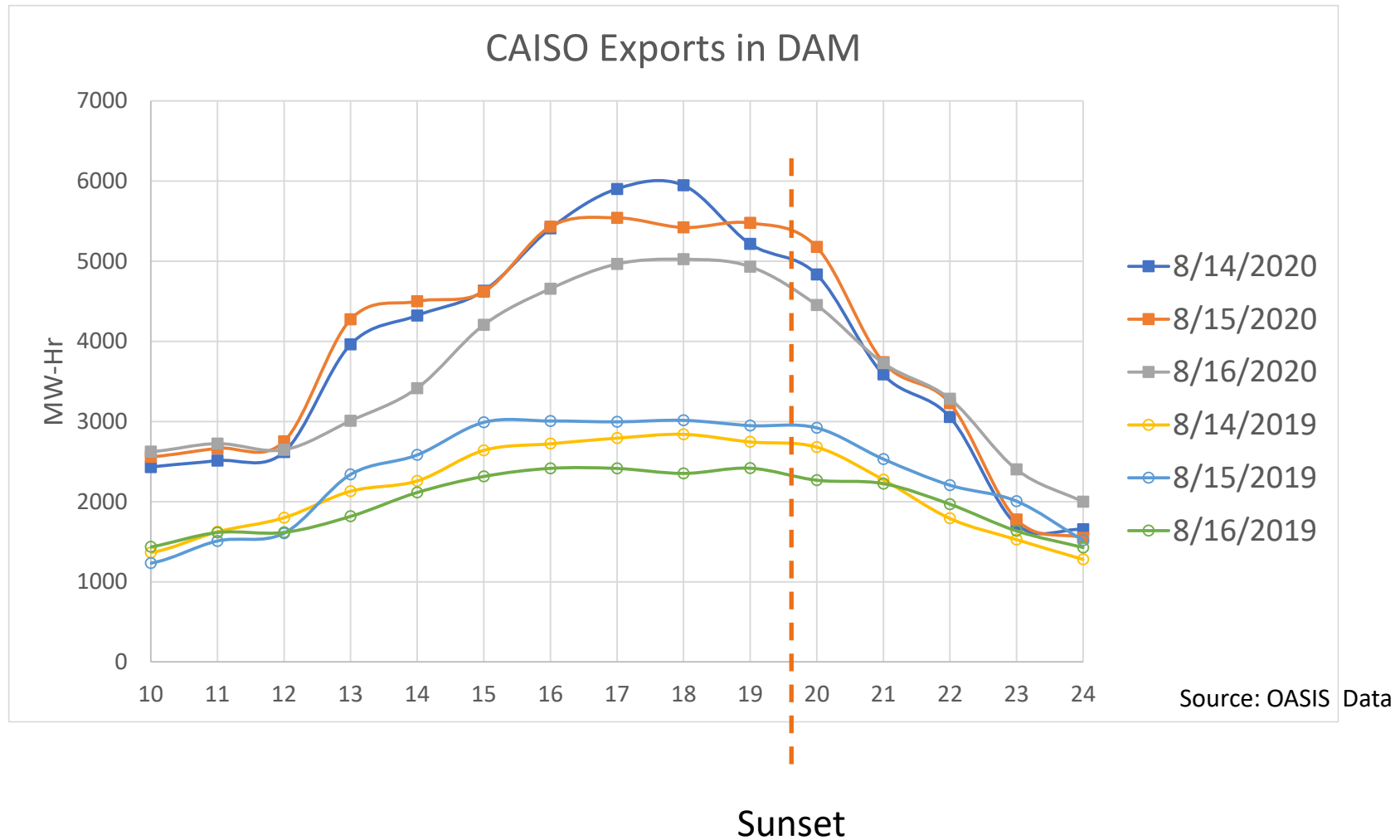
Exports



**Capacity is NOT The Problem!**

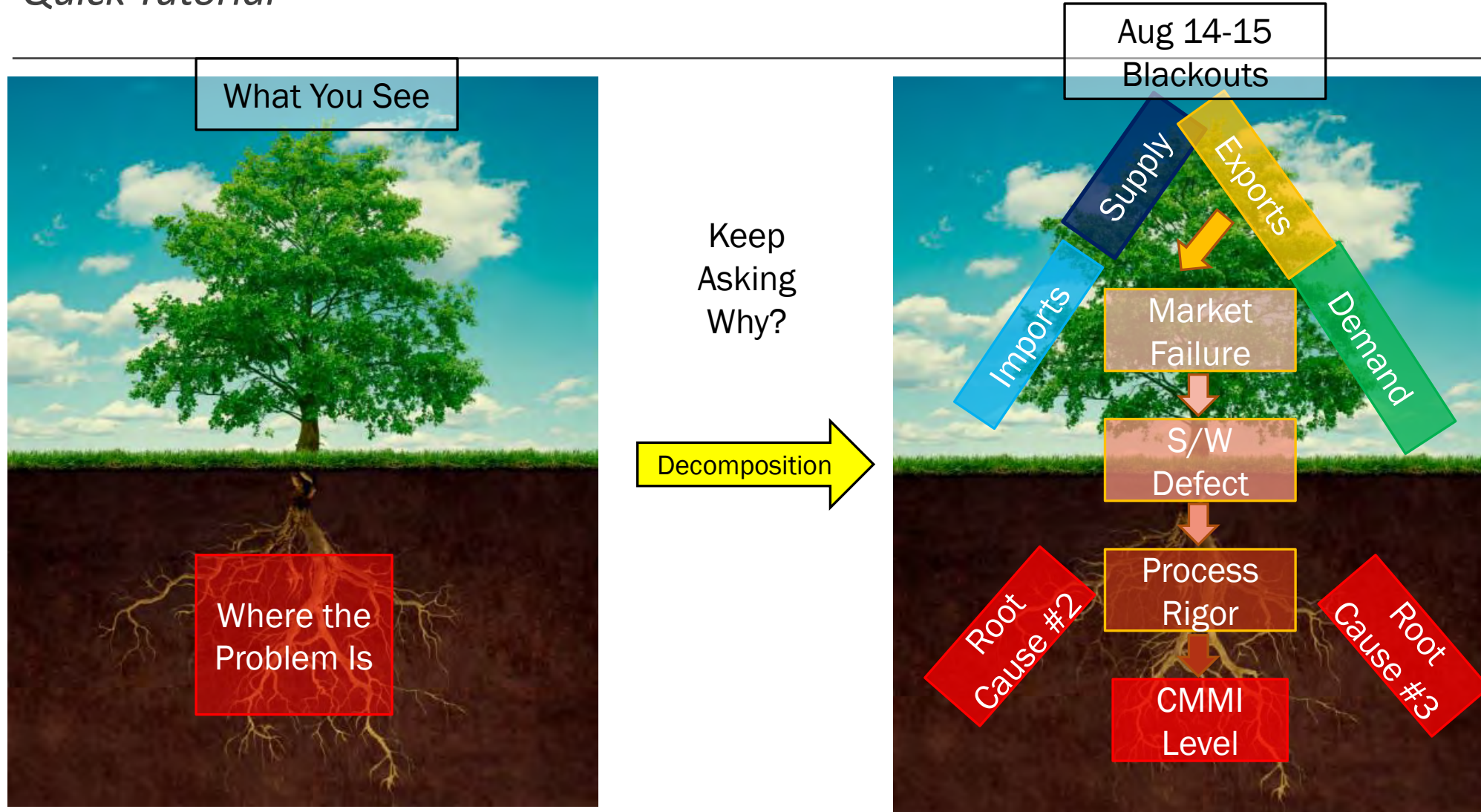


# CAISO 2020 Exports Doubled During Critical Twilight Hours Compared to 2019



# Root Cause (Fault Tree) Analysis

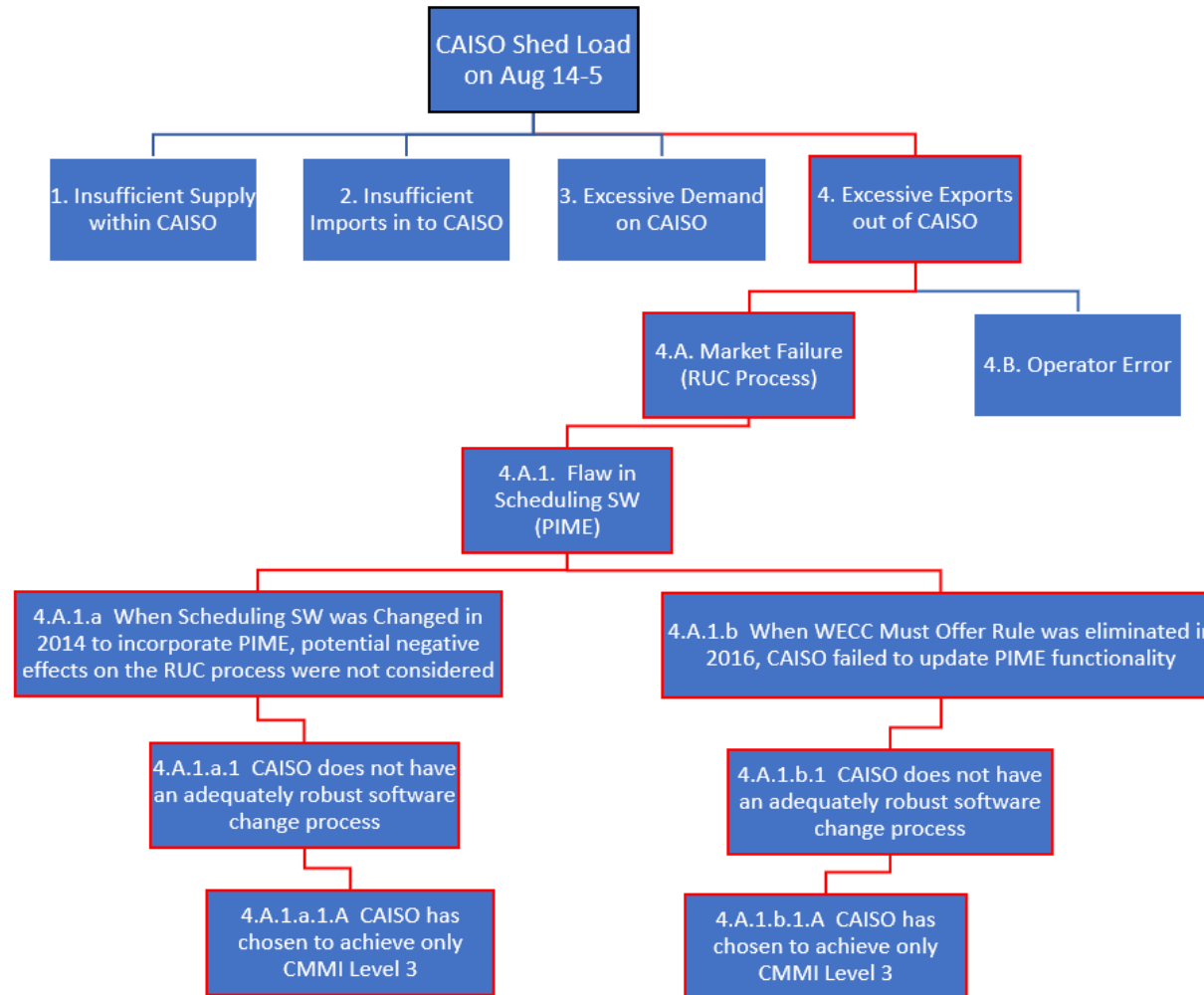
## Quick Tutorial





# 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



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# Thomas Popik

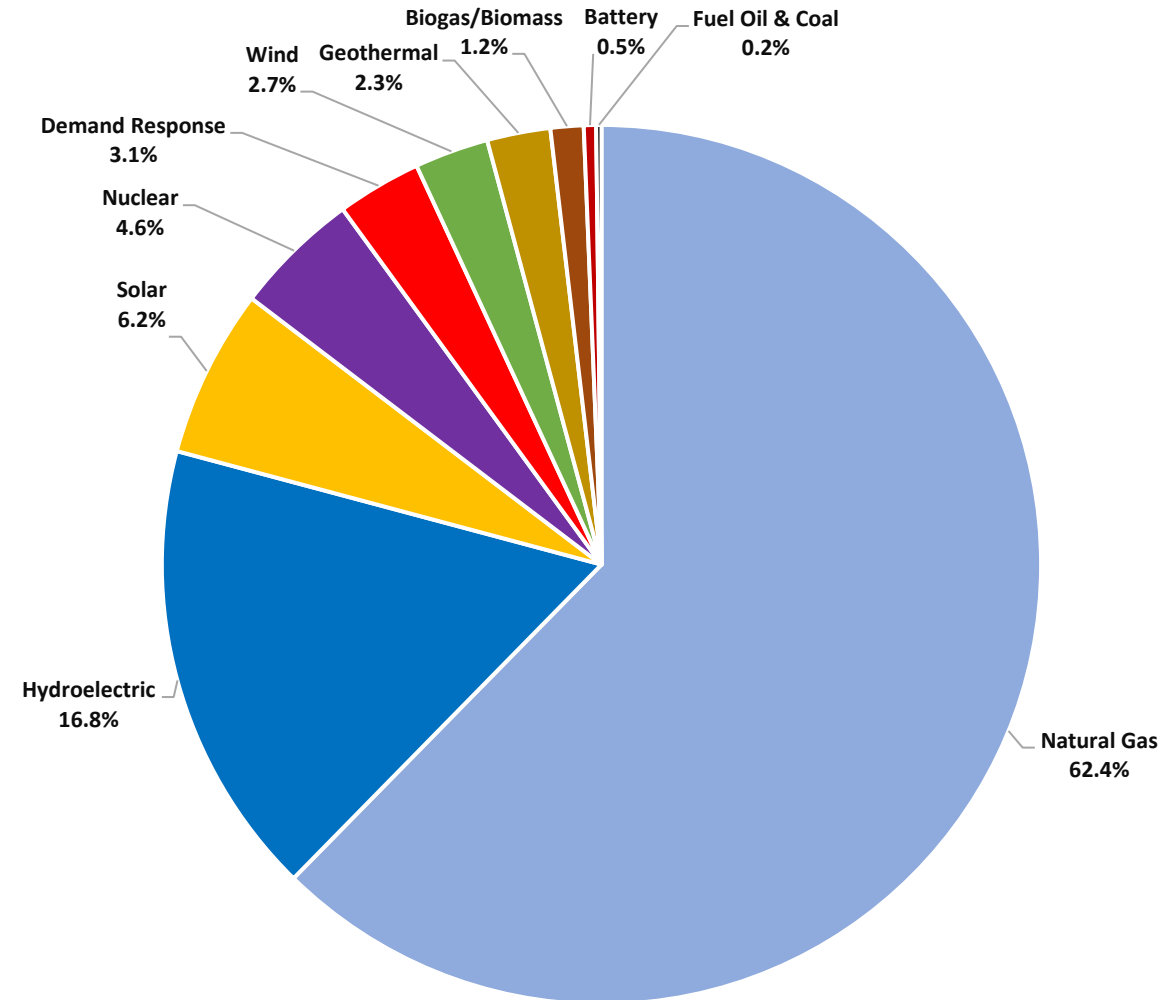
*Chairman, Foundation for Resilient Societies*

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## CAISO Net Qualified Capacity for August 2020—49.2 GW

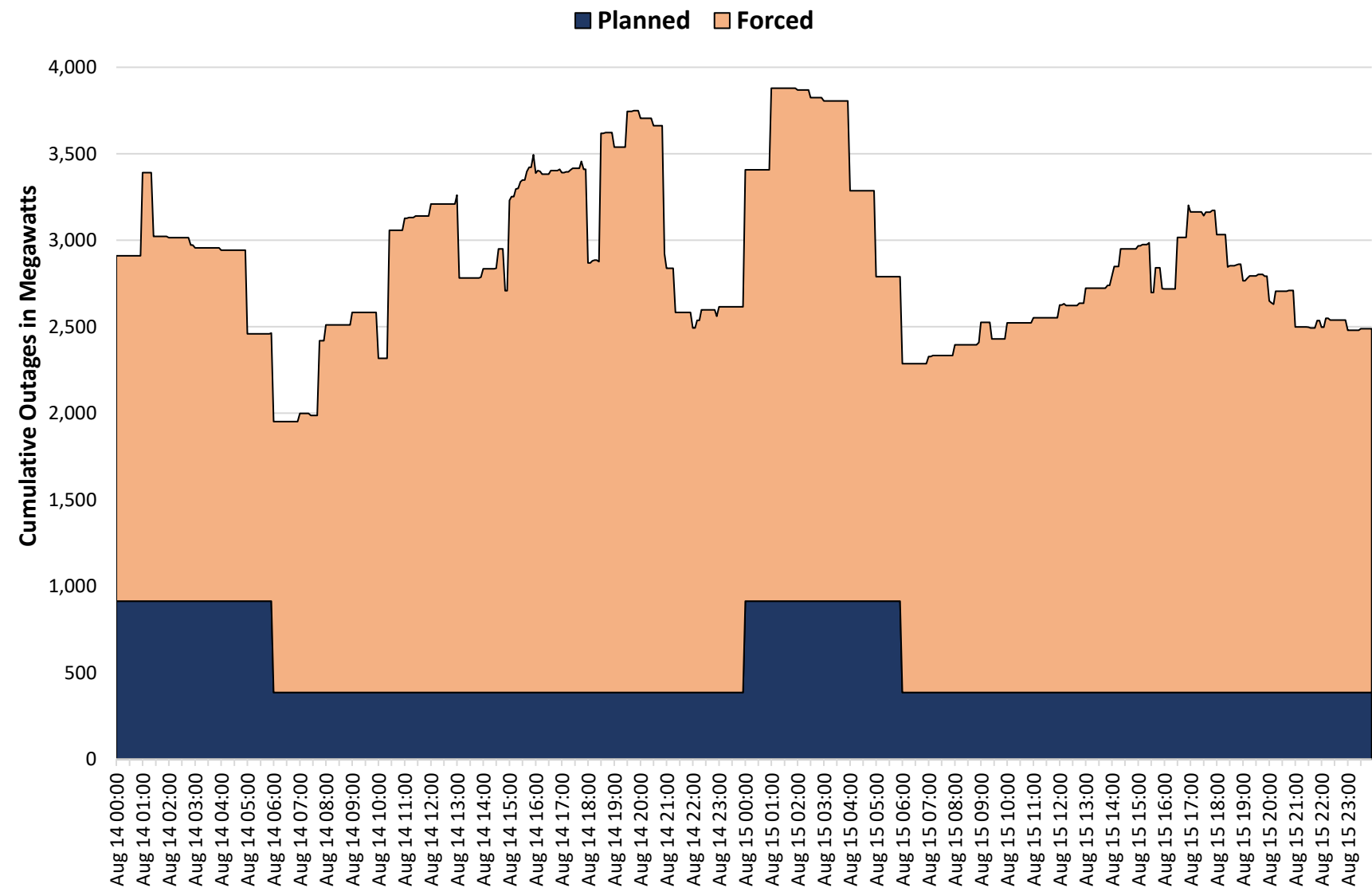
NQC does not include planned imports in CAISO Summer Forecast



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



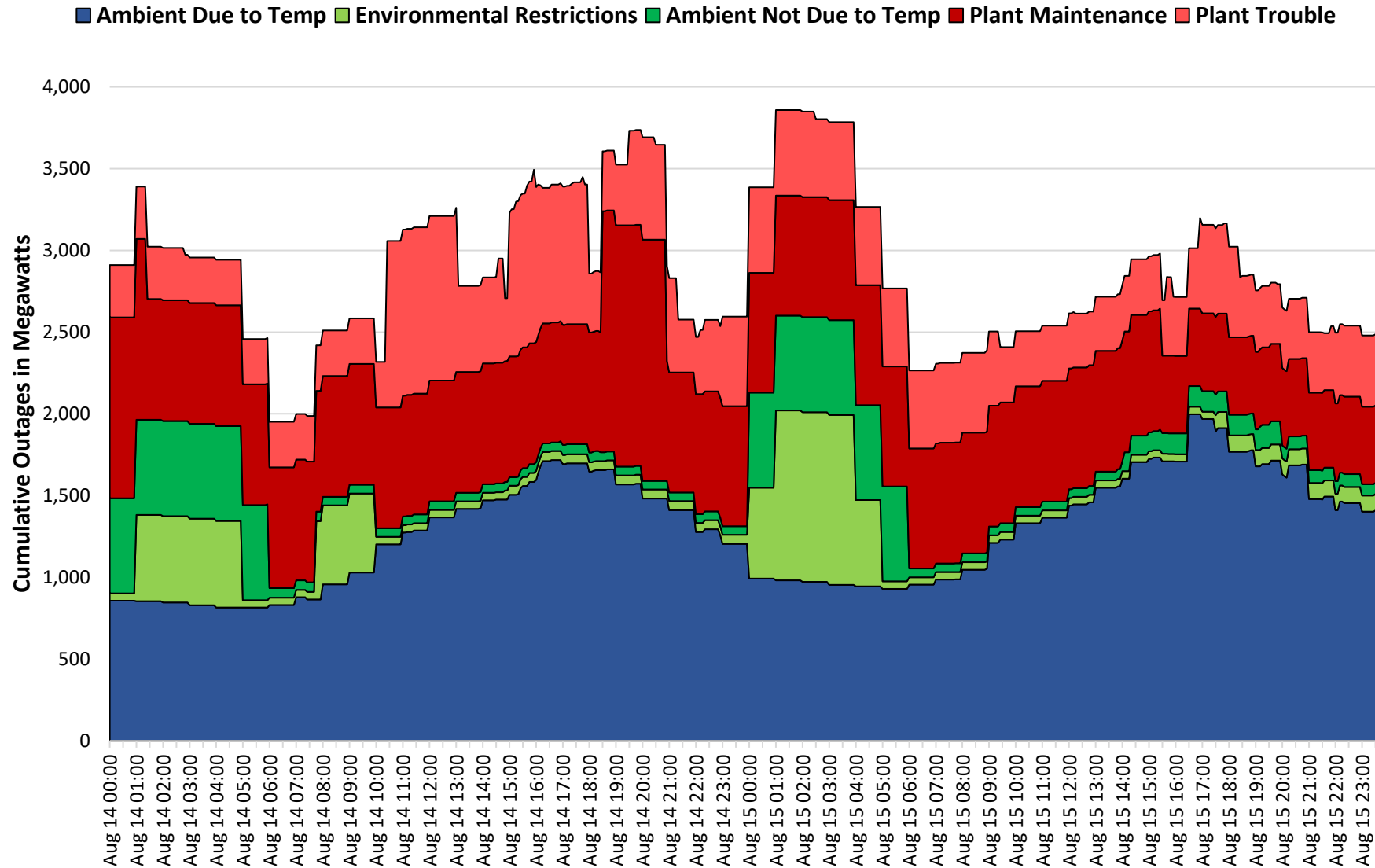
August 14-15 Outages at CAISO Gas-Fired Plants



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



## August 14-15 Outages at CAISO Gas-Fired Plants

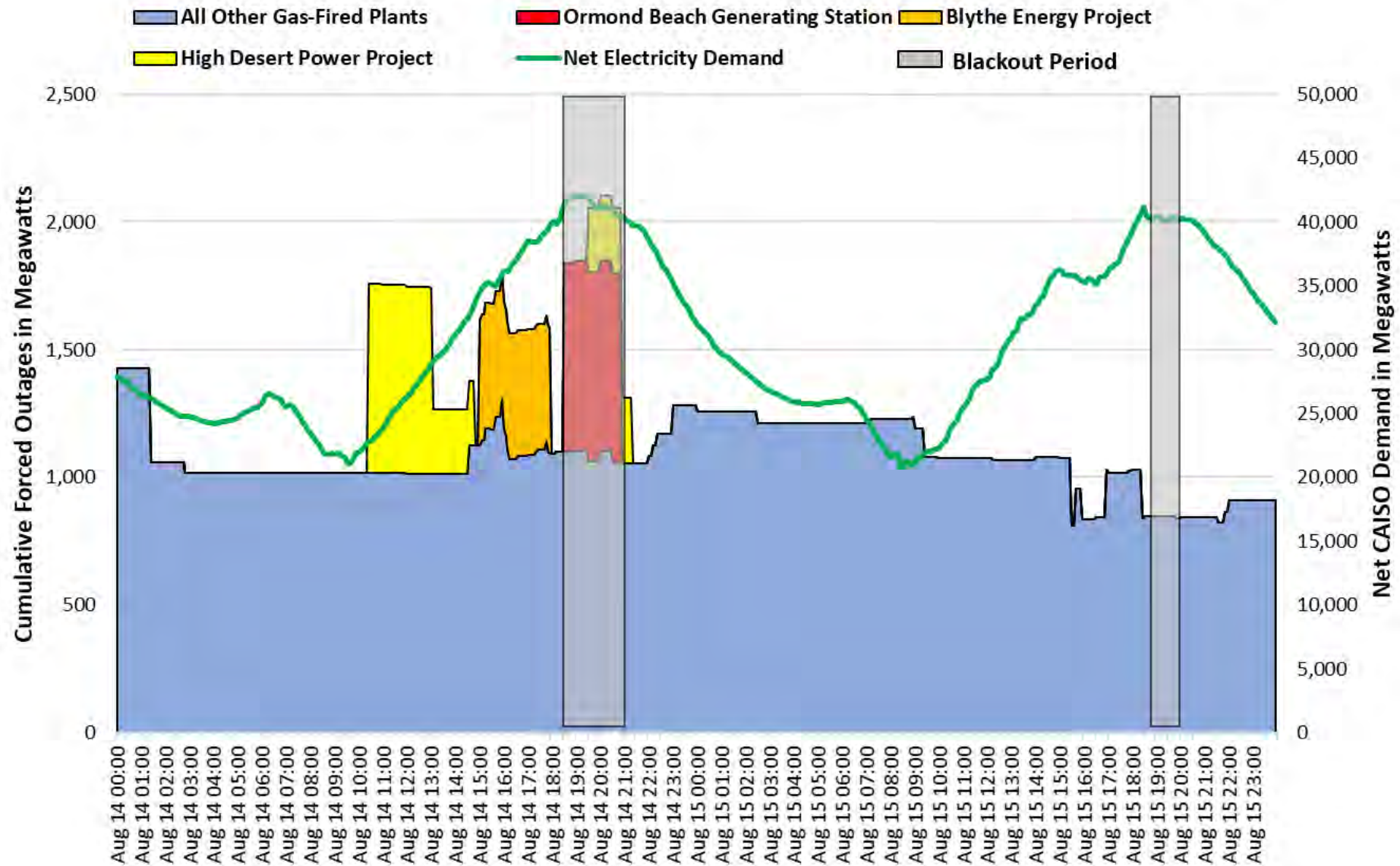


Source: CAISO Outage Data for August 13-16, Foundation for Resilient Societies Analysis





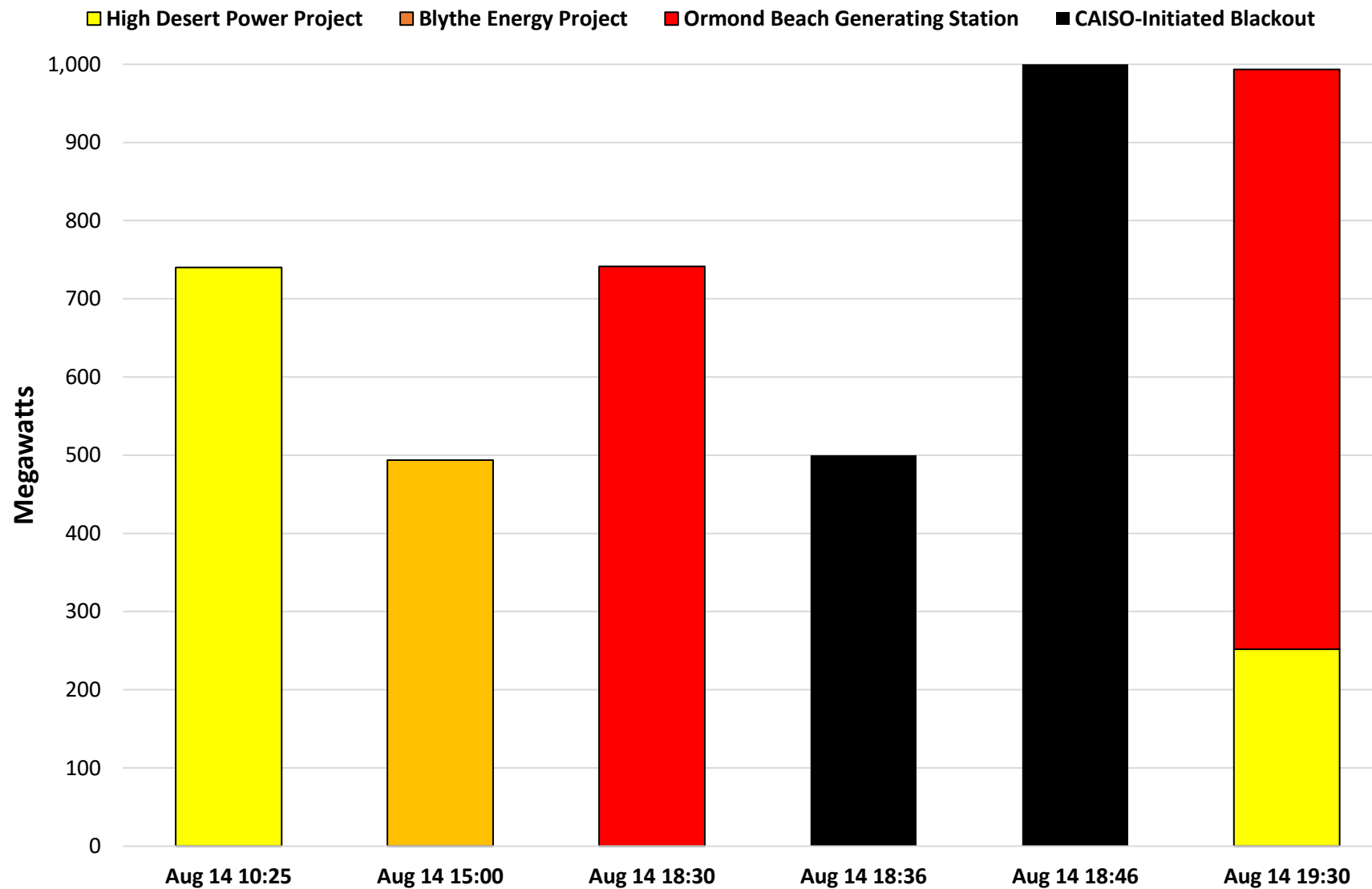
## August 14-15 Forced Outages Due to Maintenance/Trouble at CAISO Gas-Fired Plants



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



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# Bill Powers

*Registered Professional Mechanical Engineer*

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# High outage rates on August 14<sup>th</sup> and 15<sup>th</sup> : coastal boiler plants and utility gas plants



3 of 9 coastal units entirely unavailable 336 MW in planned outage  
on August 14<sup>th</sup> 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 14<sup>th</sup>



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

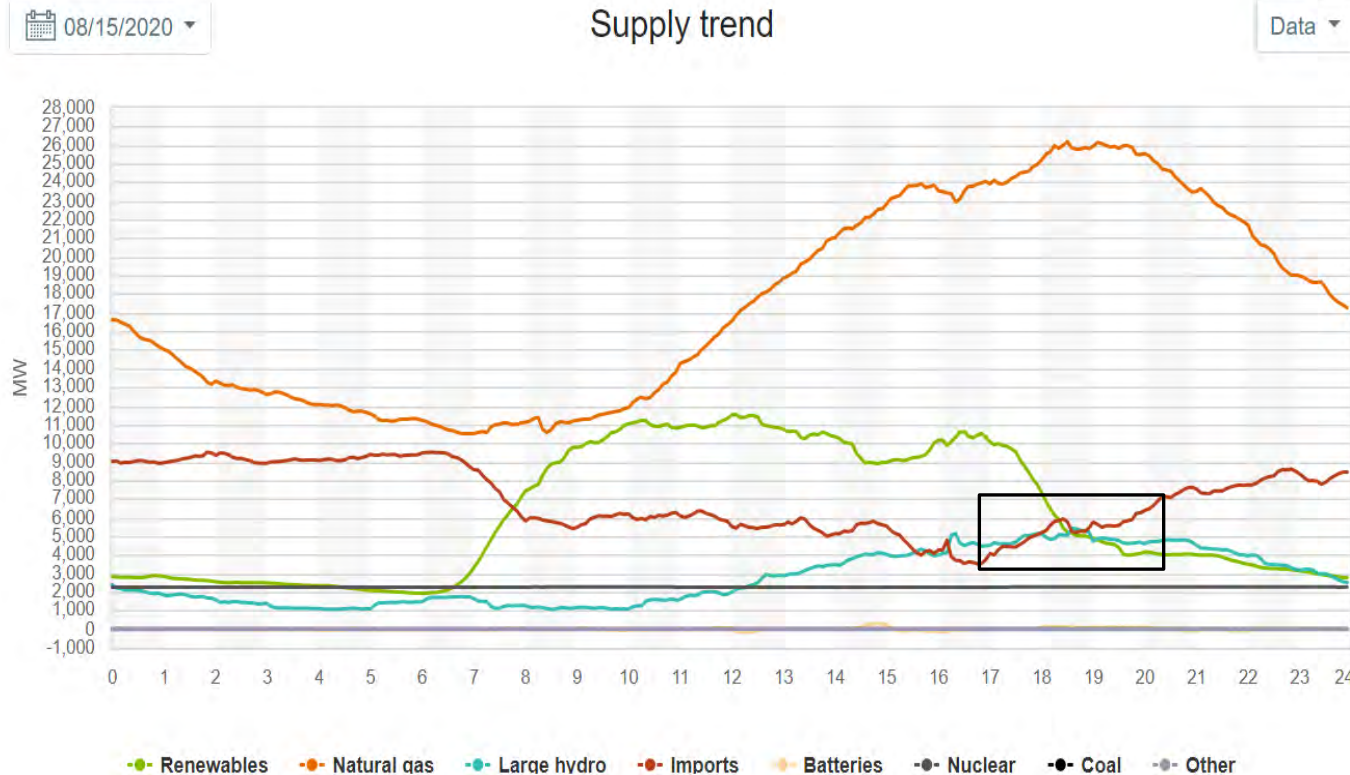


Partial curtailments continue on Gateway (PG&E), 164 MW curtailed  
August 15<sup>th</sup> into late afternoon Desert Star (SDG&E), 130 MW curtailed





# Sharp decline in imports as August 15<sup>th</sup> blackout initiated

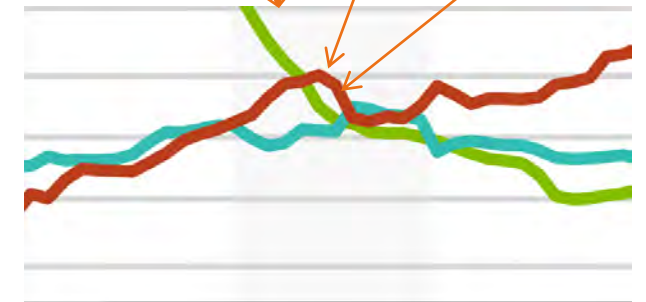


Panoche, -248 MW  
6:13 pm

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.

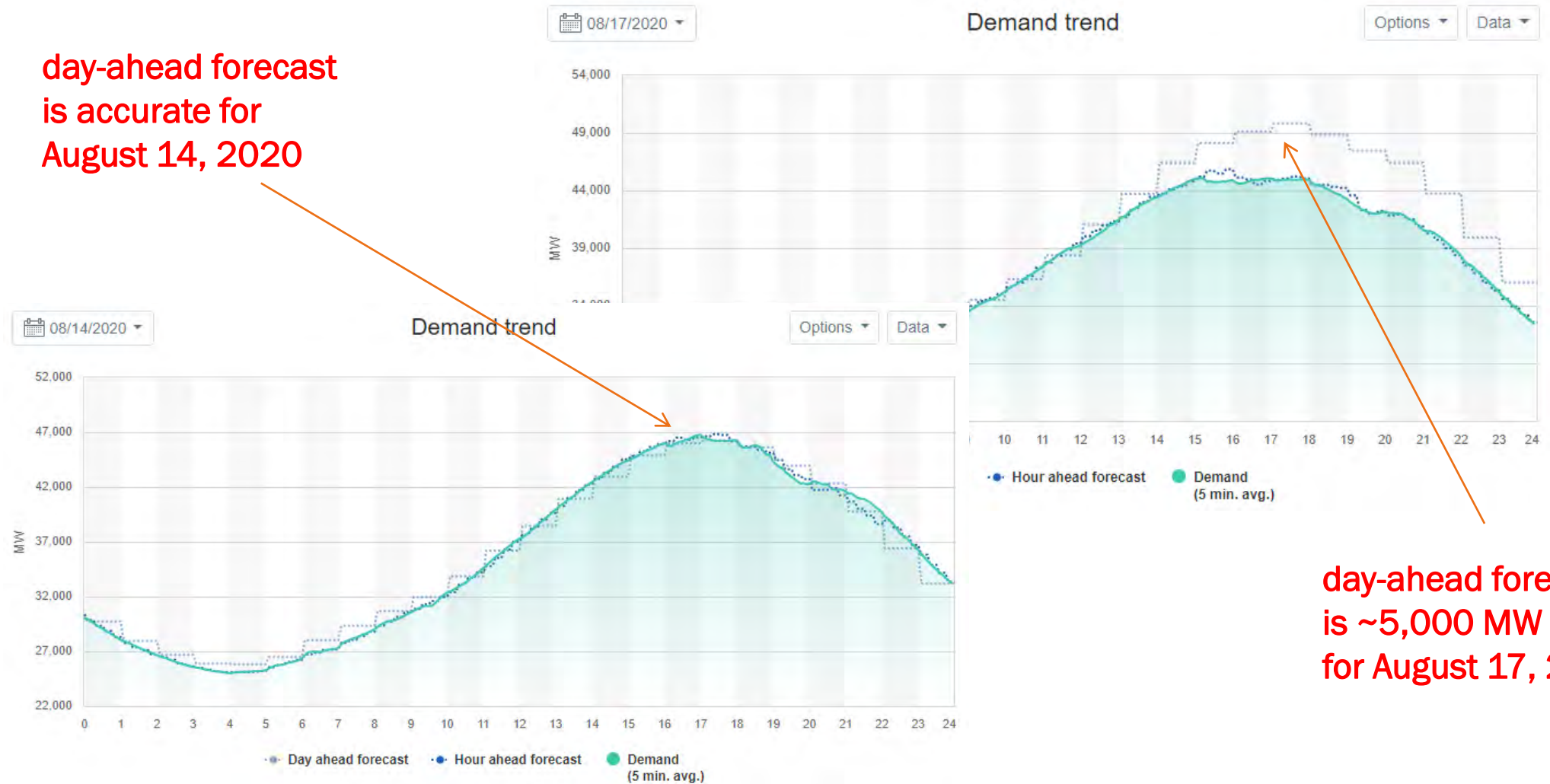
	Stage 1 Emergency	Stage 2 Emergency	Stage 3 Emergency
Reserve margin range	10% → 6%	6% → 3%	< 3%
Action triggered	Conservation	Allowable for up to 60 minutes following event, order power plants online to regain 6% reserve margin.	shed load (blackout)
August 14 <sup>th</sup> , 6:36 pm		Reserve margin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



# 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	<ul style="list-style-type: none"><li>• Improper action by CAISO operators, ordering SDG&amp;E to shed 290 MW.</li><li>• FERC: inadequate training and lack of documented operating procedure.</li><li>• CAISO admits to violations of NERC reliability standards.</li><li>• Paid civil penalty of \$200,000 to the U.S. Treasury.</li></ul>





# Lessons Unlearned: September 2011 SDG&E blackout

Date	Impact	Cause
2011 Sept	Regional blackout: SDG&E, Imperial Irrigation District, Baja California	<ul style="list-style-type: none"><li>• Insufficient local generation online on highest demand day of year.</li><li>• Most of SDG&amp;E demand being met with imported power when 500 kV transmission line tripped offline.</li><li>• 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.</li><li>• Led to trip of 2,200 MW San Onofre Nuclear and regional blackout.</li></ul>



# Lessons Unlearned from 2010 & 2011 blackouts

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- 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.



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# Bill Julian

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

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# 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

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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

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**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

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## 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)

