Summary of Rebuttal Testimony Pico Pico Energy Center Docket No. 11-AFC-01

Pio Pico Hearing, Chula Vista, California

Bill Powers, P.E., Powers Engineering

July 23, 2012

Rebuttal testimony summary – deficient alternatives analysis

- FSA alternatives analysis fails to:
  - Conduct a detailed analysis of rooftop solar as alternative (per CEC denial of 100 MW Chula Vista peaker in 2009).
  - Determine solar resource availability in top 100 demand hours or corroborate 98%+ capacity factor alleged for Pio Pico.
  - Evaluate low cost demand response alternatives, consistent with CAISO call for 1,000 MW of additional DR to address SONGS outage.
  - Establish that the ancillary services to be provided by Pio Pico cannot be met by peak load reduction measures (DR, rooftop PV) or energy/thermal storage, or improved wind and solar forecasting, or the 700 MW of existing peaking resources in SDG&E territory.
  - Assess the legitimacy of SDG&E claims that the existing 964 MW Encina plant and the nearly 200 MW of Cabrillo II peakers will be retired by 2017.
  - Acknowledge that recognition of the capability of Palomar Energy and Otay Mesa combined cycle plants to function as simple cycle units with the steam turbine generator in forced outage would add over 230 MW of local capacity to SDG&E territory.

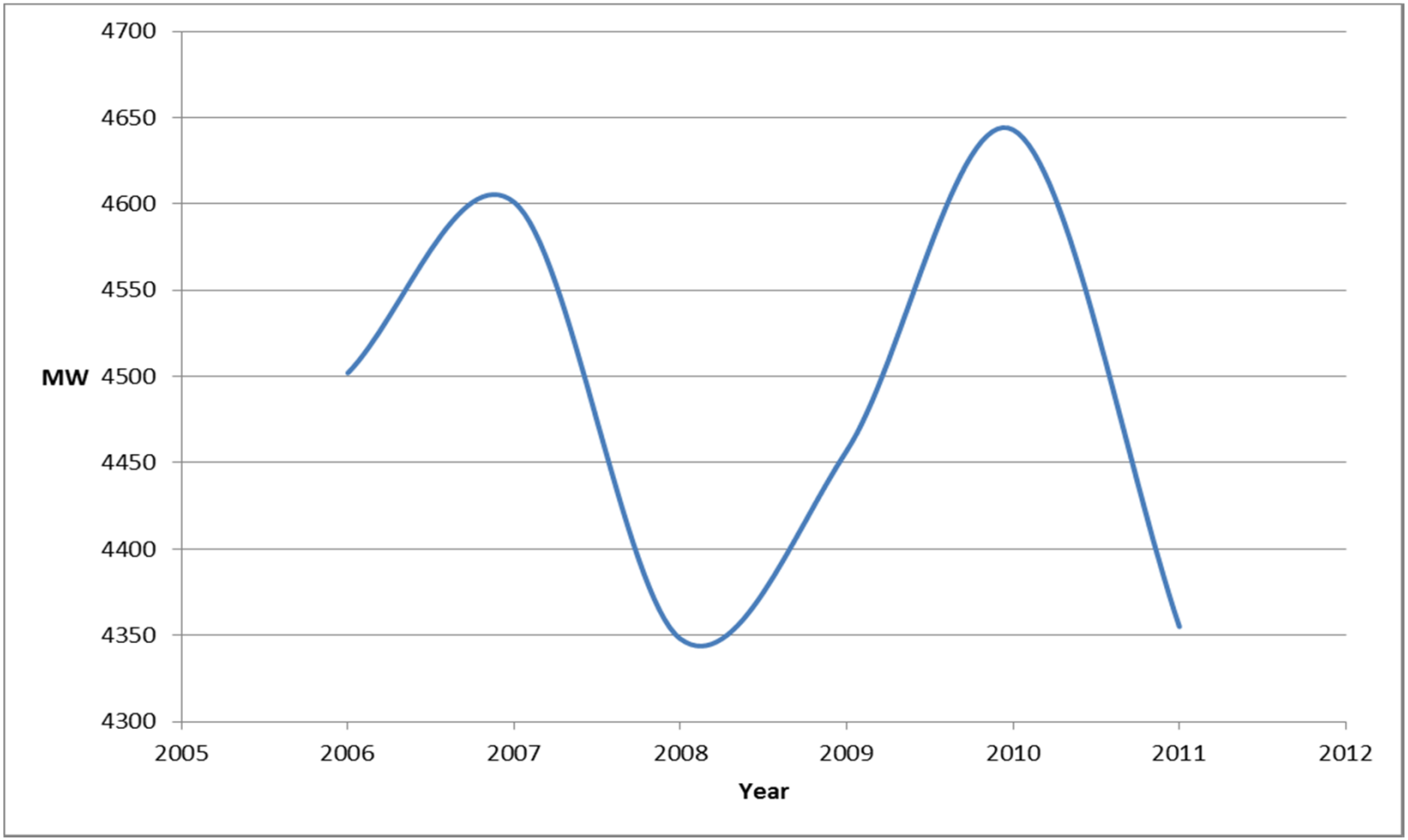
2009 CEC denial of 100 MW CVEUP puts rooftop solar on equal footing with peaking gas turbines

"Photovoltaic arrays mounted on existing flat warehouse roofs or on top of vehicle shelters in parking lots do not consume any acreage. The warehouses and parking lots continue to perform those functions with the PV in place. (Ex. 616, p. 11.). . . . Mr. Powers (expert for intervenor) provided detailed analysis of the costs of such PV, concluding that there was little or no difference between the cost of energy provided by a project such as the CVEUP (gas turbine peaking plant) compared with the cost of energy provided by PV. (Ex. 616, pp. 13 – 14.). . . . PV does provide power at a time when demand is likely to be high—on hot, sunny days. Mr. Powers acknowledged on cross-examination that the solar peak does not match the demand peak, but testified that storage technologies exist which could be used to manage this. The essential points in Mr. Powers' testimony about the costs and practicality of PV were uncontroverted."

Epilogue: Since 2009, the cost of solar PV has dropped precipitously and multi-MW battery storage systems have installed in various parts of the U.S. and the world.

SDG&E peak demand static over last 6 summers at 4,500 MW +/- 150 MW, while population has grown ~7%

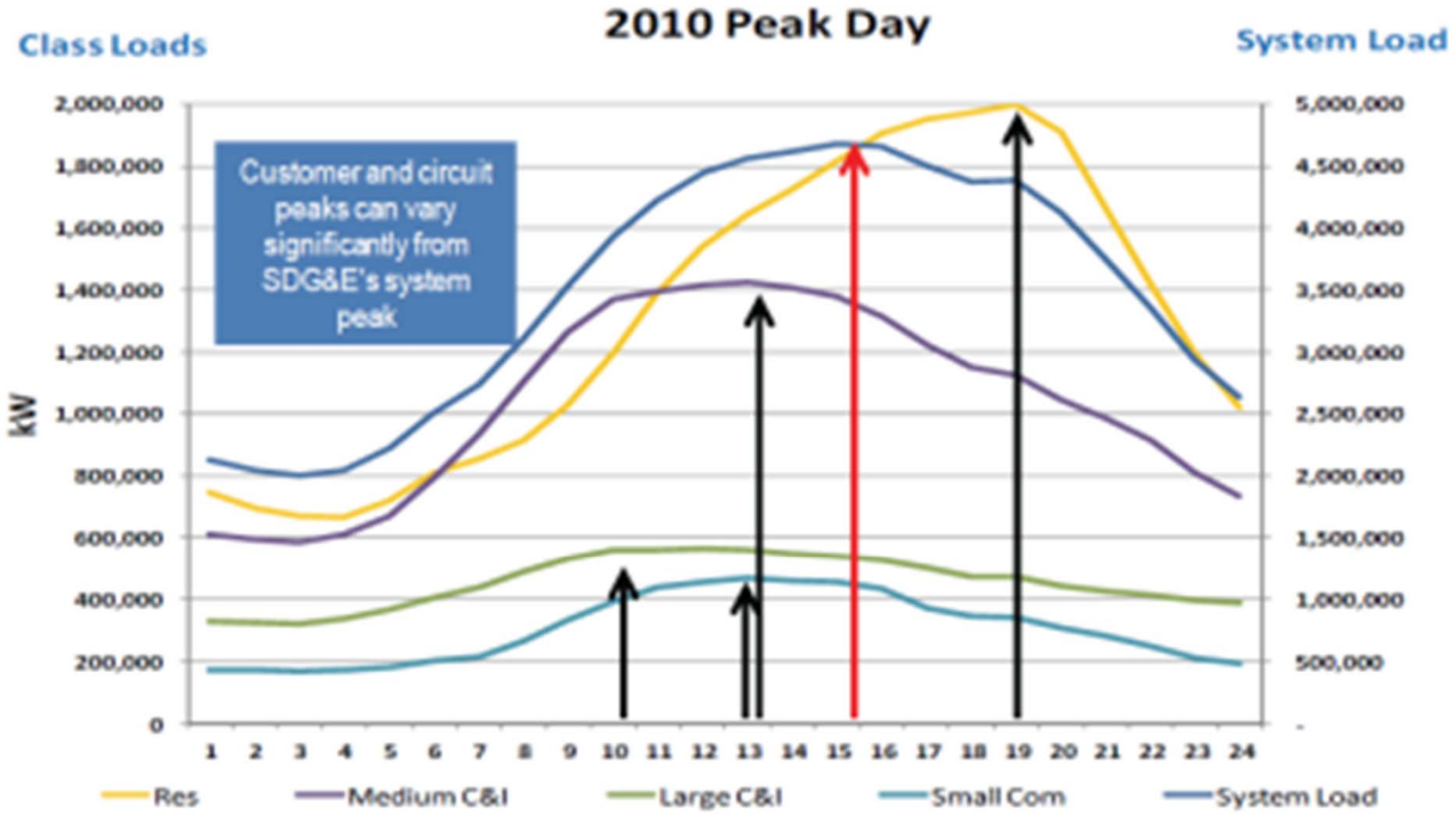
sources: Moodys.com Q2 2006 SD County = 2,941,000; U.S. Census 2011 SD County estimate: 3,140,000; CAISO OASIS



CEC 1-in-2 demand forecast for 2011 was accurate – use of CAISO 1-in-10 forecast for 2022 is not technically justified

- CEC forecast a 2011 1-in-2 peak load of 4,365 MW in SDG&E territory.
- Actual peak load in SDG&E territory was 4,355 MW.
- CPUC requires IOUs to maintain 15-17 percent reserve margin for 1-in-2 year peak forecast by CEC.
- The CPUC requirement is much more conservative than the WECC 7 percent reserve margin requirement, and assures sufficient reserve to meet WECC requirement in 1-in-10 year.
- There has been no net growth in SDG&E peak in last 6 summers, despite 7 percent population growth.
- CEC's 2012-2022 forecast presumes 1990-2005 growth trend is continues into the indefinite future, and treats static 2006-2011 peak demand as an aberration.
- Ultra-conservative CAISO forecast methodology provides open-ended justification for gas-fired peaker plant additions, and sets-up over-procurement for the wrong future scenario.

SDG&E 8 pm secondary peak is exclusively due to residential A/C loads – DR solution is more aggressive residential A/C cycling program and state-of-the-art SEER (21+) replacement A/C units



Utility-scale battery storage located at the wind farm is the cost-effective solution to wind voltage and frequency issues, not LMS100s located far from the wind farm(s) – Oregon's PGE evaluating 200 MW battery storage project for wind integration

source: Sustainable Business Oregon , http://www.sustainablebusinessoregon.com/articles/2012/04/aes-plans-to-bring-big-batteries-to.html.

34 MW NaS battery array, 51 MW wind farm, Japan

32 MW lithium battery array, 98 MW wind farm, West Virginia

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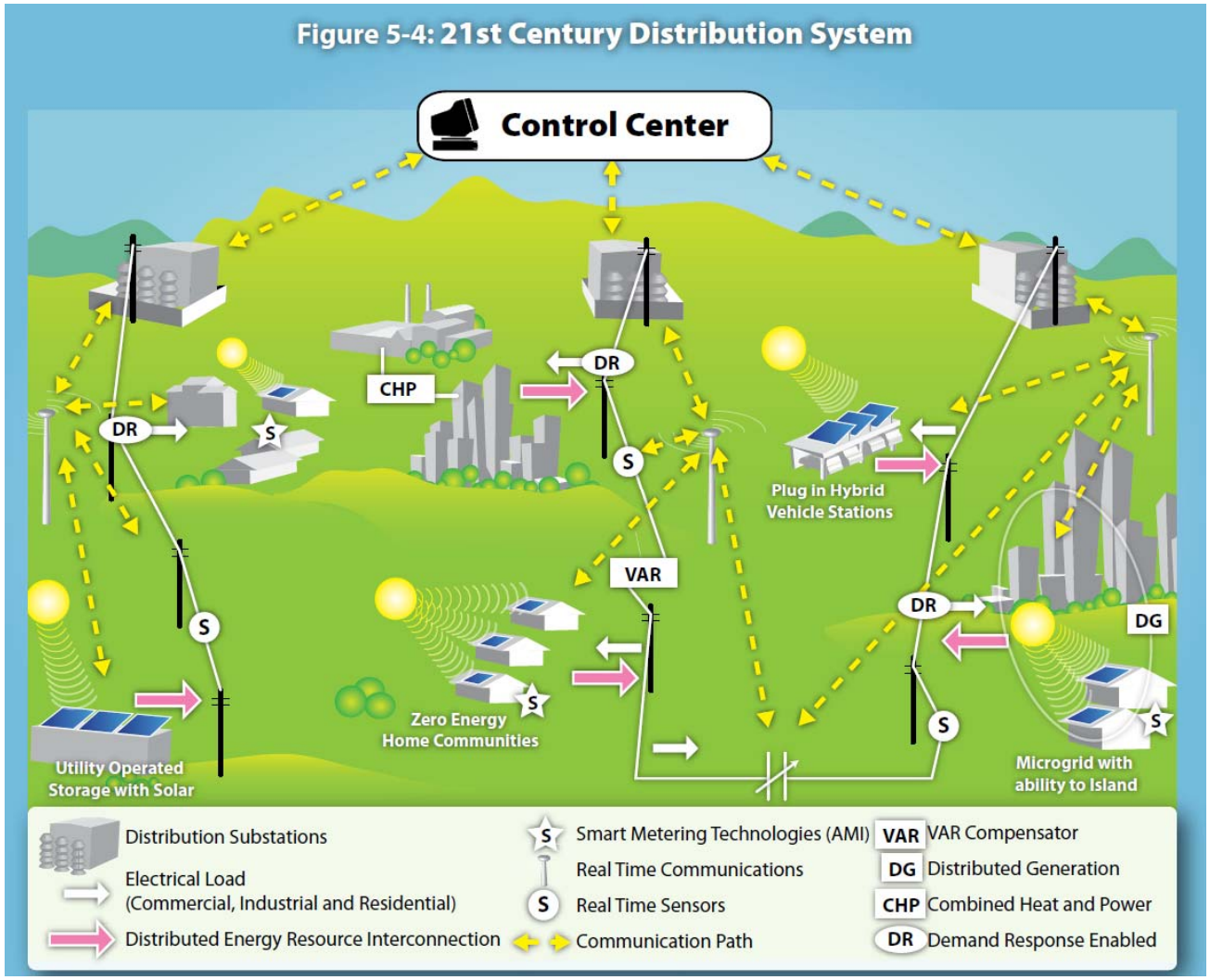
- CEC's 2012-2022 forecast presumes 1990-2005 growth trend is continues into the indefinite future, and treats 2006-2011 peak demand reality in as an aberration.
- Ultra-conservative CAISO forecast methodology provides almost unlimited justification for gas-fired peaker plant additions, and sets-up over-procurement for the wrong future scenario.

California's state energy vision is local, local, local

source: CEC 2007 Integrated Energy Policy Report, December 2009, p. 155.



What is the state's plan? Joint Utility *Long-Term Energy Efficiency Strategic Plan* (2008, 2011 update)

source: http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/eesp/.

- Energy efficiency & demand response

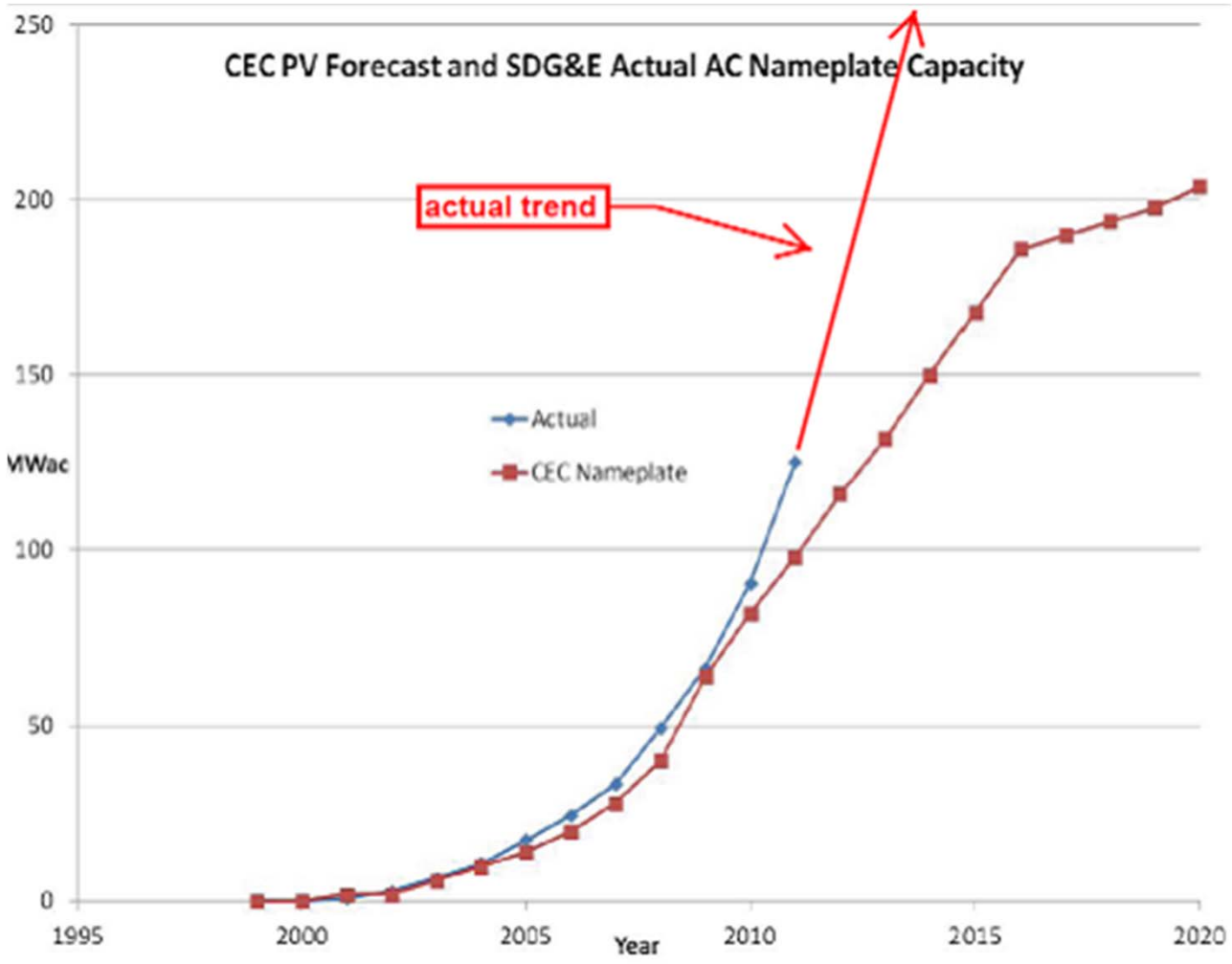
  ("net zero energy" buildings: energy efficiency + rooftop PV)
- All new residential homes net zero by 2020
- All new commercial buildings net zero by 2030
- 25% of existing residential ~ net zero by 2020
- 50% of existing commercial net zero by 2030
- 30 – 40% reduction in existing building electricity demand via energy efficiency measures
- Reduce air conditioning loads by 50% by 2020

Gov. Brown's Clean Energy Jobs Plan – local focus

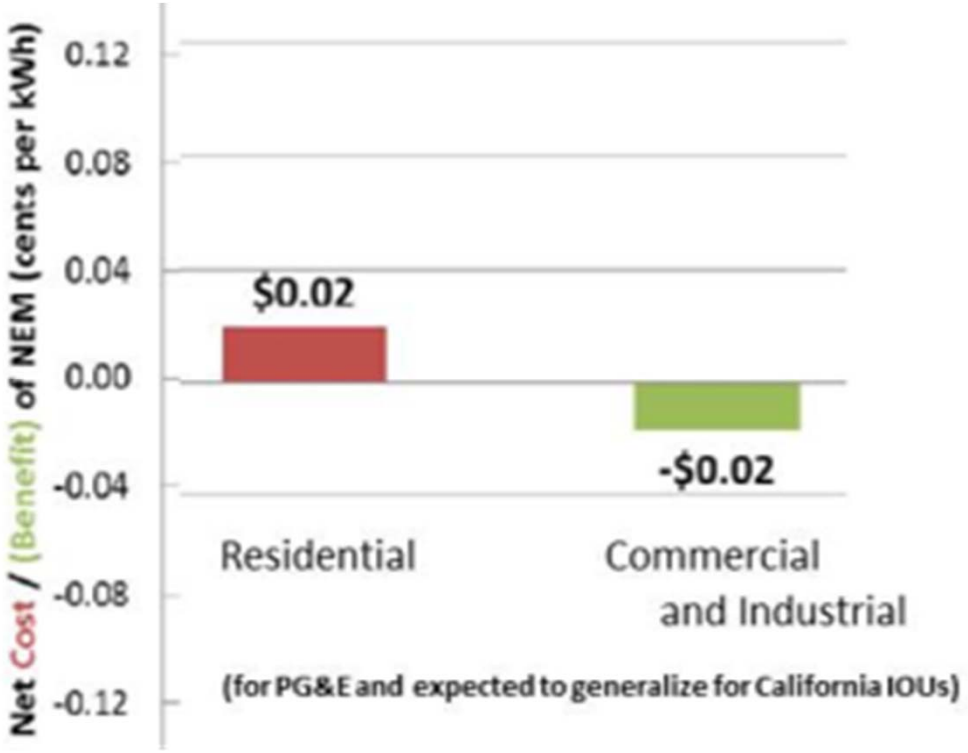
source: http://www.jerrybrown.org/Clean_Energy;

- 12,000 MW of new local renewable power by 2020, out of 20,000 MW target.
- SDG&E "pro-rated" allotment of 12,000 MW of new local renewable power would be ~1,000 MW.
- There was about 120 MW of rooftop solar installed in SDG&E territory at the end of 2011.
- SDG&E territory needs to add ~900 MW of local renewable resources to stay on track with the Governor's 12,000 MW target, and at least that much rooftop solar to meet the 2020 goals of the *Energy Efficiency Strategic Plan*.

Rooftop solar growth in SDG&E territory would achieve ~1,000 MW by 2020 if not impeded by punitive tariffs & caps

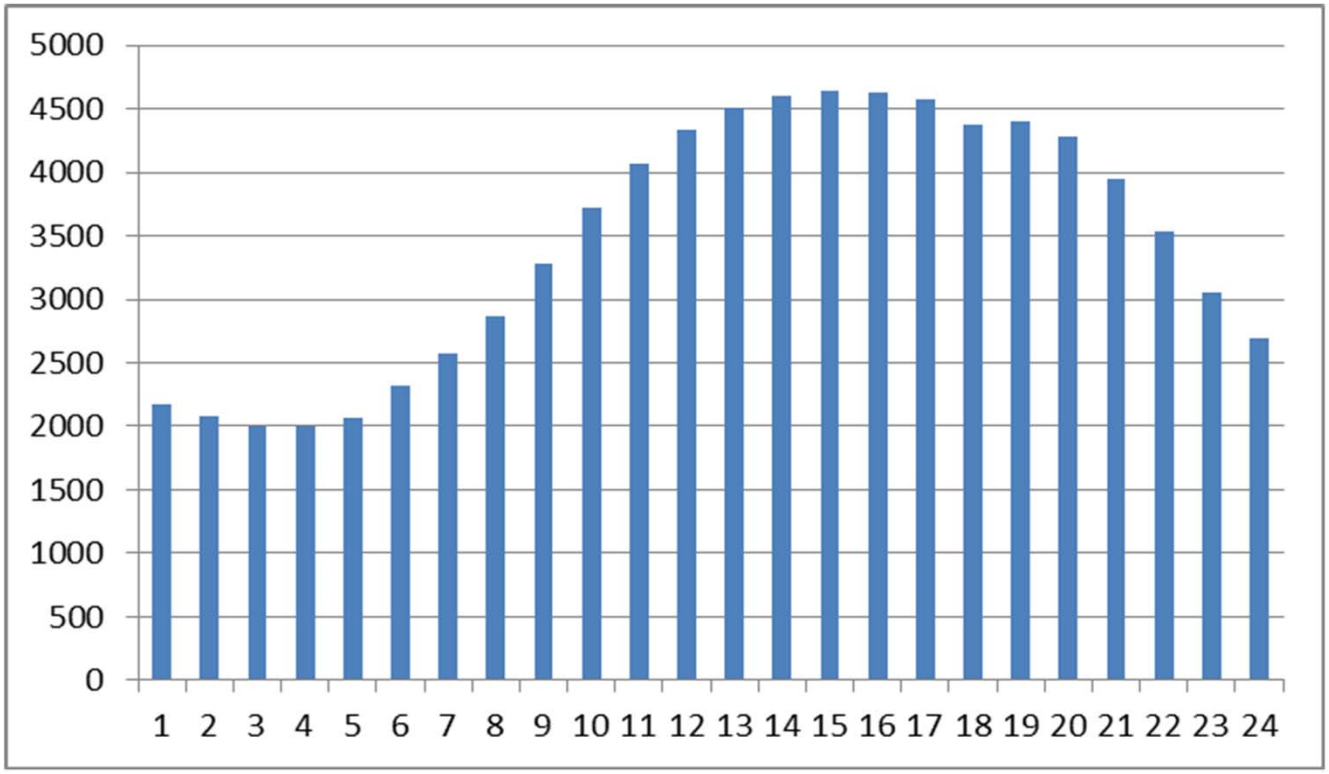


Net-metered rooftop solar imposed no net cost on ratepayers – in contrast Pio Pico capacity charges would be $85 million/yr, 20-year life-of-project would be $1.7 billion

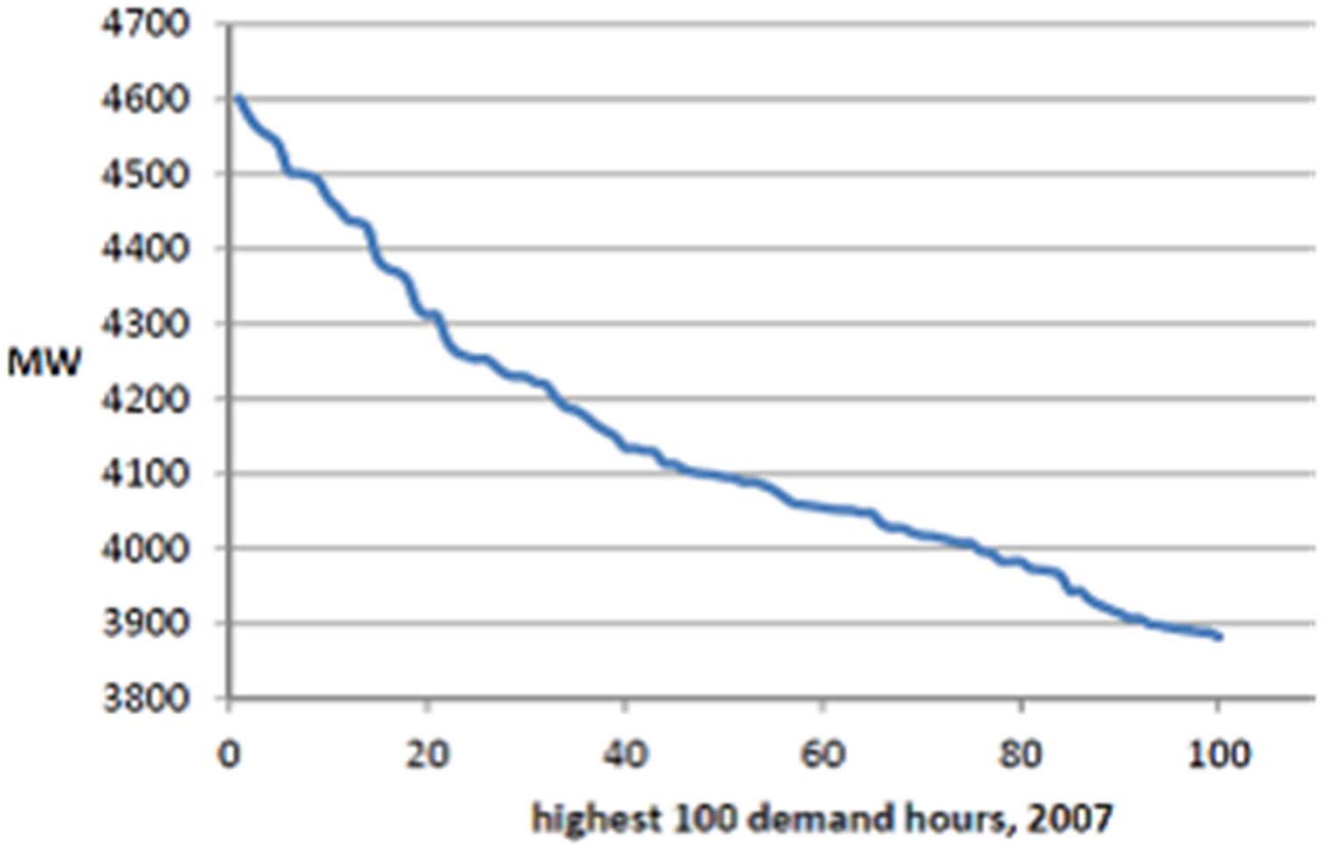


SDG&E already ramps at as much as 500 MW per hour – all local gas-fired generation can ramp quickly if necessary

source: CAISO OASIS, SDG&E actual September 27, 2010 (peak hour - HE 16 – in 2010)



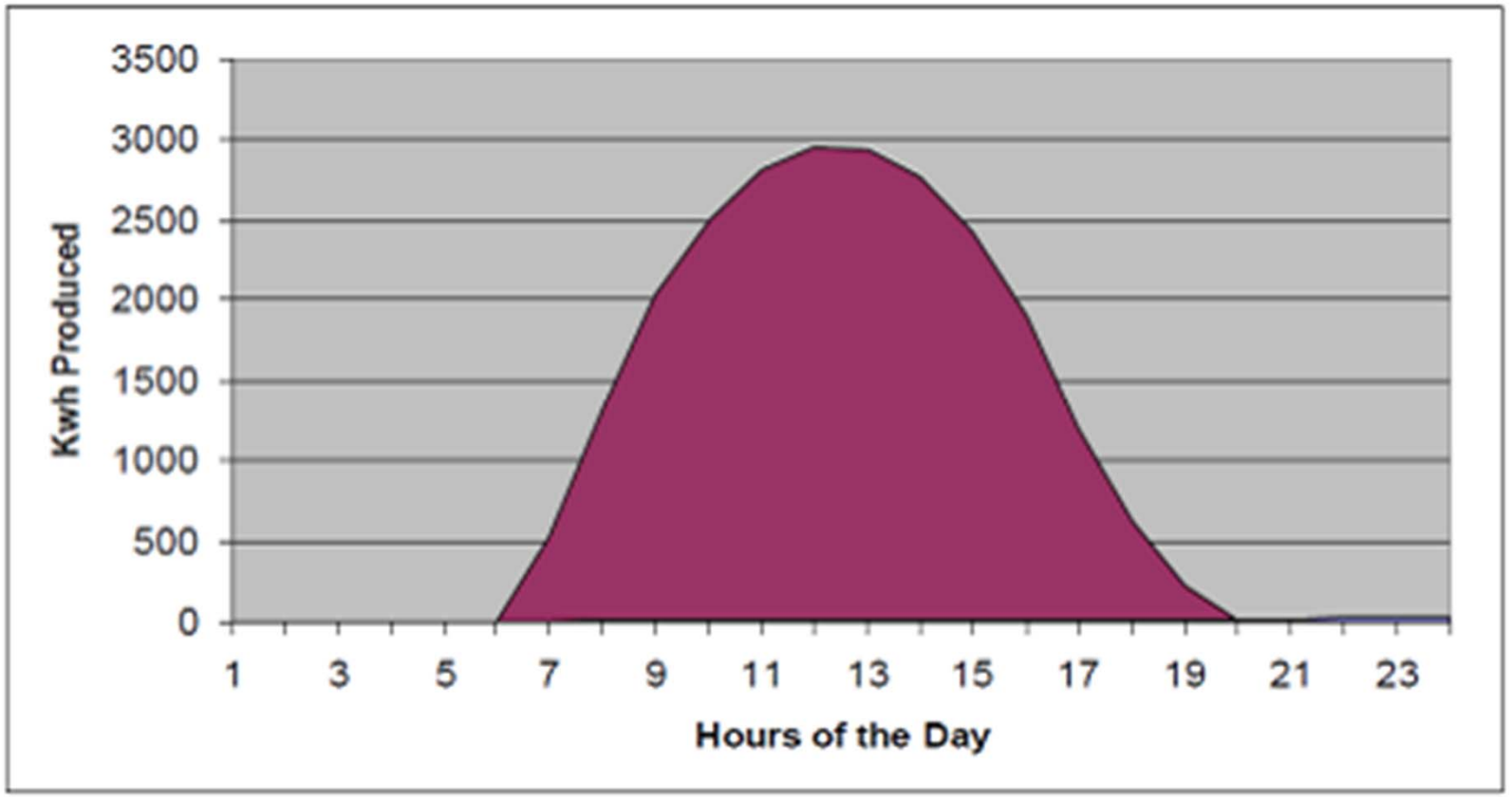
Demand declines rapidly in SDG&E territory across top 100 hours (source: CAISO OASIS System Load database)



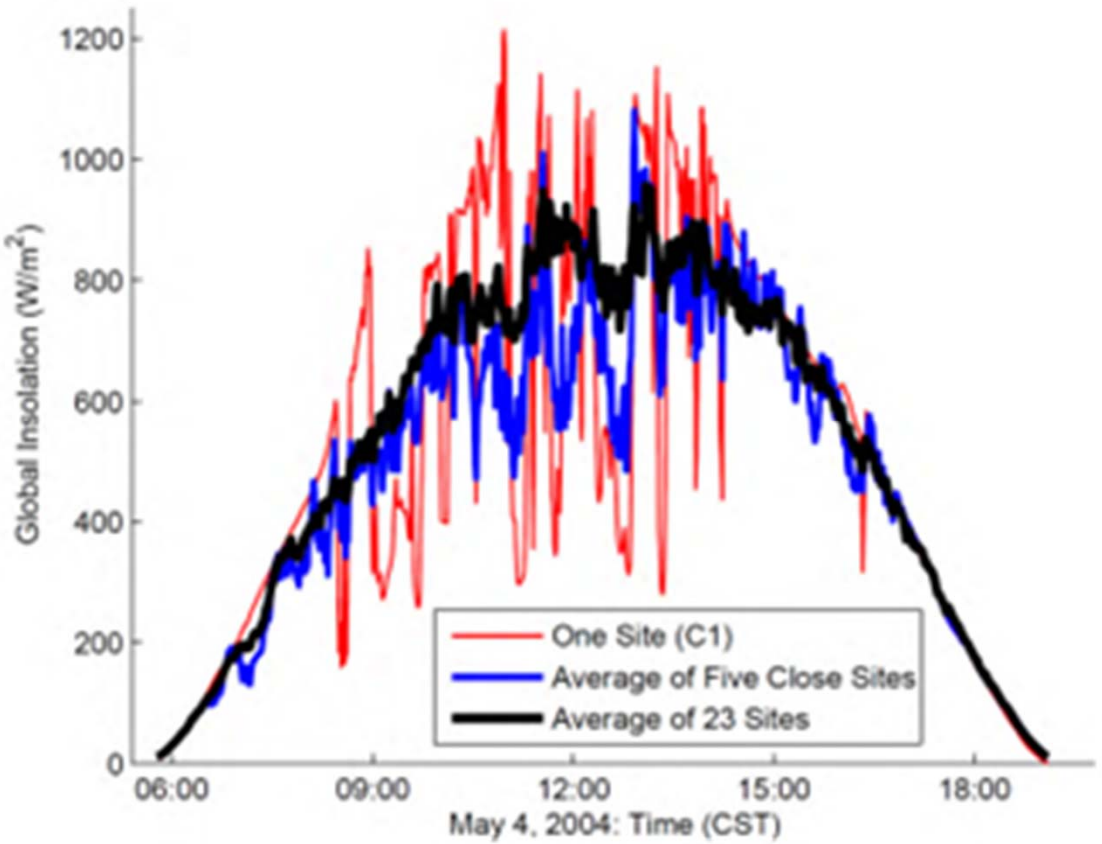
Solar resource availability in San Diego area is as good or better than unsubstantiated Pio Pico availability of 98%+

Demand hour range	Load Range (MW)	Average Solar Resource Availability (%)
Top 10 demand hours	4,468 – 4,601	98
Top 20 demand hours	4,312 – 4,601	99
Top 100 demand hours	3,883 – 4,601	99
Top 239 demand hours	3,500 – 4,601	99+

Rooftop solar output is very predictable on clear days – no fast-response ramping resources necessary



Distributed PV has predictable pattern on partly cloudy days. No fast-response ramping resources necessary. There are 15,000 PV sites in San Diego spread over 100s of square miles (graphic: LBNL)



Smart PV inverters enhance grid stability

source: B. Powers, *Bay Area Smart Energy 2020,* March 2012, pp. 103-105.

- It is necessary to keep the 60 Hz frequency as stable as possible in the transmission & distribution network.
- For the frequency to remain stable the generated active power must match the power demand at all times.
- However, many electricity consuming devices operate out-of-synch with a standard alternating current .
- This “out of synchronization” effect must be countered w/reactive power.
- Reactive power capacity of a three-phase smart PV inverter can be used as a fast-acting static reactive power compensator, controlled through a supervisory control and data acquisition system.
- Power factor correction and alternating current voltage regulation can be performed very economically by distributed three-phase smart PV inverters along the feeder.
- Germany requires smart PV inverters on systems 100 kW or greater.

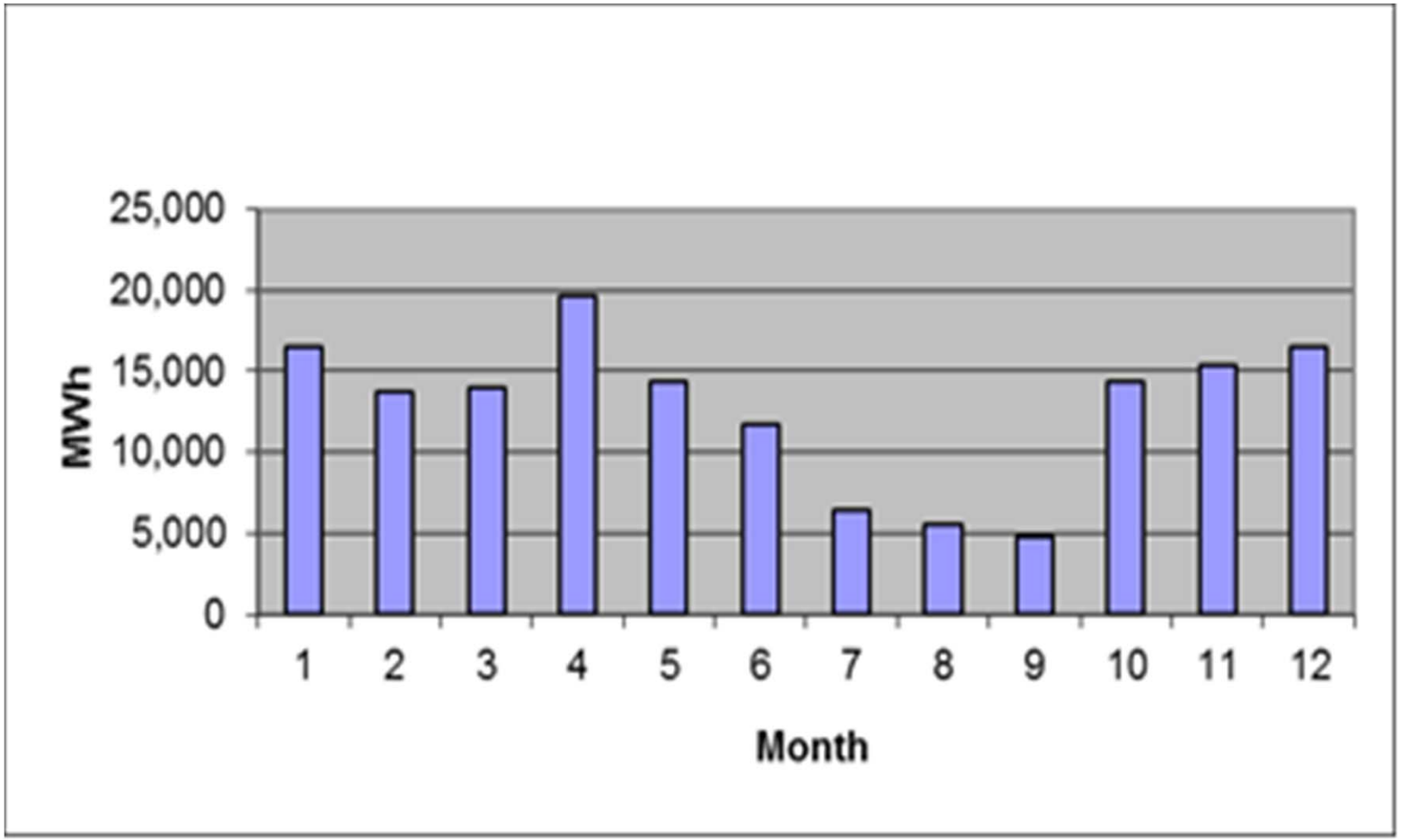
SCE warehouse rooftop PV project application, March 2008 – active remote inverter control to assure grid reliability

source: B. Powers, *Bay Area Smart Energy 2020,* March 2012, p. 105.

SCE noted in its March 2008 application that it will be able to remotely control the output from individual PV arrays to prevent overloading distribution substations or affecting grid reliability:

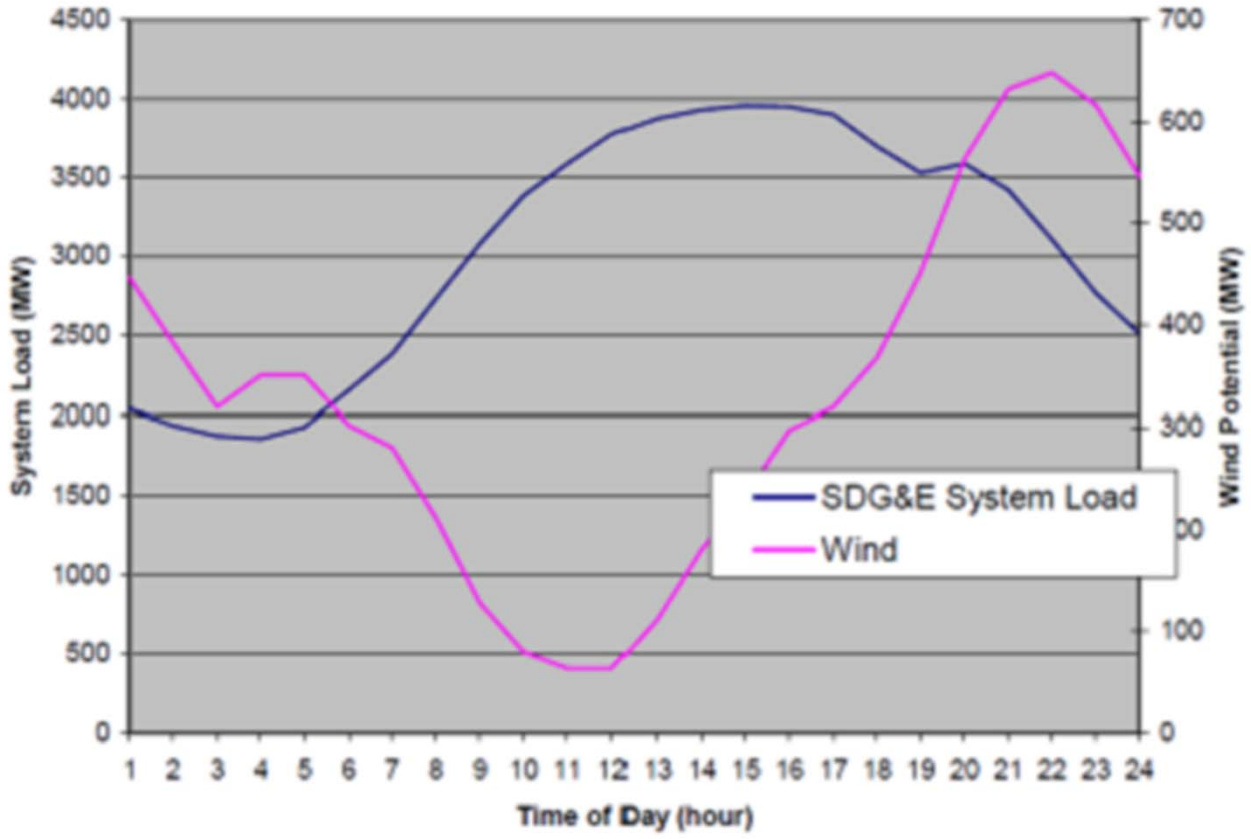
"The inverter can be configured with custom software to be remotely controlled. This would allow SCE to change the system output based on circuit loads or weather conditions."

Wind resource is weak in San Diego County in the summer months – 50 MW Kumeyaay wind project output, 2008



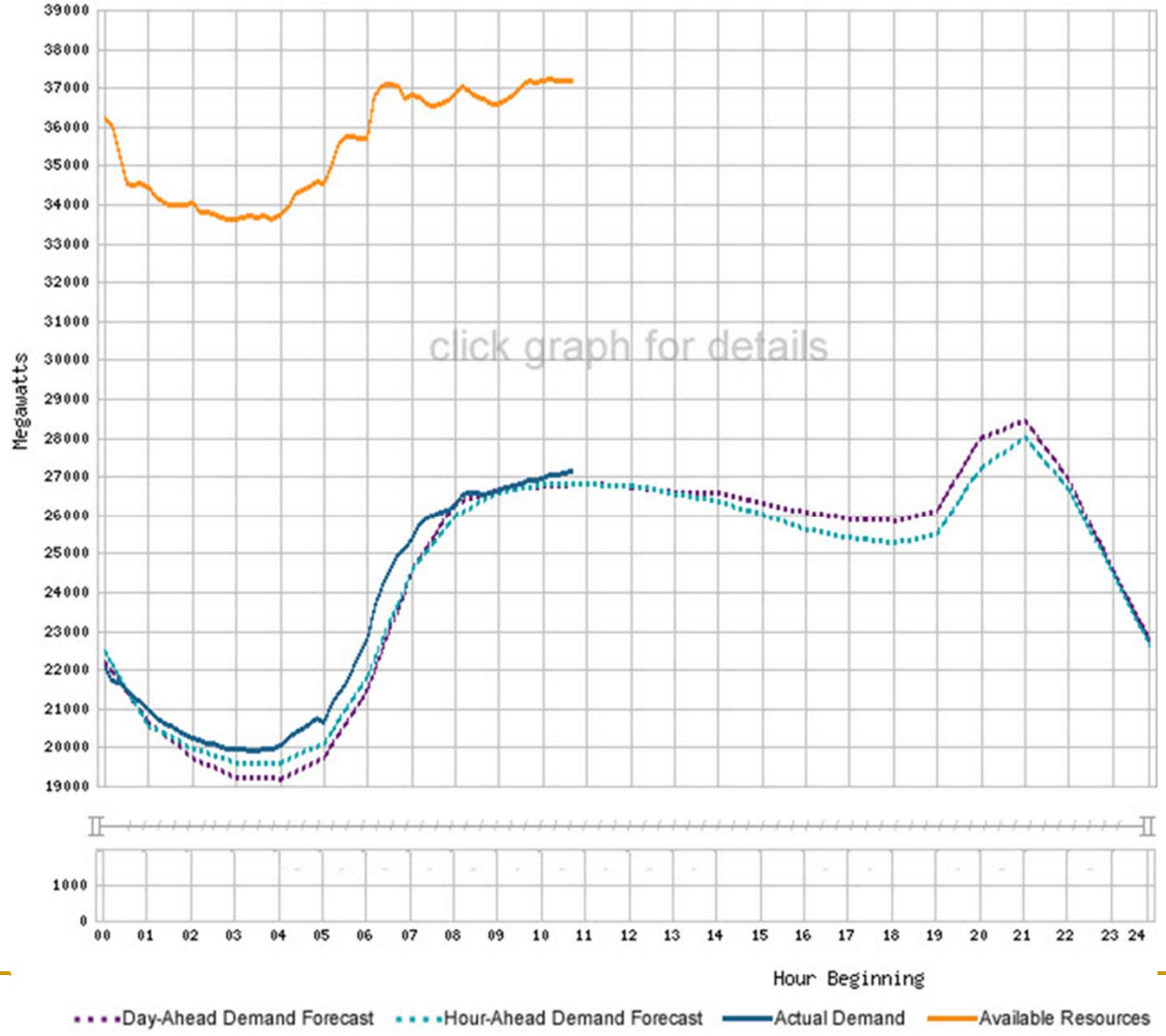
About 500 MW of regional wind in SDG&E PPA pipeline – even if entire 1,400 MW County technical potential developed, only 300 MW available at peak – yet 700 MW of existing peakers available to respond

source of 1,400 MW technical potential estimate: http://www.renewablesg.org/docs/Web/Wind.pdf.



CAISO prepares day-ahead and hour-ahead forecasts to ensure that sufficient generation is scheduled for the expected demand in the CAISO control area

source, CAISO Today's Outlook, July 22, 2012: http://www.caiso.com/Pages/AboutTodaysOutlook.aspx.



California already has ~6,500 MW of wind and solar installed – no brownouts/blackouts reported due to lack of ramping resources

sources: *AWEA U.S. Wind Industry Q1 2012 Market Report*; KCET, *California keeps breaking solar records*, July 11, 2012: http://www.kcet.org/news/rewire/solar/california-keeps-breaking-solar-records.html.

Resource type	MW installed, April 2012 (wind) and July 2012 (solar)
Wind	4,287
Utility-scale solar	971
Net-metered solar	1,255

NREL: 35 percent RPS feasible in West with little new gas-fired generation (source: National Renewable Energy Laboratory , *Western Wind and Solar Integration Study* , May 2010)

- Study examines challenges of integrating sufficient wind and solar into the grid to produce 35 percent renewable energy by 2017.
- NREL determined that utilities will have to substantially increase their coordination of operations over wider geographic areas and schedule their generation on a more frequent basis to accomplish 35 percent.
- Currently generators provide a schedule for a specific amount of power they will provide in the next hour.
- More frequent scheduling would allow generators to adjust that amount of power based on changes in system conditions such as increases or decreases in wind or solar generation.
- Coordinating the operations of utilities can provide substantial savings by reducing need for new back-up generation, such as gas-fired plants.
- Use of wind and solar forecasts in utility operations to predict when and where it will be windy and sunny is essential for cost-effectively integrating these renewable energy sources.

CEC [May 9, 2011 hearing] has already identified relatively poor wind and solar forecasting in California as problem – Germany avoided building new generation of peaker plants by improving wind and solar resource forecasting

RMSE Renewables Forecast Error	Germany, Spain[2]	California[1]
Day-Ahead	< 5%	< 15%
1 Hour-Ahead	1.5%	<10%

Conclusion

- The CEC alternatives analysis in the Pio Pico FSA is inadequate and ignores more cost-effective alternatives that are more compatible with the state's renewable energy future.

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APPLICATION FOR CERTIFICATION
FOR THE *PIO PICO ENERGY CENTER PROJECT*

Docket No. 11-AFC-01
PROOF OF SERVICE
(*Revised 7/10/2012*)

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DECLARATION OF SERVICE

I, Maggie Read, declare that on, August 13, 2012, I served and filed a copy of the attached EXHIBIT 304: SUMMARY OF REBUTTAL TESTIMONY BY BILL POWERS, P.E. POWERS ENGINEERING – PIO PICO HEARING, CHULA VISTA, CALIFORNIA, dated August 23, 2012. This document is accompanied by the most recent Proof of Service list, located on the web page for this project at: www.energy.ca.gov/sitingcases/piopico/index.html.

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