

Demand Response programs reduce or shift electricity use during peak demand times to help stabilize the grid. This can be done for a series of reasons including stabilizing electric prices and/or responding to electric grid emergencies.

Role of different entities

The California Public Utilities Commission (CPUC) is the policymaker and regulator responsible for overseeing demand response (DR) programs in the state. It sets the rules, goals, and funding levels for DR to ensure these programs align with California's broader energy, climate, and reliability objectives. The CPUC evaluates and approves DR program designs proposed by investor-owned utilities (IOUs), monitors their performance, and ensures they contribute meaningfully to Resource Adequacy (RA)—the system's ability to meet peak electricity demand. It also oversees DR pilots and research, such as Load Impact Protocols (LIPs), to evaluate program effectiveness and refine future offerings.

The California Independent System Operator (CAISO) manages the state's electricity grid and wholesale energy markets. CAISO plays a critical role in integrating DR as a grid resource, treating it as "virtual generation" that can be dispatched during times of high demand or grid stress. It accepts bids from DR programs like PG&E's Capacity Bidding Program (CBP) and triggers emergency load reduction events under programs such as ELRP. CAISO ensures DR participants are dispatched in real time alongside power plants and other resources to balance supply and demand across California.

The Investor-Owned Utilities (IOUs)—such as PG&E, Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E)—are responsible for implementing DR programs approved by the CPUC. They recruit and enroll customers, provide program incentives, and handle customer-facing operations like event notifications and baseline measurement. IOUs also coordinate with CAISO to ensure load reductions are bid into the market and verified properly. In programs like CBP, they aggregate customer load reductions and act as intermediaries between participants (like the City of Stockton) and CAISO's energy markets.

Meters

Meters can be installed to facilitate DR programs without changing the existing rate. Specific meters are required to be installed and active to participate in CBP or ELRP programs. The meter must 1) record usage in 15-minute intervals (or finer granularity) 2) be able to transmit interval data to PG&E in near real-time and 3) meet ANSI C12.20 Class 0.5 or better. The purpose of these standards is to be able to compare actual usage to baseline usage.

Generally, the number of meters correlates to the number of accounts. In some situations, multiple accounts can be combined under one account and therefore under one meter. This is not an administrative task, but physically combining circuits and load. It can only occur if multiple circuits feed together in a tree-like structure to a single meter without any non-street light load. PGE will provide the meter and installation if the account is 200kw or higher. This meter would

likely control 2000+ streetlights. If the city needs to buy and install the meter themselves it costs around \$3000 per meter (account).

Evri GIS has a PG&E street light bill for Sutter County. It looks like 1 account (1315985288-1) for 98 street lights. I assume this is 1 meter, but maybe not. I'm not sure.

https://drive.google.com/file/d/1RxIA8WXm6w7GTG4dGKEOwlr95dj37I_a/view

Understanding the baseline

Most demand response programs in California (like CBP and ELRP) use a 10-in-10 baseline with same-day adjustment. Your baseline is the average load during the same time window on the 10 most recent similar days (usually non-event weekdays). If an event occurs from 5–8 PM, your baseline = average power usage from 5–8 PM over the 10 most recent weekdays (excluding event days or holidays). If the baseline is zero (e.g., the lights are off during daylight), and the event happens from 1–3 PM, you cannot show a reduction — because there's nothing to reduce. Participation is tracked using interval meter data, and reductions are measured against a baseline.

Payment Rates

Payment rates are based upon which Sub-LAP Zone the street lights are in. We assume the street lights within the City of Stockton are entirely within the PG&E Stockton (PGST) Sub-LAP (long form) zone.

Sub-LAP Zone Map

<https://www.pge.com/assets/pge/docs/save-energy-and-money/energy-savings-programs/PGE-SubLap.pdf>

Analysis Description

This analysis assumes the city of Stockton enrolls in 2 demand response programs which can be done together. If the two programs call events at the same time, the reduction can only be counted toward one program, and PG&E will apply priority rules to determine which program takes precedence for payment. Generally, ELRP takes priority because it's an emergency program. The ELRP program has a higher payout - \$2.00 per kWh vs \$0.10/kWh. We are also going to assume PGE as the administrator of both programs.

Program 1: Capacity Bidding Program (CBP) as a Proxy Demand Resource (PDR)

This program is designed to help PG&E and CAISO avoid buying expensive electricity during peak demand periods. These are planned and scheduled proactively. Participants are notified by 3PM the day before the event of the hours during which load reduction is requested. Notifications come in multiple forms (email, text, etc) including through an API. The City will earn revenue by reducing electricity use from its streetlights during high-demand periods. The city enrolls a committed amount of load reduction capacity, which PG&E bids into the CAISO day-ahead market. When dispatched, Stockton dims its streetlights to meet the committed

reduction. If the city fails to deliver the committed reduction during a dispatched event, PG&E can reclaim (claw back) a portion of those capacity payments.

The city receives payment in two ways:

- a) Capacity Payments – for being available and committed to reduce a specific amount of load (e.g., dimming streetlights when called). This is paid regardless of whether an event occurs, as long as the city is available to respond.
- b) Energy Payments – for actual reductions during dispatched events. The more kilowatt-hours Stockton saves during a CBP event, the more it earns.

Program 2: Emergency Load Reduction Program (ELRP)

These events are called for grid emergencies called by CAISO. There are no upfront commitments and no penalties for non-performance. PG&E notifies the city of an ELRP event 2 hours to 30 minutes before an event via multiple methods including API.

How to calculate payments:

Assumptions:

- 20,000 street lights
- Average street light is 50w
- Average number of hours the lights is on 4100
- Amount of energy we can save = 75%
- Non-emergency events: 20 per year, each 3 hours long
- Emergency events: 5 per year
- CBP Capacity Payment Rate: \$100/kW/year
- CBP Energy Market Payment Rate: \$0.10/kWh
- ELRP Payment = \$2.00/kWh
- 46.8% of events occur when streetlighting is on (4100 hours / 365.25 days * 24 hours/day)

Program 1: CBP as a PDR via PG&E

Capacity Payment

$20,000 \text{ lights} \times 50\text{W} \times 75\% \text{ energy reduction} \times 46.8\% \text{ of events} = 351,000 \text{ W} = 351 \text{ kW}$

$351 \text{ kW} \times \$100 \text{ kW/year} = \$35,100/\text{year}$

Energy Payment

$20,000 \text{ lights} \times 50\text{W} \times 75\% \text{ energy reduction} \times 3 \text{ hours} \times 20 \text{ events} \times 46.8\% \text{ of events} = 21,060,000 \text{ W} = 21,060 \text{ kW}$

$21,060 \text{ kW} \times \$0.10/\text{kWh} = \$2106/\text{year}$

Total Payment

$$\$35,100/\text{year} + \$2106/\text{year} = \$37,206/\text{year}$$

Program 2: ELRP via PG&E

$$20,000 \text{ lights} \times 50\text{w} \times 75\% \text{ energy reduction} \times 5 \text{ events/year} \times 3 \text{ hour/event} \times 46.8\% \text{ of events} = 5,265,000 \text{ Wh} = 5,265 \text{ kWh}$$

$$5,265 \text{ kWh} \times \$2/\text{kWh} = \$10,530$$

Total payment for participation in both programs

$$\$37,206/\text{year} + \$10,530/\text{year} = \$47,736/\text{year}$$

$$\$47,736/\text{year}/20,000 \text{ street lights} = \$2.39/\text{street light}/\text{year} \text{ in DR payments}$$