Date of Hearing: April 23, 2025

ASSEMBLY COMMITTEE ON UTILITIES AND ENERGY
Cottie Petrie-Norris, Chair
AB 740 (Harabedian) – As Amended March 12, 2025

SUBJECT: Virtual power plants: load shifting: integrated energy policy report

SUMMARY: Requires the California Energy Commission (CEC) to create a strategy and perform a study to better understand the impact Virtual Power Plants (VPP) would have on the grid and to develop a framework for VPP implementation.

Specifically, **this bill:**

1) Requires the CEC to develop a strategy in consultation with the California Public Utilities Commission (CPUC), California Independent System Operator (CAISO), and the disadvantaged community advisory group. The strategy must:

    a. Estimate the VPP resource potential in 2030, 2035, and 2045.

    b. Identify barriers for VPPs to help with resource adequacy (RA) obligations and propose a pathway and policy changes to address the barriers.

    c. Include an assessment of the VPP resources currently eligible for RA and how this would change if the policies addressing the barriers were adopted.

    d. Include recommendations on the compensation framework for VPPs.

    e. Assess the barriers to data access necessary for VPP operation at scale.

    f. Maximize cost savings to ratepayers.

2) Requires the CEC to create a study by July 1, 2026 to better understand the impact of the implementation of Virtual Power Plants on energy cost and greenhouse gas (GHG) emissions by 2030, 2035, and 2045.

EXISTING LAW:

1) Requires the CPUC to consider the role of existing renewable generation, grid operational efficiencies, energy storage, and distributed energy resources, including energy efficiency, in helping to ensure each load-serving entity meets energy needs and reliability needs in hours to encompass the hour of peak demand of electricity. (PUC § 454.52(a)(3))

2) Requires the governing board of a local publicly owned electric utility to consider the role of existing renewable generation, grid operational efficiencies, energy storage, and distributed energy resources, including energy efficiency, in helping to ensure each utility meets energy needs and reliability needs in hours to encompass the hour of peak demand of electricity. (PUC § 9621)

3) Mandates the California Air Resources Board (CARB), in consultation with the CEC and the CPUC, to require battery electric vehicles to be bidirectional-capable, allowing EVs to support the grid. (HSC § 44269)

4) Directed the CEC to establish a statewide goal for load shifting and to adjust the goal in each biennial integrated energy policy report (IEPR). (Public Resources Code § 25302.7)

5) Allows funds from the safe drinking water, wildfire prevention, drought preparedness and clean air bond to be spent on zero-emissions distributed energy backup assets, virtual power plants, and demand side grid support. (PRC § 94530)

FISCAL EFFECT: Unknown. This bill is keyed fiscal and will be referred to the Committee on Appropriations for its review.

CONSUMER COST IMPACTS: Unknown.

BACKGROUND:
What is a Virtual Power Plant?—According to the CEC, VPPs consist of a network of decentralized, medium scale power generating units and flexible loads, such as batteries, EVs, smart appliances, and flexible heating and cooling loads that can be effectively managed to the benefit of grid operators.[1] A primary function of VPPs is to orchestrate aggregates of distributed energy resources (DERs). DERs are located on or near the site of end-use and are typically connected to the distribution grid. They fall into three categories: demand flexibility, electricity generation, and storage.[2] Common DERs are listed in Figure 1.

Potential Benefits and Problems Presented by the Implementation of Virtual Power Plants – These lists are not exhaustive.

Potential Benefits of VPPs

- VPPs may provide increased grid reliability and resilience during emergencies. VPPs may shift the daily peak load, potentially shaving 10-20%.[3]
    - This could decrease use of highly polluting peak gas power plants in the state.
    - This could decrease the cost of energy at the daily peak
- Increasing resource adequacy through VPP efficiency as opposed to building expensive infrastructure and new generation could decrease the cost of electricity for all ratepayers. The Brattle group predicts this could be $15- $35 billion by 2033 nationally.[4]

Potential Problems of VPPs

- Orchestrating the control and coordination of DERs in a circuit by circuit manner is extremely complex and has not yet been successfully implemented at scale.
- There can be difficulties in interoperability and compatibility with a diversity of DERs.

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[1] Angela Long, Ryan Long, Natalie Mims "Virtual Power Plant Profiles and Inventory", Rockcress Consulting and Lawrence Berkeley Labs, January 2025.
[2] Department of Energy, Pathways to Commercial Liftoff: Virtual Power Plants, September 2023.
[3] Department of Energy, "Pathways to Commercial Liftoff: Virtual Power Plants 2025 update", January 2025.
[4] Ryan Hledik, Kate Peters, Real Reliability: The Value of Virtual Power, May 2023

- Data collection and network connectivity is fundamental to VPP function. This makes VPPs vulnerable to cyber threats and consumers vulnerable to trespasses in privacy.
- The requirement for smart appliances, solar panels and electric vehicles as well as network connectivity will exclude moderate to low income customers from participating in these programs without assistance.

Figure 1[5]

Different types of DERs play different roles in a VPP. Four example DER types are:

Example DER	Common use in VPPs
Smart Thermostats	Internet-connected temperature controls can increase or decrease electricity demand from HVAC, particularly when seasonal demand is high (e.g., hot summer afternoons and cold winter mornings.) To avoid participant discomfort, buildings and homes can be pre-heated or pre-cooled during off-peak hours, and reductions in demand can be staggered over a two to four hour window.
Smart Water Heaters	Heat pump or resistive water heaters can be controlled remotely, for example to pre-heat water when clean energy supply is abundant or to avoid heating during peak demand. Controls may be embedded in or external to the water heater. Changes in demand timing are typically imperceptible to the owner.
EV Chargers	Managed or 'smart' EV chargers in buildings, homes, and charging stations can adjust charging power levels or delay charging sessions.[xii] Charging infrastructure may be unidirectional (charges the battery) or bidirectional (can also dispatch electricity from the battery out through the charger to a building or beyond the meter to the grid). Unidirectional chargers can time-shift demand; EV owners who leave their vehicle plugged in at home overnight, for example, will not notice changes in charge timing as long as the vehicle is sufficiently charged in the morning. Bidirectional chargers – called vehicle-to-X or V2X – may provide electricity akin to a BTM battery when an EV is plugged in.
BTM Batteries *(with solar)*	Distributed battery electricity storage systems provide back-up power during grid outages. They are charged when electricity is abundant – often with clean energy from paired distributed solar generation – and dispatched when electricity from the grid is scarce. Dispatch to the building where the battery is sited reduces demand on transmission lines and intermediate infrastructure on the distribution grid, such as substations. Batteries can also provide ancillary services to balance the grid, such as frequency regulation. When energy is dispatched beyond the meter where the battery is sited (less common today), the battery can help power other assets on the local grid.

Virtual Power Plants in the State of California – In 2020, the Federal Energy Regulatory Commission released Order No. 2222, which enabled distributed energy resources to better participate in electricity markets run by regional grid operators, primarily mediated by a distributed energy resource aggregator (a VPP or the utility itself).[6] Despite this federal permission structure, how virtual power plants should integrate into CAISO is still unclear. In

[5] Department of Energy, Pathways to Commercial Liftoff: Virtual Power Plants, September 2023.
[6] https://www.ferc.gov/ferc-order-no-2222-explainer-facilitating-participation-electricity-markets-distributed-energy, accessed April 20, 2025

addition, there remains ambiguity as to how aggregators are classified relative to utilities, how they will be regulated by the CPUC, and how these programs can be deployed at scale.

In 2021, the CPUC approved the creation of the Emergency Load Reduction Program (ELRP) as a pilot program for a demand response approach to help avoid rotating outages during peak summer electricity use. ELRP incentivizes load reduction and is administered by the 3 IOUs. Virtual Power Plants are permitted to participate in this program.

The CEC established a Load-Shift goal of 7,000 MW by 2030 and has been seeking solutions to meet this goal. In 2022, AB 205 passed, establishing the Demand Side Grid Support (DSGS) program administered by the CEC. The goal of the DSGS program is to offer incentives to electric customers that provide load reduction and backup generation to support the state's electrical grid during extreme events, reducing the risk of blackouts. The current DSGS program guidelines includes two VPP pilot programs.[7] These programs will eventually be evaluated for performance and cost effectiveness. Below are the two VPP pilot program guidelines:

1) Market-Aware Storage Virtual Power Plant (VPP) Pilot offers a capacity payment for behind-the-meter storage VPPs based on demonstrated capacity. Program events are triggered based on day-ahead California ISO energy market prices exceeding a specified price threshold, but the VPP capacity is not actually bid into the energy market. An energy incentive is available for VPPs that respond to a day-of emergency.

2) Emergency Load Flexibility VPP Pilot offers capacity-based compensation for load reduction capacity committed by dispatchable VPPs composed of aggregated smart thermostat-controlled HVAC systems, electric water heaters, electric vehicle supply equipment (EVSE), stationary batteries, and residential "smart electrical panels." Program events are triggered based on energy emergency alerts issued by a California balancing authority.

Multiple grants have been made in the DSGS program including to Tesla, Sunrun, and OhmConnect.[8] All IOUs in California now offer limited membership to VPPs. For example, Southern California Edison offers membership to VPPs through agreements with AutoGrid, Generac, SunPower, Sunrun and Swell Energy.[9]

In 2023 the CEC established load management standards that require utilities to develop and standardize the communication of time varying rates, intending to allow third parties to participate in demand response and VPPs. In 2024, the CEC released the Virtual Power Plant Approaches for Demand Flexibility solicitation, which provides $15,000,000 in grants to fund

[7] CEC, "Demand Side Grid Support (DSGS) Program Guidelines", Fourth Edition, April 2025 CEC-300-2024-021-CMF
[8] Brattle, "California's Virtual Power Potential: How Five Consumer Technologies Could Improve the State's Energy Affordability," April 2024.
[9] https://energized.edison.com/stories/virtual-power-plants-energy-reserves-for-home-and-the-grid, Accessed April 4 2020.

demonstrations of community-based virtual power plant (VPP) approaches that increase demand flexibility.[10]

COMMENTS:

1) *Author's Statement.* According to the author, "As Californians face high energy bills, virtual power plants offer a simple solution - using clean energy already in our homes and businesses to stabilize the grid, lower costs, and strengthen our future. I'm proud to partner with Advanced Energy United, Environment California, and The Climate Center to make energy cleaner and more affordable in our state."

2) *The Goal of the Bill.* Virtual Power Plants have been identified as a way meet California's load shift goals. It remains unclear how VPPs should be implemented on a statewide level that would be safe, effective and cost effective for the grid and for ratepayers. The goal of this bill is to assess the costs and benefits of VPPs to Californians and better outline an implementation plan.

3) *Clarifying the goal to understand how VPPs will qualify for resource adequacy. "*Resource adequacy" is how California utilities, community choice aggregators and other power providers refer to the process of securing enough grid resources to meet peak demand in future years. It is thought that VPPs should be able to help meet peak demand. There are currently regulatory barriers to implementation of VPPs statewide and for VPPs to gain access to appropriate statewide incentive programs and qualify for mandates. *In alignment with the author's stated intentions, the committee recommends including language to identify barriers and clarify the interagency communication required to assess VPPs' resource adequacy qualifications.*

4) *Clarifying the goal to understand how VPPs will act as load-modifying resources that reduce a Load Serving Entity's Resource Adequacy obligations.* DERs have traditionally been "visible" to CAISO as load reduction resources, where their deployment reduces the overall system demand for an LSE. For example, behind-the-meter rooftop solar reduces the need for alternative resources during the sunniest parts of the day and year. For VPPs that don't qualify as a resource adequacy resource soutright, there is still value in the VPP if the CEC considers them "load-reducing." Such valuation enables LSEs to use these demand-side resources to reduce their IEPR demand forecast, and subsequently their RA obligations. *In alignment with the author's stated intentions, committee recommends including language to identify barriers and clarify the interagency communication required to allow VPP resources to reduce a load serving entities' resource adequacy obligations.*

5) *Evaluating cost savings.* The bill currently mandates that the strategy must maximize cost savings to ratepayers. However, VPPs can impact cost in many ways. *The committee recommends including an evaluation of cost savings and a recommendation of an*

[10] CEC, GFO-23-309 Pre-Application Workshop, March 28, 2024

incentive structure that will maximize benefits to participating and non-participating ratepayers, as well as the grid. In addition, the committee recommends including language that ensures that the incentive structure does not result in increased costs for nonparticipating ratepayers as a result of VPP deployment.

6) *Removes the creation of a redundant plan.* After clarifying the goals of the original "strategy" defined in the bill, the committee finds that the additional study is redundant. *The committee recommends removing the mandate for this addition study (Section 25562 of bill).*

7) *Additional Amendments. The bill requires additional clean-up or reorganization for clarity. The committee recommends accepting all of these changes.*

8) *Related Legislation.*

AB 1117 (Zbur) Creates optional, dynamic electricity rates for large investor-owned utility (IOU) customers. These rates would change based on real-time conditions of the electricity grid and market prices. Participation in these dynamic pricing plans would be voluntary. The bill also aims to ensure that adopting these new rates doesn't unfairly shift costs between different customer groups. Status: Pending hearing the Assembly Committee on Appropriations, after passing the Assembly Committee on Utilities and Energy on a 14-0-0 vote.

AB 44 (Schultz) Requires the CEC to create and share methods for adjusting load-serving entities' energy demand forecasts. These methods will be based on the use of technologies and programs that reliably reduce or shift electricity use, as agreed upon by the CEC, the CPUC, and the California Independent System Operator. Status: Pending hearing in the Committee on Utilities and Energy on April 23, 2025.

SB 541 (Becker) requires the CEC to establish the incremental load shifting needed to meet the statewide load-shifting goal in the annual integrate energy policy report. The bill would also establish rules for evaluating load-shifting strategies and require all utilities to provide dynamic pricing tariffs. Status: Pending hearing in the Senate Committee on Energy, Utility and Communications on April 21, 2025.

9) *Prior Legislation.*

SB 1305 (Stern) would require the CPUC, in coordination with the State Energy Resources Conservation and Development Commission and the Independent System Operator, to take begin a proceeding to determine targets for virtual power plants procurement and require IOUs to report on their progress to meeting these targets. Status: Held in the Senate Committee on Energy, Utility and Communications in 2024

SB 867 (Allen) enacted the Safe Drinking Water, Wildfire Prevention, Drought Preparedness, and Clean Air Bond Act of 2024, if approved by the voters. The bill would authorize the issuance of $10,000,000,000 in bonds to finance projects for safe drinking

water, drought, flood, and water resilience, wildfire and forest resilience, coastal resilience, extreme heat mitigation, biodiversity and nature-based climate solutions, climate-smart, sustainable, and resilient farms, ranches, and working lands, park creation and outdoor access, and clean air programs. Status: Chapter 83, Statutes of 2024

SB 59 (Skinner) authorizes the California Air Resources Board (CARB), in consultation with the CEC and the CPUC, to require battery electric vehicles to be bidirectional-capable if it determines that there is a sufficiently compelling benefit to the BEV operator and the electrical grid. Status: Chapter 765, Statutes of 2024.

AB 205 (Ting) authorized funding and changes in many energy focused programs, including the Demand Side Grid Support Program and appropriated $200,000,000 to the CEC to run the Program. Status: Chapter 61, Statutes of 2022.

SB 846 (Dodd) primarily extended the operations of the Diablo Canyon Powerplant. The bill also directed the CEC to establish a statewide goal for load shifting and to incorporate the goal in each biennial integrated energy policy report. Status: Chapter 239, Statutes of 2022.

SB 49 (Skinner) Expands the California Energy Commission's (CEC) authority to develop standards for appliances to facilitate the deployment of flexible demand technologies. Status: Chapter 697, Statutes of 2019.

REGISTERED SUPPORT / OPPOSITION:

Support

350 Bay Area Action
350 Humboldt: Grass Roots Climate Action
Advanced Energy United
Boma California
California Apartment Association
California Building Industry Association
California Business Properties Association
California Energy Storage Alliance
California Environmental Voters (formerly Clcv)
California Solar & Storage Association
Center for Biological Diversity
Ceres, INC.
Clean Coalition
Clean Power Campaign
Climate Center; the
Climate Health Now
Coalition for Clean Air
Collective Resilience

Courage California
Democrats of Rossmoor
Environment California
Environmental Defense Fund
Naiop California
Pearlx
Renew Home
Rewiring America
Solar United Neighbors Action
Sustainable Rossmoor
Technet
The Climate Reality Project Orange County Chapter
The Climate Reality Project San Diego Chapter
The Climate Reality Project, Bay Area Chapter
The Climate Reality Project, California State Coalition
The Climate Reality Project, Los Angeles Chapter
The Climate Reality Project, Riverside County Chapter
The Climate Reality Project, Sacramento Chapter
The Climate Reality Project, San Fernando Valley CA Chapter
Union of Concerned Scientists
Vote Solar
Western Region Ceres

Opposition

None on file.

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