

DOCKETED

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Request for Information Flexible Demand Appliance Standards Docket 20-FDAS-01 Written Comments Due: October 1, 2021

The California Energy Commission (CEC) seeks stakeholders' input on the development of Flexible Demand Appliance Standards (FDAS) required by Senate Bill 49 (Skinner, Chapter 697, Statutes of 2019) (SB 49). FDAS promote technologies to schedule, shift, and curtail appliance operations to benefit consumers and reduce greenhouse gas (GHG) emissions associated with electricity generation, while also supporting grid resiliency.

Background

The CEC continues to work towards a clean and equitable energy future for California through implementation of innovative energy policies, including decarbonization of the state's electrical grid. Decarbonizing the state's existing residential and commercial buildings will require a variety of measures including energy efficiency, demand flexibility, strategies to reduce carbon intensity of end-use equipment and appliances, and deployment of behind-the-meter clean energy resources. The California Legislature has required through SB 49 that the CEC set minimum standards for appliances sold or leased within the State of California to promote flexible demand, ensure customer consent and protection, support grid operations, and ensure cybersecurity.

Staff initially plan to examine appliances in three phases as shown in the table below. The phases are prioritized by potential to meet state clean energy goals and readiness for flexible demand appliance standards.

Table 1. Appliance Phases

Phase	Appliance(s)
Phase 1	Thermostats
Phase 1	Pool Pump Controls
Phase 1	Dishwashers
Phase 1	Electric Clothes Dryers
Phase 2	Electric Storage Water Heaters
Phase 2	Behind the Meter (BTM) Batteries
Phase 3	Electric Vehicle Supply Equipment (EVSE)

Source: California Energy Commission

Stakeholder Feedback and Public Input

The request for information (RFI) provides an opportunity for written comment on the information presented by staff. Where feasible, comments should be as specific as possible

and include examples and recommendations with supporting references. Stakeholders should identify which comments are addressing which specific questions numbered below. Staff will review comments in depth and may use the information provided to develop implementation proposals for Phase 1 FDAS. Proposed standards will be based on the proceeding record, which may include data and technical analyses by CEC staff and stakeholders. Analysis and information developed in other proceedings at the CEC and by other agencies will be incorporated as appropriate.

General Appliances Information

Staff has identified the following appliance types and examples to be included in the first three phases of FDAS:

Table 2. Scoping Matrix

Appliance	In Scope Examples	Out-of-Scope Examples
Thermostats	Low-voltage thermostats	Line voltage, milli-volt, thermostats for building control systems
Pool Pump Controls	Pool pump controls integral to pool pumps, pool system controls, pool timers	Pool pump controls for integral cartridge or integral sand filter pumps
Dishwashers	Consumer dishwashers	Commercial dishwashers
Electric Clothes Dryers	Consumer electric clothes dryers	Commercial electric clothes dryers
Electric Storage Water Heaters	Electric resistance and heat pump electric storage water heaters	Instantaneous electric water heaters, gas and propane water heaters
BTM Battery Systems	Residential applications	Non-residential and utility applications
EVSE	Level 2, Direct Current EVSE	Level 1 EVSE, Heavy Duty EVSE

Source: California Energy Commission

Staff is seeking feedback on the following questions related to the appliance types identified above:

1. For each appliance, are there additional examples that should be considered in scope or out-of-scope? Based on what factors?
2. What additional appliances should be considered for future FDAS development beyond the first three proposed phases and why?

Flexible Demand Cost Assumptions

Staff has identified a range of typical flexible demand functions associated with appliances, assessing the current market share and likely incremental cost of including these capabilities, as identified in Table 3. Approaches are identified as flexible demand functions, such as timer-based functionality to shift load, grid response through connectivity, and ubiquitous protocols. Ensuring the validity of these cost assumptions is important to completing the cost-effectiveness analysis for any given appliance standard.

Table 3. Flexible Demand Approaches and Incremental Costs

Approach	Incremental Cost	Market Share	General Description
Delay Capability	\$3	50%	Consumer ability to delay the start of the appliance by up to 24 hours in 1-hour increments
Scheduling and Clock Capability	\$3	50%	Consumer can set a schedule for appliance to follow to control operation
Connected Appliance	\$30	10%	Capable of connection through internet protocol, Bluetooth, and/or signal response to enable receipt of load shift commands
Open Automated Demand Response (OpenADR)	\$40	10%	Capable of receiving and responding to OpenADR signals and protocol
American National Standards Institute/ Consumer Technology Association (ANSI/CTA) 2045	\$40	5%	Capable of receiving and responding to signals through the modular communications interface for energy management
FM Broadcast	\$40	5%	Capable of receiving and responding to radio FM signals and protocol

Source: California Energy Commission

3. What is the market share of each identified appliance with the flexible demand approaches identified above?
4. What other flexible demand approaches are available for staff to consider? Please include references to publicly available sources.
5. What inspections or test methods should staff use to verify compliance with each approach?

Appliance stock numbers for California are essential for estimates of future load flexibility, especially for projected savings to consumers of those appliances. Staff has compiled the following appliance stock estimates shown in Table 4 modified from the sources identified for future values, and seeks feedback on the data provided:

Table 4. Appliance Stock Numbers - California

Appliance	Estimated 2023 Stock (millions)	Estimated 2033 Projected Stock (millions)	Source
Thermostats	6.4	6.7	Residential Appliance Saturation Study (RASS) 2019
Pool Pump Controls	1.6	1.7	CEC staff and U.S. Department of Energy (DOE) Technical Support Document
Dishwashers	8.3	8.7	RASS 2019
Electric Clothes Dryers	3.9	4.2	RASS 2019
Electric Storage Water Heaters	0.9	4.3	RASS 2019 integrated with Advanced Water Heating Initiative (AWHI) targets
BTM Battery	0.3	5.0 to 7.0	BTM Energy Storage Forecast, CEC December 2020 SB 100 Joint Agency Report, CEC March 2021
EVSE (Residential + Public)	0.6	5.6	CEC

Source: California Energy Commission

6. With consideration to high and low projected stocks for Table 1 Phase 1 appliances, what other sources of information are available to estimate current and projected appliance stocks in CA?
7. Which resource(s) should be considered the most reliable estimate of appliance stock and why?

Estimated product lifetimes are shown in Table 5. These estimates impact cost-effectiveness analyses of load flexibility technologies. Table 5 details the source and estimated life span for each appliance.

Table 5. Product Lifetime

Appliance	Product Lifetime	Source
Thermostats	10 years	DOE Grid Enabled Buildings Estimate
Pool Pump Controls	7 years	Staff estimate by review of DOE Technical Support Document
Dishwashers	15 years	DOE Technical Support Document
Electric Clothes Dryers	15 years	DOE Technical Support Document
Electric Storage Water Heaters	15 years	DOE Technical Support Document
BTM Battery Cell	10 years	CEC staff based on BTM battery warranty
EVSE	10 years	U.S. Environmental Protection Agency ENERGY STAR Program

Source: California Energy Commission

- Are there alternative assumptions for product lifetime for the identified appliances that staff should consider and why? Please provide sources of information for those alternative assumptions.

Load Shift Calculation Methodology

Staff plans to estimate the flexible demand capability of appliances based on the current time of use (TOU) electricity rates by the five major load serving entities (LSEs): Pacific Gas & Electric, Sacramento Municipal Utility District, Southern California Edison, San Diego Gas & Electric, and Los Angeles Department Water and Power.

Staff is expressing the quantity of energy that is available to be shifted on average over the course of the year (or the time-period being considered, if different from a year) at times when the grid is likely to need demand shifts. Analysis is being done for each LSE and then aggregated statewide.

Staff plans to calculate the daily load shift capability of each appliance as a consumer’s reaction to utility price changes between off-peak and on-peak charges using time-of-use rates. Generally, the rate schedules used in our analysis have on-peak charges between 5:00 pm and 8:00 pm. This shift capability will be expressed in megawatt-hours (MWh).

In addition, staff will calculate flexible capacity of the appliances based on the remaining load. To determine this staff will take the current load shape adjustment based upon consumer demand price elasticity and the remaining unshifted load is assumed to be available for an emergency event. This capability will be expressed as a reduction in peak load in megawatts (MW).

- What other methods are there to estimate the flexible demand capability of appliances that better account for the range of benefits enabled?
- What forecasts for TOU rates in California are available for staff to consider?
- What information is available on the price elasticity of demand for electricity, and how should the methodology change depending upon increasing automation and changes in electricity rates?
- What comments are there on this approach to estimating flexible demand capability?

Table 6 details the hourly load shapes staff intends to utilize to model current use and potential load shape shifts of each appliance in Table 1. Staff has reviewed appliance load shape data from select sources shown in Table 6, and requests that stakeholders provide additional sources of information on load shapes for these appliances.

Table 6. Appliance Load Shape Data Sources

Load Shape Data	Organization	Description
Hourly Electric Load Model	CEC	Load forecast shapes for appliances in CA
End-Use Load and Consumer Assessment Program	Pacific Northwest National Laboratory	Load forecast shapes for appliances for USA
Residential Appliance Saturation Survey	CEC	Loads per week for clothes dryers and dishwashers; pool pump use by hour

Source: California Energy Commission

13. What other appliance load shape data sources are currently available?
14. What sources exist for commercial and industrial appliance load shapes?

Changes in GHG Emissions Calculation Methodology

SB 49 introduced the ability for FDAS to consider the value of reduced GHG emissions as part of its cost-effectiveness determination. An assessment of GHG reductions resulting from standards will also help staff estimate the environmental impact of proposed standards. From the data in Table 7, staff plans to estimate changes in GHG emissions due to flexible demand capability of appliances through use of hourly average emission intensity projections through 2033. Staff seeks responses to the following questions:

15. What other methods are there to estimate changes in GHG emissions from demand flexibility of appliances?
16. What forecasts for hourly average GHG emissions intensity are available?
17. For long-term projections on changes in GHG emissions due to load shifting, will estimates of hourly marginal emissions or hourly system average emissions be the best metric?
18. If hourly marginal projections are suggested, what information is available to support sensitivity analyses and how future rates might vary depending upon increasing challenges to electricity system reliability?

Staff plans to monetize the changes in GHG emissions associated with each appliance by multiplying the estimated change in emissions with the value per metric ton of carbon dioxide equivalent (CO₂e).

19. What comments are there on this approach to estimate the value of changes in GHG emissions?

Table 7. GHG Emissions Data Sources

GHG Emissions Data	Organization	Description
2021 Integrated Energy Policy Report (IEPR) GHG Emissions projections	CEC	Average emission projections available for 8,760 hours in a year
2021 GHG Allowance Prices	CARB	Cap-and-Trade GHG Allowance auction results
2021 California Public Utility Commission (CPUC) Avoided Cost Calculator	CPUC	Tool for cost-effectiveness analysis of distributed energy resources

Source: California Energy Commission

20. What other values in (\$) per metric ton of CO₂e for GHG emissions data sources are available?

Cybersecurity

Cybersecurity is a critical need and important consideration identified in FDAS, when it comes to protecting consumers of appliances with flexible demand technologies. Staff has compiled a list of existing standards in Table 8 that may be used as reference sources for crafting minimum cybersecurity requirements.

Table 8. Cybersecurity

Cybersecurity Standard	Organization	Description
NERC Critical Infrastructure Standards	North American Electric Reliability Corporation (NERC)	Minimum cybersecurity standards for critical grid infrastructure
NIST 8259 A	National Institute of Standards and Technology (NIST)	Cybersecurity for IoT Device Manufacturers
PAS 1878:2021 and PAS 1879:2021	British Standards Institute	British standards for smart appliances
SB 327 (Jackson, 2018)	California State Government	CA statute on connected devices and information privacy
UL 2900-1 Standards	Underwriters Laboratories (UL)	Minimum standards for network-connectable products
ETSI TS 103 645	Cyber Security for Consumer Internet of Things (IoT)	Good practices for IoT devices
CTA-2088	Consumer Technology Association (CTA)	Cybersecurity capabilities for connected consumer devices
AB 375 (Chau, 2018)	Consumer Privacy Act	Gives consumers more control over the personal information that businesses collect

Source: California Energy Commission

- 21. What other documents should staff review regarding cybersecurity standards?
- 22. What minimum standards are needed for cybersecurity of flexible demand appliances?

Customer Consent

SB 49 statutes require that staff prioritize consumer consent and consider what mechanisms should be used to inform customers of the appliances' flexible demand capabilities to obtain their consent, and maximize their use of these capabilities. Please provide comments about best practices and the effectiveness of the following approaches to obtaining customer consent:

23. Information on appliance packaging materials and manufacturer websites describing the appliances' flexible demand capabilities.
24. Electronic consent functions, opt-in or opt-out features, and error notifications.
25. Methods to obtain customer consent prior to collecting consumer data.
26. Policies for acceptable use of customer data.
27. Consent to flex features implied by purchase or express by other customer action.

Equity

Staff continues to seek information to inform an assessment of the potential impacts and benefits proposed standards may have on low-income customers and disadvantaged communities. Following guidance from the Governor and Legislature, the CEC continues to consider and prioritize equity and inclusivity as a key part of its overall clean energy goals. FDAS development and implementation efforts will consider affordability and customer benefits as key factors in determining success. In addition, staff requests the following:

28. What considerations should inform staff analyses on the projected equity impacts of proposed standards, to ensure flexible demand appliance sold or leased in California benefit all Californians?
29. What consumer protection mechanisms should be considered to prevent hardship or inconveniences to disadvantaged communities?

Appliance-Specific Questions

In addition to the general discussion and questions related to key foundational topics listed above, staff also proposes specific questions for each of the following appliance types identified in Phase 1 (Table 1) for stakeholder feedback.

Thermostats

Staff seeks information on the market share of various flexible demand technologies for thermostat regulations.

30. What percentage of thermostats have a scheduling function for automating thermostat operation?
31. What percentage of thermostats sold or leased in California have an ability to connect to the internet?
32. What percentage of thermostats sold or leased in California have an ability to receive and act upon simple OpenADR commands to alter the thermostat operating schedule?

Pool Pump Controls

Staff seeks information on definitions to describe the scope of FDAS pool pump control regulations.

33. What definitions are useful to describe a pool pump control integral to a pool pump?
34. What definitions are useful to describe a pool pump control that is a separate device from a pool pump?

Staff seeks information on the market share of various flexible demand technologies related to pool pump controls.

35. What percentage of pool pump controls have a scheduling function for automating pool pump operation?
36. What percentage of pool pump controls sold or leased in California have an ability to connect to the internet?
37. What percentage of pool pump controls sold or leased in California have an ability to receive and act upon simple OpenADR commands to alter the pool pump operating schedule?

Dishwashers

Staff seeks information to describe the state of flexible demand technology for dishwashers within the marketplace.

38. What percentage of dishwashers sold or leased in California have a delay start and/or scheduling function?
39. What percentage of dishwashers sold or leased in California can be connected to manufacturer specific app, home area network, or another communications hub?
40. Identify the specific additional costs or range of costs, at retail, of a dishwasher that has 1) a delay start or scheduling function and 2) other flexible demand functionality compared to a base model dishwasher.

Consumer Electric Clothes Dryers

Staff seeks information to describe the state of flexible demand technology for electric clothes dryers within the marketplace.

41. What percentage of electric clothes dryers sold or leased in California have a delay start and/or scheduling function?
42. What percentage of electric clothes dryers sold or leased in California can be connected to a manufacturer-specific app, home area network or another type of communications hub?
43. Identify the specific additional costs or range of costs, at retail, of a consumer electric clothes dryer that has: 1) a delay start or scheduling function and 2) other flexible demand functionality compared to a base model clothes dryer.

Submitting Comments to the CEC Docket

Active participation is encouraged because public input is essential to ensure a complete and thorough record for this rulemaking.

Written comments must be submitted to the Docket Unit **by October 1, 2021**. Written comments, attachments, and associated contact information (e.g., address, telephone number, email address) will become part of the public record of this proceeding with access available via any internet search engine. One or more public hearings, and public input periods will follow on the proposed draft text of regulations.

The CEC encourages use of its electronic commenting system. Visit the [e-commenting page](https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-FDAS-01) at <https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=20-FDAS-01>, which links to the comment page for this docket. Enter your contact information and a comment title describing the subject of your comment(s). Comments may be included in the "Comment Text" box or attached in a format consistent with California Code of Regulations, title 20, section 1208.1. The maximum file size is 10 MB.

Written comments may also be submitted by email. Include the docket number 20-FDAS-01 and "Flexible Demand Appliance Standards" in the subject line and send to <mailto:docket@energy.ca.gov>.

If preferred, a paper copy may be submitted to:

California Energy Commission
Docket Unit
Re: Docket No. 20-FDAS-01
715 P Street
Sacramento, CA 95814

Public Advisor and Other Commission Contacts

The CEC's Public Advisor's Office provides the public assistance in participating in CEC's proceedings. For information on how to participate in this forum, or to request language services or other reasonable accommodations, please contact the Public Advisor's Office at publicadvisor@energy.ca.gov, (916) 654-4489, or toll free at (800) 822-6228. Direct questions on the subject matter of this RFI to: Nicholaus Struven at nicholaus.struven@energy.ca.gov or (916) 805-7458, or Todd Ferris at todd.ferris@energy.ca.gov or (916) 931-9605.

Media

Direct media inquiries to the Media and Public Communications Office at mediaoffice@energy.ca.gov or (916) 654-4989.

Availability of Documents

All records for the process will be accessible in the [Flexible Demand Appliance Standards docket](https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-FDAS-01) (20-FDAS-01), <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-FDAS-01>. CEC staff will notice workshop dates in the docket. When new information is posted, an email will be sent to those on the Load Management and Flexible Demand list server. To receive these notices, subscribe at the [Flexible Demand Appliance webpage](https://www.energy.ca.gov/proceedings/energy-commission-proceedings/flexible-demand-appliances), <https://www.energy.ca.gov/proceedings/energy-commission-proceedings/flexible-demand-appliances>.