DOCKETED	
Docket Number:	17-AAER-10
Project Title:	Irrigation Controllers
TN #:	268960
Document Title:	Revised Staff Analysis of Proposed Efficiency Standards for Landscape Irrigation Controllers
Description:	N/A
Filer:	Soheila Pasha
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	3/5/2026 3:12:25 PM
Docketed Date:	3/5/2026

California Energy Commission

STAFF REPORT

Revised Staff Analysis of Proposed Efficiency Standards for Landscape Irrigation Controllers

Appliance Efficiency Pre-Rulemaking

Docket Number 17-AAER-10

March 2026 | CEC- 400-2023-012-REV

California Energy Commission

Soheila Pasha, Ph.D.
Primary Author

Soheila Pasha, Ph.D.
Project Manager

Peter Strait
Branch Manager
APPLIANCES BRANCH

Scott Blunk
Deputy Director
EXISTING BUILDINGS AND APPLIANCES

Michael J. Sokol
Director
EFFICIENCY DIVISION

Drew Bohan
Executive Director

ACKNOWLEDGEMENTS

The California Energy Commission Appliances Office would like to thank the following individuals and entities for their contributions:

Maria Flores-Rivera

Andrew Maksimovich

Josephine Crosby

Ana Gonzalez

David U. Johnson, Ph.D.

Jessica Lopez

The CEC's Landscape Irrigation Controllers Workgroup members

California Investor-Owned Utilities, Codes and Standards Enhancement (CASE) team

California Water Efficiency Partnership

Energy Solutions

Hunter Industries

Irrigation Association

Irrometer Company

Orbit Irrigation

Rachio

Rain Bird Corporation

Sata Rosa Water

Sonoma County Water Agency

Toro Company

U.S. Environmental Protection Agency WaterSense Program

Weathermatic

PREFACE

On March 14, 2012, the California Energy Commission (CEC) issued an order instituting rulemaking (OIR) to consider standards, test procedures, labeling requirements, and other efficiency measures to amend the Appliance Efficiency Regulations (California Code of Regulations, Title 20, Division 2, Chapter 4, Sections 1601 through Section 1609). In the OIR, the CEC identified a variety of appliances with the potential to save energy or water or both. The OIR also authorizes the CEC to investigate and adopt, if appropriate, additional priority measures as determined by the Lead Commissioner.

On April 21, 2017, the CEC released an invitation to participate to provide interested parties the opportunity to inform the CEC about the product, market, and industry characteristics of the appliances identified in the OIR. The CEC reviewed the information and data received in the docket and hosted staff workshops on July 19 through 21, 2017, to vet this information publicly.

On July 18, 2017, the CEC released a request for proposals, asking interested parties to submit proposals for standards, test procedures, labeling requirements, and other measures to improve efficiency and reduce the energy and/or water consumption of specified appliances. The Energy Commission reviewed the proposals and hosted a staff webinar to vet those proposals on October 24, 2017.

On December 17, 2019, the CEC conducted a webinar on the proposed water efficiency regulations for landscape irrigation controllers, which included information related to definitions, test methods, and performance requirements. The CEC invited stakeholders to join their workgroup to gather comments on the proposal. The CEC reviewed and considered all comments received during the six months that workgroup activities were conducted.

On November 8, 2023, the CEC published its first draft staff report, *Staff Analysis of Proposed Efficiency Standards for Landscape Irrigation Controllers*. This report included the draft proposed regulations and the draft staff analysis. The CEC staff conducted a workshop on December 11, 2023, to solicit written and oral feedback and to discuss the proposed water efficiency standards presented in the draft staff report.

In May of 2024, the CEC invited all interested parties and members of the public to work with the CEC staff to resolve several issues relating to the proposed regulations for landscape irrigation controllers. In June of 2024, the CEC staff started a workgroup for landscape irrigation controllers and hosted several rounds of meetings resulting in gathering information from the workgroup to find viable solutions for several outstanding issues and applied appropriate adjustments to the proposed regulations.

This staff report contains the revised proposed regulations that resulted from the collaboration with the workgroup. It also includes a revised analysis of the statewide benefits, cost-effectiveness, and technical feasibility of the proposed standards in support of the requirements in Section 25402(c)(1) of the Public Resources Code.

ABSTRACT

Section 25402(c)(1) of the Public Resources Code directs the California Energy Commission (CEC) to reduce the inefficient consumption of energy or water by prescribing efficiency standards to promote the use of energy- and water-efficient appliances. Assembly Bill 1928 (Campos, Chapter 326, Statutes of 2016), chaptered in California Public Resources Code Section 25401.9, further requires the CEC to adopt performance standards and labeling requirements for landscape irrigation equipment pursuant to Public Resources Code Section 25402(c).

This staff report focuses on landscape irrigation controllers, a central component of many landscape irrigation systems. The water consumption of landscape varies greatly, depending in part upon how the controller decides to apply water to a landscape. To date, no federal or state regulations mandate cost-effective, readily available technologies to improve the performance of less efficient models.

This report proposes an addition to the Appliance Efficiency Regulations (California Code of Regulations, Title 20, Division 2, Chapter 4, sections 1601 to 1609). CEC staff analyzed the cost-effectiveness and technical feasibility of the proposed standards for landscape irrigation controllers. Staff's analysis and findings of the statewide water and energy (electricity) impacts and other related environmental impacts are included in this report.

The proposed updates to Appliance Efficiency Regulations would set test methods, design standards, and performance standards for landscape irrigation controllers. The proposed standards require all landscape irrigation controllers to be capable of adjusting irrigation schedules to maintain an adequate soil moisture balance in response to weather or soil moisture conditions.

Staff finds the proposed standards to be cost-effective, technically feasible, and beneficial. If adopted, staff estimates that the standards would save about 3.6 billion gallons of water and 12.7 gigawatt-hours (GWh) of electricity for the first year the standards are in effect, and about 53 billion gallons per year and 188.8 GWh of electricity at full stock turnover. Consumers are expected to save about $942 per landscape irrigation controller over the life of the device through reduced water use. The additional upfront cost of compliant products will be paid off in less than six months through the saving cost of the reduced water use.

Keywords: Appliance Efficiency Regulations, appliance regulations, water efficiency, energy efficiency, irrigation equipment, landscape irrigation, landscape irrigation controllers, rain sensors, soil moisture-based irrigation controller, weather-based irrigation controllers, smart irrigation controllers

Please use the following citation for this report:

Pasha, Soheila. 2025. Revised *Staff Analysis of Proposed Efficiency Standards for Landscape Irrigation Controllers*. California Energy Commission. Publication Number: CEC-400-2023-012-REV.

TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

EXECUTIVE SUMMARY

The California Energy Commission's (CEC) Appliance Efficiency Program has analyzed water efficiency opportunities for landscape irrigation controllers and has developed proposals that address water efficiency opportunities through adoption of appliance efficiency regulations. Staff's analysis shows that proposed landscape irrigation controller standards are technically feasible, cost-effective to consumers, and would save a significant amount of water and electricity, including the energy associated with supplying water statewide.

The proposed standards would apply to all residential, commercial, and industrial landscape irrigation controllers sold or offered for sale in California, with limited exceptions, that are manufactured on or after one year from the date that the proposed standards are adopted by the CEC. The proposed standards and test procedures are aligned with U.S. Environmental Protection Agency's (EPA) WaterSense program specifications for weather-based irrigation controllers and soil moisture-based irrigation controllers. WaterSense is a voluntary program by the U.S. EPA that promotes water efficiency by certifying water-efficient products, homes, and programs. The proposed regulations also specify that the data required for compliance verification be reported by manufacturers to the CEC. The more limited set of information, including manufacture date, manufacturer or brand name, and model number, will be required to be marked on the device itself.

At full stock turnover, meaning the point at which all currently installed devices are replaced with compliant devices, the proposed landscape irrigation controller standards are estimated to save about 53 billion gallons of water and 188.8 gigawatt-hours (GWh) of electricity per year statewide, which equates to about $251 million of water cost savings annually.

On average, each compliant integrated irrigation controller or non-integrated irrigation controller with an add-on or plug-in is estimated to save about 15 percent of water used for landscape irrigation. Staff estimates each compliant weather-based landscape irrigation controller saves about 13,265 gallons of water annually compared to a device lacking the proposed design and performance measures. The proposed standards are cost-effective as each compliant irrigation controller that uses weather-based or soil moisture-based features provides life-cycle savings of $942.48, while addition of a WaterSense-compliant weather-based control feature applies an incremental upfront cost of $32.87. Therefore, proposed standards are cost effective with a payback period of about six months.

The proposed standards are also technically feasible as there are more than 400 stand-alone landscape irrigation controller and add-on or plug-in models certified to the U.S. EPA's WaterSense-qualified product list. All models certified to the WaterSense programs for weather-based irrigation controllers or soil moisture-based irrigation controllers meet the proposed requirements.

Moreover, establishing efficiency standards for landscape irrigation controllers, including reducing water consumption will further state policy objectives by reducing greenhouse gases emitted in the production of electricity used to transport and treat California's water.

CHAPTER 1:
Legislative Criteria and Policy

The Warren-Alquist Act[1] establishes the California Energy Commission (CEC) as California's primary energy policy and planning agency. Section 25402(c)(1) of the Public Resources Code directs the CEC to reduce the inefficient consumption of energy and water by prescribing efficiency standards and other cost-effective measures[2] for appliances whose use requires a significant amount of energy or water statewide. Such standards must be technically feasible and attainable, and must not result in any added total cost to the consumer over the designed life of the appliance.

For nearly five decades, California has regularly increased the energy and water efficiency requirements for new appliances sold in the state. Through the Appliance Efficiency Program, appliance efficiency standards have shifted the marketplace toward more efficient products and practices, reaping large benefits for California's consumers. The state's Appliance Efficiency Regulations, along with federal appliance standards encompassing a variety of appliance types, saved an estimated 34,707 gigawatt-hours (GWh) of electricity in 2017 alone, resulting in about $8.26 billion in savings to California consumers.[3]

Since the mid-1970s, California has regularly increased the energy and water efficiency requirements for new appliances sold in the state. In addition, the California Public Utilities Commission (CPUC) in the 1990s decoupled the utilities' financial results from their direct energy sales, promoting utility support for efficiency programs. These efforts have reduced peak load needs by more than 8,645 megawatts (MW) and continue to save about 32,594 GWh per year of electricity.[4] There remains immense potential for additional savings by increasing the energy and water efficiency of appliances.

In determining cost-effectiveness, the CEC considers the value of the water or energy saved, the effect on product efficacy for the consumer, and the life-cycle cost of complying with the standards to the consumer. The Commission also considers other relevant factors including, but not limited to, the effect on housing costs, the statewide costs and benefits of the standards over the lifetime of the standards, the economic impact on California businesses, and alternative approaches capable of providing equivalent benefits.

---

[1] The Warren-Alquist State Energy Resources Conservation and Development Act, Division 15 of the Public Resources Code, § 25000 et seq.

[2] These include energy and water consumption labeling, fleet averaging, incentive programs, and consumer education programs.

[3] California Energy Commission. 2017 Integrated Energy Policy Report. Publication Number: CEC-100-2017-001-CMF. https://efiling.energy.ca.gov/getdocument.aspx?tn=223205.

[4] Kavalec, Chris, Nick Fugate, Cary Garcia, Asish Gautam, and Mehrzad Soltani Nia. January 2016. *California Energy Demand 2016-2026 Revised Electricity Forecast*. California Energy Commission. Publication Number: CEC-200-2016, https://efiling.energy.ca.gov/GetDocument.aspx?tn=207439&DocumentContentId=21362.

Improving California's Resiliency to Future Drought

Section 25401.9 of the Public Resources Code requires the CEC, to the extent that funds are available, adopt by regulation performance standards and labeling requirements for landscape irrigation equipment, including, but not limited to, irrigation controllers, moisture sensors, emission devices, and valves.

On January 17, 2014, with California facing water shortfalls in the driest year in recorded state history, former Governor Edmund G. Brown Jr. proclaimed a state of emergency and directed state officials to take all necessary actions to prepare for and respond to drought conditions.

On September 13, 2016, former Governor Brown signed the Water Efficiency: Landscape Irrigation Equipment Act (Assembly Bill 1928, Campos, Chapter 326, Statutes of 2016), requiring the CEC to adopt by January 1, 2019, performance standards and labeling requirements for landscape irrigation equipment, including, but not limited to, irrigation controllers, moisture sensors, emission devices, and valves. In response, the CEC began considering standards and test procedures, labeling requirements, and other efficiency measures for several appliances including irrigation controllers.[5] Between 2020 and 2022, California once again experienced severe to exceptional drought statewide, and January, February, and March 2022 were the driest on record dating back more than 100 years,[6] confirming the need to ensure that water conservation remains a California way of life.

Water-Energy Nexus

Urban water use, including water used for landscape irrigation, consumes significant energy to move and treat water. Referred to as the embodied electricity in Appendix B, this calculation is incorporated into the cost effectiveness of a water conservation standard. A 2005 Commission study estimated 7,500 GWh per year, or roughly 3 percent of California state electrical energy, is consumed to supply and treat water intended for urban consumption.[7] A more recent study conducted by the Codes and Standards Enhancement (CASE) Team, sponsored by four California investor-owned utilities (IOUs) — Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric (SDG&E), Southern California Edison (SCE), and SoCalGas® — used data provided by the CPUC to estimate the energy to supply water for outdoor applications at 3,565 kilowatt-hours (kWh) per million gallons supplied.[8] Another study found that the energy savings resulting from drought-related urban water conservation is comparable to the energy

---

[5] California Energy Commission. 2022. *Final 2021 Integrated Energy Policy Report, Volume I: Building Decarbonization*. California Energy Commission. Publication Number: CEC-100-2021-001-V1, pg. 49, https://efiling.energy.ca.gov/GetDocument.aspx?tn=241599.

[6] California Drought Update. 2022. "California Drought Update May 31, 2022," https://drought.ca.gov/media/2022/06/Weekly-CA-Drought-Update-05312022.pdf.

[7] Navigant Consulting, Inc. 2006. *Refining Estimates of Water – Related Energy Use in California*. California Energy Commission, PIER Industrial/Agricultural/Water End Use Energy Efficiency Program. CEC-500-2006-118. Pg. 16. Refining estimates of water-related energy use in California: PIER final project report — Calisphere: https://calisphere.org/item/ark:/86086/n2hq3xr1/.

[8] Pike, Ed and Daniela Urigwe, *Codes and Standards Enhancement (CASE) Response to Invitation to Submit Proposals- Irrigation Spray Sprinkler Bodies*, pg. 49, September 18, 2017.https://efiling.energy.ca.gov/GetDocument.aspx?tn=221224&DocumentContentId=26740.

savings of energy efficiency programs offered by the state's major energy utilities.[9] Consequently, appliance standards leading to the efficient use of water also lead to significant energy savings for California.

Reducing Electrical Energy Consumption to Address Climate Change

Promoting energy and water efficiency are a key component of the reduction goals of Senate Bill 100 (De León, Chapter 312, Statutes of 2018[10] and Assembly Bill 3232 (Friedman, Chapter 373, Statutes of 2018)[11] as well as the recommendations contained in the California Air Resources Board's *2022 Scoping Plan for Achieving Carbon Neutrality*. Energy and water efficiency regulations are also identified as key components in reducing electrical energy consumption in the *2021 Integrated Energy Policy Report (IEPR)* and the *2021 California Building Decarbonization Assessment*[12].

On October 7, 2015, former Governor Brown signed the Clean Energy and Pollution Reduction Act of 2015 or Senate Bill 350 (De León, Chapter 547, Statutes of 2015),[13] requiring the CEC to establish annual targets for statewide energy efficiency savings and demand reduction that will achieve a doubling of energy savings in buildings and retail end uses through energy efficiency and conservation by 2030. Appliance efficiency standards will be critical in meeting this goal, and water end-use efficiency is one of several strategies identified to increase efficiency in existing buildings.[14]

Expanding Energy Efficiency in Low-Income and Disadvantaged Communities

California is working to ensure that clean energy transformation benefits are realized by all Californians, especially those in low-income, disadvantaged, or rural communities. In the SB

---

[9] UC Davis and LADWP Collaborate on Energy-Water Conservation Study: Saving Water Saves Energy and Reduces Greenhouse Gas Emissions | UC Davis. https://www.ucdavis.edu/climate/news/saving-water-saves-energy-and-reduces-greenhouse-gas-emissions.

[10] Senate Bill 100, California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100.

[11] Assembly Bill 3232, Zero-Emissions Buildings and Sources of Heat Energy, ttps://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB3232.

[12] Bailey, Stephanie, Jane Berner, David Erne, Noemí Gallardo, Quentin Gee, Akruti Gupta, Heidi Javanbakht, Hilary Poore, John Reid, and Kristen Widdifield. 2023. *Final 2022 Integrated Energy Policy Report Update.* California Energy Commission. Publication Number: CEC-100-2022-001-CMD, https://www.energy.ca.gov/publications/2022/2022-integrated-energy-policy-report-update.

Kenney, Michael, Nicholas Janusch, Ingrid Neumann, and Mike Jaske. 2021. *California Building Decarbonization Assessment.* California Energy Commission. Publication Number: CEC-400-2021-006-CMF, https://www.energy.ca.gov/publications/2021/california-building-decarbonization-assessment.

[13] De León. 2015. Senate Bill 350, https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350.

[14] California Energy Commission, California's Existing Buildings Energy Efficiency Action Plan – 2016 Update, https://efiling.energy.ca.gov/GetDocument.aspx?tn=214801&DocumentContentId=24031.

350 Low-Income Barriers Study, Part A, the CEC studied barriers to energy efficiency and weatherization investments for low-income customers, including those in disadvantaged communities, and made recommendations on how to increase access.[15] The CEC and its partner agencies have since taken steps to implement the recommendations in the Barriers Study, including convening the Disadvantaged Communities Advisory Group in 2018, adopting a *Clean Energy in Low-Income Multifamily Buildings (CLIMB) Action Plan*[16] and both tracking and updating key metrics to better understand energy barriers.[17] The CEC also developed an online interactive map to display energy equity indicators and highlight key opportunities to advance clean energy in low-income and disadvantaged communities. More work is needed to remove financing barriers for low-income communities and develop the local workforce needed to implement clean energy solutions.

Chapter 9 of this report analyzes the cost impact and distribution of benefits of this rulemaking to low-income and disadvantaged communities.

---

[15] Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, Bill Pennington, and Pamela Doughman. 2016. *Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities.* California Energy Commission. Publication Number: CEC-300-2016-009-CMF.

[16] Actions to implement energy and water efficiency, demand response, on-site renewable energy, electric vehicle infrastructure installation, and energy storage for multifamily housing in California: *Clean Energy in Low-Income Multifamily Buildings Action Plan | California Energy Commission*, available at https://www.energy.ca.gov/publications/2018/clean-energy-low-income-multifamily-buildings-action-plan.

[17] California Energy Commission, June 2018, Energy Equity Indicators Tracking Progress, available at https://www.energy.ca.gov/sites/default/files/2019-12/energy_equity_indicators_ada.pdf.

CHAPTER 2: Background

Drought in California and the Importance of Water Efficiency Standards

California is known for its diverse climate, fertile agricultural lands, and vast natural landscape. However, it is also a state that faces persistent challenges with water scarcity. Extended periods without adequate rainfall and prolonged heatwaves have become more frequent in California, with significant social, economic, and environmental consequences.

Figure 2-1 depicts the intensity of drought in California from 2000 to present.[18]

Figure 2-1: Historical Drought Conditions in California

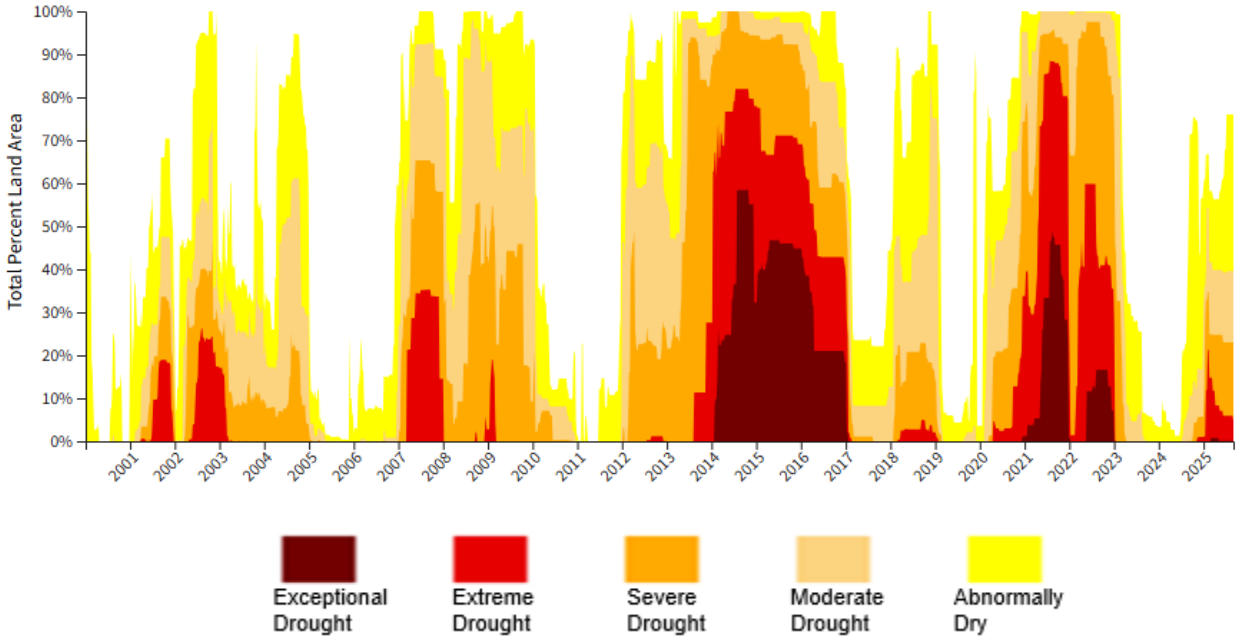


Illustration Credit: National Integrated Drought Information System (Drought.gov)

In recent decades, increases in average temperatures, population growth, and water demand have intensified the state's vulnerability to water shortages. To address these challenges, water efficiency standards have become a vital tool for ensuring the sustainable use of limited resources, including energy, and reducing water waste.

[18] National Integrated Drought Information System, available at https://www.drought.gov/states/california.

About two-thirds of the urban water consumed in California is in homes, with about half of that used for landscapes (**Figure 2-2**).[19] Reducing landscape water waste by using smart irrigation controllers provides an opportunity to reduce total water demand meaningfully without adversely affecting beneficial uses.

Figure 2-2: Water Use in California's Communities

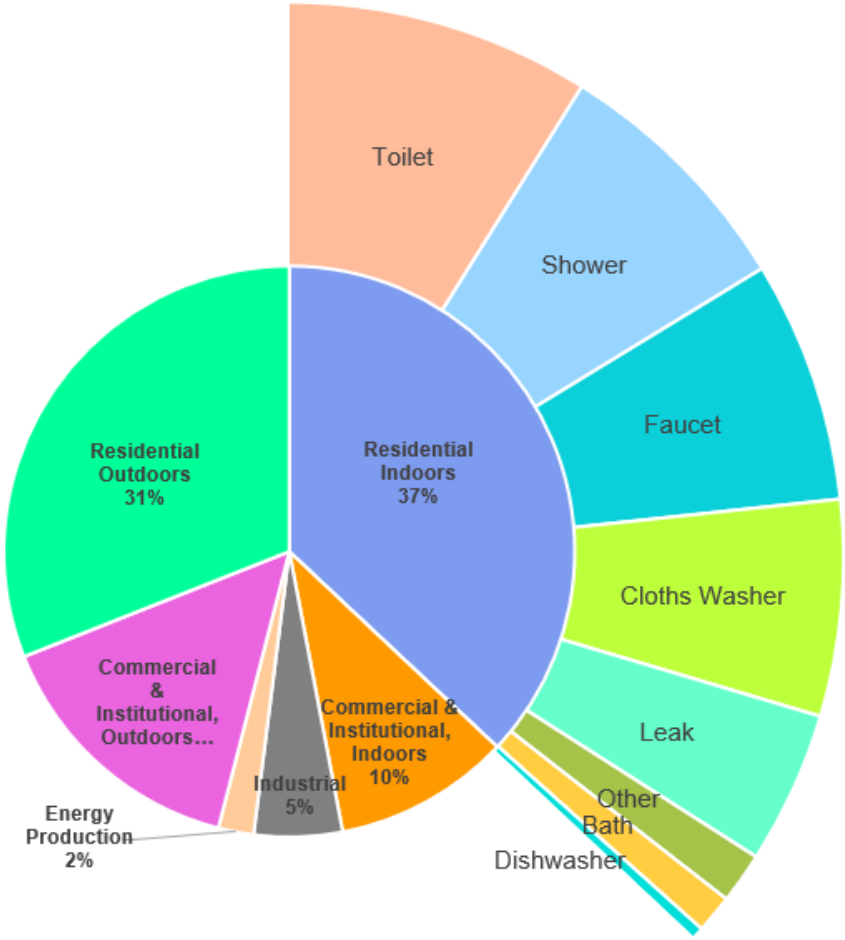


Illustration Credit: CEC with data from Public Policy Institute of California (Water Use in California's Communities) and Water Research Foundation (Residential End Uses of Water)

Landscape Irrigation Controllers

Landscape irrigation controllers automate the scheduling of the day and time of irrigation and the length of application. Irrigation controllers send an electrical signal to open irrigation valves and allow water to flow to sprinklers and emitters. Without the automation provided by even a basic controller, a property owner has to open and close their irrigation valves manually

[19] Ayres, Andrew Caitlin Peterson, and Annabelle Rosser. April 2023. *Water Use in California's Communities,* https://www.ppic.org/publication/water-use-in-californias-communities/.

DeOreo, William B., Peter Mayer, Benedykt Dziegielewski, and Jack Kiefer. 2016. *Residential End Uses of Water Version 2 Executive Report.* Denver: Water Research Foundation, https://www.waterrf.org/research/projects/residential-end-uses-water-version-2.

to water their landscape. It is small wonder that these devices have become popular and commonplace throughout California.

Moody Sprinkler Company introduced the first residential landscape irrigation controller in the 1950s that relied upon an electronic clock and hydraulic mechanism. These controllers were later upgraded to an electromechanical timer, replacing the hydraulic mechanism. In the 1970s and 1980s, controllers moved to solid-state circuitry and microprocessors, along with a great many other small electronic devices. In the 2000s, under pressure to conserve water, manufacturers began to incorporate water-saving features such as soil moisture sensing and weather-based control methods into their products. Today, landscape irrigation controllers are widely used to irrigate urban landscapes.

Figure 2-3: 1950s Landscape Irrigation Controller

Illustration Credit: Irrigation Museum

The California Department of Water Resources estimates that 29 percent of urban water use, or roughly 750 billion gallons per year, is attributable to irrigation of residential landscapes. Large landscapes, such as public parks, account for an additional 9 percent, or 235 billion gallons per year.[20] Statewide landscape water use is roughly equal to indoor home water use. Water-saving opportunities in landscape irrigation include user education and the use of efficient landscape irrigation equipment with automated controls.

Landscape Irrigation Methods

Residential and commercial property owners and occupants maintain their landscapes through several methods of irrigation, including hand watering, sprinkler systems, and drip irrigation systems. Hand watering is performed typically with a hose and a portable sprinkler that may be moved about the landscape. Sprinkler systems are permanently plumbed systems relying upon subterranean piping, valves, and landscape emitters to spray water from fixed locations and rely on a landscape irrigation controller to schedule irrigation events. Drip irrigation systems rely on a system of hoses and micro emitters to deliver water as droplets to plantings at ground level.

[20] California Department of Water Resources. June 2019. *California Water Plan Update 2018*, Table 1-1, pg. 1-4, https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/California-Water-Plan/Docs/Update2018/Final/California-Water-Plan-Update-2018.pdf.

Figure 2-4: Hand, Lawn Sprinkler, and Drip Irrigation Systems

Illustration Credit: Home Depot

Landscape irrigation controllers control the irrigation of 61 percent[21] to 73 percent[22] of landscapes. Thus, due to the large water use impacts of these landscape irrigation controllers, increasing the scheduling efficiency of these products is a key component of California's efforts to make water conservation a way of life.

Challenges to Water Efficiency

Overirrigation

Overirrigation of landscapes is common in California and across the United States.[23] Overirrigation occurs when more water is applied to a landscape than can be used by the plants. The excess water is lost through deep percolation, runoff, and evaporation, as shown in **Figure 2-5**.

A 2009 study of smart irrigation controllers by the Metropolitan Water District of Southern California and the East Bay Municipal Utility District revealed how landscape irrigation practices vary in California. The study presents an application ratio, a comparison of how much water is applied versus how much water is needed. An application ratio of 100 percent means the water applied to the landscape would exactly meet the irrigation needs of the landscape.

---

[21] *California Investor-Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers,* September 18, 2017, https://efiling.energy.ca.gov/GetDocument.aspx?tn=221225&DocumentContentId=26788.

[22] The Metropolitan Water District of Southern California. October 31, 2013. *Landscape Water Use Efficiency Research Project, Final Project Report, Prepared for the Metropolitan Water District of Southern California*, page 5, https://www.usbr.gov/lc/socal/reports/MWDLandscapeWUEResearch.pdf.

[23] Metropolitan Council. December 2016. *Efficient Water Use on Twin Cities Lawns Through Assessment, Research, and Demonstration*, https://metrocouncil.org/Wastewater-Water/Publications-And-Resources/WATER-SUPPLY-PLANNING/Twin-Cities-Lawn-Irrigation-System-Surveys-And-Ass.aspx.

Figure 2-5: Overirrigation Water Losses

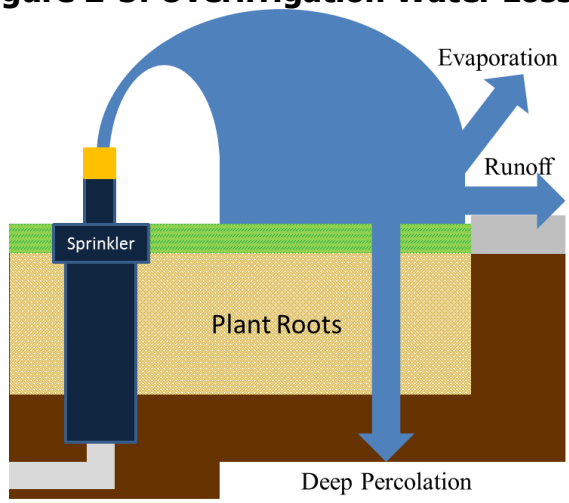


Illustration Credit: CEC

On average, Californians apply 50 percent more water than is needed.[24] Another survey of homeowners performed by the Metropolitan Water District of Southern California showed about half of homeowners water three to four days a week, well in excess of what is needed to maintain a landscape.[25] An additional study of homeowners by the Irvine Ranch Water District found more than half of surveyed irrigation controllers are set for every day or every other day irrigation. Residents were also unaware that water needs of turf, shrubs, and trees differ.[26]

Landscape Irrigation Scheduling Efficiency

Landscape irrigation provides water to supplement demands of the landscape when rainfall is not enough. Landscape irrigation requirements vary because of many factors, including type of vegetation, soil type, geographic location, shading, time of year, and weather.

Figure 2-6 illustrates how landscape irrigation requirements vary based upon location and time of year. In the winter when California's weather is cool and rainfall is more frequent, the need for irrigation is low. In the summer when the weather is hot and rainfall rare, more irrigation is needed. Landscape irrigation controllers can vary the irrigation schedule to meet the needs of the varying landscape while using less water.

---

[24] Mayer, Peter, et al. *Evaluation of California Weather Based "Smart" Irrigation Controller Programs,* 2009, pg. 95, available at http://ucanr.edu/sites/UrbanHort/files/99641.pdf.

[25] Metropolitan Water District of Southern California. October 31, 2013. *Landscape Water Use Efficiency Research Final Project Report*, pg. 7.

[26] Hunt, Theodore; Lessick, Dale; et al. (Irvine Ranch Water District.) June 2001. *Residential Weather-Based Irrigation Scheduling: Evidence From the Irvine "ET Controller" Study,* pg. 14, https://irrigatesmart.com/wp-content/uploads/2019/02/Residential-Weather-Based-Irrigation-Scheduling-Study-ET-Controllers.pdf.

Figure 2-6: Landscape Irrigation Needs Vary by Season and Location

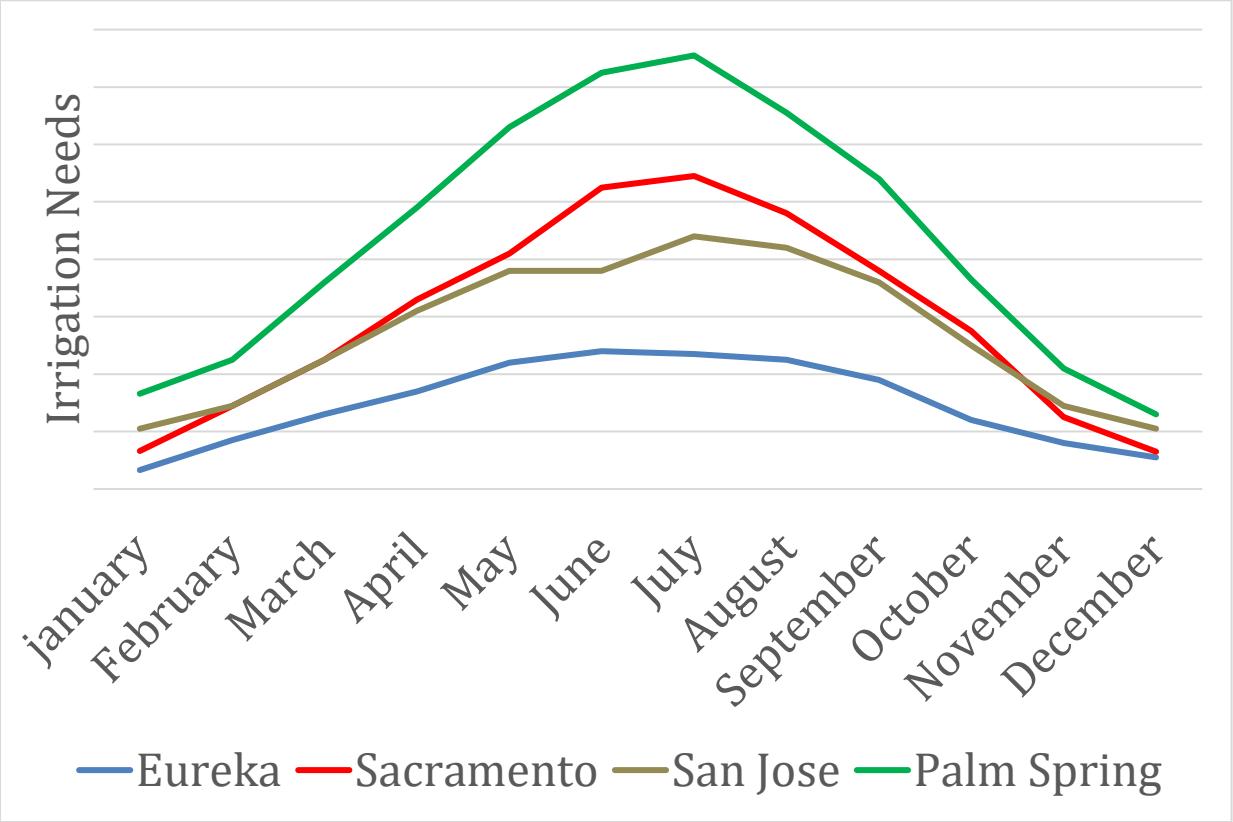


Illustration Credit: CEC with data from University of California Agriculture and Natural Resources

Figure 2-7 provides an example of the water savings from a landscape irrigation controller that can schedule irrigation based upon the needs of the landscape versus the typical homeowner scheduling, as found during a study by the Irvine Ranch Water District.[27]

The lower line is the irrigation required to support the landscape, while the upper line is the average irrigation applied by the homeowners in the study. The shaded area between the two lines represents the savings potential of a landscape irrigation controller that can alter the irrigation schedule.

[27] Hunt, Theodore; Lessick, Dale; et al. (Irvine Ranch Water District.) June 2001. *Residential Weather-Based Irrigation Scheduling: Evidence from the Irvine "ET Controller" Study,* pg. 22.

Figure 2-7: Example of Water Savings Through Better Irrigation Scheduling

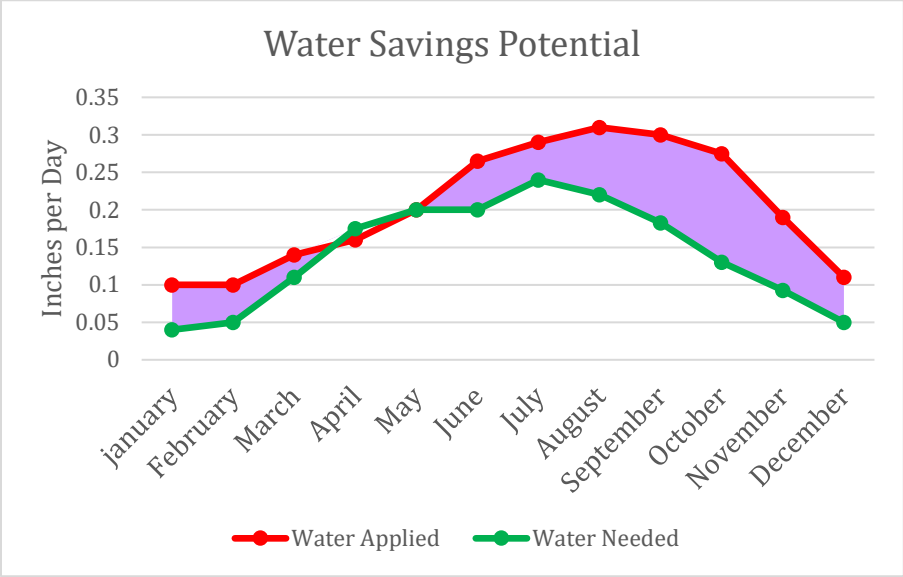


Illustration Credit: CEC with Irvine Ranch Water District Data

Landscape Irrigation Equipment

The irrigation industry provides a wide variety of landscape irrigation controllers. Landscape irrigation controllers are categorized according to the method of irrigation scheduling and installation. Additional devices considered are rain devices and soil moisture sensors that provide inputs for an irrigation controller. **Figure 2-8** shows the structure of the definitions proposed by staff.

Figure 2-8: Landscape Irrigation Equipment

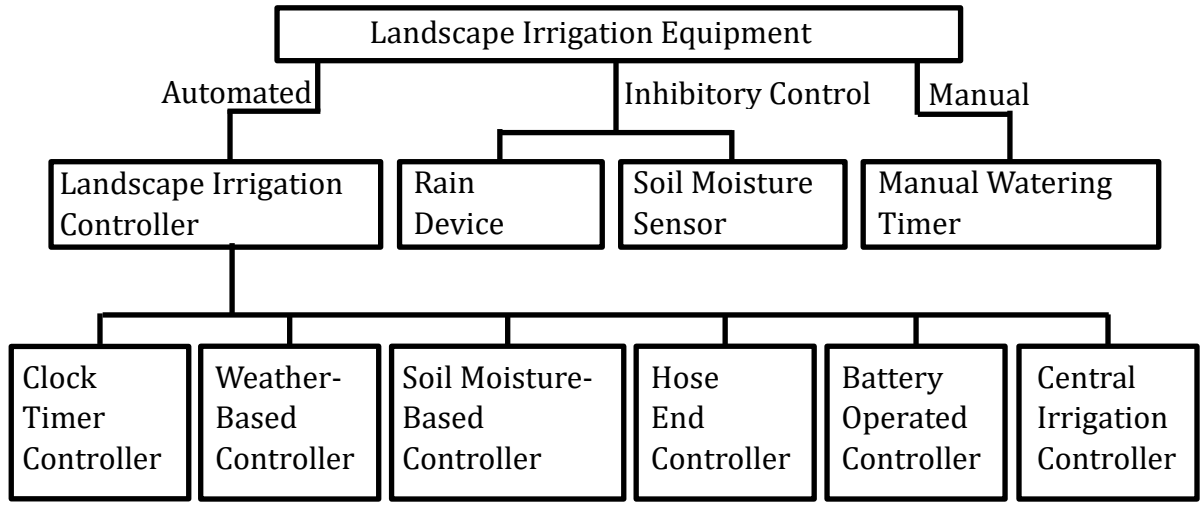


Illustration Credit: CEC

Landscape Irrigation Controllers and Equipment

A landscape irrigation controller schedules irrigation and causes irrigation valves to open and close. A controller may use a clock, rely on weather data, or measure conditions such as soil

moisture to decide when to allow or prohibit irrigation. **Figure 2-9** provides a block diagram of typical setup where the controller is remote from the irrigation valve and connected electrically.

Figure 2-9: Schematic of Signal Connections in Irrigation Controllers

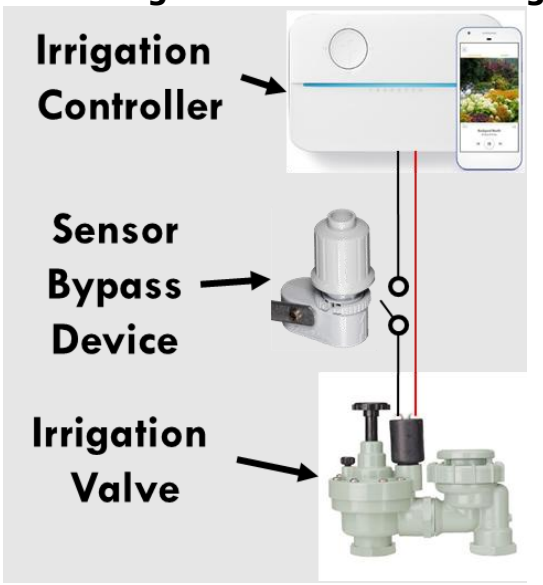


Illustration Credit: CEC

Clock Timer Controllers

A "clock timer" controller relies upon a clock and a user-defined schedule for irrigation. The user sets the start and run times of each landscape zone. The controller will automatically run the scheduled irrigation without regard to landscape moisture conditions or weather conditions.

Figure 2-10: Clock Timer Controllers

Photo Credit: Rain Bird

Weather-Based Controllers

"Weather-based" controllers rely upon historical weather data, remote weather data, or on-site sensors to vary the irrigation schedule to meet the irrigation needs of the landscape. The specific approach to setting the irrigation schedule varies greatly by manufacturer and even between irrigation controller models. Possible inputs include maximum and minimum air temperature, net solar radiation, average vapor pressure, and average wind speed. Some controllers may have historical records of the weather data that they rely on to perform calculations.[28]

Most weather-based irrigation controllers are integrated products, meaning that all hardware needed to perform these functions is built into a single device. For integrated weather-based controllers, the timer unit providing interface between the timer and sensor(s) or the unit providing Wi-Fi connectivity are integrated into the same housing. For non-integrated weather-based irrigation controllers, the hardware providing an interface between timer(s) and sensor(s) or providing Wi-Fi connectivity, generally called add-on or plug-in devices, is in separate housing from the timer and is typically sold separately. Not all timers can be connected to add-on or plug-in devices, and even those able to be connected to some separately sold devices will not be compatible with every such device.

Figure 2-11: Weather-Based Controllers

Photo Credit: Rachio

Soil Moisture-Based Controllers

Soil-moisture-based controllers sample soil conditions using a soil sensor installed within the area the controller irrigates, using data from the sensor to determine if or when irrigation is needed. Most controllers will be set to maintain the soil moisture level safely above the wilting point — the point where irrecoverable degradation of the landscape occurs.

There are two types of soil moisture-based controllers: "bypass" soil moisture-based controllers and "on-demand" soil moisture-based controllers.

Bypass soil moisture-based irrigation controllers either inhibit an irrigation event if the soil moisture is above a predetermined level or allows an irrigation event if the soil moisture is

[28] U.S. Department of Interior, Bureau of Reclamation. August 2018. *Weather- and Soil Moisture- Based Landscape Irrigation Scheduling Devices*, pp 9–10, https://www.usbr.gov/watersmart/docs/2018/6thEd_WeatherSoilMoistureBasedLandscapeIrrigationSchedulingDevices.pdf.

below a preset level, in essence bypassing the scheduled activity that would otherwise occur. Importantly, a bypass controller only works in one of these two directions, either bypassing to on or bypassing to off, not both. In contrast, an on-demand soil moisture-based irrigation controller does both, initiating irrigation when soil moisture falls below a preset level and stopping irrigation when soil moisture reaches or exceeds a predetermined level.

Similar to weather-based irrigation controllers, most soil moisture-based irrigation controllers are integrated products. However, the unit providing the interface between the timer and sensor(s) might be housed in a separate add-on or plug-in device for non-integrated soil moisture-based irrigation controllers.

Figure 2-12: Soil Moisture-Based Controllers

Photo Credit: Baseline Inc.

U.S. EPA WaterSense Plug-In and Add-On Devices

U.S. EPA WaterSense provides definitions for products to serve the retrofit market to upgrade clock-timer controllers with weather-based irrigation controllers.[29] The plug-in and add-on devices are interface equipment that communicate sensor readings or real time weather data to a time-clock controller. Add-on and plug-in devices can be sold together with compatible time-clock irrigation controllers or sold separately.

[29] U.S. EPA WaterSense. September 2, 2021. *WaterSense Specification for Weather-Based Irrigation Controllers, Version 1.1,* https://www.epa.gov/system/files/documents/2021-09/ws-outdoor-product-specification-wbic-revised-v1.1.pdf.

Figure 2-13: Plug-in Device for Retrofitting Irrigation Controllers With Weather-Based Irrigation Controller

Photo Credit: Greenhouse Megastore and Rain Bird Corporation

Hose-Bib Controllers

A hose-bib controller threads over a hose bib and is designed to be located between the bib (or spigot) and a hose. The controller may be a clock timer or a weather-based controller and is typically battery-operated. Hose-bib sprinkler systems can flow water comparable to an inground irrigation system.[30]

The controllers are offered with one or more outlets. Some controllers are also marketed with garden hose splitters that allow several single-outlet irrigation controllers to be attached to a single-hose bib. Hose-bib controllers often possess the same utility and capability as other landscape irrigation controllers despite the small size and portable design. As most of these products are battery-operated, the proposed requirements for battery-operated devices will generally apply.

Figure 2-14: Hose-Bibb Controllers

Photo Credit: Orbit Irrigation Products LLC

[30] Washington Suburban Sanitary Commission. "Water Usage, Outdoor Water Consumption," https://www.wsscwater.com/understandusage.

Figure 2-15: Multiple-Zone Hose-Bibb Controller Configurations

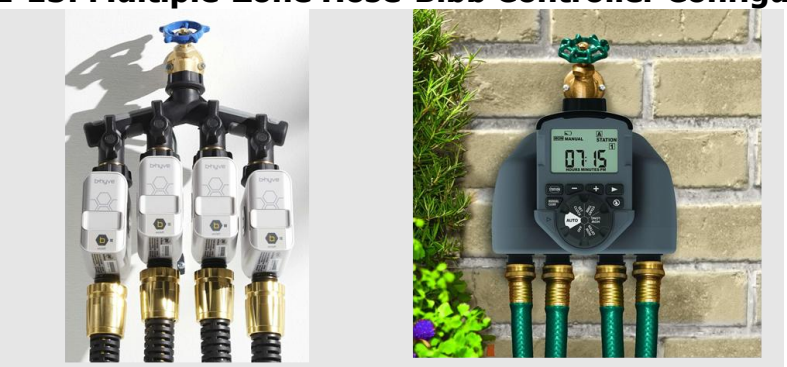


Photo Credit: Orbit Irrigation Products LLC

Battery-Operated Controllers

Manufacturers offer larger battery-operated landscape irrigation controllers for applications such as a street median. The devices are capable of actuating irrigation valves and handling several zones of irrigation.

Figure 2-16: Battery-Operated Landscape Irrigation Controller

Photo Credit: Hunter Industries

Rain Devices

Rain devices are a type of bypass add-on or plug-in device that prevent irrigation after rainfall when it is not needed. Most rain devices act as a switch that opens because of rainfall and prevents the controller from sending the signal to the irrigation valve to open. **Figure 2-17** provides examples of the tipping bucket and expanding disk rain devices. The expanding disk is far more common in a landscape irrigation system.

Figure 2-17: Rain Devices

Photo Credit: Rain Bird and Argent Systems

Soil Moisture Sensors

Soil moisture sensors detect the level of water content within the soil. Soil moisture sensors are mostly found as part of a bypass device to prevent a landscape irrigation controller from sending a valve open signal when the soil is already wet. There are several underlying technologies for soil moisture sensors, including tension meters that measure the soil moisture tension and volumetric sensors that measure the actual volume of the water in the soil.

Figure 2-18: Soil Moisture Interrupt Module and Probe

Photo Credit: Hunter Industries

Manual Watering Timers

A manual watering timer allows a limited irrigation time (that is, duration) without requiring the user to return to turn off the water. The devices are typically mechanical and cannot initiate irrigation without the user manually turning it on, nor can they track time in the manner of a clock. Manual watering timers are not within the scope of the proposed regulations for landscape irrigation controllers.

Figure 2-19: Manual Watering Timer

Photo Credit: Orbit Irrigation Products LLC

Central Irrigation Controllers

The term "central irrigation controller" refers to an advanced system used to control irrigation at large landscapes such as sports fields and golf courses. The systems can control irrigation at several facilities and are often capable of individually controlling each emitter.

Figure 2-20: Central Irrigation Controller

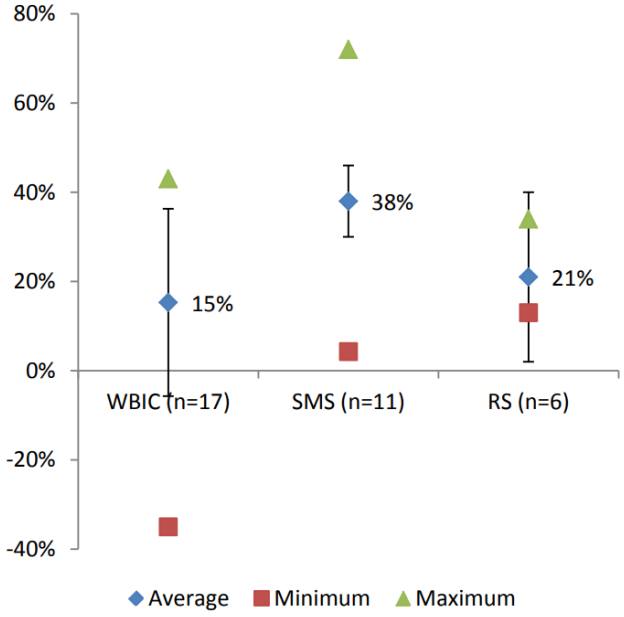
Photo Credit: Hunter

Comparison of Water Savings Among Irrigation Control Technologies

Lawrence Berkeley National Labs (LBNL) published a comparison of various studies of weather-based irrigation controllers, rain sensors, and soil moisture sensors. The study concluded that each technology could provide significant savings over manual watering or clock-based irrigation controllers. **Figure 2-21** presents the results of the comparison.[31]

[31] Williams, Alison, Heidi Fuchs, and Camilla Dunham Whitehead, Environmental Energy Technologies Division, Lawrence Berkeley National Labs. April 1, 2014. *Estimates of Savings Achievable From Irrigation Controller,* pg. 8, https://eta-publications.lbl.gov/sites/default/files/lbnl-6604e.pdf.

Figure 2-21: Savings by Irrigation Control Technology



Illustrated Credit: Lawrence Berkeley National Laboratory

CHAPTER 3:
Regulatory Context

CEC staff considered and studied regulatory pathways to achieve water savings for landscape irrigation controllers. Staff evaluated voluntary standards, including the U.S. Environmental Protection Agency (EPA) WaterSense Specifications, and existing regulations and other approaches to ensure water efficiency and water conservation.

Voluntary Standards

Irrigation Association (IA)

The Irrigation Association developed and released several test methods with the Smart Water Application Technologies (SWAT) initiative. These test procedures established the foundation for other landscape irrigation equipment test procedures and standards, in particular the U.S. EPA WaterSense Specifications and the standards from the American Society of Agriculture and Biology Engineers (ASABE).

IA released the *SWAT 8th Testing Protocol for Climatologically Based Controllers* in September 2008.[32] The protocol tests the controller for irrigation adequacy, scheduling efficiency, and runoff potential. The test defines the description of six virtual irrigation stations (zones) that vary in soil texture, ground slope, sun exposure, root zone, vegetation type irrigation system. The test is conducted over a minimum 30-day test period with requirements for varying weather conditions. The test procedure defines the method to measure performance but does not set a performance standard.

IA released the *SWAT Laboratory Screening Tests for Soil Moisture-Based Controllers* V.3.0 in August 2011.[33] The procedure measures performance of the controller for irrigation adequacy and scheduling efficiency. The test procedure has a laboratory screen phase where the controllers are tested over six to eight months in controlled conditions followed by an operational test on a virtual landscape like the IA SWAT Testing Protocol for Climatologically Based Controllers. The test method does not set a performance standard.

IA released the *SWAT Testing Protocol Version 3.0 for Rainfall Shutoff Devices* in October 2009. The test applies water to a sample of eight devices by a rainfall simulator. The devices are monitored to determine the specific time that the device detects switches to interrupt mode to prevent the irrigation controller from opening the irrigation valve. By having eight samples, the accuracy and precision of the design and manufacturing of the rainfall devices can be determined. The test yields information on the rainfall threshold before interrupt mode,

---

[32] Irrigation Association. September 2008. *Smart Water Application Technologies Climatologically Based Controllers 8th Testing Protocol,* https://www.irrigation.org/IA/FileUploads/SWAT/Climate-Based-Controllers-Testing-Protocol-Version-8-September-2008.pdf.

[33] Irrigation Association. August 2011. *Smart Water Application Technologies, Laboratory Screening Tests for Soil Moisture-Based Controllers V.3.0 in August 2011,* https://www.irrigation.org/IA/FileUploads/SWAT/Soil-Moisture-Sensor-Based-Controllers-Testing-Protocol-Version-3.0-August-2011.pdf.

accuracy, precision, and coefficient of variation. The test method does not set a performance standard.[34]

U.S. Environmental Protection Agency (EPA) WaterSense

The U.S. EPA WaterSense program has developed a voluntary test method and standard based on IA SWAT's Climatologically Based Controller test protocol. To do so, the EPA evaluated the test method and measured landscape irrigation controller performance for the ability to schedule irrigation adequacy, the ability to supply a minimum amount of water to keep a landscape healthy, and irrigation excess or measure of waste with the goal of eliminating overirrigation. The EPA made several modifications to the protocol based on the research results from work performed at the University of Florida. On November 3, 2011, the EPA published the *WaterSense Specification for Weather-Based Irrigation Controllers, Version 1.0*.[35]

On December 20, 2018, the EPA began a review of WaterSense specifications as required by the America's Water Infrastructure Act of 2018. On April 10, 2020, the EPA issued a request for information regarding the completion of its review and decision to not update any specifications.[36] However, on September 2, 2021, the U.S. EPA published an updated *WaterSense® Specification, Version 1.1, for Weather-Based Irrigation Controllers* to directly reference the ANSI/ASABE S627 standard adopted by the American Society of Agriculture and Biology Engineers (ASABE) in December 2020 and make other smaller modifications. In practice, the specification has remained unchanged since 2011.

On February 11, 2021, the U.S. EPA released a specification for soil moisture-based irrigation controllers to earn the WaterSense label.[37] This specification was developed in partnership with ASABE, and the specification established performance criteria on the function, precision, response to change in soil moisture and function following freeze conditions.

American Society of Agriculture and Biology Engineers (ASABE)

In December 2020, ASABE published the standard *ANSI/ASABE S627 Weather-Based Landscape Irrigation Control Systems*. This standard was a collaboration between the IA and the ASABE, and the testing is similar to the IA's climatological based test method with modifications for rainfall events, simulated soil types, and root zones. In October 2022, the standard revision ANSI/ASABE S627.1 was published, which corrected errors identified in

---

[34] Irrigation Association. October 2009. *Smart Water Application Technologies Testing Protocol Version 3.0 for Rainfall Shutoff Devices,* https://www.irrigation.org/IA/FileUploads/SWAT/Rain-Shutoff-Devices-Testing-Protocol-Version-3.0-October-2009.pdf.

[35] U.S. Environmental Protection Agency. November 3, 2011. *WaterSense® Specification for Weather-Based Irrigation Controllers Supporting Statement,* https://www.epa.gov/sites/production/files/2017-01/documents/ws-products-support-statement-irrigation-controllers.pdf.

[36] 85 FR 20268. April 10, 2020. *Notice of Recent Specifications Review and Request for Information on WaterSense Program,* available at https://www.epa.gov/sites/production/files/2020-04/documents/ws-frn-notice_of_review_and_rfi.pdf.

[37] U.S. EPA. February 11, 2021. *WaterSense® Specification for Soil Moisture-Based Irrigation Controllers,* https://www.epa.gov/sites/default/files/2021-02/documents/watersense_specification_for_soil_moisture-based_irrigation_controllers.pdf.

equations within the standard and ensured that terms and abbreviations were used consistently and appropriately.[38] The CEC was an active participant in the technical review of the necessary revisions, and in July 2023, the revision received a 2023 ASABE Standards Development Award.[39]

In May 2020, the ASABE released a test protocol, *ANSI/ASABE S633, Testing Protocol for Landscape Irrigation Soil Moisture-Based Control Technologies*, for bypass-type soil-moisture sensors.[40] The standard defines a procedure to test the response of a soil moisture sensor to changes in soil moisture conditions in a media that simulates soil and to determine if the sensor will enable/disable an irrigation event at preset or selected soil water values.

International Association of Plumbing and Mechanical Officials

In November 2017, IAPMO released the 2017 Water Efficiency and Sanitation Standard (2017 WE Stand) that replaced the Green Plumbing & Mechanical Code Supplement. In October 2021, a second edition of this standard was published (2020 WE Stand).[41] This standard serves as a resource for jurisdictions implementing green building and water efficiency programs. The standard remains voluntary and requires the landscape irrigation control system to adjust the irrigation schedule automatically to respond to the water needs of the plant determined by weather or soil moisture conditions. This standard further requires the use of on-site sensors to suspend irrigation when adequate soil moisture is present or during rainfall or freezing conditions.

Leadership in Energy and Environmental Design (LEED) High-Efficiency Irrigation System for Mid-Rise Buildings

LEED is a green building rating system that provides a framework to measure healthfulness, efficiency, and cost savings of green buildings. LEED provides credits for buildings that install landscape irrigation controllers that activate the valves for each watering zone at the best time of day to minimize evaporative losses and obey local regulations. Additional credits may be earned by installing a soil moisture sensor controller or rain delay controller.[42]

Existing Regulations and Other Approaches

California Model Water-Efficient Landscape Ordinance

Per Executive Order B-29-15 of April 1, 2015, the California Department of Water Resources (DWR) updated the State's Model Water Efficient Landscape Ordinance (MWELO) through

---

[38] American Society of Agricultural and Biological Engineers. October, 2022. *Weather-Based Landscape Irrigation Control Systems,* https://webstore.ansi.org/standards/asabe/ansiasabes627oct2022.

[39] American Society of Agricultural and Biological Engineers. "Standards Development Awards," https://www.asabe.org/Awards-Competitions/Standards-Development-Awards.

[40] American Society of Agricultural and Biological Engineers. May, 2020. *Testing Protocol for Landscape Irrigation Soil Moisture-Based Control Technologies*, https://elibrary.asabe.org/abstract.asp?aid=51227&t=3&redir=&redirType=.

[41] International Association of Plumbing and Mechanical Officials. October 2021. "Water Efficiency and Sanitation Standard (WE•STAND)," http://www.iapmo.org/we-stand.

[42] U.S. Green Building Council. "High-Efficiency Irrigation System for MID-RISE, Minimize Outdoor Demand for Water Through Water-Efficient Irrigation," https://www.usgbc.org/credits/homes/v2008/wec2.

expedited regulation. Cities and counties are responsible for adopting and reporting a water-efficient landscape ordinance.

MWELO applies to:

- New construction projects with an aggregate, or combined, landscape area equal to or greater than 500 square feet requiring a building or landscape permit, plan check, or design review.
- Rehabilitated landscape projects with an aggregate landscape area equal to or greater than 2,500 square feet requiring a building landscape permit, plan check, or design review.
- Cemeteries.
- Existing landscapes installed before December 1, 2015, greater than 1 acre.

MWELO includes requirements for inclusion of automatic irrigation controllers using either evapotranspiration or soil moisture sensor data into irrigation design plans. MWELO also requires sensors to alter or suspend irrigation when weather conditions are unfavorable. However, these requirements are applied in design and construction and could possibly be omitted in the adoption of comparable regulations by local authorities.

California Efficient Outdoor Residential Water Use Standards

The California Legislature in 2018 directed the DWR, in consultation with the State Water Resources Control Board (State Water Board), to conduct necessary studies and investigations and recommend standards for efficient outdoor residential water use for adoption by the State Water Board.[43] These actions are part of an effort to establish an Urban Water Use Objective.[44] DWR's recommendations for outdoor residential water use efficiency standards were published September 2022[45].

California State Water Resources Control Board Measures

Per Executive Orders B-37-16 and B-40-17, the State Water Board issued regulations to prohibit certain wasteful water uses permanently.[46] The regulations added Chapter 3.5, Article 4, *Wasteful and Unreasonable Water Uses*, to Title 23, division 3, of the California Code of

[43] Senate Bill 606 (Hertzberg) and Assembly Bill 1668 (Friedman).

[44] California State Water Resources Control Board. "Urban Water Use Efficiency Standards, Variances and Performance Measures," https://water.ca.gov/Programs/Water-Use-And-Efficiency/2018-Water-Conservation-Legislation/Urban-Water-Use-Efficiency-Standards-Variances-and-Performance-Measures.

[45] Department of Water Resources. September 2022. *Recommendations for Outdoor Residential Water Use Efficiency Standard,* https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And-Efficiency/2018-Water-Conservation-Legislation/Performance-Measures/ORWUS_STD_WUES-DWR-2021-02_COMPLETE.pdf.

[46] California State Water Resources Control Board. "Regulation on Wasteful and Unreasonable Water Uses," https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/regs/wasteful_water_uses.html#documents.

Regulations. Section 995(b)(1)[47] provides several prohibitions that apply to a variety of water users including homeowners, homeowners' associations, cities, and counties.

Wasteful and unreasonable water use prohibitions include the following:

- Don't allow runoff from irrigated landscapes.
- Don't irrigate in the rain.
- Don't irrigate turf on medians and "parkways," unless the landscape performs a neighborhood function.

Furthermore, in 2022, the State Water Board adopted water conservation emergency regulations, the last of which expired in June of 2024.[48]

Regulations in Other States

Florida statute requires that "[a]ny person who purchases and installs an automatic landscape irrigation system must properly install, maintain, and operate technology that inhibits or interrupts operation of the system during periods of sufficient moisture."[49] This mandate has been in effect since 2010 and have shown to provide significant water savings[50].

Enacted in 2003, Minnesota statute requires "[a]ll automatically operated landscape irrigation systems shall have furnished and installed technology that inhibits or interrupts operation of the landscape irrigation system during periods of sufficient moisture."[51] A survey study from 2016 found that more than 63 percent of the residential irrigation systems in the Twin Cities Metro Area of Minnesota have either rain sensors or soil moisture sensors.[52]

There are no federal efficiency standards for landscape irrigation controllers, rain devices, or soil moisture sensors.

The CEC's Pre-Rulemaking on Landscape Irrigation Controllers

The CEC has received extensive feedback from stakeholders since the CEC released an invitation to participate in April 2017. Initial comments highlighted the need to align with the

---

[47] 23 CCR § 995. Wasteful and Unreasonable Water Uses: https://govt.westlaw.com/calregs/Document/I180E7B91865111EF8F138A45C4F6F93C?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)

[48] California State Water Resources Control Board. "Water Conservation Emergency Regulations," https://www.waterboards.ca.gov/water_issues/programs/conservation_portal/regs/emergency_regulation.html.

[49] Florida Statutes Title XXVIII Chapter 373 Section 62, https://www.flsenate.gov/Laws/Statutes/2022/0373.62.

[50] Florida Department of Agriculture and Consumer Services. Water Conserving Irrigation: https://www.myfloridahomeenergy.com/help/library/water/irrigation/.

[51] Minnesota Statutes, Chapter 103G, Section 298, *LANDSCAPE IRRIGATION SYSTEMS,* https://www.revisor.mn.gov/statutes/cite/103G.298.

[52] University of Minnesota Extension Turfgrass Science. 2016. Efficient Water Use on Twin Cities Lawns Through Assessment, Research, and Demonstration: https://metrocouncil.org/Wastewater-Water/Publications-And-Resources/WATER-SUPPLY-PLANNING/TURFGRASS-AND-LAWNS/Twin-Cities-Lawn-Irrigation-System-Surveys-And-Ass.aspx.

WaterSense specification on weather-based irrigation controllers and the forthcoming ASABE S627 standard.

Following the webinar hosted by the CEC in December 2019, stakeholder comments emphasized the need for the standards to allow weather-based irrigation controllers as well as soil moisture-based irrigation controllers to comply with the standards. This request was to ensure that the standards do not impede innovation and to allow products meeting the WaterSense specification for soil moisture-based irrigation controllers to be sold in California.

In December 2021, the CEC shared draft proposed regulatory language to an informal workgroup established for the pre-rulemaking. Comments on the proposed regulatory language suggested clarifications to the regulatory text and stressed the need to define the scope of the regulations clearly. The staff proposal included in the first draft staff report published on November 8, 2023, reflected the comments received.

In the comments received following the publication of the first draft staff report, stakeholders suggested working on several outstanding issues through another workgroup.

In May 2024, the CEC invited all interested parties and members of the public to join a workgroup for landscape irrigation controllers to resolve several issues relating to the proposed regulations. In June 2024, CEC staff started a workgroup and with its members worked to resolve outstanding issues and concerns. The main issues resolved through the workgroup, and reflected in changes in this update to the initial draft proposal, are listed here:

Total Packaging Requirements

Some irrigation controllers rely on separately sold, modular components, called add-on or plug-in devices, to extend their functionality beyond basic timeclock controls. Workgroup members from the industry believed that requiring irrigation controllers to be sold with their compatible add-on or plug-in devices would have adverse economic and environmental impacts. They stated that this requirement would cause significant cost impacts to manufacturers, distributers and retailers for packaging, shipping, warehouse, and labor. Additionally, members expressed concerns about the waste that would be caused by providing redundant modular components when the core irrigation controller is replaced. As a result, the CEC amended the proposed regulations to allow irrigation controllers that need to be interfaced with another device for compliance to be packaged and sold separately from those devices. However, the proposed regulations require that a list of compatible plug-in or add-on devices, or wireless hubs needed for compliance to be printed on the package of non-integrated irrigation controllers.

Agricultural and Golf-Course Irrigation Controllers

Workgroup members expressed significant concern about the potential inclusion of these products in the proposed regulations based on statements provided that agricultural and golf-course industries are both very cognitive of their water usage, and the controllers designed for and used by these industries are far more advanced than the products designed for general residential and commercial landscaping. The workgroup concluded that including irrigation controllers designed exclusively for those applications would not contribute to additional water savings. Moreover, the proposed test procedures are developed specifically for landscape irrigation controllers. Agricultural and central golf-course irrigation controllers are excluded

from the proposed scope of the proposed standards. New definitions for these products are added based on the information provided by the workgroup.

Battery-Operated Irrigation Controllers

Workgroup members commented that this type of irrigation controller is typically used in remote fields where access to both Wi-Fi signals and utility power is limited. Workgroup members stated that requiring this type of irrigation controller to comply with the proposed standards would decrease the life of the battery causing proliferation of battery waste, and result in higher costs to consumers. Moreover, they indicated that these types of irrigation controllers are often installed in remote locations without easy access to the mains power or Wi-Fi signal. To address these concerns, the CEC is proposing to exempt battery-operated irrigation controllers from the standards that would require Wi-Fi connection or result in higher power consumption.

CHAPTER 4:
Proposed Standards for Landscape Irrigation Controllers

CEC staff has analyzed equipment and practices of landscape irrigation, as well as the cost-effectiveness, and technical feasibility of regulating landscape irrigation controllers. Staff proposes standards that meet either WaterSense® specification for soil moisture-based irrigation controllers Version 1.0[53] or WaterSense specification for weather-based irrigation controllers Version 1.1[54]. The proposed standards, as detailed in Appendix B, are cost-effective for consumers, technically feasible to achieve, and will result in significant water savings. Staff has determined that the water savings under the proposed standards are significant while imparting a small incremental cost to consumers. The proposed standards are attainable with products currently available on the market.

Scope

CEC staff reviewed the technical feasibility of the various types of landscape irrigation equipment discussed in this report for water-saving regulations. Staff also reviewed the available test procedures, availability of products with irrigation scheduling capability, and the possibility that the products meeting the standards would provide significant water savings. Staff is proposing regulations for landscape irrigation controllers because of the availability of test methods, test data, currently available compliant products, and significant cost-effective water savings.

Table 4-1 shows examples of the landscape irrigation devices that are in-scope or out-of-scope of the proposed regulations. In-scope devices are able to exert positive control over the irrigation system by initiating the start and stop of irrigation events, such as by providing a command signal to the solenoid in a landscape irrigation valve. Out-of-scope devices used for landscape irrigation cannot provide this command. Water waste is reduced when these devices utilize, the feature to automatically start an irrigation cycle when weather and/or soil moisture conditions indicate irrigation is needed, and/or to stop one when water is not needed.

Staff chose to exclude manual-watering timers from the proposed regulations. Manual-watering timers are not intended to be used for landscape irrigation on a regular basis as they are not programmable for more than a day. Moreover, by definition a failure to manually adjust these timers results in no water being used, where failure to manually adjust an automated timer can result in water being used when weather or soil conditions would make it

[53] The U.S. EPA WaterSense. February 2021. *WaterSense® Specification for Soil Moisture-Based Irrigation Controllers, Version 1.0,* available at: https://www.epa.gov/sites/default/files/2021-02/documents/watersense_specification_for_soil_moisture-based_irrigation_controllers.pdf.

[54] The U.S. EPA WaterSense. September 2, 2021. *WaterSense® Specification for Weather-Based Irrigation Controllers, Version 1.1,* available at: https://www.epa.gov/system/files/documents/2021-09/ws-outdoor-product-specification-wbic-revised-v1.1.pdf.

unnecessary. Staff therefore determined that including these timers in the proposed regulations would not be expected to result in additional water savings.

Agricultural and golf course irrigation controllers are also excluded from the proposed scope of these regulations because these industries rely on highly specific application of water and are highly motivated to only apply the amount of water needed for their crops or plants. In addition, many of these devices are outside the scope of the WaterSense program specifications and test procedures. Therefore, including them in the scope would not be expected to result in additional water savings.

Products within the scope of proposed regulations include residential and commercial irrigation controllers, other than agricultural and golf course controllers. Because most commercial businesses use the same types of irrigation controllers as residential consumers use, commercial irrigation controllers are included to ensure the scope captures all commercial-grade landscape irrigation controllers.

Another type of irrigation controller included in the proposed scope are battery operated landscape irrigation controllers. Although battery-operated controllers can accommodate sensor inputs or real-time weather data, frequent communications between the controller and sensors or weather stations drain the battery faster. Therefore, CEC staff proposes to exempt battery-operated irrigation controllers from certain parts of the proposed standards that would result in additional power consumption. Battery-operated landscape irrigation controllers are not required to be weather-based or soil moisture-based irrigation controllers. However, they are required to meet other programming capabilities and setting requirements outlined in the proposed standards. Battery operated hose-bib controllers are required to comply with the same standards as other battery-operated irrigation controllers.

Table 4-1: Examples of In- and Out-of-Scope Landscape Irrigation Controllers

In-Scope Devices	Out-of-Scope Devices
Clock-timer controllers Weather-based controllers Soil moisture-based controllers Hose-bib controllers Battery-operated controllers	Manual-watering timers Agricultural controllers Golf-course controllers

Source: CEC

Test Procedures

Staff proposes to use ANSI/ASABE S627.1 (October 2022) with some modifications as the test procedure for weather-based landscape irrigation controllers, which is aligned with the U.S. EPA *WaterSense Specification for Weather-Based Irrigation Controllers, V.1.1 September 2, 2021*. All weather-based landscape irrigation controllers, integrated and non-integrated, manufactured on or after one year from the date that the proposed standards are adopted, must show compliance by the weather-based irrigation controllers criteria and be certified as tested in a lab approved by the CEC. (For information about applying to become an approved

lab, refer to the CEC's general instructions for submitting appliance data.[55]) More specific instructions about submitting data for landscape irrigation controllers will be published on the CEC's certification packets for appliances website if the regulations are adopted, before they become effective.[56]

Staff proposes to use ANSI/ASABE S633 (May 2020) with some modifications as the test procedure for bypass soil moisture-based irrigation controllers, which is aligned with the test procedure for the U.S. EPA *WaterSense Specification for Soil Moisture-Based Irrigation Control Technologies, V1.0 February 1, 2021*. All bypass soil-moisture based landscape irrigation controllers, integrated and non-integrated, manufactured on or after one year from the date that the proposed standards are adopted must be tested in a lab approved by the CEC and show compliance with soil moisture-based irrigation controllers criteria that are aligned with the *WaterSense Specification for Soil Moisture-Based Irrigation Control Technologies, V1.0, February 1, 2021*.

Landscape irrigation controllers that are a combination of weather-based and bypass soil moisture-based landscape irrigation controllers are proposed to be tested in a lab approved by the CEC according to test procedures for the weather-based landscape irrigation controllers and soil moisture-based landscape irrigation controllers and show compliance with the proposed standards for both types.

On-demand soil moisture-based landscape irrigation controllers and, separately, battery-operated landscape irrigation controllers have prescriptive design standards and are not proposed to be tested.

Standards

Staff propose that all landscape irrigation controllers within the scope of this regulation, except battery-operated irrigation controllers, manufactured on or after one year from the date that the proposed standards are adopted by the CEC and sold or offered for sale in California be weather-based irrigation controllers, soil moisture-based irrigation controllers, or both.

Compliant weather-based and soil moisture-based irrigation controllers can be integrated or non-integrated as described in Chapter 2. For compliant non-integrated weather-based or soil moisture-based irrigation controllers, the base irrigation controller (meaning the device able to independently act as a time-clock controller) and its compatible add-on or plug-in unit(s) can be sold together or separately. However, the base unit must indicate a list of compatible add-

[55] General Instructions for Submitting Appliance Data: https://www.energy.ca.gov/sites/default/files/2020-03/MAEDBS_General_Instructions_ADA.pdf.

[56] CEC. "Certification Packets for Appliances," https://www.energy.ca.gov/files/certification-packets-appliances.

on or plug-in device models that it relies on to become a compliant weather-based or soil moisture-based irrigation controller. Refer to the marking section for this requirement.

Compliant soil moisture-based irrigation controllers can be either bypass or on-demand types of soil moisture-based irrigation controllers, as described in Chapter 2.

Staff proposes all landscape irrigation controllers within the scope of this rulemaking, including battery-operated controllers, manufactured on or after the date that is one year after the adoption of the proposed standards to have the following capabilities:

- Be capable of preserving the contents of the programmed irrigation settings for a minimum of seven days when the power source is lost and without relying on an external battery backup.
- Either be capable of independent, zone-specific programming or of storing at least three programs to allow separate schedules for zones with differing water needs.
- Be capable of indicating to the user when it is not receiving a signal or local sensor input and is not adjusting irrigation based on current weather conditions or soil moisture content. This requirement does not apply to battery-operated irrigation controllers.
- Be capable of accommodating watering restrictions as follows:
    - Operation on a prescribed day(s)-of-week schedule (for example, Monday-Wednesday-Friday, Tuesday-Thursday-Saturday; any two days; any single day).
    - Either even-day or odd-day scheduling, or any day interval scheduling between two and seven days.
    - The ability to set irrigation runtimes to avoid watering during a prohibited time of day (for example, between 9:00 a.m. and 9:00 p.m.).
    - Complete shutoff (for example, on/off switch) to accommodate outdoor irrigation prohibition restrictions.
- Include a feature to increase or decrease the runtimes or application rates for zones by means of one adjustment without modifying the settings for each zone (percentage adjustment for water budget).
- Be capable of reverting to either a proxy of historical weather data or a percentage adjustment (water budget) feature if the primary source of weather information or the soil moisture sensor mechanism signal is lost. This requirement does not apply to battery-operated irrigation controllers.
- Be capable of allowing a manual operation troubleshooting test cycle and of automatically returning to weather-based mode, soil moisture-based mode, or previous set operating mode within a set period as designated by the manufacturer.

Moreover, staff's proposed standards for integrated and non-integrated weather-based landscape irrigation controllers sold or offered for sale in California align with the *U.S. EPA WaterSense Specification for Weather-Based Irrigation Controllers, V.1.1 September 2, 2021*.[57]

[57] U.S. EPA WaterSense. September 2, 2021. *WaterSense® Specification for Weather-Based Irrigation Controllers, Version 1.1,* https://www.epa.gov/system/files/documents/2021-09/ws-outdoor-product-specification-wbic-revised-v1.1.pdf.

Specifically, all weather-based landscape irrigation controllers manufactured on or after the date that is one year after the adoption of the proposed standards, must be certified to the CEC as meeting the following requirements when tested per the proposed test procedure for weather-based landscape irrigation controllers:

- They shall be capable of interfacing with a rainfall device or soil moisture sensor.
- Irrigation adequacy, the ability to supply a minimum amount of water to keep a landscape healthy, shall be greater than or equal to 80 percent for each zone.
- Irrigation excess, or measure of waste, with the goal of eliminating overirrigation shall be less than or equal to 10 percent for each zone and the average irrigation excess across the six zones shall be less than or equal to 5 percent.

Proposed standards for integrated and non-integrated bypass soil moisture-based landscape irrigation controllers sold or offered for sale in California align with the U.S. EPA WaterSense Specification *for Soil Moisture-Based Irrigation Control Technologies, V1.0, February 1, 2021*.[58] Specifically, all bypass soil moisture-based landscape irrigation controllers manufactured on or after the date that is one year after the adoption of the proposed standards must be certified to the CEC as being sold with a soil moisture sensor (SMS) meeting the following requirements when tested according to the proposed test procedure:

- Landscape irrigation controllers using soil moisture data shall enable and disable irrigation at each of the three depletion levels specified in the test procedure.
- Landscape irrigation controllers using soil moisture data shall have a relative average deviation of the readings at which the replicate SMSs enable and disable irrigation, less than or equal to 10 percent when averaged across all water depletion level readings.
- The absolute value of the slope of the line generated from three depletion levels data points, specified in the test procedure, for both irrigation-enabled and irrigation-disabled readings, by using a least square regression plot for each replica, shall be greater than zero.
- Each SMS evaluated shall enable and disable irrigation (per the type of bypass control under evaluation) after the sensor mechanism is placed in a freezer for three days and thawed to pre-freeze medium temperature.
- They shall be capable of interfacing with a rainfall device.

Landscape irrigation controllers that are combination of weather-based and soil moisture-based irrigation controllers, that are sold or offered for sale in California and are manufactured on or after one year from the date that the proposed standards are adopted by the CEC, are required to meet the standards for both types and be certified under both categories. This requirement applies to integrated and non-integrated weather-based and soil moisture-based irrigation controllers.

The WaterSense test method and performance standards found within the specifications are vetted by the EPA in a public proceeding and are supported by EPA-sponsored efforts by the

[58] U.S. EPA WaterSense. February 2021. *WaterSense® Specification for Soil Moisture-Based Irrigation Controllers, Version 1.0.*

University of Florida to suggest improvements to the underlying *ANSI/ASABE S633, Testing Protocol for Landscape Irrigation Soil Moisture-Based Control Technologies*.[59] The EPA shows that the test method reveals differences in the ability of landscape irrigation controllers to provide adequate irrigation while minimizing water waste. Testing by the EPA shows the standards of the specification are technically feasible and yield significant water savings.

The proposed regulations detailed in Appendix B, if adopted, will result in water savings by creating mandatory standards for products manufactured on or after one year from the date that the proposed standards are adopted by the CEC and sold or offered for sale in California. Based on its independent analysis of the available data, staff has concluded that these proposed regulations are cost-effective and technically feasible. Staff's assumptions and calculations are provided in Appendix A.

Certification

Manufacturers would be required to certify each model of landscape irrigation controllers to the CEC's appliance efficiency database. Certifying each model will allow effective enforcement of the proposed standards by providing regulators with a list of products that could be legally sold in California. Certifying will also allow distributors and retailers to verify that products are code compliant before sale.

Marking

Non-integrated weather-based or soil moisture-based irrigation controllers relying on a separate add-on or plug-in unit for compliance are required to list permanently and legibly one or more compatible add-on or plug-in model(s) and manufacturer(s), including the model that the timer was tested with for certification, on the package. Although non-integrated WBIC or SMS irrigation controllers are required to be tested with only one of the listed compatible add-on or plug-in models for certification purposes, they must meet the required standards with all of the models specified on the package.

Other proposed marking and labeling requirements are general marking requirements for all appliances. All appliances will need to be marked with the manufacturer name, brand name, or trademark; the model number; and the date of manufacture, permanently, legibly, and conspicuously on an accessible place on each unit. The date of manufacture marking shall provide at a minimum the month and year that the product was produced. The marking will enable effective enforcement by requiring landscape irrigation controllers within the scope of the regulations to be identifiable.

Effective Date

The proposed standards would apply to all residential, commercial, and industrial landscape irrigation controllers sold or offered for sale in California, with limited exceptions, that are manufactured on or after one year from the date that the proposed standards are adopted by

[59] American Society of Agricultural and Biological Engineers. May 14, 2020. News Release: "ASABE Publishes New Test Protocol for Landscape Irrigation Devices," https://www.asabe.org/LinkClick.aspx?fileticket=S4HKyDWMzuY%3d&portalid=0.

the CEC. Products manufactured before the effective date can still be sold in California after the proposed standards become effective.

CHAPTER 5:
Alternatives Considered for Landscape Irrigation Controllers

The CEC staff proposal was analyzed to determine whether it meets the legislative criteria for the CEC's prescription of appliance efficiency standards. Staff also reviewed and analyzed the U.S. EPA WaterSense specification, as well as other state and local standards. Staff will continue to analyze and consider alternative proposals as they are provided to the CEC.

Alternative 1: Include Rain Sensor With Landscape Irrigation Controller Standard

Staff evaluated proposing that a rain sensor be included with each landscape irrigation controller sold or offered for sale, since many rain sensors are available and many landscape irrigation controllers are compatible with a rain sensor. Rain sensors were found to provide significant water savings.[60]

Staff found that, although this alternative would be expected to save water, it lacks a standard test procedure and minimum performance standard to allow implementation as a minimum performance standard. Moreover, in absence of rainfall, this proposal would not provide adequate watering adjustments resulting in water savings that is less than other available options. Therefore, staff did not recommend this alternative.

Alternative 2: Soil Moisture-Based Landscape Irrigation Controller Standard

Staff evaluated proposing that a soil-moisture sensor be included with each landscape irrigation controller sold or offered for sale. This proposal would be aligned with the U.S. EPA's *WaterSense Specification for Soil Moisture-Based Irrigation Controllers, Version 1.0* (February 2021).[61] If applied correctly, this alternative would provide the most water savings of the alternatives considered by staff. However, the estimated potential water savings are fully realized only when moisture sensors adequately estimate the moisture levels of the irrigated area. Large areas or areas with varying topology or soil textures could require multiple irrigation zones and soil moisture sensors to provide the adequate irrigation needed. Also, there are few complying models on the market.

Therefore, staff determined that requiring a standard that could be met only by soil moisture-based irrigation controllers might not be the most water-efficient alternative for all applications and might cause supply chain issues for California consumers. Therefore, staff did not recommend this alternative.

---

[60] Technical Reference Manual for WaterSense® Labeled Homes: https://www.epa.gov/system/files/documents/2023-08/ws-homes-TechnicalReferenceManual.pdf.

[61] *WaterSense® Specification for Soil Moisture-Based Irrigation Controllers*.

Alternative 3: Weather-Based Landscape Irrigation Controller Standard

Staff evaluated proposing that all landscape irrigation controllers meet the *U.S. EPA WaterSense Specification for Weather-Based Irrigation Controllers*[62] since this would create a performance standard with an available test method. There is enough performance data to demonstrate cost-effectiveness and technical feasibility of the controllers that meet this specification. Staff believes that although the savings from this proposal would be significant, it may preclude soil moisture-sensing technologies that have been shown to be technically feasible and cost-effective, and in doing so adversely affect the development of potentially highly effective technologies. Therefore, staff did not recommend this alternative.

Staff Proposal: Soil Moisture-Based or Weather-Based Landscape Irrigation Controller Standard

As stated in Chapter 4, staff proposes a standard that would effectively be a combination of Alternatives 2 and 3. In this proposal, a landscape irrigation controller would need to meet or be capable of meeting the requirements of either the WaterSense specification for soil moisture-based controllers (Alternative 2) or the WaterSense specification for weather-based controllers (Alternative 3), but not necessarily the requirements of both alternatives. This proposal would provide more flexibility to manufacturers of landscape irrigation controller products while also providing consumers with additional options for managing their landscape irrigation while achieving significant cost-effective water savings.

[62] *WaterSense® Specification for Soil Weather-Based Irrigation Controllers*.

CHAPTER 6:
Technical Feasibility

Compliant Product Availability

The following product types can be compliant with the proposed standards:

- Integrated (stand-alone) weather-based irrigation controllers certified to the WaterSense program.
- Integrated (stand-alone) bypass soil moisture-based irrigation controllers certified to the WaterSense program.
- Integrated (stand-alone) or non-integrated on-demand soil moisture-based irrigation controllers that meet proposed standards applicable to these product types.
- Non-integrated soil moisture-based and weather-based irrigation controllers compatible with add-on or plug-in devices certified to the WaterSense program. These are base irrigation controllers that rely on a separate add-on or plug-in device to become a soil moisture-based or weather-based irrigation controller.
- Battery-operated irrigation controllers that meet proposed standards applicable to this product type.

U.S. EPA WaterSense-Labeled Products

As of August 2025, the U.S. EPA WaterSense product website showed more than 400 stand-alone weather-based landscape irrigation controllers and more than 30 add-on or plug-in models with the WaterSense label.[63] The WaterSense-compliant product list shows landscape irrigation controller models are available from several manufacturers. The proposed standards are aligned with the WaterSense program, proving the proposed standards are technically feasible as many compliant products already exist. The variety of products available from multiple manufacturers confirms compliant product availability and a lack of any intellectual property barriers that could otherwise prevent competition.

As of the publication date of this report, the U.S. EPA's WaterSense compliant product list for soil moisture-based irrigation controllers shows four add-on or plug-in models from two manufacturers that can be used with their compatible timers to meet the specification. Since the proposed standards are identical to the WaterSense program, the proposed standards are technically feasible as compliant products already exist. Although there are only a handful of soil moisture-based models available on the market, more models are expected to become available in the future.

WaterSense-certified add-on or plug-in devices are not currently required to be packaged and sold with their compatible irrigation controllers for compliance in the proposed standards.

[63] U.S. EPA. "WaterSense Product Search," https://lookforwatersense.epa.gov/products/index.html.

The proposed standards provide flexibility for California consumers to choose from a growing list of more than 450 compliant models altogether.

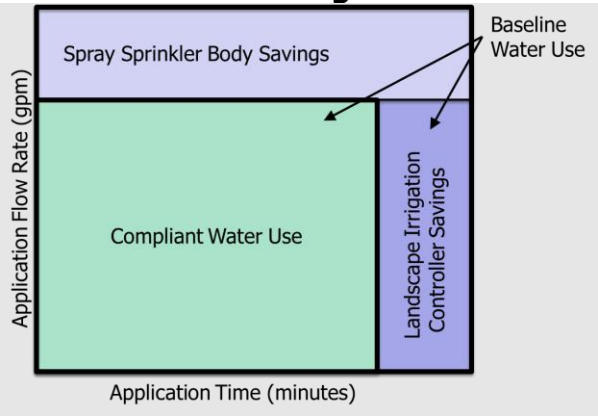
CHAPTER 7:
Costs and Savings Analysis

The proposed standards for landscape irrigation controllers would significantly reduce water and embedded energy consumption. The CEC staff estimated per device water savings by reviewing the compilation of studies performed by Lawrence Berkeley National Laboratory (LBNL) on weather-based irrigation controllers (WBIC). The compilation showed that on average WBIC reduced water consumption by 15 percent[64] and controllers with soil moisture sensors saved even more.[65] Because the proposed regulations allow for both WBIC and SMS controllers, staff's analysis conservatively assumes only the water savings associated with the less effective control (i.e., WBIC).

To calculate savings, staff also considered the adopted spray sprinkler body (SSB) appliance standards[66] that significantly increase the water efficiency of landscape irrigation systems. Each measure will have a complementary effect. The SSB standards provide more efficient irrigation through reducing the application flow rate of the SSB while the landscape irrigation controller standards will reduce the irrigation time. Total irrigation can be visualized as an area equal to the product of application flow rate and the application time.

Figure 7-1 shows the interaction of landscape irrigation controller and SSB savings. Staff calculated water savings assuming a baseline that the spray sprinkler body standards are fully implemented. With this baseline, staff calculated additional savings due to the proposed landscape irrigation controller standards.

Figure 7-1: Combined Water Savings from California Regulations



Source: CEC illustration

[64] Williams, Alison, Heidi Fuchs, and Camilla Dunham Whitehead. April 1, 2014. *Estimates of Savings Achievable From Irrigation Controllers.* Lawrence Berkeley National Laboratory, https://eta-publications.lbl.gov/sites/default/files/lbnl-6604e.pdf.

[65] WaterSense Specification for Soil Moisture-Based Irrigation Controllers Supporting Statement: https://www.epa.gov/sites/default/files/2021-02/documents/ws_sms_final_spec_supporting_statement.pdf.

[66] Adopted Spray Sprinkler Body appliance standards: https://efiling.energy.ca.gov/GetDocument.aspx?tn=230199&DocumentContentId=61741.

Although weather-based and soil moisture-based irrigation controllers meet the proposed standards, staff used weather-based controllers for costs and benefits analysis because they encompass most of the compliant products on the market.

The values in **Table 7-1** list the design life and per-unit annual and life-cycle water savings. The estimates for the design life and water savings of a compliant weather-based irrigation controller is based on the U.S. EPA's WaterSense estimates.[67] The estimated baseline water use is from the staff estimate of annual water use after spray sprinkler body water efficiency standards went into effect October 1, 2020.[68]

Table 7-1: Per Unit Water Savings for WBIC

Product Type	Design Life (years)	Water Savings (%)	Baseline Water Use (Gal/yr)	Compliant Water Use (Gal/yr)	Water Savings (Gal/yr)	Life-Cycle Water Saving (Gal)
WBIC	15	15%	88,436	75,171	13,265	198,981

Source: CEC

Staff studied prices for integrated and non-integrated weather-based landscape irrigation controllers as well as prices for not-compliant irrigation controllers that are on the market. **Figure 7-2** compares these prices. Consumers mostly consider products based on their prices, features or perceived value, and the quality of the product.[69]

Prices for integrated WBICs have the largest range as smart controllers can have more advanced features that affect prices. Prices for non-integrated WBICs are listed for both cases, that is, for the base controller with and without an add-on or plug-in device that enables smart features. To have similar functionalities as integrated products, non-integrated products should be purchased with an add-on or plug-in device which will increase their overall prices. Integrated WBICs and non-integrated WBICs *without* their add-on or plug-in device have comparable lowest prices. The price gap between products in the lower portion of their price ranges is expected to further decrease over time.

In conclusion, non-integrated WBICs without add-on or plug-in devices provide less functionalities for similar prices as integrated WBICs. Otherwise, they would need to accompany an add-on or plug-in device which would make them more expensive than integrated WBICs. Therefore, the market is expected to shift further toward integrated WBICs

[67] U.S. EPA. *WaterSense® Specification for Weather-Based Irrigation Controllers Supporting Statement*.

[68] Steffensen, Sean. April 2019. *Final Staff Analysis of Water Efficiency Standards for Spray Sprinkler Bodies.* California Energy Commission, CEC-400-2018-005-SF, https://efiling.energy.ca.gov/GetDocument.aspx?tn=227860&DocumentContentId=59234.

[69] Martinčić, M., Vuković, D., & Hunjet, A. (2022). Consumer Responses to Selected Activities: Price Increases, Lack of Product Information and Numerical Way of Expressing Product Prices. Journal of Risk and Financial Management, 15(6), 255. https://doi.org/10.3390/jrfm15060255.

over time when the proposed regulation becomes effective and non-compliant controllers are eliminated from the California market.

Figure 7-2: Landscape Irrigation Controller Prices.

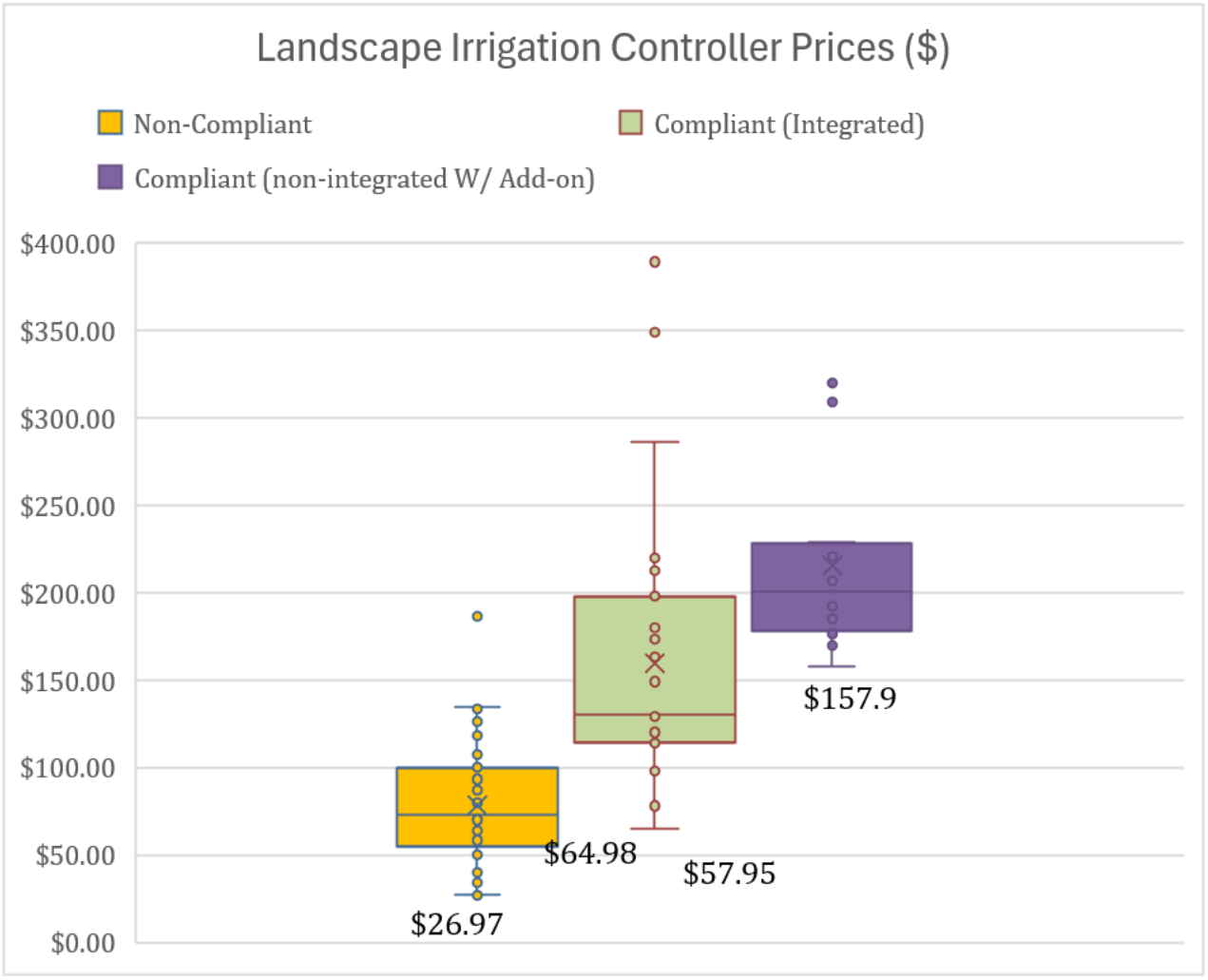


Illustration Source: CEC

Table 7-2 summarizes estimated average incremental cost of upgrading a non-compliant product to a compliant product, first year, and life-cycle monetary savings. The average annual savings are the savings that consumers will receive once an integrated compliant product or a non-integrated compliant product with its compatible add-on or plug-in device is installed. To determine incremental costs of landscape irrigation controllers that meet the proposed standards, CEC staff gathered retail price data from landscape equipment vendor websites. Staff analyzed the data to estimate the cost difference to consumers with the addition of the weather-based irrigation-scheduling features. Staff used integrated WBICs and non-integrated WBICs without an add-on or plug-in device, that otherwise meet the proposed standards, as compliant products for calculating the average price of compliant products. Staff applied a 3 percent discount rate to calculate the net present value of the anticipated savings over the design life of the product.

Table 7-2: Per-Unit Monetary Costs and Savings for WBIC ($2025)

Water Rate ($/1000 Gal)	Water Cost First Year Saving ($/yr)	Incremental Costs ($)	Water Cost Life-Cycle Savings ($)	Life-Cycle Net Benefit ($)	Payback Period (Years)	Benefit to Cost Ratio
$6.13	$76.65	$32.87	$942.48	$909.61	0.43	28.67

Source: CEC

To estimate the monetary value of the water saved, an average metered water rate in California is needed. CEC staff used publicly available data from various sources such as the Department of Water Resources (DWR) audit reports for urban water suppliers,[70] California Water Association (CWA),[71] and water utility providers websites to estimate the weighted average rate for water in California. The annual savings of each unit are calculated by multiplying the annual water savings by the water rate charge of $6.13 per 1,000 gallons.

The life-cycle benefit reflects the savings the consumer will receive over the life of the appliance and is the aggregate of the average annual savings over the design life of the unit.

The net life-cycle benefit, which determines the cost-effectiveness of the proposed standards, is the difference between the average life-cycle savings and the average incremental cost of each compliant unit. For the purposes of this analysis, a compliant product that receives water savings is assumed to be a WaterSense certified weather-based landscape irrigation controller. A comparison of the initial cost to upgrade a not-complying irrigation controller device to a complying device and the cost of water saved as a result of this regulation shows that this proposal is extremely cost-effective with a benefits-to-costs ration of more than 28 and a payback period of about six months.

As a note for readers who have also read the original staff proposal[72], under the revised proposal, certain basic irrigation controllers that rely on an add-on or plug-in device for compliance **can** be sold or offered for sale in California with or without their respective add-on or plug-in devices. In the previous analysis, CEC staff excluded from the analysis of impacts integrated (stand-alone) weather-based and soil moisture-based irrigation controllers that are projected to be on the market irrespective of adoption of proposed minimum standards; the impact of potential standards are measured from the baseline of the current status quo, of which these are a part. In this revised analysis, the CEC staff is also excluding non-integrated

[70] The Water Use Efficiency (WUE) data submitted to the Department of Water Resources: https://wuedata.water.ca.gov/default.asp.

[71] California Water Association. "Regulated Water Utilities," https://calwaterassn.com/about-cwa/regulated-water-utilities-in-california/.

[72] Pasha, Soheila and David U. Johnson. 2023. Staff Analysis of Proposed Efficiency Standards for Landscape Irrigation Controllers. California Energy Commission. Publication Number: CEC-400-2023-012: https://efiling.energy.ca.gov/GetDocument.aspx?tn=253050&DocumentContentId=88249.

weather-based and soil moisture-based irrigation controllers that are projected to be on the market without regulation from the saving analysis, for the same reason.

Figure 7-3: Projected Market Share of Compliant and Not-Compliant Products

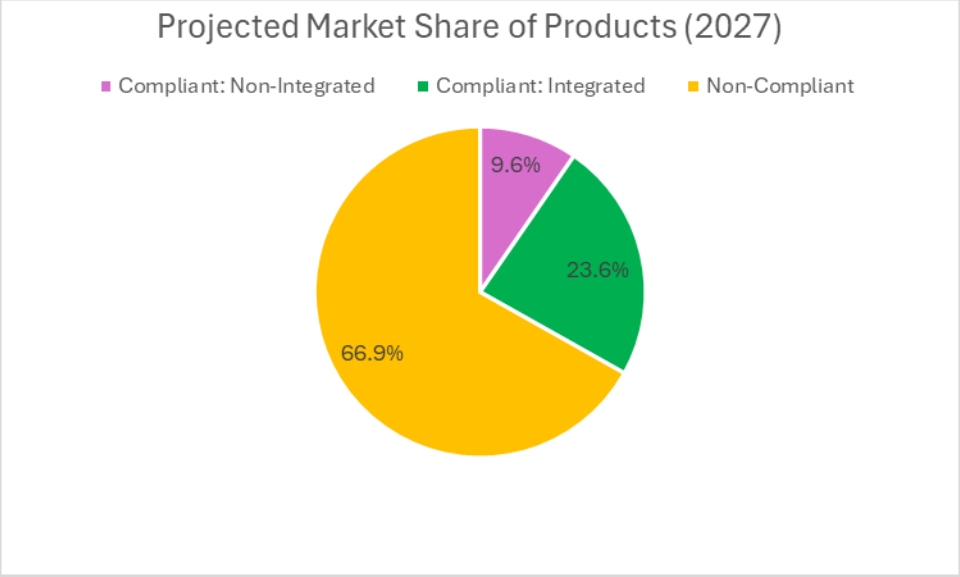


Illustration Source: CEC

Staff projects that by 2027 about two-thirds of the products on the market won't meet the proposed standards as indicated in **Figure 7-3** and will be removed from the market.

The proposed standards will also result in significant electricity and natural gas savings attributed to reduction in water pumping, treatment, and delivery.[73] However, these embedded energy savings are not included in the cost analysis as the associated costs of electricity and natural gas are already included in the water rates. Staff used the data provided by the California investor-owned utilities (IOUs), indicating that every million gallons of water use 3,565 kilowatt-hours (kWh), to estimate embedded electricity savings by the proposed standards shown in **Table 7-3**.

[73] *California Investor Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers,* June 16, 2017, https://efiling.energy.ca.gov/GetDocument.aspx?tn=219251&DocumentContentId=26786.

Table 7-3: Embedded Electricity Savings

1st Year Embedded Electricity Saving (kWh/yr per unit)	Embedded Electricity Saving Over the Life of Product (kWh/unit)	Statewide 1st Year Embedded Electricity Savings (GWh/yr)	Statewide Stock Turnover Embedded Electricity Savings (GWh/yr)
47.29	709	12.7	188.8

Source: CEC

Although compliant weather-based or soil moisture-based irrigation controllers contribute significant energy savings in the form of embedded electricity used for water treatment and delivery, they are expected to result in higher standby power consumption.[74] Data reviewed by the California IOUs CASE team showed that there is no difference in minimum standby power between basic controllers and weather-based controllers.[75] This indicates that existing products are not designed for standby power efficiency.

None the less, staff assumed that the proposed standards increase standby power consumption by 0.2 Watts, consistent with the state's Appliance Efficiency Regulations for the standby power limit of connected state-regulated light emitting diode (LED) lamps.[76] Although irrigation controllers and lamps are two different types of products, the functionality of remaining connected to a network or sensors while in standby mode are similar.

California IOUs CASE team pointed out that a typical irrigation controller spends 97 percent of its time in standby mode. The expected additional annual power consumption from the higher standby power for the compliant products is calculated by multiplying the difference in standby power between compliant and non-compliant products by the number of hours irrigation controllers spend in standby mode in a year.

Difference in annual energy use (Wh/yr) = 0.2 (W) x 97% x 24 (hour/day) x 365 (days/yr)

Difference in annual energy use (kWh/yr) = 1.7 (kWh/year)

Assuming $0.32 per kWh[77], consumers would pay an additional estimated cost of $0.55 per year for the higher standby mode power consumption. This minimal additional cost does not

---

[74] Brown, Rich Brown. Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory (LBNL). "Energy Consumption of Irrigation Controllers," June 1, 2009, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjUy9Xmu4WBAxUqD0QIHQamANsQFnoECCQQAQ&url=https%3A%2F%2Fefiling.energy.ca.gov%2FGetDocument.aspx%3Ftn%3D52060%26DocumentContentId%3D37063&usg=AOvVaw1zGQ7luvo-eRpbLdkWPXqR&opi=89978449.

[75] *California Investor Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers,* September 18, 2017, https://efiling.energy.ca.gov/GetDocument.aspx?tn=221225&DocumentContentId=26788.

[76] State-regulated LED lamps standby power requirement: https://govt.westlaw.com/calregs/Document/I67801CF04B7911EFAB72FF2DA1536AFB?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default)&bhcp=1.

[77] California Energy Demand, 2024-2040, Baseline Demand Forecast Files, residential electricity rates: https://efiling.energy.ca.gov/GetDocument.aspx?tn=260931.

affect overall cost effectiveness or the anticipated payback period of the proposed standards. Moreover, the significant statewide electricity savings identified as embedded electricity resulted from the proposed standards outweighs the increased electricity consumption from the higher standby power.

As California IOUs CASE team stated in their comments, "[the] wide range of standby power measured within the irrigation controller category indicates that these products have not yet been fully optimized for energy efficiency." [78] Therefore, there are potential power-saving opportunities that could be considered through other programs. The CEC could, for example, allow irrigation controllers to participate in the Voluntary Performance Framework under development by a separate team, focusing on voluntary reductions in standby power use.[79]

To arrive at an estimate for the existing inventory of automatic landscape irrigation control systems installed in California homes, staff used 2023 demographic information from the California Department of Finance (DOF) to find the number of single-family and multifamily homes in California.[80] Staff then used the data provided by the California IOUs' comments in response to the invitation to participate for landscape irrigation controllers for an estimated percentage of homes that have an automatic landscape irrigation system.[81] Staff used the data provided by the IOUs' comment indicating that 68 percent of California's single-family homes use automatic sprinkler system from which 89 percent use an irrigation timer to control the irrigation schedule to conclude that 60.5 percent of single-family homes in California use irrigation control systems. Staff extended this conclusion to residential buildings containing multifamily homes.

Staff relied on this information to calculate that about 5.7 million landscape irrigation controllers are in use in California. Staff further assumed that the number of landscaped commercial buildings is insignificant compared to the number of residential landscapes and would fall within the margin of error for this estimate. Therefore, staff did not include commercial landscapes in this calculation. Assuming an average growth rate aligned with the growth rate for housing in California and a 15-year design life, staff estimates about 397,000 landscape irrigation controllers were shipped in 2025 to California. Details of these calculations are in Appendix A.

The water savings of each unit are estimated by comparing the baseline water consumption for landscape irrigation controllers with the respective water consumption under the proposed standards. For the annual and accumulative statewide savings estimates, per-unit savings are

---

[78] *California Investor Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers,* September 18, 2017, https://efiling.energy.ca.gov/GetDocument.aspx?tn=221225&DocumentContentId=26788.

[79] California Energy Commission. "Low-Power Roadmap," https://www.energy.ca.gov/proceeding/low-power-mode.

[80] California Department of Finance. *"E-5 Population and Housing Estimates for Cities, Counties, and the State, January 2021-2025, with 2020 Benchmark,"* https://dof.ca.gov/wp-content/uploads/sites/352/Forecasting/Demographics/Documents/E-5_2025_InternetVersion.xlsx.

[81] *California Investor Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers,* September 18, 2017, https://efiling.energy.ca.gov/GetDocument.aspx?tn=221225&DocumentContentId=26788.

multiplied by the annual sales and by the total stock of compliant products in California. These calculations are available in **Appendix A**. In **Tables 7-4**, the potential statewide water and cost savings of the proposed standards are provided for the first year after the regulations take effect.

Estimated water and cost savings are calculated assuming that 33.15 percent of landscape irrigation controllers meet the proposed standards in 2027 without regulations and, therefore, are part of baseline estimates and don't contribute to the potential savings. Furthermore, staff assumed products compliant with the proposed standards grow by 0.5 percent without regulations year after year. With the currently proposed standards, California consumers would save more than 3.5 billion gallons of water equating to $20.6 million in water cost savings in the first year after the regulations take effect.

Staff calculations and assumptions used to estimate first-year savings and stock turnover savings are provided in **Appendix A**.

Table 7-4: First-Year Statewide Costs and Water and Cost Savings ($2025)

Product	Per-Unit Water Savings (gal/yr/unit)	1st Year Sales in CA (Units/yr)	Statewide 1st Year Water Savings (million gal/yr)	Statewide 1st Year Costs ($million/yr)	Statewide 1st Year Costs Savings ($million/yr)
Landscape Irrigation Controllers	13,265	402,363	3,568	$8.6	$20.6

Source: CEC

Table 7-5 shows the potential total water and costs savings after the existing stock of landscape irrigation controllers in use are entirely turned over with compliant devices. As provided in **Table 7-5**, if all landscape irrigation controllers complied with the currently proposed standards (annual stock savings), California would save about 53 billion gallons of water, which equates to $251 million in water cost savings. The amount of water saved annually is enough to provide water to about 450,000 homes in California.

Table 7-5: Statewide Water and Cost Savings After Stock Turnover ($2025)

Application	Stock Turnover Year	Statewide Stock Turnover Water Savings (million gal/yr)	Statewide Stock Turnover Costs Savings ($million/yr)
Landscape Irrigation Controllers	Year 15th (2041)	52,969	$251

Source: CEC

In conclusion, the proposed standards are clearly cost-effective with a short payback period of less than six months, as consumers will receive net savings from the installation of landscape irrigation controllers over the life of the product.

CHAPTER 8:
Environmental Impacts and Benefits

This chapter provides the basis for the staff determination that adoption of the proposed standards are exempt from the requirements of the California Environmental Quality Act (CEQA).

Proposed Notice of Exemption Finding

Categorial Exemptions, Classes 7 and 8 Exemptions

California Code of Regulations, Title 14, Sections 15307 and 15308, exempt from CEQA actions taken by a regulatory agency to "assure the maintenance, restoration, or enhancement of a natural resource" and actions taken to "assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment." The proposed landscape irrigation controller standards will have no significant effect on the environment due to unreasonable circumstances and fall squarely within the categorical exemptions of Sections 15307 and 15308.

Establishing standards for landscape irrigation controllers sold or offered for sale in the state, that are manufactured on or after the date that is one year after the adoption of the proposed standards, are being undertaken in furtherance of the CEC's Appliance Efficiency Regulations to establish efficiency standards that promote the use of energy- and water-efficient appliances. The project is designed to benefit the environment and natural resources by reducing water and energy consumption in the state, thereby reducing irrigation excess, water waste, and the water supplied to keep a landscape healthy. As detailed in Chapter 7, the proposed standards for landscape irrigation controllers would significantly reduce water and energy consumption. Thus, this rulemaking directly addresses significant environmental impacts associated with excess water supply and the over consumption of the state's energy and water resources. Thus, the adoption of the proposed standards, assures the maintenance, restoration, or enhancement of a natural resource while also protecting the environment as required by sections 15307 and 15308 of the CEQA Guidelines, respectively.

Further, none of the exceptions to exemptions listed in CEQA Guidelines Section 15300.2 apply to this project. Furthermore, there is no reasonable possibility that the activity will have a significant effect on the environment because of unusual circumstances. For these reasons, this project is exempt from CEQA.

Common Sense Exception

The development and adoption of the landscape irrigation controller standards are also exempt from CEQA under the "common sense exemption." CEQA only applies to projects that have the potential for causing a significant effect on the environment (Cal. Code Regs., Tit. 14, Section 15061(b)(3)). "A significant effect on the environment" is defined as a substantial, or a potentially substantial, adverse change in the environment and does not include an economic change by itself (Pub. Resources Code, Section 21068; Cal. Code Regs., Tit. 14, Section

15382.) The adoption of the proposed standards is an action taken by a regulatory agency for the protection of the state's natural resources and environment. As further discussed below, the proposed standards for landscape irrigation controllers will reduce a significant amount of water consumption and the associated energy required to pump, treat, and deliver that water. Additionally, as detailed throughout this paper, no significant adverse impacts to the environment have been identified as resulting from this action. For these reasons, adoption of the proposed standards would not be subject to CEQA under the common sense exemption of Section 15061(b)(3).

Impacts

The proposed regulation requires landscape irrigation controllers manufactured on or after the effective date (one year after the proposed standards are adopted) of this regulation to comply with the proposed standards. Landscape irrigation controllers are usually replaced when they are at the end of useful lives; therefore, the replacement of controllers manufactured under current or past standards with controllers manufactured under the updated proposed standards would present no additional impact to the environment beyond the natural cycle.

Typically, these devices feature a microprocessor and circuit board to keep time and initiate irrigation cycles. Weather-based irrigation controllers typically add more sophisticated software to determine when to begin and end an irrigation cycle. Adding a soil-moisture sensor to a landscape irrigation controller would not introduce any materials not already found in the controller. The proposed standards do not require the use of any specific material to improve the efficiency of the product.

Since these improvements are already common practice, updating the efficiency of landscape irrigation controllers is not likely to change industry practice, the landscape irrigation controller design, or the material composition of these landscape irrigation controllers. In addition, the materials found in the final product do not contain any hazardous materials, pose no harm to the user, and would not cause a significant environmental impact.

The marking requirement would require product information to appear on the appliance. The marking requirement could be accomplished with existing marking techniques and would not cause a significant environmental impact.

Benefits

The proposed standards would save significant amounts of water, estimated at about 49.5 billion gallons annually after full-stock turnover. The proposed standards also save significant amounts of electricity used for water pumping, treatment, and delivery. The embedded electricity saving is estimated to be about 176.4 GWh annually after full-stock turnover.

For homes and workplaces, reducing water consumption would reduce the demand for water supplies, which will help decrease the need for investing in costly, large-scale infrastructure projects. It will also result in reduced operating costs for water utilities, as it takes a significant amount of energy to get water to a home or business. Energy is needed to extract water from the source; treat, distribute, and use it; and collect and treat wastewater for release back into the environment.

Furthermore, reducing water consumption would improve water quality and help the state maintain higher water levels in lakes, rivers, and reservoirs, including during drought conditions. On the demand side, reducing water consumption would also provide the co benefit of improving air quality by reducing greenhouse gases emitted in the production of energy used to transport and treat California's water.

CHAPTER 9:
Equity of the Impacts and Benefits

To fulfil the CEC's commitment to ensure an equitable distribution of benefits, especially to the most vulnerable communities, staff analyzed how the cost and environmental impacts would affect low-income communities.

Staff previously assumed low-income households pay a discounted price for their utilities, including water utility. That assumption would have reduced the monetary benefits received from the reduced water consumption while the initial higher cost to purchase compliant products remained the same. In that analysis staff applied a 30 percent discount on the water rate when performing cost analysis to ensure proposed standards remained cost-effective. **Table 9-1** shows the cost analysis results under that assumption for each unit of irrigation controller for low-income households. The result shows that the proposed standards remained extremely cost effective even if consumers paid a discounted water rate with a benefit to cost ratio of more than 20 and a payback period of less than eight months. The proposed standards would result in about $627 in net savings over the life of the product.

Table 9-1: Per-Unit Monetary Costs and Savings for Low-Income Households ($2025)

Water Rate ($/1000 Gal)	Water Cost Life-Cycle Savings ($)	Incremental Costs ($)	Life-Cycle Net Benefit ($)	Pay Back Period (Years)	Benefits to Cost Ratio
$4.29	$659.74	$32.87	$626.87	0.63	20.07

Source: CEC

Some members of the irrigation controller workgroup provided feedback that there are no systematic water rate discount for low-income households. Through additional research, staff found that while some water utility providers offer discounts for low-income households, utilities only apply the discounts to the fixed portion of their charges. For example, Cal Water offers fixed monthly discount equal to 50 percent of the 5/8 x 3/4-inch meter service charge to those who meet their income guidelines.[82] CEC staff's findings are consistent with the workgroup members assertion that low-income households pay regular residential water rates for the metered portion of their water utility, therefore, low-income households will receive the same benefits from the proposed standards as other households. It means that the upfront increased cost of a compliant landscape irrigation controller will be paid off in about six months through the water consumption savings of their landscape.

Low-income families and other consumers without Wi-Fi connections still benefit from the proposed standards that require specific programming capability requirements such as

[82] Cal Water Customer Assistance Program (CAP): https://www.calwater.com/customercare/customer-assistance-program-cap/.

reverting to proxy of historical weather data or a percentage adjustment (water budget) feature if the weather data or sensor information is not received.

Low-income families equally benefit from the environmental impacts as substantially lower statewide water consumption leads to significant savings of the amount of electricity used for water pumping, treatment, and delivery. Additionally, these factors would result in reduced greenhouse gases and criteria pollutant emissions that benefit all Californians.

ACRONYMS

AB	Assembly Bill
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
ANSI	American National Standards Institute
ASABE	American Society of Agriculture and Biology Engineers
ASTM	American Society for Testing and Materials
CA	California
CASE	Codes and Standards Enhancement
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CLIMB	Clean Energy in Low-Income Multifamily Buildings
CPUC	California Public Utilities Commission
CWA	California Water Association
DOF	Department of Finance
DWR	Department of Water Resources
EUL	Expected useful life
Gal	Gallon
GHG	Greenhouse gas
GWh	Gigawatt-hours
IA	Irrigation Association
IEPR	Integrated Energy Policy Report
IOU	Investor-owned utilities
kWh	Kilowatt-hours
LBNL	Lawrence Berkeley National Laboratory
LEED	Leadership in Energy and Environmental Design
MW	Megawatts
MWELO	Model Water Efficient Landscape Ordinance
MWh	Megawatt-hours
NPV	Net present value

OIR	Order instituting rulemaking
SB	Senate Bill
SMS	Soil moisture sensor
SSB	Spray sprinkler body
SWAT	Smart Water Application Technologies
US EPA	United States Environmental Protection Agency
WBIC	Weather-based irrigation controllers

GLOSSARY

Add-on device	An interface device separate from the main landscape irrigation controller (base controller) that communicates the sensor mechanism readings to the base controller through a wired or wireless connection and which are designed to work with multiple brands of base controllers (epa.gov/watersense).
Annual statewide stock water savings	The difference in statewide annual water use with and without proposed regulations for landscape irrigation controllers.
Annual statewide water savings	Statewide water savings from the portion of the annual sale of compliant landscape irrigation controllers resulted from the proposed regulation.
Baseline irrigation controller or basic irrigation controller	A landscape irrigation controller that is in the scope of the proposed regulations but does not comply with the proposed standards.
California Environmental Quality Act (CEQA)	California statute passed in 1970 that requires disclosure to the public of the significant environmental effects of a proposed discretionary project, through the preparation of an initial study, negative declaration, mitigated negative declaration, or environmental impact report.
Criteria air pollutant	An air pollutant for which acceptable levels of exposure can be determined and for which the U.S. Environmental Protection Agency has set an ambient air quality standard. Examples include ozone (O3), carbon monoxide (CO), nitrogen oxides (NOx), sulfur oxides (SOx), and particulate matter (PM10 and PM2.5).
Design life, or estimated useful life (EUL)	The average period that a product class of appliances or devices will perform the intended function fully, given proper care and maintenance.
Disadvantaged communities	Disadvantaged communities refer to the areas throughout the state that most suffer from a combination of economic, health, and environmental burdens. These burdens include poverty, high unemployment, air and water pollution, presence of hazardous wastes, as well as high incidence of asthma and heart disease

Embedded Electricity	The electricity consumed for pumping, treatment, and delivery of water from the source to destination.
Equity	The fair treatment, meaningful involvement, and strategic investment of resources through clean transportation programs, incentives, and processes for all Californians so that race, color, national origin, or income level are not barriers to increased opportunities and participation.
evapotranspiration (ET)	The combination of water transpired by vegetation and evaporated from soil, water, and plant surfaces (mm or inches of water per time period).
Gigawatt-hour (GWh)	A unit of energy representing 1 billion (1,000,000,000) watt-hours and is equivalent to 1 million kilowatt-hours. A single watt-hour is a measure of electrical energy equivalent to a power consumption of 1 watt for 1 hour. A kilowatt-hour (kWh) is a unit of energy equal to 1 kilowatt of power sustained for 1 hour or to 3,600 kilojoules (3.6 megajoules). 1 million watt-hours = 1 megawatt-hour (MWh).
Greenhouse gas (GHG)	Any gas that absorbs infrared radiation in the atmosphere. Common examples of greenhouse gases include water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), halogenated fluorocarbons (HCFCs), ozone (O3), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs)
Hose bib	Valve configured to be mounted on a wall having threads to accommodate the connection of a water hose (www.irrigation.org).
Incremental Cost or Initial Cost	The additional cost (average) at retail that a consumer would pay for an appliance that meets the proposed standards. This cost is the difference between an existing base model and the same model that has the added functionality to comply with the new appliance standards for landscape irrigation controllers.
Investor-owned utility	A private company that provides a utility, such as water, natural gas, or electricity, to a specific service area. The California Public Utilities Commission regulates investor-owned utilities that operate in California.

Life-cycle water savings	The amount of water saved over the life of a compliant landscape irrigation controller from upgrading a baseline product to a compliant product.
Life-cycle net benefits	The difference between water cost life-cycle savings and the initial incremental cost.
Low-income communities/households	Communities tracked by the U.S. Census or households that are either at or below 80 percent of the statewide median income or at or below the threshold designated as low-income by the California Department of Housing and Community Developments Income Limits.
Payback period	The amount of time it takes to recover the initial cost through the water cost savings.
Per-unit baseline water use	Average water used with a baseline landscape irrigation controller for a single-family home.
Per-unit compliant water use	Average water used with a compliant landscape irrigation controller for a single-family home.
Per-unit water savings	The difference between per unit baseline water use and per unit compliant water use.
Plug-in devices	An interface device separate from the main landscape irrigation controller (base controller) that communicates the sensor mechanism readings to the base controller through a wired or wireless connection and which are designed to work with one brand of base controller (epa.gov/watersense).
Solenoid	A coil of wire that acts as an electromagnet when electric current is passed through it, often used to control the motion of metal objects, such as a switch or relay. Used in irrigation as a component of remote control valves.
Stock turnover year	The first year that all landscape irrigation controllers in use in the state are turned over to products compliant with the proposed standards.
Water cost life-cycle savings	The cost of life-cycle water savings. A 3 percent annual discount rate is applied to the cost savings.

APPENDIX A:
Staff Assumptions, Calculations, Tables, and Equations

Appendix A discusses the information and calculations used to characterize landscape irrigation controllers in California, the current water and energy use, and the associated potential savings. CEC staff considered information from a variety of sources, including information contained in the CASE and Irrigation Association proposals submitted to the CEC. Staff provides the approach used for water and energy consumption and savings. Staff has rounded the results of the calculations as they are presented in this appendix. Unrounded numbers are used for subsequent calculations.

Assumptions

Table A-1 summarizes the values and assumptions used to analyze consumption and savings.

Table A-1: Summary of Values and Assumptions

Item	Value	Unit	Source
Expected useful life (EUL) of compliant product	15	Years	U.S. EPA WaterSense[83]
The water savings of a compliant product's	15%	Percent	U.S. EPA WaterSense[84]
Assumed effective date	January 1, 2027	-	CEC staff
Portion of single-family homes that use an automatic sprinkler	68%	Percent	California IOU CASE Team[85]
Portion of single-family homes with an automatic sprinkler that use a timer to control the irrigation schedule	89%	Percent	California IOU CASE team[86]

[83] *WaterSense Specification for Weather-Based Irrigation Controllers Supporting Statement*, November 3, 2011: https://www.epa.gov/sites/default/files/2017-01/documents/ws-products-support-statement-irrigation-controllers.pdf.

[84] Ibid.

[85] *California Investor Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers*, 9/18/2017, https://efiling.energy.ca.gov/GetDocument.aspx?tn=221225&DocumentContentId=26788.

[86] Ibid.

Item	Value	Unit	Source
Portion of single-family homes with automatic irrigation controller	60.5%	Percent	CEC staff (68% x 89%)
Baseline average annual water used for irrigation for a single-family home	88,436	Gallon	CEC staff analysis report for spray sprinkler bodies[87]
Compliant product market share as of 2027	33.15%	Percent	CEC staff and California IOU CASE team[88]
Annual compliant products market share increase without regulations	0.5%	Percent	CEC staff
Average water rate per 1000 gallons in California	$6.13	$/1000 Gallon	CEC staff

Source: CEC and as noted

The proposed effective date of the proposed standards will be one year from the date of adoption by the CEC. For this staff analysis, it is assumed that regulations become effective January 1, 2027. However, the regulations become effective one year after the adoption of the standards by the CEC.

Market data provided by the California IOUs in their comment submitted on September 18, 2017[89] estimated that about 20 percent of the irrigation controllers on the market comply with the proposed standards. Staff assumes that this number represents integrated, compliant weather-based or soil moisture-based irrigation controllers. Current market analysis of available product models reflects an average annual growth of approximately 0.5 percent year over year. Staff assumed the market share for weather-based and soil moisture-based irrigation controllers will continue to grow by the same rate without regulations.

Based on the number of available models on the market, staff estimated that another 8 percent of landscape irrigation controllers on the market are non-integrated compliant products. Staff used these data to determine that by the effective date of the proposed regulations, assumed to be 2027, about 33.15 percent of the irrigation controllers on the market would meet the proposed standards. As explained in more detail in Chapter 7 of this staff report, this portion of controllers are excluded from the water-saving calculations. **Table A-2** shows the market share of compliant and not-compliant products from 2027 through 2041 without regulations.

[87] Steffensen, Sean. 2019. Final *Staff Analysis of Water Efficiency Standards for Spray Sprinkler Bodies*. California Energy Commission, CEC-400-2018-005-SF, page A-11.

[88] *California Investor-Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers*, 9/18/2017.

[89] Ibid.

Table A-2: Market Share of Compliant and Not-Compliant Controllers Without Regulations

Year	Percentage of Compliant Products W/O Regulation (%)	Percentage of Not-Compliant Products W/O Regulation (%)
2027	33.15%	66.85%
2028	33.65%	66.35%
2029	34.15%	65.85%
2030	34.65%	65.35%
2031	35.15%	64.85%
2032	35.65%	64.35%
2033	36.15%	63.85%
2034	36.65%	63.35%
2035	37.15%	62.85%
2036	37.65%	62.35%
2037	38.15%	61.85%
2038	38.65%	61.35%
2039	39.15%	60.85%
2040	39.65%	60.35%
2041	40.15%	59.85%

Source: CEC

Water Rate

California Public Resources Code Section 25402(c)(1) requires any proposed appliance efficiency standard to be cost-effective. Therefore, the average per-unit water rate is needed to establish the cost-effectiveness of the proposed standards. There are scattered reports available from various water agencies that can be used to estimate the weighted average price of a unit volume of water and support staff's findings that the proposed standards are cost-effective.

The California Water Association's (CWA) website provides a list of more than 90 water utilities serving about 15 percent of California population.[90] CWA's water utilities are grouped based on the number of service connections they provide; however, not all utilities listed have a website or have their rates published.

The California Department of Water Resources (DWR) publishes audit reports from various urban water suppliers on its website.[91] The California Water Code defines an "urban water supplier" as a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than

[90] California Water Association, https://calwaterassn.com/about-cwa/regulated-water-utilities-in-california/.

[91] The Water Use Efficiency (WUE) data submitted to the Department of Water Resources: https://wuedata.water.ca.gov/default.asp.

3,000 acre-feet of water annually. These reports contain a great deal of helpful information, including water rates. However, typically the data for some regions are reported for several years, the data for some regions are not reported consistently for most recent years, and some of the formats differ. Therefore, all reports must be reviewed to keep the most recent data and remove redundant reports. Also, typically water utility charges include two parts: a fixed service charge and a metered per-use charge. In addition, many water utilities have several tiers for the metered portion of their charges. These details are not provided in these reports.

Staff used a combination of aforementioned resources, as well as water rate information provided directly by the water providers websites, to estimate a weighted average of $6.13 per 1000 gallons for the water rate. The weighting used for the average rate calculation is based on the number of service connections provided for each data entry.

Stock and Sales

Staff used California residential data[92] to estimate the stock of landscape irrigation controllers because almost all commercial irrigation controllers on the market comply with the proposed standards and, therefore, are not used for water and cost savings estimates. Staff also reviewed estimates provided by the CASE team.[93] The estimates provide a means of validation to the staff estimate since they are similar in magnitude.

To estimate the inventory of irrigations controllers in use, staff used California housing data because there is no published source for stock available. Staff assumed the following ratio of single-family and multifamily homes for each irrigation controller:

- One irrigation controller per one single-family detached home
- One irrigation controller per two single-family attached homes
- One irrigation controller per four multifamily homes (2–4 units)
- One irrigation controller per 30 multifamily homes (5-plus units)

Total number of residential landscapes =

(Number of single-family detached homes/1) +

(Number of single-family attached homes/2) +

(Number of multifamily 2–4 units homes/4) +

---

[92] E-5 Population and Housing Estimates for Cities, Counties, and the State, January 2021-2025, with 2020 Benchmark: https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fdof.ca.gov%2Fmedia%2Fdocs%2Fforecasting%2FDemographics%2Festimates%2Fe-5-population-and-housing-estimates-for-cities-counties-and-the-state-2020-2025%2FE-5_2025_InternetVersion.xlsx&wdOrigin=BROWSELINK.

[93] California Investor Owned Utilities (IOUs) Response to Invitation to Submit Proposals - Landscape Irrigation Controllers: https://efiling.energy.ca.gov/GetDocument.aspx?tn=221225&DocumentContentId=26788.

(Number of multifamily 5-plus units homes/30)

Staff used the data provided by the IOUs indicating that 68 percent of California's single-family homes use automatic sprinkler system from which 89 percent use an irrigation timer to control the irrigation schedule.[94] Therefore, 68 percent times 89 percent, or 60.5 percent of single-family homes in California use irrigation control systems. Staff extended this conclusion to residential buildings containing multifamily homes. Total number of residential landscapes are multiplied by 60.5 percent to estimate the total number of residential landscape irrigation controllers in use. Staff repeated these calculations for 2019 through 2022 to estimate the growth rate of irrigation controller stock for each year then averaged them to estimate the average annual growth rate for stock and shipment of irrigation controllers to be 0.63 percent. **Table A-3** shows the estimates for number of residential landscapes and landscape irrigation controller stock.

Table A-3: Estimate of Residential Landscapes as a Proxy for Number of Irrigation Controllers

Items	2019	2020	2021	2022	Average
CA Single-Family detached Homes (units)	8,190,950	8,264,309	8,294,195	8,341,577	8,272,758
CA Single-Family attached Homes (units)	994,710	1,002,826	1,006,435	1,010,851	1,003,706
CA Multifamily Units (2-4 units) (units)	1,132,562	1,148,977	1,157,442	1,168,669	1,151,913
CA Multifamily Units (5 plus units) (units)	3,357,051	3,416,231	3,452,743	3,500,674	3,431,675
Total Number of Residential Landscapes (units)	9,083,347	9,166,841	9,201,864	9,255,859	9,176,978
Stock of Irrigation Controllers in use (units)	5,497,242	5,547,772	5,568,968	5,601,646	5,553,907
Estimated Irrigation Controllers Annual Stock Growth Rate (%)	-	0.92%	0.38%	0.59%	0.63%

Source: CEC

Staff used the estimated stock of existing landscape irrigation controllers for 2022, along with the product life of 15 years and an average yearly growth rate of 0.63 percent to estimate the annual sale of 389,937 units in 2022. Staff then used the average annual growth rate to project annual sales and stocks of irrigation controllers for 2027 through 2042, as shown in **Table A-4**.

[94] *California Investor-Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers*, 9/18/2017.

Table A-4: Estimated Annual Sales and Stock of Landscape Irrigation Controllers

Year	Shipment (units)	Stock (units)	Compliant Products' Market Share Without Regulations	Stock of Compliant Products Replacing Existing Units in Use (units)	Stock of Compliant Products Contributing to Savings (units)
2027	402,363	5,780,147	33.15%	402,363	268,987
2028	404,895	5,816,525	33.65%	807,258	537,642
2029	407,443	5,853,131	34.15%	1,214,701	805,951
2030	410,008	5,889,967	34.65%	1,624,709	1,073,899
2031	412,588	5,927,035	35.15%	2,037,297	1,341,470
2032	415,184	5,964,337	35.65%	2,452,481	1,608,649
2033	417,797	6,001,873	36.15%	2,870,279	1,875,420
2034	420,427	6,039,646	36.65%	3,290,705	2,141,768
2035	423,073	6,077,656	37.15%	3,713,778	2,407,677
2036	425,735	6,115,906	37.65%	4,139,513	2,673,131
2037	428,415	6,154,396	38.15%	4,567,928	2,938,114
2038	431,111	6,193,129	38.65%	4,999,039	3,202,608
2039	433,824	6,232,105	39.15%	5,432,863	3,466,598
2040	436,554	6,271,326	39.65%	5,869,418	3,730,067
2041	439,302	6,310,795	40.15%	6,308,719	3,992,997
2042	442,067	6,350,512	40.65%	6,348,423	3,986,385

Source: CEC

Baseline and Compliant Water Use

Landscape water usage was, in part, calculated from recommendations on the water required by the landscape. CEC staff provided survey of several methods in the Spray Sprinkler Body (SBB) Staff Report.[95] The baseline water values in this report are assumed to be the compliant values after full stock turnover of the SSB standards. This assumption prevents double-counting savings due to the SSB standards.

[95] Steffensen, Sean. April 2019. *Final Staff Analysis of Water Efficiency Standards for Spray Sprinkler Bodies.* California Energy Commission, CEC-400-2018-005-SF, https://efiling.energy.ca.gov/GetDocument.aspx?tn=227860&DocumentContentId=59234.

Staff reviewed studies of irrigation practices with weather-based controllers by Lawrence Berkley National Labs (LBNL), who published a comparison of various studies of weather-based irrigation controllers, rain sensors, and soil moisture sensors. The study concluded that each technology could provide significant savings over manual watering or clock-based irrigation controllers. **Figure A-1** presents the results of the comparison.

For the savings analysis, staff assumed a reduction of 15 percent in water use.[96] This amount of water efficiency for compliant products that use weather-based or soil moisture-based features is also aligned with the data provided by the California IOUs.[97]

The water use of the compliant product is calculated as the baseline water use reduced by the water efficiency rate:

Compliant water use per device /yr = (1 - efficiency rate) x baseline water use per device /yr

Compliant water use per device /yr = (1-15%) x 88,436/ yr = 75,171 gal/yr

Similarly, the average water savings per device are calculated by multiplying the baseline water use by the water efficiency rate of 15 percent.

Compliant water savings per device /yr = efficiency rate x baseline water use per device /yr

Compliant water savings per device /yr = 15% x 88,436/ yr = 13,265 gal/yr

Figure A-1: Savings by Irrigation Control Technology

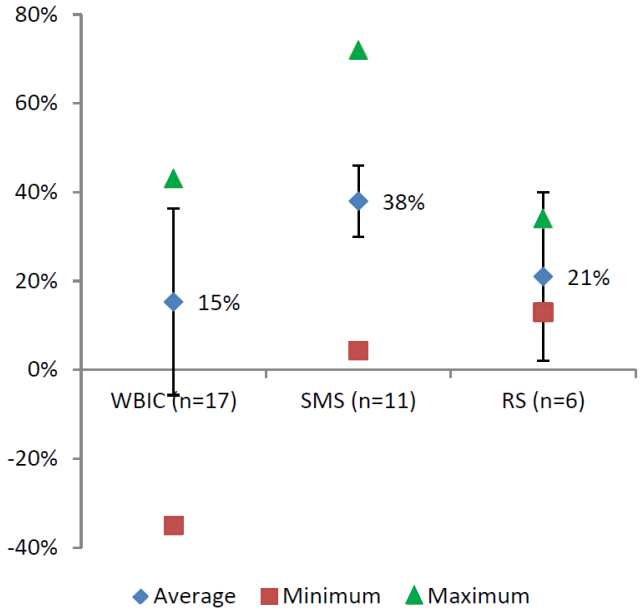


Illustration Credit: Lawrence Berkeley National Laboratory

[96] Williams, Alison, Heidi Fuchs, and Camilla Dunham Whitehead. Lawrence Berkeley National Labs. April 1, 2014.

[97] *California Investor-Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers,* 9/18/2017.

Table A-5 shows the statewide water savings from the annual sale of compliant products, as well as the annual stock savings. Market share of products that are assumed to be compliant without any regulations are excluded from water savings.

Table A-5: Estimated Annual Statewide Water Savings

Year	Shipment (units)	Stock (units)	Percentage of Default Compliance (%)	Statewide Water Savings (Million Gal/yr)	Statewide Stock Water Savings (Million Gal/yr)
2027	402,363	5,780,147	33.15%	3,568	3,568
2028	404,895	5,816,525	33.65%	3,564	7,132
2029	407,443	5,853,131	34.15%	3,559	10,691
2030	410,008	5,889,967	34.65%	3,554	14,246
2031	412,588	5,927,035	35.15%	3,549	17,795
2032	415,184	5,964,337	35.65%	3,544	21,339
2033	417,797	6,001,873	36.15%	3,539	24,878
2034	420,427	6,039,646	36.65%	3,533	28,411
2035	423,073	6,077,656	37.15%	3,527	31,939
2036	425,735	6,115,906	37.65%	3,521	35,460
2037	428,415	6,154,396	38.15%	3,515	38,975
2038	431,111	6,193,129	38.65%	3,509	42,484
2039	433,824	6,232,105	39.15%	3,502	45,986
2040	436,554	6,271,326	39.65%	3,495	49,481
2041	439,302	6,310,795	40.15%	3,488	52,969
2042	442,067	6,350,512	40.65%	3,481	52,881

Source: CEC

Cost and Savings

To determine the per-unit initial cost of upgrading a baseline irrigation controller to a compliant product, staff obtained retail price data for baseline and compliant integrated and non-integrated products from online landscape equipment retailers, including Home Depot, Lowes, and Amazon. The costs for separately sold components such as sensors, or add-on or plug-in devices for non-integrated irrigation controllers, are not included. Moreover, the installation costs are not included in the cost analysis. Staff grouped irrigation controllers based on associated zone capacity and calculated the cost difference between baseline and compliant products for each group. Staff then averaged the cost difference across all zone capacity groups to calculate the average upfront incremental cost for upgrading a baseline

product to a compliant product. For cost calculations, staff did not include highly elaborative products with additional functionalities beyond what is required for compliance.

Staff calculated the average per unit incremental cost of $32.87 to upgrade an uncompliant baseline irrigation controller to a compliant unit with similar functionalities and number of irrigation stations. Staff also applied a 3 percent discount rate to calculate the net present value of the annual statewide cost. To calculate the annual statewide cost, staff used the following equation:

Annual statewide cost = per unit cost x

(Total annual statewide sales – Annual statewide sales of compliant products without regulations) x (3 percent discount rate per year)

Table A-6 shows statewide annual costs and savings.

Table A-6: Estimated Annual Statewide Costs and Savings ($2025)

Year	Shipment (units)	Stock (units)	Per Unit Annual Cost Savings ($/yr)	Statewide Annual Cost (Million $/yr)	Statewide Annual Savings (Million $/yr)	Statewide Accumulated Annual Savings (Million $)
2027	402,363	5,780,147	$76.65	$8.6	$20.6	$20.6
2028	404,895	5,816,525	$74.42	$8.3	$20.0	$40.6
2029	407,443	5,853,131	$72.25	$8.1	$19.4	$60.0
2030	410,008	5,889,967	$70.14	$7.8	$18.8	$78.8
2031	412,588	5,927,035	$68.10	$7.6	$18.2	$97.0
2032	415,184	5,964,337	$66.12	$7.4	$17.7	$114.7
2033	417,797	6,001,873	$64.19	$7.1	$17.1	$131.8
2034	420,427	6,039,646	$62.32	$7.1	$16.6	$148.4
2035	423,073	6,077,656	$60.51	$6.7	$16.1	$164.5
2036	425,735	6,115,906	$58.75	$6.5	$15.6	$180.1
2037	428,415	6,154,396	$57.03	$6.3	$15.1	$195.2
2038	431,111	6,193,129	$55.37	$6.1	$14.6	$209.8
2039	433,824	6,232,105	$53.76	$5.9	$14.2	$224.0
2040	436,554	6,271,326	$52.19	$5.7	$13.8	$237.8
2041	439,302	6,310,795	$50.67	$5.5	$13.3	$251.1
2042	442,067	6,350,512	$49.20	$5.4	$12.9	$243.4

Source: CEC

A discount rate of 3 percent is applied to the annual values for the costs and savings to calculate the values in terms of the value of the dollar in 2023.

$$Annual\ saving_i(\$2025) = Annual\ water\ saving_i\ x\ Water\ rate/(1 + Discount\ rate)^{(i-2025)}$$

Where:

$$i = 2027, 2028, \dots, 2042$$

Staff assumed each year's savings materialize at the end of each year, while the annual costs happen at the beginning of each year because they are paid upfront.

$$Annual\ cost_i(\$2025) = Annual\ cost_i/(1 + Discount\ rate)^{(i-2025-1)}$$

Where:

$$Annual\ cost_i = (Annual\ shipment_i - \ Annual\ compliant\ by\ default\ shipment_i)\ \ x\ per\ unit\ cost$$

$$i = 2027, 2028, \dots, 2042$$

Embedded Electricity Savings

The embedded electricity savings are the electricity saved from the reduction in water pumping, treatment, and delivery. Staff assumed every million gallons of water uses 3,565 kilowatt-hours (kWh).[98] **Table A-7** shows the embedded electricity saved by each unit of a landscape irrigation controller over the life of the product.

Table A-7: Estimated Annual and Life-Cycle Embedded Electricity Saved per Unit

Life of Product (Years)	Annual Water Saving (Gal/yr per Unit)	Annual Embedded Electricity Saving (kWh/yr per Unit)	Water Saving Over the Life of Product (Gal/unit)	Embedded Electricity Saving Over the Life of Product (kWh/unit)
15	13,265	47.29	198,981	709

Source: CEC

Table A-8 shows estimated annual statewide embedded electricity savings. The electricity savings are calculated for annual sales and accumulated savings for the stock of products turned over to compliant irrigation controllers as a result of this regulation.

[98] *California Investor-Owned Utilities Comments Response to Invitation to Participate — Landscape Irrigation Controllers*, June 16, 2017.

Table A-8: Estimated Annual Embedded Electricity Saved From Annual Sales and Stock

Year	Statewide Annual Water Savings (million Gal/yr)	Statewide Annual Embedded Electricity Savings (MWh/yr)	Statewide Stock Water Savings (million Gal/yr)	Statewide Annual Accumulated Embedded Electricity Savings (GWh/yr)
2027	3,568	12,721	3,568	12.7
2028	3,564	12,705	7,132	25.4
2029	3,559	12,689	10,691	38.1
2030	3,554	12,672	14,246	50.8
2031	3,549	12,654	17,795	63.4
2032	3,544	12,635	21,339	76.1
2033	3,539	12,616	24,878	88.7
2034	3,533	12,596	28,411	101.3
2035	3,527	12,575	31,939	113.9
2036	3,521	12,554	35,460	126.4
2037	3,515	12,531	38,975	138.9
2038	3,509	12,508	42,484	151.5
2039	3,502	12,484	45,986	163.9
2040	3,495	12,460	49,481	176.4
2041	3,488	12,434	52,969	188.8
2042	3,481	12,408	52,881	188.5

Source: CEC

APPENDIX B:
Proposed Regulatory Language

The proposed new language appears as underline (example) and proposed deletions appear as strikeout (~~example~~). Existing language appears as plain text. Three dots or "…" represents the substance of the regulations that exists between the proposed language and current language.

1602. Definitions.

…[skipping (a) through (w)]

(x) Landscape Irrigation Equipment.

~~(1) Spray Sprinkler Bodies.~~

"Add-on device" or "plug-in device" means an interface device, connected via wire or wireless connection and housed separate from the landscape irrigation controller, that communicates sensor mechanism readings or current weather data to the base landscape irrigation controller.

"Agricultural irrigation controller" means an irrigation controller designed and marketed exclusively for agricultural use and that controls one or more valves to engage irrigation of farms as defined by the U.S. Department of Agriculture.

"Base landscape irrigation controller" means a landscape irrigation controller that relies on a separately packaged or sold add-on or plug-in device to enable weather-based or soil-moisture-based features. The add-on or plug-in device may communicate with the controller through one or more wired or wireless connections.

"Battery-operated landscape irrigation controller" means a landscape irrigation controller that is entirely powered by batteries for operation and does not have a wire connection to a mains power source. Battery-operated landscape irrigation controllers may be powered by disposable batteries, rechargeable batteries, or solar cells.

"Bypass soil moisture-based landscape irrigation controller" means a landscape irrigation controller that is sold with a soil moisture sensor mechanism to either inhibit or allow an irrigation event based on a reading from a soil moisture sensor mechanism.

"Designed and marketed", when used with respect to irrigation controllers, means exclusively designed to fulfill the indicated application and, when distributed in commerce, designated and marketed solely for that application, with the designation prominently displayed on the packaging and all publicly available documents (e.g., product literature, catalogs, and packaging labels).

"Golf course irrigation controller" means an irrigation controller designed and marketed exclusively for golf course use and capable of all of the following:

- Utilizing central control irrigation software;

- Utilizing real-time weather or evapotranspiration (ET) data; and
- Monitoring and controlling live water flow and pressure at each sprinkler individually.

…[skipping "Integral pressure regulator"]

"Irrigation adequacy" means a measure of how well the consumptive water needs of the landscape are met. Section 1604(x)(2)(A) of this Article specifies how irrigation adequacy is measured.

"Irrigation excess" means a measure of water applied in excess of the consumptive needs of the landscape. Section 1604(x)(2)(A) of this Article specifies how irrigation excess is measured.

"Irrigation station" means a circuit on a controller that:

(1) Has the ability to be programmed with a run time that is unique and separate from other circuits, and

(2) Provides power to one or more remote control valves.

"Landscape" means any areas that are planted or installed and designed to receive irrigation, including turf grass, ground covers, shrubs, trees, flowers, and similar plant materials. Landscape does not include areas planted or installed with agricultural crops grown and harvested for monetary return.

"Landscape irrigation controller" means a timing device that controls one or more valves used to engage irrigation of a landscape. Landscape irrigation controller does not include agricultural irrigation controllers or golf course irrigation controllers or manual watering timers.

"Manual operation troubleshooting test cycle" means a mode in which a zone cannot be initiated without an intervention by a human operator and either is terminated by the operator or automatically reverts to other modes of operation.

"Manual watering timer" means an irrigation timer device that is activated by a human operator and is not capable of storing watering schedules beyond 24 hours.

…[skipping "Maximum operating pressure" and "Nozzle"]

"On-demand soil moisture-based landscape irrigation controller" means a landscape irrigation controller that is sold with a soil moisture sensor mechanism to initiate irrigation at a lower preset soil moisture level and terminate irrigation at an upper preset soil moisture level.

…[skipping "Orifice"]

"Percent adjust or water budget feature" means the ability to increase or decrease the runtimes or application rates for zones by means of fractional adjustment without modifying the settings for each individual zone.

"Planted area" means an area that is planted or installed with plants and that receives irrigation for the benefit of those plants.

"Rainfall device" means a device that senses or measures rainfall and reduces or interrupts irrigation in response to rainfall.

"Reference weather station" means the weather station utilized by the licensed certifying body that produces the reference weather data used during the performance test of section 1604(x)(2)(A) of this Article.

…[skipping "Regulation pressure"]

"Soil-moisture mode" means the operating mode in which the landscape irrigation controller is using readings from the soil moisture sensor mechanism to modify the irrigation schedule.

"Soil moisture sensor mechanism" means the portion of the device that contacts the soil and measures physical properties that are related to the amount of moisture in the soil.

…[skipping "Spray sprinkler" through "Sprinkler body"]

"Standard mode" means the operating mode in which the controller is not using weather or soil moisture data to schedule irrigation or to modify stored irrigation schedules.

"Weather-based landscape irrigation controller" means a landscape irrigation controller that is capable of creating or modifying irrigation schedules based on evapotranspiration (ET) principles by:

(1) Storing historical crop evapotranspiration (ETc) data characteristics of the site and modifying these data with an onsite sensor;

(2) Using onsite weather sensors as a basis for calculating real-time ETc;

(3) using a central weather station as a basis for ETc calculations and transmitting the data to individual users from remote sites; or

(4) using onsite weather sensors to otherwise create or modify irrigation schedules.

"Weather-based mode" means the operating mode in which the landscape irrigation controller is using weather data to schedule irrigation or modify the irrigation schedule.

The following documents are incorporated by reference in section 1602.

Number	*Title*

…[skipping FEDERAL STATUES AND REGULATIONS through ANSI C82.6-2005 under AMERICAN NATIONAL STANDARDS INSTITUE (ANSI)]

Copies available from:

~~AMERICAN NATIONAL STANDARDS INSTITUTE~~American National Standards Institute
~~1819~~ 1899 L ~~STREET~~Street, NW, ~~6TH~~11th ~~FLOOR~~Floor
~~WASHINGTON~~Washington, DC 20036
www.ansi.org
~~PHONE~~Phone: (202) 293-8020
FAX: (202) 293-9287

…[skipping ASSOCIATION OF HOME APPLIANCES MANUFACTURERS (AHAM) through the end of the section]

Note: Authority cited: Sections 25213, 25218(e), 25401.9, 25402(a)-25402(c) and 25960, Public Resources Code; and Sections 16, 26, and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015).
Reference: Sections 25216.5(d), 25401.9, 25402(a)-25402(c), 25402.5.4, and 25960, Public Resources Code; and Section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

§ 1602.1. Rule of Construction.

(No Change)

§ 1603. Testing All Appliances.

(No Change)

§ 1604. Test Methods for Specific Appliances.

…[skipping (a) through (w)]

(x) Landscape Irrigation Equipment.

…[skipping (x)(1)]

(2) Landscape Irrigation Controllers.

(A) Weather-Based Landscape Irrigation Controllers. The test method for weather-based landscape irrigation controllers is section 4 (Test Method #1) of ANSI/ASABE S627.1 OCT2022 with the following test modifications:

1. The test period shall be 30 consecutive days. The test may run past the initial 30 days until a 30-day period occurs where all conditions in section 4.6 (weather requirements) of ANSI/ASABE S627.1 OCT2022 are met. The first valid 30-day test period shall be used to calculate irrigation adequacy and irrigation excess.

2. Landscape irrigation controllers with fewer than six irrigation stations shall meet the six-zone programming requirement of section 4 (Test Method #1) of ANSI/ASABE S627.1 OCT2022 by programming and testing multiple landscape irrigation controllers of the same model at the same time.

3. The landscape irrigation controller shall be programmed according to the list of settings specified by the manufacturer in the instruction manual. Manufacturers shall have no interaction with the product during testing, including programming of the controller during setup or for the duration of the test.

4. No special accommodations shall be made during testing for the controller to select the reference weather station as its data source. The test report shall include the name and address of the reference weather station.

(B) Bypass Soil Moisture-Based Landscape Irrigation Controllers. The test method for bypass soil moisture-based landscape irrigation controllers is ANSI/ASABE S633 MAY2020 with the following test modifications:

1. Bypass soil moisture-based landscape irrigation controllers shall only be tested in the moderately coarse test medium and water with electrical conductivity (EC) of 3 dS/m, as defined in ANSI/ASABE S633 MAY2020.

2. The freeze test shall be conducted in the 40 percent water depletion container using the moderately coarse medium after the initial test is complete.

The following documents are incorporated by reference in section 1604.

…[skipping CALIFORNIA ENERGY COMMISSION TEST METHODS through ANSI C82.6-2005 under AMERICAN NATIONAL STANDARDS INSTITUE (ANSI)]

ANSI/ASABE S627.1 OCT2022	Weather-Based Landscape Irrigation Control Systems
ANSI/ASABE S633 MAY2020	Testing Protocol for Landscape Irrigation Soil Moisture-Based Control Technologies
…[skipping ANSI Z21.10.3-1998 through ANSI/AHRI 550-590(I-P)2011	
Copies available from:	American National Standards Institute ~~1819~~ 1899 L Street, NW, ~~6th~~ 11th Floor Washington, DC 20036 www.ansi.org Phone: (202) 293-8020 FAX: (202) 293-9287

…[skipping AMERICAN SOCIETY FOR MECHANICAL ENGINEERS (ASME) through the end of the section]

Note: Authority cited: Sections 25213, 25218(e), 25401.9, 25402(a)-25402(c) and 25960, Public Resources Code; and Sections 16, 26, and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25401.9, 25402(a)-25402(c) and 25960, Public Resources Code; and Section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

§ 1605. Energy Performance, Energy Design, Water Performance, and Water Design Standards: In General.

(No Change)

§ 1605.1. Federal and State Standards for Federally Regulated Appliances.

…[skipping (a) through (w)]

(x) Landscape Irrigation Equipment.

~~See section 1605.3(x) of this Article for water efficiency standards for landscape irrigation equipment.~~

(1) Spray Sprinkler Bodies. See section 1605.3(x) of this Article for water efficiency standards for spray sprinkler bodies.

(2) Landscape Irrigation Controllers. See section 1605.3(x) of this Article for water efficiency and design standards for landscape irrigation controllers.

The following documents are incorporated by reference in section 1605.1.

Number	*Title*

…[skipping FEDERAL STATUES AND REGULATIONS through ANSI C78.5 under AMERICAN NATIONAL STANDARDS INSTITUE (ANSI)]

Copies available from:	American National Standards Institute ~~1819~~ 1899 L Street, NW, ~~6th~~ 11th Floor Washington, DC 20036 www.ansi.org Phone: (202) 293-8020 FAX: (202) 293-9287

…[skipping ILLUMINATING ENGINEERING SOCIETY (IES) through the end of the section]

Note: Authority cited: Sections 25213, 25218(e), 25401.9, 25402(a)-25402(c) and 25960, Public Resources Code; and Sections 16, 26, and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25401.9, 25402(a)-25402(c) and 25960, Public Resources Code; and Section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

§ 1605.2. State Standards for Federally Regulated Appliances.

…[skipping (a) through (w)]

(x) Landscape Irrigation Equipment.

~~See section 1605.3(x) of this Article for water efficiency standards for landscape irrigation equipment.~~

(1) Spray Sprinkler Bodies. See section 1605.3(x)(1) of this Article for water efficiency standards for spray sprinkler bodies.

(2) Landscape Irrigation Controllers. See section 1605.3(x)(2) of this Article for water efficiency and design standards for landscape irrigation controllers.

…[skipping the rest of the section]

Note: Authority cited: Sections 25213, 25218(e), 25401.9, 25402(a)-25402(c), and 25960, Public Resources Code; and sections 16, 26, and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25401.9, 25402(a)-25402(c), and 25960, Public Resources Code; and Section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

§ 1605.3. State Standards for Non-Federally Regulated Appliances.

…[skipping (a) through (w)]

(x) Landscape Irrigation Equipment.

…[skipping (x)(1)]

(2) Landscape Irrigation Controllers. Landscape irrigation controllers manufactured on or after one year from the date that these standards are adopted shall comply with all of the following requirements:

(A) Shall be one or more of the following types:

1. Weather-based landscape irrigation controller;

2. On-demand soil moisture-based landscape irrigation controller;

3. Bypass soil moisture-based landscape irrigation controller;

4. Base landscape irrigation controller that supports a plug-in or add-on device to become a weather-based landscape irrigation controller;

5. Base landscape irrigation controller that supports a plug-in or add-on device to become an on-demand soil moisture-based landscape irrigation controller; or

6. Base landscape irrigation controller that supports a plug-in or add-on device to become a bypass soil moisture-based landscape irrigation controller.

EXCEPTION to section 1605.3(x)(2)(A) of this Article: The standards found in section 1605.3(x)(2)(A) of this Article do not apply to battery-operated landscape irrigation controllers.

(B) Shall be capable of preserving the contents of the programmed irrigation settings, and soil moisture sensor mechanism settings if applicable, for a minimum of seven days when the power source is lost and without relying on an external battery backup.

(C) Shall be capable of independent, zone-specific programming or of storing a minimum of three different programs to allow for separate schedules for zones with differing water needs.

(D) Shall be capable of indicating to the user when it is not receiving a signal or sensor input and is consequently unable to adjust irrigation based on current weather conditions or soil moisture content in the landscape.

EXCEPTION to section 1605.3(x)(2)(D) of this Article: The standards found in section 1605.3(x)(2)(D) of this Article do not apply to battery-operated landscape irrigation controllers.

(E) Shall be capable of accommodating the following watering restrictions:

1. Operation on a prescribed day or days-of-week schedule;

2. Operation on any day interval scheduling between two and seven days, including even day and odd day scheduling;

3. The ability to set irrigation runtimes to avoid watering during a prohibited time of day;

4. Complete shutoff to accommodate outdoor irrigation prohibition restrictions; and

5. Weather-based or soil moisture-based mode shall be capable of accommodating mandated irrigation restrictions.

(F) Shall include a percent adjust feature.

(G) Shall be capable of reverting to either a proxy of historical weather data or a percent adjust feature if the primary source of weather information or the soil moisture sensor mechanism signal is lost.

EXCEPTION to Section 1605.3(x)(2)(G) of this Article: The standards found in section 1605.3(x)(2)(G) of this Article do not apply to battery-operated landscape irrigation controllers.

(H) Shall be capable of allowing for a manual operation troubleshooting test cycle and, when left in the manual operation troubleshooting test cycle, shall automatically return to weather-based mode, soil moisture-based mode, or previous set operating mode within a period of time designated by the manufacturer.

(I) Weather-based landscape irrigation controllers, including base landscape irrigation controllers that support a plug-in or add-on device to become weather-based landscape irrigation controllers,-shall be capable of the following:

1. Interfacing with a rainfall device or soil moisture sensor;

2. Providing irrigation adequacy of greater than or equal to 80 percent for each of the six zones;

3. Having irrigation excess of less than or equal to 10 percent for each of the six zones; and

4. The average of the irrigation excess scores calculated across the six zones shall be less than or equal to 5 percent.

(J) Bypass soil moisture-based landscape irrigation controllers, including base landscape irrigation controllers that support a plug-in or add-on device to become bypass soil moisture-based landscape irrigation controllers, shall be capable of the following:

1. Interfacing with a rainfall device;

2. Enabling and disabling irrigation at each of the three depletion levels: 20 percent, 40 percent, 60 percent;

3. Having a relative average deviation of the enable and disable readings less than or equal to 10 percent. The relative average deviation shall be calculated per Equations 1 through 3 of Section 2.2.1.2 of the WaterSense® Specification for Soil Moisture-Based Irrigation Controllers Version 1.0, February 2021;

4. The absolute value of the slope of the line generated using least square regression with the enable readings on the y-axis and depletion levels on the x-axis shall be greater than zero when rounded to two significant digits for each of the three replicate soil moisture-based landscape irrigation controllers. The enable readings shall be expressed in percent of full scale of the product. The depletion levels shall be expressed in percent, and all three depletion levels of 20 percent, 40 percent, and 60 percent shall be used in the calculation of the slope;

5. The absolute value of the slope of the linear line generated using least square regression with the disable readings on the y-axis and depletion levels on the x-axis shall be greater than zero when rounded to two significant digits for each of the three replicate soil moisture-based landscape irrigation controllers. The disable readings shall be expressed in percent of full scale of the product. The depletion levels shall be expressed in percent and all three depletion levels shall be used in the calculation of the slope; and

6. enabling and disabling irrigation after the soil moisture sensor mechanism is placed in a freezer for three days and thawed to prefreeze medium temperature when tested per section 1604(x)(2)(B) of this Article.

(K) On-demand soil moisture-based landscape irrigation controllers, including base landscape irrigation controllers that supports a plug-in or add-on device to become on-demand soil moisture-based landscape irrigation controllers, shall be capable of interfacing with a rainfall device.

The following documents are incorporated by reference in section 1605.3.

Number	*Title*

FEDERAL REQUIREMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EPA)

	EPA ENERGY STAR® Program Requirements Product Specification for Lamps (Light Bulbs) Version 1.1 (August 2014)
	EPA ENERGY STAR® Program Requirements Product Specification for Lamps (Light Bulbs) Version 2.0 (December 2015)
	EPA ENERGY STAR® Program Requirements for CFLs (December 2008)
Copies available from:	US EPA Climate Protection Partnership ENERGY STAR® Programs Hotline & Distribution (MS-6202J) 1200 Pennsylvania Ave NW Washington, DC 20460 www.energystar.gov
	Section 2.2.1.2 of the WaterSense® Specification for Soil Moisture-Based Irrigation Controllers Version 1.0 (Dated February 2021)
Copies available from:	WaterSense® U.S. Environmental Protection Agency Office of Wastewater Management (4204M) 1200 Pennsylvania Ave N.W. Washington, D.C. 20460 https://www.epa.gov/watersense

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

…[skipping ANSI C78.377-2015]

Copies available from:	American National Standards Institute ~~1819~~ 1899 L Street, NW, ~~6th~~ 11th Floor Washington, DC 20036 www.ansi.org Phone: (202) 293-8020 FAX: (202) 293-9287

…[skipping AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) through the end of the section]

Note: Authority cited: Sections 25213, 25218(e), 25401.9, 25402(a)-25402(c) and 25960, Public Resources Code; and Sections 16, 26, and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25401.9, 25402(a)-25402(c) and 25960, Public Resources Code; and Section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

§ 1606. Filing by Manufacturers; Listing of Appliances in MAEDbS.

(a) Filing of Statements.

Each manufacturer shall electronically file with the Executive Director through the MAEDbS a statement for each appliance that is sold or offered for sale in California. The statement shall contain all of the information described in paragraphs (2) through (4) of this subsection and shall meet all of the requirements of paragraph (1) of this subsection and all other applicable requirements in this Article.

The effective dates of this section shall be the same as the effective dates shown in section 1605.1, 1605.2 or 1605.3 of this Article for appliances for which there is an energy efficiency, energy consumption, energy design, water efficiency, water consumption, or water design standard in section 1605.1, 1605.2, or 1605.3 of this Article. For appliances with no energy efficiency, energy consumption, energy design, water efficiency, water consumption, or water design standard in section 1605.1, 1605.2, or 1605.3 of this Article, the effective date of this section shall be one year after they are added to section 1601 of this Article, unless a different effective date is specified.

…[skipping "EXCEPTIONS"]

(1) General Rules.

(A) Format and Categories. Each statement shall be in a format (including but not limited to computer formats) and in categories specified by the Executive Director.

(B) When Different Statements Are Required. The Executive Director may establish, modify, and enforce schedules for the submittal of statements where it is reasonably necessary for orderly processing of submittals, for example when manufacturers or third parties often submit many statements simultaneously.

(C) Asterisks in Model Numbers. In filing any statement, the manufacturer may use asterisks as a substitute for letters, numbers, blanks, or other characters in the model number, provided that an asterisk (i) shall be used only for a part of the model number that does not indicate energy consumption, energy efficiency, water consumption, or water efficiency, or a design or feature affecting such efficiency or consumption; (ii) shall represent a single letter, number, blank, or other character at the asterisk's location in the model number; and (iii) shall not be used for any of the first four letters, numbers, blanks, or other characters in the model number.

(D) Different Functions. Except as provided in section 1606(a)(1)(G) of this Article, if the same appliance is sold or offered for sale as more than one type of appliance shown in Table X (for example, if the appliance can serve both water heating and pool heating functions),

the manufacturer shall submit a separate statement for each appliance type. Each appliance type for which a statement is submitted must match all the common identifiers shown in Table X.

(E) Multiple Statements. A manufacturer may file statements for more than one appliance in a single submittal to the Executive Director. If a submittal contains statements for more than one appliance, there shall be only one statement for each appliance, except as provided in sections 1606(a)(1)(D) and 1606(a)(1)(G) of this Article. The Executive Director shall allow multiple statements to be submitted on the same sheet of paper or in the same electronic file under conditions she or he determines are reasonably necessary to ensure accuracy and compatibility with the database.

…[skipping the rest of (a)(1)]

(2) Manufacturer Information.

(A) The name, address, telephone number, and, if available, fax number, URL (website) address, and email address of the manufacturer; provided, however, that if a parent entity is filing on behalf of a subsidiary entity, if a subsidiary entity is filing on behalf of a parent entity, or if an affiliate entity is filing on behalf of an affiliate entity, then each entity shall be clearly identified and the information shall be provided for both entities.

(B) The name, address, telephone number, and, if available, fax number and email address of the individual to contact concerning the statement pursuant to section 1606(a)(4) of this Article. There shall be only one individual to contact for each category (box) in the "Appliance" column of Table X, except that the individual may, during his or her absence, delegate his or her duties in this regard.

(C) The name, address, telephone number, and, if available, fax number and email address of the person signing the declaration pursuant to section 1606(a)(4) of this Article.

(3) Testing and Performance Information.

(A) A statement that the appliance has been tested in accordance with all applicable requirements of sections 1603 and 1604 of this Article. If section 1604 of this Article provides more than one test method that may be used, the manufacturer shall identify which method was used.

…[skipping "EXCEPTIONS"]

(B) The name and address and, if available, telephone number, fax number, URL (web site) address, and e-mail address of the laboratory or other institution where the testing required by sections 1603 and 1604 of this Article was performed.

(C) The applicable information listed in Table X; provided, however, that submittal of information marked with "1" is voluntary for federally regulated appliances, and that submittal of information marked with "2" is voluntary for state-regulated appliances. Where there is text in the "Permissible Answers" column, the information provided must be one of the answers shown. If the text in the "Permissible Answers" column states "other (specify)," the information provided must be a specific response for the "Required Information" category (e.g., a response of "other" is not acceptable).

…[skipping "EXCEPTIONS"]

(D) How Tested Data Must Be Reported.

1. For any numerical value required by Table X that is produced by a test specified in section 1604 of this Article, the reported value shall be no higher for the value for which the consumer would prefer a high number, and no lower for the value for which the consumer would prefer a low number, than the values obtained by testing; unless different specific instructions are specified in the test method specified in Section 1604 of this Article.

2. For any numerical value required by Table X that is produced by calculation from measured numerical test results, the reported value shall be no higher for the values where the consumer would prefer a high number than the exact result of the calculation, and no lower than the exact result of the calculation where the consumer would prefer a low number, than the values obtained by calculating, unless different specific instructions are specified in the test method specified in section 1604 of this Article.

3. Manufacturers may report:

a. Numbers higher than tested values, where the consumer would, all other things being equal, prefer lower values (or is indifferent); and

b. numbers lower than tested values, where the consumer would, all other things being equal, prefer higher values (or is indifferent).

…[skipping "Example"]

Table X
Data Submittal Requirements

	Appliance	Required Information	Permissible Answers
	All Appliances	* Manufacturer's Name	
		* Brand Name	
		* Model Number	
		Date model to be displayed	
		Regulatory Status	Federally regulated consumer product, federally regulated commercial and industrial equipment, non-federally regulated, other

*"Identifier" information as described in section 1602(a) of this article.

…[skipping sections (A)-(W) and (X) Spray Sprinkler Bodies of Table X]

	Appliance	Required Information	Permissible Answers
X	Landscape Irrigation Controllers (All)	Irrigation Station Capacity in Base Configuration	
		Maximum Irrigation Station Capacity	
		Weather-based landscape irrigation controller (as shipped or capable)	As shipped, Capable, Neither
		Compatible add-on or plug-in device models if capable of weather-based landscape irrigation controller as shipped	
		Add-on or plug-in device model used for testing if capable of weather-based landscape irrigation controller as shipped	
		Bypass soil moisture-based landscape irrigation controller (as shipped or capable)	As shipped, Capable, Neither
		Compatible add-on or plug-in device models if capable of bypass soil moisture-based landscape irrigation controller as shipped	
		Add-on or plug-in device model used for testing if capable of bypass soil moisture-based landscape irrigation controller as shipped	
		On-demand soil moisture-based landscape irrigation controller (as shipped or capable)	As shipped, Capable, Neither
		Compatible add-on or plug-in device models if capable of on-demand soil moisture-based landscape irrigation controller as shipped	
		Battery operated landscape irrigation controller	True, False
		Base Landscape Irrigation Controller That Relies on an Add-on or Plug-in Device for Compliance	True, False
		Manufacturer of Add-on or Plug-in Device Used for Testing	

	Appliance	Required Information	Permissible Answers
		Model of Add-on or Plug-in Device Used for Testing	
		Test Procedure used	
		Capable of Preserving the Contents of the Programmed Irrigation Settings as per Section 1605.3(x)(2)(B) of This Article	True, False
		Capable of Independent, Zone-Specific Programming or Storing a Minimum of Three Different Programs to Allow for Separate Schedules for Zones With Differing Water Needs	True, False
		Capable of Indicating to the User When It Is Not Receiving a Signal or Soil Moisture Sensor Mechanism Input as per Section 1605.3(x)(2)(D) of This Article	True, False
		Capable of Accommodating Watering Restrictions as per Section 1605.3(x)(2)(E) of This Article	True, False
		Includes a Percent Adjust Feature	True, False
		Capable of Reverting to Either a Proxy of Historical Weather Data or a Percent Adjust Feature as per Section 1605.3(x)(2)(G) of This Article	True, False
		Capable of Allowing for a Manual Operation Troubleshooting Test Cycle as per Section 1605.3(x)(2)(H) of This Article	True, False
		Capable of Interfacing With a Soil Moisture Sensor Mechanism	True, False
		Capable of Interfacing With a Rainfall Device	True, False

	Appliance	Required Information	Permissible Answers
	Landscape Irrigation Controllers Tested per Section 1604(x)(2)(A) of This Article	Irrigation Adequacy Zone 1 (%)	
		Irrigation Adequacy Zone 2 (%)	
		Irrigation Adequacy Zone 3 (%)	
		Irrigation Adequacy Zone 4 (%)	
		Irrigation Adequacy Zone 5 (%)	
		Irrigation Adequacy Zone 6 (%)	
		Irrigation Excess Zone 1 (%)	
		Irrigation Excess Zone 2 (%)	
		Irrigation Excess Zone 3 (%)	
		Irrigation Excess Zone 4 (%)	
		Irrigation Excess Zone 5 (%)	
		Irrigation Excess Zone 6 (%)	
		Average Irrigation Excess Across the Six Zones (%)	
	Landscape Irrigation Controllers Tested per Section 1604(x)(2)(B) of This Article	Ability to Enable and Disable Irrigation at Each of the Three Depletion Levels	True, False
		Relative Average Deviation (%)	
		Slope Using Enable Readings for First Soil Moisture-Based Landscape Irrigation Controller, Calculated per Section 1605.3(x)(2)(J)4. of This Article (unitless)	

	Appliance	Required Information	Permissible Answers
		Slope Using Enable Readings for Second Soil Moisture-Based Landscape Irrigation Controller, Calculated per Section 1605.3(x)(2)(J)4. of This Article (unitless)	
		Slope Using Enable Readings for Third Soil Moisture-Based Landscape Irrigation Controller, Calculated per Section 1605.3(x)(2)(J)4. of This Article (unitless)	
		Slope Using Disable Readings for First Soil Moisture-Based Landscape Irrigation Controller, Calculated per Section 1605.3(x)(2)(J)5. of This Article (unitless)	
		Slope Using Disable Reading for Second Soil Moisture-Based Landscape Irrigation Controller, Calculated per Section 1605.3(x)(2)(J)5. of This Article (unitless)	
		Slope Using Disable Reading for Third Soil Moisture-Based Landscape Irrigation Controller, Calculated per Section 1605.3(x)(2)(J)5. of This Article (unitless)	
		Ability to Enable and Disable Irrigation After the Soil Moisture Sensor Mechanism is Placed in a Freezer for Three Days and Thawed to Pre-Freeze Medium Temperature	True, False

(4) Declaration.

(A) Each statement shall include a declaration, executed under penalty of perjury of the laws of California, that

1. All the information provided in the statement is true, complete, accurate, and in compliance with all applicable provisions of this Article;

2. If the statement is being filed electronically, that the requirements of section 1606(g) of this Article have been and are being complied with;

3. For appliances for which there is an energy efficiency, energy consumption, energy design, water efficiency, water consumption, or water design standard in section 1605.1, 1605.2, or 1605.3 of this Article, that the appliance complies with the applicable standards;

4. The appliance was tested under the applicable test method specified in section 1604 of this Article, and, for the following appliances, was tested as follows:

…[skipping the rest of section 1606]

Note: Authority cited: Sections 25213, 25218(e), 25401.9, 25402(a)-25402(c) and 25960, Public Resources Code; and Sections 16, 26, and 30, Governor's Exec. Order No. B-29-15 (April 1, 2015). Reference: Sections 25216.5(d), 25401.9, 25402(a)-25402(c) 25402.5.4, and 25960, Public Resources Code; and Section 16, Governor's Exec. Order No. B-29-15 (April 1, 2015).

§ 1607. Marking of Appliances.

(a) Scope of Section 1607.

Every unit of every appliance within the scope of section 1601 of this Article shall comply with the applicable provisions of this section. The effective dates of this section shall be the same as the effective dates shown in section 1605.1, 1605.2 or 1605.3 of this Article for appliances for which there is an energy efficiency, energy consumption, energy design, water efficiency, water consumption, or water design standard in section 1605.1, 1605.2, or 1605.3 of this Article. For appliances with no energy efficiency, energy consumption, energy design, water efficiency, water consumption, or water design standard in section 1605.1, 1605.2, or 1605.3 of this Article, the effective date of this section shall be January 1, 2006.

(b) Name, Model Number, and Date.

Except as provided in section 1607(c) of this Article, the following information shall be permanently, legibly, and conspicuously displayed on an accessible place on each unit;

(1) Manufacturer's name or brand name or trademark (which shall be either the name, brand, or trademark of the listed manufacturer specified pursuant to section 1606(a)(2)(A) of this Article;

(2) Model number; and

(3) date of manufacture, indicating (i) year and (ii) month or smaller (e.g. week) increment. If the date is in a code that is not readily understandable to the layperson, the manufacturer shall immediately, on request, provide the code to the Energy Commission.

…[skipping (c)]

(d) Energy Performance Information.

…[skipping (d)(1) through (d)(13)]

(14) Landscape Irrigation Equipment.

(A) Spray Sprinkler Bodies. Each spray sprinkler body manufactured on or after October 1, 2020, shall be marked, permanently and legibly, to indicate the presence of an internal pressure regulator. The marking shall be on an accessible and conspicuous place on the spray sprinkler body and designed to be visible after installation.

(B) Landscape Irrigation Controllers. Each package of base landscape irrigation controller manufactured on or after one year from the date that the proposed standards are adopted, that relies on an add-on or plug-in device for compliance shall be marked permanently and legibly on an accessible and conspicuous place with information about the manufacturer and model number of compatible add-on or plug-in devices that, when connected, makes the base landscape irrigation controller compliant.

…[skipping the rest of section 1607]

§ 1608. Compliance, Enforcement, and General Administrative Matters.

(No Change)

§ 1609. Administrative Civil Penalties.

(No Change)