DOCKETED	
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Document Title:	Landscape Irrigation Controllers Staff Workshop Presentation (12-11-2023)
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Landscape Irrigation Controllers

Staff Workshop

Appliance Efficiency Branch

December 11, 2023

Workshop Agenda

10:30 AM	**Welcome & Logistics**	**Peter Strait**
10:35 AM	Opening Remarks	Chair Hochschild
10:45 AM	CEC Staff Presentation	Soheila Pasha
11:30 AM	Open Discussion and Comment	
12:30 PM	Adjourn	

House-Keeping Rules

- All lines are muted.
- Comments will be taken at the end of the presentation.
- For general clarifying question type your question in the Q&A section.
- To comment – raise hand to speak
  - Online: Raise your hand, host will give you the ability to speak, then caller must push unmute.
  - Cell phone: Raise your hand by pushing *9, host will give you the ability to speak, then caller must push *6 to mute and unmute.
- This workshop will be recorded.
- State your name and affiliation when speaking.

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Opening Remarks

Chair David Hochschild

California Energy Commission

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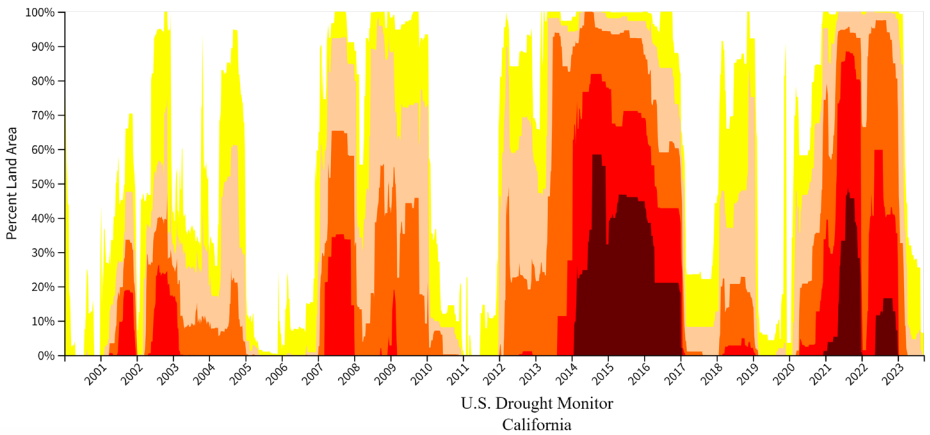
Landscape Irrigation Controllers

Staff Workshop

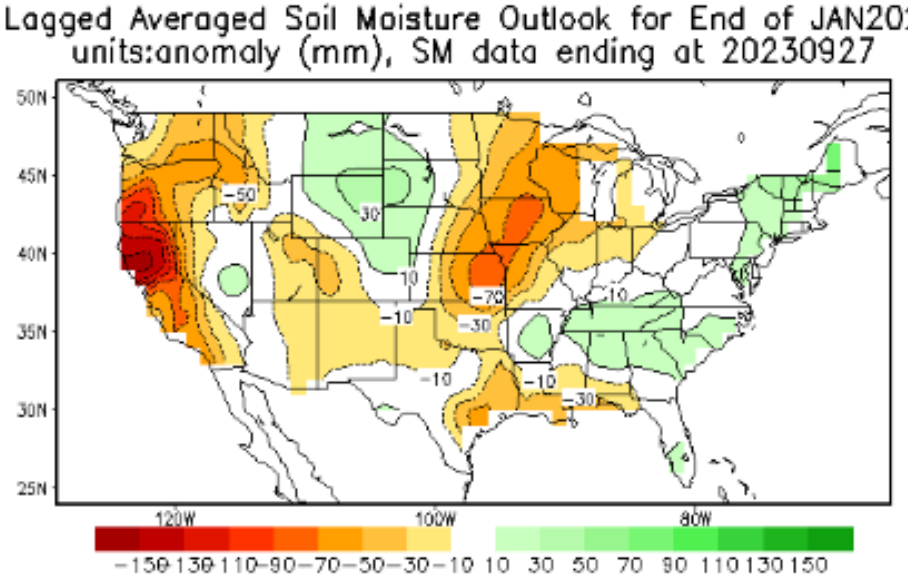
Soheila Pasha, Ph.D.

December 11, 2023

Drought Situation

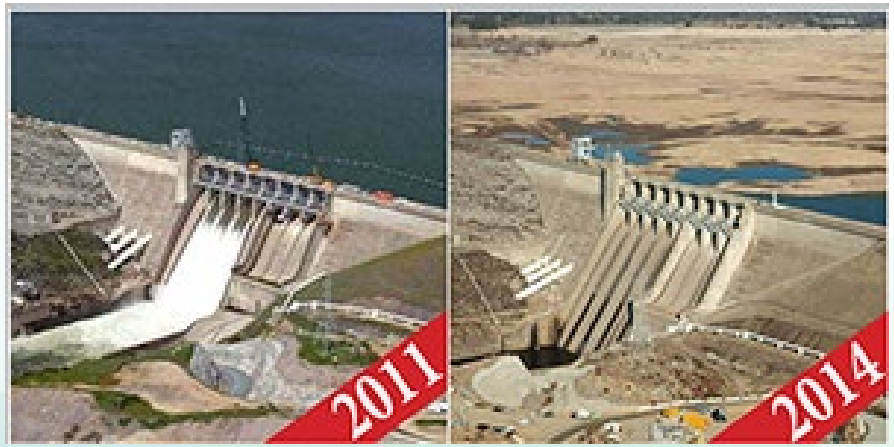


Source: National Weather Center, Climate Prediction Center



Source: National Weather Center, Climate Prediction Center

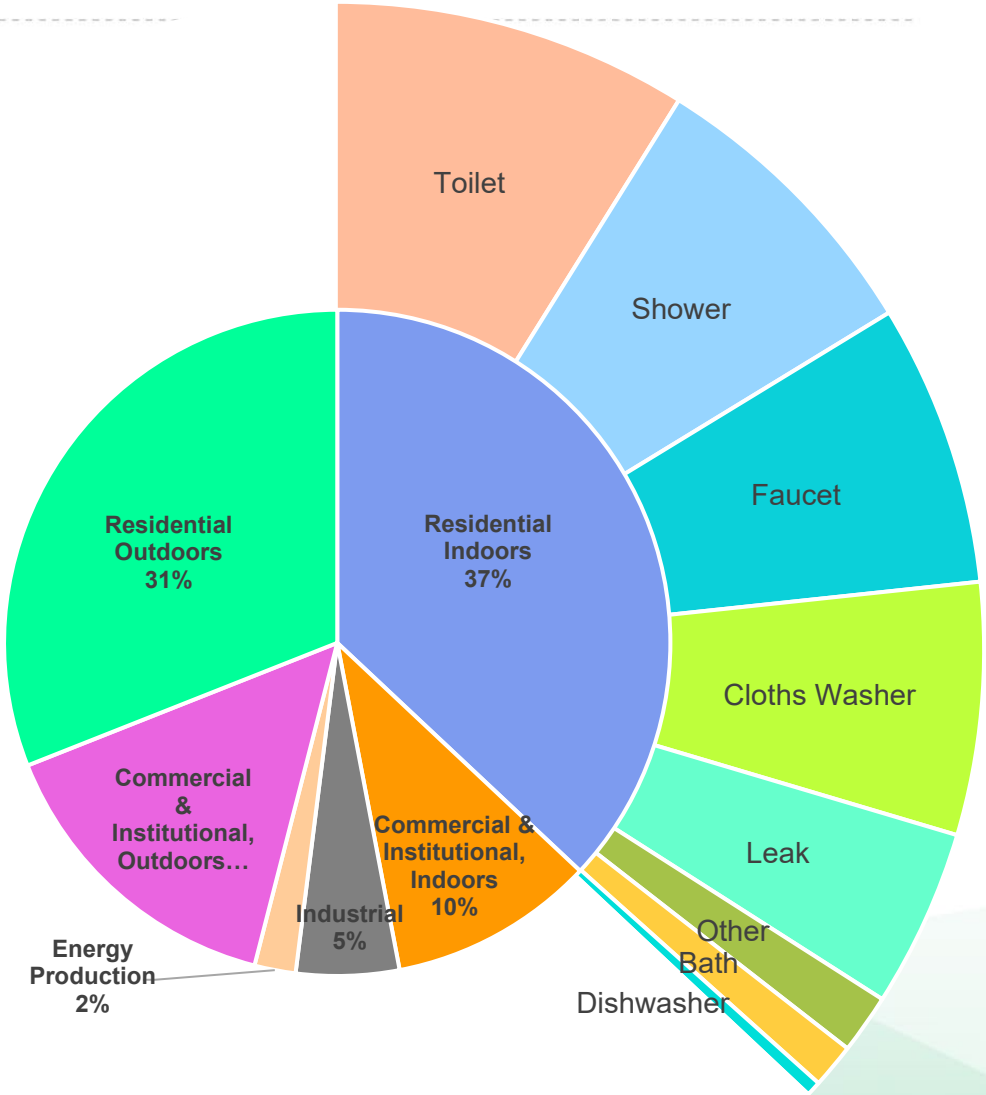
- Prominent drought levels becoming more prevalent year over year.
- Drought in California is expected to persist despite last year's rains.



Folsom Lake
Photos by: California Department of Water Resources

Water Consumptions for Various Applications

- About half of all water used is for outdoors.
- Residential outdoor consumes more water than any single household water consuming fixture.
- Single family homes use more than 88,000 Gallons per year for their landscape.



Sources:
1. Public Policy Institute of California: Water Use in California's Communities.
2. Water Research Foundation: Residential End Uses of Water.

Benefits of Adequate Landscape Watering

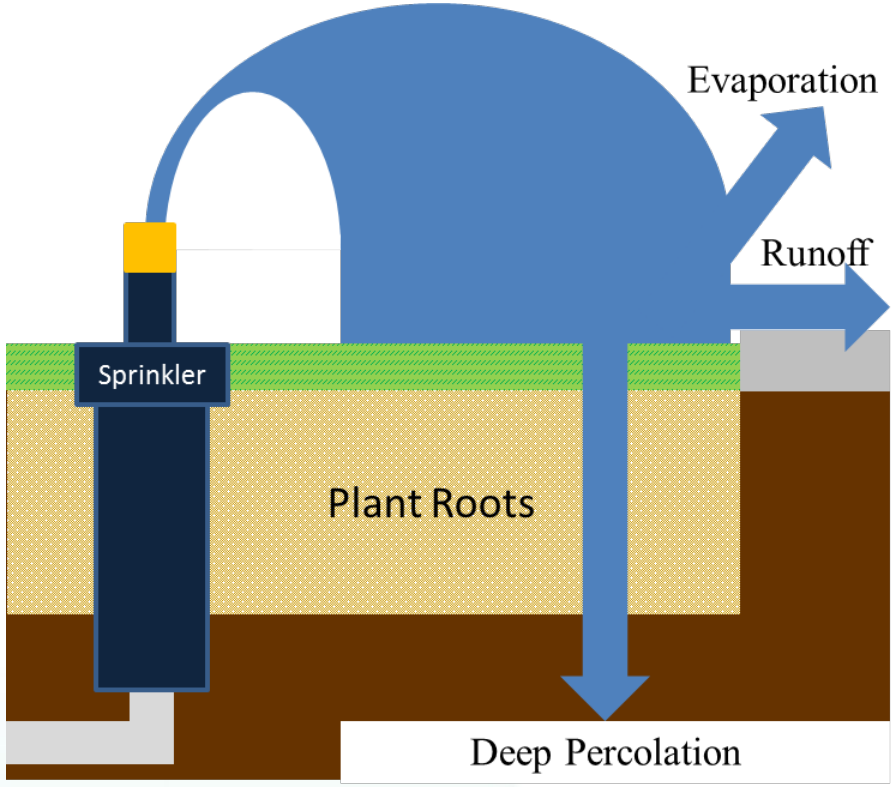
- Over-watering and under-watering are both damaging to landscapes and crops.
- Benefits of adequate watering:
  - Healthier plants
  - Saving water resources
  - Saving energy
  - Saving money (utilities and plants)
  - Environmental benefits

Source: https://oneilstreeservice.com

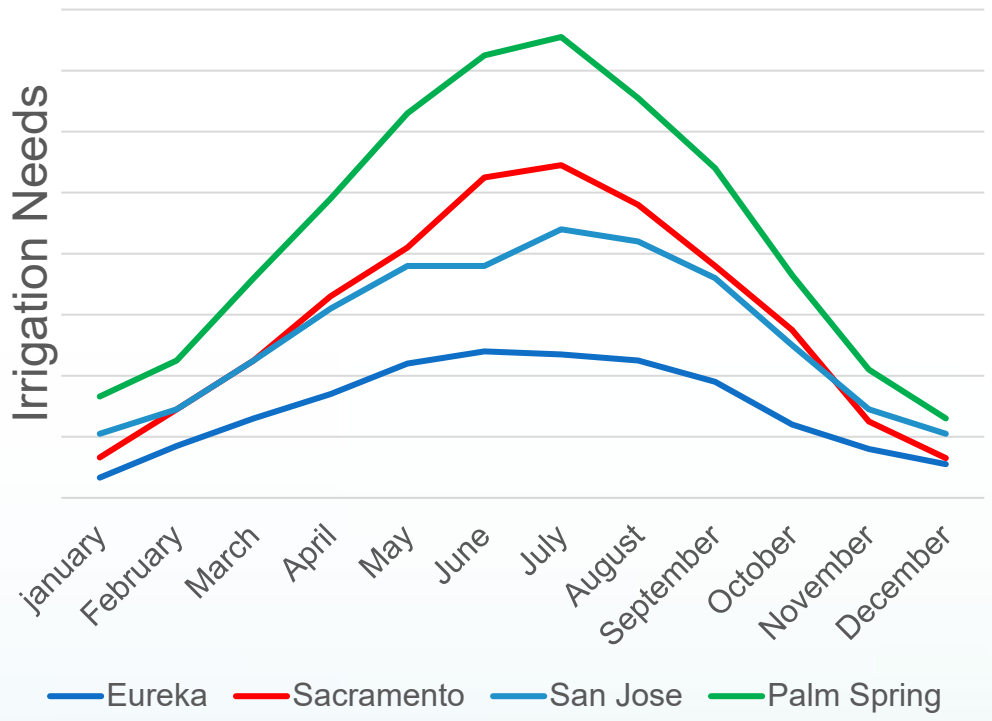
Irrigation Water Use

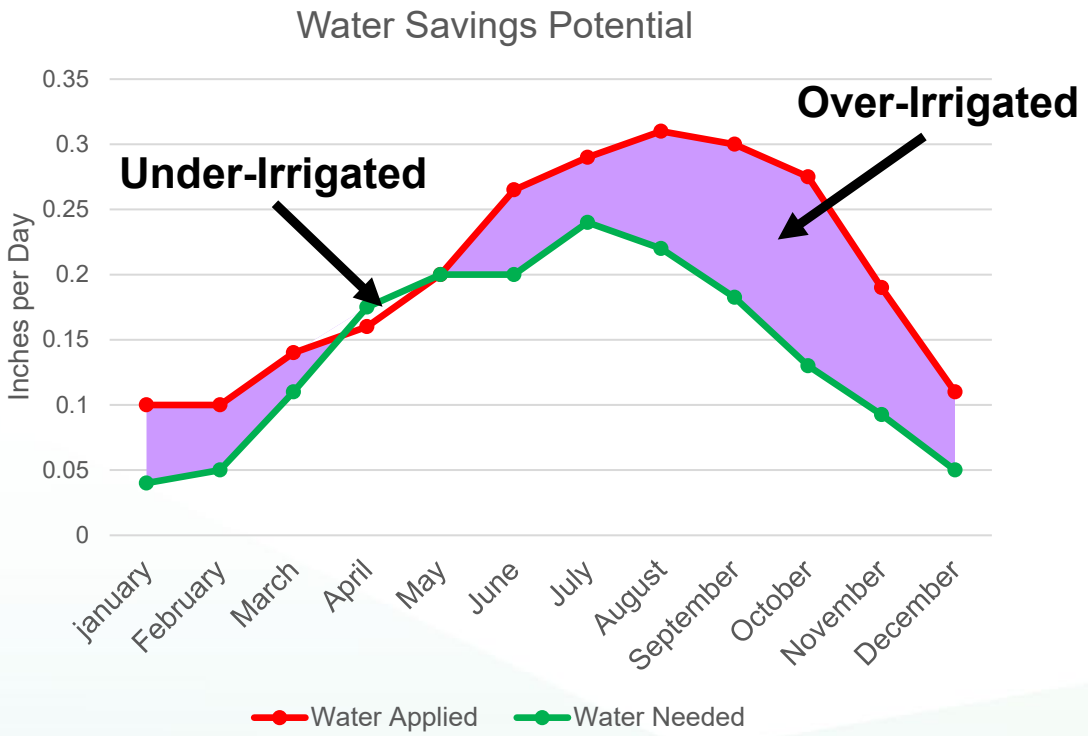
- Over-Irrigation can cause:
  - Water run-off
  - Deep Percolation
  - Evaporation
  - Standing water (poor drainage)

- Californians apply 50 percent more irrigation water than is needed.



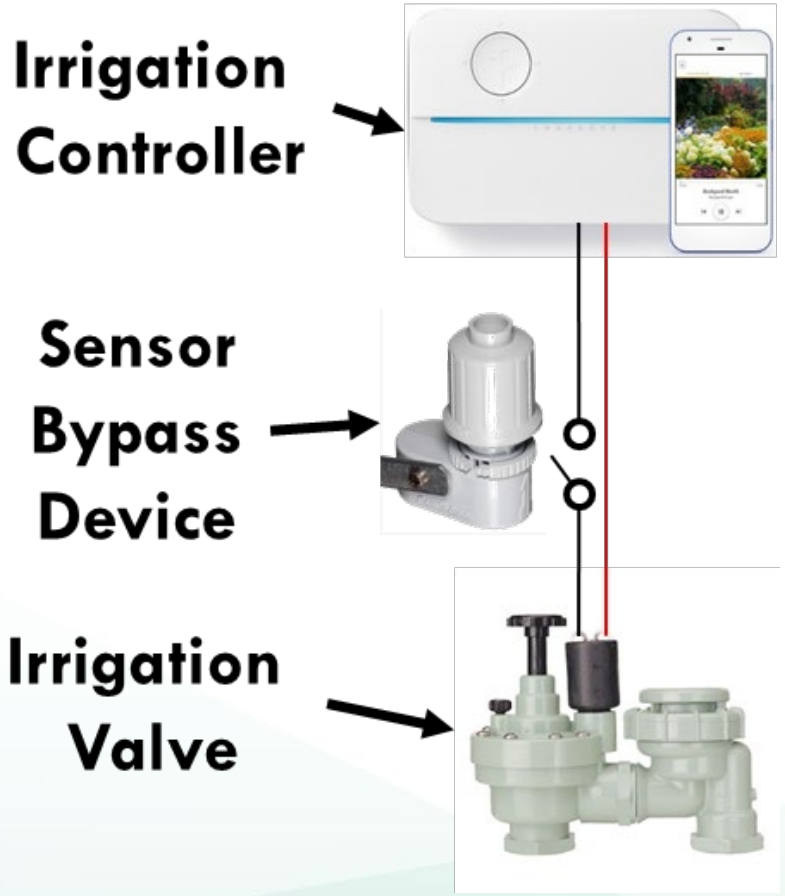
Time and Amount of Irrigation are Important





Landscape Irrigation Controllers

- Controllers are timing devices that send signals to open or close irrigation valves.
- Controllers schedule irrigation by:
  - Time clock
  - Weather data
  - Soil moisture



Staff Proposal: Scope

In-Scope:

- Clock timer controllers
- Weather-based controllers
- Soil moisture-based controllers
- Hose-bib controllers
- Battery-operated controllers
- Central control irrigation systems

Single Outlet Controllers With Hose Bibb Splitter

Multiple Outlet Controller

Clock Timer Controller

Weather-Based Controller

Out-of-Scope:

- Manual-watering timers

Staff Proposal: Definitions

- “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 manual watering timers.
- “Soil moisture-based landscape irrigation controller” means a landscape irrigation controller that is sold with a soil moisture sensor mechanism and that enables or disables an irrigation event at preset or selected soil moisture values.

Staff Proposal: Definitions

"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.

Staff Proposal: Test Procedure

Staff's proposal aligns with the U.S. EPA WaterSense Program:

- Weather-based landscape irrigation controllers:

  ANSI/ASABE S627 (October 2022) with some modifications

- Soil-Moisture-based landscape irrigation controllers:

  ANSI/ASABE S633 (May 2020) with some modifications

Staff Proposal: Standards

- Landscape irrigation controllers shall be weather-based, soil moisture-based, or both.
- Weather-based landscape irrigation controllers: meet U.S. EPA WaterSense specification for weather-based controllers.
- Soil moisture-based landscape irrigation controllers: meet U.S. EPA WaterSense specification for soil moisture-based controllers.

Proposed Standards: All Irrigation Controllers

All landscape irrigation controllers shall:

- Preserve programmed settings when power is lost without relying on an external battery
- Have zone-specific programming or store at least 3 programs
- Indicate when not receiving weather / local sensor input (as applicable)
- Accommodate specific watering restrictions
- Accommodate percent watering change

Proposed Standards: All Irrigation Controllers (Continued)

All landscape irrigation controllers shall (continued):

- Revert to historical data or percentage adjust feature if signal is lost
- Allow manual operation for troubleshooting, with automatic return to an automated mode afterward

Proposed Standards: Weather-Based Irrigation Controllers

Weather-based landscape irrigation controllers shall:

- Be capable of interfacing with a rainfall device or soil moisture sensor
- Ensure irrigation adequacy by supplying no less than 80 percent of water needed to maintain landscape
- Limit over-irrigation to 10 percent or less for each individual zone, and 5 percent or less on average across all zones

Proposed Standards: Soil Moisture-Based Irrigation Controllers

Soil moisture-based landscape irrigation controllers shall:

- Be capable of interfacing with a rainfall device
- Allow enabling and disabling irrigation at 20, 40, and 60 percent depletion levels
- Meet precision and responsiveness targets (on next slides)
- Shall 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

Proposed Standards: Soil Moisture-Based Irrigation Controllers (Continued)

- **Precision:** Relative average deviation (RAD) of the enable and disable readings across 3 depletion levels shall be 10 percent or less.

	Enable Irrigation			Disable Irrigation		
	Depletion Level 20%	**Depletion Level 40%**	**Depletion Level 60%**	**Depletion Level 20%**	**Depletion Level 40%**	**Depletion Level 60%**
Replica#1	$R_{(E\text{-}1\text{-}20)}$	$R_{(E\text{-}1\text{-}40)}$	$R_{(E\text{-}1\text{-}60)}$	$R_{(D\text{-}1\text{-}20)}$	$R_{(D\text{-}1\text{-}40)}$	$R_{(D\text{-}1\text{-}60)}$
Replica#2	$R_{(E\text{-}2\text{-}20)}$	$R_{(E\text{-}2\text{-}40)}$	$R_{(E\text{-}2\text{-}60)}$	$R_{(D\text{-}2\text{-}20)}$	$R_{(D\text{-}2\text{-}40)}$	$R_{(D\text{-}2\text{-}60)}$
Replica#3	$R_{(E\text{-}3\text{-}20)}$	$R_{(E\text{-}3\text{-}40)}$	$R_{(E\text{-}3\text{-}60)}$	$R_{(D\text{-}3\text{-}20)}$	$R_{(D\text{-}3\text{-}40)}$	$R_{(D\text{-}3\text{-}60)}$
Average Deviations (AD)	$AD_{(E\text{-}20)}$	$AD_{(E\text{-}40)}$	$AD_{(E\text{-}60)}$	$AD_{(D\text{-}20)}$	$AD_{(D\text{-}40)}$	$AD_{(D\text{-}60)}$

$$AD_{(E/D-DL)} = \frac{\sum_{i=1}^{3} \left| R_{(E/D-i-DL)} - \bar{R}_{(E/D-DL)} \right|}{3} \Big/ \bar{R}_{(E/D-DL)}$$

$$\text{Where: } \bar{R}_{(E/D-DL)} = \frac{\sum_{i=1}^{3} R_{(E/D-i-DL)}}{3} \text{ and } DL = 20\%, 40\%, 60\%$$

- RAD is the average of 6 average deviations:

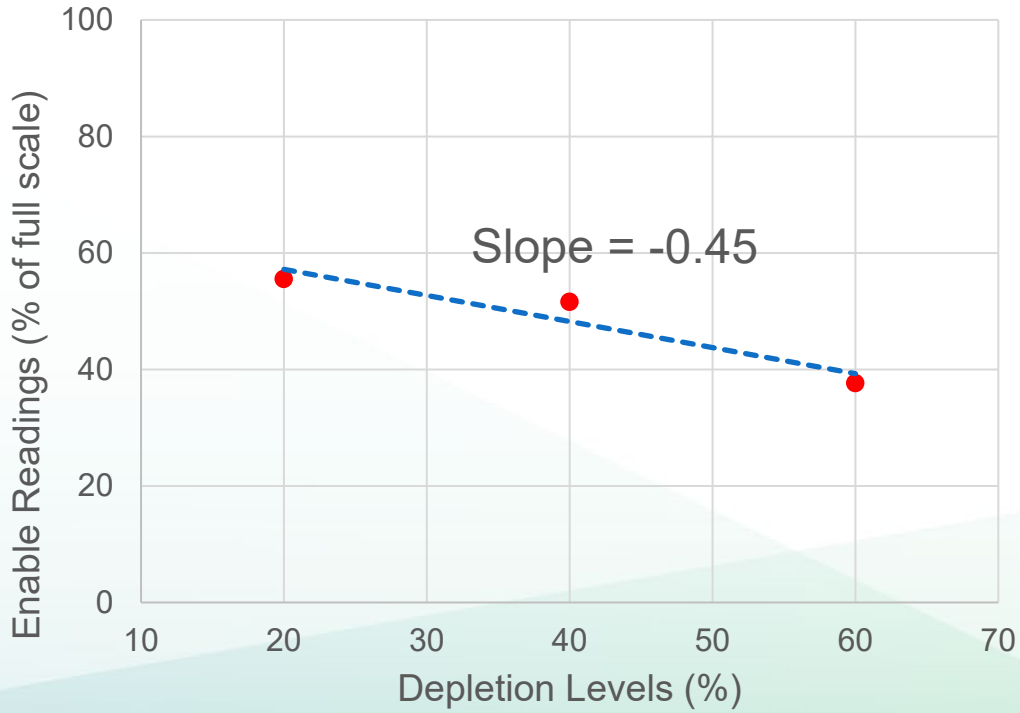
$$RAD = [AD_{(E\text{-}20)} + AD_{(E\text{-}40)} + AD_{(E\text{-}60)} + AD_{(D\text{-}20)} + AD_{(D\text{-}40)} + AD_{(D\text{-}60)}] / 6$$

Proposed Standards: Soil Moisture-Based Irrigation Controllers (Continued)

- **Responsiveness to soil moisture changes:** The absolute value of the slope of the least-square-regression line for three points represented by the average readings ($R_{(E/D\text{-}DL)}$) on Y-axis and depletion levels (DL) on X-axis shall be greater or equal to 0.01, for both enable irrigation and disable irrigation.

$$\overline{R}_{(E/D-DL)} = \frac{\sum_{i=1}^{3} R_{(E/D-i-DL)}}{3}$$

$$\text{Depletion Level (DL)} = 20\%, 40\%, 60\%$$



Staff Proposal: Certification and Marking Requirements

- Manufacturers would be required to certify each model of landscape irrigation controller to the CEC's appliance efficiency database
- Manufacturers would be required to mark each controller with:
  - Manufacturer name, brand name or trademark
  - Model number
  - Date of manufacture

Technical Feasibility

- Proposed standards are aligned with U.S. EPA WaterSense programs for weather-based and soil moisture-based irrigation controllers.
- U.S. EPA WaterSense product website shows about 960 weather-based and soil moisture-based irrigation controllers.
- U.S. EPA WaterSense certified products are from multiple different manufacturers.
- Proposed standards are technically feasible and there are no intellectual property barriers.

Benefits

Proposed standards:

- Are cost effective to California consumers
- Save significant amounts of water and embedded electricity used for water pumping, treatment, and delivery
- Decrease the need for investing in costly, large-scale infrastructure projects to supply more water
- Reduce operating costs for water utilities to collect and treat wastewater before releasing it back into the environment

Per Unit Costs and Savings

Product Type	Design Life (Years)	Water Savings (%)	Water Savings (Gal/yr)	Life-Cycle Water Saving (Gal)
Irrigation Controllers	15	15%	13,265	198,981

Water Rate ($/1000 Gal)	Water Cost Savings ($/yr)	Water Cost Life-Cycle Savings ($)	Incremental Costs ($)	Life-Cycle Net Benefit ($)	Pay Back Period (Years)	Benefits to Cost Ratio
$6.13	$74.42	$915.03	$24.83	$890.20	0.33	36.85

Note: a 3 percent discount rate is applied to calculate the net present values.

Statewide Costs and Savings

Product	1st Year Sales in CA (units/yr)	1st Year Water Savings (million gal/yr)	1st Year Initial Costs ($million/yr)	1st Year Water Costs Savings ($million/yr)
Irrigation Controllers	399,846	4,005	$7.1	$22.5

Product	Stock Turn Over Year	Embedded Electricity Savings (GWh/Yr)	Stock Turnover Water Savings (million gal/yr)	Stock Turnover Water Costs Savings ($million/yr)
Irrigation Controllers	Year 15th	213.3	59,830	$275

Note: a 3 percent discount rate is applied to calculate the net present values.

Environmental Impacts

- Proposed standards:
  - Improve air quality by reducing greenhouse gases emitted in the production of energy used to transport and treat water.
  - Have no adverse environmental impacts.
  - Do not result in early disposal of non-compliant products.
- The materials found in compliant products do not contain any hazardous materials.
  - The proposed standards do not require the use of any specific material to improve the efficiency of the product.
- The marking requirement can be accomplished with existing marking techniques and does not cause a significant environmental impact.

Equity of the Impacts and Benefits

- Proposed standards are cost effective for low-income households with a pay back period of less than six months.
  - Rental households benefit slightly more as they don't typically pay for the upfront costs.

Discounted Water Rate ($/1000 Gal)	Water Cost Life-Cycle Savings ($)	Incremental Costs ($)	Life-Cycle Net Benefit ($)	1st Year Cost Savings ($)	Pay Back Period (Years)	Benefits to Cost Ratio
$4.29	$640.52	$24.83	$615.69	$52.09	0.48	25.80

Note: a 3 percent discount rate is applied to calculate the net present values.

- Low-income families equally receive the environmental benefits: reduced greenhouse gas and criteria pollutant emissions.

What Happens Next

- CEC staff will review all comments received.
- Proposed regulation will be revised if needed.
- If there are changes affecting staff analysis, CEC staff will update and publish the final staff analysis report.
- The CEC will start a formal rulemaking for landscape irrigation controllers.

Thank You!

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Comments

- Comments are due by 5:00 p.m. on January 8, 2024.
- Oral comments will be accepted at the end of the workshop today.
- To submit electronically:
  - Go to https://www.energy.ca.gov/proceeding/irrigation-controllers
  - Click on “Submit Comment (17-AAER-10)”
- To send a digital copy: email to docket@energy.ca.gov, include “docket number 17-AAER-10” and “Landscape Irrigation Controllers” in the subject line.
- To send a hard copy, mailed to:

  California Energy Commission
  Docket Unit, MS-4
  Docket No. 17-AAER-10
  715 P Street
  Sacramento, California 95814

Document Availability

- Today's workshop is a part of the pre-rulemaking process.
- All documents related to the Landscape Irrigation Controllers pre-rulemaking, including this presentation, are available on the Energy Commission's website at (Docket# 17-AAER-10): https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-AAER-10