DOCKET
09-AAER-1A
DATE June 01 2009
RECD. June 17 2009

Key Questions for Setting Efficiency Standards and Labeling Requirements for Landscape Irrigation Equipment

Staff Technical Workshop

June 1, 2009

1. How do we define water "wastes", and how do these "wastes" occur in landscape irrigation practices? What are the different categories of wastes and strategies for mitigating them?

Irrigation Water Wastes are any excessive water applied to a landscape where the landscape does not fully utilize the water to sustain plant health and quality.

Water waste is defined as any amount of water applied above the plant water need to sustain plant health and quality (Kc x ETo). This can include an irrigation system (sprinklers) inefficiency percentage. However, irrigation system efficiency should be driven as close to 100% as possible in order to attain the highest efficiency levels possible.

Irrigation waste comes from

1) Over Irrigation – Water applied to the landscape that is not required. This is based on the plant demand and high resolution weather data.
2) Run-off – Water applied to the landscape, but runs off and not utilized by the landscape.
3) Overspray – Water that is not targeted to the landscape area.
4) System Efficiency – Water that is applied to the landscape to account for general application inefficiencies. For example, Spray Head sprinklers in a well designed plan will have system efficiency of 60% to 70%.
5) System Breaks – Water lost due to breaks in the system, including laterals, mainlines, sprinklers, ….

2. How are landscape irrigation controllers, both weather based and moisture sensor based or add-on devices, expected to help reduce these wastes? How effective are they in actually reducing waste of water in landscape irrigation?

Weather-based controllers and soil moisture sensors in and of themselves are only partial solutions. Only a truly smart controller (defined as that which can calculate efficient irrigation schedules for each and every zone in the landscape and change according for daily weather conditions…by changing the minutes, days, cycles and soak time of each station without people). Therefore, a truly smart controller would apply only the water that is required to plants, as defined above as Kc x ET. It would remove people and the guesswork from that part of the water efficiency equation.

Numerous studies have shown that a truly smart controller can remove at least 95% of a sites water waste (Note: not every landscape site wastes water and sites water waste

can vary from 1% to 500% over-watering). The LADWP measured, in a 2004 study, that while both smart controller products saved water, one unit saved 71% of the potential water waste while one product saved 95% of the potential water waste. Not all weather-based, ET, soil sensor or smart controllers are created equal. The SWAT test, while a legitimate attempt to measure a products performance level, does not fully comprehend the abilities or inabilities of controllers. Since the act of applying water to a landscape is complex, changing and subject to numerous variables, most often outside the operation of a controller, the test does not fully recognize the common variables that can affect product performance. Unfortunately, marketing by irrigation manufacturers makes all products sound virtually the same.

3. Definitions of specific terms and equipment are required for any standards or labeling requirements. What are the applicable definitions for irrigation equipment, performance metrics and functions to be regulated? Are all the definitions used for the terms for this equipment agreed-to within the industry? If so, what is that terminology and what are the related definitions?

Controller: people managed controller that requires input of minutes, days, cycles and soak time
Smart Controller: A controller that dynamically determines the landscape water requirements based on landscape water demand. To be more specific an automated efficient schedule produced by the controller (based on zone by zone SWAT identified variables of plant type, soil type, sun/shade, slope, sprinkler precip rate, root depth to irrigate and system uniformity); must change the full schedule (minutes, days, cycles and soak) based on real-time weather and the maximum allowable soil moisture depletion. Currently the standard for a smart controller is a SWAT test report. The SWAT test has a 55% wide range in which to score a 100% Irrigation Adequacy.

4. How do we minimize water use increases and maximize water use savings with an efficiency standard for landscape irrigation devices? What performance metrics must be included in such a standard (i.e., flow or application rate, pressure, net volume applied, duration, etc…)?
The best way to minimize water use and maximize savings is to minimize waste. The first step is to understand when something is wasteful.
To minimize over-irrigation waste, there should be a standard set to determine water demand. As an example, HydroPoint data systems can provide High Resolution ET data down to a square kilometer for all of California and the rest of North America. This information could be used to determine the overall irrigation requirements and be used as a baseline to determine over irrigation waste. This could then put into a real-time performance metric to determine how much water a system is using vs. the system demand. This cannot be tested under the SWAT protocol since the data changes daily.

To minimize run-off waste, irrigation systems must be properly setup and able to account for soil and slope issues. These are tests performed by the California SWAT protocol and system with 0% run-off have shown the ability to manage run-off.

To minimize overspray, the irrigation system must be properly setup and maintained. Also, the design of the system must be able to account for high water pressure with pressure regulators to ensure that sprinklers are working within their designed pressure.

To minimize system efficiency waste, the use of more efficient sprinklers can be utilized. For example, High Efficiency spray heads such as the MP Rotor or the Toro Precision Series can increase system efficiencies.

Another important method is to set a water budget. Enforce the water budget with punitive water rates. Allow products that meet the most efficient standard (100% Irrigation efficiency and 0% Excess). This "industry standard" for controllers is does not solve all issue because of users and common poor irrigation systems (sprinklers). A proven smart/efficient controller (from SWAT testing) can not be responsible for user error or poor irrigation systems.

5. What measurements/protocols are used to verify these savings? Can these methods be applied to all types of controllers? If not, what adjustments must be made to more equitably compare different types of controllers? Sensors? Emitters? Valves?

Each method to eliminate waste components must be measured differently.
Over-irrigation: Currently the best protocol that is able to determine over-irrigation waste is the SWAT protocol as it measures the right landscape demand factors variables (soil type, plant type, root depth, sun/shade, slope, precip rate, uniformity and soil moisture depletion). This test is controller agnostic and performance based. A minimum score result of 100% system efficiency should required.

Run-off: Currently the best protocol that is able to determine over-irrigation waste is the SWAT protocol. This test is controller agnostic and performance based. A maximum score result of 0% run-off reduction should be required.

6. Do we have definite measurements of efficiency or quantity of water and/or energy being saved by the use of either forementioned controllers? How does this compare to add-on devices to traditional timers? Could standard or traditional timer-based controllers achieve similar savings? If so, how?

Add-on style devices will always be limited to the boundaries of the current conventional controller and will therefore be limited in their ability to reduce waste because of their practical inability to control over-irrigation and run-off in all conditions.
A list of studies for savings are consolidated at
http://www.weathertrak.com/smart-irrigation/research-studies.php

7. Is there a common characteristic or operational element that can be defined between "smart" and "conventional" controllers that could be the basis of a performance standard for water savings? For energy savings?

Conventional controllers do not change the irrigation schedules based on actual demand (See definition above).
Smart controllers change irrigation schedules based on the actual landscape demand due to plant type and ET.
The SWAT protocol can be used as a performance measurement for efficiency.

There are 2 major differences between a smart and conventional controller. First, a smart controller receives real time ETo data daily. A conventional controller does not and therefore can not change irrigation schedules for actual need. Second, a smart controller can calculate an efficient irrigation schedule and change that schedule daily (minutes, days, cycles and soak) as the weather changes. If a controller has any of the following elements it should not be considered "smart". They include:

- must not require people to insert/set schedules (minutes, days, cycles and soak)
- must not require people to set the days of irrigation
- must be able to get ET data at least daily

8. What are the mandatory or required elements of an irrigation system to ensure increased efficiency?

Many components contribute to an overall increase in system efficiency.
Maximum conservation potential cannot be achieved without a Smart Controller in a properly working system. None the less, significant savings can still be achieved with an ET based smart controller even in a system that lacks optimum efficiency (LADWP 2004). Using a Smart Controller the overall system allows all parts of the landscape to benefit immediately since the controller manages all stations from a central location. From the central smart controller, the system maintainer can also manage and prioritize which areas should be modified to gain maximum conservation.
While other components contribute to making parts of the system more efficient, an ET based smart controller is mandatory.

9. Are new controllers or add-on devices compatible to existing irrigation systems? What difference in performance is there between new and modified systems?

Smart Controllers can be used in retrofit situations because the irrigation industry long ago standardized on 24 volts AC to actuate valve solenoids. There are limitations with add-on style devices in that their dependency on the conventional in-field old controller may lower their reliability and limit their flexibility in native plant applications.

10. Do we know whether the uses of the weather or moisture sensor based controllers (or add-on devices) would result in a statewide net saving of water use compared to current time setting or clock controllers? How much? What should be the minimum

expected water savings and energy savings of an efficiency performance standard for controllers? Sensors? Emitters? Valves?

If water is being wasted on a site, it is proven in numerous public agency field studies that water can be saved, and continue to be saved over years. Agencies have spent millions of dollars in studies, starting in 1998 in Irvine, to find that water is saved. However much water is over-applied can be saved (LADWP, 2004). However much runoff is occurring can be reduced and almost eliminated (MWDOC 2004, MWDOC 2008). How much water would be saved is a inadequate question, as sites waste water at different rates and some landscape sites under-irrigate. Set water budgets for every site and the answer of how much water can be will be answered. Public agency studies do show that as much as 59% of landscape water is wasted on sites. Using a different metric (a site by site water budget), one water agency found that 40% of previous landscape water was saved. That savings has persisted for 15 years with a water budget rate structure. The minimum amount of water savings should be the difference between the water budget and the actual water use. All products should have to meet the same standard of maximum water efficiency potential.

11. What key elements or information are required for label content of landscape irrigation equipment (controllers, sensors, emitters, valves) to properly inform customers about potential of these devices to save water or energy? What content is required to ensure adequate understanding and installation to ensure desired performance? Where should labels be placed (on the device packaging, on the device itself, on informational documentation included with the device, etc…)?

Customers want to see a “confidence” label (tested by. All products should provide proper installation requirements. Products with built-in service components should be awarded higher ratings due to the verifiable installation/set-up/customer training expertise rolled into the product. That these products consist of a “service fee” is understandable and desirable. A market approach to offer a complete installation and on-going customer service frees the public agency from trying to perform those tasks. This market system approach will save more water for the long-term compared to handing out products and expecting end-users to install and monitor over the long-term. Water savings will deteriorate with a “service” approach and business model. That was borne out of a study conducted by the LADWP and recently reported by researchers of Statewide rebate programs. In only one location did water savings increase over time. That finding was in the LADWP and was centered around 1 product with a business model designed to save water for the long-term without public agency assistance.

12. Is there adequate evidence to substantiate a specific standard of performance for all controllers? Sensors? Emitters? Valves? If not, what analyses or evidence is required?

The number of controller that have been studied and shown overall savings, particularly over a multi-year period.

13. The Energy Commission must do a cost benefit analysis as defined by statute. What costs should be used for a unit of water saved (i.e., current average statewide average cost per gallon; marginal cost of next increment of new water to statewide supplies such as ocean desalination, etc…)? What costs should be used for a unit of energy (i.e., current statewide electric or natural gas average cost per watt; marginal cost of next increment of new generation or natural gas supplies, etc…)?

A number of metrics should be included to the cost benefit analysis. The cost of water (different for virtually every agency in the state). The avoided cost of water. The cost of energy (different across the State). The life of the expected water savings (see the answer from #11). While the cost of products may be considered, the cost of installation, customer training, customer follow-up and long-term customer service should also be included. If a product does not supply those "extras" and/or can not show the company size and business plan to do so, then all of that necessary work falls to the public agency. Public agencies are in a mode of cost-cutting and will likely be so for many years. Public agencies can not afford, nor do they have the expertise, to perform the installation, training and follow-up customer service that will be required to attain long-term water savings. That these features exist in a limited number of products, a complete solution, those products should be rewarded. Those products not only save water they save public agency expenses and staff time.

14. What is the expected average operational life of landscape irrigation equipment: controllers, sensors, emitters, valves? What is the design life of these devices (required information to evaluate costs to consumers)? What are the retail costs of these devices? How are these costs expected to change over the next 10 years?
The Digital, above ground controllers built into protective steel or durable and tested plastics should have an expected operational life of between 7 to 10 years depending on model or make.

15. AB 1881 requires the Energy Commission to prohibit the sale and installation of noncompliant equipment on or after January 1, 2012. How should the Energy Commission enforce the prohibition of the sale or installation of non-compliant devices? What partners should the Energy Commission collaborate with and what role should these partners play?

16. Are there any special operational or regulatory considerations needed for systems that use recycled water?

No. The same high standard should apply to recycled water the same as potable water. Both are in short supply. Water efficiency is just as important with recycled water to eliminate water runoff and non-point source pollution.

17. What on-going data collection requirements are needed to ensure the compliance of regulated irrigation equipment with the standards?