Blueprint for Pilot Testing and Replacing Standard Clock Irrigation Controllers with Smart Technology

Summary

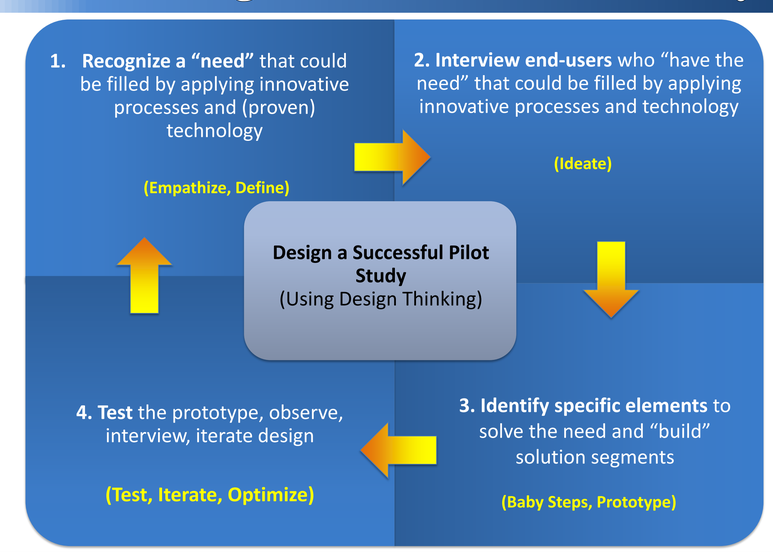
From 2001 through mid 2014, Stanford University's (SU) Water Efficiency Program reduced campus water use by 22% by retrofitting more than 13,000 indoor fixtures, equipment, and landscape sites. In 2012, SU implemented an institutional smart controller pilot study working with HydroPoint Data Systems Inc. The major, yet untapped area is the irrigated landscaping of 750 single-family residences on campus.

While attending the 2013 WaterSmart conference, Stanford staff learned about a promising smart-controller technology well suited for this application, and soon after pursued another pilot to determine its worth. The extreme drought of 2014 in California added further significance to this pilot study. To achieve long-term water efficiency at these large residential sites (the goal of this study) participant "buy in" was critical. Development of a successful process for changing out standard clock controllers with smart controllers was key to this effort. The study made it as easy as possible for participants, essentially creating: "one-stop shopping" for a smart controller targeting both water efficiency and ease of use. The study team included a partnership with OnPoint EcoSystems, the smart controller developer, and Santa Clara Valley Water District, who offered significant rebates. SU Water Efficiency staff solicited volunteers and targeted residences with manual (clock) irrigation controllers on larger lots, using over 1,000 gallons per day (gpd) during the main irrigation months. Typically, irrigation accounts for about 75% of the group's total domestic water use. The study team streamlined the process by: integrating pre-installation site visits, identifying needed fixes, providing a 1.5 hour training with a hands-on segment, and prior to processing the rebate, performing a post-installation visit. The study team also facilitated the purchase and rebate process after the training session and actively solicited and responded to participant feedback. Participants used an average of 27% less water in the first year (2014-2015 compared to 2013-2014). The pilot study has been expanded in 2015. This successful process can easily be duplicated by other water agencies.

Utility Goal → Long-term reduction of water use for institutional and residential irrigated decorative landscapes

Select technology with high potential for success, easy to use, cost effective; cultivate a productive partnership with vendor	• **Test** landscape areas with independent meters • **Focus** on areas with high water use, common runoff, high potential for water reduction • **Target** areas with existing standard clock irrigation controllers • **Select** end users willing to test new technology, work collaboratively with Utilities staff, technology reps
Institutional vs. Residential Pilot Groups	• **Institutional** sites managed by professional staff, so after initial training, less "hand-holding" • Irrigation separately metered • **Residential** sites managed by homeowners or their staff, so after initial training, much more "hand-holding" • Indoor, outdoor combined metered
Lessons Learned & Recommendations	**Facilitate a productive outcome!**

How to Design a Successful Pilot Study



Smart Irrigation Controller Technology - Key Characteristics

Basic Technology Requirements

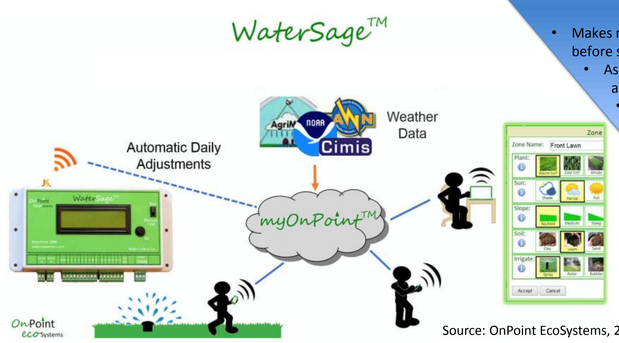
- Weather-based irrigation controller (ETo automatically adjusted daily) suitable for large residential and institutional landscapes.
- US EPA WaterSense certified.
- Available, ready to be pre-tested on site by Utilities staff.
- Site-specific characteristics – plant type, sun exposure, soil, slope, more specific adjustments
- Must be easy to use with graphic, simple user interface (residential only), automated software updates.
- Preferably no subscription fees.

Vendor Requirements

- Makes necessary improvements to user interface after staff testing, before start of pilot.
- Assists with installations as needed, partners with Utilities staff and is responsive to customers.
- Provides on-site and on-line video training for participants.

Extra Useful Stuff

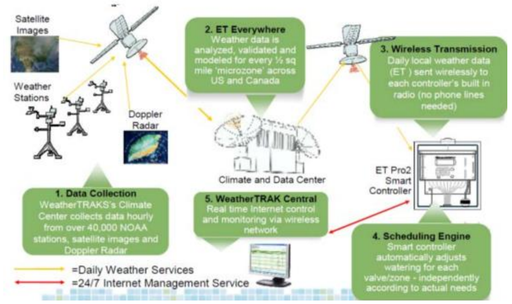
- Visual, Wi-Fi mobile device programming
- Irrigation reports, ETo history
- Irrigation forecast



Source: OnPoint EcoSystems, 2014

Residential Weather-Based Technology

WeatherTRAK



Source: HydroPoint Data Systems Inc. WeatherTRAK Fact Sheets, January 2012

Institutional Weather-Based Technology

Similarities and Differences between Institutional and Residential Pilot Projects

Similarities

- Clock controller in use before smart controller is installed
- Smart controller certified by US EPA WaterSense
- Smart controller technology pre-tested by staff, before starting pilot
- Landscape area contains decorative turf
- Participant willing to: take the time to learn about the technology, provide periodic feedback, work with technologists if issues arise, remain calm
- Common site conditions: high water use, runoff from irrigated area, irrigation system leaks (e.g., stuck valves, broken lines)
- Require leaks and broken sprinklers be fixed before starting pilot project

Differences

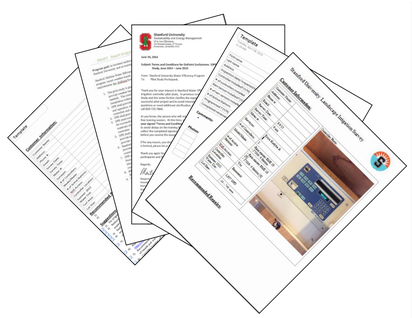
Institutional Project

- Technology: HydroPoint, managed by professional staff
- Landscape metered separately

Residential Project

- Technology: OnPoint, managed by homeowner and/or gardener
- Landscape and indoor use metered together
- Use >1,000 gals/day during peak irrigation season of base year (June – Sept 2013)
- Complete extensive landscape survey and training

Process for Residential Pilot Study



Forms developed for Residential Pilot Study to streamline the process.

1. **Landscape Survey**
2. **Onsite Training**
   - Alternate: **Online Training** (Developed by OPE and SU staff)
3. **Terms & Conditions** (Developed by SU staff, signed by participant)
4. **Rain Sensor** (Required for rebate, free to participant)
5. **Participant Purchases Controller** (at training)
   - Alternate: **Participant Purchases Controller** (directly from OPE)
6. **Post inspection AND review controller settings with participant** (SU sends post inspection & invoice to SCVWD)
7. **Participant Receives Rebate** (participant previously submitted application & Tax Form)
8. **Monthly Feedback Surveys for 12 months** (Developed by SU staff, filled out by participant)
9. **Periodic Review, Summary of Results** Certificate of completion (at end of pilot)

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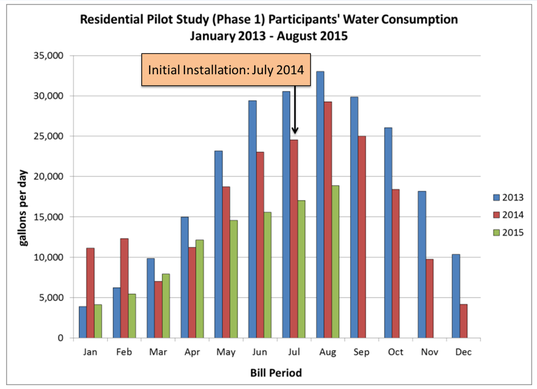
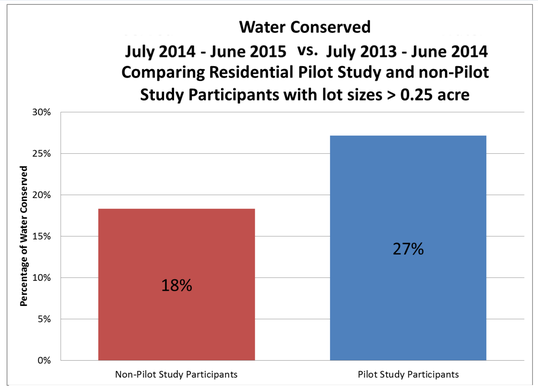
Results from Residential Pilot Study



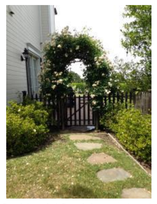
Pilot Study Participants saw an average of a 27% reduction during the first year of use (from July 2014 - June 2015 compared to July 2013 - June 2014)



Pilot Study Participants saved 50% more water during the first year of use (from July 2014 - June 2015 compared to July 2013 - June 2014)


Residential Participant's Landscaping

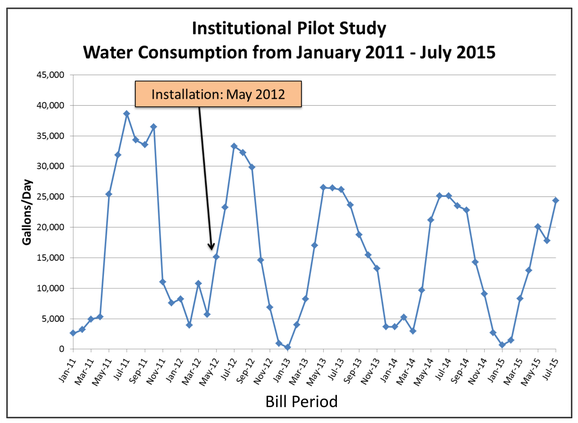

Residential Participant's Landscaping


Residential Participant's Landscaping


Installation of the Residential OPE Smart Controller

Technology used in Residential Pilot Study

Results from Institutional Pilot Study



Pilot Study Participants saw an average of a 26% reduction during the first year of use (from May 2012 - April 2013 compared to May 2011 - April 2012)


Institutional Participant's Landscaping

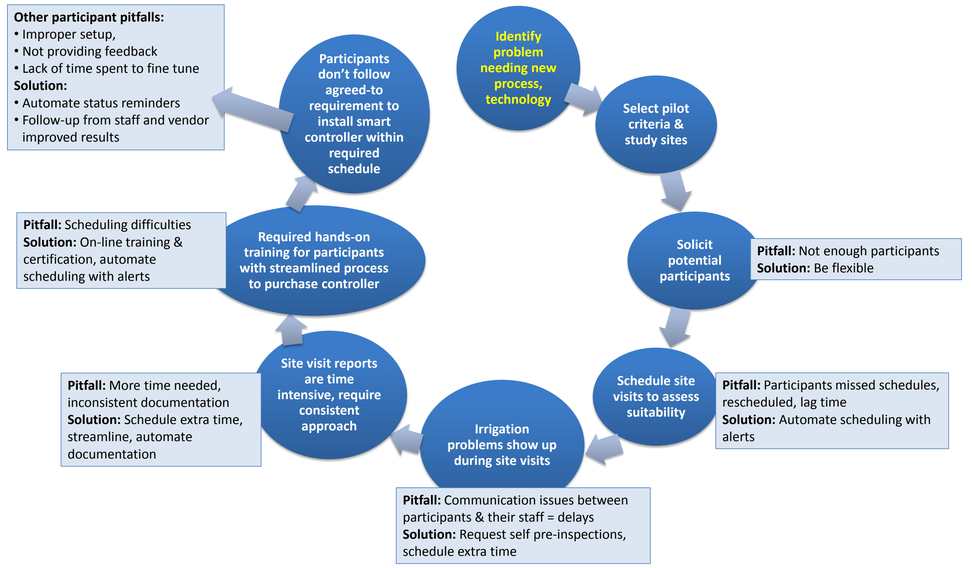

Institutional Participant's Landscaping


Institutional Participant's Landscaping

Institutional Controller and Rain Sensor


Technology used in Institutional Pilot Study

Pitfalls & Lessons Learned in Residential Pilot Study - Iterative Process & Follow-up

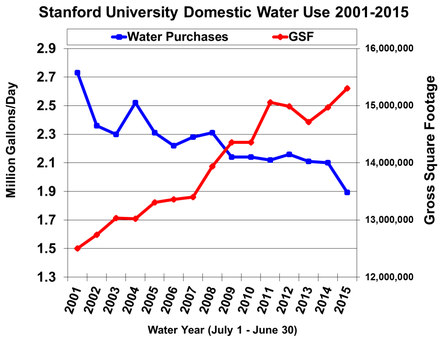


Pilot Study Findings, Recommendations, Challenges, & Conclusions

Pilot study success depends on facilitating a "best fit"
- Select achievable project and process
- Make informed decisions, pre-test technology
- Empathize with and engage participants
- Collaborate with agency and vendor staff
- Prototype, test solutions and processes

Cultivate trust, develop "feedback loop" with participants and vendors, pivot to deal with challenges, follow-up!
- Anticipate issues, be responsive
- Streamline the process, make it easy for participants to comply with study requirements
- Expect confounding factors – changes in landscaping, impact from other water conservation measures, DROUGHT !

Form partnerships - local agencies, technologists, use data analytics
- Make it easy for all partners to succeed. Agency support, rebates, vendor partnership matter!
- Use meter data, site information, develop user engagement
- More effective results when integrated with real-time metering and leak alerts



Conclusion

The success of these pilot studies resulted from working closely with participants and selecting appropriate technologies for the end users. Continued engagement by staff and vendors with participants impacted the positive long-term outcomes.

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