Proposal Monitoring

Verifying the water and energy savings from WaterSmart Software

The CWEE research group believes in a highly data-driven approach for designing projects that aim to jointly secure water-energy savings as well as for monitoring and verifying the results from the project implementation. To understand the effectiveness of WaterSmart Home Water Reports to generate water and energy savings, we will need to measure the conservation of both resources at two separate scales: the infrastructure scale (delivered water and wastewater energy savings) and at the residential scale (water, hot water, and water-related energy savings in the home). Because this aspect of the project is so important for its success, we have created a specific separate task (Task 7) in the Work Plan to review and refine this approach directly with our colleagues in DWR.

Residential Savings

The objective of this project is to reduce household water and hot water-related energy use in in residential households by sending water and hot water conservation messages directly to consumers. To verify both the water and energy savings derived from WaterSmart, we will deploy the "gold standard" monitoring and verification approach of conducting a randomized control trial (RCT). This approach involves randomly dividing the target population into treatment (receives WaterSmart) and control (does not receive WaterSmart) groups, and then comparing the participating households' water and energy consumption data to see if there is any discernible reduction in resource use in the treatment group relative to the control group (see Task 3 in the project Work Plans for details on the proposed treatments). Greenhouse gas (GHG) emission reductions will be also calculated directly from the resulting energy savings.

Infrastructure Savings

Not only do we aim to save residential energy through behavior-based water conservation messaging to consumers, but we also are hoping to drive energy savings in the associated water and wastewater infrastructure by reducing volumetric demand on these services. In our previous work with a number of California water utilities, CWEE has developed a unique methodology for characterizing the energy intensity of water and wastewater systems at a high resolution in both space and time. We take the highest resolution water flow data available (hourly data whenever possible) from water utility supervisory control and data acquisition (SCADA) systems and the associated electricity meters to produce a detailed understanding of energy intensity for every key component in the infrastructure (water treatment plants, pumps, lift stations, wastewater treatment plants, etc.). We then virtually connect these component results according to the actual structure of the engineered infrastructure system to accurately map and monitor the flows of water and energy through the system.

This methodology allows for developing regional and temporal specific energy intensity and water flow results for every customer in the system. Hence, we can use this data to verify the expected upstream and downstream energy savings accrued through WaterSmart-driven residential water conservation. Again, GHG emission reductions will be calculated directly from the resulting energy savings.