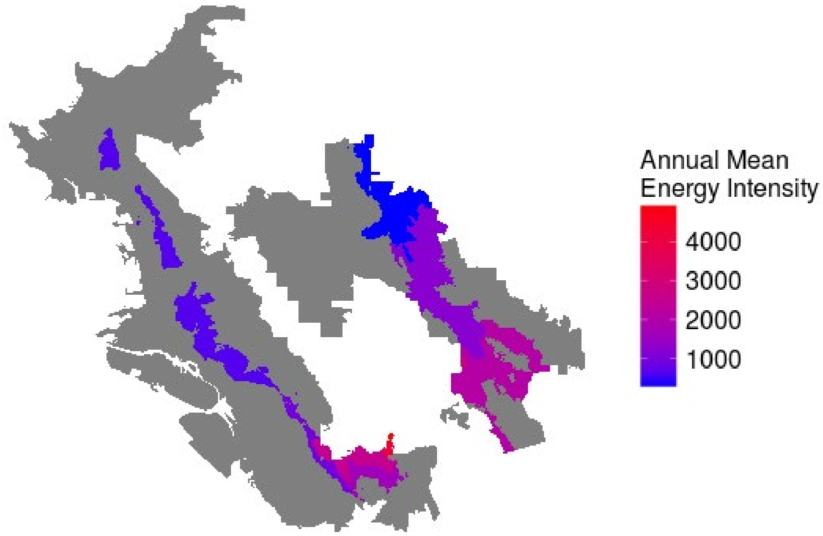
CENTER FOR WATER-ENERGY EFFICIENCY

Fact Sheet
August 2013

HIGH-RESOLUTION ANALYSIS OF WATER UTILITY ENERGY INTENSITY

Background

California's water infrastructure is an emerging target for energy efficiency (EE) and greenhouse gas (GHG) emission reduction efforts (CPUC Rulemaking 09-11-014; California State Assembly Bill 32). The water sector demands large amounts of energy. Upwards of 20% of the electricity and 30% of the non-power-plant natural gas used in California goes to producing, moving, treating, and heating water. One logical way to limit that energy consumption is to look hard at water utilities: eliminating waste in the water system (desirable already) brings the added benefit of reducing energy waste.



Energy intensity across EBMUD service area pressure zones (Gray-area pressure zones not included in the analysis.)

However, allocating EE and GHG reduction dollars to water efficiency programs requires clear, defensible methods for calculating the energy intensity (EI) of water, and reliable, verifiable monitoring of energy and carbon savings. This is no small challenge, because energy use varies significantly depending on where and when it's used. No two water agencies are the same, so there's no one-size-fits-all EI number that can be given to a gallon of water.

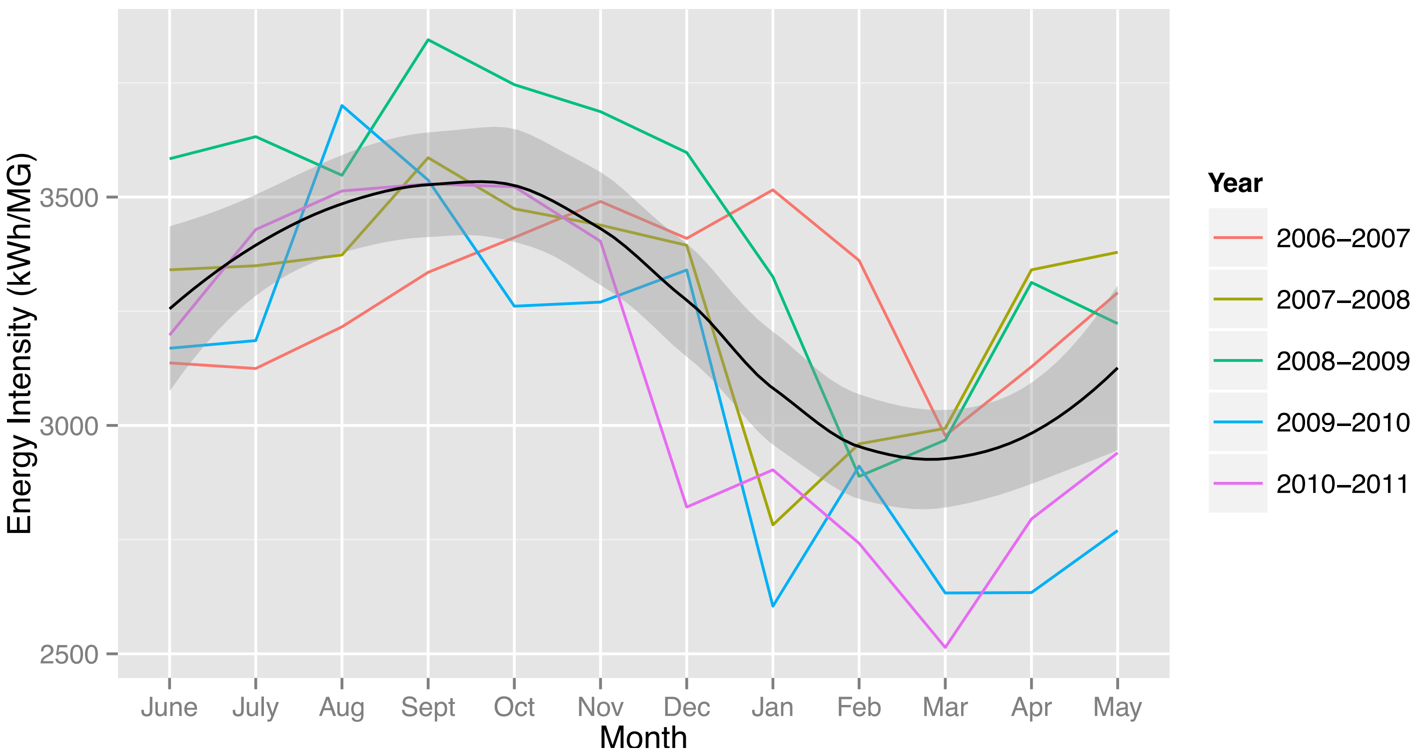
Leveraging a built-in monitoring network

Reducing waste and increasing efficiency is impossible without reliable baseline energy consumption numbers. The complexity of major water providers' infrastructure and operations means that calculating system-wide energy intensity from the top down can obscure significant seasonal and spatial effects on energy. It seems as if the only answer would be to install a vast network of sub-metering hardware to monitor the energy and water flows through the system—an expensive proposition.

Thankfully, an operating monitoring system already exists for many water agencies, in the form of their Supervisory Control And Data Acquisition (SCADA) systems. SCADA systems provide operators with real-time control over the water infrastructure enabling them to manage flow and pressure across the network. Our approach repurposes existing SCADA data streams towards calculating and monitoring the energy consumed in water distribution at the water-utility level.

In partnership with Pacific Gas and Electric (PG&E), CWEE successfully tested this approach for the East Bay Municipal Utility District (EBMUD). We found that monthly EI varied ± 13% around the annual average and that high-elevation pressure zones had EI values more than five times higher than low-elevation pressure zones. Capturing this variability in EI values is essential for planning effective programs to save energy through water conservation. Further, with the ongoing data flows provided by the SCADA system, EBMUD can easily track the impact of conservation programs on water and energy resource savings.

UC DAVIS
CENTER FOR WATER-ENERGY EFFICIENCY



Seasonal fluctuation in full life-cycle (water and wastewater) energy intensity

Next steps

A repeatable, defensible method for establishing water-energy equivalences gives water utilities and their customers several advantages: it provides a baseline for testing new efficiency programs, yields tremendous volumes of useful data suitable for planning and near real-time conservation programs and pricing, and lays the groundwork for selling water-energy efficiencies on the California-Québec carbon market.

Furthering this basic research, CWEE is working to develop a universal platform to convert SCADA data to actionable water-energy efficiency information. Using these analytics will further empower utilities to increase their efficiency, lower their carbon and water footprints, and pass the savings and proceeds along to rate-paying customers. We look forward to replicating the methodology developed from our project with EBMUD and PG&E in further partnerships with the Los Angeles Department of Water and Power, San Diego Gas & Electric, and the City of San Diego.

Principal investigators

Frank Loge, Ph.D., P.E.
Director, CWEE
(530) 754-2297
fjloge@ucdavis.edu

Ned Spang
Program Manager, CWEE
(530) 754-5447
esspang@ucdavis.edu