

# County of Los Angeles RCx Program Overview



## LA County Overview



120,000 Employees



\$25 Billion Yearly Budget



4,000 Facilities / 90 Million Sq. Ft.



## Occupancy Types



Large, medium and small commercial



Courthouses



Offices



Libraries



Public Safety, including Jails



Hospitals & Health

# Energy Management Division



165 Employees



Oversees a Utilities Budget Over \$200 Million Per Year



600 + Projects Over Twenty Years



RCx in over 80 Facilities



Average Cost \$1.20 Per Sq. Ft



Average Savings \$0.50 Per Sq. Ft.



Facilities Average Over 100,000 Sq. Ft.



Smaller Facilities Are Not Showing The Same Results

# What Is RCx & Why?



RCx: Retrocommissioning existing buildings is a systematic process for improving building HVAC operation and maintenance



Optimize operations of Heating, Ventilation and Air Conditioning (HVAC) systems in County Facilities



Identify optimization and energy efficiency measures



Improve thermal comfort, ventilation and indoor air quality in the County buildings















Develop tools for a sustainable reduction of electricity and natural gas














Provide operations staff with comprehensive facility information, update methods to efficiently operate, maintain and monitor HVAC systems












# County RCx Process

-  Whole Building Performance Calcs
  -  Baselines & Benchmarking
-  Planning
-  Investigation
-  Corrections
-  Engineering Calcs, especially Equest
-  Identify EEMs & Select For Implementation
-  Functional Performance Test
-  System Level Performance Calcs
  -  Baselines & Benchmarking
-  Documentation & Training
-  Ongoing / Continued Optimized Performance (I Have A Dream!)









# When Soliciting RFP's: Contractors are asked to submit on the following Defined Project Tasks

-  Whole building energy baselines & benchmarking
-  Diagnostic measurements
-  Pre-functional testing of individual components
-  Minor HVAC system repairs
-  Building automation improvements
-  Functional Performance Testing of HVAC systems
-  Install new optimization energy efficiency measures
-  Modeled energy savings projections
-  System level baselines & benchmarks
-  Retro-commissioning reports & schematics
-  Documentation & Training manuals

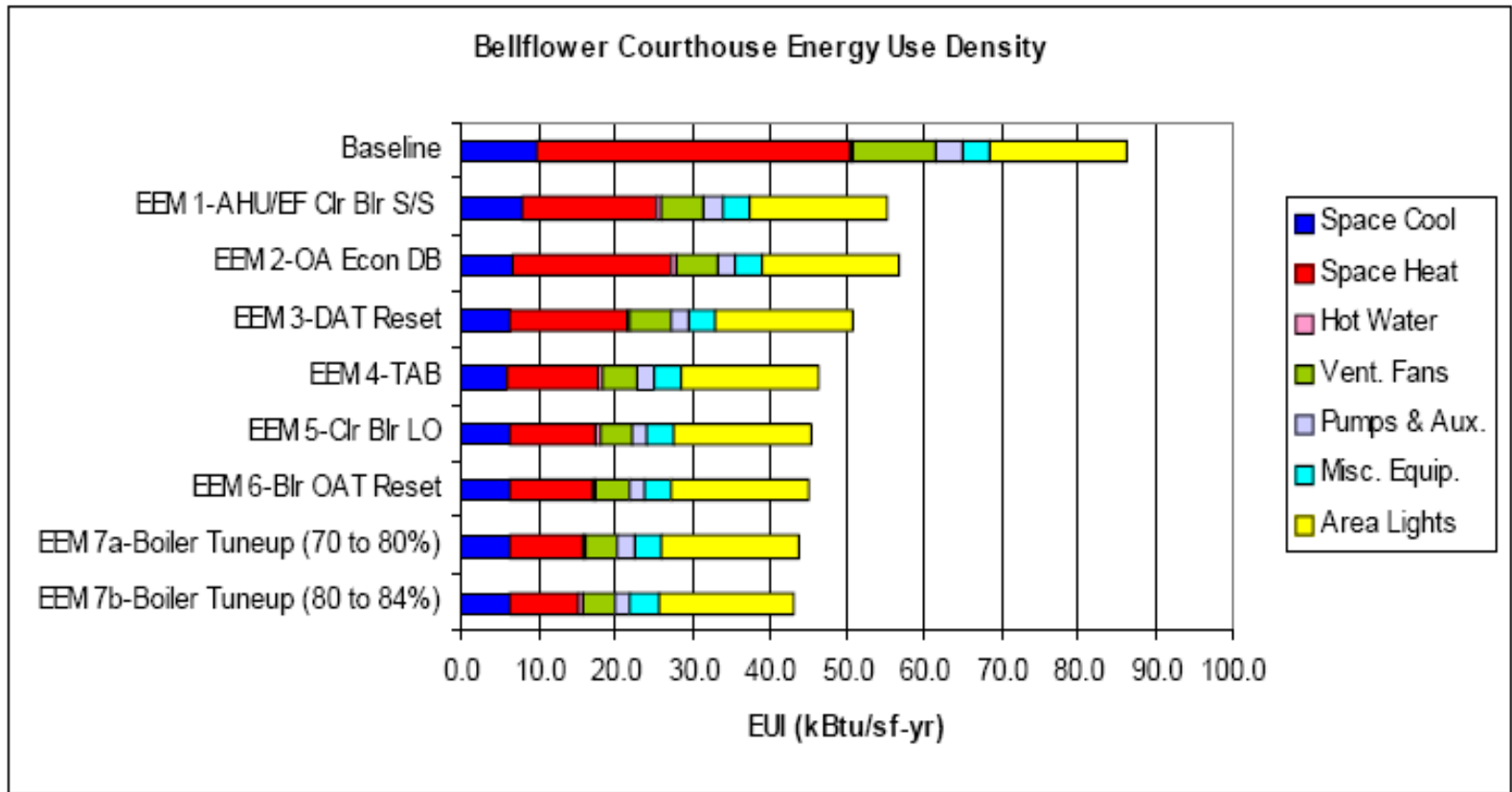
# Typically Taken HVAC RCx Measures

-  Optimized Sequence of Operations
-  Control programming upgrades
-  Tested and calibrated all existing controls
-  Improved Chiller Sequencing
-  Chilled Water Reset
-  Optimized Start
-  Installed customized Purge Cycles
-  Optimized Economizer Controls
-  Installed Discharge Air Reset Controls
-  Improved VAV Static Pressure Controls
-  Performed Diagnostic Air and Hydronic Testing

# Typically Taken HVAC RCx Measures cont.

-  Improved Boiler Combustion Efficiency
-  Installed Boiler Hot Water Reset Controls
-  Optimized Schedules based on actual occupancy
-  Install carbon monoxide system on garage fans
-  Restored Lead/Lag and alarming functions
-  Corrected airside flow deficiencies
-  Selective air balancing and terminal box repairs
-  Discovered and repaired broken turning vanes

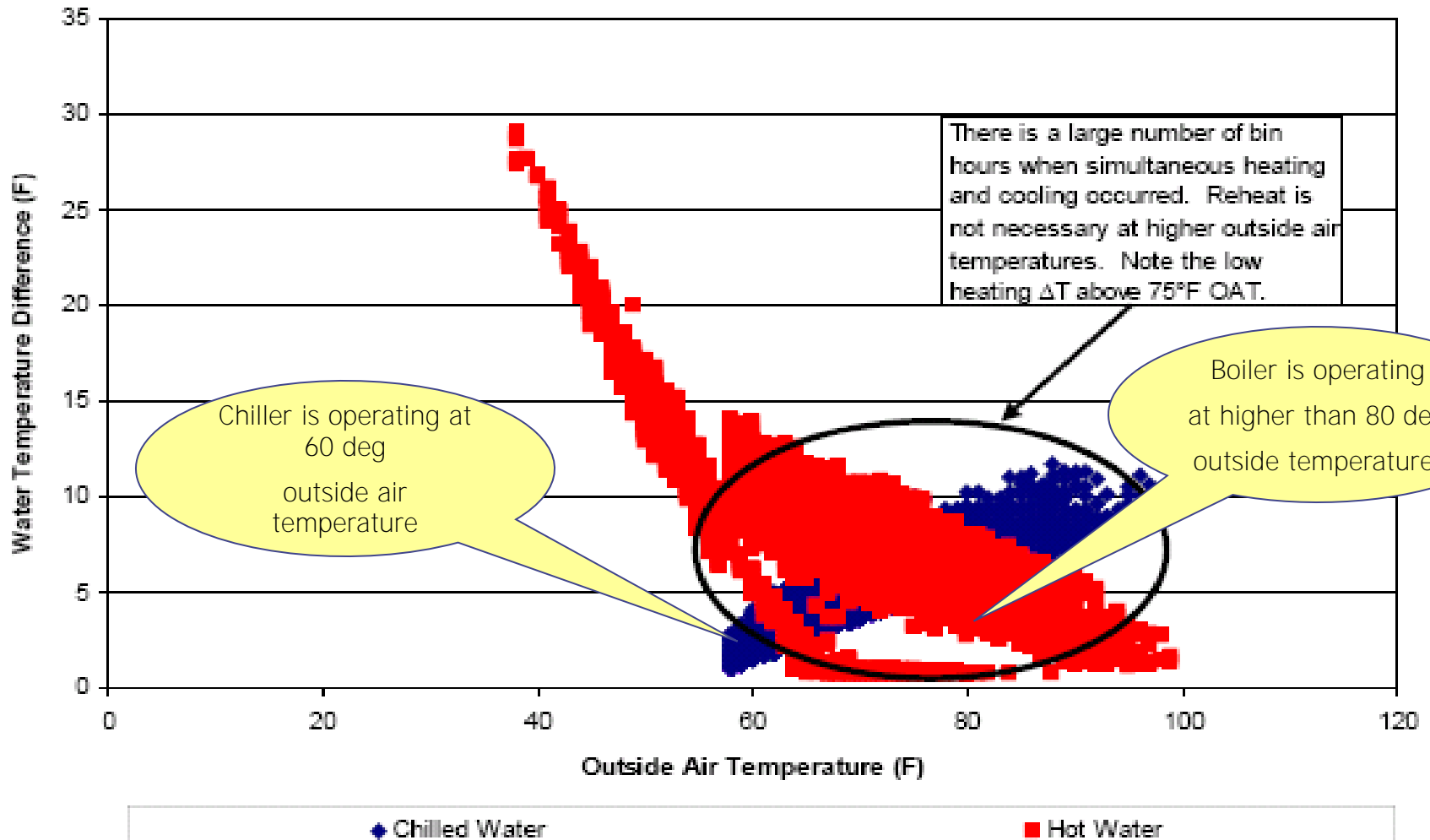
# Bellflower Courthouse eQUEST Model Savings





# Public Library Headquarters Simultaneous Heat/Cool

Public Library HQ - Chilled vs Hot Water  $\Delta T$  - Baseline



# System Level Benchmark Chiller kW Vs. OAT

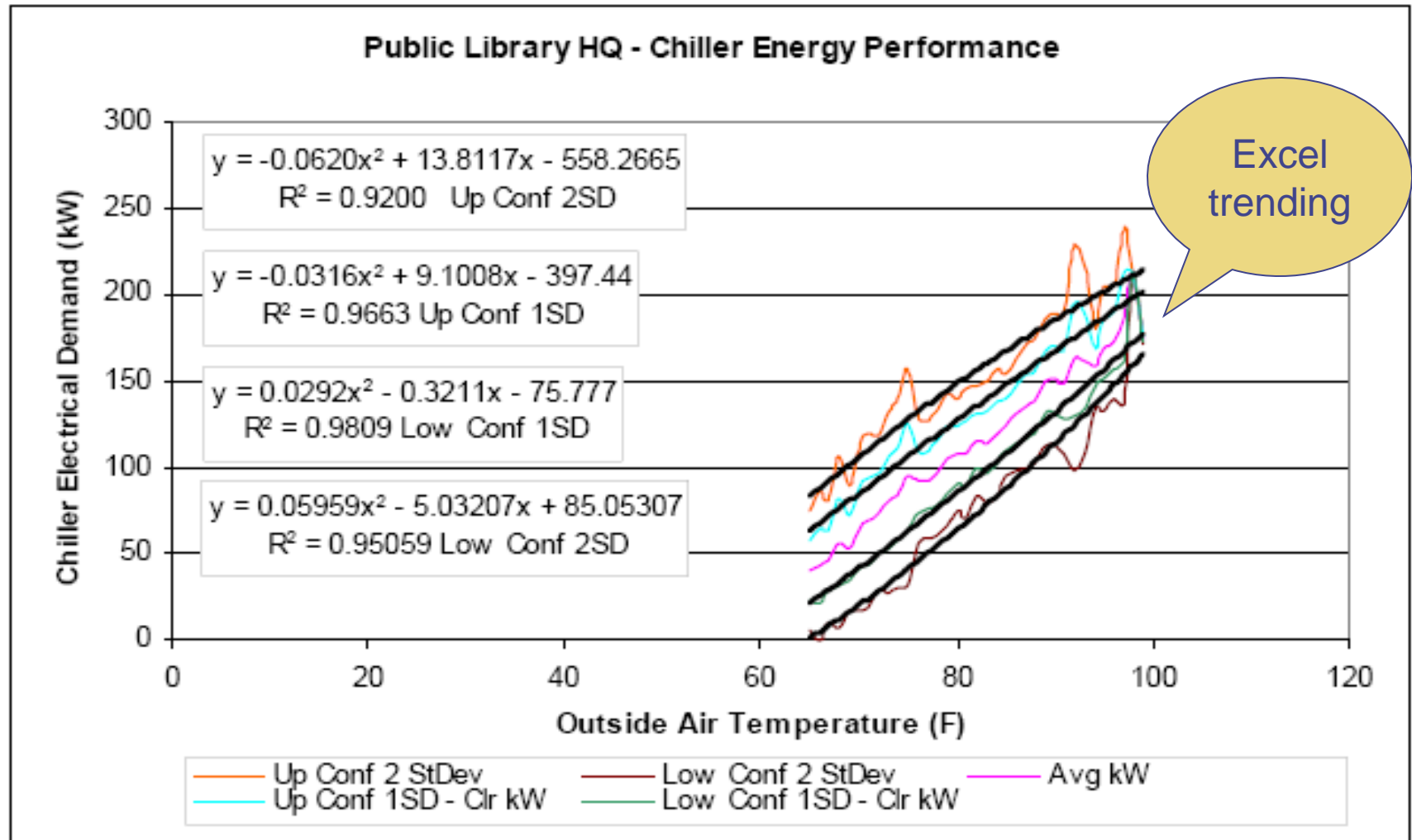
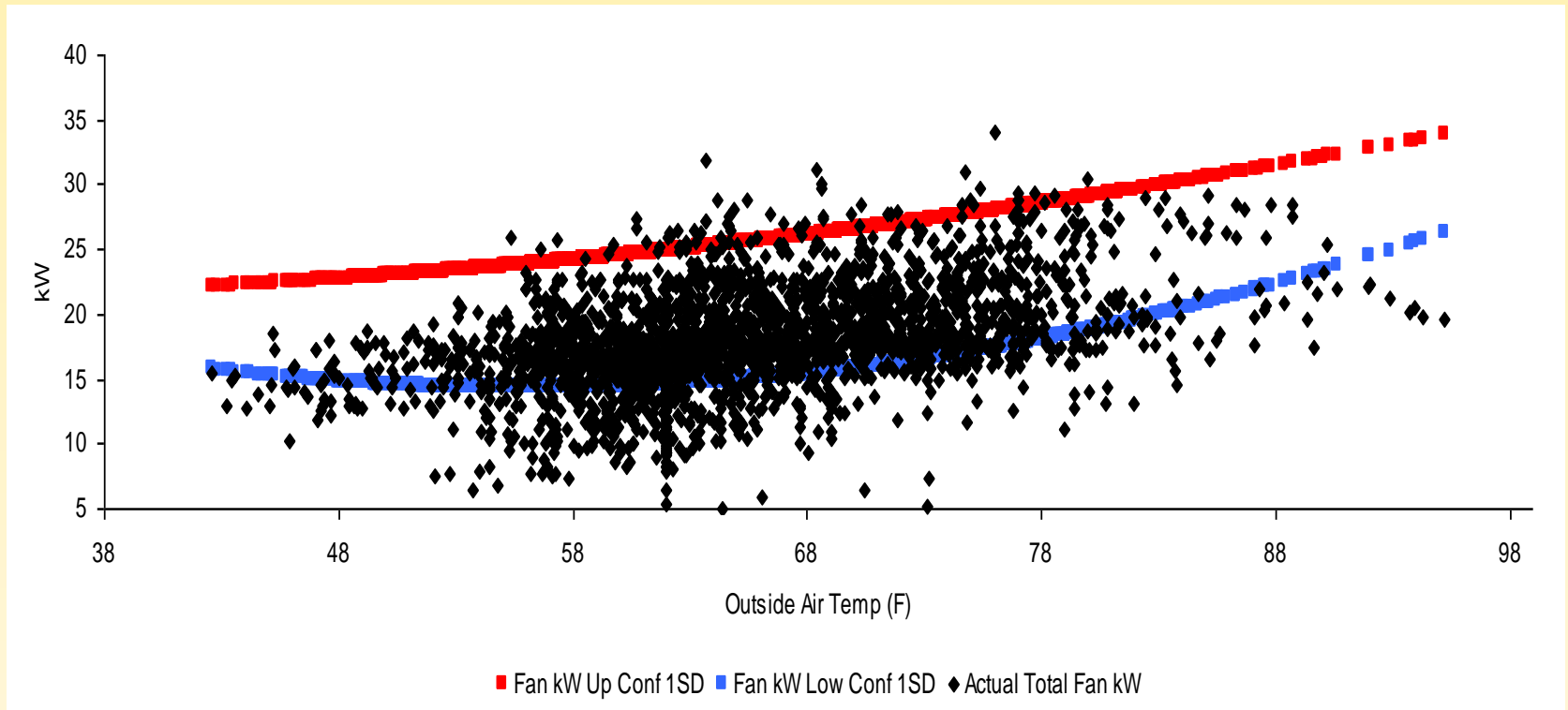
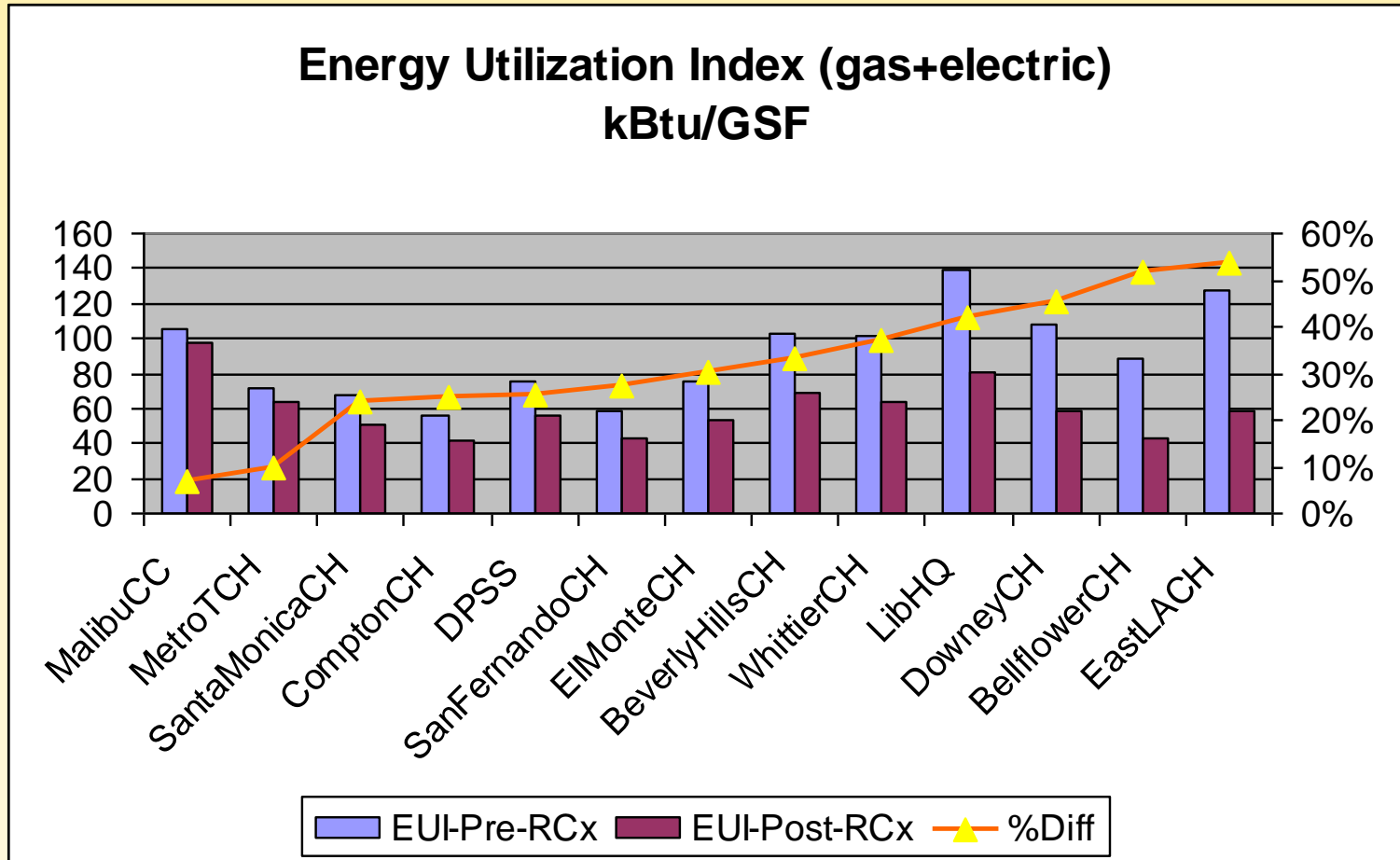


Figure 4-2. Chiller Energy Performance – Representation with Equations

# Public Library Headquarters VFD Fan Performance



# Energy (electric + gas) Utilization Pre- & Post-RCx



# Enhanced Monitoring 3-Prong Approach

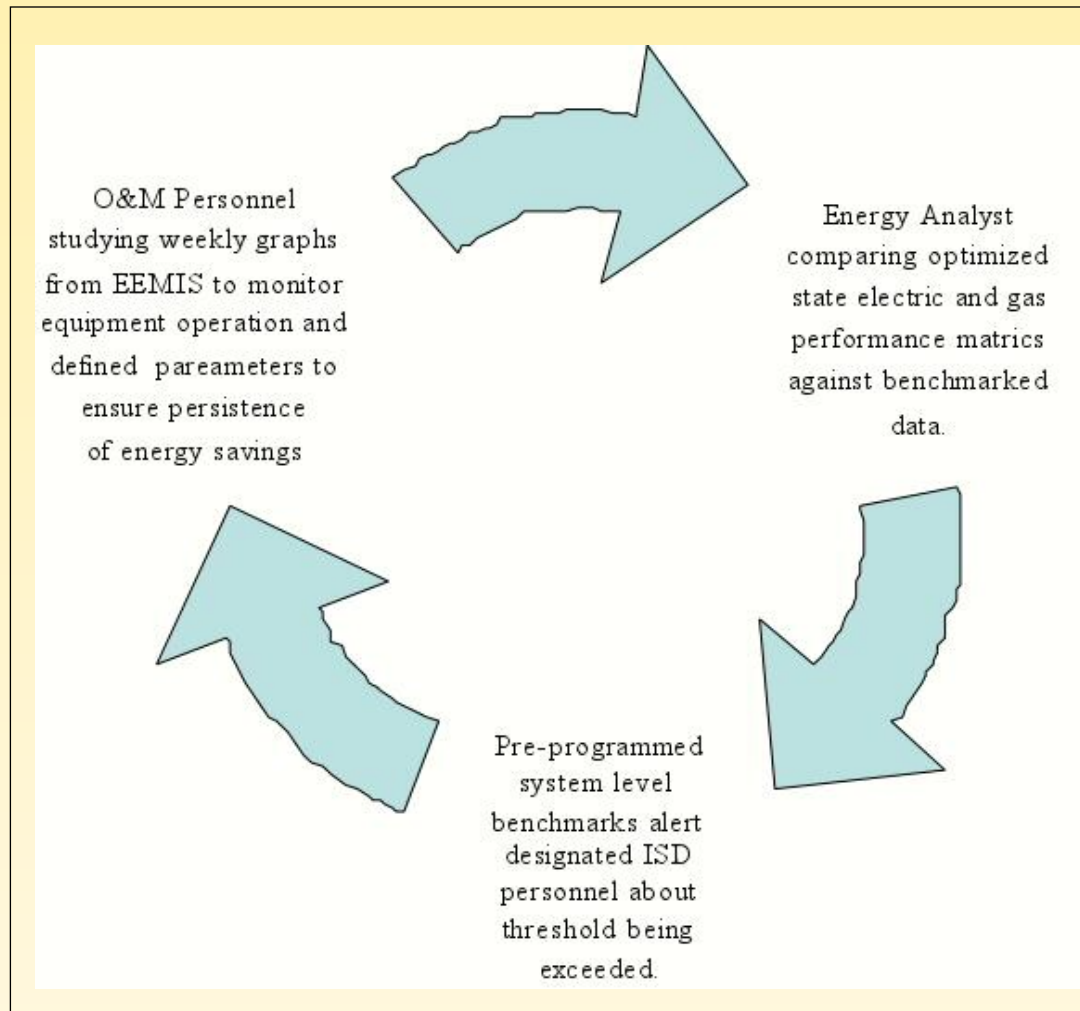
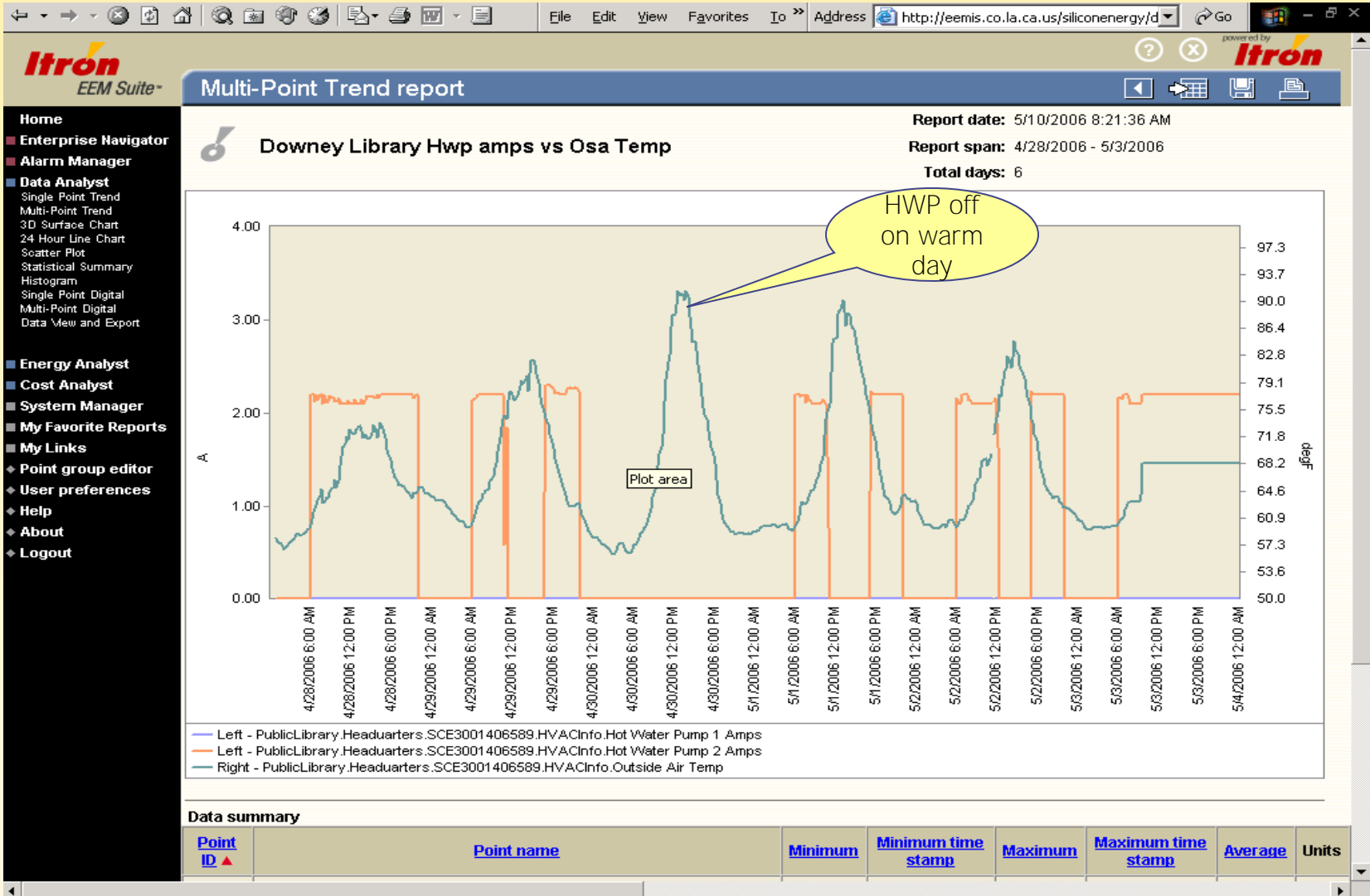


Figure 3: Three-prong approach for persistence of RCx savings.

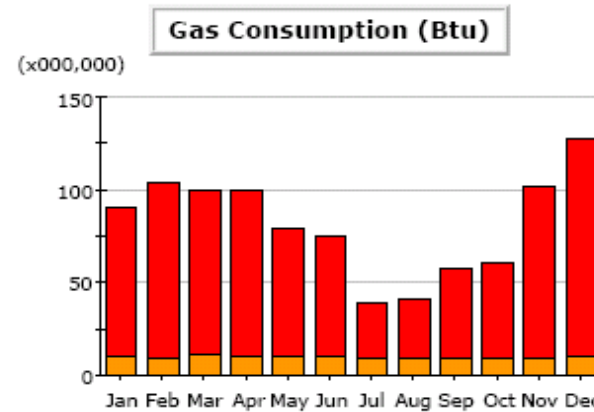
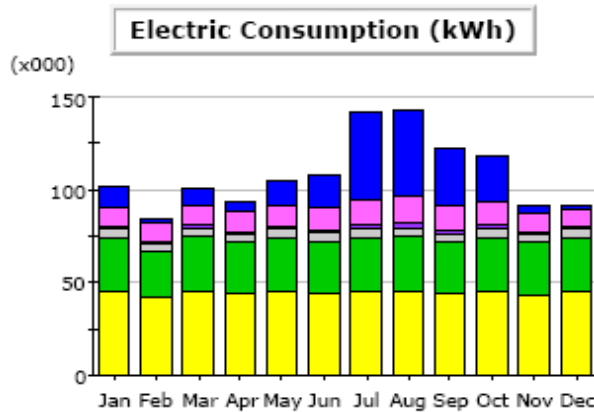
# Hot Water Pump Operation



# Optimized eQUEST Output

Project/Run: Downey Public Library - 7

Run Date/Time: 02/24/06 @ 14:01



- Area Lighting
- Exterior Usage
- Water Heating
- Refrigeration
- Task Lighting
- Pumps & Aux.
- Ht Pump Supp.
- Heat Rejection
- Misc. Equipment
- Ventilation Fans
- Space Heating
- Space Cooling

Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	10.5	2.0	9.0	5.1	12.3	16.9	47.6	46.9	30.4	25.5	3.7	2.0	211.8
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	11.0	9.8	11.5	11.1	12.0	12.9	13.8	15.0	13.2	12.9	10.7	10.3	144.3
Pumps & Aux.	1.4	0.8	1.4	1.1	1.5	1.8	2.3	2.4	2.1	1.9	0.9	0.9	18.4
Ext. Usage	4.5	4.0	4.5	4.3	4.5	4.3	4.5	4.5	4.3	4.5	4.3	4.5	52.6
Misc. Equip.	28.8	26.1	29.1	28.1	28.9	28.2	28.8	29.1	28.1	28.8	27.9	28.9	340.9
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	45.3	41.0	45.5	43.9	45.4	44.0	45.3	45.5	43.9	45.3	43.9	45.4	534.3
<b>Total</b>	<b>104.3</b>	<b>83.7</b>	<b>100.9</b>	<b>93.6</b>	<b>104.5</b>	<b>108.1</b>	<b>142.2</b>	<b>143.5</b>	<b>122.0</b>	<b>118.9</b>	<b>91.5</b>	<b>91.9</b>	<b>1,302.3</b>

# eQUEST vs Actual - kWh



## Single-level Bill Scenario Variance

Facility: NW Regional HQ

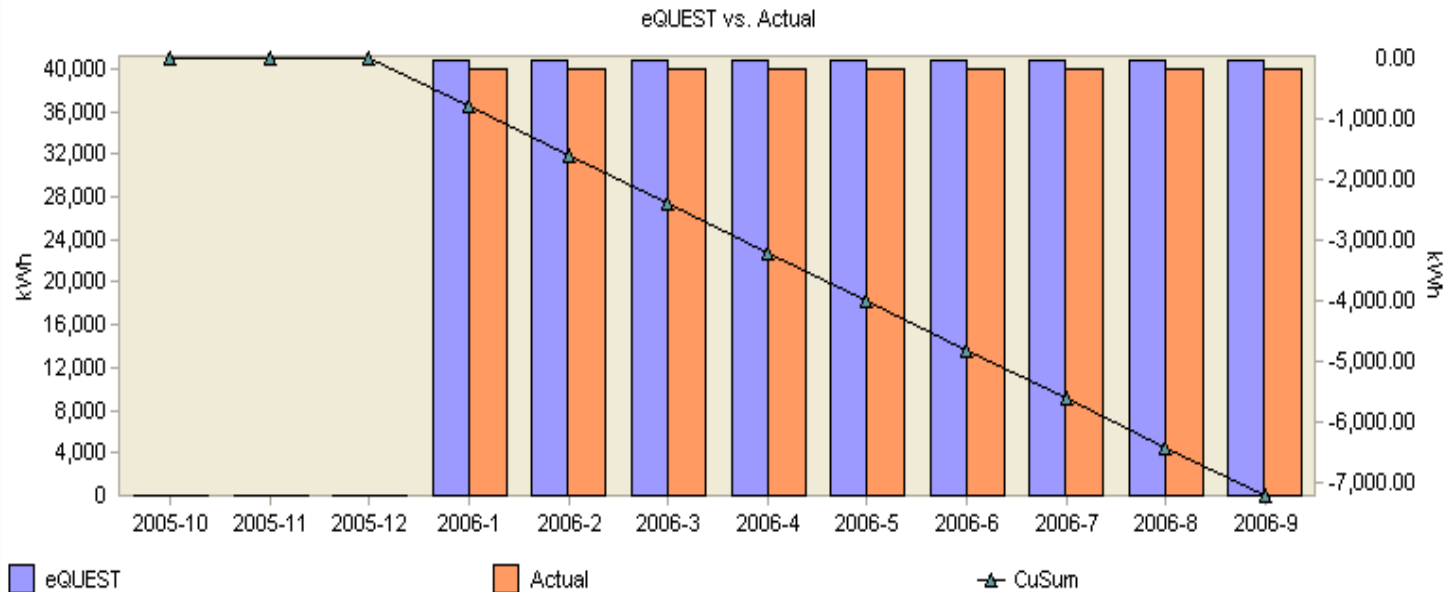
Report date: 10/20/2006

City, Region: Seattle, WA

Start period: 10/01/05

Provider: All providers

End period: 09/30/06



### eQUEST vs. Actual

Facility	Commodity	Unit	Scenario	2005-10 (Oct-05)	2005-11 (Nov-05)	2005-12 (Dec-05)	2006-1 (Jan-06)	2006-2 (Feb-06)	2006-3 (Mar-06)	2006-4 (Apr-06)	2006-5 (May-06)	2006-6 (Jun-06)	2006-7 (Jul-06)	2006-8 (Aug-06)	2006-9 (Sep-06)
NW Regional HQ	Electricity	kWh	eQUEST				40,800.00	40,800.00	40,800.00	40,800.00	40,800.00	40,800.00	40,800.00	40,800.00	40,800.00
			Actual				40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
			Variance				-800.00	-800.00	-800.00	-800.00	-800.00	-800.00	-800.00	-800.00	-800.00
			CuSum				-800.00	-1,600.00	-2,400.00	-3,200.00	-4,000.00	-4,800.00	-5,600.00	-6,400.00	-7,200.00

Note: Data is prorated to fiscal periods



# County RCx Program Failures & Barriers



## External



Funding, specifically needed repairs that are identified during the process



Unstable program environment, yearly changes from the PUC and Utilities



Contractors, most look at it from either a repair program perspective, or an audit on steroids. 30% of our contractors have been removed from the projects.



## Internal



Management Buy-in, **(Energy isn't their business!)**



**Facilities Maintenance Management & Staff, efficiency isn't in their** vocabulary. Facilities Maintenance budgets and Energy Budgets are separate funding accounts. Management does not have an incentive to spend resources on efficiency



**Facilities Maintenance expertise and legacy practices don't include efficiency.**



Smaller Facilities Are Not Showing The Same Results, audit, inventory and repair seems like a better approach

# THANK YOU

Ronald Mohr  
County of Los Angeles  
Energy Management Division  
o. 323-881-3979  
c. 323-627-4070  
rmohr@isd.lacounty.gov