

Retrocommissioning for Energy Efficiency

Prepared For:



Prepared By:



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AGENDA

Retrocommissioning (RCx) Defined

RCx Benefits

LEED Buildings – Good Candidates?

RCx Opportunity Indicators

Typical RCx Measures

Case Study – Lab & Office Scheduling & Setpoint Resets

Case Study – RCx & Retrofit Whole Building M&V

RCx Barriers & Solutions

Typical RCx/Partnership Program Services

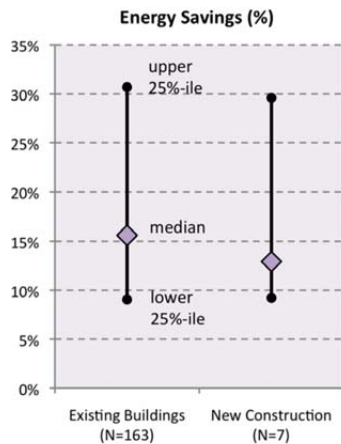
RETROCOMMISSIONING (RCX)

ret·ro·com·mis·sion·ing¹

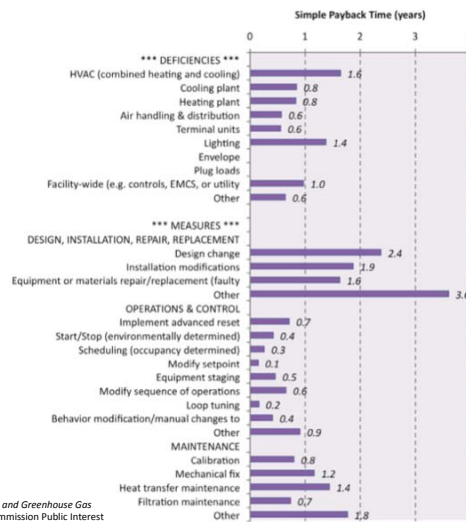
A systematic method for investigating how and why an existing building's systems are operated and maintained, and identifying ways to improve overall building performance

¹Haasl, T. Heinemeier, K. 2006, "California Commissioning Guide: Existing Buildings" Prepared by Portland Energy Conservation, Inc. for California Commissioning Collaborative

RETROCOMMISSIONING OUTCOMES: SAVINGS RANGES AND PAYBACK



Mills, E. 2009, "Building Commissioning A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions" Prepared by Lawrence Berkeley National Laboratory for California Energy Commission Public Interest Energy Research (PIER) 59pp (Figure s 10 & 11)



RETROCOMMISSIONING FOR ENERGY EFFICIENCY: TYPICAL RESULTS BY BUILDING TYPE

Results by Building Type (Existing)

	Pre-Cx EUI (kBtu/ft ² -year)	Source Energy Savings (%)	Simple Payback Time (PBT - years)	Number of buildings (by PBT)
K-12			3.3	19
Higher education	250	11%	1.5	165
Food Sales	510	12%	0.3	10
Food Service				
Inpatient	532	15%	0.6	15
Outpatient	764	10%	0.1	13
Cleanrooms				
Data Center				
Laboratory	600	14%	0.5	50
Lodging	48	12%	1.5	38
Retail			1.4	9
Service				
Office	141	22%	1.1	145
Public Assembly			1.0	6
Public Order and Safety	229	16%	3.2	15

Values only shown when the sample size is five or more buildings.

Mills, E. 2009, "Building Commissioning A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions" Prepared by Lawrence Berkeley National Laboratory for California Energy Commission Public Interest Energy Research (PIER) 59pp (Table 5)

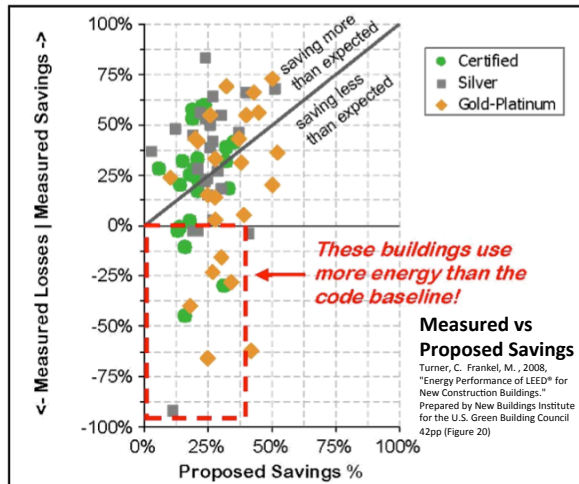
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MEASURED VS. PROPOSED SAVINGS FOR LEED® BUILDINGS

Predicted and Measured Energy Use may not correlate!

Why?

- **Overly optimistic energy models**
- **Changes in building use (longer hours of operation, increased occupant density, etc.)**
- **Unresolved deficiencies from construction**
- **Inadequate Cx**
- **Operator overrides and inadequate training & resources**



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RCX OPPORTUNITY INDICATORS

Retrocommissioning Opportunity Indicators¹

- Presence of systems that simultaneously heat and cool, such as constant and variable air volume reheat
- Presence of economizers
- Pumps with throttled discharge valves
- Equipment or lighting that is on when the space is unoccupied
- Improper building pressurization (either negative or positive); i.e., doors that won't close or are difficult to open
- Equipment or piping that is hot or cold when it shouldn't be; unusual flow noises at valves or mechanical noises
- Short cycling of equipment
- Variable frequency drives appear to be operating at or close to 100% most of the time
- **High Energy Costs !**

¹Haas, T. Heinemeier, K. 2006, "California Commissioning Guide: Existing Buildings" Prepared by Portland Energy Conservation, Inc. for California Commissioning Collaborative

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TYPICAL RCX MEASURES

HVAC Airside

- Reduce supply fan operating schedule
- Adjust airside economizers
- Adjust zone temperature dead-band
- Add supply air temperature setpoint reset strategy
- Reduce supply duct static pressure setpoint
- Add supply duct static pressure setpoint reset strategy
- Add / restore fan VFD

HVAC Waterside

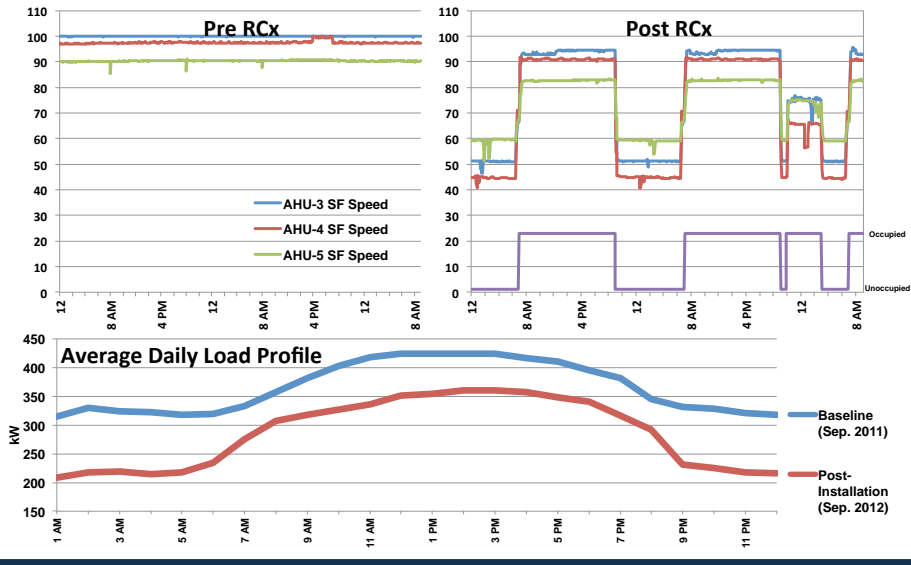
- Add / optimize boiler lockout
- Add chilled water supply temperature setpoint reset strategy
- Add condenser water supply temperature setpoint reset strategy
- Add / restore pump VFD

Lighting

- Reduce lighting operating schedule
- Install lighting occupancy sensors

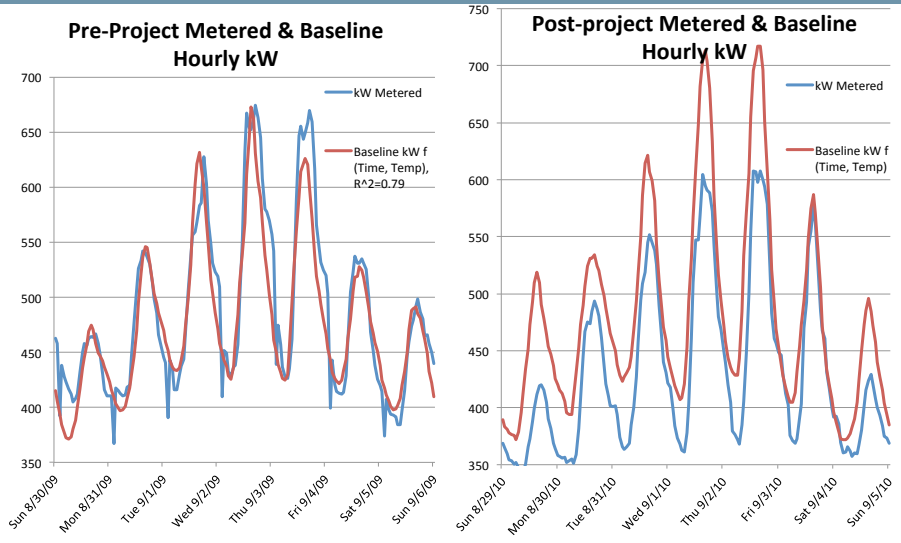
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CASE STUDY: RCX RECIPIENT LAB & OFFICE VAV SCHEDULING & SETPOINT RESETS



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CASE STUDY: RCX RECIPIENT WHOLE BUILDING PRE V POST DEMAND



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BARRIERS & SOLUTIONS

Barriers

Is RCx Needed?

Who to trust?

How to fund?

Solutions

Benchmarking (e.g. Energy Star)

Referrals from RCx Customers

Utility/Partnership Programs

Fast Paybacks, Typically 2y or less

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TYPICAL RCX & PROGRAM/PARTNERSHIP SERVICES



- Consultation with customer to understand general facility characteristics and financial criteria for implementing energy projects
- Detailed facility assessment to identify deficiencies and quantify energy reduction opportunities
- Implementation coordination assistance
- Reporting on reductions in facility energy use, cost, and greenhouse gas emissions
- Cash incentives based on verified energy savings

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