

Healthcare Facilities Management Society of New Jersey

Retro-Commissioning "Optimize the Performance of Your Facility"

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Agenda

- Commissioning (Cx)
- Retro-Commissioning (RCx)
- Research Findings
- Frequently Asked Questions
- Case Studies
- Q&A



What is Commissioning?

 A planned, documented, and managed engineering approach to the start-up and turnover of facilities, systems, and equipment that results in a safe and functional environment that meets established design requirements and stakeholder expectations.

 Management of the "Completion of Construction" process.





Why Commission?

Building System Complexity

- Building systems comprised of many different components
- Energy efficiency and redundancy design strategies result in complex Building Automation Systems

Procurement Philosophies

- Multiple parties responsible for design, fabrication and installation of systems
- Trend towards pre-purchase equipment
- Break up of single source trades
- Acceleration of activities to meet schedule
- Value engineering resulting in system component compromises

Transfer of Knowledge

Training and turn-over is critical to post occupancy operations



What is Retro-Commissioning?

- A systematic, documented process to identify low cost operational and maintenance improvements for existing buildings, while meeting the design requirements of current use.
- Focuses on energy-using equipment and related controls to optimize system performance, rather than major equipment replacement.





Why Retro-Commission?

- Optimize System Performance
- Energy Savings
- Cost Savings
- HVAC = ~ 60% of Energy Usage
- Reduced Carbon Footprint
- Attractive ROI
- Potential to significantly reduce overall energy consumption with minimal financial investment.





Cx and RCx Process Overview

Commissioning

Select a commissioning lead Pre-Design Phase commissioning meeting Pre-Design Phase Begin developing Owner's Project Requirements Develop initial Commissioning Plan outline Design Phase commissioning meeting (If Pre-Design meeting didn't occur) Perform commissioning-focused design review **Design Phase** Update Commissioning Plan Develop commissioning requirements for the specification Begin planning for verification checklists, functional tests, Systems Manual, and training requirements Construction Phase kick-off meeting Review submittals, monitor development of Shop and Coordination Drawings Review O&M Manuals Perform ongoing construction observation **Construction Phase** Perform verification checks Perform diagnostic monitoring Perform functional testing Develop Commissioning Report and Systems Manual Develop Recommissioning Plan Verify and review training of owner's staff Resolve outstanding commissioning issues Occupancy and Perform seasonal /deferred testing **Operations Phase** Perform near warranty-end review

Retro-Commissioning

· Select the project Set project objectives and obtain support Select a commissioning lead Document the current operating Planning Phase requirements · Perform an initial site walk-through Develop the Retrocommissioning Plan Assemble the retrocommissioning team Hold a project kick-off meeting Review facility documentation · Perform diagnostic monitoring · Perform functional tests Investigation Phase Perform simple repairs Develop Master List of Findings Prioritize and select operational improvements Develop Implementation Plan Implement selected operational Implementation Phase improvements Verify results Develop Final Report Compile a Systems Manual Develop Recommissioning Plan **Hand-Off Phase** Provide training Hold close-out meeting Implement persistence strategies

RCx Process Overview

Phase I & II Planning & Investigation

- Establish Operating Requirements
- Field Investigation & Design Review
- Report Develop Energy Conservation
 Measures (ECMs), implementation strategies,
 costs and return on investment.

Phase III Implementation

- Select ECMs
- Perform repairs, changes and adjustments as agreed upon in Phase I

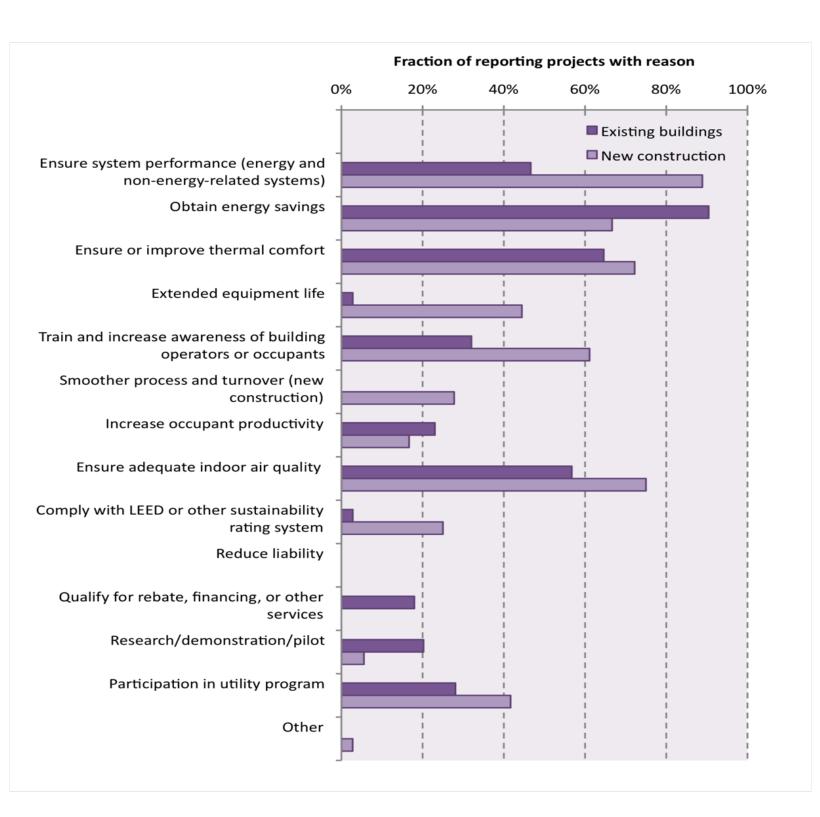
Phase IV Hand Off (Turnover)

- Final Report (Results)
- Training
- Recommissioning Plan

- Research conducted by Lawrence Berkley National Laboratory (Evan Mills, Ph.D)
- Report Prepared for The California Energy Commission (Public Interest Energy Research (PIER)
- New and Existing Building Commissioning
- Analysis of 643 Buildings
- Over 99 Million SF
- 26 States Represented
- www.green.ca.gov



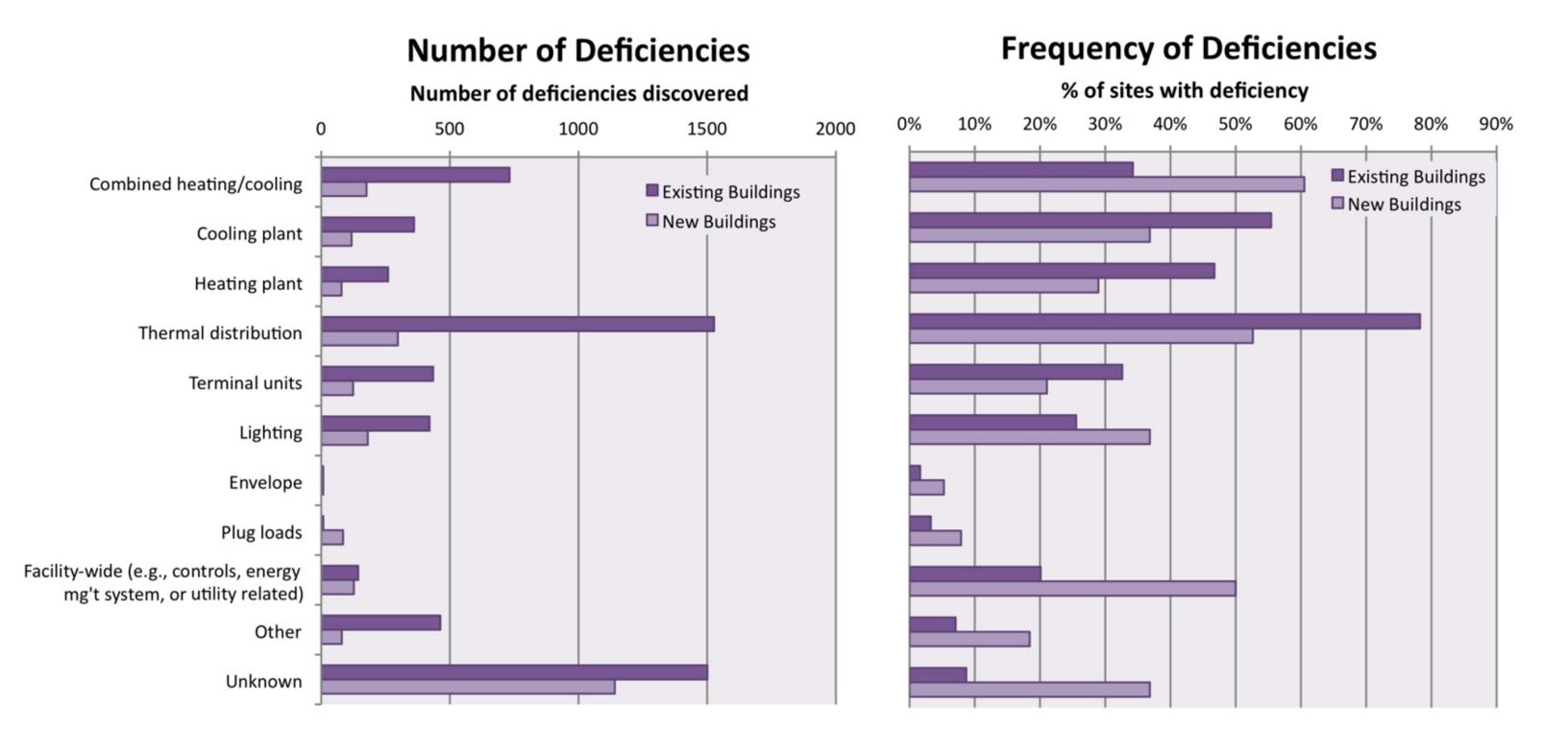


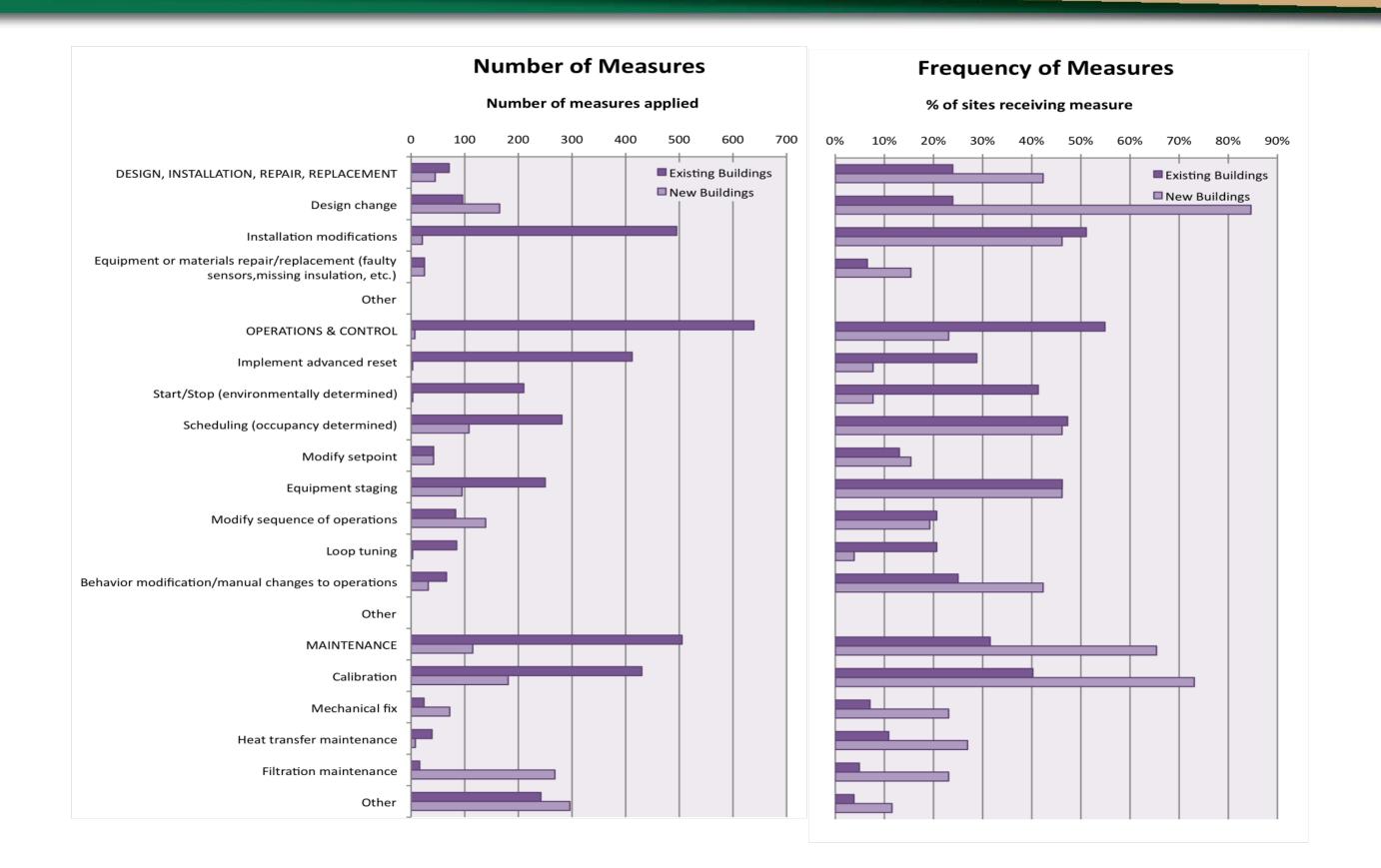


Wide Diversity of Reasons to Commissioning Projects

- Ensure System Performance
- Obtain Energy Savings
- Improve Thermal Comfort
- Indoor Air Quality









Key Findings

Average Costs:

Existing Buildings \$0.30/sf

New Buildings \$1.16/sf (0.4% of total construction costs)

Average Energy Savings:

Existing Buildings 16%

New Buildings 13%

Average ROI:

Existing Buildings 1.1 years

New Buildings 4.2 years



Frequently Asked Questions

Can Retro-Commissioning be done in stages to minimize cost impact to budgets?

Answer: Yes

With careful planning for the implementation of the selected Energy Conservation Measures (ECMs), today's healthcare facilities can be successfully commissioned system by system.





Frequently Asked Questions

How will Retro-Commissioning benefit my HealthCare Facility?

Answer:

Ensure building systems perform effectively and efficiently to meet your current operating requirements. This yields a number of benefits for your business:

- Return Equipment to its Proper Operational State
- Extend Equipment Service Life
- Reduce Maintenance and Repair Costs
- Improve Occupant Comfort and Reduce Complaints
- Improve Outside Air Control and Indoor Air Quality
- Adjust Equipment Operating Schedules





120,000 sq ft Facility; 53,000 sq ft Laboratory

- Lab HVAC Costs = \$800,000 (\$15.10 per sq ft) per year
- Five 100% OA AHUs, common header
- Five main exhaust fans, common header
- 200,000 CFM main air system capacity
- No heat recovery
- Old company ventilation standard: 12 ACH
- New ventilation standard: 8 ACH



LABORATORY AIR CHANGE RATE SUMMARY						
SERVICE	EXISTING		NEW OCCUPIED		NEW UNOCCUPIED	
	SUPPLY	EXHAUST	SUPPLY	EXHAUST	SUPPLY	EXHAUST
	(ACH)	(ACH)	(ACH)	(ACH)	(ACH)	(ACH)
AVERAGES	13.9	15.0	9.3	10.0	5.4	6.0

ECMs:

- Airflow Reduction
- VFD Control to Pumps
- AHU Static Pressure Reset
- Operational Deficiencies (Controls, Over-Ventilation)

Savings:

- Occupied Mode: \$274,000 per year
- Unoccupied Mode: \$114,000 per year
- Less than one year ROI



175,000 gsq ft Office Building

- 14 AHUs
- 225,000 CFM main air system capacity
- No heat recovery
- Electric Reheat
- Significant Comfort Issues
 - Humidity
 - Temperature
- BAS Overrides on Setpoints / Controls
- OA Airflow Issues



ECMs:

- Reduced Supply Airflow by 58,000 CFM (26%)
- Optimized OA Airflow
- BAS Thermostat Audit
- Modified Control Sequences for AHU Temp / RH

Savings:

Per Year of \$70,000



Three Things to Take Away...

• HVAC uses 60% of a building's energy, so it should be the prime focus of building energy reduction efforts.

 Retro-Commissioning saves energy by ensuring the building is operating to optimal efficiency.

 Many buildings are currently over-ventilated due to adherence to obsolete standards and can have their airflows reduced resulting in considerable additional energy savings.







Acronym List

ACH – Air Changes per Hour

AHU – Air Handling Unit

BAS – Building Automation System

CFM – Cubic Feet per Minute

Cx – Commissioning

ECMs – Energy Conservation Measures

OA – Outside Air

RCx – Retro-Commissioning

ROI – Return on Investment

RH – Relative Humidity

VFD – Variable Frequency Drive

