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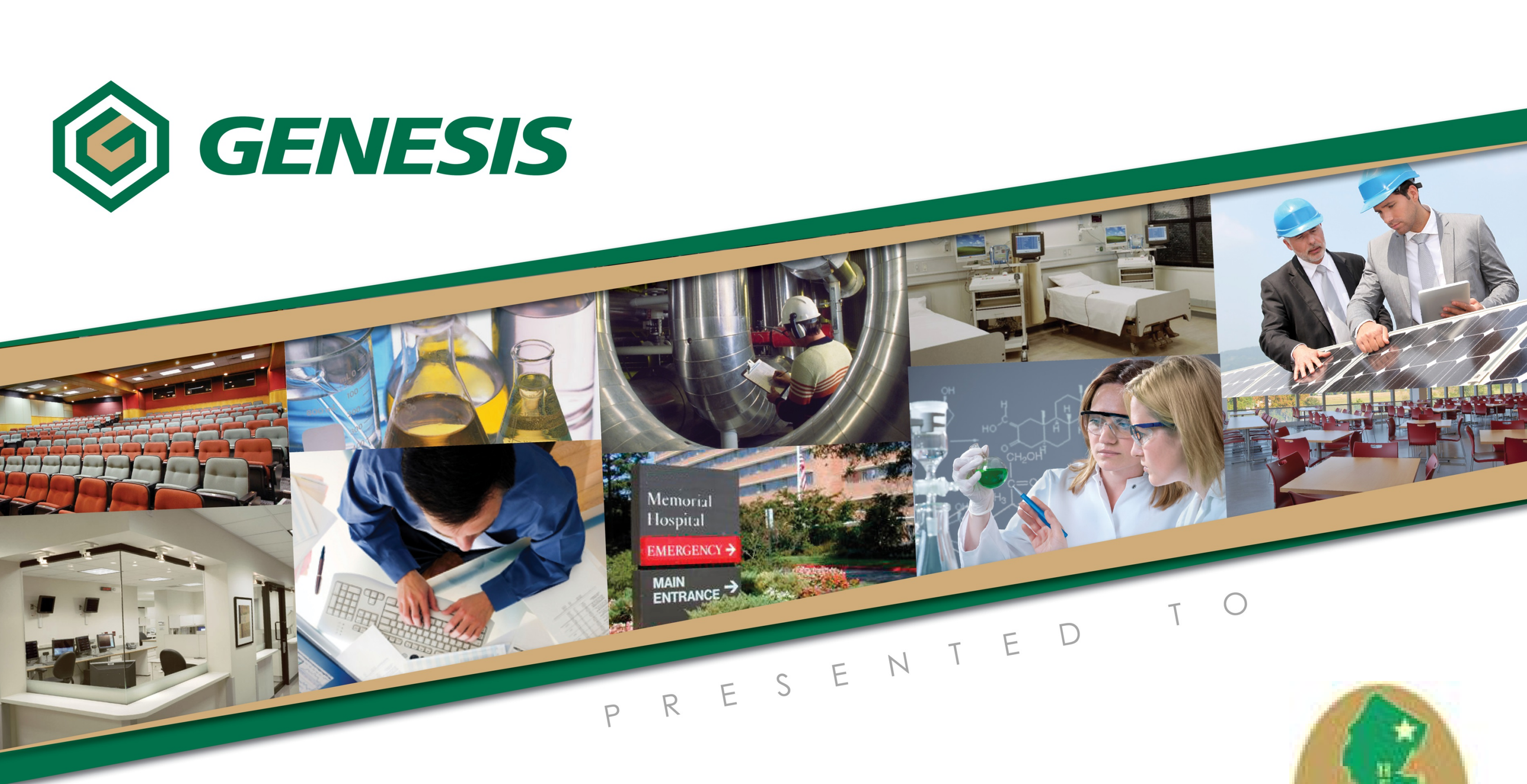


P R E S E N T E D T O

Healthcare Facilities Management Society of New Jersey

Retro-Commissioning

“Optimize the Performance of Your Facility”

Presenters: Genesis Engineers, Inc.

Joseph O’Donnell, CBCP

Sr. Principal

Josh Blair, CBCP

Associate Principal

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.

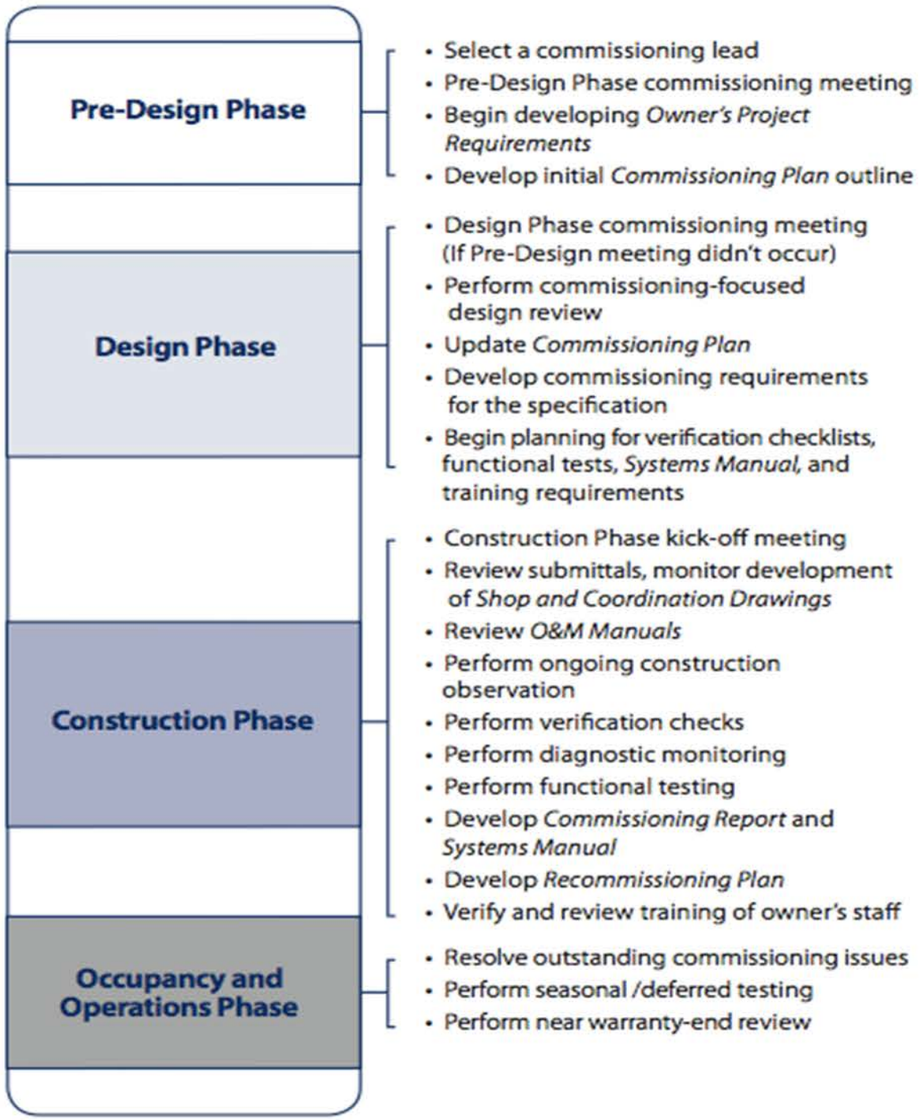
Why Retro-Commission?

- Optimize System Performance
- Energy Savings
- Cost Savings
- HVAC = ~ 60% of Energy Usage
- Reduced Carbon Footprint
- Attractive ROI

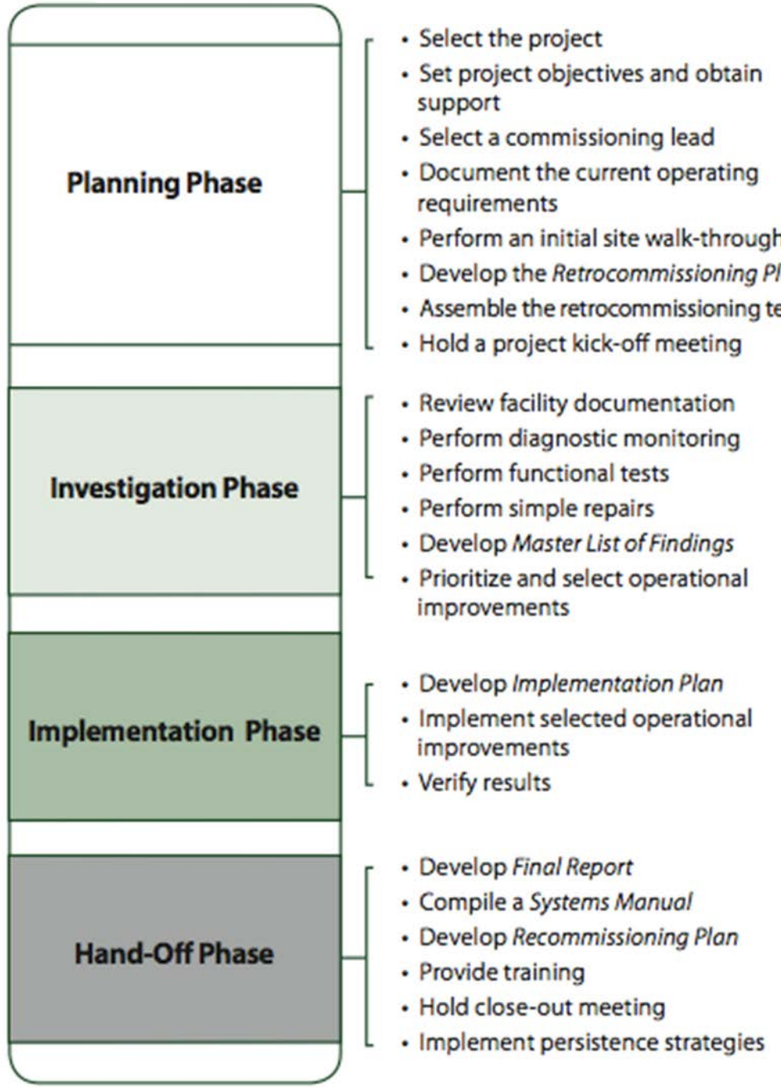
- Potential to significantly reduce overall energy consumption with minimal financial investment.

Cx and RCx Process Overview

Commissioning



Retro-Commissioning



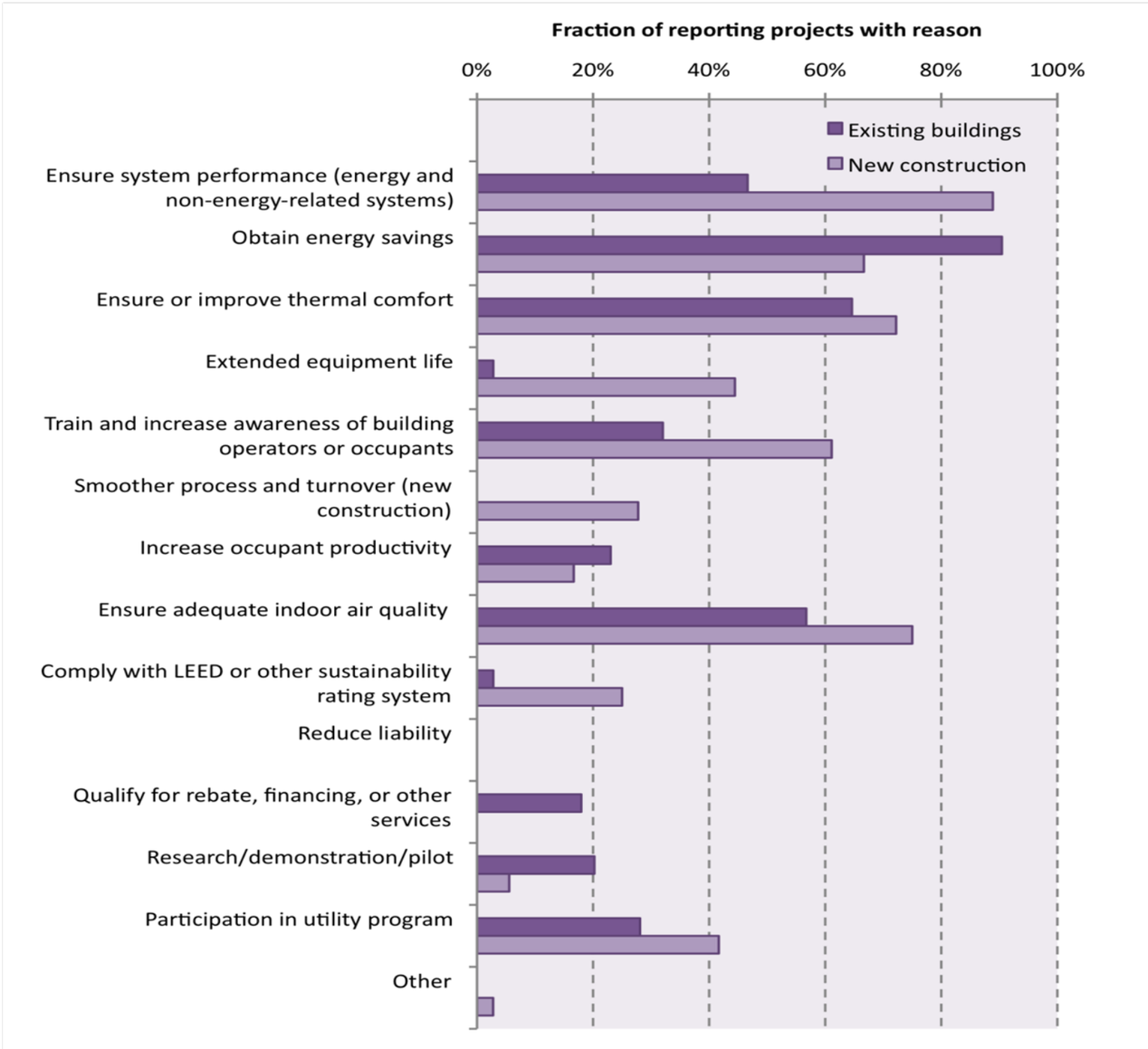
RCx Process Overview

- **Phase I & II Planning & Investigation**
  - o Establish Operating Requirements
  - o Field Investigation & Design Review
  - o Report – Develop Energy Conservation Measures (ECMs), implementation strategies, costs and return on investment.
- **Phase III Implementation**
  - o Select ECMs
  - o Perform repairs, changes and adjustments as agreed upon in Phase I
- **Phase IV Hand Off (Turnover)**
  - o Final Report (Results)
  - o Training
  - o Recommissioning Plan

Research Findings

- 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

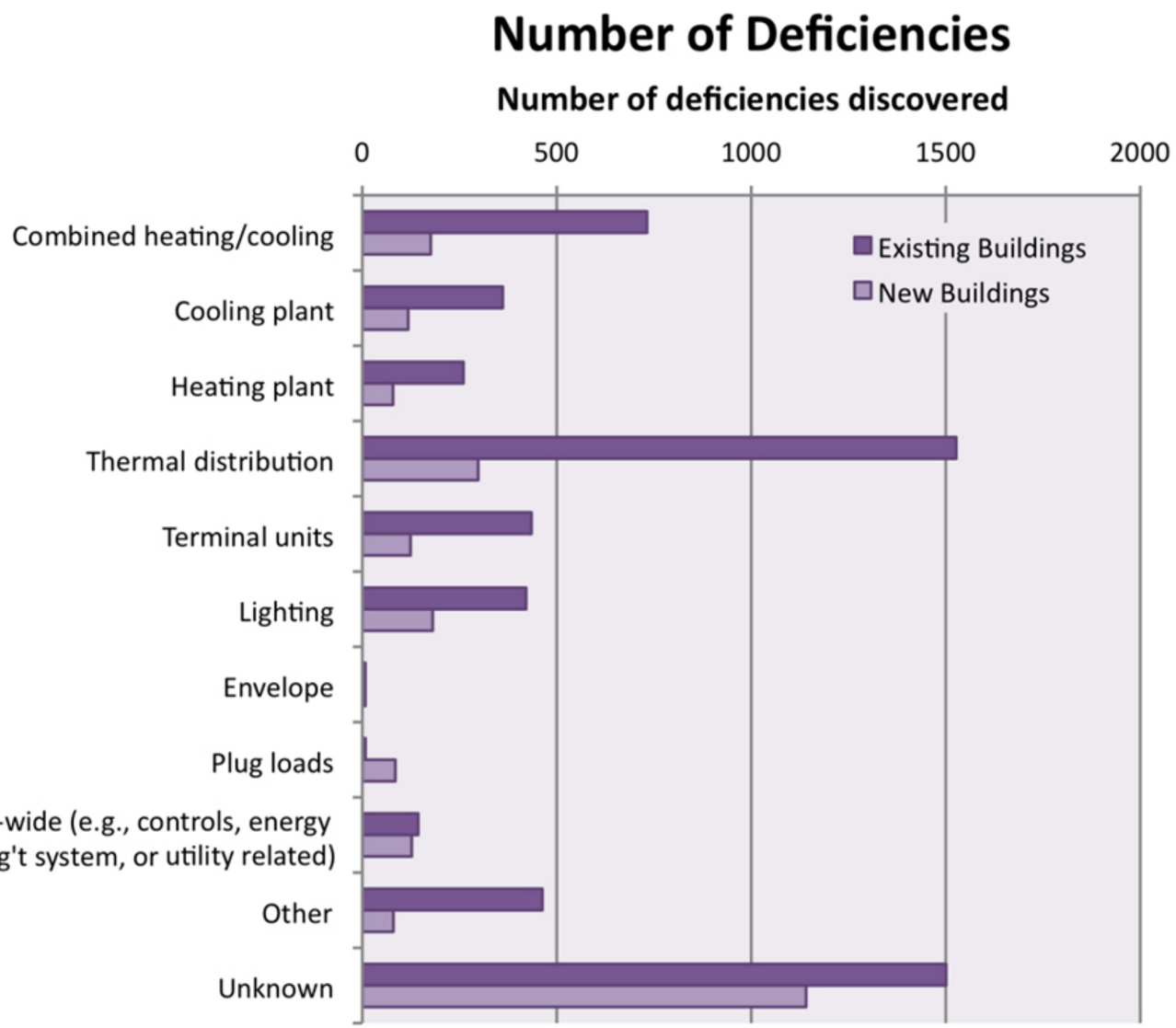
Research Findings

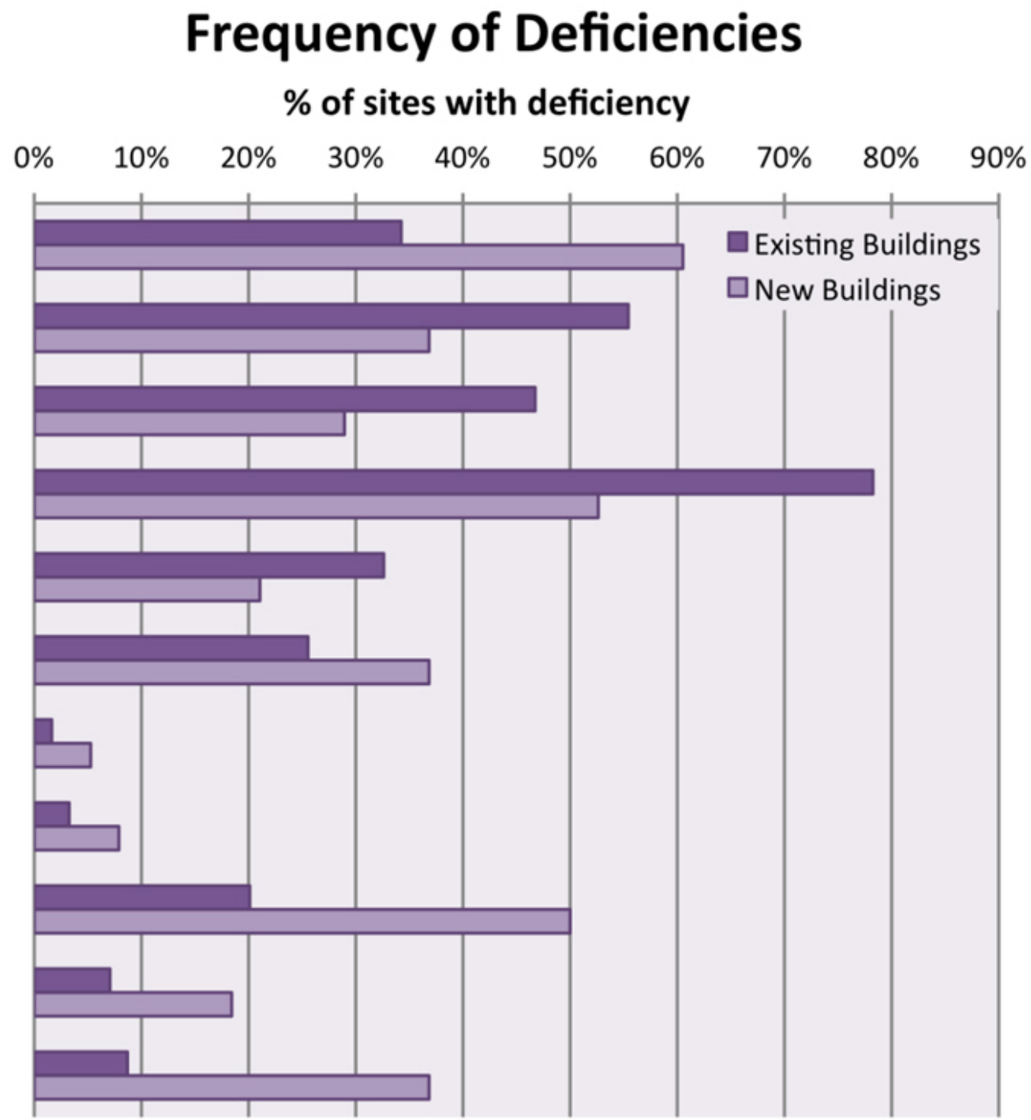


Wide Diversity of Reasons to Commissioning Projects

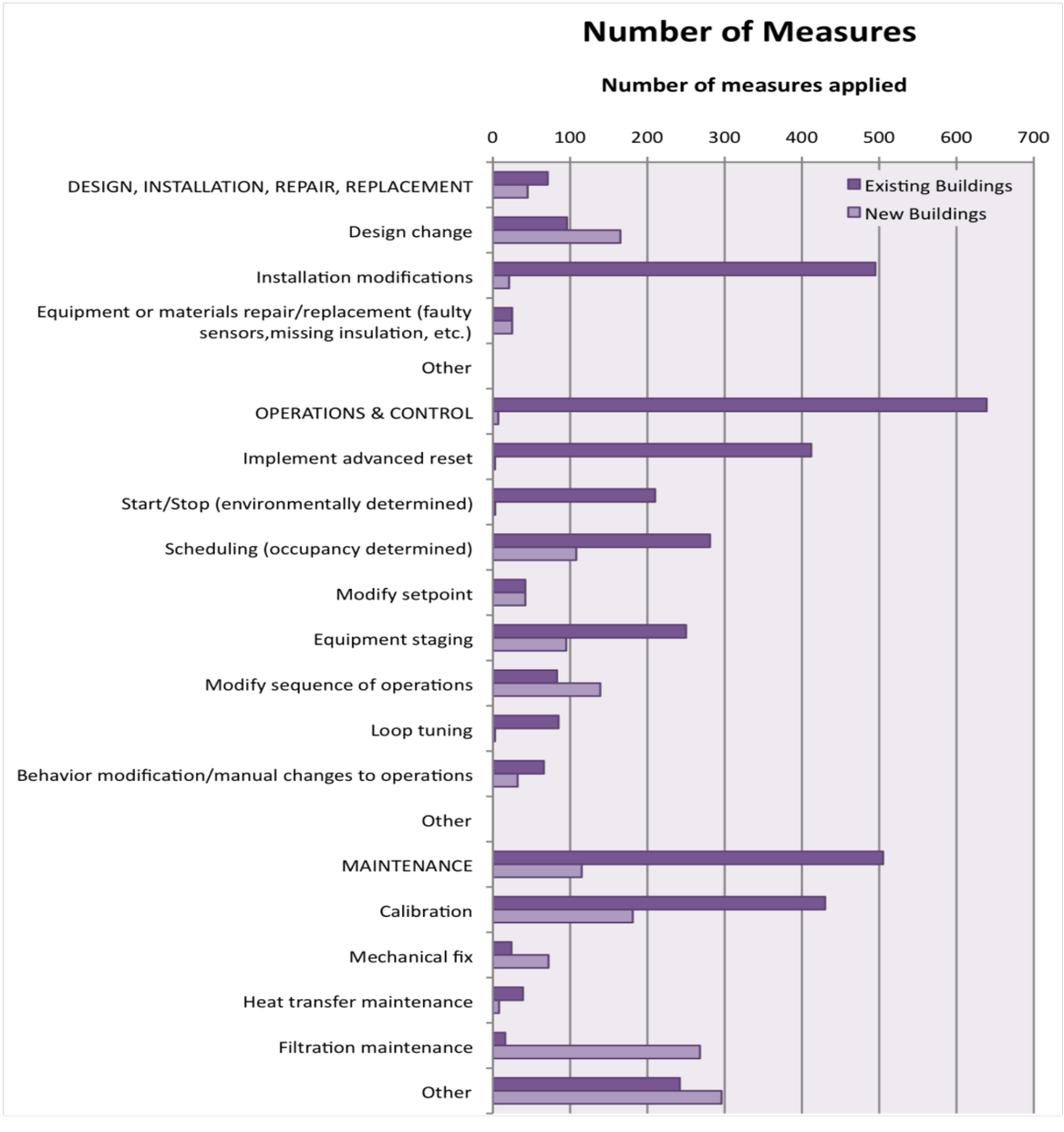
- Ensure System Performance
- Obtain Energy Savings
- Improve Thermal Comfort
- Indoor Air Quality

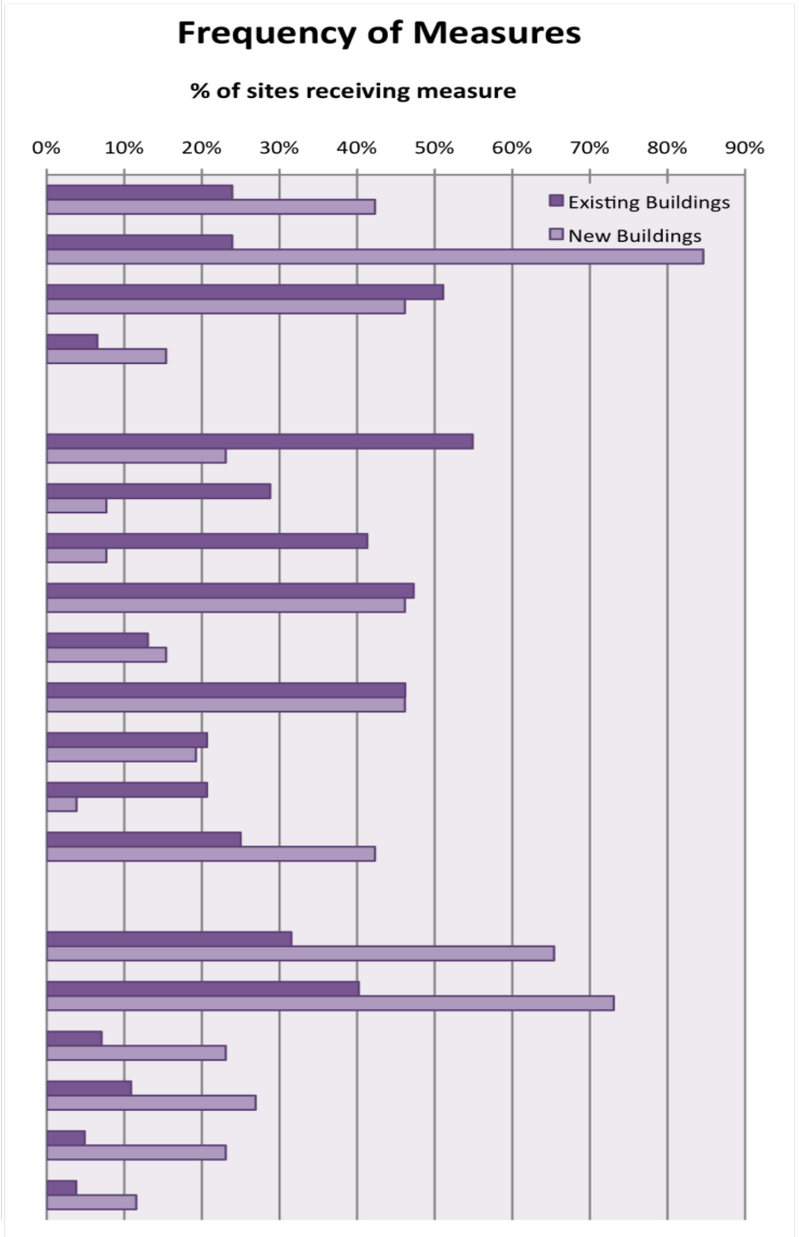
Research Findings





Research Findings





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

Case Study 1

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

Case Study 1

LABORATORY AIR CHANGE RATE SUMMARY						
SERVICE	EXISTING		NEW OCCUPIED		NEW UNOCCUPIED	
	SUPPLY (ACH)	EXHAUST (ACH)	SUPPLY (ACH)	EXHAUST (ACH)	SUPPLY (ACH)	EXHAUST (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

Case Study 2

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

Case Study 2

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.***

Q & A

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