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Operation and Maintenance

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Operation and Maintenance

Overview

- What is Operation and Maintenance?
- Developing and Operation and Maintenance Plan
- Types of Maintenance
- Effects of O&M on Measurement and Verification

Operation and Maintenance

- What is Operation and Maintenance?

  Services required to assure the built environment will perform the functions for which a facility was designed and constructed.

Operation and Maintenance

- What is Operation and Maintenance?
  - Includes day-to-day activities necessary for the building and its equipment to perform their intended function.
  - A Facility cannot operate at peak efficiency without properly maintaining and operating the systems and equipment.

Operation and Maintenance

- What is Operation and Maintenance?

  Facility Functions for an Energy Savings Performance Contract

  - Energy Savings
  - Comfort

Operation and Maintenance

- Developing and Operation and Maintenance Plan
  - Design and Engineering Phase
    - O&M Personnel work with design team to identify maintenance requirements for inclusion in the design
  - Construction Phase
    - Commissioning
    - Vendor/Manufacturer O&M Manuals
    - Training
    - Spare Parts/Warranty

Operation and Maintenance

- Developing and Operation and Maintenance Plan
  - O&M Phase
    - responsible for operating utility systems and for maintaining the built environment
      - utility systems may be simple supply lines/systems or may be complete production and supply systems
      - maintenance work may include preventive/predictive/ (planned) and maintenance, corrective (repair)

Operation and Maintenance

- Primary Maintenance Categories
  - Preventative (Quarterly and Annual Service)
  - Predictive/Planned
  - Corrective (Repair)
  - Trouble Calls (Room too cold)

These primary maintenance strategies, rather than be in applied independently, are integrated to take advantage of their respective strengths in order to maximize facility/equipment reliability, while minimizing life-cycle costs.

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Operation and Maintenance

- FEMP O&M Bust Practices Guide
  - **save an estimated 5% to 20% on energy bills**
- International Facilities Management Association (IFMA)
  - the operating life cycle costs of a facility typically are comprised of 2% for design and construction, 6% for O&M and 92% for occupants' salaries

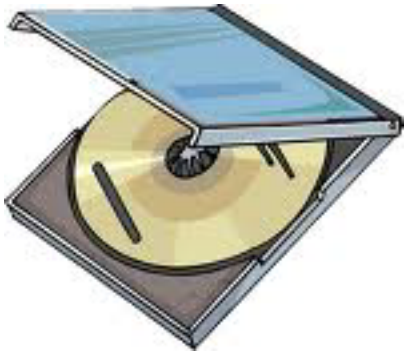
Operation and Maintenance

- Effects of O&M on Measurement and Verification
  - O&M helps ensure energy savings are being met
  - Corrective action to deliver energy savings
  - Ensure system is operated as designed

Operation and Maintenance

- Summary
  - O&M ensures peak efficiency performance
  - O&M personnel involved in design, construction, commissioning, and Measurement and verification
  - O&M key to successful measurement and verification program

What Do You See?



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Operation and Maintenance

- Types of HVAC Systems Operation and Maintenance Programs
  - Equipment Manufactures O&M Guidelines
  - O&M Plan Developed for the Site
  - Continual Improvement and Real Time Monitored
  - Recommissioning (ReCx)

Staff Cultural Observations

- Don’t know if they have a problem
- If they recognize there is a problem
  - To Busy to Address
  - Don’t Know How to Fix
  - No Budget for Repair
- Don’t have a plan in place
- Don’t hold anyone accountable

Operation and Maintenance

- Equipment Manufactures Guidelines
  - Appropriate Filter Changes (Frequency, Type and SIZE)
  - Proper Chemical Systems Maintained
  - System Cleaning or Parts Replacement

❖ The Manufacture Has Safety Reasons for Maintenance

Existing Building or Retro Commissioning

- ***A systematic investigation process for improving and optimizing operation and maintenance.***
- ***Focused on energy using equipment and controls.***
- ***Applies to buildings not previously commissioned.***

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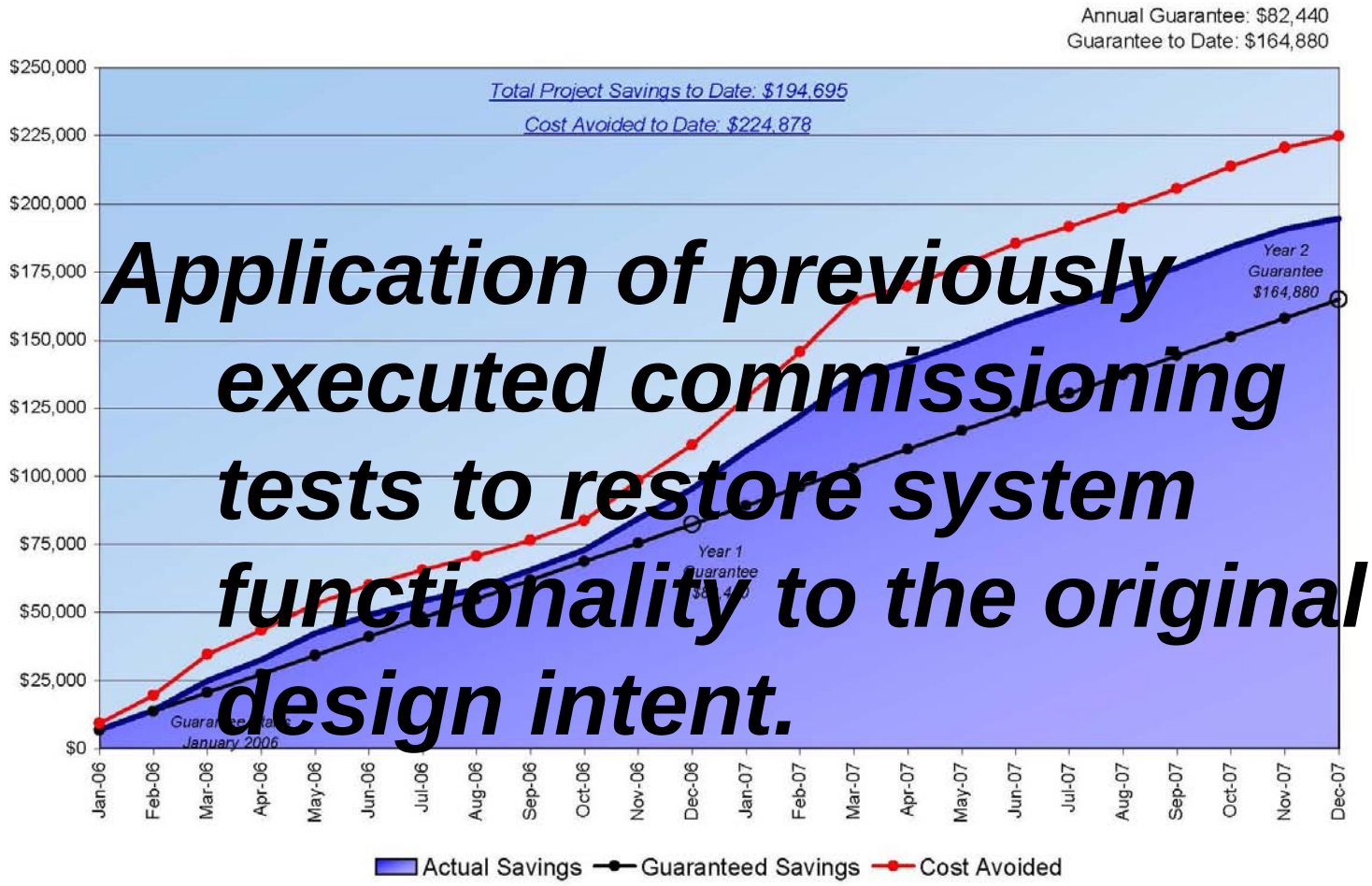
Types of Commissioning: **Recommissioning**



Application of previously executed commissioning tests to restore system functionality to the original design intent.

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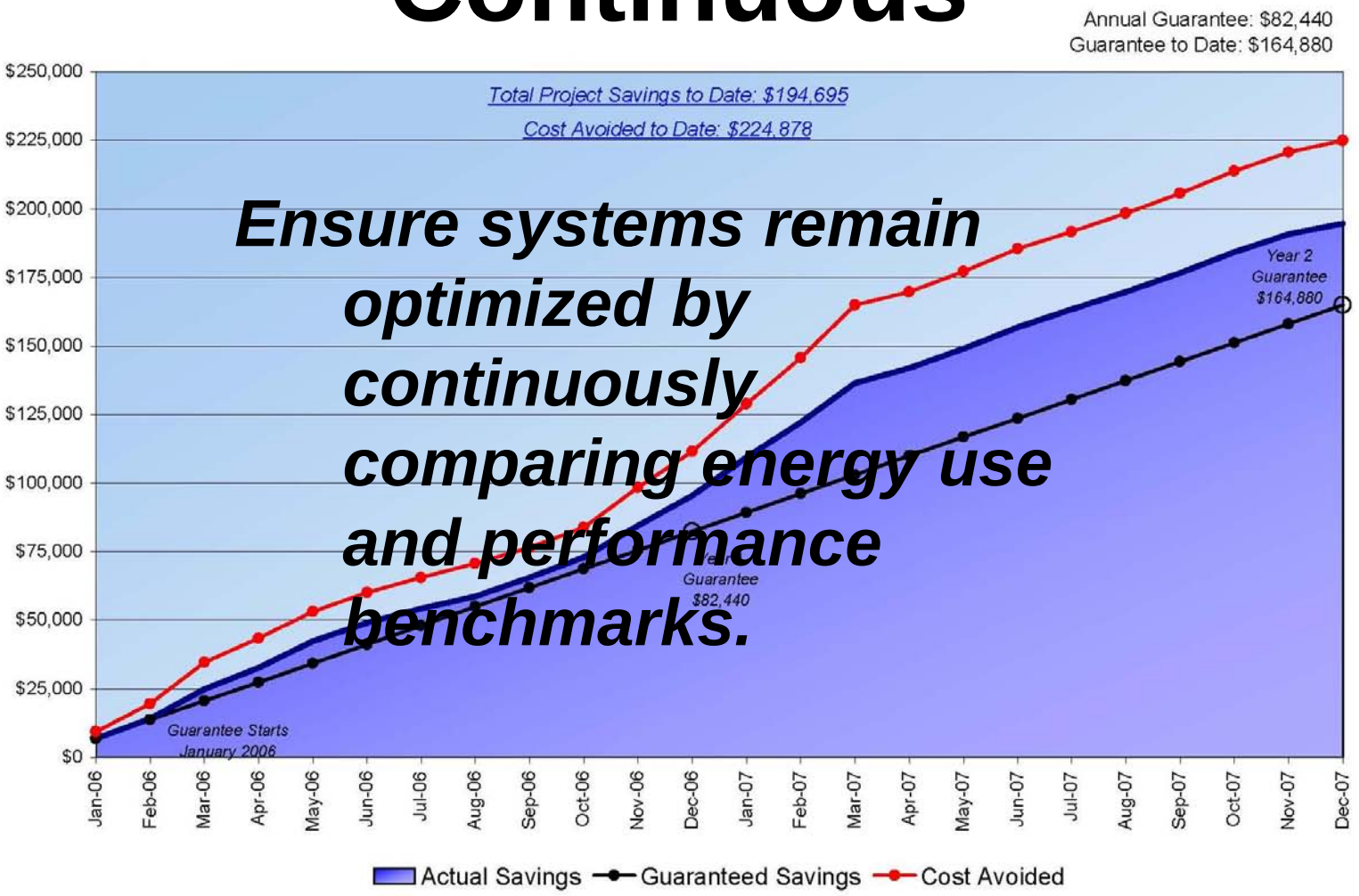
Types of Commissioning: **Continuous**



Ensure systems remain optimized by continuously comparing energy use and performance benchmarks.

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Why Recommission?

- Risk Reduction for daily operation
- Improve equipment operation and life expectancy
- Reduce energy consumption
- Mitigate Indoor Air Quality problems
- Increase asset value
- Reduce tenant complaints
- Identify failing components to prevent emergency replacement

M&V and Recommissioning Program Coverage

Areas Affected

- Energy Savings
- Carbon Foot Print Reduction
- Reliability of Proper Implementation and Performance
- Functionality for Customer Comfort

Major Components Included

- Structure (envelope when implemented)
- HVAC Plant (energy supply)
- Distribution System
- Power systems

Controls Systems Issues

Extremes

- **Poor Maintenance Program**
  - **–90% systems overridden**
  - **–Two years - 2% points overridden**
  - **–Equates to Approximately 15% systems**
- **Outsourced Maintenance – Good program**
  - **–9% points overridden**
  - **–Points affect vary on system but generally affects the energy use negatively**

Effects on BAS Controls and ReCx

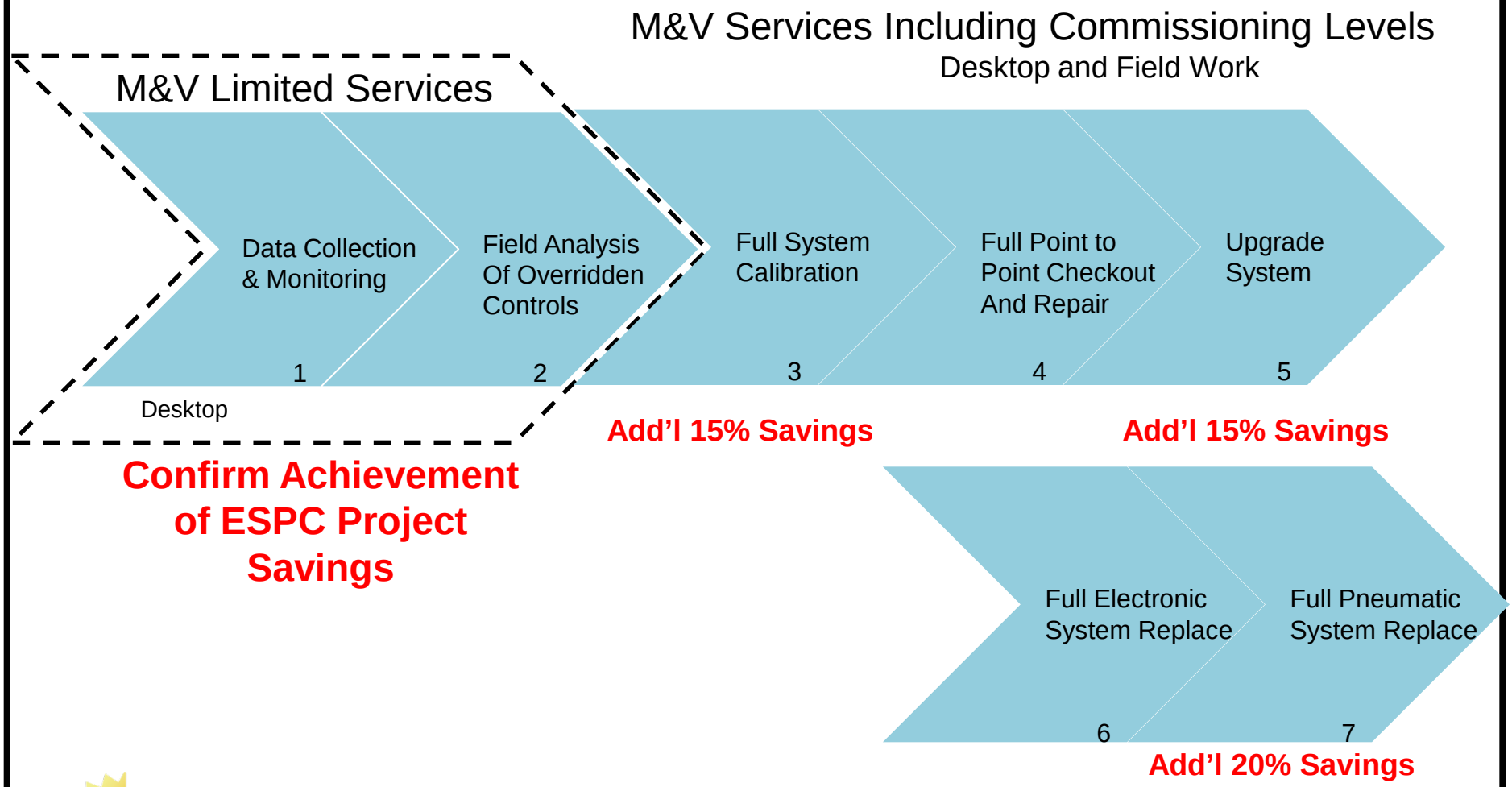
-Improve Mechanical Systems Functional Performance

-Energy Savings

-Comfort Levels For Customers are Achieved

-Improve Life Cycle of System and Components

Understanding Levels of and Commissioning Energy Savings



- Information from DOE FEMP
- Berkley June 2009 Commissioning Study

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What is the Price for Proper O&M and ReCx?

. . . 6 mo Chiller Improper Chemicals.

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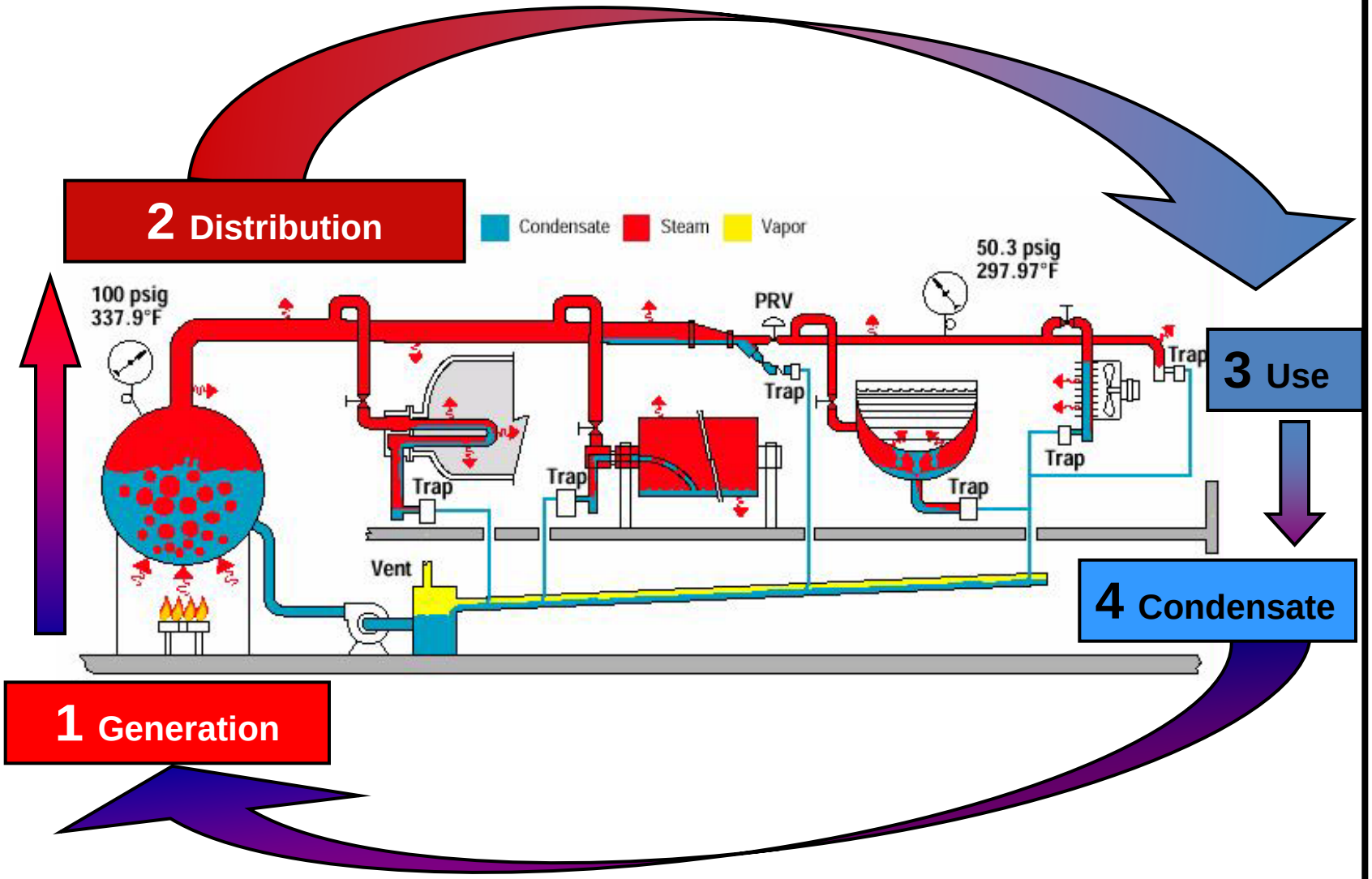
Extensive and Dangerous Process



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Maintain Components!

$100.00 Parts

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Causing Equipment Self Relocation

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Continuous Commissioning: Best Practices

- Conduct visual inspections
- Perform all maintenance per manufacturer requirements.
- Report any anomalies *immediately*
- **AND**

correct a *small* problem before . . .

Control Systems Degradation

- –Sustainability is Major Problem
  - Degrade with Maintenance
  - Degrade with Operations
  - Degrade with Policy
- –Processes limit success
  - Training on turnover
  - Maintenance nonexistent
  - Diagnostics not part process
  - QC is not existent

Monitored ReCx

-Performed Internally

-Already done (how's that working for ya)

-Performed Externally

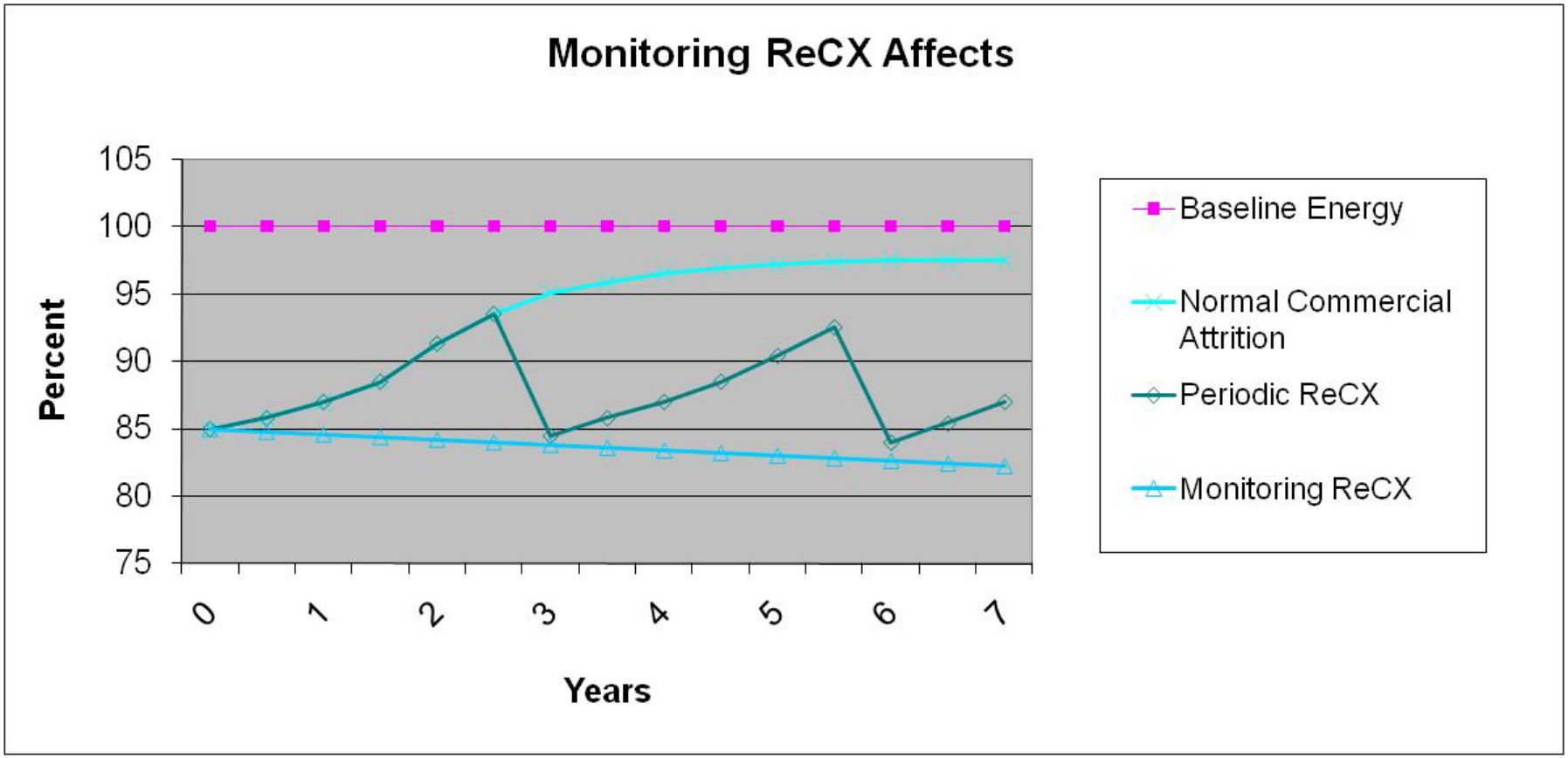
-Contractor $ responsible

- (Qualified/Certified Contractor)
- (System Improvement Performance Incentive)

-Strict Reporting

- (Thorough details)
- (Monthly, Quartely, Annual reports with Action Plan)

Advantage of Monitoring Recommissioning



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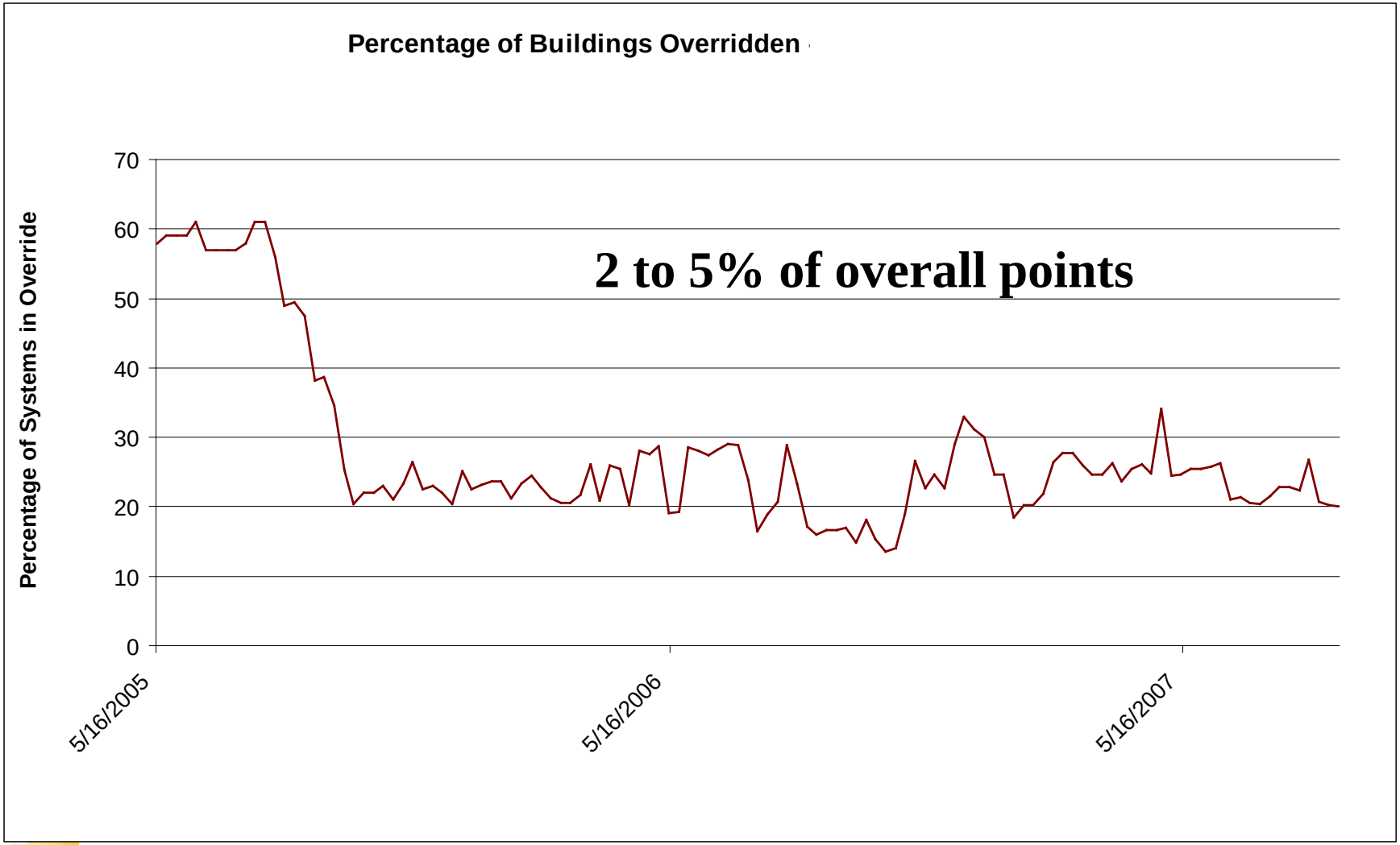
Project Example



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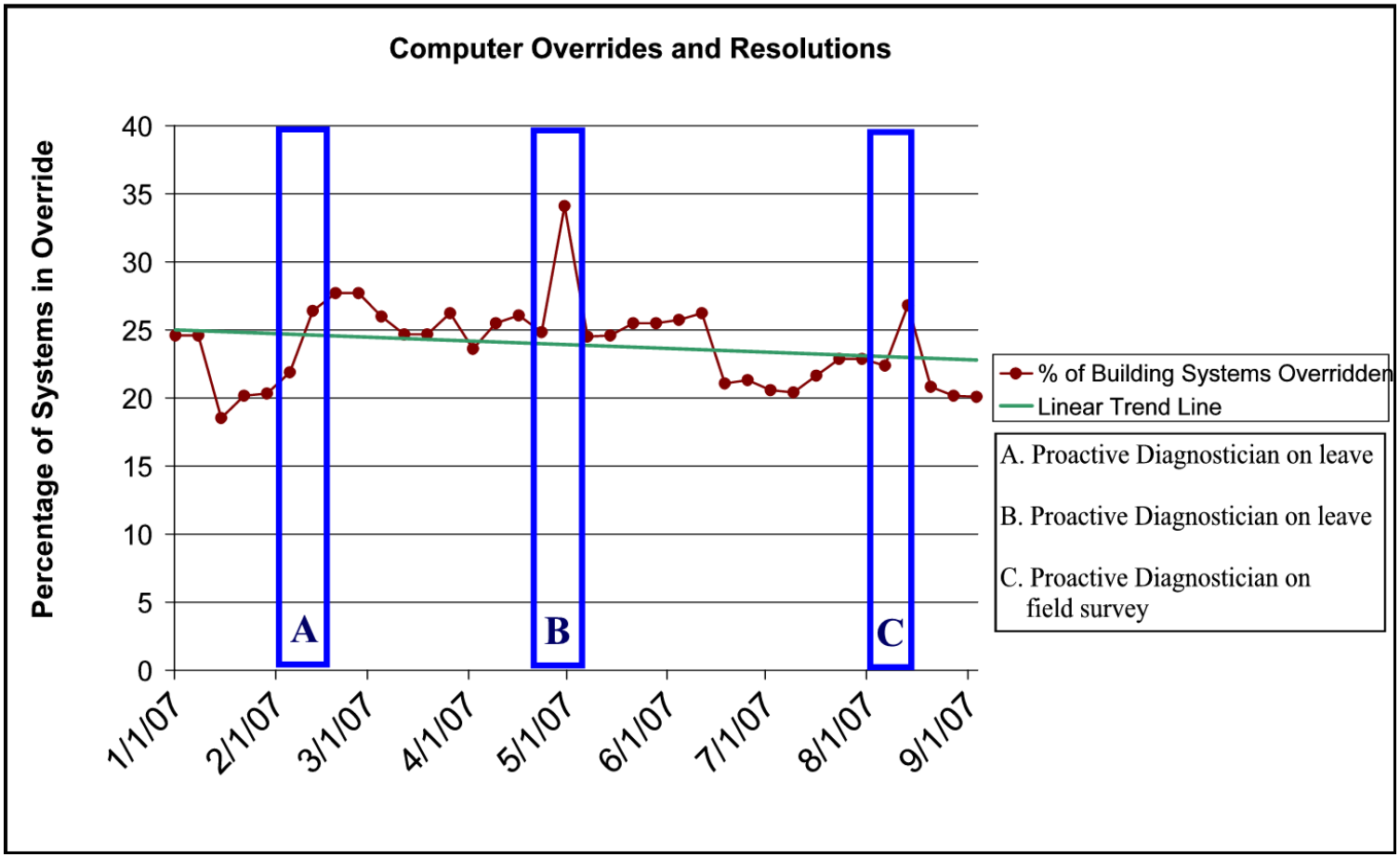
Degradation Without Oversight



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Observation: Diagnostics

Without a continuous diagnostics approach, energy usage will be 20% to 40% higher than required to provide a comfortable and healthful indoor environment.

Summary

- **Don’t settle** for not having an O&M Program
- **Keep Systems Maintained**
- **Monitor** Systems Performance
- Determine **root causes** of problem
- **Strategize** a Operational sustained solution