



Retro-Commissioning & Automated Fault Detection & Diagnostics

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Today's Challenges & Drivers

- Rising Energy Costs
 - Electric, steam and gas
- Tight Operating Budgets
- Limited staff and internal resources
- Short payback requirements for energy projects

- Carbon footprint reductions
- Energy Star





Solution: Optimize Existing Systems

- Optimizing your existing systems can potentially yield greater energy conservation than any new technology or retrofit.
 - Just because space temperature and humidity control are excellent, doesn't mean the HVAC systems are as efficient as they can be



It's a Fact – Building Systems Deteriorate

- Control systems deviate from original design intent
 - Unauthorized changes to algorithms and set points to “fix problems”
 - Improperly maintained schedules
- Sensors drift out of calibration
- Equipment performance degrades
 - Economizers
 - Dampers
 - Valves

Degraded performance can exist unnoticed for years
No occupant complaints  No problems



Retro-Commissioning

... a means of discovering and correcting HVAC/ utility system defects in existing systems so that the building will function as intended.

“Retro-commissioning is a rigorous and systematic process.”



Retro-Commissioning Stages

- Energy Use Index / Energy Star Rating
- Site orientation & documentation review
- Define the current design intent
- Trending / data logging
- Design / installation reviews (DIRs)
- Functional checks (FCs)
- Performance tests (PTs)
- Issues resolution
- Retro-Cx Report
- Persistence





Typical Retro-Commissioning Benefits

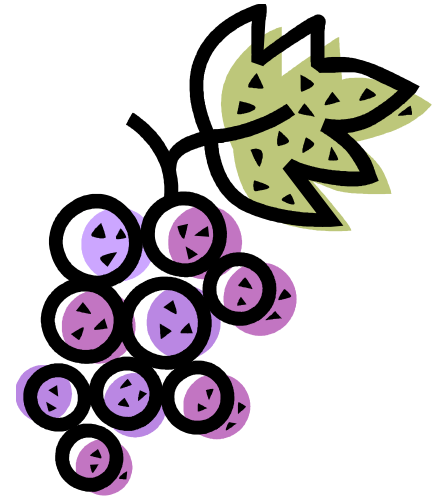
- Excellent ROI (return on investment)
- Reduces energy costs/ budget
- Identifies IAQ problems/ issues
- Verifies/ validates environmental criteria
- Reduced maintenance
- Increased system reliability
- Improved occupant comfort/ Solve long term operating problems





What's the Catch?

- Low hanging fruit grows back
- What are the two most important part of any RCx Project?





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- Retro-Cx Report
- **Persistence**





Persistence Plan / Sustainability

- Persistence Plan – Create a program in which key RCx activates are executed at regular intervals
- Ongoing Commissioning – Utilize software to perform automatic fault detection
 - Fault Detection and Diagnosis (FDD)



What is FDD?

- Typically a third party product installed to extract and analyze data from the building automation system (BAS).
 - FDD is typically not a control system, data only runs one way, no commands issued to the BAS system.
 - Data is analyzed and issues communicated to operating personnel for corrective actions.
 - FDD ranges from simple energy use vs outdoor air condition comparisons to detailed identification of issues and recommendations for corrective actions.



The Goals - Fault Detection & Diagnostics

- Identify issues early and correct before they become significant monetary issues.
- Increase Productivity
 - Analyze and service more buildings and equipment in less time
 - Decrease time/expertise needed to analyze data
 - Utilize staff to correct issues, not find and diagnose them
- Conditioned-based maintenance instead of schedule-based
 - Manage staff by issue/cost priority instead of nuisance alarms or routine schedules



Most Common Methods

- The “Black Box”
 - Interface panel installed on site retrieves data and sends to vendor for analysis.
 - Vendor provides hard copy summary reports.
 - No user interface.
- The “Do it Yourself”
 - Vendor sets up software and allows owner to use / manage it.



Most Common Methods

- The “Data Center”
 - Owners data is sent to the vendors data center where it is evaluated in real time by a person.
 - Vendor then calls / e-mails the owner with corrective actions.

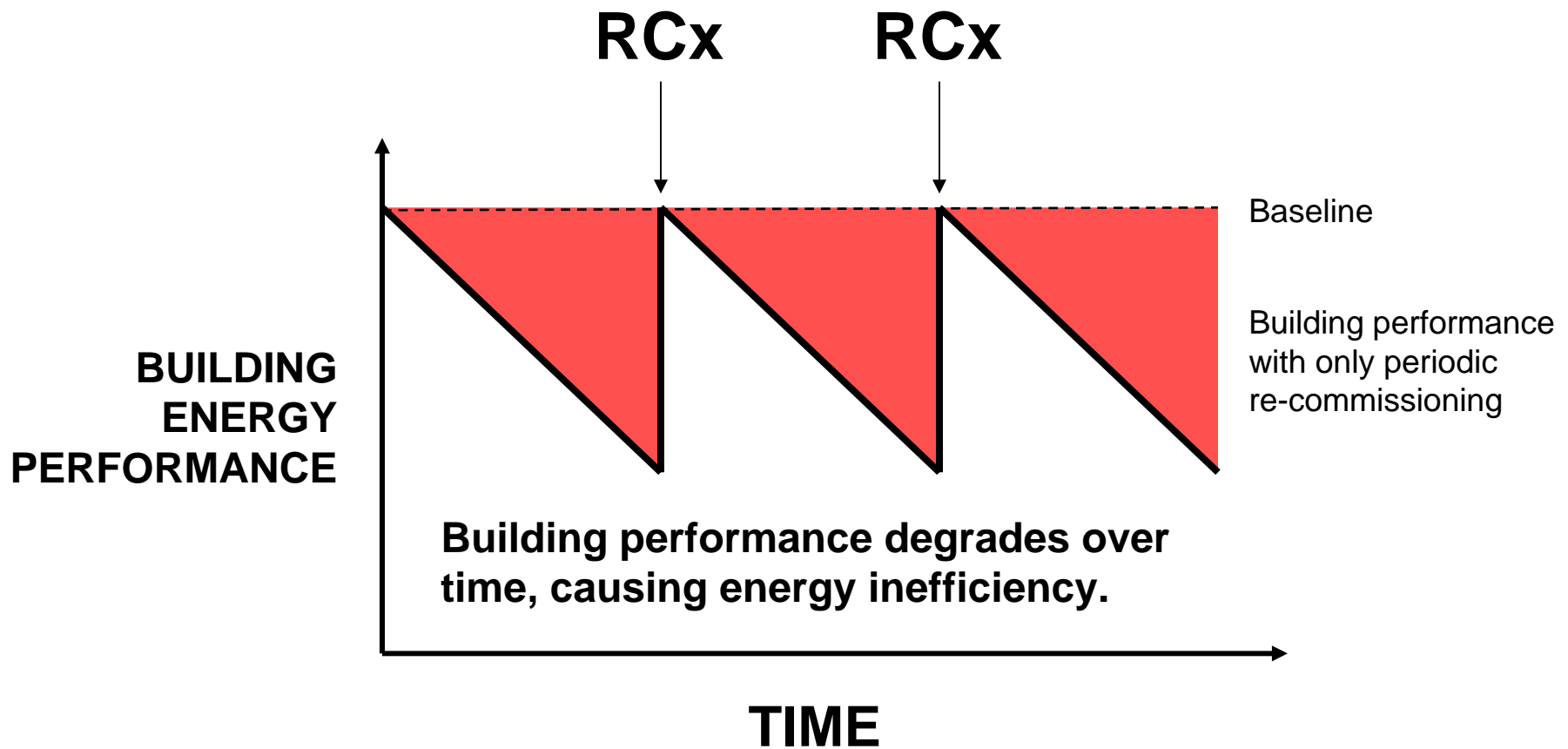


Most Common Methods

- The “Hybrid”
 - Data is evaluated by vendors program.
 - Vendor provides services to review the buildings performance on a routine basis and provide recommendations for corrective action and improvement.
 - Program is accessible to owner and staff for review and use.
 - Owner can create custom diagnostic algorithms

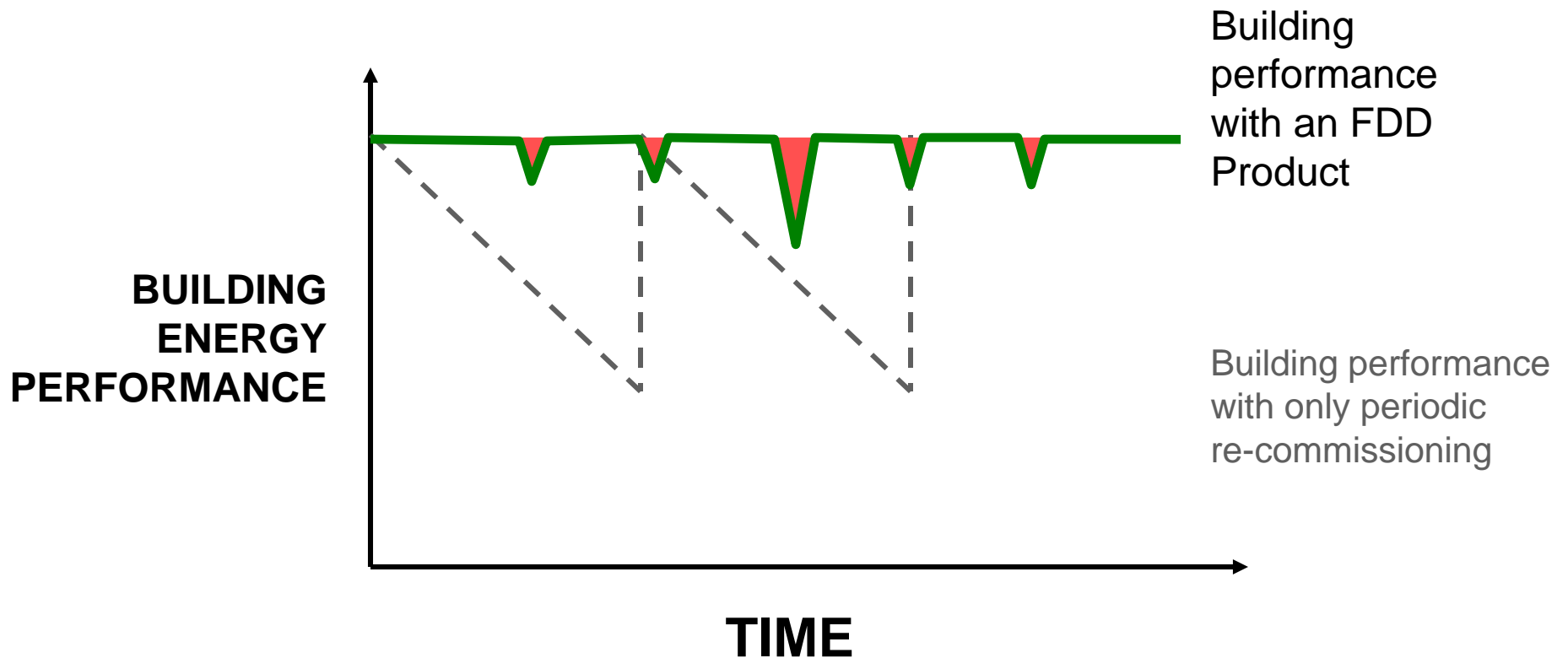


Building System Deterioration - What's it Look Like?





What Can Automated FDD do?





Caveat's

- **Issues Resolution & Persistence**– Still most important.
 - If insufficiently staffed or dedicate to closing out issues, don't waste your money.
- **Operator Overload**
 - Make sure there is an element that quantifies the magnitude and frequency of the issues so correct actions can be prioritized.



Questions?

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