An Overview of Commercial Building
Re-Tuning

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Presentation Outline

• Definition of Re-tuning
• Background of Re-tuning
• Washington State Project Approach to Re-tuning
Definitions

- HVAC Retro-commissioning
- HVAC Re-tuning
- HVAC Re-commissioning
- HVAC Continuous CommissioningSM
- Monitoring-Based Commissioning
- All processes above in part relate to setting up control systems to some known design configurations, verifying set points and adding control algorithms
Origins for Re-Tuning

• In 1990s several researcher organizations were developing automated fault detection and diagnostics (FDD) tools – the researchers found that the FDD tools can indeed be used for commissioning building systems

• Also, at the same time Texas A&M University was using a process called continuous commissioning to retro-commission existing buildings

• In 2000s monitoring-based commissioning was being applied at many California campus
What is Re-Tuning?

• A systematic process to identify and correct building operational problems that lead to energy waste
• Implemented primarily through the building control system at no cost other than the labor required to perform the re-tuning process
• Includes small, low-cost repairs, such as replacing faulty sensors
• Includes identifying other opportunities for improving energy efficiency that require investment
• Might be thought of as a scaled-down retro-commissioning focused on identifying and correcting operational problems
Purpose of Re-Tuning

• Improve the building’s energy efficiency through low-cost and no-cost operational improvements (mostly control changes)

• Identify opportunities to further increase the building’s energy efficiency

• Identify problems requiring physical repair

• Catch the big energy saving opportunities
Six Primary Steps of Re-Tuning

• Collecting initial building information: Basic building information
• Pre-Re-Tuning Phase: Trend-data collection and analysis
• Building Walk Down: Getting to know the building
• Re-Tuning: Identifying and correcting operations problems
• Post Re-Tuning: Reporting re-tuning findings
• Savings Analysis: Determining and reporting the impacts
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Trend-Data Collection & Analysis: Purpose

- Detect potential operational problems even before visiting the building
- Identify problems that require time histories to detect – incorrect schedules, no use of setback during unoccupied modes, poor economizer operation
Steps for Trend Data Collection

• Develop a monitoring plan – develop forms to guide service providers through this. Plan includes the points to trend and for each point:
  – Planned trend start time
  – Planned trend end time
  – Length of measurement period (2 weeks recommended)
  – Time interval between logged measurements (30 minutes or less recommended)
  – Measurement units (e.g., °F for temperature)

• Implement trend logs in control system
Analyze Trend Log Data – Major Steps

• Download trend log data files from BAS
• Format data files for compatibility with the spreadsheet analysis tool
• Open data files in spreadsheet analysis tool and automatically generate graphs
• Review graphs to identify operational issues
• Record operational issues for reference during re-tuning
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Building Walk Down: Purpose

• Get to know the building better
• Develop a general impression of:
  – Overall building condition
  – Overall building design
  – HVAC system design
• Collect some basic data on the building systems at a level of detail greater than the initial data collection
Building Walk Down: Major Steps

• Review electrical and mechanical prints
• Walk the outside of the building
• Walk the inside of the building
• Walk down the roof
• Walk down the air handlers
• Walk down the plant area
• Review the DDC system (BAS) front end
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Using the knowledge learned from trend-data analysis and building walk through to start the re-tune process
Major Focus Areas in Re-Tuning

- Occupancy scheduling
- Discharge-air temperature control
- Discharge-air static pressure control
- Air-handling unit (AHU) heating & cooling
- AHU outside/fresh air makeup
- AHU economizer operation
- Zone conditioning
- Meter profiles
- Central plant
Highlights of Re-Tuning

- Every set point adjustment made will have an impact of some sort on the utility meter
- Can save energy and keep occupants comfortable
- It takes time to tune a building
- There are no magic set points that work all the time
- Always monitor the utility meters (gas & electric) to see what affect you have had
- Look at the big picture when making adjustments
- Watch the meter profiles weekly
- Learn and know the building’s personality
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Measuring Impacts and Successes

• Widespread acceptance of these technologies will depend on electric energy savings and cost-effectiveness of the proposed solutions
  – We will determine electric energy savings impacts based on
    - reported problems and solutions
    - utility data (monthly kWh, weather data, and other important data) and submetered RTU electricity data

• Effectiveness of the service companies in providing the re-tuning is important to ensure that the benefits from this program continue beyond the initial demonstration
  – We will develop metrics to evaluate each technician’s performance
  – Number of companies and technicians using the methods and installing the new technologies after participating in the program

• The long-term success of the program will depend on the rate and degree of market penetration of these technologies
Post-Re-Tuning: Calculating Energy Savings – Overview of Approach

• Calculated as the difference between the actual energy use in the post-re-tuning 12 months and the energy use that would have occurred during the same 12 months if the building had not been re-tuned.

\[ E_{\text{savings}, j} = E_{\text{base}, j} - E_{\text{actual}, j} \]

- \( E_{\text{savings}, j} \) = energy savings for a specific building (j)
- \( E_{\text{actual}, j} \) = actual measured energy use of the building during the 12 months after re-tuning
- \( E_{\text{base}, j} \) = energy consumption of the building during the 12 months after re-tuning if it had not been re-tuned
Questions?