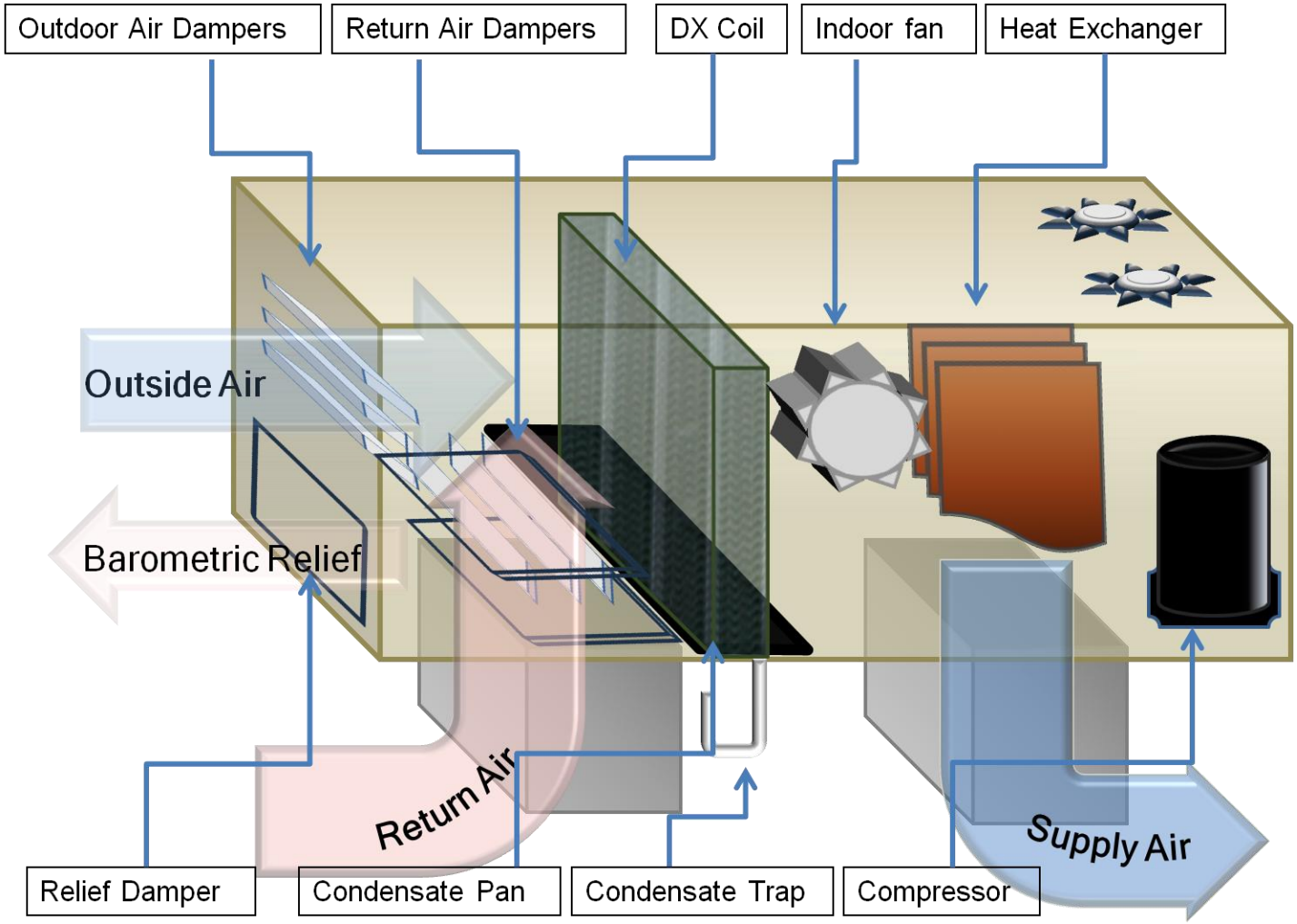
Roof Top Units
Saving Energy and Improving Occupant Comfort

Presented by Ethan Bellavance and Mary Jane Poynter

Presentation Outline

- Roof Top Unit (RTU) Overview- how do they work, key components
- Why are RTU's so prevalent?
- What are problems with RTU's
- How to improve reliability and reduce energy usage. Good, Better, Best Approach
- Results of Efficiency Vermont RTU pilot
- Conclusion

Roof Top Unit Components



Key Energy Components

1.) Compressors

2.) Supply fans, condenser fans

3.) Heat Source

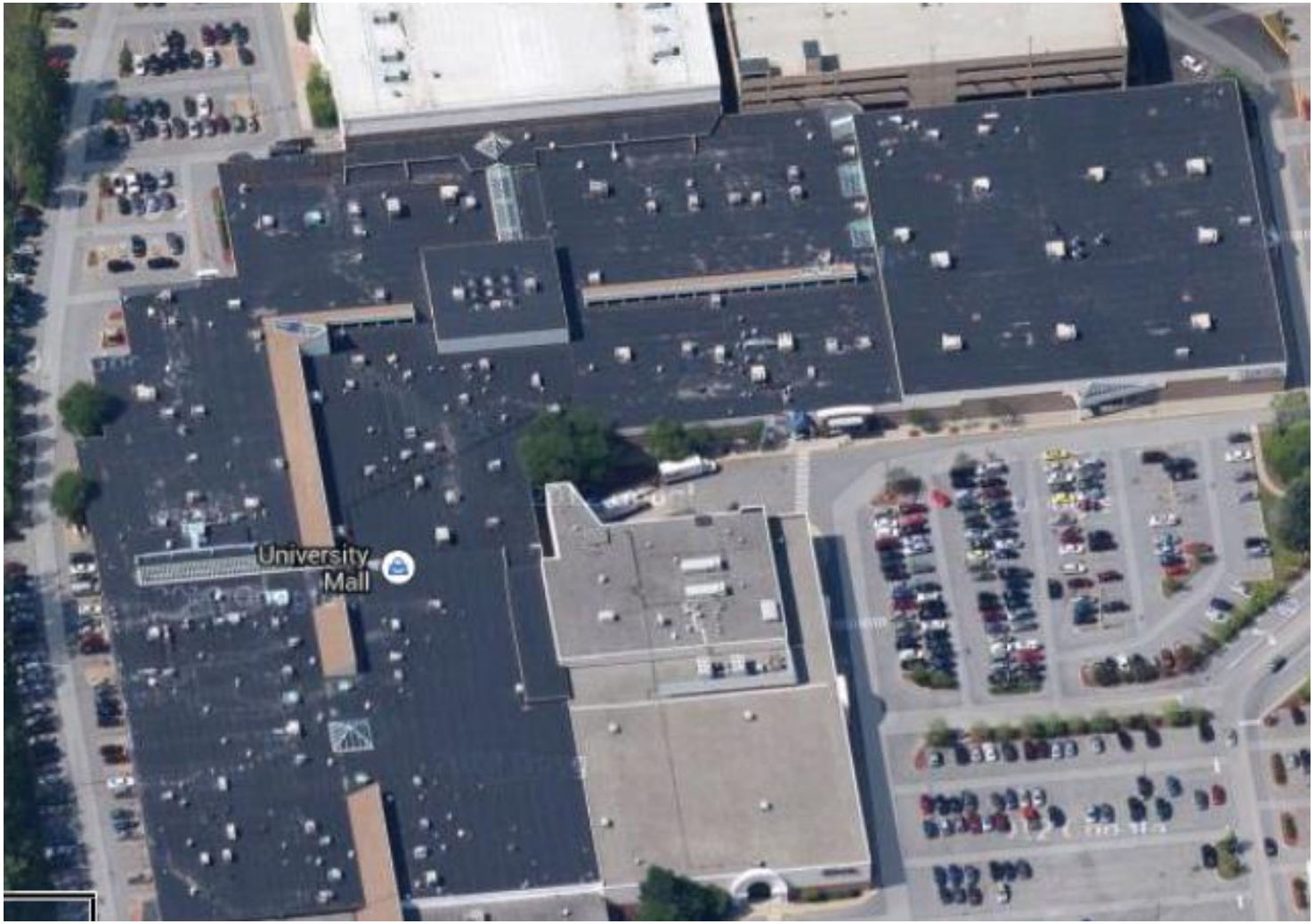
4.) Economizer

5.) Crankcase heaters

Why are they everywhere?

- Simplicity – you can get it all (heating, cooling, ventilation)
- Readily Available
- Great option for leased space
- Low first cost option

University mall



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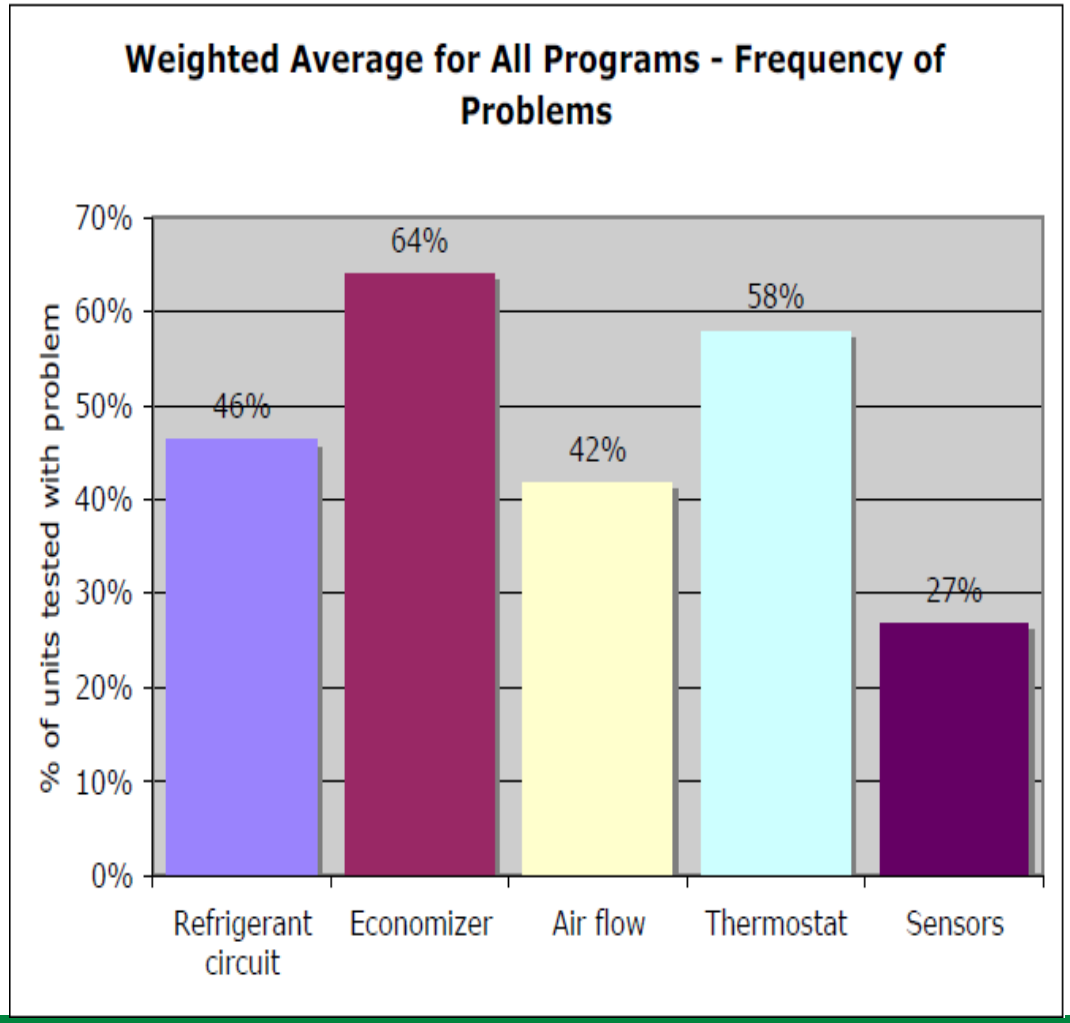
Barnes and Noble

RTU Problems

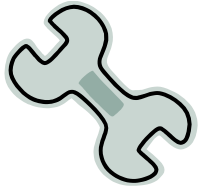
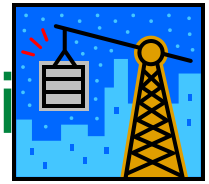
- Out of sight out of mind
- Lack of maintenance
- Limp along attitude
- False sense of efficiency



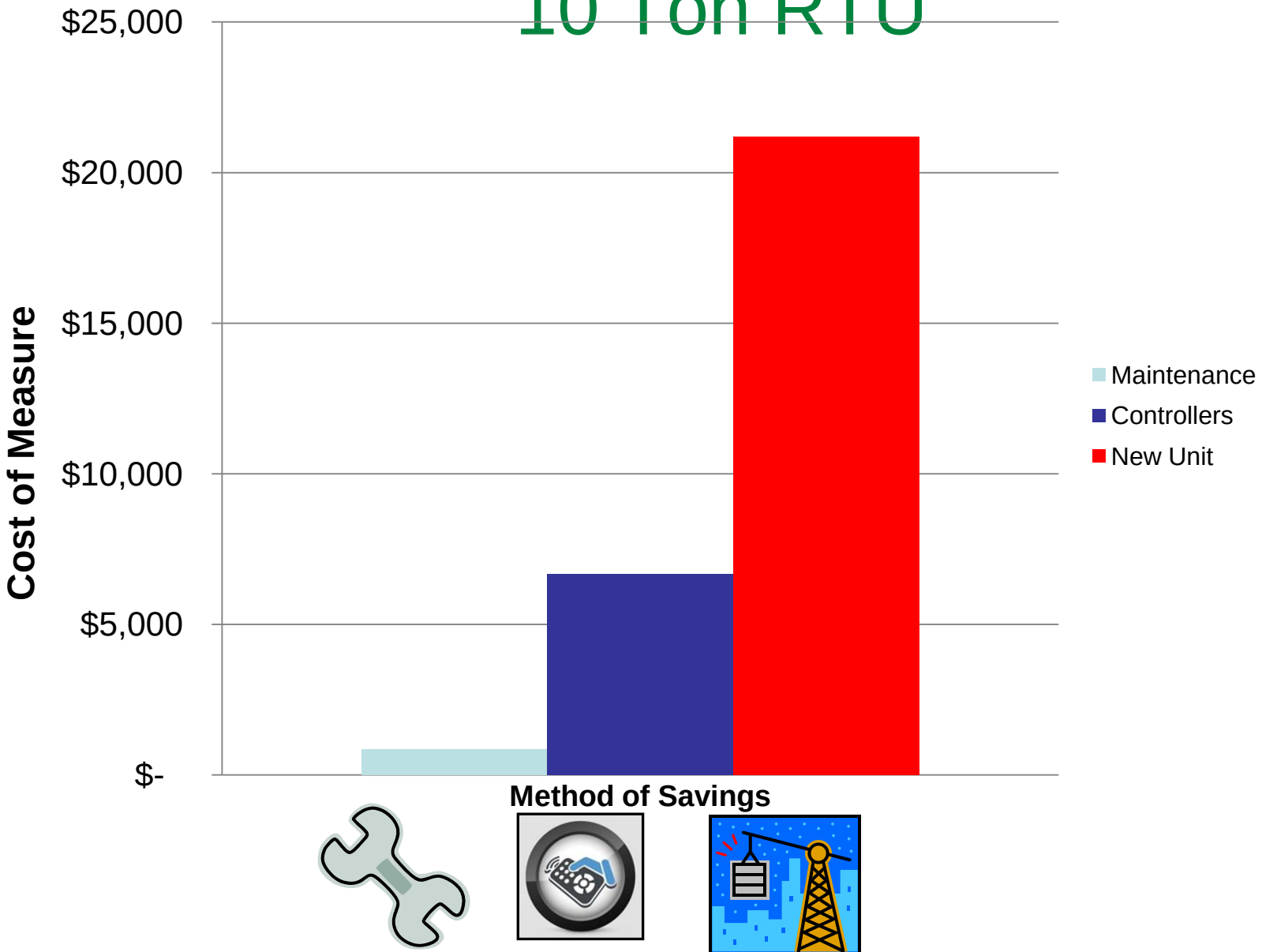
NBI - REVIEW OF RECENT COMMERCIAL ROOF TOP UNIT FIELD STUDIES IN THE PACIFIC NORTHWEST AND CALIFORNIA, 2004"; pg. 6

What can be done to improve them?

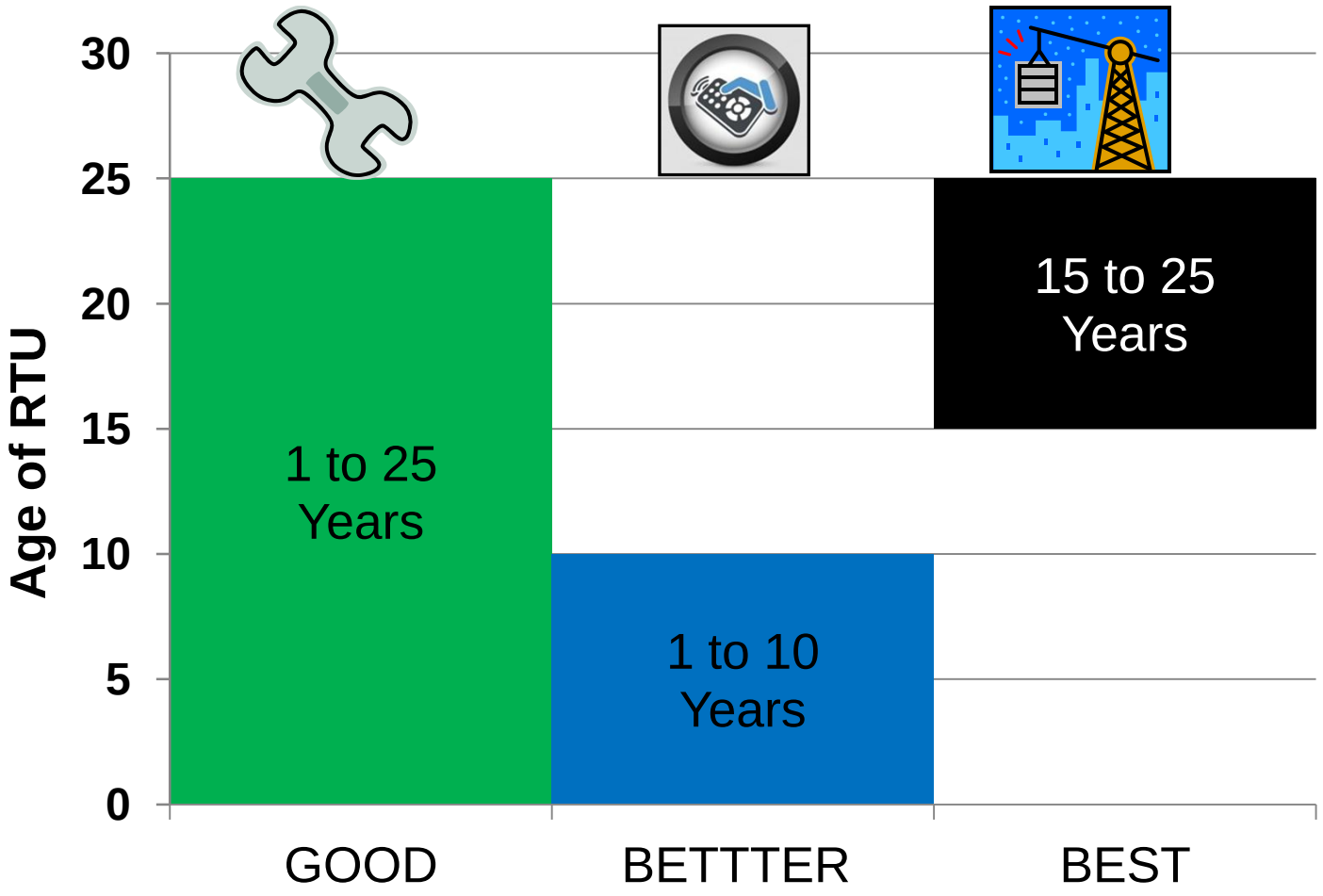
We propose three options to fit numerous budget situations.

1. Good - Maintenance 
2. Better – Advanced Controls 
3. Best – New “Best of the Best” Uni 

Average Costs of Approach
10 Ton RTU



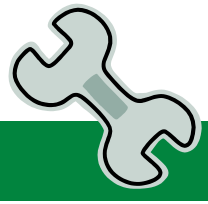
Age Based Approach Applicability



The Good Approach

Overhauling and maintaining your existing RTU

- Quarterly and yearly preventive maintenance
- Planning for failures and replacements
- What do you need to be looking for?
- Education

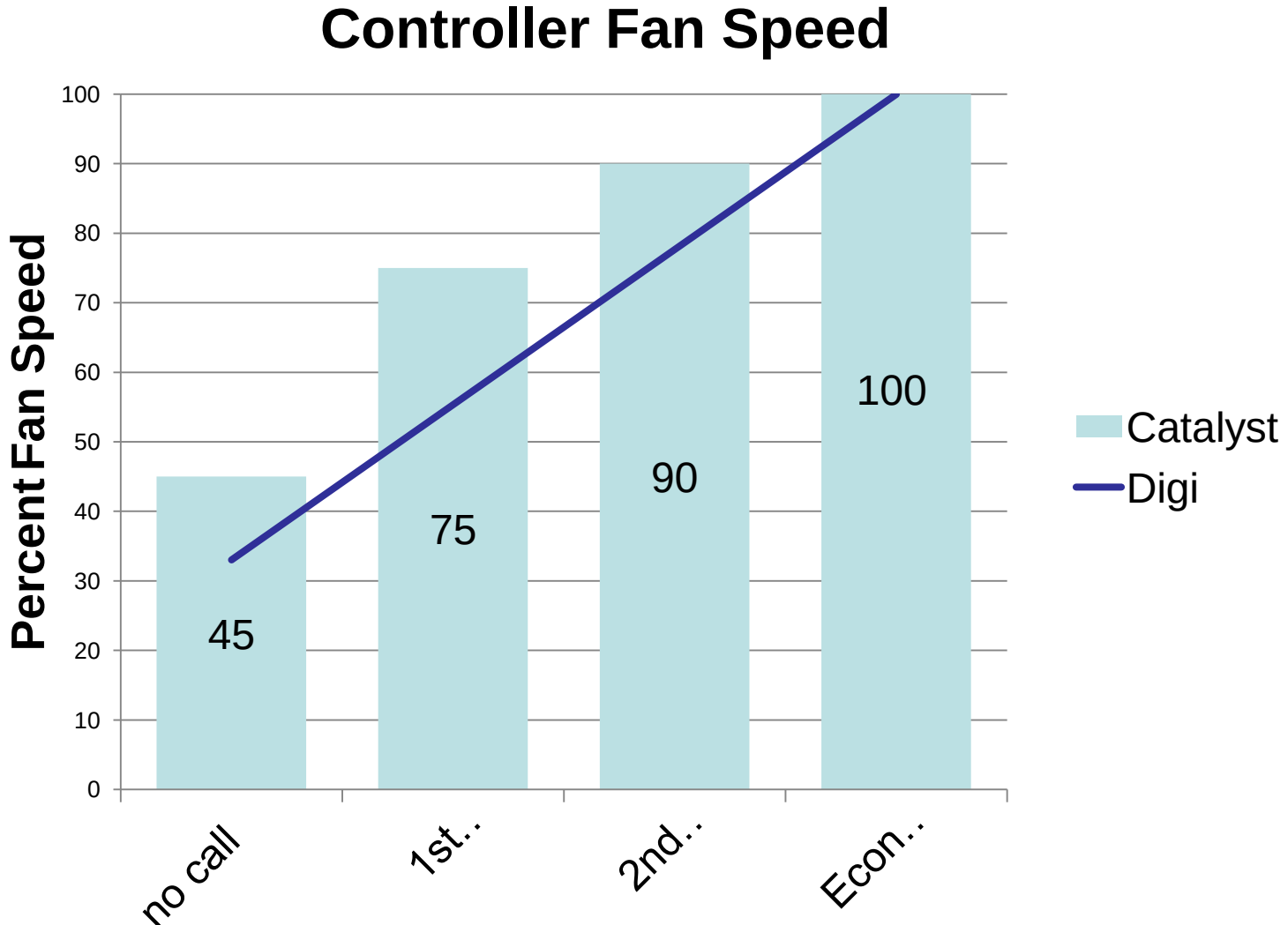


The Better Approach

Add advanced controls to existing RTU

- Definition of advanced controls:
- VFD control of supply fan and compressor or supply fan only
- Advanced Economizer functions
- Fault diagnostics and web based interface
- We've worked with Digi RTU and Catalyst

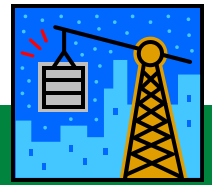
How do Controllers Work?



- Note: You need a properly functioning RTU before a controller is installed.

The Best Approach: DOE Challenge Qualifying Units

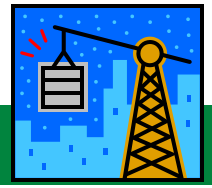
- Install new “high efficiency” >18IEER unit
- Not cost effective if existing RTU is functioning properly and is well maintained.
- Best when replacing failed units or scheduled replacement due to end of life
- R22 phase-out will have an impact on the market take-up



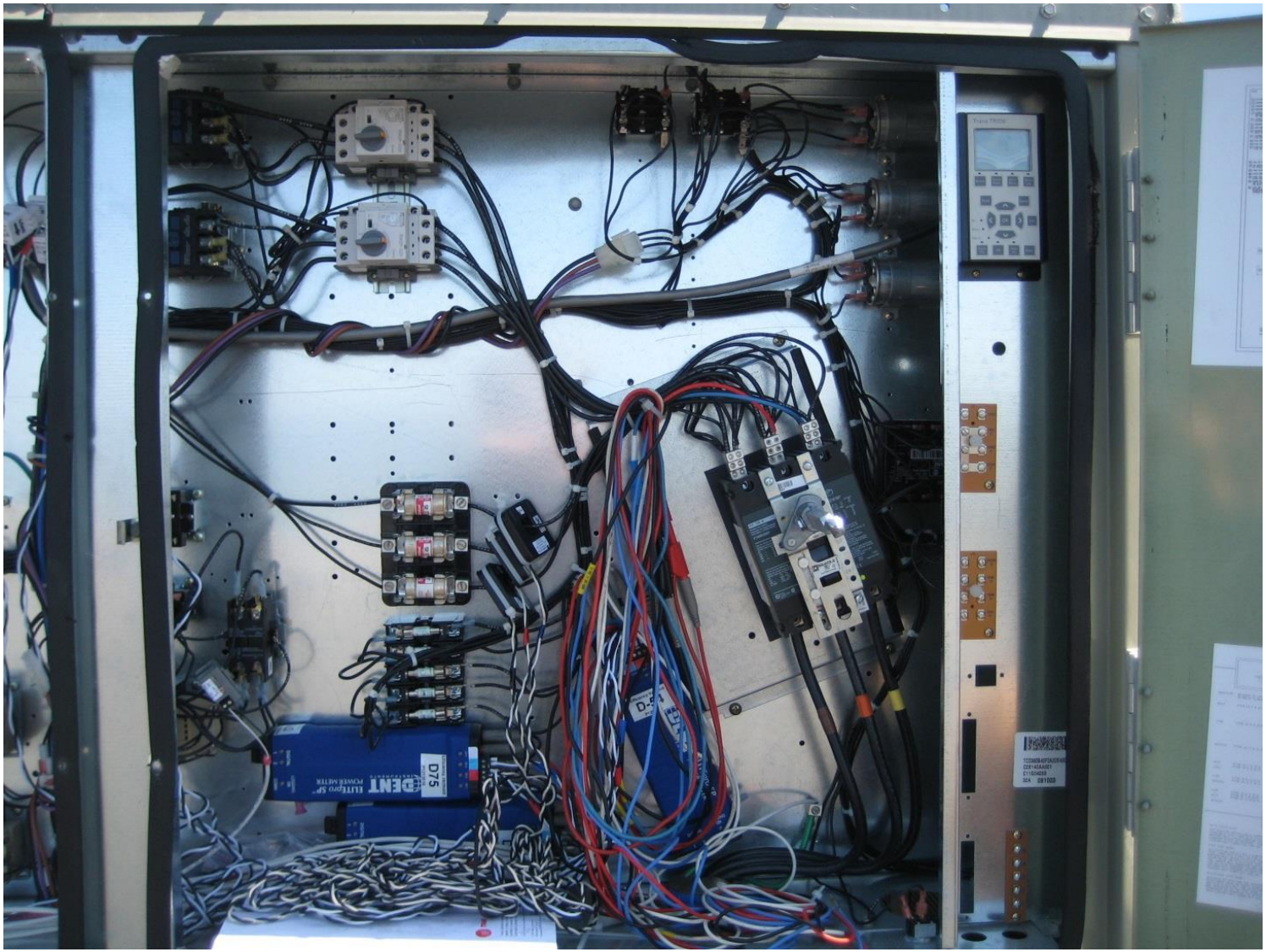
Potential Energy Savings

- Compared to a code compliant 10 ton RTU
- 5,000 KWH savings/Year
- 30 MMBTU savings/Year
- $1100-1600/year operating cost savings

- Conservative Incremental Cost $8,000
- Return on Investment 5-7 years



Efficiency Vermont RTU Pilot Results



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Pilot Scope

Location	Space Type	RTU Size Range	RTU Age Range	Number of RTU's Metered
Vermont Country Store	Mixed Use, Mainly Warehouse, some Office	8 to 20	13 to 21	6
Vishay	Light Manufacturing	10 to 15	1 to 12	5
Vermont Energy Investment Corporation	Office	8 to 30	2 to 10	3

What did we Find?

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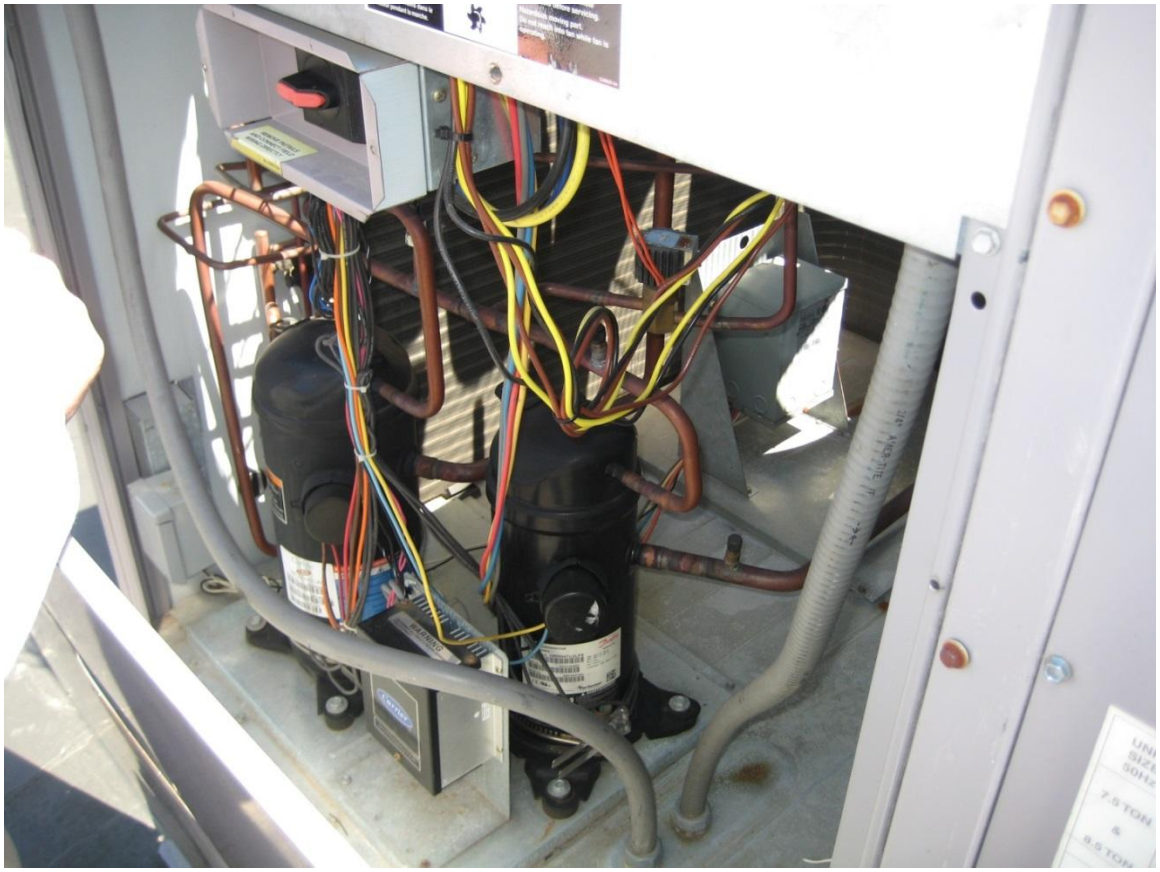
Inoperable Compressors



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Compacted Coils

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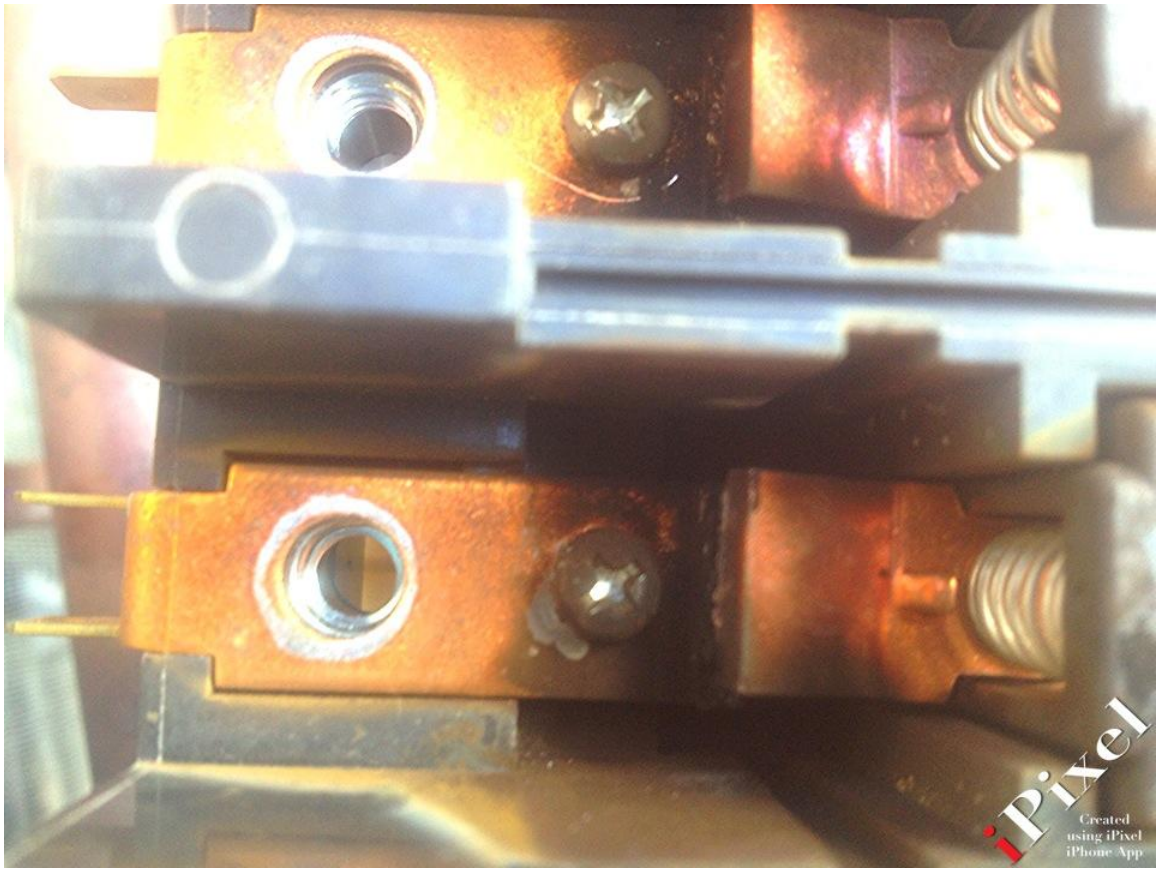
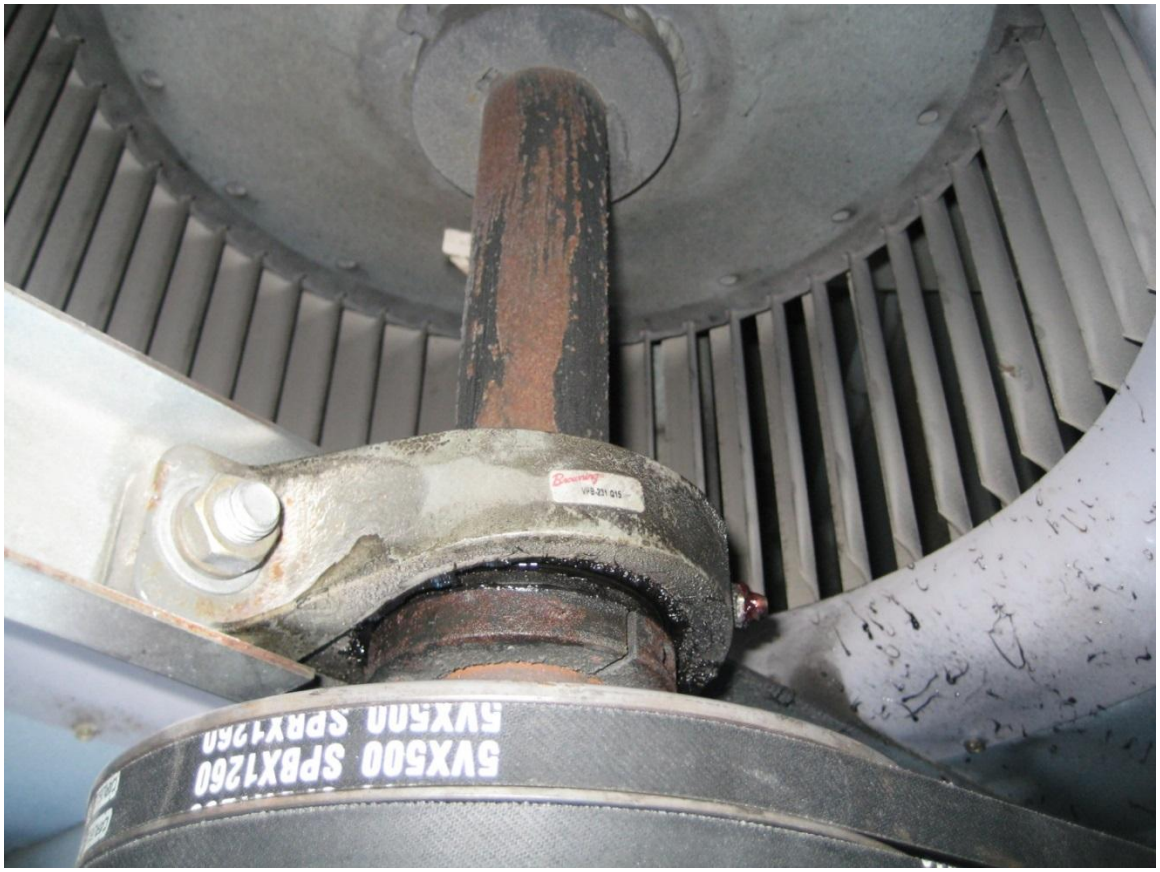
Corroded Contactors



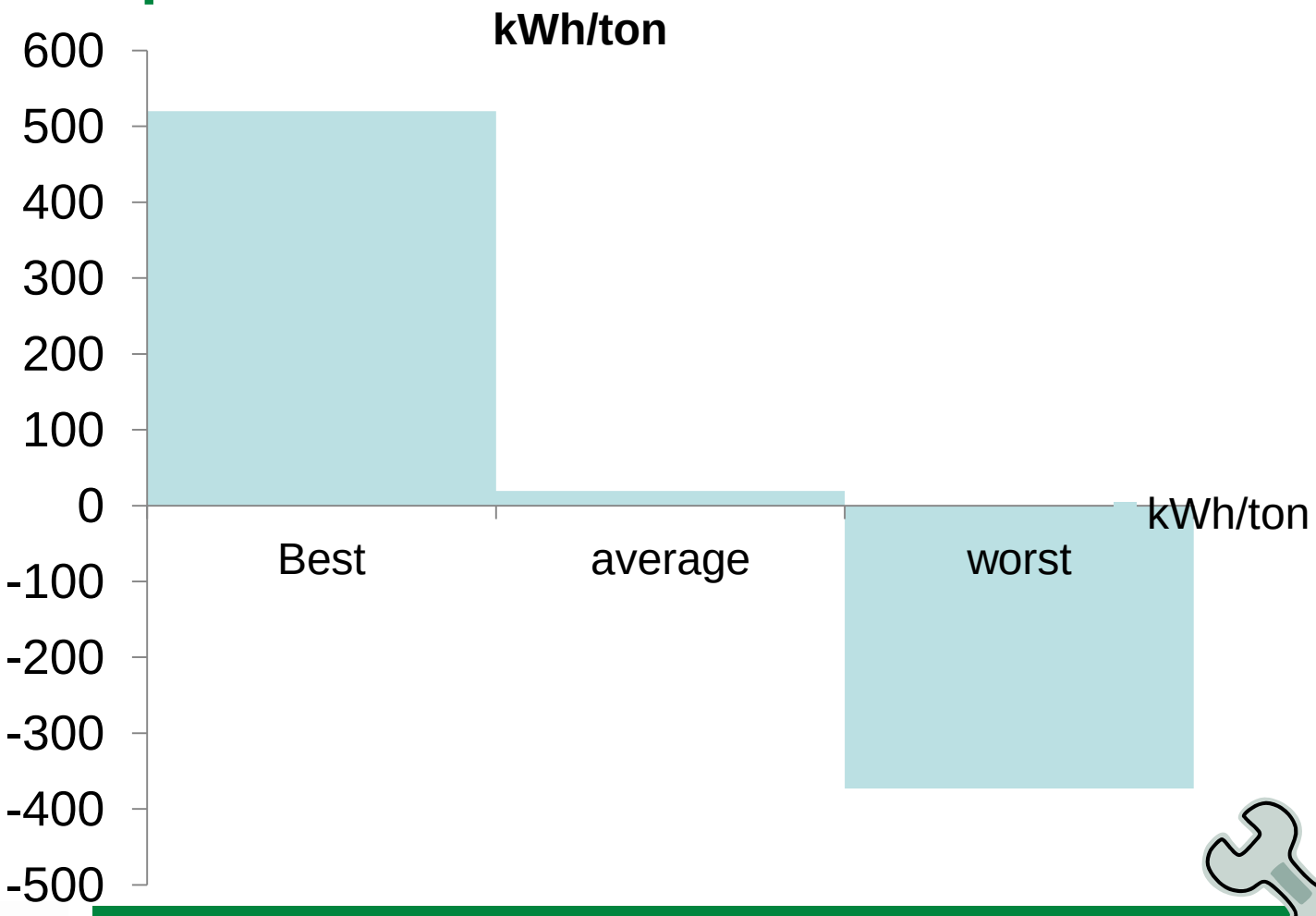
Worn Belts



Things to Watch out For

http://images04.olx.com/ui/4/28/53/1357337656_469672553_4-Bee-removal-silver-lake-save-the-bees-
213-928-7764-Services.jpg

What was the energy impact of the tune-up?



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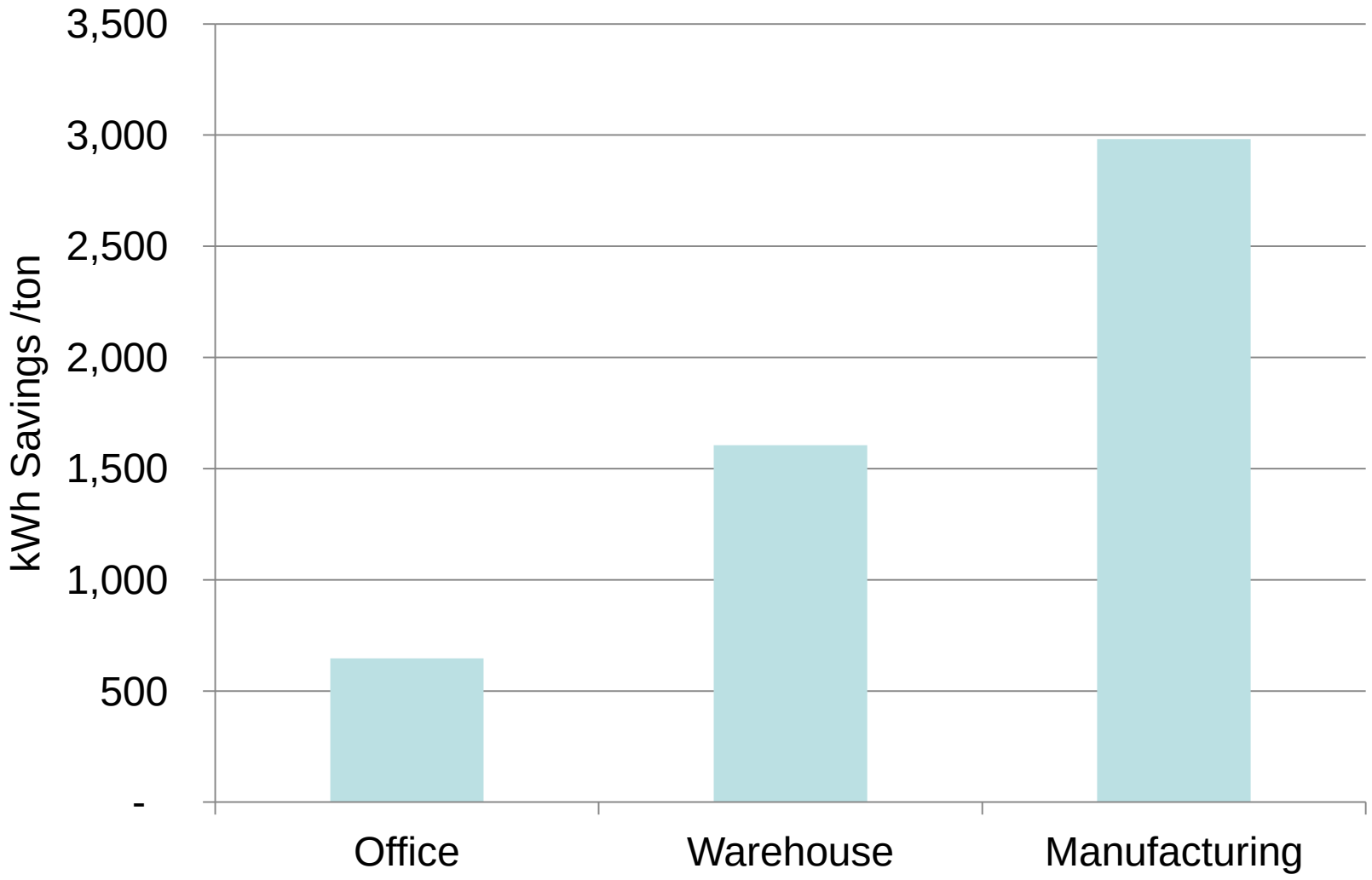
Controller Energy Savings per Ton



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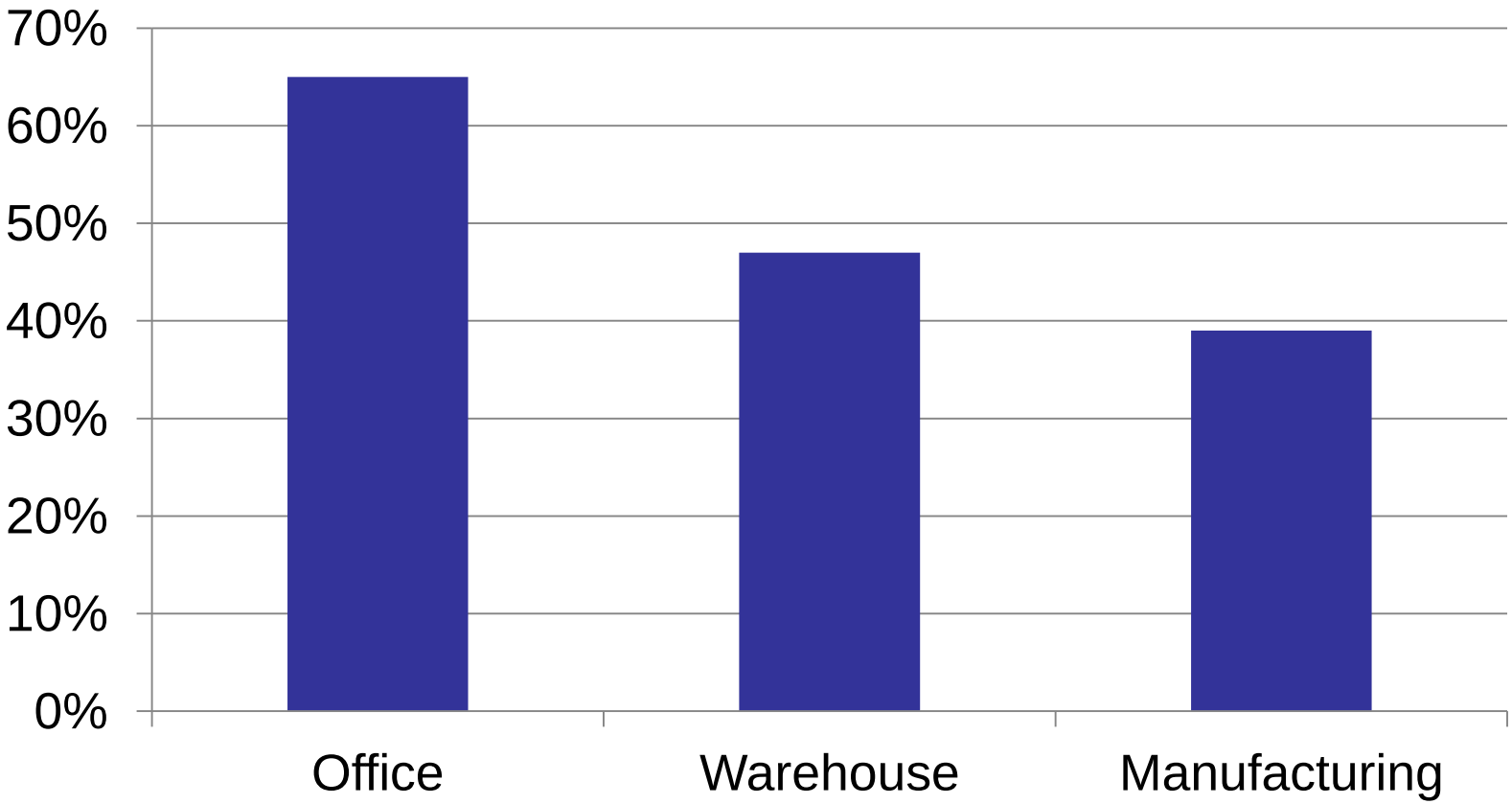
The Better Approach: Controller % Savings



Pilot Status

- Data will continue to be collected at phase 1 sites in 2014.
- Identification and metering of Phase 2 clients will begin in spring 2014.
- Installation of up to another 8 controllers in phase 2
- Published results of all pilot locations

Conclusion

- Options for existing RTU
- Cost effective solutions
- Path to energy savings