

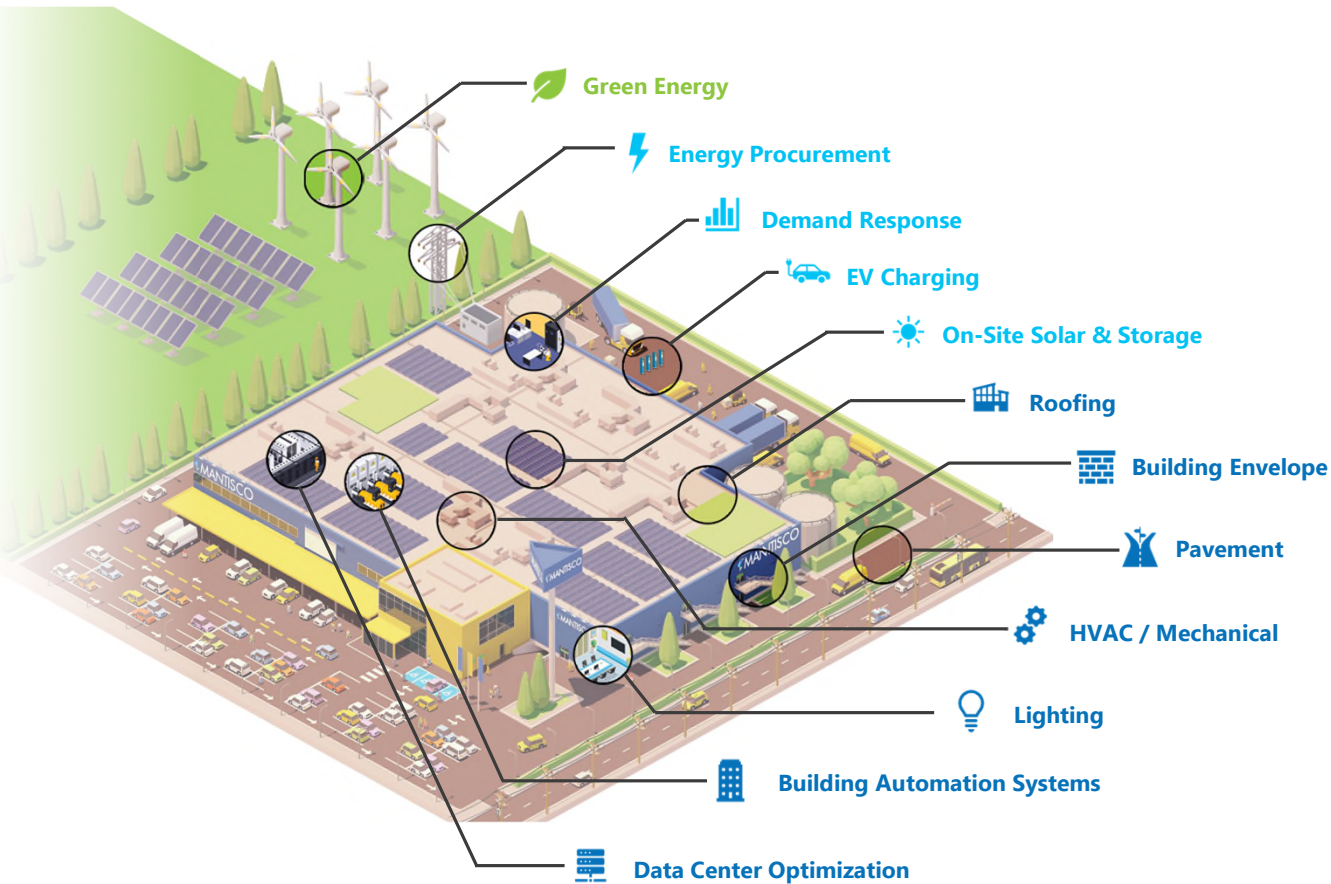


Dissecting Equipment (HVAC) Maintenance Agreements & Integrating Data Analytics

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About Mantis Innovation



Complete Facility Expertise Matters

Mantis Innovation improves global sustainability by delivering smart solutions that reimagine facility performance.

We bridge gaps between the board room and the mechanical room to optimize budgets and manage risk across the portfolio.

- Find the most cost-effective path to reducing carbon emissions and risk across your portfolio.
- Create an implementation plan that makes the most of your available budgets over time.
- Ensure successful project delivery as your unique plan becomes a reality.

Key points of today's presentation

▲ Repercussions of Maintenance Budget Cuts

- Deferred maintenance/liability
- Regulatory risk
- Sustainability goals

▲ Disrupters...Technology: BAS, Controls, and Fault Detection & Diagnostics (FDD)

- Cost for this technology has decreased
- Analytics have improved

▲ Capturing Maintenance Cost Savings

- Technology buy-in
- Restructuring maintenance contracts

Maintenance Contracts Variations

- ▲ As-Needed Maintenance Work vs Ongoing Maintenance Work
- ▲ Annual Maintenance Contract (AMC) vs Comprehensive Maintenance Contract (CMC)
- ▲ Corrective, Preventive, Risk-based, or Condition-based
- ▲ Time-Based Service vs Analytics-Based Service Contract

Options for HVAC equipment maintenance

How is equipment maintenance dealt with at your facility or facilities?

- A. In-house maintenance teams
- B. Original equipment manufacturer (OEM) technicians
- C. Third-party maintenance service providers
- D. A combination of the above
- E. Wait until it breaks down and deal with the emergency



Repercussions of Maintenance Budget Cuts

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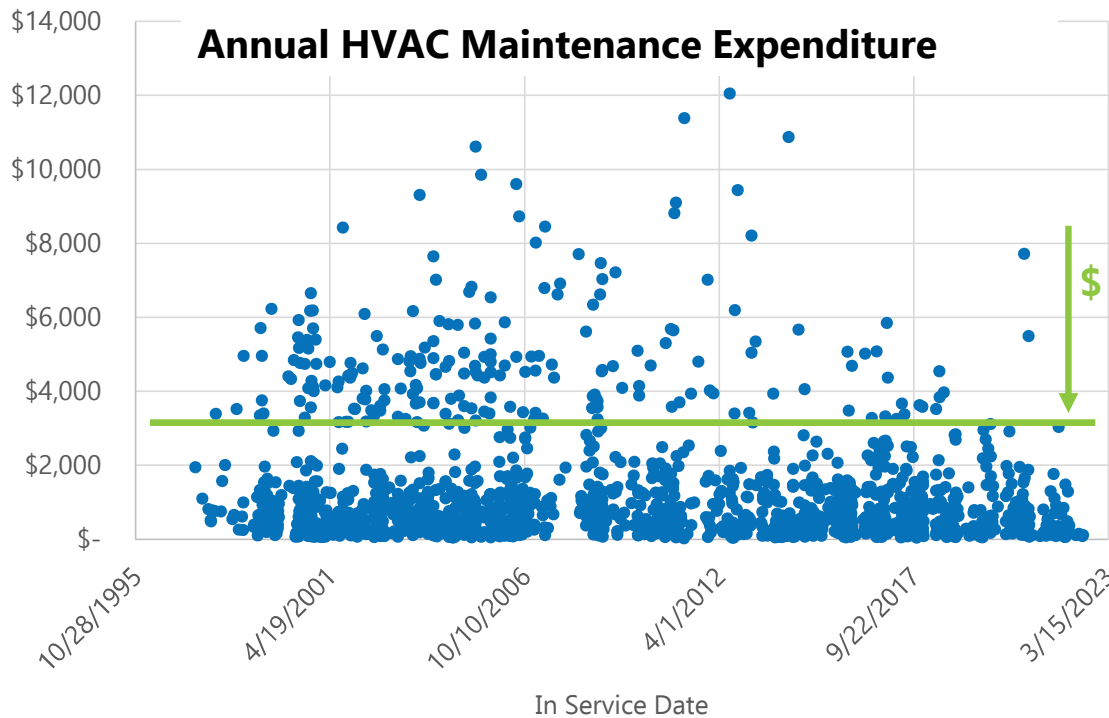
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Unchecked maintenance practices can create expenses all over the map



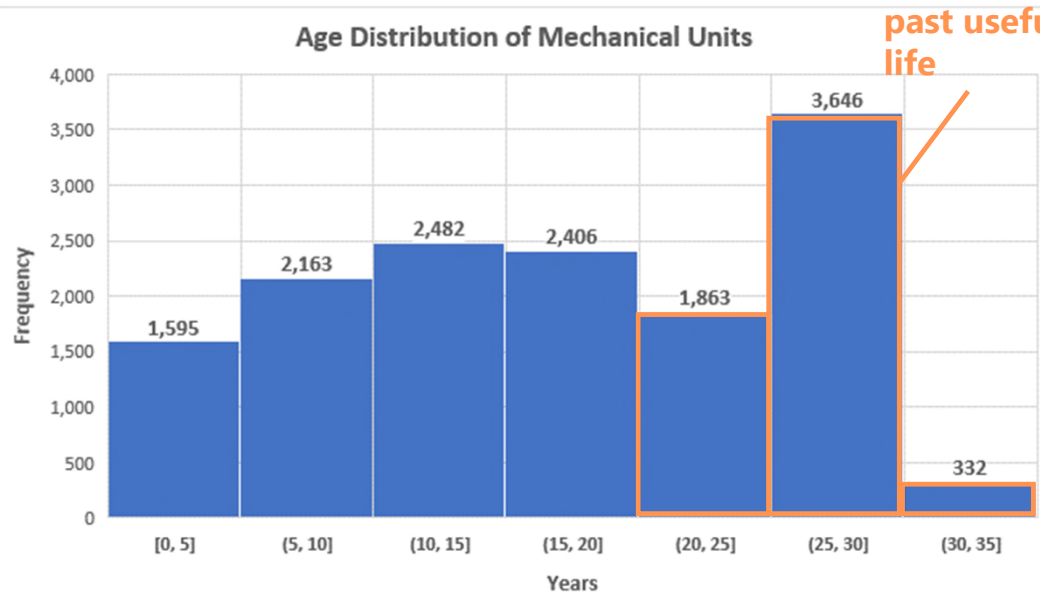
- 1800 assets - RTU or split system 1-10 tons
- 1600 required maintenance over the past 3 years \$1300
- reducing to \$3000 or less – (215 location) = over \$400,000/yr

Limited HVAC maintenance also creates risk of business interruption

Equipment and systems age beyond their useful life without anyone noticing and become a hidden liability

HVAC failure interrupts business operations and can destroy business value

Equipment past useful life



Source: Mantis client analysis of over 2500 sites, 14,50 assets

Extended Interruptions to Occupants

- HVAC failure interrupts operations
- Long equipment lead times extend the interruptions, often requiring temporary HVAC that is disruptive to occupants

Higher and More Volatile Replacement Costs

- Temporary HVAC to satisfy tenants while waiting for replacement is much higher cost than normal operations
- Unforeseen spike in replacement expenses could derail capital budgeting efforts

Poor Performance "Lock in"

- Emergency replacements are often "like-for-like" rather than smaller, cheaper, more efficient, and easier-to-maintain options

National and local regulations are phasing out refrigerants with high global warming potential

Federal laws are becoming more stringent over time⁽¹⁾

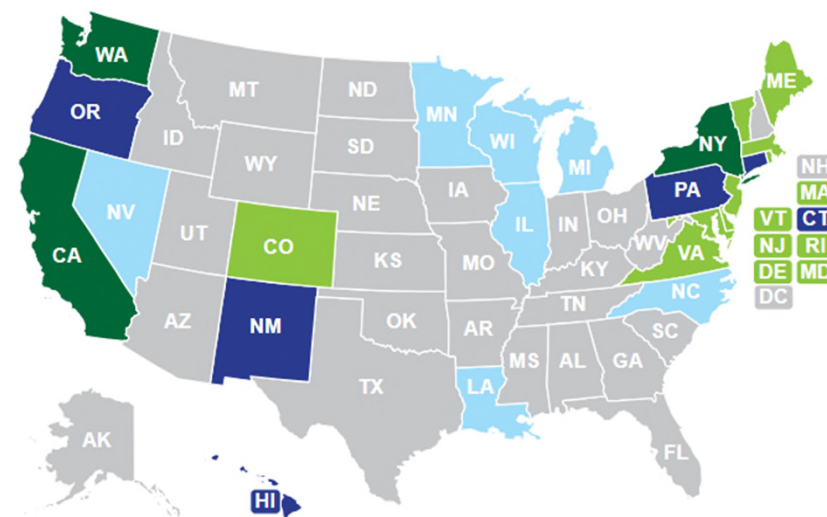
1987-1991: Montreal Protocol and Clean Air Act begin phase-out of CFC and HCFC (including R-22)

2020: AIM Act phases out HFC (including R-410A) and promotes next-generation refrigerants (A2L)

Risks:

- Cost increase: R22 prices increased from \$1/lb to \$50/lb during the phase out process; R410A prices should expect a similar escalation
- Fines: Companies face legal and regulatory penalties; EPA is authorized to assess fines of up to \$37,500 per day⁽²⁾

Colorado is more restrictive than federal law⁽³⁾



■ SNAP + Additional GWP Limits ■ SNAP 20/21 Signed Into Law ■ SNAP 20/21 Pending
■ US Climate Alliance Member

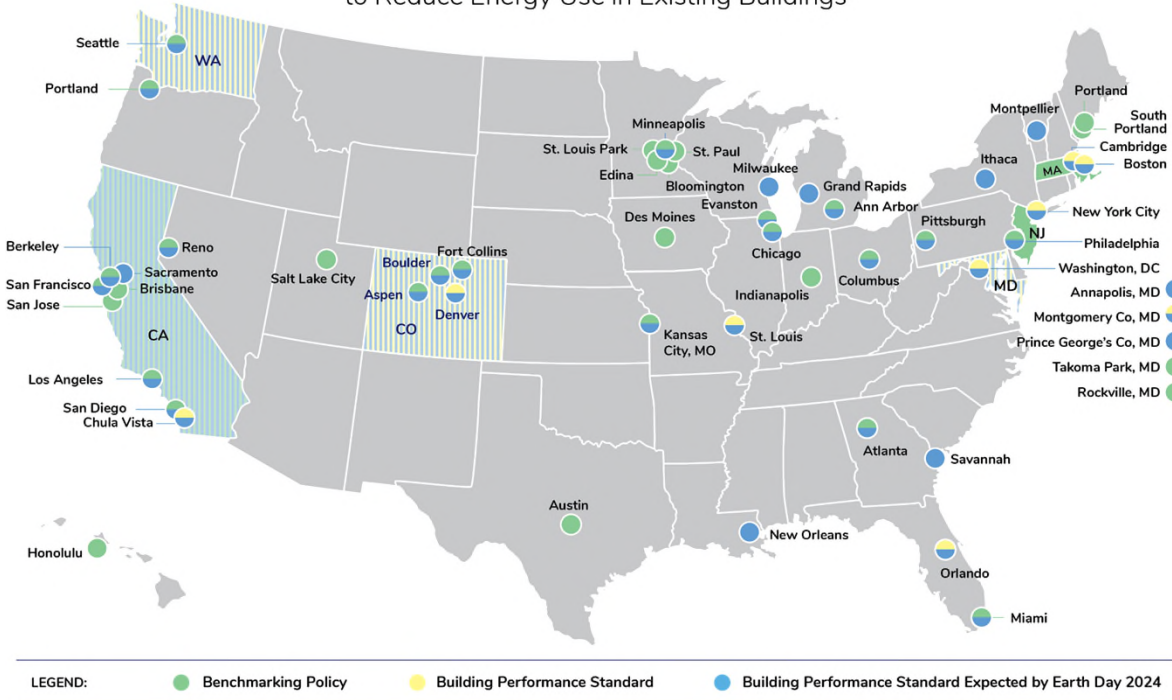
(1) <https://www.epa.gov/climate-hfcs-reduction>

(2) https://19january2017snapshot.epa.gov/sites/production/files/2015-08/documents/section_608_of_the_clean_air_act.pdf

(3) <https://nasrc.org/hfc-policy>

Local regulations are expanding across 20% of the building stock; forcing building owners to benchmark, disclose, and improve

Cities and States with Policies and Commitments to Reduce Energy Use in Existing Buildings

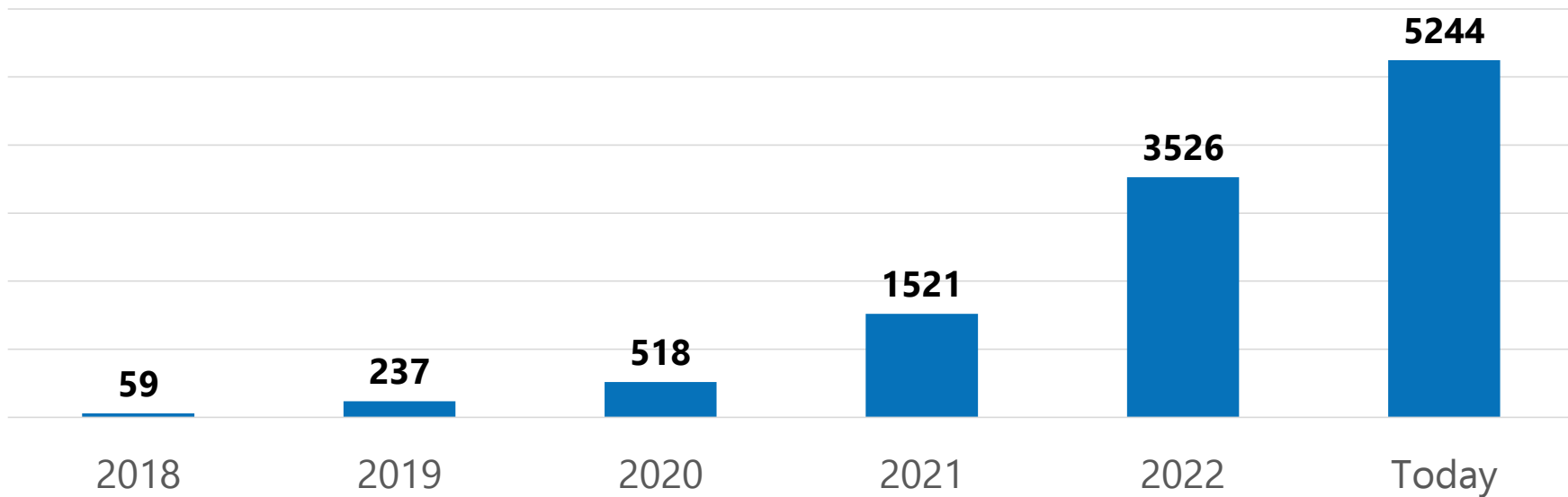


Energize Denver requires buildings 25,000+ square feet to meet energy performance requirements:

- Hotel EUI (kBtu/sf/yr) must be at or below 61.1 by 2030 with interim targets in 2024 and 2027¹
- Building owners who don't meet the targets will be subject to penalties of \$0.30/ft² per kBtu not achieved²
- The City has [rebates, incentives, and financing options](#) to support building owners meeting performance standard requirements³
- Compliance status for Denver's Benchmarking Policy and interim targets for the Performance Standard can be found on the [Energize Denver disclosure](#) website

Companies are committing to portfolio-level Greenhouse Gas (GHG) emissions reductions

Number of companies with Science-Based Net Zero Targets (cumulative) ⁽¹⁾



(1) <https://sciencebasedtargets.org/>; updated June 2023

Disrupters with Technology

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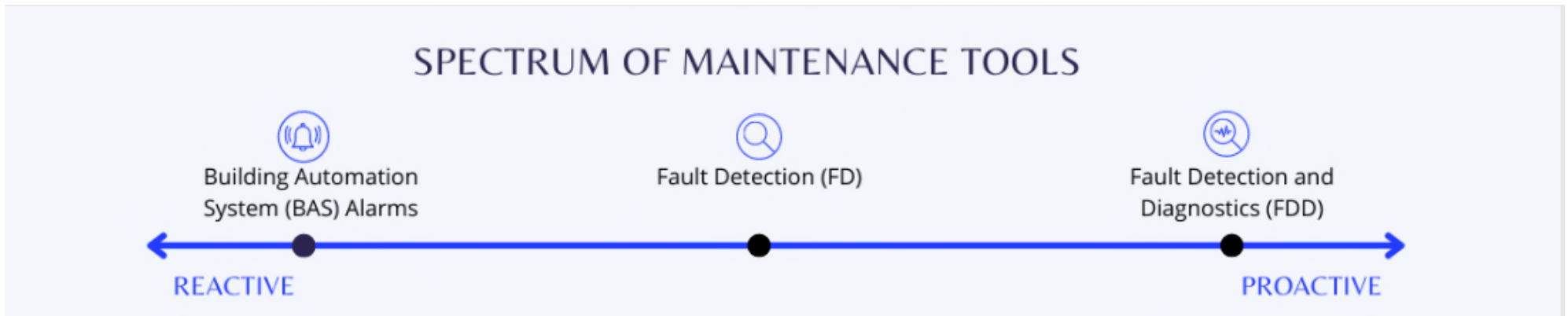
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▲ Capturing Maintenance Cost Savings

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Remote building monitoring, control and analytics are disruptive forces for cost-effective maintenance

- ▲ Fault Detection & Diagnostics (FDD) = Data Analytics: identifies faults in HVAC systems and provides advice about how to address those problems.



Remote building monitoring, control and analytics deliver integrated benefits



More Efficient Maintenance Operations



Better Occupant Experience



Improve Sustainability



Reduced Capital and Operational Expenses



Workforce Development & Resiliency

The market for monitoring and analytics capability has exploded

Types of Vendors

- ▲ Software as a Service (SaaS)
- ▲ Feature on the Building Automation System
- ▲ Tool for service provider

Important Considerations

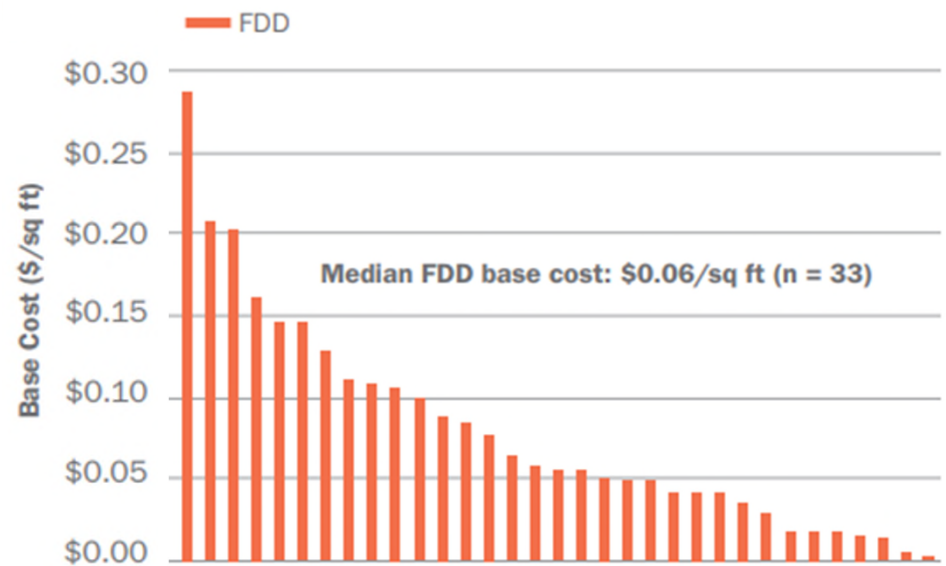
- ▲ The Why – Benefits
- ▲ The Who – Internal user groups and third-party service providers
- ▲ The How – How will they use it
- ▲ The Where – Deciding which buildings:
 - is the building complex
 - is there a portfolio of buildings
 - is there sufficient and available data
 - is energy or carbon performance poor

Cost for monitoring equipment remotely

Cost Considerations

- Hardware cost/control upgrades
- Software Set-up cost ~ \$0.06/sqft
- Software subscription
 - \$0.02 - \$0.12/ sq ft /yr
- In-house labor or consulting services
 - 25 - 250 hours/bldg/yr
- Change management
 - In-house labor and/or consulting

Set-up cost: wide range driven by building size and number of items being monitored



Capturing Maintenance Costs

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Keys to success: (1) Proper vetting and procurement

1. Establishing a multi-disciplinary buying team
2. Speed to value
3. Business health/longevity
4. Proven to drive action
5. Scalability
6. Interoperability
7. Support and services
8. Cybersecurity
9. Accurate, automated analysis
10. Automated diagnosis and prioritization

Keys to success: (2) Restructuring maintenance contracts

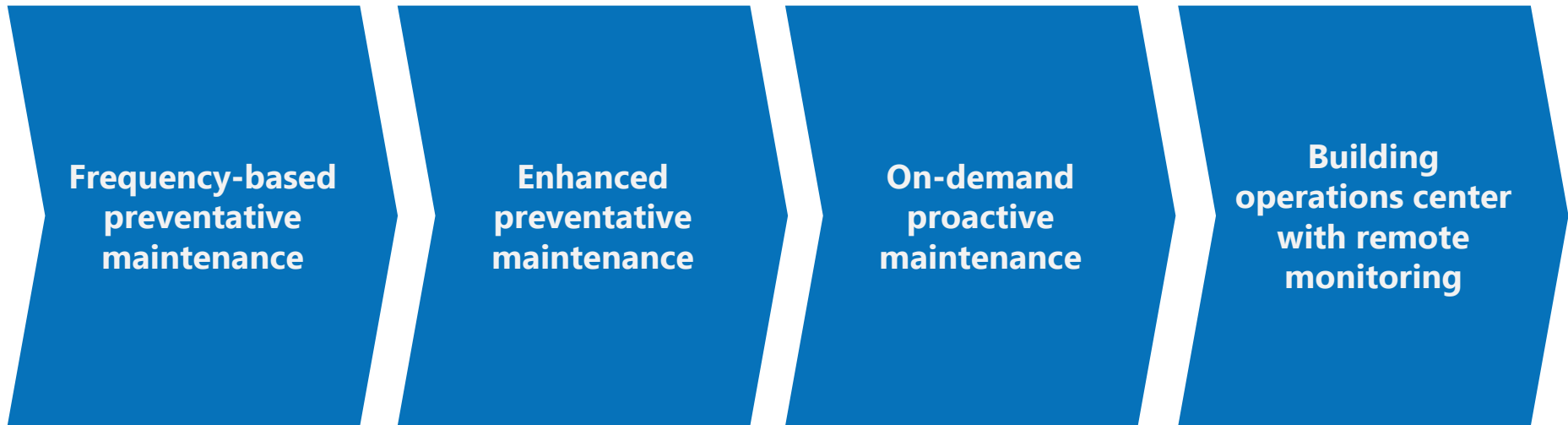
Time-Based Service Contract

Versus

Analytics-Based Service Contracts



The migration plan for analytics-driven maintenance



Case Studies

▲ [Better Buildings - Scaling up HVAC Fault Detection in a portfolio - Kaiser Permanente](#)

- Pilot - 8 buildings in different markets 5.5M SqFt
- 2.5-year payback with savings - \$579,000/ yr
- Now at 150 sites – 16.5MM SqFt

▲ [Nexus Labs - University of New South Wales \(UNSW\) w/Tom Balme \(Nexus Labs\)](#)

- Used FDD to restructure the maintenance agreements
- Reduced annual maintenance costs by 21%

▲ [Clockworks Analytics - University Of Iowa's FDD Program](#)

- 47 buildings, 6.8M SQFT, \$2.5M in annual savings

Key takeaways of today's presentation

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Thank You!
Questions?

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