LEAD.
EXECUTE.
DELIVER.

NDHES
North Dakota Healthcare Engineering Society

Helping ND Healthcare Achieve their Facilities Objectives

Johnson Controls

Introduction

JON PAUL

Senior Account Executive

Fargo, ND

YEARS OF EXPERIENCE

- 6 years with Johnson Controls
- 17 years in construction & facilities management

EDUCATION & TRAINING

- Bachelor of Science, Construction Management – North Dakota State University

PROJECT EXPERIENCE

- Deferred Maintenance Assessments
- Planned Service Agreements
- HVAC Retrofits
- Controls Upgrades
- Long Range Planning
- K-12 Referendums
- Building Wide System Integration Projects
- Mechanical Design-Build
- CM – Agency
- CM – At Risk

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Group Exercise

WHO MANAGES A FACILITIES STAFF?

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Group Exercise

WHAT FACTORS
ARE LIMITING
THE FULL POTENTIAL
OF YOUR FACILITIES STAFF?

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Agenda

- ✓ Leveraging Technology to Improve Facility Operations
- ✓ The Hidden Cost of Deferred Maintenance

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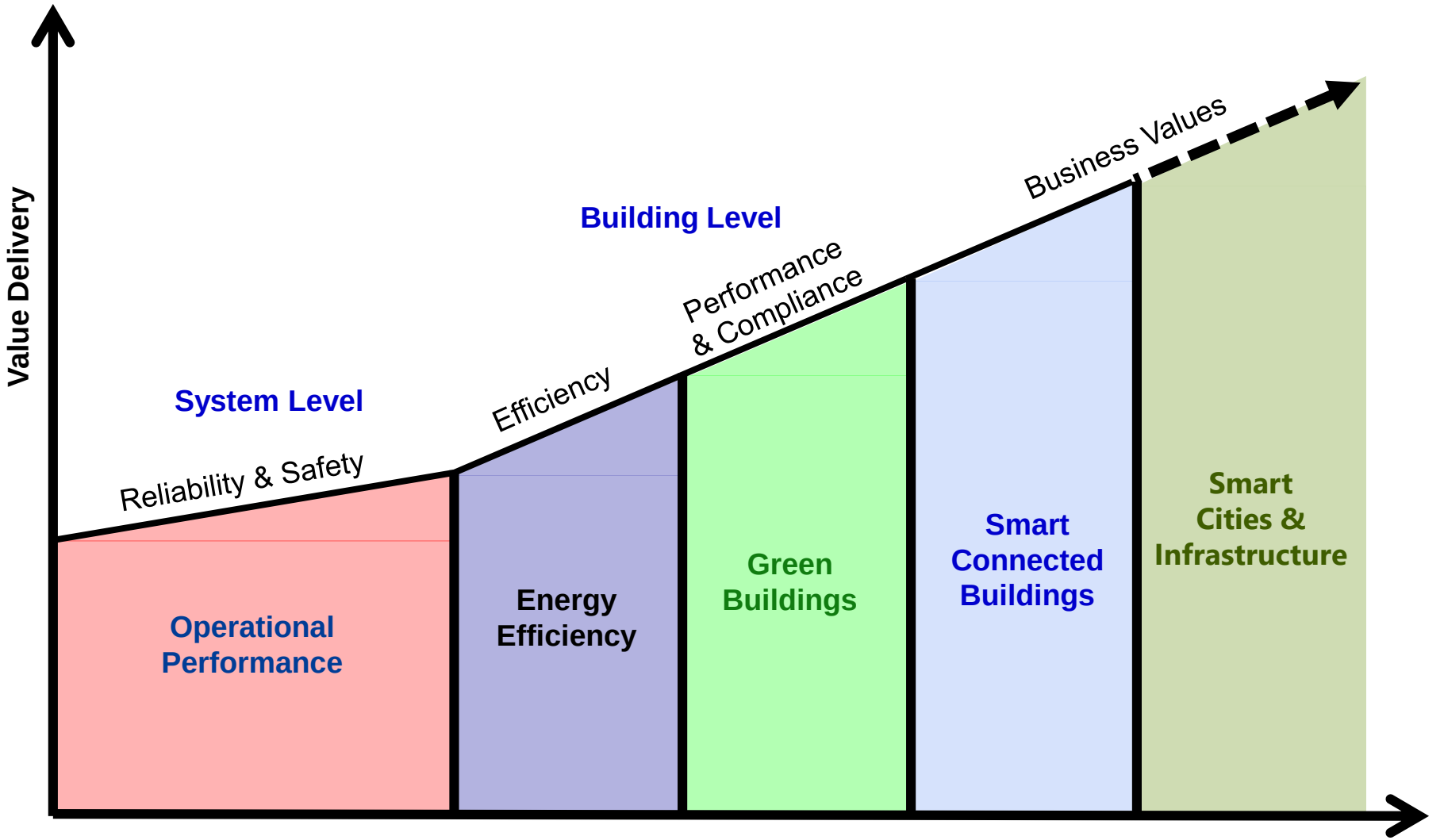
Leveraging Technology to Improve Facility Operations

Evolution of the building industry



You’re at the center of many challenges.

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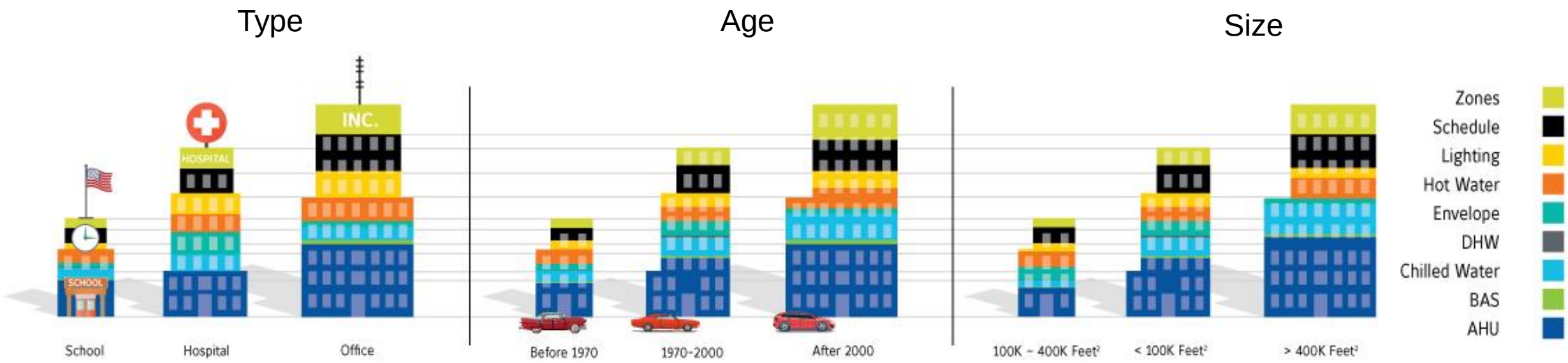
Nearly every building has common operational problems
and is paying the price in energy and other operational issues



Comfort & Environmental Control

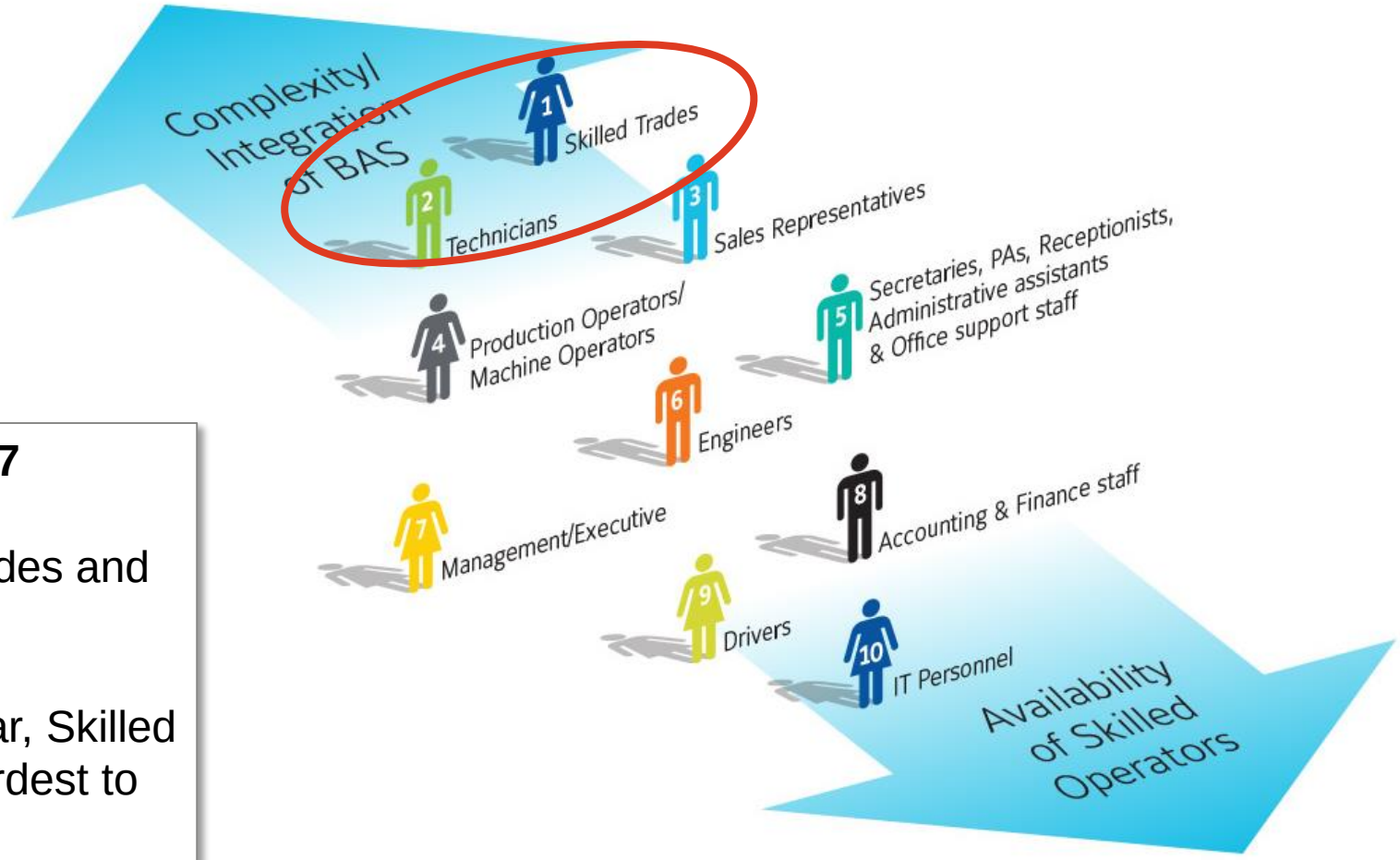
Operator Productivity

Energy & Reliability

Cybersecurity Risk

Source: Pacific Northwest National Laboratory (PNNL) “Improving Commercial Building Operations thru Building Re-tuning: Meta-Analysis”

Difficulty addressing issues stems from increasing system complexity/ integration and a lack of skilled operators



Results of Manpower 2016-17 Talent Shortage Survey

- In the Americas, Skilled Trades and Technicians are the hardest positions to fill
- For the fifth consecutive year, Skilled Trades positions are the hardest to fill globally

Source: Manpower 2016/2017 Talent Shortage Survey

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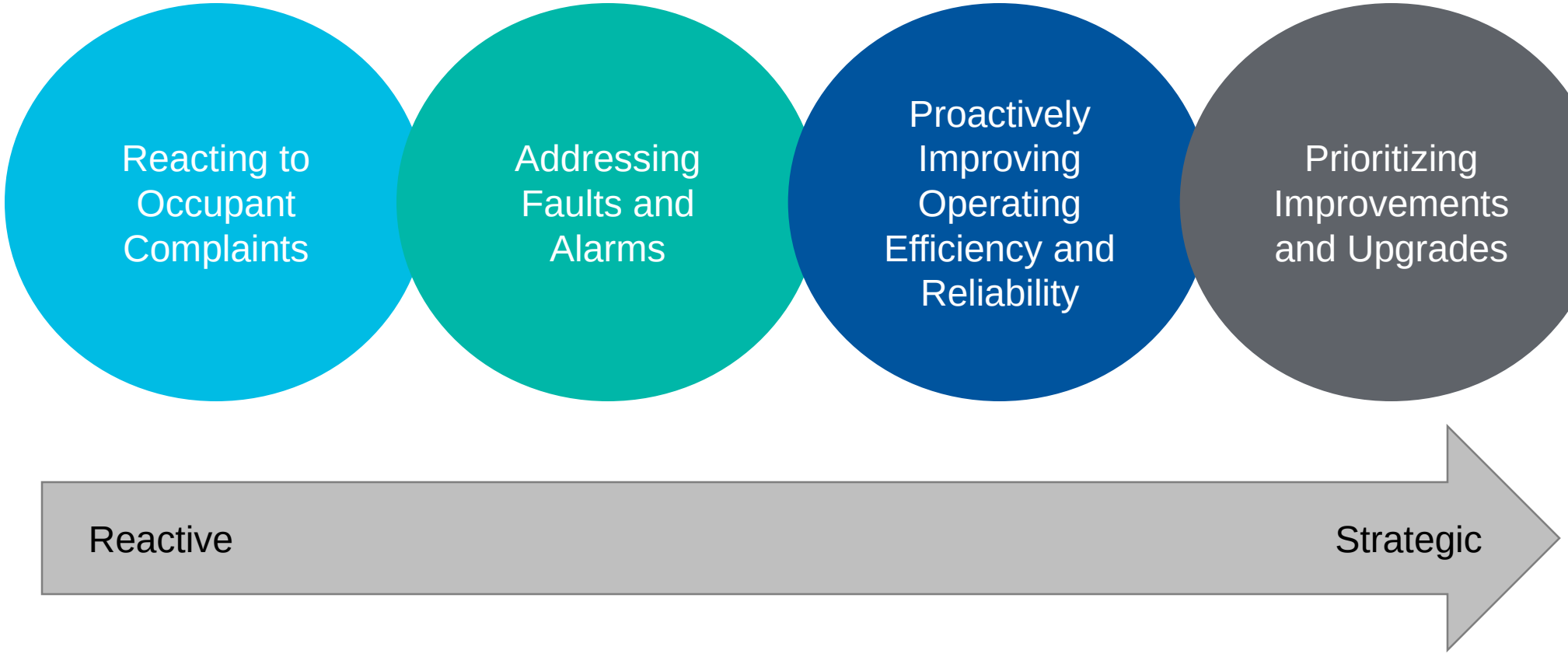
Technology can help fill the gap to shift from a reactive to strategic approach



How do we move from reactive firefighting to a more strategic approach?

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Delivering key outcomes

Reduce energy consumption & spend

Achieve sustainability goals and stay compliant

Proactively diagnose and resolve issues

Demonstrate payback on building investments

Improve Tenant Management Experience

Energy Management Features	Equipment Management Features	Asset Maintenance Features	Tenant Management Features

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Technology for improving maintenance effectiveness

Level	Technology Examples
Equipment	• Predictive Technologies • Smart Connected Equipment
Building Automation Systems	• Performance Verification
Enterprise Dashboard	• Building Enterprise Management
Support and Infrastructure	• Service Management Platform • Training and Support • Remote Operations Center • Centralized Operations Support Center

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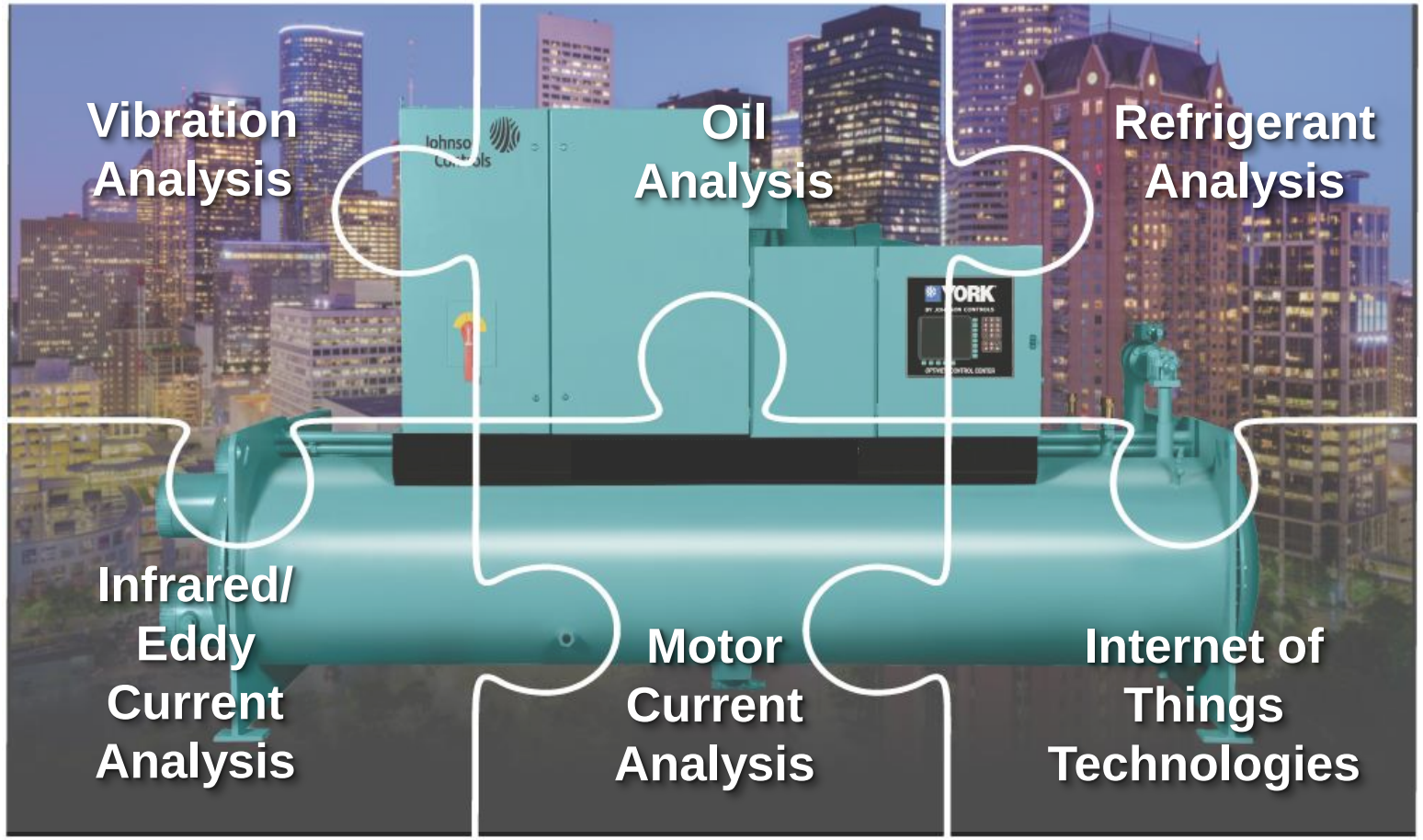
Predictive/IoT technologies provide a complete picture of equipment health/performance that helps avoid failures and improve operations



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Johnson Controls approach to predictive testing

Focus on HVAC Equipment

Centralized approach

Statistical approach to analysis

27,500

chillers analyzed in the last 5 years by the Johnson Controls Centralized Predictive Team

12,242 – York (9000 YKs)
4,656 – Trane
4,878 – Frick
2,578 – Carrier
1,200 – McQuay

Why is this Important?

Group like machines together (Same Make and Model)

↓

US Patent 7124637 - Determining amplitude limits for vibration spectra

↓

Statistically Derived Limits for each major Component

↓

Factory Support

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What are the challenges in operating a chiller plant?

Even with all the technology we have, we still have technicians manually logging chiller data.

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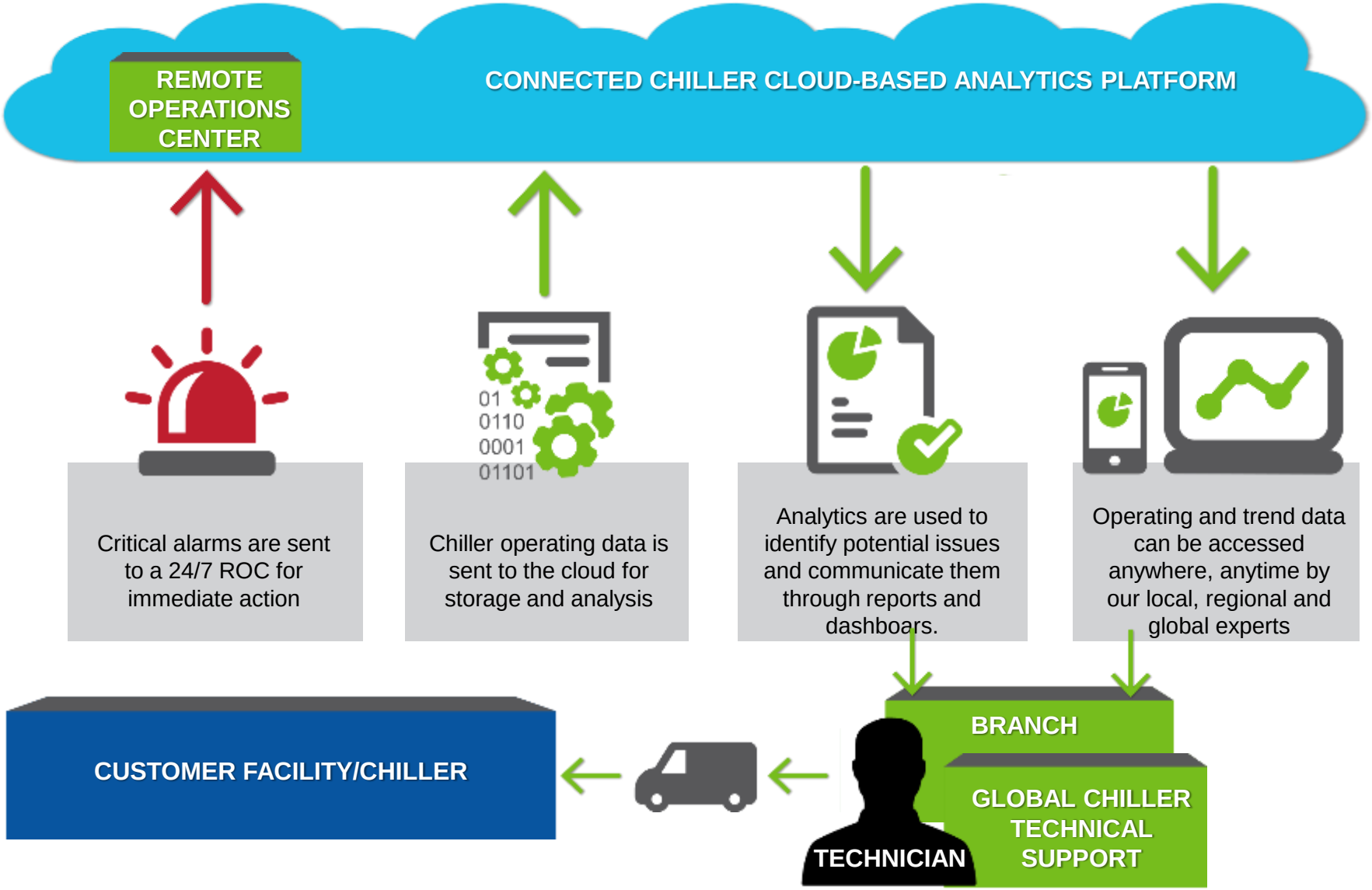
How can we use technology to help?



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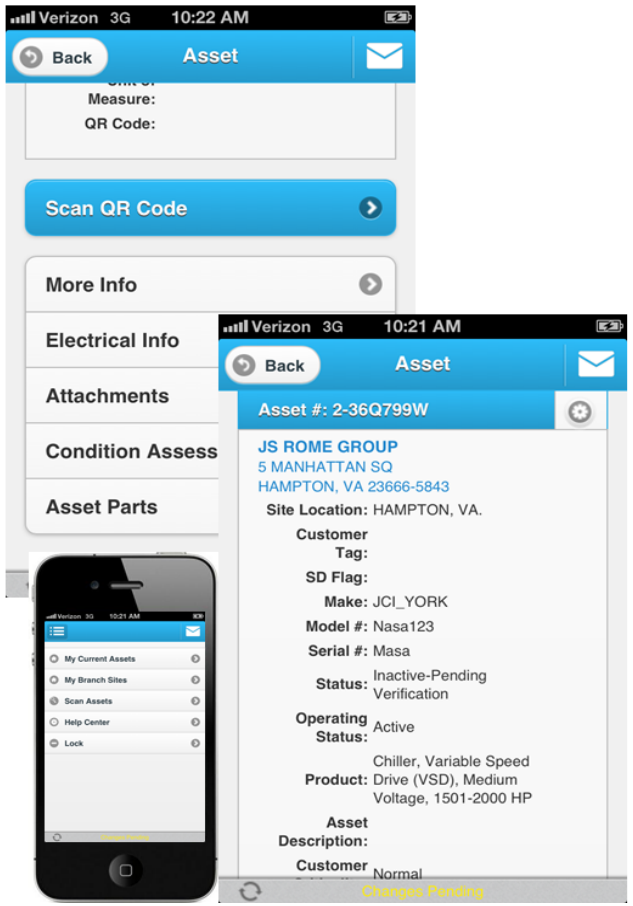
Leveraging Technologies - Capabilities

Technology Applications



Features & Benefits

- Software and hardware agnostic (ios – Android – Windows) compatible – Interface to CRM
- Safety Jobsite assessments and audit functionality
- Quoting standards – Technician quick quotes
- Refrigerant tracking and reporting
- GEO fencing – Dispatch activities include site address and driving instructions
- Capture client signature & email service report to client – Real-Time
- Easily view asset and service history
- Quick efficient asset creation by Service Technician
- Asset condition assessment and recommendations
- Barcode scanning / QR codes
- Access ROC - Site and asset operations data - Predictive Diagnostics data
- Connected Services – ROC and Technician 24/7 Chiller monitoring - Operation data – Customer Trend Reports -Customer chiller health reports

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Predictive Maintenance – Mobile Gateway

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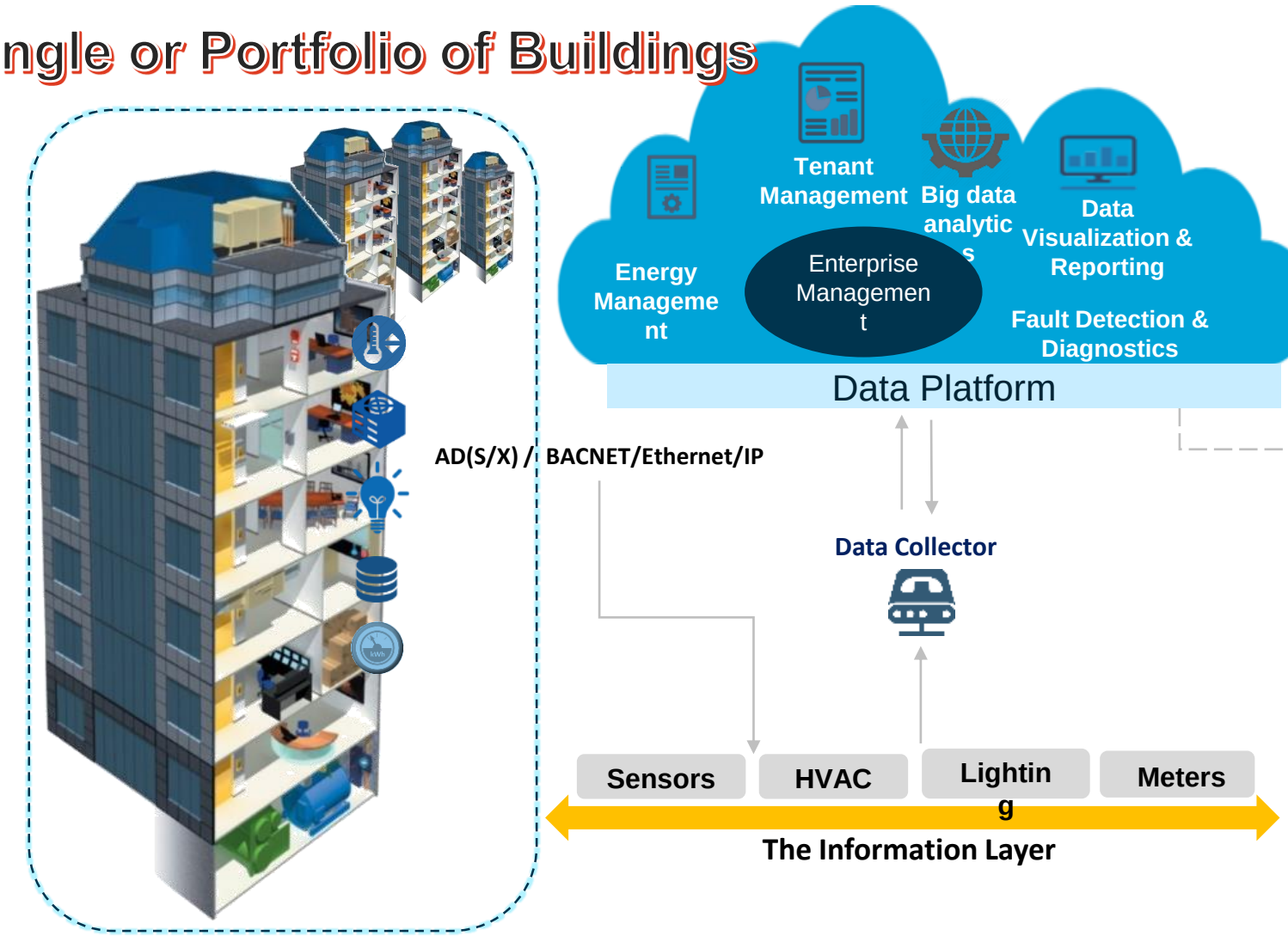
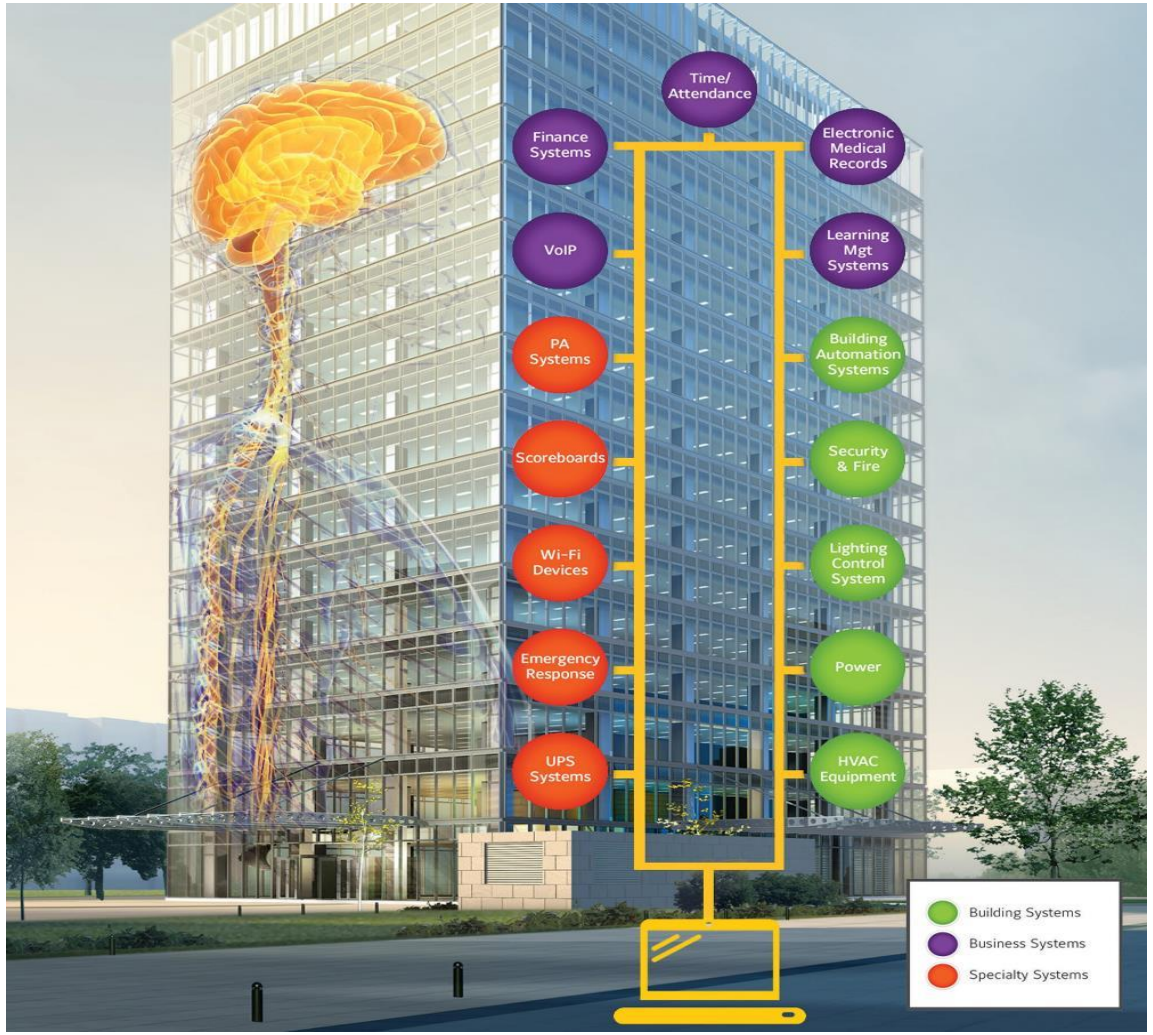
Portfolio wide energy savings & optimization



Offerings	Business value for customer
Automated fault detection and diagnostics	Ensure minimum downtime of critical equipment
Baseline Tracking	Drive a unified mission across different roles in the organization
Peer – Peer Benchmarking	Achieve sustainability and compliance goals
Plant room monitoring and KPI's	Demonstrate payback on building investments
Energy, Equipment & Tenant KPI's	Communicate energy information for management review, regulatory reporting and operational debriefs
Comfort factor monitoring	
Work orders to maintenance team	Gain insights on enterprise wide performance and prioritize actions

Buildings are complex to maintain



- Lifespan of **40+** years outlives most systems
- Mix of systems, suppliers and protocols
- Dynamic ecosystems
- Changing regulations and building codes over time

The Deferred Maintenance Challenge

- What is Deferred Maintenance?

  “Maintenance and repairs that were not performed when they should have been or were scheduled to be and which are put off or delayed for a future period.” - Federal Accounting Standards Advisory Board

- Business impact of deferring maintenance
  - Risk to business continuity
  - Energy consumption
  - Repair costs
  - Equipment lifecycles

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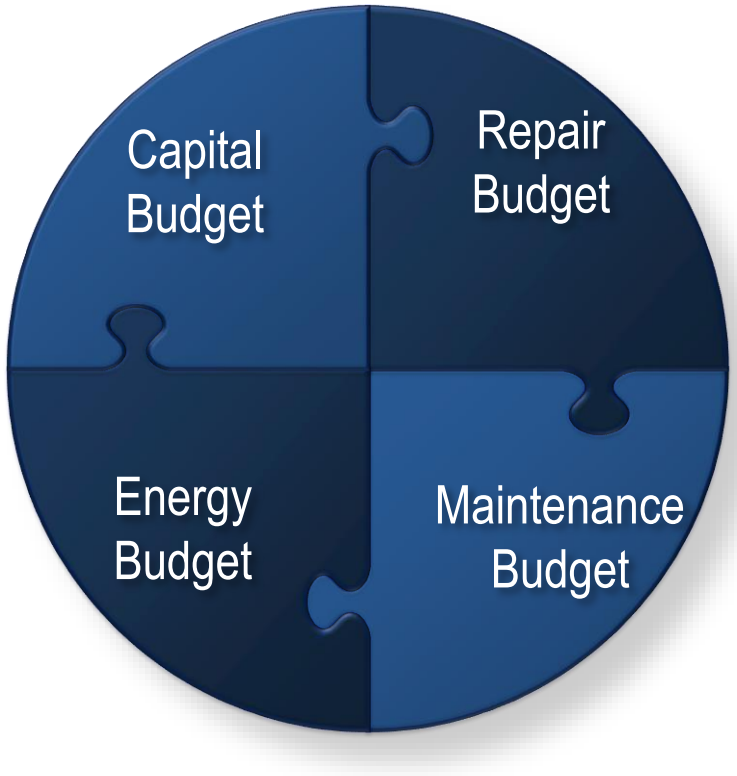
The Hidden Cost of Deferred Maintenance

You manage budgets that are complex and interrelated



Underinvesting in maintenance
can have unintended consequences to repair capital and energy budgets

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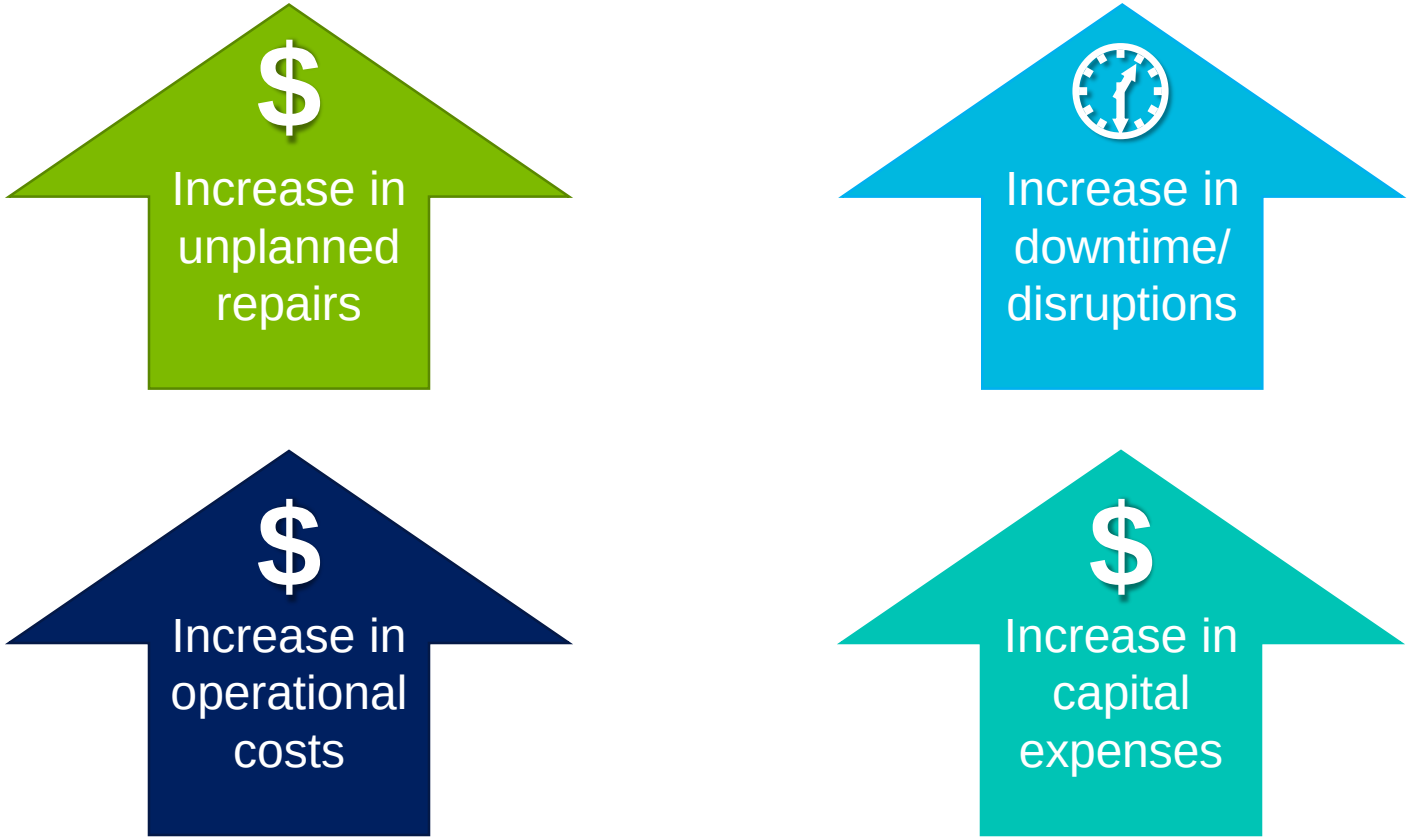
Although deployed as a savings measure, deferred maintenance has hidden costs



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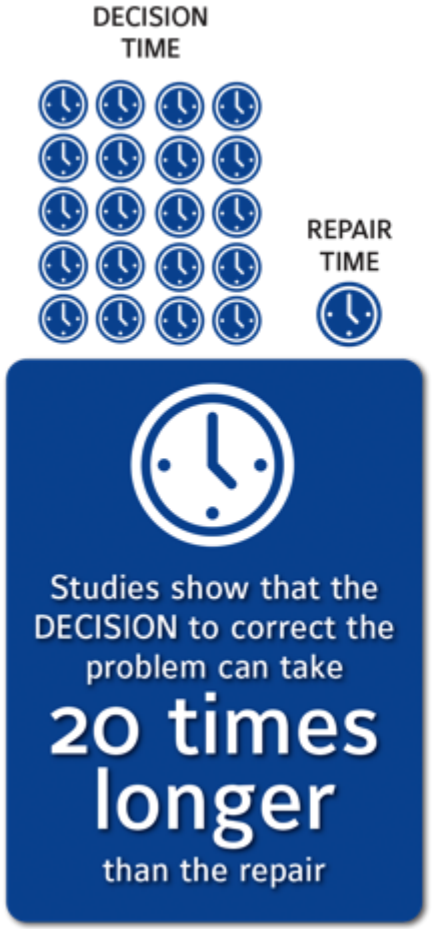
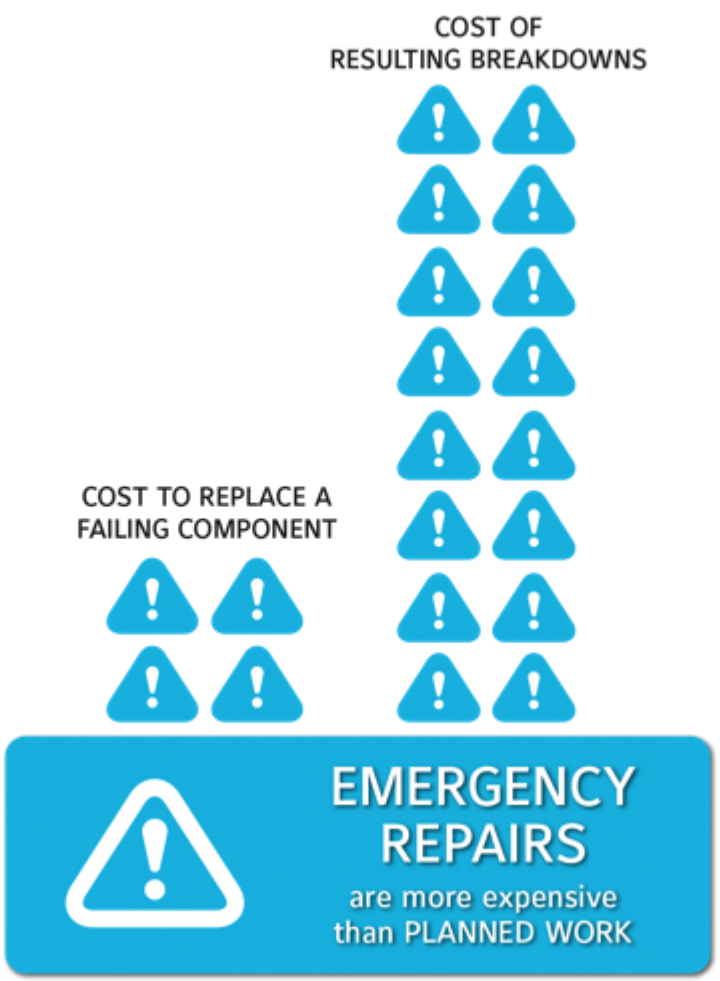
Unplanned failures have consequences in terms of time and money – both opex and capex



RELIABILITY AND FUNCTIONAL AVAILABILITY OF HVAC SYSTEMS Sonny Myrefelt, *Dep. of Build. Serv. Eng., KTH, 10044 Stockholm, Sweden, and SKANSKA Sydost, Växjö, Sweden.*



David Tod Geaslin – *Reversing the Cycle of Deterioration in the Nation's Public School Buildings*, The Council of the Greater City Schools, October 2014. Maintenance Excellence: Optimizing Equipment Life-Cycle Decisions By John D. Campbell, Andrew K.S. Jardine.

In fact, we have found that $1 spent in stewardship avoids $3 in capital reinvestment. – Sightlines, 2014

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Poorly maintained systems also use more energy

Issue	Energy penalty
Suboptimal refrigerant levels	20%
Compressor leaks	15% for every 1° F increase in condenser leaving water temp
Oil contamination in refrigerant	2% for every 1% oil in refrigerant
Economizer failure	14-40%
Thermostat, sensor and control problems	Up to 40%

Institute of Building Efficiency article, "*HVAC System Maintenance Saves Energy*"

The impact of maintenance issues on building energy can reach up to

85%

of overall HVAC source energy use

HVAC Faulty Operations and Performance Degradation due to Maintenance Issues
Liping Wang, Tianzhen Hong. Environmental Energy Technologies Division

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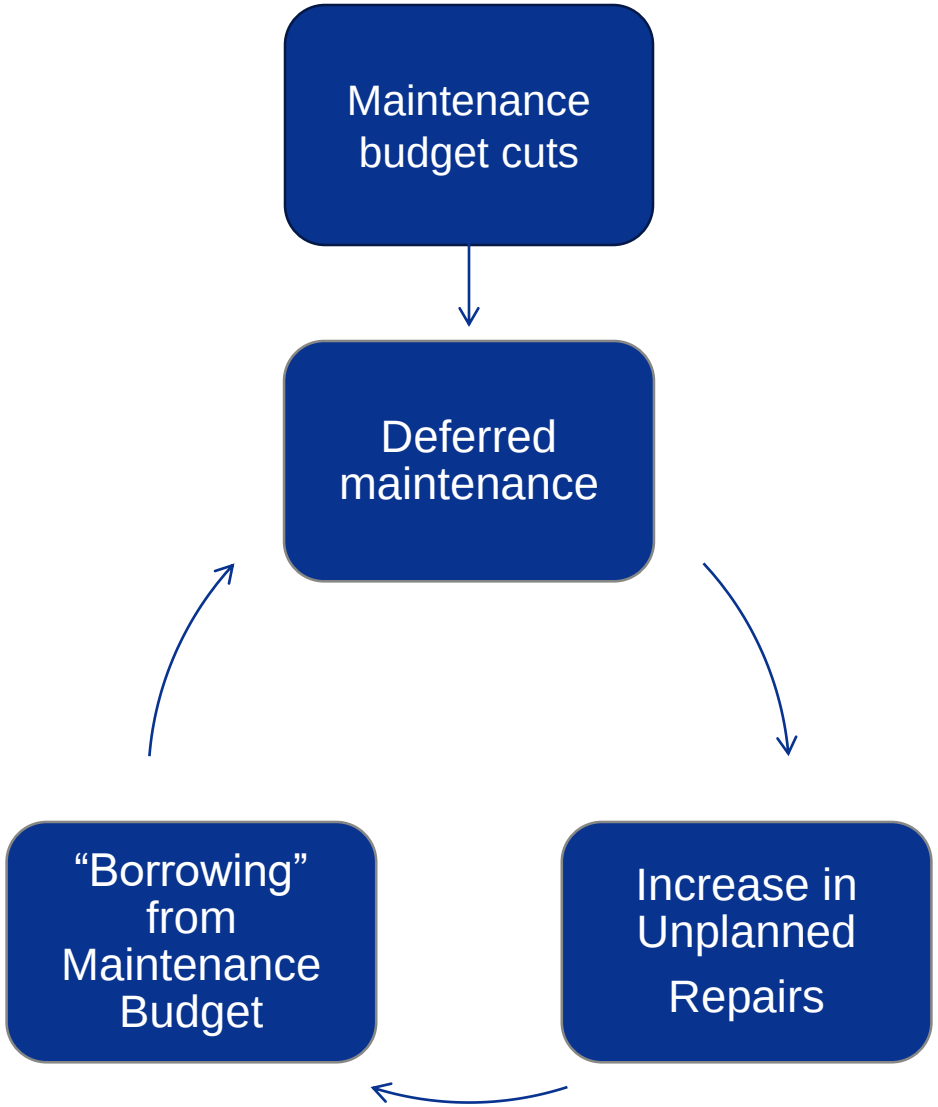
The downward spiral of deferred maintenance



How do you avoid this?

Taking an optimized approach to maintenance

Asset condition assessment
Asset renewal plan
Financing

Planned Maintenance
Predictive Maintenance
Proactive Maintenance

Repair Coverage

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Reducing the deferred maintenance backlog

Taking an optimized approach to maintenance

Asset condition assessment
Asset renewal plan
Financing

Planned Maintenance
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Repair Coverage

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Perform an asset condition assessment

- Identify assets
  - What equipment do you have?
  - What is the age and condition of that equipment?
  - What areas does it serve?
  - What are current expenses for maintenance and repairs?
- Use a standard format and rating scale for asset condition

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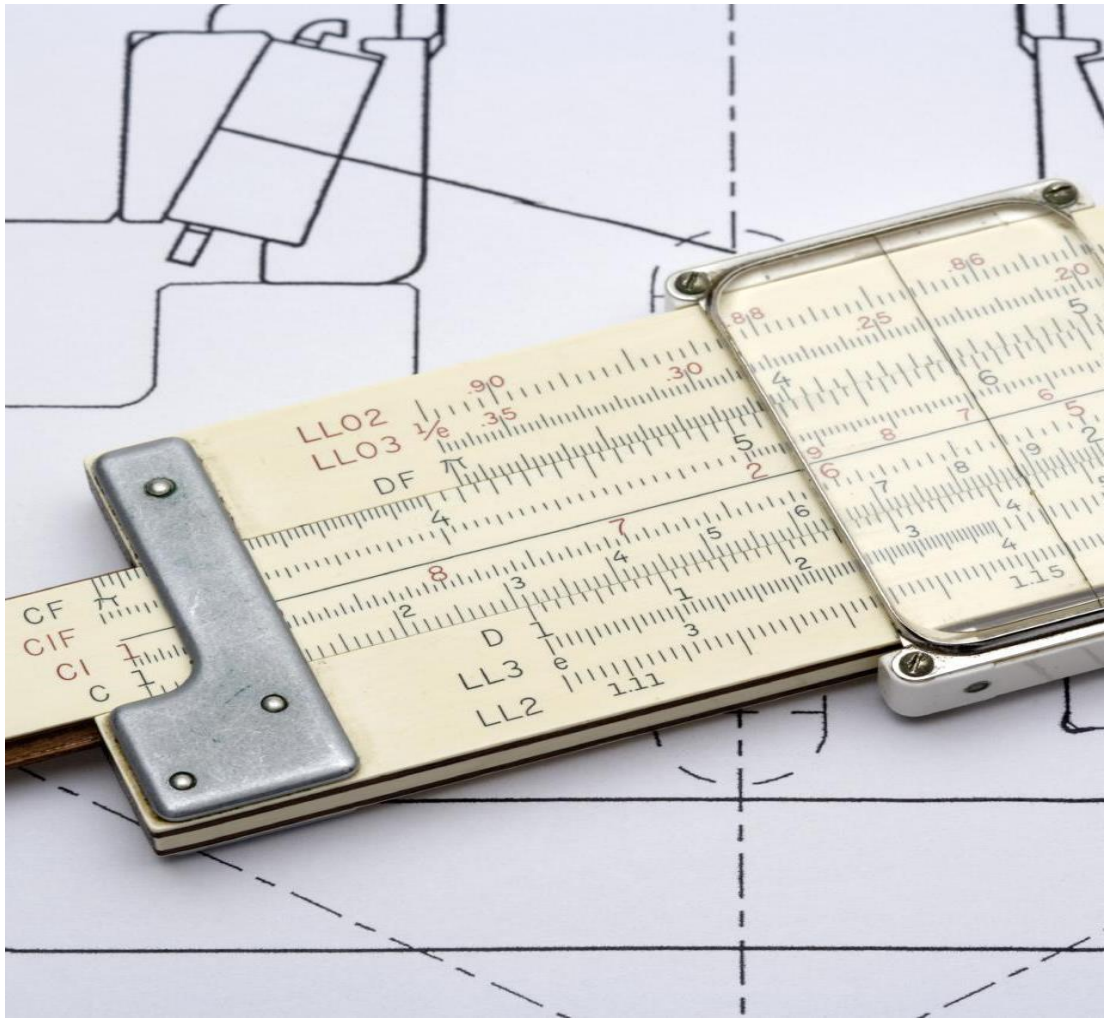
Create an asset renewal plan

- Review facility; identify critical spaces and equipment
  - Consider potential impact of downtime
- Assess the risk profile of each asset. Consider:
  - Redundancy
  - Cost of secondary damage
  - Condition and age of machine
  - Availability of repair parts
  - Equipment environment and application
- Assign each asset high, medium or low risk designation
- Create a prioritized plan for asset renewal based on these inputs



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Use financing to accelerate critical asset renewal projects

Why finance?

- Preserves cash
- Extends your budget
- Allows you to make decisions based on facility need

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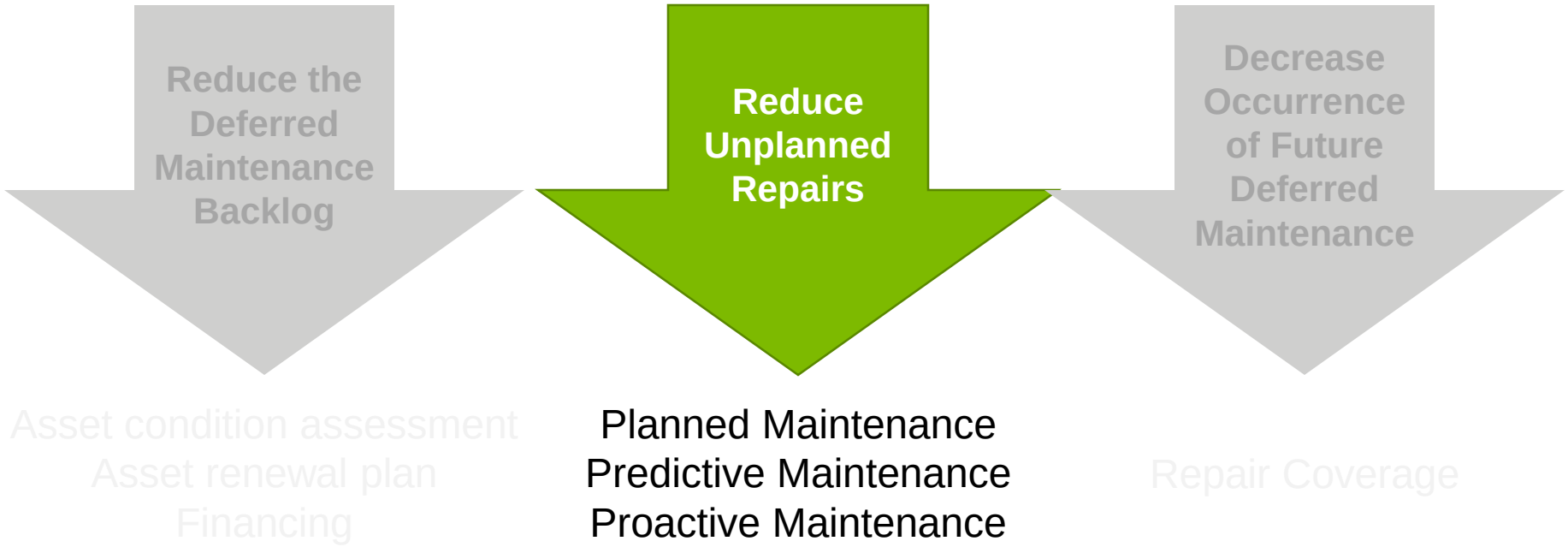
Reducing unplanned repairs

Taking an optimized approach to maintenance



Reduce unplanned failures

- Based on your assessment, create a maintenance strategy built around :
  - Planned maintenance
  - Predictive maintenance
  - Proactive maintenance

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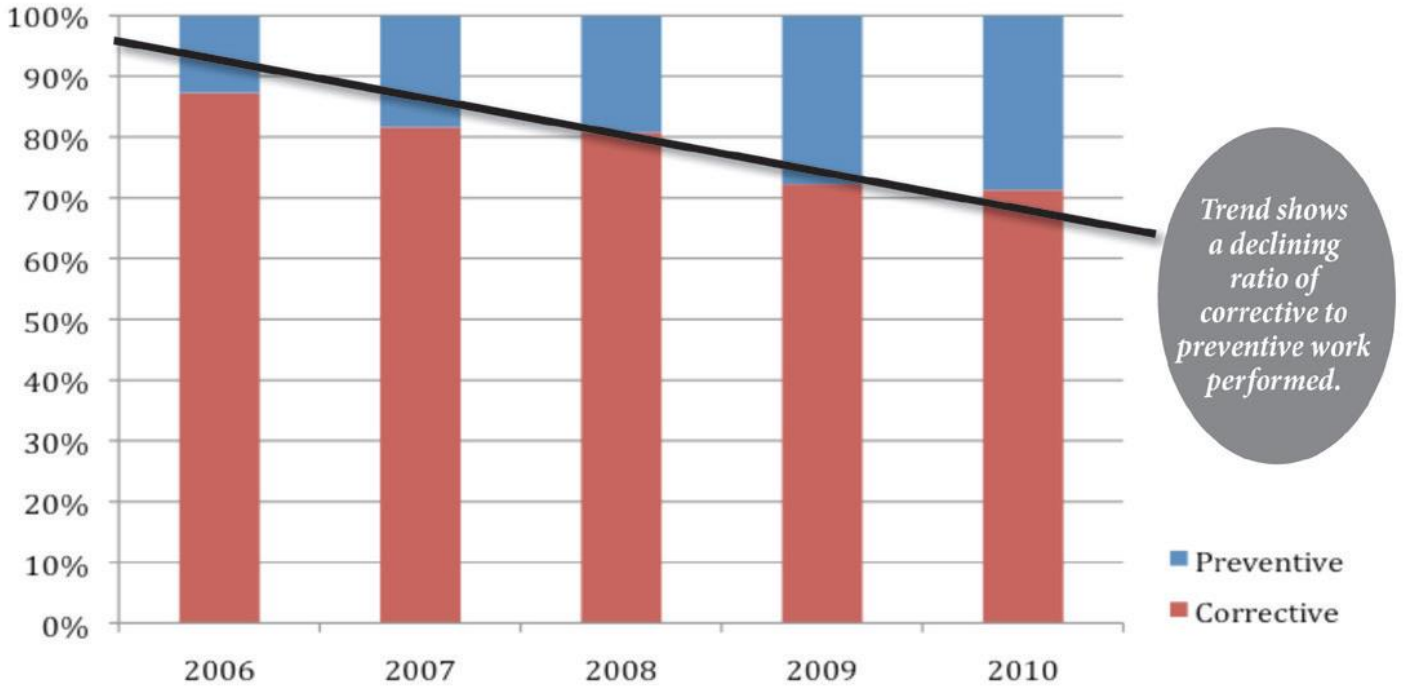
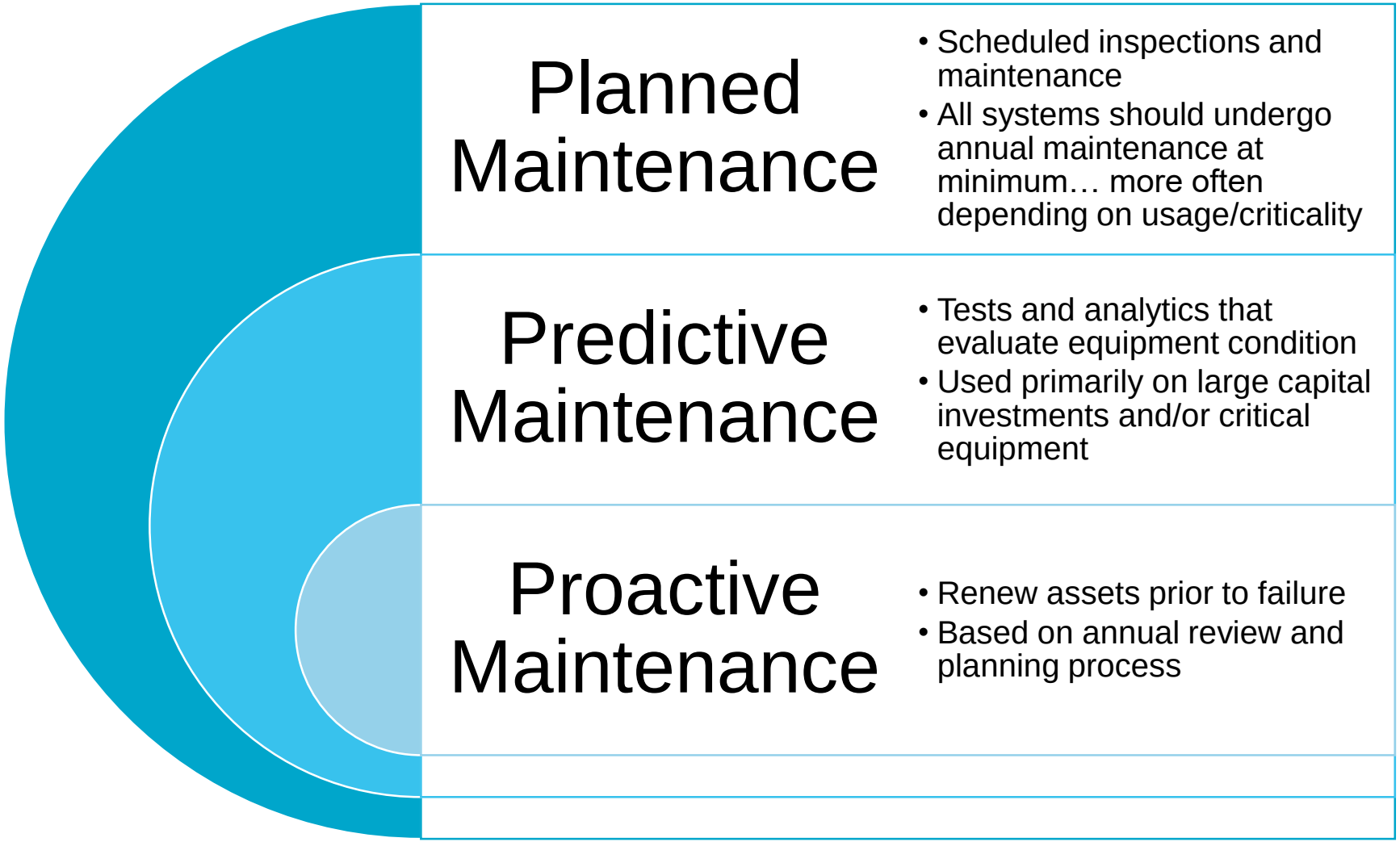
Why maintenance?

Good maintenance practices result in

- A 50% - 65% reduction in the rate of emergency work
- 30-40% reduction in the cost of work performed
- A 16% reduction in corrective maintenance work as a percent of the total work over a 5-year time period.



What does “good maintenance” look like?



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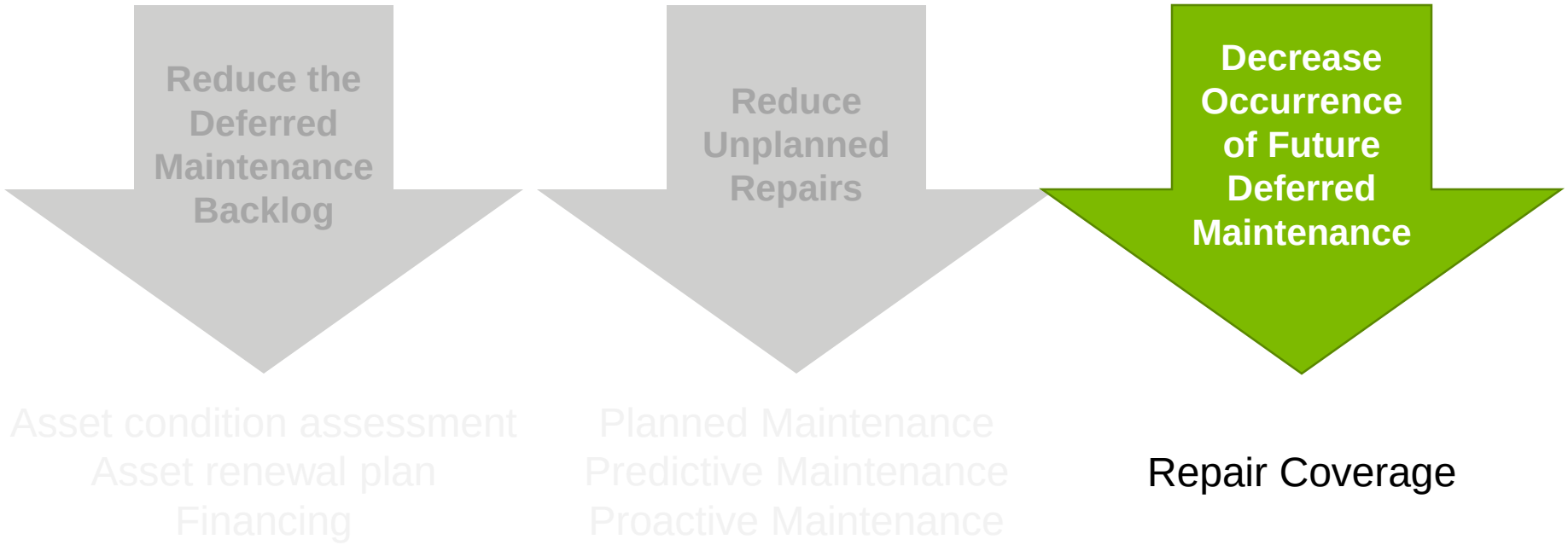
Decreasing future deferred maintenance

Taking an optimized approach to maintenance



What is the benefit of this approach?

Taking an optimized approach to maintenance

Asset condition assessment
Asset renewal plan
Financing

Planned Maintenance
Predictive Maintenance
Proactive Maintenance

Repair Coverage

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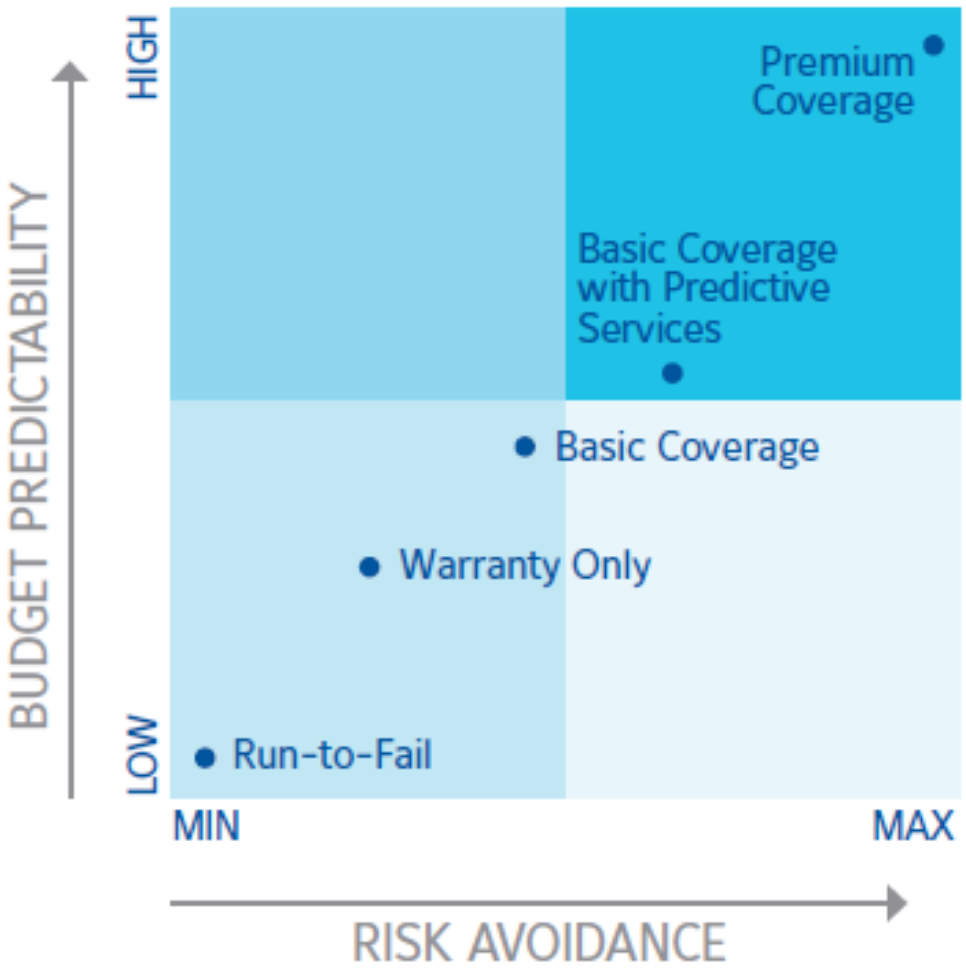
Repair coverage contracts



- Provides a way to take care of issues right away – most repairs are covered
- Shifts risk to provider
- Avoids “decision delay”
- Prevents additional items from being added to the deferred maintenance backlog

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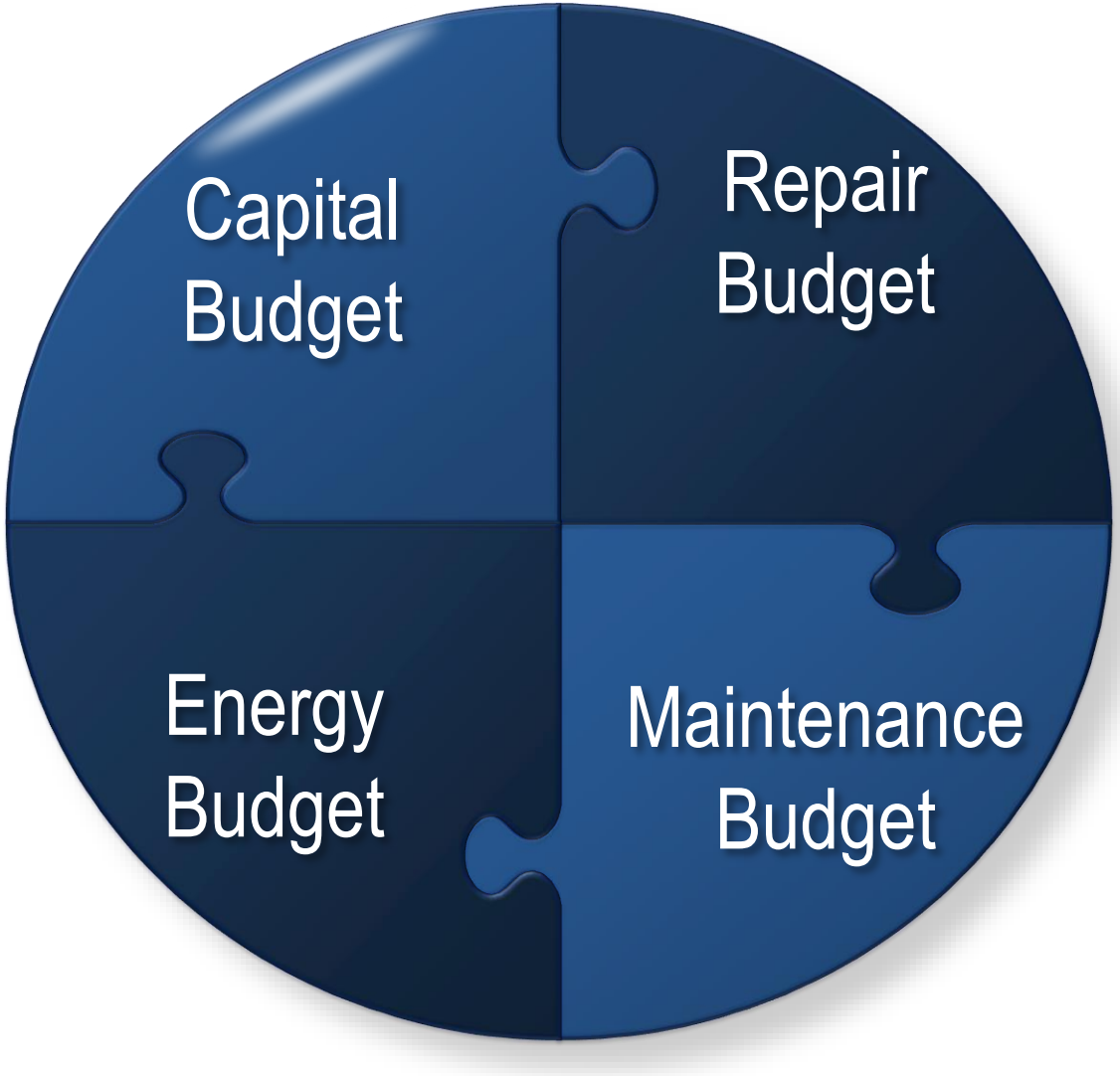
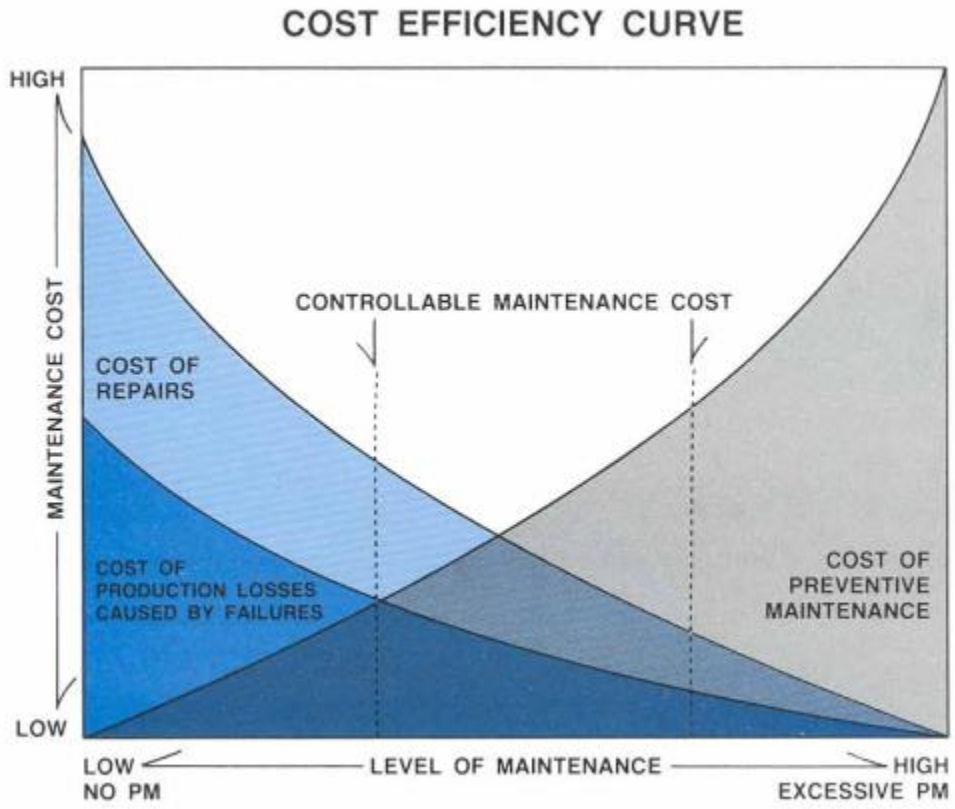
Why optimize your maintenance approach?



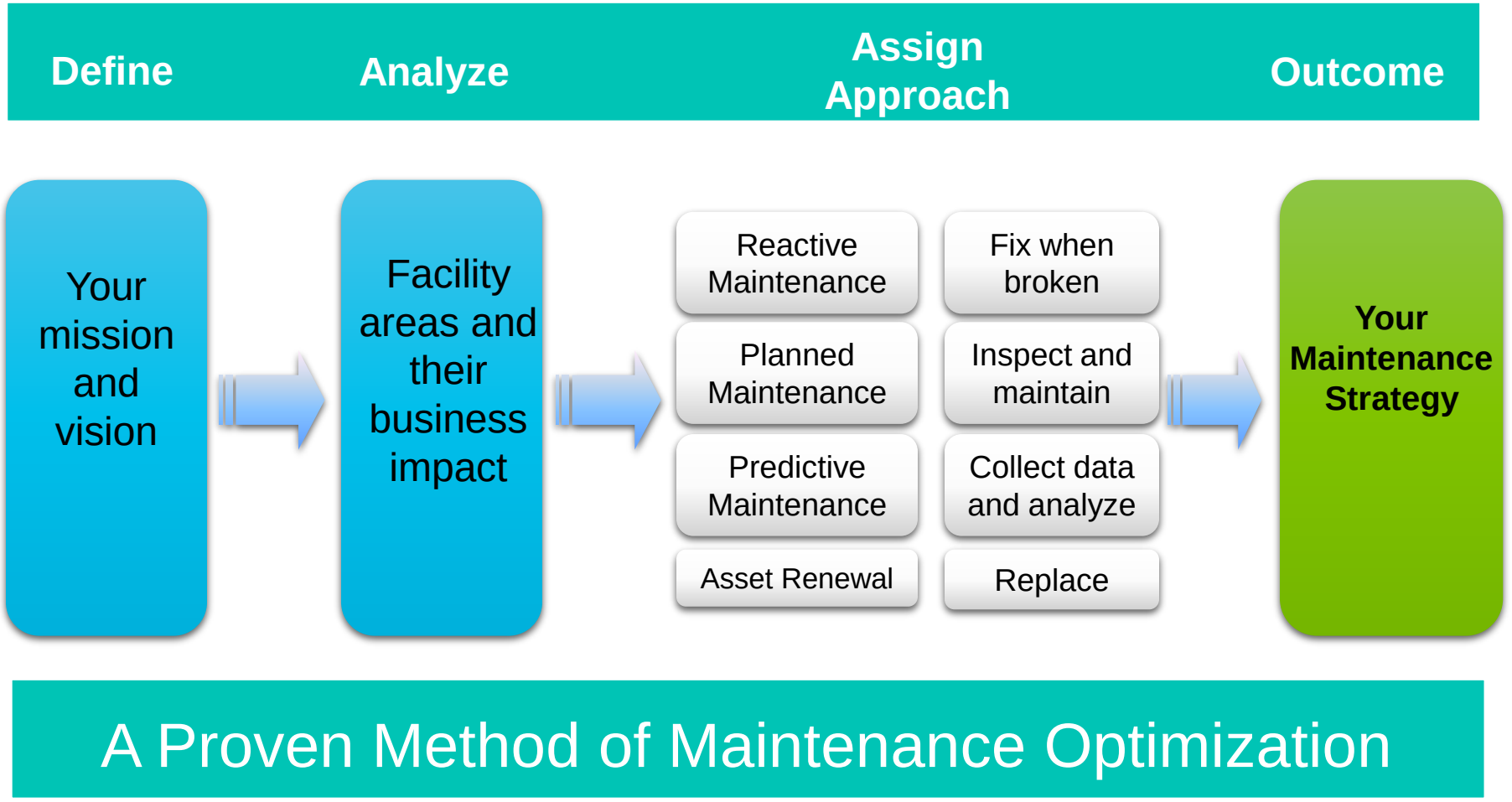
The objective of **maintenance optimization** is to develop a **sustainable maintenance program** that will **extend asset life** and **reduce overall facility operations costs**.

How does an optimized maintenance approach work?



Optimizing your maintenance approach allows you to minimize repair costs & downtime and maximize the value of your preventive maintenance

How do you optimize your maintenance approach?



The End

THANK YOU!

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