



Unlocking the Potential of AI in Buildings

April 24, 2024

Agenda

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Industry Challenges



Future Technologies Impacting Today's Design



The Age of the Smart Building



Getting Connected



What are common challenges for building owners



Rising
Energy
Costs

Decarb &
Sustain-
-ability
Goals

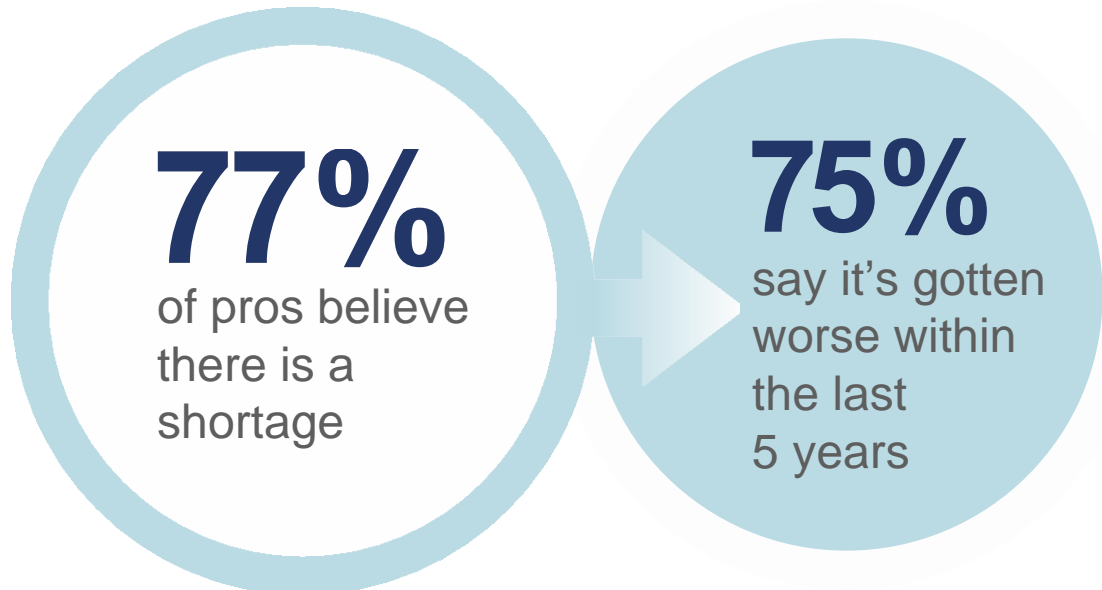
Technician
Shortage

Manage
Budget!

Plan
for the
future

Compliance
Reporting

What The Industry Is Saying



27%

of workers are within 10 years of retirement

+40,000

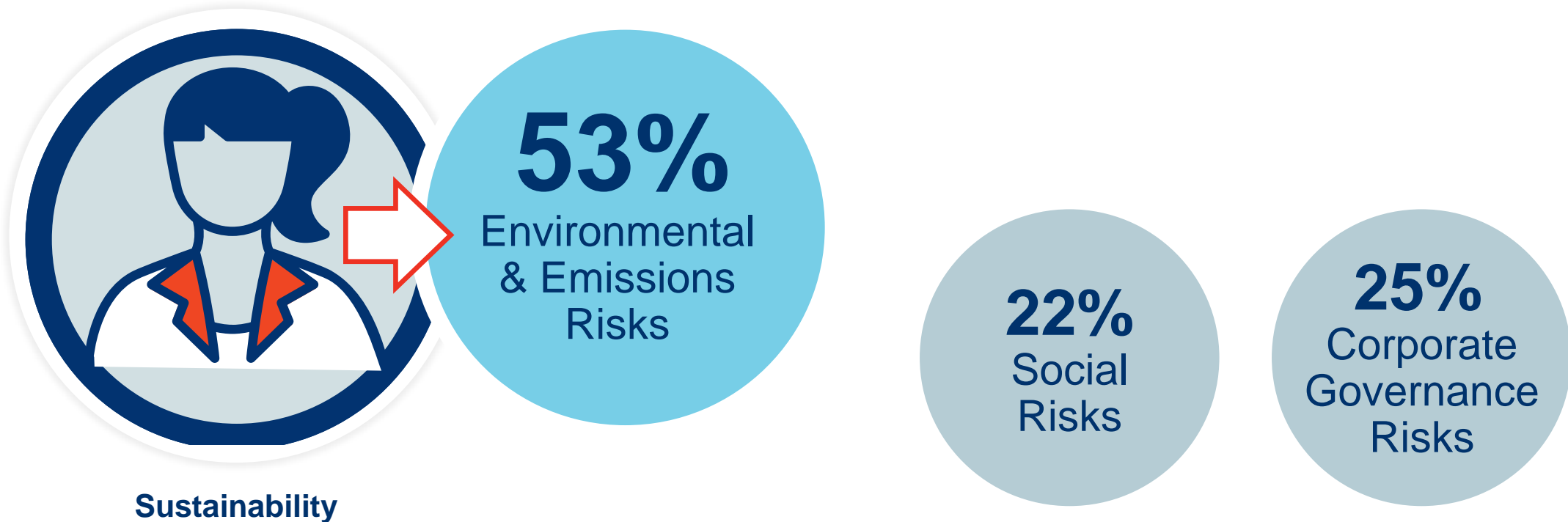
openings are projected every year on average for the next 10 years.

↑5%

Employment of HVAC technicians is projected to grow 5% from 2021 - 2031

What is the Reality?

Many of those companies have identified strategic issues but less have a formal strategy and even less have specific goals or KPI's.





Future Technologies are Impacting Today's Design

The State of Smart Buildings

Facilio State of Smart Buildings 2024



87%

Of businesses prioritize connected ecosystems for efficiency and operational improvements.

78%

Of businesses prioritize optimizing existing systems, indicating a shift towards data-driven incremental improvements.

33%

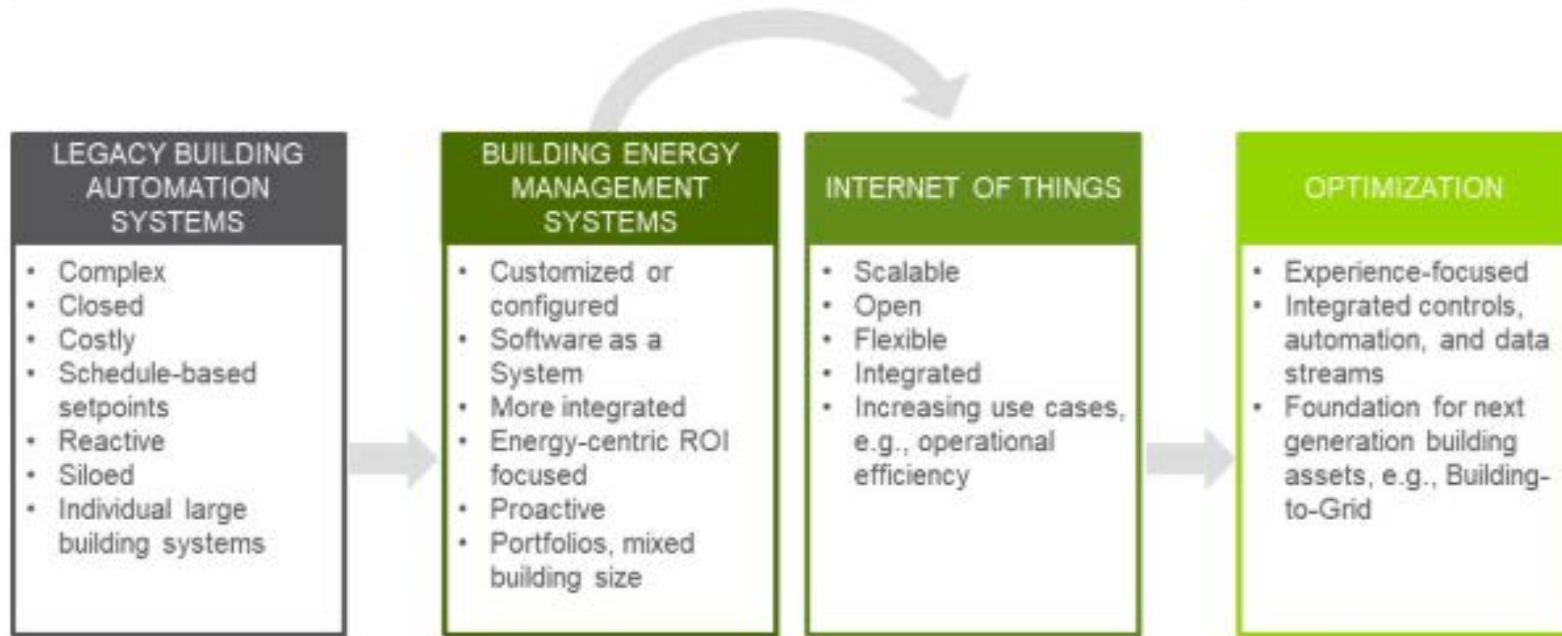
Of businesses face challenges integrating automation systems effectively due to the current fragmented technology landscape

State of the Smart Building Market

Navigant Report



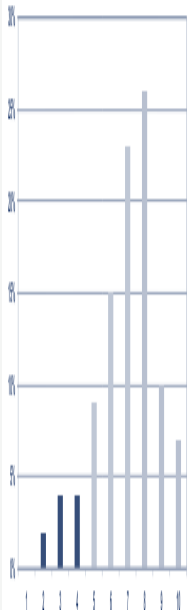
Figure 1 Market Evolution: Products to Solutions and Broader Market Applicability



(Source: Navigant Research)

Market evolution – moving towards optimization

Rate the importance of having a smart building strategy on a scale of 1 to 10 where 1 is not at all important to your business and 10 is key to the success of your core business strategy.

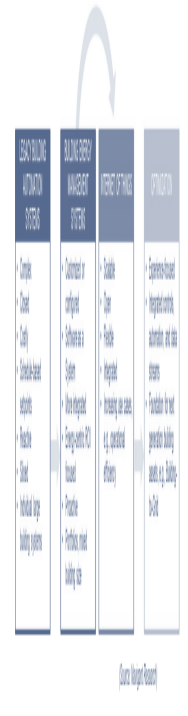


State of the Smart Building Market

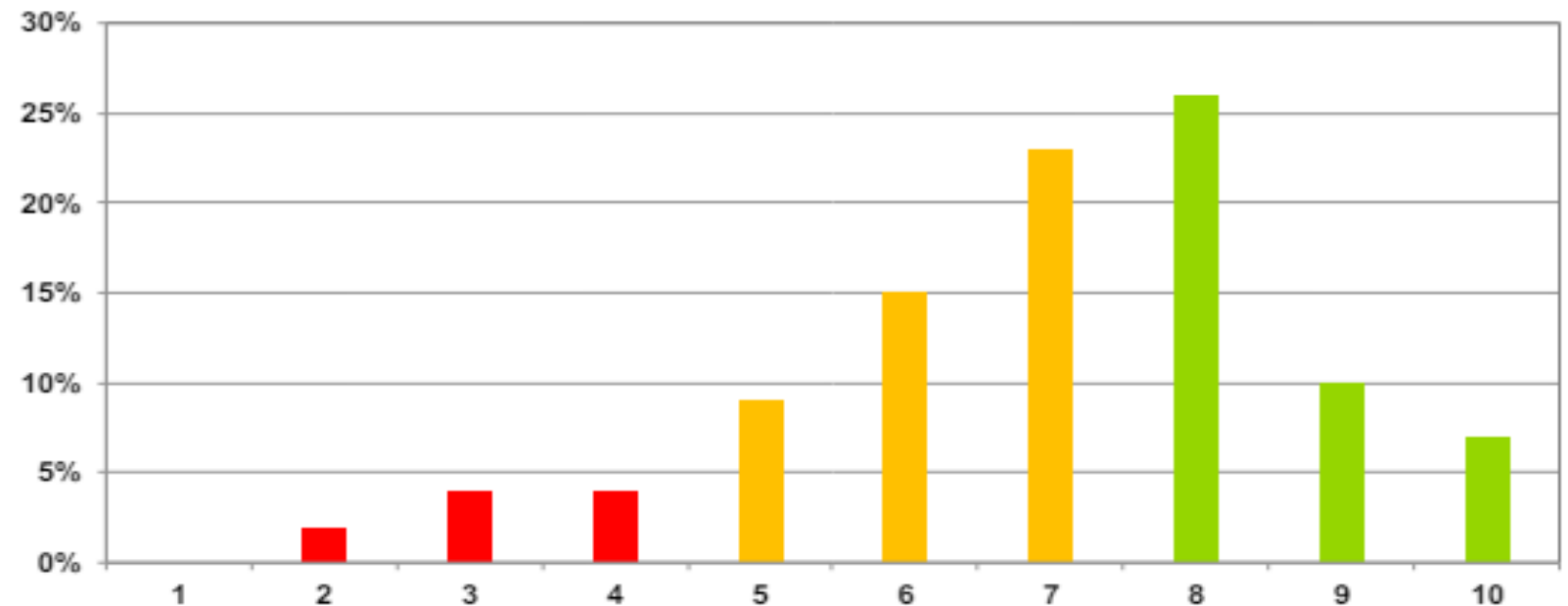
Navigant Report



Figure 1: Market Evolution: Products to Solutions and Greater Market Opportunity



Rate the importance of having a smart building strategy on a scale of 1 to 10 where 1 is not at all important to your business and 10 is key to the success of your core business strategy.

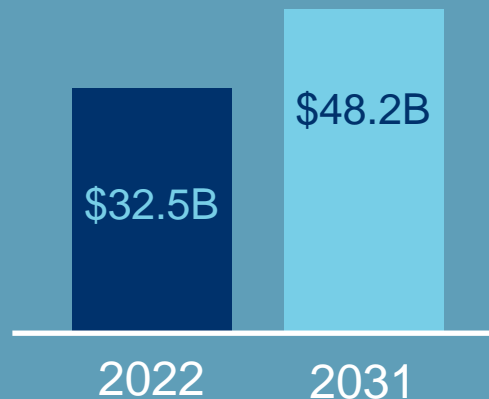


Building owner importance of having a smart building

The Growing Smart Building Market

Smarter buildings require smarter decisions.

Globally, revenue attributed to building automation systems in commercial buildings is expected to increase, with a compound annual growth rate (CAGR) of 4.5%.

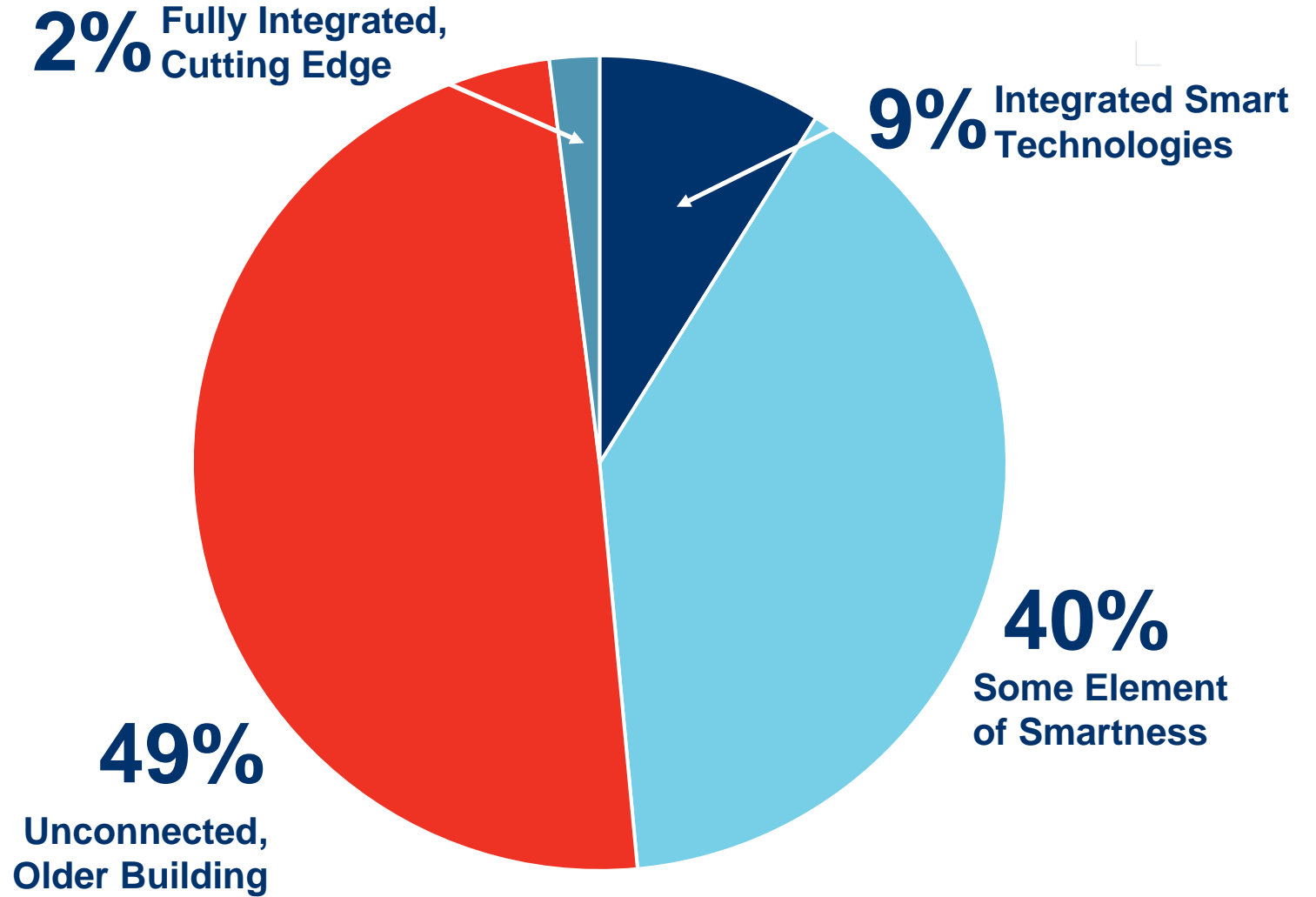


Source: Guidehouse Insights, "Market Data: Building Automation and Controls," 2022



Smart buildings connect technologies and automate processes to improve their performance by continuously learning, adapting, and responding.

How smart are *commercial buildings* in the United States?



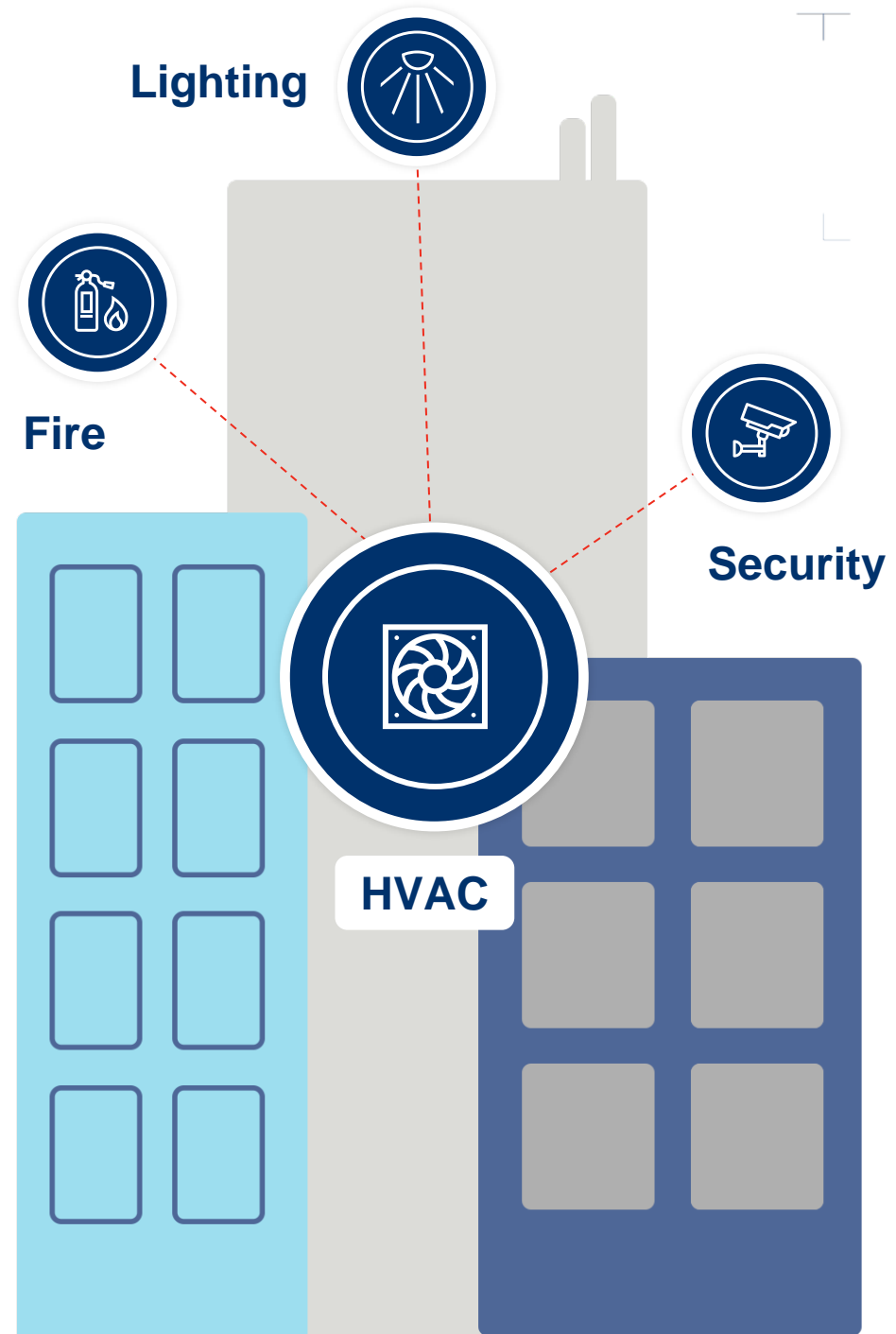
The Modern Building

(Automated, Intelligent, Connected Buildings)

Smart buildings connect technologies and automate processes to improve their performance by continuously learning, adapting, and responding.

Artificial Intelligence (AI) has entered the smart building space, having a significant role in the enabling advanced data analysis, predictive maintenance, and personalized occupant experiences.

Source: BSRIA, "Global Trends in HVAC & Smart Technologies," 2022



How does this impact an engineer?



Government Regulations & Compliance



Keeping Up with Future Technologies

Buildings are responsible for **40%** of energy use in the US
([NREL](#))

Connectivity & interoperability

On average, **30%** of energy use is wasted in commercial buildings
([energy.gov](#))

Meeting business ESG goals & requirements

More than **50%** of businesses will use cloud-implemented technologies by 2028 (gartner)

Evolving communication protocols

Connected buildings have contributed to **29%** energy savings
([energy.gov](#))

61% of organizations are using AI and machine learning
([GITNEX](#))

Productivity tools for staff

Challenges & trends that are impacting you today.



The Age of the Smart Building

What can AI really do for energy efficiency?

How is the industry using AI to increase energy efficiency for building owners?

Artificial Intelligence combines....



Everything you know about running your building

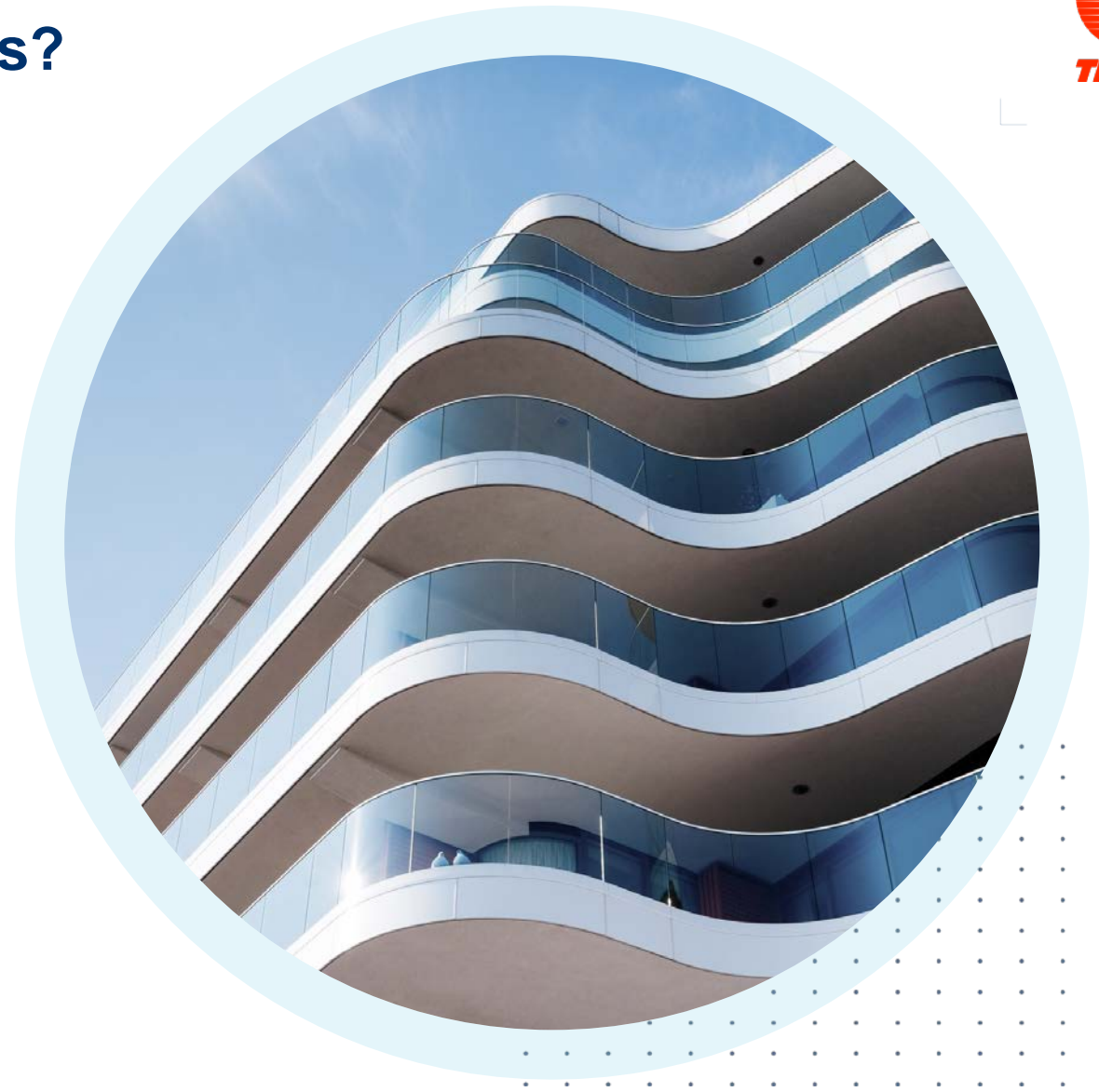


Everything Trane knows about system optimization



Additional internal and external data points

- Occupancy patterns
- Weather forecast, grid intensity



How is AI different from traditional BAS?



Traditional BAS

Likely web-based, but not necessarily

Need for active management by operators

Changes are not real time

Large manual interaction

Changes to schedules, setpoints, alarms



BAS with AI

24/7 observation AND analysis

Automatic improvements

Real time improvements

Limited manual interaction

Optimizes energy while maintaining comfortable spaces

What Can You Expect?



Reduce
HVAC Energy Costs
Up to 25%



Reduce
Carbon Emissions
Up to 40%

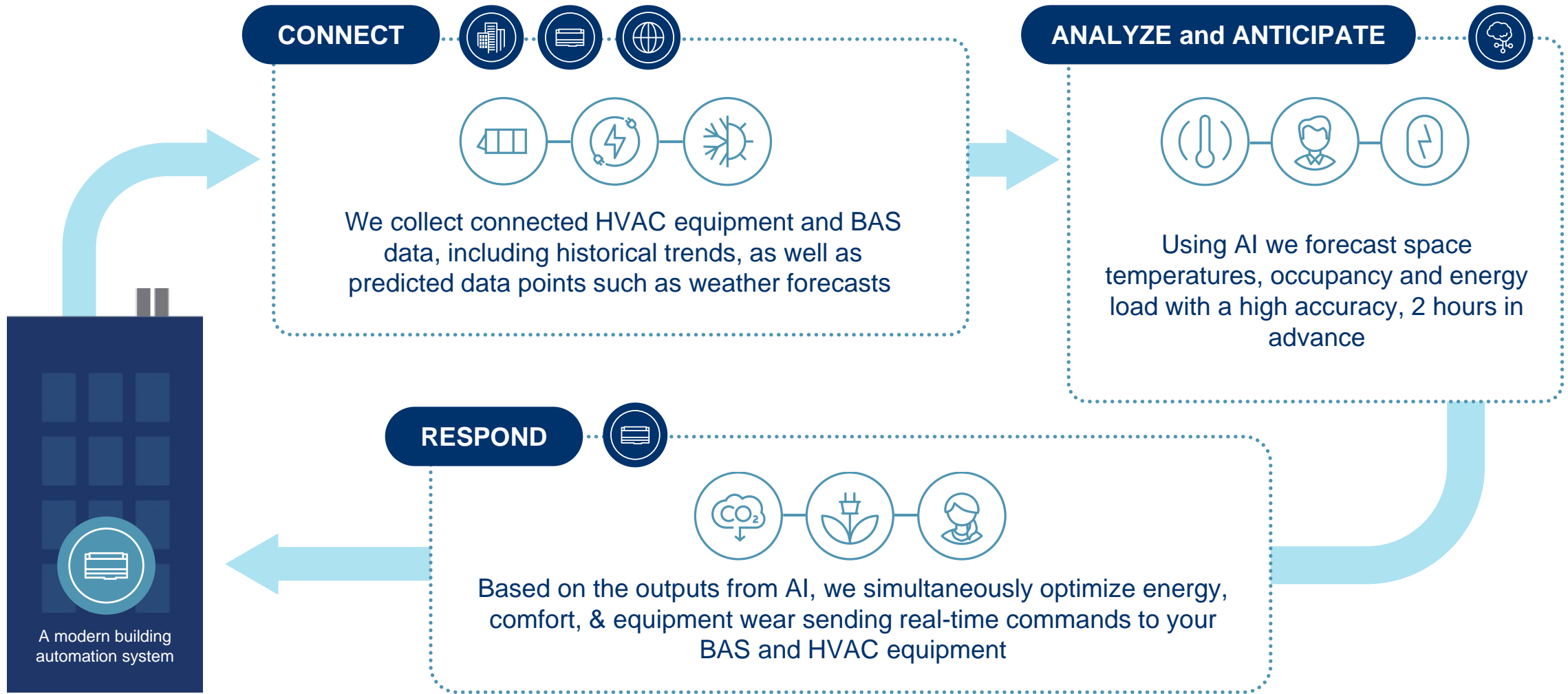


Improve
Occupant Comfort
Up to 60%



Extend
Equipment Service Life
Up to 50%

How does it work?





**How do I do it?
Get connected.**



Modernization with sustainable BAS

Most facilities have some level of building automation, ranging from schedules to complex plant and air system coordination.

**Coordinate
mechanical
HVAC systems**

**Support
complementary
systems
(lighting, energy
meters,
sensors)**

**Meet building
codes,
standards &
guidelines**

**Alert occupants
or operators
when something
is wrong**

Customer Considerations for Implementation

The essential piece to system modernization without a complete building replacement.



Robust sequences, points lists, specification language for equipment optimization



System Safeguards (temporary overrides, role-based security, etc.)



Intuitive, task-based interface to improve daily operations for relevant personnel



Embedded logic that delivers performance based on the latest industry standards and guidelines



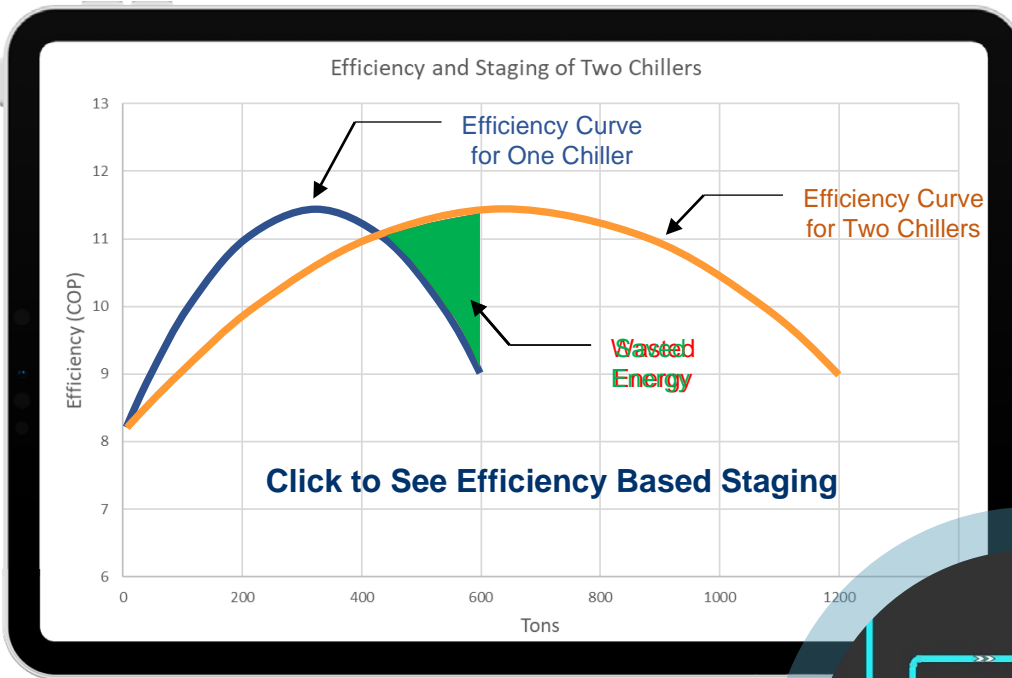
Proper, validated project execution



Your thoughtful planning can mitigate many common challenges.

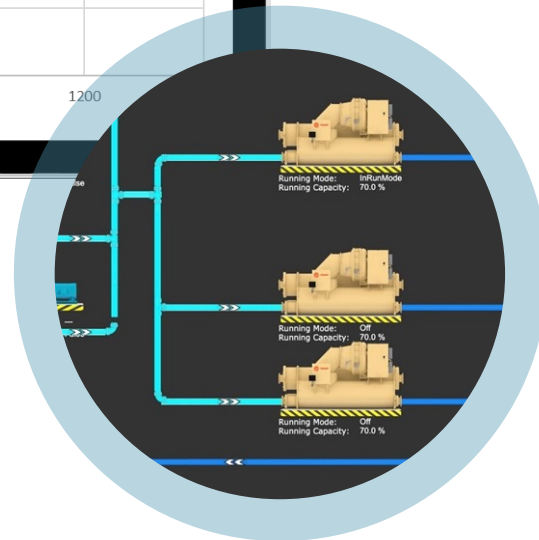
Leverage a Valuable Chiller Plant Optimization

Efficiency-Based Chiller Staging



This is just one example of the things that are expected from smart buildings. The list gets longer by the day...

- ASHRAE Std 90.1, 62.1, GL 36
- Water & Air System Optimization
- Demand Management
- Scheduling
- Ventilation
- Data Logging
- Alarming ... etc.





Optimization can be valuable...

*Many projects are funded
based on expectation of
energy savings vs. a baseline.*

9% savings

Trane modeling using
Optimization
Applications over
ASHRAE 90.1
baselines

Pacific Northwest
National Lab Study:

**29%
energy savings**

Optimized VAV
Savings:

**23% HVAC energy
savings**

ASHRAE Guideline 36
– studies claim up to

30% energy savings

Trane® Autonomous Control



Trane Autonomous Control is an artificial intelligence-enabled service that works with your Tracer® SC+ controls. Constantly observing, correcting, and improving, it's technology. To meet your targets, you need more — more carbon reduction, more energy savings, more action without more expense.

Experience technology that seeks out and implements energy optimization — without human intervention.



Reduce your building's carbon footprint up to 40%



Reduce total energy costs by up to 25%



Make improvements 24/7 without human interaction



Cut operating and maintenance costs



Optimize your efficiency without sacrificing comfort

Exceeding Decarbonization Goals Through AI-Enabled Building Technology



Case Study:

Trane added a layer of Artificial Intelligence to existing controls infrastructure to drive down energy use, cost and emissions through real-time optimization of Center HVAC assets without impact to operations or tenant comfort.

Savings that the Customer Saw After Year One:



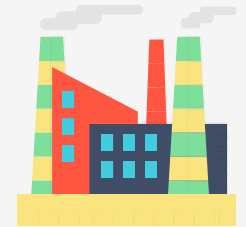
Total Therms
Reduced:
6,613 therms



Total kWh
Reduced:
945,650 kWh



Energy
Cost Savings:
\$127,517



CO₂e
Savings:
457 mtCO₂e

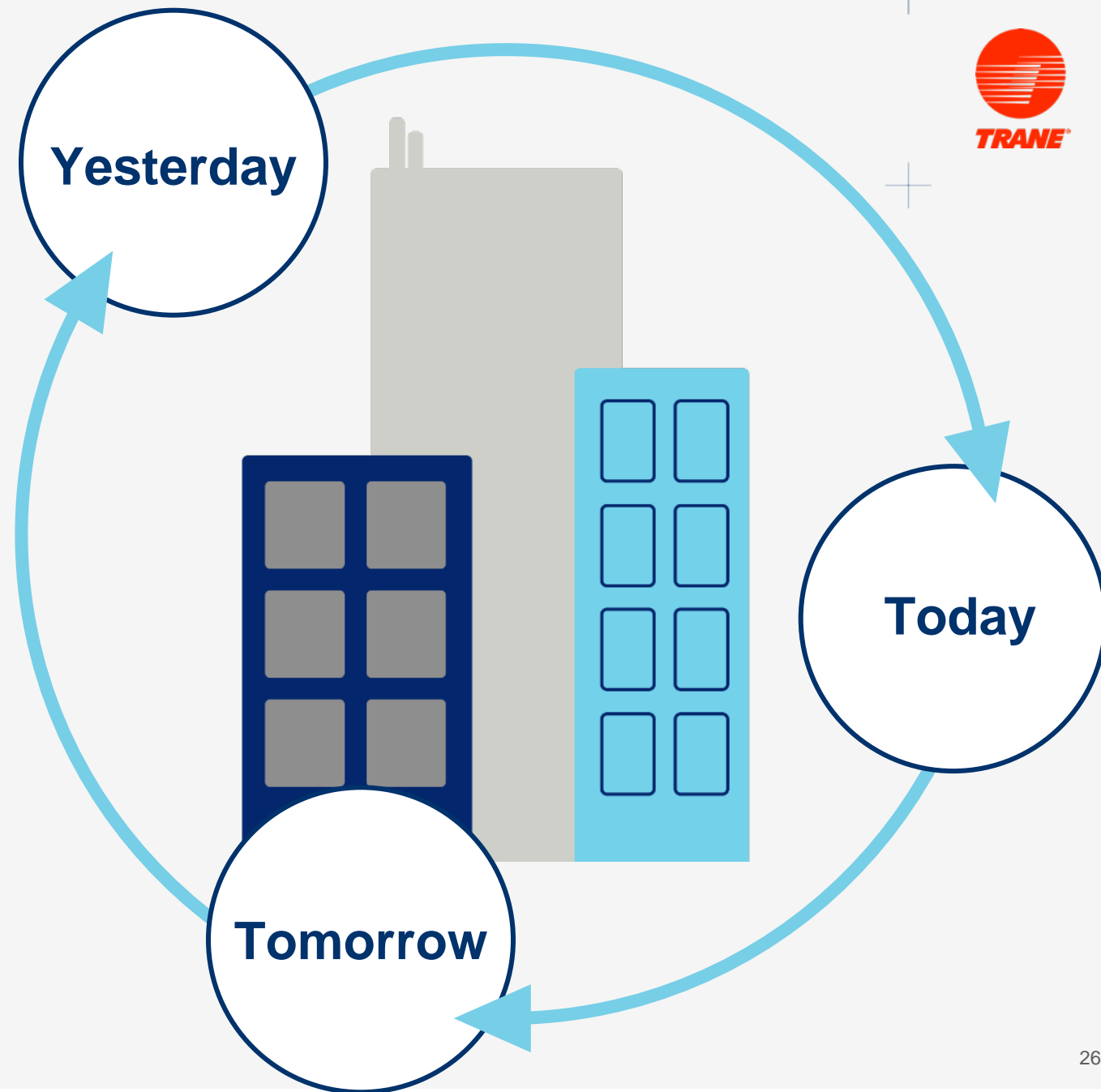
By incorporating variables such as predictive weather data, occupancy trends, and equipment performance data, the use of AI technology allowed for advanced optimization, which positively impacted the customer's energy and financial goals.

Action:

Do your part. *Educate yourselves on emerging technologies.*

Lead with controls. *A modern smart building supports communication protocols from yesterday, today, and tomorrow.*

Lean on your partners. *Work with trusted advisor to help your strategic plan.*



**Open to any
region**

**Open to any
vertical market**



**What questions
do you have?**

**Open to single
buildings**

**Open to multiple
buildings**