



Intelligently building the campus of the future... today!

Cheryl L. Altany
Global Vertical Strategy Lead
Education | STEM | Campuses
Carrier Building Solutions Group

Lauren Brust Moss
Program Director
NORESO
Sustainability Services

CARRIER

Global provider of intelligent building technologies



55,000

Employees



\$17.8B

Net sales



54

Factories



41

Design centers

CAMPUSES INCLUDE...

Residence Halls/Housing

Dining Halls/Restaurants

Classroom Spaces

Laboratory Facilities

Administrative / Office Spaces

Athletic Complexes

Performance Art Spaces

Libraries

Conference Centers

Health Care Facilities

Student / Employee Centers

Data Centers

Museums / Fine Arts Spaces

Innovation / "Maker Spaces"

Physical Plant Facilities

Retail Areas

The demands and specific attributes of education and campus spaces varies significantly building to building and institution to institution, all contributing to the complexity of a "campus"

TRENDS DRIVING EDUCATION AND CAMPUSES



Enrollment Growth



Hyper Competition



Evolving Classrooms



Increased Mobility



World-Class



Social Responsibility



Funding Sources Shift



Brand Extension



Security Concerns

RESULT IN . . .

- Open, collaborative buildings
- Enhanced cognitive function, wellness, productivity
- Operational and energy efficiencies for ROI
- LEED® Platinum
 - Digital, tech-enabled experience
 - Interactive student, faculty, staff and visitor experiences
 - Innovative building solutions
 - Attracting and retaining the best talent (students, staff, Faculty)
 - Attracting maximum research dollars
 - Secure, flexible network
 - IT design incorporated into construction planning
 - Adaptable building systems based on usage



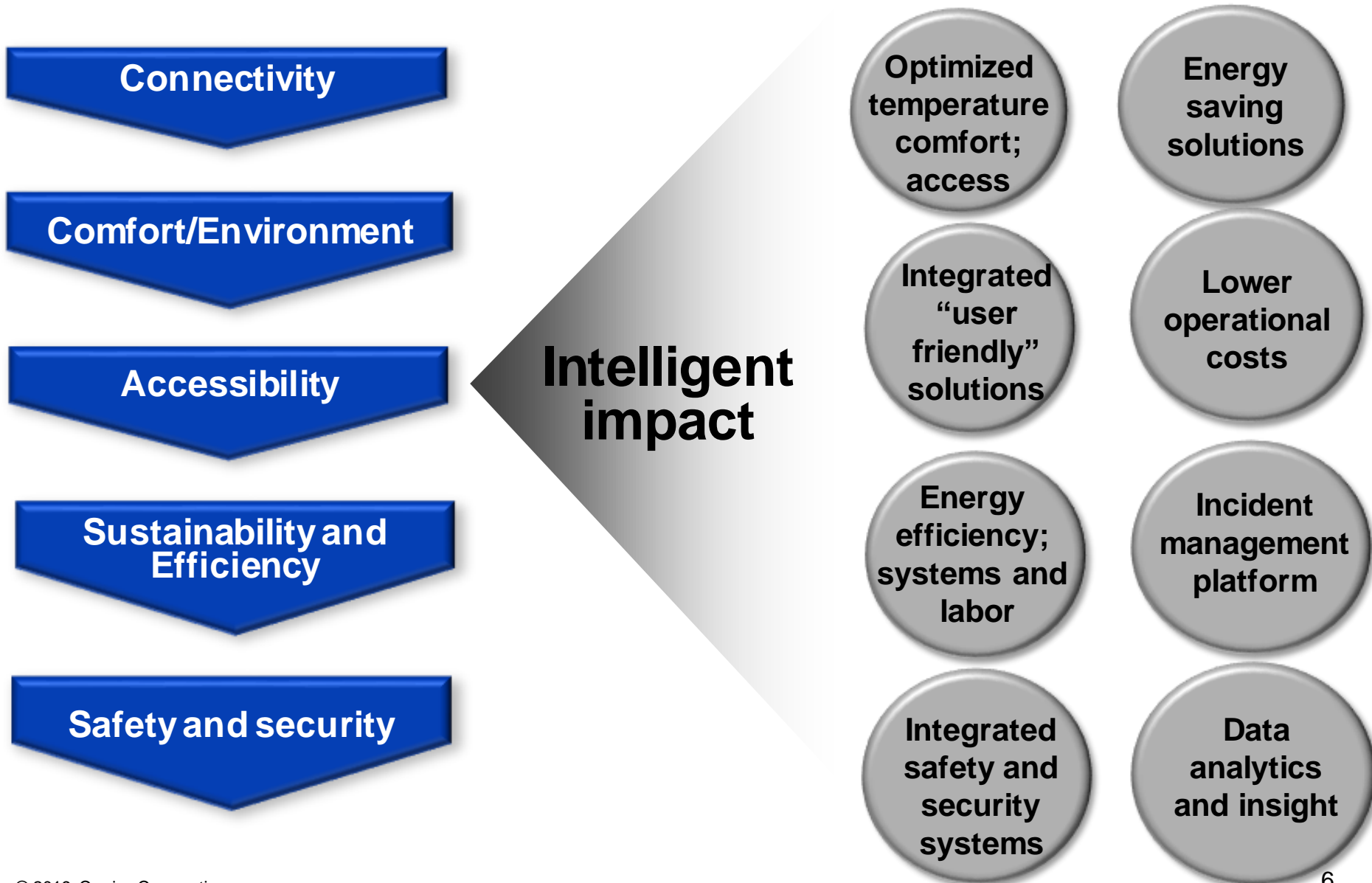
THE VALUE OF INTELLIGENT CAMPUSES



Which group benefits the most from technologies installed in intelligent buildings across intelligent campuses?

- A. Senior administrators
- B. Faculty and staff
- C. Students
- D. General public and visitors
- E. Security and IT
- F. Environmental, Health and Safety
- G. Operations

COMPONENTS OF INTELLIGENT CAMPUSES



WHY MASTER PLANNING?

Focus on the triple bottom line

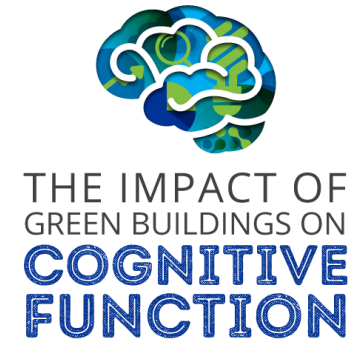


WHY ARE WE **IGNORING** THE

90%?

TOOLS TO ACHIEVE THE TRIPLE BOTTOM LINE

Framework to support master plan development



Other rating systems

- fitwel
- Green Globes
- Enterprise Green Communities
- Sustainability Tracking, Assessment & Rating System™ (STARS)
- ENERGY STAR®
- Living Building Challenge
- IGCC
- Envision

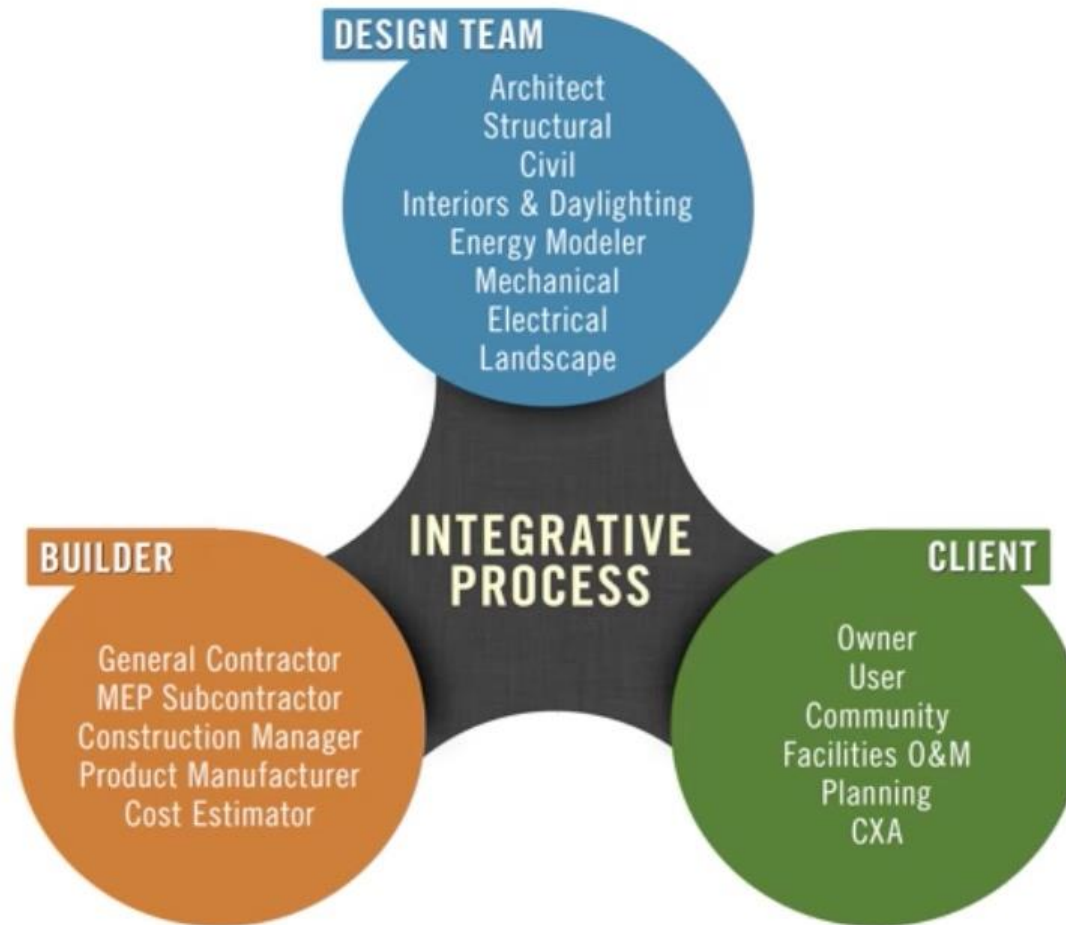
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• International WELL Building Institute™ and the related logo are trademarks used with permission from the International WELL Building Institute™
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STRATEGIC PROGRAMMING APPROACH

OCCUPANT FOCUSED & SUSTAINABLE DESIGN CERTIFICATION COMPARISONS

COMPARABLE VARIABLES FOR CERTIFICATION	WELL BUILDING STANDARD	FITWELL WORKPLACE	LEED EB O&M/ARC
3rd Party Reviewer	GBCI	CfAD	GBCI
Rigor of Standards	Technical: Prescriptive and Performance	Less Technical: Prescriptive	Technical: Prescriptive and Performance
Documentation Requirements	Similar to LEED	Less Rigorous	Rigorous
Approach	Occupant Focused	Occupant Focused	Design and Operations Focused
Number of Strategies	105 Features, including prerequisites	63 Credits, with no prerequisites	40 Optional Credits, and 12 prerequisites
Integration with LEED	Overlap throughout WELL Features and LEED Credits	Overlaps with Various Points via Indoor Air Quality	Overlaps with WELL Features
Intent	Focused on improving occupant health through building design and operations	Focused on occupant health through building operations and environs while maximizing existing attributes of the building	Focused on building design and operations
On-Site Assessment	Yes	Yes	Yes

INTEGRATIVE PROCESS



An iterative, collaborative approach that involves a project's stakeholders from visioning through completion of construction and throughout building operation (Source: USGBC)

SUSTAINABILITY & RESILIENCY STRATEGIES

“Building RESILIENCY”

Health and wellness
of occupants

Limit exposure and
vulnerability to
climate

Utilizing alternative
energy solutions to
minimize stress on
existing campus
energy systems and
lower carbon
emissions

Adaptation and
anticipation

The project’s ability to respond to short and long-term stresses so the outcome doesn’t have a long-lasting effect on the ability of the project to remain a vital part of the overall campus environment.

SUSTAINABILITY & RESILIENCY STRATEGIES



Design each project to help achieve a campus-wide goal of “**CARBON NEUTRALITY**”

Water reduction of 40% or greater over baseline

Energy reduction of 37% or greater over baseline

Alternative energy solutions

Material selections

Design each project to help achieve a campus-wide goal of “**CARBON NEUTRALITY**”

SUSTAINABILITY & RESILIENCY STRATEGIES



Design each project to help achieve
“OCCUPANT WELLNESS”

Increase ventilation
and air quality
without
compromising
energy goals

Create active
occupants with
showcasing interior
staircases

Connectivity to the
outside

The next generation of sustainable buildings are now healthy buildings—focused on indoor environmental quality and a building’s impact on the occupants’ health, wellness and productivity.

APPLYING MASTER PLANNING TECHNIQUES

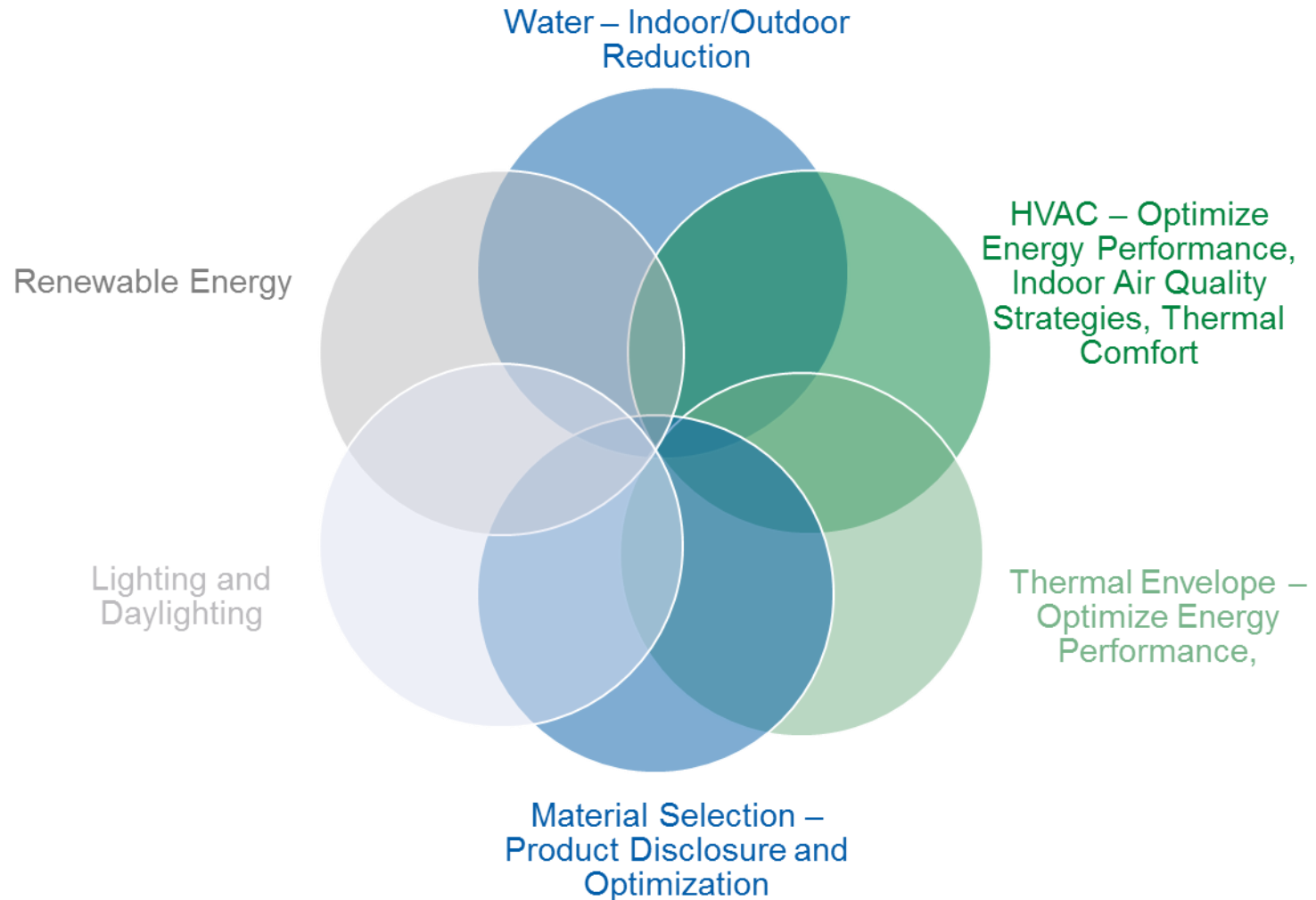


Columbia University



University of Colorado Boulder

SUSTAINABILITY & RESILIENCY STRATEGIES



UTC CENTER FOR INTELLIGENT BUILDINGS



Carrier World Headquarters

- State-of-the-art innovation and technology center, conference center and customer showcase
- A “living laboratory” for advanced building solutions, with **24 patent applications** pending
- Targeting U.S. Green Building Council’s **LEED® Platinum** certification
- Uses **60% less annual energy costs** than a standard office building₁

1. Projected savings based on building energy model from ASHRAE 90.1-2010, Appendix G

STAKEHOLDER REQUIREMENTS

Operational Efficiencies

Energy reduction through highly efficient equipment and advanced controls

Enhanced Experience

Use mobile device to interact with building systems, the campus environment and services

Protecting People and Property

Advanced situational awareness and building system automation supported by intelligent security response and centralized command centers

INTELLIGENT BY DESIGN

Energy efficiency



Chiller plant controls

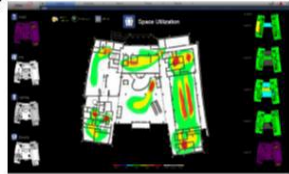


Lighting controls



Building energy management

Operational efficiency



Space utilization heat maps



Equipment service dashboard



Elevator monitoring

Safety & security



Single entry access



Situational awareness



Centralized alarm monitoring

Occupant experience



CIB Building Applications



Ventilation control for improved cognitive function

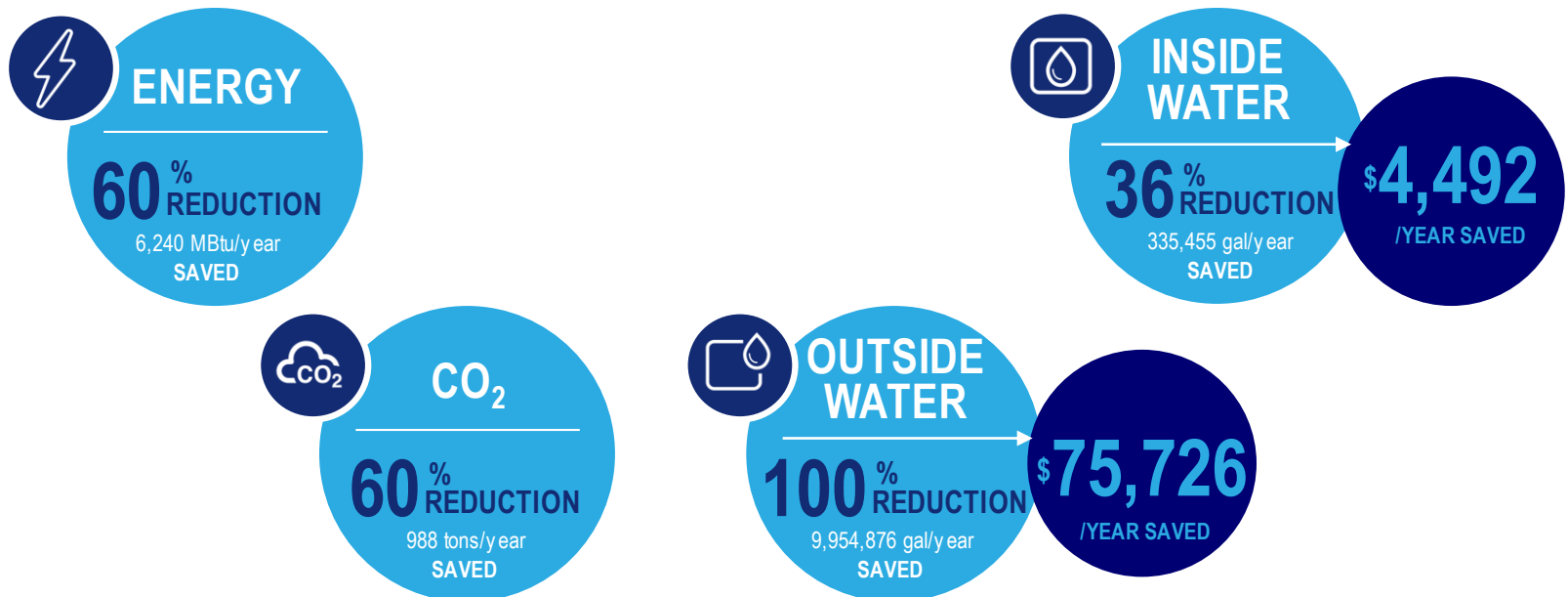


Connected workplace

IT installation integrated with construction plan

ENERGY EFFICIENCY

- High-efficiency equipment and chiller plant
- Solar panels for 30% of the building's energy needs
- Positioning the building to minimize tropical sunlight
- Water re-use and reclamation
- Data analytics to streamline building operations
- Targeting LEED® Platinum



OPERATIONAL EFFICIENCY

High Efficiency Equipment



Efficient Variable Speed Chillers



LED Lighting Systems



Variable Refrigerant Flow Technology



Regenerative Elevators

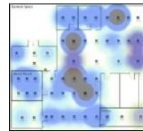
Controls and Integrated Solutions



Integrated Building System Controls



Advanced Plant Control Algorithms



Occupant Detection and Response



Traffic Dispatching Optimization

Smart Grid



Onsite Solar Generation



Net Metering and Real Time Monitoring

60%

less annual energy costs than a standard office building

Projected savings based on building energy model from ASHRAE 90.1-2010

ENERGY

\$172,121

/YEAR SAVED

\$0.76/sq.ft./year SAVED

SAFETY AND SECURITY

- Design emergency response plan (ERP) with Environmental Health and Safety team to **align processes with building technologies**
- **Minimize security and building management labor** by incorporating ERP into building design and integrating systems
- Automatically respond to building emergencies with an **integrated command center**



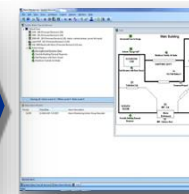
**FEWER
STAFF**

NEEDED FOR
**SECURITY AND
BUILDING
MANAGEMENT**

Guard
identifies
external issue



Security
response
Initiated



BMS Responds
to
Security



EXPERIENCE

- Electronic credentials for **seamless movement** to learn occupant behavior
- Secure, connected workspaces for an **open, collaborative environment**
- Dynamic glass to create a **comfortable work environment**
- Increased ventilation to improve **health, wellness and cognitive function**
- **Smartphone platform empowers users** to interact with building systems



Engagement and productivity platform

MyWay™



- Control comfort
- Adjust lighting
- Open doors
- Call elevators
- Locate employees
- Reserve conference rooms
- Wayfinding

EXPERIENCE IN GREEN BUILDINGS

COGfx Study and benefits of green building

The COGfx Study



↑ **131%**
HIGHER



↑ **299%**
HIGHER



↑ **288%**
HIGHER

UTC Center for Intelligent Buildings

Doubled

ventilation rate in office areas

30%

above the ASHRAE 62.1 standard

Received

LEED® credit

for “Enhanced IAQ Strategies”

Green buildings and impact on market value

The transaction prices of green buildings are about

↑ **13%**
HIGHER ON AVERAGE¹

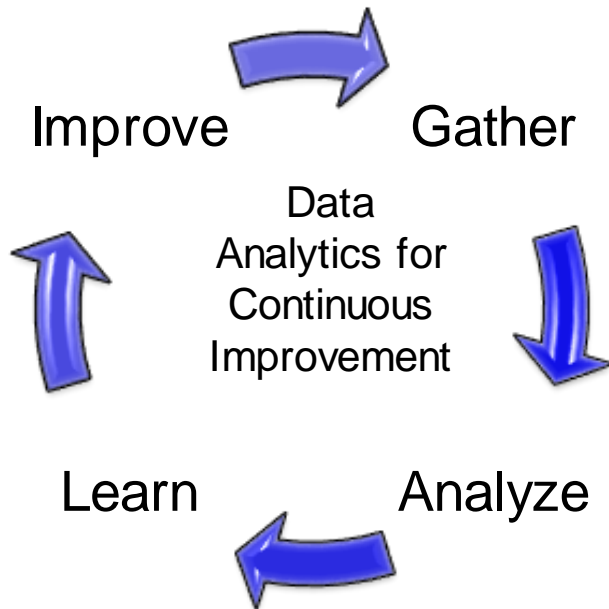
Buildings registered with LEED® are associated with a nearly

↑ **8%**
EFFECTIVE VALUE INCREMENT²

1. Nils Kok, “The Economics of Green Building,” (April 2011): page 21. 2. Nils Kok, “The Economics of Green Building,” (April 2011): page 19.

CONTINUOUS IMPROVEMENT

Data analytics and machine learning



Data streaming up to
100k points
every 15 minutes

Examples

Operational and Energy Efficiencies

- Fault detection and diagnostics (FDD) for improved operations
- Sensors for smart space management
- Sub-metering for system performance

Enhanced Experience

- Space temperature, relative humidity, reduce CO₂, to improve occupant comfort

Protecting People and Property

- Card reader activity to improve traffic patterns
- Detect security abnormalities and reduce false alarms

BEST PRACTICES

- **Partner** with companies who have **holistic experience** in intelligent building and campus solutions
- **Define key stakeholders, define escalation decision tree**
- **Define your core needs** driven by educational objectives
- **Align IT and construction plans** at the design stage
- **Collaborate** with Environmental Health and Safety to **automate and centralize** emergency response
- **Enable effective decision-making** process to serve as your compass



*Decision management
can make or break an
advanced, intelligent
building*



QUESTIONS?

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