



International Institute for  
Sustainable Laboratories

# The Sweet Spot of Lab Flexibility – Designing for Adaptability, Sustainability, and Innovation

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# The Sweet Spot of Lab Flexibility

## Designing for Adaptability, Sustainability, and Innovation



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# Learning Objectives

- Understand how the design process can help you find optimizations for agile spaces based on your unique needs.
- Analyze how construction constraints, budgets, and methods can optimize business decisions for future flexibility.
- Recognize the impact of energy consumption, waste, business practices, and safety on your lab and business's adaptability, sustainability and employee retention
- Examine the value of collecting data and measuring outcomes with technology and benchmarking to prepare your team and space for scientific and technological advances.



# Topics

- Design
- Construction
- Sustainability
- Analytics
- Safety
- Questions



Design

# Lab Design Evolution

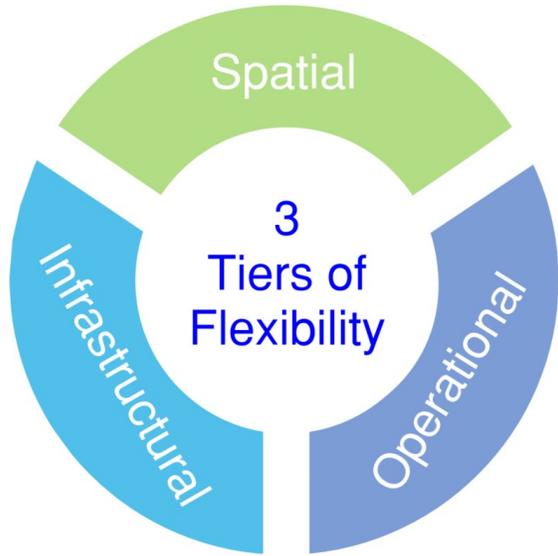


*Traditional lab design has had many evolutions in response to shifts in science, technology and work culture.*

*“Flexibility” has grown from being a luxury to a strategic necessity.*



# Defining Flexibility



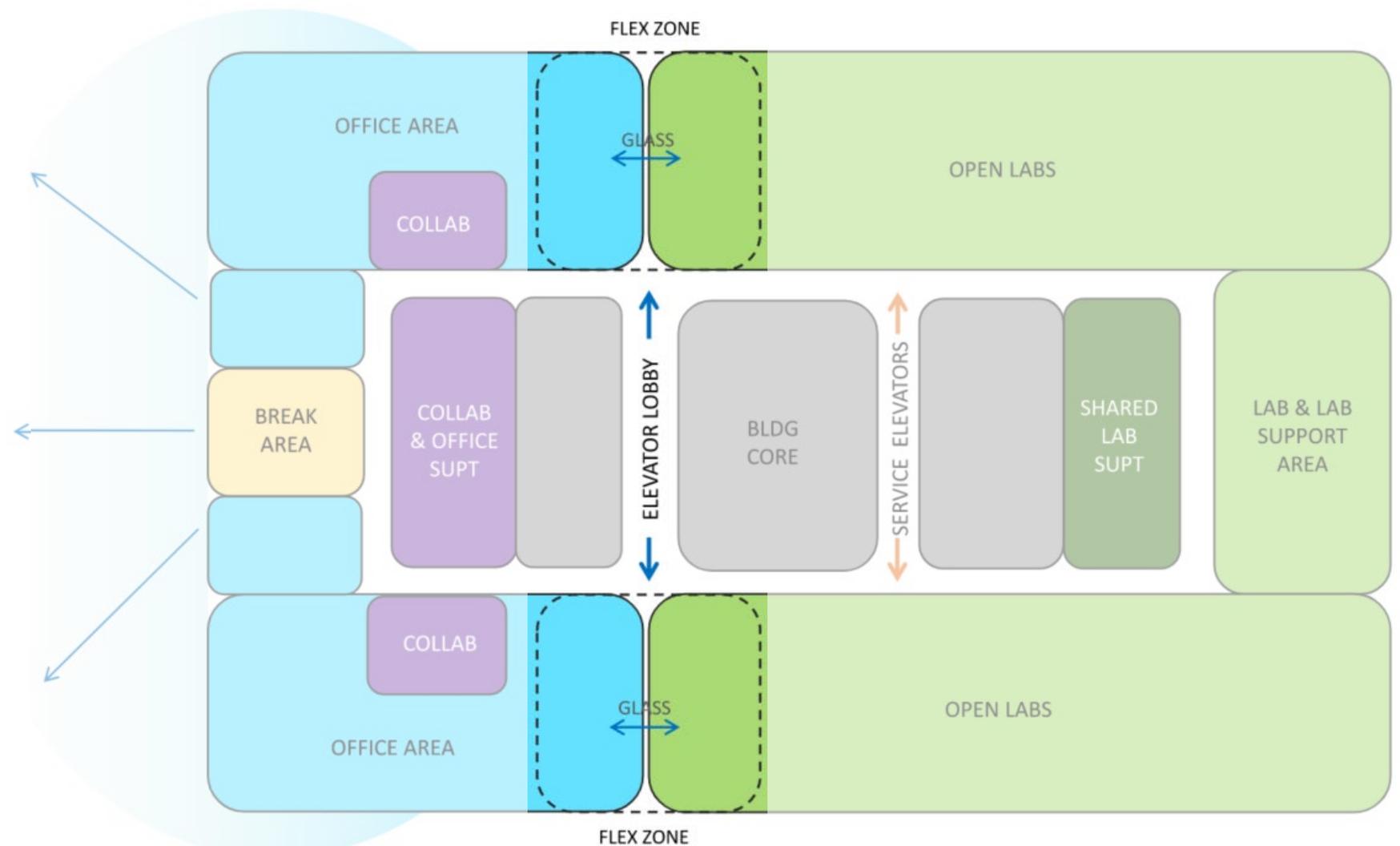
*Flexibility can be achieved in physical layouts, building systems, & organizational processes.*

*Flexibility does not equal unlimited adaptability – there is a cost-performance balance to consider - a sweet spot.*

# Planning Flexibility



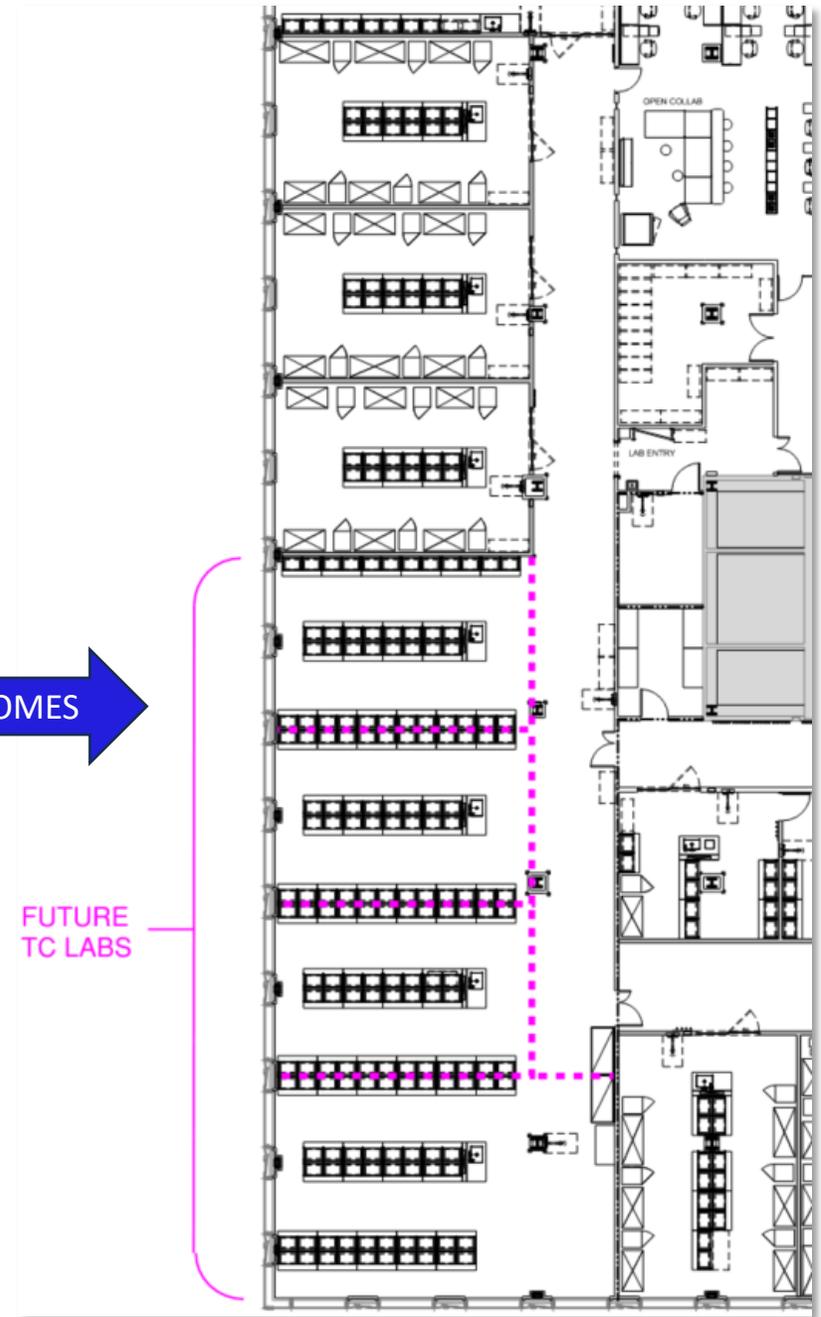
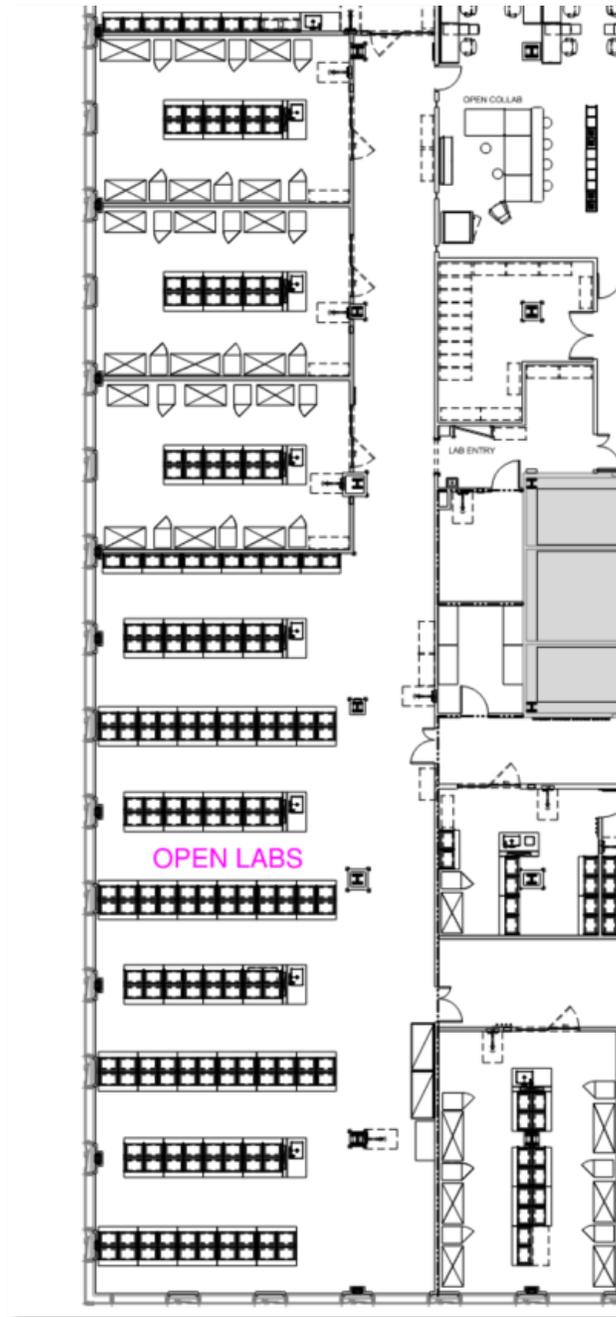
*As ratios of lab space versus office space continue to evolve, adjustable boundaries can be implemented to provide the ability to flex with the changing scientific and business needs.*



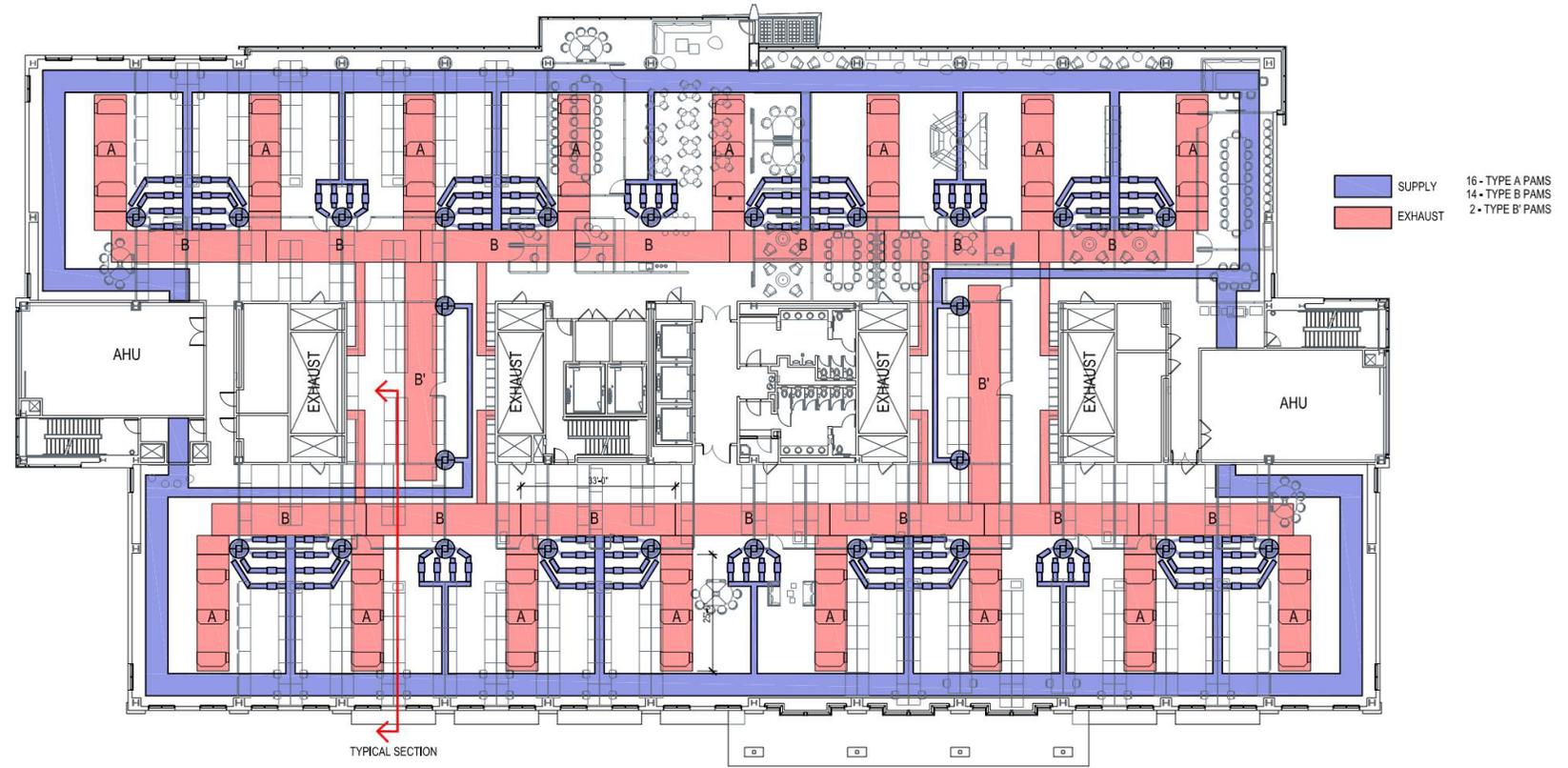
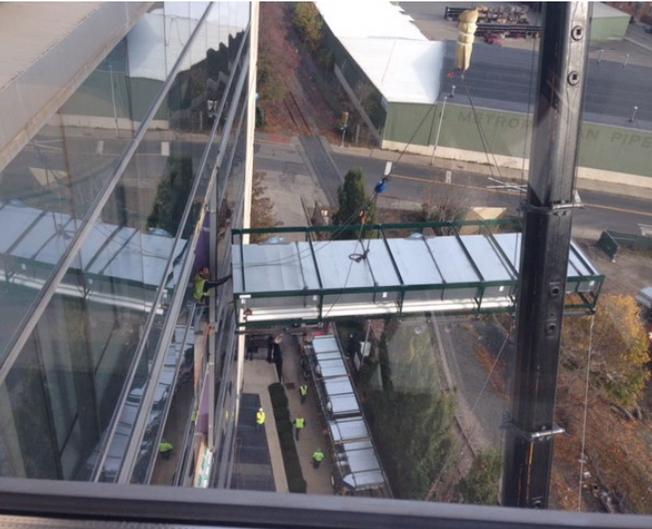
# Spatial Flexibility



*Planning scenarios that prioritize agility can identify early flexible measures, such as adding demountable partitions, to adapt Day One layouts for future needs with minimal costs and disruption.*



# Infrastructural Flexibility



*Ultimate flexibility comes at a higher initial cost, but the justifiable ROI is found in the drastic reductions to downtime and disruption.*

*Pre-assembled modules provide 100% convertibility between lab & offices uses.*



## Building for Agile Science



*Early stakeholder engagement is key to understanding the client's science type and desired pace of change.*

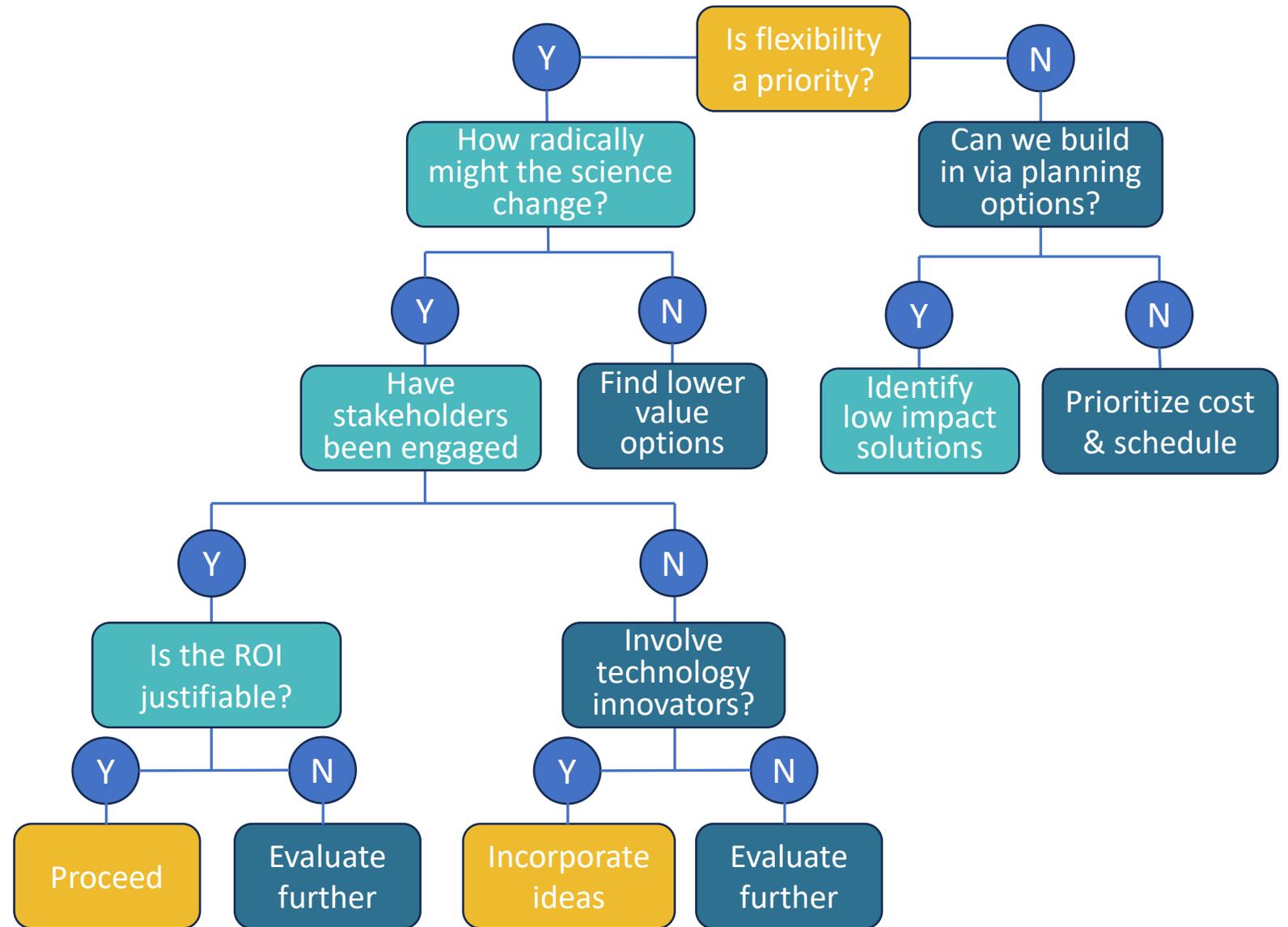
*The design process can then identify optimizations and typologies that support both short and long term adaptability.*





Construction

# If This, Then That



*Hypothesis-driven design thinking applies to lab flexibility and can identify the highest value priorities.*

*Encouraging your clients to model multiple scenarios early in the design process.*

# Constructing Flexibility

## EXAMPLE:

- *Density of Lab Gas*
- *Ceiling Utility Panels*
- *Turrets, Quick Connects and Regulators*

*SOLUTION: Flexibility and Cost Savings can both be achieved.*

*Flexibility is a balance on day 2 work, actual needs, and operating budgets*



## Assess

Evaluate current and future requirements

## Align

Decide on direction and priorities

## Adapt

Execute what's feasible now and stay flexible for future additions





Sustainability

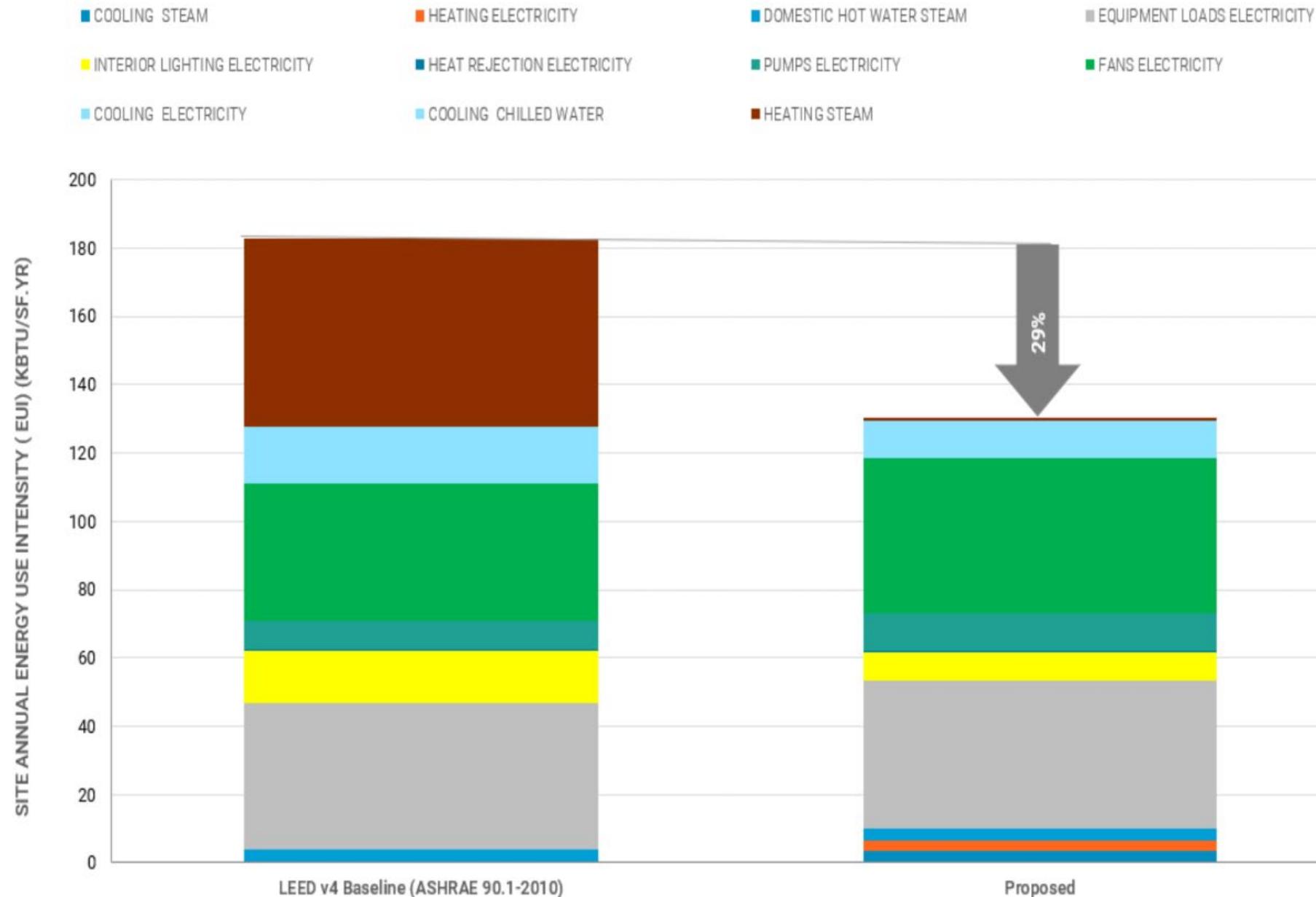
## The Hidden Flexibility

*Early energy modeling studies can result in significant energy savings over the life of the project*

*Sustainable design can be a long-term flexibility strategy – reducing operational costs and enabling change with minimal waste.*

*Renewable-ready infrastructure, shared resources, & circular design link energy efficiency with user well-being and retention.*

## ANNUAL SITE-ENERGY USE INTENSITY BY END-USE



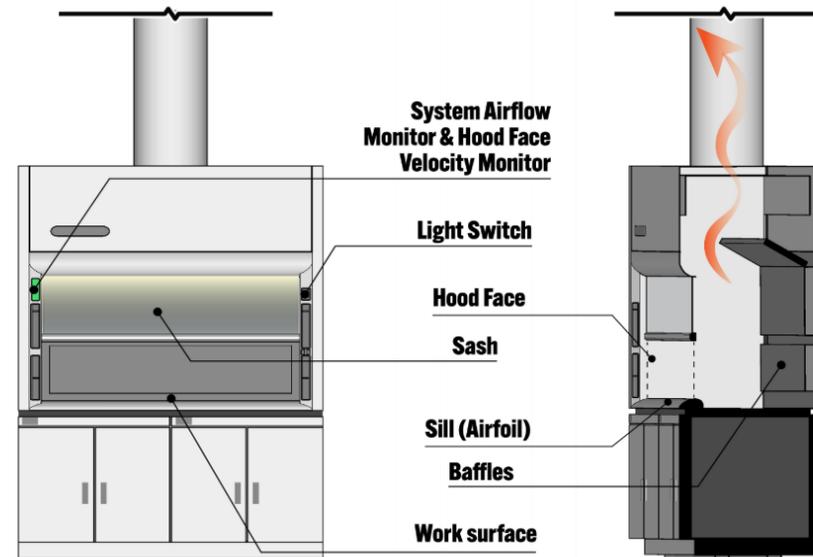
# Sustainable Ventilation

## EXAMPLE:

*Balancing Infrastructure and Implementation with Science and Safety*

- Energy Hogs – 40-60% of Lab Energy Cost
- Evaluate 100% outdoor Air, when and where
- Determine correct Air Changes per hour...is it a leasing strategy, over-design, or and EH&S need
- Energy Recovery Coils (Konvecta)
- Sensor and technology solution like Aircuity – basically a t-stat for usage

*SOLUTION: “Minimum air requirements” still means the design delivers a balanced approach that fully satisfies code, safety, and scientific requirements while improving sustainability*





Analytics

# Data-Driven Adaptability

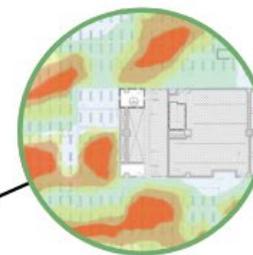
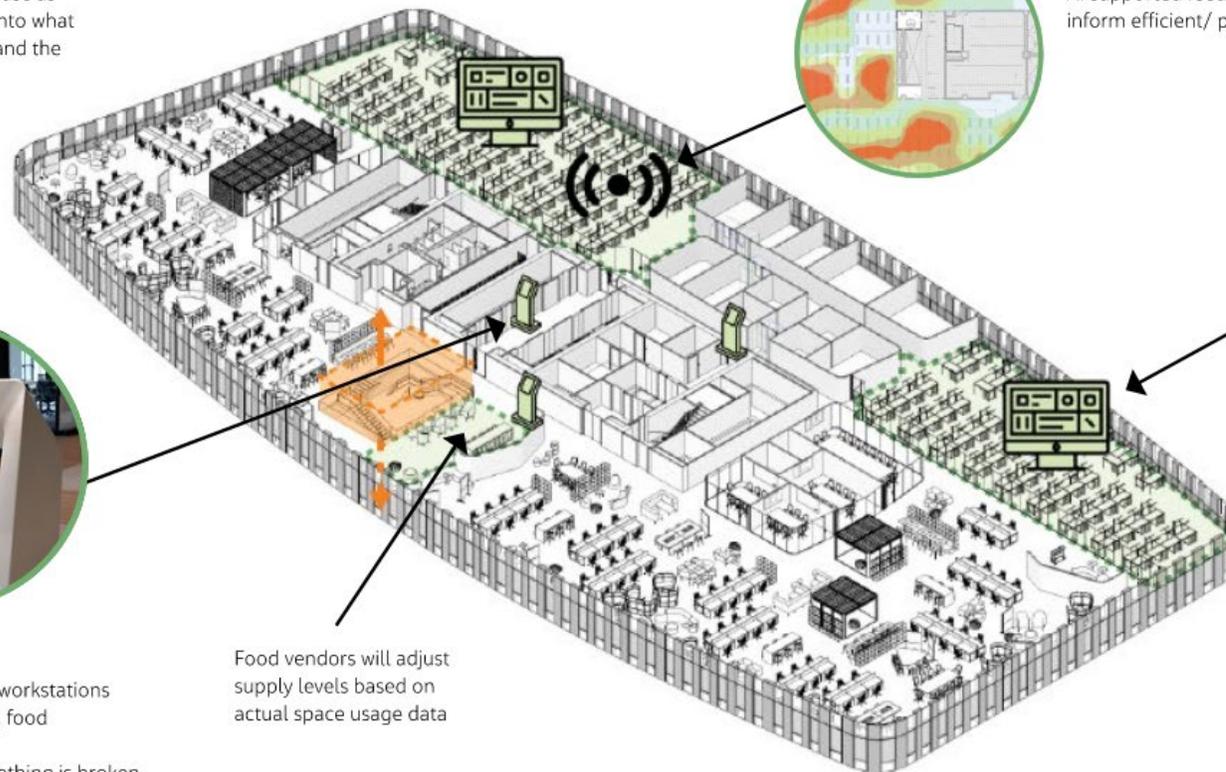
Building a culture of continuous feedback and open communication is essential to solving problems quickly. This applies to space use as well. A suite of devices provide insight into what employees need from their workplace and the tools to deliver it quickly.



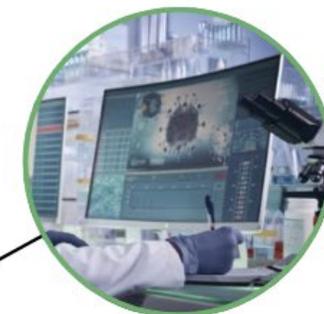
### Digital Concierge

- Personalized wayfinding
- Find available rooms and workstations
- Information about: events, food options, Takeda Initiatives
- Notify facilities when something is broken
- Find nearby transportation options
- Order supplies

Food vendors will adjust supply levels based on actual space usage data



Occupancy and Interaction Sensors located throughout every floor provide an AI supported feedback loop that will help inform efficient/ productive space use



### Virtual Backsplash in Lab:

-  Manage the whole lab for hours, and support remote satellite labs by seeing what they see
-  Remotely control instruments for direct instrument validation
-  View all instrument status, alarms, and result flags
-  Take control of instruments across all manufacturers

*Data helps close the loop between design intent and real-world performance.*

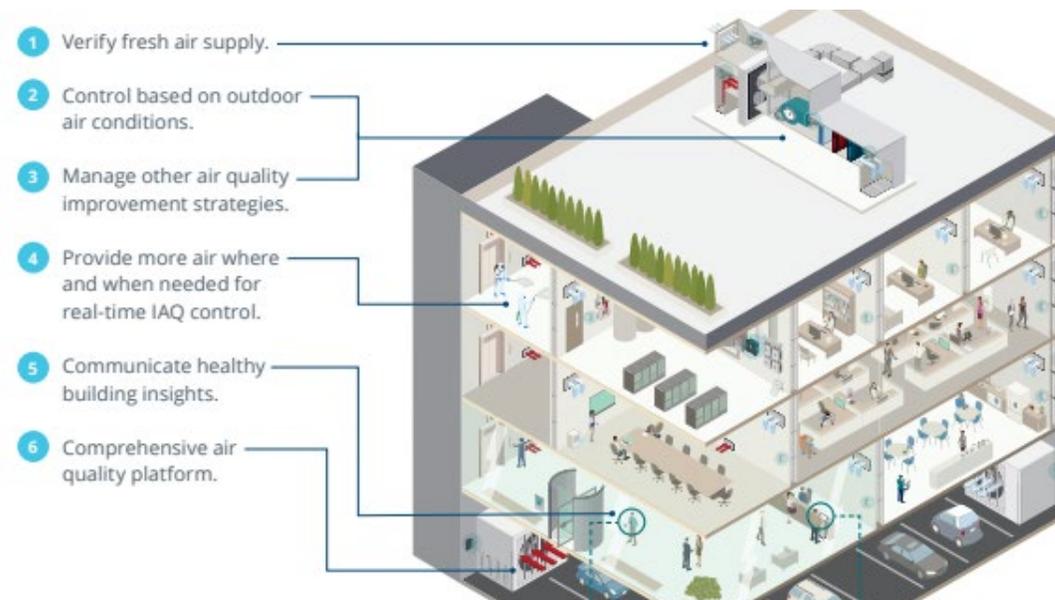
*Sensors, analytics and benchmarking tools can be used to measure flexibility and optimize operational gains.*

## CHALLENGE:

*Providing holistic Healthy and Safe environments for Life Sciences without a “One Size Fits All” solution*

- Demand Control Ventilation
- “T-stat” for Air Quality
- Constant Monitoring and Trending
- Optimization based on Occupancy
- Economics and Lifecycle Cost Benefit

*SOLUTION: Using technology and occupancy feedback to build in flexibility, save energy and optimize safety requirements*





Safety

## *How Safety and Sustainability can complement each other*

- Make EH&S a partner
- Prioritization of Healthy Environments to support occupant wellness, cognitive performance, and safer research
- Collaborate on real needs, effects and impacts
- Monitor and Maintain IAQ
- Evaluate range from 60 vs 100 fpm on fume hoods or BSC vs Exhaust hood

**SOLUTION:**  
*Collect the Data and have flexibility in your systems to continually monitor and adjust as required.*



## Low-Hanging Reactions

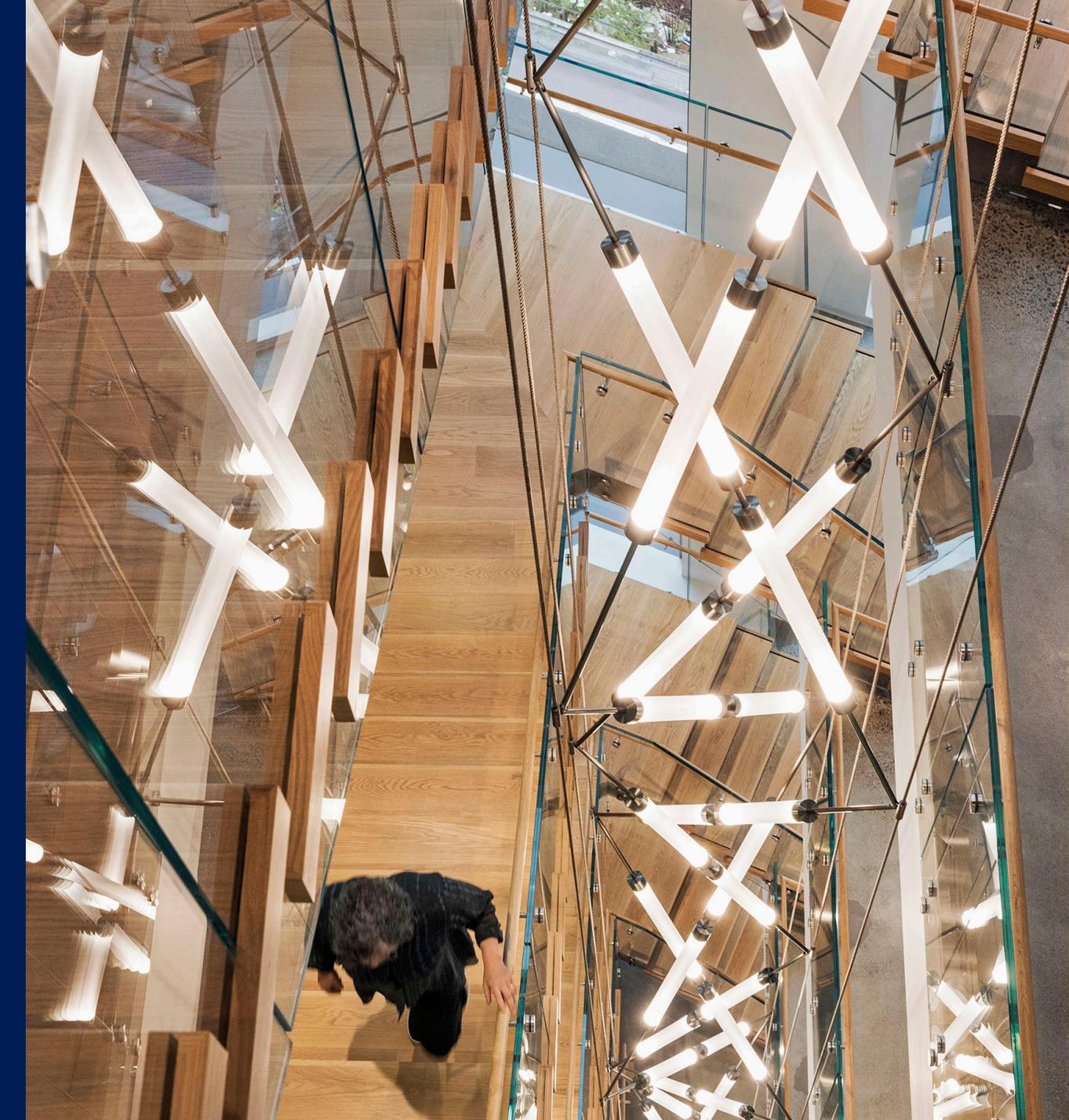
### *Incremental Optimization Efficiencies*

- Filter Change Schedule
- Ice Machine Specifications & Usage
- Gray Water Systems
- Shared Equipment rooms
- BSC use
- Task Lighting
- Recycling plans
- Smart plug strips / shut-off times
- BIM and Prefabrication

#### *SOLUTION:*

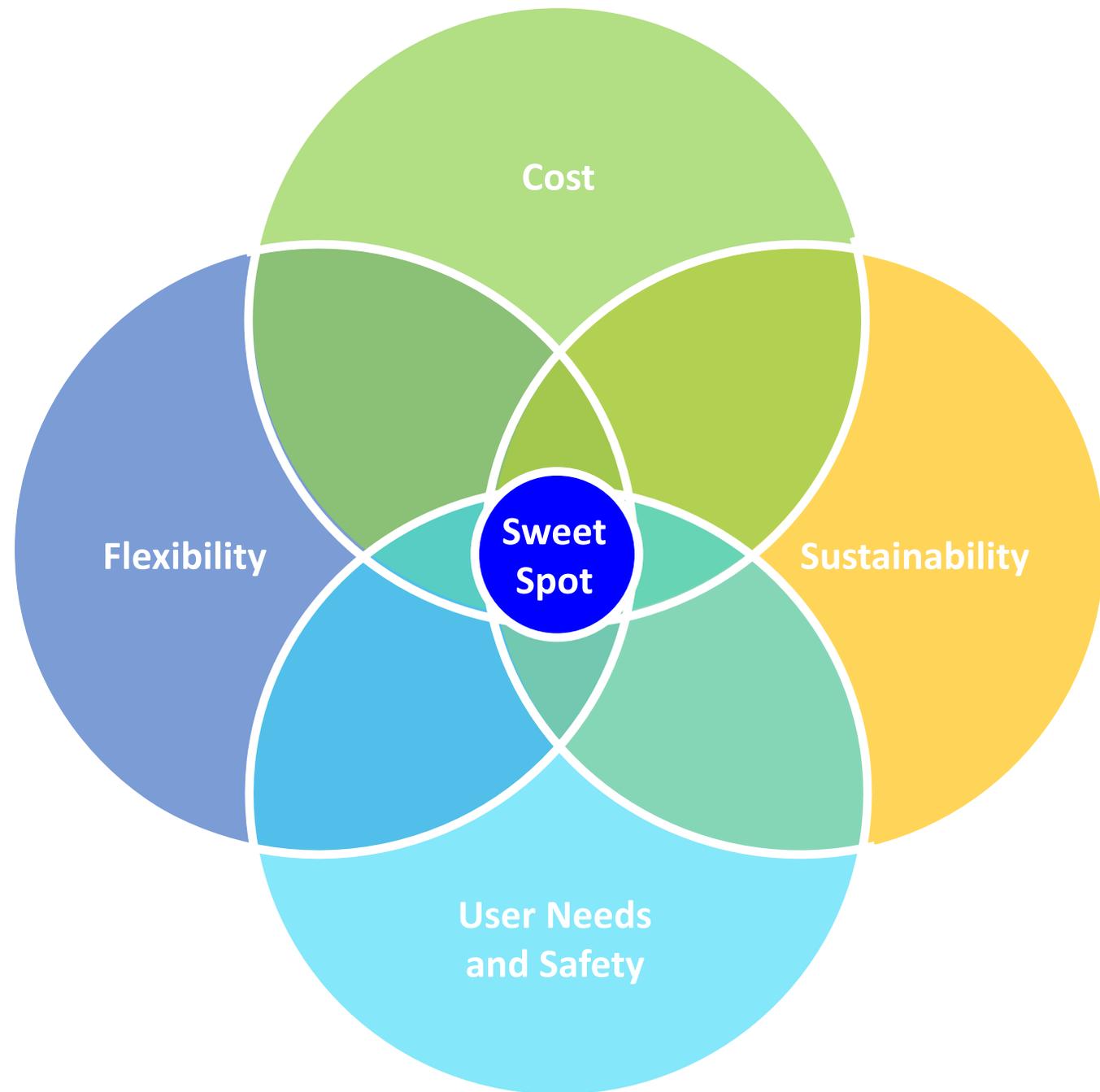
*Make a list of all items that provide flexible sustainable options yet retain safety and end user requirements. Review and prioritize with team and make decisions on immediate and day 2 implementation*





The Sweet Spot

## The Sweet Spot



*Identifying the right level of flexibility is the goal – not overbuilt and not underprepared for the future.*

# Questions