Laboratory Efficiency Strategies and the Smart Labs Program

Session Outcomes

- Recognize the benefits of implementing a Smart Labs Program.
- Identify how to reduce energy consumption and carbon emissions.
- Choose characteristics of a core team for successful project implementation.
- Recognize how to improve efficacy of laboratory ventilation systems.
- Select options that indicate an understanding of the tools that can be utilized in the design and construction process.


Energy
Exchange℠

Laboratory Efficiency Strategies and the Smart Labs Program

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Why Labs?

Laboratories typically use **3 - 4 (up to 10) times more energy** than an average office building.

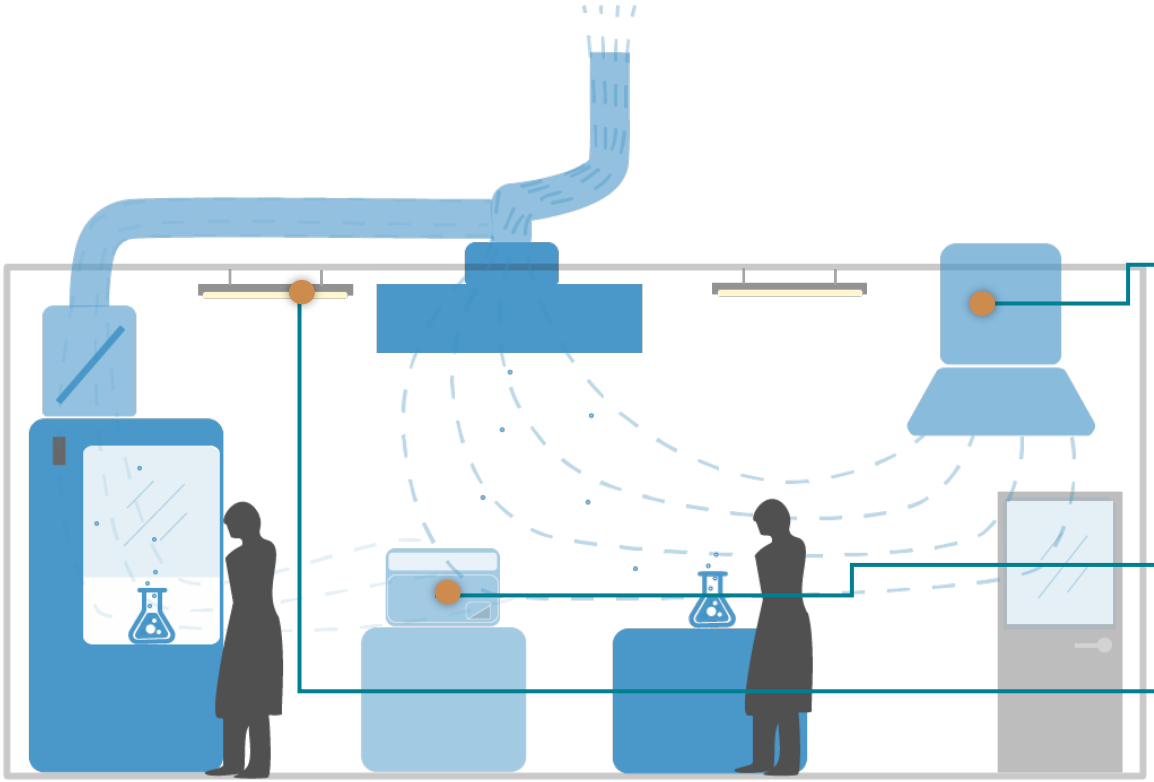
20% - 40%

Cost-saving opportunities in labs

$1-2 Billion

Potential energy savings across US labs

Energy Use in Laboratories



Top 5 Energy Users

1. **Ventilation**
2. Cooling
3. Heating
4. Plug Loads
5. Lighting

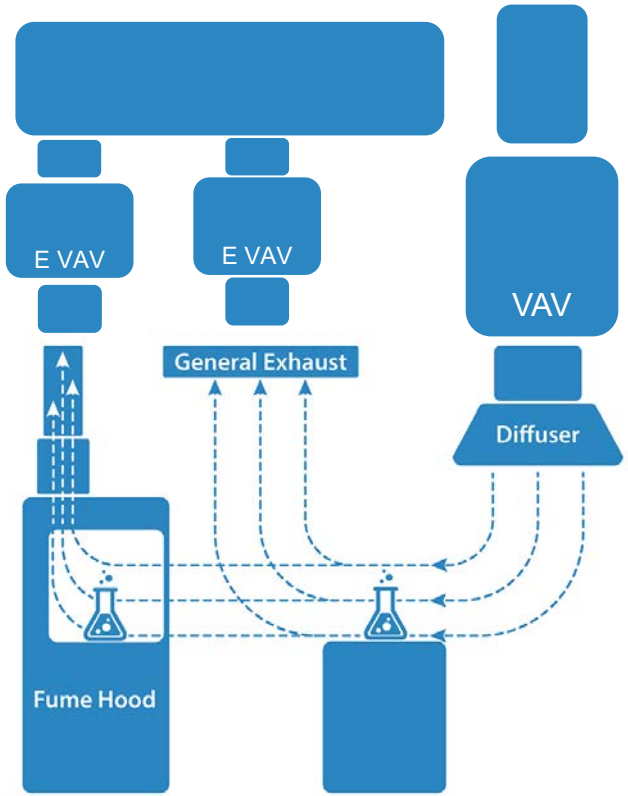
Big Picture Impact

There are over **150,000 U.S. labs** where **500,000 people** collectively depend on laboratory systems to **keep them safe**.

Even high-performance airflow systems **can lose up to 50% of their control ability** within five years.

Yet…

ACH ≠ **Improved Safety**



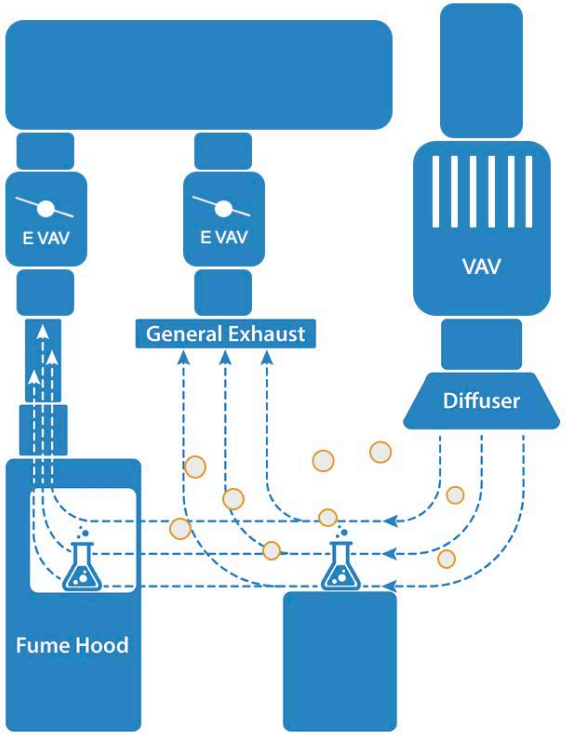
Big Picture Impact

ANSI Z9.5: Laboratory Ventilation…

- Discusses how air flow rate is just one factor that **safeguards** workers from harmful airborne contaminants
- Recommends a **ventilation risk assessment** to determine minimum airflow rates

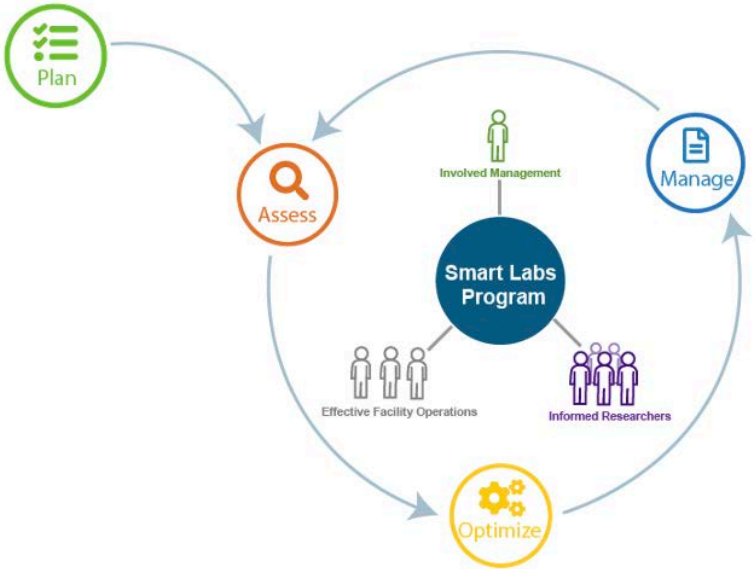
Pattern of airflow

ACH ≠ Improved Safety



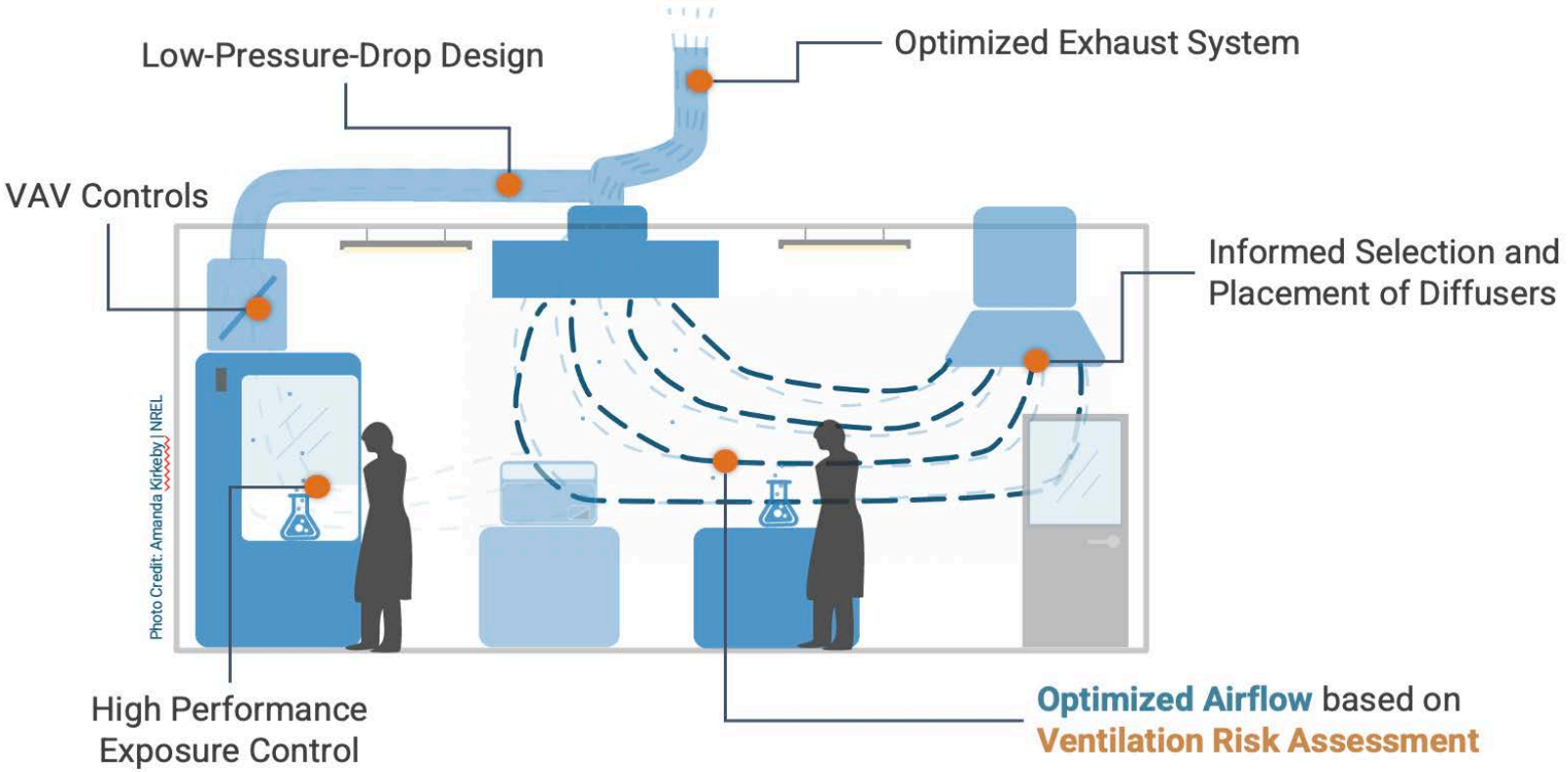
A Smart Labs program enables **world class science** through the design and operation of **safe and efficient** high-performance labs.

The Future is…Smart Labs!



- Optimize Safety
- Improve Energy Efficiency
- Reduce Costs
- Maintain High Performance Labs

High Ventilation Effectiveness



Laboratory Ventilation Risk Assessment

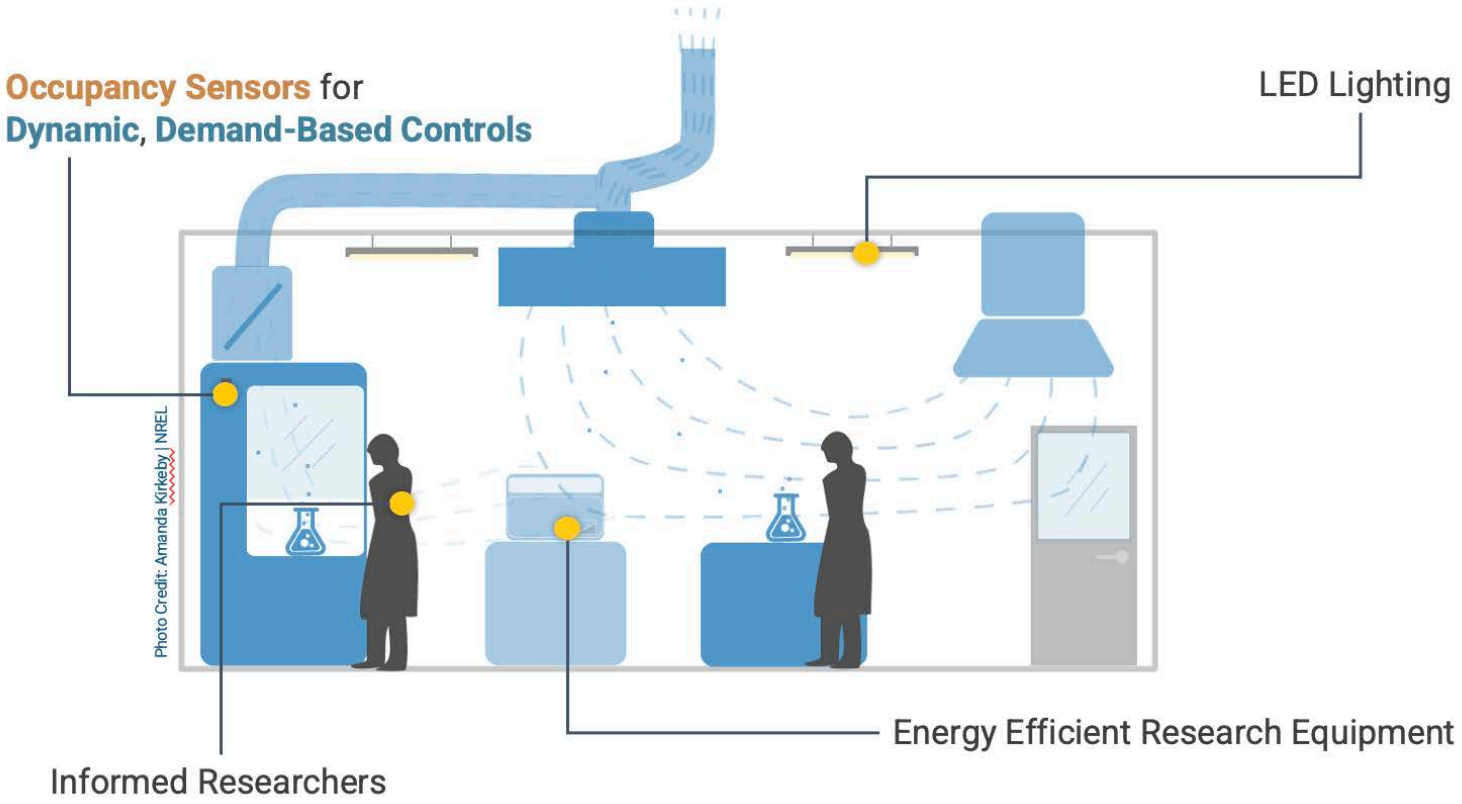
Method to provide ventilation designers and laboratory safety personnel with a **systematic, effective process to assess risk.**

- Assessment Categories
  - Types of hazards and procedure
  - Generation characteristics of hazard
  - Quantity of materials used or generated
  - Frequency and duration of hazard generation
  - Containment by exposure control devices

Risk Level	Description
0	Negligible
1	Low
2	Moderate
3	High
4	Extreme

ASHRAE-Recommended Minimum Room Flows

Reducing Lighting and Plug Loads



The Smart Labs Process

Plan

Form a team comprised of lab stakeholders, profile buildings, and develop a strategic plan for cost-effective implementation.

Assess

Review the laboratory ventilation system and other building systems to develop a scope of work for optimizing systems.

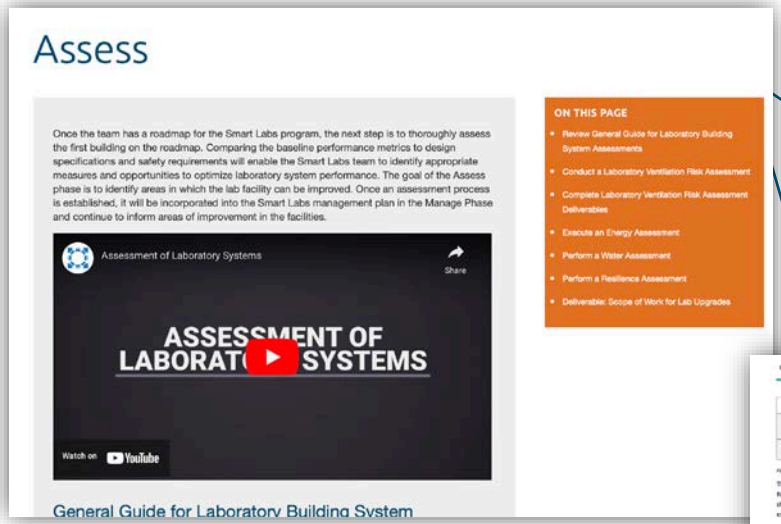
Optimize

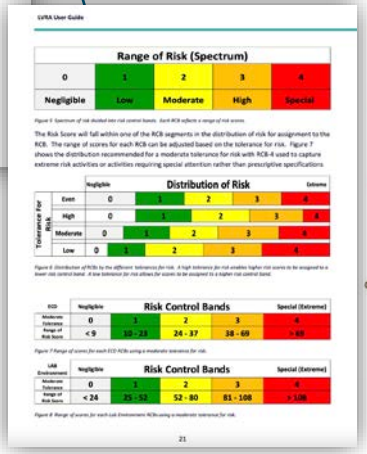
Execute meaningful projects to improve building systems in laboratories.

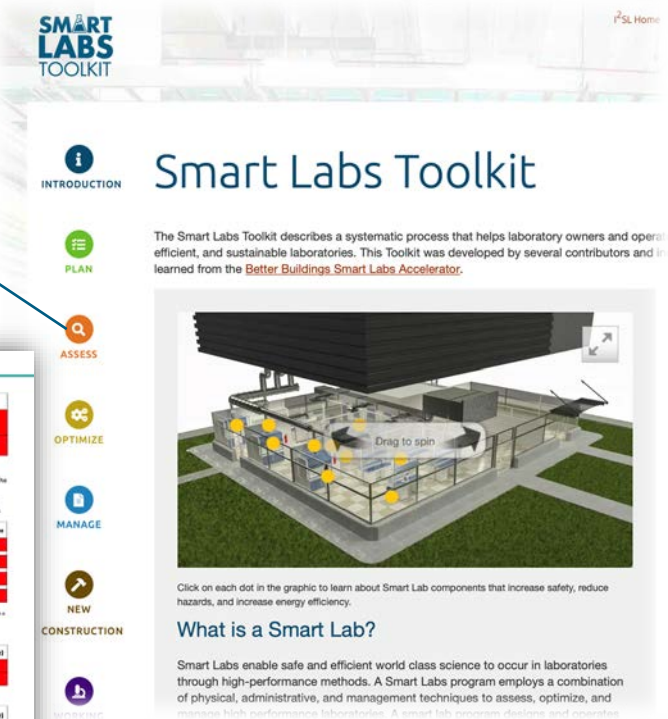
Manage

Implement a lifecycle performance management plan to continue to achieve safe and efficient labs.

Visit the Smart Labs Toolkit







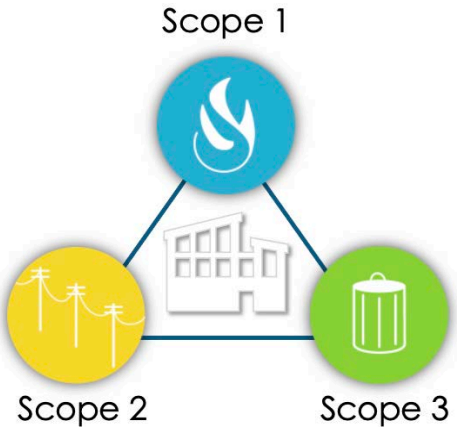
- Partner Case Studies
- Step-by-step Guidance
- User Friendly Tools & Calculators
- Helpful Resources & Templates
- Best Practices Guides

HVAC Resource Map

Decarbonization in Labs

Preparing for the Future

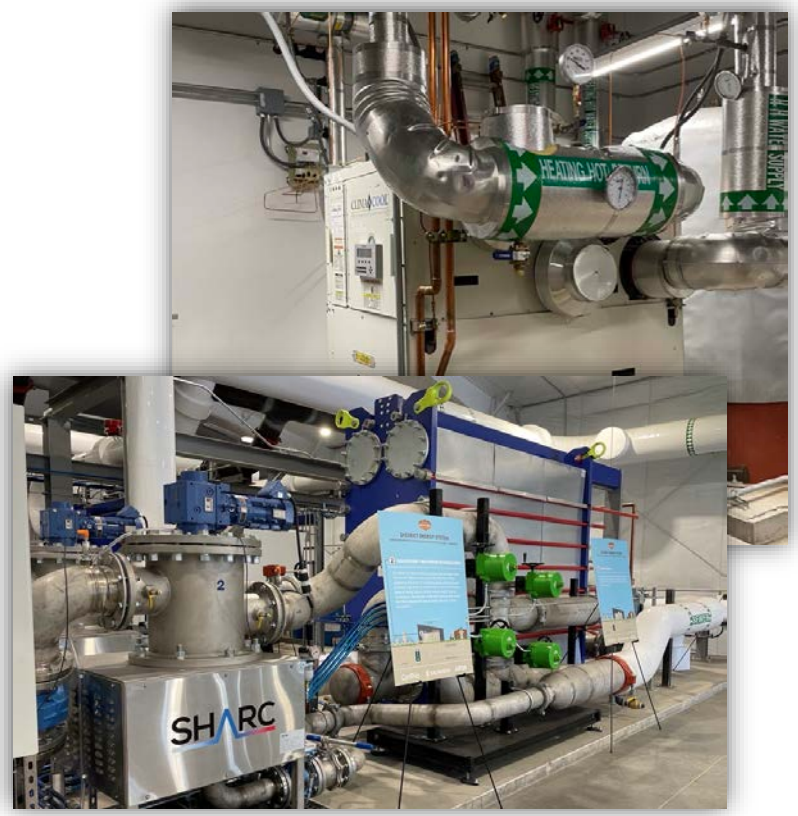
Decarbonizing Labs



- Energy Efficiency
  - Reduces a building's energy loads, decreasing dependence on fossil fuels
- Renewable Generation
  - Produces energy from clean energy sources where the supply cannot be depleted or can be reliably restored
- Electrification
  - Converts technologies that rely on fossil fuels to using electricity
- Demand Flexibility and Grid Interaction
  - Shifts a building's energy loads to non-peak demand, reducing strain on the grid

Decarbonizing Checklist

- **Get the ventilation right!**
  - Conduct recurring LVRAs
  - Modify setpoints and operating specs to optimize HVAC systems
- **Consider energy recovery**
  - Exhaust energy recovery
  - Heat recovery chillers
  - Other sources of waste heat
    - Data Centers
    - Sewer pipelines
- **Install heat pump, air-source or ground source**



Argonne National Laboratory Incorporates a Smart Labs Program

ANL enhanced existing campus-wide sustainability efforts with new resources and a network of laboratory partners

2017

ANL launched a pilot of its retro commissioning program

2018

ANL joined the SLA, a DOE program committed to the adoption of best practices

2019

Foundation set by ANL's existing sustainability infrastructure for its Smart Labs program

Learn more about ANL's Smart Lab Program Case Study on the toolkit

The University of Chicago's Smart Labs Program

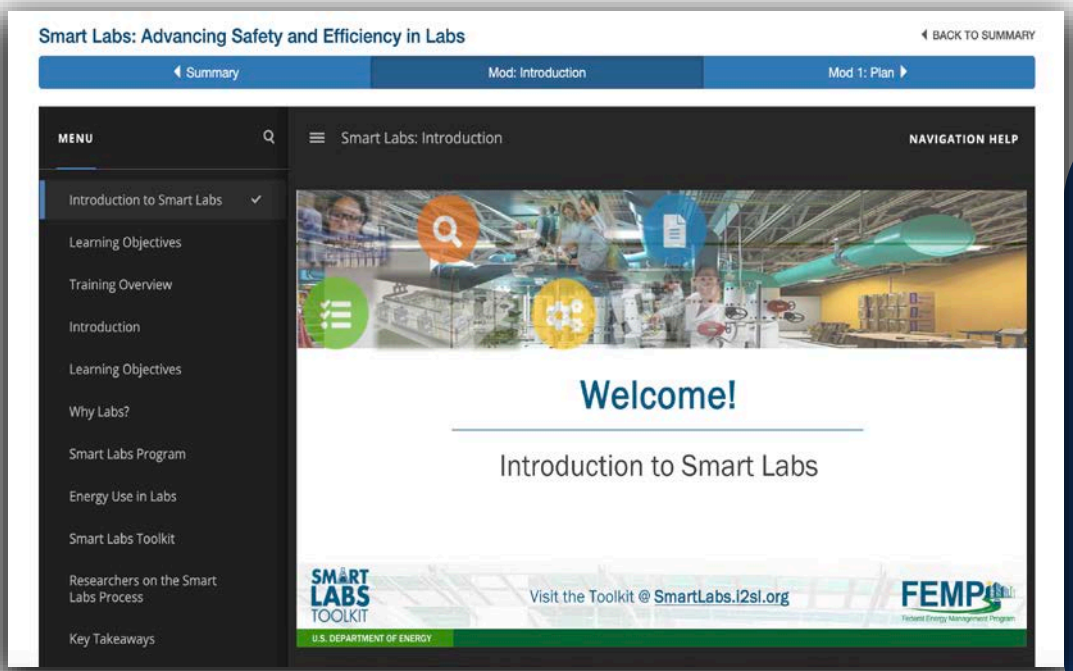
The University of Chicago's Ellen and Melvin Gordon Center for Integrative Science (GCIS)

GCIS is also the largest energy consumer on campus, accounting for over 15% of usage

- ✓ Laboratory safety benefited through improved fume hood
- ✓ Occupant comfort improved through optimizing equipment and sensors
- ✓ Reduced equipment loads increased available capacity improving system performance
- ✓ Energy savings reduced total building energy use intensity by over 13%

See more on University of Chicago's Smart Labs Program here

Smart Labs Training



<u>The Smart Labs Training Provides:</u>

The framework necessary to assemble a collaborative team

Identify and implement efficiency improvements

Join Us!

Smart Labs for National Labs

Federal Labs Work Groups

Various groups to share **best practices** and **strategies**

Use the QR Code to join the Smart Labs Partner List

Act Today!

1. Take the Smart Labs training and read the Smart Labs Toolkit

2. Find your EHS/Industrial Hygienist

3. Develop your Smart Labs Roadmap with your team

“People willing to buck the status quo and question all the assumptions which have been touted as best practices for not just years, but decades.”

– Wendell Brase, *Vice Chancellor, University of California, Irvine*

Questions?

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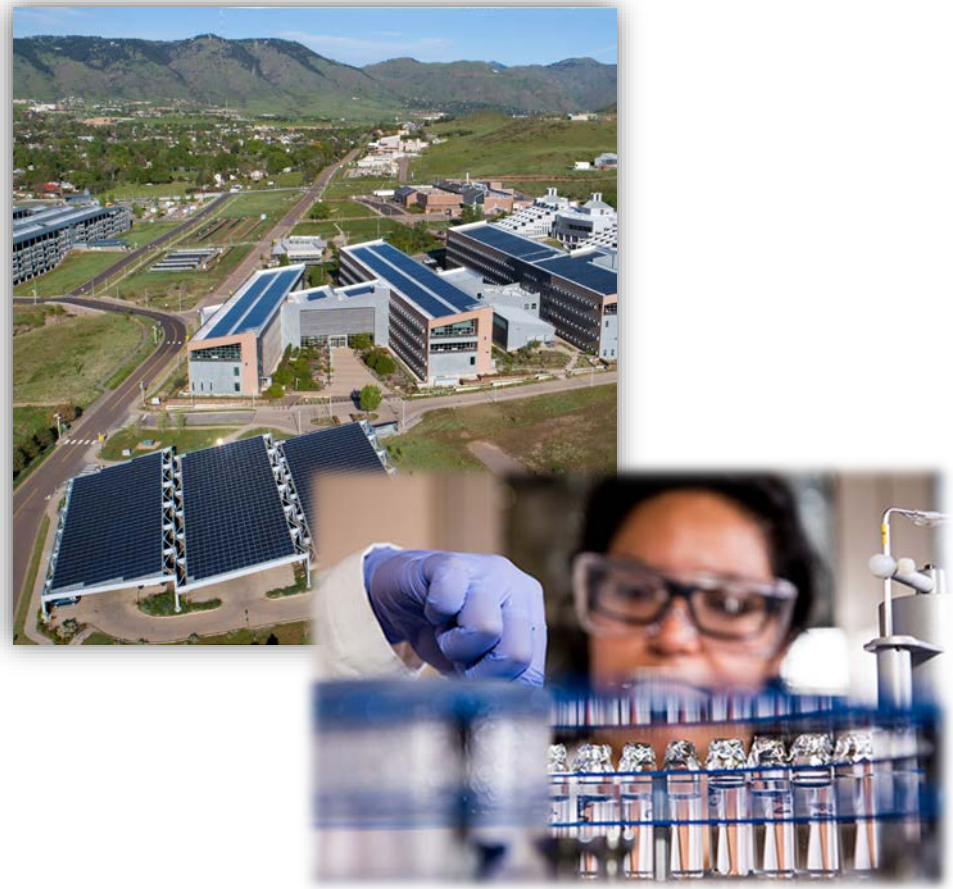

NREL Transforming ENERGY

FEMP Federal Energy Management Program

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