

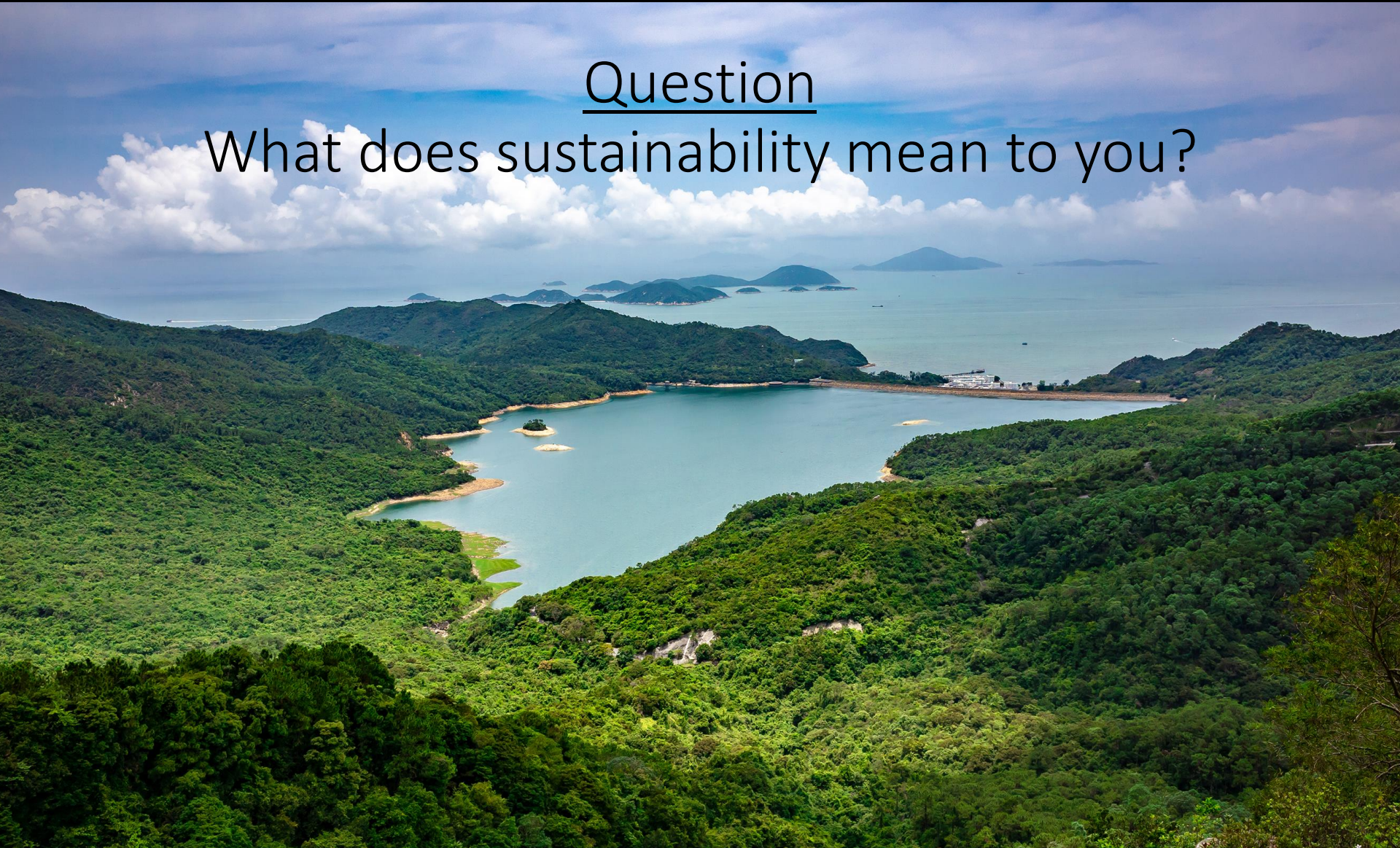
Sustainability & Resiliency on the CU Anschutz Medical Campus



What is Sustainability?

Question

What does sustainability mean to you?



What is Sustainability?

Question

What does sustainability mean to you?

United States Environmental Protection Agency (EPA)

Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment.

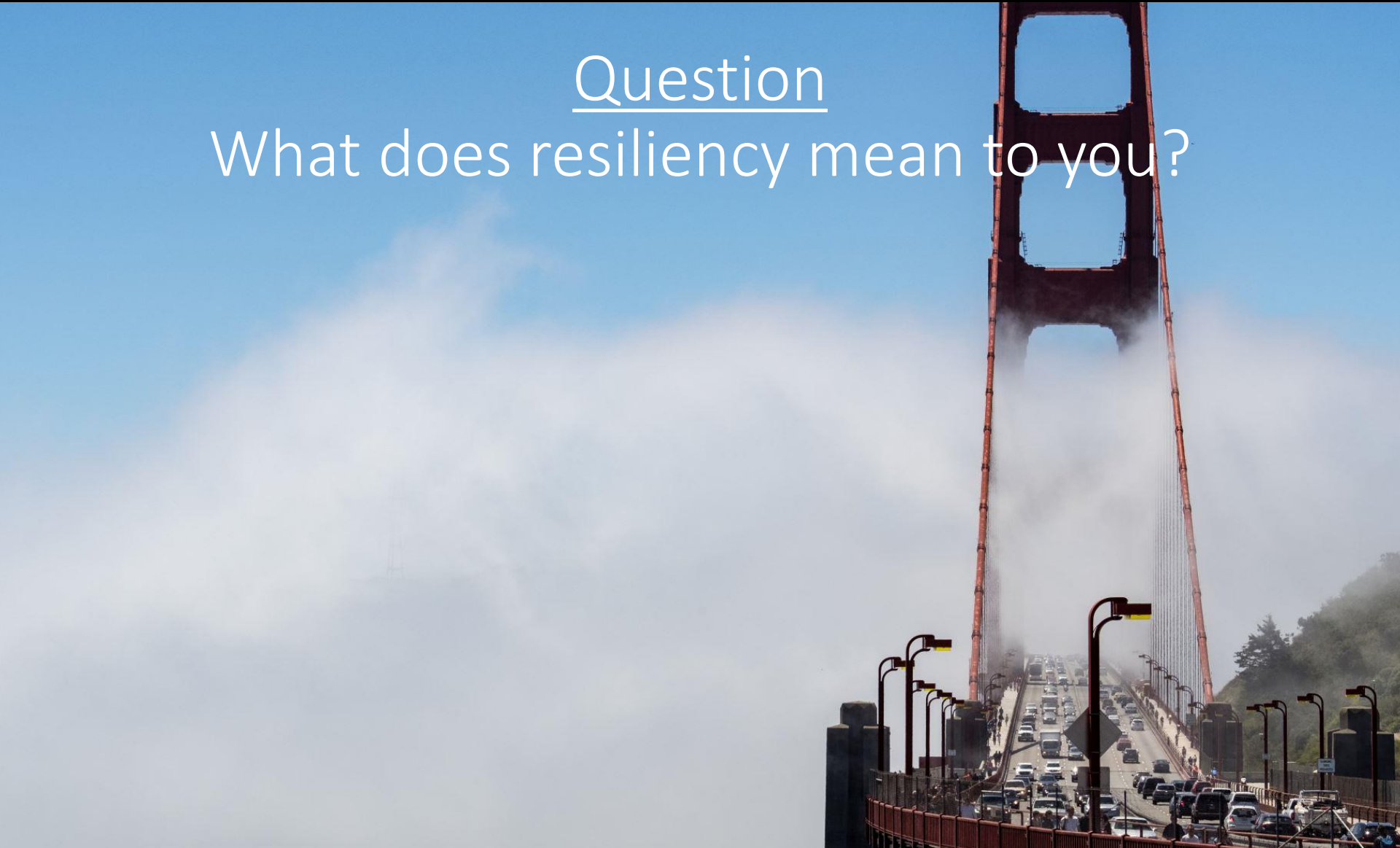
To pursue sustainability is to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations.



What is Resiliency?

Question

What does resiliency mean to you?



What is Resiliency?

Question

What does resiliency mean to you?

Resilience – the capacity to recover quickly from difficulties; toughness

While sustainability looks at how current generations can meet their needs without compromising that ability for future generations, resilience considers a system's ability to prepare for threats, to absorb impacts, and to recover and adapt after disruptive events.



Greenhouse Gas Emissions Scopes

Scope 1: What We Burn – Natural Gas to make Steam, Fleet Vehicle Fuel

Scope 2: What We Buy – Electricity from Xcel

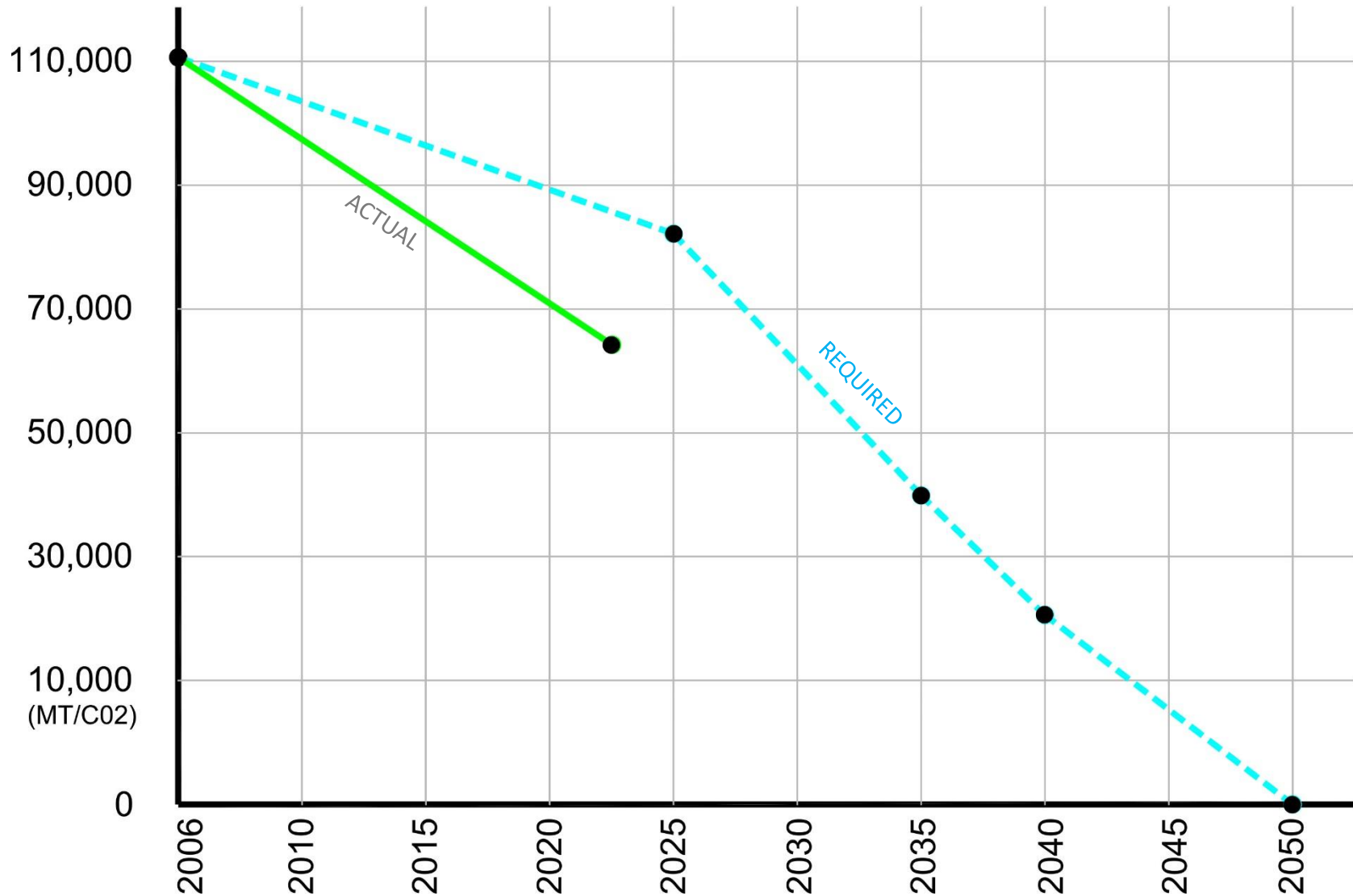
Scope 3: What We Don't Control (Directly) – The "3 E's" of Education for Sustainability

- Commuting
- Business Travel
- Purchasing/supply chain
- Waste generation
- Water Use



Colorado has requirements for addressing Scopes 1 & 2

GHG Inventory & Accounting



Lessons Learned

Research Complex 1

- First Research Tower on Campus – Built before State Standards for High Performance Buildings
- Value-Engineered During Construction
- Energy Hog – Energy Use Intensity is 352 (2023)
- Started Energy Conservation Measures (ECMs) in 2011
- Spent over \$11 Million – still doing work today to complete the full list of ECMs
- Lesson Learned – Build Better First
- Need for Long-term Planning – Physical & Financial



Recent Colorado Legislation

HB19-1261 (Climate Action Plan to Reduce Pollution – Established Clean Energy Plan requirements)

HB19-1260 (Building Energy Codes)

HB21-1286 (Energy Performance for Buildings)

SB21-264 Reduce Natural Gas Utility Emissions (Clean Heat Plan)

HB22-1362 (Energy-Efficient Building Codes)

SB22-051 (Heat Pumps and Building materials)

HB22-1218 (EV-ready Building Codes)

SB23-016 (Greenhouse Gas Emission Reduction)



SB 23-016 (2023)

Greenhouse Gas Emission Reduction

Concerning measures to promote reductions in greenhouse gas emissions in Colorado, and, in connection therewith, making an appropriation.

Greenhouse gas (GHG) is measured in metric tons of carbon dioxide equivalent or MTCO₂. This unit represents an amount of a GHG whose atmospheric impact has been standardized to that of one unit mass of carbon dioxide based on the global warming potential of the gas.

GHG EMISSIONS REDUCTION REQUIREMENTS

2006 Baseline: 112,039 MT/CO₂

2023 Actual: 64,687 MT/CO₂

2025 Goal (26% reduction): 82,909 MT/CO₂

2030 Goal (50% reduction): 56,020 MT/CO₂

2035 Goal (65% reduction): 39,214 MT/CO₂

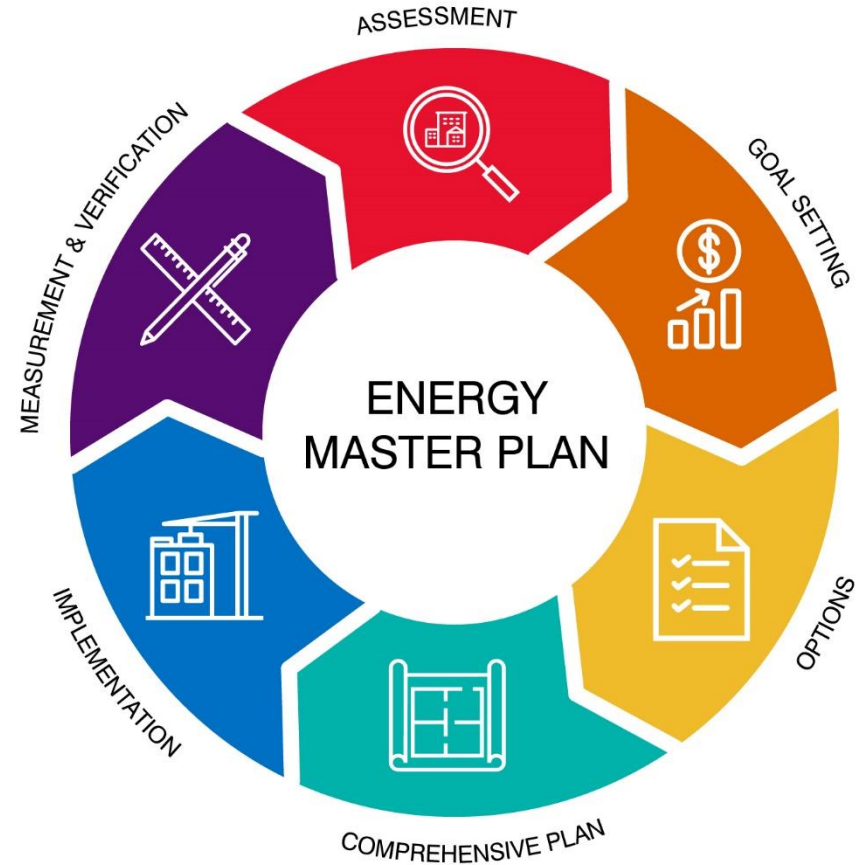
2040 Goal (75% reduction): 28,010 MT/CO₂

2045 Goal (90% reduction): 11,204 MT/CO₂

2050 Goal (100% reduction): 0 MT/CO₂

CU ANSCHUTZ – Energy Master Plan (EMP)

The University of Colorado | Anschutz Medical Campus ENERGY MASTER PLAN, when fully implemented, will provide the university with a financially sustainable energy program; providing specific guidance in achieving State legislated energy goals, reducing GHG emissions, EUI and potable water usage, while opening a path to full energy sustainability over time through the greening of the campus electricity supply.



Climate Action Plan Update

CLIMATE ACTION PLAN:
a strategic framework for measuring, planning, and reducing greenhouse gas (GHG) emissions and related climatic impacts. (i.e. energy and water consumption, waste diversion, transportation, etc.)

Climate action plans, at a minimum, include an inventory of existing emissions, reduction goals or targets, and analyzed and prioritized reduction actions. Ideally, a climate action plan also includes an implementation strategy that identifies required resources and funding.



University of Colorado Denver
Anschutz Medical Campus • Denver Campus

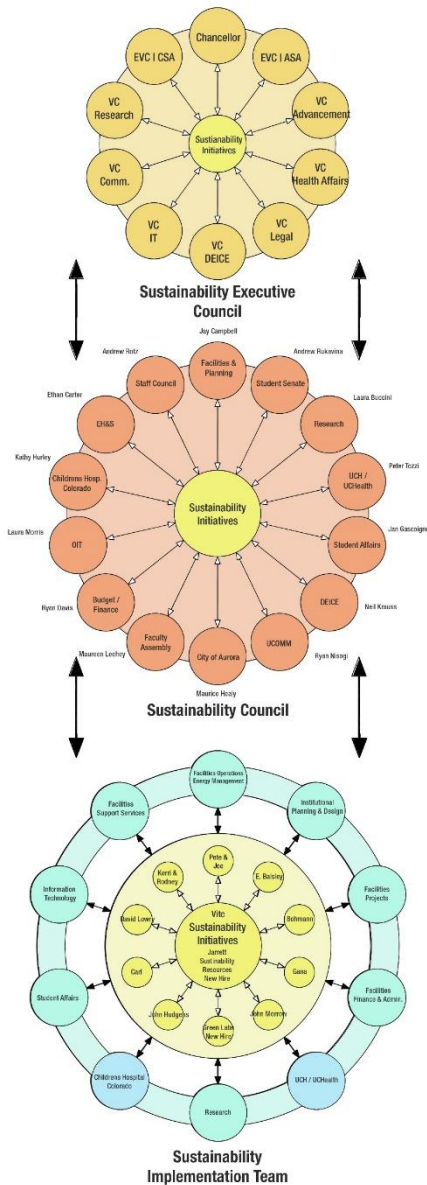
The development of this plan fulfills university climate action planning requirements as a signatory of the



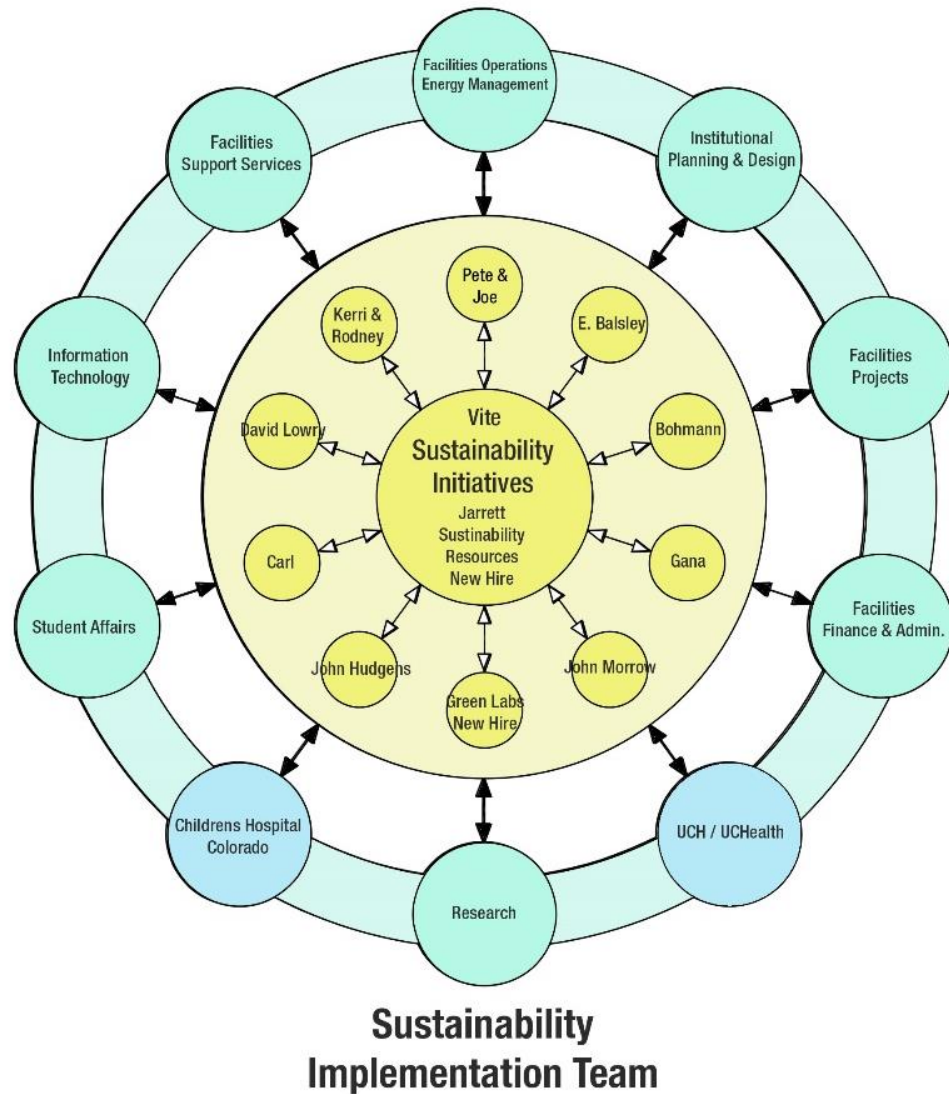
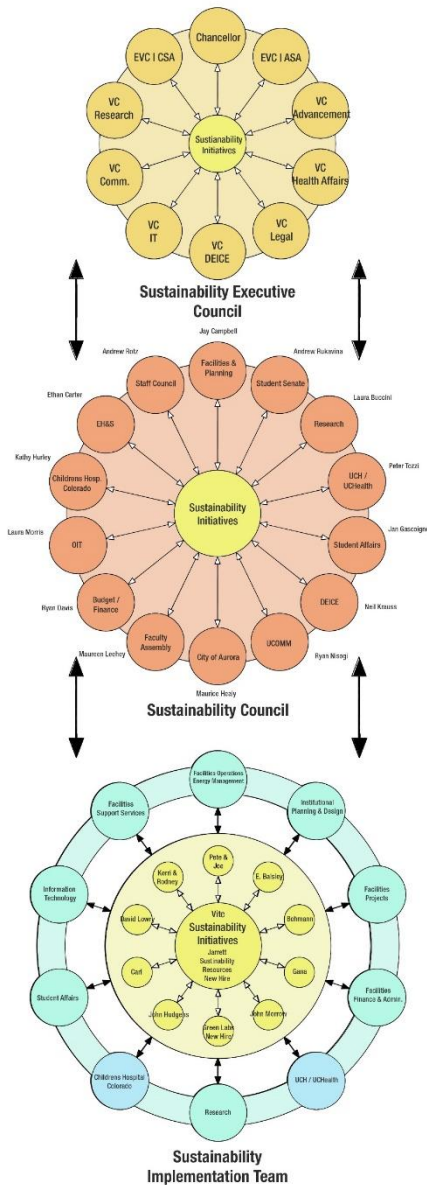
AMERICAN COLLEGE & UNIVERSITY
PRESIDENTS CLIMATE COMMITMENT



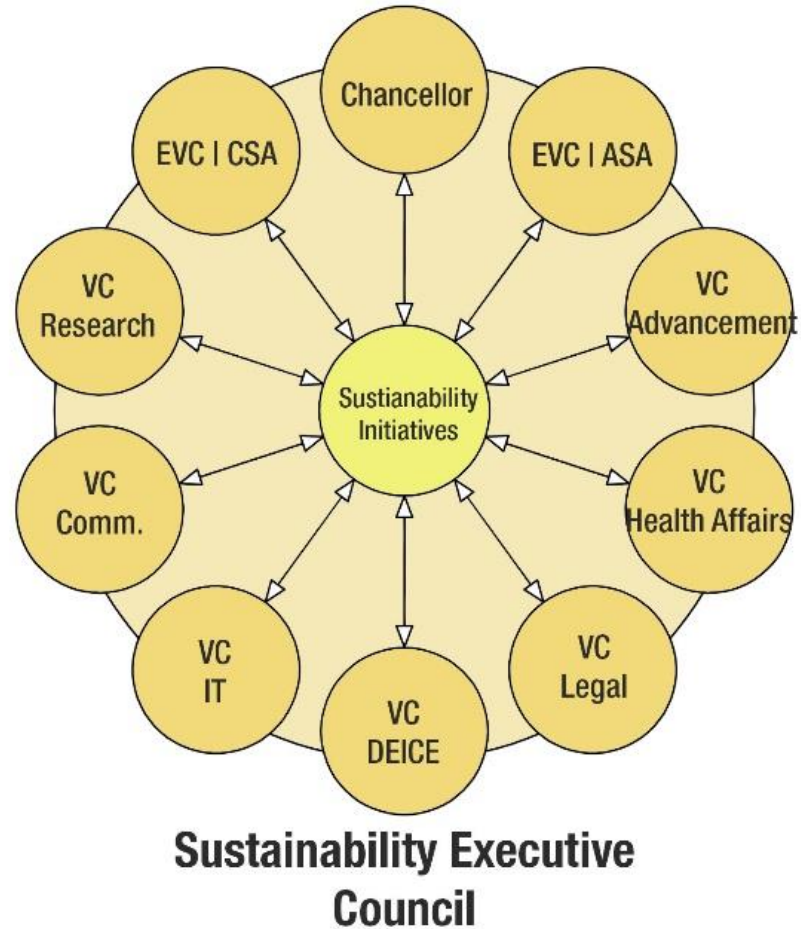
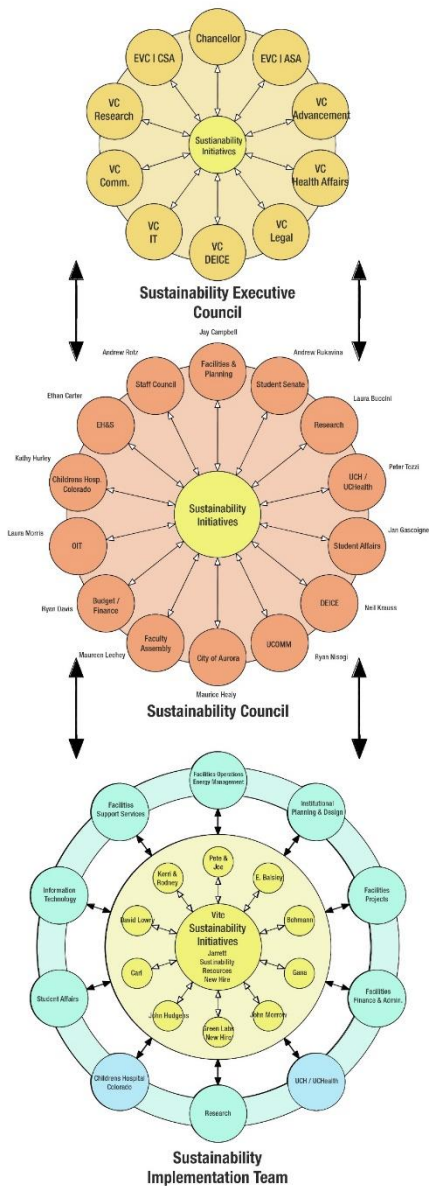
SUSTAINABILITY COUNCIL STRUCTURE



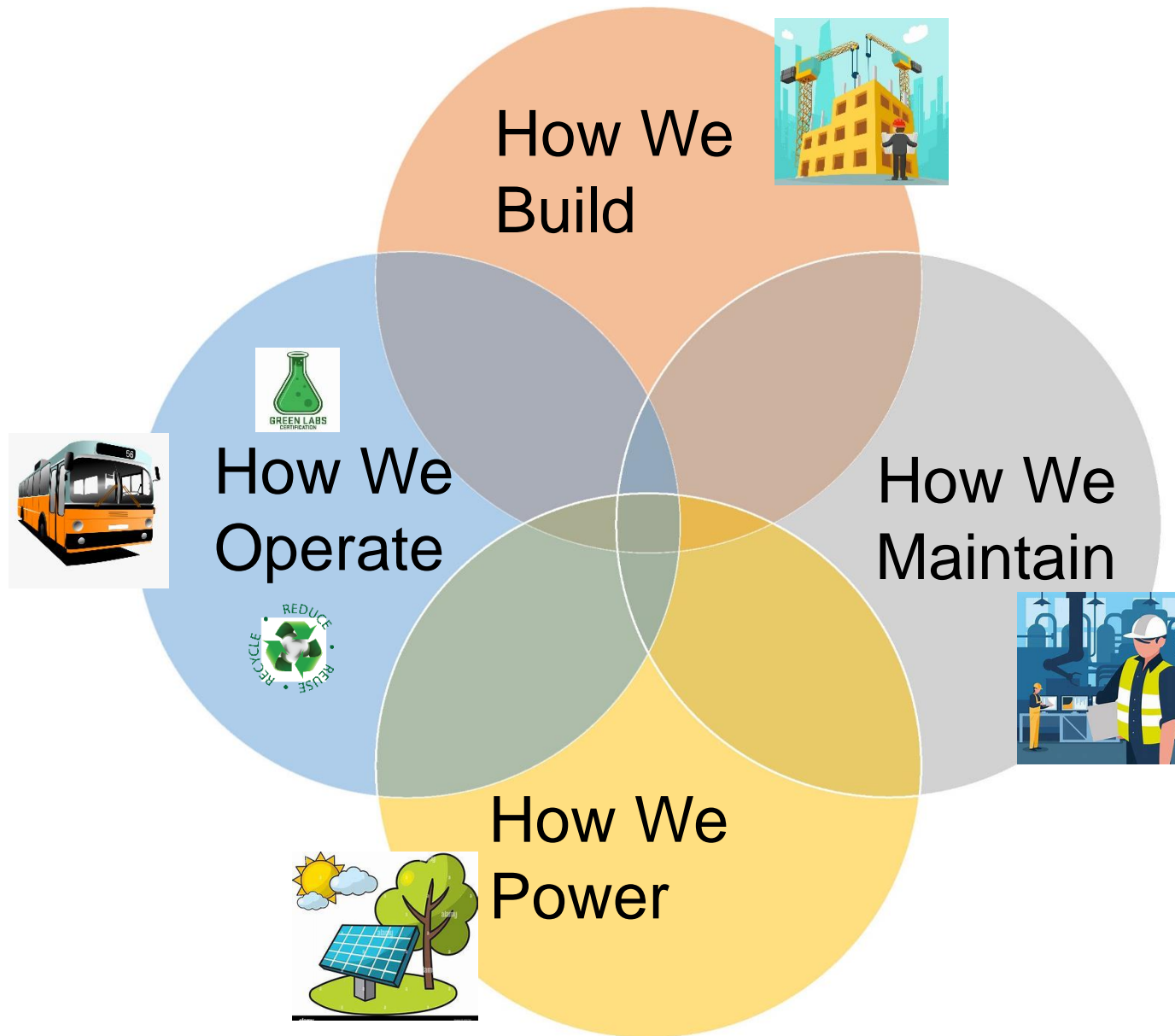
SUSTAINABILITY COUNCIL STRUCTURE



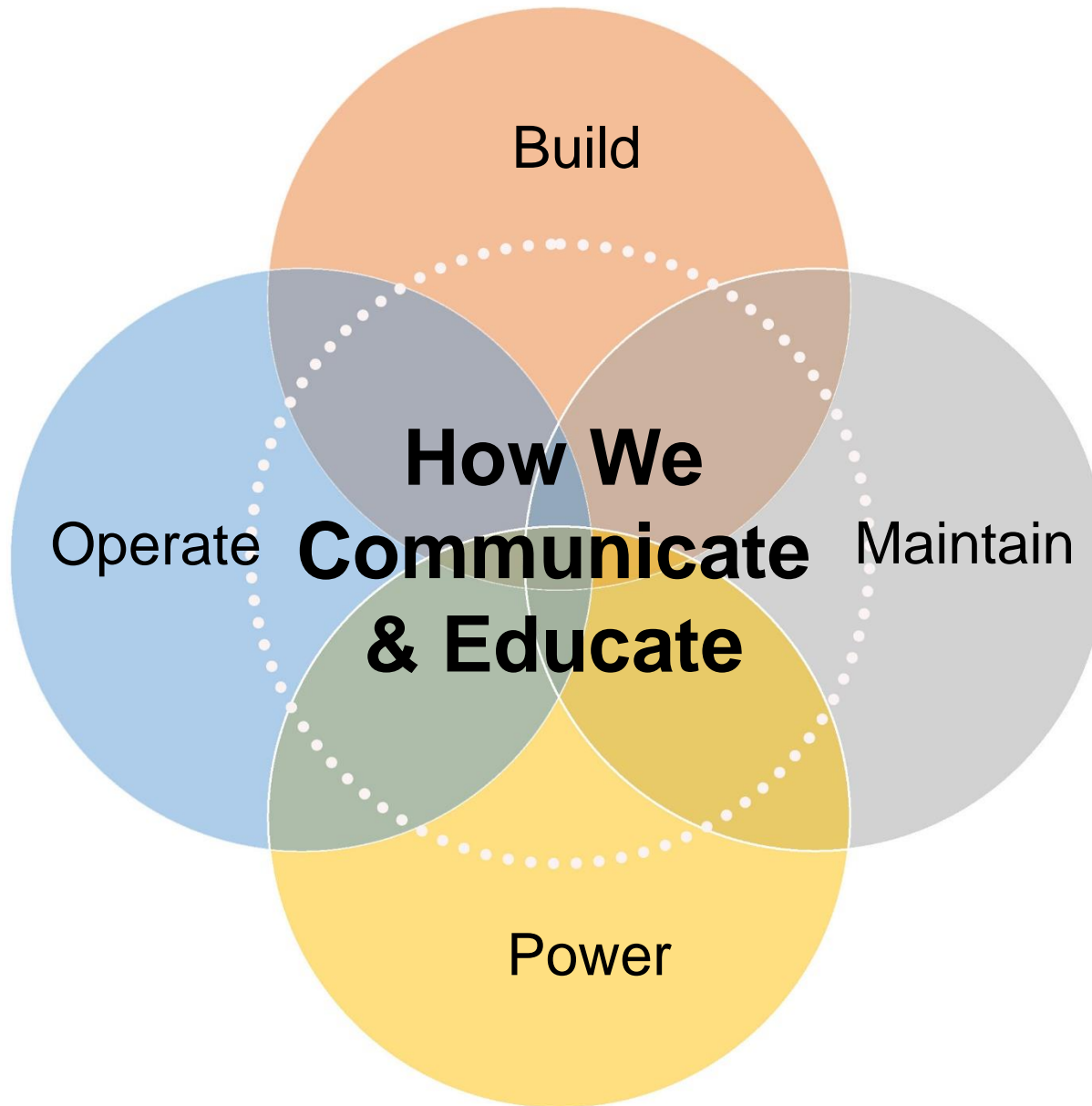
SUSTAINABILITY COUNCIL STRUCTURE



Sustainability Council



Sustainability Council



How We Operate

Energy (Scope 1 & 2 GHG Emissions)

- CUP was efficient design in 2000 to heat and cool University and 2 hospitals
- EMP Goals require a different approach – move toward electrification of operations on campus and development of large-scale sustainable and resilient energy resources
- Electrification of Building 534
- Move to EV fleet for O/M and light rail shuttle
- Build out of EVSE (Charging) Infrastructure on Campus to support fleet and community
- Phase out of gas-powered hand tools on campus

How We Maintain

- **Facilities Condition Audit (FCA)** – a process to document, analyze and benchmark the current condition of a building's assets and make the data actionable by using this data to develop capital plans, impact to master plans, and updating the maintenance tasking and scheduling to ensure optimum life for the building asset.
- **Facilities Condition Index (FCI)** – a key benchmarking tool used to compare the condition and maintenance needs of a facility to its replacement value.
 - Calculation of FCI =
$$\frac{\text{Total Cost of Deficiencies}}{\text{Current Building Replacement Value}}$$

Facilities Condition Categories	Facilities Condition Index Scoring (FCI)
Targeted Condition:	0.85 → 1.0 (85% to 100%)
Fair → Good Condition:	0.61 → 0.84 (61% to 84%)
Poor → Fair Condition:	0.35 → 0.60 (35% to 60%)
Poor Condition:	0 → 0.34 (0% to 34%)

What We Maintain – Anschutz Campus Facilities

Henderson Garage Parking Structure – (495,499 gsf)
complete lighting retrofit

Perinatal Research Facility– (24,128 gsf)
complete lighting retrofit

T-36 – (68,333 gsf)
complete lighting retrofit in shop areas

Ed 2 North 5 stories (160,454 gsf) –
Complete lighting retrofits (1st floor, 2nd floor)

Ed 2 South 5 stories (114,922 gsf) –
Complete lighting retrofits (1st floor, 2nd floor))

Fitzsimmons Building (479,660 gsf) –
Replaced 30-yr old chillers

What We Maintain – Anschutz Campus Exterior Lighting

- East Rock Lot
- West Rock Lot
- Aspen Parking
- Vail Parking Lot
- Breckenridge Parking Lot
- Monte Vista Parking Lot
- Sidewalk area – between Wellness Center/Commander's House
- Sidewalk area – Pharmacy and Strauss Library
- Sidewalk area – Ben Nighthorse Campbell/Barbara Davis
- Along Henderson Drive
- Montview Street – multiple pedestrian crossing locations



What is The Sustainability Impact from Campus Lighting Enhancements?

LED Fixture Replacements – Henderson Parking Garage

- **430 Metal Halide fixtures replaced – Henderson Garage**
- Efficiency: Decrease of 8,600 Watts
Operations: Next anticipated lighting retrofit- 10 years
- Safety: 3,500 Lumens to 9,200 Lumens per fixture - **163% Increase**
- 16.3 MT-CO² avoided per year
CO² emissions – 749 propane cylinders used for home barbeques
CO² emissions – 18.95 tons of coal burned

LED Pole Fixture Replacements – Campus Parking Lots

- **37 Metal Halide pole fixtures replaced – Breckenridge/Monte Vista lots, and Roadway between Aspen/Breckenridge lots**
- Efficiency: Decrease of 5,000 Watts
Operations: Next anticipated lighting retrofit- 10 years
- Safety: 5,000 Lumens to 15,000 Lumens per fixture – **200% Increase**
- 9.5 MT-CO² avoided per year
CO² emissions – 1.2M smartphones being charged
CO² emissions – 5.32 tons of coal burned

LED Fixture Replacements – East Rock Lot

- **10 Metal Halide fixtures replaced
10 new LED fixtures installed**
- Efficiency: Decrease of 1,600 Watts
Operations: Next anticipated lighting retrofit- 10 years
- Safety: 3300 Lumens to 9700 Lumens per fixture - **194% Increase**
- 1.1 MT-CO² avoided per year
CO² emissions – 112 gallons of gasoline consumed
CO² emissions – .56 tons of coal burned



What's Next – Future Improvements

- Lighting Improvements
 - Red Cross Memorial
 - Parade Area
- Building Improvements
 - Continuing with general LED lighting upgrades
 - Bottle fillers throughout campus
 - Infrastructure completion for EV charging station
- Continue conversions – “greening” of vehicle fleet
 - How many already?
- Numerous mechanical systems requests submitted for State Controlled Maintenance
 - Fitzsimmons (AHU replacement-multiple units)
 - RC 1 (AHU replacement-multiple units)

Campus Initiatives

“Stuff”

- Unlimited flow of materials coming onto campus, especially into research labs
- Renewed focus on upstream materials flow (CU Procurement), use and storage on campus and downstream flow once it leaves campus (waste diversion)
- Expanded recycling and compost efforts throughout campus
- I2SL Award for Space Utilization – SOM, Fac Man, EH&S
- 2 new FTE to address these issues through new programs

Campus Initiatives

Sampling of current campus initiatives.....

- EV Chargers – currently have 58 on campus, additional 8 Level 2 EV Chargers in Aspen Lot (\$40k grant from Charge Ahead Colorado)
- Expanded Composting and Waste Diversion Efforts
- Potential Public Electrification Grant opportunity in Building 534
- Glove Recycling Program in 30+ labs
- Quarterly Newsletters

<https://www.cuanschutz.edu/offices/facilities-management/sustainability>

Campus Initiatives

Green Labs Program Coordinator

Duties:

30%: Perform day-to-day operation of the Green Labs program

30%: Research, Planning, and Reporting

25%: Outreach to labs, lab departments, and other institutions

15%: Events, presentations, and communication

Sustainability Resources and Waste Diversion Coordinator

Duties:

40% Grants Coordination

50% Waste Diversion Efforts

10% Education and Outreach



Green Labs Program

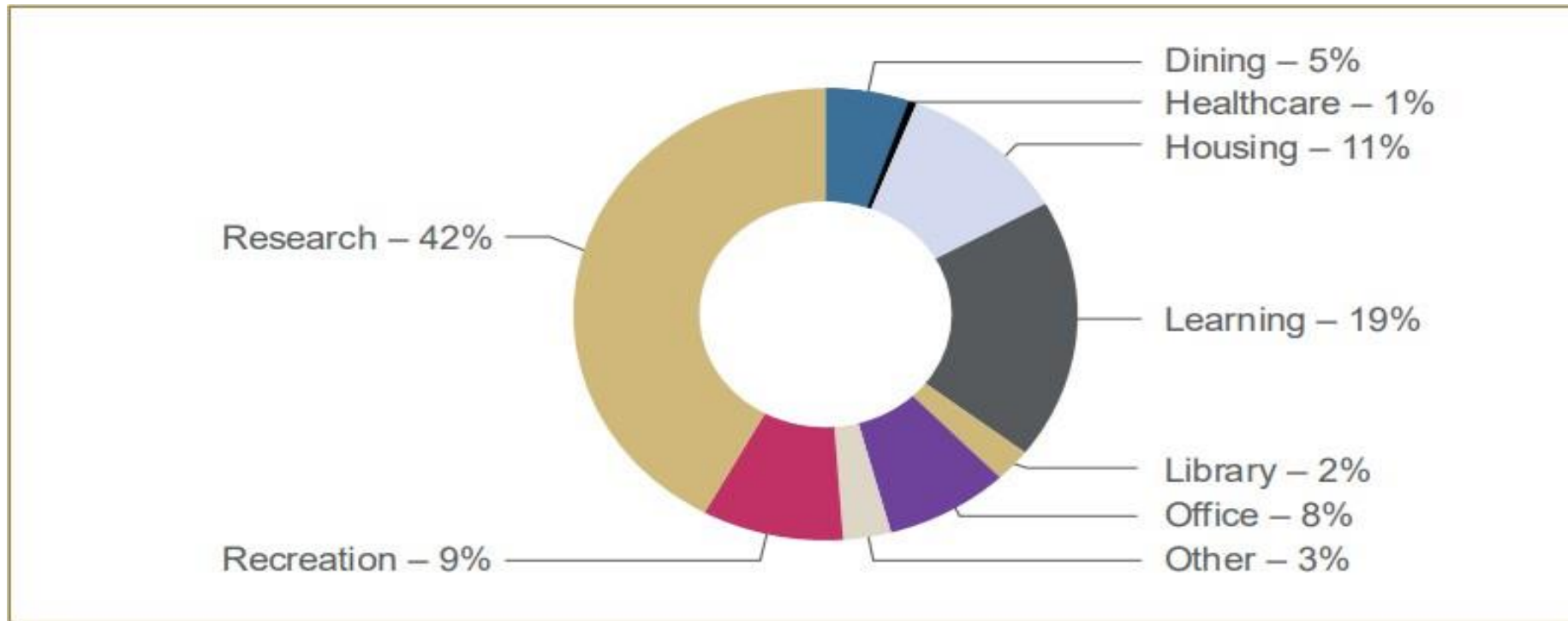


Figure 6: Energy Use by Building Type

Labs are one of the most resource intensive spaces on campus - energy, water, chemicals, materials

Most Expensive Places to Build and Support

Green Labs Program



Energy
Conservation

Water
Conservation

Solid
Waste
Reduction

Hazardous
Waste
Reduction

Efficient use
of space
& equipment

Scientist
Engagement



Green Labs Program

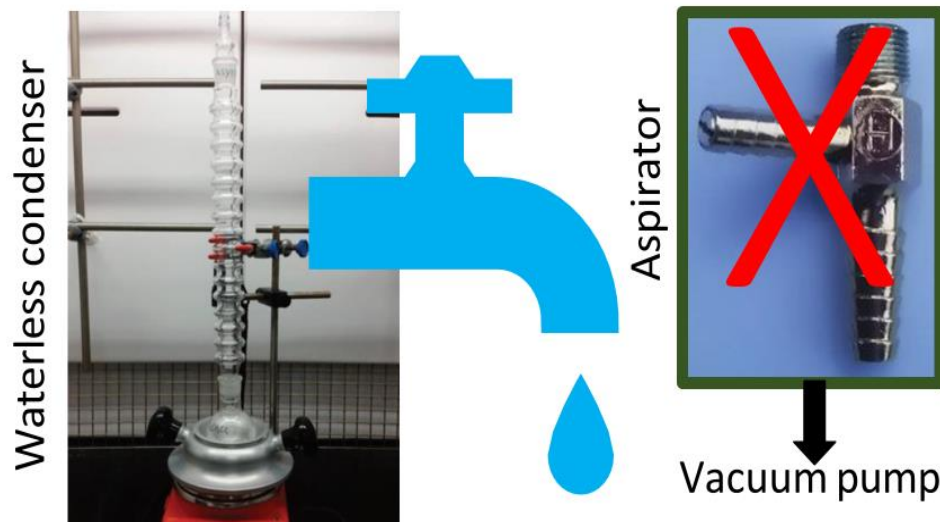
Lab Specific Recycling



Water Savings



Re-circulators



Green Labs Program

-70°C

(up to 4 kWh

Switching your ULT freezer 1
more electricity than a full-size

-70°C
(up to 4 kWh/day saved!)

Switching your ULT freezer from -80 °C to -70 °C saves
more electricity than a full-size household freezer uses!

Energy

Energy Savings

I'm on a timer!

If you need to override the timer,
turn the gear at the top. Timer



I'm on a timer!

If you need to override the timer,
turn the gear at the top. Timer
resets automatically.
www.colorado.edu/ecenter/greenlabs



greenlabs

Rent ULT freezer
space for just a

Be green & avoid the \$10k+ price
tag for a new,
temperature (

37¢/month/3 inch
tall freezer box

Three locations:

- JSCBB
- Ramaley*

*For IPhy, EBio & MCOL only

Rent ULT freezer
space for just a

Be green & avoid the \$10k+ price
tag for a new, full-size ultra-low
temperature (ULT) freezer!

37¢/month/3 inch
tall freezer box

25¢/month/2 inch
tall freezer box

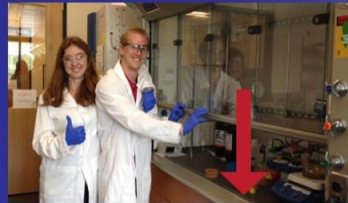
Three locations:

- JSCBB
- Ramaley*

*For IPhy, EBio & MCOL only

Write us to
suggest the
location of the
next shared,
managed ULT
freezer.

Friends don't let friends
leave sashes open!



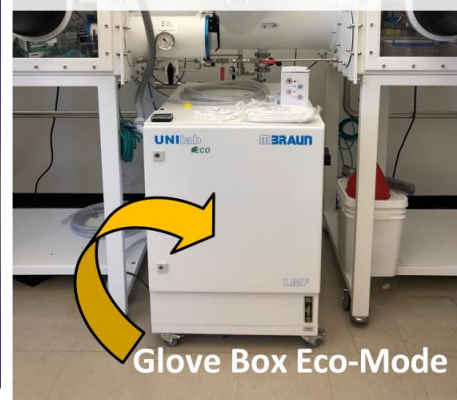
Shut your sash &
panels to...

SAVE ENERGY
& BE SAFE!!!

Shut your sash &
panels to...

SAVE ENERGY
& BE SAFE!!!

**\$ incentives for energy
efficient equipment**



Glove Box Eco-Mode

**for energy
equipment**



Glove Box Eco-Mode



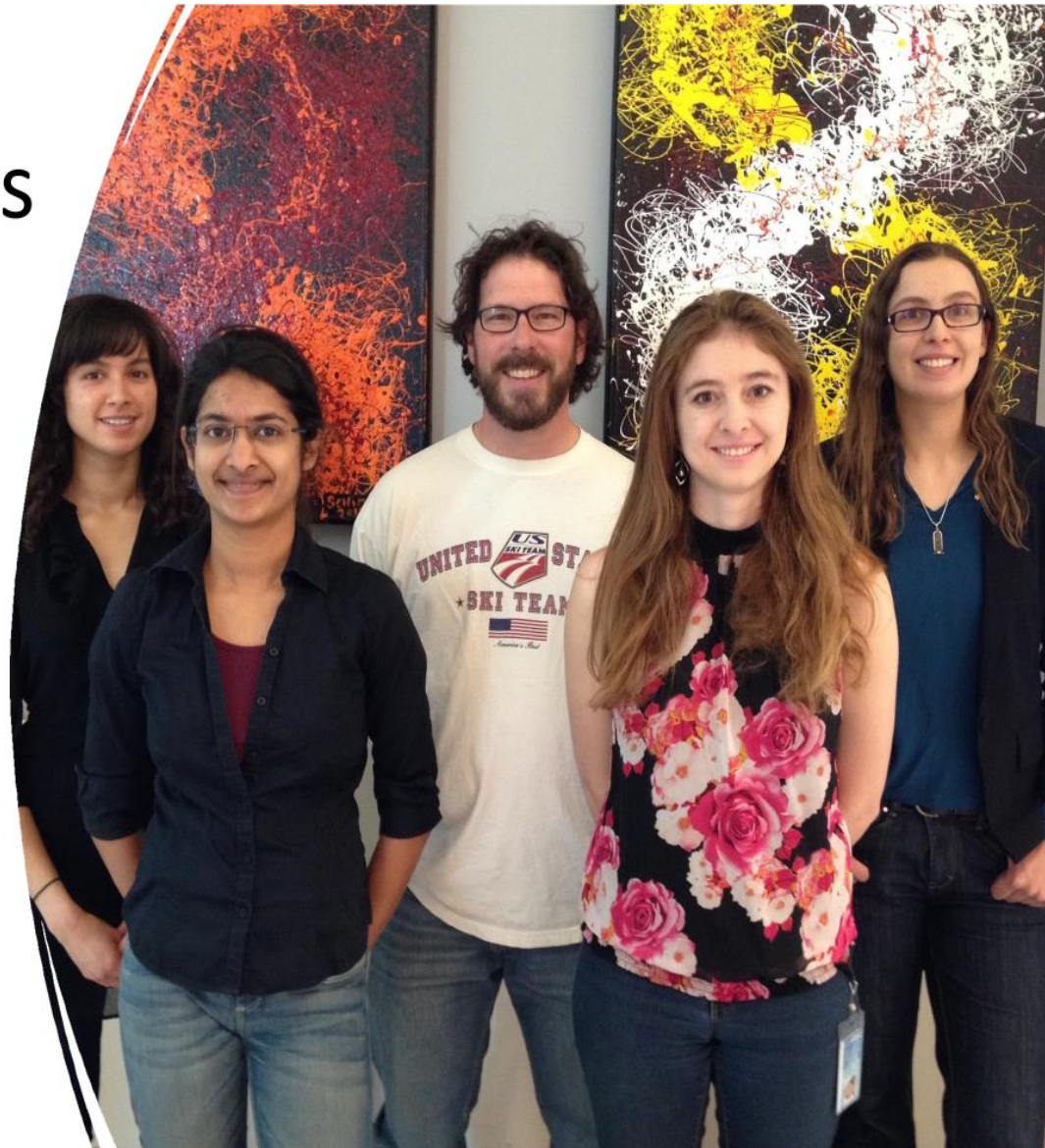
University of Colorado
Anschutz Medical Campus

Green Labs Program

Roles for researchers

LAB ECO-LEADERS:
volunteer lab members
advancing efficiency and
green efforts in their lab

LAB TEAM LEADS:
paid students leading Eco-
Leaders & building-wide
green lab efforts



How to Be Involved

- 1. How can people who don't normally impact sustainability on campus promote best practices in our offices?**
- 2. Tips for supporting those with limited resources.**
- 3. I'd like to learn more about waste diversion efforts with regard to events and large gatherings. How can the University Events office support these efforts?**
- 4. Will the parking structures be able to handle the additional weight if all cars on campus were electric vehicles?**
- 5. Preserving green space while facilitating growth**



MOVING THE NEEDLE– Campus Safety Building

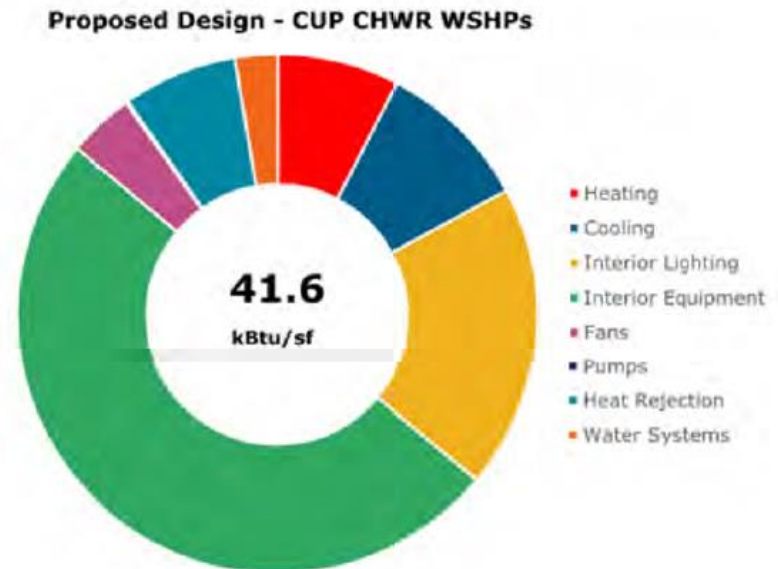
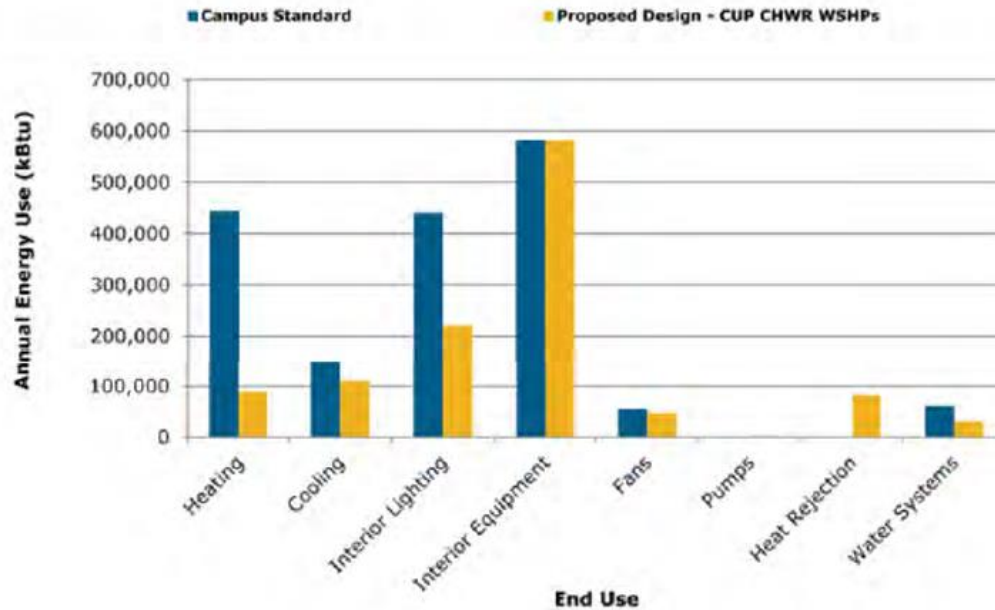
On October 28, 2021, the CU Anschutz Medical Campus broke ground for the first Net Zero Energy facility in the entire CU system.



Sustainability as Part of an Integrated Design Process

ENERGY COST RESULTS	First Cost Mechanical	Total Energy Cost	Energy Cost Index	Electricity			District Energy		Savings	
	(\$/sf)	(\$/yr)	(\$/sf)	Total Electric Cost	Use	Facility Demand	Cooling	Heating	Energy Cost	Energy Cost %
Campus Standard	\$56.14	\$44,554	\$1.59	\$35,231	\$11,673	\$23,558	\$3,139	\$6,184		
Proposed Design - CUP CHWR WSHPs	\$49.76	\$37,846	\$1.35	\$36,097	\$10,669	\$25,428	\$1,110	\$639	\$6,708	15.1%

ENERGY USE RESULTS	PV Size for NZE	Energy Use Index	Electricity			District Energy		Savings	
	kW	(kBtu/sf*yr)	Use (kWh/yr)	Annual Demand (kW/yr)	Peak Demand (kW/mo)	Cooling (MBtu/yr)	Heating (MBtu/yr)	Energy Use %	
Campus Standard	311	61.9	333,272	1,211	103	149	445		
Proposed Design - CUP CHWR WSHPs	217	41.6	325,528	1,302	114	53	30	32.8%	



MECHANICAL OPTIONS ENERGY MODEL RESULTS - MARCH 18, 2021

MOVING THE NEEDLE— AHSB



As the first **LEED Version 4.0 Gold Certified** facility on campus, the AHSB is the most energy-efficient mixed-use facility at CU Anschutz. A highly efficient heat recovery system supports the university's energy goals, resulting in an approximate **60% energy reduction** compared to existing buildings, and **20% energy cost savings** against current energy code.

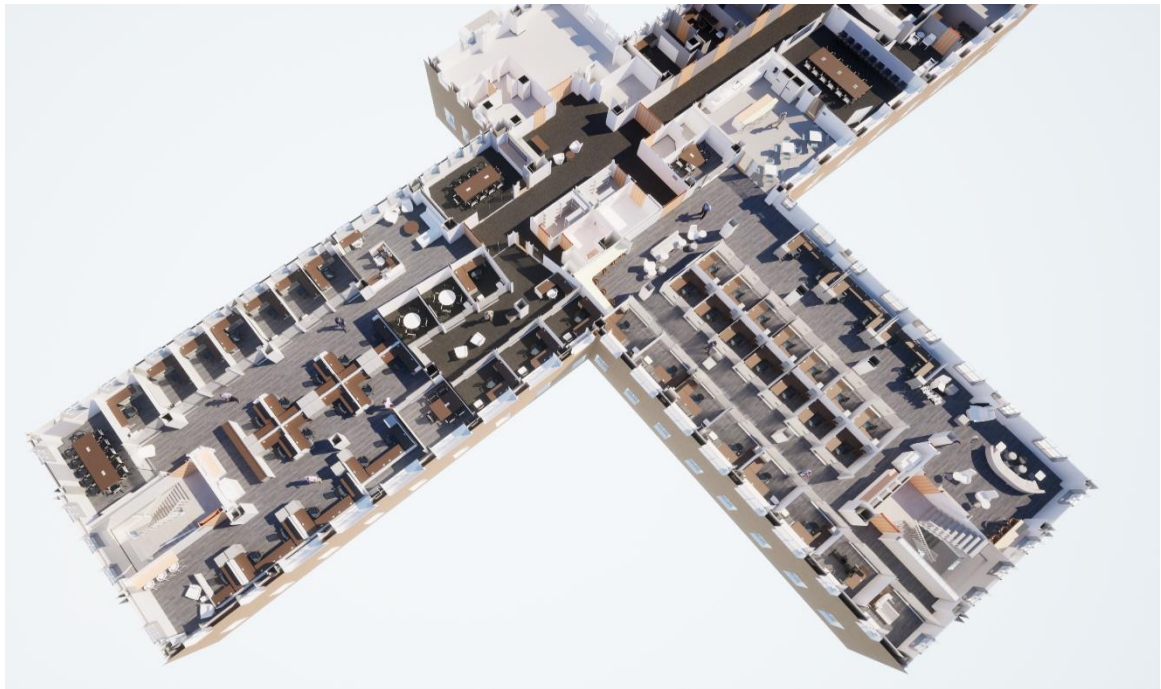
Designed using parametric modeling to analyze the building envelope, daylighting and glazing performance and inform a rich compositional design approach that combines sustainability, resiliency and beauty into a truly integrated design solution. Both the interior and exterior of the building prioritize the integration of biophilia, maximizing connections to natural light and views while regulating a sustainable, efficient building microclimate.



MOVING THE NEEDLE– Office Space Optimization



CU Anschutz continues to emphasize renovation over new construction and to explore shared workspace models; optimizing our existing resources, reducing energy use intensity, and reducing the carbon footprint of our students, staff, & faculty.



MOVING THE NEEDLE— Office Space Optimization

Regulatory Compliance

Gross Square Footage

8,120

Project Completion

2015

Colorado Center for Personalized Medicine (CCPM)

Gross Square Footage

11,120

Project Completion

2017

CU Innovations | Legal | Grad School

Gross Square Footage

10,985

Project Completion

2018



MOVING THE NEEDLE— AO1 HUB



MOVING THE NEEDLE— AO1 HUB

Space Type	Gross Square Feet	Gross Square Feet	Gross Sq. Ft. per Faculty
Faculty Office Space	96,000	\$322	\$30,912,000
Hub Space	10,576	\$322	\$3,405,472
Total Project Build Savings			\$27,506,528

Space Type	Faculty Count	Gross Square Feet	Gross Sq. Ft. per Faculty
Faculty Office Space	500	96,000	192.0
Hub Space	500	10,576	21.2
Real Estate Savings		85,424	170.8



CU Anschutz Medical Campus



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