Welcome to UCSC's Decarbonization & Electrification Town Hall!

The presentation will start momentarily.

Please take this poll while you wait.

Go to:

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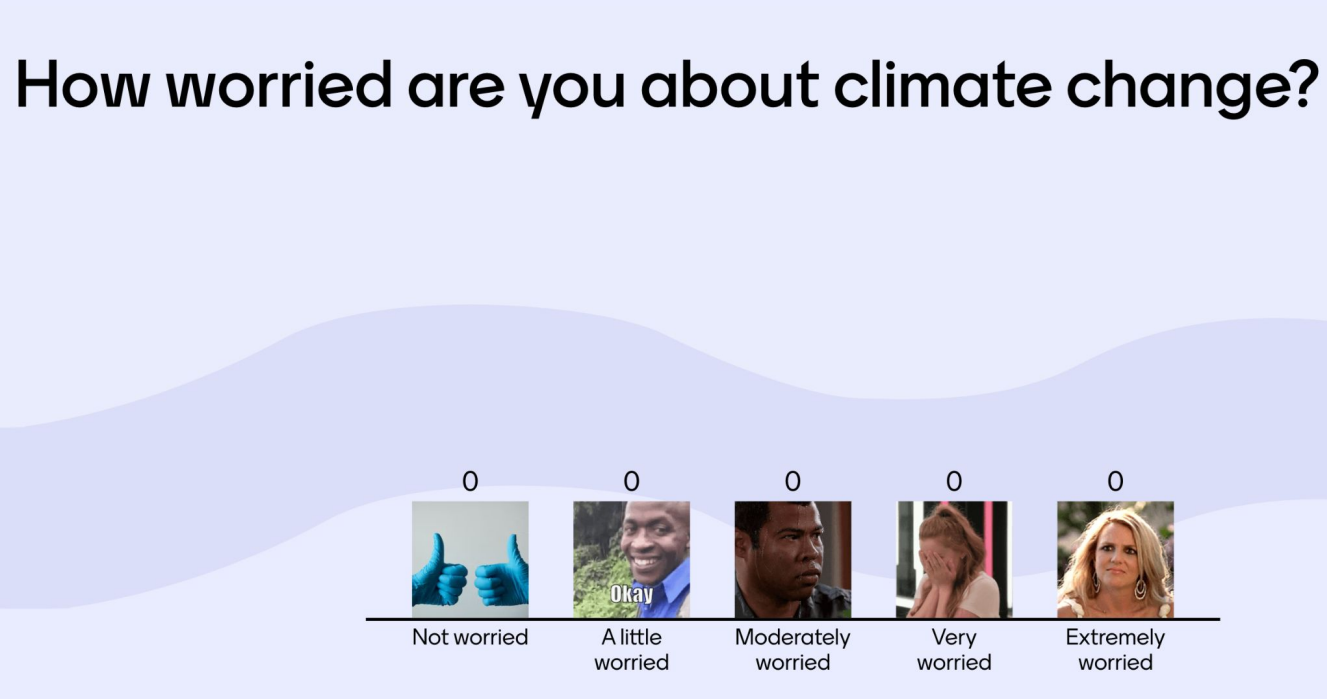
Code: 8311 8358



UCSC Land Acknowledgement

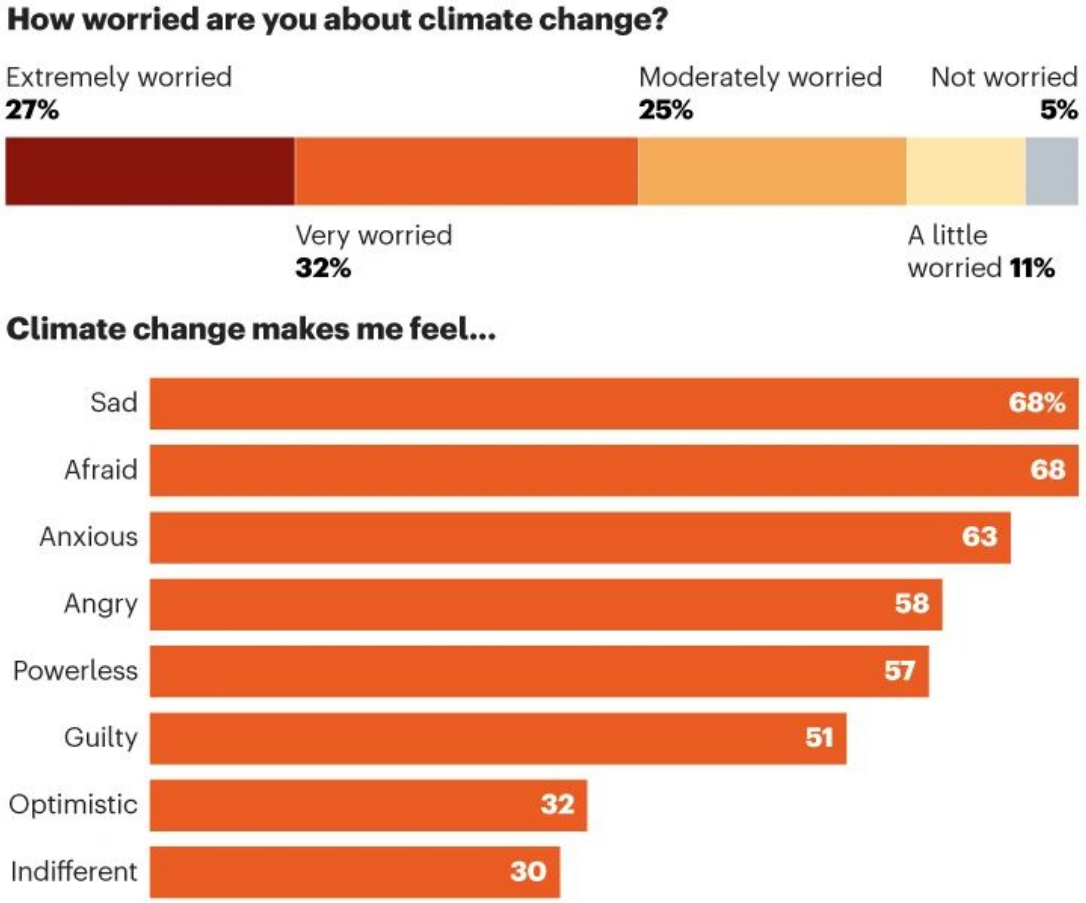
The land on which we gather is the unceded territory of the Awaswas-speaking Uypi Tribe. The Amah Mutsun Tribal Band, comprised of the descendants of indigenous people taken to missions Santa Cruz and San Juan Bautista during Spanish colonization of the Central Coast, is today working hard to restore traditional stewardship practices on these lands and heal from historical trauma.

Climate Anxiety

A survey of 10,000 young people shows that negative feelings about climate change can cause psychological distress.

©nature

Hickman *et al.*, 2021



Decarbonization & Electrification Town Hall

Overview of UC Santa Cruz's Emissions and Decarbonization & Electrification Work to Date

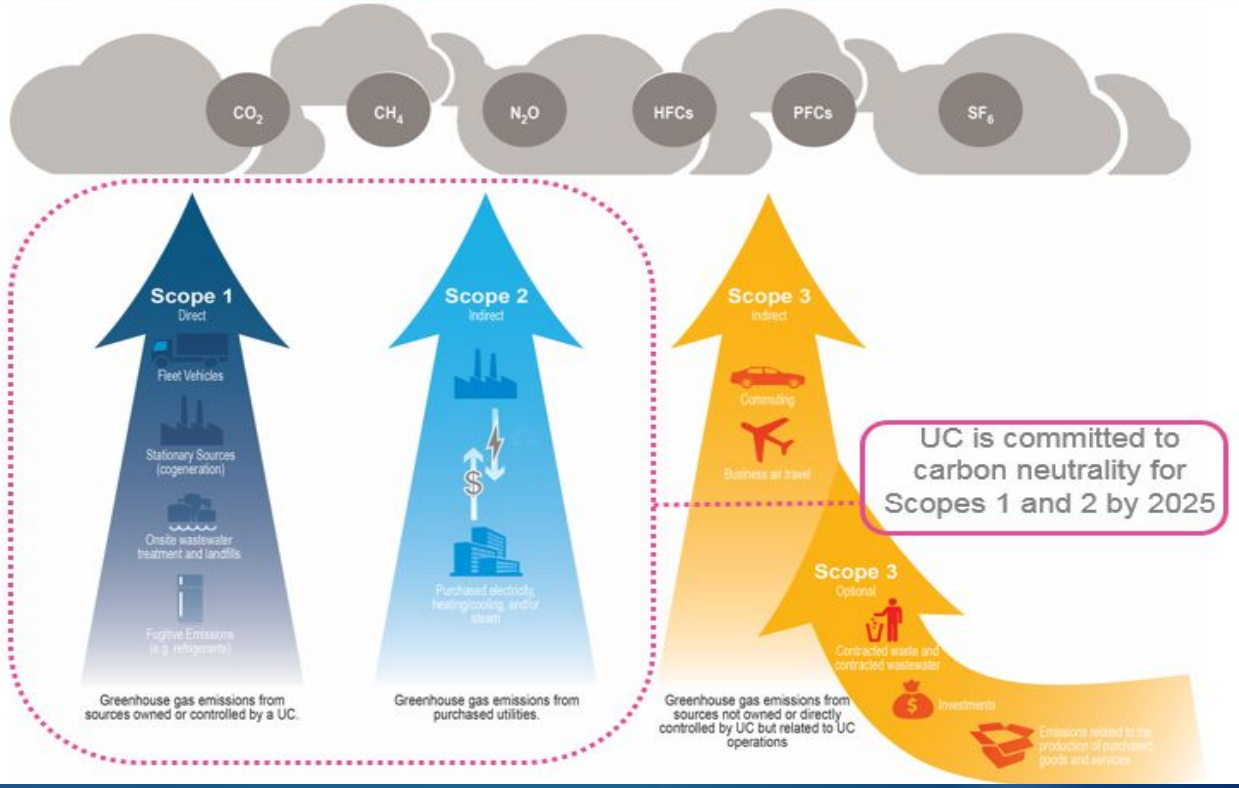
Ellen Vaughan
Water & Climate Action Manager
Sustainability Office

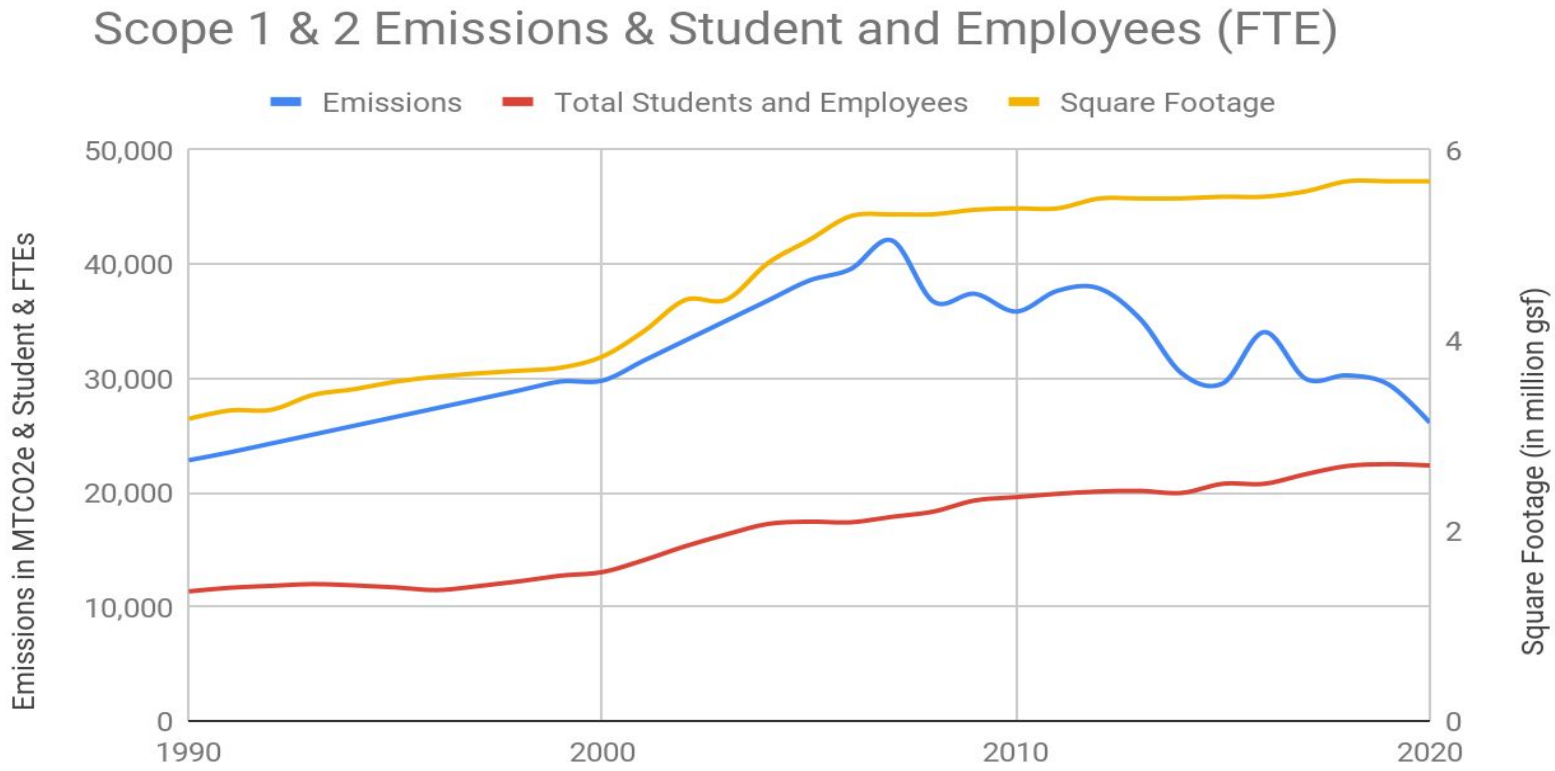
Patrick Testoni
Energy Manager
PPDO

Carbon Neutrality v. Decarbonization & Electrification

- Carbon Neutrality: achieving net zero greenhouse gas emissions by balancing what you emit with projects that mitigate emissions or sequester carbon.
- Decarbonization: not combusting fossil fuels on site. Using clean electricity instead.

UC Carbon Neutrality Initiative



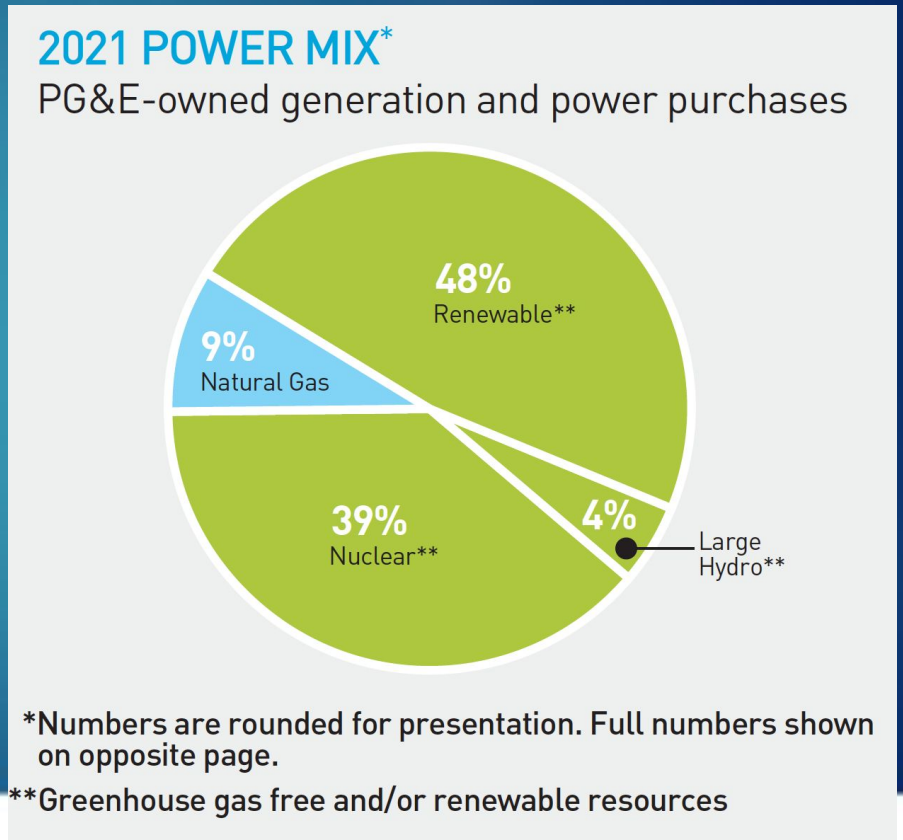


Since 1990, emissions have increased 16% while students and staff have increased 48% and square footage has increased 44%

Why electrify?

- The majority of PG&E's local grid is very clean: nuclear, solar & wind are all carbon free
- Additionally, our imported electricity is emission free from UC's Clean Power Program

PG&E 2021

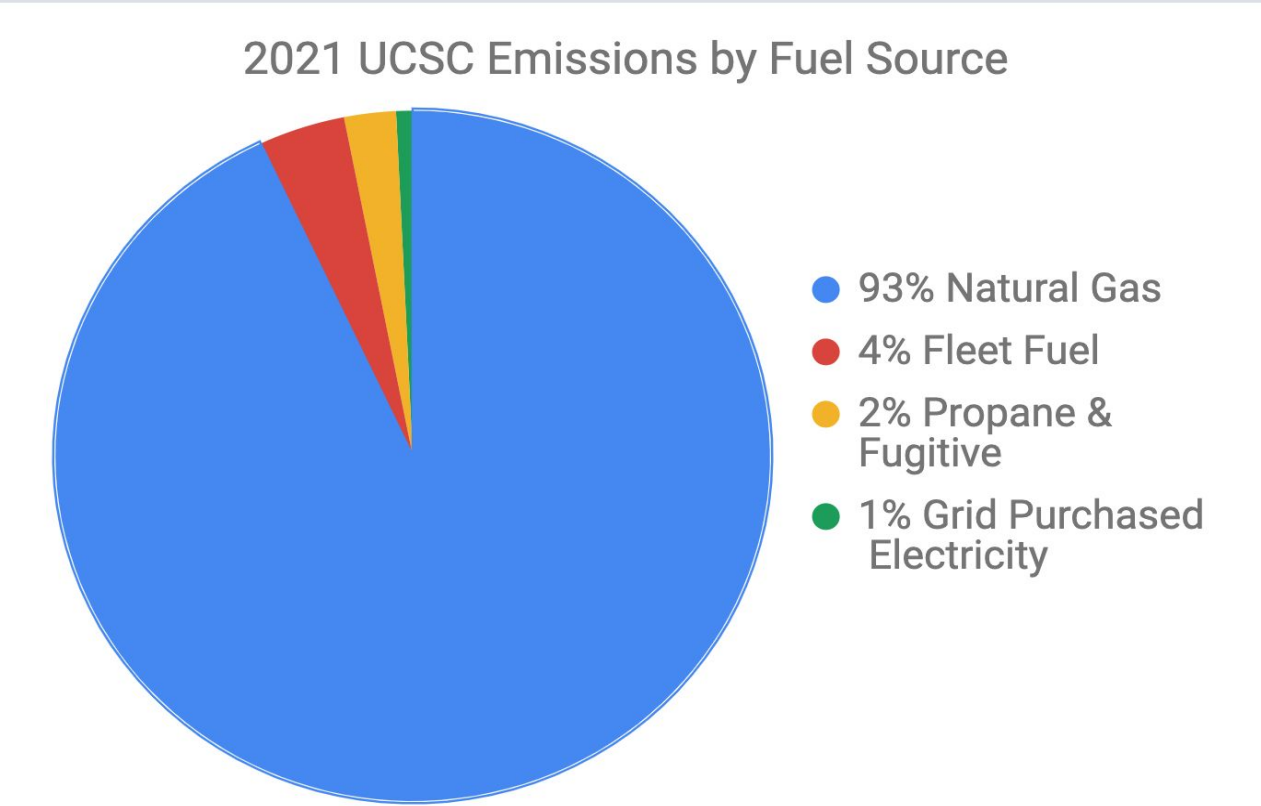


Five Points Solar Farm in Fresno

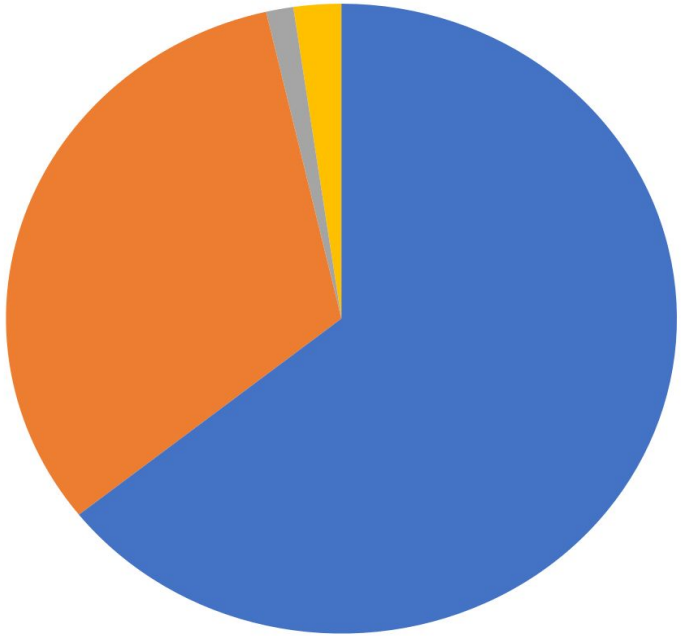
- Largest solar project built by a university in the US, composed of 271,200 solar panels
- Produces 80 megawatts of power!
- The EPA ranks the University of California No. 1 among colleges and universities when it comes to green electricity use.

Aerial view of the Five Points Solar Farm, Fresno County.

UCSC's Energy and Emissions



UCSC 2021 Natural Gas Use Breakdown



- Cogen Plant: 64%
- Other, Main Campus: 32%
- Westside Research Park (WRP): 1.5%
- Coastal Science Campus (CSC): 2%

Case Study: UC Berkeley

Natural Gas Cogeneration Plant

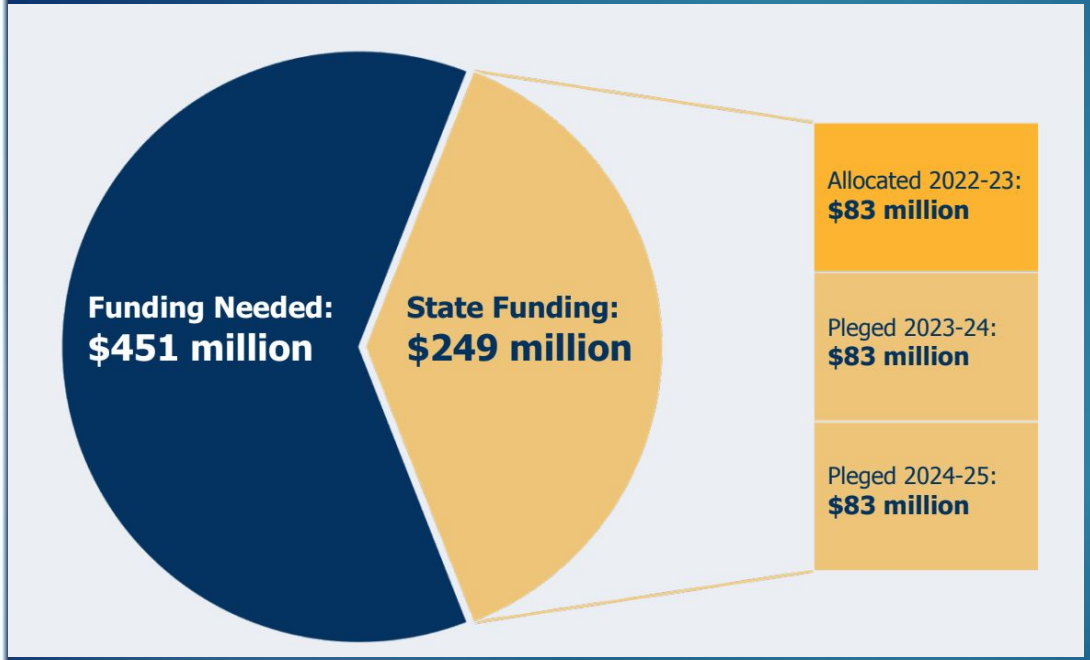
- 25 MW supplies 90% of campus energy
- 71% of emissions

Case Study: UC Berkeley

- Construct a new central electrified thermal plant or hybrid nodal plants
  - Additionally investigating: solar, geothermal, battery, advanced building, fuel cells, only induction stoves

- Keep the cogen for resiliency?

UC Berkeley - Funding



Current full project cost estimate: $800 million

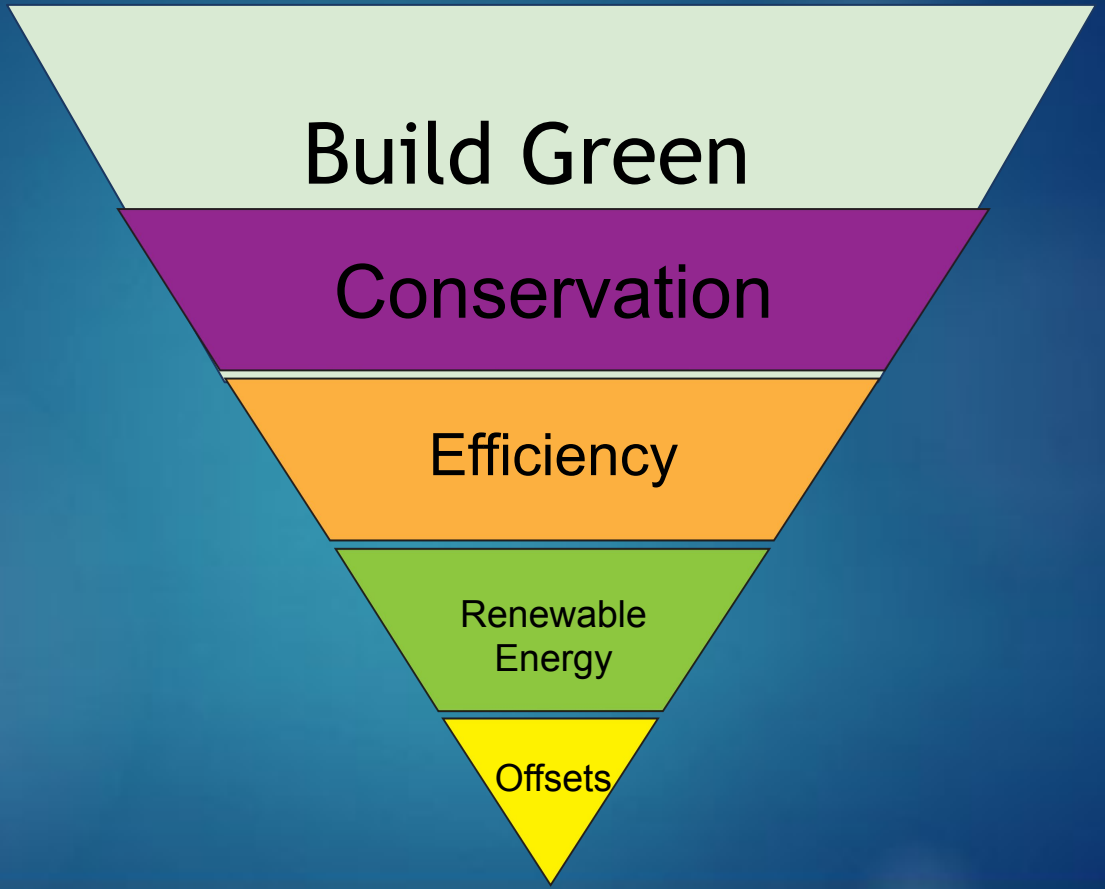
The State of California will invest $249 million.

Thank you!

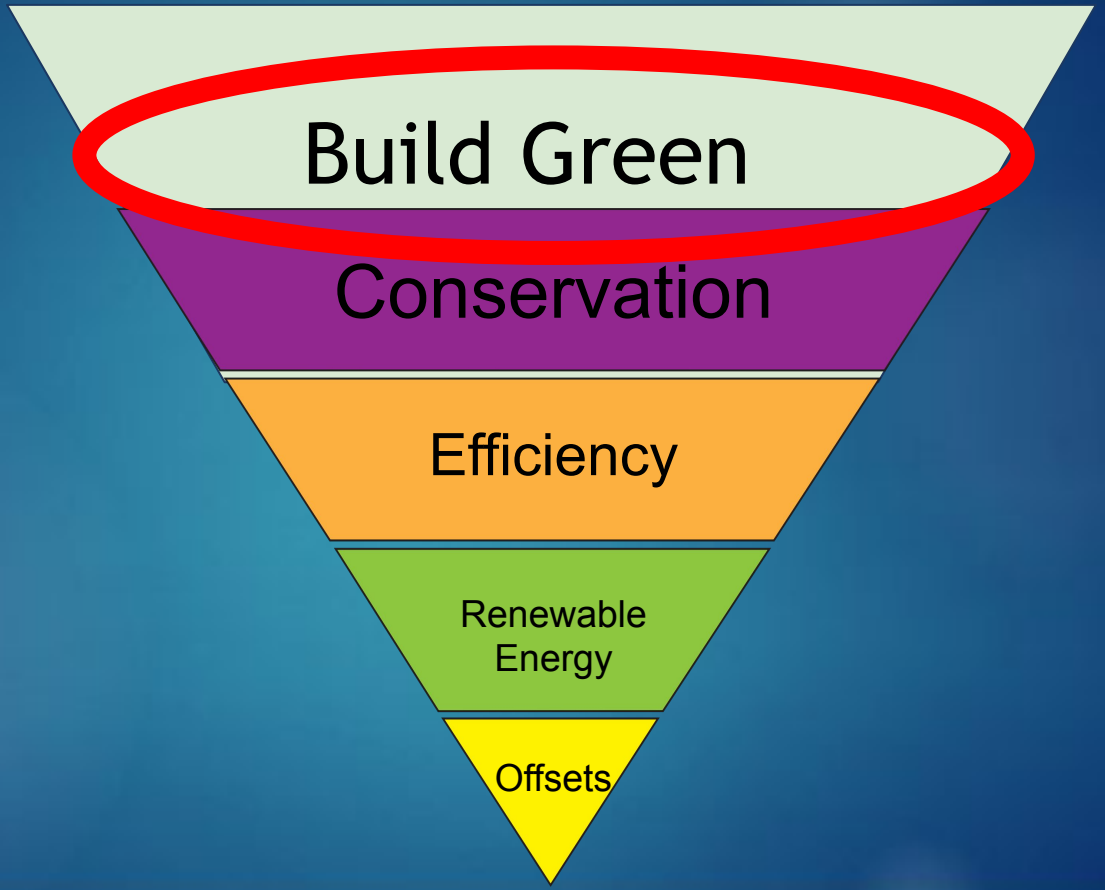
Energy & Emission Reductions UC Santa Cruz

Patrick Testoni
Energy Manager
PPDO

Our Actions:
Energy
Reduction
Hierarchy



Our Actions:
Energy
Reduction
Hierarchy



BUILD GREEN

Kresge College
Renewal and Expansion Project

- All electric design (space heating and domestic water heating)
- Passive building design
- Energy Efficient: Designed to meet UCSC's Energy Usage Intensity (EUI) stretch goals
- Water: Dual plumbing allowing the use of non-potable water for toilet flushing

BUILD GREEN

STUDENT HOUSING WEST, UC SANTA CRUZ P3

Designed to meet UCSC Net Zero New Construction Goals

Zero Net Energy: Hybrid solar thermal/PV systems

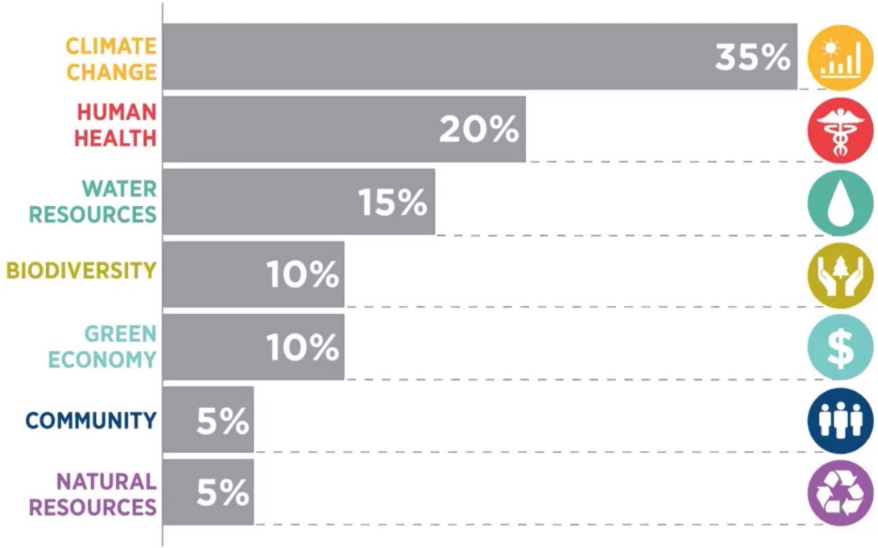
Zero-Net Water: Two on-site wastewater treatment facilities = no new non-potable water use

- Zero Net Waste: Designed to support UC's zero waste goals

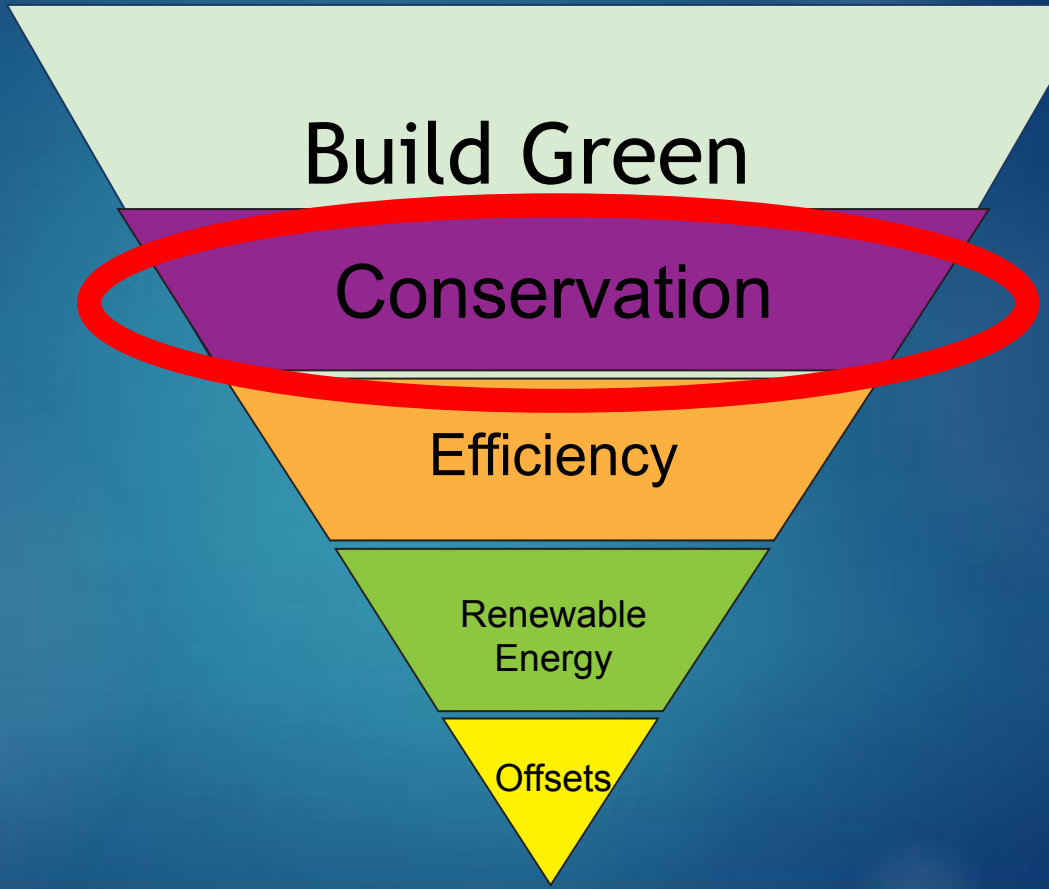
LEED

LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

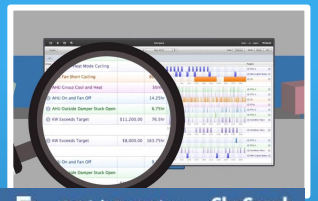
LEED v4 SYSTEM GOALS

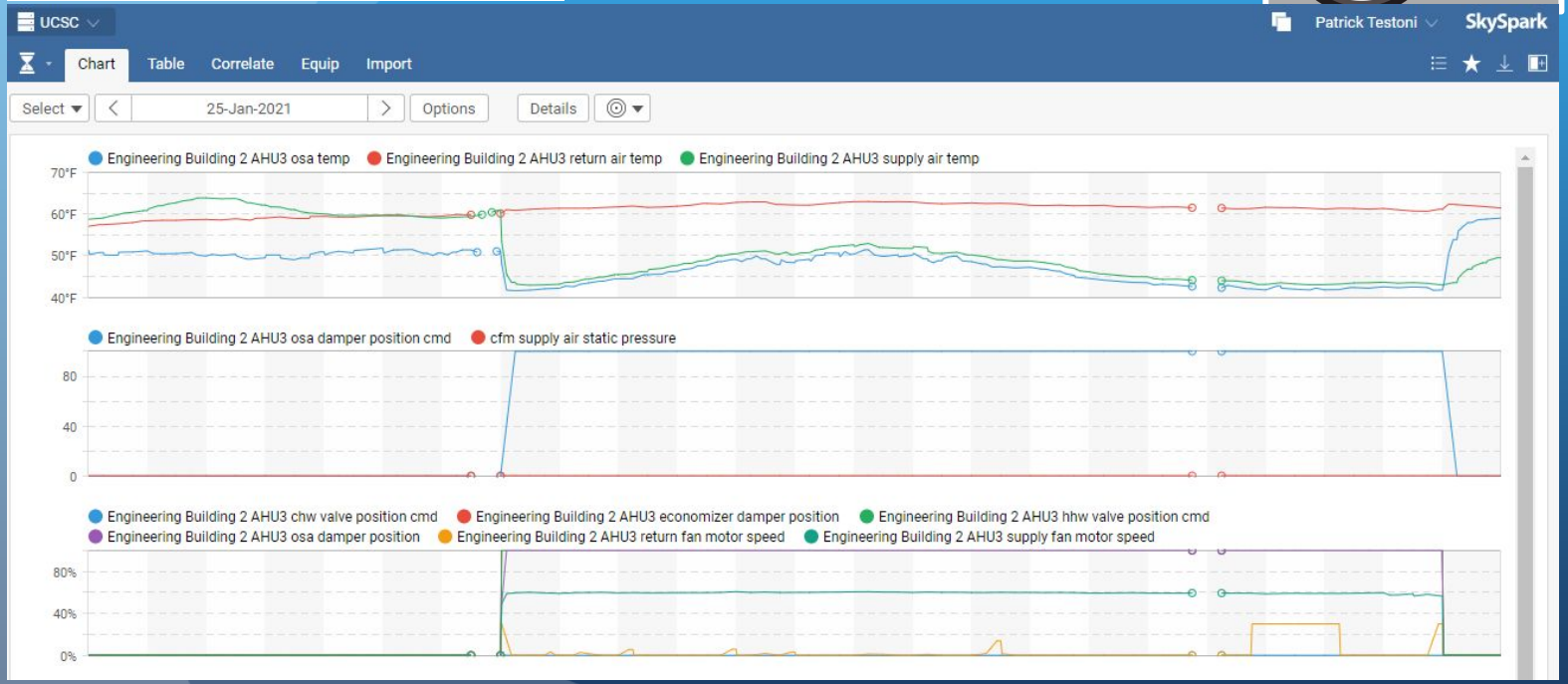


Our Actions:
Energy
Reduction
Hierarchy

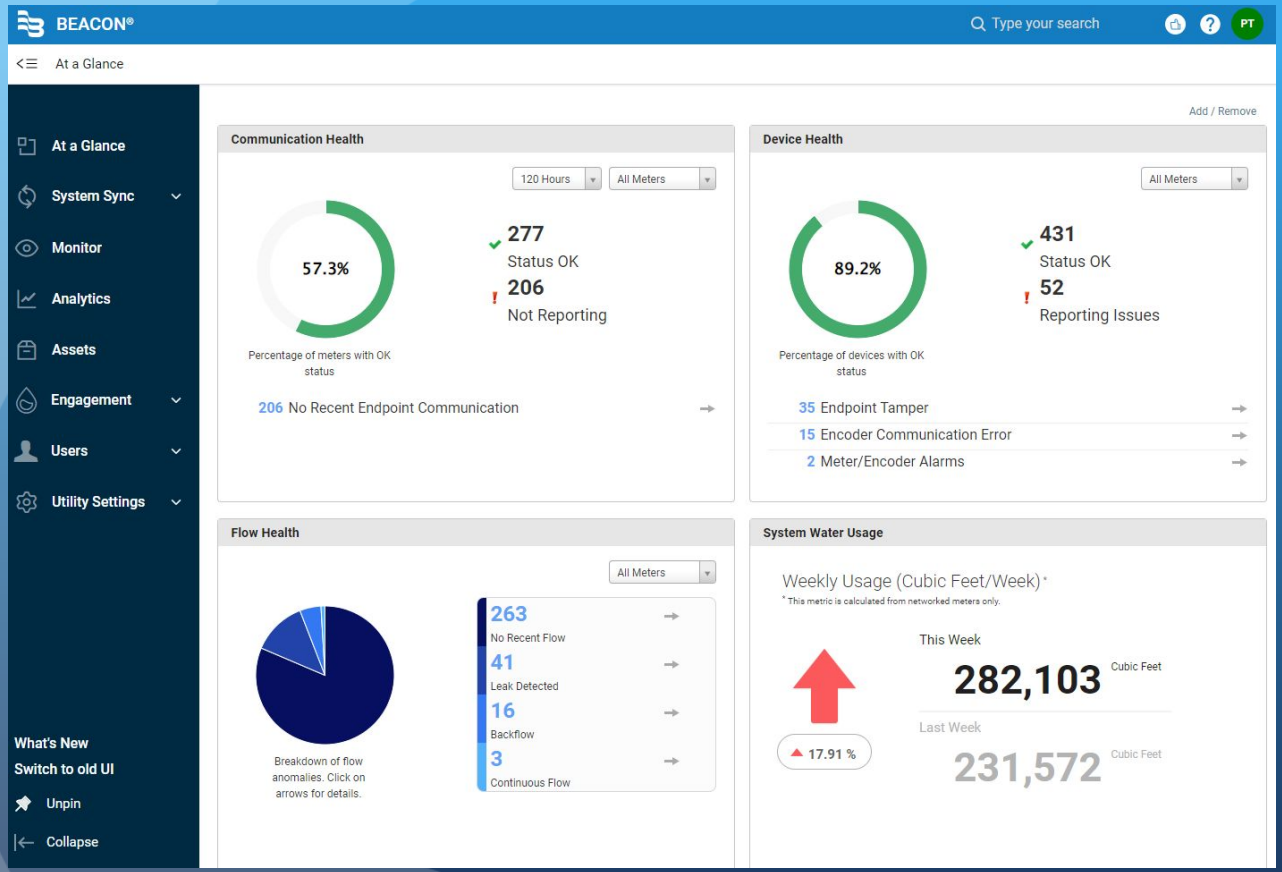


Smart Buildings: Persistent Commissioning

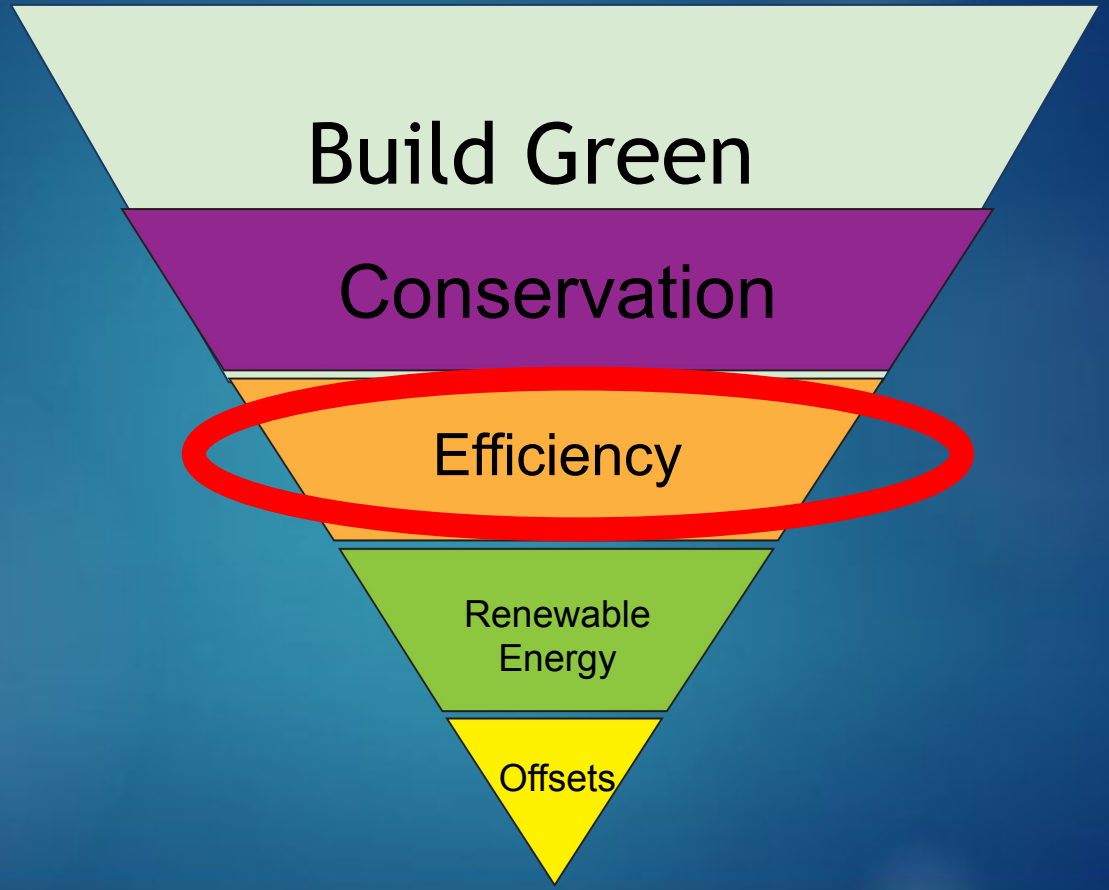




Smart Buildings: Water Monitoring and Automated Leak Detection



Our Actions:
Energy
Reduction
Hierarchy



LED Lighting Improvements Campus Wide

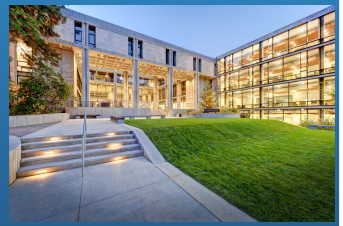
Convert all major buildings to LED Fixtures

- Install occupancy and daylighting controls
- Reduce building electricity use by 15-30%

LED Lighting Improvements Campus Wide

Buildings

- Hahn Student Services (120,000 annual kWh Savings, $385k Project Cost
- ISB (235,000 annual kWh Savings, $770k Project Cost)
- Communications Building (250,000 annual kWh Savings, $539k Project Cost)
- McHenry Library (650,000 annual kWh Savings, $2 million Project Cost
- JBEB (770,000 annual kWh Savings, $1.9 million Project Cost



Scope of Work

- Replacing fluorescent lighting with LED fixtures (replacement/retrofit)
- Installation of occupancy / daylight sensors and web based controls

Heating Hot Water System Modernization Project

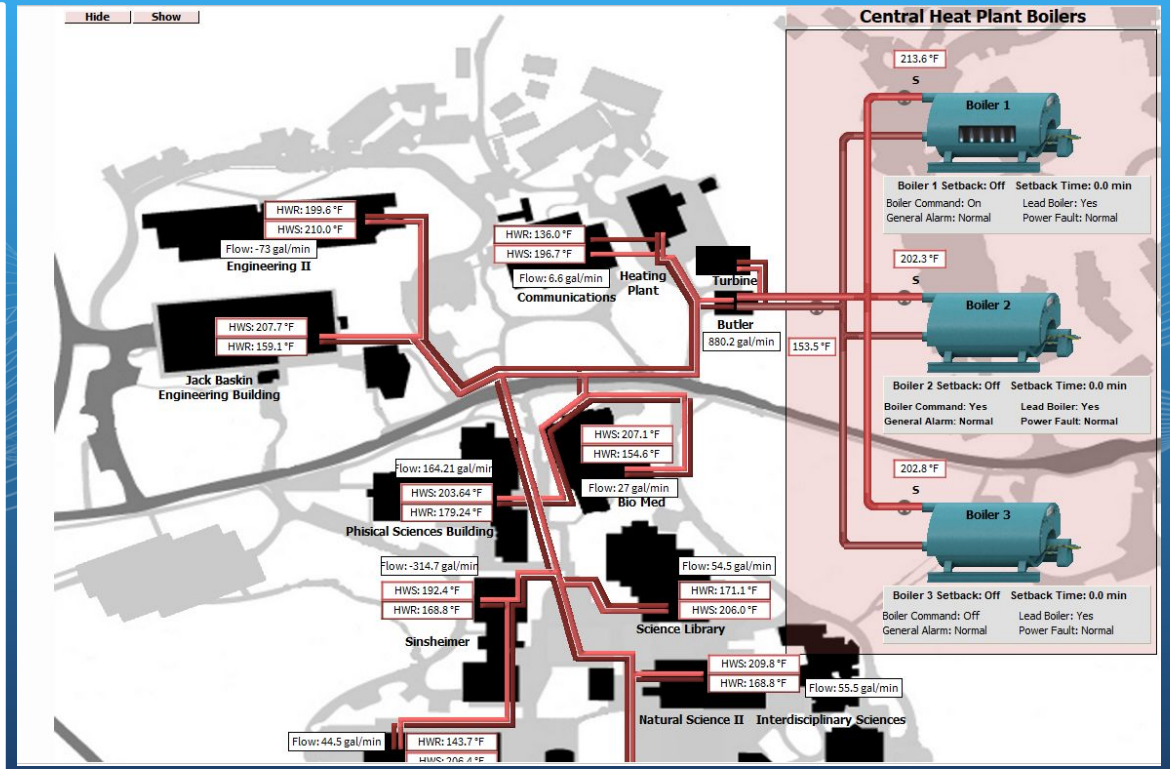
Scope of Work

Modifications to the sequence of operations that control the heating water system

Hardware changes to the equipment that controls heating water flow from plant

145,000 annual natural gas therm savings

$1.06 million Project Cost



SEP Program Metrics (2005-2020)

[UCSC Project Metrics Workbook from Program Administrator]

200710 UCSC Projects 2005+ .XLSX

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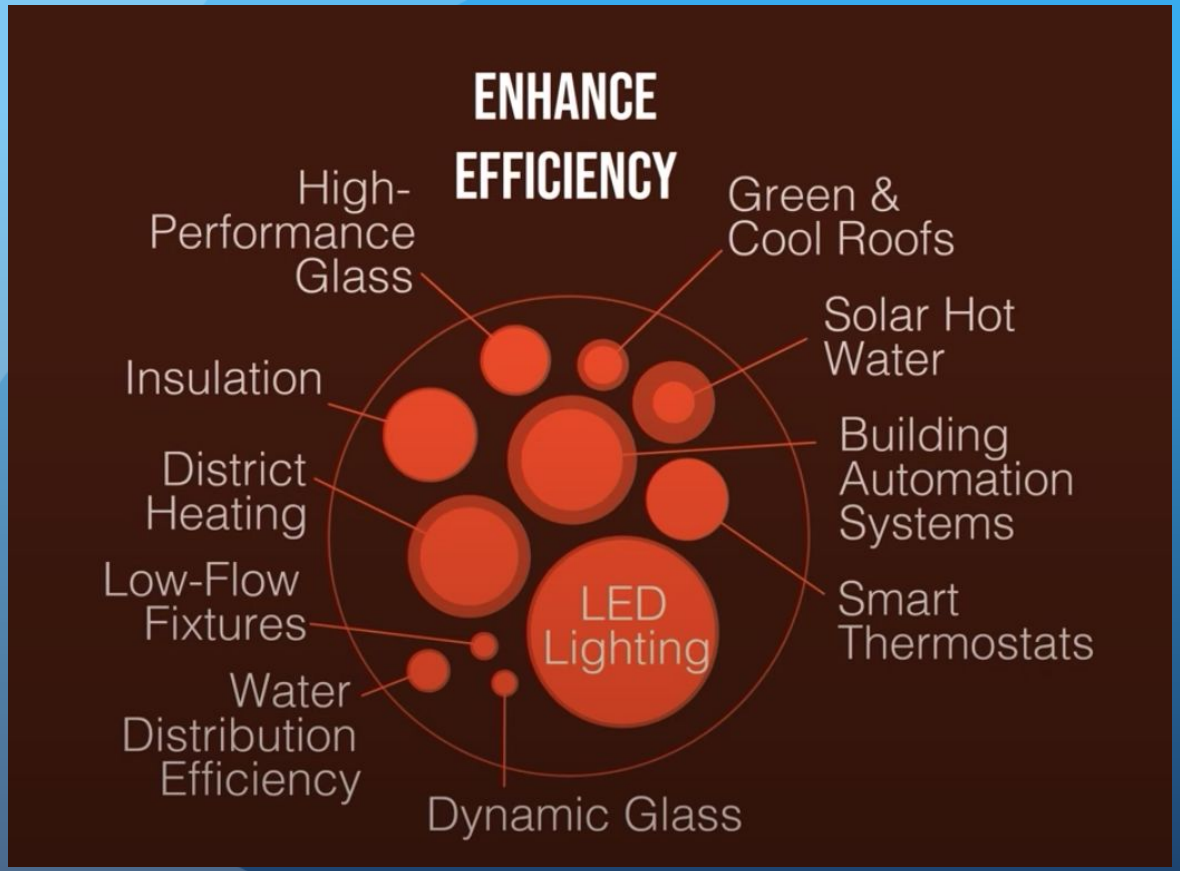
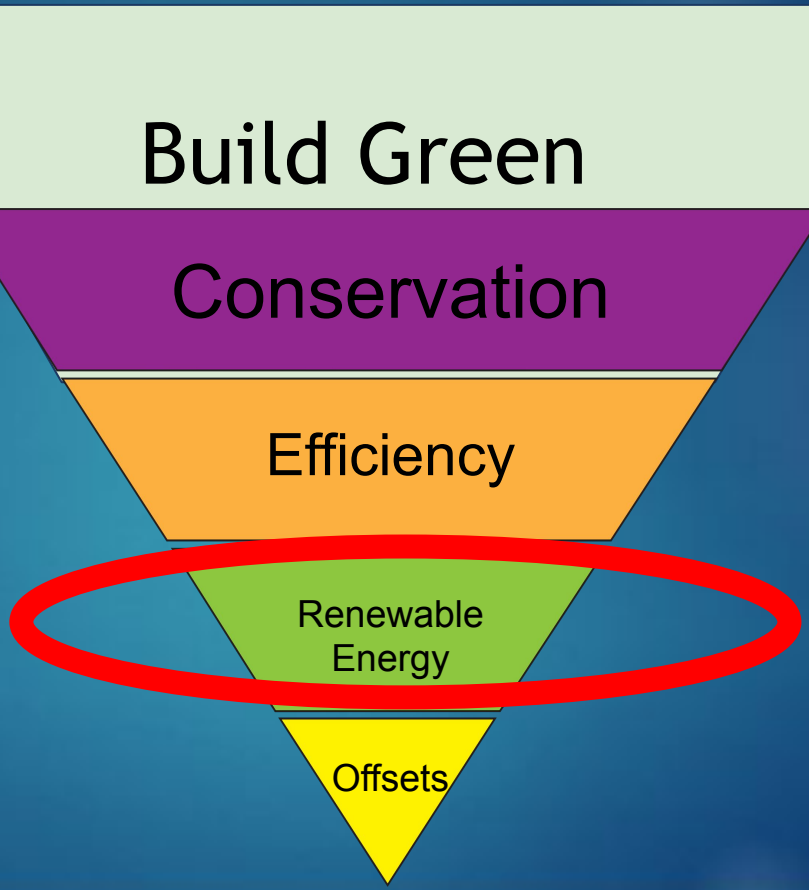
V24 443112

	Project Name	Project Statu	Project T	Measure Type	SEP ID	Accrual D	kWh Savings	kW Sav	Therm Sav	GHG Savings (M
							9,771,618		408,442	
4	Phase 1	PAID/COMPLETE	RETROFIT	Other	0408007-2005	12/31/2005	160,256	-	-	
5	Phase 2	PAID/COMPLETE	RETROFIT	Other	0408008-2005	12/31/2005	82,901	9	-	
6	Boiler Autoflame Control Project	PAID/COMPLETE	RETROFIT	HVAC	04					
7	Earth & Marine Sciences	PAID/COMPLETE	MBCx	Commissioning	04					
8	Condenser Water Loop	PAID/COMPLETE	MBCx	Commissioning	04					
9	Earth/Marine Science Lighting Upgrade	PAID/COMPLETE	RETROFIT	Lighting	04					
10	Multiple Building Relamping	PAID/COMPLETE	RETROFIT	Lighting	04					
11	Social Sciences 1 & 2 Bldg Relamping	PAID/COMPLETE	RETROFIT	Lighting	04					
12	Multiple Building Relamping - Phase II	PAID/COMPLETE	RETROFIT	Lighting	04					
13	Bi Level Stairway Lighting Retrofit	PAID/COMPLETE	RETROFIT	Lighting	04					
14	Multiple Building Relamping - Phase III	PAID/COMPLETE	RETROFIT	Lighting	04					
15	Data Center Server Migration	PAID/COMPLETE	RETROFIT	Other	04					
16	Multiple Buildings Relamping - Phase IV	PAID/COMPLETE	RETROFIT	Lighting	04					
17	Lighting Retrofit - College 9 Dining, ARCen	PAID/COMPLETE	RETROFIT	Lighting	04					
18	Central Plant Piping Modification and VFD	PAID/COMPLETE	RETROFIT	HVAC	04					
19	Demand Control Ventilation - Lecture Hall	PAID/COMPLETE	RETROFIT	HVAC	04					
20	Engineering 2 MBCx	PAID/COMPLETE	MBCx	Commissioning	04					
21	Housing Lighting Retrofit Phase I	PAID/COMPLETE	RETROFIT	Lighting	04					
22	MBCx - Social Sciences 2	PAID/COMPLETE	MBCx	Commissioning	0408234-2008	12/31/2008	49,434	7	(14)	
23	Retrofit - Core West Parking-Eng2-MBEST	PAID/COMPLETE	RETROFIT	Lighting	G8020	4/17/2009	121,932	14	-	
24	Retrofit - Sinsheimer Lab VFD	PAID/COMPLETE	RETROFIT	HVAC	G5034	6/19/2009	417,486	74	-	
25	Retrofit - 2009 Controls Upgrade - VAV DC	PAID/COMPLETE	RETROFIT	HVAC	G8010	7/21/2009	200,337	28	15,062	

66	Projects
9,771,618	Annual kWh Savings
408,442	Annual therms Savings
$1,772,200	Annual Cost Savings (2022 rates)
$2,947,004	Utility Incentive Payments
$12,635,049	Total SEP Projects Cost
$9,688,045	Net Total SEP Projects Cost


ENHANCE EFFICIENCY
High-Performance Glass
Green & Cool Roofs
Solar Hot Water
Insulation
Building Automation Systems
District Heating
Low-Flow Fixtures
LED Lighting
Smart Thermostats
Water Distribution Efficiency
Dynamic Glass

Our Actions:
Energy
Reduction
Hierarchy



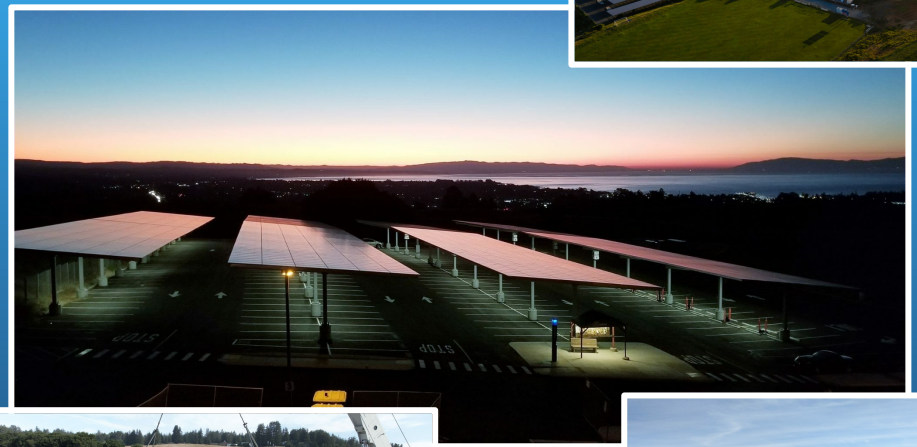
East Remote Solar Array

2MW array producing enough to power more than 330 houses for a year

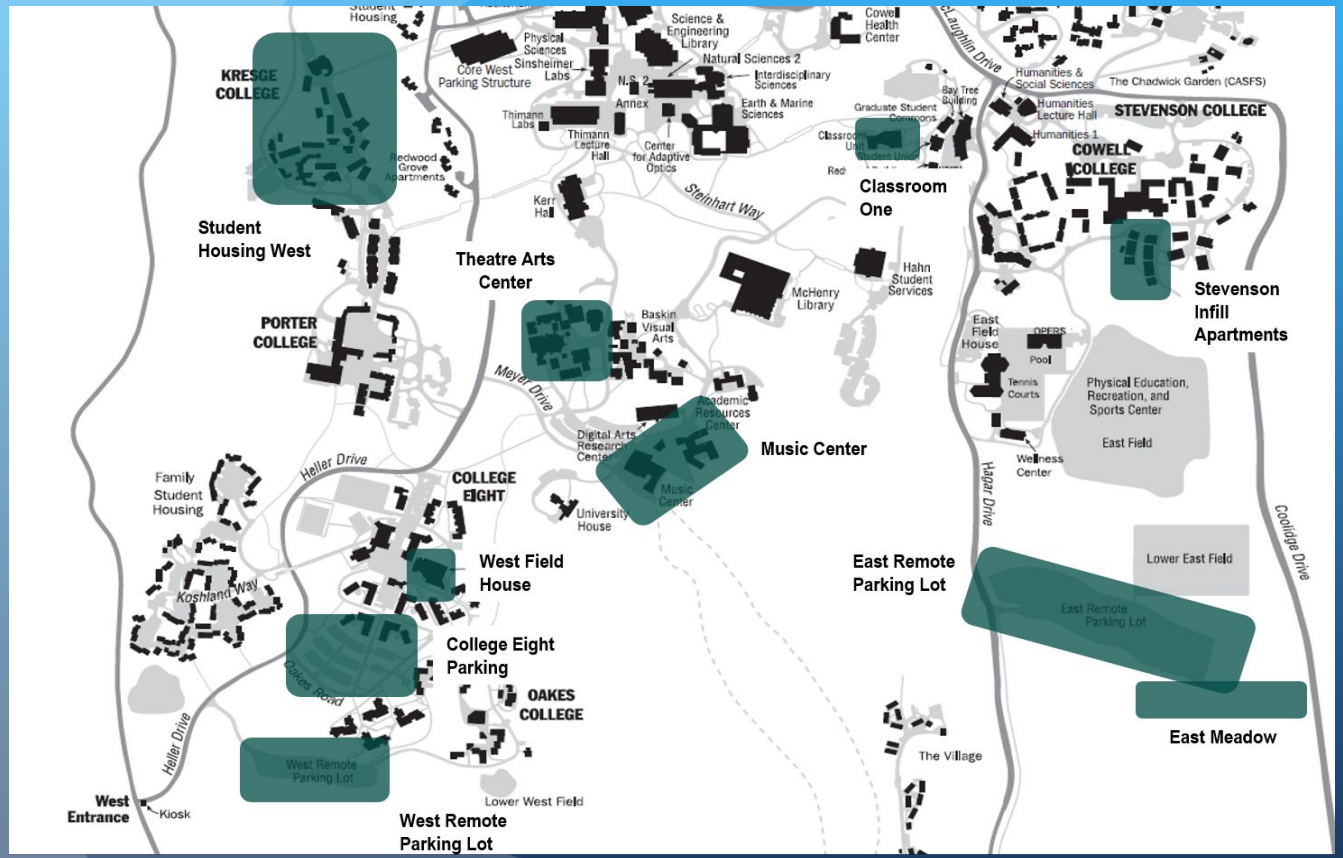
Will provide over 6% of UCSC's electrical demand

20+ year lifespan and save $6 million in energy costs

1 MW battery storage



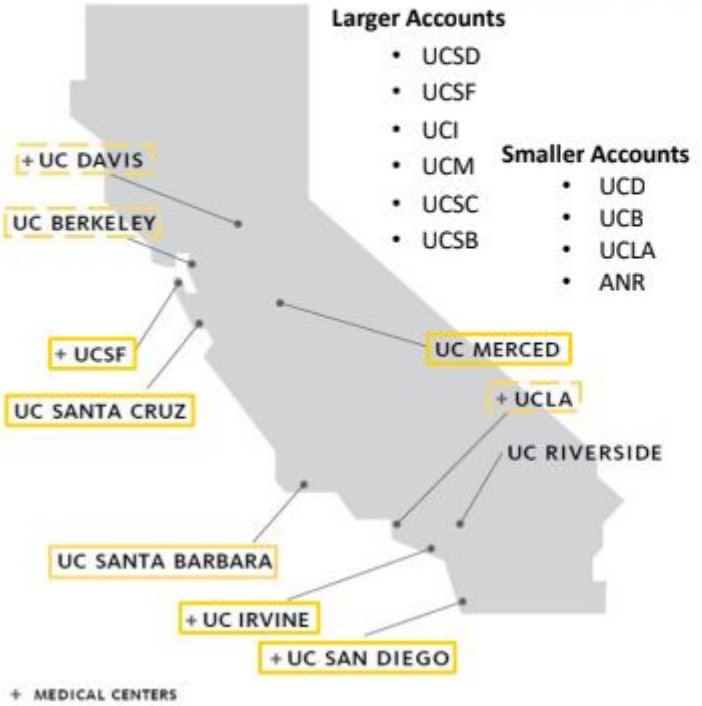
Potential Solar Projects



UNIVERSITY OF CALIFORNIA Carbon Neutrality Initiative

UC Clean Power Program Overview

Clean Power Program



- Zero carbon power (TCR verified)
- Cost competitive rates
- Multiple long-term renewable contracts
  - 2 solar projects operating
  - Additional solar PPA signed (+storage in negotiation)
  - 2 wind PPAs in negotiation
- Provides 40% of systemwide purchased electricity
- Cost transparency and collective action
- Contributes half of the voluntary renewable energy to UC's #1 EPA standing
- Provides credit towards LEED certification
- Regulatory compliance (CPUC, CAISO, CEC, EIA)

Renewable Transportation

In February of 2019 we switched all of our campus fleet from diesel to biodiesel!

- Biodiesel derived from Ag waste
- Cost Neutral
- 25% reduction in Fleet emissions

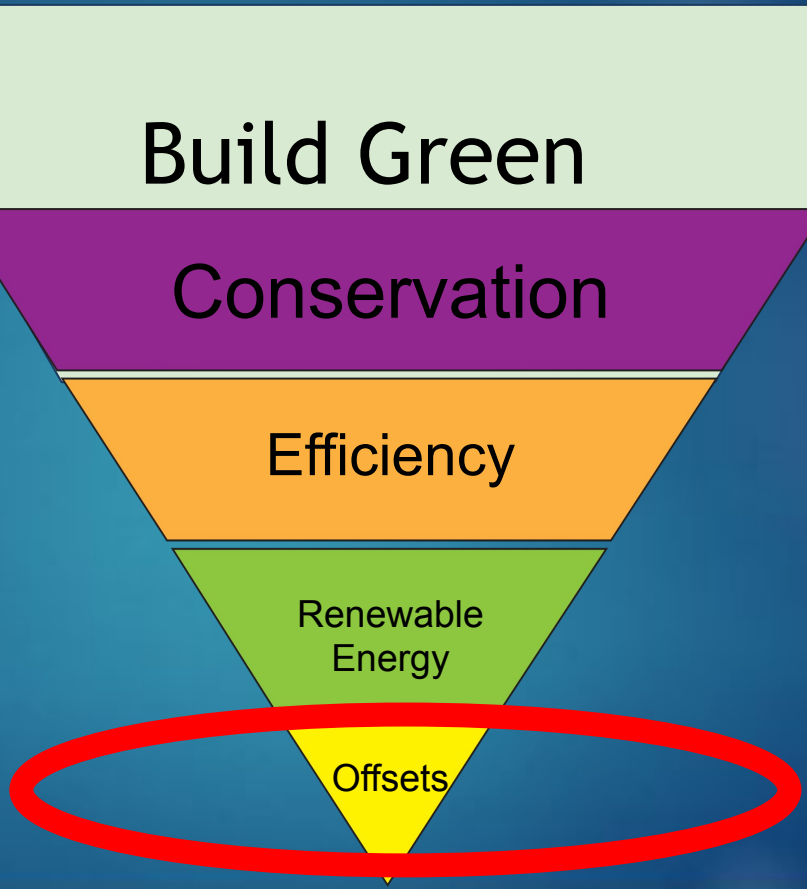
Utilization of Biogas

- UCOP is actively working to secure 20% of our gas needs with biogas by 2025
- That percentage will increase to 40% by 2030

Big Run Biogas Deal Signed

- Located in Ashland, KY.
- Agreement completed in June, 2022.
- Biogas deliveries began in July.
- Flare (pictured) is now inactive.
- Receiving 182,500 MMBtu/year – slightly more than the annual fossil natural gas consumption of the UCSF Mission Bay Medical Center.

Our Actions:
Energy
Reduction
Hierarchy

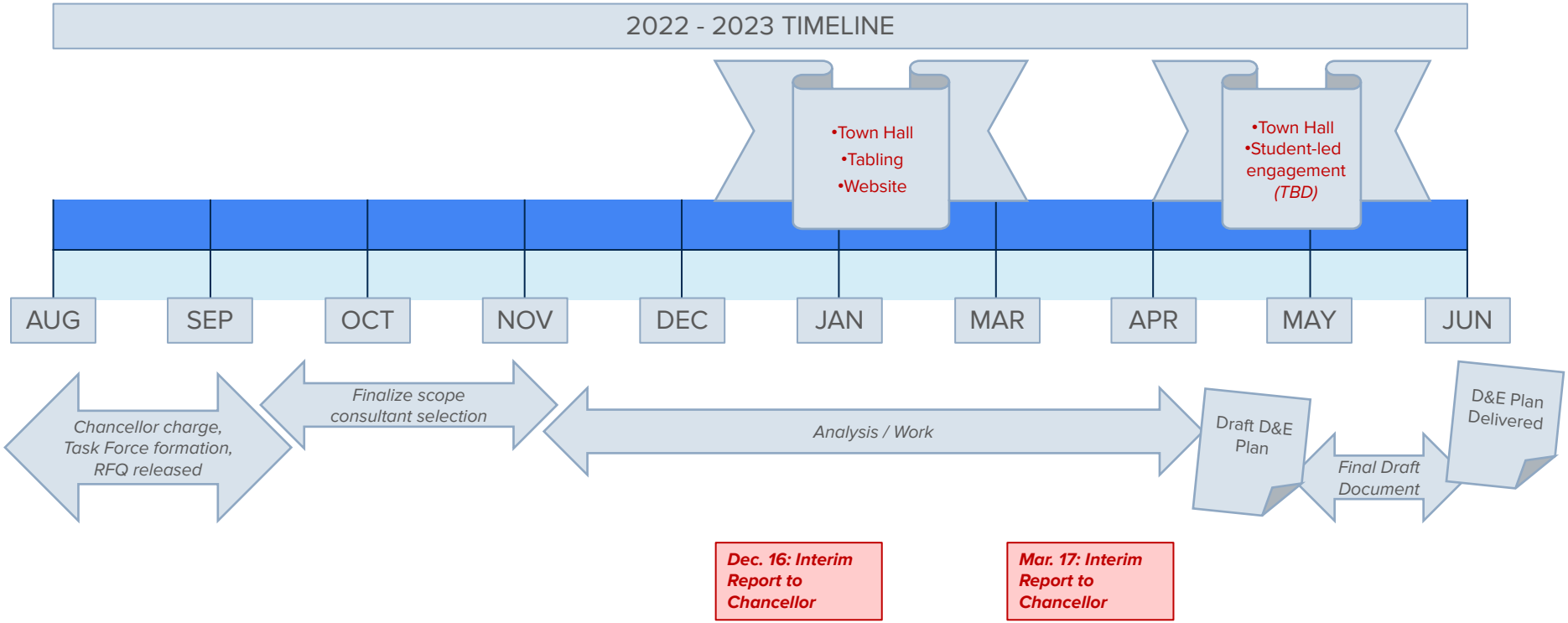


Thank you!

Decarbonization & Electrification Plan, Progress, Timeline

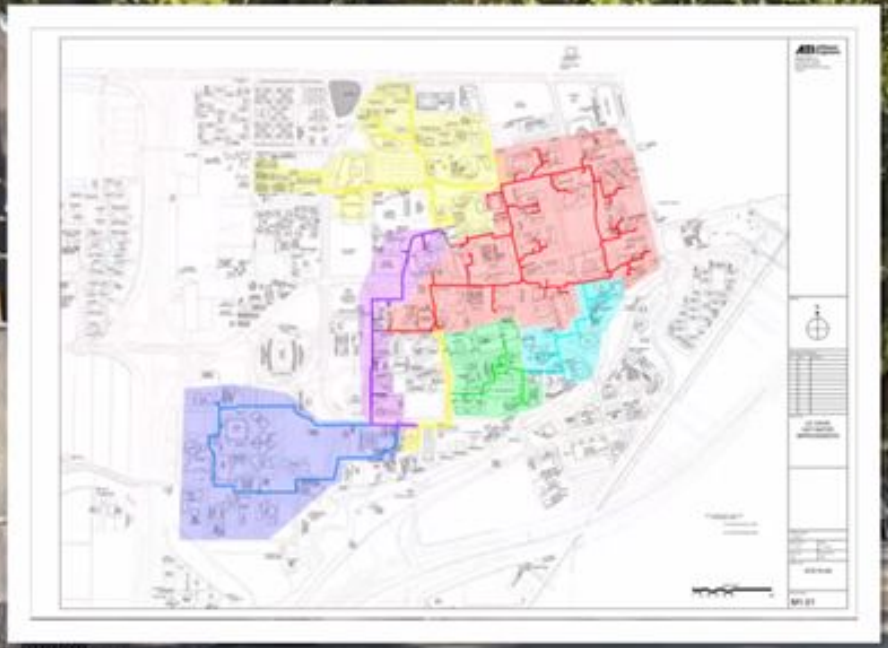
Phil Boutelle, P.E.
Associate Engineer
PPDO Engineering Services

Decarbonization & Electrification - Timeline



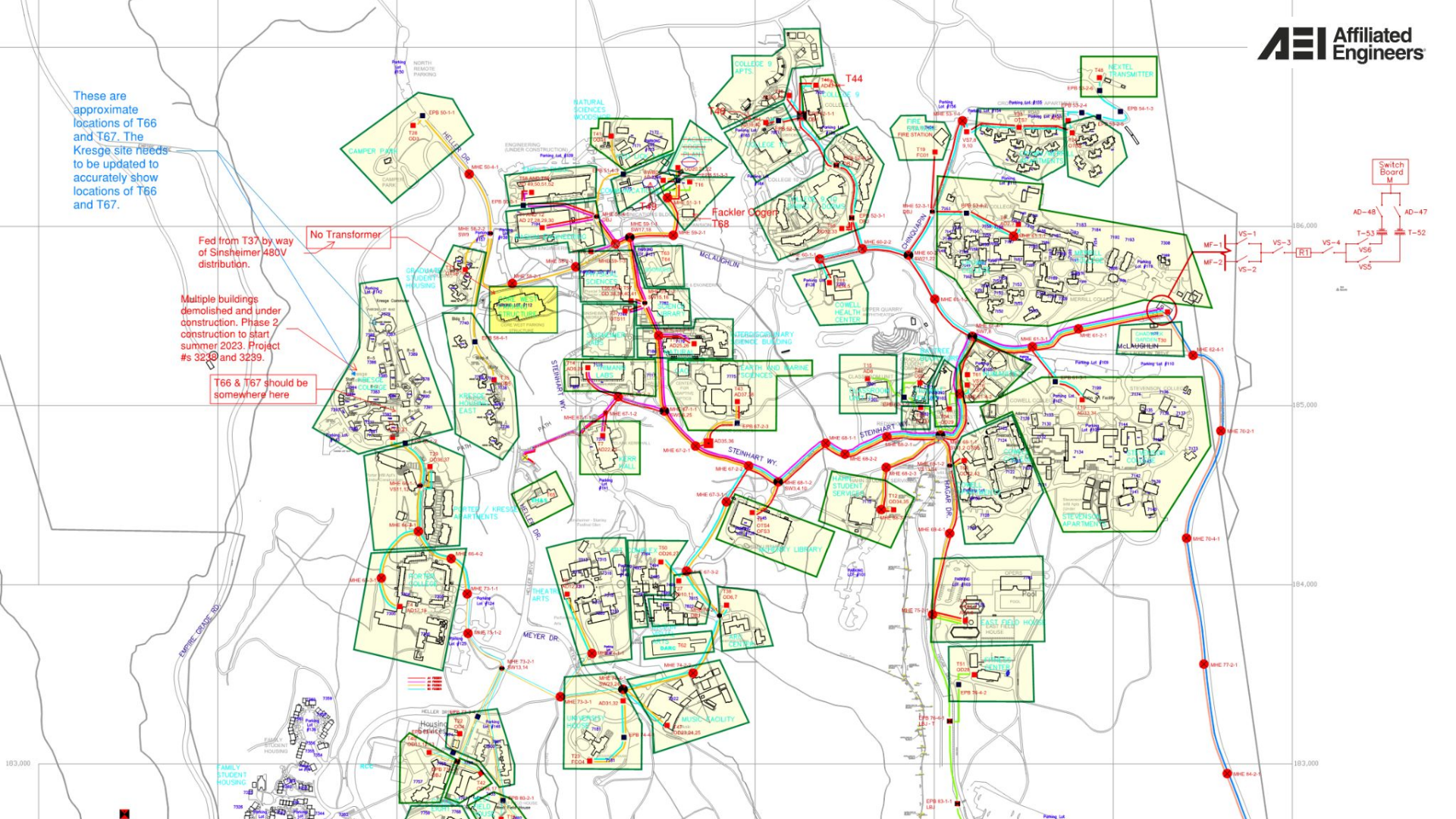
Decarbonization & Electrification - Consultant

- Selection Process: Competitive RFQ
- 10 Firm Submissions
- UCSC selection committee
- Final Four!
- Interviews & Scoring
- Final selection: **Affiliated Engineers, Inc.**



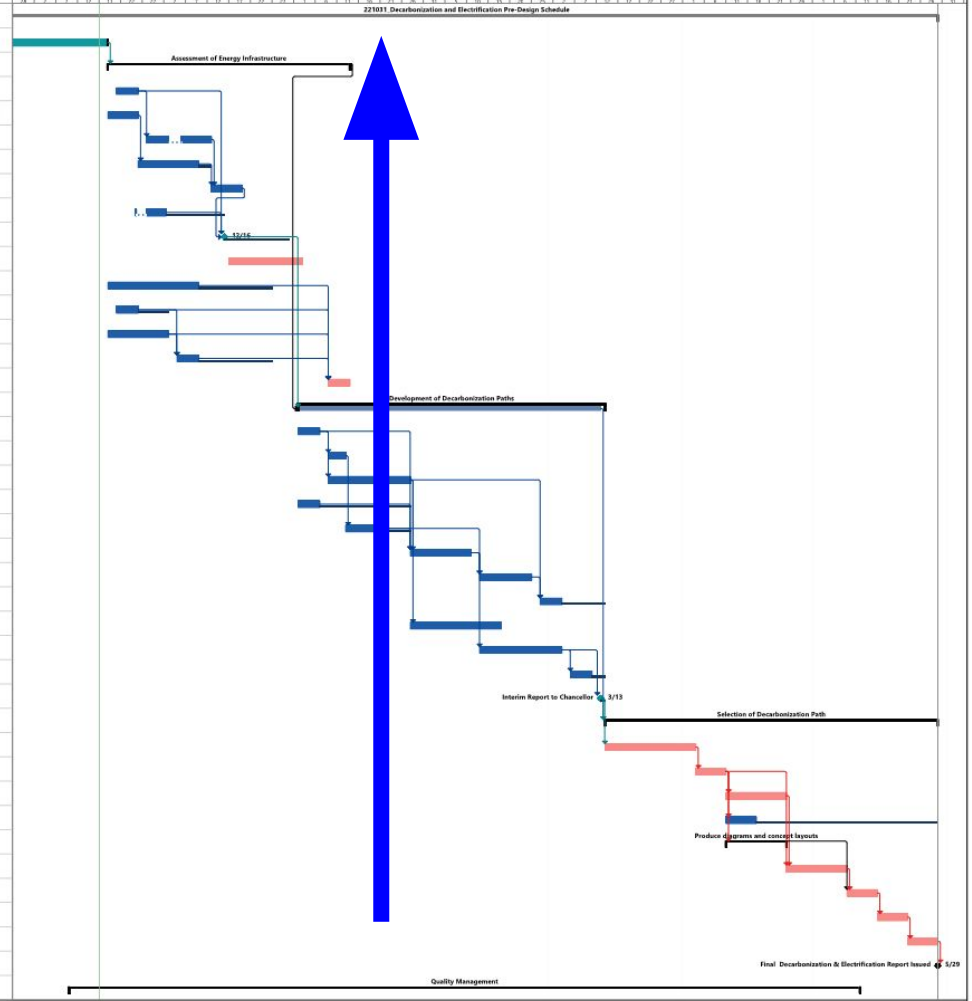
Decarbonization & Electrification - Phases

Phase 1	Assessment of Energy Infrastructure
Phase 2	Development of Decarbonization Path
Phase 3	Selection of Decarbonization Path



These are approximate locations of T66 and T67. The Kresge site needs to be updated to accurately show locations of T66 and T67.
Fed from T37 by way of Sinsheimer 480V distribution.
No Transformer
Multiple buildings demolished and under construction. Phase 2 construction to start summer 2023. Project #s 3238 and 3239.
T66 & T67 should be somewhere here
Fackler Ogen
T68
T44
T49
T40
Switch Board M
AD-48
AD-47
T-53
T-52
VS-1
VS-2
VS-3
VS-4
VS5
VS6
MF-1
MF-2
R1
McLAUGHLIN
STEINHART WY.
HELLER DR.
MEYER DR.
HAGAR DR.
CHINQUAPIN
EMPIRE GRADE RD.
186,000
185,000
184,000
183,000

ID	Task Name	Start	Finish	Duration	Resource Group
0	**221031_Decarbonization and Electrification Pre-Design Schedule**	**Mon 10/24/22**	**Mon 5/29/23**	**156 days**	
1	1 [redacted]				
2	**2 Assessment of Energy Infrastructure**	**Fri 11/18/22**	**Fri 1/13/23**	**40 days**	
3	2.1 [redacted]	Mon 11/21/22	Fri 11/25/22	5 days	
4	2.2 Site Visits	Fri 11/18/22	Fri 11/25/22	5 days	
5	2.3 [redacted]				
6	2.4 [redacted]				
7	2.5 [redacted]				
8	2.6 Town Hall Workshop(s)	Fri 11/25/22	Fri 12/2/22	5 days	
9	2.7 [redacted]				
10	2.8 [redacted]				
11	2.9 Future Load Projections	Fri 11/18/22	Fri 12/9/22	15 days	
12	2.10 [redacted]				
13	2.11 [redacted]				
14	2.12 [redacted]				
15	2.13 [redacted]				
16	**3 Development of Decarbonization Paths**	**Mon 1/2/23**	**Mon 3/13/23**	**51 days**	
17	3.1 [redacted]				
18	3.2 Building Conversion Site Investigation	Mon 1/9/23	Thu 1/12/23	4 days	
19	3.3 Energy Network Analysis	Mon 1/9/23	Fri 1/27/23	15 days	
20	3.4 Infratructure Siting Workshop	Mon 1/2/23	Fri 1/6/23	5 days	
21	3.5 Financial Team Workshop	Thu 1/12/23	Thu 1/19/23	5 days	
22	3.6 Concept Options Narrative Development	Fri 1/27/23	Fri 2/10/23	10 days	
23	3.7 Opinion of Probable Cost Development	Mon 2/13/23	Fri 2/24/23	10 days	
24	3.8 Path Review Workshop	Mon 2/27/23	Fri 3/3/23	5 days	
25	3.9 Production of Interim Report Diagrams & Concept Layouts	Fri 1/27/23	Fri 2/17/23	15 days	
26	3.10 Draft Plan Development	Mon 2/13/23	Fri 3/3/23	15 days	
27	3.11 Issue Draft Plan	Mon 3/6/23	Fri 3/10/23	5 days	
28	3.12 Interim Report to Chancellor	Mon 3/13/23	Mon 3/13/23	0 days	
29	**4 Selection of Decarbonization Path**	**Tue 3/14/23**	**Mon 5/29/23**	**55 days**	
30	4.1 Interim Report Review	Tue 3/14/23	Mon 4/3/23	15 days	
31	4.2 Path Selection Workshop	Tue 4/4/23	Mon 4/10/23	5 days	
32	4.3 Opinion of Probable Cost Development	Tue 4/11/23	Mon 4/24/23	10 days	
33	4.4 Town Hall	Mon 4/10/23	Mon 4/17/23	5 days	
34	**4.5 Produce diagrams and concept layouts**	**Tue 4/11/23**	**Mon 4/24/23**	**10 days**	
39	4.6 Development of Final Report	Mon 4/24/23	Mon 5/8/23	10 days	
40	4.7 Draft Report Issued	Tue 5/9/23	Mon 5/15/23	5 days	
41	4.8 UCSC Report Review Period	Tue 5/16/23	Mon 5/22/23	5 days	
42	4.9 Final Report Revisions	Tue 5/23/23	Mon 5/29/23	5 days	
43	4.10 Final Decarbonization & Electrification Report Issued	Mon 5/29/23	Mon 5/29/23	0 days	
44	**5 Quality Management**	**Thu 11/10/22**	**Thu 5/11/23**	**131 days**	



Thank you!

How can I get engaged?

Cole Seither

UC Office of the President Carbon Neutrality Initiative Fellow

Supporting D&E on UCSC campus and everywhere!

Student Organizations & UCSC Sustainability Office Initiatives

- Climate Coalition, Enviroslug, Right Livelihood
- Student Sustainability Advisors
- People of Color Sustainability Collective
- Sustainability & Environmental Justice Ambassadors
- Green Office, Green Labs, Carbon Fund
- Sustainability Certificate Program
- Diversity and Inclusion Certificate Program
- The Cool Campus Challenge

UCSC Climate Coalition & Enviroslug

Climate Coalition

- Collective of UCSC Students, Faculty
- Biweekly meetings: McHenry, Sat 1pm

Enviroslug

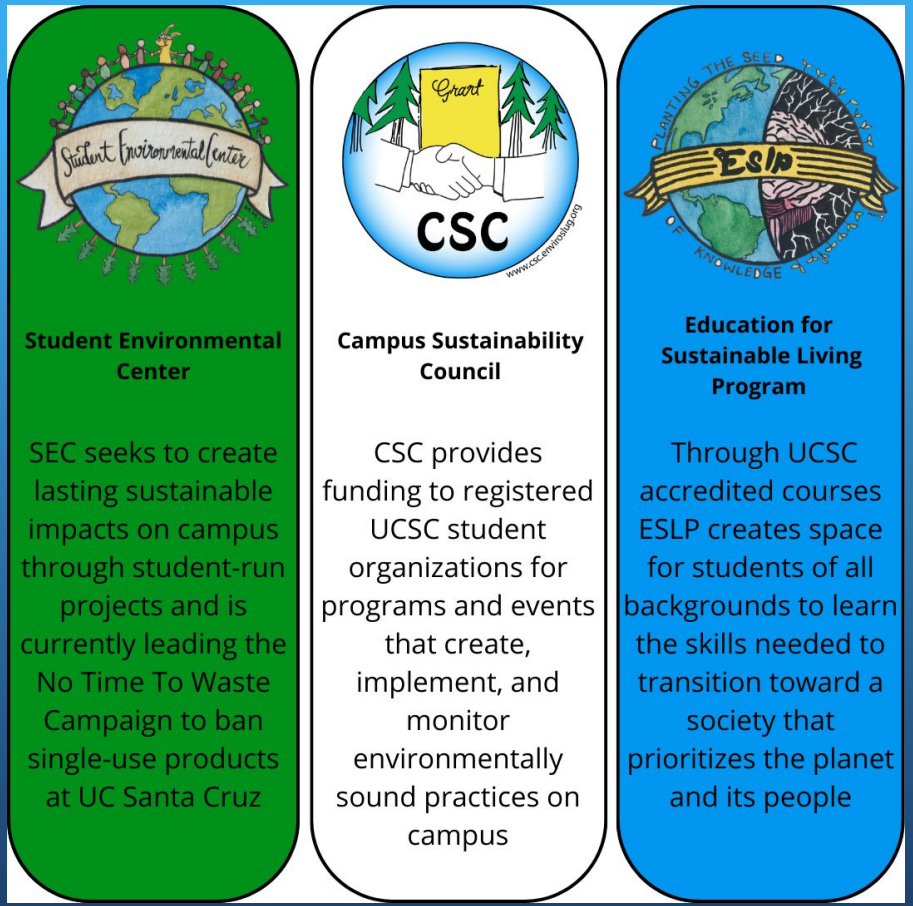
- Network of sustainability-minded campus organizations
- Student driven initiatives

AT UC SANTA CRUZ

Enviroslug

Collective of Student Run Sustainability Organizations

They're here!



- Collective of three orgs:
  - Student Environmental Center
  - Campus Sustainability Council
  - Education for Sustainable Living Program
- Looking for new folks to join, come learn about our upcoming Zero Waste Scavenger Hunt and how you can get involved!

Right Livelihood College

Right Livelihood
COLLEGE SANTA CRUZ

- Campus community affiliated with the international organization Right Livelihood
- Undergraduate and Graduate Clubs
- UCSC courses for undergraduate students
  - ANTH 110I: Cultures of Sustainability and Social Justice
  - KRSG 78: Social and Environmental Justice Activism and the Right Livelihood Award Foundation

"Linking activists and academics for research and education about courageous solutions to global problems."

They're here!

Student Sustainability Advisors (SSA)

- UCSC Sustainability Office Student Employees
- Affiliated with the Residential Colleges

"Student Sustainability Advisors (SSAs) are peer-to-peer educators who serve UC Santa Cruz's residential housing areas. These student leaders provide programming and educational opportunities within UC Santa Cruz's residential communities around sustainability topics, share events and information with the residents of their communities about sustainability and environmental behavior, and serve as sustainability liaisons."

People of Color Sustainability Collective

Collaboration between the Ethnic Resource Centers, Colleges 9 and John R. Lewis, and the UCSC Sustainability Office

"The mission of the People of Color Sustainability Collective is to make UCSC a leader not just in mainstream sustainability, but also environmental justice, in recognition of our changing demographics and pressing ecological challenges."

They're here!

Sustainability and Environmental Justice Ambassadors

The goals of the SEJA team:

1. *increase visibility and student understanding of environmental justice through peer-to-peer education and outreach*
2. *To design accessible educational modules on environmental justice for undergraduate students*
3. *To collaborate with and elevate the visibility of organizations on campus and in the community already doing important environmental justice work.*

Green Office & Green Labs

- UCSC Sustainability Office Student-Run Initiatives
- Direct campus labs and offices to modify their habits and protocols to reduce their environmental impacts.

UC SANTA CRUZ GREEN OFFICE CERTIFICATION PROGRAM

Sign up your office or lab today!

Faculty, Staff & Graduate Student Trainings

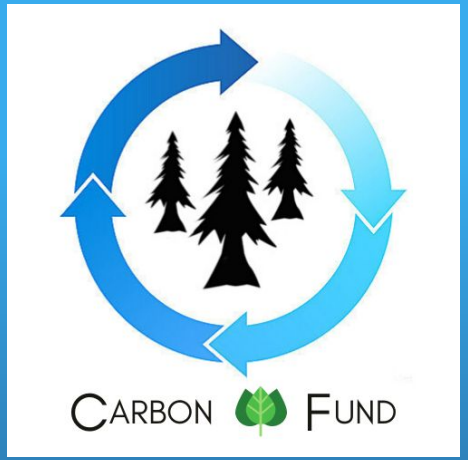
- Sustainability Certificate Program & the Diversity and Inclusion Certificate Program
- Continuing education programs designed to advance your knowledge and engagement around sustainability and diversity issues.

Go to their websites to learn more!

They're here!

Carbon Fund

- Sustainability Office Student-Run Program
- Supports sustainability initiatives on campus
- Develop a team, a plan, and submit funding requests in fall quarter



"The UCSC Carbon Fund is a granting body that funds student and staff projects that reduce our carbon footprint. We provide funding, support, and participation in sustainability projects on campus and in the community that directly reduce greenhouse gas emissions, conduct relevant research, or carry out educational programs."

They're here!

Cool Campus Challenge

- Digital platform designed to help individuals reduce their resource use
- Open to students, faculty, staff and community members
- Learn about your personal contribution to greenhouse gas emissions and resource use, and how to reduce your impact!
- Running Winter Quarter ‘23 - Active Now!
- Join a team for your Residential College, a friend group, or a class!

They're here!

Cool Campus Challenge

SARAH LATHAM
UCSC BAS

47 out of 1515 at UCSC

Guru ?

Co2 saved
19,422 lbs.

Points
16,652

PLEDGES TAKEN

Verified — 390 points

Eliminate mini-fridge

I have shifted to use of our group fridge.

Verified — 62 points

Curtail that energy use

This has been my standard practice even closure and I will do it again this year.

Verified — 380 points

Keep sensors accurate

I never realized that there was equipment giving off heat right next to my temperature sensor at my home. I have moved them across the room. I have also adjusted the window so the sun is not shining directly on the sensor.

Verified — 60 points

Go meatless at your events

I hosted a dinner for a group of students and we all went meatless.

Verified — 70 points

Reduce vampire loads

I unplug my power strips at home when they are not in use.

Ana Bayliss Grijalva
7 months ago
UC Santa Cruz

I watched the "The environmental cost of free two-day shipping"

Points 100
Pounds CO_2

Janet Gudino
7 months ago
UC Santa Cruz

I rarely use my printer so I am going to donate it!

Points 200
Pounds CO_2 150

this could be YOU!

and we're here to support you!

Community

D&E Task Force

Campus Planning/Transportation
Jolie Kerns, Director of Physical and Environmental Planning

Living Lab / Research
Susan Monroe, Executive Assistant, AVC for PPDO

D&E Project Manager / Energy
Phil Boutelle, Associate Engineer, PPDO - Engineering Services

People of Color Sustainability Collective

Sustainable Certificate Program

UCSC's Strategic Planning

Cool Campus Challenge

Climate Coalition

EnviroSlug

Right Livelihood

Thank you!