

January Brown Bag Presentations

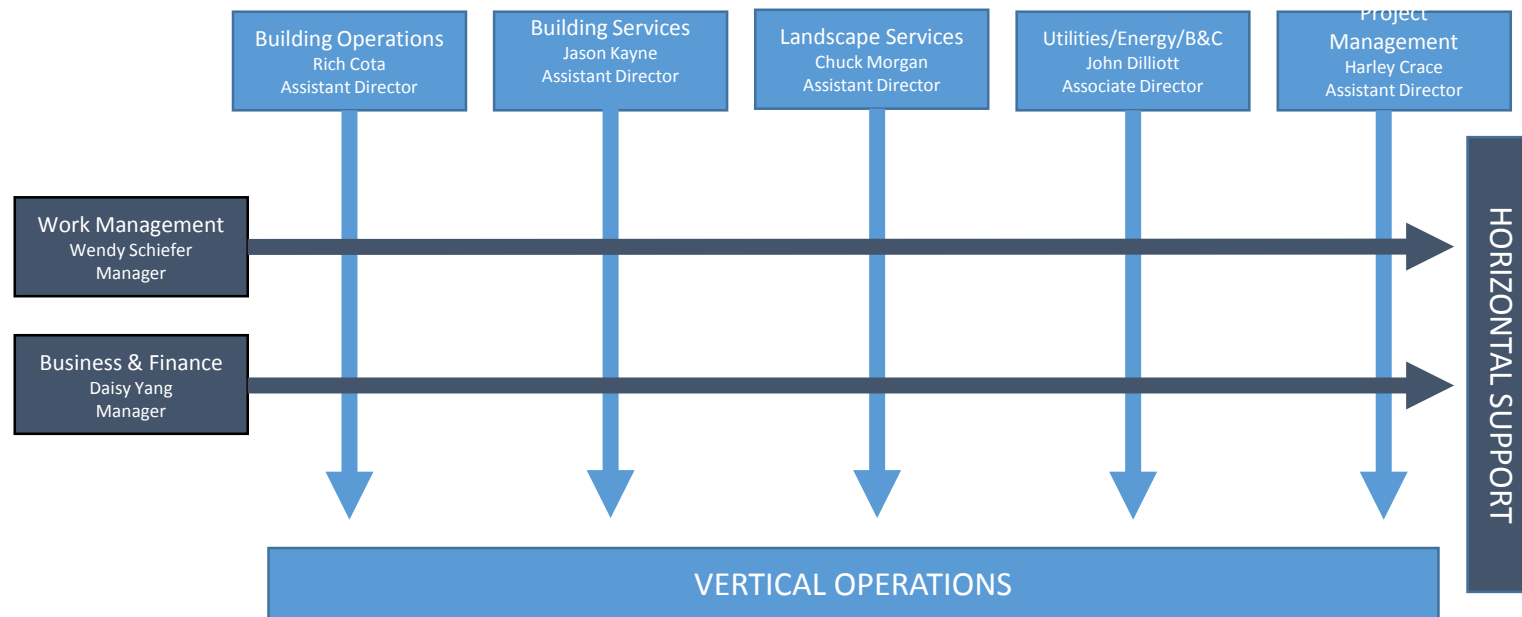
Presentation 1: Energy and Utilities-Freezer Update

Presentation 2: Recycling 101

Energy and Utilities: Freezer Update

John Dilllott

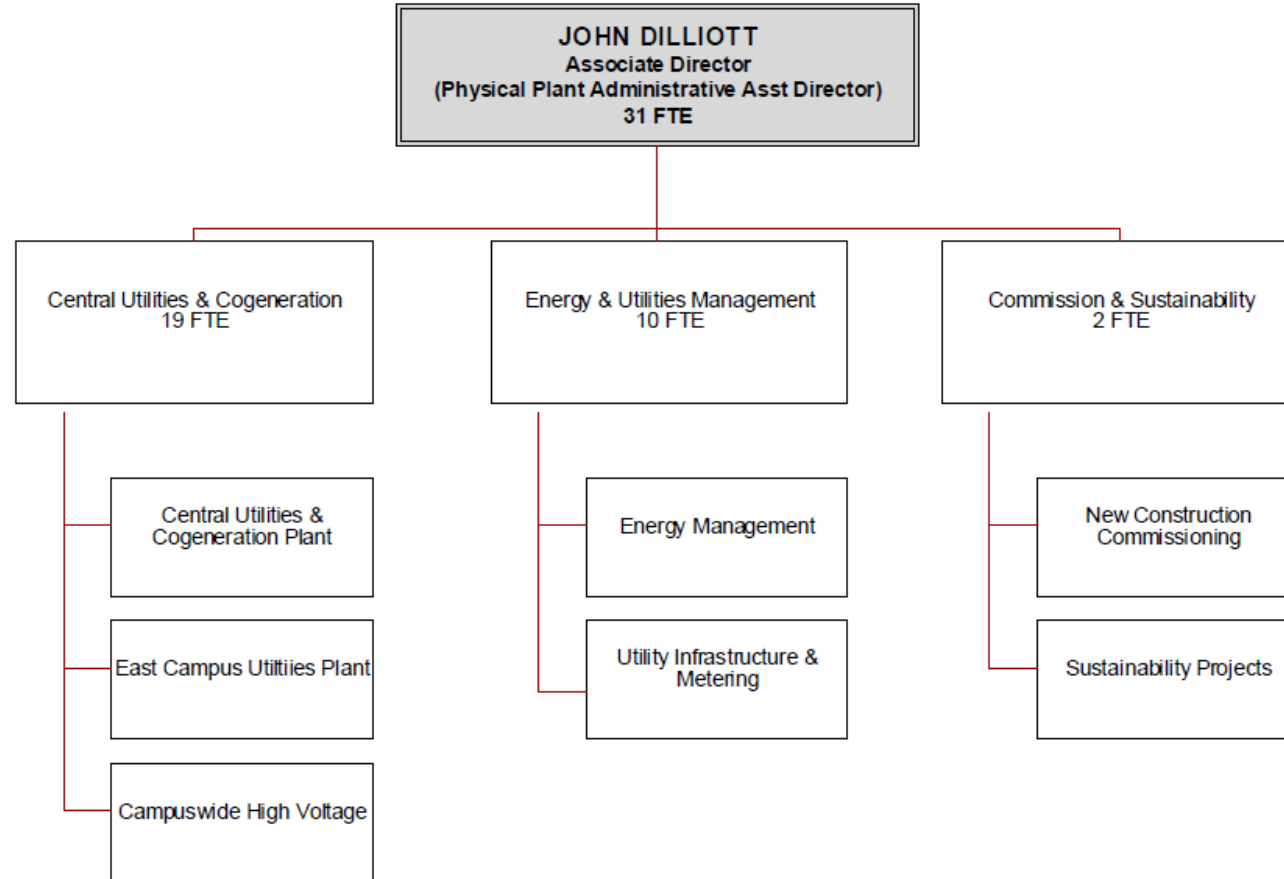
FM Organization Structure



UC San Diego



Campus Energy & Utilities
Facilities Management
Supporting Educational and Research Environments



Lab Freezer Energy Use

- 600-800 -80 C ULT Freezers
- ?? -20C Freezers
- \$1M+ annual energy costs



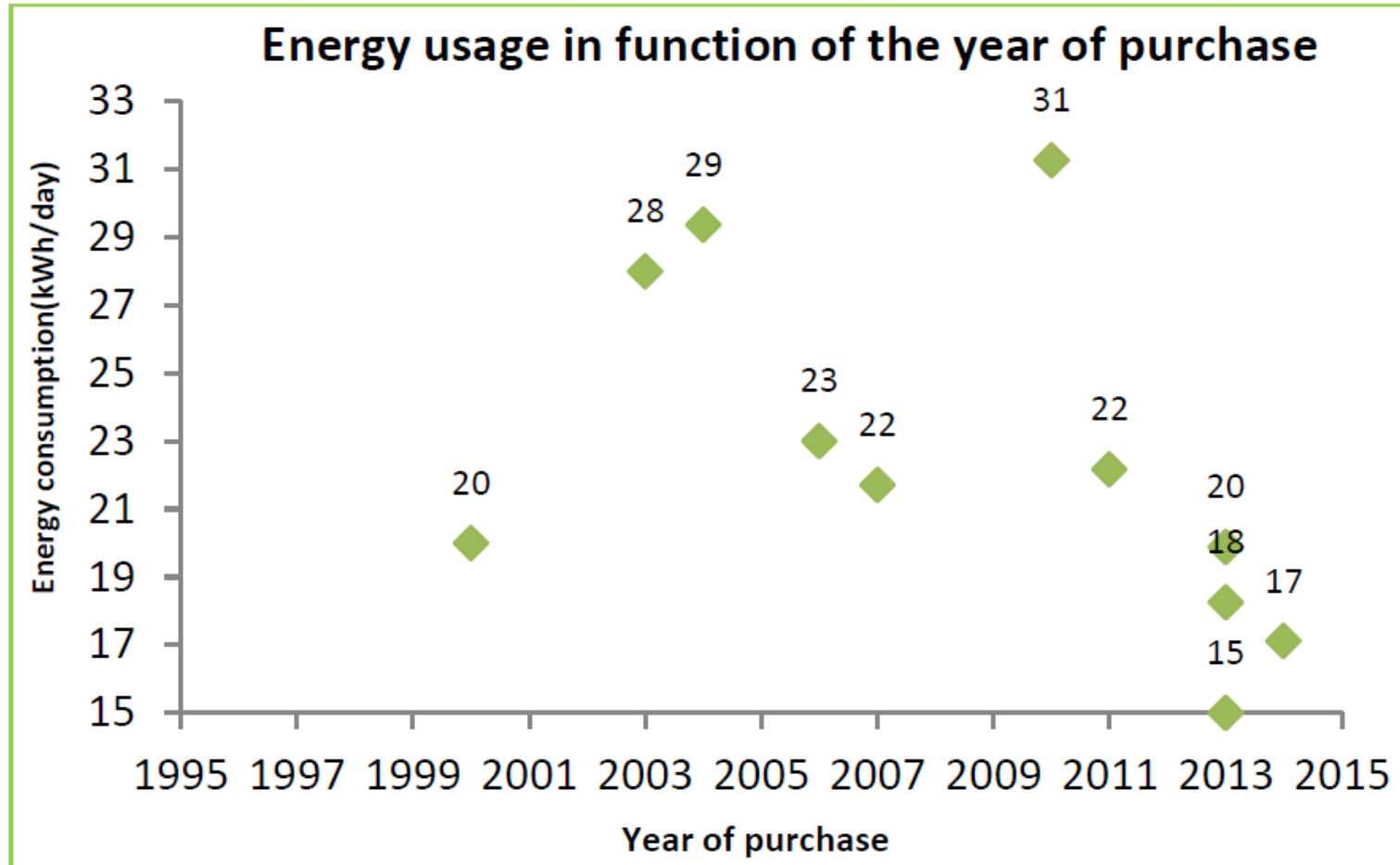


Figure 1: Energy usage of monitored Freezer during the freezer audit in 2014-2015

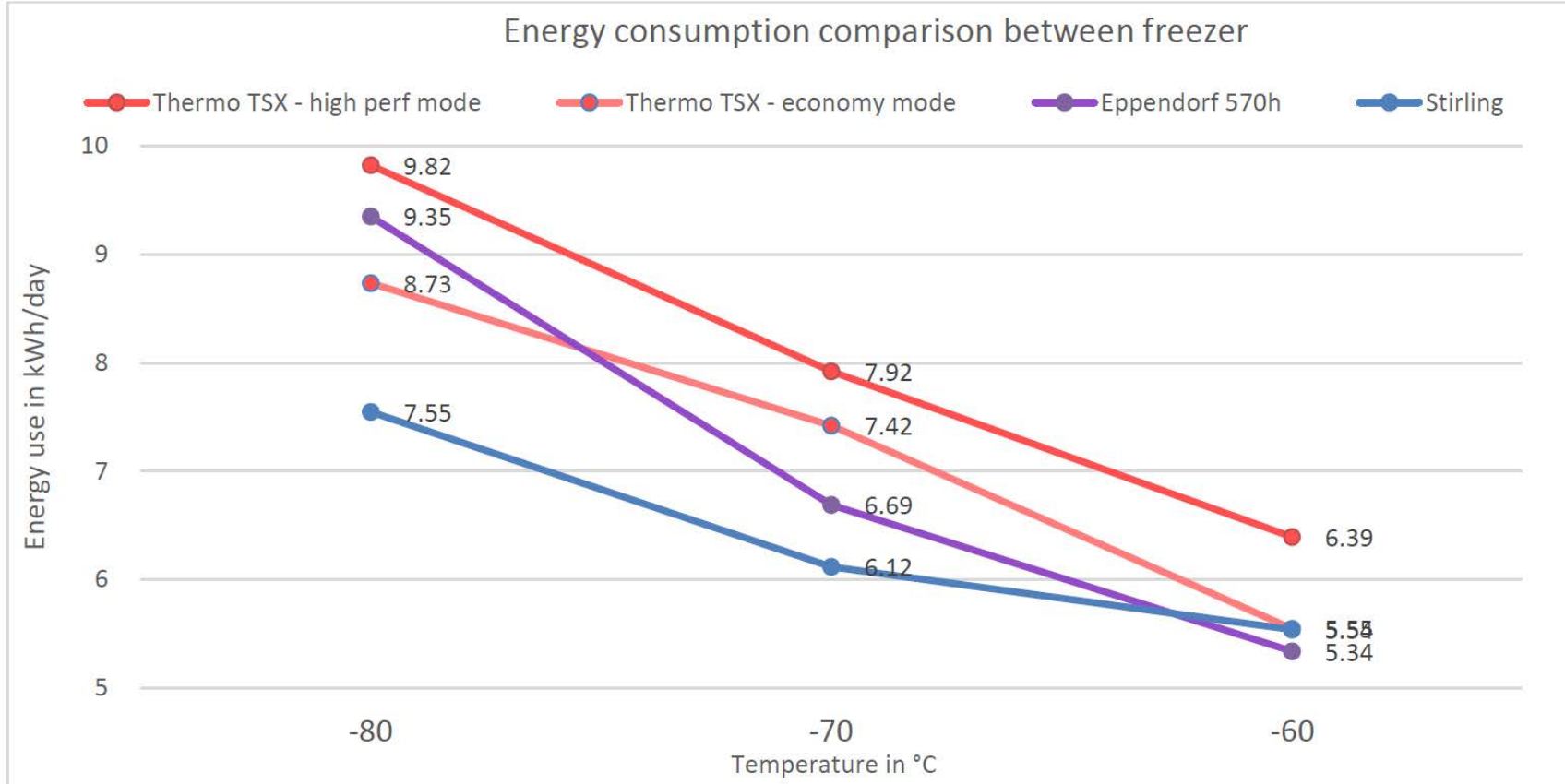


Figure 9: Energy consumption comparison between freezers

Goal

- Reduce, Replace & Consolidate
- -80's in 'freezer farms'
- Consider
 - -70 C set point
 - Potential 30% savings
 - Room temperature storage

Costs Covered by the Program

- Purchase of **Replacement** freezer/refrigerator
 - Including delivery, electrical connection & disposal of old unit
- \$3,000 subsidy for a **New** Stirling ULT

Process

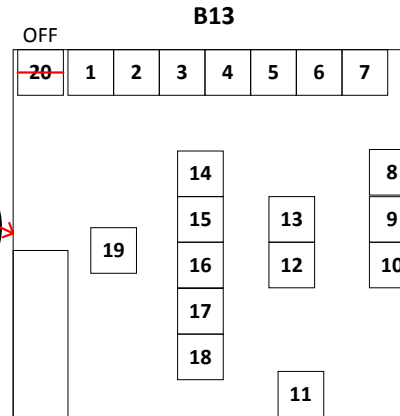
1. Freezer Farm Assessment

- -80F ULT's only
- Completed – We will be reaching out to you
 - CMME, Leichtag, Pac Hall, NSB, BSB, Bonner Hall, SIO, BRF2, Surge Lab

2. Interior Lab Assessment

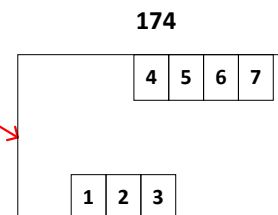
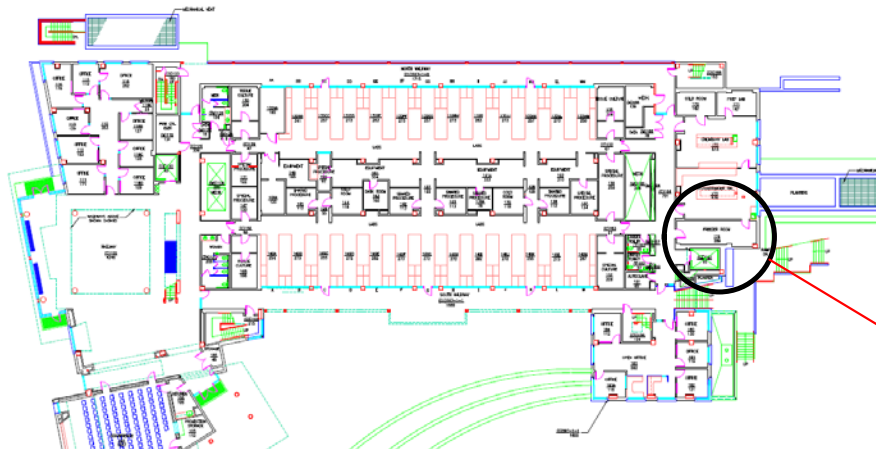
- -20F and -80F units
- Floor by Floor accounting
 - Need your help to coordinate
 - Need your help to determine potential replacement(s)

Leichtag BASEMENT



Freezer #	kWh/day
1	36.44
2	1.50
3	49.92
4	1.73
5	49.92
6	3.00
7	28.45
8	34.56
9	32.83
10	23.46
11	0.58
12	32.83
13	32.83
14	15.84
15	1.50
16	14.48
17	32.45
18	34.85
19	37.44

Leichtag 1st FLOOR



Freezer #	kWh/day
1	0.00
2	0.00
3	0.00
4	0.00
5	0.00
6	0.00
7	5.76

Technology Comparison



Cascade system

- Two compressors
- Condenser
- Tubing



Stirling system

- Free-piston engine
- Integral linear motor
- Integral heat reject

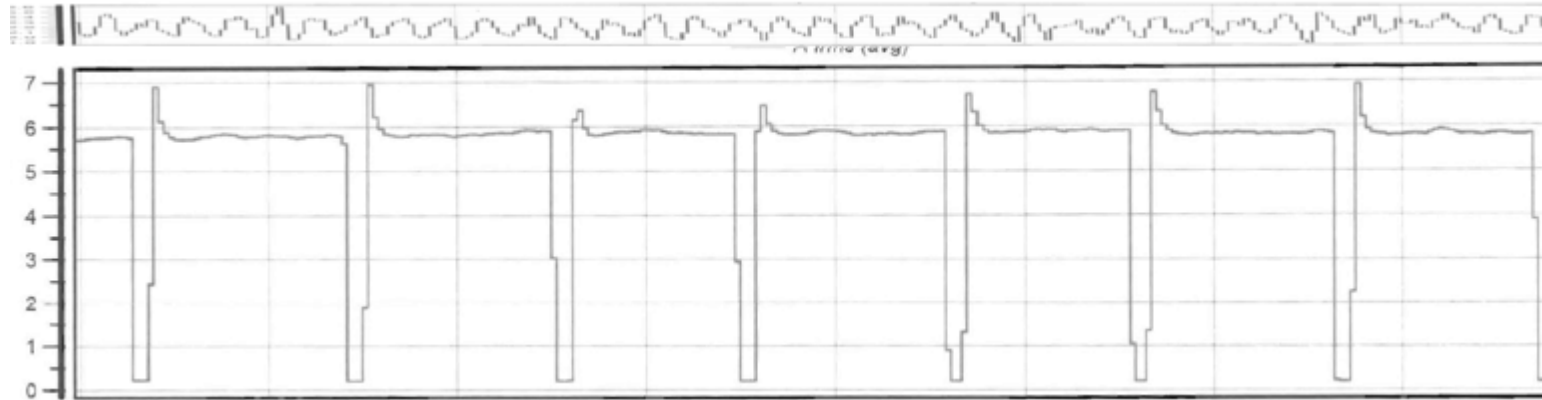
Today's Cascade ULT Freezers

- Use two compressors, a high and a low stage unit, in a cascade arrangement.
- Each refrigeration loop, high and low stage, contains a combination of refrigerant and oil.
- Typically R508B (SUVA 95™) is used as the low stage refrigerant in the US.
- Temperature control is achieved by switching on and off either (or both) the high and low stage compressors.

Stirling Ultracold System

- High efficiency linear free-piston Stirling engine
 - Helium working fluid
 - Gas bearings → non-contact operation → no oil
 - Continuously modulates – no stop start operation
- Gravity driven thermosiphon
 - No moving parts
 - No oil
 - Heat transport
 - 99g R170 (ethane)
 - Up to 17,000 times less damaging to the environment than HFC cascade compressor system

Independent Testing Current Surge



Brand T Stirling Current plots to scale

	kWh/day	kWh/day/ 10,000 vials	%	Max Current	%
SU780U	10.8	1.73	55%	2.6	37%
Latest Brand T	19.0	3.17	100%	7.0	100%

Overview

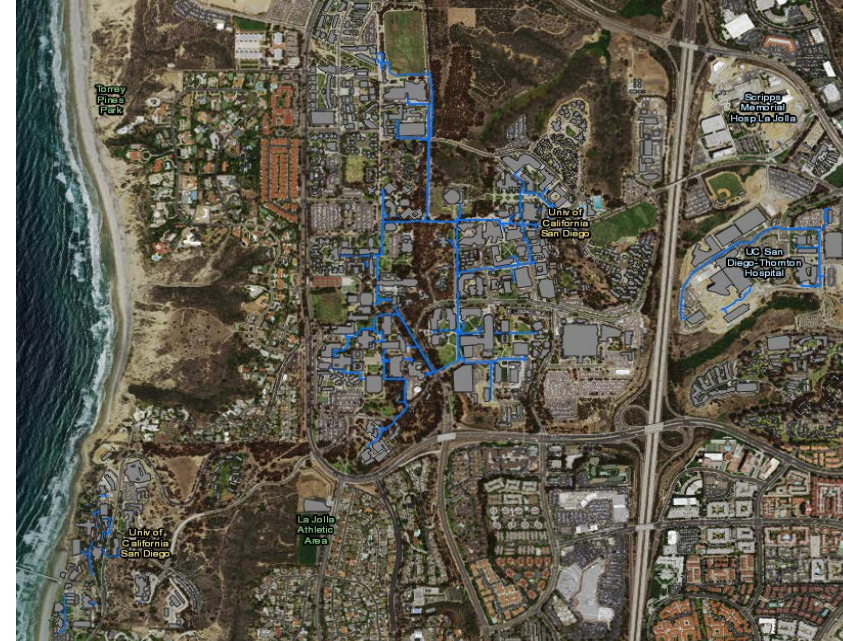
New Electrical Needs

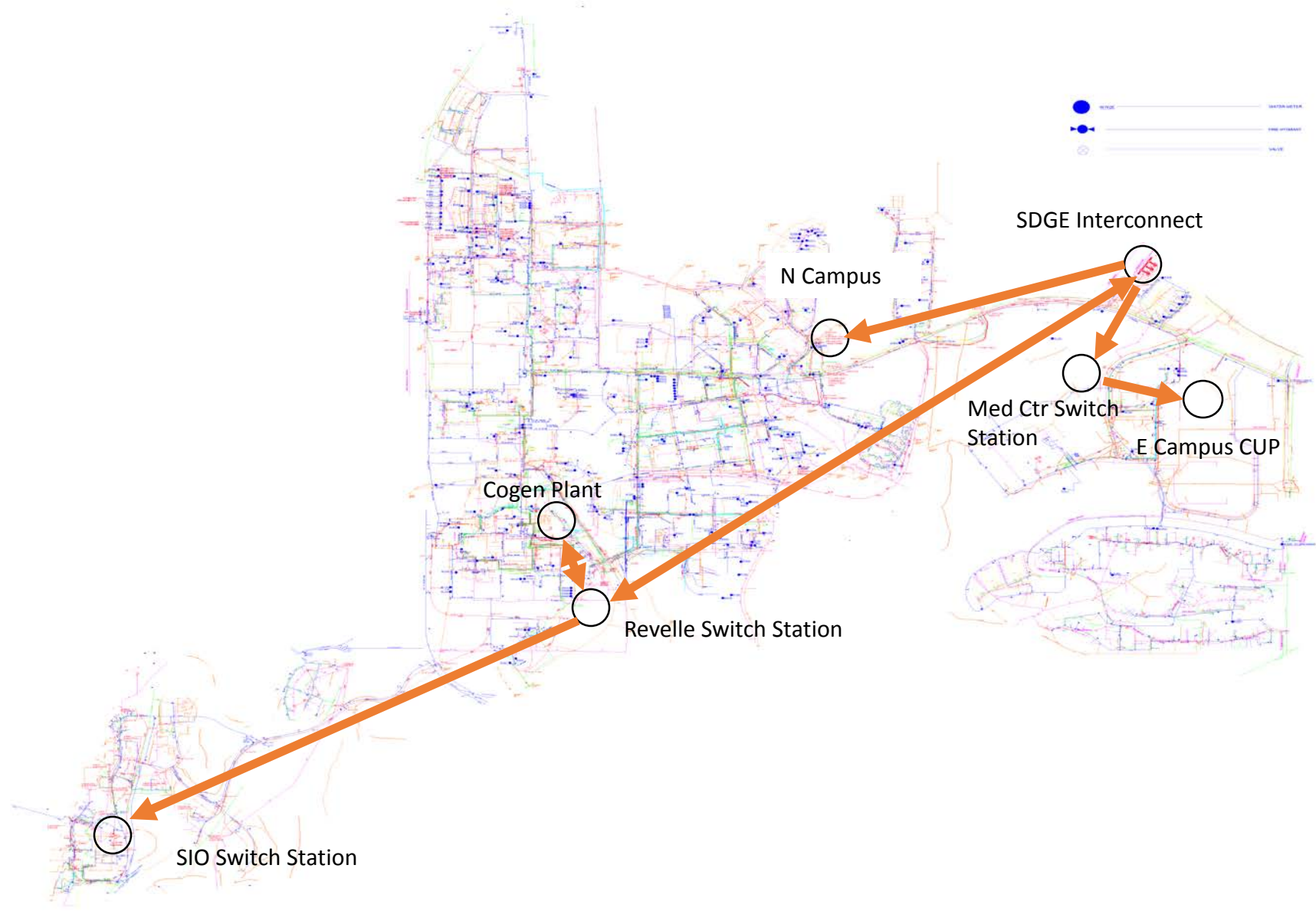
- Revelle Substation
- SIO Emergency Generator
- Satellite Utilities Plant (SUP)
- East Campus Substation Upgrade



New Cooling Needs

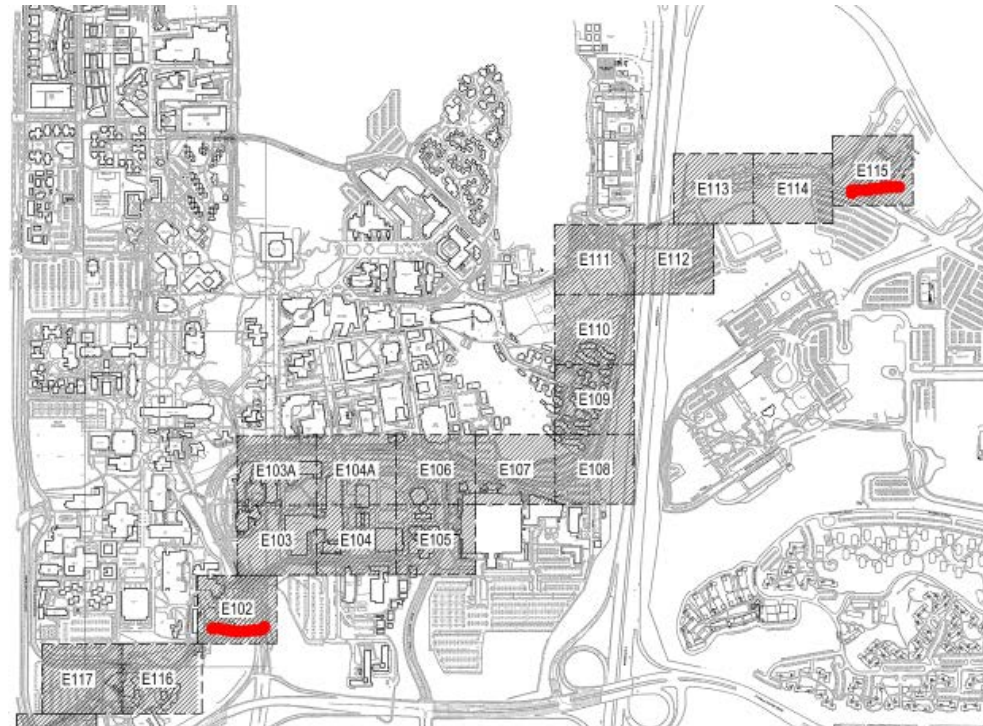
- Main Campus CHW Expansion
- East Campus CHW Expansion





Revelle Substation

- Load Growth
- New duct bank & feeders from CUP to ECSS
- Project budget \$30 million
- Project schedule:
 - May 2016 to Sept 2017



Existing Revelle Substation



New duct bank on North Gilman



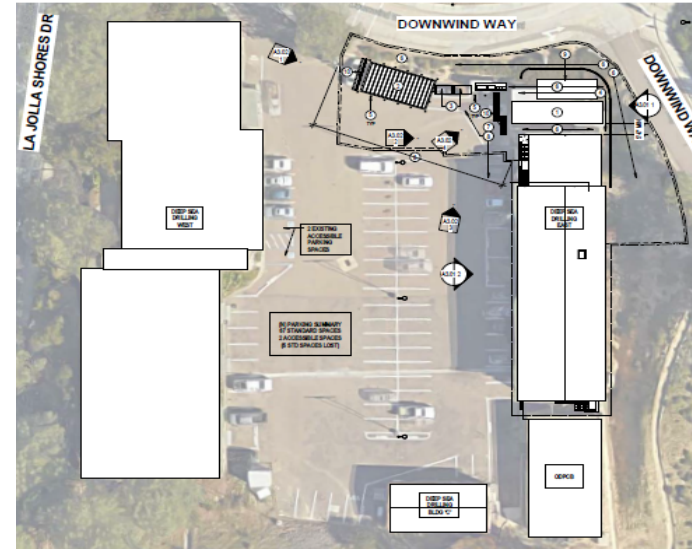
New Revelle Substation Vault



New Revelle Substation Building

SIO Emergency Power

- New 12 kV substation in Deep Sea Drilling parking lot
- 4 MW emergency generator
- Demo existing SIO SS near Vaughan Hall
- Finalizing design



Satellite Utilities Plant (SUP)

- 4 MW emergency power to SOM
 - Skaggs Pharmacy, BRF-II, Cage Wash
- Project budget \$14 million
- Project schedule:
 - Jan 2016 to Dec 2017

Proposed view looking from La Jolla Village Drive



SATELLITE UTILITY PLANT

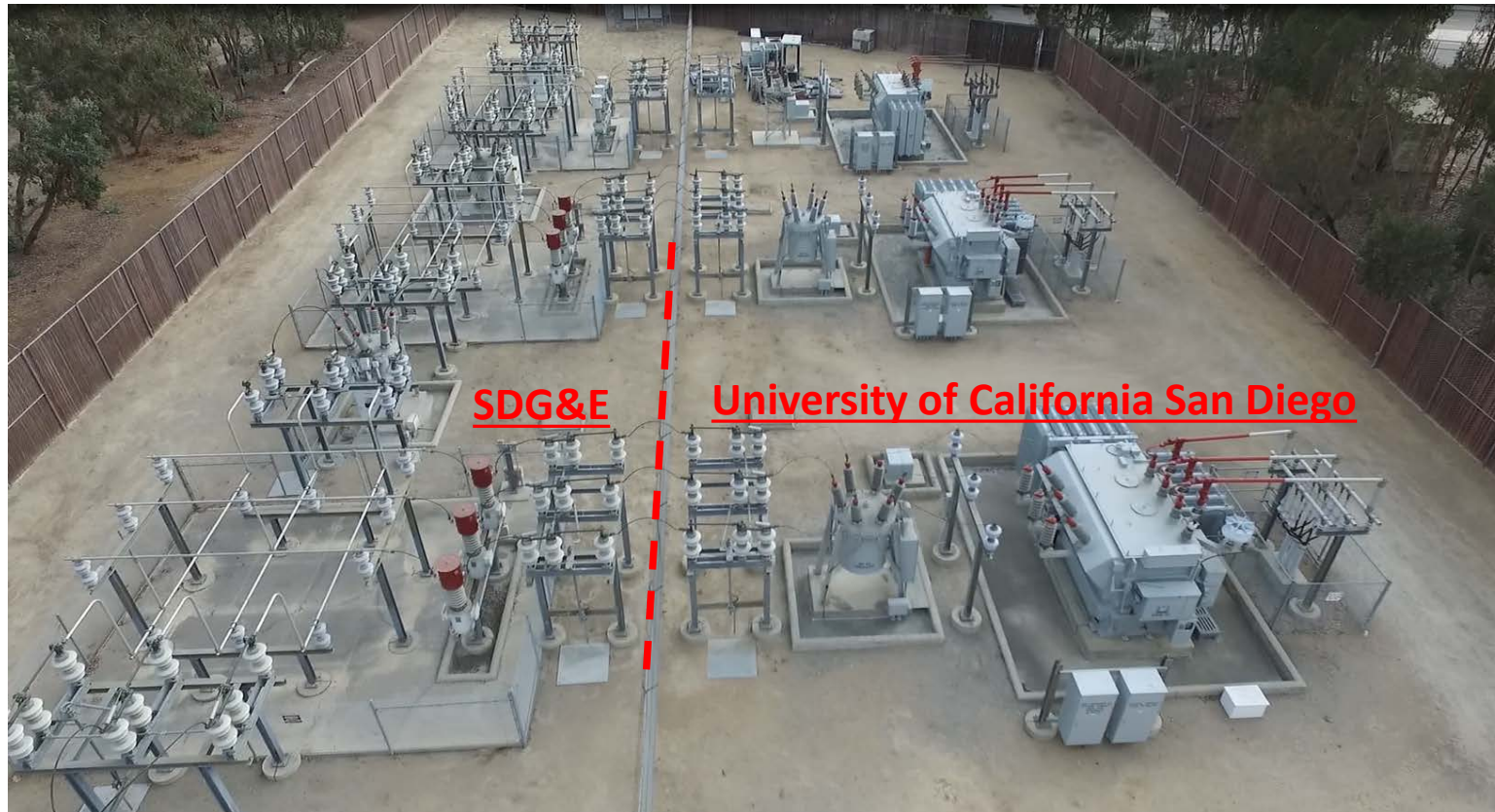
UCSD CCPC October 22, 2015



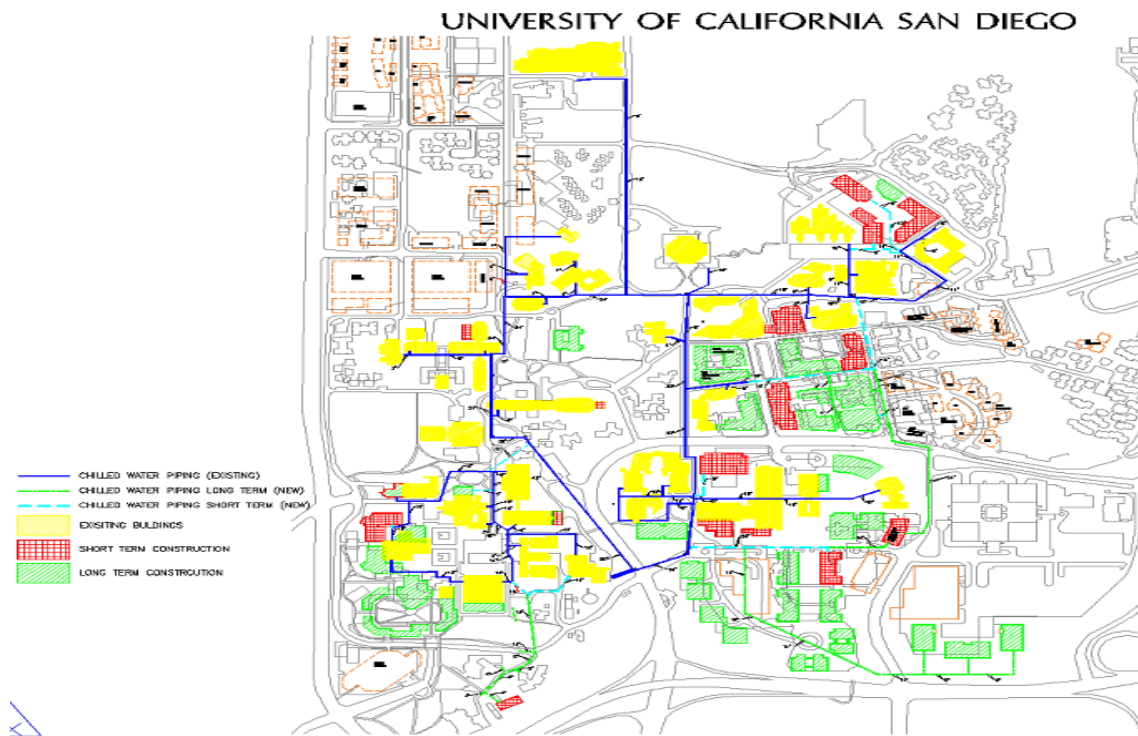
SATELLITE UTILITY PLANT

East Campus Substation Upgrade

- Upgrade existing transform to increase power capacity
- Project budget \$6.5 million

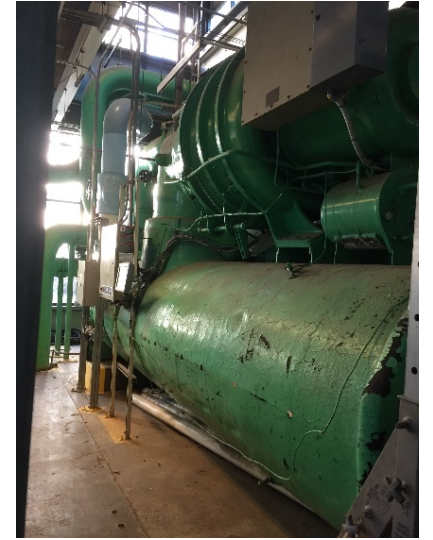
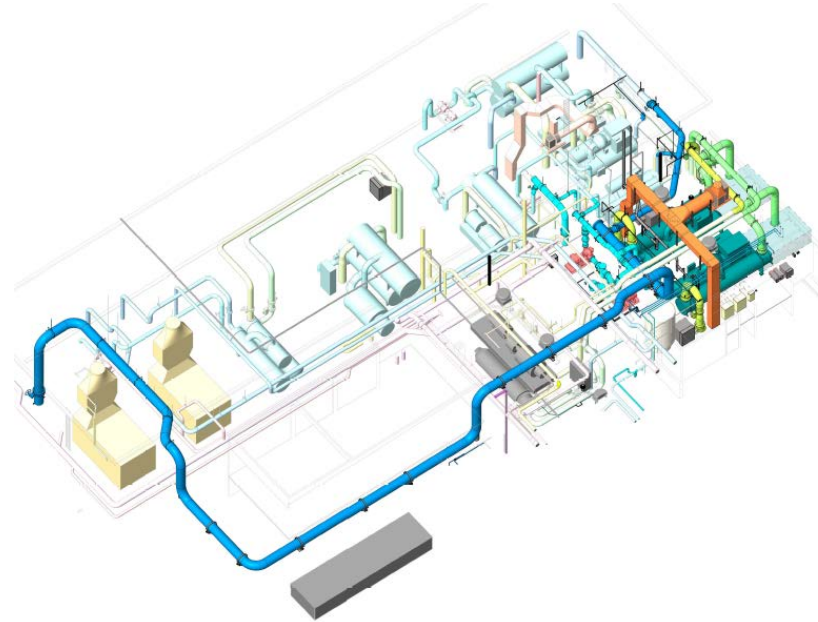


Main Campus CUP



Main Campus Chilled Water Upgrade

- Increasing campus cooling load
- CUP cooling capacity
 - Current: 17,500 tons
 - After-upgrade: 21,000 tons
- Upgrade project scope
 - Replace 2 electric chillers at CUP
 - Improve/extend large diameter CHW & CW piping
 - Completed design, going to bid
 - Project budget \$14 million
 - Winter of 2017 start



East Campus Chilled Water Upgrade

- OPP + (?)
- ECUP cooling capacity (excludes hospitals)
 - Current: 3,400 tons
 - After-upgrade: 4,600 tons
- Upgrade project scope
 - Install one new electric chiller at ECUP
 - Install new cooling towers
 - Second TES tank
 - Project budget \$5 million
 - Jan 2016 to Aug 2016







University of California San Diego Recycling 101

What is Zero Waste?

Historical Waste Data

Single Stream Recycling Program

Waste Diversion Continuous Improvement Partnerships

Promotional Programs

What is Zero Waste ?

The University of California has committed to sending zero waste to landfill by 2020.

To achieve Zero Waste, University of California San Diego will have to divert 95% of our ***Total Solid Waste*** from being disposed of in a landfill.



Diversion Rate or Recycle Percentage =
(Total Recycled Waste / Total Waste Generation)



University of California San Diego Historical Waste Data

	FY 2015/16	FY 2014/15	FY 2013/14	FY 2012/13
<u>Municipal Solid Waste & Construction & Demolition</u>				
<u>Waste (tons)</u>				
Reduce	134.00			
Reuse	354.66			
Organics	2,243.91	2,418.00	2,581.00	2,281.00
Recycled	7,723.27	7,243.00	4,268.00	9,064.00
Landfill	6,375.00	5,964.00	6,792.00	5,872.00
Total Waste Generation	16,830.84	15,625.00	13,641.00	17,217.00
Diversion Rate	62.12%	61.83%	50.21%	65.89%
<u>Municipal Solid Waste ONLY (tons)</u>				
Per Capita (WCU) Landfill Waste Generation	0.14	0.15		
Per Capita (WCU) Total Waste Generation	0.26	0.27		
Reduce	134.00			
Reuse	354.66			
Organics	2,243.91	2,418.00	2,581.00	2,281.00
Recycled	2,568.45	1,973.00	2,219.00	3,410.00
Landfill	6,375.00	5,414.00	5,798.00	5,582.00
Total Waste Generation	11,676.02	9,805.00	10,598.00	11,273.00
Diversion Rate	45.40%	44.78%	45.29%	50.48%

Single Stream Recycling

No More Sorting!

Now, ALL RECYCLABLES can go in the same bin!

It's faster, easier, and more convenient!



Dry food boxes, packaging, paper bags, cardboard, milk cartons and juice boxes



Magazines, newspapers, catalogs, phone books and paper bags



White paper, colored paper, letters, junk mail, wrapping paper, paper bags and shredded paper (bagged)



Steel, tin, pie tins, hangers, aluminum cans, foil and clean foil trays—all California Redemption Value (CRV) containers are acceptable.



Empty aerosol and paint cans



Glass or plastic bottles and jars—all California Redemption Value (CRV) containers are acceptable.



Clean plastic food containers and cups



Plastic buckets, toys, tubs, pots and trays

Empty and flatten all cardboard boxes and place them inside recycling bins. (Do not leave boxes near bins, dumpsters, or on loading docks.)

What's not recyclable?

- Food scraps
- Plastic-coated papers
- Tissue or paper towels
- Paper or containers contaminated by food or other organic waste
- Plastic bags and film
- Styrofoam packing peanuts, clamshells, plates, cups, etc.



Recycle Flow Chart



Waste Diversion Continuous Improvement Partnerships

- Source Reduction with Purchasing
- Reuse with Surplus Sales and Housing
- Food Waste with Housing, Dining and Price Center
- Construction Debris with Facilities Project Mgt.
- Scrap Metal with Facilities Maintenance
- Green Waste and Wood with Landscape Services
- Solid Waste and Recycling collection with Custodial



With less than 4 years to go until the University of California system is set to meet its awesomely audacious Zero Waste 2020 goal, now is the perfect time to instill Zero Waste awareness and values in the Class of 2020. The #MyLastTrash campaign is designed with UC students in mind and the goal is to change their behaviors around how they handle and reduce waste.

2017 Monthly Themes

- **January** - Launch
- **February** - Recycling & Plastic
- **March** - Paper
- **April** - E-waste & Social Justice
- **May** - Green Labs/ Living Labs
- **June** - Move-Out
- **July** - Staff/ Faculty Engagement
- **August** - Staff/ Faculty Engagement
- **September** - Move-In
- **October** - Compost
- **November** - Re-Use and Upcycling
- **December** - Reduce



- **Feb. 5 to April 1**
- [RecycleMania](#) is a friendly competition between colleges and universities across the U.S. and Canada to promote waste reduction activities among their campus communities. During the 8-week competition, each school will report weekly amount of recycling and trash they have collected.
- The winning schools will receive an award made from recyclable materials, national recognition in each category on the RecycleMania website in addition to winning the right to host that category's special traveling trophy for the upcoming year!
- **Overall RecycleMania Goals**
- Motivate students, faculty and staff to increase recycling efforts and reduce waste generation
- Promote and support campus recycling programs
- Encourage colleges to measure and benchmark recycling activities in their efforts to improve their programs
- Have a fair and friendly competition
- **Visit the RecycleMania Booth!**
Each Thursday between Feb. 2 and March 9 and Tuesday, March 14
11 a.m. – noon
Price Center Plaza