UC Irvine’s
Student Center Interior Lighting Upgrade 2014

Vicky Do – Energy Analyst
Joseph Fleshman, P.E. – Project Manager
Student Center Overview

- 400,000 sq. ft.
- Multi-tenant, multi-use facility: conference spaces, offices, food service, retail, auditorium.
- Approximately 4,000 light fixtures.
Student Center as a Business

- Funded by student fees, retail spaces, tenant leases, conference bookings.
- Pays Facilities Management for electricity, heating, cooling, and natural gas.
- Treated as a business for all intents and purposes.
To facilitate participation in the SEP, each campus organization was made responsible for their portion of the emission reduction goal.
Campus Greenhouse Gas Emissions

- Electricity
- Natural Gas
- Chilled Water
- High Temp Water

MTCO2e

Now → 2025
UCI’s climate protection goals are based on UC policy, state AB 32 law, and ACUPCC commitments.

### MTCO2e Reduction Required

<table>
<thead>
<tr>
<th></th>
<th>2020 Reduction Required</th>
<th>2025 Reduction Required</th>
<th>2050 Reduction Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Campus</td>
<td>66,300</td>
<td>41,600</td>
<td>-</td>
</tr>
<tr>
<td>Medical Center</td>
<td>3,700</td>
<td>12,500</td>
<td>-</td>
</tr>
<tr>
<td>Student Affairs</td>
<td>4,300</td>
<td>1,800</td>
<td>-</td>
</tr>
<tr>
<td>Commuting</td>
<td>4,500</td>
<td>-</td>
<td>16,650</td>
</tr>
<tr>
<td>Air Travel</td>
<td>2,200</td>
<td>-</td>
<td>19,100</td>
</tr>
</tbody>
</table>
Energy Projects Are an Investment

Total Energy Use

<table>
<thead>
<tr>
<th>Energy Projects</th>
</tr>
</thead>
</table>

Net CO2e

Carbon Free Energy = 2-3x Cost

Most affordable way is to not use the energy in the first place
UC Irvine’s Energy Team

- Representatives present from each department
- Meet once a month
- Team members are held accountable by visible goals
Student Center - Overarching Goals

• Reduce greenhouse gas emissions.
• Enable advanced lighting controls.
• Standardize color temperature.
• Improve light quality with high CRI.
• Reduce in-house labor costs from lamp failures.
• Eliminate mercury.
Financial Considerations

• Reduce electrical and chilled water costs.
• Return on investment: Simple payback of five years.
• Improve sales in retail and food service spaces.
Iterative Scoping Process

• Audited building, scoped all fixtures.
• Tailored project to customer’s phasing requirements.
  • Removed 13W CFLs, exterior fixtures, and others with poor payback.
  • Removed auditorium and dimming ballroom spaces.
• Payback estimated at 5.7 years. Customer elected to proceed.
Existing Lighting

- 4-pin compact fluorescents in cans
- 2’x4’ recessed parabolic linear fluorescent troffers
- Hanging and surface mount linear fluorescents
- Under-cabinet linear fluorescents
- Controlled via switches

(All lamps were properly recycled/disposed of)
New Lighting

- Replaced 3,200 light fixtures and lamps with LED technologies. (~90% of interior)
- 1:1 light replacements
- Occupancy sensors and timers

2’4’ LED troffer
LED Lightbar
Plug and play LED for CFL
Screw in LED
Lunera Helen Lamp

- Replaced 600 lamps at Student Center
- 26W, 32W, or 42W CFL to 13W LED
- Powered by existing fixture’s ballast
- 5 times the lifespan of a CFL
Cree UR Lightbar

- Installed 700 sets at the Student Center
- Retrofit T8 and T12 fluorescents to LED lightbars with LED drivers.
- Surface-mount, pendant-mount, under-cabinet mount, light shelves.
- Low use areas – Mechanical, Electrical, Storage.
Cree ZR Troffer

- Replaced 1,500 troffers at the Student Center
- Applicable to recessed fixtures in drop ceilings.
- Primarily offices, conference rooms, hallways.
- 100W 3-lamp fixtures to 44W LED.
Student Center Savings

- CFLs - 50-60% savings
- 125,000 kWh/year, 86 tonnes CO$_2$e
Student Center Savings

- T8: 20-50% savings
- 485,000 kWh/year, 334 tonnes CO$_2$e
Student Center Savings

- T12: 55% savings
- 208,000 kWh/year, 143 tonnes CO$_2$e
Student Center Energy Impact

- Annual Savings - 972,000 kWh
- Average Demand Reduction - 94 kW
Student Center Impact Summary

- Project Budget: $570,000
- Cost Savings: $126,000/year ($0.13/kWh)
- Utility Incentive: $234,000 ($0.24/kWh)
- CO₂ Savings: 670 tonnes CO₂e
- Return on Investment: ~32 months
# Lighting Lessons Learned

- **#1 Complaint - TOO BRIGHT!**
- The LED fixtures have higher efficacy, higher lumen output, and more even light distribution.
- **1:1 replacements caused over-lighting.** With the >90 CRI, studies have shown the quantity of light can be lowered (e.g. via dimming) and still satisfy occupants.
- Future projects should have light level evaluations performed to possibly reduce the number of new fixtures.
- Future projects should include CREE SmartCast (or similar), or whole-building control systems with integrated daylight and occupant-controlled dimming for additional savings.
Student Center Next Steps

- Exterior Lighting
- Interior Lighting with scene-based dimming capabilities, compatible with new audio-visual system installed in 2014.
- Remaining interior lighting not addressed by 2014 project.

- 2x 42W CFL Physically Removed for Scene
- Burned Out CFLs
- Color Temperature Mismatch

Lamps Physically Removed for Scene
Student Center Lighting Upgrade

There is plenty more to do, and we are excited to do it!

Thank you!

Vicky Do - vdo1@uci.edu
Joseph Fleshman, P.E. - joseph.fleshman@uci.edu