



INSTITUTE FOR  
SUSTAINABILITY



# CSUN's Plan for Carbon Neutrality

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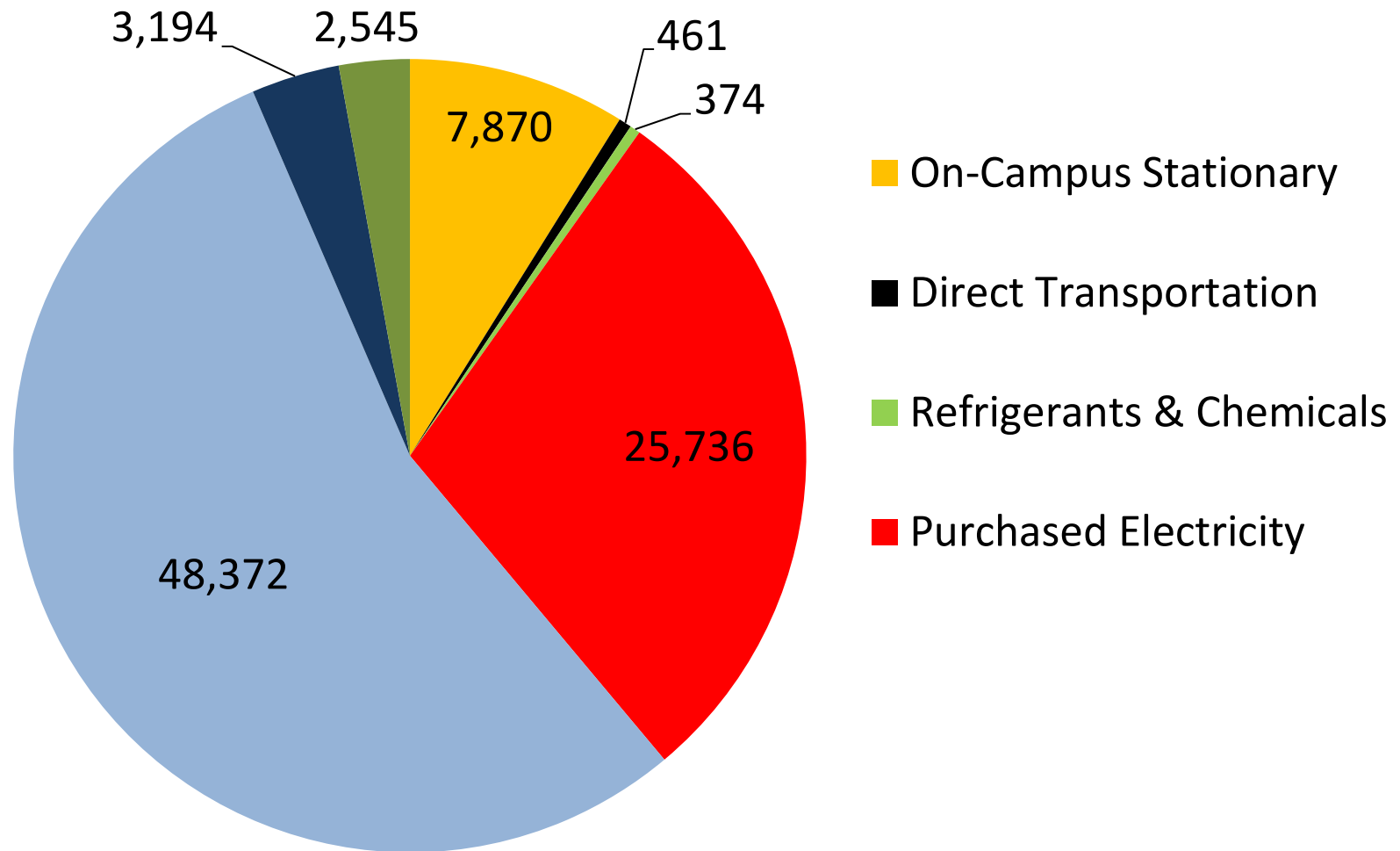
**California Higher Education Sustainability Conference**

**June 26th-June 30th, 2016**

# Methodology

- Existing Greenhouse Gas Inventory
- Modelled Business As Usual (BAU) scenario
- Developed Strategic Energy Plan
- Conducted Solar Feasibility Study
- Identified strategies for alternative transportation
- Modelled effect of energy strategies
- Added solar for net zero emissions
- Generated plan for net-zero Scope 1&2 emissions by 2040
- Modelled Scope 1, 2 and 3 future emissions
- Established targets

# Climate Action Plan

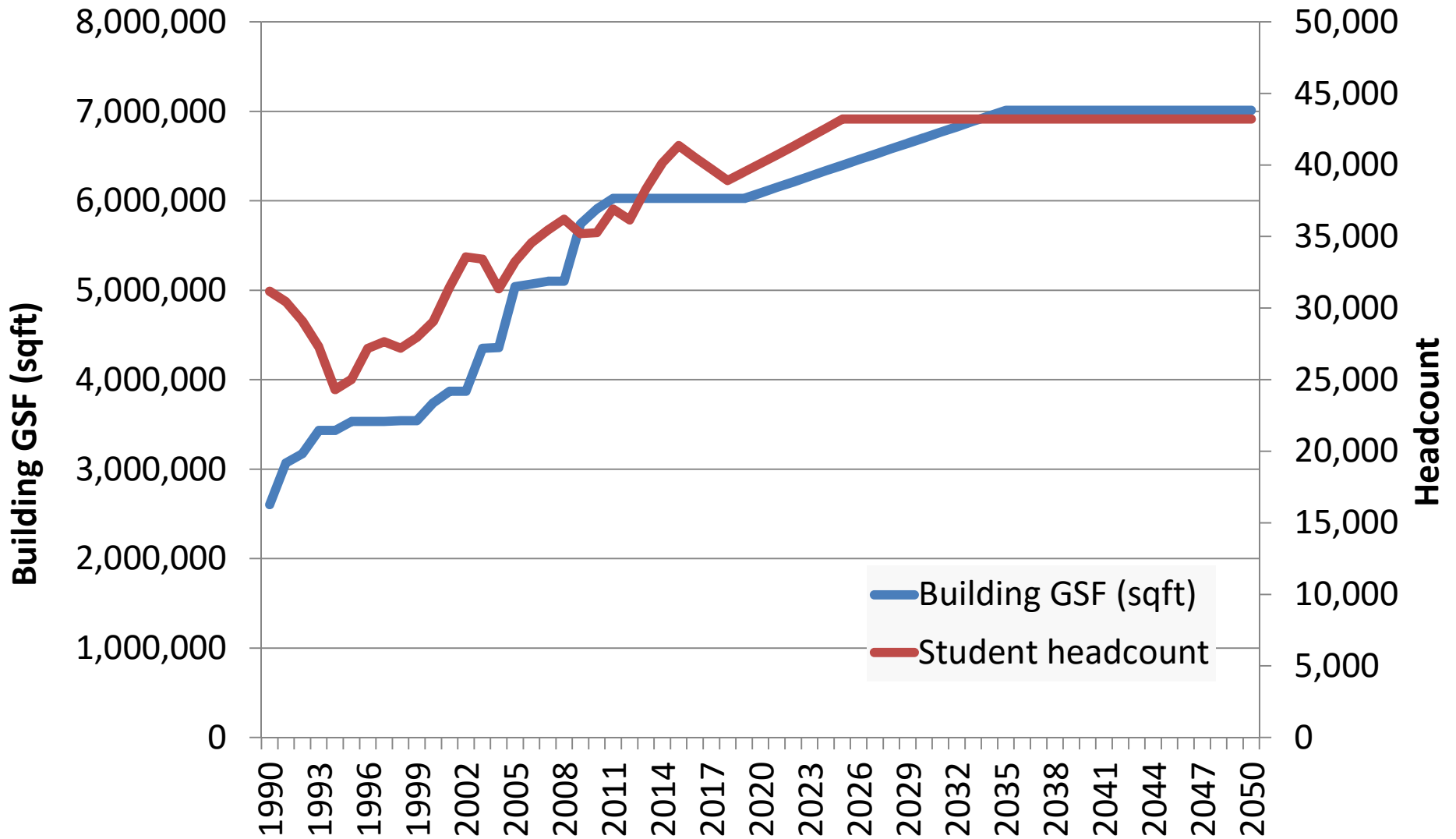


**2013 Greenhouse gas emissions by source. Shown in (equivalent) tonnes of CO<sub>2</sub>. Total emissions were 88,552 tonnes.**

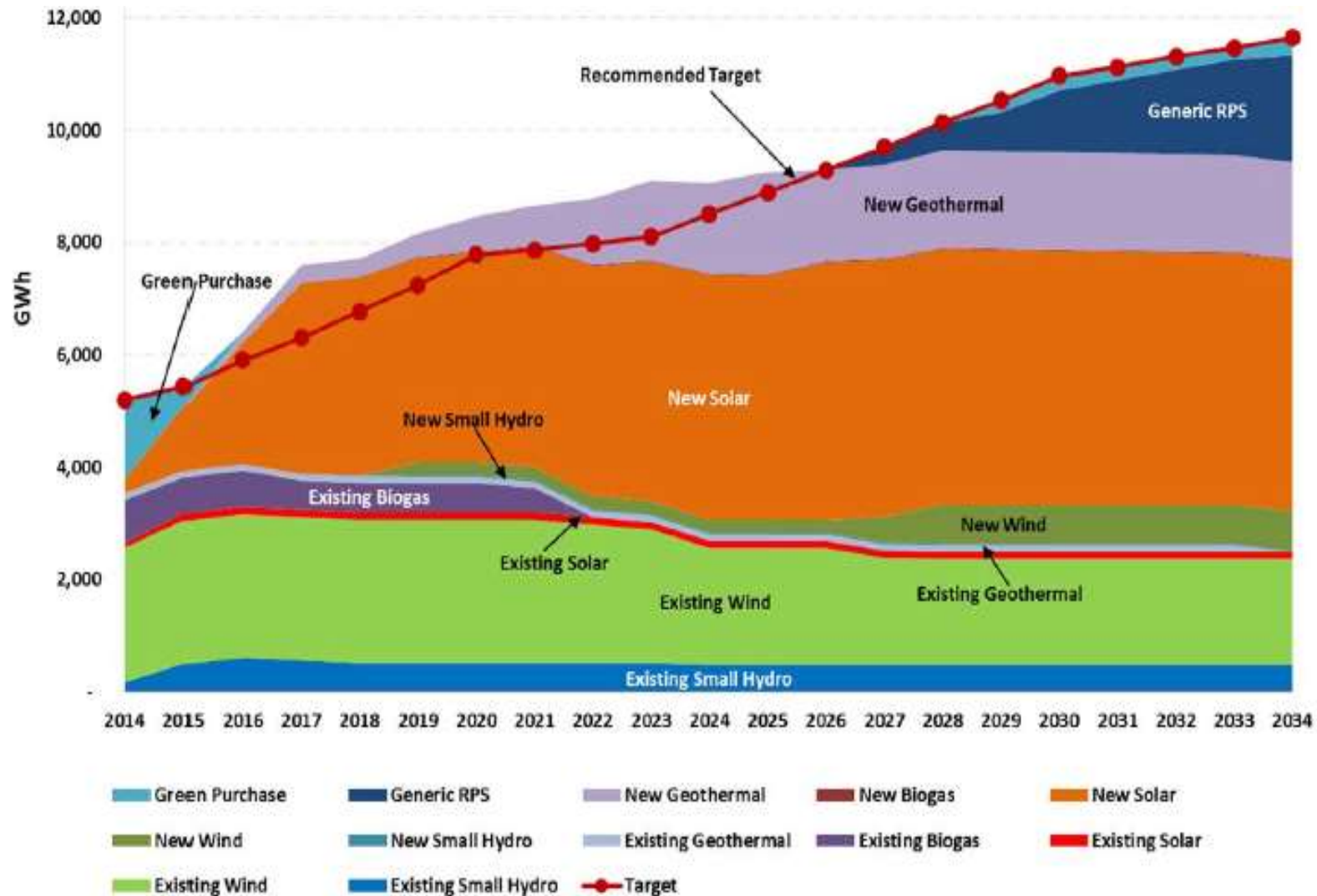
# BAU Projection (Assumptions-1)

- Building expansion based on 2005 Master Plan. Parking lots and other outdoor areas not included.
- All energy (Scope 1 and 2) consumption was projected based on building square footage with energy densities for each emission source based on the 2012 and 2013 averages.
- Student headcount projections based on a 2% decrease annually for 2016, 2017 and 2018 (impaction), and thereafter growth at an annual rate of 1.5% through 2028 until an FTES target of 35,000 is met. From 2026 onwards the FTES is held at 35,000 and headcount at 43,200.
- Faculty and staff headcounts based on current values projected out at the same growth rate as the student FTES and headcount.

# BAU Growth Projections



# LADWP's projected power generation mix



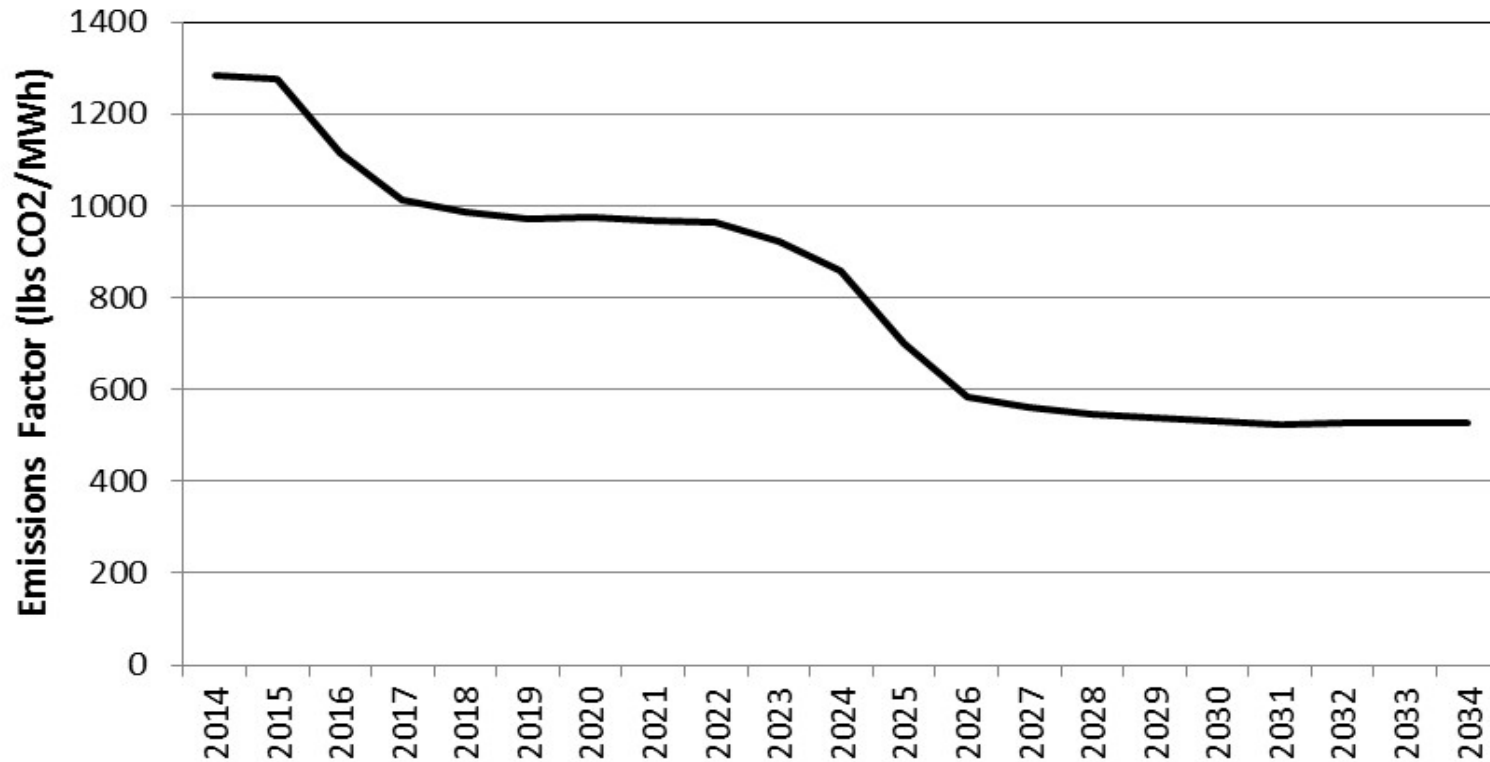
# 2014 IRP Recommended Case

Case ID	2030	SB 1368 Compliance Date		New Renewables Installed (MW) 2014-2020				New Renewables Installed (MW) 2014-2034				
	RPS Target	Navajo	IPP	Geo/Biomass	Wind	Non-DG Solar	Dist. Solar	Geo/Biomass	Wind	Non-DG Solar	Dist. Solar	Generic
Case 4 w/ 800 MW Local Solar	40% <sup>1</sup>	12/31/2015	7/1/2025	76	70	1,059	579	216	270	1,305	704	723

<sup>1</sup>33% RPS by 2020

<sup>2</sup>Incremental to current 100 MW installed

# BAU Projection (Assumptions-2)



**LADWP's projected emissions factor based on:**

- 1) 50% RPS by 2030,**
- 2) 15% Energy Efficiency by 2020,**
- 3) 800 MW local solar by 2023, and**
- 4) High transportation electrification (2014 Integrated Resource Plan)**

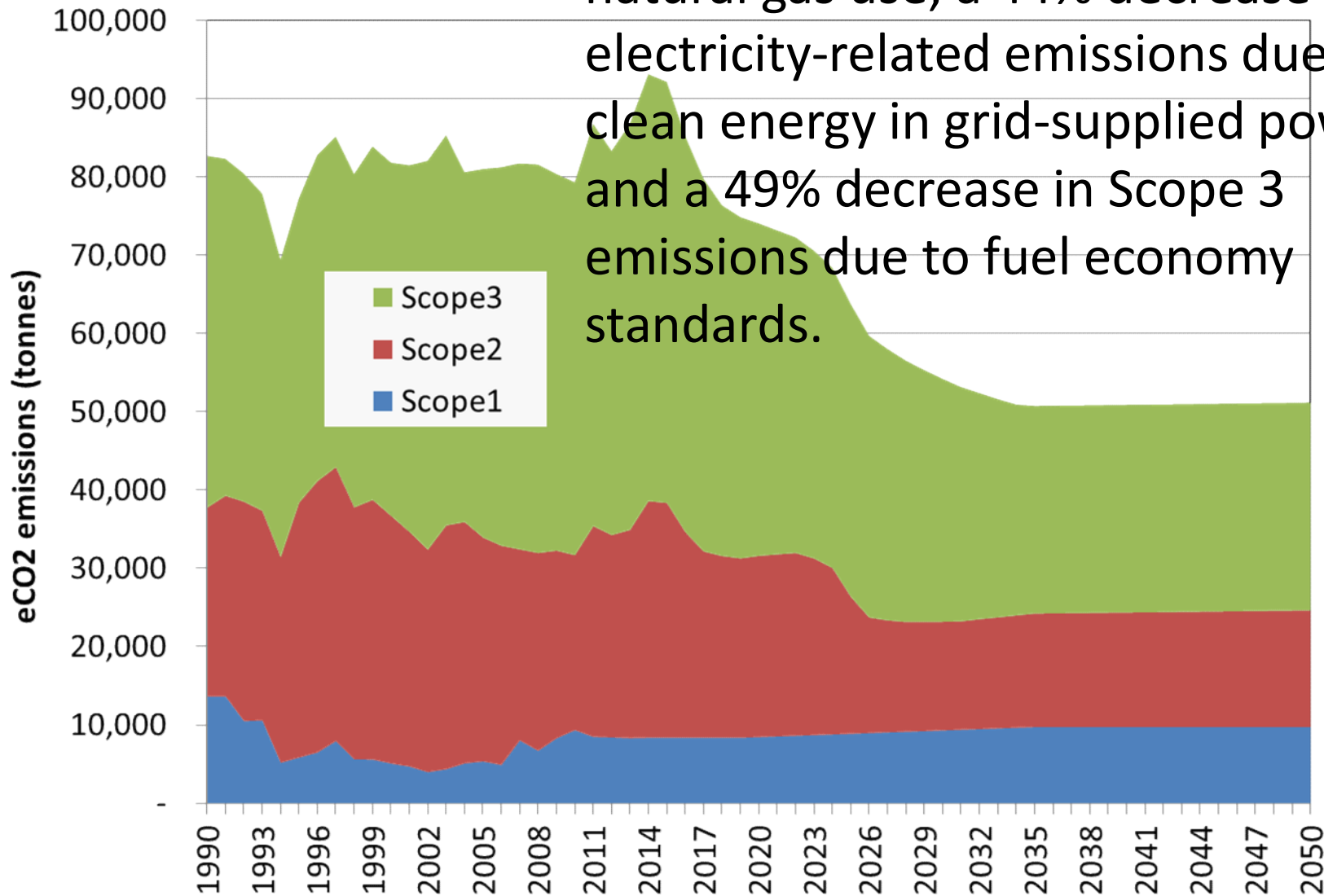


# BAU Projection: Scope 3 (Assumptions)

- Business travel footprint projections based on faculty and staff headcounts and per capita averages from 2010 – 2014.
- Commuting projections based on 2010 mode mixes, headcount projections and additional assumptions for future fuel economy improvements of vehicles based on new EPA standards. (These assume a 5% per year improvement in the fuel efficiency (mpg) of automobiles until a value of 60 miles per gallon is reached in 2035, and an improvement rate of 3.5% per year for buses and trains throughout the same timeframe.)

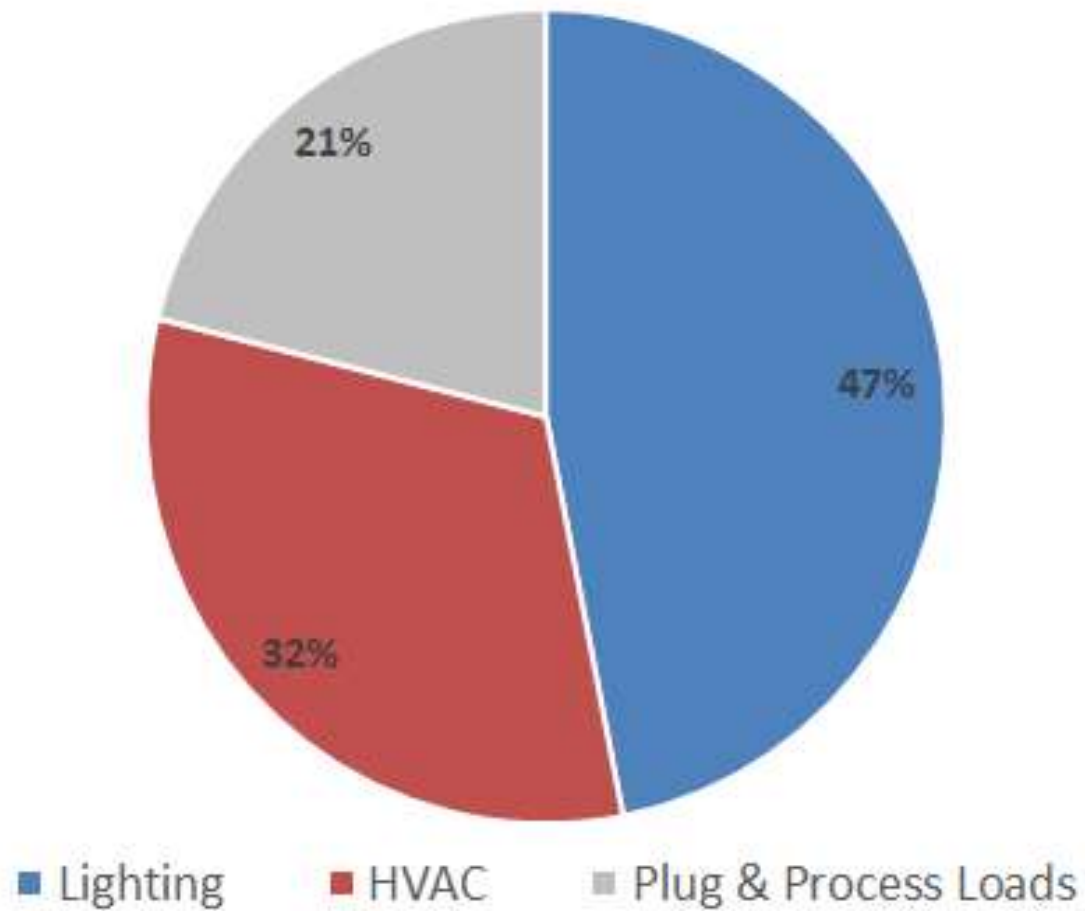
# BAU Projection

Model projects a 17% increase over 2013 in direct emissions due to natural gas use, a 44% decrease in electricity-related emissions due to clean energy in grid-supplied power, and a 49% decrease in Scope 3 emissions due to fuel economy standards.



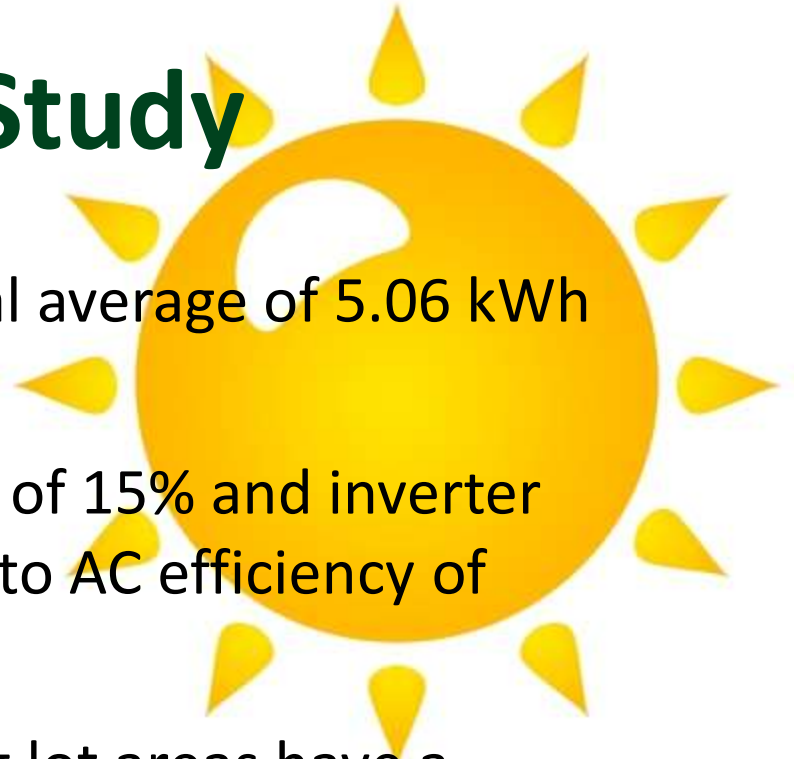
# Electricity Use

CSUN Electricity Use Balance:  
Campus



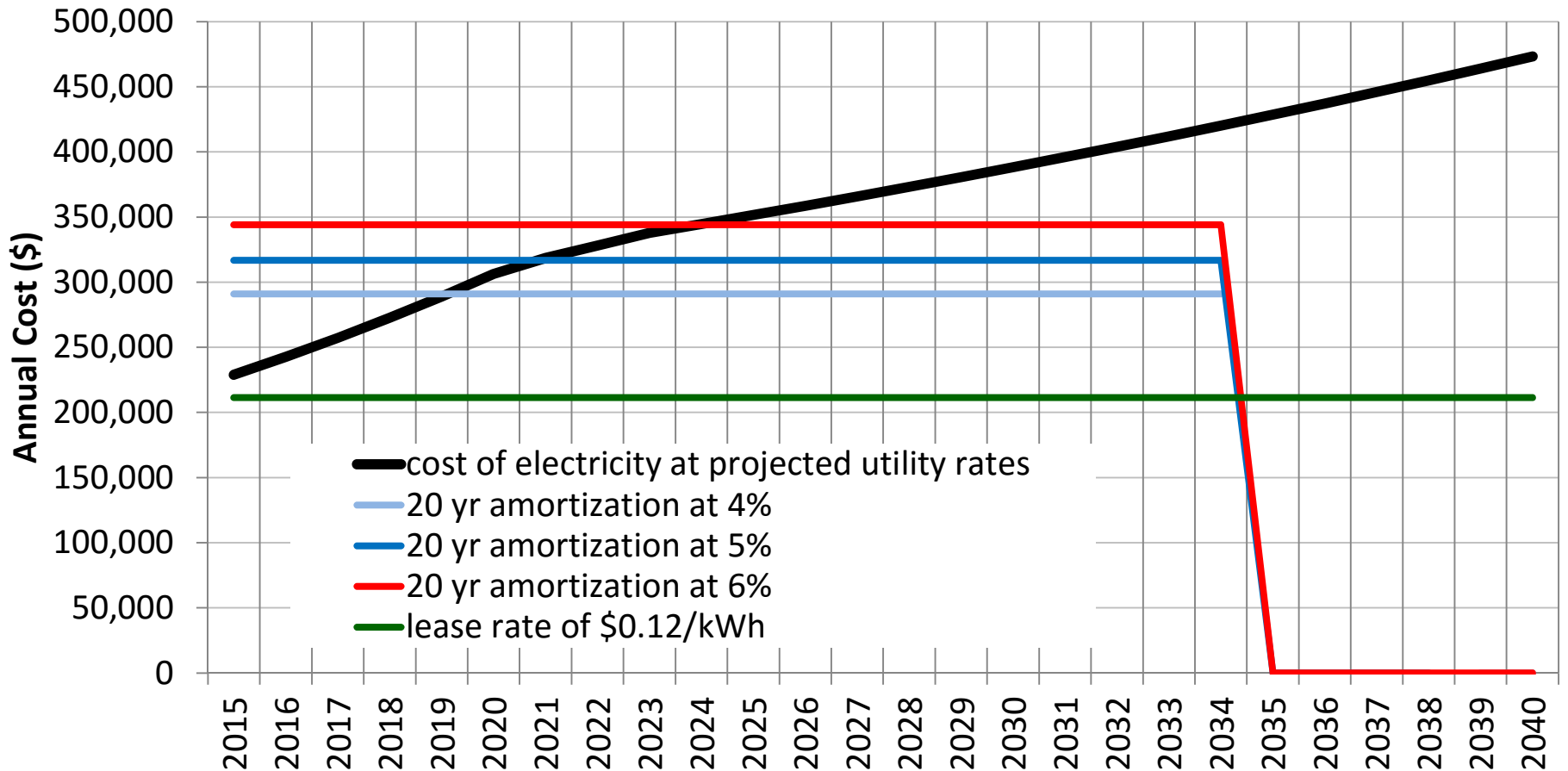
1. LED lighting for interior spaces	6,313,835 kWh
2. Task area lighting	168,517 kWh
3. Lighting occupancy sensors	1,825,920 kWh
4. Stairwell bi-level lighting	56,100 kWh
5. Daylight harvesting at perimeter zones	381,253 kWh
6. Occupancy-based book-stack lighting	73,878 kWh
7. LED lighting & bi-level controls for exterior	1,452,080 kWh
8. New AHUs w/ economizers	1,127,051 kWh
9. Pneumatic to DDC controls	697,570 kWh
10. Demand controlled ventilation (DCV)	781,321 kWh
11. Occupancy-based HVAC	2,301,631 kWh
12. High-efficiency motors at elevators	10,277 kWh
13. Computer shut-down management	447,454 kWh
14. Vending misers for vending machines	37,215 kWh
15. High efficiency windows	1,010,156 kWh
16. Network Thermostats	1,631,847 kWh
17. Central Plant Chiller Retrofit	908,645 kWh

# Renewables – Solar Study



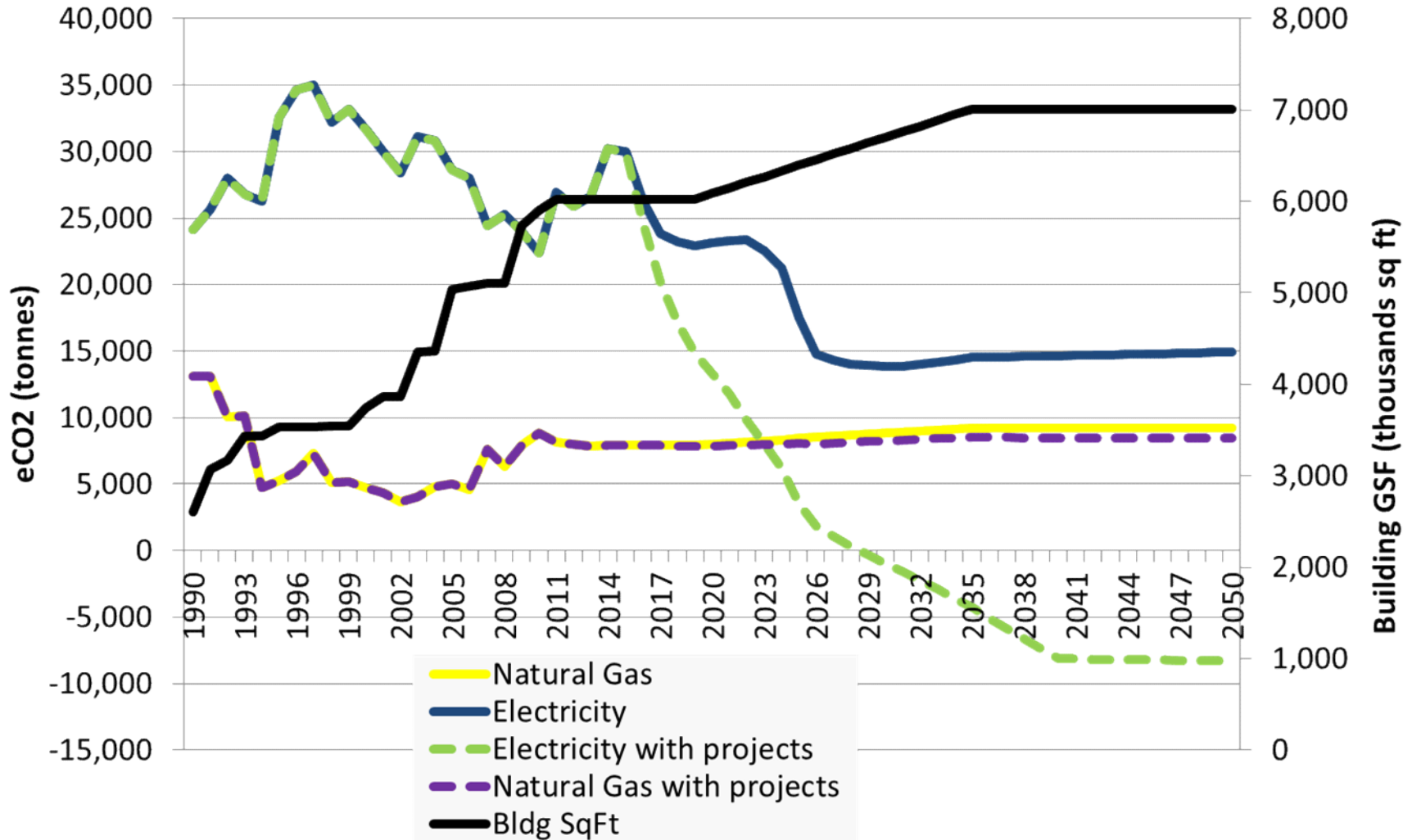
- CSUN weather station data: annual average of 5.06 kWh of sunlight per m<sup>2</sup> per day
- Assume efficiency (sunlight to DC) of 15% and inverter efficiency of 95% (overall sunlight to AC efficiency of 14.25%)
- Using a GIS, the 33 surface parking lot areas have a combined area of 2,168,505 sq ft (201,461 m<sup>2</sup>)
- Assume 70% coverage with solar panels, potential to generate **37.1 million kWh per year** (72% of the power purchased from LADWP).
- Average panel size of 18 sq ft and capacity of 250W, area accommodates **21 MW of solar**.

# Solar cost-benefit analysis



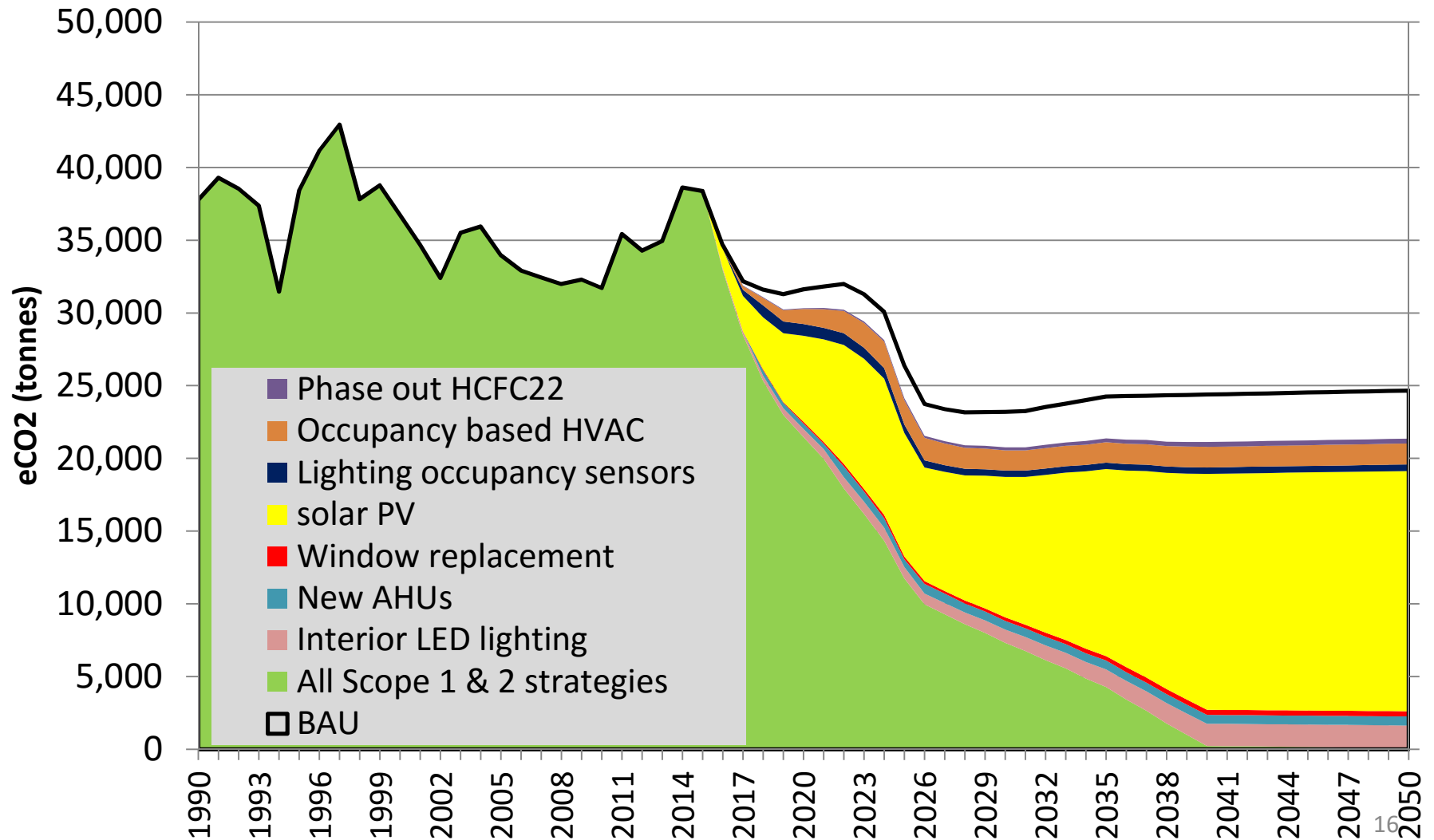
**Projected annual cost of equivalent power produced by a 1MW array purchased through the utility provider and by various solar financing options.**

# BAU & Projections with Projects



19 MW solar required to achieve zero Scope 2 emissions by 2040.  
 Another 19 MW required to offset emissions from gas use.

# Carbon emission projections (Scope 1 & 2)





# Strategies to reduce commuting footprint

## **EXPANDING BICYCLING INFRASTRUCTURE**

Bicycle rental for dorm residents

Improve bicycle infrastructure within campus

Work with the city to improve the quality and connectivity of bike lanes around campus

Expand bicycle theft prevention strategy

## **EXPANDING PUBLIC TRANSIT SERVICES**

Partner with Metro and other agencies to bring major bus lines to the CSUN Transit Station

Increase the subsidy of transit passes for students and staff members, potentially providing a free transit pass program to students.

Partner with Metro, LADOT and the City to solve connectivity issues between CSUN and major transit hubs

Priority class enrollment for students travelling by public transit

# Strategies to reduce commuting footprint<sup>1</sup>

## **EXPANDING RIDESHARE PROGRAMS**

Implement Zimride – ridesharing

Implement special parking zones to incentivize ridesharing

Auto-enroll students in the rideshare program upon class enrolment through SOLAR

## **PARKING MANAGEMENT**

Limit number of housing parking permits to current housing parking capacity

Install real-time information system that tells drivers where parking is available, reducing the need to circle in search of parking.

Do not allow use of housing parking permits for parking on campus.

# Strategies to reduce commuting footprint<sup>2</sup>

## **PROVIDE SHUTTLE SERVICES**

Replace housing shuttle with shuttle providing service within three miles of campus

## **EXPANDING ELECTRIC CAR CHARGING STATIONS**

Add electric car charging stations on campus

## **OTHER INTERVENTIONS**

Expand student housing (with a no-car policy, bike rental and rideshare programs)

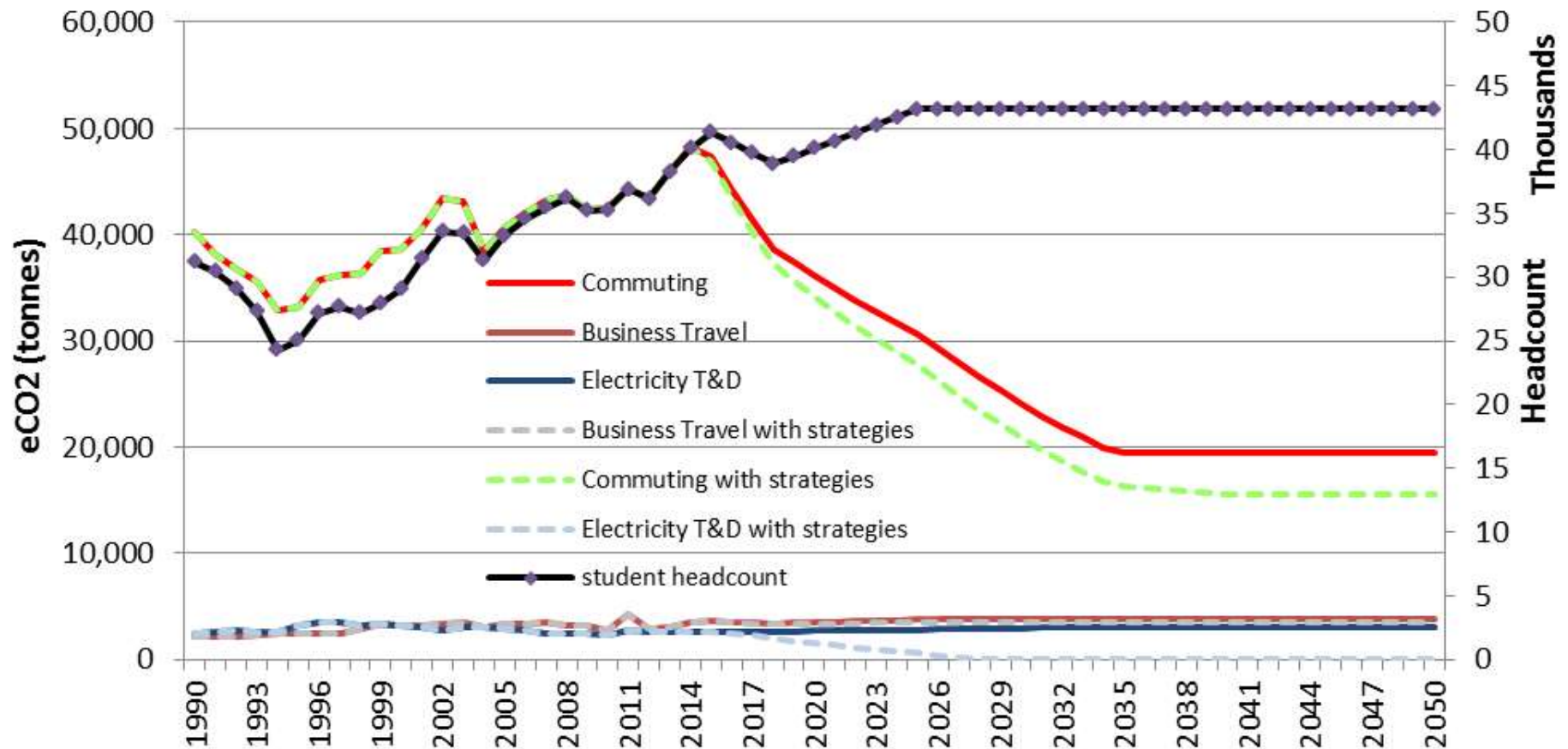
Increase online and hybrid classes

Expand telecommuting and compressed work schedules for staff

Develop an outreach plan to increase knowledge about transportation options

Expand faculty and staff housing to reduce commuting

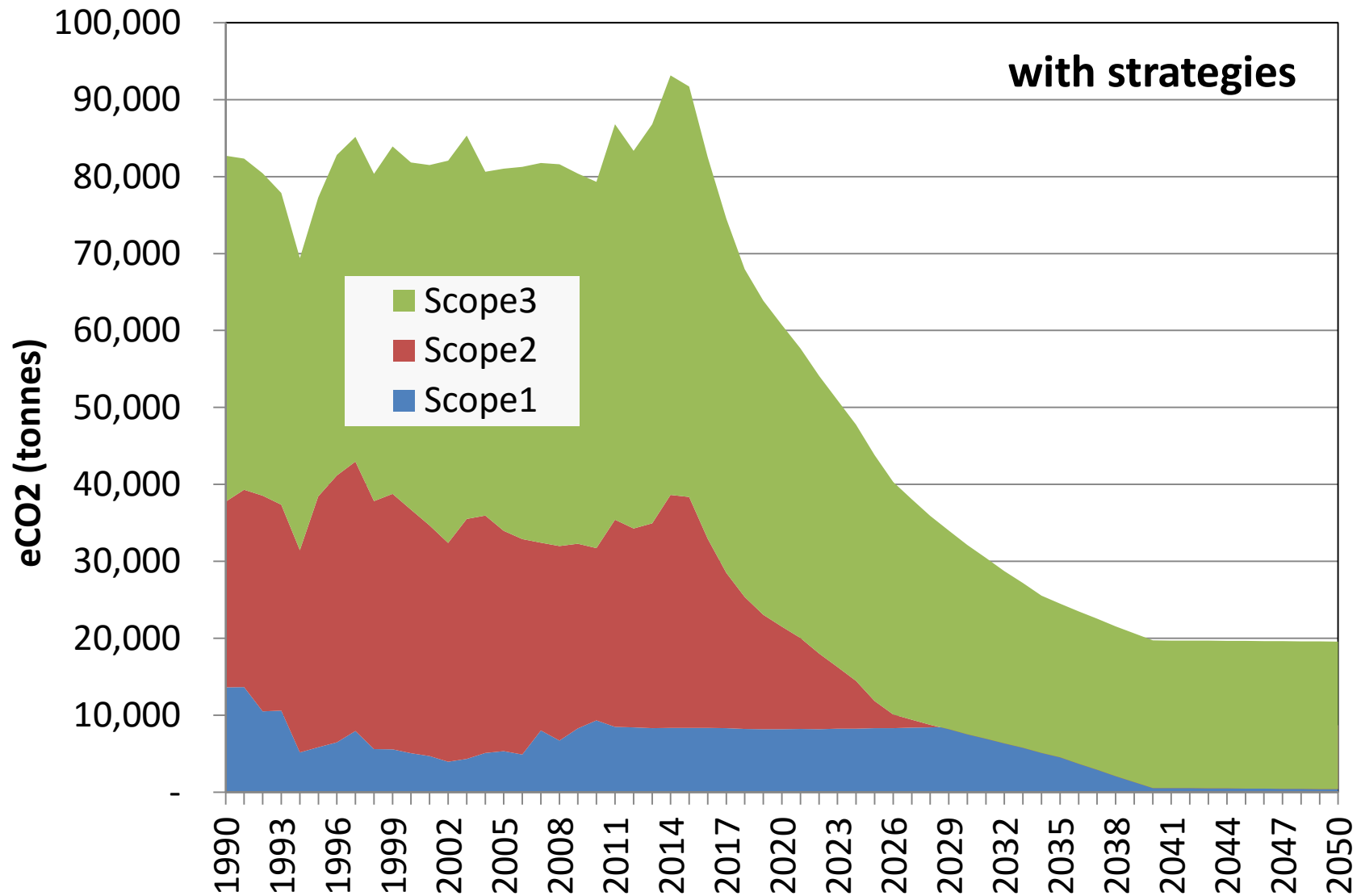
# Strategies to reduce commuting footprint<sup>3</sup>



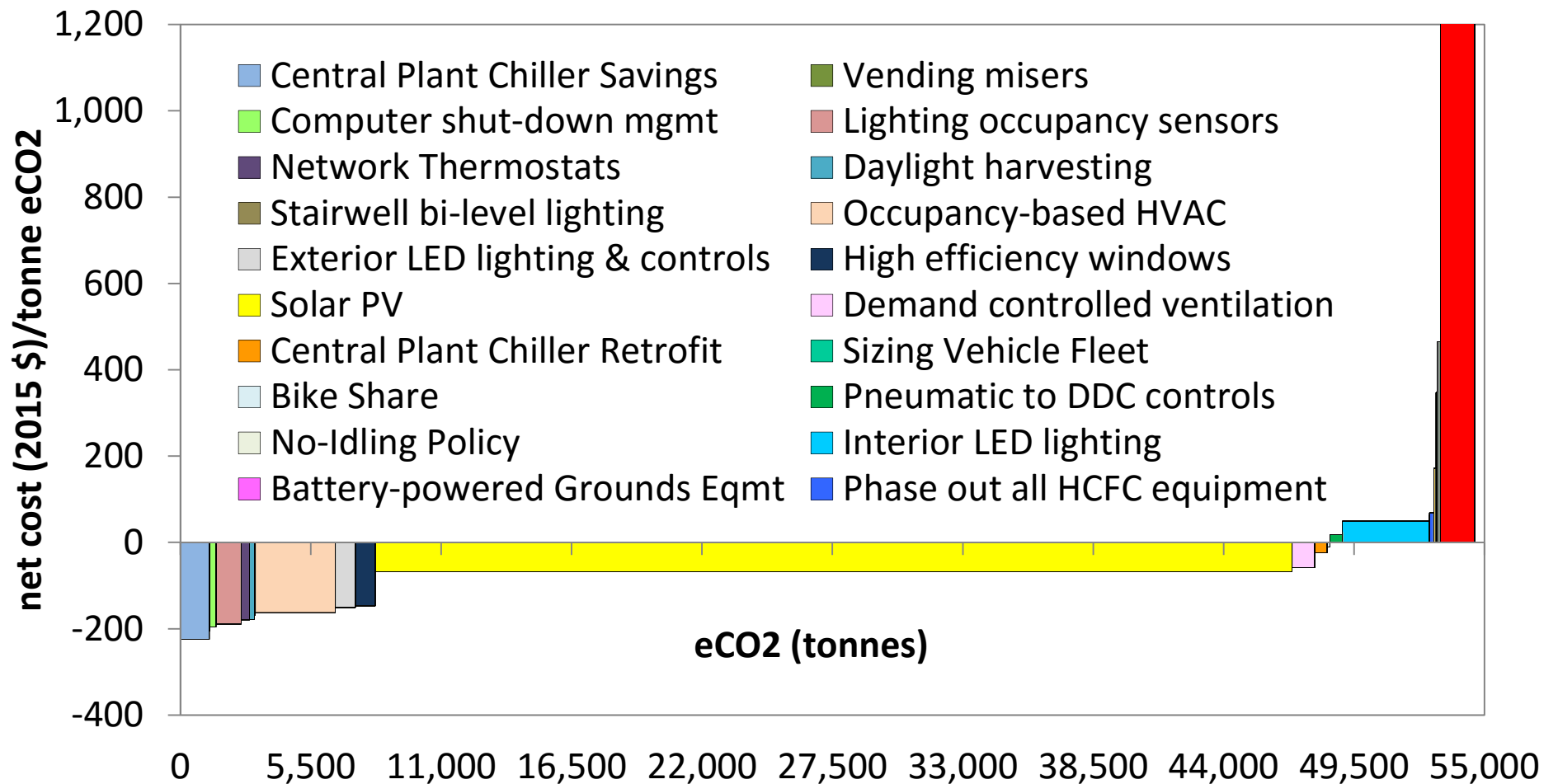
BAU based on the mode mix from 2010 commuting survey.

Projections assume by 2040 three times as many faculty, staff and students will be using public transit as now, three times as many faculty/staff will be ridesharing and five times as many students.

# Emission projections (all scopes)



# Net project cost per tonne CO2 saved (20 yr)



Net cost (cost minus energy savings) per annual tonne of eCO<sub>2</sub> emissions saved for proposed projects. Column width represents total annual emissions savings for each.

# Climate Action Plan Goals

- Reduce commuting carbon footprint to below 1990 levels by 2020
- Reduce total GHG emissions to below 1990 levels by 2020
- Reduce Scope 1 and 2 GHG emission levels to 50% below 1990 levels by 2030
- Reduce Scope 1 and 2 GHG emission levels to 80% below 1990 levels by 2035
- Reduce Scope 3 GHG emission levels to 50% below 1990 levels by 2035
- Reduce total GHG emissions to net zero by 2040

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