

# Reducing Carbon Emissions on Campus Through Alternative Transportation

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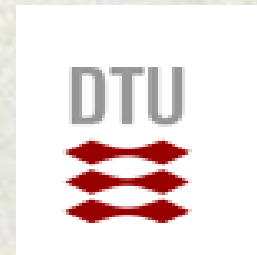
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# An Introduction to our Project Plan

- 19,700 car trips per day to UCSC campus last fall 2008
- Busses have become noticeably more crowded in the past 4 years
- Parking passes are expensive (between \$400 and \$700), parking lots are crowded, and the remote parking lots are far away from class rooms.





# Why biking works:

- Biking solves virtually all of the hassles involving transportation
- No parking fee's
- Gas money
- Waiting for crowded busses
- Its also a great source of exercise
- And reduces your carbon footprint



# Why eBike's could work even better:

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- The campus is essentially a series of giant hills
- This is great once you are up, but actually riding up is a challenge
- We think Electric Bicycles could be a perfect solution for broadening the UCSC biking community.
- Currently only 3-5% of UCSC traffic is bicycles



# What we're proposing:

- A pilot project that introduces 20 electric bicycles for student and faculty use
- Based on a membership, day rentals, and/or rebate system for purchasing discounted eBikes



# Some eBike Options:

- Electric Sierra Cycles
- Dave's Custom Bikes
- Green Station



Electric Bike Options:	Est. Cost Per Bike	Est. Total Fleet cost
Dave's Custom Bikes	~\$1,200	~\$24,000
Electric Sierra Bike 1	~\$800	~\$16,000
Electric Sierra Bike 2	~\$1,800	~\$36,000
Green Station	~\$500	~\$10,000



# Funding Opportunities:

- Despite the state and federal budget, funding still exists for alternative energy projects
- American Recovery and Investment Act of 2009
- Campus Sustainability Council (CSC)
  - \$250,000/yr
  - \$75,000/quarter
- Bike Facility Program
- Bikes Belong Coalition
- Community Based Transportation and Planning
- Transportation Enhancement Activities
- Environmental Enhancement and Mitigation Program



# Community Bicycles





# The Grid



# Awareness





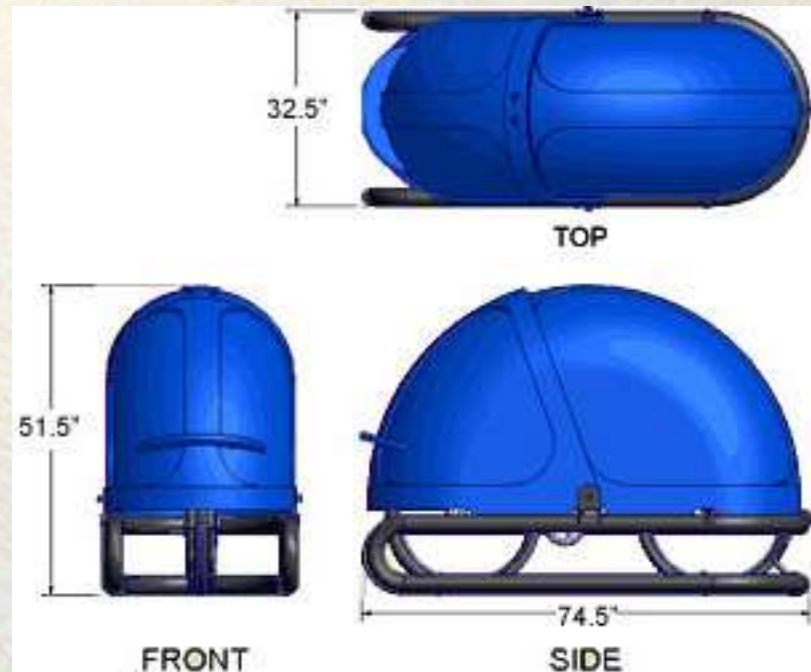
# Storage

- Bike Cage
- BikeLinks, a company based out of Palo Alto, CA, offers a very secure system for bike lockers. The lock has an electronic system ideal for membership and security issues. Each member will have his or her own card and can check out bikes electronically.
- Price: \$50,000 US (20 cages)
  - Pros: Extremely secure and water resistant. Relatively small land use for storage. Electronic locking ideal for self check out
  - Cons: Extremely expensive. Limited mobility if hub site must change. (BikeLink)



# Storage

- Bike POD
- Huntco, a company based out of Portland, Oregon, specializes in outdoor, urban structures that gives an alternative to bike cages. The POD's have proven to be relatively water resistant and have a good record for keeping thefts low. The city of Santa Cruz has similar units installed on the Wharf.
- Price: \$25,000 US (20 POD's)
- Pros: Price is more applicable to a pilot project. Water resistance.
- Cons: Bike slightly exposed. Land use for POD's could cause problems. (Huntco)





# Storage

## Storage Container

- There are large storage containers that
- are typically placed on site to store bikes.
- monthly fee is attached to the container
- and will take up limited amount of space.
- Price: \$4,000 US/year (20 bikes)
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- Pros: minimal land use. Not as expensive
- As the alternatives. High Security
- 
- Cons: not appealing to the eyes. Not
  - individual containers.

## Bike Racks

Normal bikes racks will still be able to suit our needs for storage. A The problems highly outweigh the benefits. Huntco has many differing bike storage racks. Price: \$2,500 US (20 bikes)

Pros: Extremely inexpensive. Great for pilot program to get started

Cons: Low security. Exposed to elements. (Huntco)

# Audience

## Campus Hub

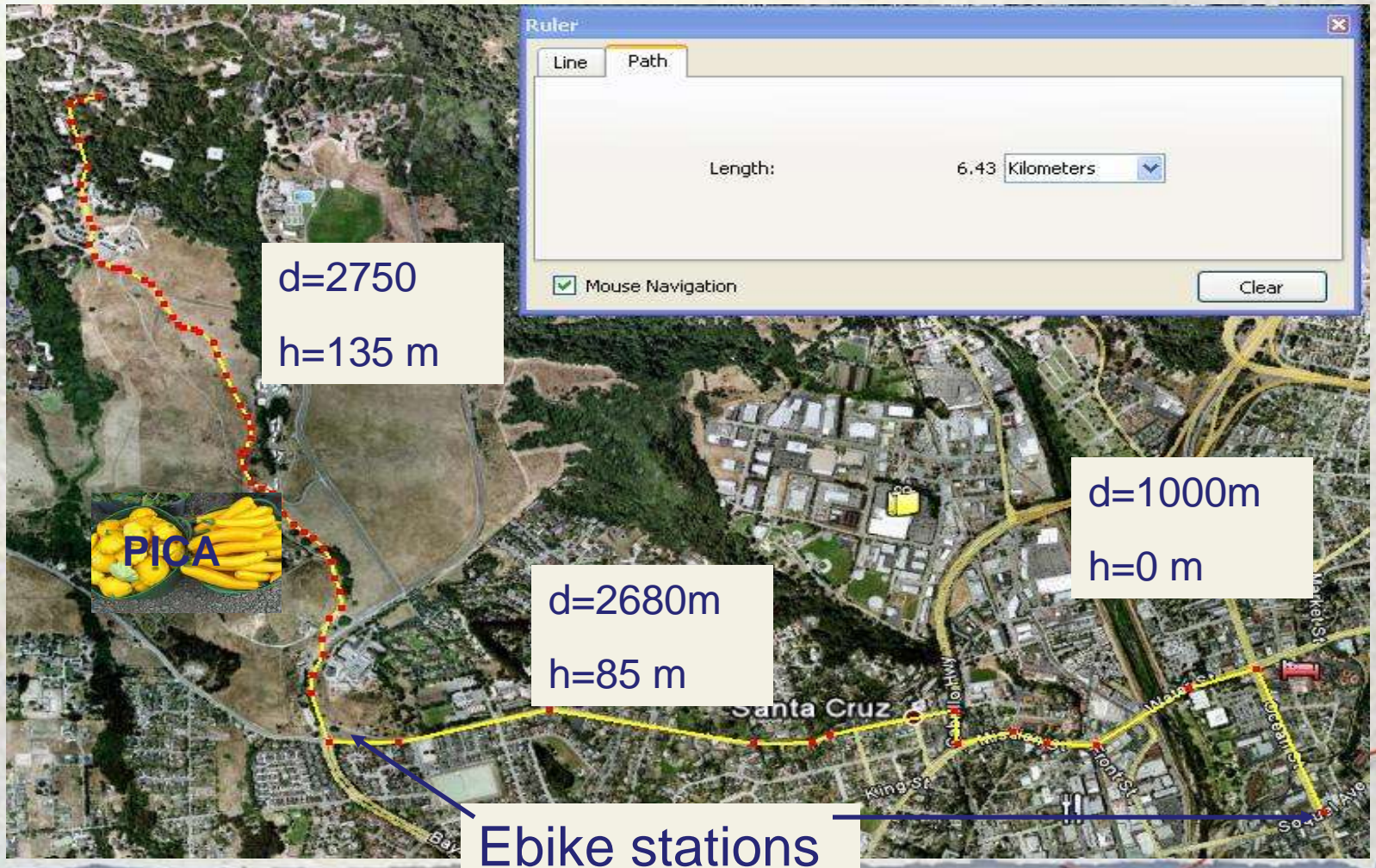
- A lot of students live between high and Nobel who walk to school. They then ride the shuttle up to class
- Instead, students could walk to the base and take an eBike up to class
  - Faster commute
  - Less emissions
  - Decreases the amount of busses needed on campus

## Downtown Hub

- Many UCSC commuters come from the midtown/east side areas primarily by car.
- Instead students could take an eBike from Ocean and Soquel up to campus.
  - Faster commute
  - Far less emissions
  - Less cars on campus
  - Allows more room for bike shuttle



# The modelled routes





# Power

- Different resistances to take into account
  - Resistance due to gravity (75%)
  - Rolling resistance (12.5%)
  - Air drag resistance (12.5%)
  - Loss in the electrical system
- Power out at the wheel 450W for 20km/h average speed

	Bottom Campus (Ah)	Green Station (Ah)	3 trips Bottom Campus (Ah)	2 trips Green Station (Ah)
24V	2.368	4.292	7.105	8.584
36V	1.579	2.861	4.627	5.722

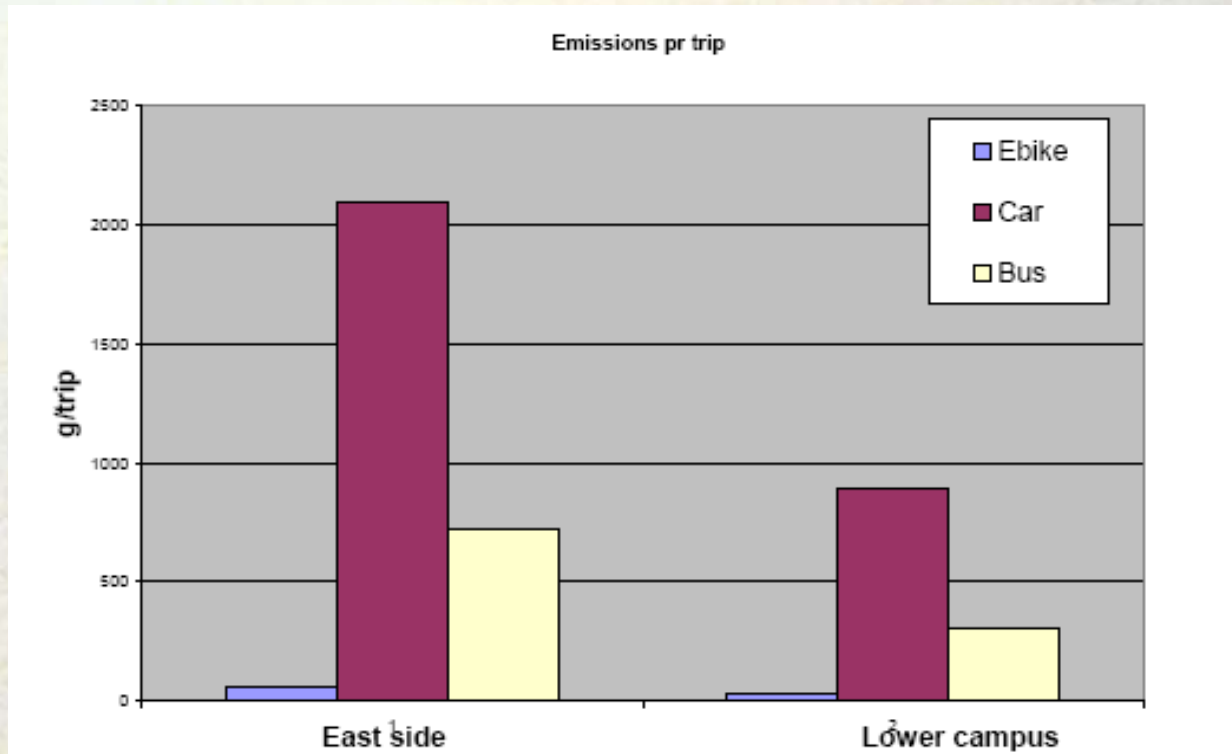
- Typical battery (24-36V) 7-12 Ah



# Carbon emissions

- U.S. Car: 162 g/km
- U.S. Bus: 56 g/km per passenger
- U.S. kWh: 607 g/kWh
- Bike uses 0.1kWh for Green Station trip
  - Distance: 6.43 km
- UCSC buying carbon credits
  - Theoretically no emissions, but still the same power as anyone else get.

# Carbon emissions



- Reductions
  - 97 % compared to a car driver
  - 90 % compared to a bus passenger



# UCSC

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- People at campus entering 20000
  - 400 bikes a day
  - 19700 cars a day
- Average distance 8.8 km (one way)
- If 1% switch to ebikes
  - Co2 savings of 110 Ton year

# Student savings

- Estimated costs
  - driving from the green station
    - Car: Atleast \$710 year + maintainance
    - Bike: membership fee \$ 200 + \$3.7 for charging
  - Potential student savings: \$500+ a year
    - Enough to buy a private ebike ;)



# Future Expansion

- **Pilot Program**

- Lots of room for growth
- One of the first eBike programs at a university could gain some recognition
- Lead the way for eBike sharing program



- **Future**

- Ideally some where down the road the bikes will be charged with a solar PV system
- The program will expand and need volunteerism as well as paid positions
- More hubs and locking stations will be installed around campus

# Uncertainty

- Will the students actually change their habits and take an alternative method of transportation to campus?
- Can we receive funding even though there are budget cuts all over the nation?
- Maintenance and longevity
- Security
- Ownership of bikes





**I want to ride my  
electric bicycle...**

# Thanks! Questions?

