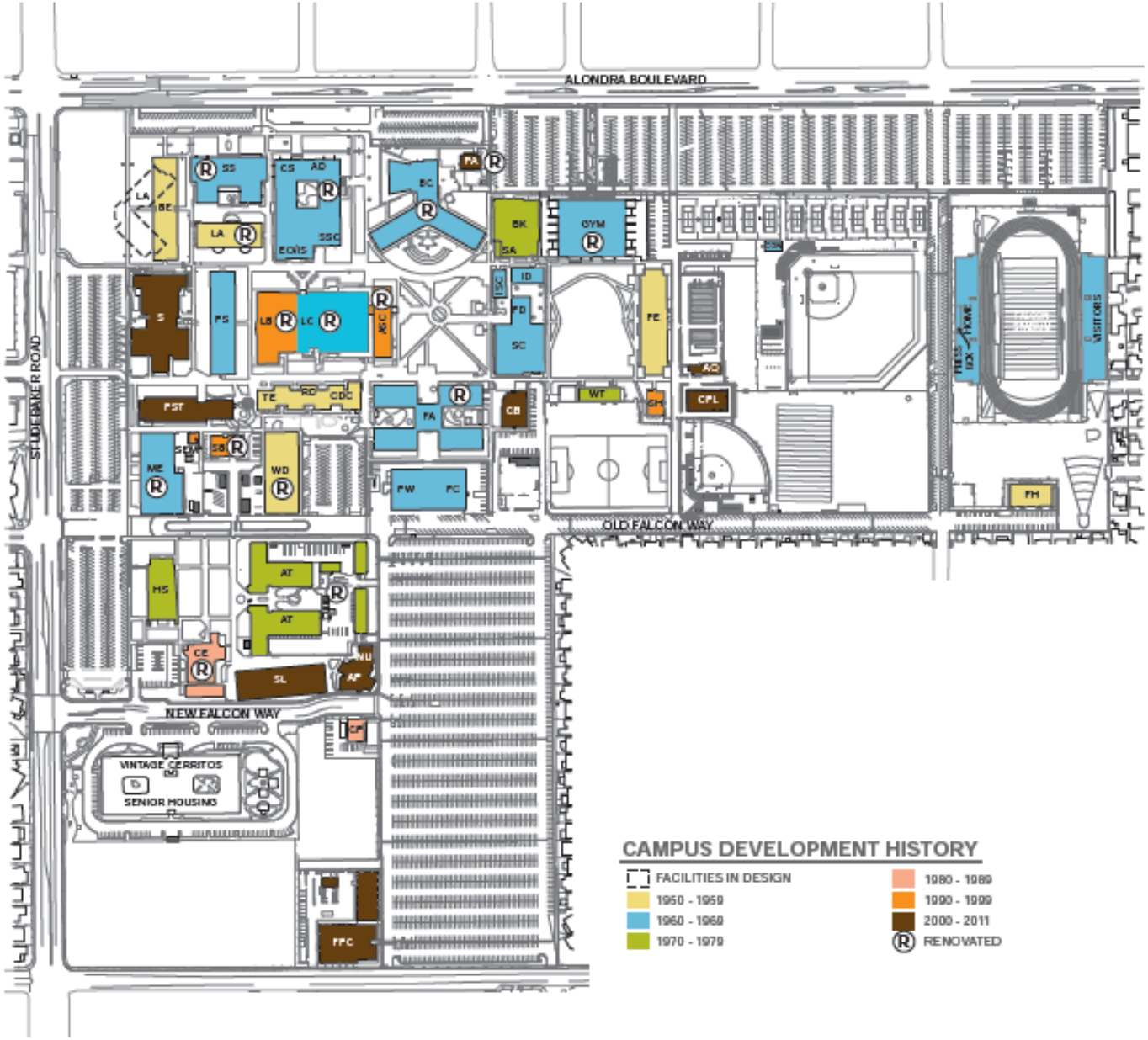
CERRITOS COLLEGE

INTEGRATED ENERGY MASTER PLAN

HARLEY ELLIS DEVEREAUX

Cerritos College Campus



BUILDING KEY

AD	Administration
ASC	Academic Support Center
AQ	Aquatics Center
AP	Automotive Partners
AT	Automotive Technology
BC	Burnight Center/Theatre
BE	Business Education
BK	Bookstore
CB	Classroom Building
CDC	Child Development Center
CE	Community Education
CON	Concessions
CP	Campus Police
CPL	Central Plant
CS	Career Services
EOI/S	EOPS / International Students
FA	Fine Arts
FC	Facilities
FD	Food Court
FH	Field House
FPC	Facilities & Purchasing Complex
GYM	Gymnasium
HS	Health Science
ID	Student ID Center
ISC	Instructional Support Center (DSP&S)
LA	Liberal Arts
LB	Library
LC	Learning Resource Center
ME	Metals
NU	Northwood University
PA	Public Affairs/Cerritos College Foundation
PE	Physical Education
PS	Physical Sciences
PST	Physical Science Technology
PW	Purchasing/Warehouse
RD	Research and Development
S	Science/Project Hope
SA	Student Activities
SB	Santa Barbara (DSP&S)
SC	Student Center
SEM	Sem Storage
SH	Student Health & Wellness
SL	Skills Lab
SS	Social Science
SSC	Student Services Center
TB	Stadium Ticket Booth
TE	Technology
WD	Wood Manufacturing Technology
WT	Weight Training

CAMPUS DEVELOPMENT HISTORY

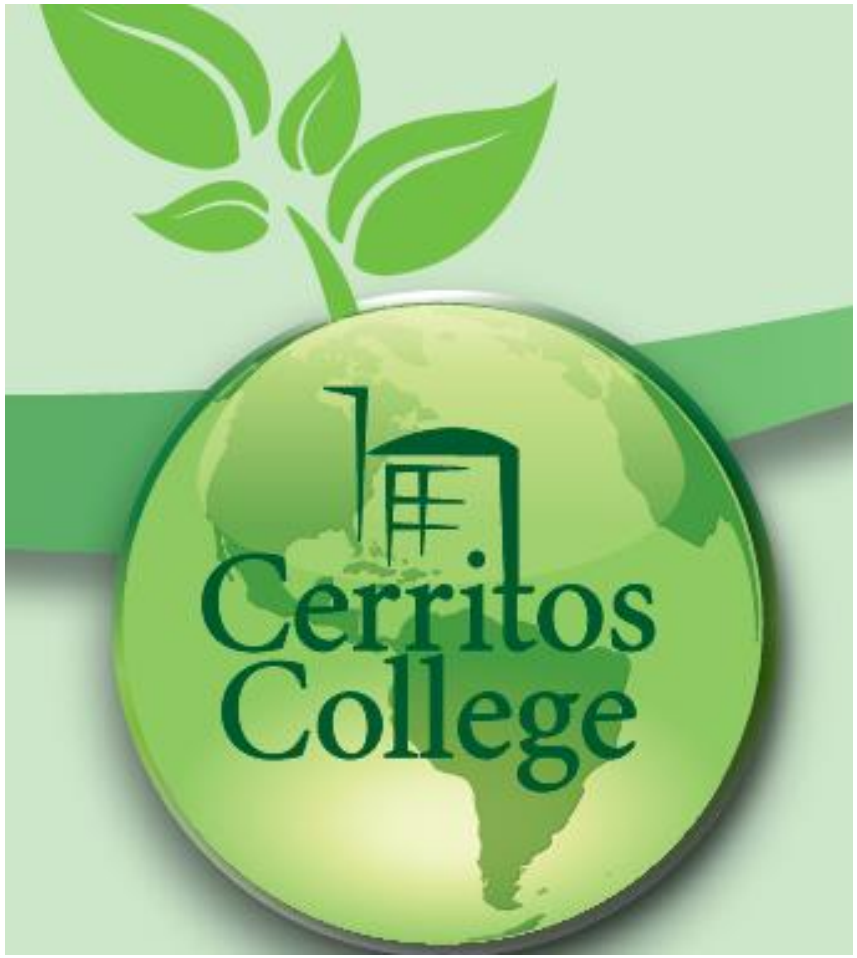
- FACILITIES IN DESIGN
- 1950 - 1959
- 1960 - 1969
- 1970 - 1979
- 1980 - 1989
- 1990 - 1999
- 2000 - 2011
- (R) RENOVATED

NORTH 0 150 250 350 450

Quick Facts

- Founded in 1955
- 18,000+ students (FTES)
- 135 acres
- 41 buildings, I million gsf
- $560 million for modernization and new construction
- $115 million operating budget
- $2.1 million annual cost of energy

Green Cerritos College Environmental Stewardship



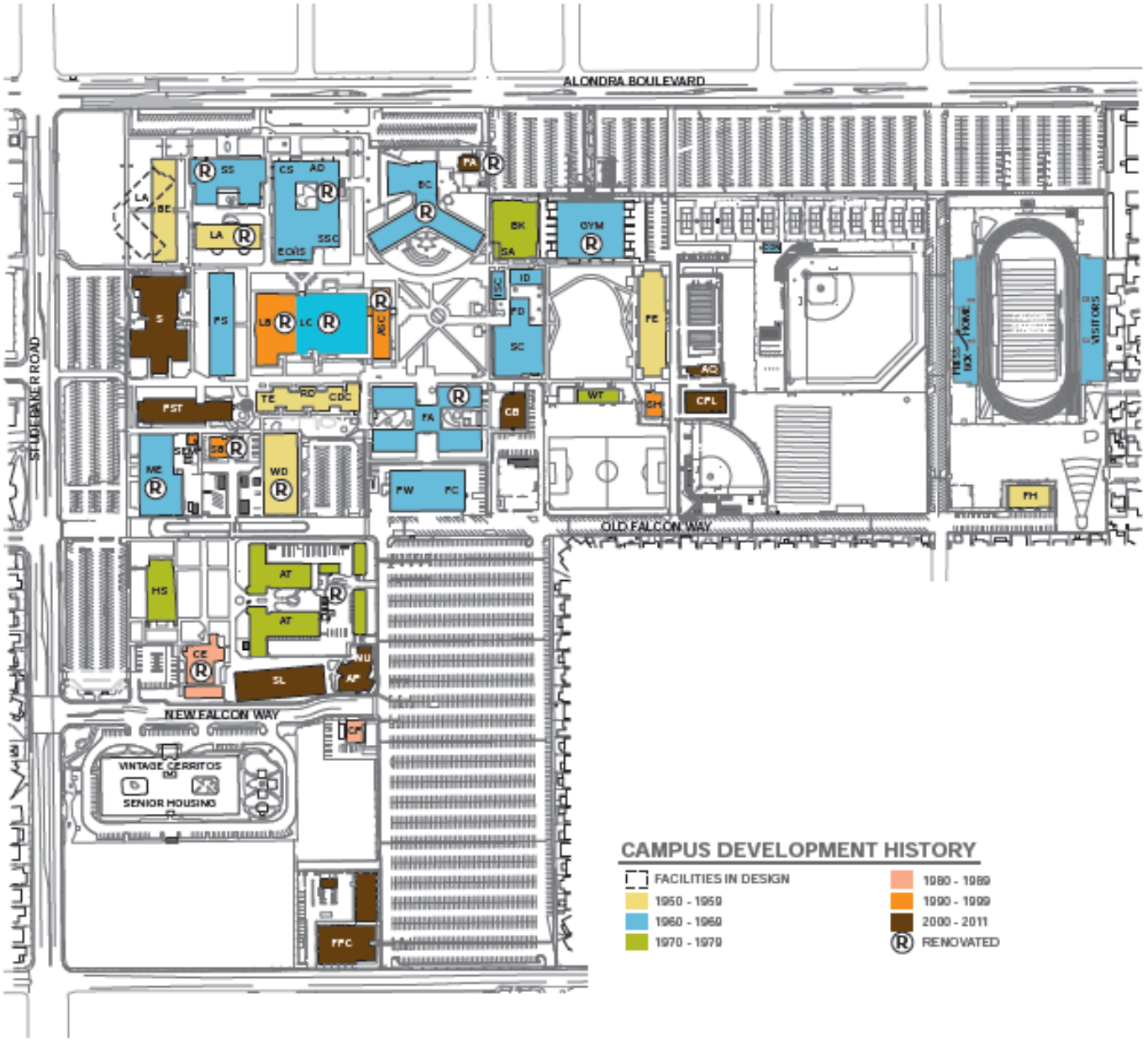
Sustainability Initiatives

- Board Policy 3580 – Environmental Sustainability
- Cerritos College Sustainability Plan
- Greenhouse Gas Reductions
- Energy Savings
- Water Conservation
- Green Education
- USGBC's LEED standard for projects above $5 million
- CCC/IOU Partnership first-of-a-kind Integrated Energy Master Plan

Project Approach

- Create a comprehensive plan of holistic energy solutions
- Align with present state and future condition of campus
- Dual integration: intra-campus and with California's guiding energy policies
- Real – world solutions using a wide spectrum of applications
- A strategic roadmap for other institutions

Cerritos College Campus



BUILDING KEY

AD	Administration
ASC	Academic Support Center
AQ	Aquatics Center
AP	Automotive Partners
AT	Automotive Technology
BC	Burnight Center/Theatre
BE	Business Education
BK	Bookstore
CB	Classroom Building
CDC	Child Development Center
CE	Community Education
CON	Concessions
CP	Campus Police
CPL	Central Plant
CS	Career Services
EOI/S	EOPS / International Students
FA	Fine Arts
FC	Facilities
FD	Food Court
FH	Field House
FPC	Facilities & Purchasing Complex
GYM	Gymnasium
HS	Health Science
ID	Student ID Center
ISC	Instructional Support Center (DSP&S)
LA	Liberal Arts
LB	Library
LC	Learning Resource Center
ME	Metals
NU	Northwood University
PA	Public Affairs/Cerritos College Foundation
PE	Physical Education
PS	Physical Sciences
PST	Physical Science Technology
PW	Purchasing/Warehouse
RD	Research and Development
S	Science/Project Hope
SA	Student Activities
SB	Santa Barbara (DSP&S)
SC	Student Center
SEM	Sem Storage
SH	Student Health & Wellness
SL	Skills Lab
SS	Social Science
SSC	Student Services Center
TB	Stadium Ticket Booth
TE	Technology
WD	Wood Manufacturing Technology
WT	Weight Training

Challenges

- Facilities master plan – IEMP overlay
- One meter – over 40 major buildings
- One gas meter
- Sub meters do not isolate the different load cooling load, lighting loads, plug loads and heating.
- Data gathered over 3 years to be effective
- Installation of permanent sub meter very expensive and time consuming
- Electric circuits will need to be modified
- Temporary meters when installed are for a few months only

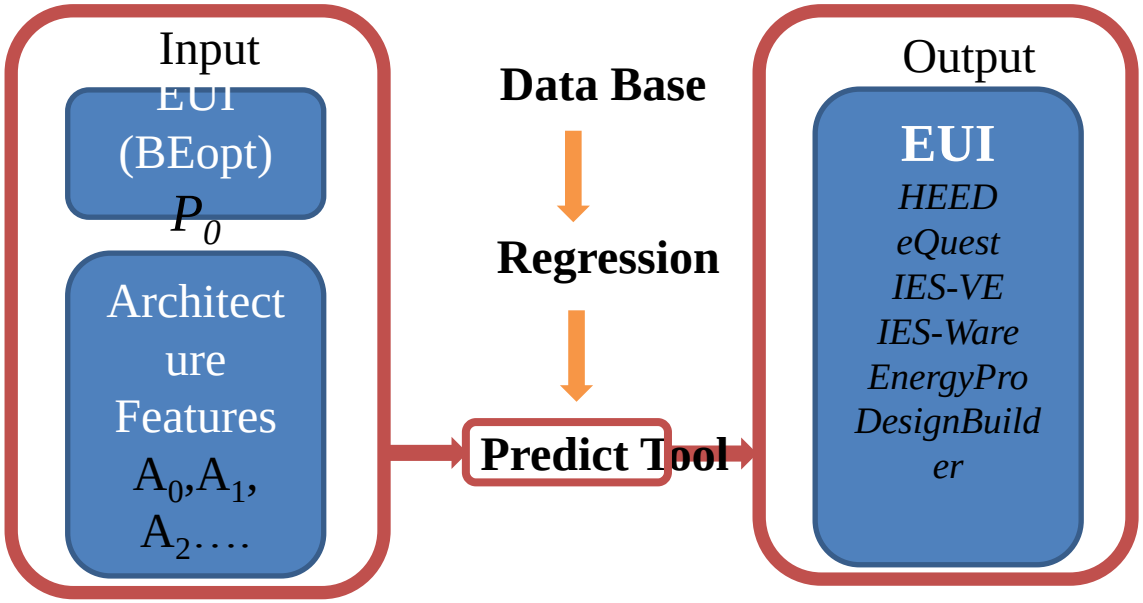
What do we know

- Facilities master plan and phasing
- Spatial mapping – window, walls, footprint, etc
- Age of each building – Codes determine performance and construction
- Climate files – cooling and heating loads
- Light fixtures – lighting consumption
- Types of mechanical systems – central plant, roof top packaged system, VRF systems, etc
- Energy Upgrades will effect IEMP

Data Analytics

- Regression methods in predicting the accuracy of software.
- ASHRAE recommendation of consumption in sq ft
- CBECS method for consumption
- Utility Data for electricity gas and water
- Utility bill alignment – 15 minute data for 3 years
- Calibration

Methodolo


Input
EUI (BEopt) P_0
Architecture Features A_0,A_1, A_2….
Data Base
Regression
Predict Tool
Output
EUI
HEED
eQuest
IES-VE
IES-Ware
EnergyPro
DesignBuilder

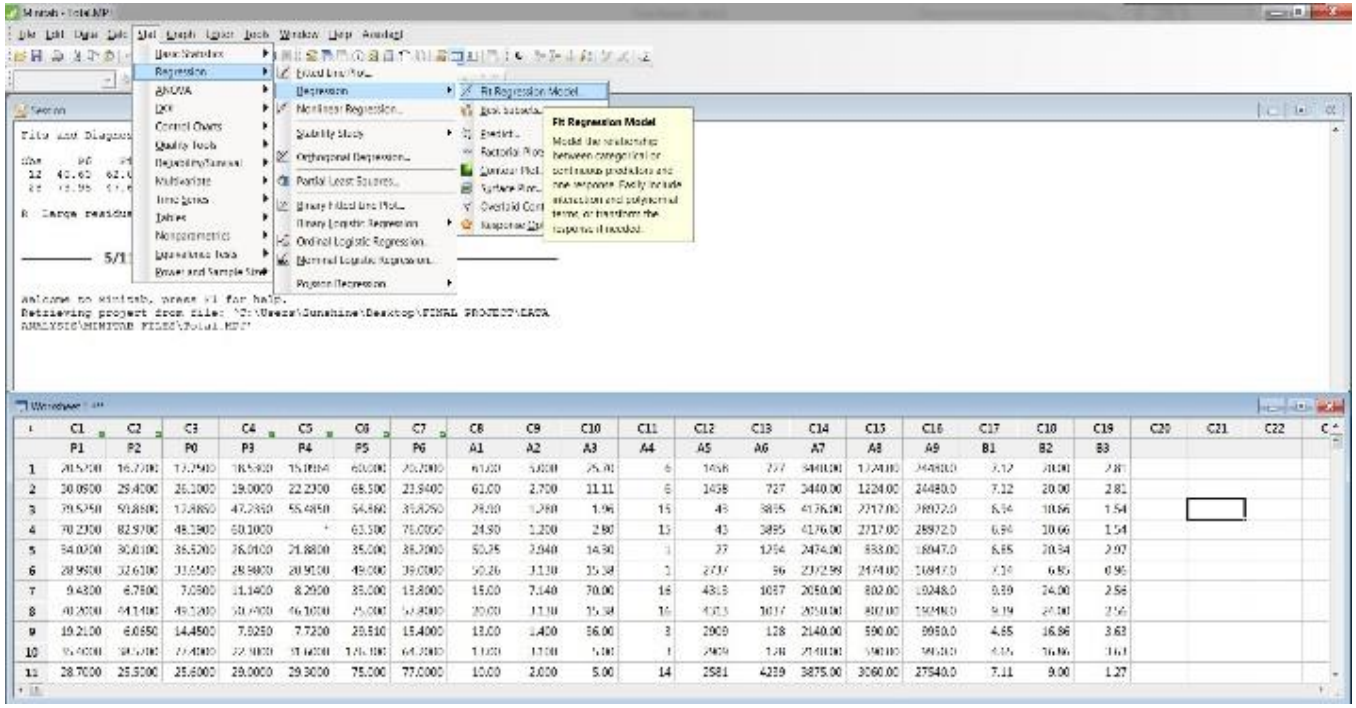

BEopt - Shortcut
DesignBuilder
EnergyPro 6
eQUEST 3-65
HEED
IESVE 2014
Minitab 17


Workflow
Data Collection
Factor selection
Regression
Results Analysis
Tool Development
Verification

Regression

Minitab 17

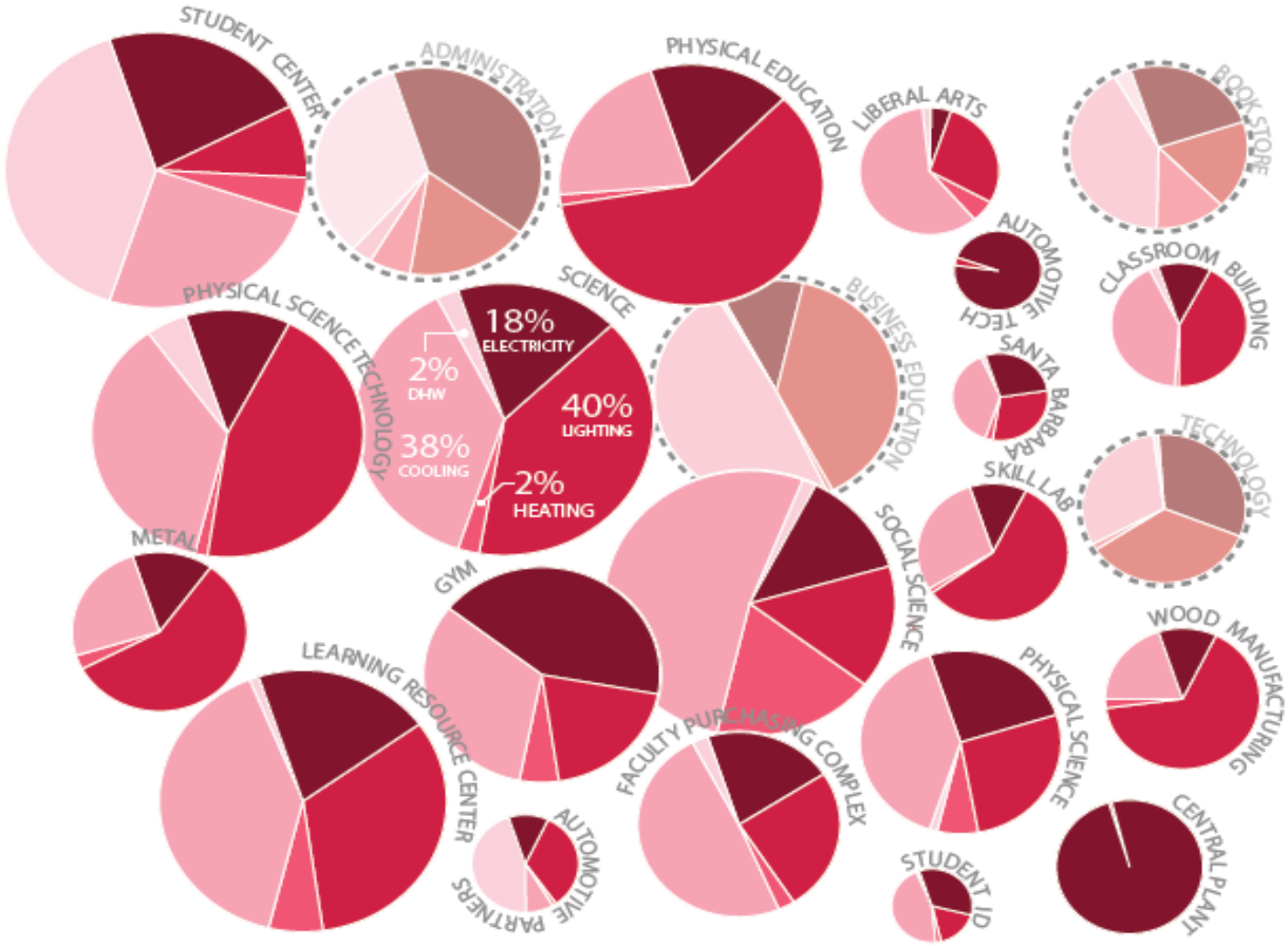
Fitted Regression Model----Stepwise



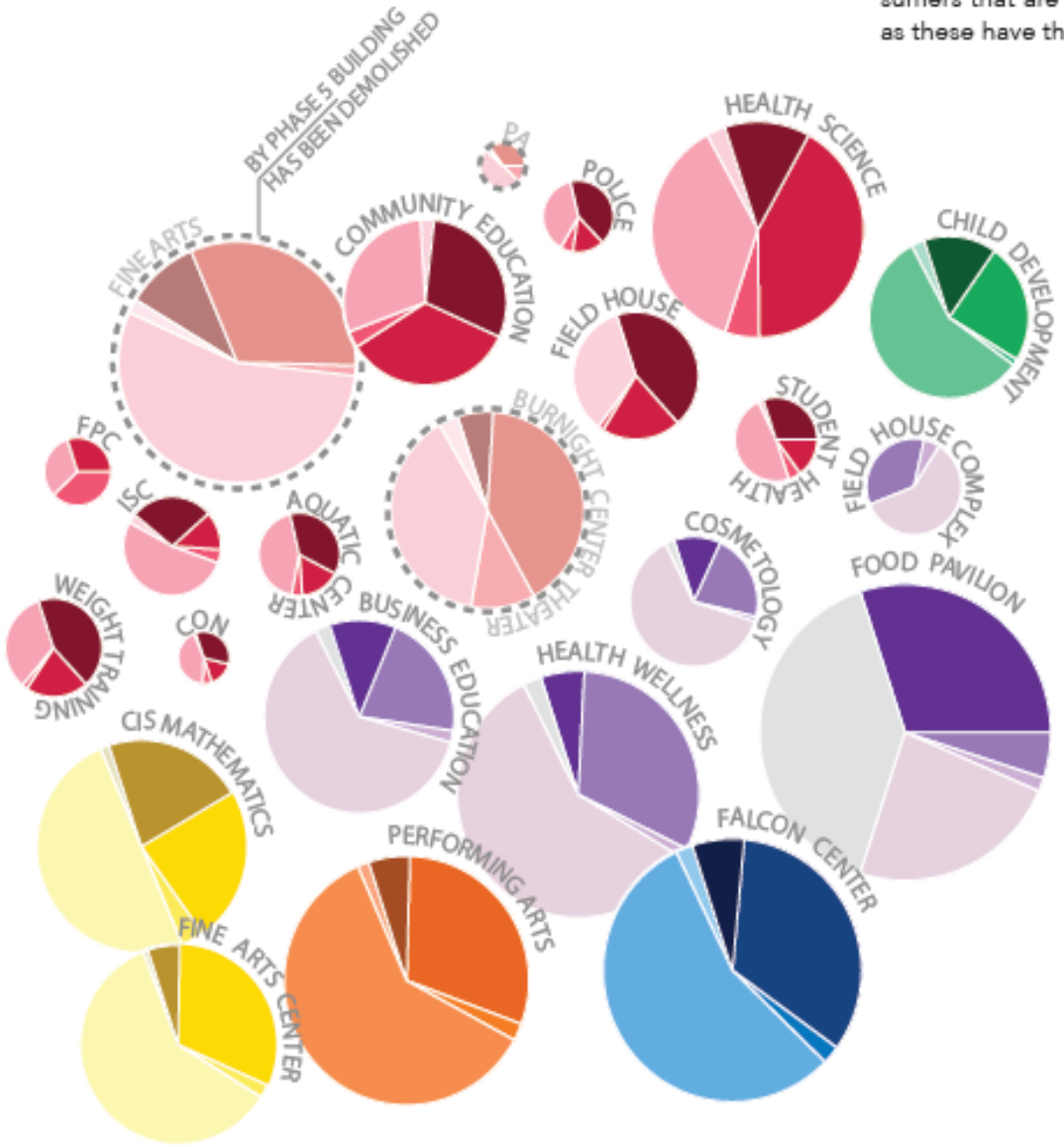
- Total
- Heating
- Cooling

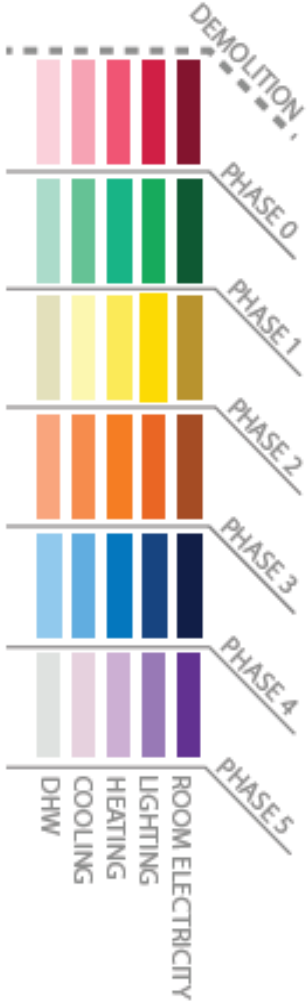
Response: EUI (HEED), EUI(eQuest), etc.
Predictor: EUI (BEopt), A1-A9, B1- B3
Stepwise: $\alpha = 0.15$

Existing Energy Consumption By Building

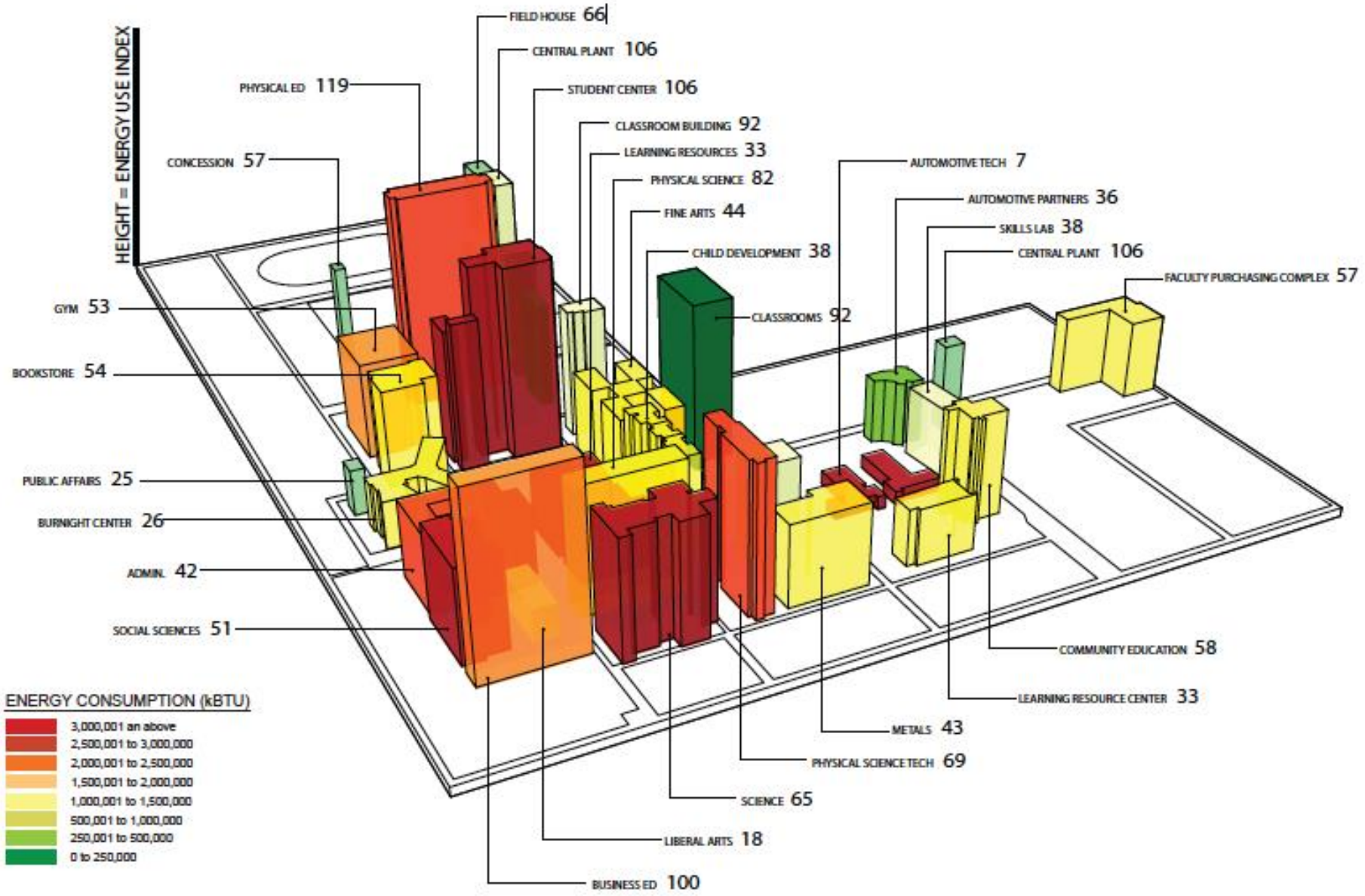


The charts provides provides visualization energy consumption and provides a quick comparison to show that there is an immediate need for energy efficiency measures that fall into the category of large consumers that are not slated for either demolition nor major renovation as these have the largest impact on savings for the college

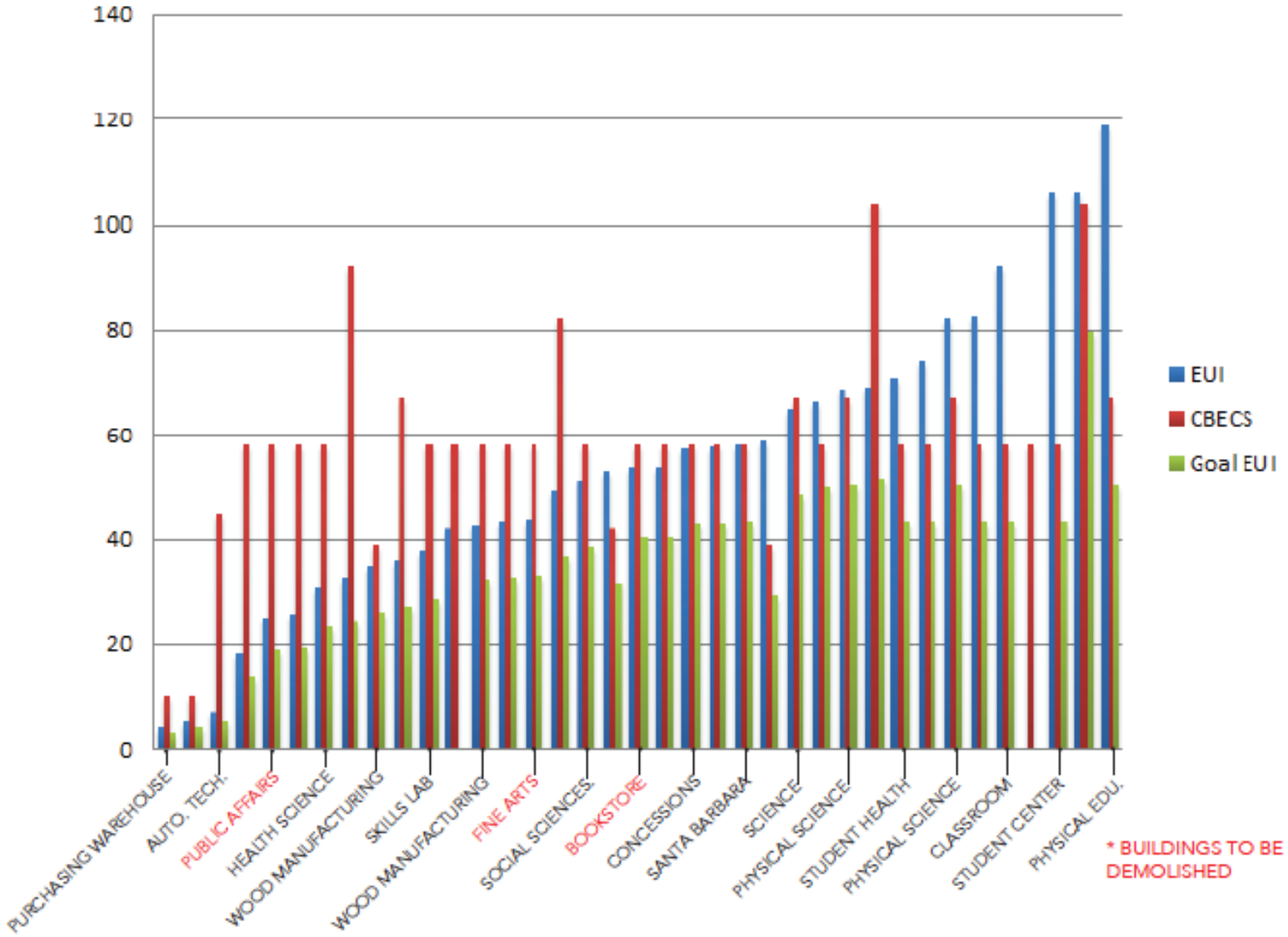




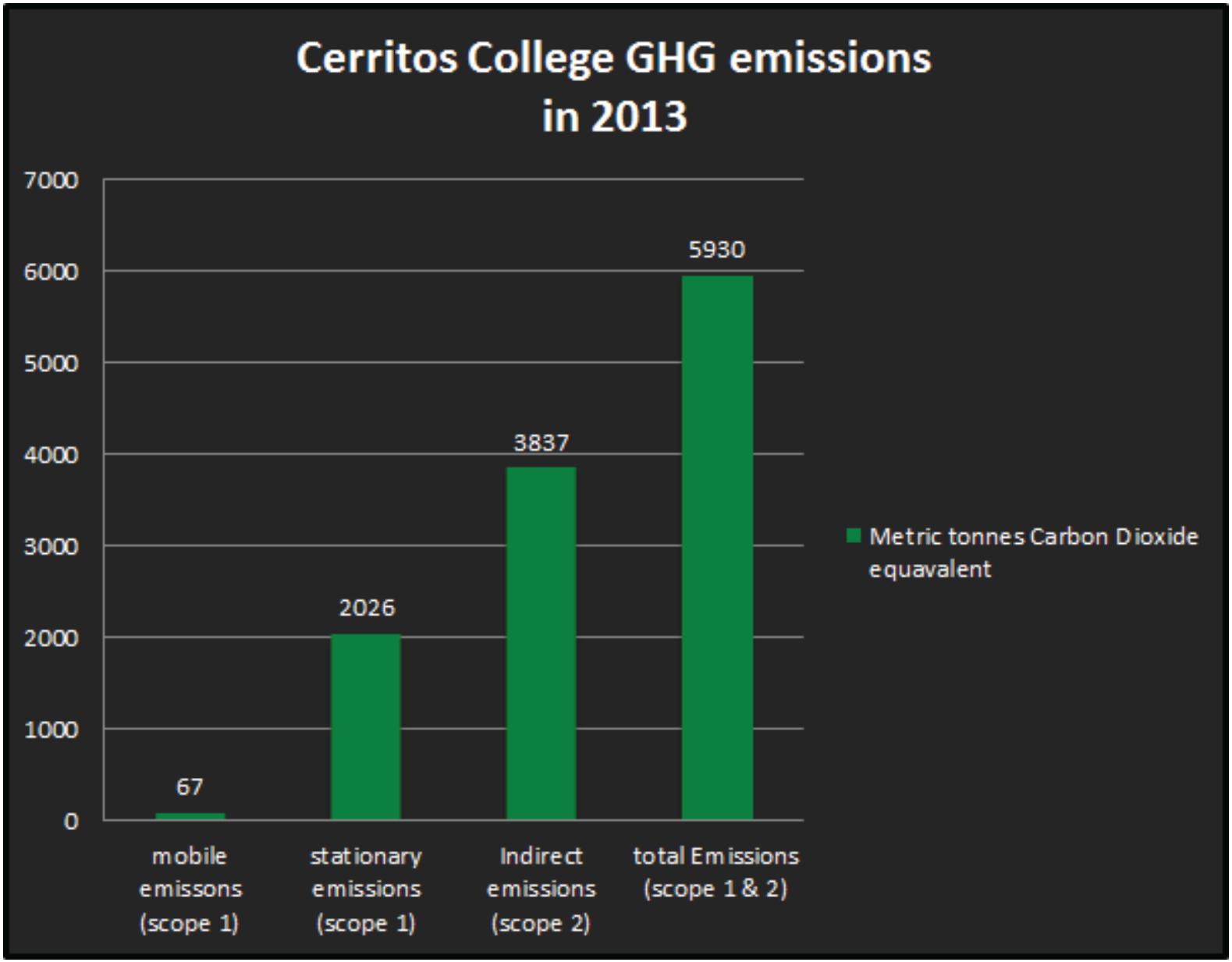
Existing Energy Consumption By Building



Comparison of Cerritos College EUI, CBECS and Goal EUI



Green House Gas Emissions



Conclusion

- Road map : An integrated energy masterplan overlay to facilities masterplan.
- Bench marking the entire campus
- Manage energy costs, short term, medium and long term
- Capturing funding opportunities: utility rebates, Prop 39, bond funds
- Reduction in operational costs