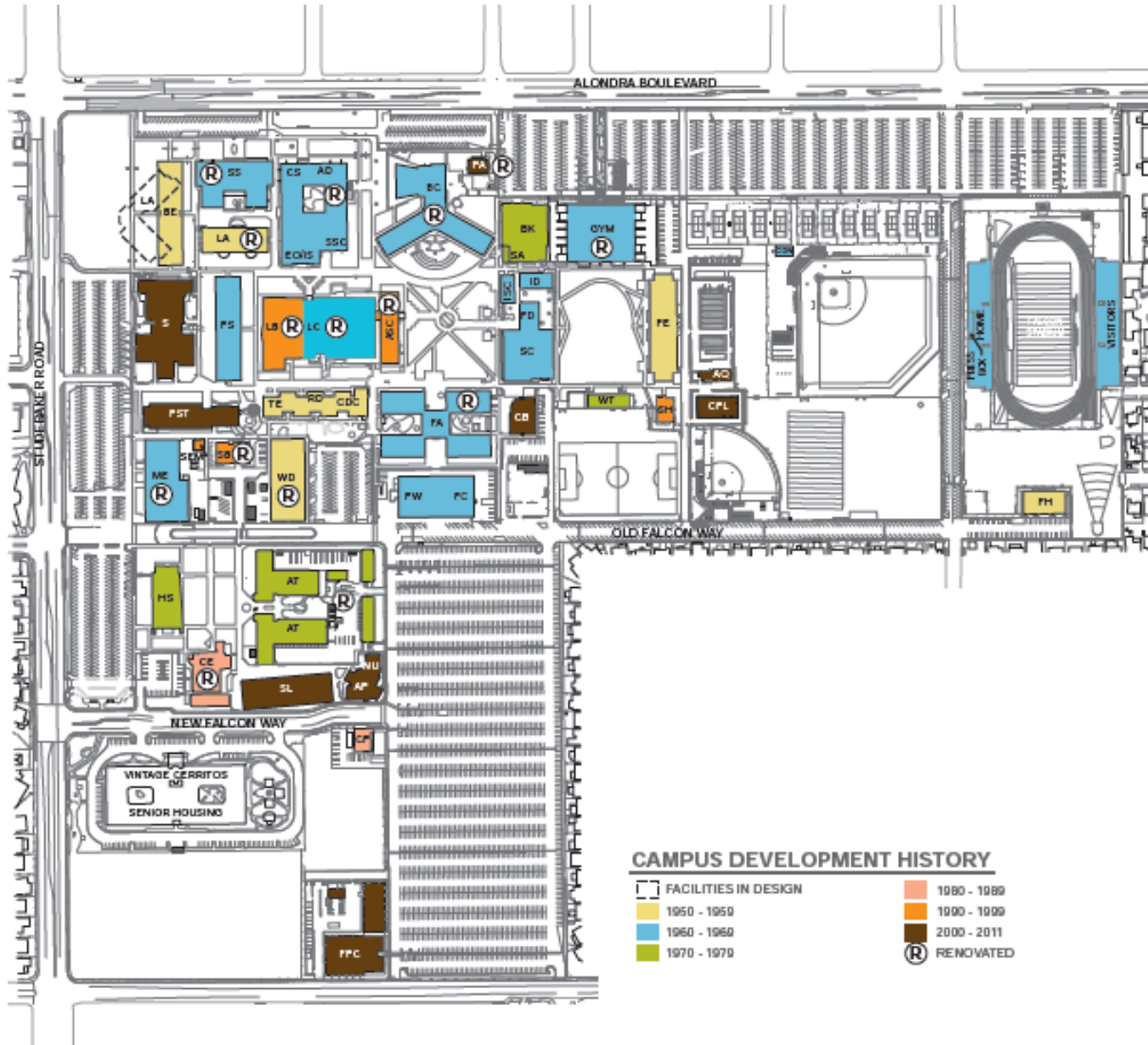


# CERRITOS COLLEGE

## INTEGRATED ENERGY MASTER PLAN



# Cerritos College Campus

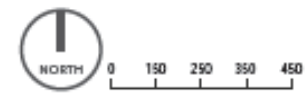


## BUILDING KEY

- 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
- EOPS/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
- RENOVATED



# Quick Facts



- Founded in 1955
- 18,000+ students (FTES)
- 135 acres
- 41 buildings, 1 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



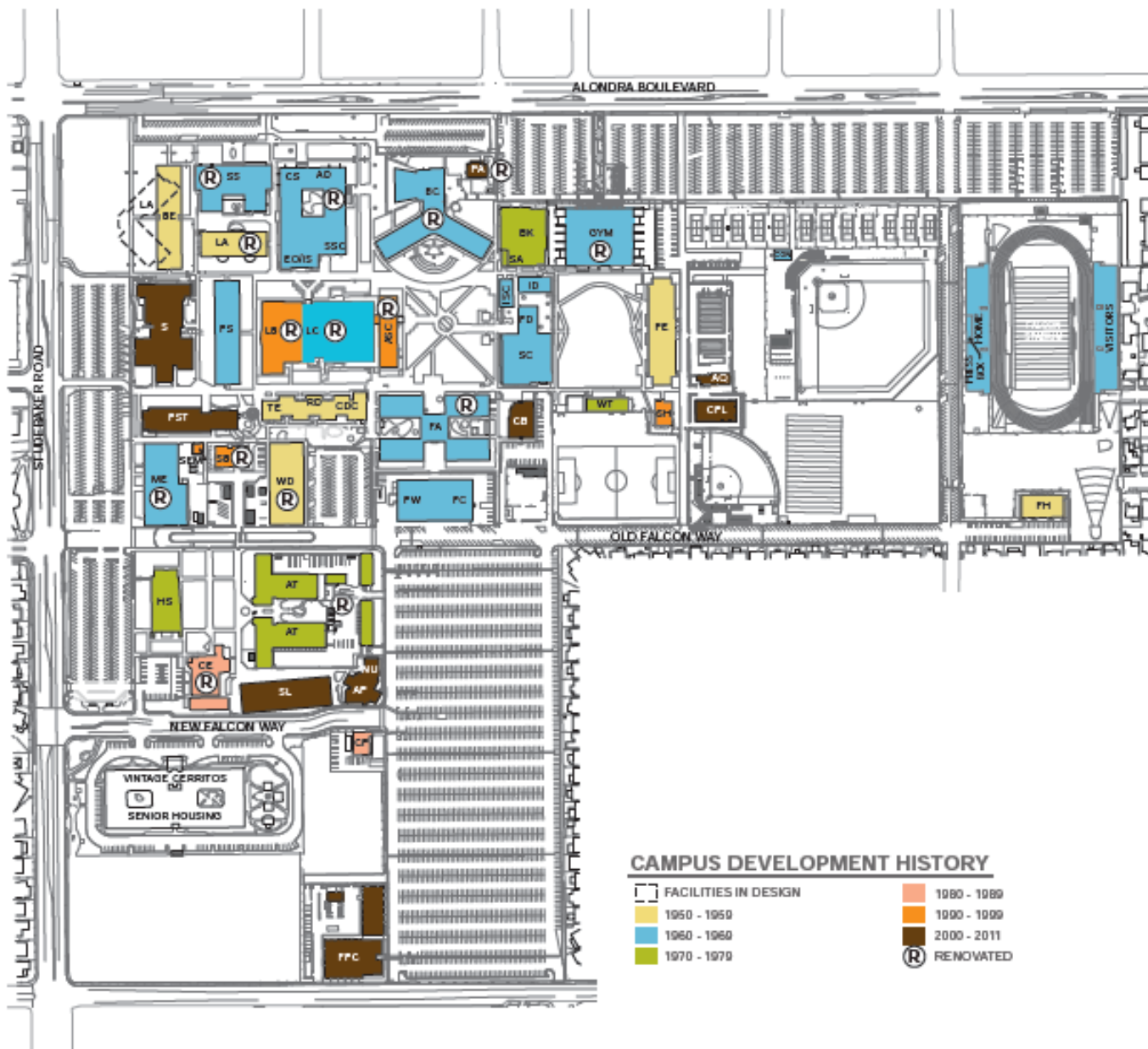
- Board Policy 3580 – Environmental Sustainability
- Cerritos College Sustainability Plan
- Greenhouse Gas Reductions
- Energy Savings
- Water Conservation
- Green Education
- USGBC’s LEED standard for projects above \$5 million
- CCC/IOU Partnership first-of-a-kind Integrated Energy Master Plan

# 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

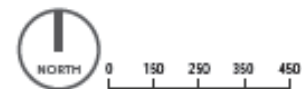


## BUILDING KEY

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
EQ/IS	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
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PST	Physical Science Technology
PW	Purchasing/Warehouse
RD	Research and Development
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SEM	Sem Storage
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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	1980 - 1989
1950 - 1959	1990 - 1999
1960 - 1969	2000 - 2011
1970 - 1979	RENOVATED



# 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

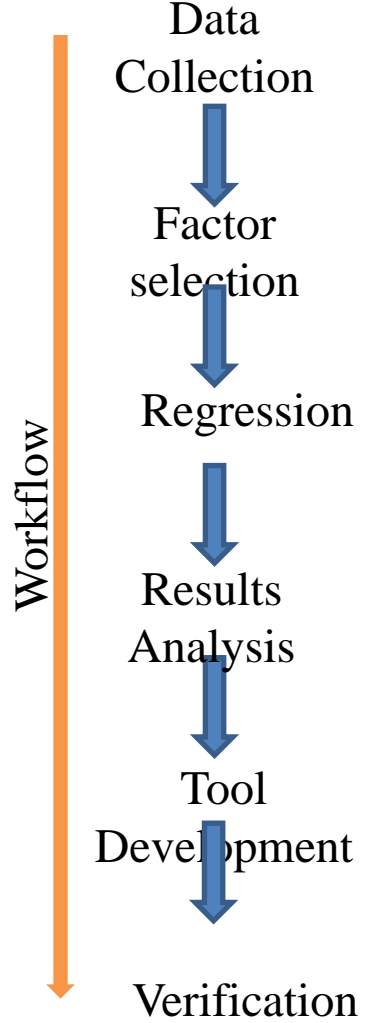
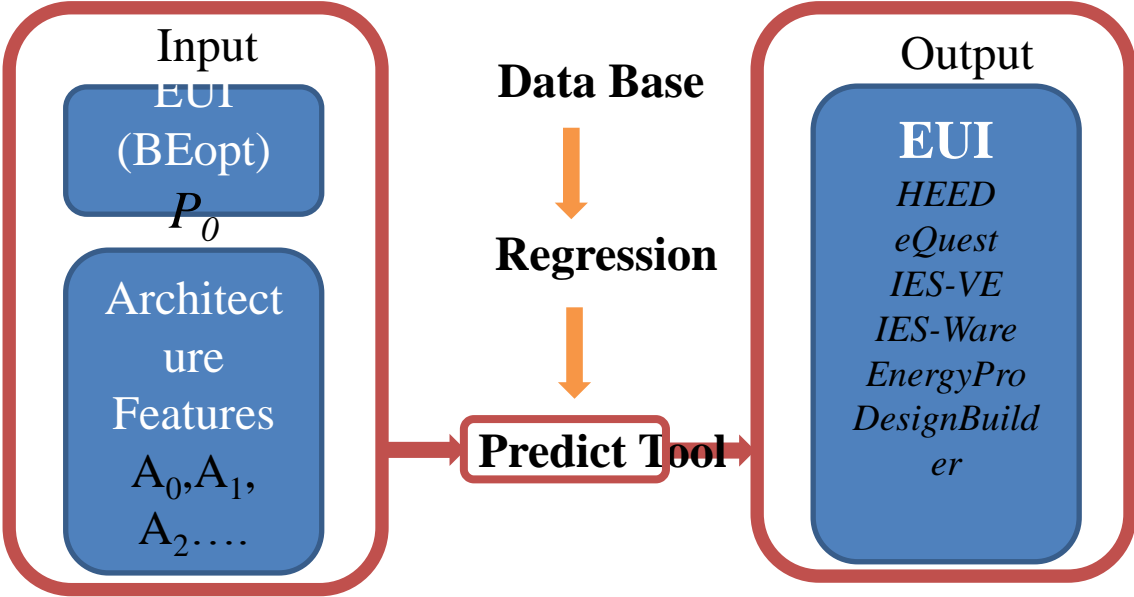
# What do we know

- 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

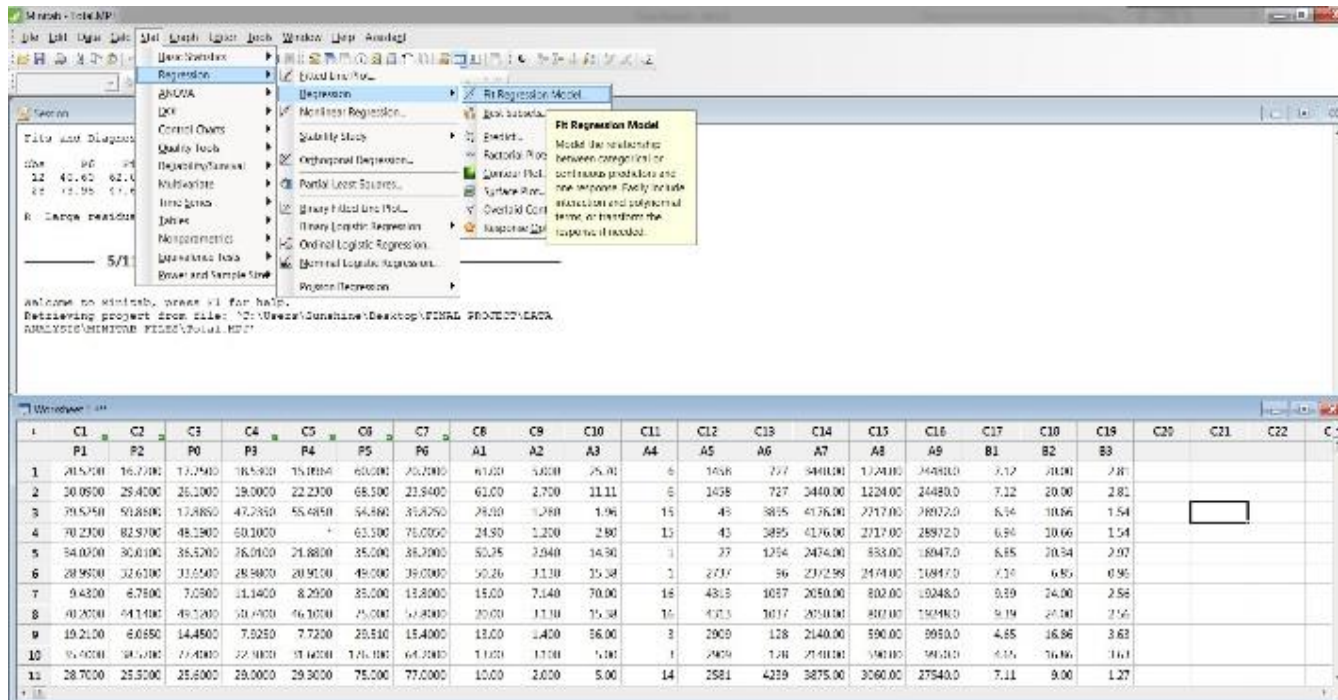
- Regression methods in predicting the accuracy of software.
- ASHRAE recommendation of consumption in sq ft
- CBECS method for consumption
- Utility Data for electricity gas and water
- Utility bill alignment – 15 minute data for 3 years
- Calibration





# Minitab 17

## Fitted Regression Model----Stepwise



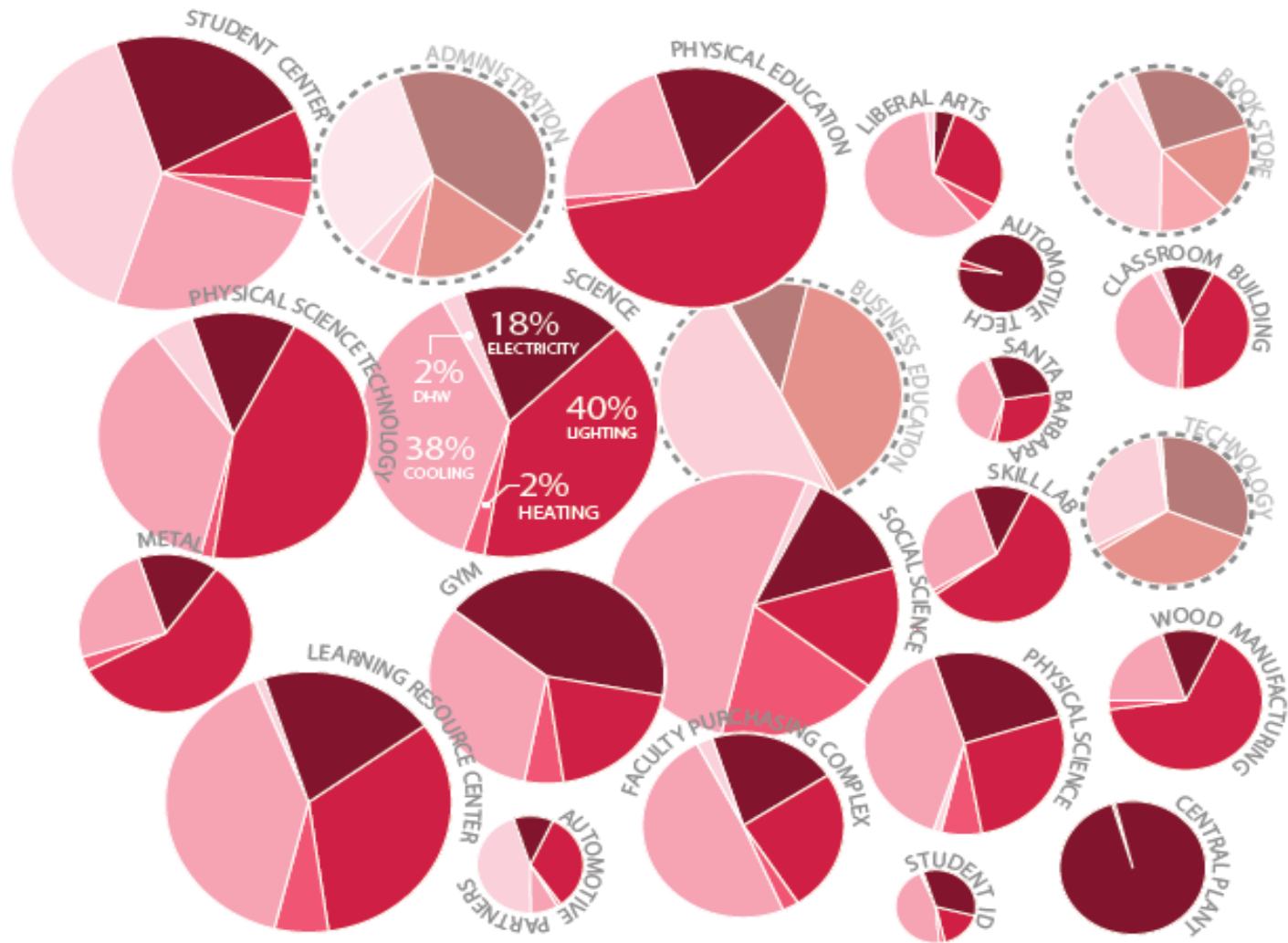
The screenshot shows the Minitab 17 interface. The 'Fit Regression Model' dialog box is open, with 'Response' set to 'EUI' and 'Predictors' set to 'EUI (BEopt), A1-A9, B1-B3'. The 'Stepwise' method is selected. Below the dialog box, a data table is visible with columns labeled C1 through C22. The table contains numerical data for 13 rows.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22
	P1	P2	P0	P3	P4	P5	P6	A1	A2	A3	A4	A5	A6	A7	A8	A9	B1	B2	B3			
1	205.900	16.7700	17.7900	18.5300	19.1800	6000.00	20.2000	61.00	5.000	25.00	6	1456	777	5400.00	17240.00	24480.00	3.12	20.00	2.81			
2	30.0500	25.4000	25.1000	19.0000	22.2300	68.500	23.8400	61.00	2.700	11.11	6	1458	727	3440.00	12240.00	24480.00	7.12	20.00	2.81			
3	39.5750	50.8500	13.8850	47.2350	55.4850	56.890	35.6250	28.00	1.280	1.96	15	49	3835	4176.00	2717.00	28972.00	6.94	10.66	1.54			
4	70.2300	82.9700	48.1900	50.1000		63.3000	75.0700	24.80	1.200	2.80	13	43	3895	4176.00	2717.00	28972.00	6.94	10.66	1.54			
5	54.0000	30.0100	35.5200	26.0100	21.8800	35.2000	38.2000	50.25	2.940	14.90	1	27	1254	2474.00	833.00	18047.00	6.85	20.54	2.97			
6	28.9500	32.6100	31.5500	28.9800	20.9100	49.0000	39.0000	50.26	1.110	15.34	1	2737	56	2312.98	2474.00	16947.00	3.70	6.85	0.95			
7	9.4300	4.7500	7.0500	11.1400	8.2000	35.000	13.2000	15.00	7.140	70.00	16	43.5	1037	2050.00	802.00	10248.00	9.39	24.00	2.58			
8	40.2000	44.1100	49.1300	30.4900	46.1000	25.000	53.8000	20.00	11.10	15.34	16	42.3	1017	2050.00	802.00	10248.00	9.39	24.00	2.58			
9	19.2100	6.0550	14.4500	7.5250	7.7200	25.510	15.4000	13.00	1.400	36.00	3	2903	128	2140.00	590.00	9950.00	4.85	16.96	3.63			
10	19.4000	34.7100	77.4300	22.9800	31.6200	176.100	64.2000	11.00	13.00	1.00	1	2409	1.78	2740.00	190.00	9410.00	4.54	16.96	3.63			
11	28.7000	25.5000	25.6000	29.0000	29.3000	75.000	77.0000	10.00	2.000	5.00	14	2581	4239	3875.00	3060.00	27540.00	7.11	9.00	1.27			

- Total
- Heating
- Cooling

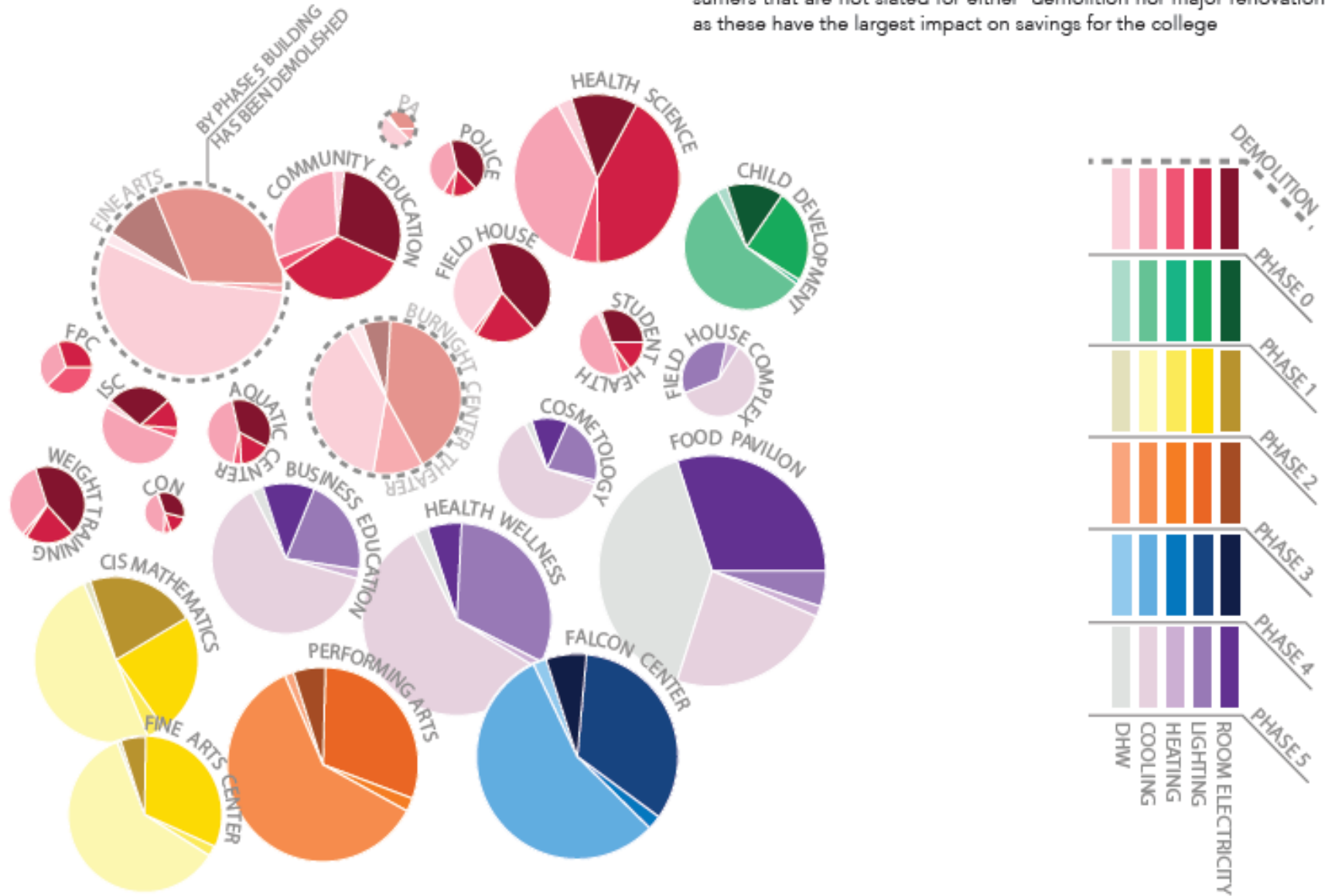
**Response:** EUI (HEED), EUI(eQuest), etc.  
**Predictor:** EUI (BEopt), A1-A9, B1- B3  
**Stepwise:**  $\alpha = 0.15$

# Existing Energy Consumption By Building



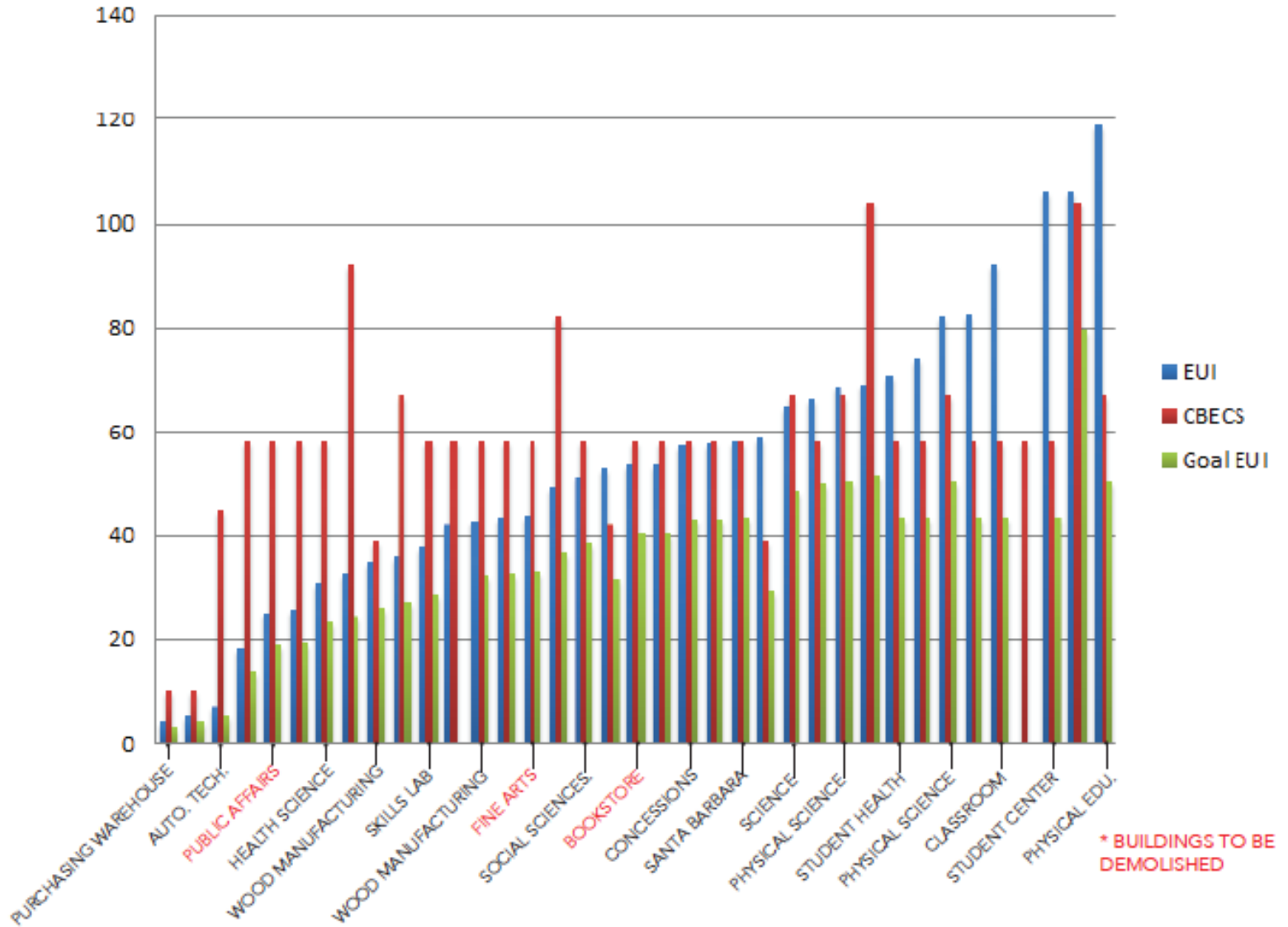
## INTEGRATED ENERGY MASTER PLAN | CERRITOS COLLEGE

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



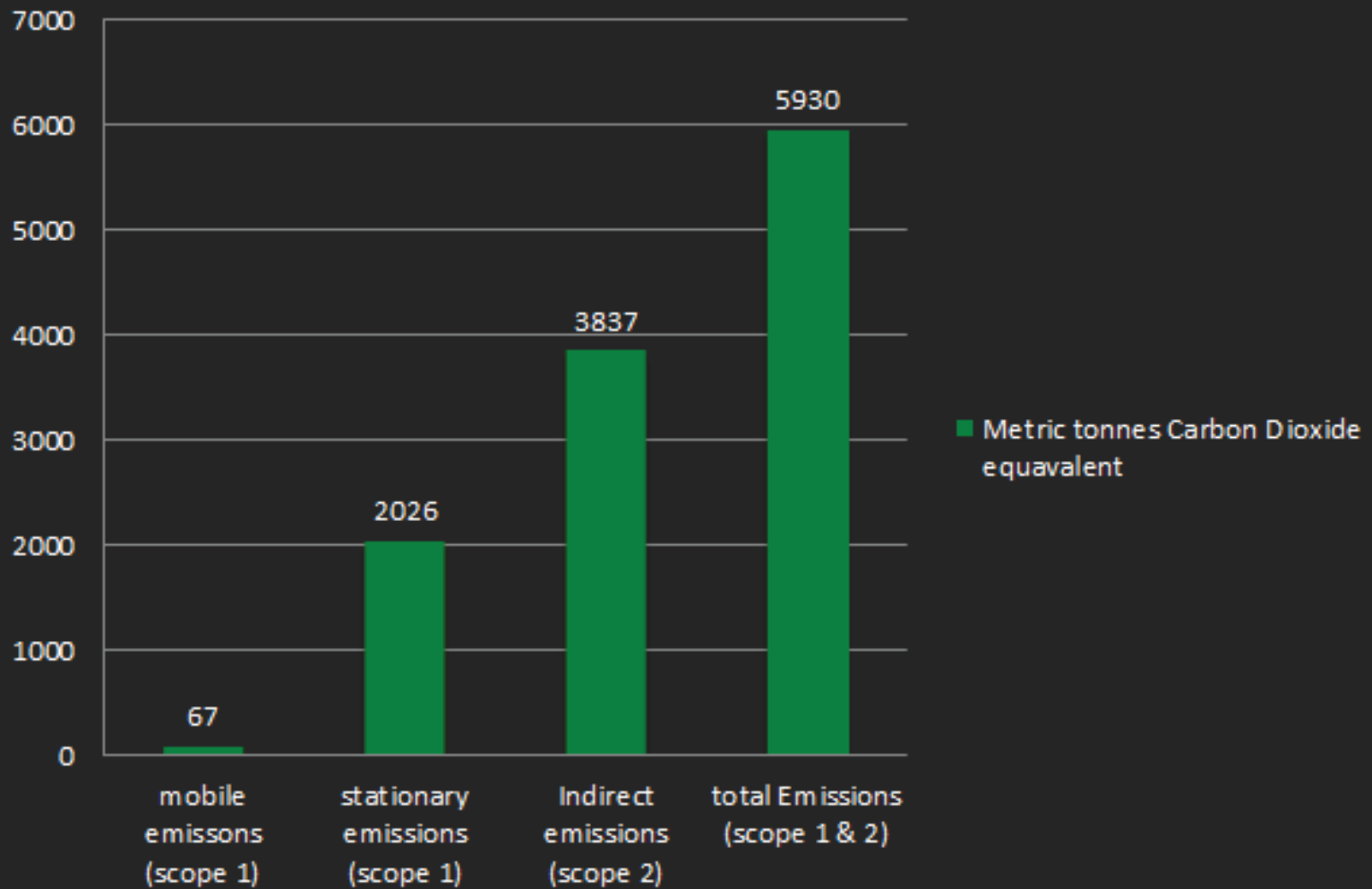


# Comparison of Cerritos College EUI, CB ECS and Goal EUI



# Green House Gas Emissions

## Cerritos College GHG emissions in 2013





# 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