



# USC's Sustainability story in a nutshell

*Team: **Red** goes **Green**!*





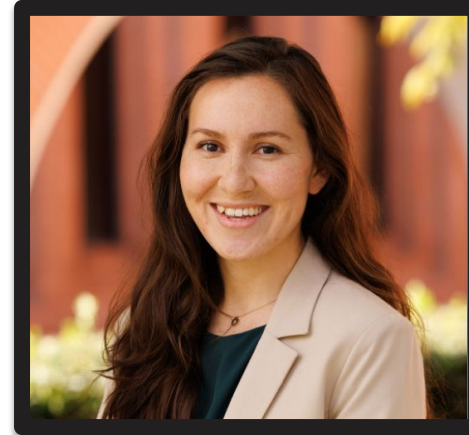
# Team Members:



Amrita Ligga



Ankita Sachan

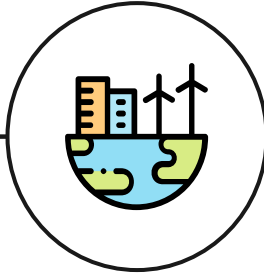


Alyssa Lopez



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# Overview of USC Sustainability Plan:



Silver on STARS

Awareness Campaigns

Dr. Folt's Vision

2028 Framework



# Trend Analysis

# Electricity Consumption:

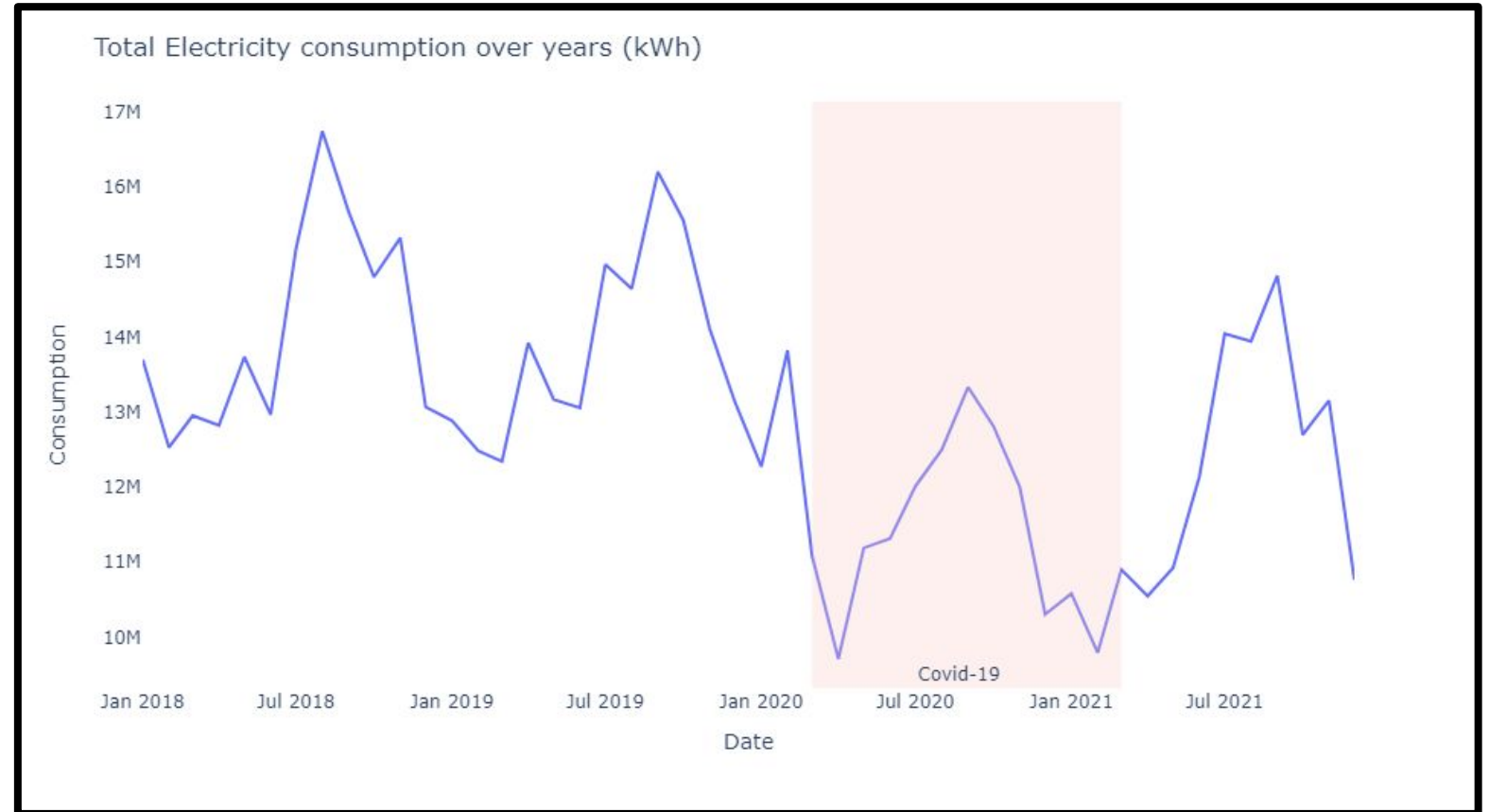


**20%** of housing/kitchen needs fulfilled by **solar initiatives**

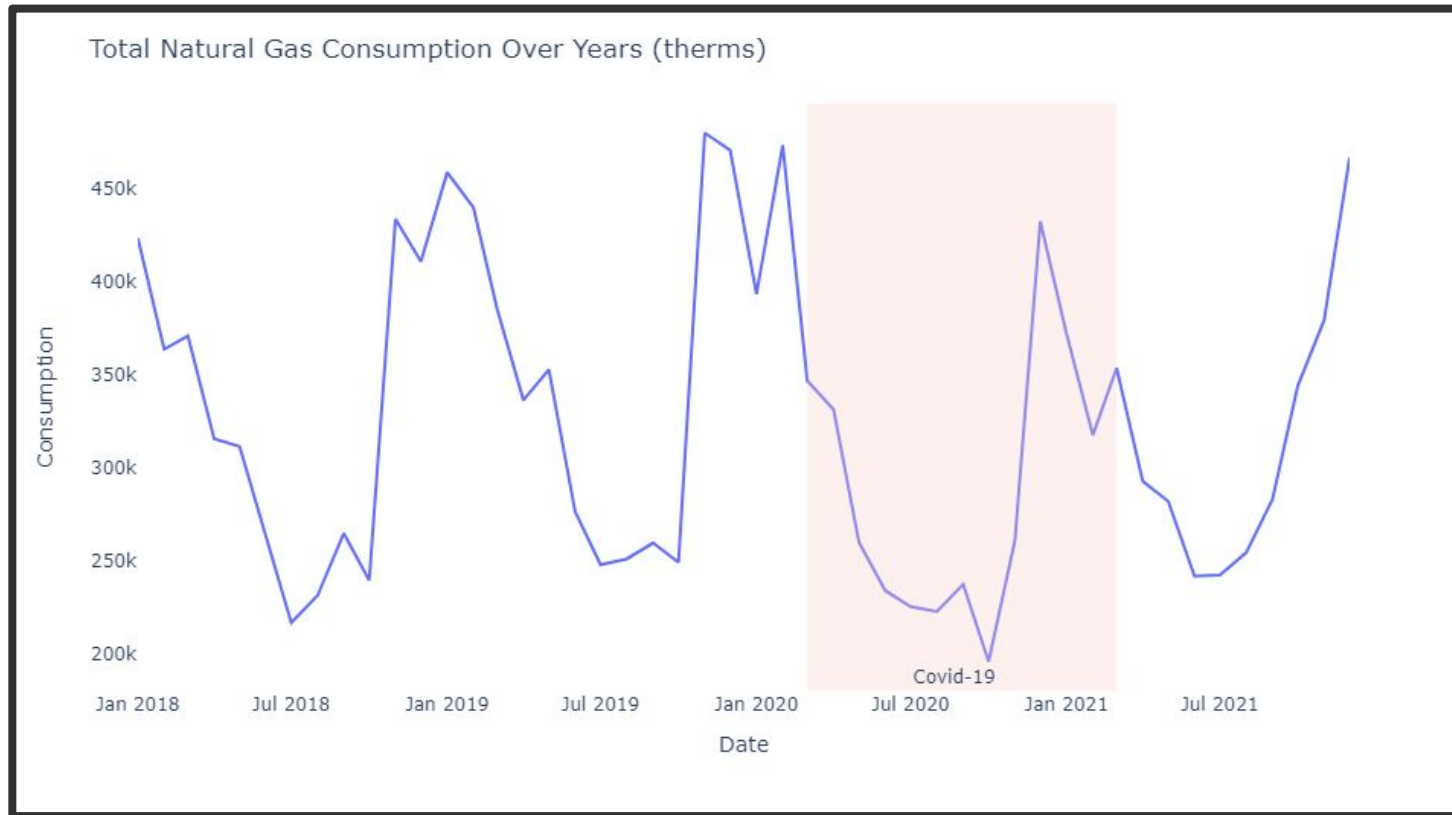
**35%** reduction in **GHG emissions** since 2014

**5** certified **LEED** buildings

**200%** life service improvement through Lightning program



# Natural Gas:



Post Covid levels = Pre Covid levels

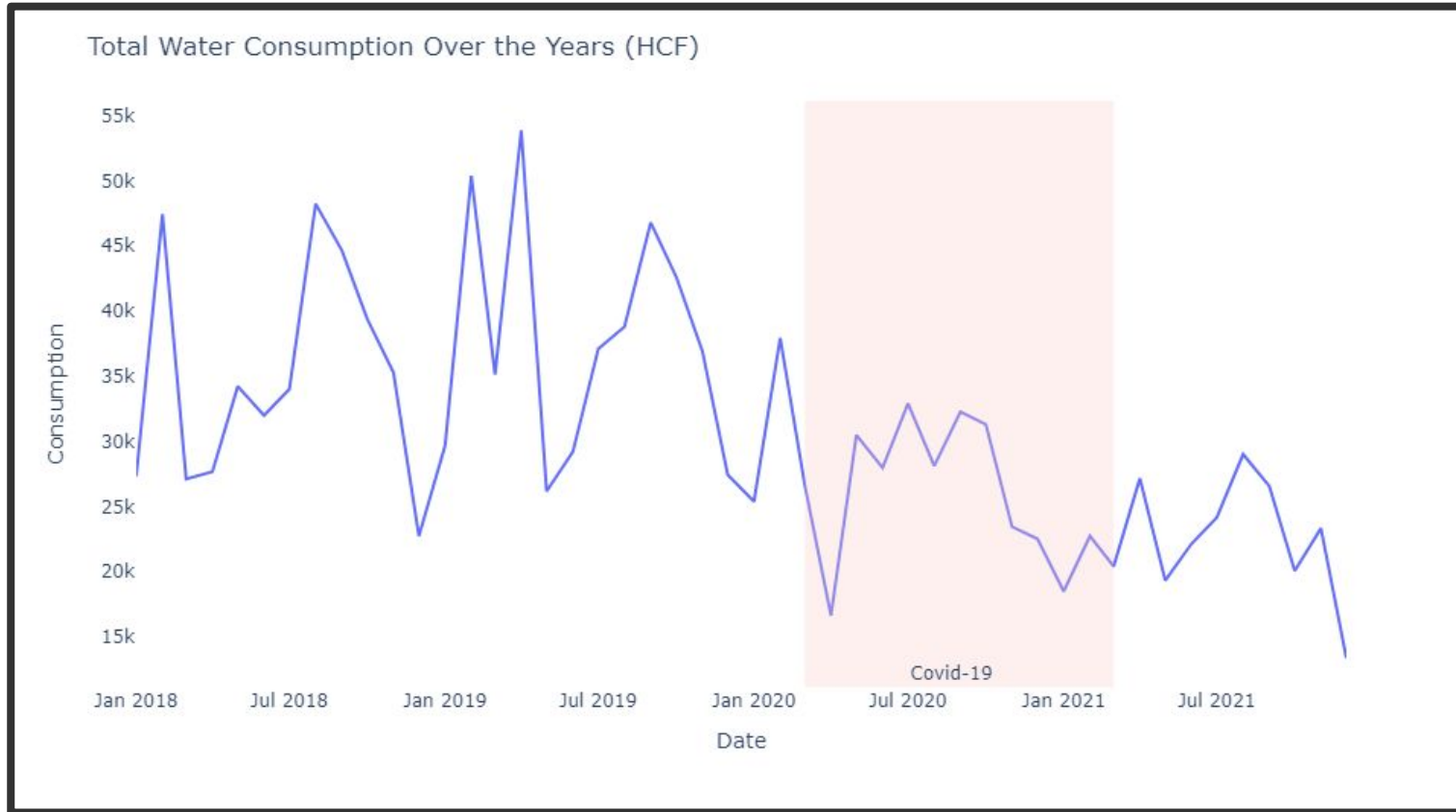
Only **1%** contributed from Natural gas in **35%** total energy reduction

Almost **all buildings** show similar trend





# Water Usage:



Achieved **10%** reduction in potable water (Targeted **25%**)

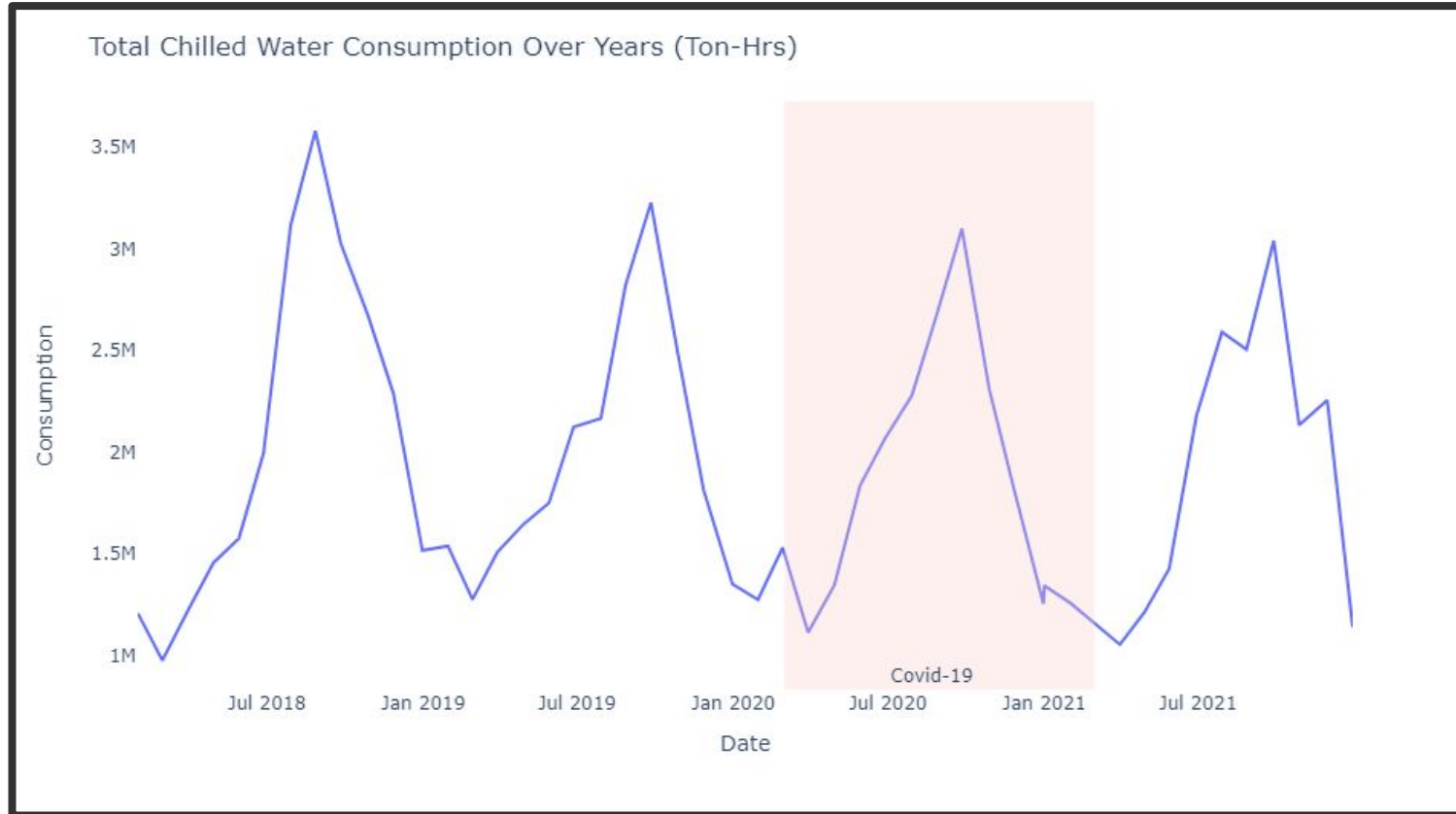
Educational campaigns

Low-flow water fixtures were installed - Replaced **6800** fixtures

**50%** UPC Buildings show real-time water usage



# Chilled Water Usage:



Centralized Chilled Water plant -  
**25-35%** more efficient

Started running at night (**charge 3M Gallon tank**)- supported new building demands without installing new chillers

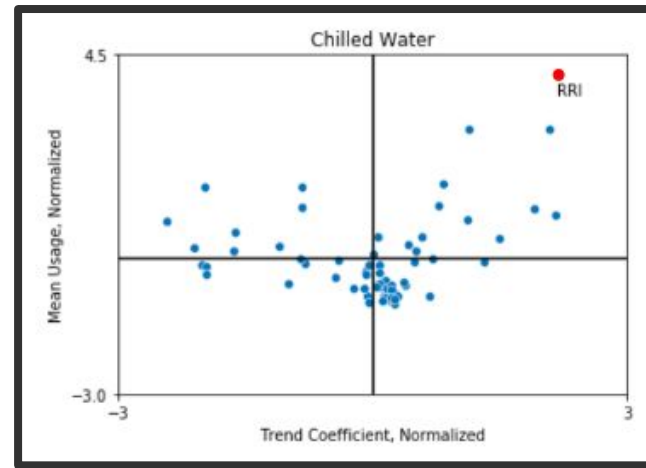
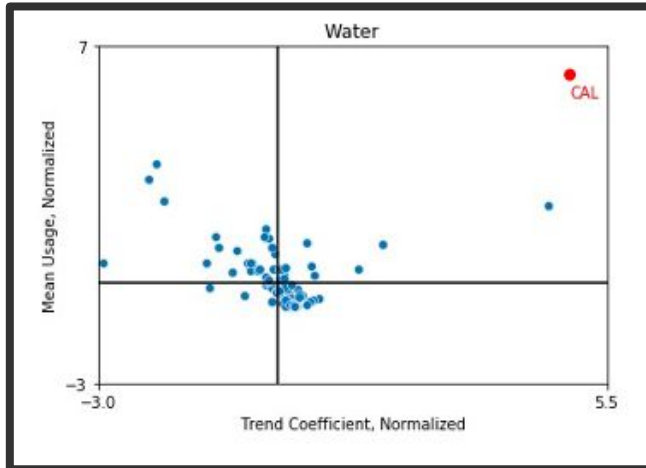
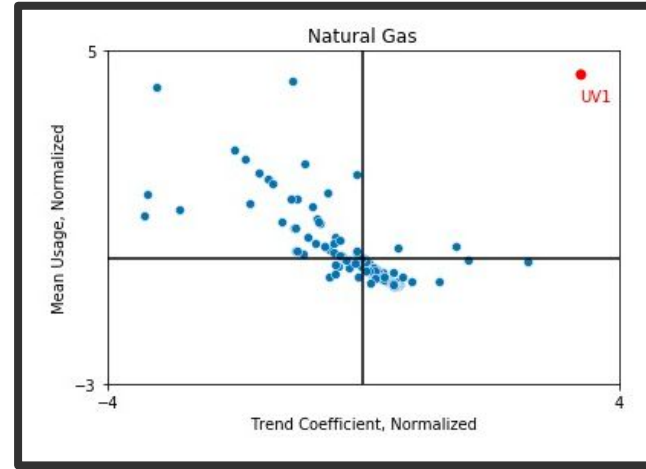
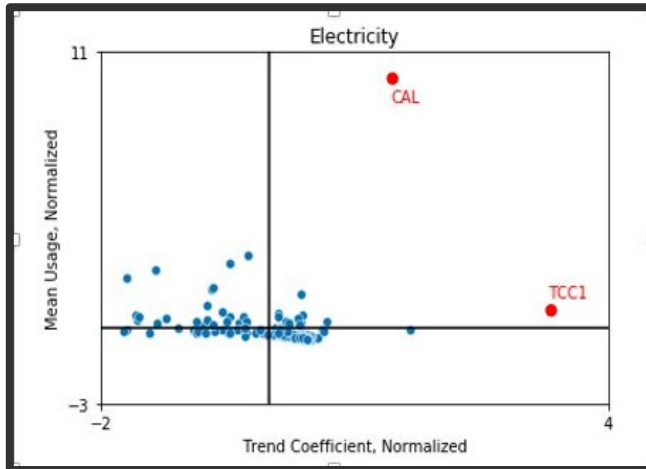
Serves - **70** buildings and **4M** square feet



# Individual Building Analysis: Problematic Buildings



# Perception Map & Priority Ranking of Buildings:



## Electricity:

**CAL:** Carol A Little Building

**TCC1:** Topping Campus Center - Chiller plant

## Natural Gas:

**UV1:** University Village One

## Water:

**CAL:** Carol A Little Building

## Chilled Water:

**RRI:** Molecular Biology

# Carol A Little (CAL) Building:



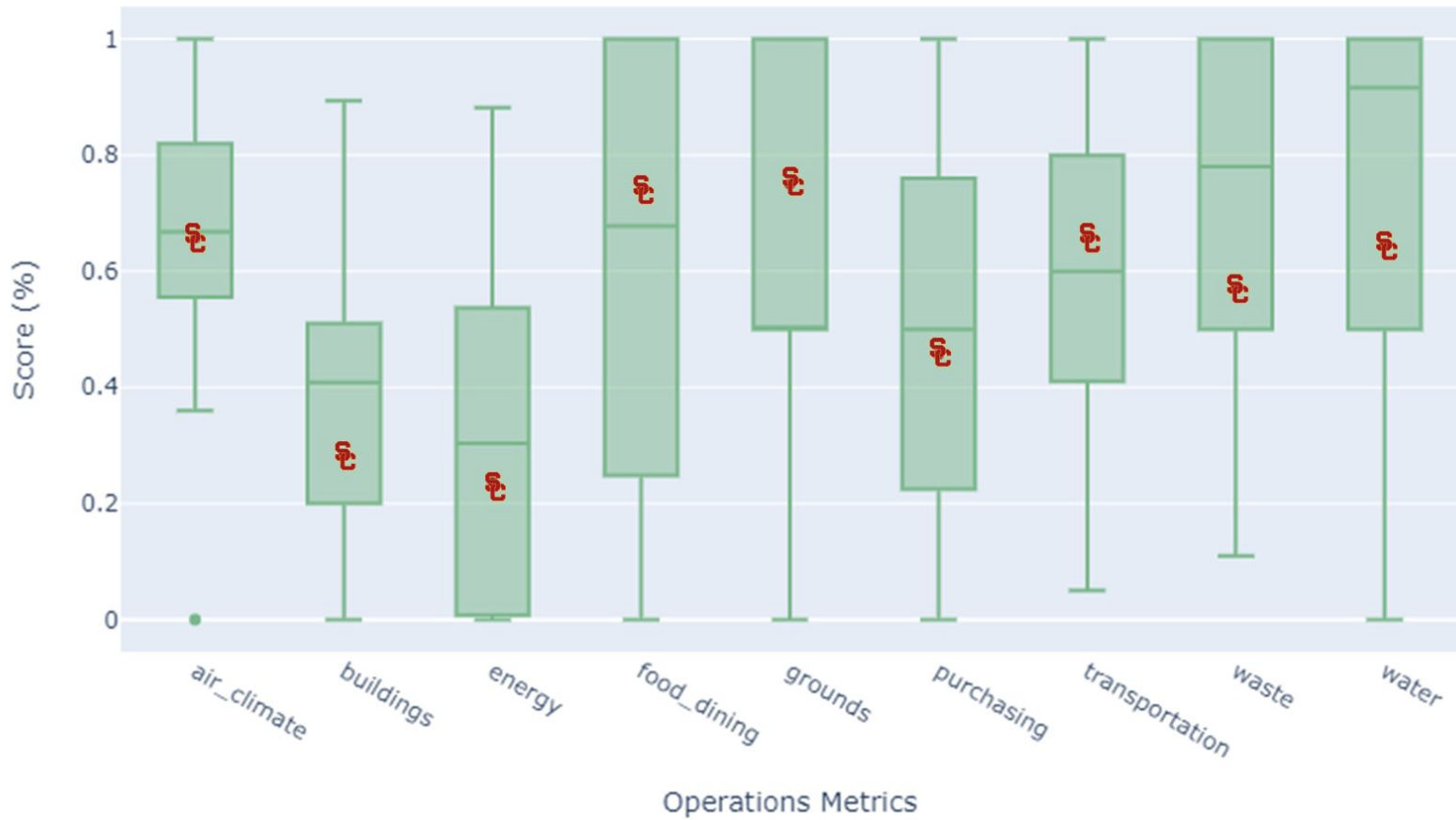
**Not** rated by Energy Star

**High** Source vs Site EUI differential

Source energy EUI **> 2.91**  
SD higher than mean for offices  
at USC

# Peer Comparisons

# Comparison with Schools (n=9):



# Recommendations



# Recommendations and Learning:



1

## Ongoing Risk Assessment

- ( ) Data product to identify buildings at risk
- ( ) integrate additional data to improve strength

2

## Improve Buildings

- ( ) Room for growth across campuses
- ( ) USC in lower 50%

3

## Look into Carol A Little

- ( ) High consumption office
- ( ) High source energy

4

## Increase campus awareness

- ( ) Waste Management Education
- ( ) Recycling Rewards
- ( ) Eco-friendly alternatives



ENVIRONMENT

MATTERS

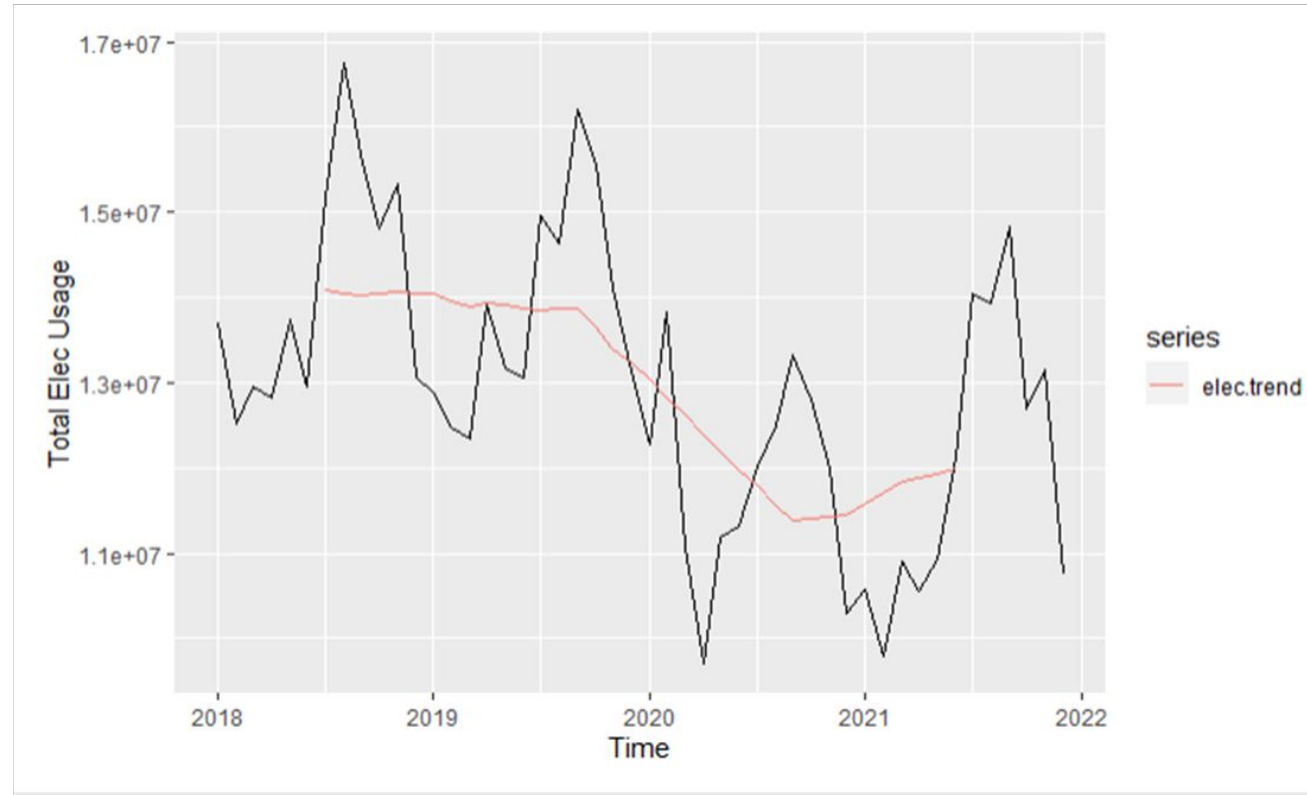
*Thank You!*

# Appendix



## Proof of Concept: Ranking Methodology (1 of 3)

- Moving Average of Total Electricity Usage shows trend over time

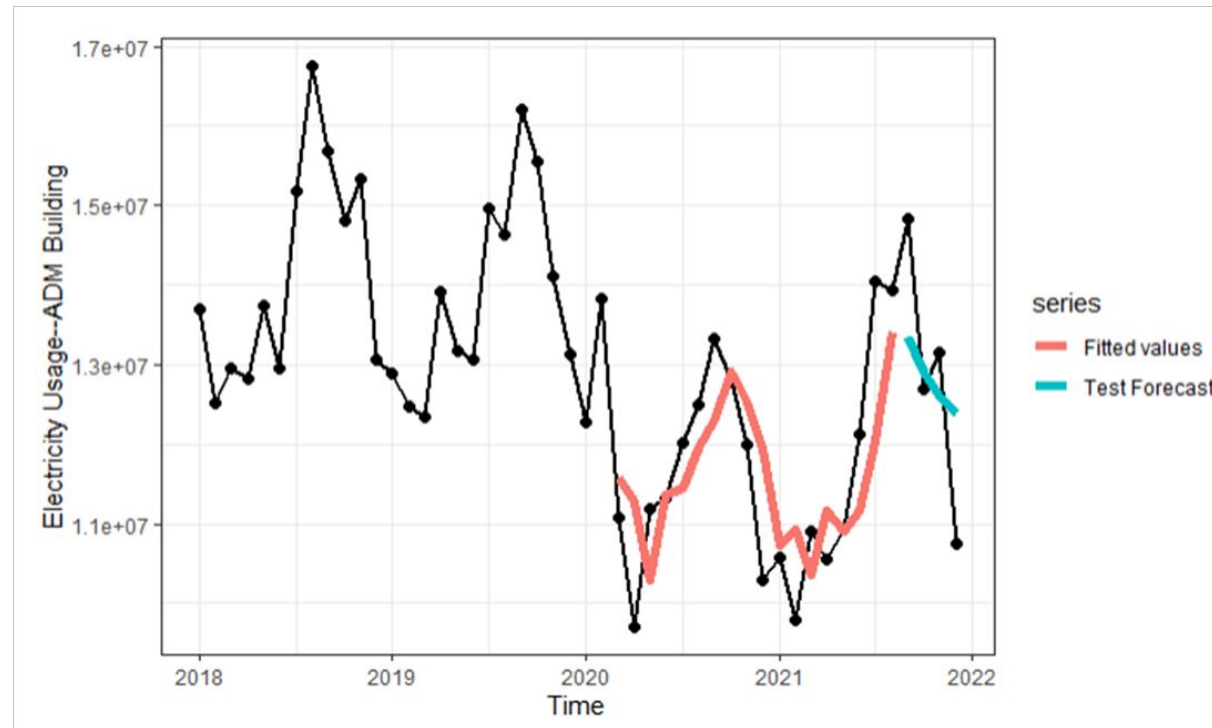




## Proof of Concept: Ranking Methodology (2 of 3)

This AutoARIMA model was made by adjusting for sudden change caused by COVID, then mapping trend in following time

- we aren't attempting to forecast usage, this is just proof of mathematical concept/design of upcoming tool
- key takeaway: for models, using post-COVID data is more accurate than using a trend line that incorporates pre-COVID data

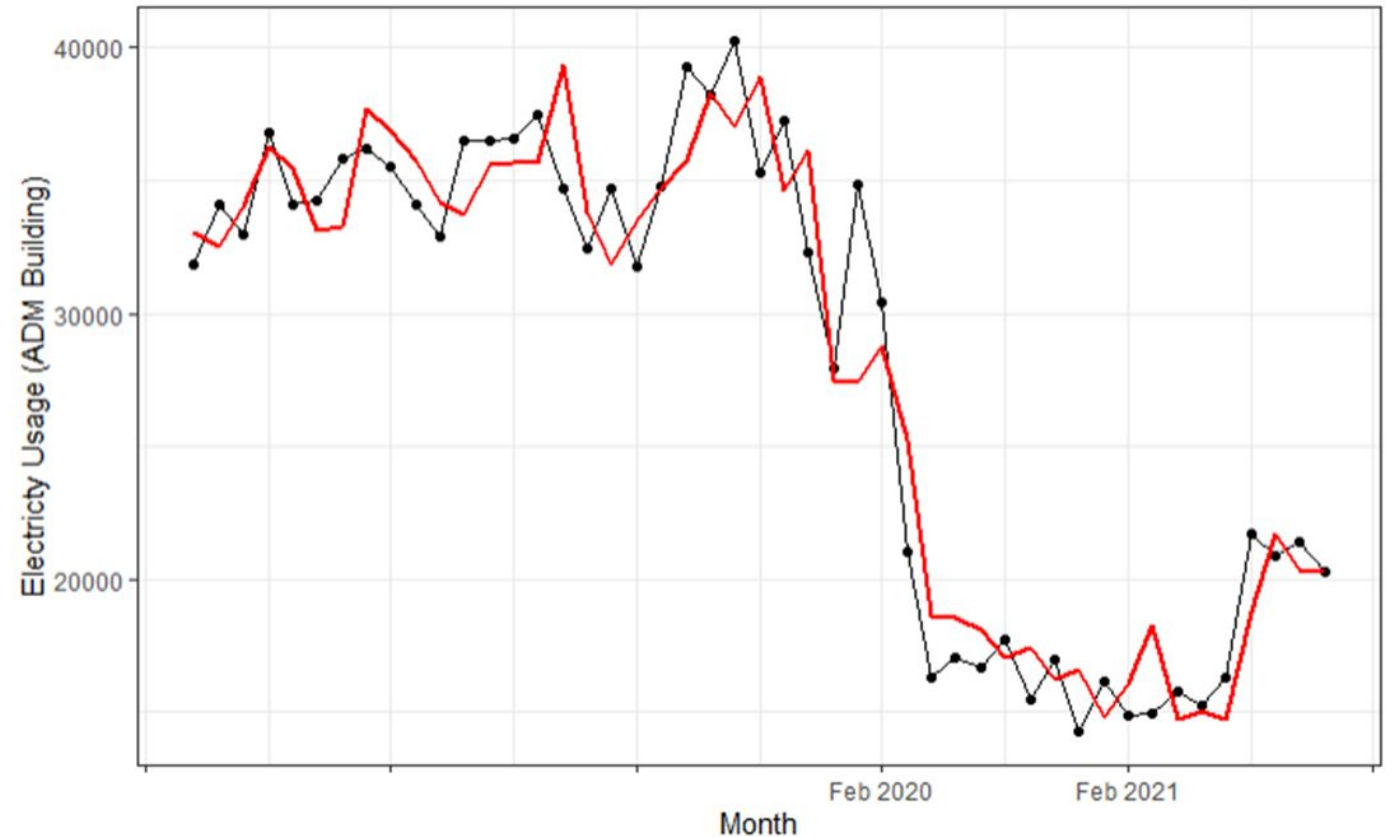




## Proof of Concept: Ranking Methodology (3 of 3)

This graph shows a linear model fitted to the electricity usage at the ADM building.

$R^2$  is pretty good and p-value is significant. We can therefore use Ramp coefficient from after COVID period from each building's stats to make a comparative table/graph that shows the highest using, highest trending buildings.



Multiple R-squared: 0.9315, Adjusted R-squared: 0.8984  
F-statistic: 28.11 on 15 and 31 DF, p-value: 6.734e-14



# Perception Map & Priority Ranking of Buildings:



<u>Electricity</u>	coefficient	mean
tcc1	80451.6	168024
cal	27973.99	1489292
drb	6321.752	102457.8

<u>Water</u>	coefficient	mean
cal	748.8422	1774.396
uvo	688.423	777.8549
mrc	237.5781	477.1873
rri	34.57852	494.979

<u>Nat Gas</u>	coefficient	mean
uv1	2841.993	15711.21
cal	2042.462	1755.521
drb	1124.139	1923.141
esh	935.7896	2914.292
kdc	44.92777	2770.133

<u>Chilled</u>	coefficient	mean
rri	20154.57	129464.1
dml	19832.36	50884.51
rth	19158.46	99468.81
zhs	17293.18	54707.04
kap	13285.8	37722.84

**Electricity:**

**TCC1:** Topping Campus Center - Chiller plant

**CAL:** Carol A Little Building

**Natural Gas:**

**UV1:** University Village One

**CAL:** Carol A Little Building

**Water:**

**CAL:** Carol A Little Building

**UVO:** University Village One

**RRI:** Ray R Irani/Molecular Biology

**Chilled Water:**

**RRI:** Ray R Irani/Molecular Biology

**UV0:** University Village