De-Carbonizing the Campus: Planning, Tools & Technologies

CampusEnergy2023

February 27 – March 2, 2023

Gaylord Texan Resort & Convention Center | Grapevine, Texas

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Energy Conservation vs. Campus Growth:
Implementing Campus Utility Submetering

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Outline

1. Background
2. Problem
3. Goals
4. Finding a Partner
5. Designing a Solution
6. Implementation
7. Results
8. Lessons Learned

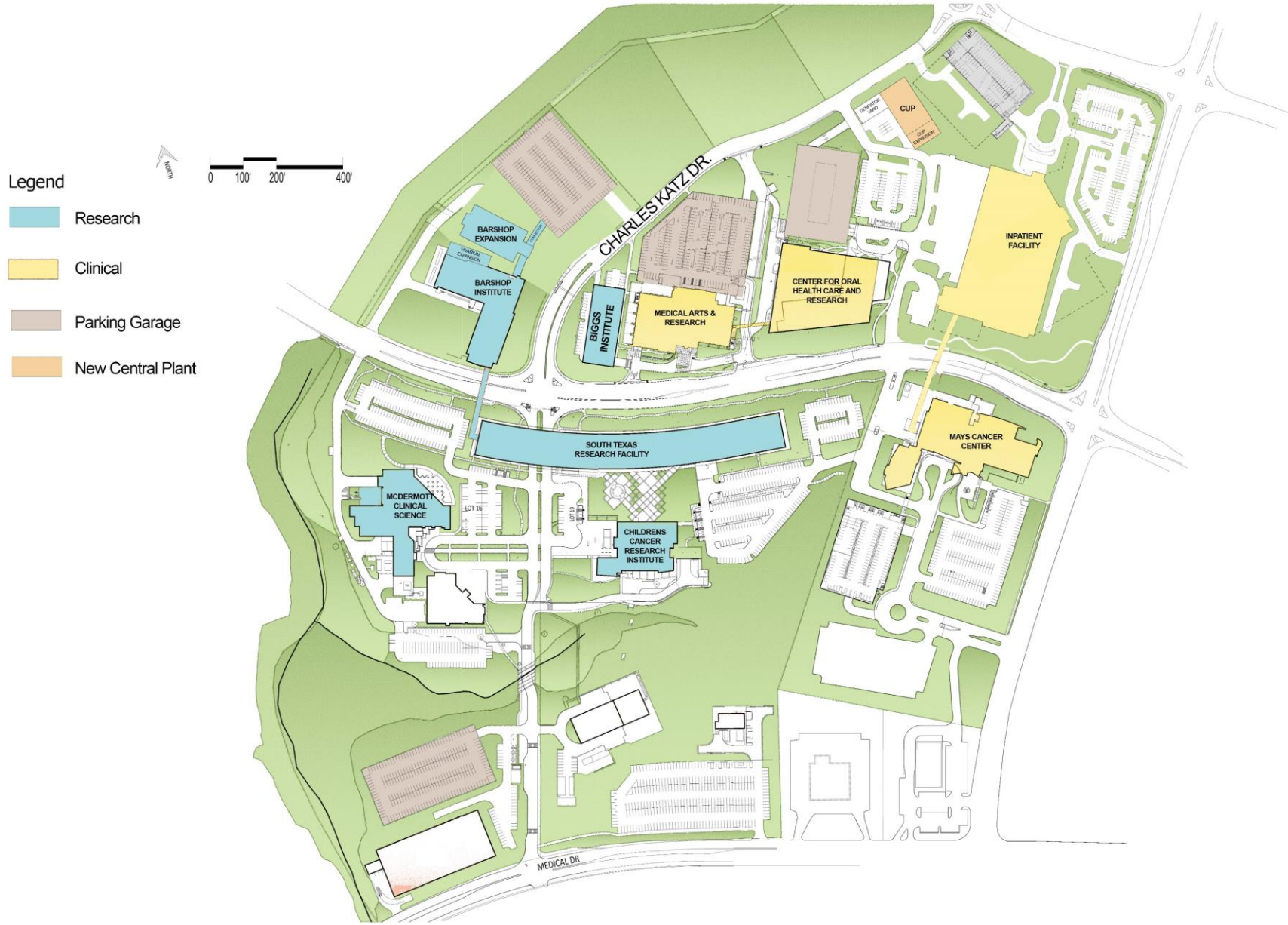
UT Health San Antonio
The University of Texas Health Science Center at San Antonio

- Facilities Management of Greehey Campus
- 1.4 million gross square feet of space over 14 buildings
- Two buildings currently under construction
  - Park West – 80,000-square-foot outpatient clinic
  - 144-bed multispecialty & research hospital
- Future construction of Center for Brain Health and Barshop expansion

UT Health San Antonio

The University of Texas Health Science Center at San Antonio

GREEHEY CAMPUS



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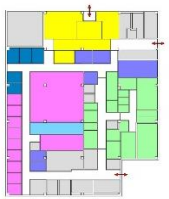
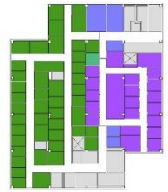


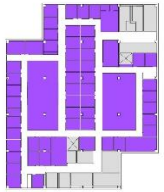
Level 1

Level 2

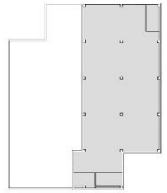
Level 3



Level 4



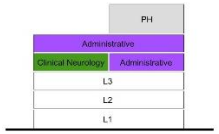
Level 5



Level 6

Legend:

Section Diagram:



Exam Room/
Office Breakdown:

Shell Space (sf):	0
Exam Rooms:	104
Clinical Offices:	9
Admin Offices:	66
Workstations:	74

3D Massing Model:

BACKGROUND

Greehey Campus

YEAR BUILT	BUILDING	GSF
1991	McDermott Clinical Science Building	137,768
1994	Mays Cancer Center (Grossman Building)	87,403
1998	Research Administration Building	112,701
2001	Mays Cancer Center (Zeller Building)	103,343
	Mays Cancer Center (Urschel Tower)	71,981
2003	Office of New Construction	3,995
	North Energy Plant	12,703
	Children's Cancer Research Institute	105,432
2010	Medical Arts Research Center	280,034
2011	North Energy Plant Expansion	6,877
	South Texas Research Facility	188,530
2015	Center for Oral Health Care & Research	200,986
2019	Advanced Datacenter	3,170
2020	Barshop Center for Aging Research	109,785

TOTAL ADDED GSF BY YEAR	
1991	137,768
1994	84,403
1998	112,701
2001	175,324
2003	122,130
2010	280,034
2011	195,407
2015	200,986
2019	3,170
2020	109,785

Total GSF
1,424,708

OPENING DATE		
2024	Clinical Research Thermal Plant	22,400
	In-Patient Hospital	448,819
2025	Center for Brain Health	90,000

Upcoming GSF
541,219

Lack of granular insight into operations

PROBLEM 1

Cumbersome data collection processes

PROBLEM 2

Infrastructure gaps & safety concerns

PROBLEM 3

Low system visibility & deliverables

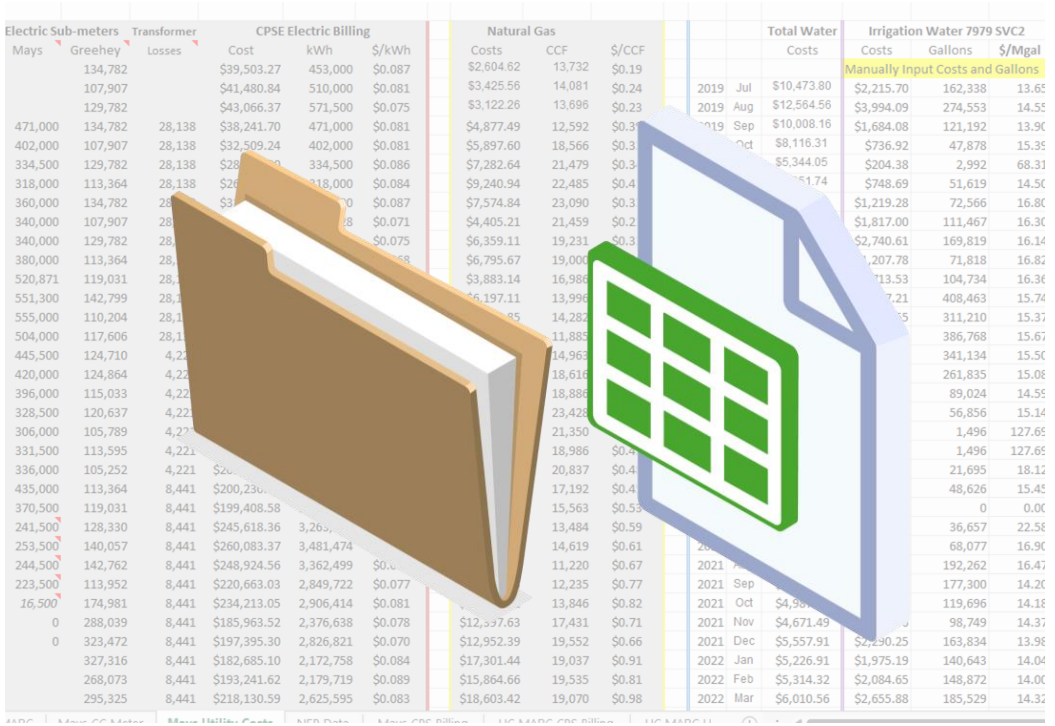
PROBLEM 4

Lack of bandwidth, resources, & expertise

PROBLEM

1: Cumbersome data collection processes

* Once-monthly manual meter reads
* 2 master spreadsheets
    * 48 tabs
    * 20,000 cells w formulas
    = Data management nightmare



PROBLEM

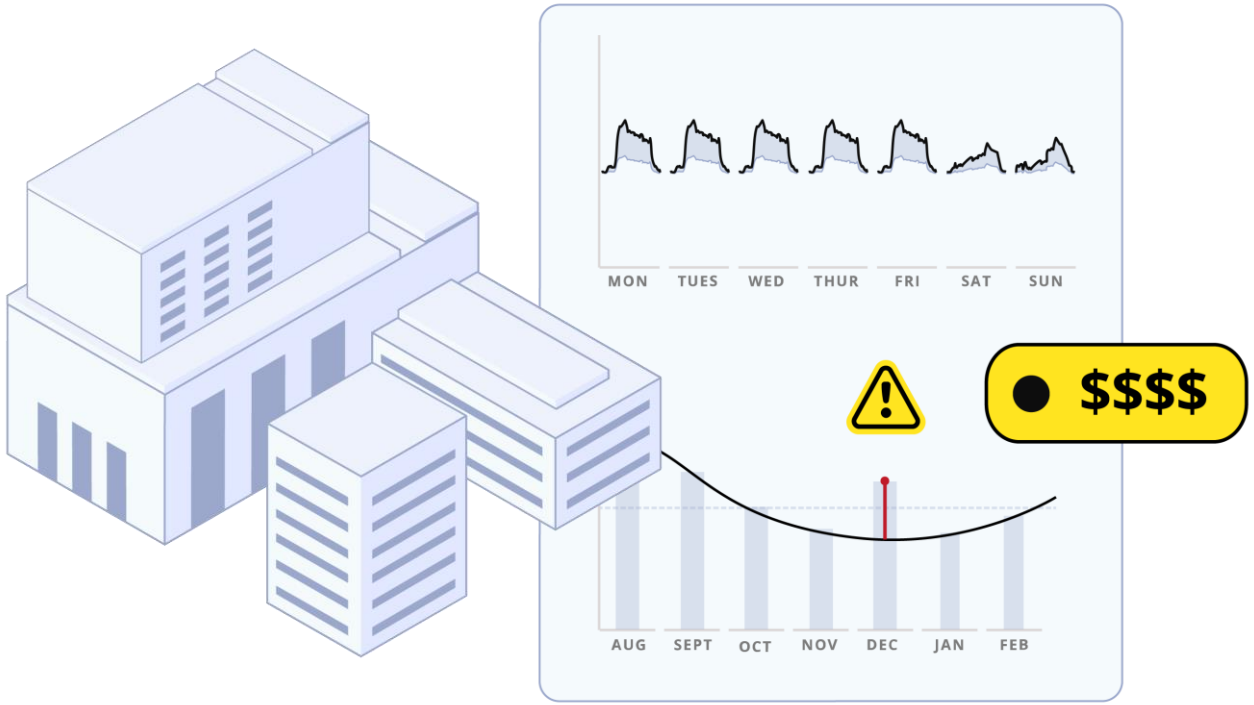
2: Infrastructure gaps & safety concerns

- Insufficient meter coverage
- Outdated equipment that cannot network
- No primary system to capture, store, or display data
- Safety concerns and system impacts when reading meters
- Outage notifications

PROBLEM

3: Low system visibility & deliverables

- No granular data for baseline evaluation
- No real-time dynamic alerting
- Inability to identify drift or effectiveness of energy conservation measures
- No detailed deliverables for tenants



PROBLEM

4: Lack of bandwidth, resources & expertise

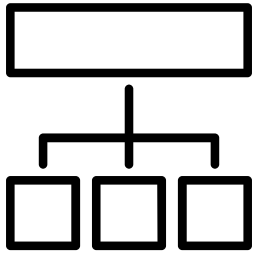
- Need time and resources (people and technology) associated with investigating interval data and making it actionable
- Existing BAS systems must have the ability and functionality for utility evaluation
- Staff have to focus on utility niche in addition to daily responsibilities
- Exporting data and creating customized graphs and tools to help diagnose electrical usage is a specialized skill

Without these tools & team, it would just be a report sitting on a shelf. It's nice to get information translated onto a system and operations center that makes the data actionable.

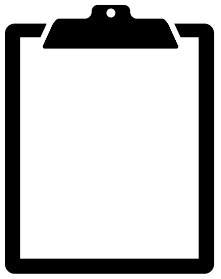
– Major Jeff Davidson

PROBLEM

Net Results of Legacy Submetering Process

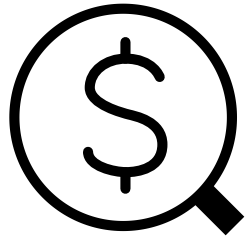


Underbilling of department utility costs

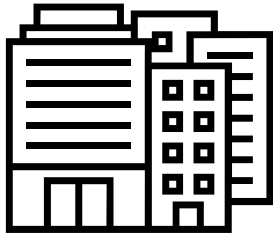


Laborious, time-intensive process that can't be delegated

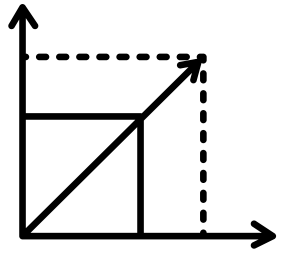
Difficulty in troubleshooting data errors or anomalies



No ability to substantiate ECMs/ROIs and building drift



No baseline building consumption for comparison



Inability to scale with campus additions and changes

No data for informed decision-making as the campus grows

Tenants unable to visualize their electrical consumption

Goals of New Submetering Process

- Transparency
- Utility costs per building
- Cost per degree program
- Data for campus planning
- Account for transmission loss & inaccurate readings
- Budgeting and allocating utility costs
- Environmental & sustainability planning
- Compliance with stricter reporting and decarbonization goals

Voltages ranging from the incoming 35kV level to the 480V distribution level switchgear

Integration of electric metering from different manufacturers

Collecting data from various buildings and transmitting integral data through the JACE

1. Audit / Procure
2. Install / Replace
3. Test
4. Capture Data
5. Validate

Outcomes

Pre-Implementation [UTHSCSA]

- Manual period read meters
- Record in spreadsheet
- Allocate costs
- Cross-reference utility bills
- Submit to accounting/billing for payment

Post-Implementation [utiliVisor]

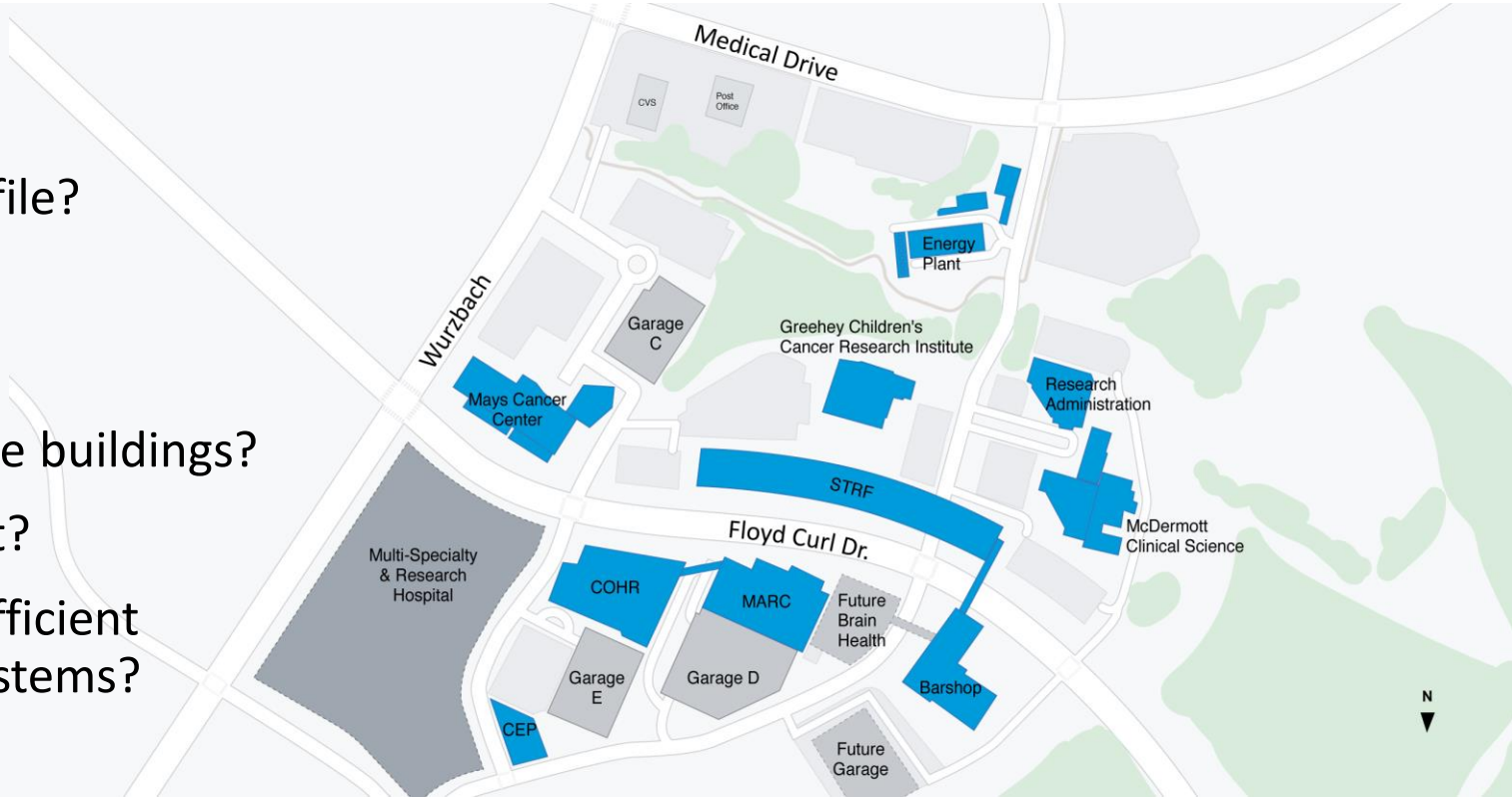
- Automatic interval readings
- Validation of utility fee structure
- Ability to pull utility reports and readings for any date & time interval
- Cross-reference of costs for similar building usage
- Utility bill reconciliation
- Continuous oversight of utilities consumption from an operations center
- Alerts for high electrical usage & anomalies
- Dynamic notifications from operations team
- Billing package & deliverables

RESULTS

Full Oversight Capability

Metrics for Future Growth & Decarbonization Decisions

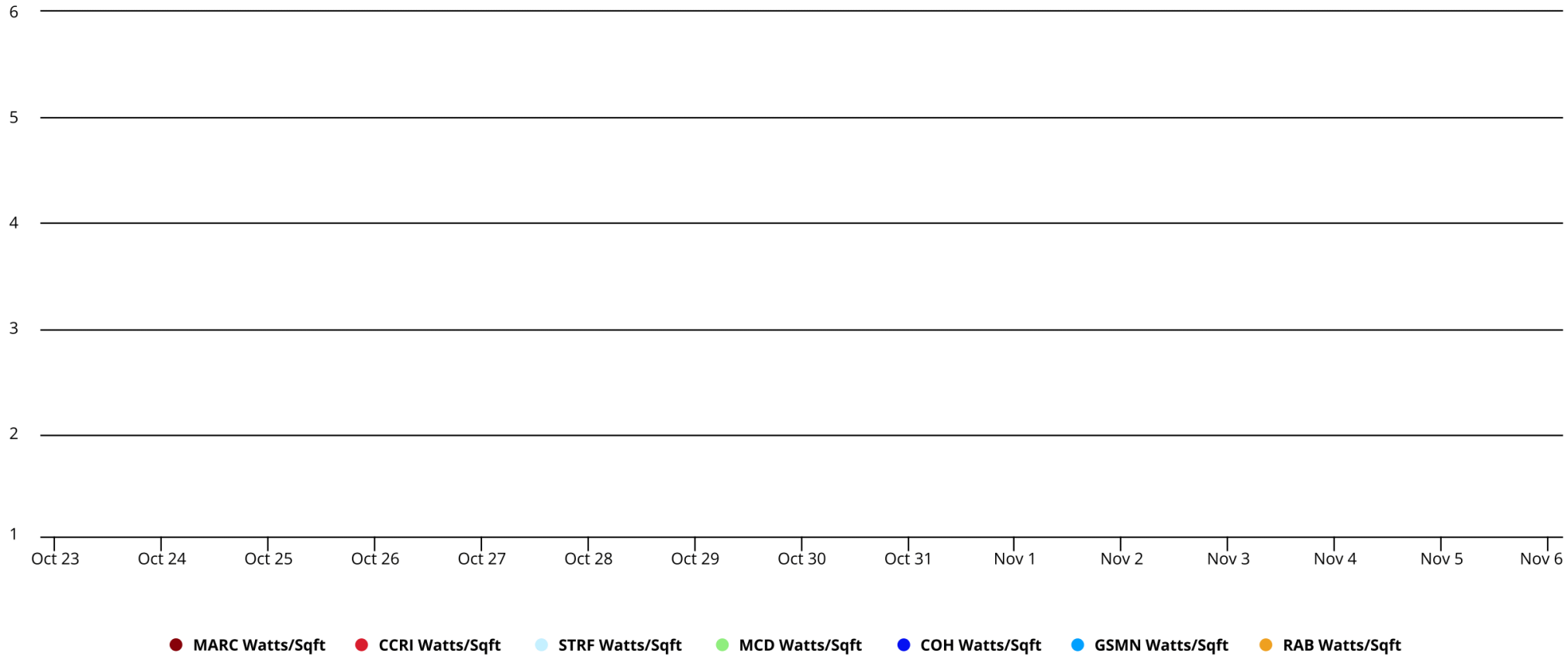
- Where are electrical loads constant?
- What is each building's electrical profile?
- What is the cost per square foot?
- What are peak load characteristics?
- Is watts/sq. foot similar to comparable buildings?
- What is our baseline carbon footprint?
- What is the best basis of design for efficient building materials and mechanical systems?



RESULTS

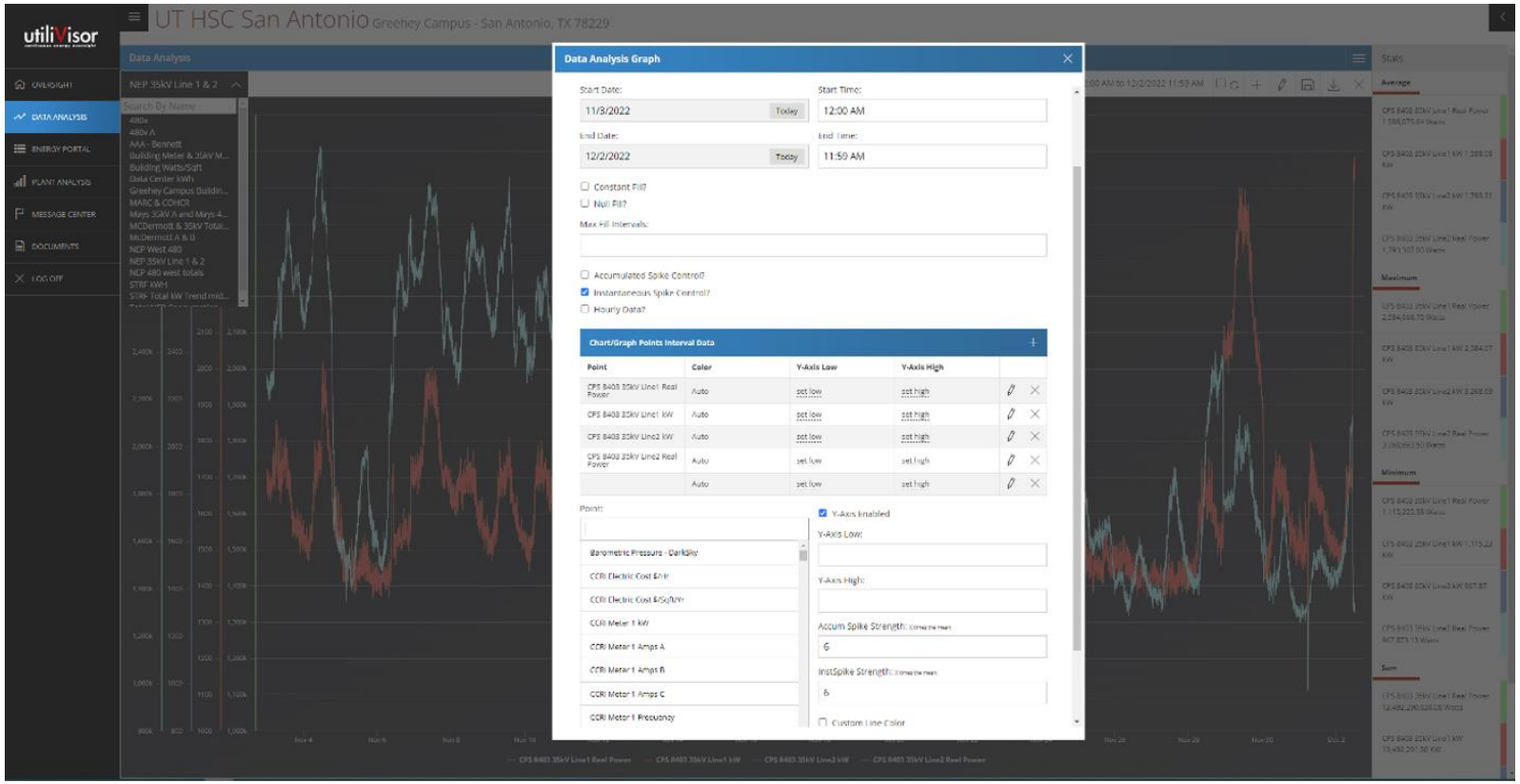
Full Campus Visibility

BUILDING WATTS / SQ. FT



RESULTS

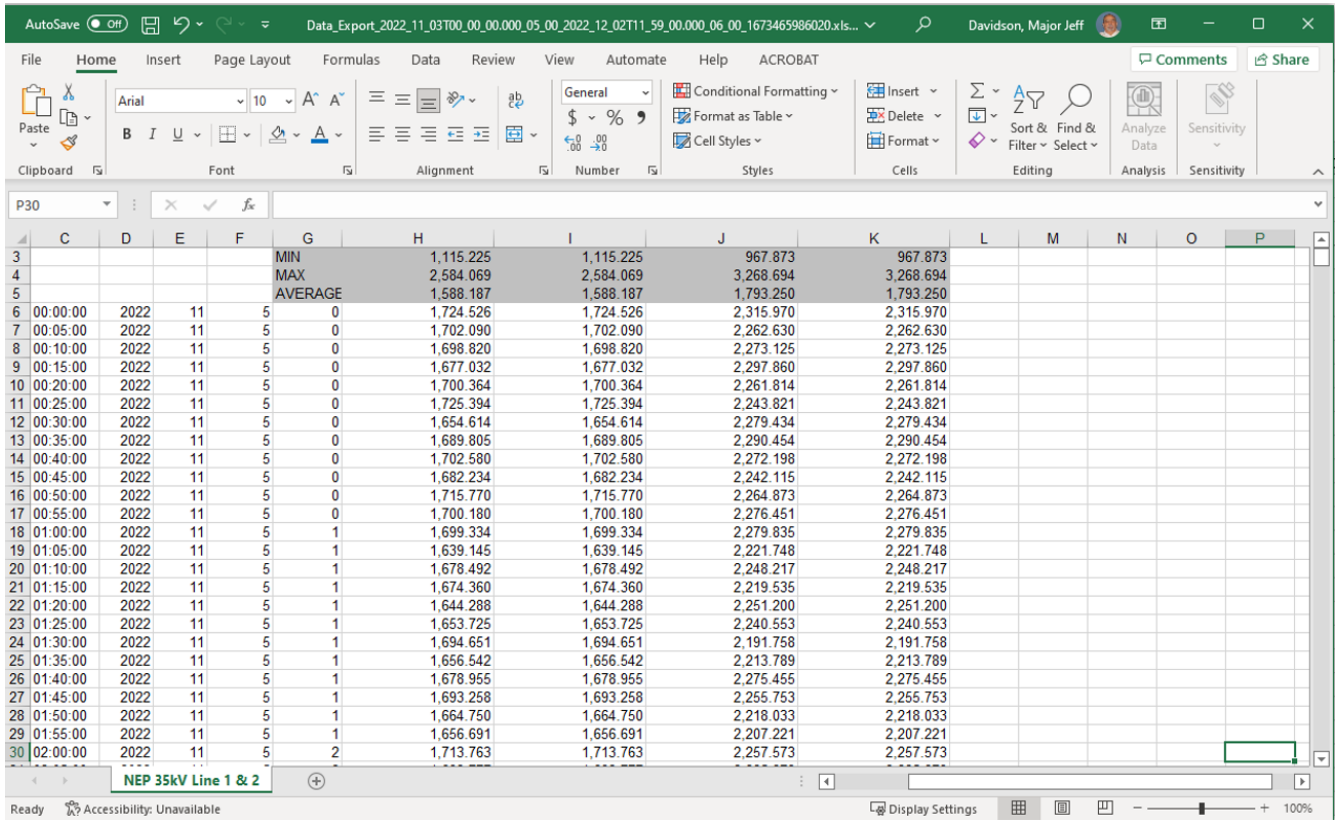
Full Campus Analysis



- User access to create charts / graphs
- User-defined performance metrics
- Setup by an experienced operations team
- Access control
- Download to Excel

RESULTS

Full Campus Analysis



	C	D	E	F	G	H	I	J	K	L	M	N	O	P
3					MIN	1,115.225	1,115.225	967.873	967.873					
4					MAX	2,584.069	2,584.069	3,268.694	3,268.694					
5					AVERAGE	1,588.187	1,588.187	1,793.250	1,793.250					
6	00:00:00	2022	11	5	0	1,724.526	1,724.526	2,315.970	2,315.970					
7	00:05:00	2022	11	5	0	1,702.090	1,702.090	2,262.630	2,262.630					
8	00:10:00	2022	11	5	0	1,698.820	1,698.820	2,273.125	2,273.125					
9	00:15:00	2022	11	5	0	1,677.032	1,677.032	2,297.860	2,297.860					
10	00:20:00	2022	11	5	0	1,700.364	1,700.364	2,261.814	2,261.814					
11	00:25:00	2022	11	5	0	1,725.394	1,725.394	2,243.821	2,243.821					
12	00:30:00	2022	11	5	0	1,654.614	1,654.614	2,279.434	2,279.434					
13	00:35:00	2022	11	5	0	1,689.805	1,689.805	2,290.454	2,290.454					
14	00:40:00	2022	11	5	0	1,702.580	1,702.580	2,272.198	2,272.198					
15	00:45:00	2022	11	5	0	1,682.234	1,682.234	2,242.115	2,242.115					
16	00:50:00	2022	11	5	0	1,715.770	1,715.770	2,264.873	2,264.873					
17	00:55:00	2022	11	5	0	1,700.180	1,700.180	2,276.451	2,276.451					
18	01:00:00	2022	11	5	1	1,699.334	1,699.334	2,279.835	2,279.835					
19	01:05:00	2022	11	5	1	1,639.145	1,639.145	2,221.748	2,221.748					
20	01:10:00	2022	11	5	1	1,678.492	1,678.492	2,248.217	2,248.217					
21	01:15:00	2022	11	5	1	1,674.360	1,674.360	2,219.535	2,219.535					
22	01:20:00	2022	11	5	1	1,644.288	1,644.288	2,251.200	2,251.200					
23	01:25:00	2022	11	5	1	1,653.725	1,653.725	2,240.553	2,240.553					
24	01:30:00	2022	11	5	1	1,694.651	1,694.651	2,191.758	2,191.758					
25	01:35:00	2022	11	5	1	1,656.542	1,656.542	2,213.789	2,213.789					
26	01:40:00	2022	11	5	1	1,678.955	1,678.955	2,275.455	2,275.455					
27	01:45:00	2022	11	5	1	1,693.258	1,693.258	2,255.753	2,255.753					
28	01:50:00	2022	11	5	1	1,664.750	1,664.750	2,218.033	2,218.033					
29	01:55:00	2022	11	5	1	1,656.691	1,656.691	2,207.221	2,207.221					
30	02:00:00	2022	11	5	2	1,713.763	1,713.763	2,257.573	2,257.573					

- User access to create charts / graphs
- User-defined performance metrics
- Setup by an experienced operations team
- Access control
- Download to Excel

RESULTS

Increased Building Visibility

Example Building Metrics

STRF Building

COST / SQ. FT
$2.88

WATTS / SQ. FT
3.9255

ELECTRIC COST / HR
$49.39

AS OF **12/27/22**

RESULTS

Increased Building Visibility

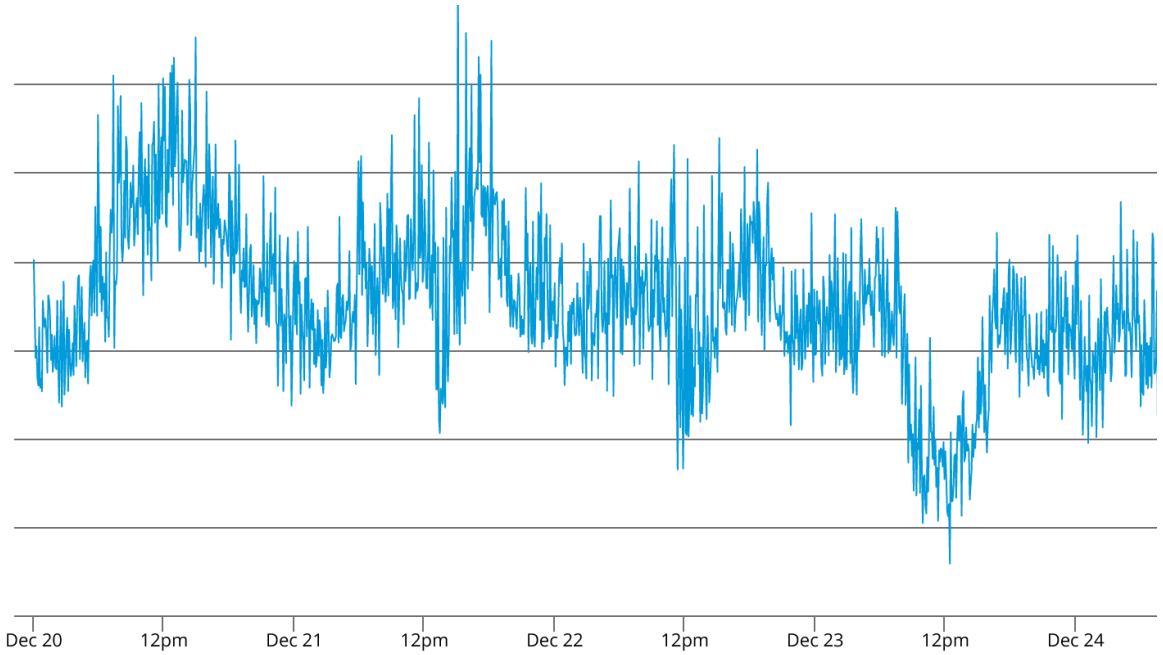
MONTHLY READING

860kW

STRF December

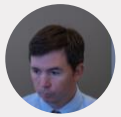
vs

REAL-TIME READINGS

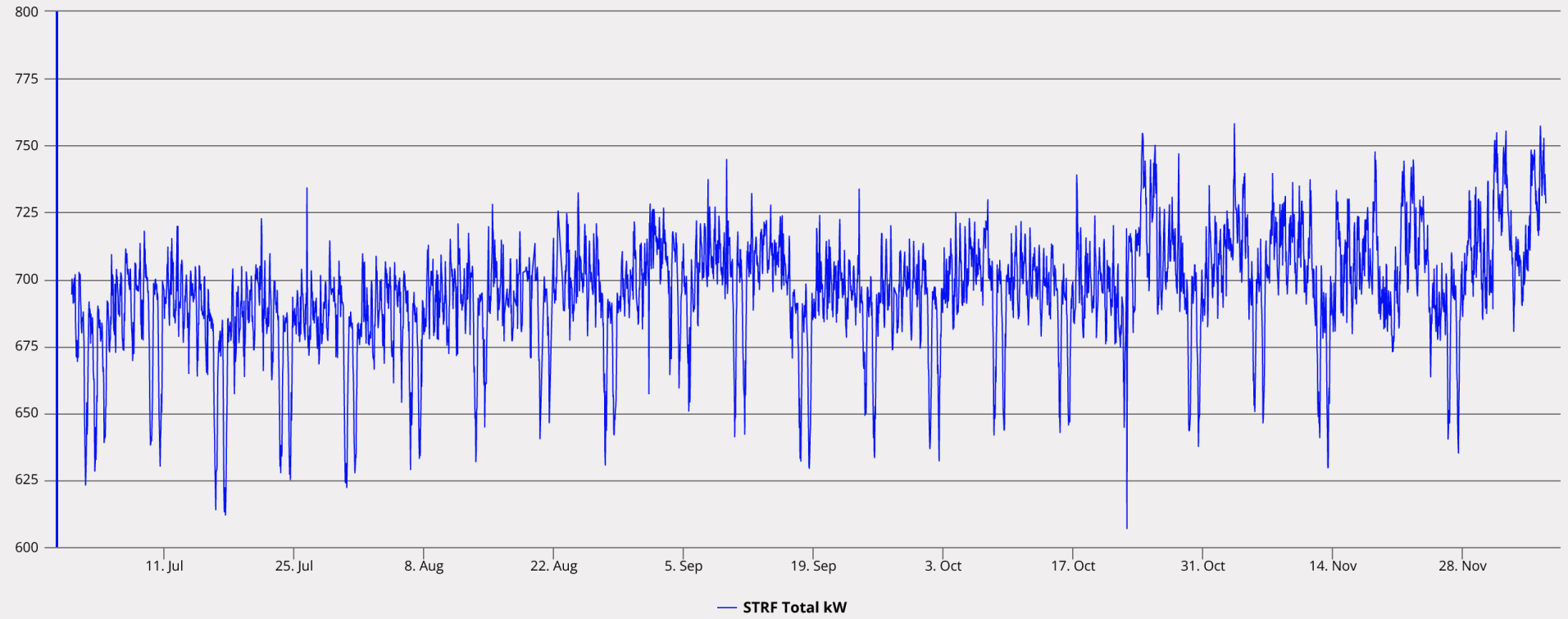


RESULTS

Example: STRF Total kW Trend Anomaly



ERICH HESS
Senior Systems Engineer at utiliVisor



RESULTS

Early Successes

RESULT

5 min

Interval meter data

RESULT

Real-time

Outage alerts

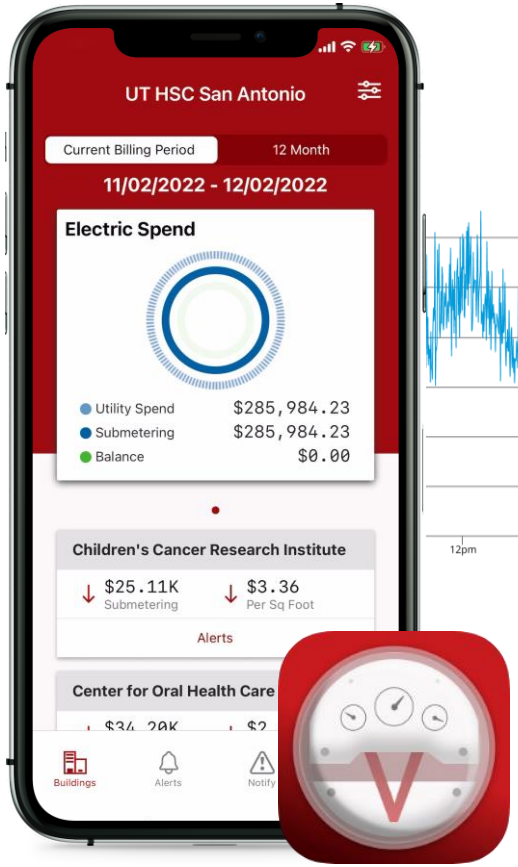
RESULT

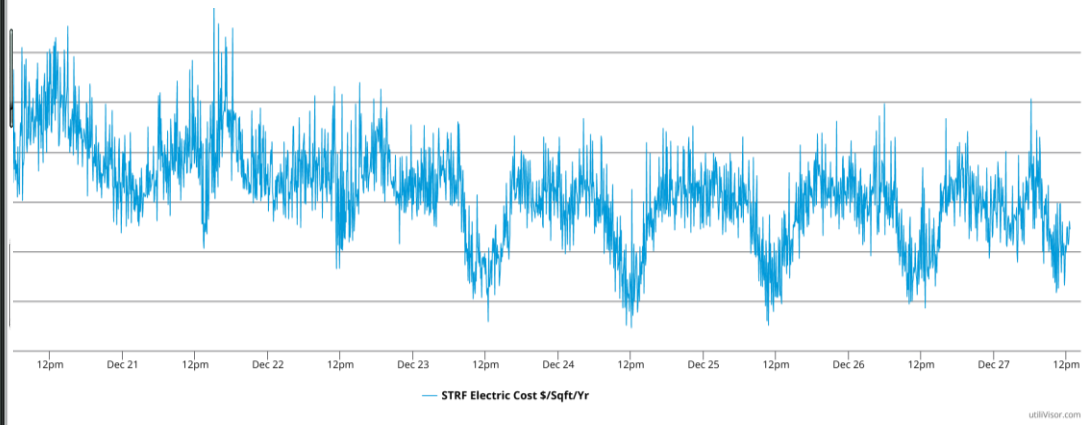
$427K saved in 3 mo.

Utility overbilling

RESULTS

Continuous Energy Oversight





How can we help shortcut your learning curve?

1. Coordinate across all shareholders (Especially campus electrical and IT departments) early and often.
2. Expect delays to occur periodically.
3. Partner with a metering expert that has a turnkey reading, billing, and performance monitoring solution.
4. Provide guidance on meter selection.

Questions?

Michael Charlton, Ph.D.

Major Jeff Davidson

UT Health San Antonio
The University of Texas Health Science Center at San Antonio

Shannon McAuliffe

utiliVisor