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4B3 District Demand-Side Energy Management System

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The Past

- Energy Portal no direct control over adding new features, dated interface
- ITS Firewalls make it really hard to share data with campus researchers and third party service providers
- Manual data entry from internal meters to billing software
- Multiple locations of data storage
- Analytics and visualization tools limited to MS Excel

The Need

- Single location to house data
- To organize and analyze energy and water data
- Automation that eliminates manual errors
- Accommodate recent focus on Greenhouse Gas Emissions
- Data analytics and visualization tools for internal stakeholders
 - Predictive modeling
- To reach UT's energy & water conservation goals
- Interactive public website for users to explore UT buildings' energy and water use and our efforts to reduce their environmental footprint
- Easily provide data to campus researchers and third party service providers without having to make multiple holes through firewalls



Project Themes



Data Visualization Product Comparison

Data Visualization Product	Cloud Compatible	Automatically refreshes all** data sources	User can create custom charts & reports	Web-Based Application (runs on multi- platform)	Cost/ Month
Tableau	\checkmark	\checkmark	\checkmark	\checkmark	\$1,925
Power Bl	\checkmark	\checkmark	\checkmark	×	\$750
QuickSight	\checkmark	\checkmark	\checkmark	\checkmark	\$188
Google Analytics	\checkmark	\checkmark	\checkmark	\checkmark	?
Energy Portal	X	×	×	×	\$0
In-House Product	X	\checkmark	X	\checkmark	\$0



UT Energy Hub

UT Energy Hub

EXTERNAL LINKS

L Quicksight Dashboard

Power Generation Overview

- Q PRISM Insight
- UEM Website
- 😑 pgAdmin

💋 Trefoil

NAVIGATION

- ECM Forms
- Meter Validation App
- ப் Logout



Welcome to the UT Energy Hub

Current Projects (hover over images for more info)





ECM Project Form

[tonhr]

laseline

[kWh]

Project Info						
Building: JCD	~		Baseline	Reporting		
Measure Type: EMOCx	~	Start Date:	2017-08-31	2020-08-15	Staff Lead:	Ý
Status: 4-Completed	~	# of Days:	365	365	Staff Support:	×
Project Fiscal Year: 2020		End Date:	2018-08-30	2021-08-14	Analyst:	×
Project Description: Revis Supp Instal Nonenergy Benefits: Resc	ed sequences of c y air temperature ed new variable f ved 250+ issues	peration for 3 and static pre requency drive with air handle	3 air handlers a ssure resets for a and associate ers and building	nd associated he air handlers as a d controls for AH automation syst	eating and chilled water pur appropriate for each system IU AC01M. tem graphics.	nps.
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HHW [mmbtu] WTR [kgal] Peak CHW

[Hours]

Predicted A	alysis												
	CHW [tonhr]	ELE [kWh]	STM [lb]	HHW [mmbtu]	GAS [CCF]	WTR [kgal]	Peak CHW [ton]	Labor [Hours]	Total	Miscellaneous [\$]	Annual Cash Flow [\$]	Payback [years]	NPV [\$]
Predicted	756,566	603,058	3,980,000				251						
	ø	ø	ø				ø						
%	13%	8%	21%				30%		13%				
Plant Gas (mmbtu)	4,656	5,716	4,400						14,771				
CTWater [kgal]	1,347								1,347				
UEM	\$23,494	\$21,748	\$16,741						\$61,983		\$61,983	0.00	\$ 502,737
υτ	\$23,494	\$21,748	\$16,741						\$61,983		\$61,983	0.00	\$502,737
AUX	\$145,261	\$41,008	\$105,470						\$291,739		\$289,439	0.51	\$2,200,207

M&V Analysis													
	CHW [tonhr]	ELE [kWh]	STM [Ib]	HHW [mmbtu]	GAS [CCF]	WTR [kgal]	Peak CHW [ton]	Labor [Hours]	Total	Miscellaneous [\$]	Annual Cash Flow [\$]	Payback [years]	NPV [\$]
M&V	1,359,475	1,157,663	9,297,807				84						
	ß	ø	Ø				ø						
%	24%	16%	50%				10%		25%				
Plant Gas [mmbtu]	8,366	10,972	10,278						29,616				
CTWater [kgal]	2,420								2,420				
UEM	\$42,216	\$41,749	\$39,109						\$123,074		\$123,074	0.00	\$998,240
υτ	\$42,216	\$41,749	\$39,109						\$123,074		\$123,074	0.00	\$998,240
AUX	\$261,019	\$78,721	\$246,392						\$586,132		\$583,832	0.25	\$4,588,002

Meter Validation App

Sa

Steward:	Select Stewar	rd		✓ APPLY
Search		Remove 0	's 🗸 Sł	now Reviewed 🗸
Bu	uilding	Meter	# of Flags	Reviewed
AC	СВ	A2095	35	No
AC	СВ	E1540	58	No
AC	СВ	E1559		No
	рн	A0001	33	No
O AC	ЭН	E1075		No
• AC	рн	E1076		No
• AC	рн	S0001		No
• AF	łG	A2101		No

CONFIRM METER SELECTION

E1075

This meter and E1076 were IP inverted until 12/21 when they were switched. Baselines will not be accurate until 12/22.

Analysis Start: 2022-04-01

Analysis End: 2022-04-30

RUN MODEL



ed Model:	Base Temp:	% Auto lanored:	Slope:	Intercept:	R-Squared:	Std Dev:	Start Date:	End Date:
			74 70	500.01	0.75	4577.44	2024 02 04	2022 02 27
	53	0%	/1./2	500.01	0.75	457.11	2021-03-01	2022-02-27

<u> </u>						 	
•							
•							
•							
• 0							
•	2022-04-26	65.3	13	1655	1382		

Weter

Campus Map



Campus Summary

Total Energy Consumption

Date Range: Last 12 Months



Campus Summary



Campus Summary



Building

Individual Building Overview



JES Metadata, consumption, EUI & WUI

Building Summary

Full name	Beauford H. Jester Center
Acronym	JES
Aliases	
Use type	Food Service
Gross square footage	179,357
Year constructed	1969
Zone	4
Owner	UHD, E&G, TXU, ATM
Steward	Matt Stevens
BAS	Andover
DDC level	4-Full AHU No Zones
Cooling commodity	CHW
Heating commodity	STM
CHW service provider	UEM
STM service provider	UEM
ELE service provider	UEM
HHW service provider	
GAS service provider	TCLO

Space Use Type Allocation





Target Water Use Intensity (WUI) Gallons/ft^2/year



Building Rolling Source EUI vs Target



Project Table

Energy Conservation Measure (ECM) Project Summary

Energy Savings	Energy Savings per Commodity (%)	Peak CHW Savings	Water Savings
16%	HHW GAS STM CHW ELE 0.00 20.00 40.00 50.00	12%	27%

Projects

Click on a Project ID to view individual project results

Project ID	Project Description	Staff Lead	Payback (Years)	Plant Gas Savings (mmBTU)	Cost (\$)	Annual Savings (\$)
ADH 2018 EMOCx	CP713117	Adam Keeling	Immediate	4,649	0	20,572
ADH 2022 Temporary Scheduling	Holiday Scheduling: 12/16/21 - 1/16/22	Meagan Jones	Immediate	2,779	0	11,132
BAT 2013 Scheduling	HVAC Scheduling	Matt Stevens	Immediate	277	0	758
BEN 2013 Scheduling	HVAC Scheduling	Matt Stevens	Immediate	2,635	0	13,292
BMC 2015 EMOCx	Repaired or replaced minor equipment $\hfill\square$ sensors & actuators \dots	Grace Hsieh	0.56	3,964	9,792	17,580
BMC 2020 EMOCx wFDD	Pilot project for Texas A&M's Energy Systems Laboratory Faul	Grace Hsieh	0.88	2,145	5,500	6,223
BME 2016 EMOCx	Repaired or replaced minor equipment - sensors & actuators	Meagan Jones	3.66	6,019	113,187	30,951
BME 2017 Optimum Energy	BME OE Optimum Air Project: Added supply air temp and stat	Meagan Jones	12.47	5,116	206,302	16,543
BME 2019 Heat Recovery	Drained, flushed and repaired leaks in the hydronic heat	Pat Mazur	11.05	828	42,507	3,847
BME 2021 Water	Replace 2 Nash-Hytor liquid ring, building wide vacuum pum	Pat Mazur	7.01	-3	32,789	4,679
BMS 2017 EMOCx	Repairs: - All Air Handling Unit (AHU) Return Air CO2 sensors	John Milton	0.49	1,260	3,404	6,882
BRB 2014 AHU DDC & Scheduling	BAS upgrade - 64 points	Matt Stevens	16.03	618	56,677	3,535

Project Visual



Lessons Learned

- How to organize and normalize data
- Benefits of web-based services
- Benefits of utilizing and visualizing Big Data
- Confirmed need to clean data for whole process to work better all the way to visualization

Q&A

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