

# **Penn State University Libraries Greenhouse Gas Inventory**

Ben Goldman

University Archivist

NOT IN OHIO!

**Penn State University Libraries**  
**Greenhouse Gas Inventory**

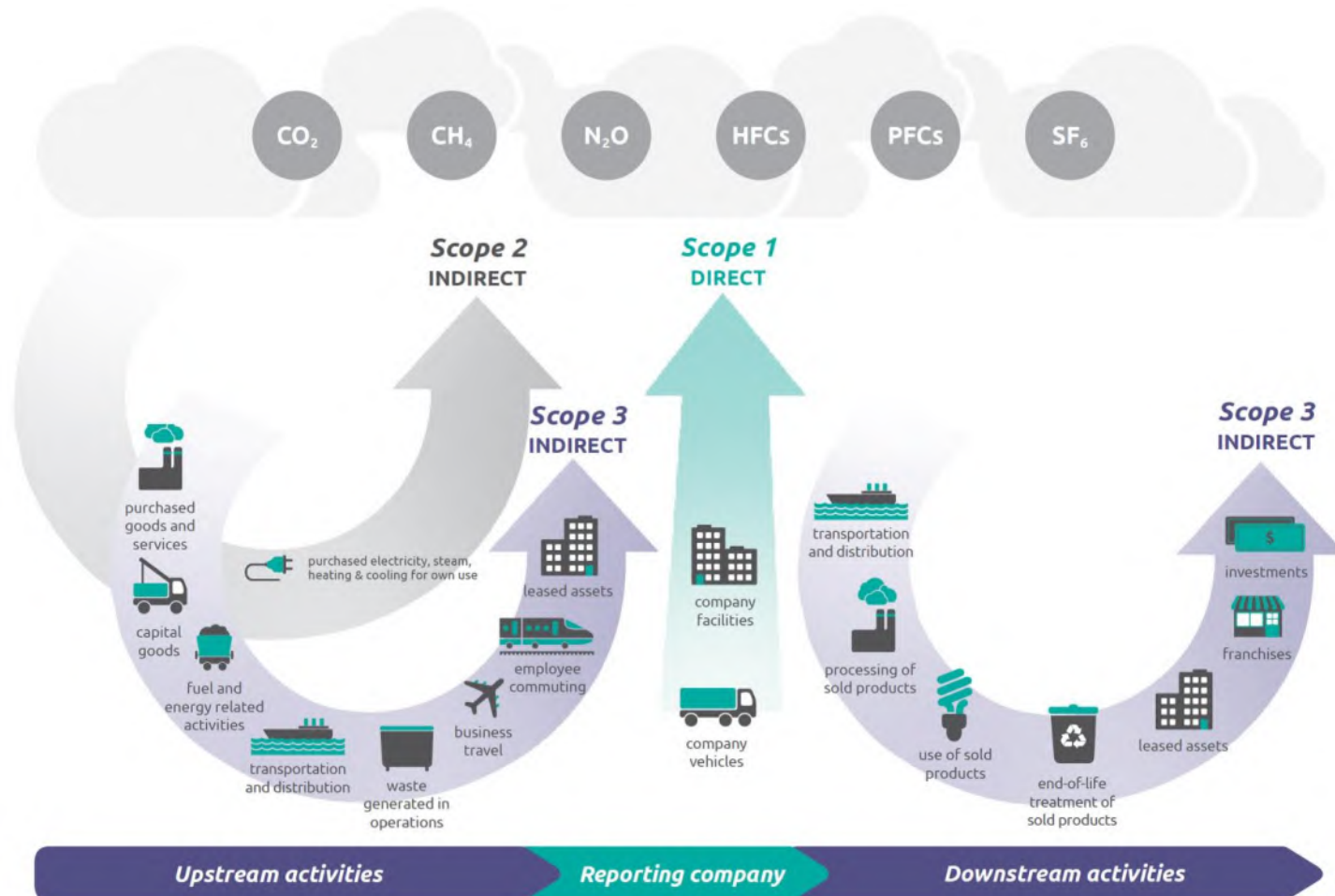
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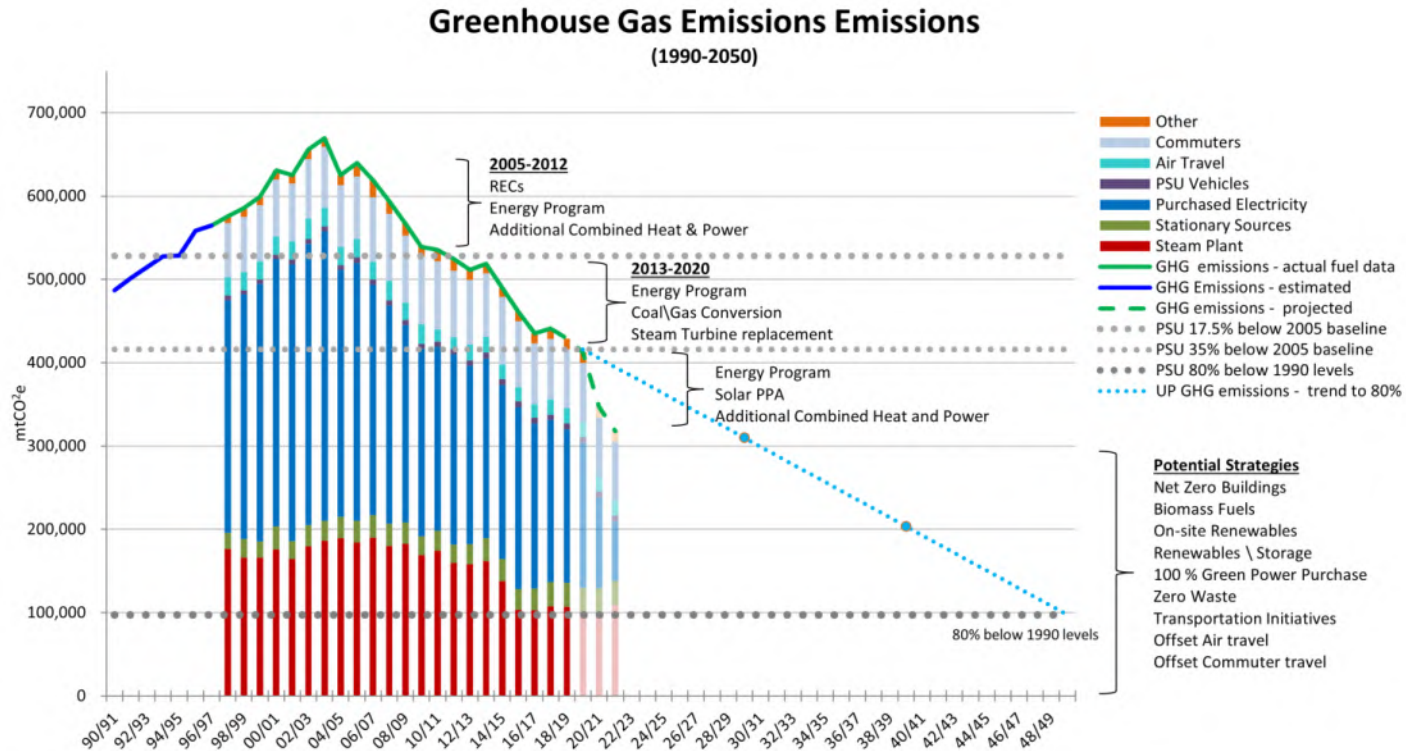
# What is this?

- **GHG Inventory:**  
A breakdown of emissions – the "carbon footprint" – in metric tons of carbon dioxide equivalent (mtCO<sub>2</sub>e) arising from different organizational activities for a selected year.

# Understanding GHG Emissions



# Why Do This?



Other includes waste, refrigerants and animal management. Hershey Medical & Pennsylvania College of Technology not included.

# The Big Picture



[Credit: Shari Gearheard | NSIDC]

“There’s no going back from some changes in the climate system. However, some changes could be slowed and others could be stopped by limiting warming.”

# Project Drawdown Scholars

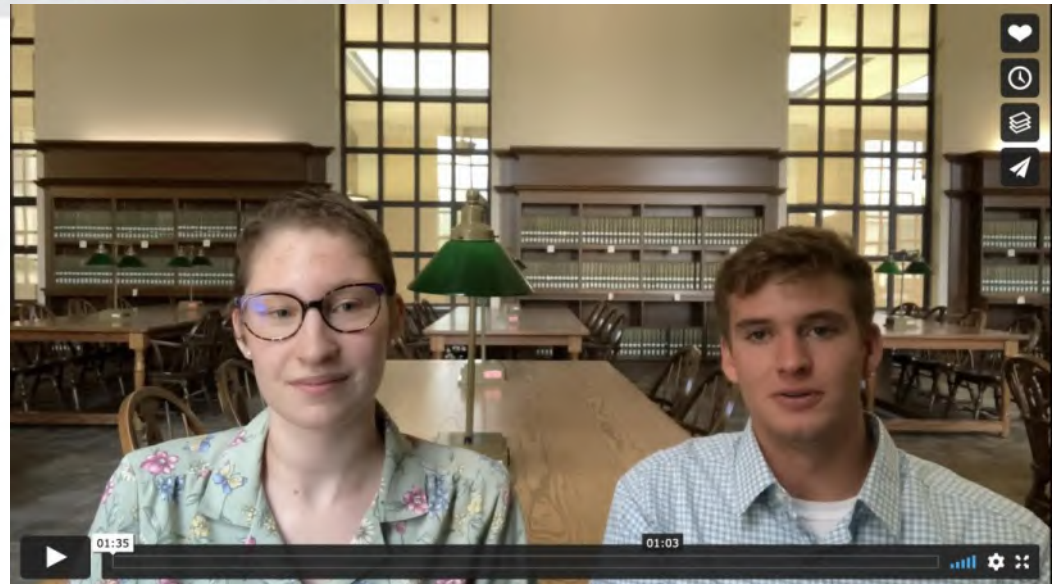


## Program Overview

Penn State is partnering with **Project Drawdown** to explore and enhance “the most comprehensive plan ever proposed to reverse global warming.” The Drawdown mission seeks to clarify a positive solutions-oriented path ahead for action on climate change. By working with researchers from across the world, the team has already identified 100 of the most substantive solutions to address climate change.

The Penn State Drawdown Research Experience for Undergraduates Program (Drawdown Scholars) supports the Drawdown mission by training students in:

- transformational technical, ecological, and social solutions for climate mitigation;
- climate communication;
- environmental law and policy;



# What Was Measured

- Utilities – steam, water, electricity, natural gas, chilled water, and wastewater
- Commuter travel
- Air travel
- Leased and Fleet vehicles
- Data Center
- \*2019

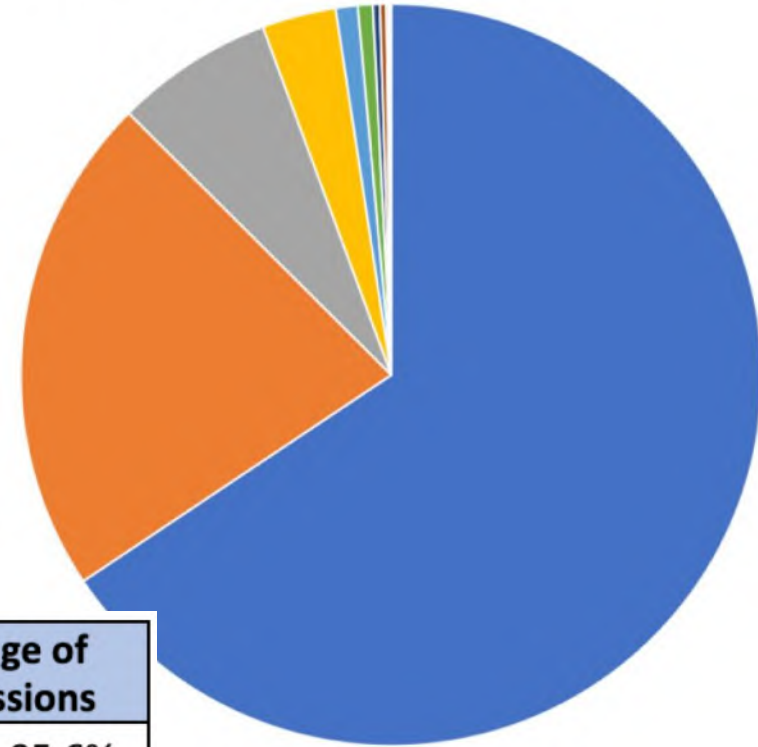


# What Wasn't Measured

- Commonwealth campus employee commuting
- Business travel using personal vehicles
- Interlibrary loan / Remote borrowing / campus delivery
- Procurement (Scope 3)
- Library databases (Scope 3)

# Results

- Electricity
- Steam
- Natural Gas
- Commuter
- Air Travel
- Chilled Water
- Water
- Waste Water
- Leased Vehicles
- Data Center
- Fleet Vehicles



Source	Emissions (MtCO <sub>2</sub> e)	Percentage of Total Emissions
Utilities	10,673	95.6%
Commuter	360	3.2%
Air Travel	107	1.0%
Leased Vehicles	12	0.11%
Data Center	8	0.07%
Fleet Vehicles	5	0.05%
<b>Total</b>	<b>11,165</b>	<b>100.0%</b>

\*\*Complete data and calculations for this inventory are available in an Excel spreadsheet.



**11,165** Metric Tons ▾ of Carbon Dioxide (CO<sub>2</sub>) equivalent

**This is equivalent to greenhouse gas emissions from:**

**2,406** gasoline-powered passenger  
vehicles driven for one year ?



**This is equivalent to CO<sub>2</sub> emissions from:**

**1,256,329** gallons of gasoline consumed ?



**12,353,059** pounds of coal burned ?



**1,406** homes' energy use for one year ?



# Comparison

Source	<u>ECoS</u> Percentage of University (CY2019)	EMS Percentage of University (FY18-19)	UL Percentage of University (CY2019)
Stationary Sources/Purchased Electricity/Steam Plant	8.28%	4.40%	3.33%
Campus Vehicles	0.01%	1.10%	0.24%
Commuters	1.21%	1.70%	0.51%
Air Travel	4.06%	5.10%	0.56%
<b>Total</b>	<b>6.36%</b>	<b>4.10%</b>	<b>2.52%</b>

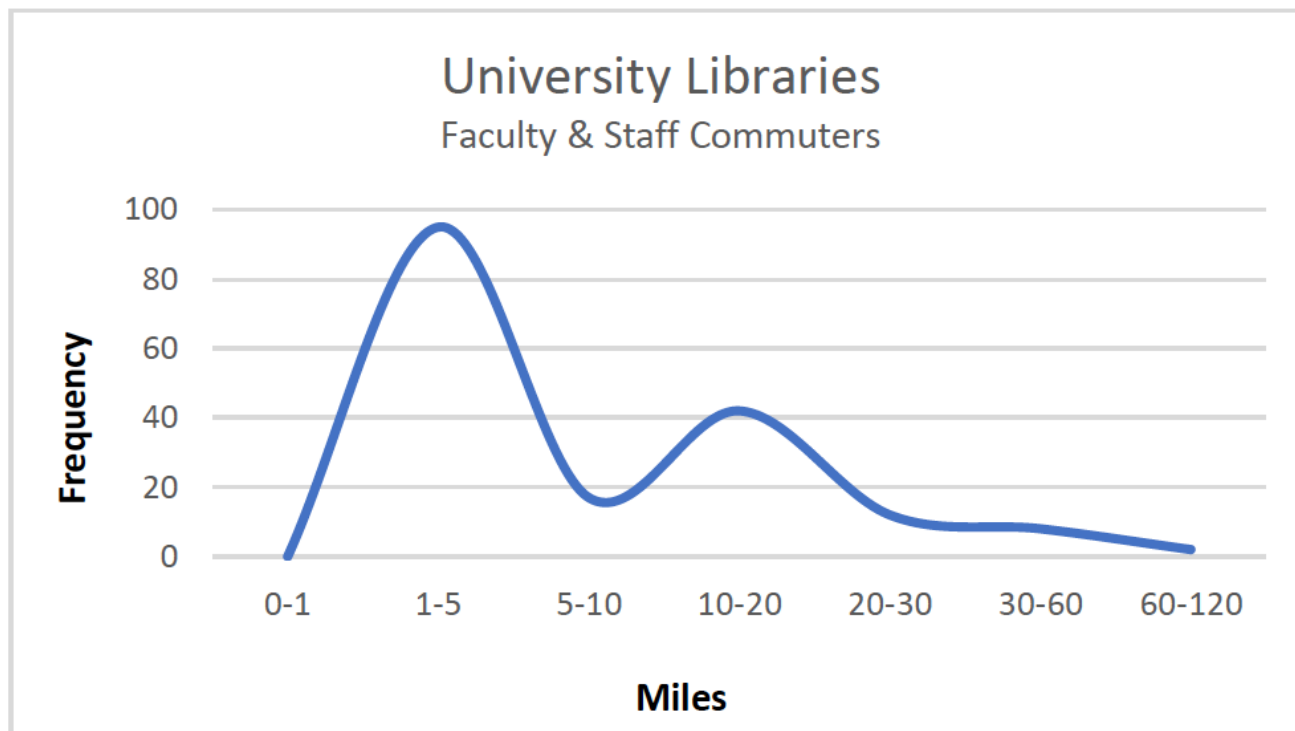
**Table 2.** Simplified Comparison of ECoS, EMS, and UL to University.

# Air Travel

	Definition	Flights	Total Miles	Emissions (MtCO2)
Short Haul	Flight < 300 Miles	185	30,437	6.61
Medium Haul	Flight < 2300 Miles	545	416,498	55.92
Long Haul	Flight > 2300 Miles	67	266,263	44.35
<b>Libraries Total</b>		<b>797</b>	<b>713,198</b>	<b>107</b>

UP FLIGHT HAUL BREAKDOWN		UNIT BREAKDOWNS (FY2018-19)	
AIR DISTANCE	Empirical Proportion of Trips, UP '06-'07	Eberly	University Libraries
Short Haul (<= 300 miles)	18%	6%	23%
Medium Haul (> 300 miles)	39%	38%	68%
Long Haul (> 2300 miles)	43%	57%	8%

# Ground Travel



**Figure 5.** Length of 1-Way Commute for UL Employees

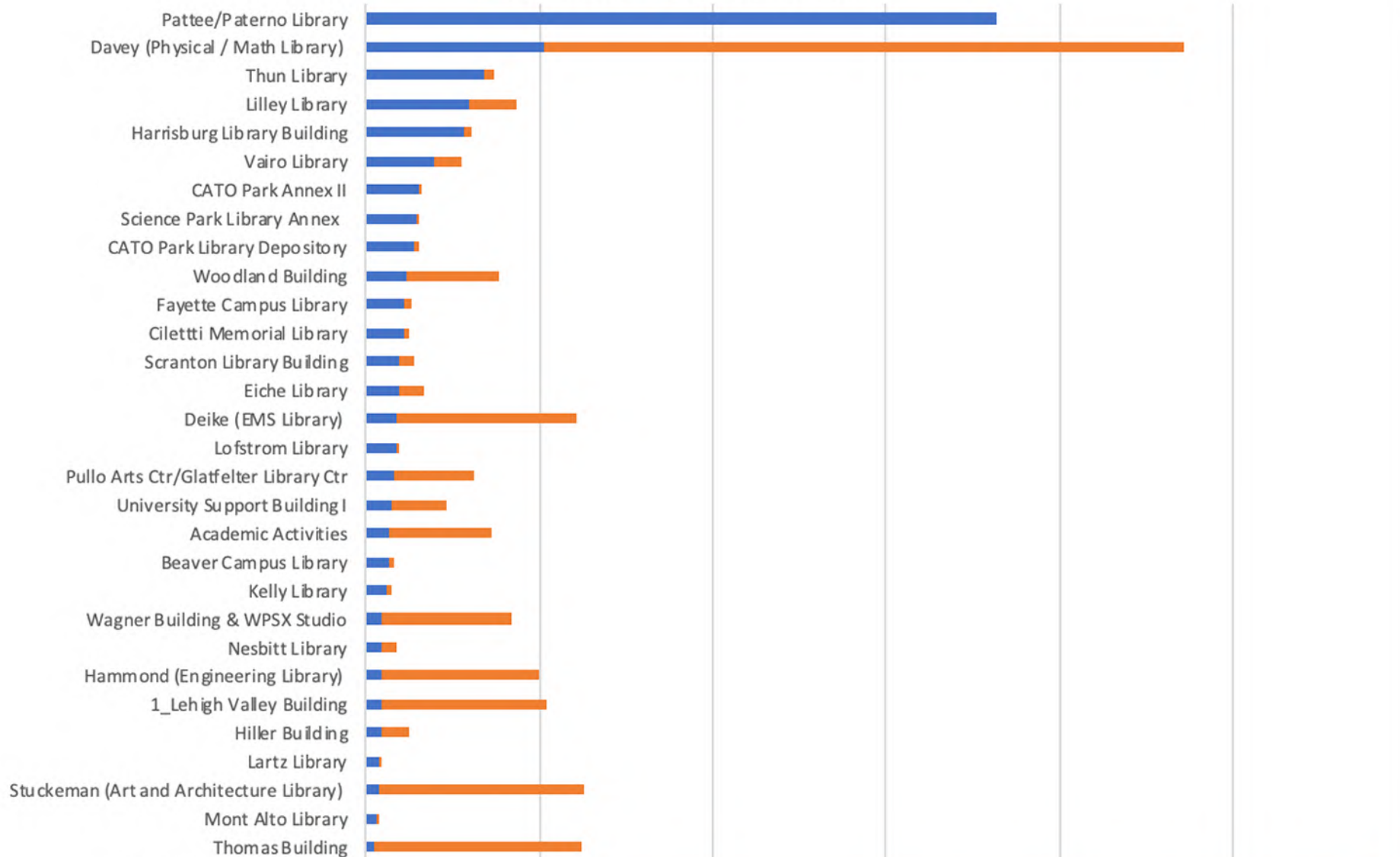
# Data Storage





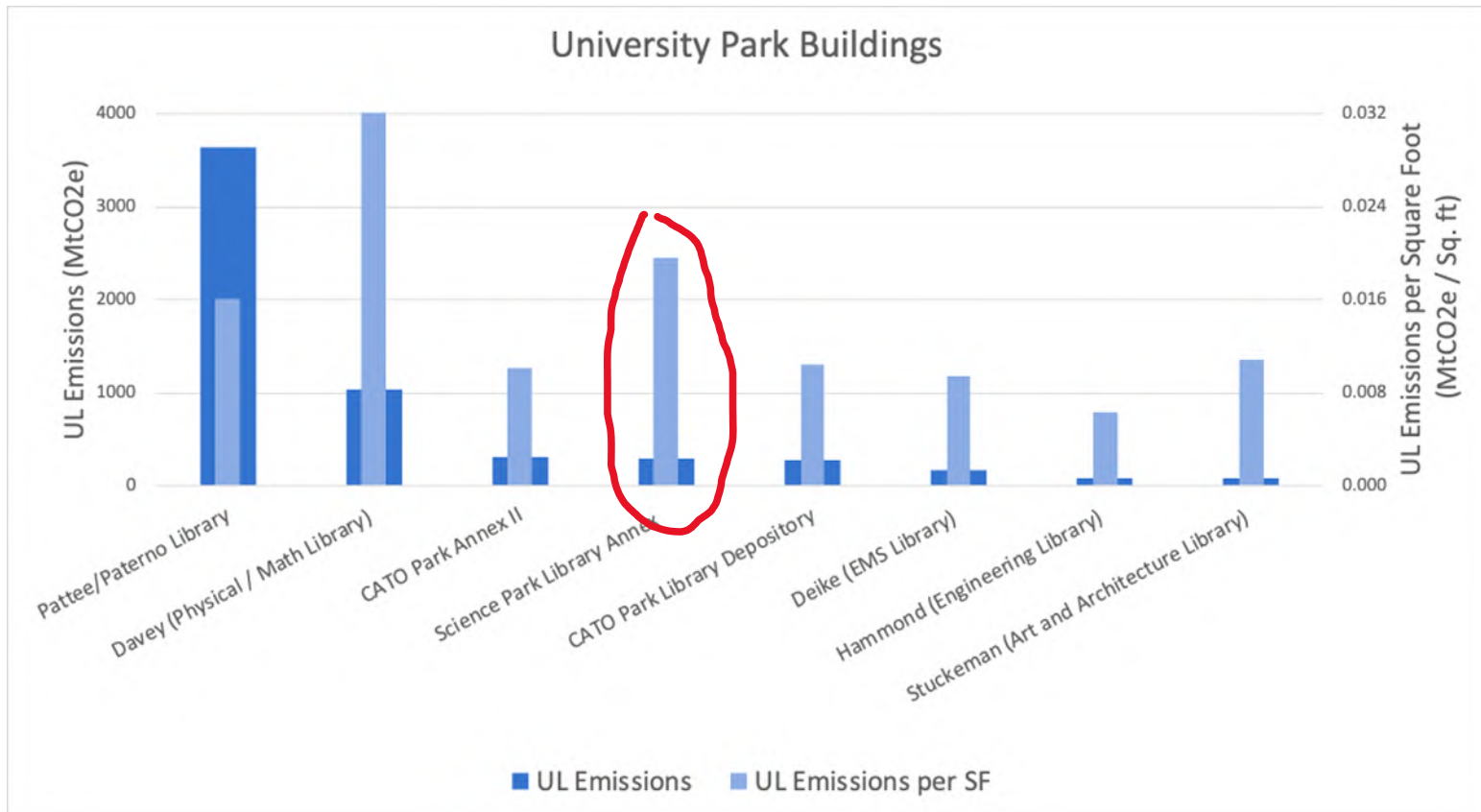
## Emissions Breakdown for Each Building

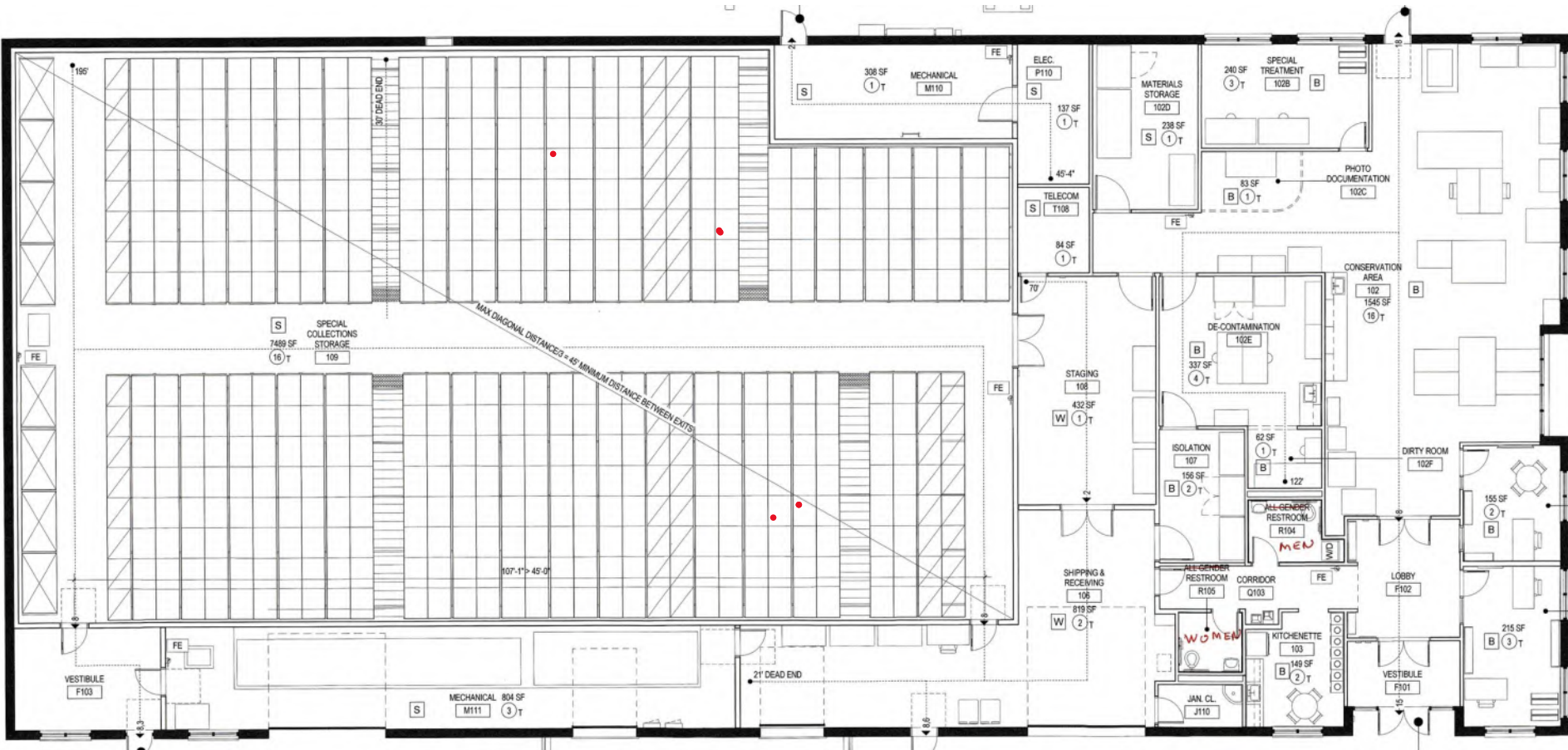
■ UL Emissions ■ Non - UL Emissions





# Energy Intensity







	Electric				Natural Gas		
	Use kWh	Demand kW	Cost	AUC	Use MMBtu	Cost	AUC
01-2019	48,200.0	93	\$4,292	\$0.089	55.0	\$540	\$9.809
02-2019	43,218.0	91	\$3,688	\$0.085	49.1	\$484	\$9.859
03-2019	34,539.0	86	\$2,912	\$0.084	50.8	\$498	\$9.809
04-2019	39,834.0	76	\$3,291	\$0.083	51.7	\$497	\$9.618
05-2019	41,303.0	80	\$3,300	\$0.080	52.5	\$503	\$9.576
06-2019	41,335.0	79	\$3,224	\$0.078	48.8	\$467	\$9.570
07-2019	42,104.0	96	\$3,326	\$0.079	50.7	\$477	\$9.416
08-2019	38,321.0	91	\$3,085	\$0.080	51.0	\$481	\$9.424
09-2019	34,401.0	98	\$2,844	\$0.083	50.1	\$474	\$9.476
10-2019	32,777.0	72	\$2,650	\$0.081	47.4	\$435	\$9.186
11-2019	41,451.0	86	\$3,331	\$0.080	48.2	\$439	\$9.110
12-2019	40,577.0	84	\$3,269	\$0.081	56.1	\$508	\$9.042
<b>Total</b>	<b>478,060.0</b>	<b>1,032</b>	<b>\$39,213</b>	<b>\$0.082</b>	<b>611.4</b>	<b>\$5,803</b>	<b>\$9.492</b>

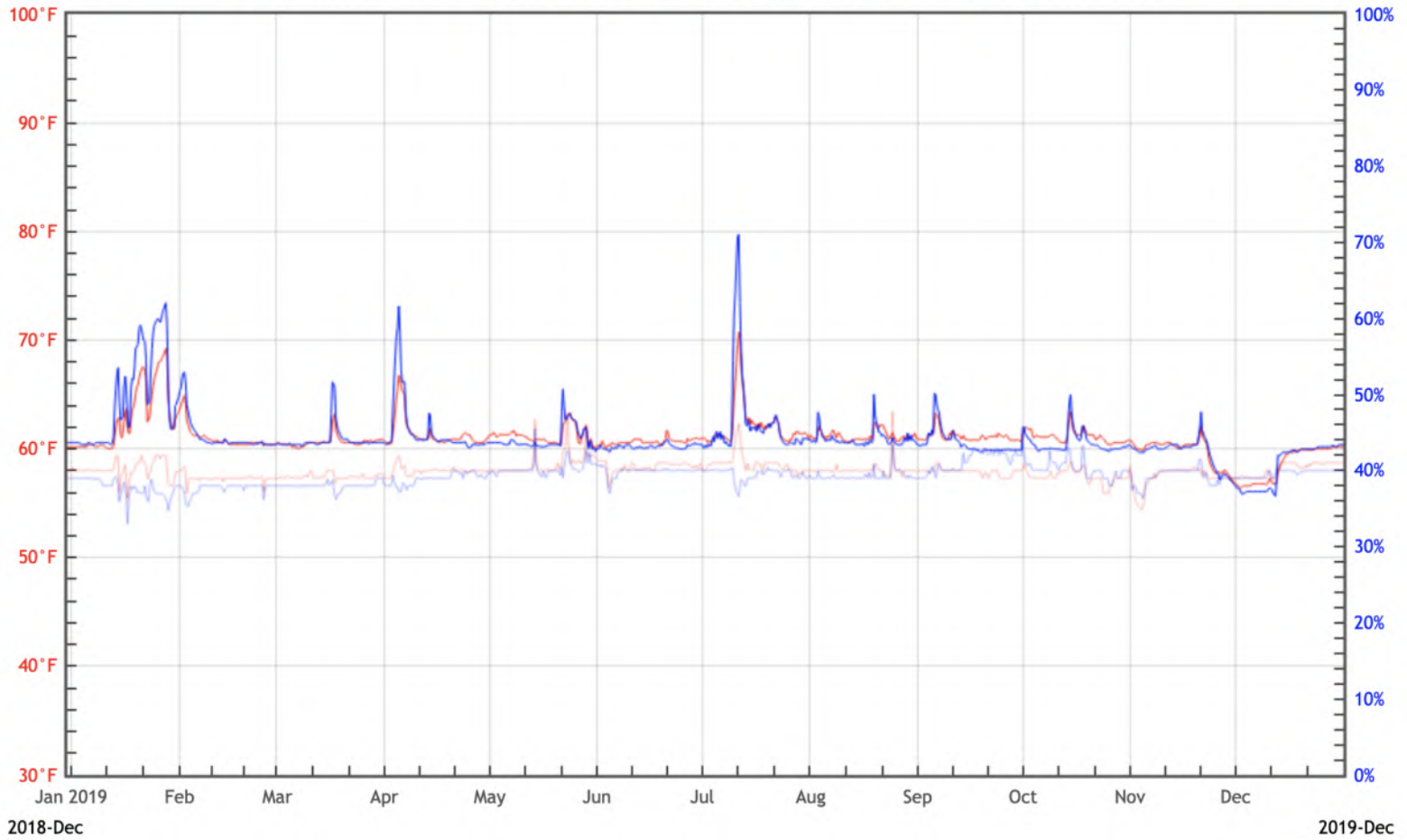
# Amateur math ensues...

- $\$45,000 / 23,000 \text{ lf} = \$1.96 \text{ per lf}$
- $294 \text{ tons mtCO}_2\text{e} = 648,270 \text{ pounds}$
- $648,270 / 23,000 \text{ lf} =$   
**28.2 pounds mtCO<sub>2</sub>e per lf per year**



**T °F & RH of SCL SPLA 109 NE et al.**  
2018-12-31 - 2019-12-31

SCL SPLA 109 NE T °F    SCL SPLA 109 NE %RH    SCL SPLA 109 SW T °F    SCL SPLA 109 SW %RH



*IPI's Methodology for:*



**Implementing Sustainable  
Energy-Saving Strategies**

*in collections environments*



[https://s3.cad.rit.edu/ipi-assets/publications/methodology\\_guidebook/methodology\\_guidebook\\_all.pdf](https://s3.cad.rit.edu/ipi-assets/publications/methodology_guidebook/methodology_guidebook_all.pdf)



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**Haley BeMiller**

The Columbus Dispatch

Published 10:00 p.m. ET May 9, 2022 | Updated 11:02 a.m. ET May 10, 2022

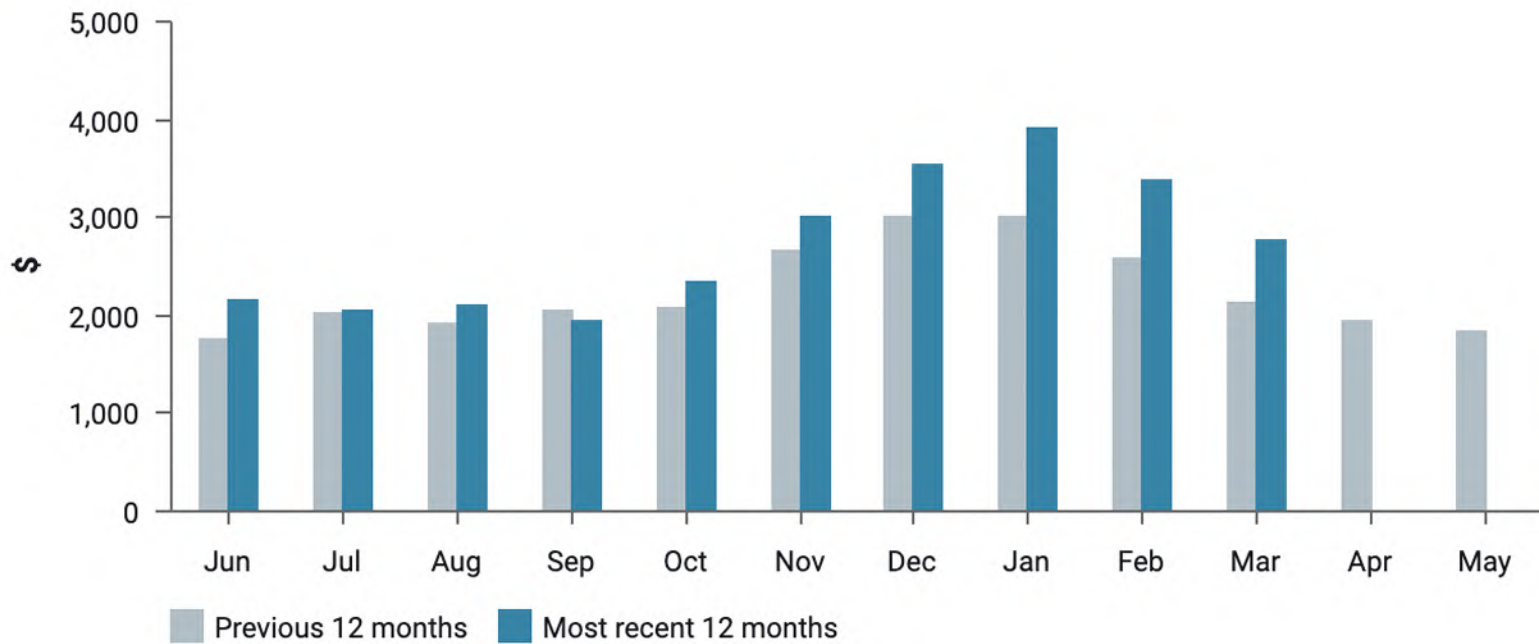
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By Anthony Hennen | The Center Square May 10, 2022

## **Vast Swath of US at Risk of Summer Blackouts, Regulator Warns**

Drought, plant closures and supply-chain woes threaten electric grid

## Monthly Cost





# Thanks for listening!

- Full report and data here:  
<https://bit.ly/3LxAxsr>