

University of Pittsburgh, Pittsburgh Campus **Greenhouse Gas Inventory** **Fiscal Year 2023**



Isabella Cicco

Graduate Research Student, Department of Civil & Environmental Engineering

Aurora Sharrard, PhD

Assistant Vice Chancellor for Sustainability, Office of Sustainability

Melissa M. Bilec, PhD

*Co-Director, Mascaro Center for Sustainable Innovation
George M. & Eva M. Bevier Professor, Department of Civil & Environmental Engineering*

University of Pittsburgh, Pittsburgh Campus Greenhouse Gas Inventory

Background



Pitt GHG Emissions Inventory History

1) Past GHG Inventories

- **Fiscal Year 2008** - GHG Inventory Baseline Year
- **Fiscal Years 2011, 2014, & 2017** – Triennial inventories
- **Fiscal Years 2019, 2020, 2021, 2022, & 2023** – Annual inventories starting with Fiscal Year 2019
 - Fiscal Years 2020, 2021, & 2022 were impacted by the COVID-19 pandemic
- **Lead Authors** - Graduate Student from the Department Civil & Environmental Engineering
- **Faculty Advisor** - Melissa M. Bilec, PhD, *Co-Director*, Mascaro Center for Sustainable Innovation;
George M. & Eva M. Bevier Professor, Department of Civil & Environmental Engineering
- Collaborations & Internal review by University Operations
 - FY19 forward - University Sustainability staff lead co-author.

2) University of Pittsburgh GHG Emissions Reduction Goals

- **50% reduction by 2030 below Fiscal Year 2008**
 - Adopted in 2018
- **Carbon neutrality by 2037**
 - Adopted in 2020
 - Pitt Climate Action Plan published in 2022

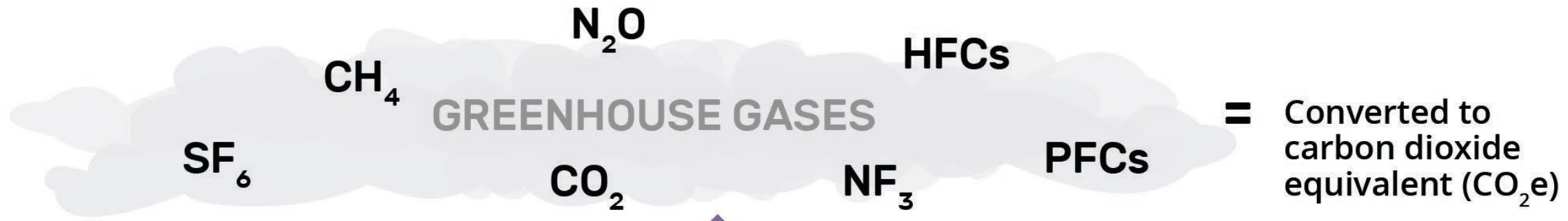
Acronyms

Acronym	Definition
AASHE	Association for the Advancement of Sustainability in Higher Education
BBP	Bellefield Boiler Plant (Pitt purchases steam from this off-campus facility)
CH ₄	Methane
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalents
COVID-19	Coronavirus disease 2019
CSSP	Carrillo Street Steam Plant (Pitt makes steam at this on-campus facility)
FERA	Fuel & Energy-Related Emissions
FTE	Full Time Equivalent
FY	Fiscal Year
GHG	Greenhouse Gas
GWP	Global Warming Potential
LEED	Leadership in Energy and Environmental Design
MMBTU	Million British thermal unit
MT CO ₂ e	Metric tons of carbon dioxide equivalents
Pitt	University of Pittsburgh
REC	Renewable Energy Certificate (1 MWh)
SF	Square Feet
SIMAP	Sustainability Indicator Management & Analysis Platform
T&D	Transmission & Distribution

SIMAP: Inventory Data & Analysis

- **SIMAP (Sustainability Indicator Management & Analysis Platform)**
 - User-friendly, all-in-one carbon and nitrogen-accounting tool designed for higher education campuses.
 - Affordable, online solution to track, analyze, & enhance sustainability efforts across the entire campus.
 - Algorithms are grounded in *Greenhouse Gas Protocol* standards & backed by two decades of experience with the Campus Carbon Calculator, CarbonMAP, & Nitrogen Footprint Tool.
 - [UNHsimap.org/home](https://unhsimap.org/home)
- **Mission** - To assist institutions, colleges, and universities in monitoring their environmental footprints, enabling them to achieve their sustainability goals efficiently & effectively.
 - Assists users in establishing a baseline, benchmarking performance, generating reports, setting goals, analyzing year-over-year progress, & accessing resources.
- As a signatory Second Nature's Climate Leadership Commitments & reflecting best practice in higher education GHG inventorying & benchmarking, **the University of Pittsburgh uses SIMAP to publicly report our GHG emissions data.**





SCOPE 2

INDIRECT
EMISSIONS

Purchased Electricity
Steam from Bellefield Boiler Plant
Transmission & Distribution
Electricity Losses

SCOPE 1

DIRECT EMISSIONS
FROM COMBUSTION

Steam from Carrillo Street Steam Plant
Natural Gas to Buildings
Pitt Fleet Vehicles
Refrigerants & Chemicals

SCOPE 3

OTHER INDIRECT
EMISSIONS

Commuter Travel
Air Travel
Other Pitt-Sponsored Travel
Paper Purchasing
Solid Waste
Wastewater

Pittsburgh Campus **Greenhouse Gas Inventory**

Fiscal Year 2023 RESULTS



Executive Summary: FY23 GHG Emissions

- The University of Pittsburgh's Pittsburgh campus **FY23 GHG emissions were 210,319 MT CO₂e**, a 2% decrease from FY19 (the last pre-pandemic-influenced GHG inventory year), and a 22% increase from FY22.
- Increases occurred in all categories except refrigerants, fertilizers, purchased steam, and student commuting.
- The largest increases occurred in the Scope 3 categories of Pitt-Sponsored Travel, including Air & Ground Travel (bus, rail, & car). *As a result, FY22 is now retroactively considered pandemic-influenced.*
- GHG emissions are still **23.1% below the FY08 baseline**, but missed the FY23 incremental reduction target to meet 50% reductions by 2030.
- The most current SIMAP emissions factors were used (AR6), causing a slight increase in emissions.

Category		Previous Fiscal Years								Current FY
SCOPE	SOURCE CATEGORY	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
SCOPE 1	On-Campus Steam	-	22,200	32,981	25,623	24,978	29,627	29,644	27,532	33,417
	Other On-Campus Stationary	9,200	5,700	6,386	5,245	7,470	7,102	8,167	7,348	8,111
	Fleet Vehicles	500	700	1,273	1,388	1,992	1,629	1,506	1,364	1,472
	Refrigerants & Chemicals	800	2,300	2,192	1,266	2,240	789	644	1,450	974
	Fertilizers & Animals	-	1	2	1	1	2	1	7	5
TOTAL SCOPE 1 (MT CO₂e) (Direct Emissions)		10,500	30,901	42,834	33,523	36,681	39,148	39,962	37,700	43,979
SCOPE 2	Purchased Electricity	138,700	135,500	115,341	105,607	73,802	84,753	85,544	64,777	72,666
	Purchased Steam	55,100	29,400	23,404	17,238	16,892	13,247	15,954	20,310	16,193
TOTAL SCOPE 2 (MT CO₂e) (Indirect Emissions)		193,800	164,900	138,745	122,845	90,694	98,000	101,498	85,087	88,859
SCOPE 3	Faculty & Staff Commuting	13,600	14,700	9,845	12,433	23,293	15,330	5,672	9,961	10,482
	Student Commuting	5,200	5,500	6,064	5,962	12,036	10,318	2,927	2,264	1,928
	Directly Financed Air Travel	24,800	33,600	23,921	24,706	36,560	10,273	4,018	10,400	29,651
	Other Directly Financed Travel	100	50	211	548	582	1,593	683	1,140	3,812
	Study Abroad Air Travel	-	1,100	775	4,578	8,816	3,489	153	626	765
	Solid Waste	5,700	1,400	1,437	1,522	1,454	1,793	1,413	1,445	1,607
	Wastewater	1,500	1,400	136	104	102	107	353	510	542
	Paper	1,600	1,500	1,949	2,441	729	509	167	214	241
	Food	-	-	-	-	-	-	2,861	5,141	6,803
	Transmission & Distribution Losses	16,600	13,400	7,596	5,523	4,575	5,509	5,395	4,417	4,876
Fuel & Energy Related Activities								14,122	16,772	
TOTAL SCOPE 3 (MT CO₂e) (All Other Emissions)		69,100	72,650	51,934	57,817	88,147	48,919	23,642	50,238	77,481
SINKS	Compost	0	0	0	0	0	0	0	19.4	0
ALL ACCOUNTABLE EMISSIONS (MT CO₂e)		273,400	268,451	233,513	214,185	215,522	186,068	165,101	173,006	210,319

Notable Changes in FY23

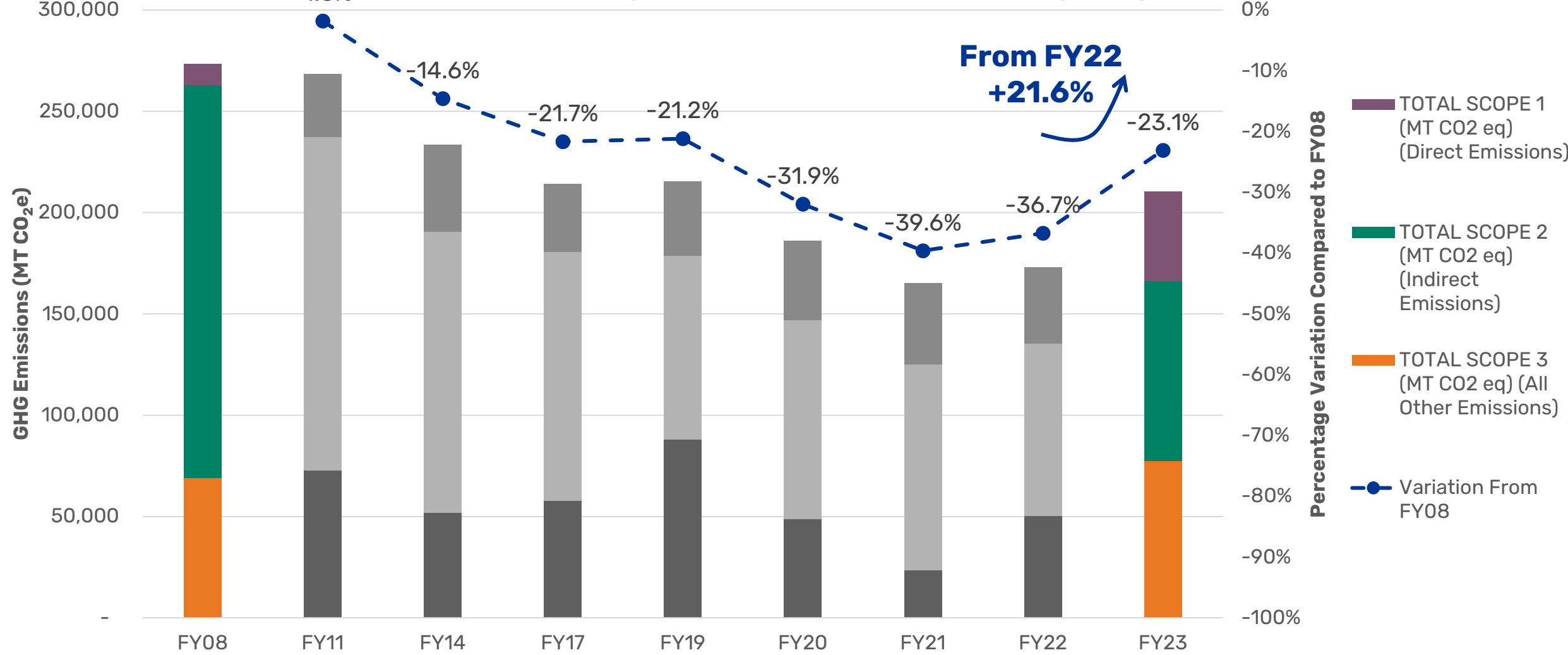
Scope	Category	Variation Compared to FY22	% of Total GHG Emissions	Potential Explanations
2	Electricity	12% ↑	35%	<ul style="list-style-type: none"> Increased Building Square Footage – Electricity consumption increased due to the addition of over 694,779 in building square footage (including laboratories, which on average use much more energy than other typical campus building use types).
1 & 2	Total Steam (Produced On-Campus & Purchased)	4% ↑	24%	<ul style="list-style-type: none"> Use Increase – Combined steam consumption (produced & purchased) increased in part due to the addition of over 694,779 in building square footage (up 6%); however, not all of new spaces & buildings use steam. Efficiency - More on-campus steam was used in FY23 than FY22, but Pitt's on-campus steam plant is more efficient than purchased steam from off-campus.
3	Directly Financed Air Travel	185% ↑	14%	<ul style="list-style-type: none"> More Air Travel - Air travel increased considerably for both Athletics & Pitt-sponsored travel (by employees and students) compared to FY22 Pandemic - Due to an elongated return to pre-pandemic travel habits, all travel increased from FY22; combined air & ground travel is still below FY19 levels.
3	FERA	16% ↑	8%	<ul style="list-style-type: none"> Fuel Use - FERA increase is related to increase in the use of natural gas, fleet fuel, and purchased electricity.
3	Other Directly Financed Travel (Bus, Car, Rail)	234% ↑	2%	<ul style="list-style-type: none"> Pandemic - Due to an elongated return to pre-pandemic travel habits, all travel increased from FY22. Data - Personal car reimbursement data included in FY23 (but not in FY22), which also contributes to this increase.

Future GHG Emissions Reduction

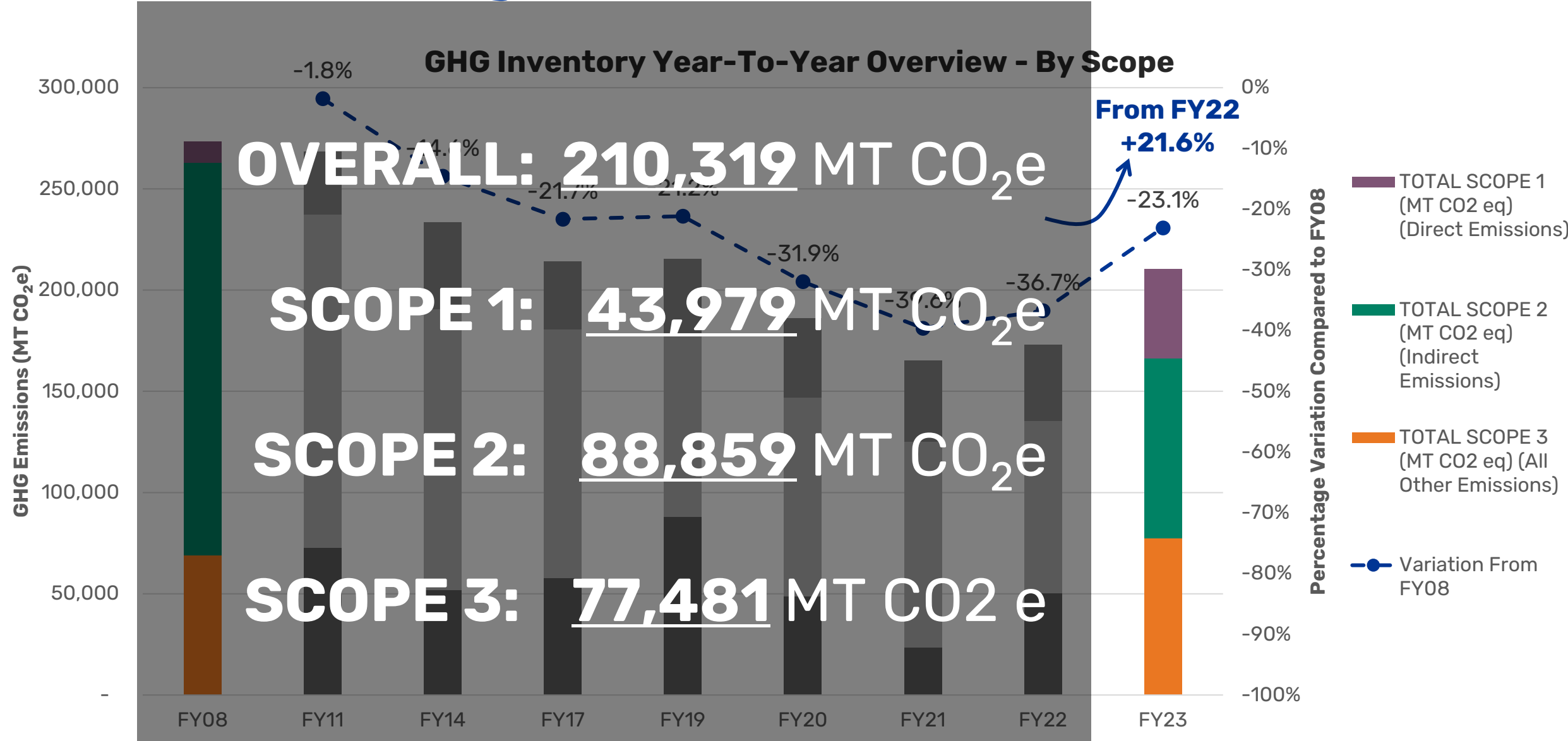
- 1) **Growth** - Pitt's continued growth in physical space & population size will outpace efforts focused on reducing GHG emissions; as a result, a redoubling of efforts will be needed across all categories
- 2) **Purchased Electricity** - Remains the largest GHG emissions category.
 - a) More aggressive building energy efficiency retrofits are needed for more buildings more quickly.
 - b) Energy use intensity performance goals for all existing buildings should be revisited.
 - c) Energy performance goals for new buildings should be as rigorous as possible.
 - d) On- and off-campus renewable electricity generation projects and procurement should advance quickly.
- 3) **Clean Energy** - To assist with clean energy sourcing, recommend shifting building systems and components away from natural gas and steam when possible.
- 4) **Steam** – Regardless of source, total usage is up across Scopes 1 & 2, with all drivers not yet identified (i.e., FY23 saw a decrease in Heating Degree Days and an increase in building square footage).
 - a) Recommend analysis of steam use at both the steam system and building scales to facilitate future operational focus on steam use reduction.
- 5) **Travel** – Increased significantly from FY22 and is now returned to near pre-pandemic levels. Increased and focused engagement with the Pitt community is needed on avoiding and/or shifting air travel to ground, along with travel carbon offsets. Reconciliation in SIMAP is also needed.
- 6) **Academics** - Pitt's research & academic community offers tremendous opportunities for innovation and collaboration. Strategically tapping these resources could lead to important reductions and longer-term cultural shifts.

GHG Inventory Overview FY23

GHG Inventory Year-To-Year Overview - By Scope

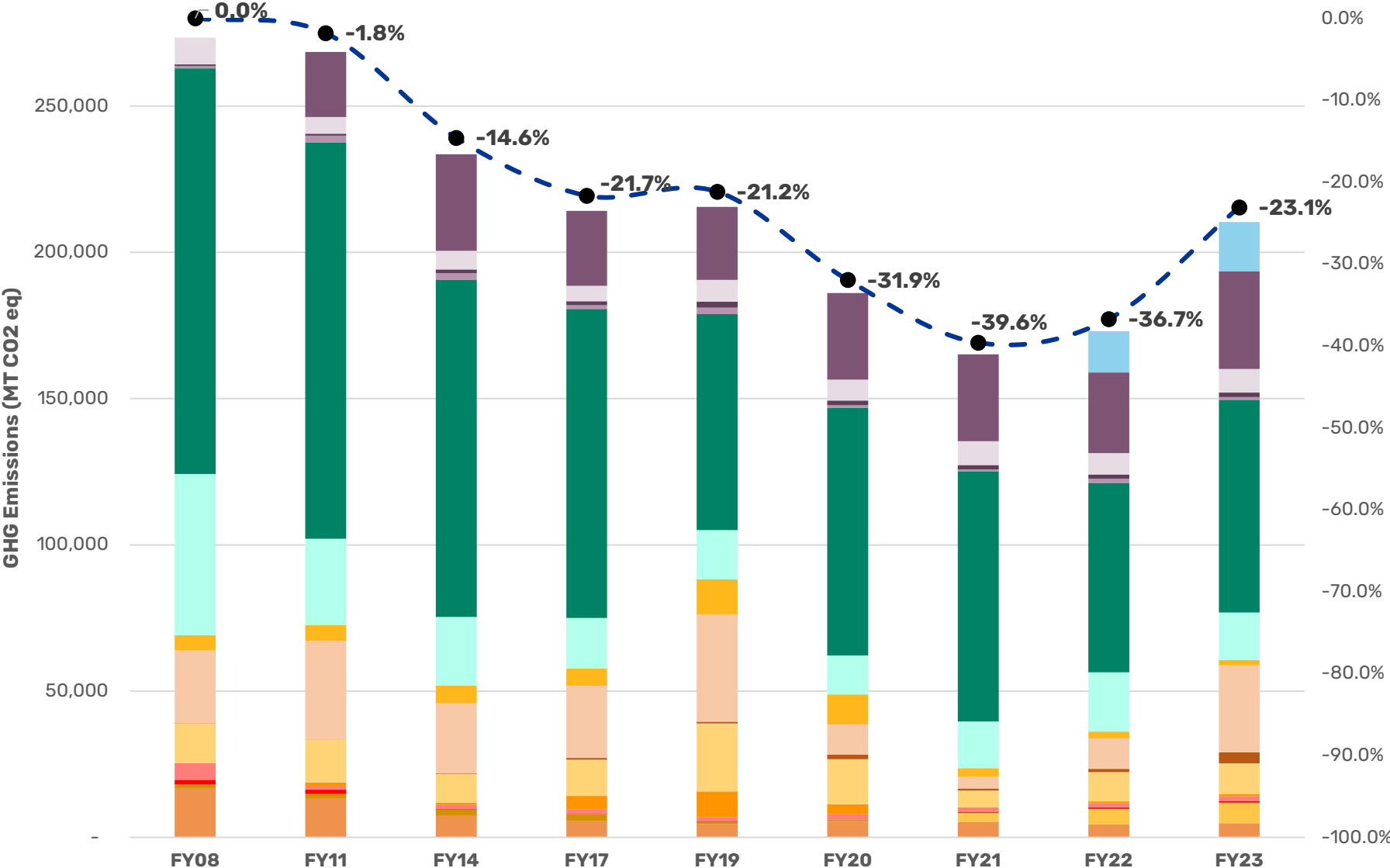


GHG Inventory Overview FY23



GHG Inventory Overview

GHG Inventory Year-To-Year Overview - All Categories



**FY23 emissions
-2% from FY19**

- Scope 1**
 - Fuel & Energy Related Activities
 - On-Campus Steam
 - Other On-Campus Stationary
 - Direct Transportation
 - Refrigerants & Chemicals
 - Fertilizers & Animals
- Scope 2**
 - Purchased Electricity
 - Purchased Steam
- Scope 3**
 - Student Commuting
 - Directly Financed Air Travel
 - Other Directly Financed Travel
 - Faculty & Staff Commuting
 - Study Abroad Air Travel
 - Solid Waste
 - Wastewater
 - Paper

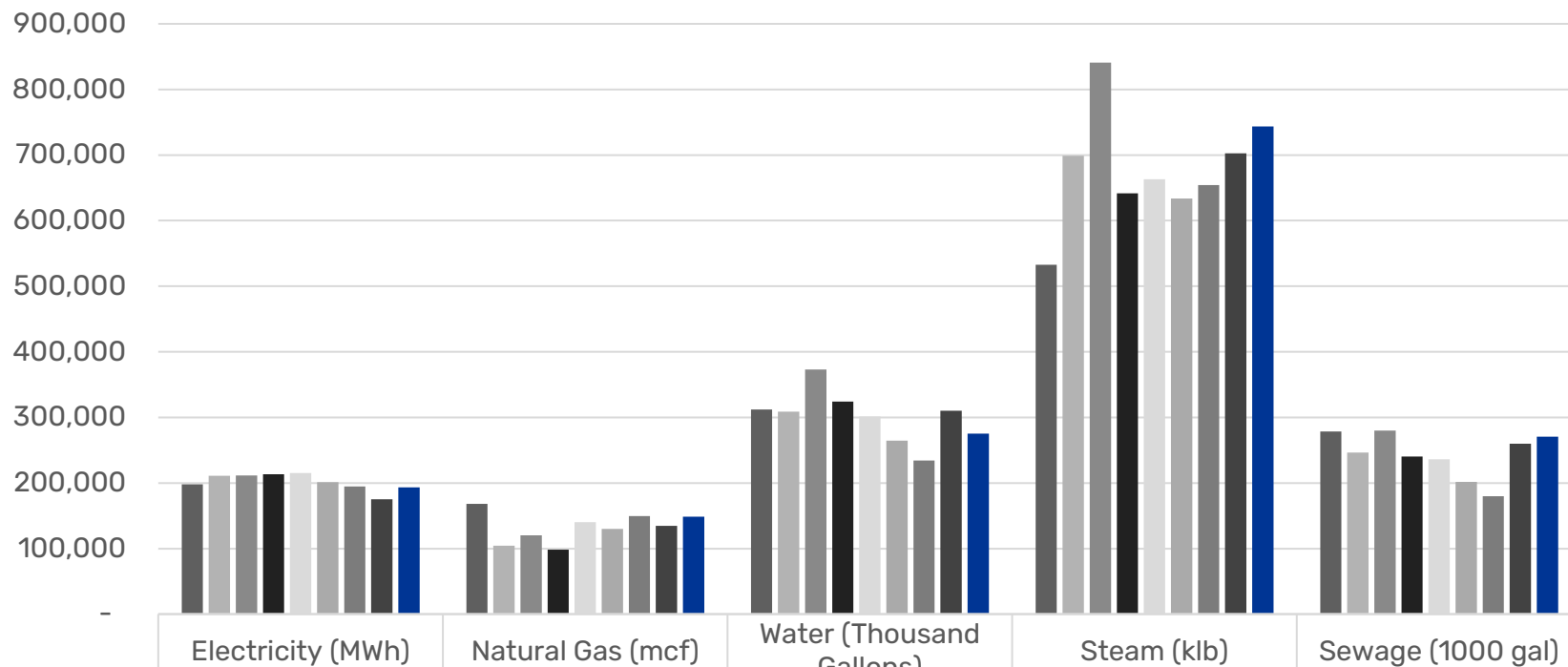
University Overview

Buildings

Fiscal Year	Gross SF
FY 08	9,403,627
FY 11	9,650,285
FY 14	10,209,646
FY 17	10,187,967
FY 19	11,564,332
FY 20	11,645,940
FY 21	11,691,649
FY22	11,026,502
FY 23	11,821,234

- **794,732 SF** more than FY22
 - 7.2% increase
- **2,417,607 SF** more than FY08
 - 25.7% increase

Building Utilities per SF - Year-To-Year Comparison



	Electricity (MWh)	Natural Gas (mcf)	Water (Thousand Gallons)	Steam (klb)	Sewage (1000 gal)
FY08	198,040	168,289	312,018	532,693	278,350
FY11	211,102	104,555	308,886	698,786	246,450
FY14	211,615	120,120	372,837	840,701	280,055
FY17	213,622	98,595	324,294	641,819	240,165
FY19	215,391	140,427	301,532	663,093	236,027
FY20	201,482	130,011	264,785	633,710	201,772
FY21	194,767	149,503	234,363	654,148	179,836
FY22	175,334	134,513	310,302	702,650	259,850
FY23	193,535	148,491	275,273	743,630	270,762

FY23 Building List



Building	Gross Sq. Ft.	Building	Gross Sq. Ft.	Building	Gross Sq. Ft.
229 Atwood	3,350	College Gardens Apartments	297,510	Hillman Library	252,778
3343 Forbes Avenue	25,122	Computer Center (RIDC)	19,355	Hyacinth Place Apartments	25,967
3401 Boulevard of the Allies (Old Quality Inn)	63,888	Craig Hall	55,115	Information Sciences Garage	38,499
480 Melwood St.	44,562	Craig Hall Garage	10,409	Langley Hall	90,592
530 Melwood (Motor Pool)	8,200	Crawford Hall	87,637	Learning Research and Development Center	99,734
718 Devonshire Avenue	16,000	Darragh Street Housing	102,217	Life Sciences Annex	50,000
Allegheny Observatory	30,017	David Lawrence Hall	57,956	Litchfield Towers A,B,C	465,393
Allen Hall	58,026	Eberly Hall	56,051	Lothrop Hall	241,770
Alumni Hall	162,970	Eberly Solvent Storage	380	Mark A. Nordenberg Hall	200,471
Barco Law Building	139,611	Eureka Building	36,607	Mayflower Apartments	14,940
Bellefield Hall	107,545	Falk School	66,213	McGowan Institute for Regenerative Medicine	45,000
Benedum Hall	473,392	Fitzgerald Field House	105,045	Mervis Hall	86,570
Biomedical Science Tower 3	326,000	Forbes Craig Apartments	43,554	Music Building	21,275
Bouquet Gardens	152,737	Forbes Pavilion	87,114	Oakwood Apartments	14,886
Bouquet Gardens J	64,800	Franklin Complex	50,753	OC Garage	106,629
Cathedral of Learning	599,637	Fraternity Housing Complex	82,800	O'Hara Student Center	40,000
Center for Bioengineering	91,123	Frick Fine Arts	73,088	Old Engineering Hall	67,859
Centre Plaza Apartments	138,600	Gardner Steel Conference Center	26,714	Panther Hall	161,542
Charles L. Cost Sports Center	82,977	GSPH Public Health Building & Crabtree	284,908	Parkvale Building	42,263
Chevron Science Center	269,135	GSPH Public Health Garage	56,941	Parkvale Plaza	14,821
Clapp Hall	85,893	Heinz Chapel	18,717		

FY23 Building List Continued

Building	Gross Sq. Ft.	Building	Gross Sq. Ft.
Pennsylvania / K. Leroy Irvis Hall	127,835	Trees Field - Sports Dome	105,608
Petersen Events Center	430,000	Trees Hall	244,412
Petersen Sports Complex	50,415	University Child Development Center	24,517
Plum Borough Research Facility	41,139	University Club	85,000
Ruskin Hall Apartments	120,000	University Public Safety Building	23,200
Salk Hall	333,995	Van de Graaff (Nuclear Physics)	36,691
Salk Hall Pavilion	81,000	Victoria Hall	128,759
Scaife Hall	474,881	Wesley W. Posvar Hall	513,893
Schenley Quad	367,219	Wesley W. Posvar Hall Garage	203,746
Sennott Square (includes vendors)	250,800	William Pitt Union	178,726
Sennott Square Garage	Included in Sennot Sq.		
SHRS (Housed in Iroquois)	60,000		
SIS	76,130		
Soldiers & Sailors Garage	344,626		
Space Research Coordination Center	41,849		
Stephen Foster Memorial	27,182		
Sutherland Hall	223,903		
Thackeray Hall	99,147		
Thaw Hall	51,379		
Thomas Boulevard	192,000		
Twentieth Century Club	54,340		

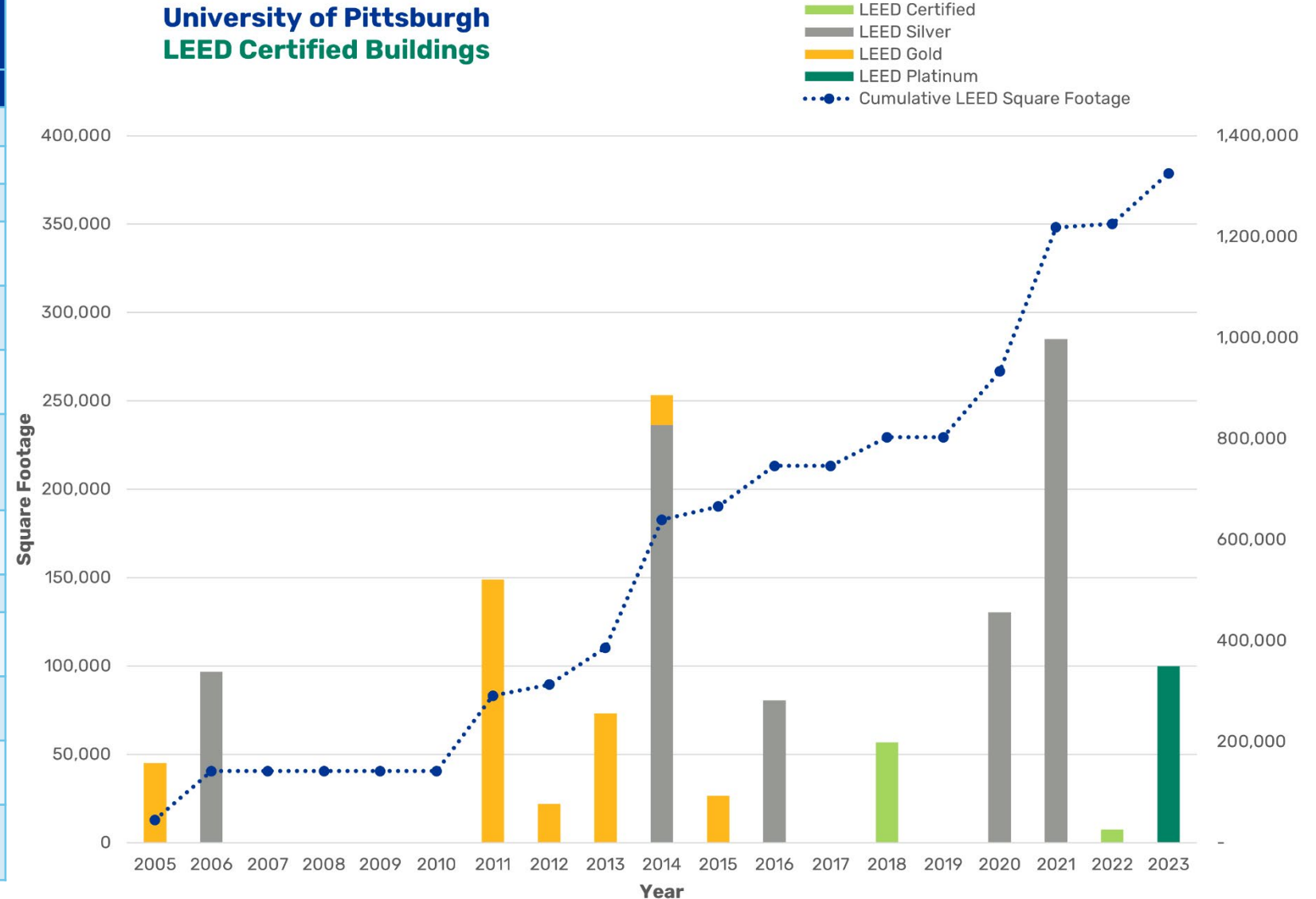
FY23 & FY24 Building Acquisitions
(To be Added to FY24 GHG Inventory)

- 1) 257 Oakland
- 2) Assembly Garage [200,000 ft²]
- 3) Bridgeside Point 2 [161,669 ft²]
- 4) Pitt IT @ 3512 Fifth Avenue [9,000 ft²]
- 5) Residences on Bigelow [125,000 ft²]
- 6) Scaife Hall Addition [94,792 ft²]
- 7) Strand Building
- 8) University Hall

University Overview: LEED Certified Buildings



LEED Certified Buildings		
Building Name	Certification	Year
Clapp Hall Renovation	Silver	2020
GSPH Renovations	Silver	2021
Salk Hall Renovation	Platinum	2023
Peterson Sports Complex Addition	Tracking Silver	
Scaife Hall Addition & Renovation	Tracking Gold	
Arena & Sports Performance Center	Anticipate Gold	In Construction
Bioforge Cell & Gene Therapy at Hazelwood Green	Anticipate Gold	In Construction
Crawford Hall Renovation	Anticipate Gold	In Construction
Fifth & Halket	Anticipate Gold	In Construction
Hillman Library Renovation	Tracking Platinum	In Construction
Recreation and Wellness Center	Tracking Platinum	In Construction
Hillside Housing	Passive House + Anticipate Gold	In Design
Central Oakland Housing	Passive House + LEED	To Be Registered



University Overview: FY23 Leased Non-Pitt Owned Buildings

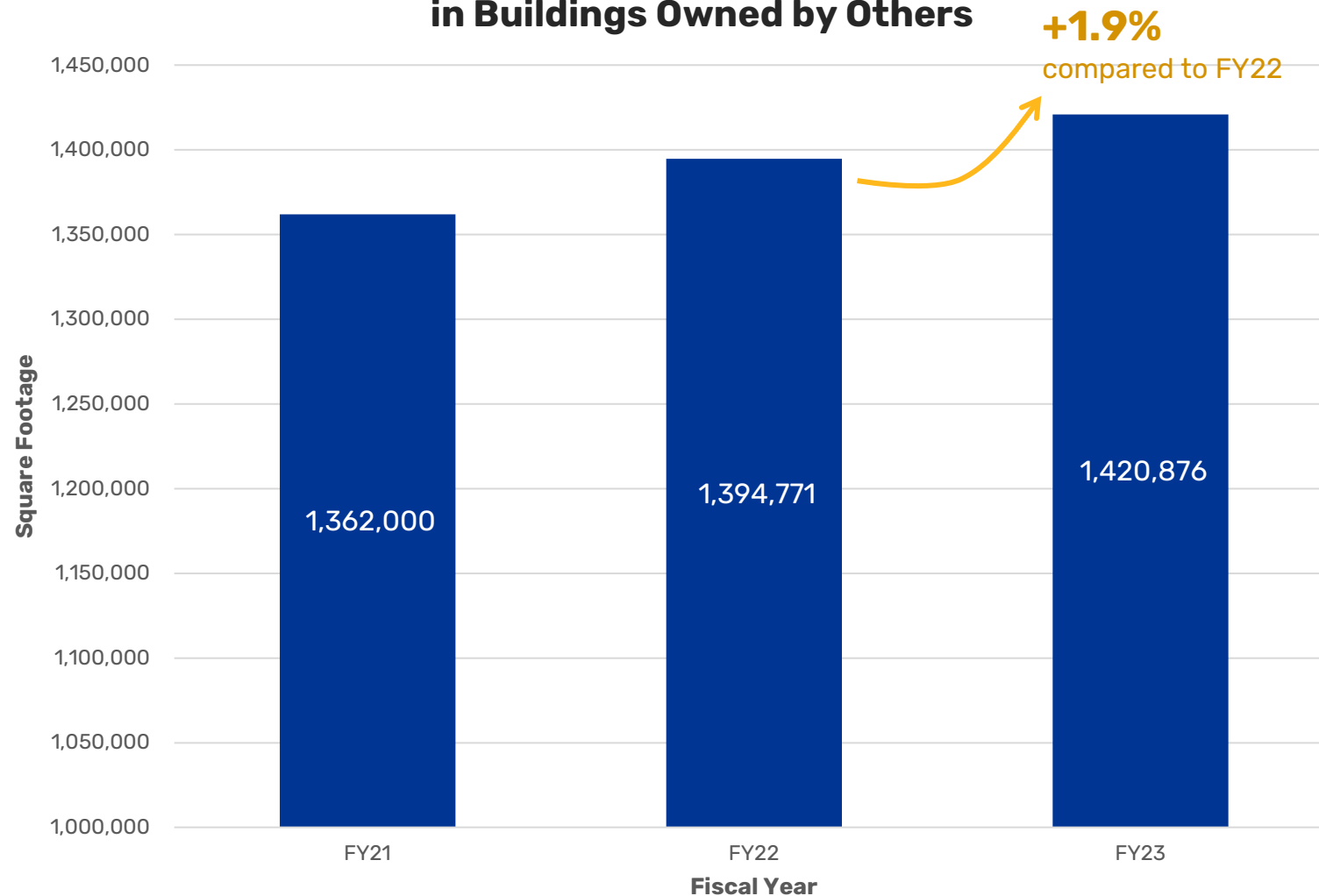
Leased space is NOT included in the GHG Inventory Boundary.

The University had **128 leases** in non-Pitt-owned buildings in Pennsylvania, occupying **1,420,876 square feet** of leased space.

This leased space had an estimated **34,662 MT CO₂e** of GHG Emissions in FY23 (equivalent to **16% of total FY23 emissions**).

NOTE: Leased space energy use was estimated using square footage and national average energy use intensity based on primary use.

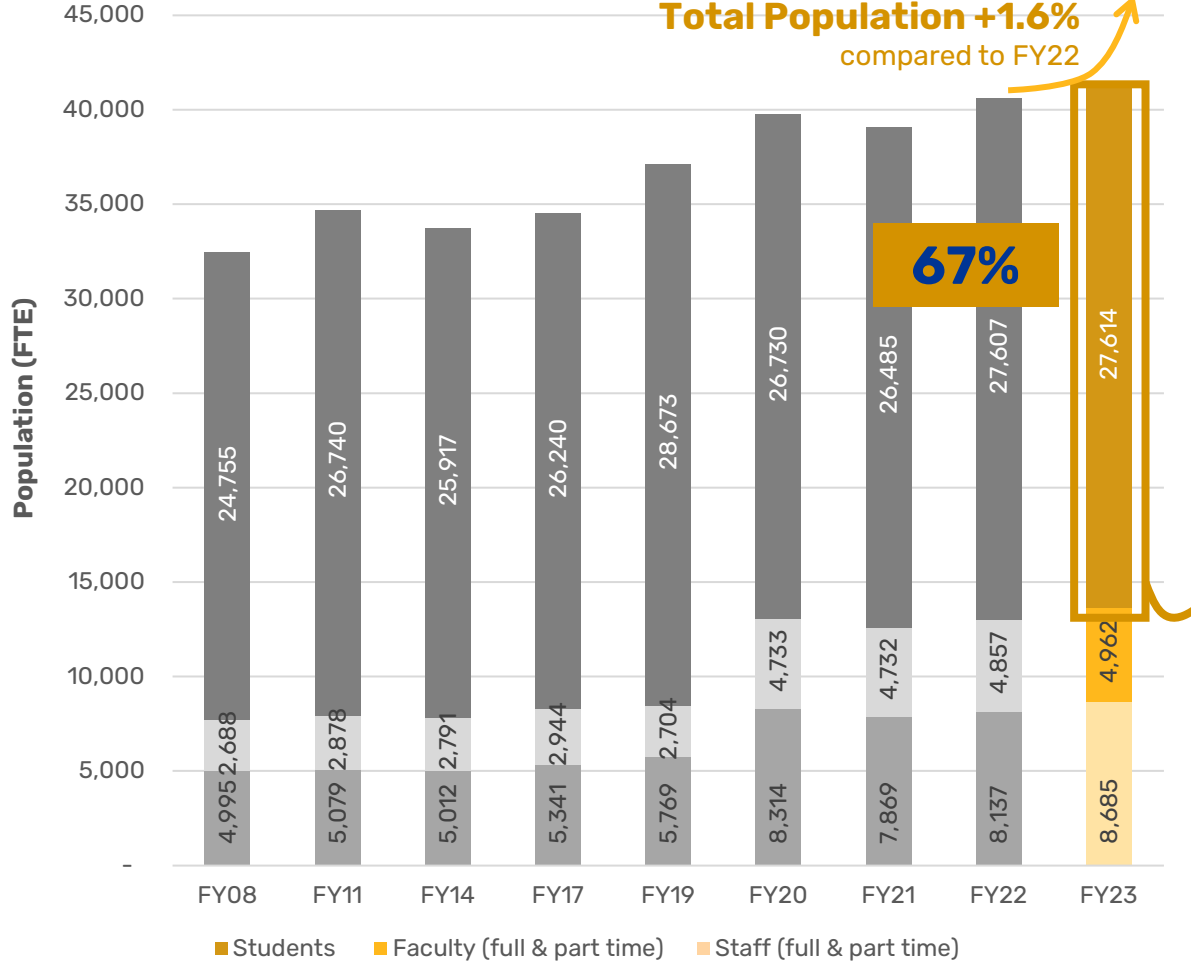
Pitt Leased Space in Buildings Owned by Others



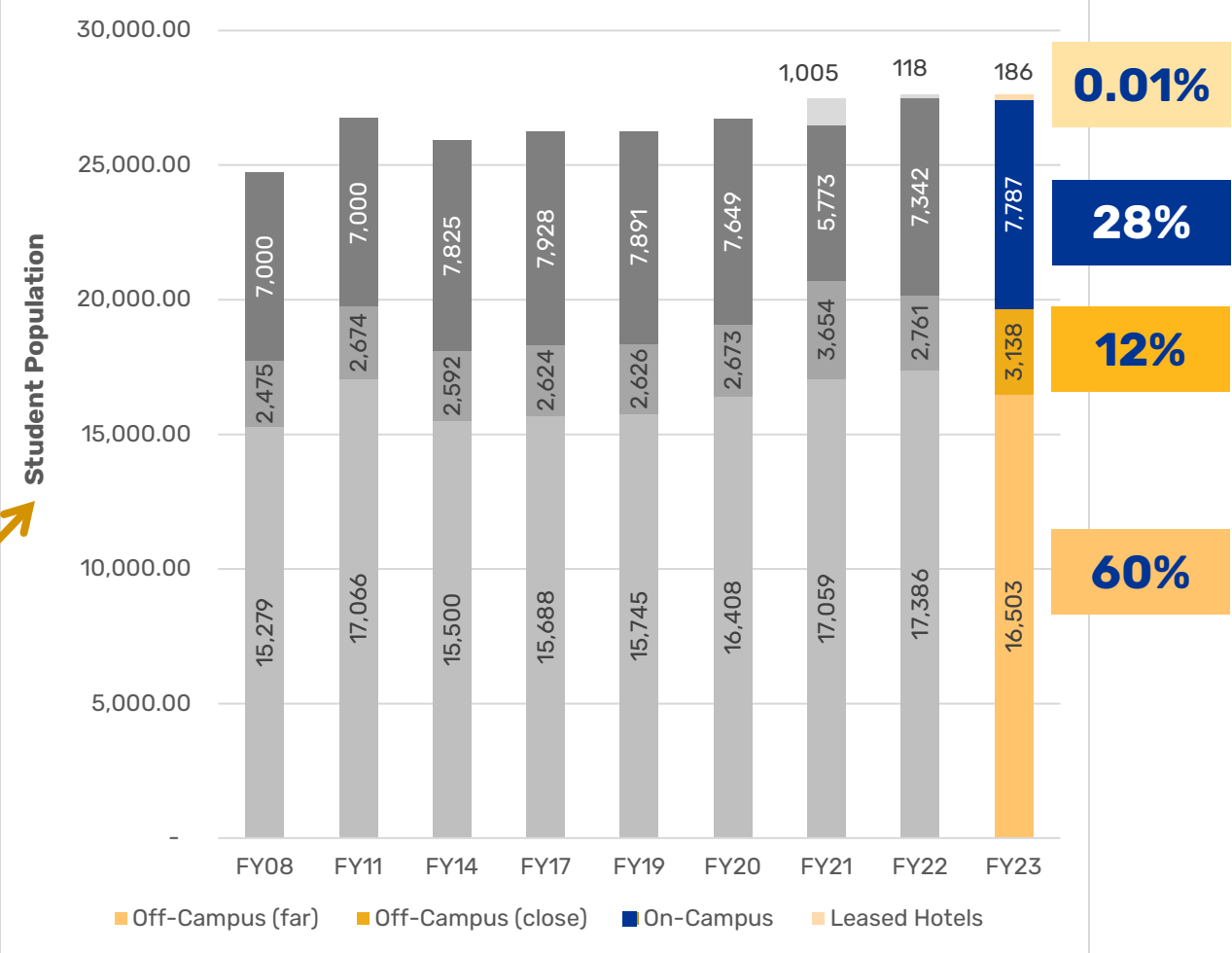
University Overview: FY23 Population & Student Housing

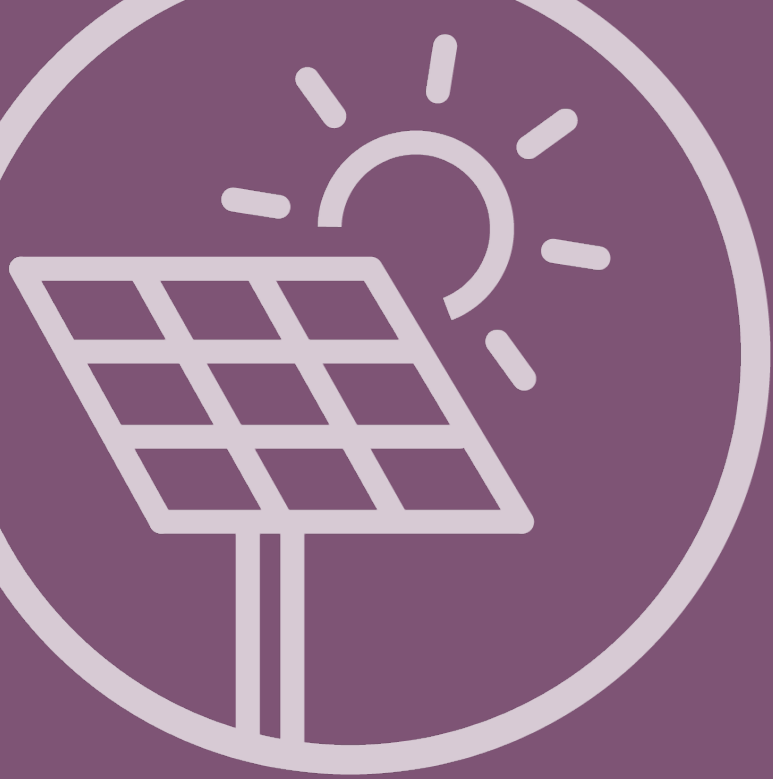


Year-To-Year Comparison Pitt Campus Population (FTE)



Student Housing Locations





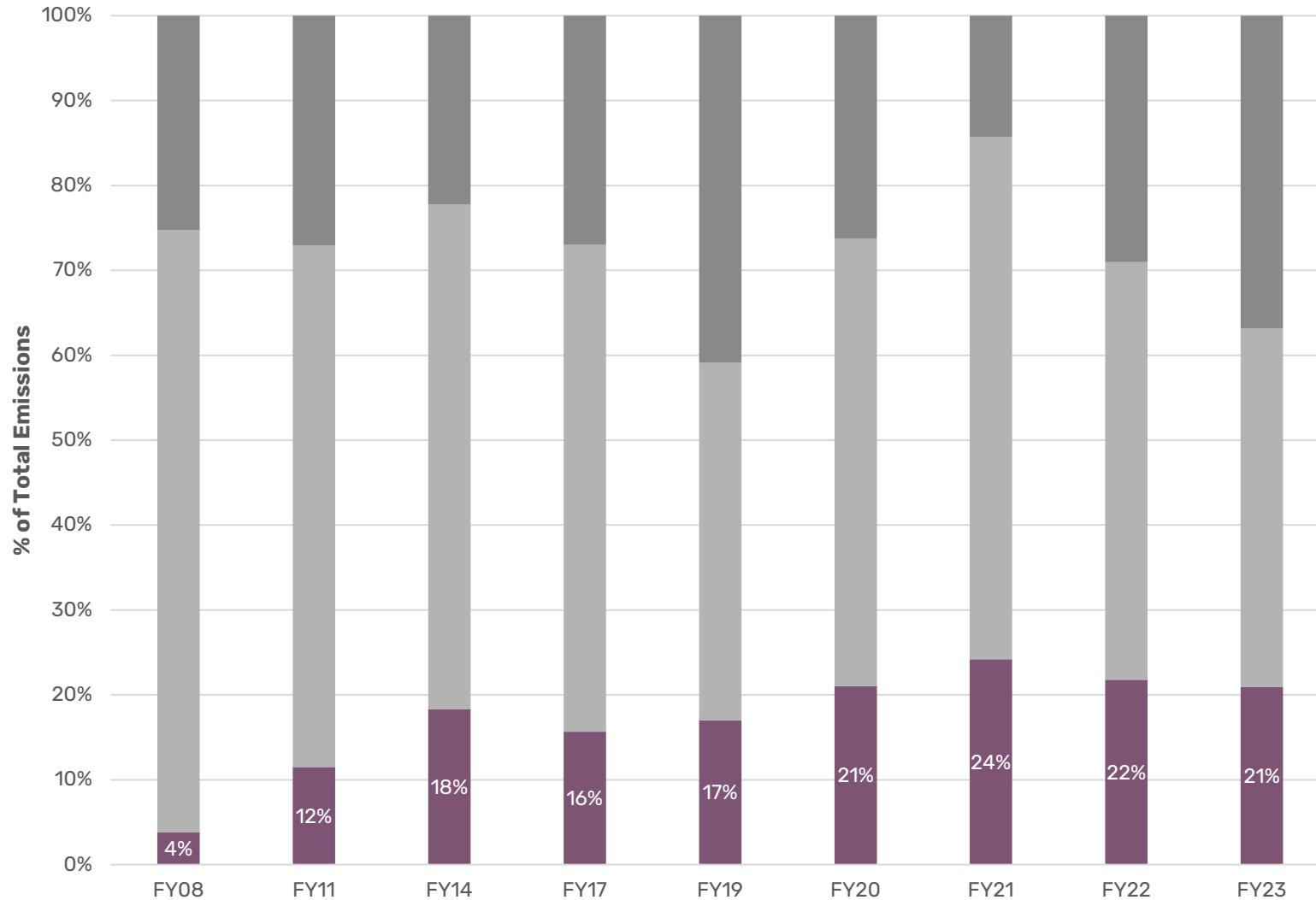
SCOPE 1

DIRECT EMISSIONS
FROM COMBUSTION

Scope 1: FY23 Trends

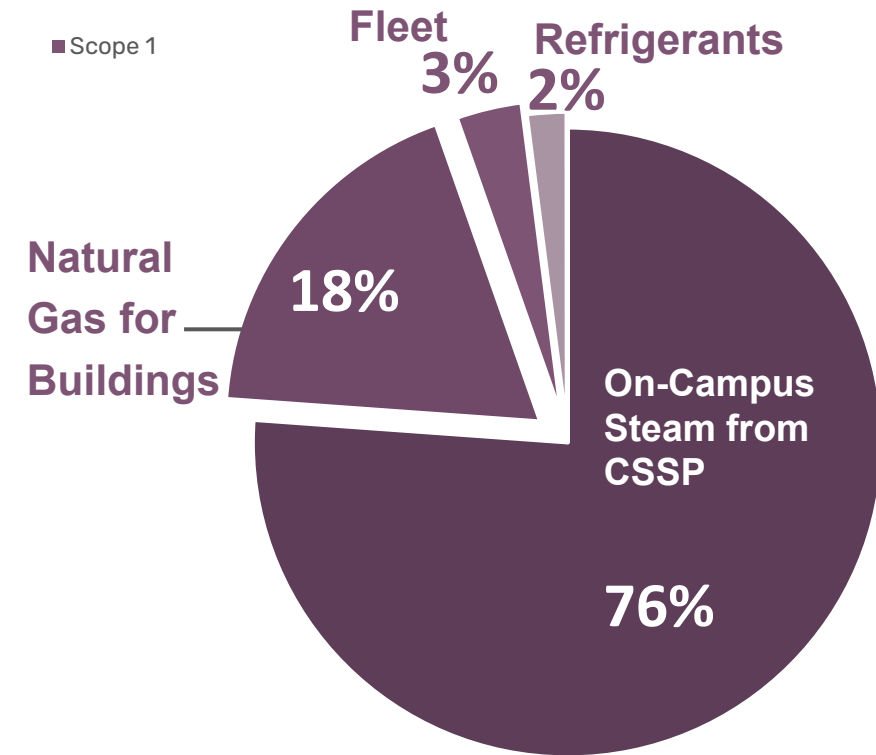
SCOPE 1
Direct Emissions
From Combustion

Scope 1 % of Total Emissions



**Scope 1 is
21%
of Total Emissions
[43,888 MT CO₂e]**

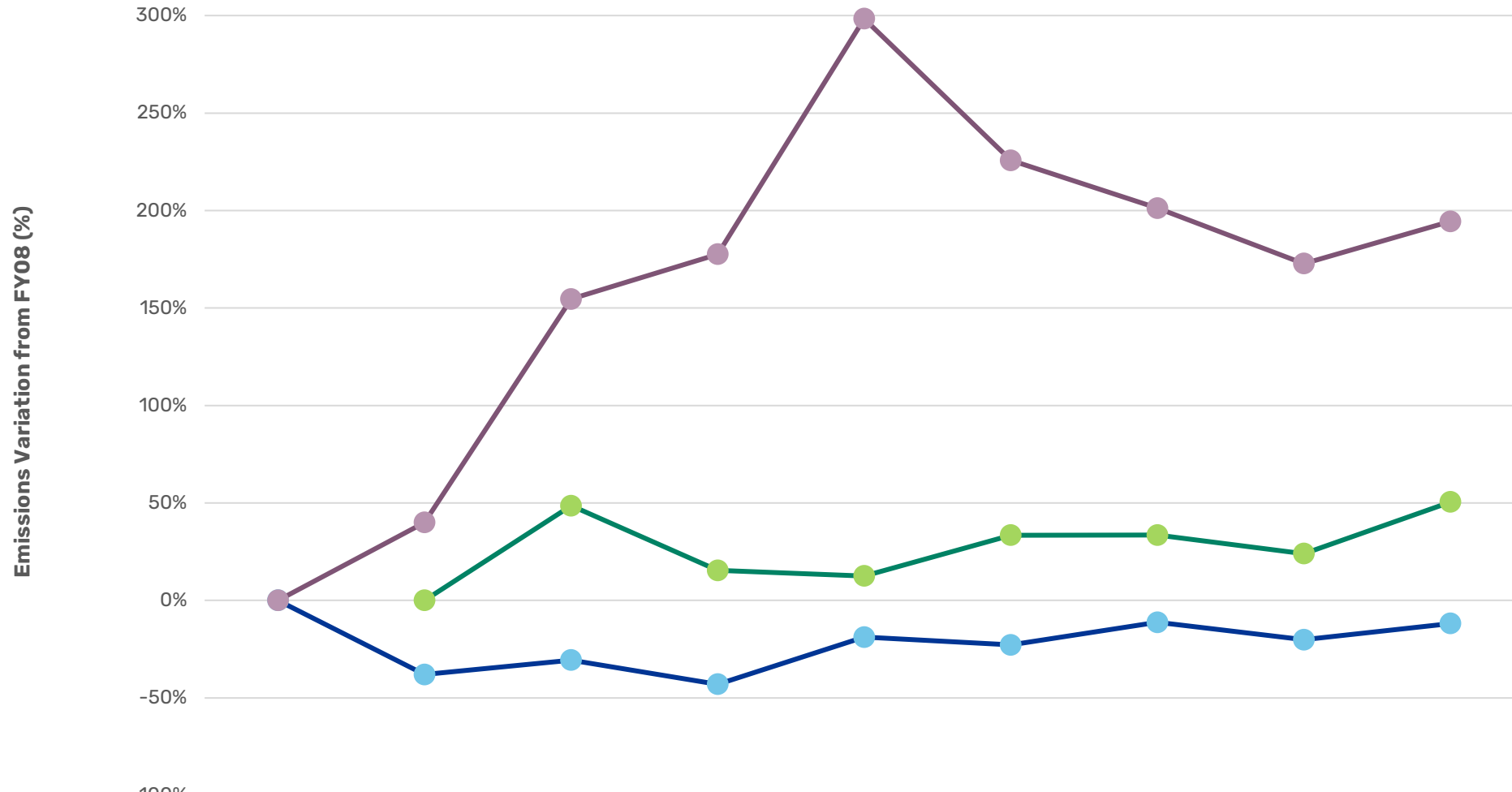
- Scope 3
- Scope 2
- Scope 1



Scope 1: Major Sources FY23 Trends

SCOPE 1
Direct Emissions
From Combustion

SCOPE 1 - Emissions Trends Major Sources



Stationary Sources & Fleet are 98% of Scope 1 Emissions

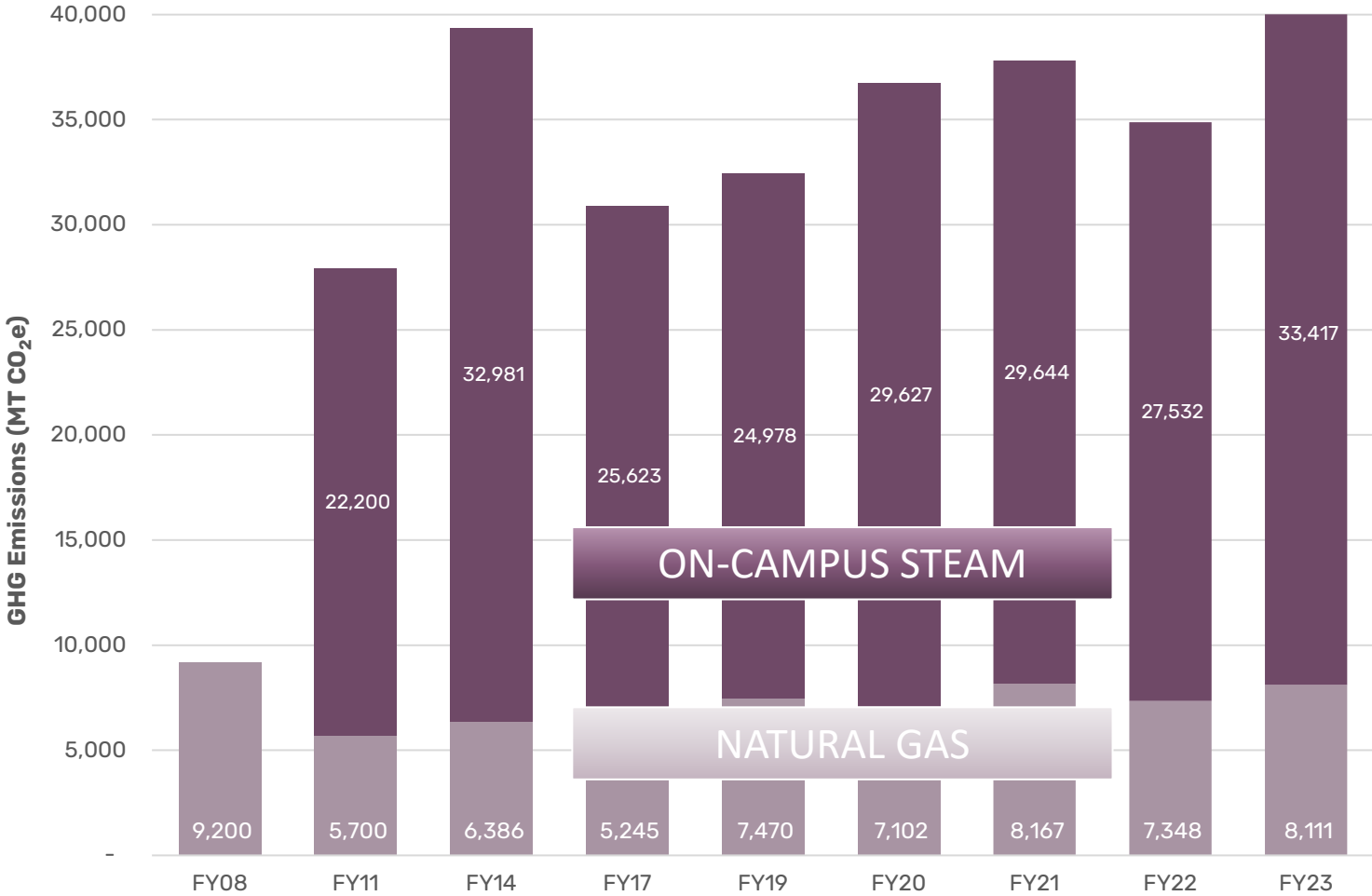
- NOTES**
- Fleet vehicle emissions have relatively increased more than any other category.
 - As Pitt transitions more of our steam needs to the CSSP, on-campus steam has continued to increase.

	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
On Campus Steam	0%	0%	49%	15%	13%	33%	34%	24%	50.5%
Natural Gas	0%	-38%	-31%	-43%	-19%	-23%	-11%	-20%	-11.8%
Fleet	0%	40%	155%	178%	298%	226%	201%	173%	194.4%

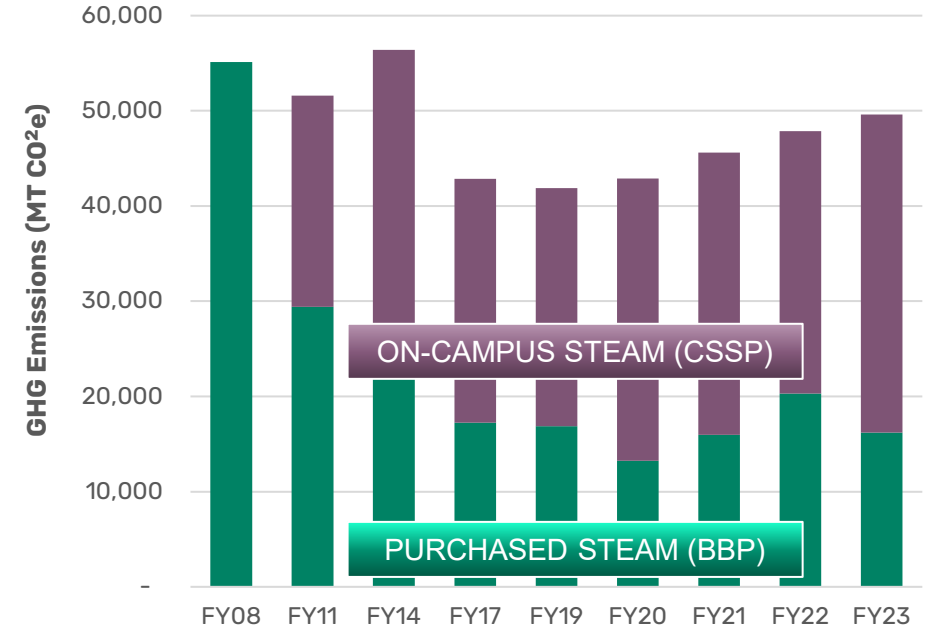
Stationary Sources

20% of Total Emissions

SCOPE 1 EMISSIONS - On-Campus Stationary Sources



Total Steam Emissions



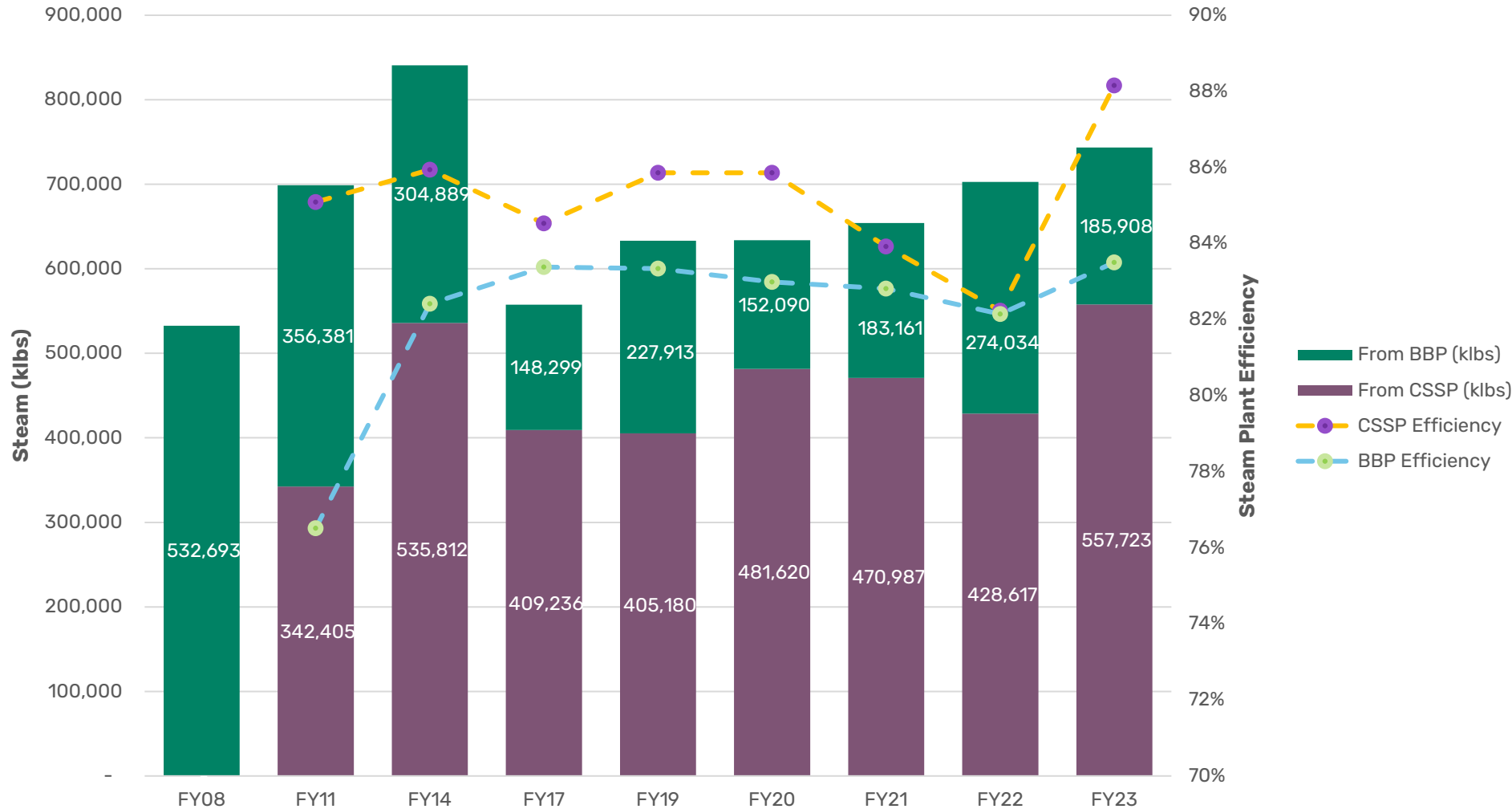
NOTES

- Pitt has Steam emissions in both Scope 1 & 2.
- Left figure shows Scope 1 GHG emissions only.
- Right figure shows total steam emissions
 - Scope 1 = On-Campus Carrillo Street Steam Plant
 - Scope 2 = Purchased from Bellefield Boiler Plant

Stationary Sources: Steam & Natural Gas

SCOPE 1
Direct Emissions
From Combustion

**Total Steam Used
On-Campus Carrillo Steam Plant
+ Purchased Steam from Bellefield Boiler Plant (klbs)**



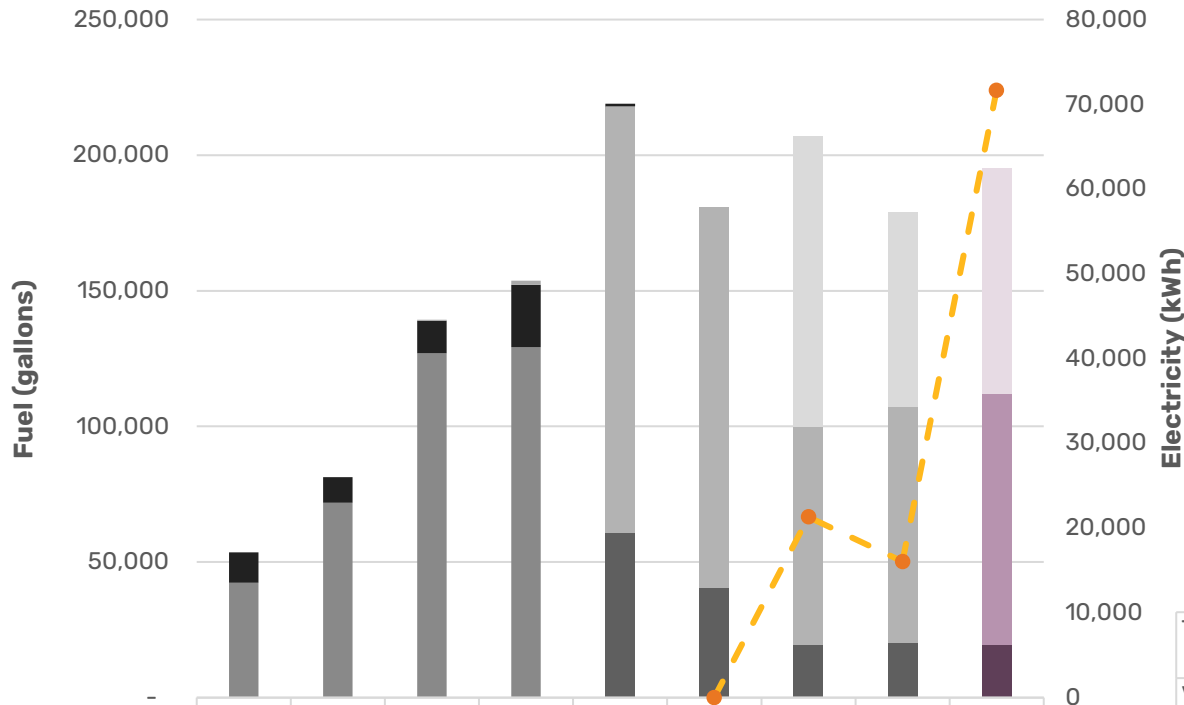
**Compared to
FY22,
Heating Degree
Days
decreased 4%,
but
building square
footage
increased 7%.**

Fleet Vehicle Fuel Use & Emissions

SCOPE 1
Direct Emissions
From Combustion

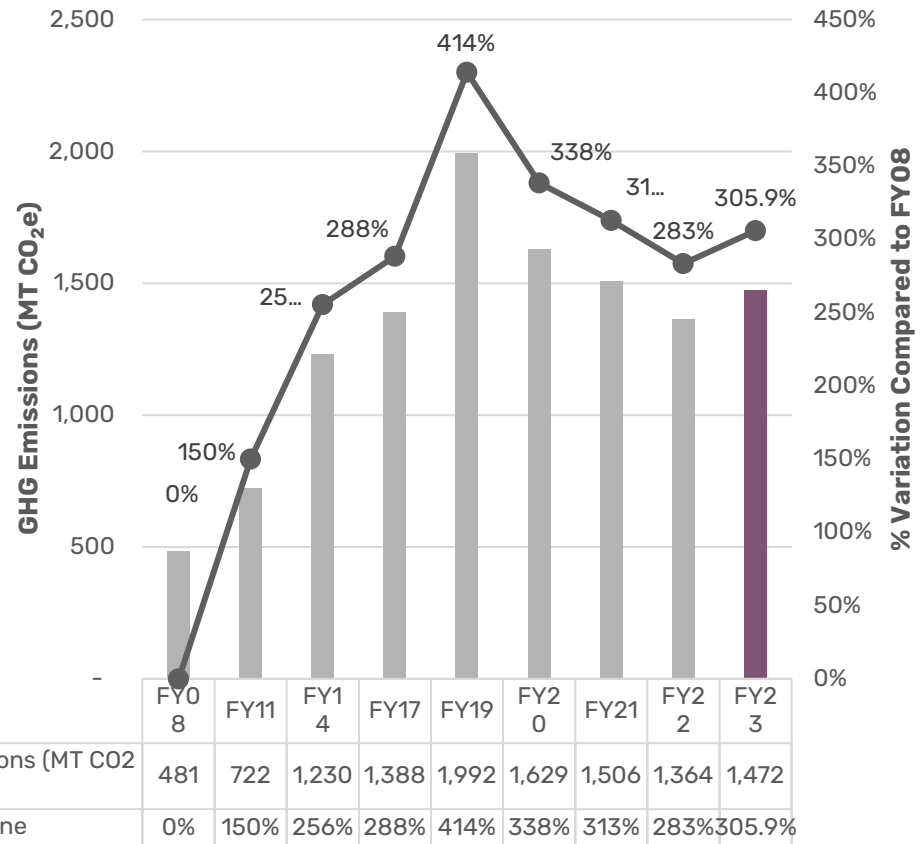
0.7% of Total Emissions

Year-To-Year Comparison Fleet Fuel Type



	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
Other (gal)	-	-	402	1,487	-	-	-	-	-
Propane (gal)	-	-	-	-	-	-	107,32	71,752	83,276
Biodiesel (gal)	11,220	9,500	11,976	23,050	994	-	-	-	-
Regular (gal)	42,300	71,800	126,97	129,16	-	-	-	-	-
Gasoline (gal)	-	-	-	-	157,40	140,17	80,655	87,172	92,391
Diesel (gal)	-	-	-	-	60,626	40,578	19,277	20,101	19,588
Electricity (kWh)	-	-	-	-	-	-	21,317	16,042	71,653

SCOPE 1 EMISSIONS – Fleet Vehicles



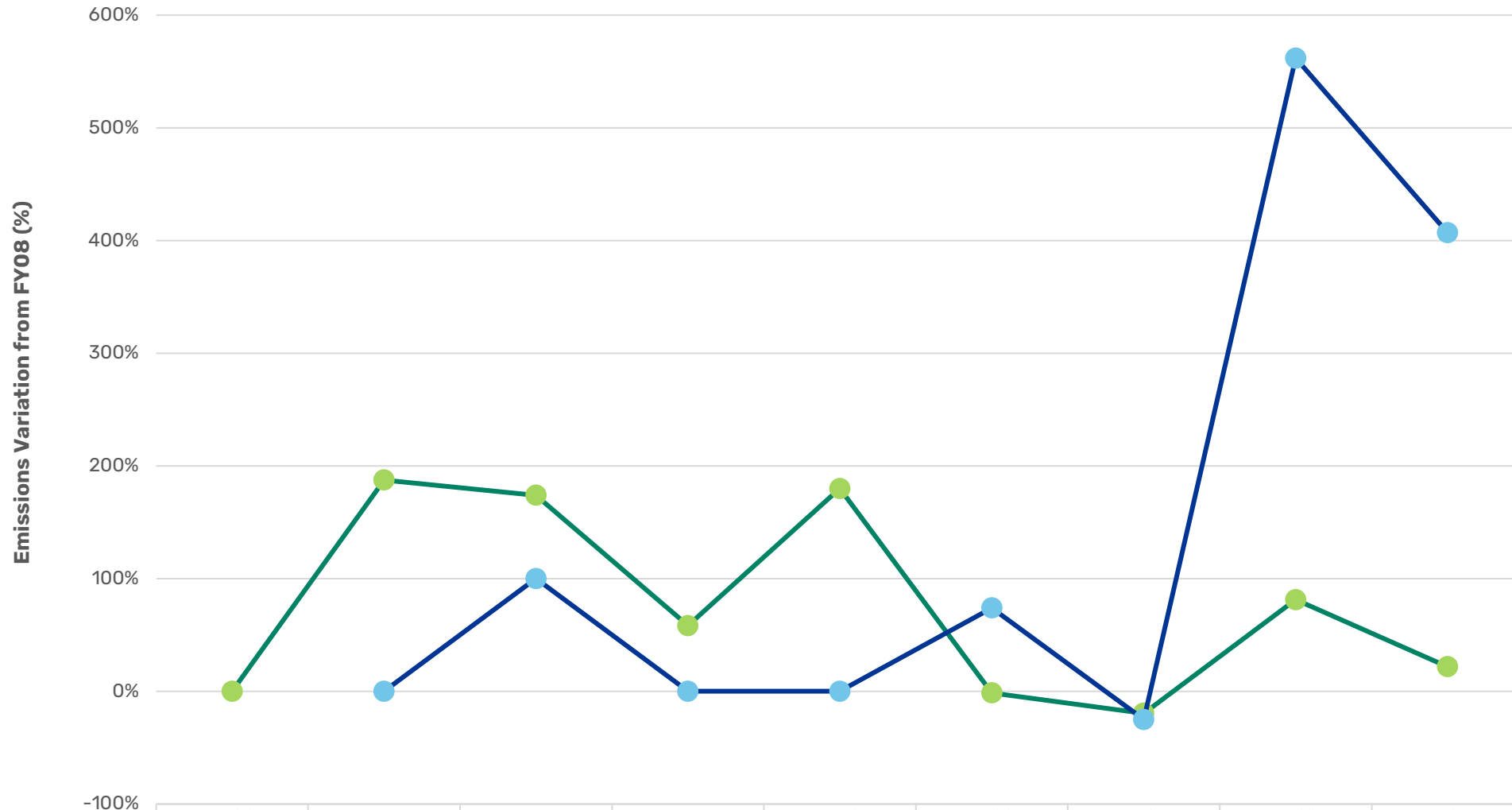
NOTES

- Despite being externally contracted, University shuttles are included in this category.
- In FY21, Shuttles shifted from biodiesel to propane.
- In FY23, emissions are up due to an increase in gasoline & propane use.

Scope 1: Minor Sources FY23 Trends

SCOPE 1
Direct Emissions
From Combustion

SCOPE 1 - Emissions Trends Minor Sources



Refrigerants & Fertilizers are 2% of Scope 1 Emissions

NOTES

- Refrigerant use varies widely year over year.
- Fertilizer data entry error was corrected in FY22 forward.

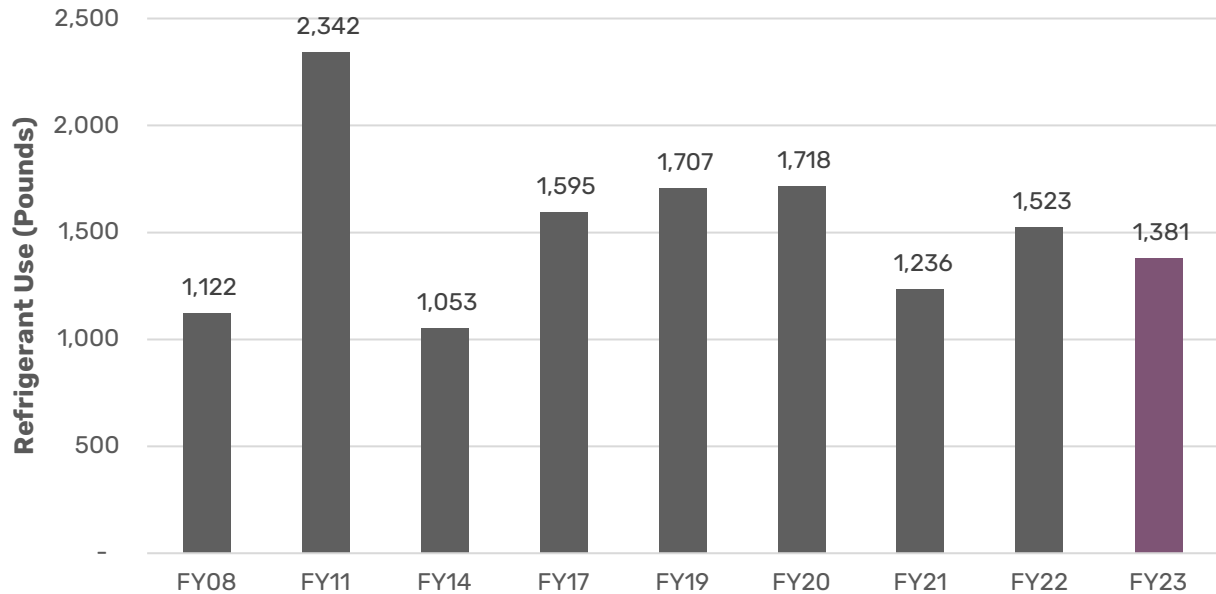
	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
Refrigerants	0%	188%	174%	58%	180%	-1%	-20%	81%	21.7%
Fertilizers	0%	0%	100%	0%	0%	74%	-25%	562%	407.0%

Refrigerants

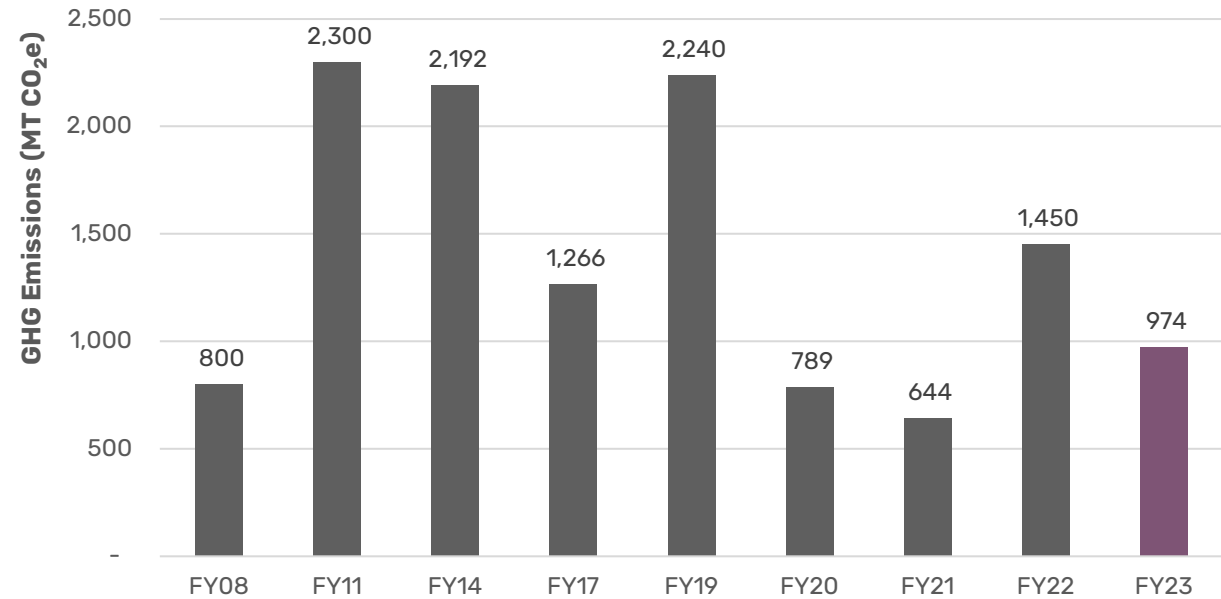
0.5% of Total Emissions

SCOPE 1
Direct Emissions
From Combustion

Year-To-Year Comparison Refrigerants Used



SCOPE 1 EMISSIONS - Refrigerants



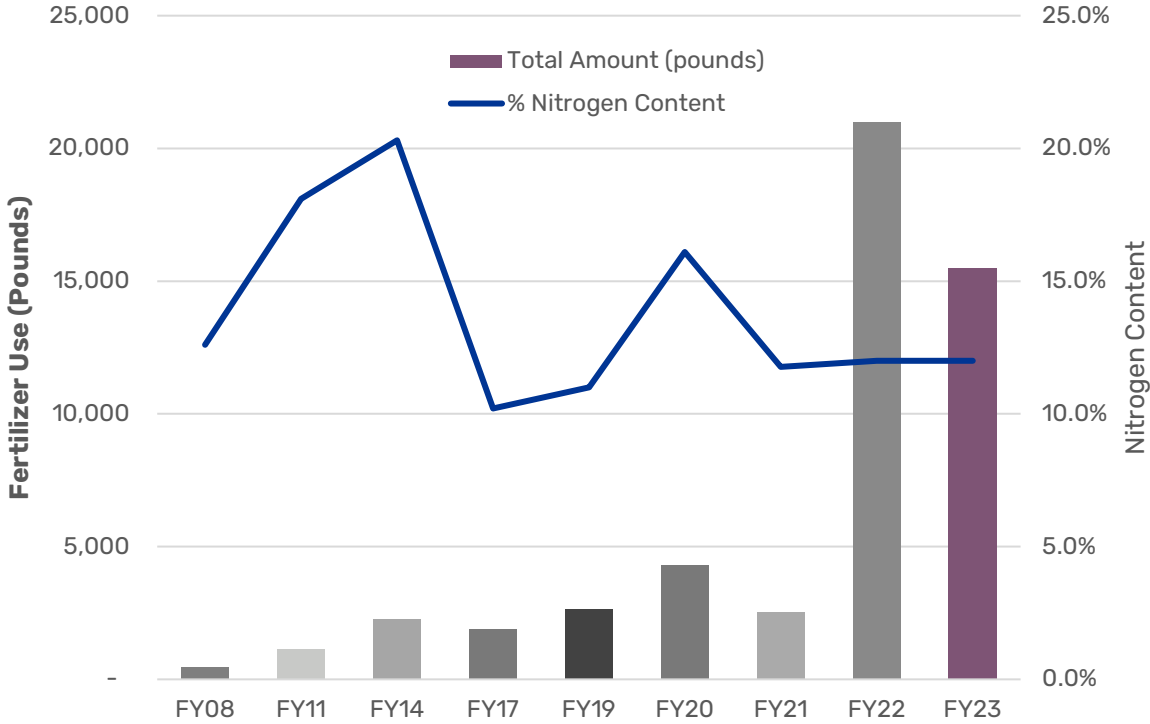
- NOTES**
- Refrigerants account for less than 1% of total GHG emissions.
 - Since FY08, Pitt has switched to refrigerants with lower GWP.
 - Refrigerant use varies widely year-over-year.
 - ★ Notable shifts in usage

Refrigerants			
Type of Refrigerant	GWP (100 yr)	FY22 (lbs used)	FY23 (lbs used)
★ R-508A	13214	26	0
★ R-507	3985	0	50
★ R-404A	3943	72	39
★ R-408A	2430	15	0
★ R-410A	1924	701	328
R-22	1810	412	286
R-407C	1624	82	92
R-134a	1430	205	186
R-448A	1387	11	0
★ R-123	77	0	400

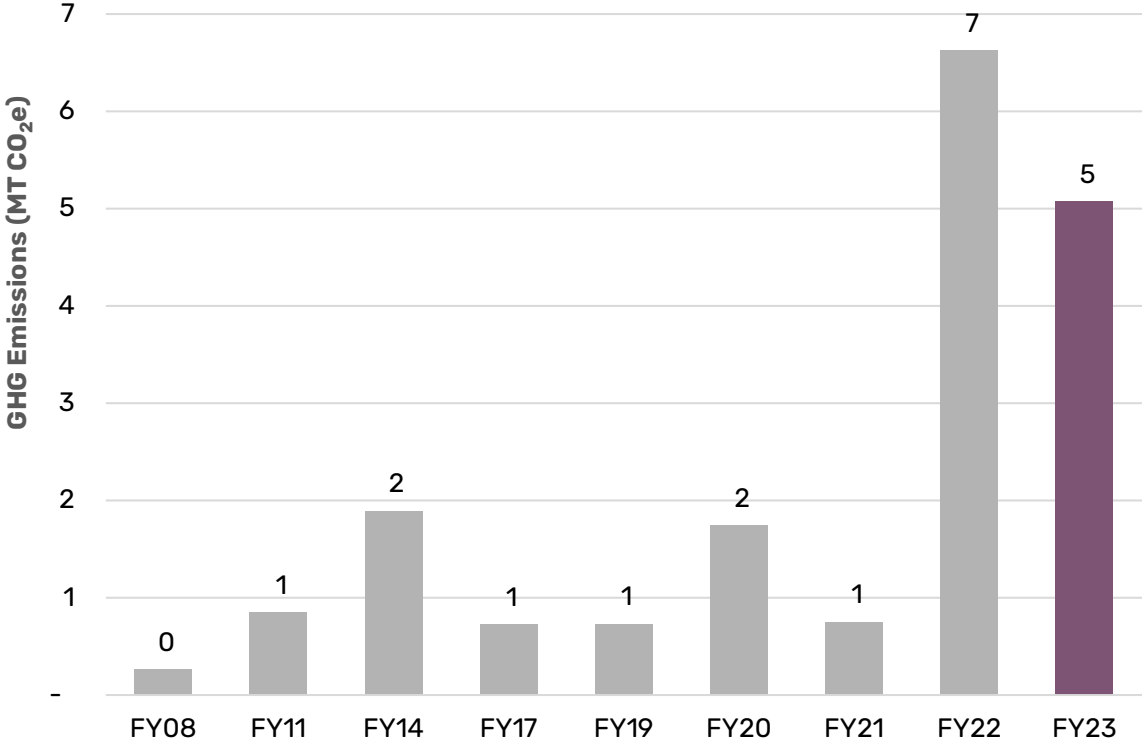
< 0.01% of Total Emissions

Fertilizers

Fertilizer Use



SCOPE 1 EMISSIONS - Fertilizers



NOTES

- FY08 – FY21 results include a data entry error relating to nitrogen content.
- FY22 forward, fertilizer use & emissions will appear much larger due to correction of this error.
- Less fertilizer was used in FY23 compared to FY21.



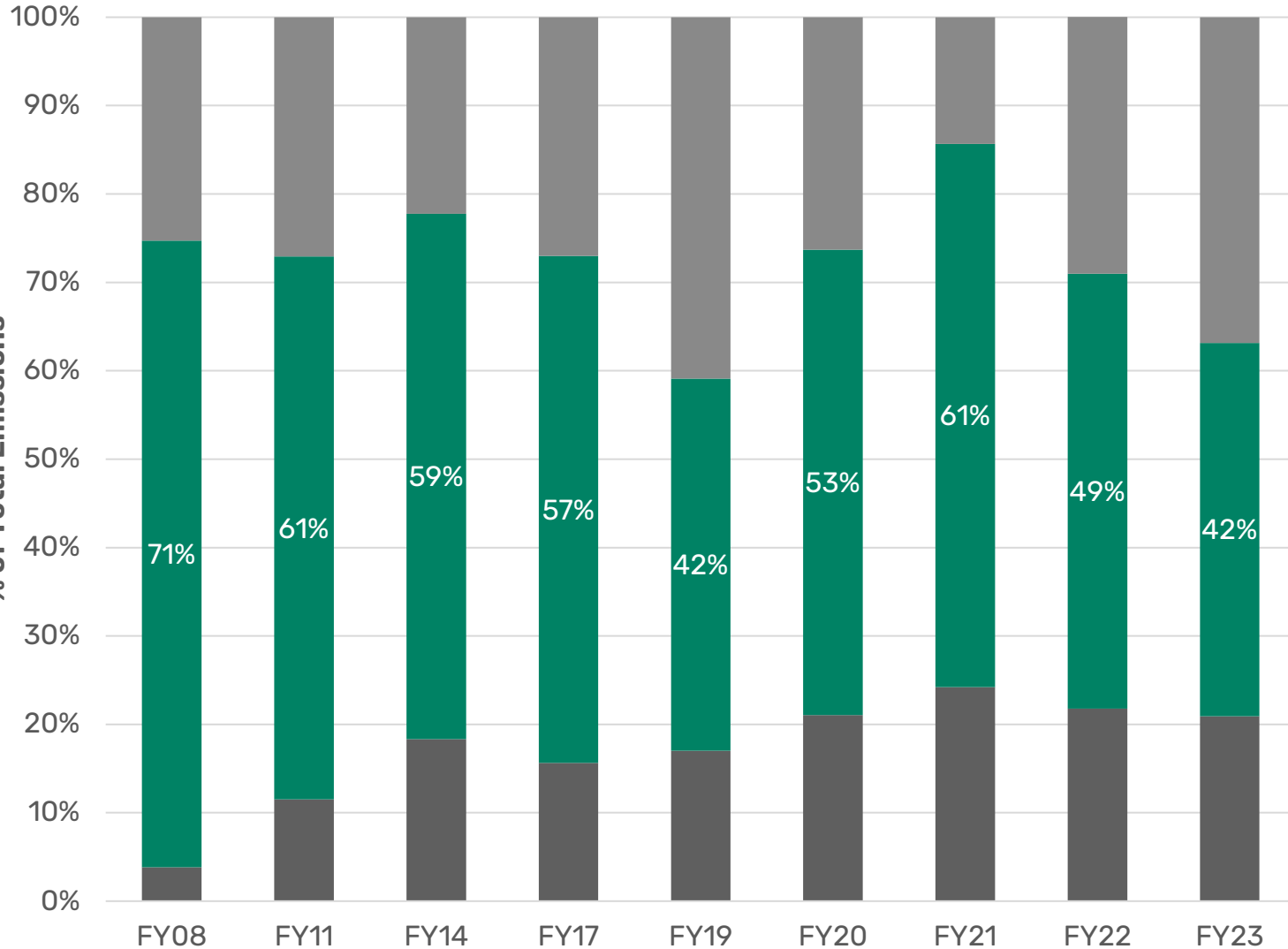
SCOPE 2

INDIRECT EMISSIONS

Scope 2: FY23 Trends

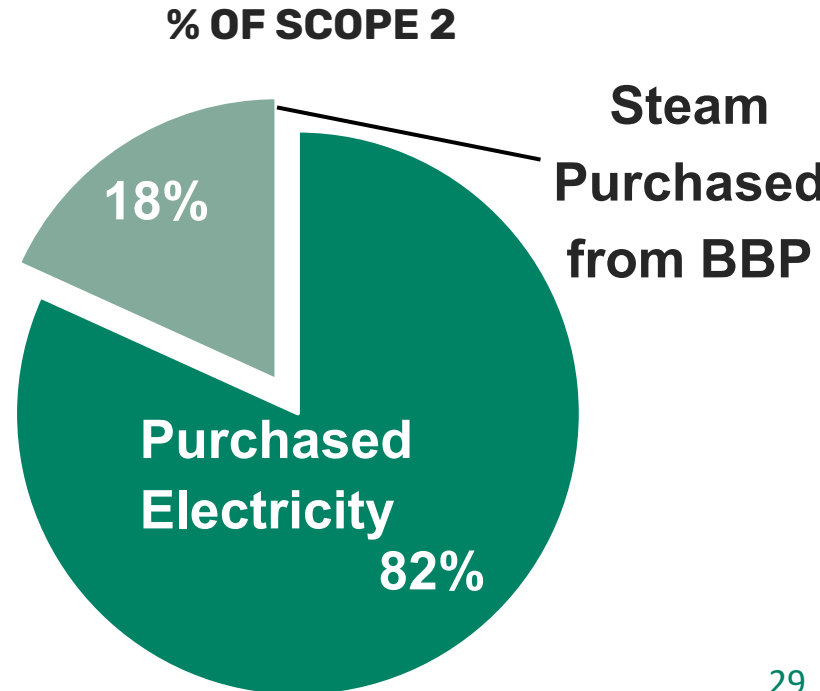
SCOPE 2
Indirect Emissions

Scope 2 % of Total Emissions



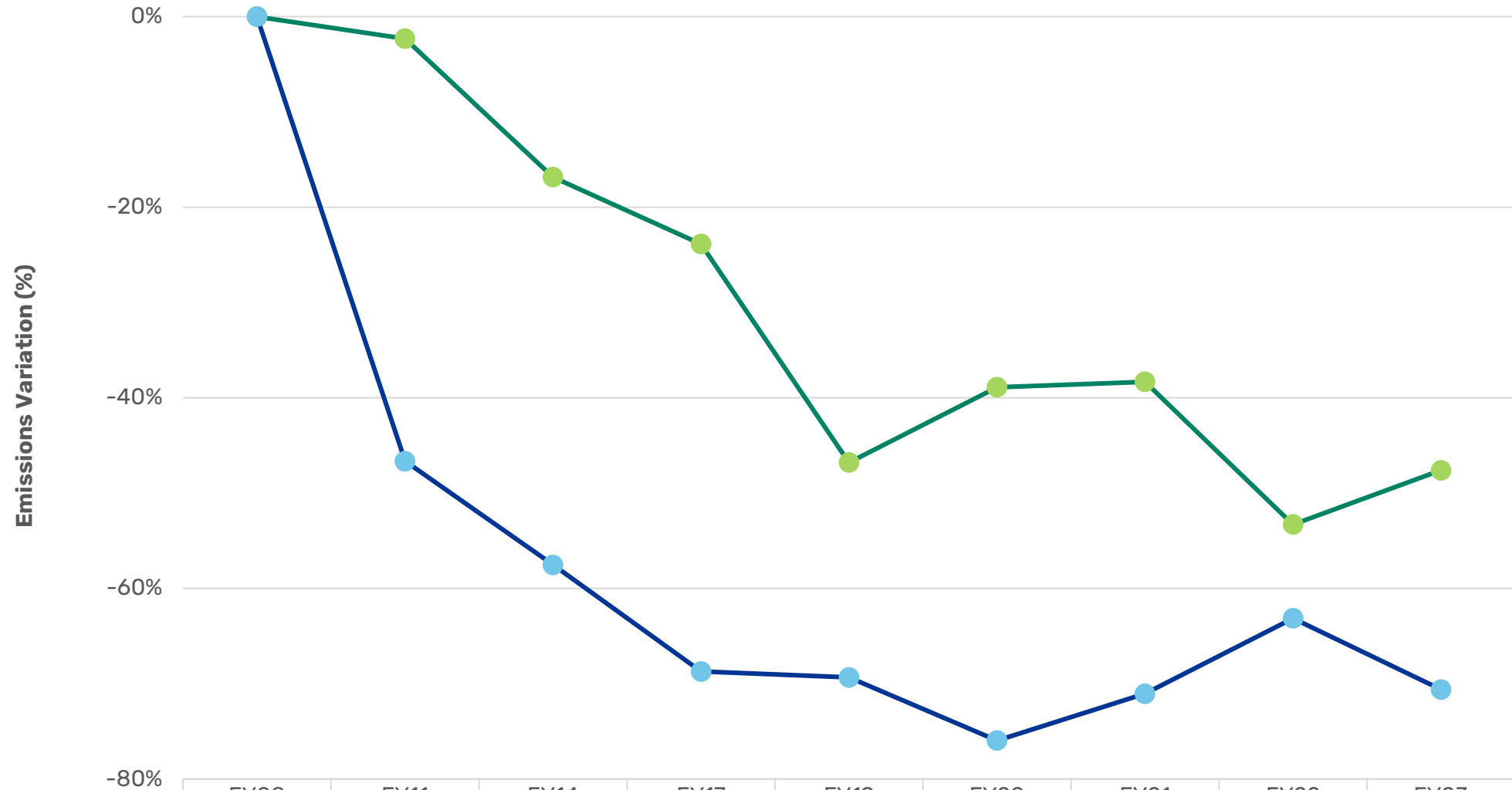
**Scope 2 is
42%
of
FY23 GHG Emissions
[88,859 MT CO₂e]**

- Scope 3
- Scope 2
- Scope 1



Scope 2: FY23 Trends

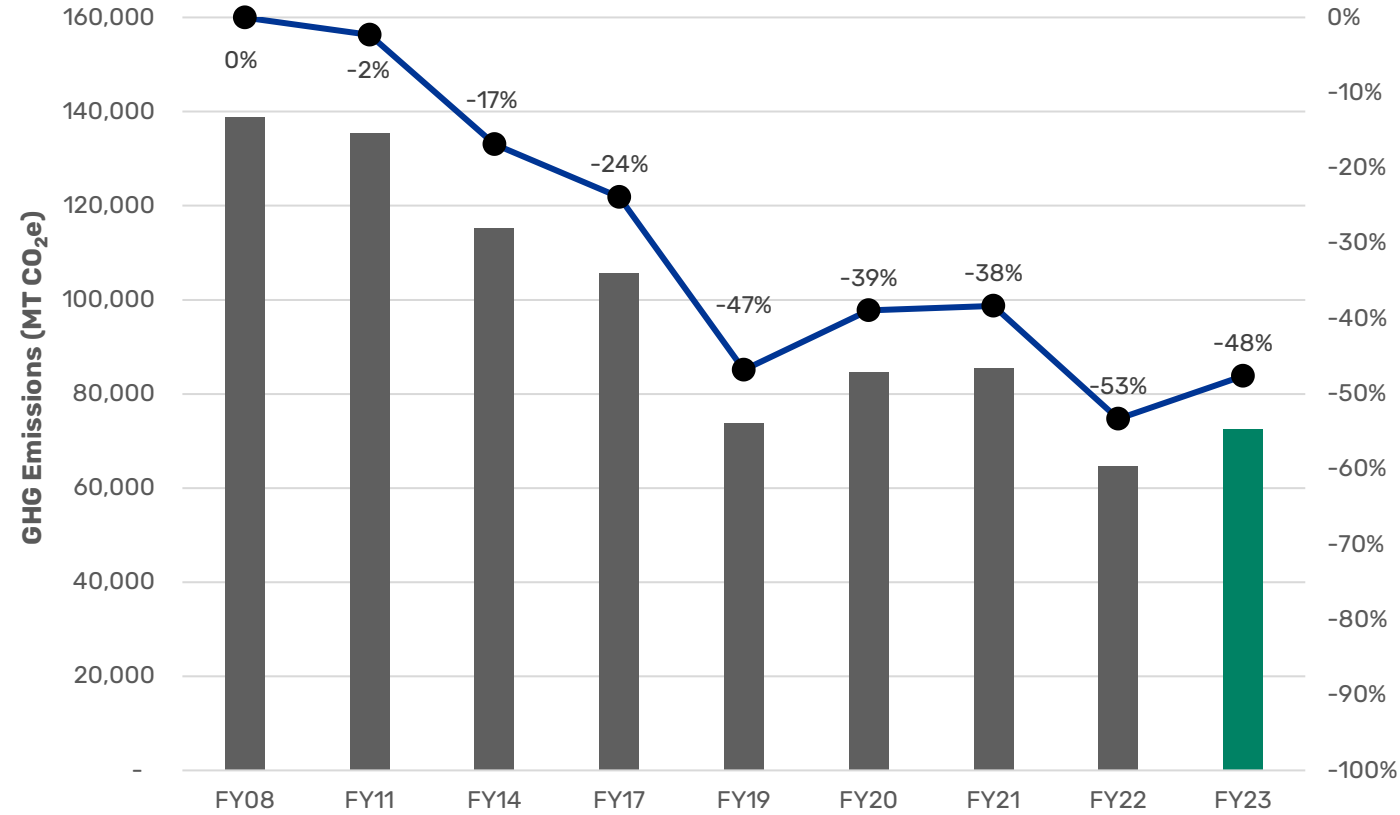
SCOPE 2 - Emissions Trends



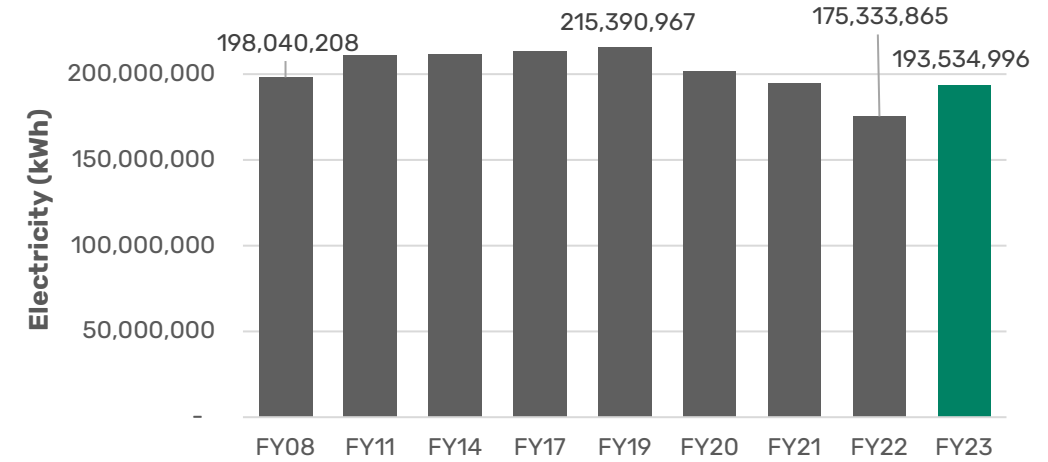
	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
Purchased Electricity	0%	-2%	-17%	-24%	-47%	-39%	-38%	-53%	-47.6%
Purchased Steam	0%	-47%	-58%	-69%	-69%	-76%	-71%	-63%	-70.6%

Purchased Electricity

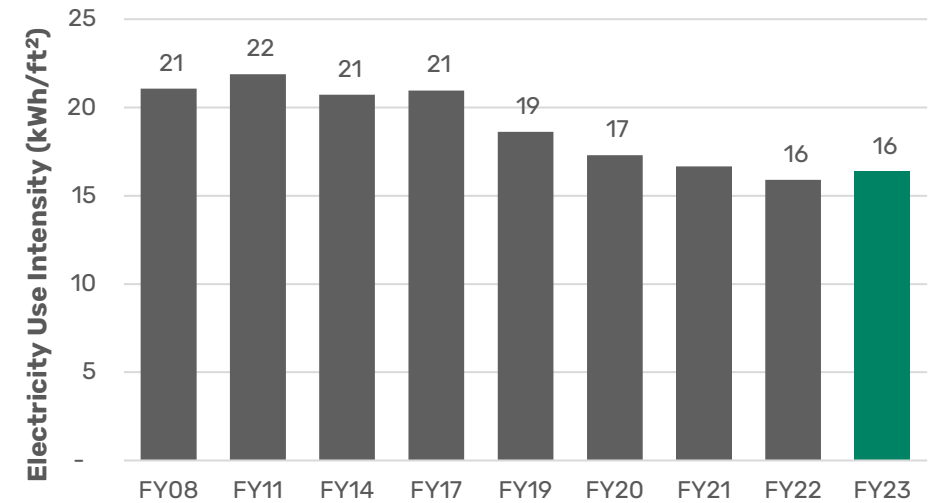
SCOPE 2 EMISSIONS - Electricity Usage Emissions



Year-To-Year Comparison Total Electricity



Year-To-Year Comparison Total Electricity per Building Sq. ft.



NOTES

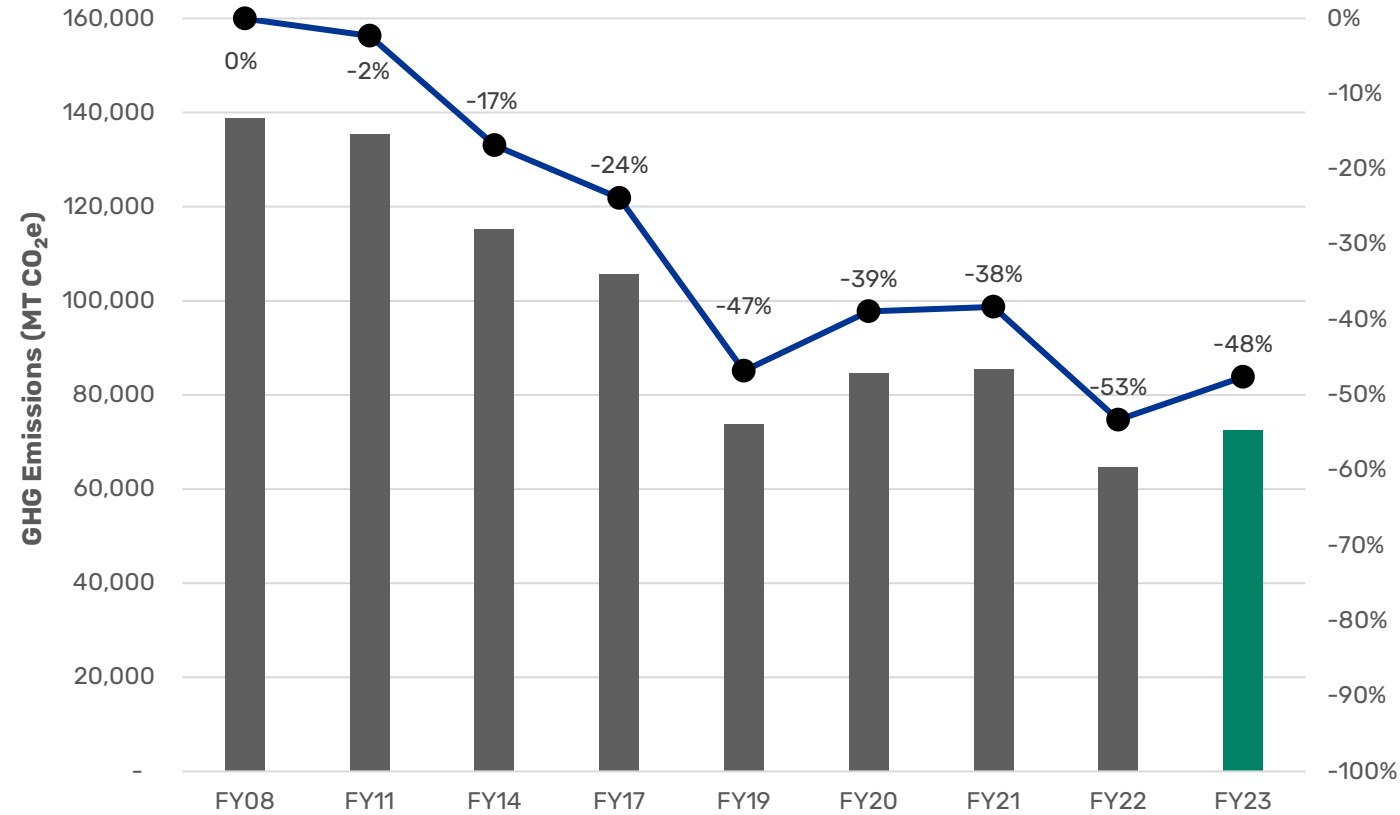
FY23 electricity use

- Decrease from FY19 (last pre-pandemic year)
- Increase compared to FY22 (primarily due to square footage increase).

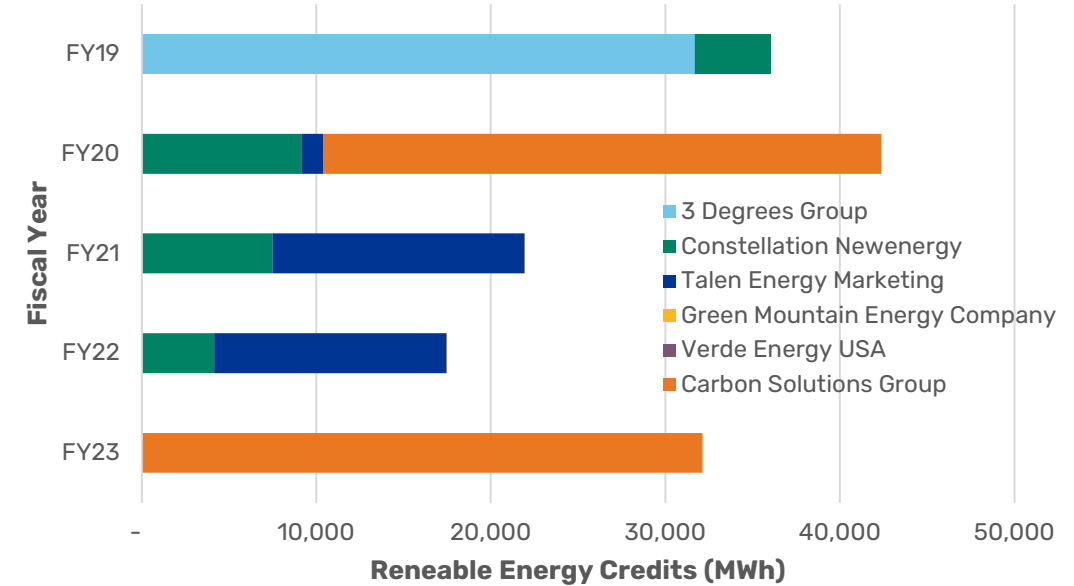
Purchased Electricity - Renewables

SCOPE 2
Indirect Emissions

SCOPE 2 EMISSIONS - Electricity Usage Emissions



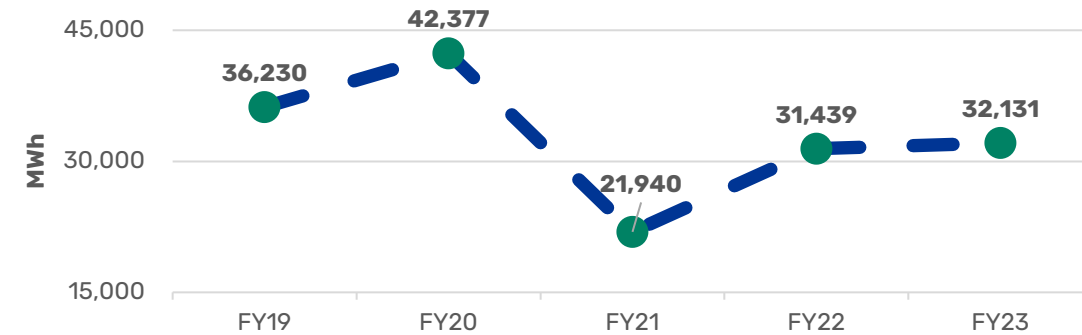
Renewable Energy Credit Sources



NOTES

- Prior to FY19, only minor REC procurement.
- Pitt's goal is 50% renewable electricity by 2030 and 100% by 2037.

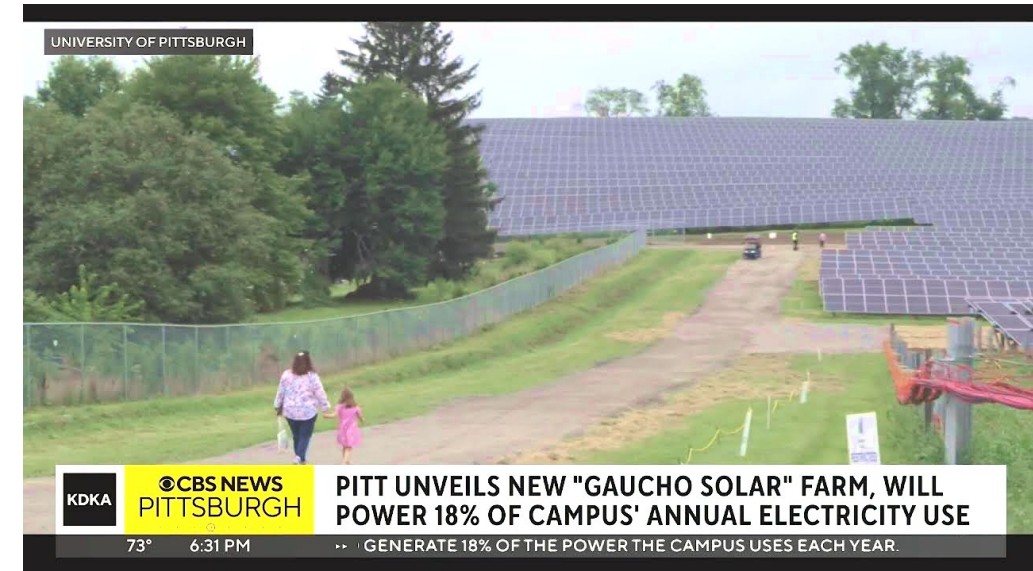
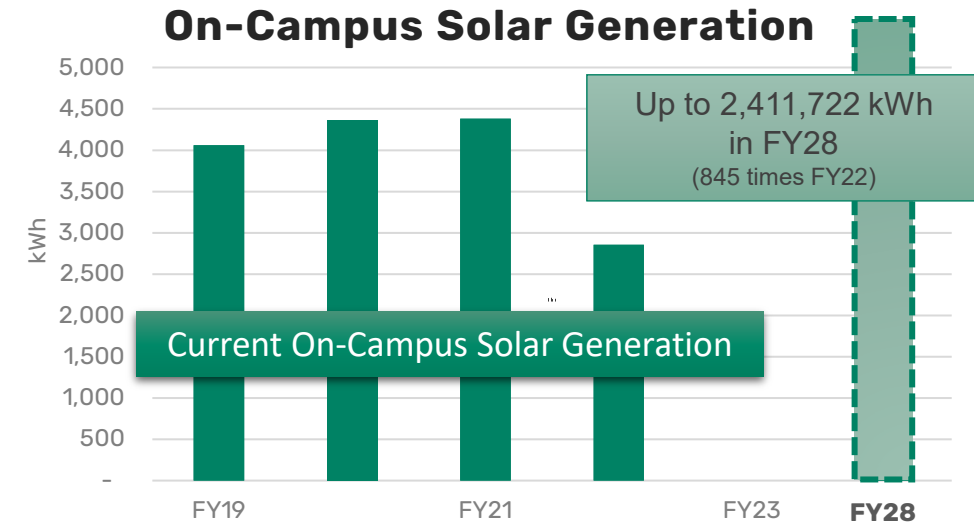
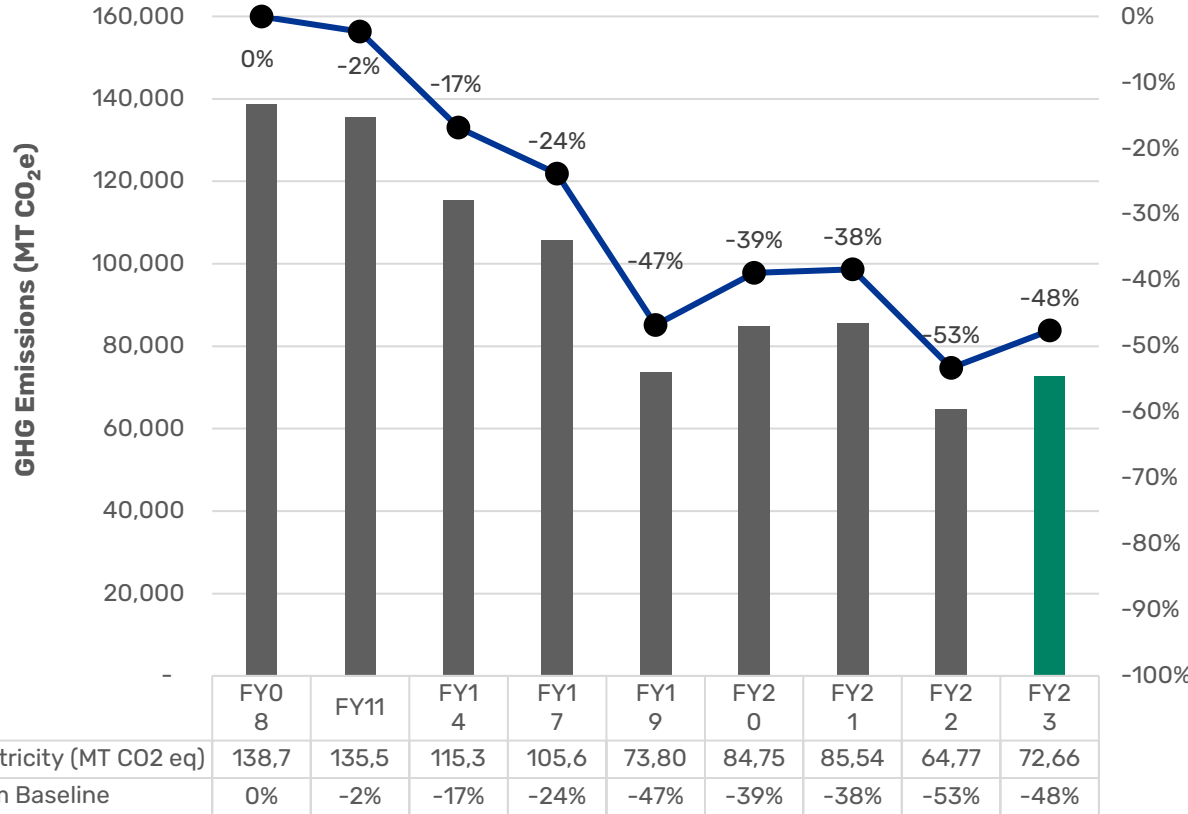
RECs - Annual Variation



Purchased Electricity

35% of FY23 GHG Emissions

SCOPE 2 EMISSIONS - Electricity Usage Emissions



NOTE

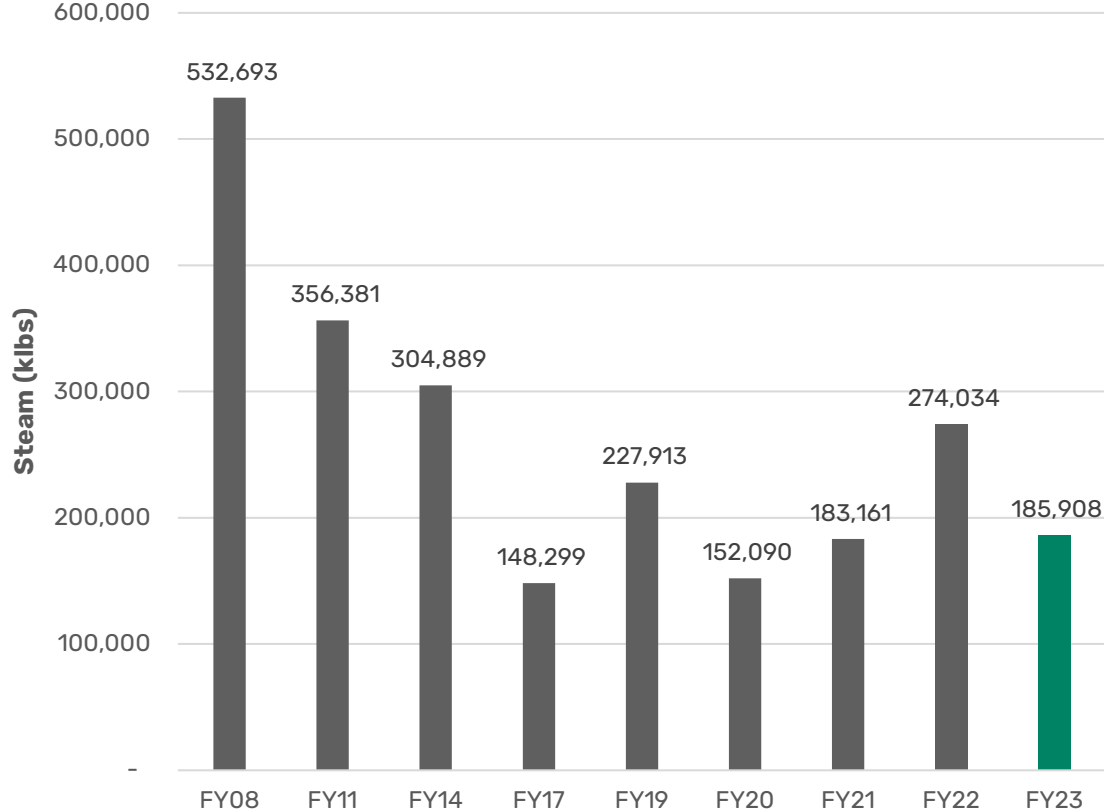
- Despite square footage growth from FY08 to present, 48% decrease in electricity-related GHG emissions due to both building efficiency & renewable procurement.

Purchased Steam & Relative Emissions

8% of Total Emissions

SCOPE 2
Indirect Emissions

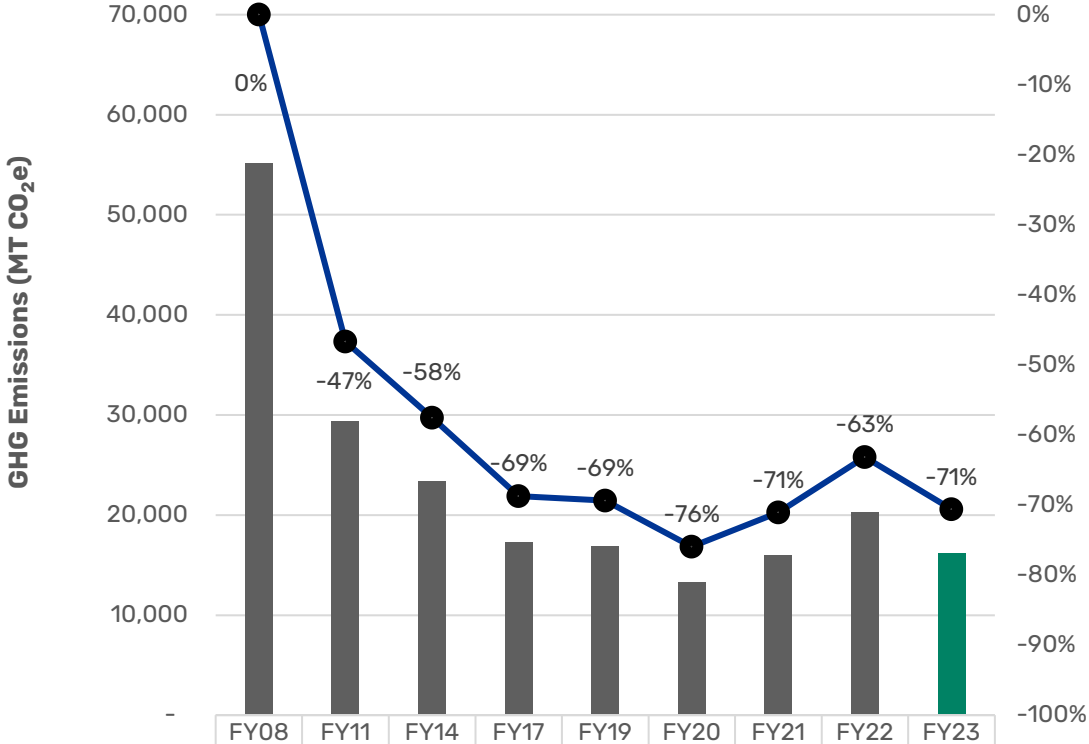
Year-to-Year Steam Purchased from Off-Campus Bellefield Boiler Plant (klbs)



NOTES

- In FY23, purchased steam use & GHG emissions decreased because more on-campus steam was used (Scope 1).
- Total steam use increased (Scope 1 + 2).

SCOPE 2 EMISSIONS - Purchased Steam Emissions



	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
Bellefield Purchased Steam Emissions (MT CO2 eq)	55,100	29,400	23,404	17,238	16,892	13,247	15,954	20,310	16,193
Variation % from Baseline	0%	-47%	-58%	-69%	-69%	-76%	-71%	-63%	-71%

SCOPE 3

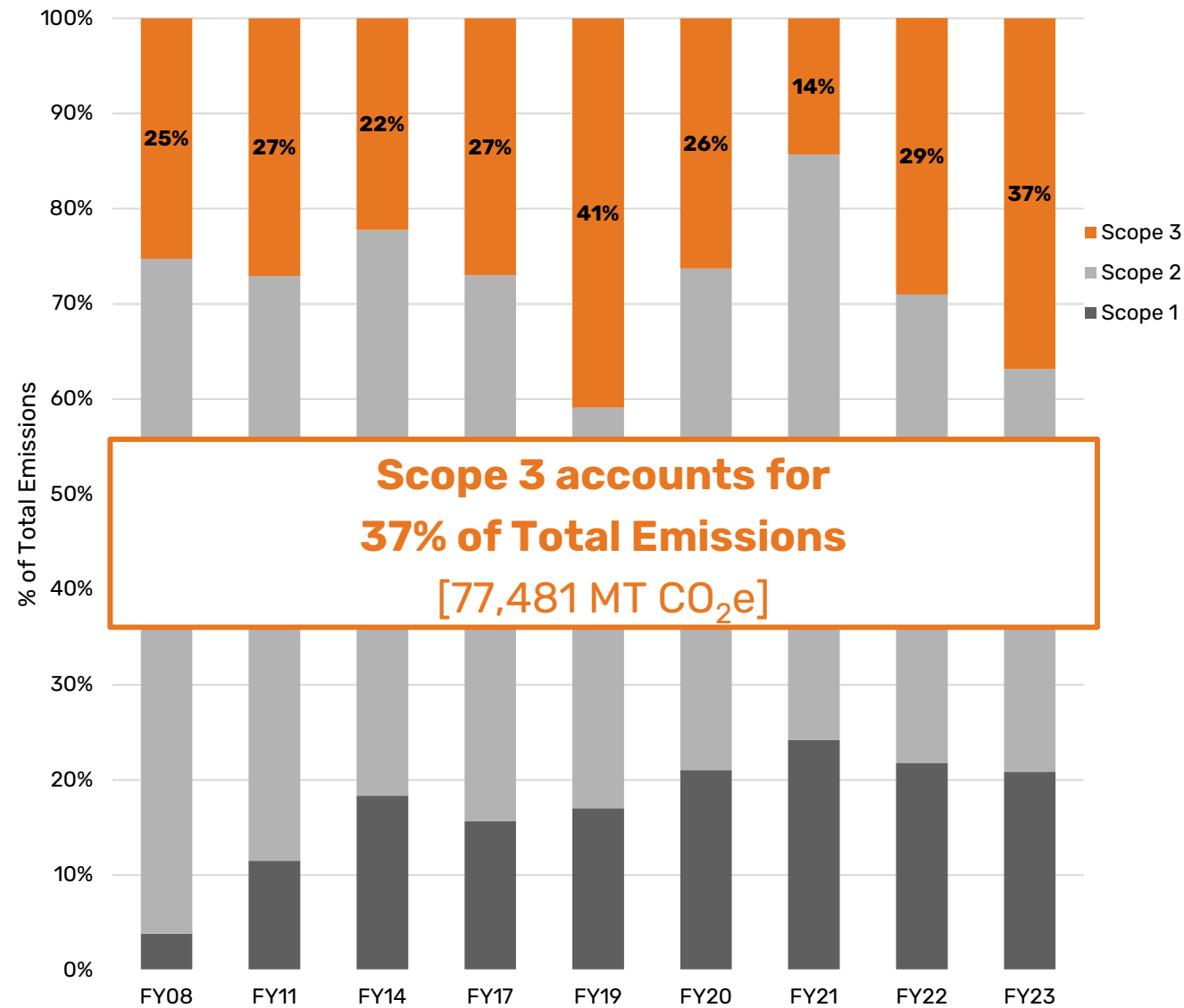
OTHER INDIRECT EMISSIONS



Scope 3: FY23 Trends – Travel

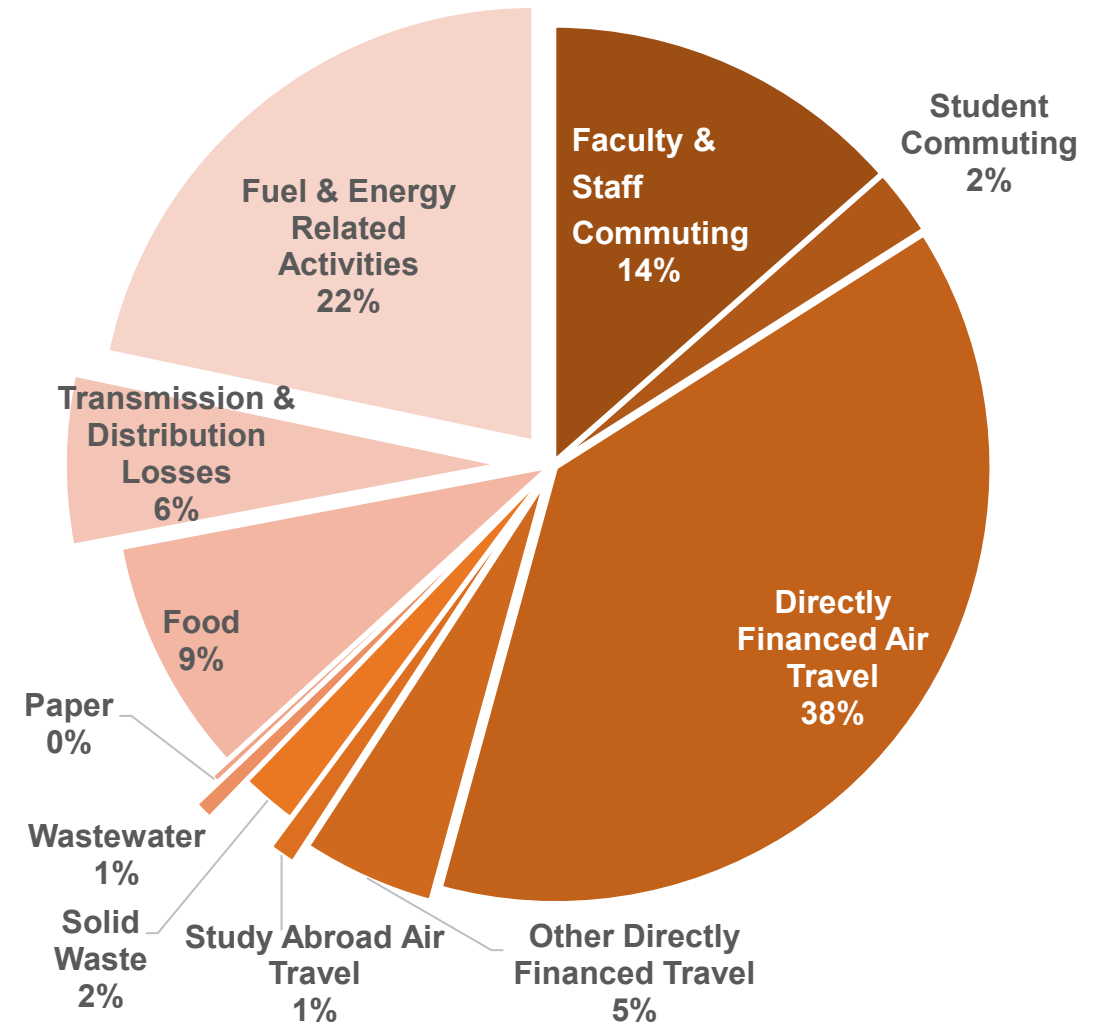
SCOPE 3
Other Indirect Emissions

Scope 3 % of Total Emissions



Scope 3 accounts for 37% of Total Emissions
[77,481 MT CO₂e]

% OF SCOPE 3



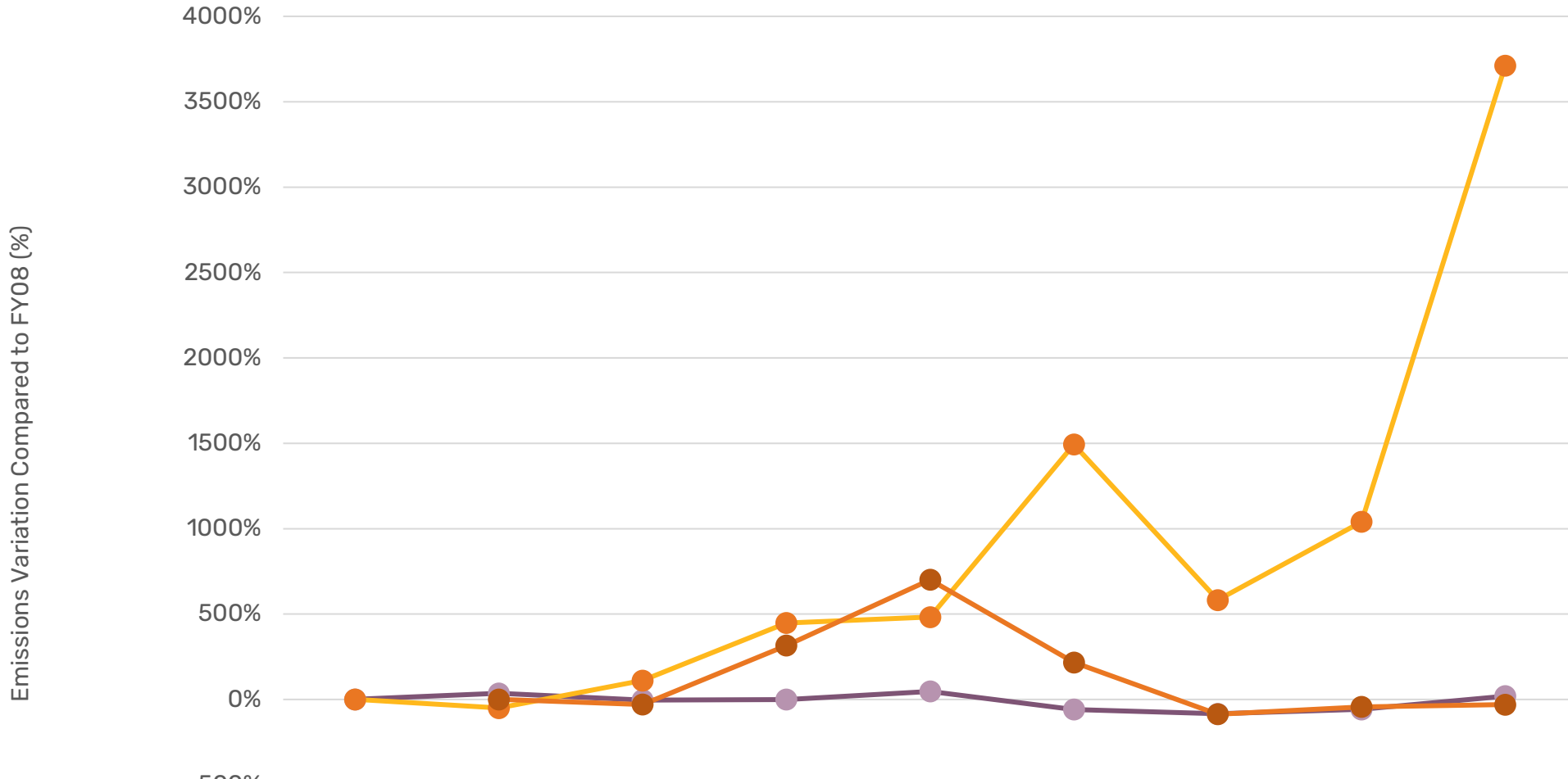
NOTE

- Scope 3 emissions were the largest since pre-pandemic.
- FY23 included a return to normal travel patterns, especially for Athletics, and Faculty & Staff Air Travel.

Scope 3: FY23 Trends – Travel

SCOPE 3
Other Indirect Emissions

SCOPE 3 - Emissions Trends - Travel



Travel is 16% of FY23 GHG Emissions (+9% from FY22)

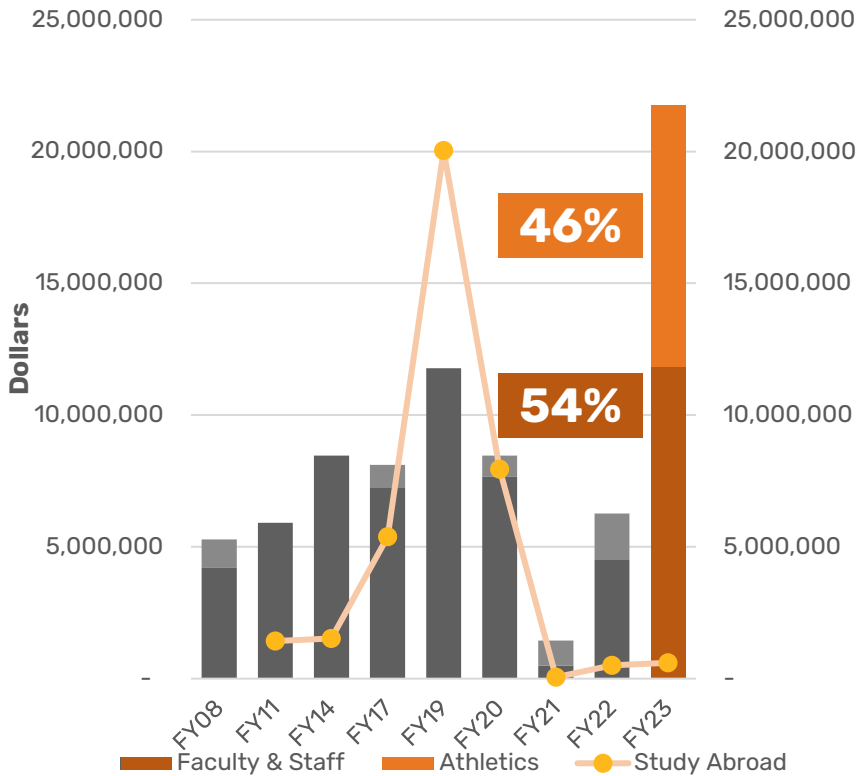
- NOTE**
- FY20-22 Pandemic-Influenced
 - FY22 - Personal car travel reimbursement data not provided.

	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
Directly Financed Air Travel	0%	35%	-4%	0%	47%	-59%	-84%	-58%	19.6%
Other Directly Financed Travel	0%	-50%	111%	448%	482%	1493%	583%	1040%	3712.0%
Study Abroad Air Travel		0%	-30%	316%	701%	217%	-86%	-43%	-30.4%

Directly Financed Travel & Study Abroad

SCOPE 3
Other Indirect Emissions

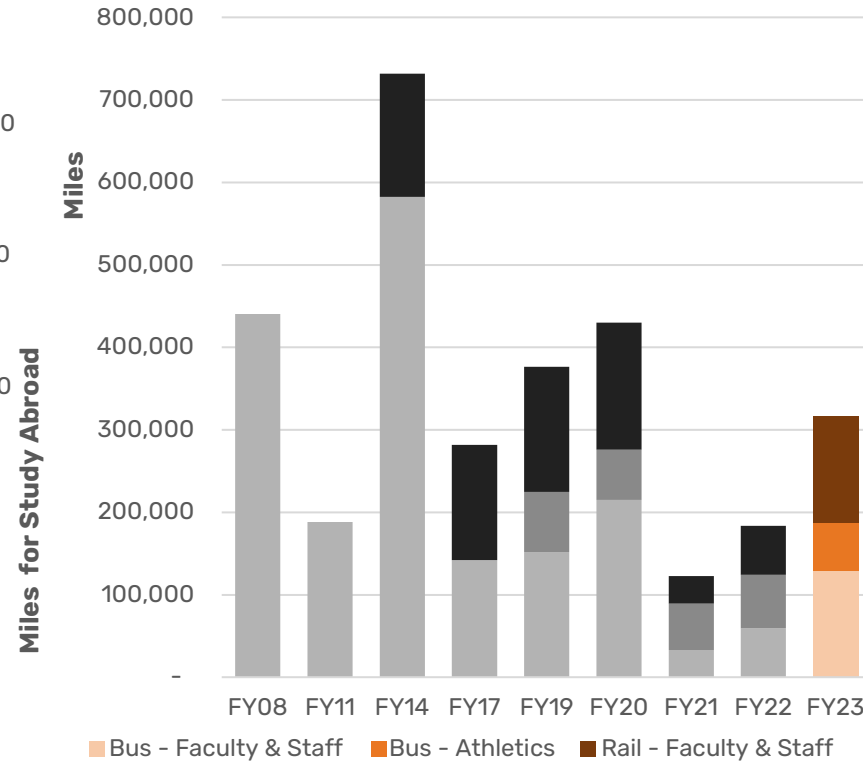
Air Travel



DATA NOTES

- Not adjusted for inflation.
- FY11, FY14, & FY19 - Athletics data not provided.

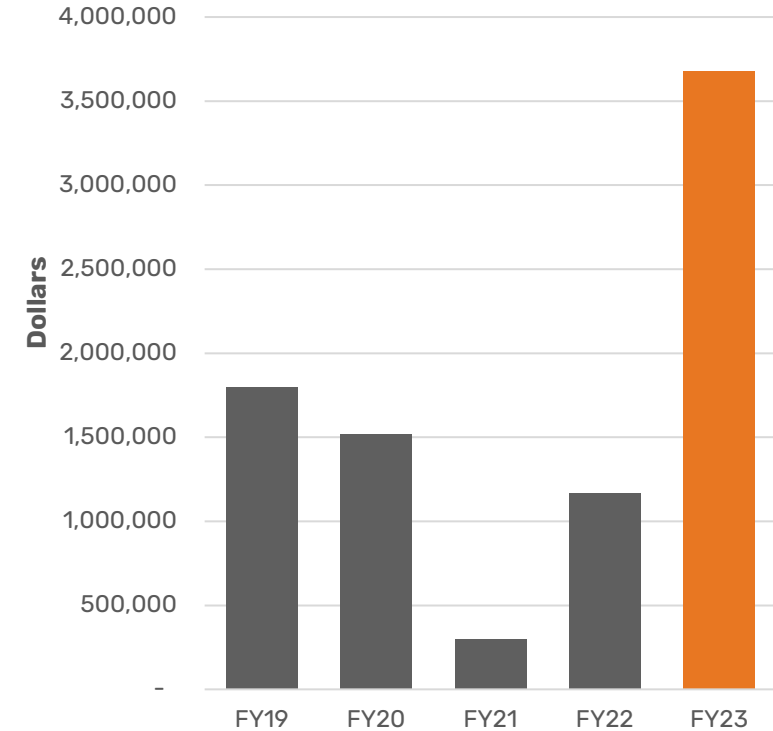
Bus & Rail Miles



DATA NOTES

- FY23 - Bus & rail use up between FY17 & FY19 levels.
- FY21 & FY22 – Pandemic-influenced

Car Travel - Faculty & Staff



DATA NOTES

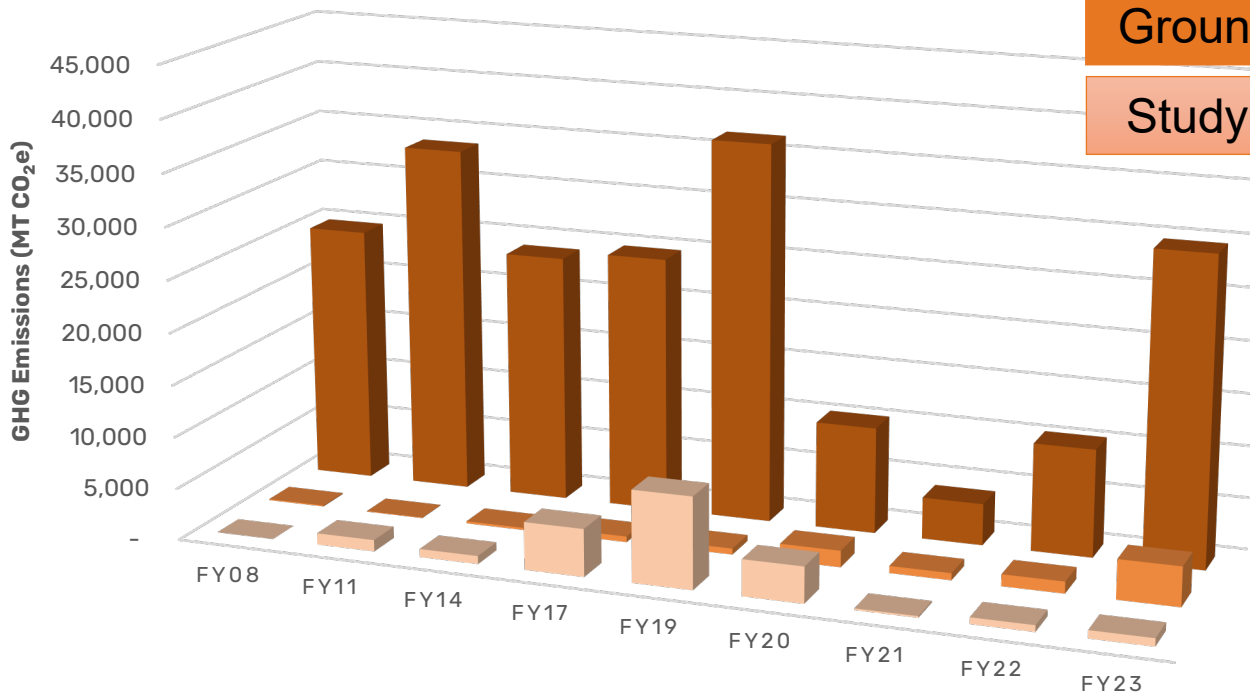
- Not adjusted for inflation
- FY23 – Personal car data included & car travel increased significantly.
- Prior to FY19 & FY22 - Personal car travel reimbursement data not provided.

Directly Financed Travel & Study Abroad

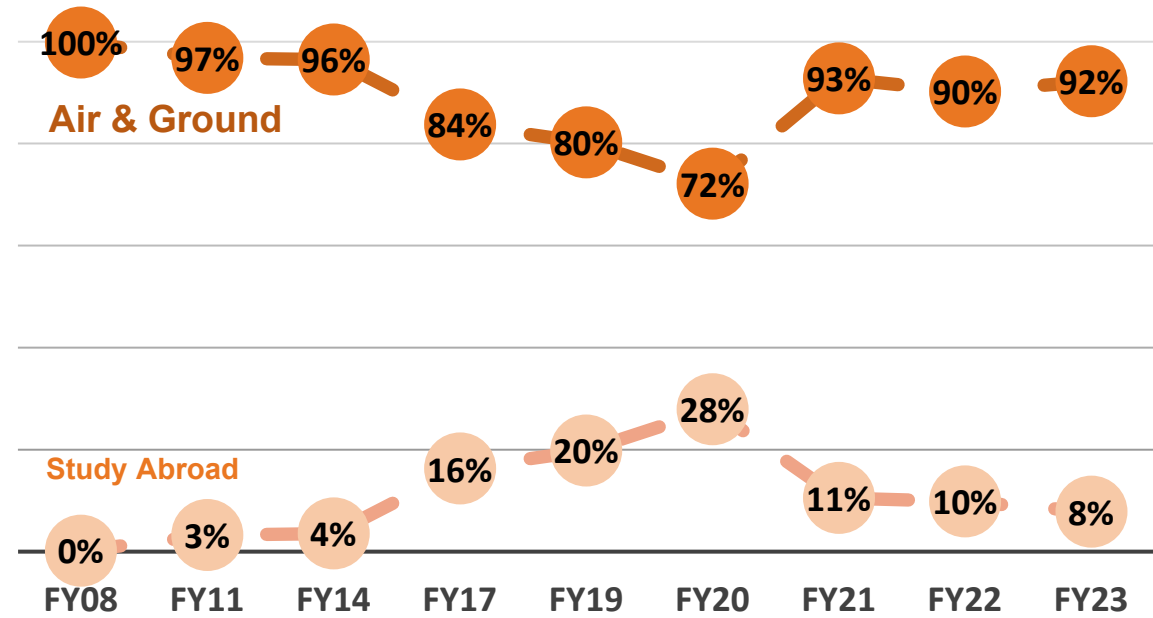
16% of Total Emissions

SCOPE 3 - Travel Emissions

- Air Travel
- Ground Travel
- Study Abroad



Percentage of Travel Emissions

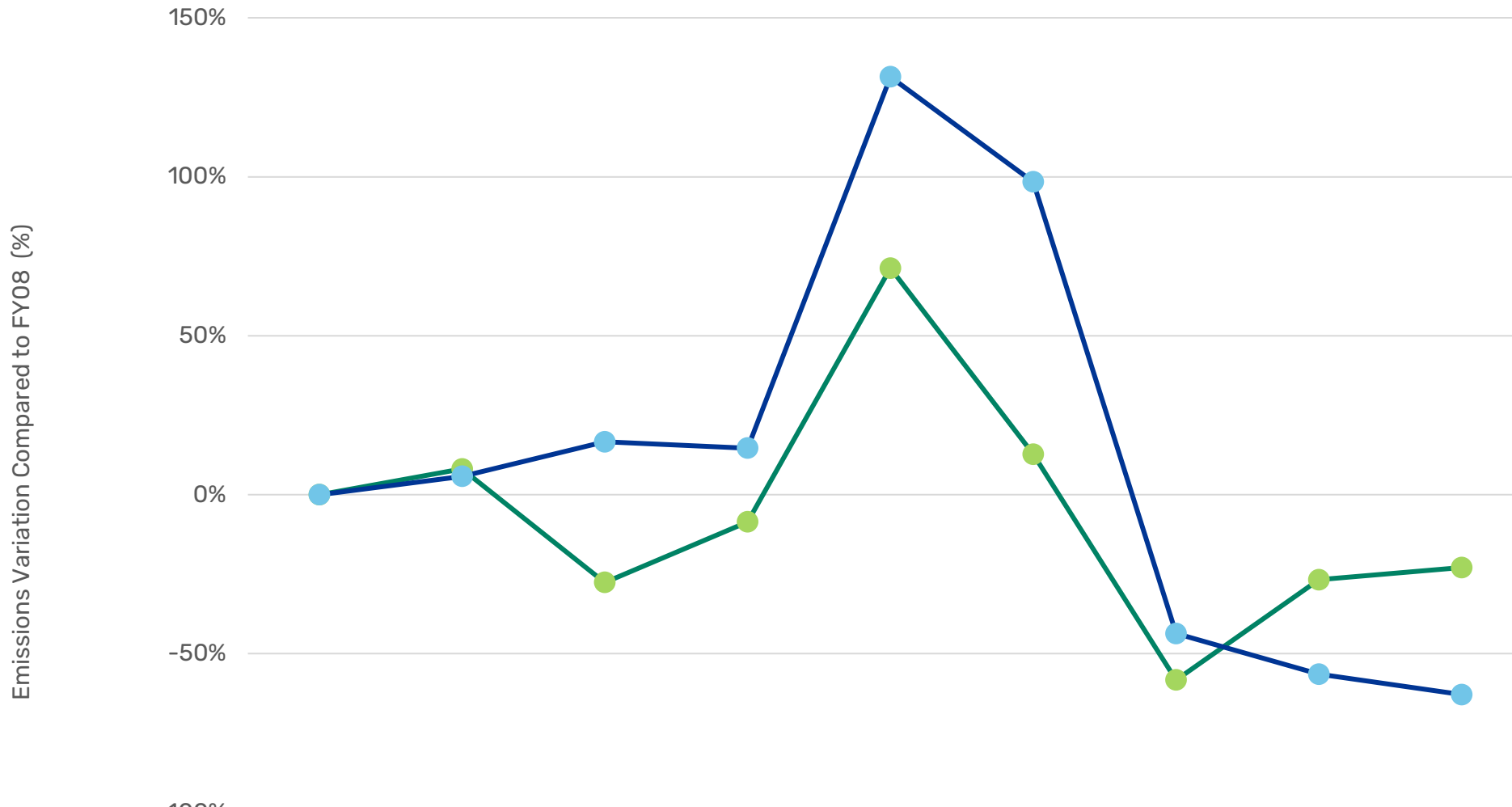


	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
Study Abroad	-	1,100	775	4,578	8,816	3,489	153	626	765
Ground Travel	100	50	211	548	582	1,593	683	1,140	3,812
Directly Financed Air Travel	24,800	33,600	23,921	24,706	36,560	10,273	4,018	10,400	29,651

Scope 3: FY23 Trends – Commuting

SCOPE 3
Other Indirect Emissions

SCOPE 3 - Emissions Trends - Commuting



Commuting
6%
of FY23 GHG
Emissions
(-1% from FY22)

NOTES

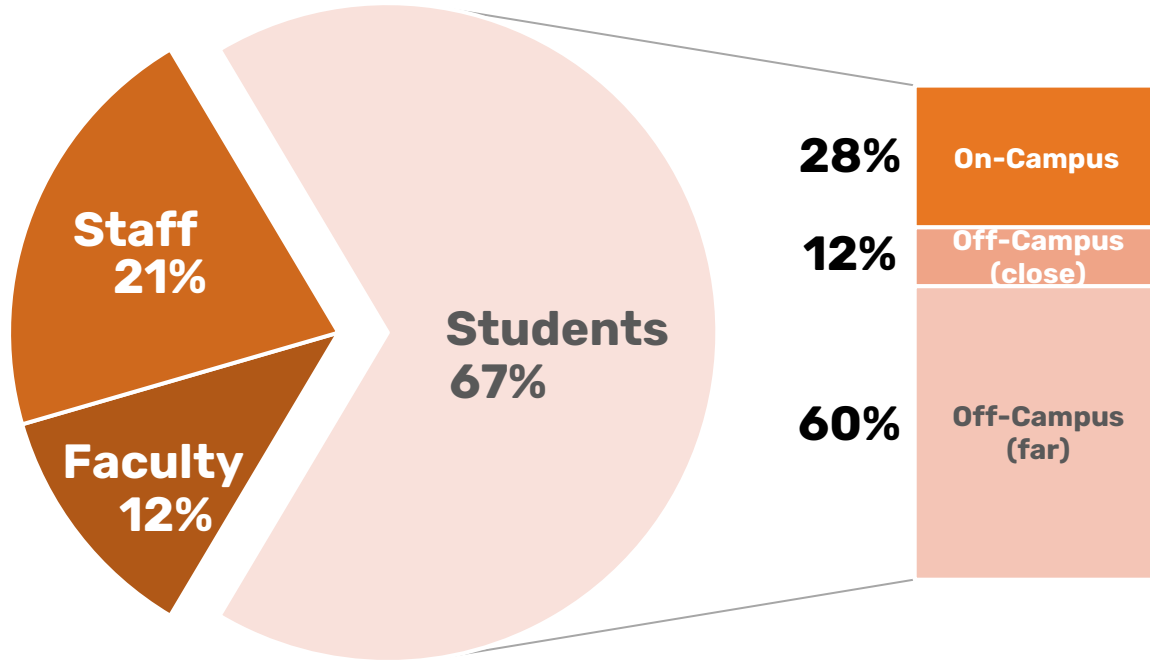
- Commuting assumptions (& thus emission) had little variation between FY22 & FY23
- Faculty & staff commuting increased 5% due to an increase in employee count
- Student commuting decreased 15% due to an increase in students living close to campus & walking.

	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
Faculty & Staff Commuting	0%	8%	-28%	-9%	71%	13%	-58%	-27%	-22.9%
Students Commuting	0%	6%	17%	15%	131%	98%	-44%	-56%	-62.9%

Commuting

6% of Total Emissions

Commuting Population (FTE) & Student Population Living Locations

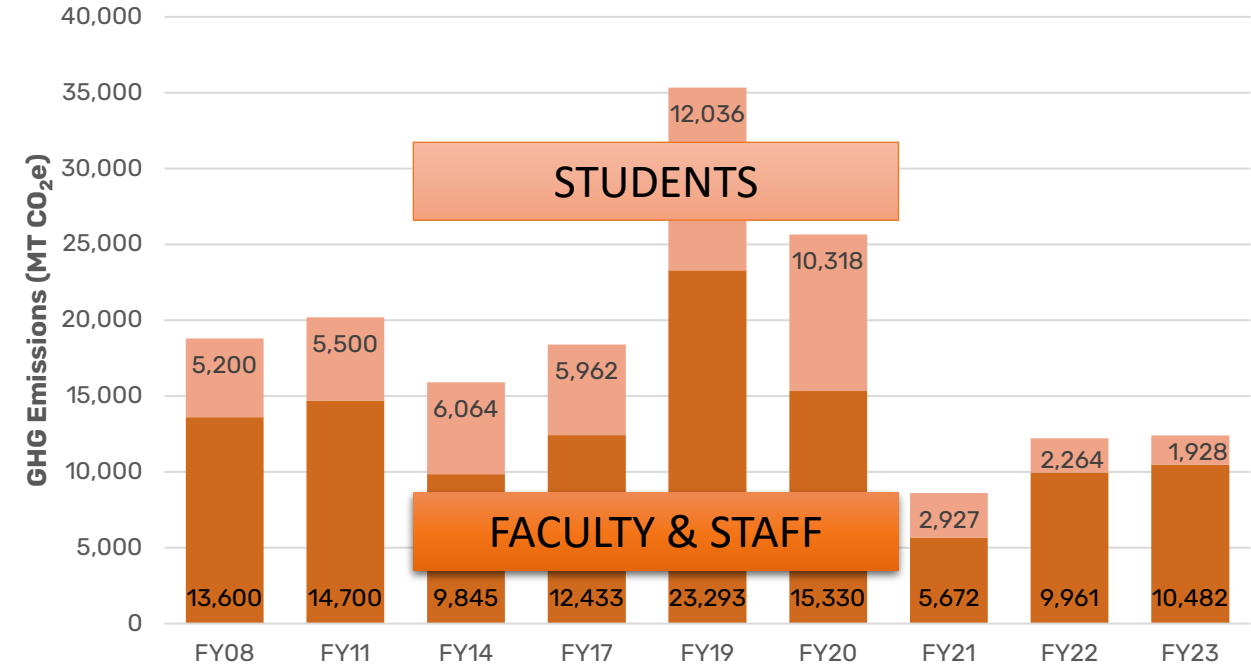


DATA NOTES

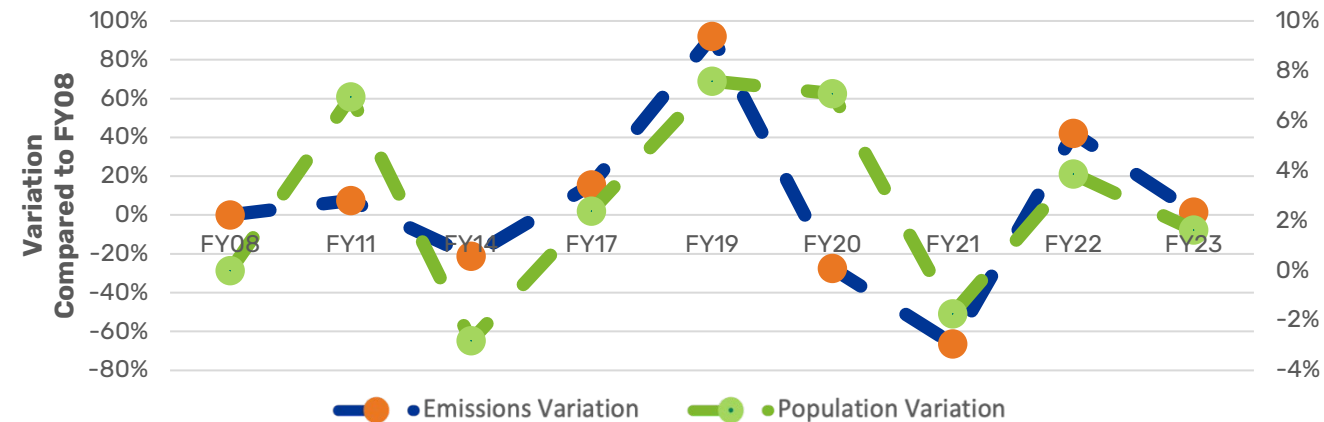
- Faculty & staff consistently contribute most commuting emissions.
- FY23 Student population = 67% of total population, but only 15.5% of commuting GHG emissions (across varied housing locations)
- Methods shifted in FY22 to be survey-based.
- Starting in FY21, formal staff flex work arrangements reflected.

SCOPE 3 - Commuting Emissions

SCOPE 3
Other Indirect Emissions

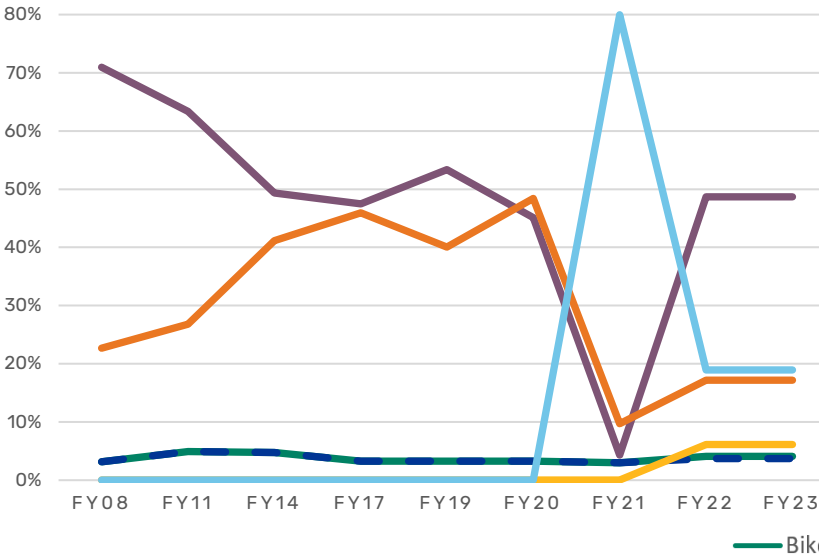


Commuting Emissions - Yearly Variations

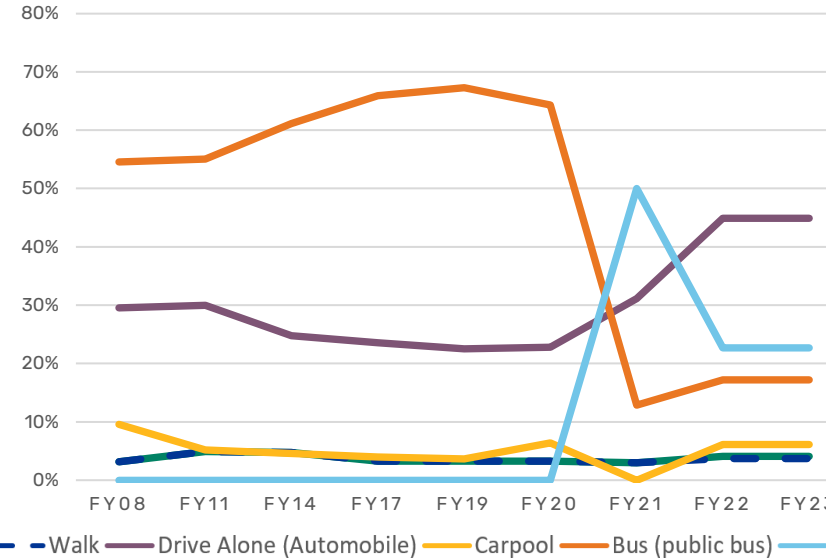


Commuting: Trends & COVID-19 Assumptions

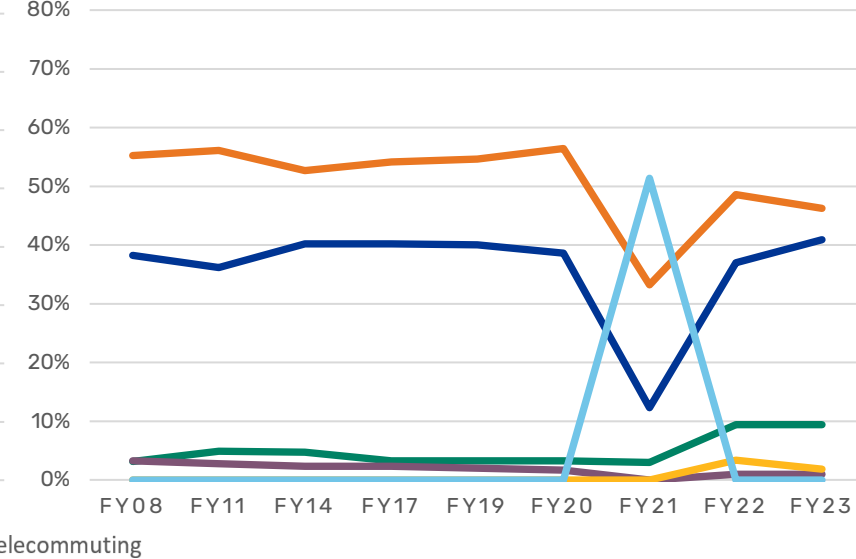
FACULTY COMMUTING



STAFF COMMUTING



STUDENT COMMUTING



ASSUMPTIONS

- **Telecommuting:** Staff 23%, Faculty 19%. Students 0%
- Fall 2022 Commuter Survey informed process
- Info on POGO Bike Share, Incline, & Scooters added

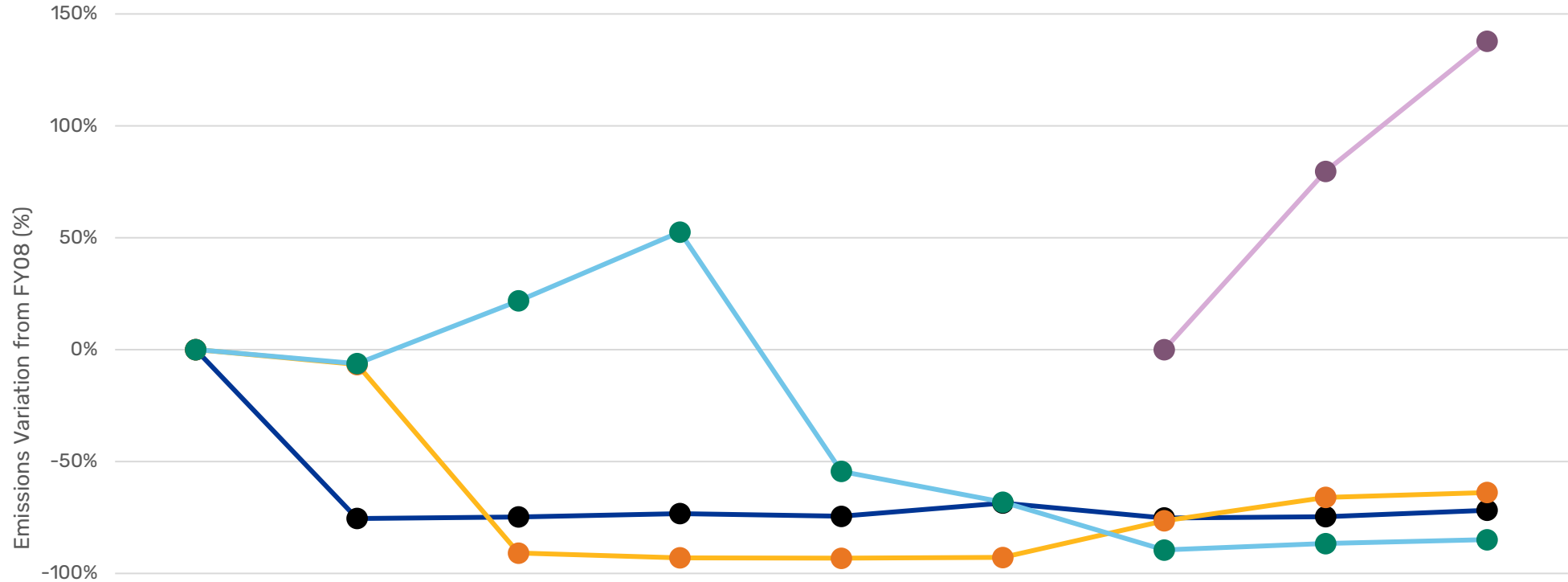
FY23 Commute Mode	Miles/Trip	Faculty	Staff	Students
Drive Alone (Internal Combustion Vehicle)	10	49%	45%	1%
Bus (Public Transit)	5	17%	17%	47%
Carpool	10	6%	6%	2%
Bike	5	4%	4%	9%
Walk	1	4%	4%	40%
Light Rail (Public Transit)	1	1%	1%	1%
Telecommute	-	19%	23%	0%
Drive Alone (Electric Vehicle)	-	0.24%	0.24%	0%

Scope 3 FY23 Trends: Waste, Paper, & Food

4%
of
FY23 GHG
Emissions
(+0.1% from FY22)

NOTE
Since FY19, all
categories consistent
except Food, which is
pandemic-influenced

SCOPE 3 - Emissions Trends - Waste - Paper & Food



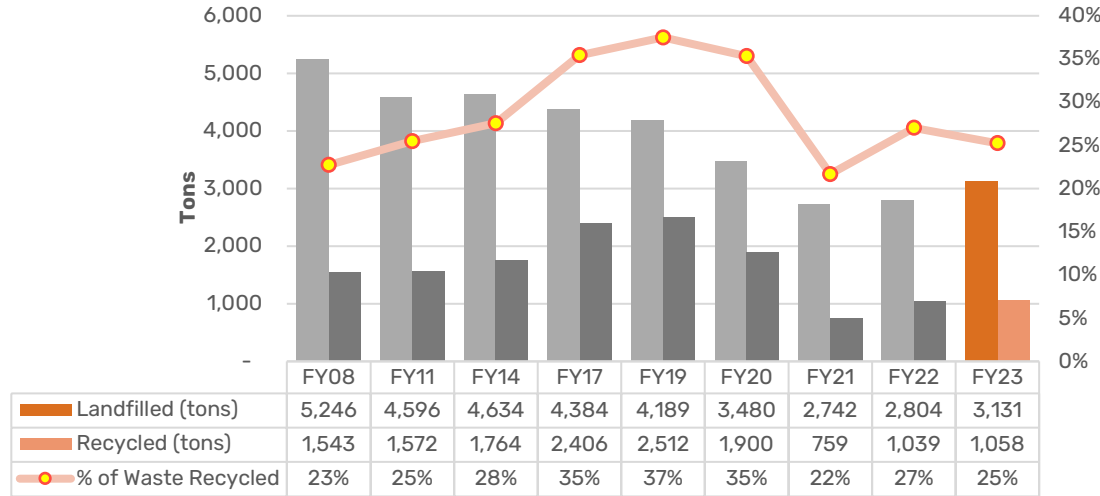
	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
● Solid Waste	0%	-75%	-75%	-73%	-74%	-69%	-75%	-75%	-71.8%
● Wastewater	0%	-7%	-91%	-93%	-93%	-93%	-76%	-66%	-63.8%
● Paper	0%	-6%	22%	53%	-54%	-68%	-90%	-87%	-85.0%
● Food							0%	80%	137.8%

Solid Waste & Wastewater

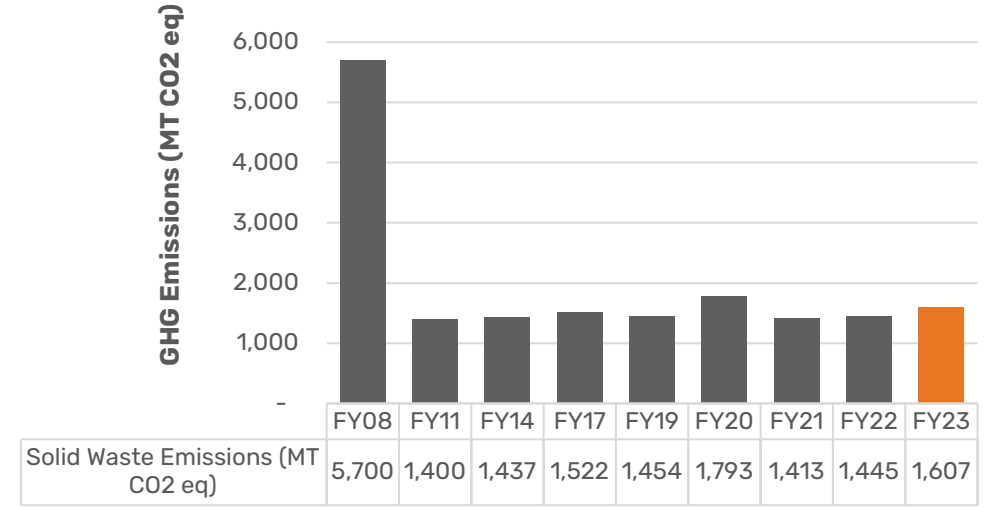
SCOPE 3
Other Indirect Emissions

Solid Waste
< 1% of
Total
Emissions

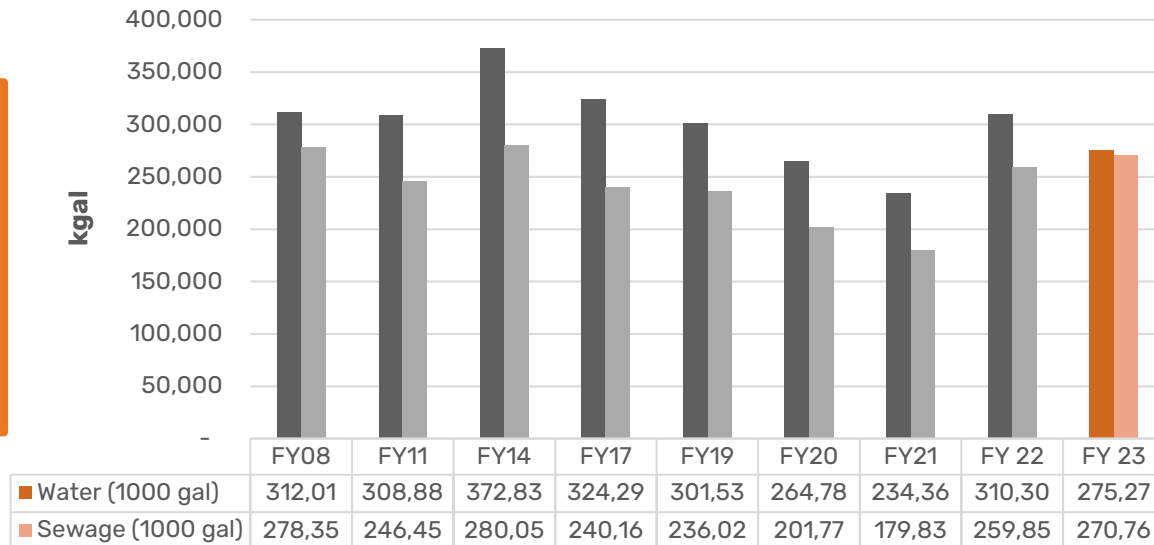
Year-To-Year Solid Waste Landfilled & Recycled



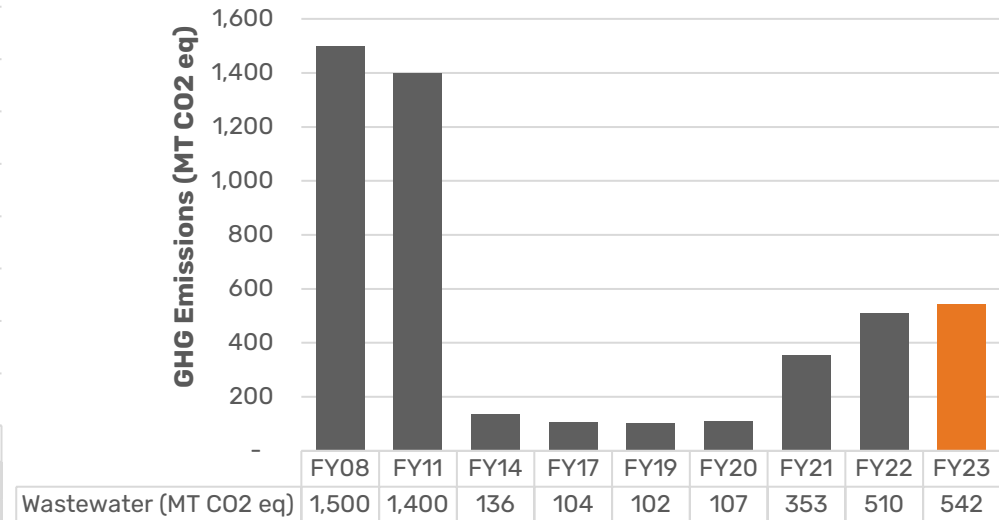
SCOPE 3 EMISSIONS - Solid Waste



Year-To-Year Comparison Water and Sewage



SCOPE 3 EMISSIONS - Wastewater



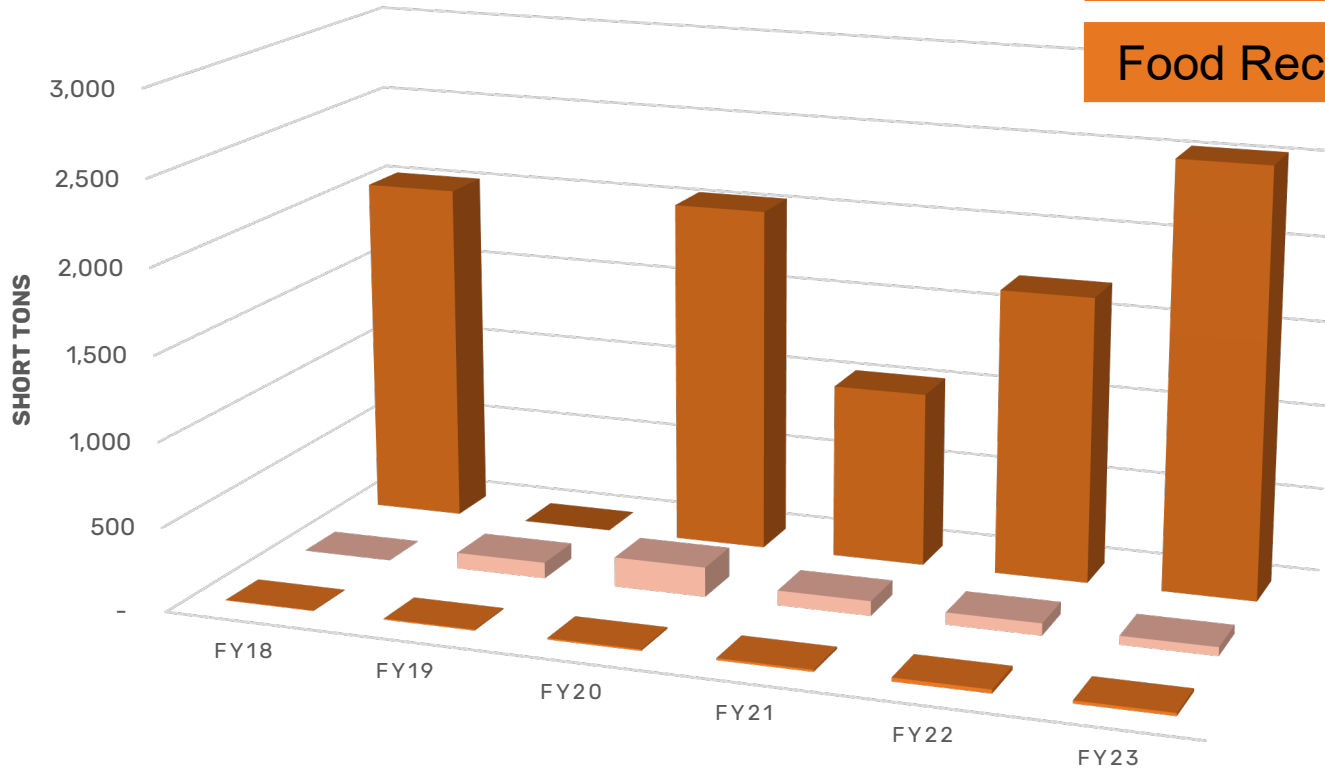
Wastewater
< 0.5%
of Total
Emissions

Data Retrieved Thanks to Ernest Robinson, Lela Loving & Aurora Sharrard

Food

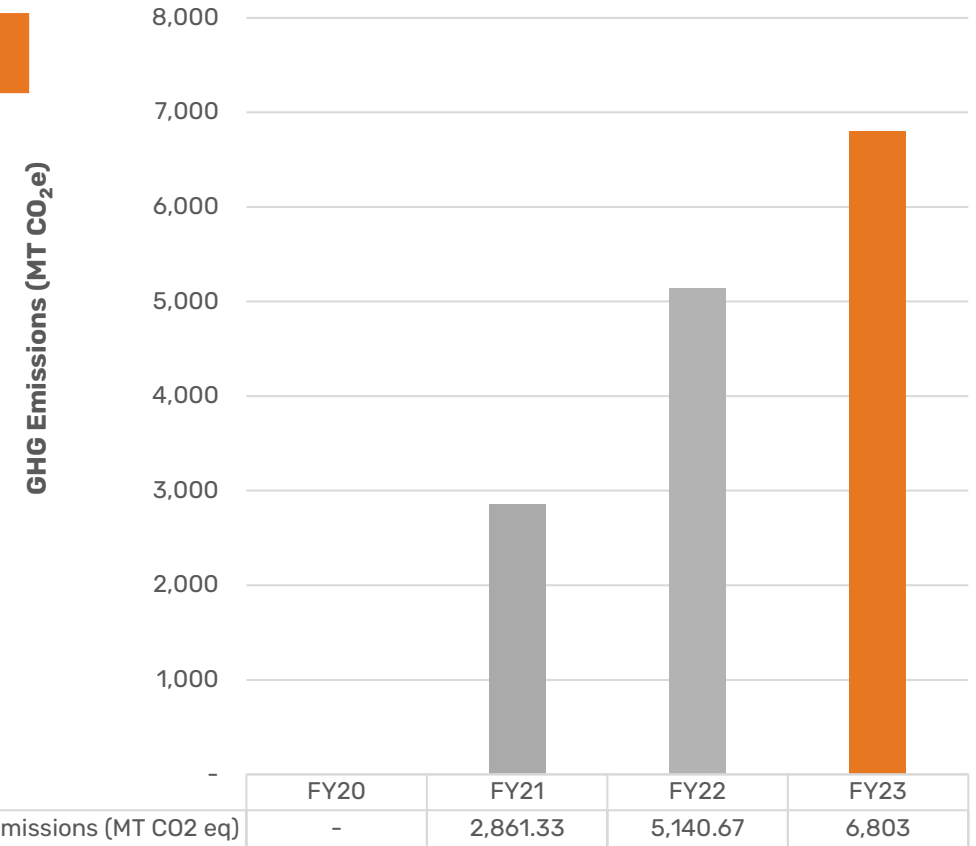
3% of Total Emissions

- Food Purchased
- Food Composted
- Food Recovered



	FY18	FY19	FY20	FY21	FY22	FY23
Total Food Recovered (lbs)	3	6	9	12	23	18
Total Food Composted (tons)	-	94	176	88	72	52
Total food Purchased (tons)	2,030	-	2,051	1,037	1,700	2,535

SCOPE 3 EMISSIONS - Food



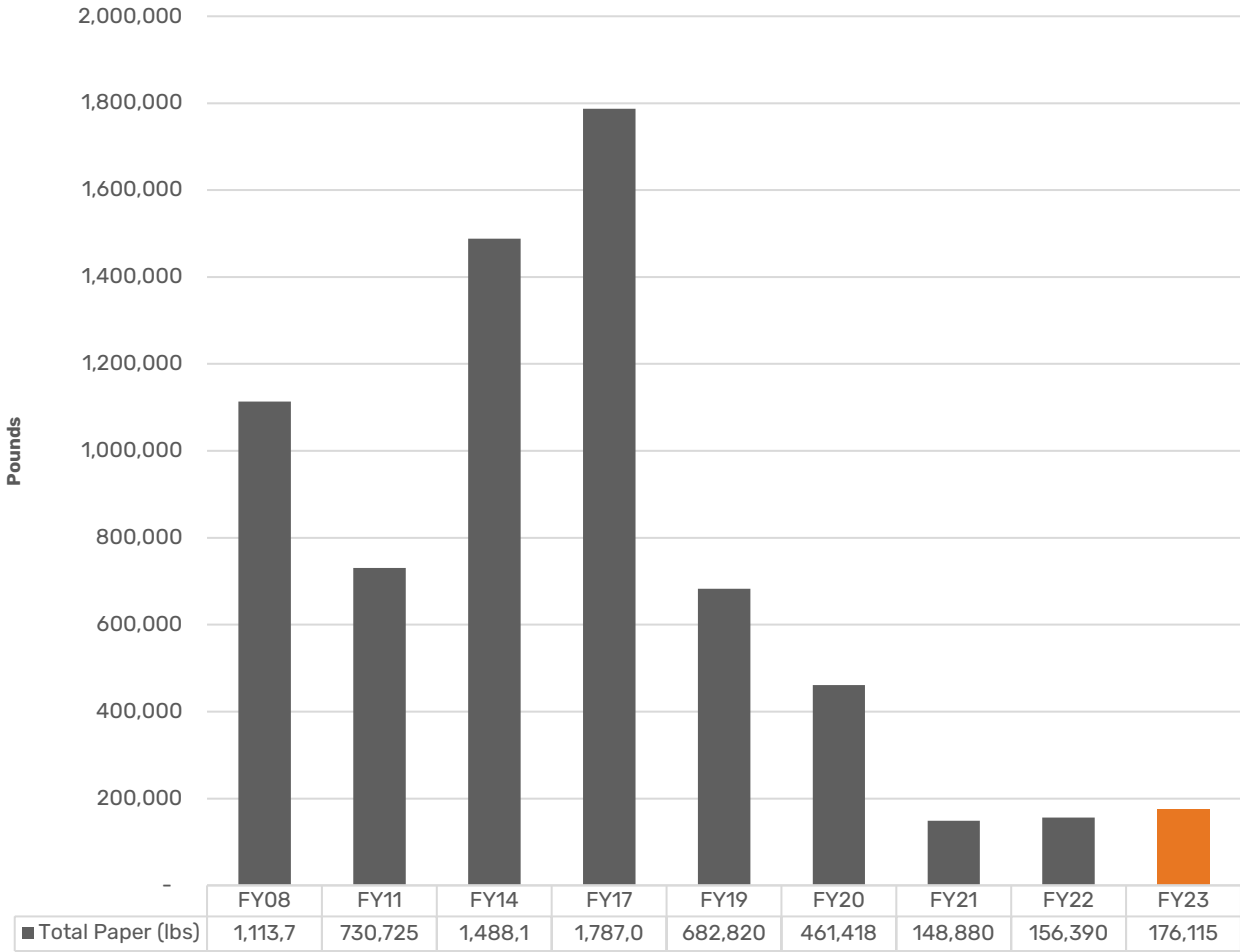
	FY20	FY21	FY22	FY23
Food Emissions (MT CO ₂ eq)	-	2,861.33	5,140.67	6,803

DATA NOTES

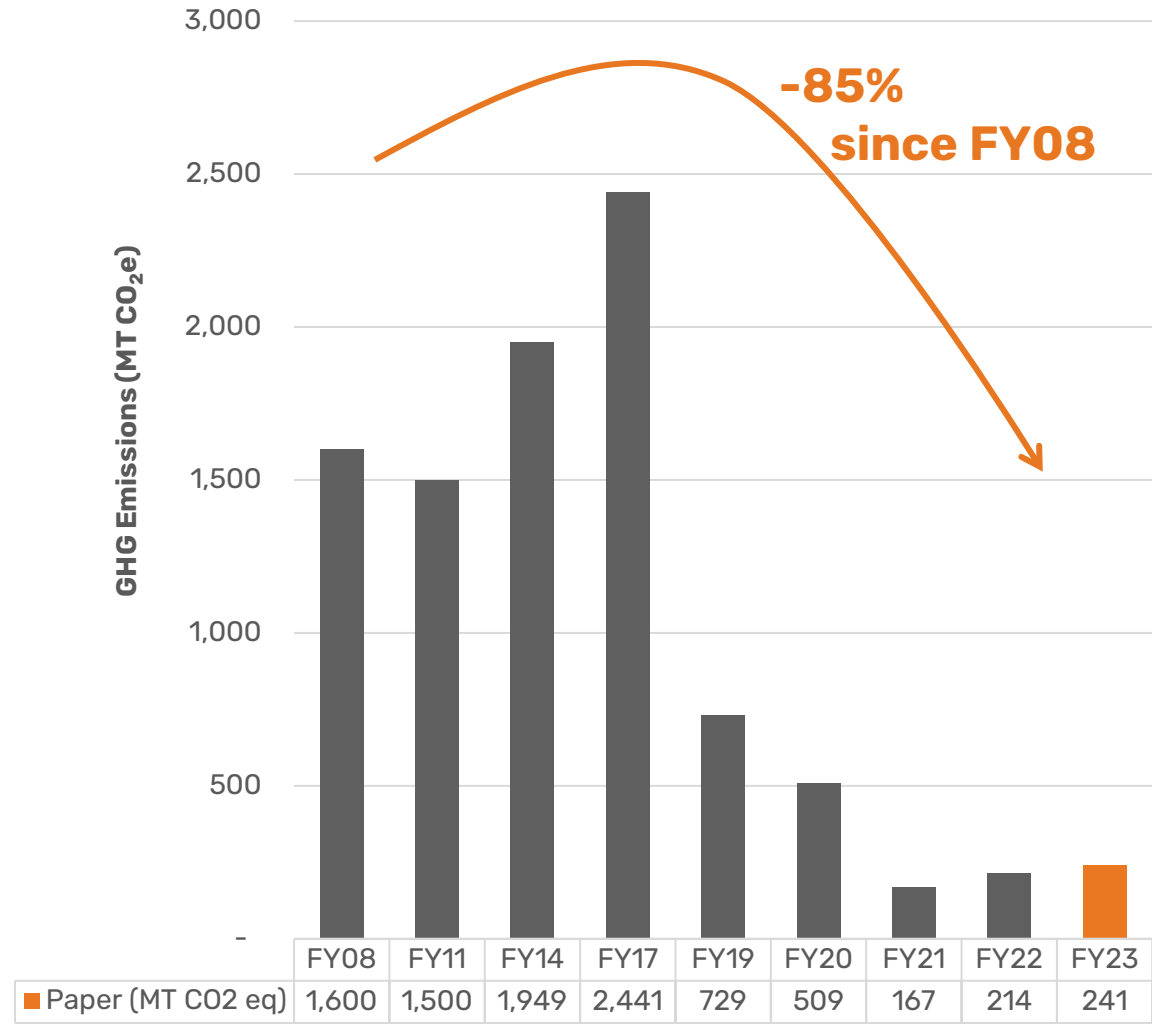
- Food emissions category added in FY21
- FY21 & FY22 food volume served was pandemic-influenced.
- Compost activities include yard waste & are not calculated as a carbon offset.

0.1% of Total Emissions

Year-To-Year Comparison Total Paper Purchased



SCOPE 3 EMISSIONS - Paper



NOTE: Reductions since FY17 due to behavior change from reducing on-campus printing (and thus paper use & associated GHG emissions).

Scope 3: FY22 Updates

In FY22, SIMAP released updated functionalities of Scope 3 accounting. All 15 GHG Protocol Categories are now included.

SCOPE 3 STRUCTURE THROUGH FY 21

- 1) Commuting
- 2) Business Travel
- 3) Study Abroad
- 4) Food (*new in FY21*)
- 5) Paper
- 6) Waste & Wastewater

SCOPE 3 STRUCTURE FROM FY 22

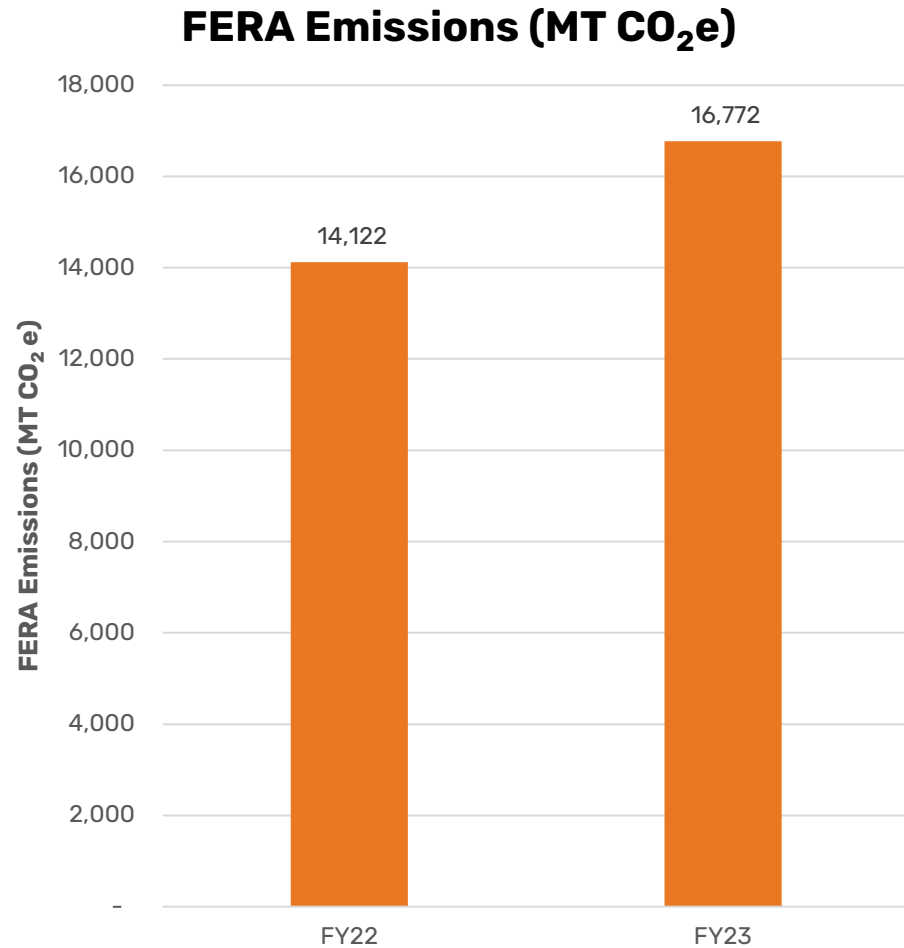
- 1) Purchased Goods and Services
- 2) Fuel- and Energy-Related Activities
- 3) Waste Generated in Operations
- 4) Business Travel
- 5) Commuting
- ★ 6) Upstream Leased Assets
(Examples include office space and vehicles that are operated and leased by the reporting organization)
- 7) Capital Goods
- 8) Downstream Transportation and Distribution
- 9) Upstream Transportation and Distribution
- 10) Processing of Sold Products
- 11) Use of Sold Products
- 12) End-of-Life Treatment of Sold Products
- 13) Downstream Leased Assets
(emissions generated from the operation of assets owned by the reporting organization & leased to other entities in the reporting year that are not already included in Scope 1 or Scope 2)
- 14) Franchises
- 15) Investments

Not Included
in Pitt GHG Boundary

★ FY23 Estimate of Potential Impact

FERA: Fuel- & Energy-Related Emissions

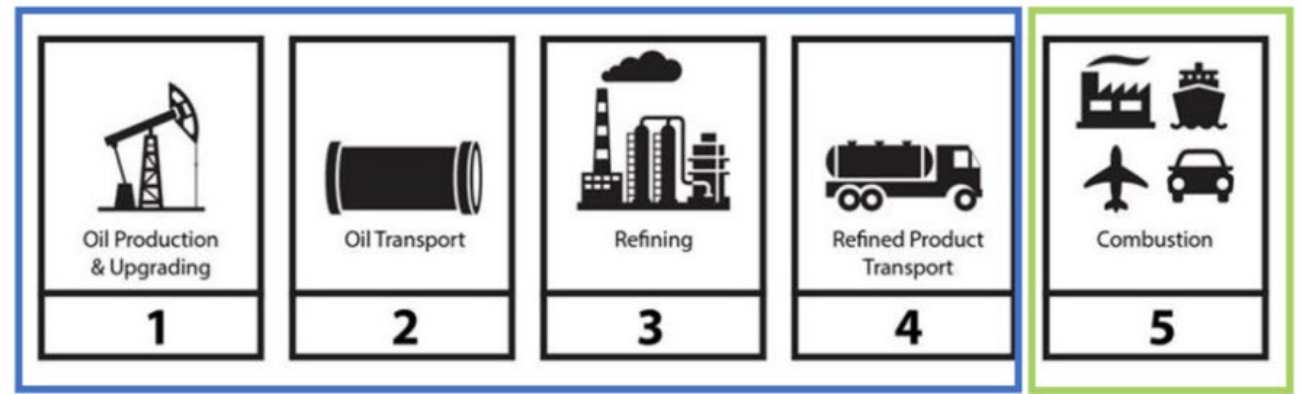
8% of Total Emissions



- New Scope 3 category in FY22
- Automatically calculated by SIMAP for Scope 1 Stationary Sources & Scope 2 Purchased Electricity
- FERA accounts for all upstream emissions for Scope 1 stationary sources (e.g., direct combustion of fuel or generation of energy); for Pitt this includes:
 - Natural gas combustion from the Carrillo Street Steam Plant
 - Diesel fuel used for fleet vehicles and Pitt's backup generators.
- At 8% of total GHG emissions, FERA had a significant effect on FY23 emissions, mostly due to natural gas from on-campus steam.

Figure: Lifecycle stages of fuel oil are included in Scope 3 FERA vs. Scope 1.

System Boundaries



Scope 3
Upstream Emissions across supply chain

Scope 1
Direct combustion emissions



SUMMARY

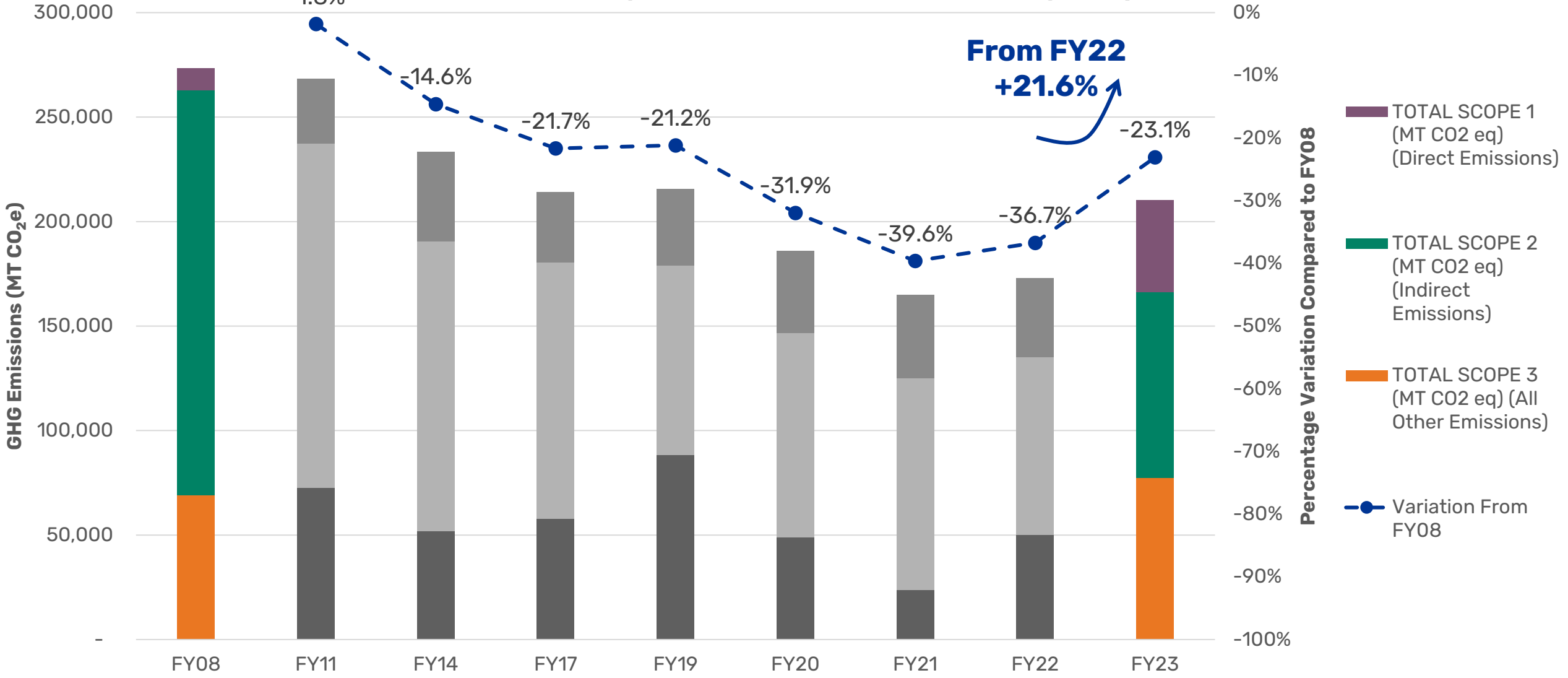
& COMPARISONS



GHG Inventory Overview FY23

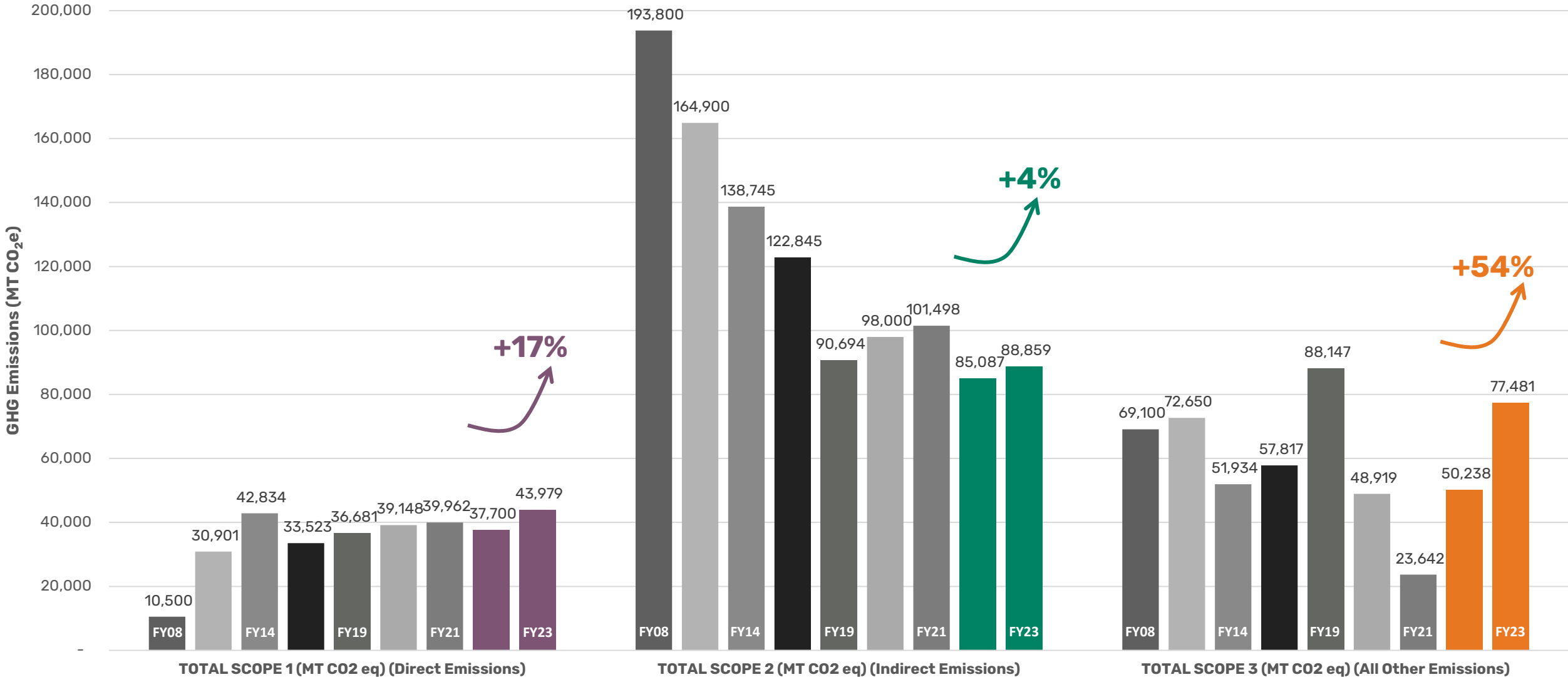


GHG Inventory Year-To-Year Overview - By Scope



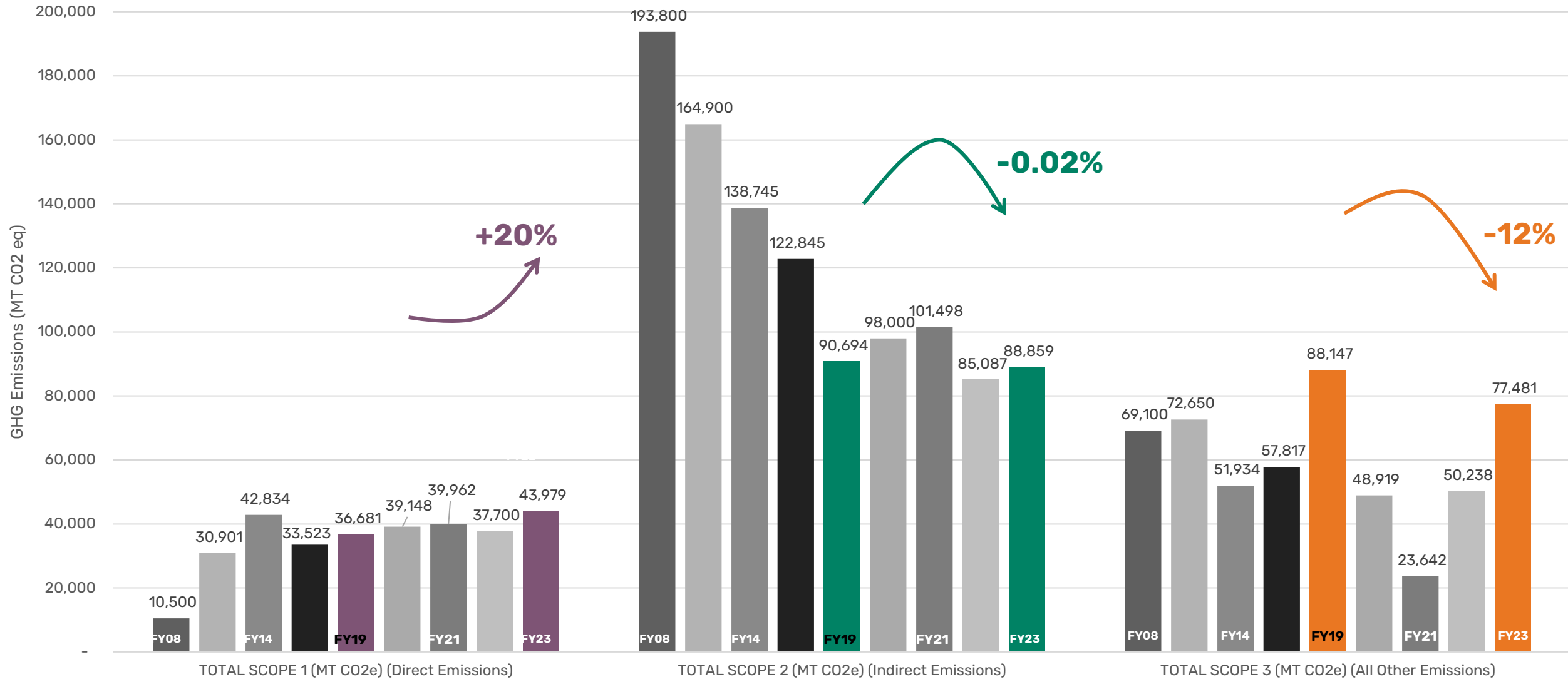
Total GHG Emissions **+22% from Previous FY**

All Scopes Year-To-Year Comparison



Total GHG Emissions **-2% from FY19** (Pre COVID-19 pandemic)

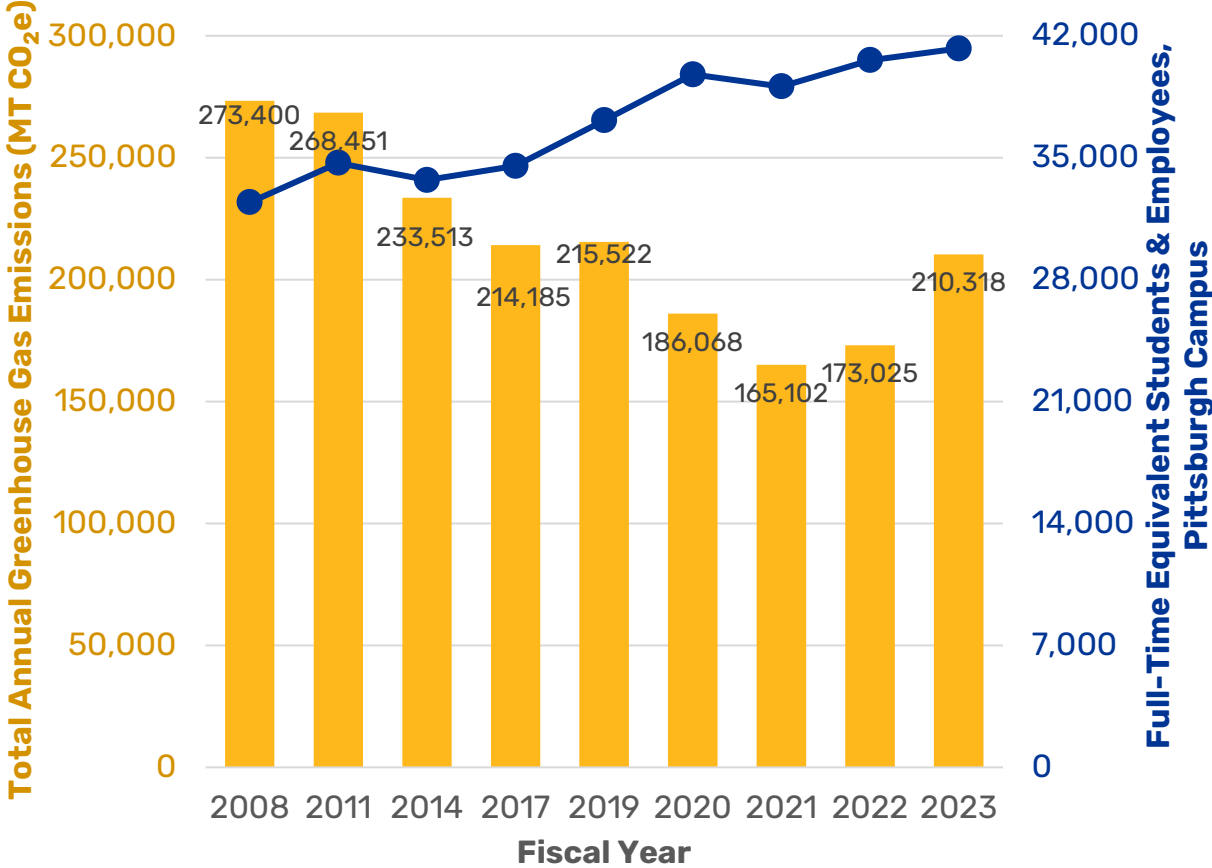
All Scopes Year-To-Year Comparison



GHG Emissions Normalized

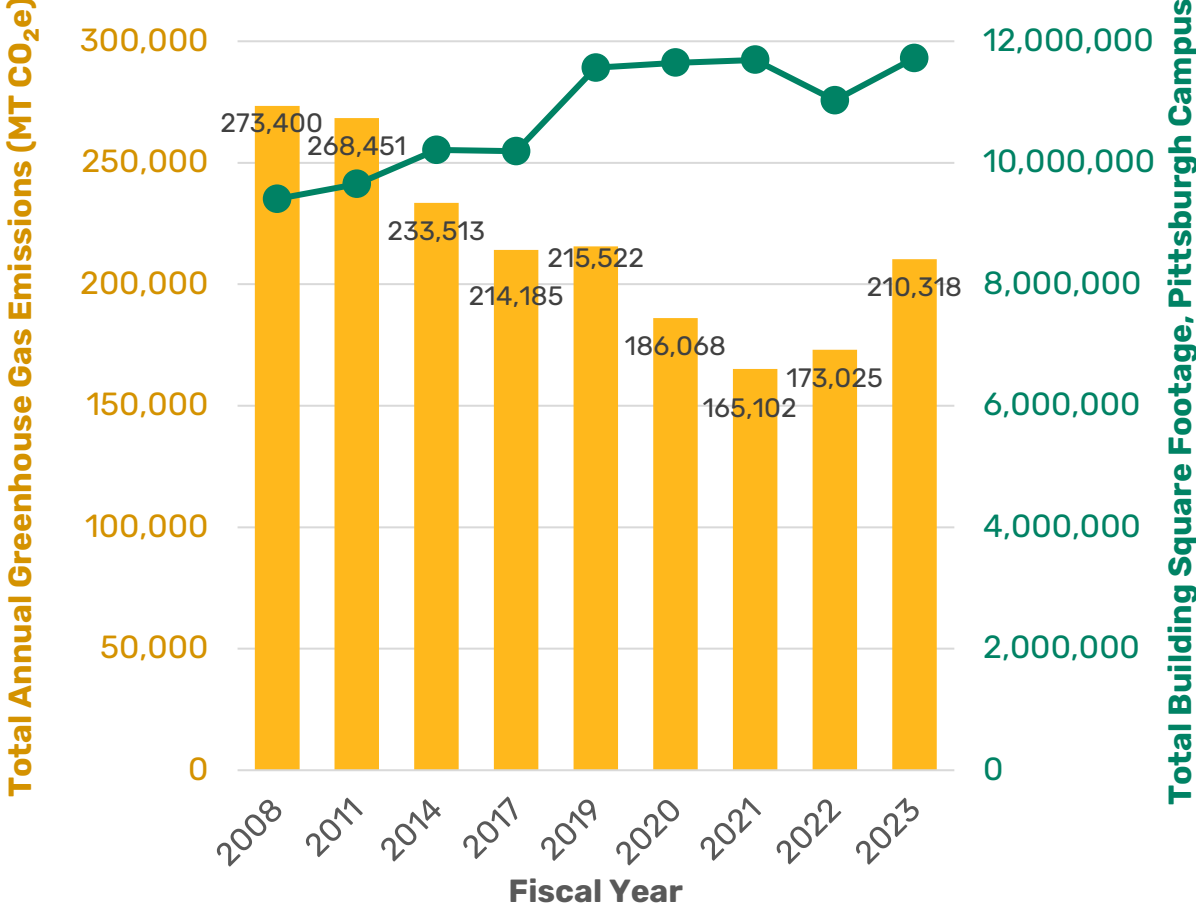
GHG Emissions & Full Time Equivalents (FTE)

Fiscal Years 2008 through 2023



GHG Emissions & Square Footage (SF)

Fiscal Years 2008 through 2023

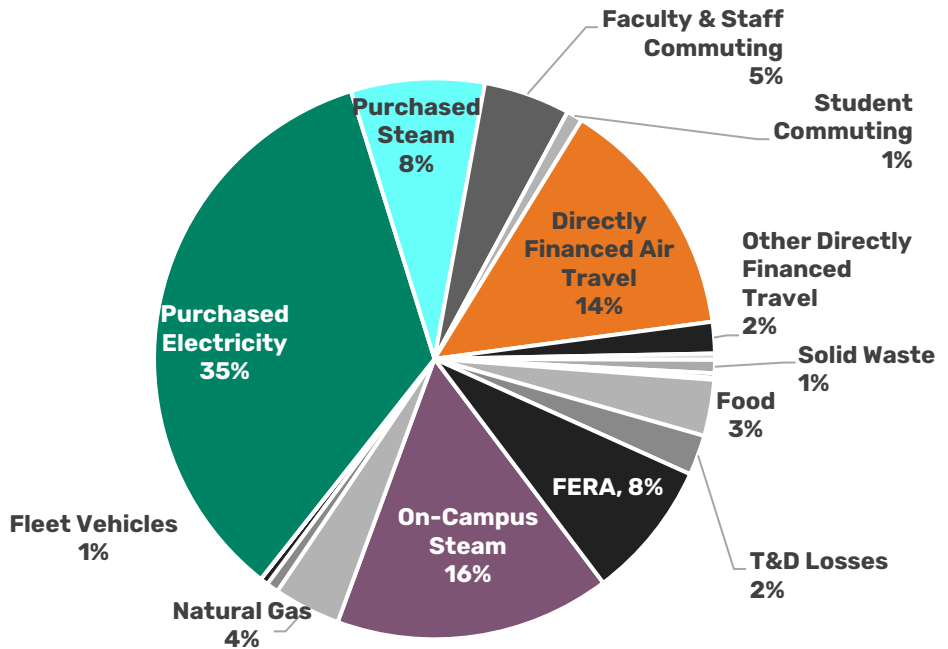


Key FY23 GHG Emissions Takeaways



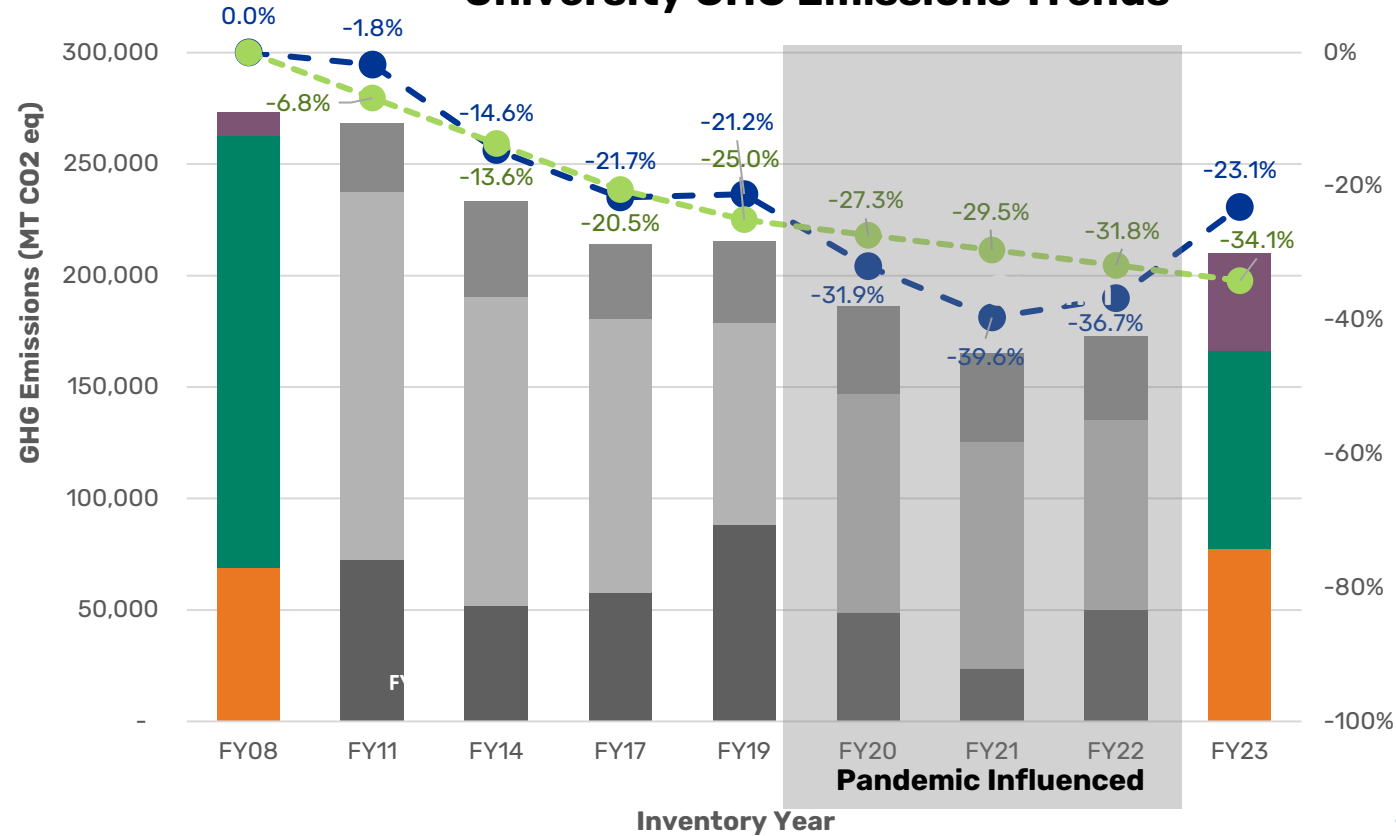
- 1) Pittsburgh campus population & building square footage are continuing to grow.
- 2) Top 3 GHG emissions sources are electricity, steam, and air travel.
- 3) Building energy use remains the largest contributor to GHG emissions.
- 4) Missed incremental target to reach 50% reduction in GHG emissions by 2030.

FY23 GHG Emissions



*Categories < 1% of emissions not included

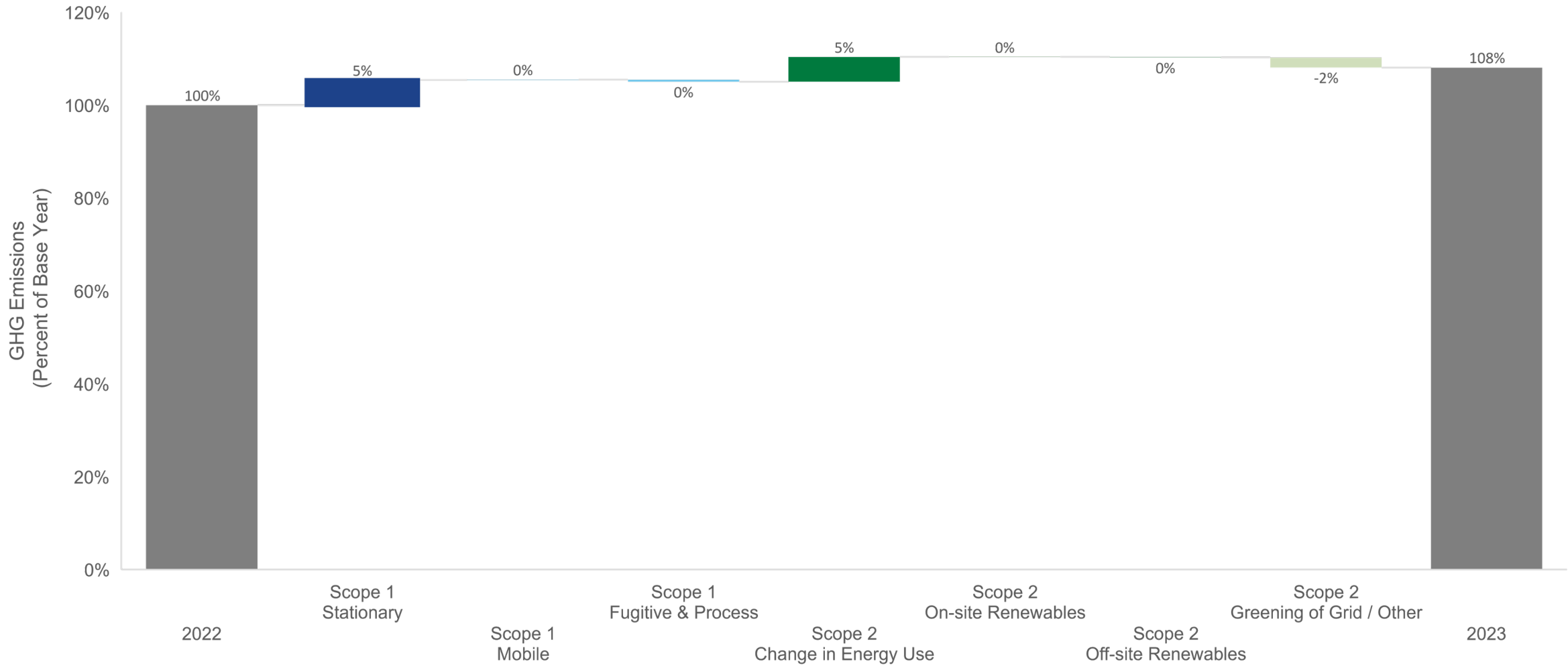
University GHG Emissions Trends



DOE Better Climate Challenge FY22 to FY23 Summary of Changes



Emissions Reduction Strategies Deployed



University GHG Emissions Benchmarks



PEER GROUP BENCHMARKING FOR GHG EMISSIONS

Sorted By Net Emissions

Higher Education Institution	FY	Net Emissions (MT CO ₂ e)	Students (MT CO ₂ e / FTE Students)	Building Space (MT CO ₂ e / 1,000 ft ²)
Ohio State University	2022	499,253	8.84	19.47
Pennsylvania State University - University Park	2020	369,292	8.03	-
Duke University	2023	212,132	12.17	12.76
University of Pittsburgh	2023	210,319	7.62	17.79
Cornell University	2022	161,474	6.95	10.20
University of Pennsylvania	2023	156,185	5.82	9.66
Case Western Reserve	2023	135,533	10.99	13.90
University of Maryland - College Park	2021	124,555	3.34	7.91
Ohio University - Athens Campus	2022	109,095	5.37	1.32
Georgia Southern University	2022	97,950	4.00	13.29
Duquesne University	2022	60,745	7.51	-
Villanova University (Scopes 1&2)	2021	40,546	4.31	8.34
Carnegie Mellon University (Scopes 1&2)	2021	34,064	-	-
Chatham University	2018	8,031	3.88	7.30

References

1) University of Pittsburgh GHG Inventory Reports

- Fiscal Year 2008, 2011, 2014, 2017, 2019-23
- [Sustainable.pitt.edu/Commitments-Reports/](https://sustainable.pitt.edu/Commitments-Reports/)

2) Pitt SIMAP Public GHG Emissions Disclosure

- [UNHsimap.org/public/institution/728](https://unhsimap.org/public/institution/728)

3) Greenhouse Gas Protocol

- [GHGprotocol.org/standards-guidance](https://ghgprotocol.org/standards-guidance)

4) Pitt Sustainability GHG Emissions Dashboard

- [Sustainable.pitt.edu/Dashboard/](https://sustainable.pitt.edu/Dashboard/)

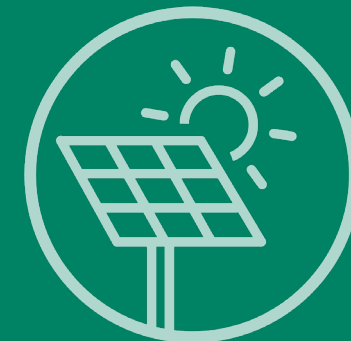


FY23 GHG Emissions Inventory Results

Category		Previous Fiscal Years								Current FY
SCOPE	SOURCE CATEGORY	FY08	FY11	FY14	FY17	FY19	FY20	FY21	FY22	FY23
SCOPE 1	On-Campus Steam	-	22,200	32,981	25,623	24,978	29,627	29,644	27,532	33,417
	Other On-Campus Stationary	9,200	5,700	6,386	5,245	7,470	7,102	8,167	7,348	8,111
	Fleet Vehicles	500	700	1,273	1,388	1,992	1,629	1,506	1,364	1,472
	Refrigerants & Chemicals	800	2,300	2,192	1,266	2,240	789	644	1,450	974
	Fertilizers & Animals	-	1	2	1	1	2	1	7	5
TOTAL SCOPE 1 (MT CO₂e) (Direct Emissions)		10,500	30,901	42,834	33,523	36,681	39,148	39,962	37,700	43,979
SCOPE 2	Purchased Electricity	138,700	135,500	115,341	105,607	73,802	84,753	85,544	64,777	72,666
	Purchased Steam	55,100	29,400	23,404	17,238	16,892	13,247	15,954	20,310	16,193
TOTAL SCOPE 2 (MT CO₂e) (Indirect Emissions)		193,800	164,900	138,745	122,845	90,694	98,000	101,498	85,087	88,859
SCOPE 3	Faculty & Staff Commuting	13,600	14,700	9,845	12,433	23,293	15,330	5,672	9,961	10,482
	Student Commuting	5,200	5,500	6,064	5,962	12,036	10,318	2,927	2,264	1,928
	Directly Financed Air Travel	24,800	33,600	23,921	24,706	36,560	10,273	4,018	10,400	29,651
	Other Directly Financed Travel	100	50	211	548	582	1,593	683	1,140	3,812
	Study Abroad Air Travel	-	1,100	775	4,578	8,816	3,489	153	626	765
	Solid Waste	5,700	1,400	1,437	1,522	1,454	1,793	1,413	1,445	1,607
	Wastewater	1,500	1,400	136	104	102	107	353	510	542
	Paper	1,600	1,500	1,949	2,441	729	509	167	214	241
	Food	-	-	-	-	-	-	2,861	5,141	6,803
	Transmission & Distribution Losses	16,600	13,400	7,596	5,523	4,575	5,509	5,395	4,417	4,876
	Fuel & Energy Related Activities								14,122	16,772
TOTAL SCOPE 3 (MT CO₂e) (All Other Emissions)		69,100	72,650	51,934	57,817	88,147	48,919	23,642	50,238	77,481
SINKS	Compost	0	0	0	0	0	0	0	19.4	0
ALL ACCOUNTABLE EMISSIONS (MT CO₂e)		273,400	268,451	233,513	214,185	215,522	186,068	165,101	173,006	210,319



FY23 GHG Inventory Authors



Please contact the authors with questions or requests:

Isabella Cicco

Graduate Research Student, Department of Civil & Civil Environmental Engineering
iac11@pitt.edu



Melissa M. Bilec, PhD

Co-Director, Mascaro Center for Sustainable Innovation
George M. & Eva M. Bevier Professor, Department of Civil & Environmental Engineering
mbilec@pitt.edu



Aurora Sharrard, PhD

Assistant Vice Chancellor for Sustainability, Office of Sustainability
asharrard@pitt.edu