MIT GHG Inventory
Overview

Methodology, Boundaries, Scope and Data Overview

November 2018

Includes information for FY14 –FY18 inventories

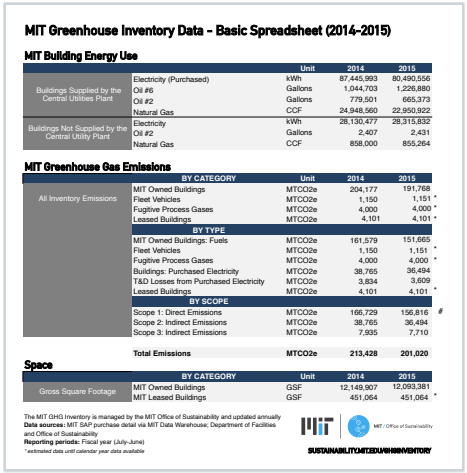
MIT completed a greenhouse gas inventory to understand and manage our Institutional climate change impact.

Who should use the inventory?

How will it be used?

The inventory will be used as a tool for meeting MIT's carbon reduction goal, and as tool for learning and engaging with real-time carbon footprint assessment.

MIT is committed to becoming a test-bed for climate innovation; staff, students, and faculty can use the inventory to identify ways to reduce the Institute's footprint, understand energy and emission trends, and improve methodology in data collection.



MIT Greenhouse Inventory Data - Basic Spreadsheet (2014-2015)

MIT Building Energy Use

		Unit	2014	2015
Buildings Supplied by the Central Utilities Plant	Electricity (Purchased)	kWh	87,445,993	80,490,556
	Oil #6	Gallons	1,044,703	1,226,880
	Oil #2	Gallons	779,501	665,373
	Natural Gas	CCF	24,948,560	22,950,922
Buildings Not Supplied by the Central Utility Plant	Electricity	kWh	28,130,477	28,315,832
	Oil #2	Gallons	2,407	2,431
	Natural Gas	CCF	858,000	855,264

MIT Greenhouse Gas Emissions

	BY CATEGORY	Unit	2014	2015
All Inventory Emissions	MIT Owned Buildings	MTCO2e	204,177	191,768
	Fleet Vehicles	MTCO2e	1,150	1,151 *
	Fugitive Process Gases	MTCO2e	4,000	4,000 *
	Leased Buildings	MTCO2e	4,101	4,101 *
	BY TYPE			
	MIT Owned Buildings: Fuels	MTCO2e	161,579	151,665
	Fleet Vehicles	MTCO2e	1,150	1,151 *
	Fugitive Process Gases	MTCO2e	4,000	4,000 *
	Buildings: Purchased Electricity	MTCO2e	38,765	36,494
	T&D Losses from Purchased Electricity	MTCO2e	3,834	3,609
	Leased Buildings	MTCO2e	4,101	4,101 *
	BY SCOPE			
	Scope 1: Direct Emissions	MTCO2e	166,729	156,816 #
	Scope 2: Indirect Emissions	MTCO2e	38,765	36,494
	Scope 3: Indirect Emissions	MTCO2e	7,935	7,710
	Total Emissions	**MTCO2e**	**213,428**	**201,020**

Space

	BY CATEGORY	Unit	2014	2015
Gross Square Footage	MIT Owned Buildings	GSF	12,149,907	12,093,381
	MIT Leased Buildings	GSF	451,064	451,064 *

The MIT GHG Inventory is managed by the MIT Office of Sustainability and updated annually
Data sources: MIT SAP purchase detail via MIT Data Warehouse; Department of Facilities and Office of Sustainability
Reporting periods: Fiscal year (July–June)
* estimated data until calendar year data available

MIT / Office of Sustainability

SUSTAINABILITY.MIT.EDU/GHGINVENTORY

Why Complete a GHG Inventory?

MIT completed a greenhouse gas inventory to understand and manage our Institutional climate change impact.

A greenhouse gas (GHG) inventory measures the amount and source of an organization's "carbon footprint" – that is, how institutional activities contribute to climate change.

The process looks at the impact from burning fossil fuels and using other resources, and assesses the greenhouse gases which contribute to climate change from their use into a single metric: metric tons of carbon dioxide equivalent (MTCO2e).

GHG Inventory

Methodology

Protocol

GREENHOUSE GAS PROTOCOL

WORLD RESOURCES INSTITUTE

wbcsd

The Greenhouse Gas Protocol, developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD), sets the global standard for how to measure, manage, and report greenhouse gas emissions.

Calculator

Clean Air-Cool Planet Campus Carbon Calculator

The Campus Carbon Calculator (formerly the Clean-Air Cool Planet calculator) is used to calculate emissions based on the GHG Protocol.

The Campus Carbon Calculator is the standard tool used for American campus greenhouse gas (GHG) data collection and inventory reporting.

Gases

Six greenhouse gases are measured and converted to metric tons of CO_2 equivalent:

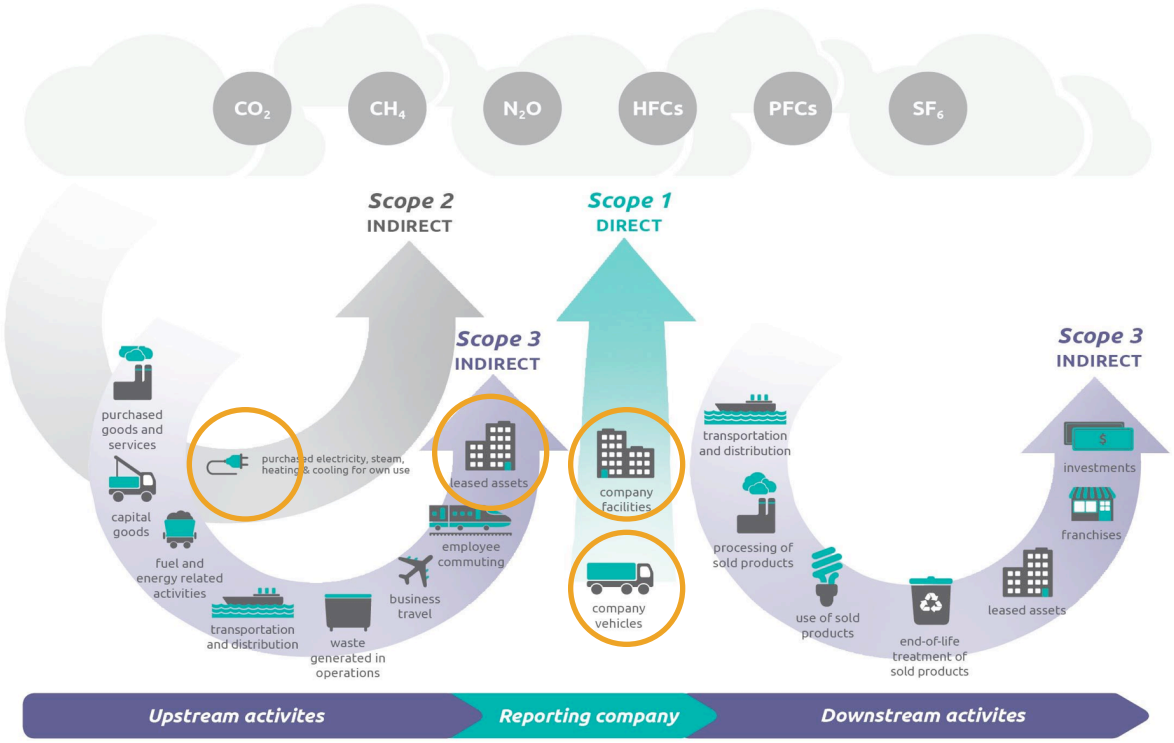
- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Sulfur hexafluoride (SF_6)
- Perfluorocarbons (PFCs)

Six greenhouse gases are measured and converted to metric tons of CO_2 equivalent.

MIT uses the "operational control" method for inventory boundaries.

GREENHOUSE GAS PROTOCOL

Figure [1.1] Overview of GHG Protocol scopes and emissions across the value chain



http://www.ghgprotocol.org/
http://www.ghgprotocol.org/files/ghgp/public/overview-of-scopes.JPG

GHG Inventory

Scopes Measured

Scopes measured by MIT in the FY2014 -FY2018 GHG Inventories*

**Transmission & distribution losses are not shown on this graph, but are measured by MIT in Scope 3 according to the GHG Protocol*

The GHG Protocol categorizes emissions into three broad scopes:

1: All direct GHG emissions.
2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.
3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc.

MIT measures the areas indicated on the graph, which is in line with industry best practice for higher education.

GHG Inventory

Scopes Measured

GREENHOUSE GAS PROTOCOL

GHG Protocol Scopes

Scope 1
Direct Emissions

- Building energy use
- Campus vehicles
- Fugitive gases

Scope 2
Indirect Emissions

- Purchased electricity
- Purchased steam & chilled water

Scope 3
Indirect Emissions

- Leased space
- Transmission & distribution losses

MIT measures all of these, and organizes into three large categories:

MIT Emissions Categories

MIT measures all direct emissions in Scope 1 and all indirect emissions in Scope 2. MIT also currently measures T&D losses and space leased for academic purposes on the Cambridge campus in Scope 3.

Because "scopes" are not an easily recognizable set of categories for the general public, MIT, like most of our institutional peers, categorizes emissions into more familiar categories. Which emissions from each scope are included in these categories is shown in the diagram to the left.

The three categories used by MIT are Buildings, Fugitive Gases, and Campus Vehicles.

GHG Inventory

Different Reporting Boundaries

The MIT GHG inventory represents a full accounting according to industry best practice of the Institute's carbon footprint.

MIT also reports a portion of it's institutional emissions through mandated reporting to the EPA.

Self-Reporting

MIT publishes the inventory on our website – makes the information accessible where we want, how we want

Why: Transparency & accountability to our community, campus as a test bed for learning, standard best practice among our peers

GREENHOUSE GAS PROTOCOL

MIT GHG Inventory (Full Accounting)

Uses the WRI GHG Protocol is voluntary and includes:

- Scope 1
- Scope 2
- Scope 3
- Boundary flexibility, defined by operational control

Mandated Reporting

MIT is required by law to report certain institutional emissions to a central reporting agency, for public / state and federal dissemination, publish, or use.

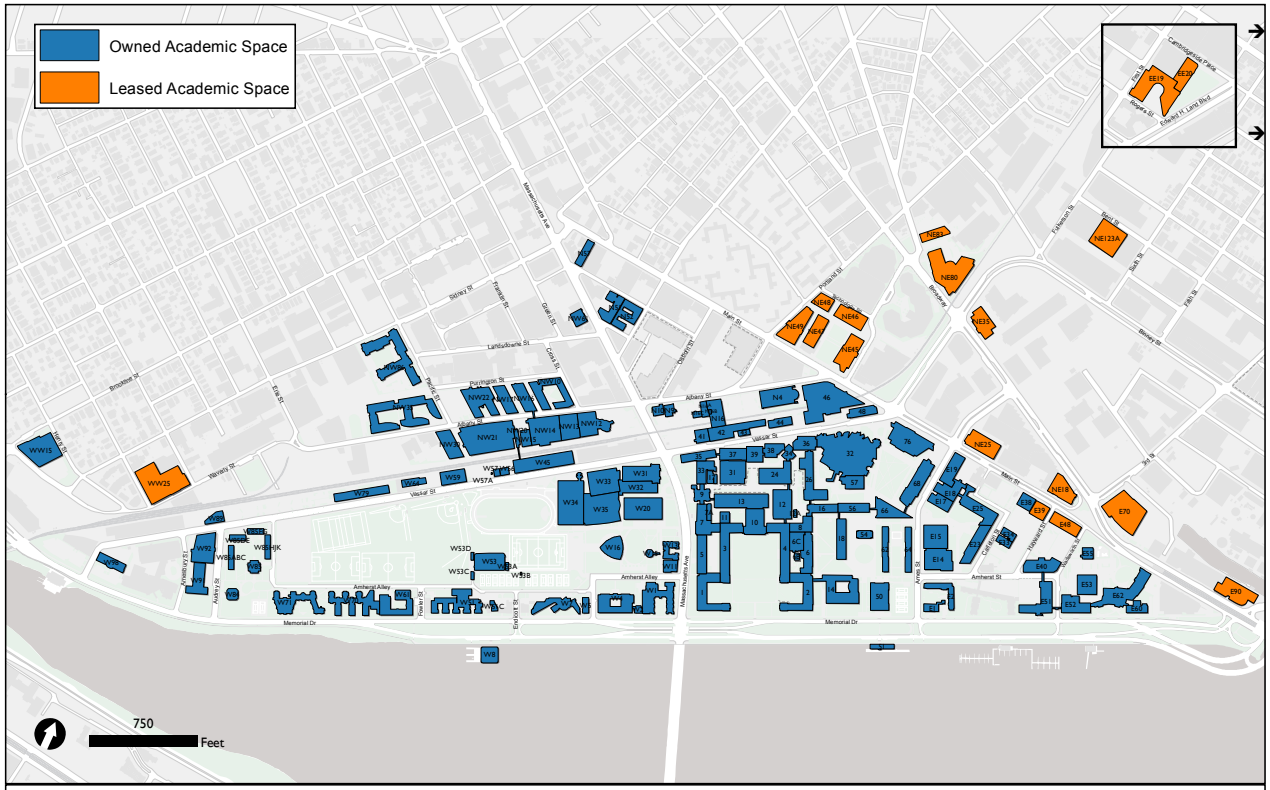
EPA United States Environmental Protection Agency

MassDEP

MIT Federal / State Reporting (Mandated Only):

The EPA and DEP reporting is regulated and includes:

- Scope 1 Only
- No Scope 2 (purchased electricity)
- No Scope 3
- Boundary defined by source



GHG Inventory

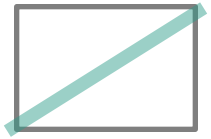
Space Measured

The MIT FY2014-FY2018 inventories include buildings owned and leased for the Cambridge campus. The inventories do not currently include real estate investment holdings managed by MITIMCO, off-campus space, Lincoln Laboratory, Endicott House, Haystack Observatory, Bates Linear Accelerator Center, or the MA Green High Performance Computing Center. The map indicates buildings included in our baseline year 2014.

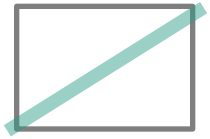
- MIT OWNED BUILDINGS (FOR ACADEMIC USE)
- MIT LEASED BUILDINGS (FOR ACADEMIC USE)

Not Included

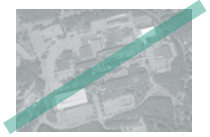
MITIMCO



OFF-CAMPUS SPACES



LINCOLN LABORATORY



ENDICOTT HOUSE

HAYSTACK OBSERVATORY

BATES LINEAR ACCELERATOR CENTER

MA GREEN HIGH PERFORMANCE COMPUTING CENTER

Office of Sustainability

MIT GREENHOUSE GAS EMISSIONS INVENTORY

FY2014 BASELINE BUILDINGS INCLUDED

Owned Academic Spaces						Leased Academic Spaces	
number	name	number	name	number	name	number	name
1	Pierce Laboratory	68	Koch Biology Building	NW61	Random Hall	E39	290 Main Street
2	Building 2	76	David H Koch Institute for Integrative Cancer Research	NW86	70 Pacific Street Dormitory	E48	Building E48
3	Maclaurin Buildings (3)	E1	Gray House	W1	Fariborz Maseeh Hall	E70	Badger Building
4	Maclaurin Buildings (4)	E2	Senior House	W2	Building W2	E90	Building E90
5	Pratt School	E14	Building E14	W4	Mccormick Hall	E94	245 First Street
6	Eastman Laboratories	E15	Wiesner Building	W5	Green Hall	EE19	Building EE19
6B	Solvent Storage	E17	Mudd Building	W7	Baker House	EE20	Building EE20
6C	Building 6C	E18	Ford Building (E18)	W8	Pierce Boathouse	NE18	255 Main Street
7	William Barton Rogers Building	E19	Ford Building (E19)	W11	Religious Activities Center	NE35	145 Broadway
7A	Rotch Library Extension	E23	Health Services	W13	Bexley Hall	NE45	300 Technology Square
8	Building 8	E25	Whitaker College	W15	MIT Chapel	NE46	400 Technology Square
9	Samuel Tak Lee Building	E33	Rinaldi Tile	W16	Kresge Auditorium	NE47	500 Technology Square
10	Maclaurin Buildings (10)	E34	Building E34	W20	Stratton Student Center	NE48	700 Technology Square
11	Homberg Building	E38	Suffolk Building	W31	Du Pont Athletic Gymnasium	NE49	600 Technology Square
13	Bush Building	E40	Muckley Building	W32	Du Pont Athletic Center	NE80	Hill Building
14	Hayden Memorial Library	E51	Tang Center	W33	Rockwell Cage	NE83	Building 300
16	Dorrance Building	E52	Sloan Building	W34	Johnson Athletics Center	NE123A	300 Bent Street
17	Wright Brothers Wind Tunnel	E53	Hermann Building	W35	Sports & Fitness Center	WW25	Building WW25
18	Dreyfus Building	E55	Eastgate	W45	West Garage		
24	Building 24	E60	Arthur D Little Building	W51	Burton-Conner House		
26	Compton Laboratories	E62	Building E62	W51C	405 Memorial Drive		
31	Sloan Laboratories	N4	Albany Garage	W53	Carr Indoor Tennis Facility		
32	Stata Center	N9	Superconducting Test Facility	W53A	Carr Indoor Tennis Facility		
33	Guggenheim Laboratory	N10	High Voltage Research Lab	W53B	Dupont Tennis Courts (Office)		
34	EG&G Education Center	N16	Cooling Tower & Oil Reserve	W53C	Building W53C		
35	Sloan Laboratory	N16A	Building N16A	W53D	Carr Indoor Tennis Facility (Svc)		
36	Fairchild Building (36)	N16B	Fire Pump Room	W56	Building W56		
37	Mcnair Building	N16C	Building N16C	W57	Building W57		
38	Fairchild Building (38)	N51	Building N51	W57A	Building W57A		
39	Brown Building	N52	MIT Museum	W59	Heinz Building		
41	Building 41	N57	Building N57	W61	MacGregor House		
42	Cogeneration Plant	NW10	Edgerton House	W64	Building W64		
43	Power Plant Annex	NW12	Nuclear Reactor Lab	W70	New House		
44	Cyclotron	NW12A	Building NW12A	W71	Next House		
46	Brain and Congnitive Sciences Center	NW13	Building NW13	W79	Simmons Hall		
48	Parsons Laboratory	NW14	Francis Bitter Magnet Lab	W84	Tang Hall		
50	Walker Memorial	NW15	Francis Bitter Magnet Lab	W85	Westgate		
51	Wood Sailing Pavilion	NW16	Plasma Science & Fusion Center	W89	MIT Police		
54	Green Building	NW17	Plasma Science & Fusion Center	W91	Information Systems Operations		
56	Whitaker Building	NW20	Albany St Generator Shelter	W92	Building W92		
57	MIT Alumni Pool	NW21	Plasma Science & Fusion Center	W98	Building W98		
62	Alumni Houses: Munroe Hayden Wood	NW22	Plasma Science & Fusion Center	W85A-K	Westgate Low Rise Residences		
64	East Campus: Walcott Bemis Goodale	NW30	224 Albany Street	WW15	Building WW15		
66	Landau Building	NW35	Ashdown House				

The MIT FY2014-FY2017 inventories include MIT-owned buildings on the Cambridge campus and leased academic space. The inventories do not yet include off-campus, MITIMCO, Lincoln Laboratory, Bates Linear Accelerator Center, Endicott House, MGHPCC, or Haystack Observatory.

GHG Inventory

Space Measured

The buildings listed here are included in the baseline FY2014 MIT GHG inventory. Annual changes are included below.

Total Space FY2014 Inventory	
Academic Owned Buildings	12,149,907 GSF
Academic Leased Buildings	451,064 GSF

Total Space FY2015 Inventory	
Academic Owned Buildings	12,093,381 GSF
Academic Leased Buildings	451,064 GSF*

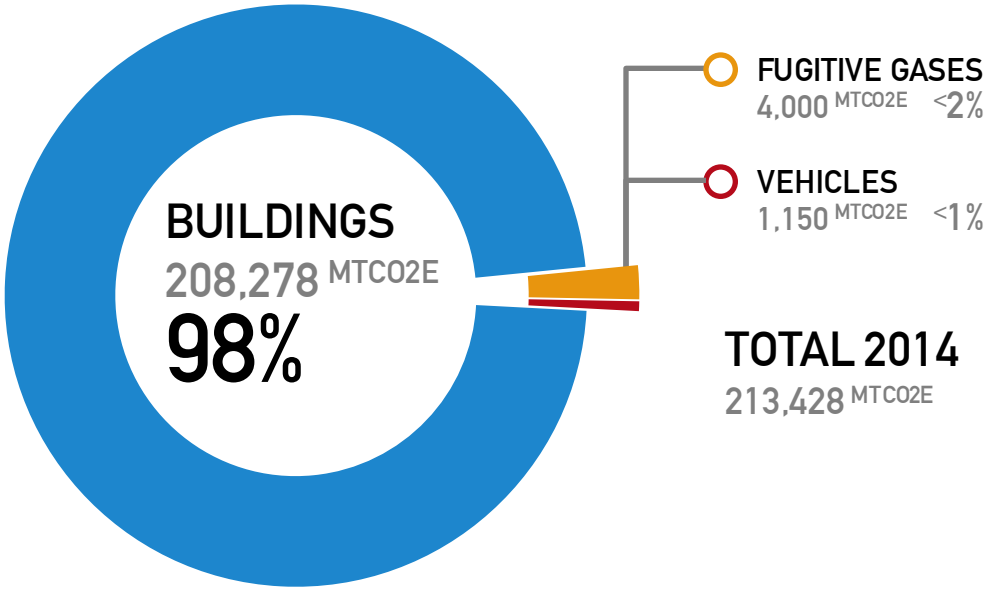
Total Space FY2016 Inventory	
Academic Owned Buildings	12,164,223 GSF
Academic Leased Buildings	515,732 GSF

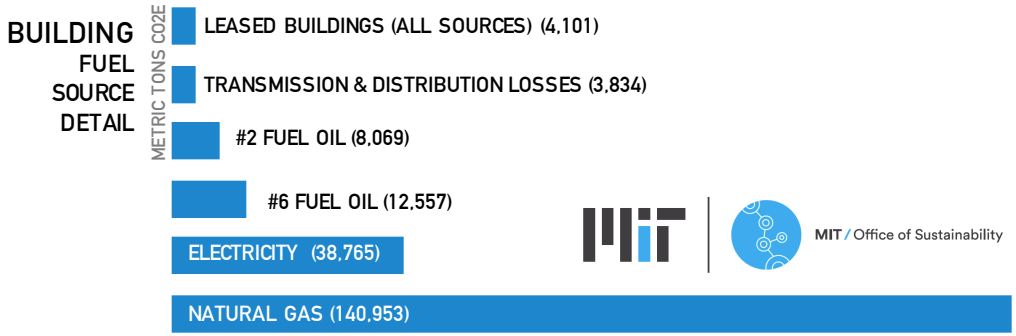
Total Space FY2017 Inventory	
Academic Owned Buildings	12,394,103 GSF
Academic Leased Buildings	515,856 GSF

Total Space FY2018 Inventory	
Academic Owned Buildings	12,396,148 GSF
Academic Leased Buildings	470,464 GSF

MIT GREENHOUSE GAS EMISSIONS INVENTORY

2014 MAIN CATEGORIES





MIT / Office of Sustainability

GHG Inventory

FY14 Inventory

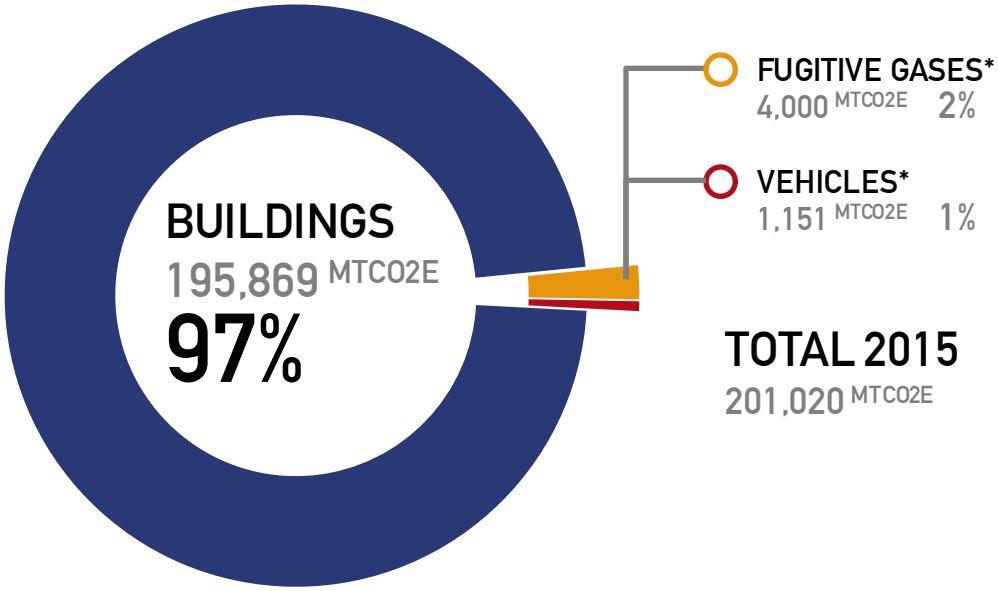
- Buildings
- Fugitive Gases
- Campus Vehicles

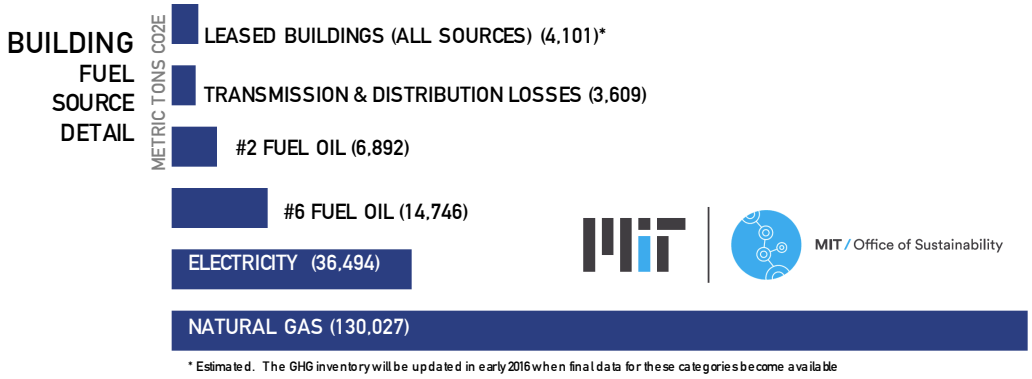
2014 is the baseline year for MIT emissions reduction. It is the year from which MIT will begin accounting as the Institute works to achieve it's GHG reduction goal and represents the first year of comprehensive and streamlined data collection.

Fugitive gas emissions and fleet vehicle use comprise <3% of emissions, while 98% of emissions stem from operation of labs, offices, and facilities across campus.

MIT GREENHOUSE GAS EMISSIONS INVENTORY

2015 MAIN CATEGORIES





MIT / Office of Sustainability

* Estimated. The GHG inventory will be updated in early 2016 when final data for these categories become available

GHG Inventory

FY15 Inventory

The 2015 inventory was audited by the MIT Office of Treasury and represents the second year of comprehensive inventory assessment for the Institute.

The total change in emissions from 2014 was a reduction of 12,408 MTCO2e, or 6%.

* This data is based on the calendar year, where MIT building data is fiscal year.

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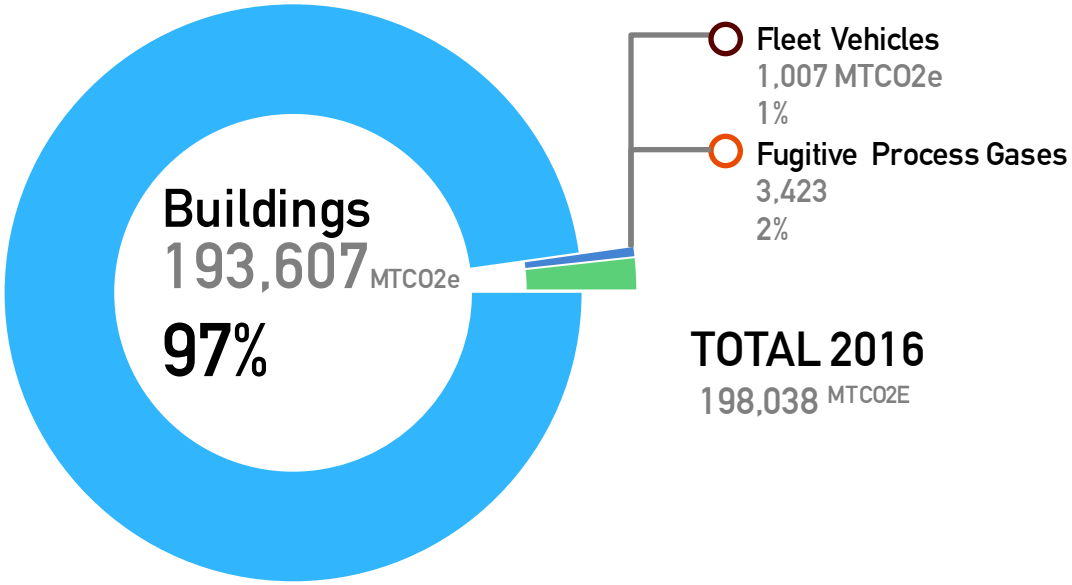
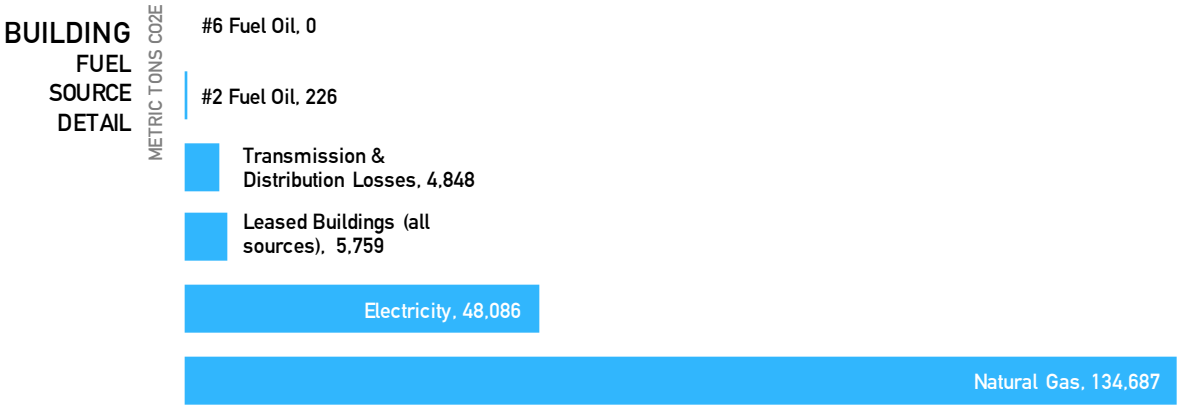
MIT GREENHOUSE GAS EMISISONS INVENTORY

2016 MAIN CATEGORIES





GHG Inventory

FY16 Inventory

The 2016 inventory was audited by the MIT Office of Treasury and represents the third year of comprehensive inventory assessment for the Institute.

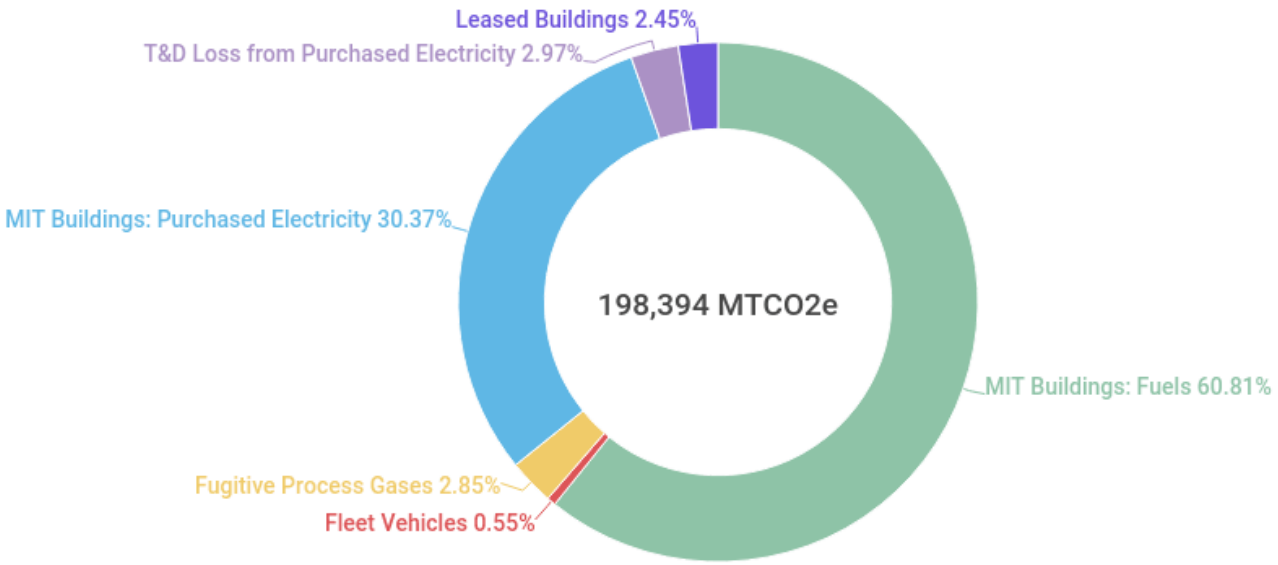
The total change in emissions from 2015 was a reduction of 2,982 MTCO2e, or 1.5%.

The total change in emissions from 2014 was a reduction of 15,390 MTCO2e, or 7%.

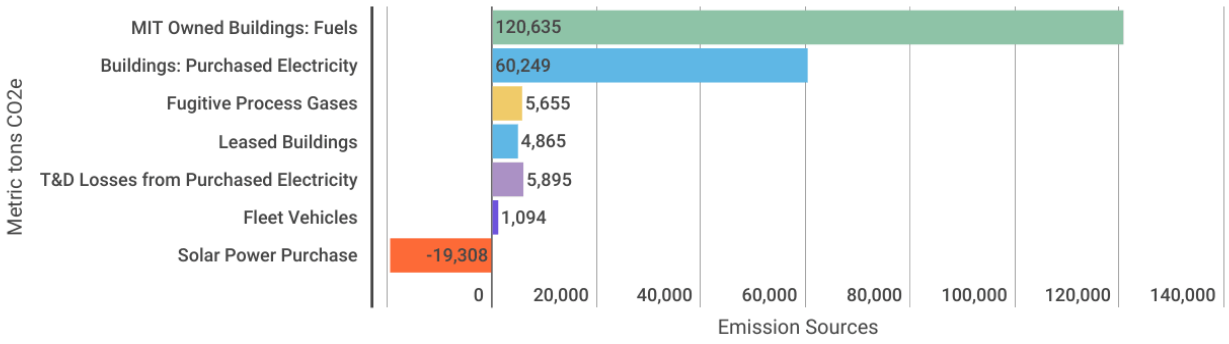
Office of Sustainability

MIT GREENHOUSE GAS EMISISONS INVENTORY

2017 MAIN CATEGORIES



GHG SOURCE DETAIL



GHG Inventory

FY17 Inventory

The 2017 inventory was audited by the MIT Office of Treasury and represents the third year of comprehensive inventory assessment for the Institute.

The total change in on-campus emissions from 2016 was a reduction of 356 MTCO2e, or 0.18% 515,856 , not accounting for MIT's solar power purchase in 2017.

The total change in emissions from 2014 was a reduction of 15,034 MTCO2e, or 7%.

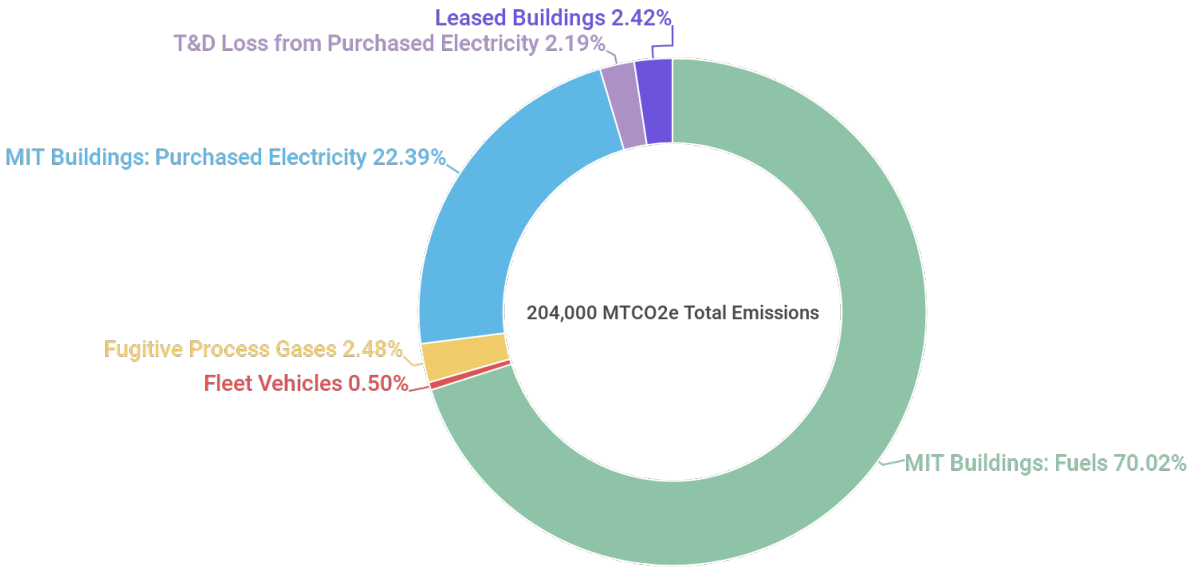
Role of Solar Power Purchase

Fiscal year 2017 marked the first year MIT began to account for the impact of their large Summit Farm solar energy purchase.

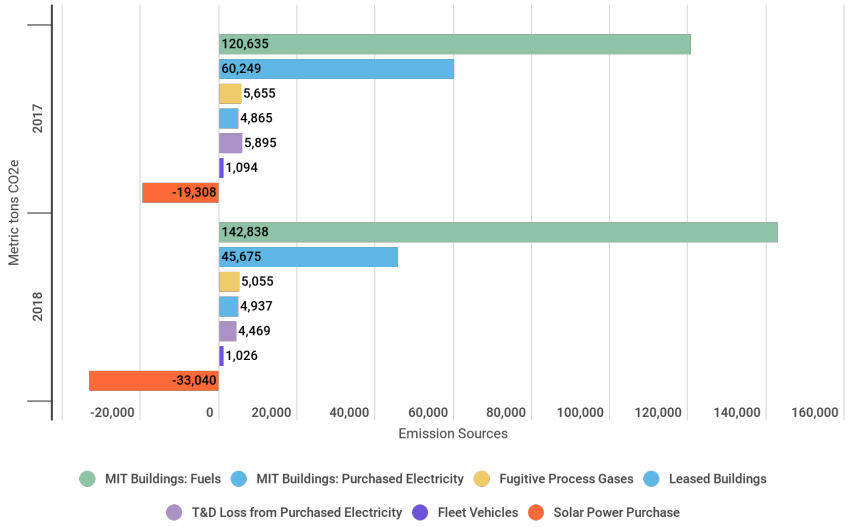
Since the solar-generated electricity is considered to be carbon-free, the net impact is a reduction of greenhouse gas emissions associated with MIT's greenhouse gas inventory. The solar power purchase had a net impact of reducing our total emissions by 19,308 metric tons of CO2 equivalents.

MIT GREENHOUSE GAS EMISISONS INVENTORY

2018 MAIN CATEGORIES



GHG SOURCE DETAIL



GHG Inventory

FY18 Inventory

The 2018 inventory was audited by the MIT Office of Treasury and represents the third year of comprehensive inventory assessment for the Institute.

The total change in on-campus emissions from 2017 was an increase of 5,606 MTCO2e, or 3%, not accounting for MIT's solar power purchase in 2018.

The total change in emissions from 2014 was a reduction of 9,428 MTCO2e, or 4.4%.

Role of Solar Power Purchase

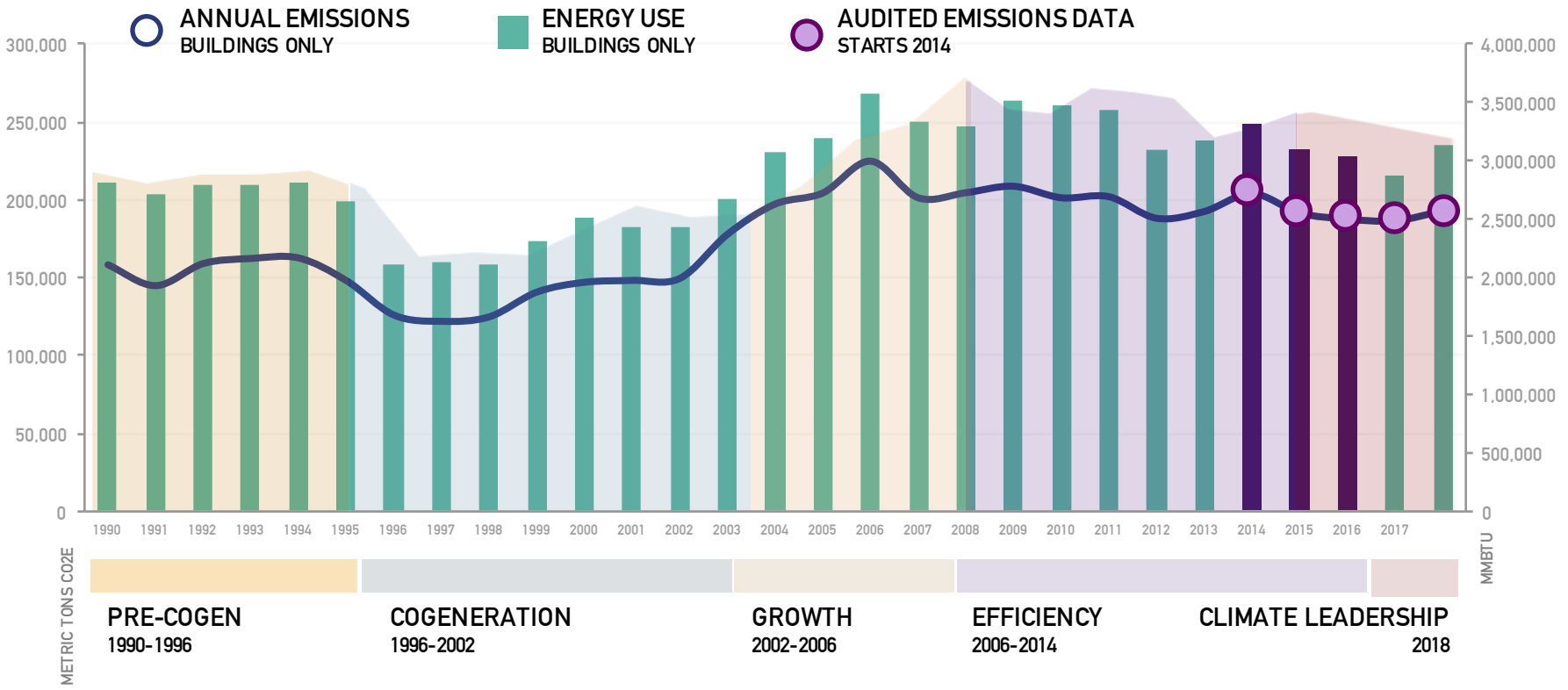
Fiscal year 2018 marked the first complete year of production for MIT to account for from their large Summit Farm solar energy purchase.

Since the solar-generated electricity is considered to be carbon-free, the net impact is a reduction of greenhouse gas emissions associated with MIT's greenhouse gas inventory. The solar power purchase had a net impact of reducing our total emissions by 33,040 metric tons of CO2 equivalents.

MIT GREENHOUSE GAS EMISSIONS INVENTORY

HISTORICAL EMISSIONS FROM MIT BUILDINGS ONLY

MIT / Office of Sustainability



MIT has non-audited greenhouse gas data for buildings dating back to 1990. From this data, emissions can be roughly categorized into four phases of development from 1990 to the present: *Pre-Cogeneration*, *Cogeneration*, *Campus Growth*, and *Efficiency*. The next phase of MIT's greenhouse gas management is *Climate Leadership*, beginning with the first Institutional GHG reduction goal of at least 32% by 2030 below 2014 levels being set in 2015, and the release of the first comprehensive and audited institutional GHG inventories for 2014-2018.

Note that this graphic shows trends only for emissions from MIT owned academic buildings, and does not include MIT's solar power purchase in 2017-2018. Beginning in 2014, MIT also measures emissions from fugitive gases and campus vehicle use which are omitted from this figure.