

Explaining Harvard's Greenhouse Gas Inventory

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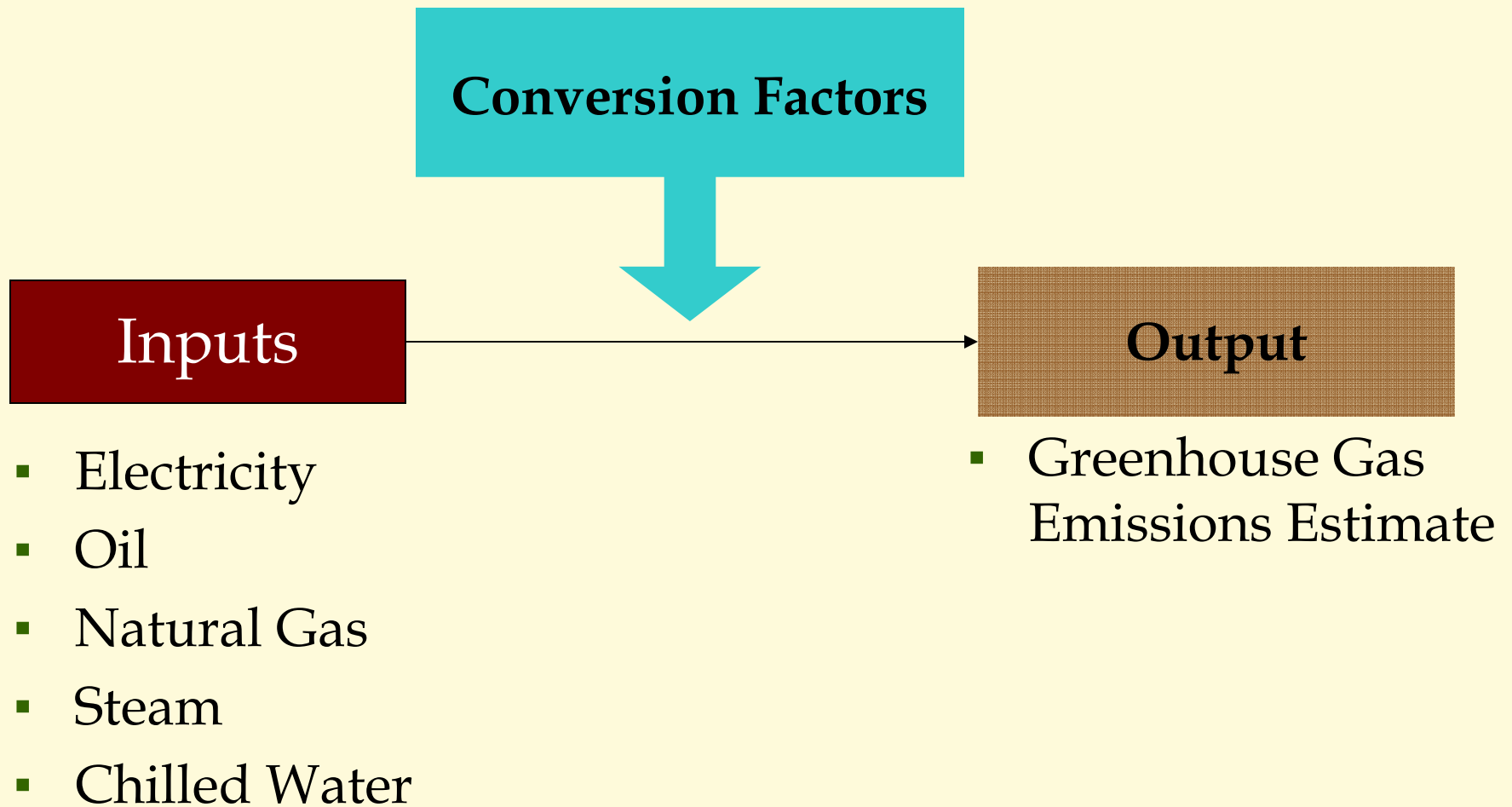


What is a Greenhouse Gas Inventory?

- An estimation of an entity's emission of greenhouse gasses, including:
 - CO₂
 - CH₄
 - N₂O
 - SF₆
 - HFCs, PFCs
- Accomplished by applying “conversion factors” to utilities usage
- Process is standardized by the WRI/WBCSD **Greenhouse Gas Protocol**
 - Ghgprotocol.org



Inventory Schematic



What is a MTCDE?

- MTCDE = Metric ton (1000 kg) of carbon dioxide equivalent
- Includes greenhouse gasses other than CO₂ that have a larger warming effect in the atmosphere
 - CH₄ (23 times as powerful)
 - NO_x (296 times as powerful)

All Greenhouse Gas Inventories should report emissions as MTCDE, but not all do!



Scope of Harvard's Inventory

Scope 1

Emissions from
on-campus
combustion

Scope 2

Emissions from
purchased energy
(e.g. electricity)

Scope 3

Indirect emissions
(e.g., transport, solid
waste, air travel)

- In compliance with the WRI/WBCSD Protocol, only Scope 1 and 2 emissions are included in our total
 - Scope 3 data on commuting, solid waste, and air travel are tracked separately

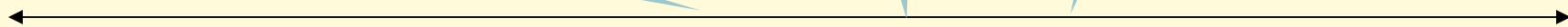
History of Harvard's Inventory

Harvard's first Inventory completed by Jessica Wooliams using the ICLEI methodology

Years FY90 to FY03 assessed

Years FY03 to FY05 assessed by Gosia Sklodowska using the Clean Air Cool Planet methodology

All previous data years reassessed and FY06 assessed by Emily Martin to comply with the Greenhouse Gas Protocol methodology



2001-2003

2005

2006



Data Inputs



Two Campuses, Two Sets of Inputs

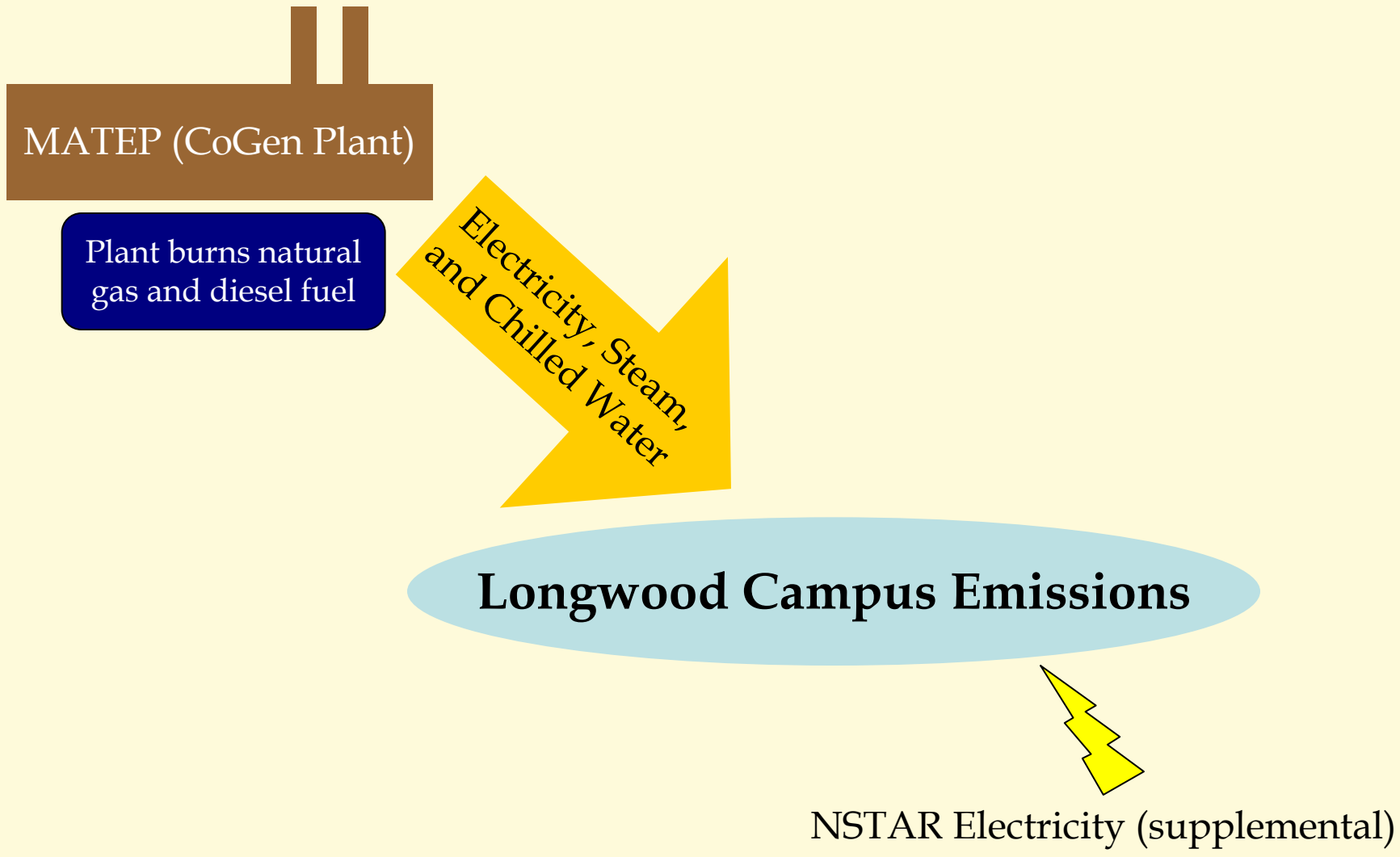
MATEP (CoGen Plant)

Plant burns natural gas and diesel fuel

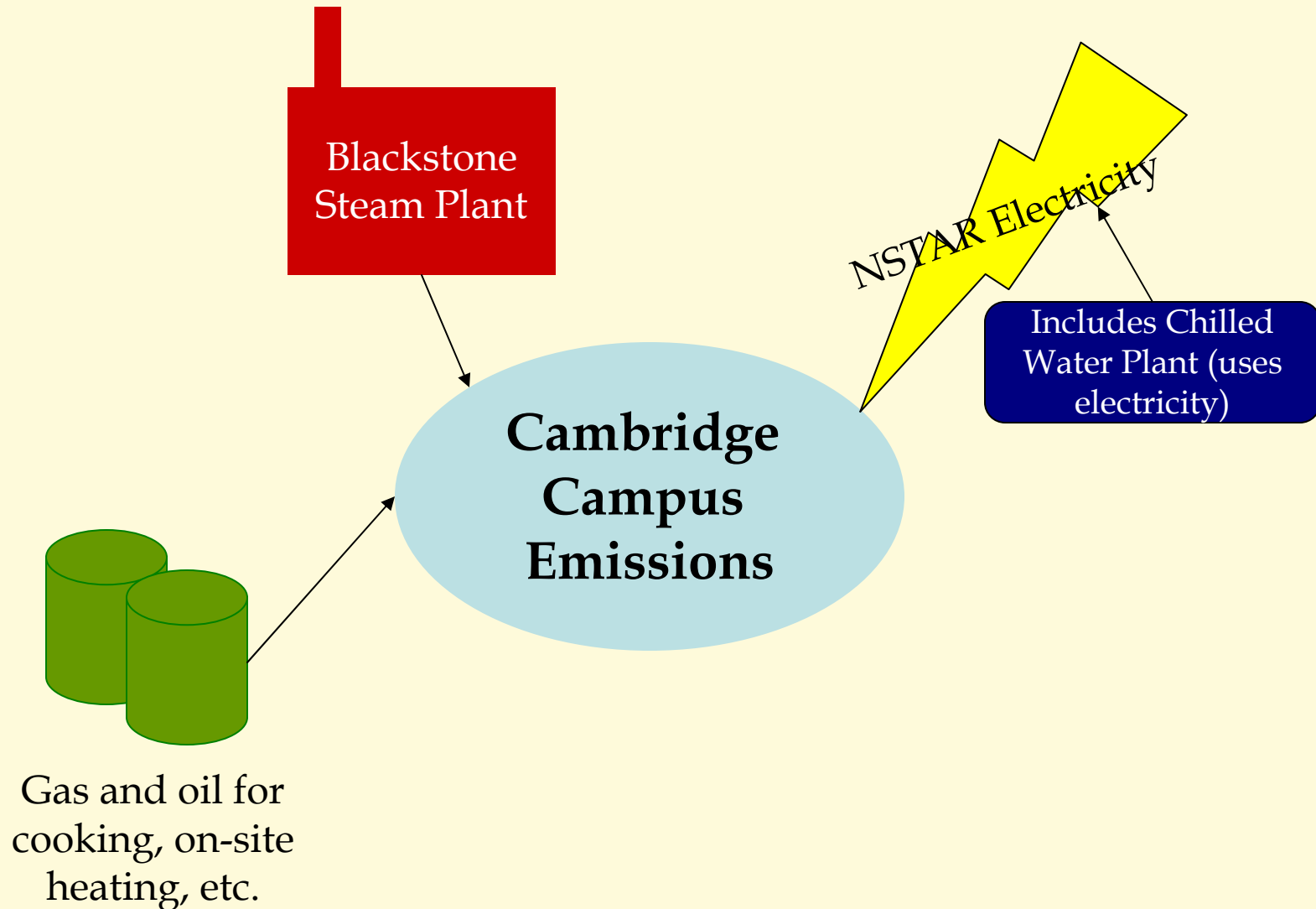
Electricity, Steam, and Chilled Water

Longwood Campus Emissions

NSTAR Electricity (supplemental)



Cambridge Campus Inputs



Cambridge/ Allston Data Sources

1. UOS E&U Utilities Tracking Database

- Electric usage
 - Includes chilled water plant consumption
- Stationary fuel usage
 - Steam plant emissions are calculated separately

2. Harvard Real Estate Services Utilities Tracking Database

- FY06 only
 - 41,000 therms of natural gas
 - 33,000 MWh

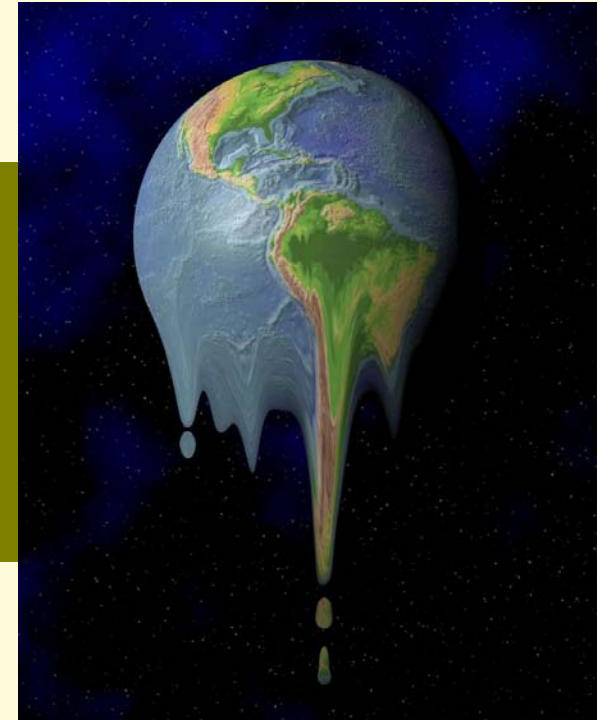


Longwood Data Sources

1. School-Specific Usage Tracking

- Harvard Medical School
- Harvard School of Public Health
- Harvard Dental School

Conversion Factors



Conversion Factors: Electric

	MTCDE / kWh	
FY90	0.001008	No data available
FY91	0.001008	
FY92	0.001008	
FY93	0.001008	
FY94	0.001008	
FY95	0.001008	
FY96*	0.001008	Factors from EPA's eGRID database, MA-specific
FY97*	0.001074	
FY98*	0.000936	
FY99*	0.001003	
FY00*	0.000857	
FY01**	0.000863	Factors from ISO NE's emission reports, MA-specific
FY02**	0.000854	
FY03**	0.000769	
FY04*	0.000909	No data available
FY05	0.000909	
FY06	0.000909	



Electric Conversion Factors

- We use Massachusetts specific conversion numbers, leading to a higher GHG total

	HARVARD: MTCDE / kWh MASS-SPECIFIC	TUFTS: MTCDE / kWh NEW ENGLAND-SPECIFIC
FY90	0.001008	0.000618
FY91	0.001008	0.000618
FY92	0.001008	0.000618
FY93	0.001008	0.000618
FY94	0.001008	0.000618
FY95	0.001008	0.000618
FY96	0.001008	0.000618
FY97	0.001074	0.000618
FY98	0.000936	0.000518
FY99	0.001003	0.000518
FY00	0.000857	0.000518

Stationary Fuels Conversion Factors

- US EPA's Conversion Factors, from "Inventory of Greenhouse Gas Sources and Sinks"

	<u>HARVARD: MTCDE / fuel</u>	<u>TUFTS: MTCDE / fuel</u>
Natural Gas	0.00529 / therm	0.00548 / therm
Distillate Oil	0.0101 / gal	0.0101 / gal
Residual Oil	0.0118 / gal	0.0118 / gal



Longwood Conversion

- No data on fuel mix at MATEP
 - FY03 – FY05 worked with a colleague who worked at MATEP until 2005 to estimate fuel mix
 - Moving forward, we will apply FY05 fuel mix to usage numbers



MATEP Fuel Mixes

	Distillate Oil	Natural Gas	Residual Oil
FY90	75%	0%	25%
FY91	75%	0%	25%
FY92	75%	0%	25%
FY93	100%	0%	0%
FY94	100%	0%	0%
FY95	100%	0%	0%
FY96	15%	85%	0%
FY97	15%	85%	0%
FY98	15%	85%	0%
FY99	15%	85%	0%
FY00	15%	85%	0%
FY01	15%	85%	0%
FY02	15%	85%	0%
FY03	48%	52%	0%
FY04	49%	51%	0%
FY05	58%	42%	0%
FY06	58%	42%	0%



Longwood Workaround

Steam, Chilled Water, and Electric Usage in MMBtu

CoGen Efficiency Factor of 75%

% MMBtu Fuel A

% MMBtu Fuel B

Gallons or therms
Fuel A

Gallons or therms
Fuel B

Apply GHG Conversion Factors

Longwood GHG Output from Steam, Chilled Water and Electricity

Longwood Green
Campus Initiative



Limitations

- Accept uncertainty inherent in utilities tracking database
- Don't know MATEP's fuel mix from year to year
- Recognize that there are many many different ways to convert from usage units to GHG



For More Information

- www.greencampus.harvard.edu/ggi
- www.ghgprotocol.org
- emily_martin@harvard.edu