

# USGBC-STL

Program on Campus Greenhouse Gas Inventories

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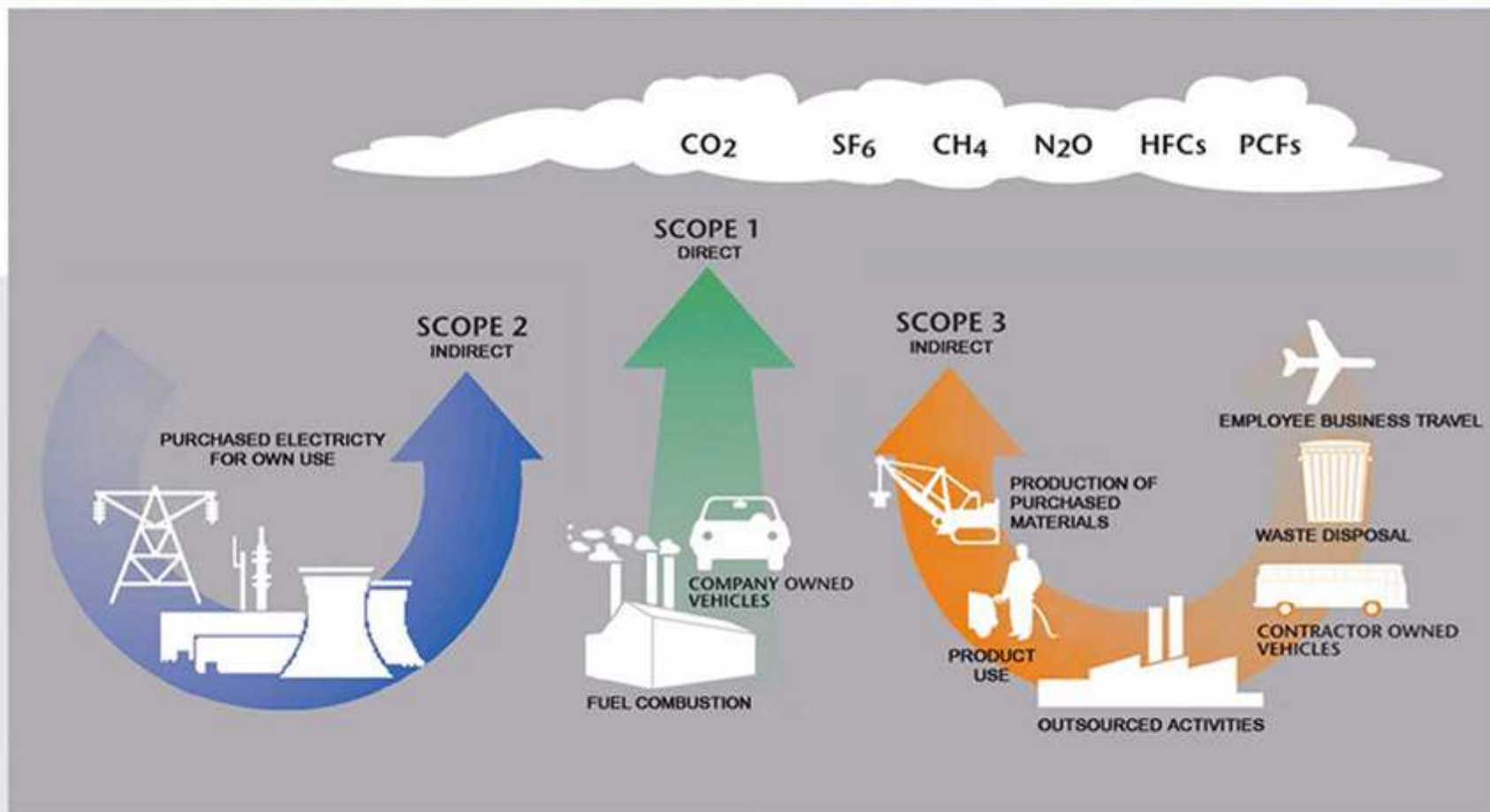
June 6, 2009

# Our Carbon Footprint



Washington University in St. Louis

# Each Emission Scope Counted & Reported Separately



**Scope 2:** Emissions from utility production not at the institution

**Scope 1:** Emissions from the direct activities of the campus

**Scope 3:** Indirect emissions including transportation, waste disposal, etc.

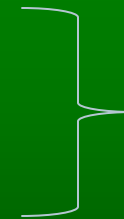
# Why We Completed our GHG Inventory

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- The American Colleges & Universities President's Climate Commitment (decision not to sign)
- To manage risks & identify reductions
- Public reporting & participation in voluntary GHG programs (Climate registry)
- Participation in mandatory reporting programs (in anticipation of future legislation)
- Participation in GHG markets (To determine if we need to take a different approach to carbon offsets / credits)
- Recognition of early volunteer action

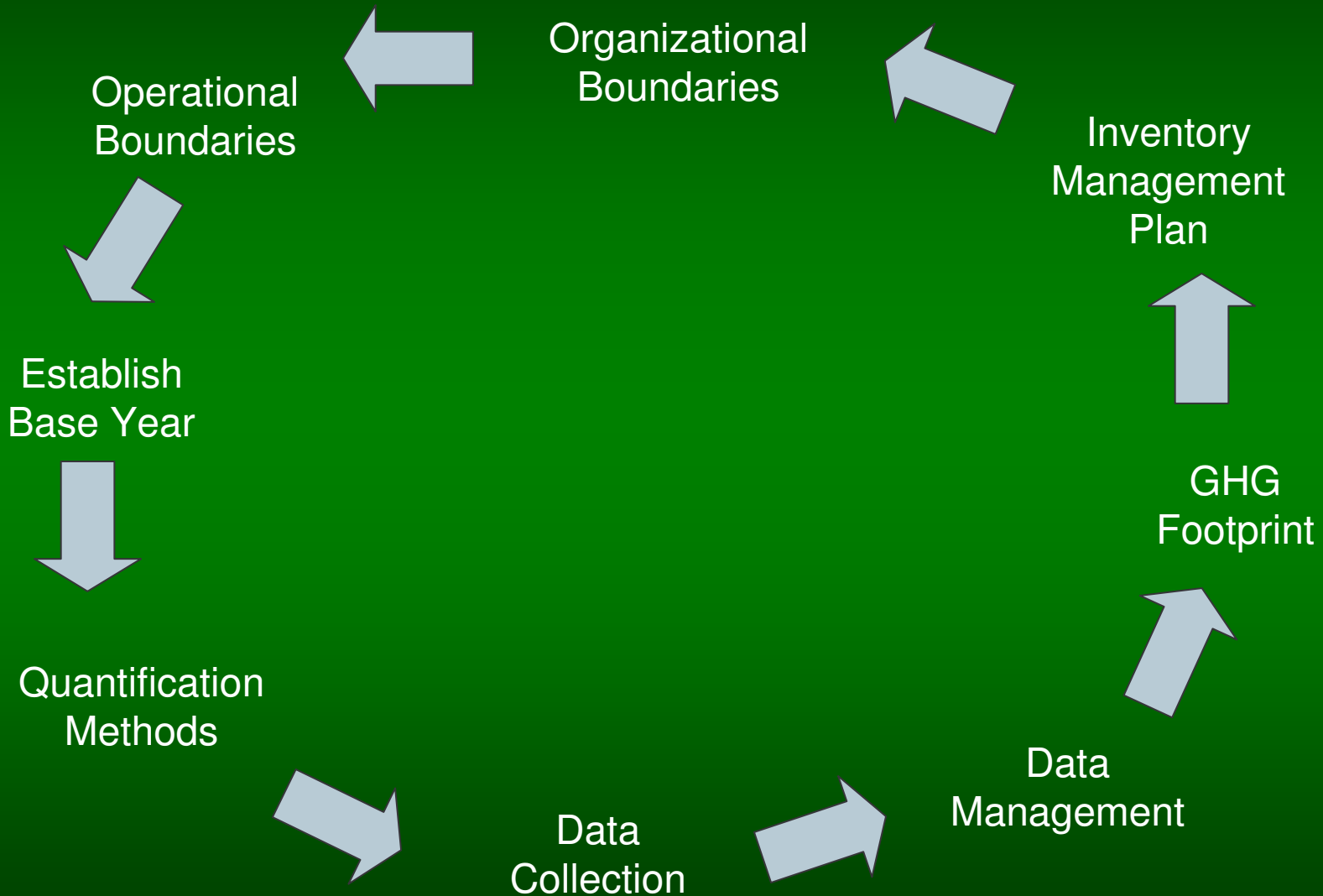
# GHGs Covered in the Inventory

- Carbon Dioxide (CO<sub>2</sub>)
- Methane (CH<sub>4</sub>)
- Nitrous Oxide (N<sub>2</sub>O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur Hexafluoride (SF<sub>6</sub>)



No expectations

# GHG Footprinting 101



# Our Organizational Boundaries

- Danforth Campus
- Medical School Campus
- North Campus
- West Campus
- Tyson Research Center
- Quadrangle Housing (off campus residences)
- Off campus buildings and clinics



# Operational Boundaries: Determining Types & Scopes of Emissions

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- Required
- ✓ **Scope 1**
    - Direct emissions sources owned or controlled by company
  - ✓ **Scope 2**
    - Indirect emissions from purchased finished energy, generated off-site, used by operations

- Optional
- ✓ **Scope 3**
    - Other indirect emissions consequence of company, but occur from/at other sources
      - o Students estimated commuter airline travel (do not have a high-level accuracy)
      - o Outweigh Scope 1 & 2?
      - o Concern over double-counting

# Scope 1 direct emissions

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- Stationary combustion sources (heating, laboratories, electric generators, waste combustion)
- University vehicle feet
- Fertilizer application
- Animal agriculture
- Fugitive emissions from air conditioning equipment

# Insignificant Contributions

- Scope 1 emissions
  - Agriculture – Fertilizer Application
  - Agriculture – Animals
  - Solid, Hazardous, and Medical Waste Incineration

# Scope 2 direct emission source

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- Purchased Electricity

# Scope 3 Indirect Emissions

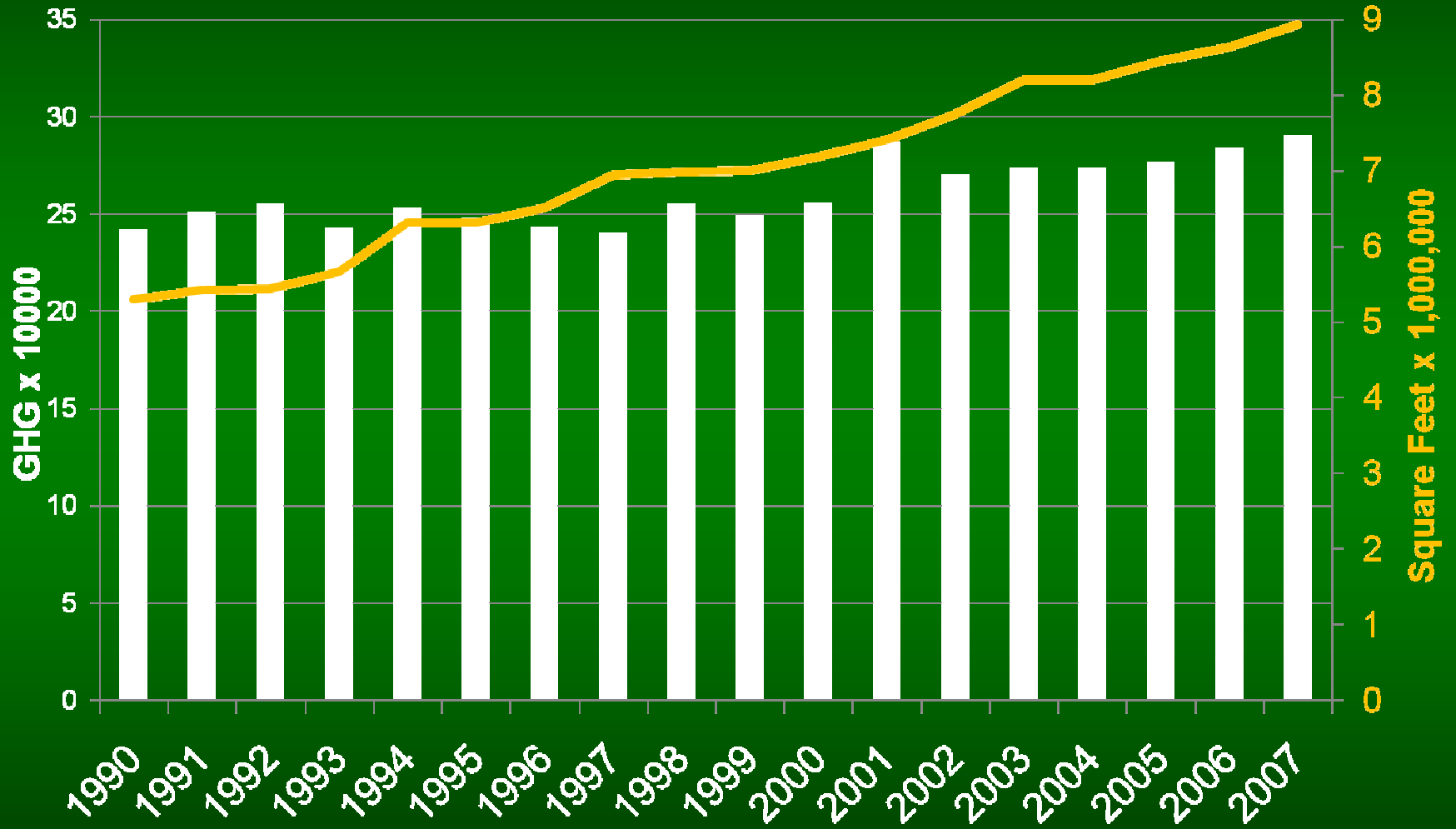
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- Commuting in personal vehicles.
- Airline travel.
- Decomposition of solid waste generated at the University.
- Contracted transportation.
- Transportation of solid waste and delivery of supplies to the University.
- Contractor owned and operated vehicles.

# GHG Emissions Summary

Scope / Category	GHG Emissions (Metric tons of CO2e)	
	Base Year: Fiscal Year 1990	Fiscal Year 2007
Scope 1 – Direct Emissions	122,000	74,000
Scope 2 – Energy Indirect Emissions	104,000	198,000
Scope 3 – Other Indirect Emissions	16,000	18,000
Total	242,000	290,000

# Next Steps



# Energy Reduction Strategies

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- Innovative Design
- Capital Renewal & New Technology
- Operational Improvements

# Innovative Design Examples

## Design Standards



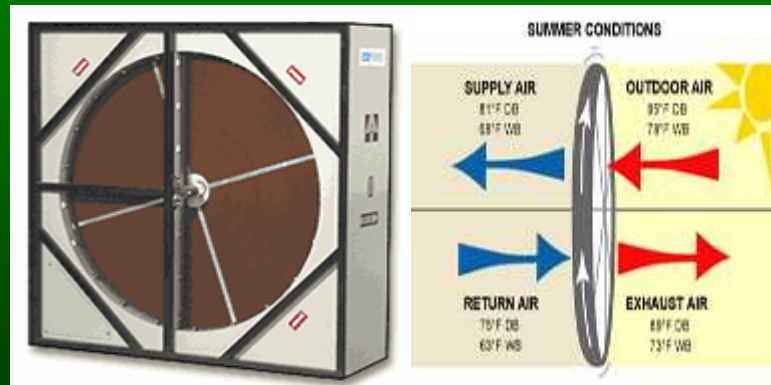
## LEED-NC Buildings



## Low-Flow Fume Hoods



## Heat Recovery Systems



# Capital Renewal Examples

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Heat Recovery Chillers



Steam Plant Decentralization & LP Conversion



Lighting Retrofits



Variable Speed Chillers

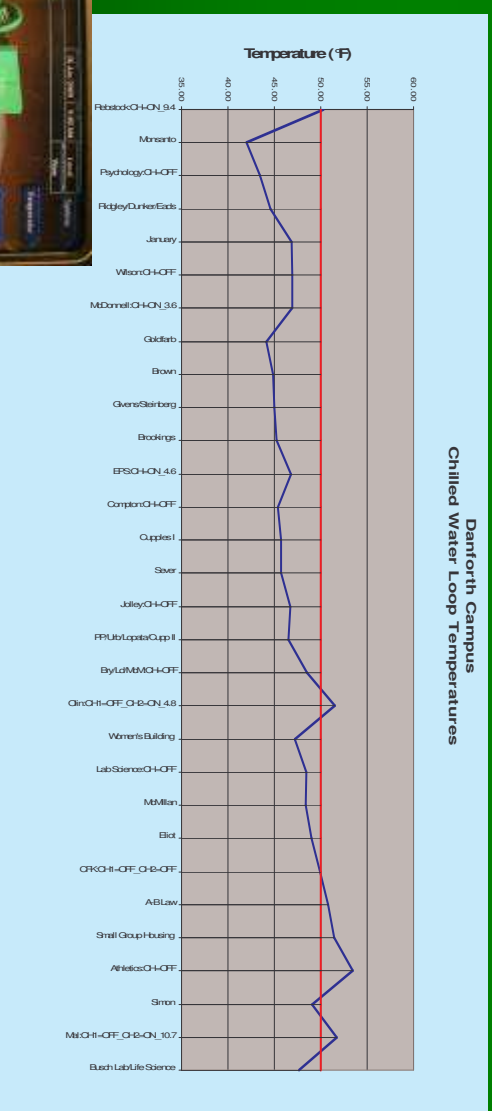


# Operational Improvement Examples

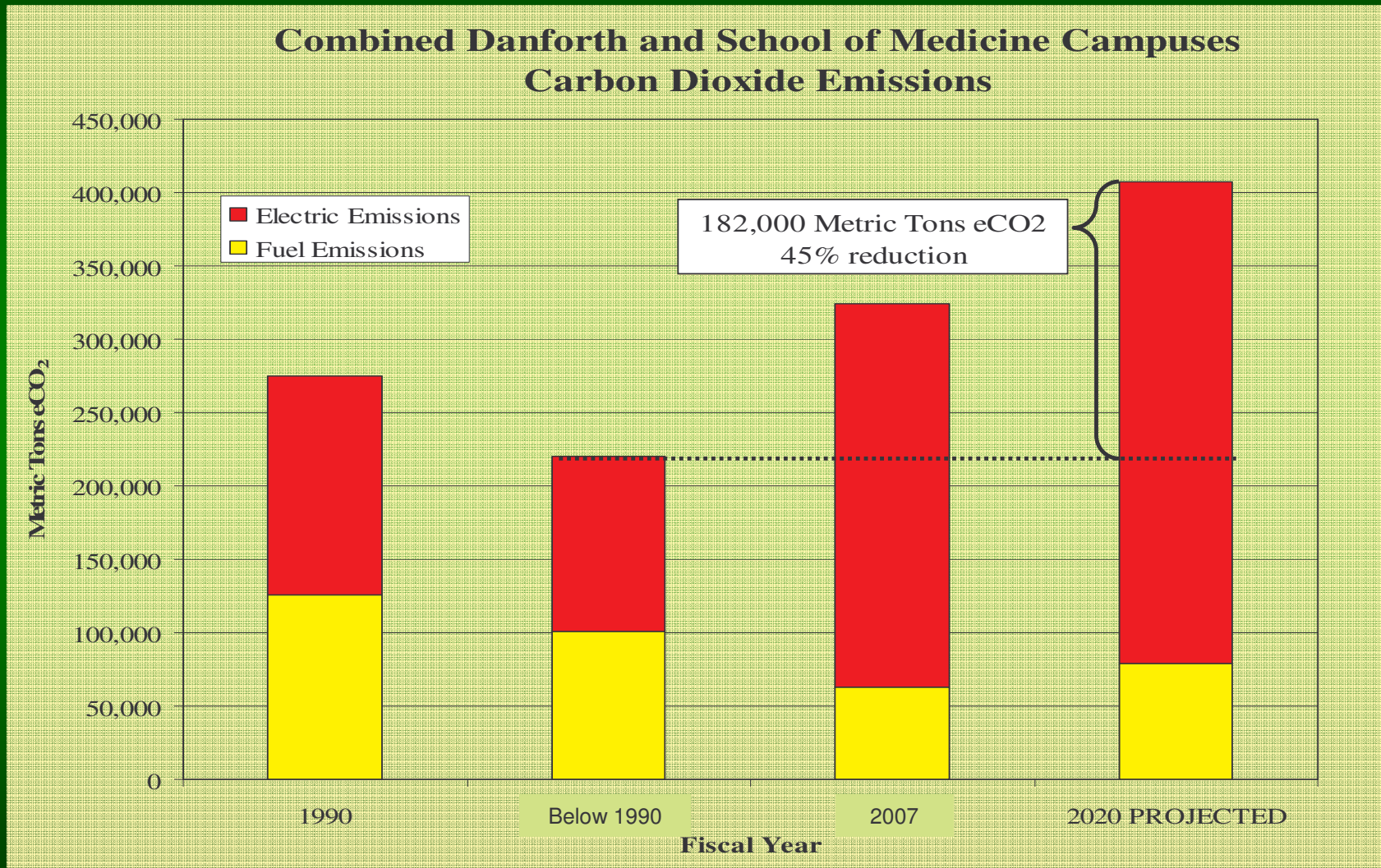
## Re-commissioning Team



## Computer Optimized Chilled Water System

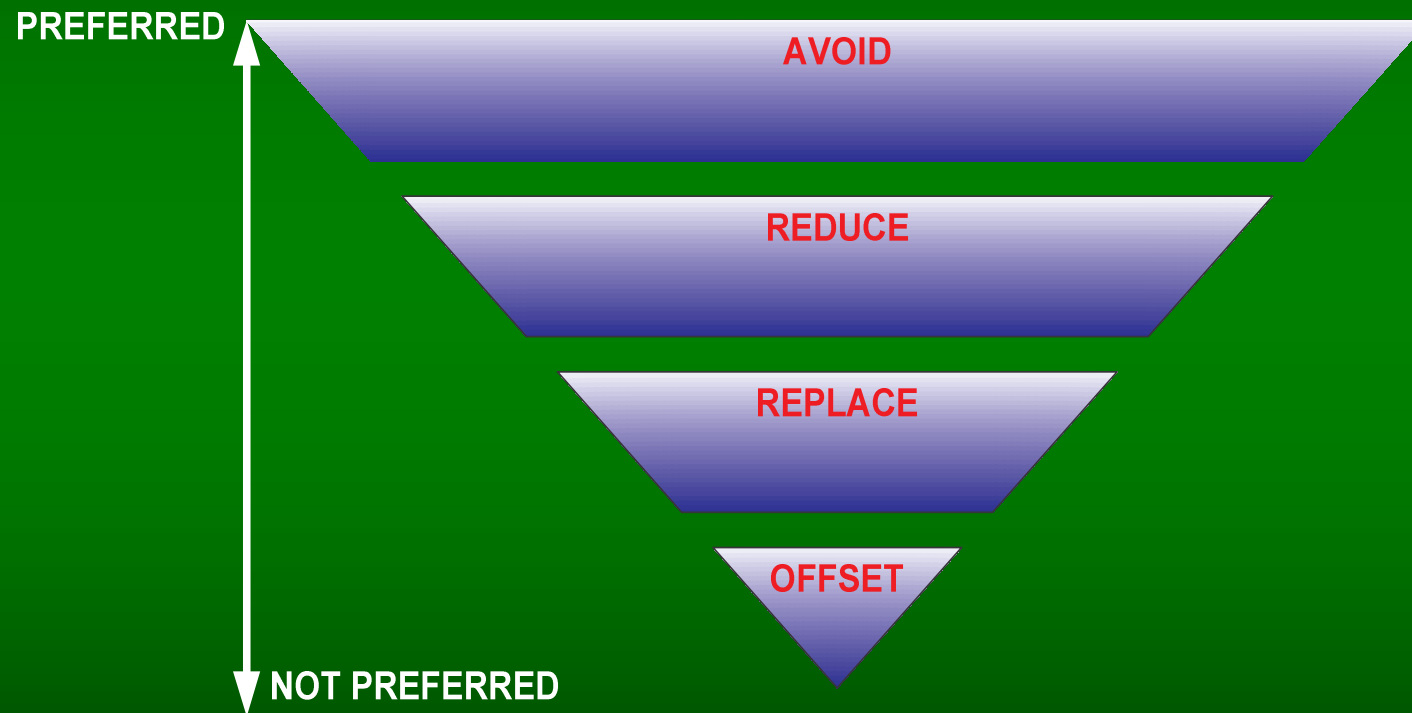


# Target: Reduction Below 1990 Levels



# Carbon Reduction Plan

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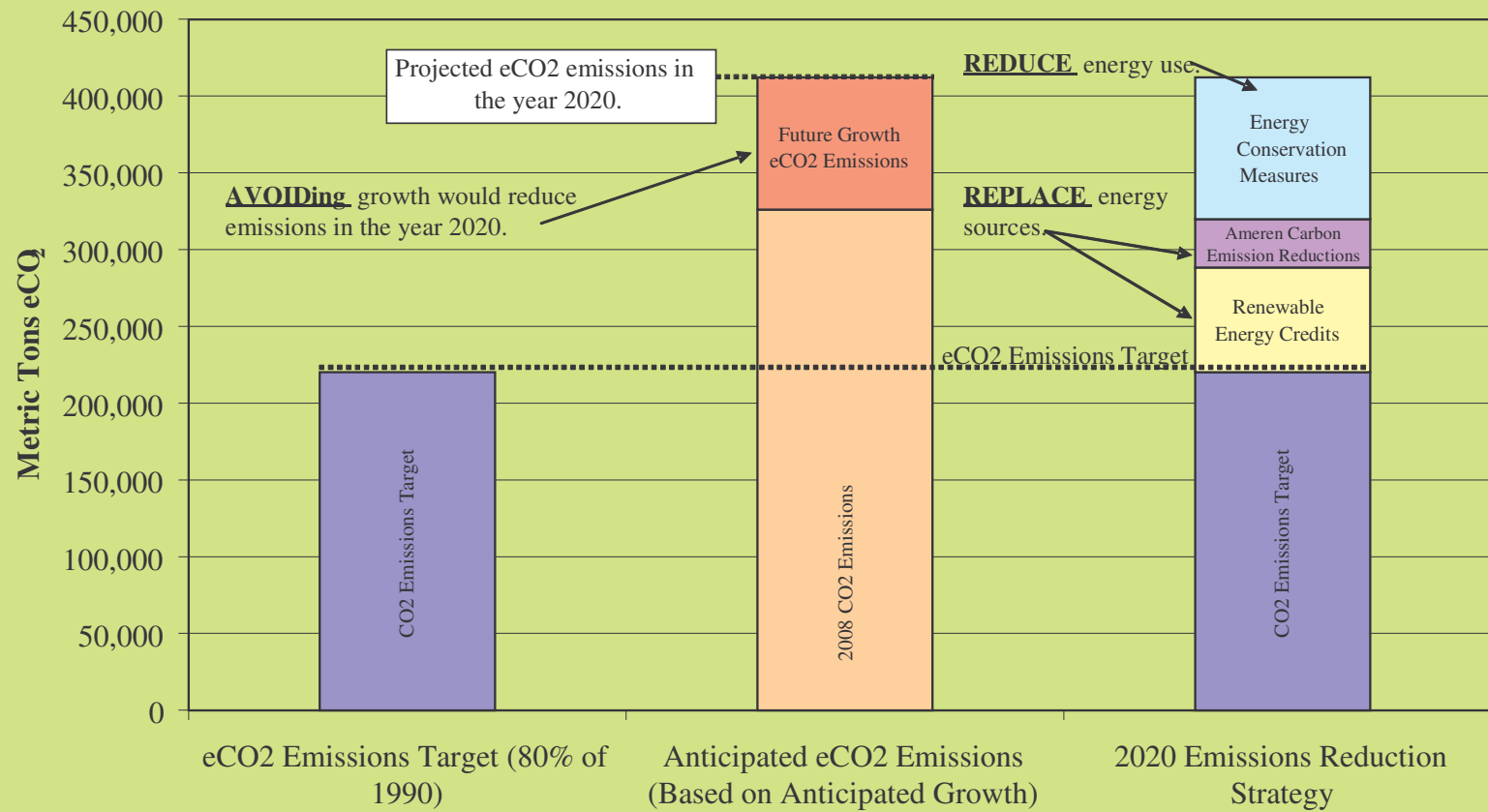
# Carbon Reduction Plan

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- **Avoid** carbon intensive activities
- **Reduce** by improving efficiency
- **Replace** high carbon with low carbon energy sources
- **Offset** remaining as last resort

# Carbon Reduction Plan

**FIGURE 6: Washington University Danforth Campus and Medical School Campus Carbon Dioxide Emissions Reduction Strategy**



# Energy conservation measures

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- Recommended ECM's from parametric analysis
  - Rebalance air systems
  - Reduce lighting levels and add lighting occupancy controls
  - AHU night/weekend setbacks
  - Shutdown residence halls in summer
  - Install heat recovery chillers