# Climate Realities and Mason's Responses

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Tuesday, November 4th, 2008

# Agenda

| |
|---|
| Climate Realities – Frying an egg on your car hood |
| Mason's Climate Commitment and Actions |
| Q&A |

# Sources for Graphs

Publicly available from IPCC, DOE, NASA, NOAA, ASPO, WEC, IEA, UCSD, NYT

Dr. Peter Balint, GMU, Energy and Climate Presentation, 2007

Many collected at Wikipedia Online Encyclopedia

http://en.wikipedia.org/wiki/Global_warming

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# IPCC Concluded that…

- It is unequivocal that the average temperature of Earth's surface has warmed recently.

- It is *very likely* (greater than 90% probability) that most of this global warming is due to increased concentrations of human generated greenhouse gases.

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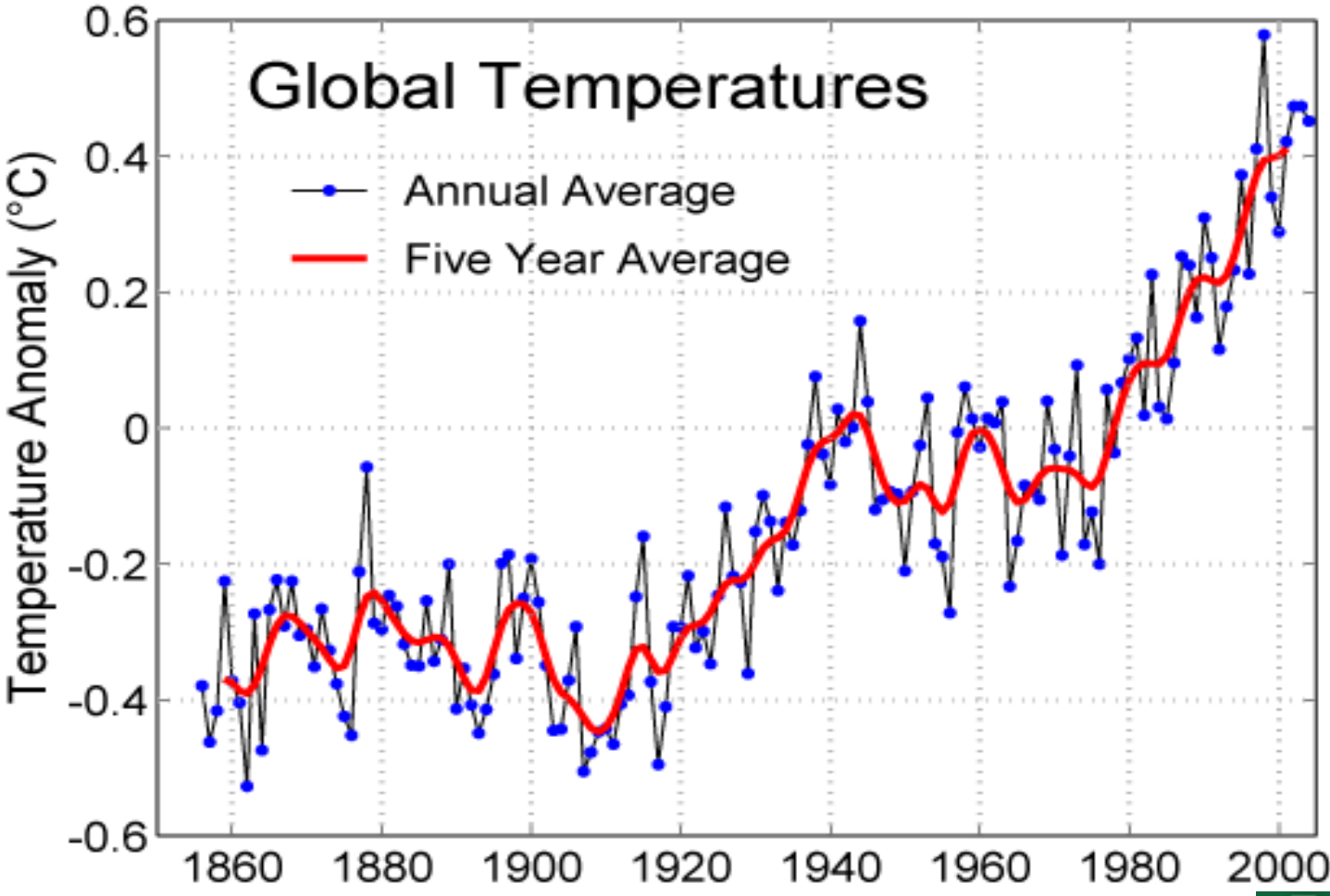
# Temperatures: 150-year estimate

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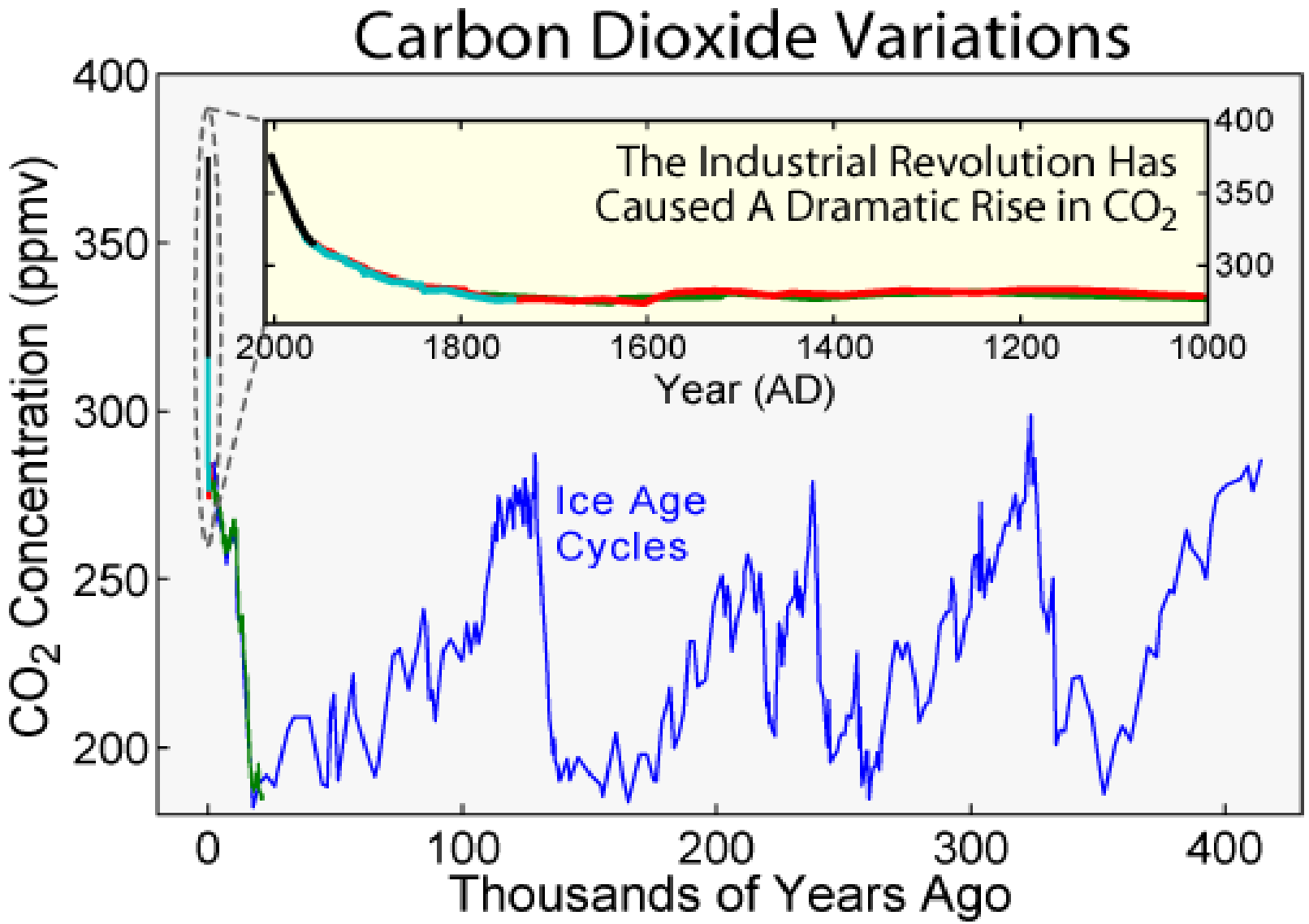
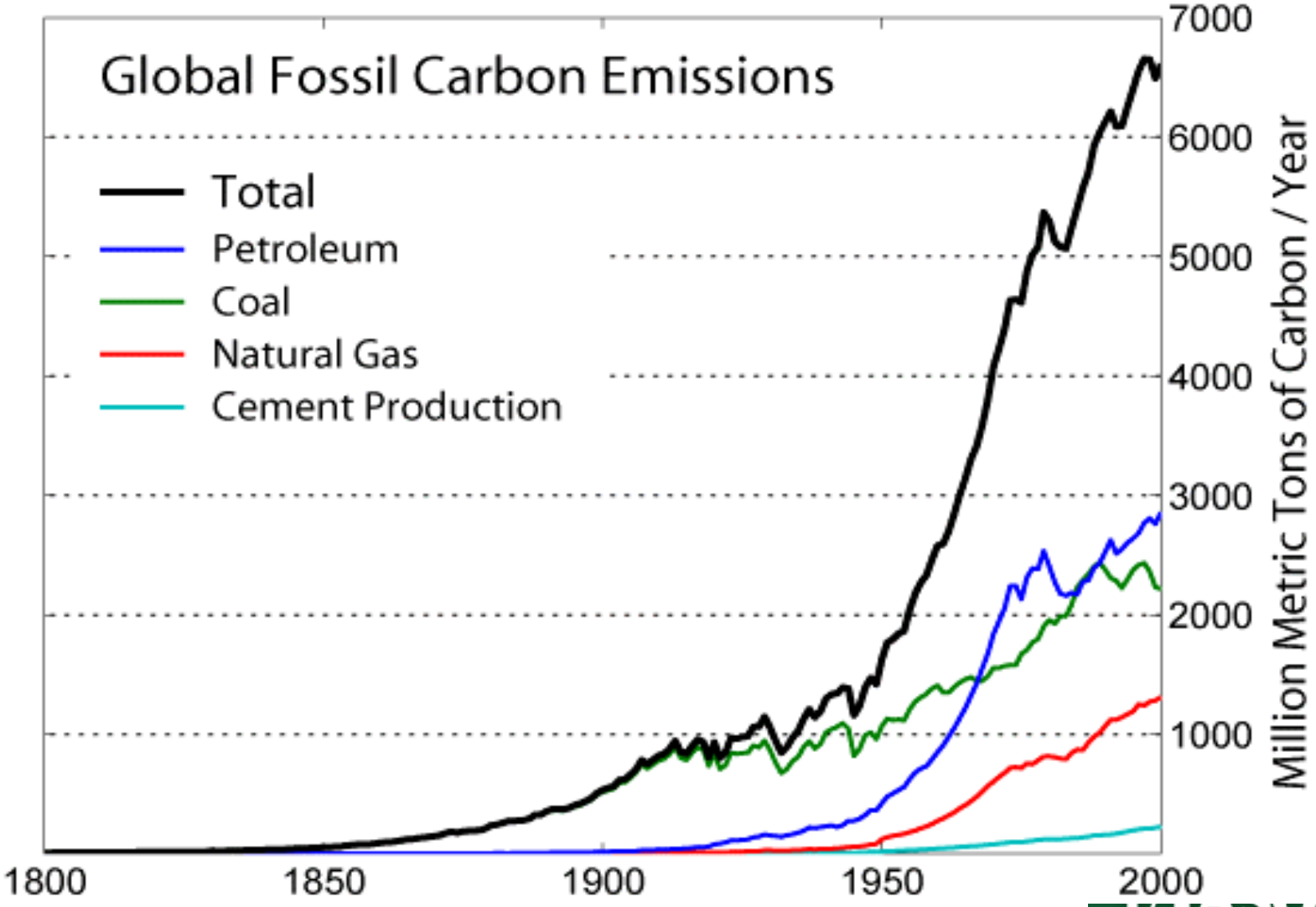
# CO2: 400,000 (&1000) years



# Carbon emissions: 200-yr estimates



# IPCC Concluded that…

- **Global GHG emissions will continue to grow over the next few decades.**
- **Warming and sea level rise will continue for centuries due to the time scales associated with climate processes and feedbacks, even if GHG concentrations were to be stabilized**

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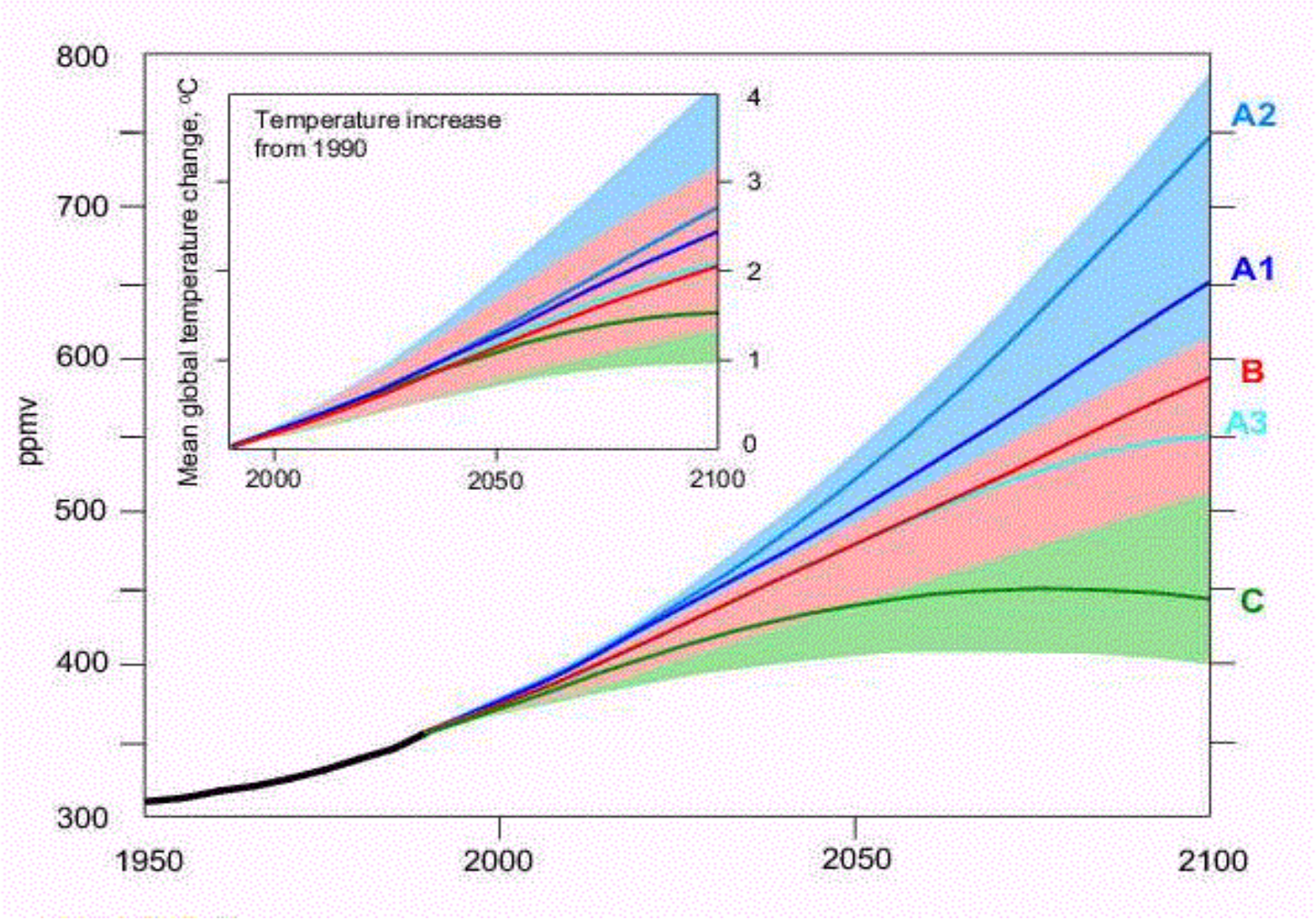
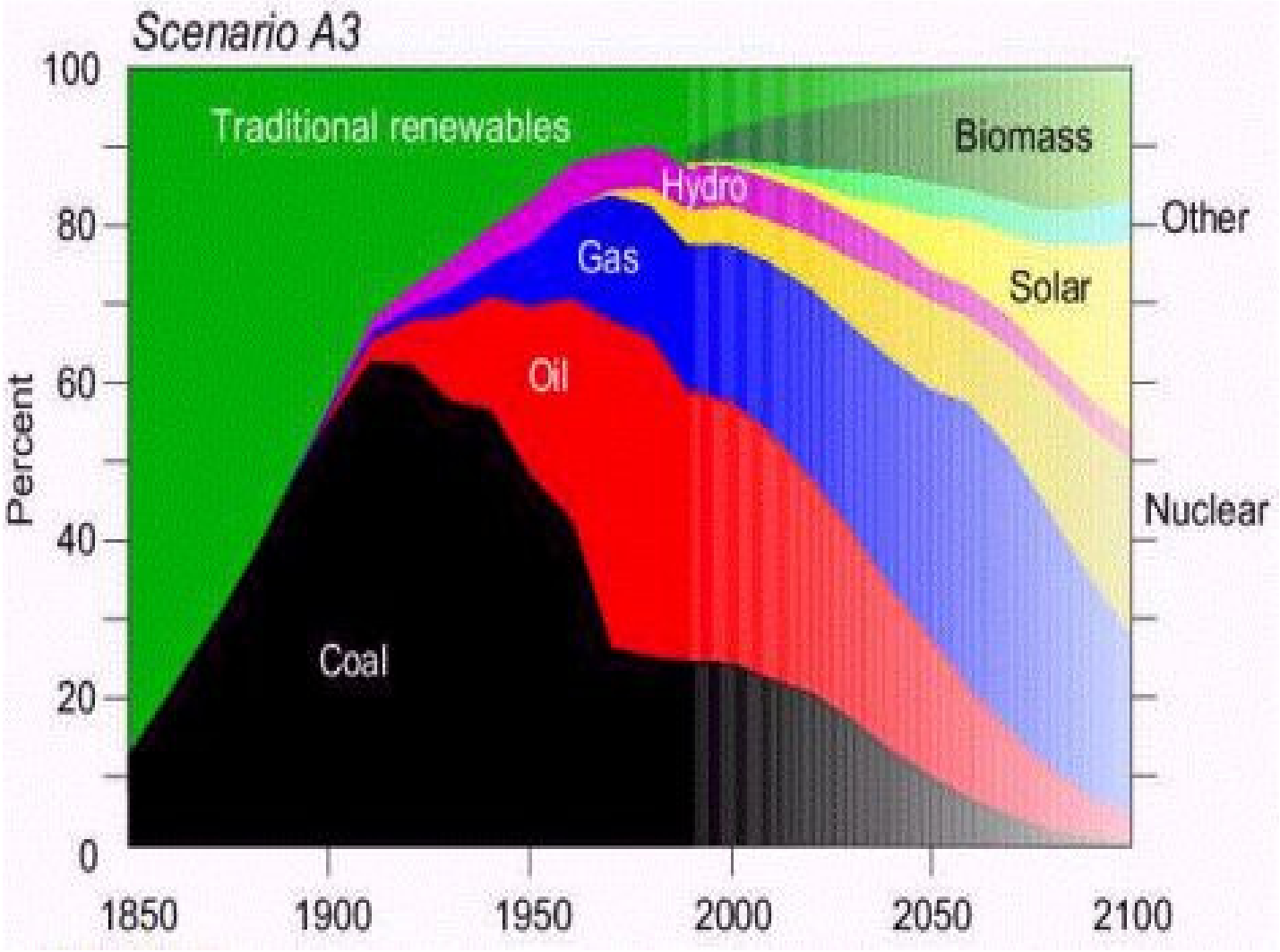
# Temps & CO2: past and projections



# Energy sources: past & projections




**2005**

*Source*

Fossil fuels 80%
- Oil 34%
- Coal 25%
- Nat gas 21%

Biomass 11%
Nuclear 6%
Hydro/other 3%

*Use*

Industry 34%
Buildings 32%
Transport 31%

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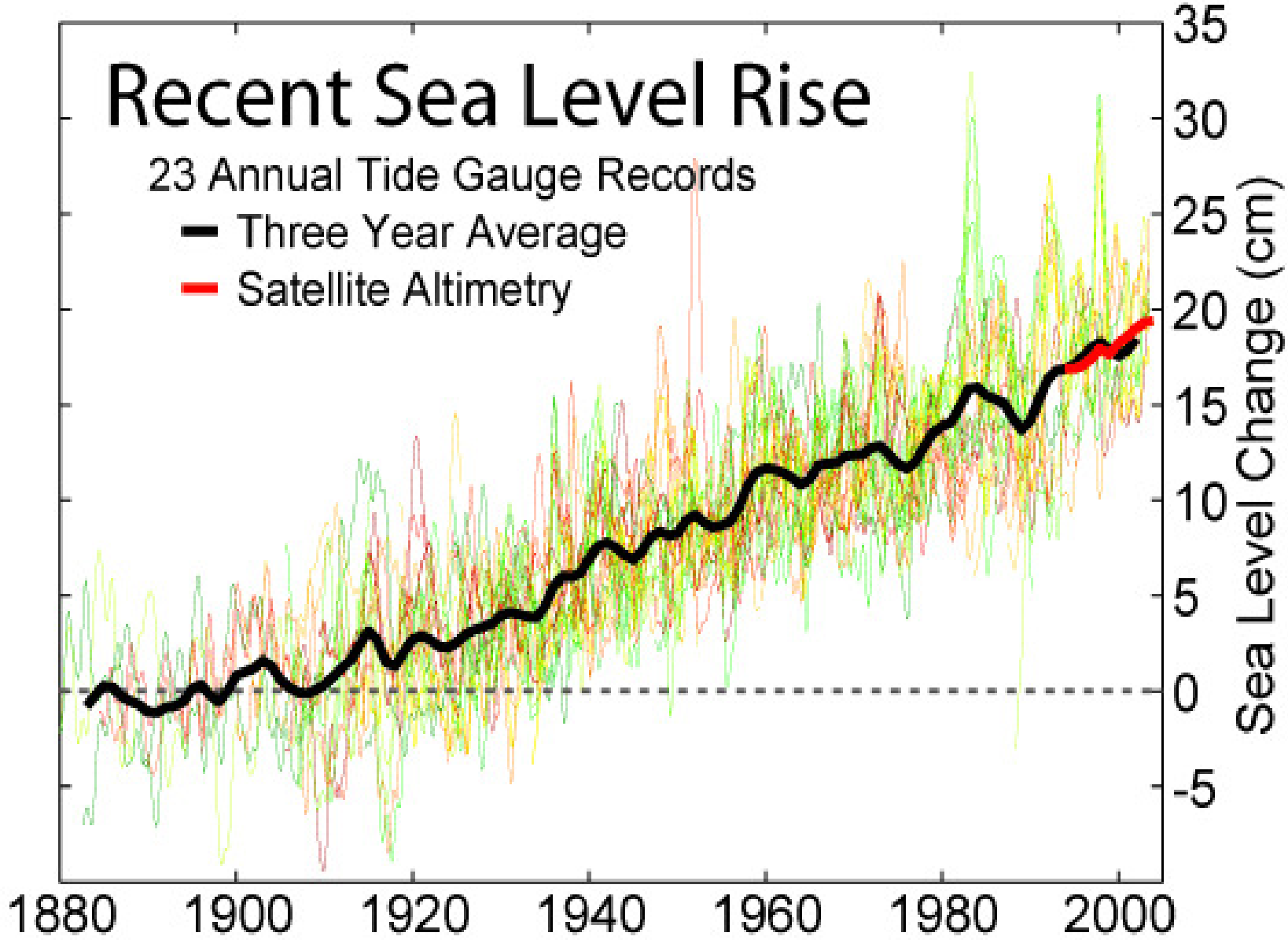
# Sea level: 125 years



# IPCC Concluded that…

- **We are already facing**

  – **Altered frequencies and intensities of extreme weather, together with sea level rise, that are expected to have mostly adverse effects on natural and human systems.**

**James Hansen**
**Director of the Goddard Institute of Space Studies**

# Has expressed concerns of the IPCC Report :

- Greater heat retention as ice disappears,
- Thawing of huge areas of permafrost and resulting greenhouse gas emissions
- The reduced ability of the oceans to absorb and sequester atmospheric carbon

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# James Hansen, cont'd

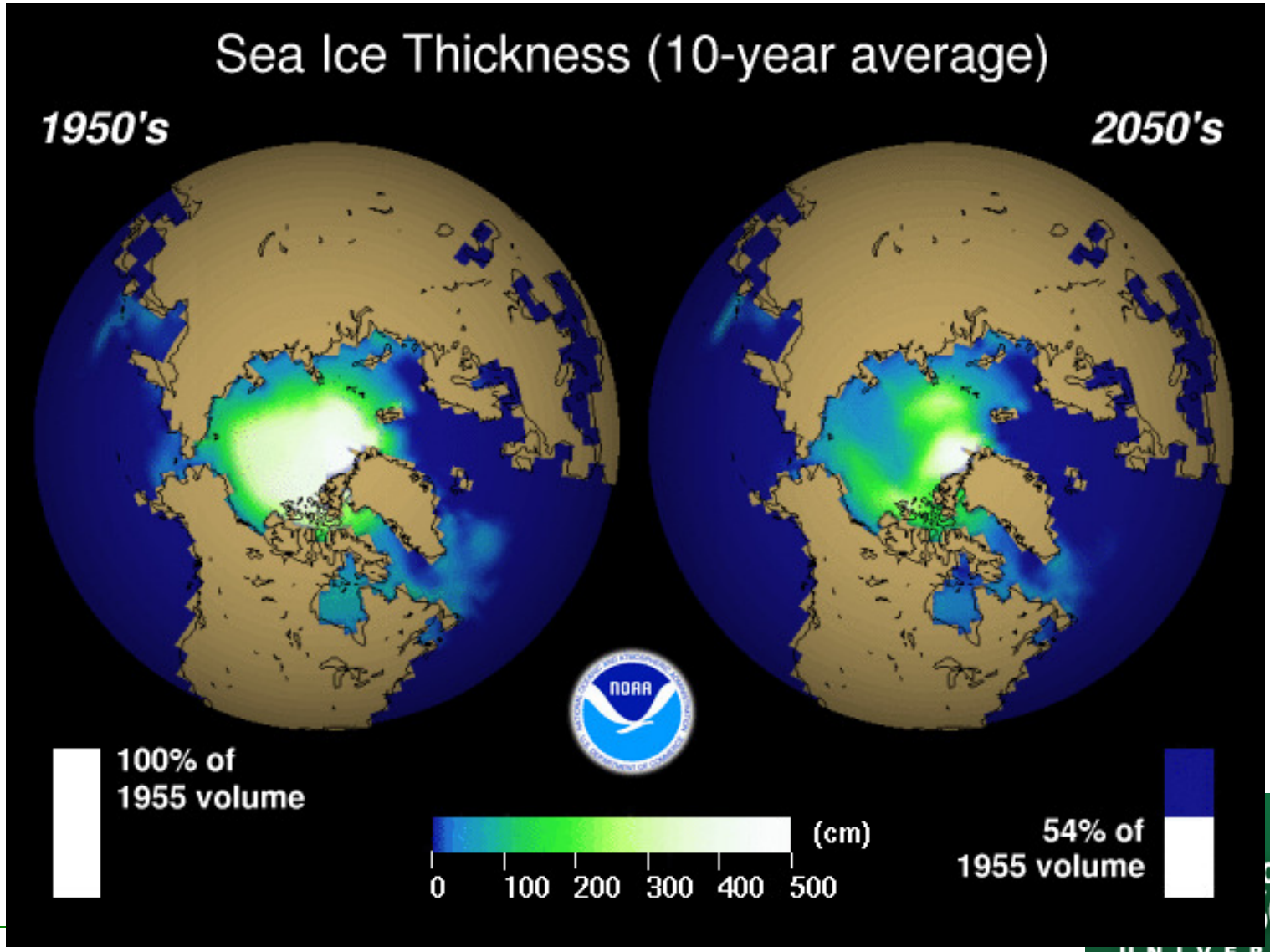
**Recent events and data noted, including**:

- The rapid decline of the Artic sea ice,

- The diminishing capacity of the oceans near Antarctica to absorb CO2, and

- The observed thawing of permafrost in Alaska and Russia

# Arctic Ice: 50 years (+/-)



# IPCC concluded that…

- **…there is high agreement and much evidence that mitigation of global GHG emissions over the coming decades that could reduce emissions below current levels.**

- **There is high confidence that adaptation and mitigation can complement each other and together can significantly reduce the risks of climate change.**

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# Energy alternatives

- Reduce energy intensity
- Sequester carbon from fossil fuels
- Expand nuclear (fission)
- Develop renewables
- Chase fusion

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# Obstacles

- Multiple uncertainties
- Large scales
- No precedents
- Lots of money at stake
- Heated politics
- Big risks (but opportunities too)

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# Policy alternatives

- "No regrets" actions
- Carbon trading regimes
- Carbon taxes
- Rapid technology transfer

- Major investment in carbon-free energy

# 7 50-year options (1 GtC/yr each)

- Capture 90% C from 800 new coal plants
- Build nuclear plants instead of coal
- Increase auto efficiency to 60mpg
- 80x increase in wind, use to generate H2
- Raise elec. plant efficiency from 40-60%
- Decrease elec. use by 25%
- 700x increase in solar
- Lifestyle changes

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# What can we do?

What is Mason doing to reduce the impact of *our* operations on the climate?

- ACUPCC Signatory
- Climate Communications Working Group
- Siemens Building Tech Contracts

# Mason is an ACUPCC Signatory

The American College and University Presidents Climate Commitment

- Acknowledgement of concern about global warming
- Acknowledgement of leadership role in global warming through education
- Pledges a commitment to climate neutrality through specific actions and timelines


# Climate Neutrality

Climate neutrality means two things:

1. We will make every endeavor to reduce the emissions we create through regular operations as much as possible
2. Offset emissions that cannot be reduced any further through carbon offsets, renewable energy credits, or by buying renewable energy directly

American College & University Presidents Climate Commitment

George Mason University

# Three Phases of the Commitment

Deliverables from a Summer 2007 start date:

- Within two months of signing, implement decision making structure: set up Sustainability Office, Hire Coordinator; set up Executive Steering Committee, Council, and Working Groups
- Implement interim projects: LEED standard for all new buildings, energystar purchasing policy, public transportation options provided
- Within 1 year, complete GHG inventory
- Within 2 years, complete plan for climate neutrality

# The Greenhouse Gas Inventory

How we did it:

- We used a tool called the Clean Air-Cool Planet Campus Carbon Calculator (see www.cleanaircoolplanet.org/toolkit)
- Team collected data from all over the university
- Completed and submitted our inventory to ACUPCC website
- In the middle of pack of peer institutions in emissions per square foot, but way ahead in emissions per full-time equivalent student

# The Greenhouse Gas Inventory

Data we had to collect:

- Institutional data: # of FTE students, staff, faculty; square feet of building space, research space; operating $, energy $, research $
- Energy data: electricity, natural gas, propane, and heating oil
- Fleet information
- Commuter and travel information
- Solid waste volumes
- Fertilizer usage and other refrigerants

# The Eye Chart

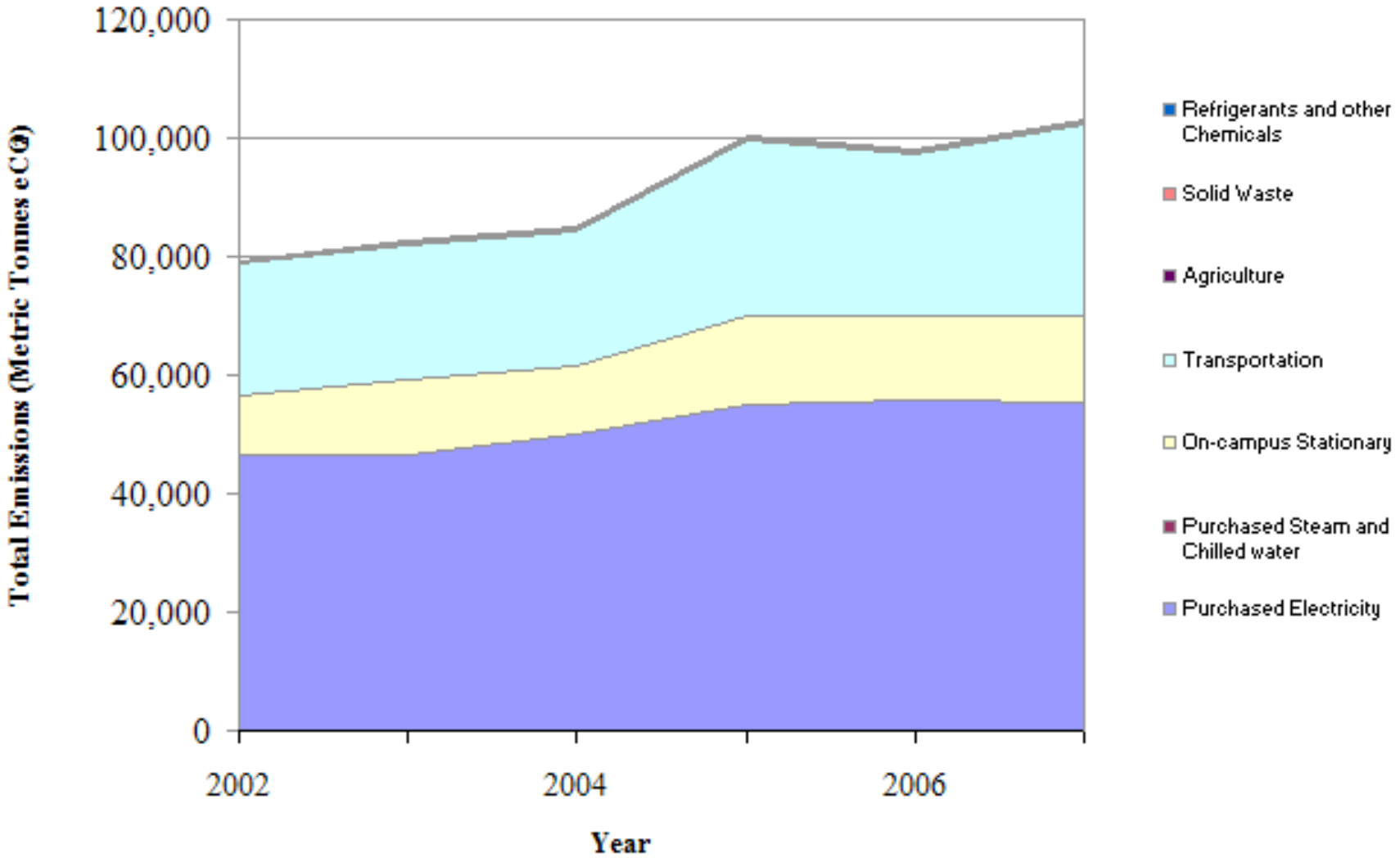
On this Worksheet: Enter data related to emissions. If a column does not apply or the data is unavailable, leave it blank.

| MODULE | Input |
|---|---|
| WORKSHEET | Data |
| UNIVERSITY | George Mason University |

| | Institutional Data | | | | | | | | | | Purchased E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fiscal Year | Budget | | | Population | | | | | Physical Size | | Electric produce campus |
| | Operating Budget | Research Dollars | Energy Budget | Full Time Students | Part-Time Students | Summer School Students | Faculty | Staff | Total Building Space | Total Research Building Space | All users: Clic your electric "custom" if you electric fu |
| | | | | | | | | | | | SERC Virginia |
| | $ | $ | $ | # | # | # | # | # | Square feet | Square feet | kWh |
| 1996 | | $ 28,014,859.00 | | | | | 1,722 | 1,027 | | | |
| 1997 | $ 243,500,000.00 | $ 27,327,503.00 | | | | 10,182 | 1,783 | 1,102 | | | |
| 1998 | $ 268,600,000.00 | $ 28,502,266.00 | | 11,959 | 12,409 | 10,457 | 1,813 | 1,166 | 2,948,070 | | |
| 1999 | $ 286,600,000.00 | $ 33,082,766.00 | | 11,967 | 12,043 | 10,532 | 1,920 | 1,192 | 3,397,725 | | |
| 2000 | $ 330,000,000.00 | $ 37,204,434.00 | | 12,410 | 11,770 | 10,211 | 1,973 | 1,275 | 3,397,725 | | |
| 2001 | $ 341,000,000.00 | $ 44,183,316.00 | | 12,249 | 11,159 | 10,768 | 2,129 | 1,376 | 3,504,934 | | |
| 2002 | $ 365,000,000.00 | $ 52,651,219.00 | | 13,078 | 11,819 | 11,377 | 2,250 | 1,419 | 3,542,834 | 148,028 | |
| 2003 | $ 422,100,000.00 | $ 65,512,322.00 | $ 5,669,400.00 | 14,175 | 12,621 | 12,214 | 2,447 | 1,461 | 3,646,489 | 155,936 | |
| 2004 | $ 455,100,000.00 | $ 68,925,036.00 | $ 6,446,714.87 | 14,861 | 13,385 | 12,453 | 2,752 | 1,506 | 3,934,443 | 165,419 | |
| 2005 | $ 483,200,000.00 | $ 59,238,606.00 | $ 7,034,480.45 | 15,218 | 13,656 | 12,464 | 2,678 | 1,587 | 4,229,422 | 177,894 | |
| 2006 | $ 528,700,000.00 | $ 70,907,388.00 | $ 7,859,881.68 | 15,829 | 13,899 | 12,352 | 2,893 | 1,703 | 4,689,422 | 222,136 | |
| 2007 | $ 634,100,000.00 | $ 84,272,909.00 | $ 7,694,155.65 | 16,267 | 13,622 | 12,345 | 3,155 | 1,845 | 4,689,422 | 215,143 | |
| 2008 | $ 747,800,000.00 | $ 75,200,000.00 | $ 9,090,058.94 | 16,332 | 14,000 | 12,336 | 3,232 | 1,951 | 5,187,522 | | |
| 2009 | | | | | | | | | | | |
| 2010 | | | | | | | | | | | |
| 2011 | | | | | | | | | | | |
| 2012 | | | | | | | | | | | |
| 2013 | | | | | | | | | | | |
| 2014 | | | | | | | | | | | |
| 2015 | | | | | | | | | | | |

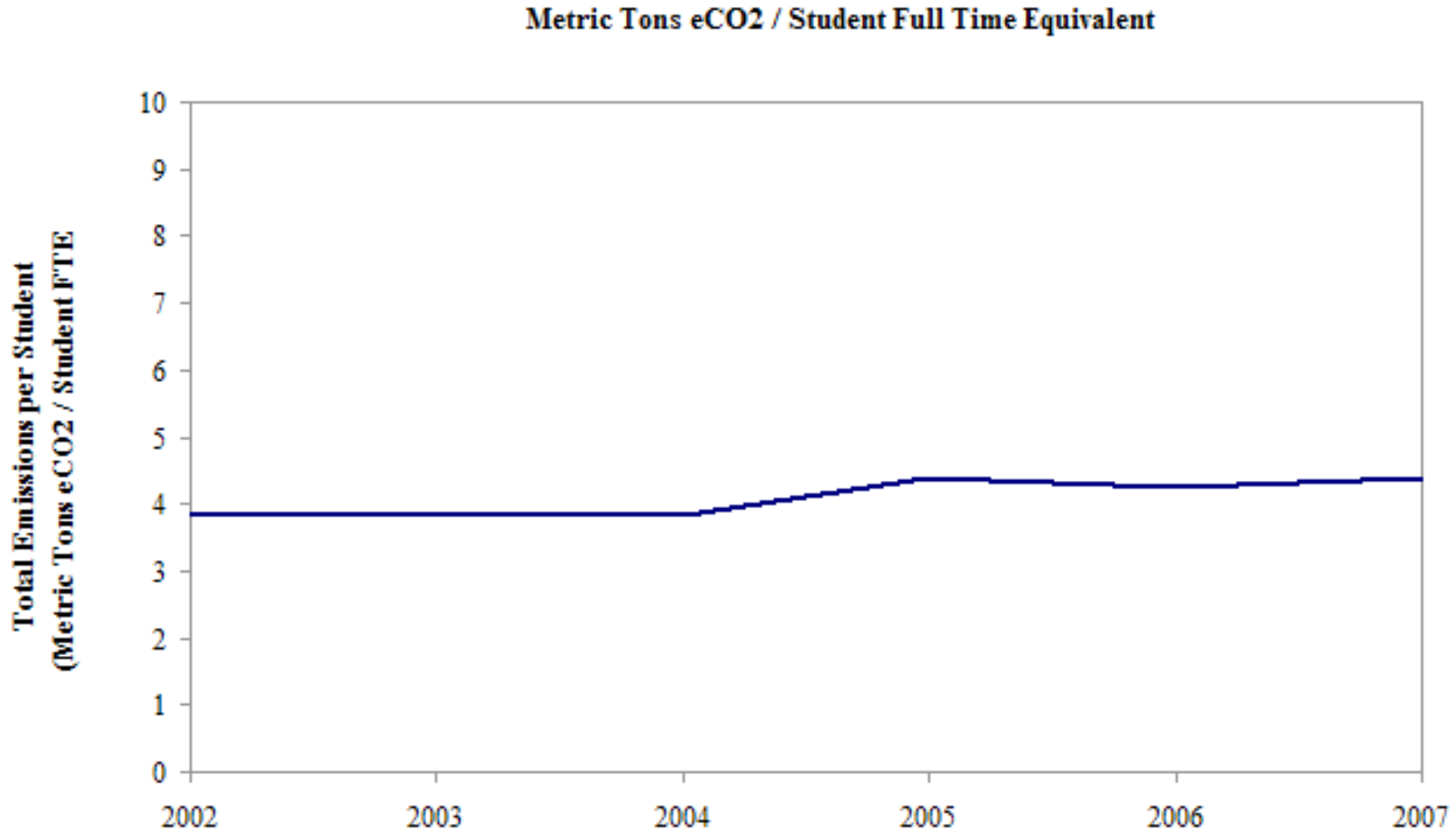
# The Greenhouse Gas Inventory

On this worksheet: Total emissions by sector (Metric Tonnes $eCO_2$)



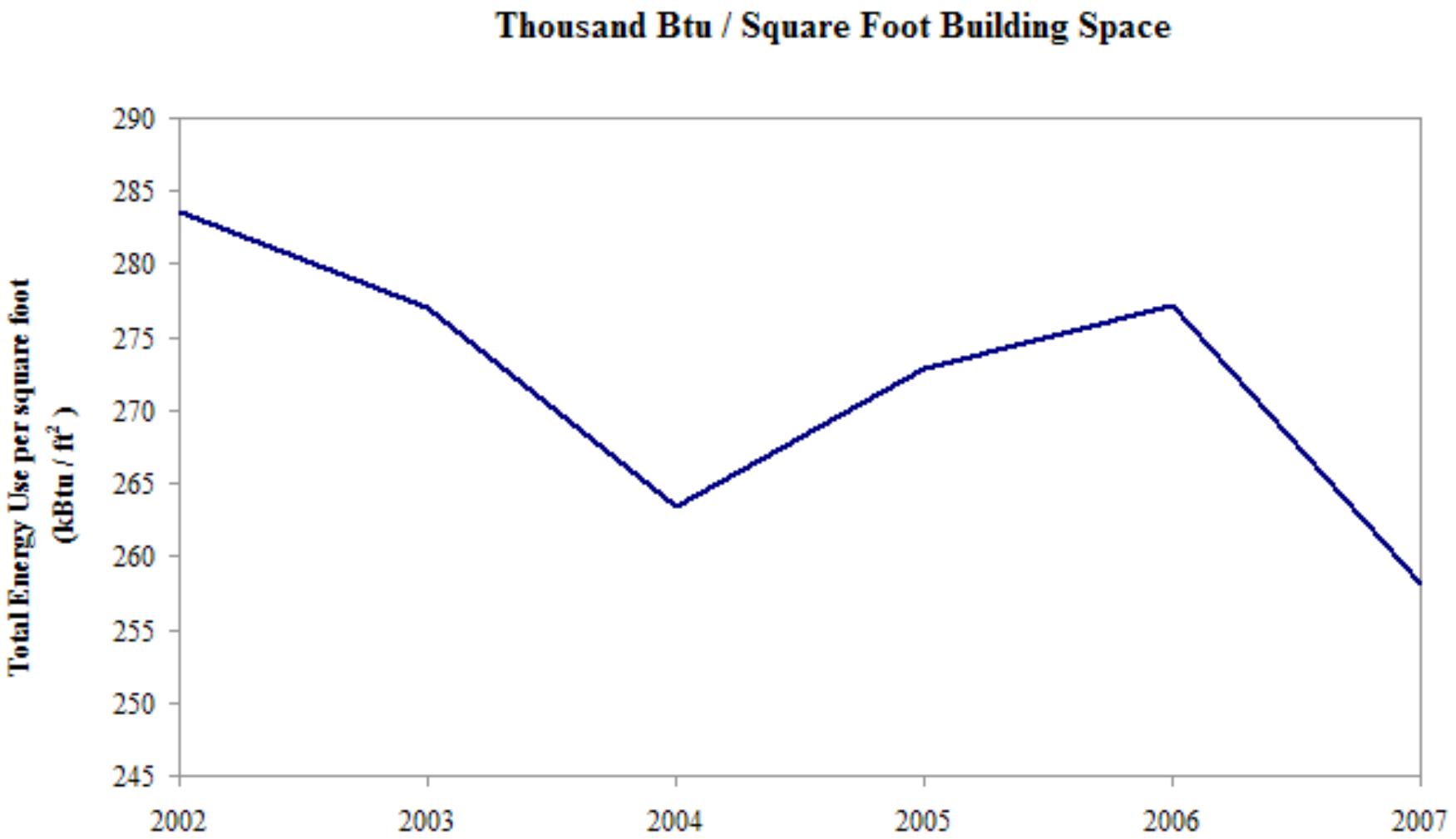
# The Greenhouse Gas Inventory

**On this worksheet: Total emissions divided by the number of students (Metric Tonnes eCO2 / Student full-time equivalent)**



# The Greenhouse Gas Inventory

**On this worksheet: Total energy use divided by total square footage of university (MMBtu / ft²)**



# Conclusions

We realized that:

- Most of our emissions come from our electricity usage, heating and hot water, and transportation
- Tracking travel and commuting data is next to impossible, so the data for these categories was estimated by building our own model – VERY uncertain data
- While our per-unit consumption is flat or declining, our campus is still growing – huge challenge ahead!

# Climate Planning

- Posted GHG inventory in September, was about 103,000 tons in 2007
- Currently forming groups to work on recommendations for each major source of emissions
- Will have facilitated brainstorming sessions to begin with and then each participant will be responsible for researching the possibility/impact of each potential solution
- Using the NWF climate action planning guide and the CACP to help guide us

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# COMM 690

- Graduate communications class surveyed all of campus on awareness and attitudes toward climate initiatives
- 74% of responders said they had no idea the President had signed the PCC
- 90% said they'd be pleased or very pleased if Mason were able to reduce emissions
- Many offered their concerns about feasibility or seriousness of admin commitment
- 500 volunteered to help spread the word and educate the campus community

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# COMM 690

- Formed Climate Champions working group
- Kickoff meeting on Earth Day 2008
- Provided supporting information to use to have active conversations with peers/colleagues
- Website online for anyone to download info
- Class developed marketing strategy for communicating climate messages at Mason – working group formed and will work on executing strategies (quiz cards, tee shirts, athletic events, etc.)

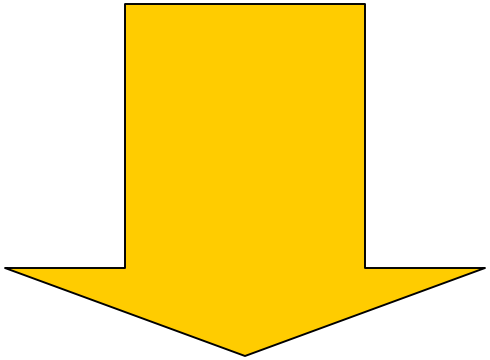
# Performance Contract

In 2007, Mason avoided the use of…

15,343,249 in kWh

697,943 in CCF or Therms

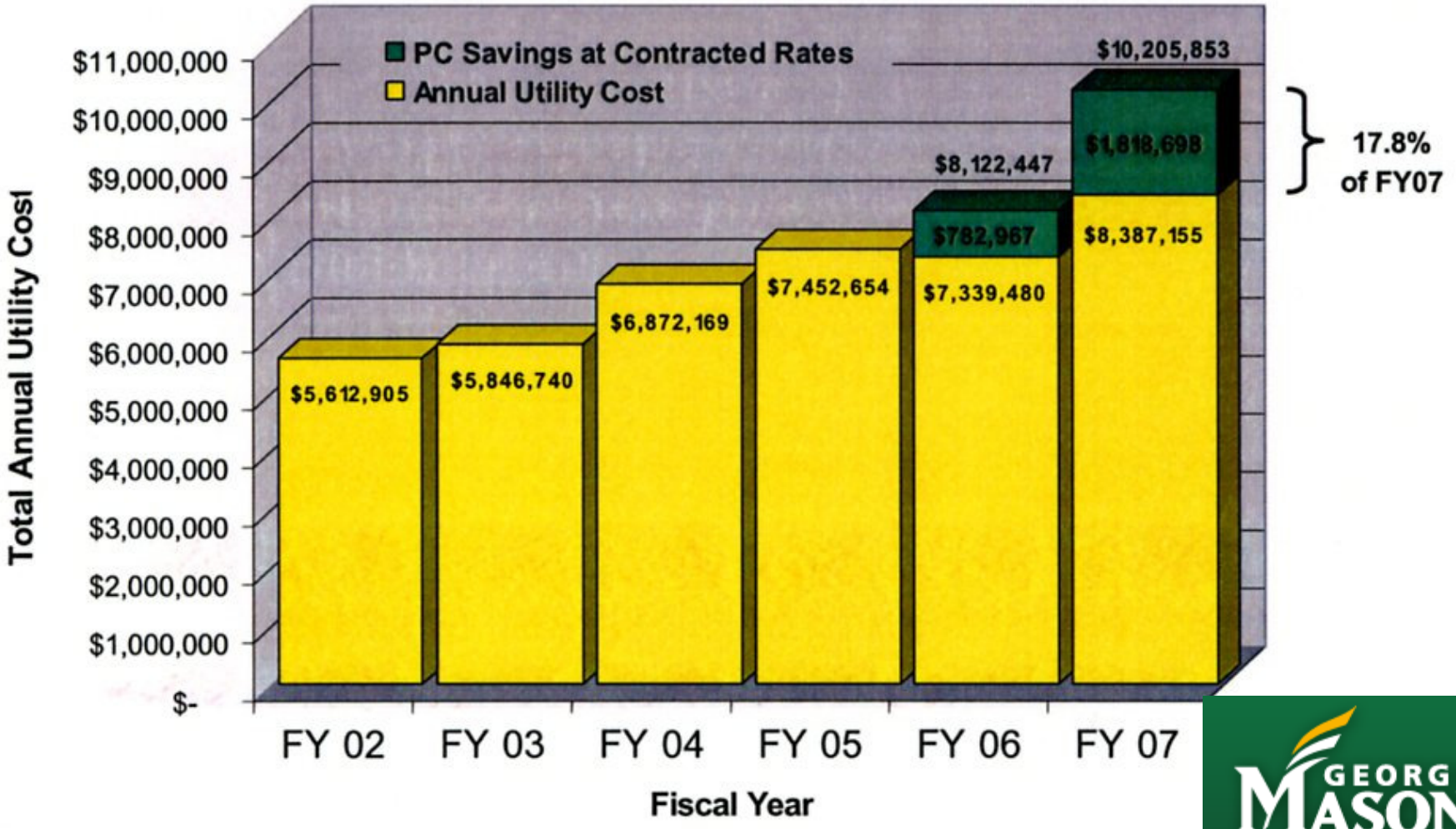
64,495,000 in gallons of water usage



*$1.8 million in avoided cost*

# Performance Contract

**Figure 1: Energy Performance Contract Contribution to GMU Utility Cost Reduction**



# Performance Contract

***Positive impact on climate "balance sheet"***

**Table 4: Energy Performance Contract Environmental Benefits**

| | Annual | 15 yr Term | Equivalent |
|---|---|---|---|
| $CO_2$ | 29,152,173 lbs | 437,282,591 lbs | 2,522 Cars off the Road |
| $SO_2$ | 133,333 lbs | 1,999,992 lbs | or |
| NOx | 76,716 lbs | 1,150,744 lbs | 3,976 Acres of Forest |

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# Benefits of the PCC Commitment

- Cost savings from efficiency improvements
- Unification of the campus community
- Increased investment in education resulting from cost savings
- Better equip students to capitalize on solving the world's toughest problems
- Increased grant funding and research
- Attract higher caliber of student and faculty
- Endowment growth
- Leadership in the "next industrial revolution"

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# Policies and Projects

Sustainability Office:

- Submitted GHG inventory Sep08 - 102 tons CO2 in fiscal year 06/07
- Staffing up!
- Climate Champions program launched (Center for Climate Change Communication)
- Launching Climate Action Plan Work Groups in November/December 2008

# Policies and Projects

Provost's Office: Big Steps in Curricular Programs

Hired New Faculty Fellow for Sustainability Curricula (half-time, Sharon deMonsabert) this summer to implement a Minor in sustainability and to assist with co-curricular planning – getting students involved in helping green Mason

# Policies and Projects

Facilities:

- USGBC LEED Silver standard for all new buildings; building first LEED-certified building on campus (Academic VI)
- Design manual incorporating high-efficiency standards for *all* contracted projects
- No idling policy for Facilities fleet vehicles
- Bought several new electric vehicles
- Examining possibility of biodiesel in fleet
- Embarked on phase 2 of energy service contract with Siemens Building Technologies

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# Policies and Projects

- Purchasing: Green purchasing policy drafted
- HR initiatives:
  - Streamlining forms and admin processes through virtualization (online)
  - Strongly encouraging flex and remote schedules for all non-essential personnel
- ITU initiatives:
  - All employees required to do flex schedule unless unable, since IT is well-suited for remote work
  - Green committee

# Policies and Projects

University Services:

- Print services:
  - All printer/copier paper sold by print services 30% PCR as of Spring ’08
- Transportation:
  - First Transportation Coordinator hired: focus on promotion of alternative transportation
  - Commuter Choice program – free money for using public transportation
  - New shuttles under development

# Policies and Projects

University Services (cont'd):

- Dining (and Sodexho):
  - Southside dining 96% waste-free with recycling, composting, biofuel
  - Cheaper beverages using reusable canteens and mugs through Dining Services
  - Many sustainable food initiatives are planned for this year and beyond; will know more after sustainable food summit in Fall 08

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# Challenges

- Responding to all of the interests of the community with one person – recent hire of second person is helping out immensely
- Trying to make people “get it” who think there is some “reason” they cannot change their processes
- The slow pace of decision making
- Difficulty getting game-changing funding when other programs at Mason demand the same resources

# Building a Network

- Virginia institutions face unique challenges
- Network of professionals can teach each other by example
- Communication methods: listserv, blogs, groups, conference calls, meetings
- Expected outcomes: increased efficiency and speed implementing new green initiatives, network of issue-specific professionals able to make formal recommendations to policy changes at state level for sustainability, conference and research synergies

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# Building a Network

- Example: recent biodiesel production attempts and assistance from CJ and others at Madison.
- Synergies: some of us have expertise in specific research areas, and could partner on research, entrepreneurship, and conference ideas
- Answering the Big Questions: for example: how do we start producing our own renewable energy most cost-effectively?

*Scale will help us all in trying to meet our goals!*

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# Questions?

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# Questions/Discussion

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