

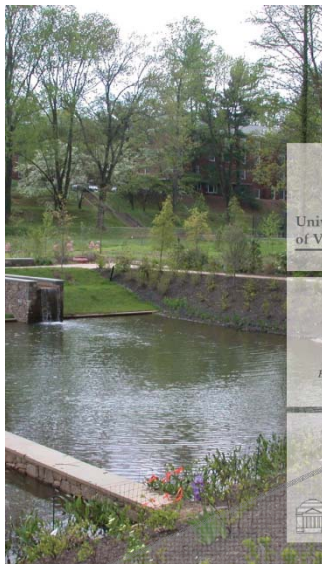
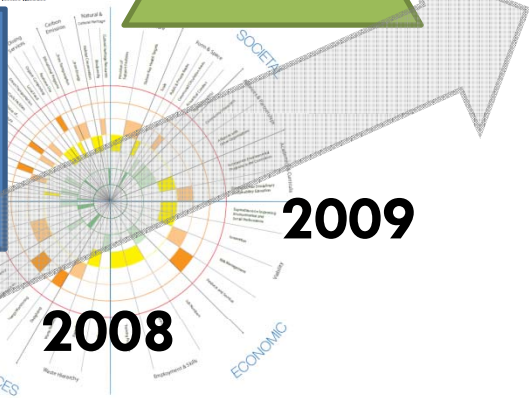


Baseline Greenhouse Gas Assessment for the University of Virginia
UVA's Carbon Footprint

Presidential Committee on Sustainability



Sustainability Advisory Panel



SUSTAINABILITY ASSESSMENT 2006
UNIVERSITY OF VIRGINIA

2005

2006

2007

2008

2009



University of Virginia
Environmental Footprint Reduction Plan
Phase 1 - Greenhouse Gas

Environmental Footprint Reduction Plan

Environmental Footprint Reduction Plan

Key Objectives

- Demonstrate continued University leadership in sustainability and environmental impact reductions
- Define a realistic goal for significant reductions in our institution's greenhouse gas emissions
- Detail specific strategies by which to achieve this goal

Environmental Footprint Reduction Plan

**Phase 1
Greenhouse Gas**

**Phase 2
Water Use**

**Phase 3
Waste**

**Phase 4
Nitrogen**

Environmental Footprint Reduction Plan


UNIVERSITY of VIRGINIA

Office of the Architect

Metric Ton = 1,000 kg
= 2,205 lbs

Equivalent CO₂
Measure of CO₂ and other
gases that contribute to
global warming expressed
in terms of Carbon Dioxide

1 MT eCO₂



x

13 watts
24h/7d

=

15.2 years



x

60 watts
24h/7d

=

3.3 years



x

33 mpg
City/Hwy

=

3460 miles



x

16 mpg
City/Hwy

=

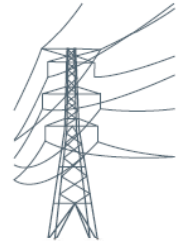
1740 miles

Metric Ton eCO₂



Scope 1 Emissions

Direct Emissions generated by University-owned equipment and activities. Includes: heating plants, fleet, University Transit Service, jet, fertilizer application, refrigerants



Scope 2 Emissions

Emissions generated through the production of electricity purchased by the University.



Scope 3 Emissions (Partially Known)

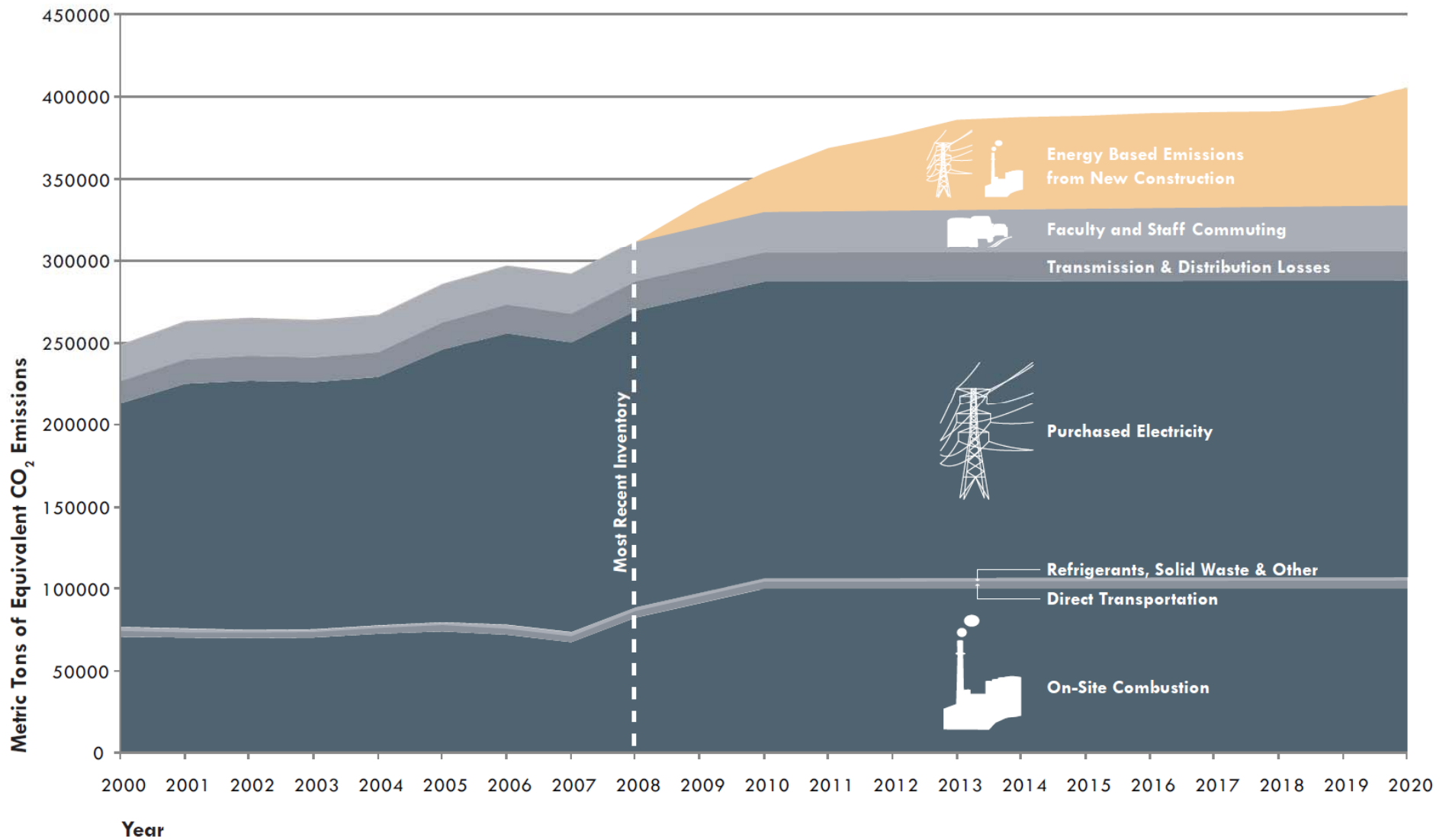
Emissions generated by sources related to, but not controlled by, the University. Includes: employee commuting, solid waste, wastewater, etc.



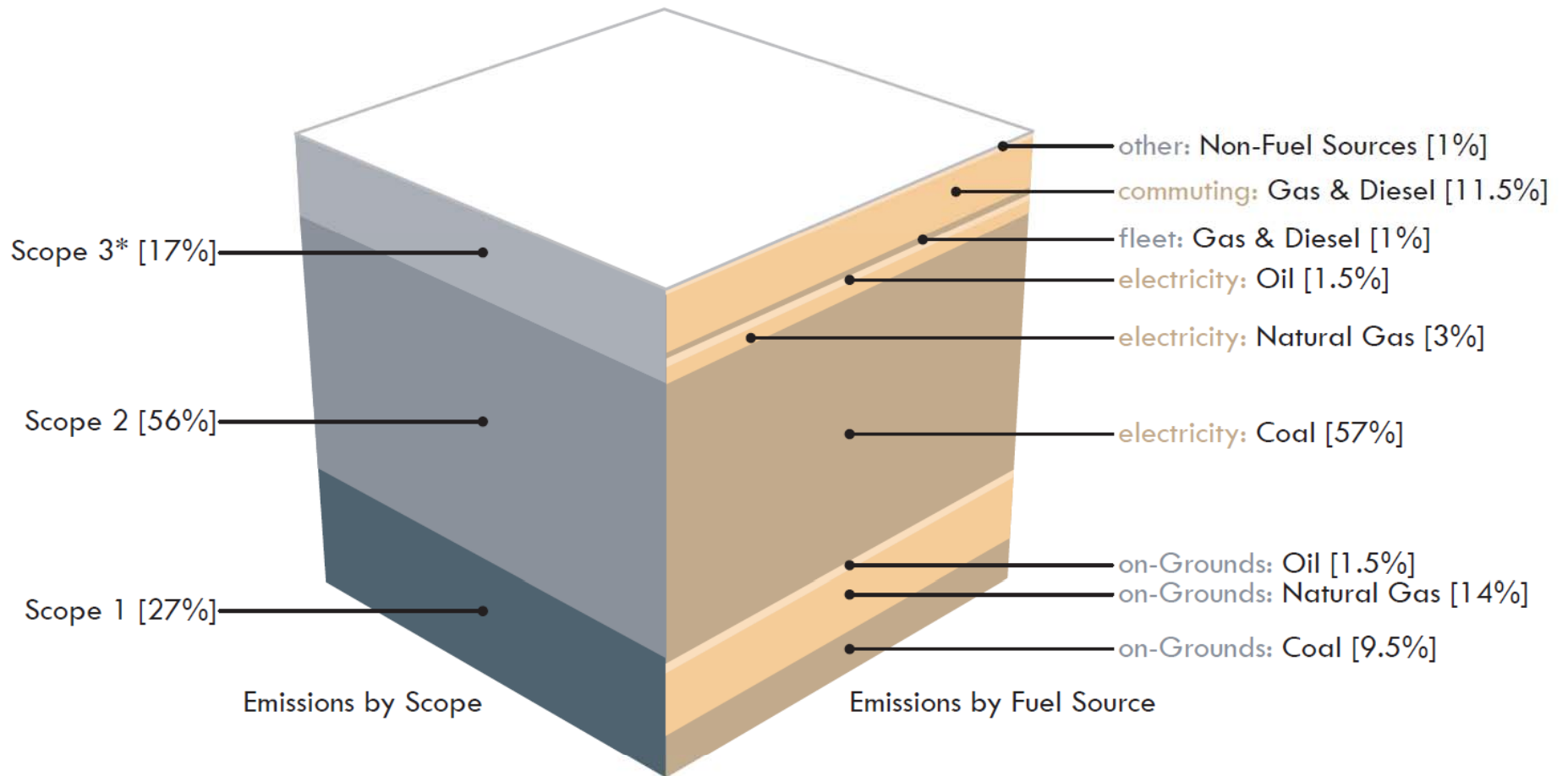
Unknown Scope 3 Emissions

Data not yet available for: University-sponsored air travel, procured goods and services, construction activities, etc.

Emissions Scopes



GHG Emissions Trends



*Scope 3 emissions inventory not complete

Emissions Sources



Minimize and Mitigate Emissions Growth from New Construction

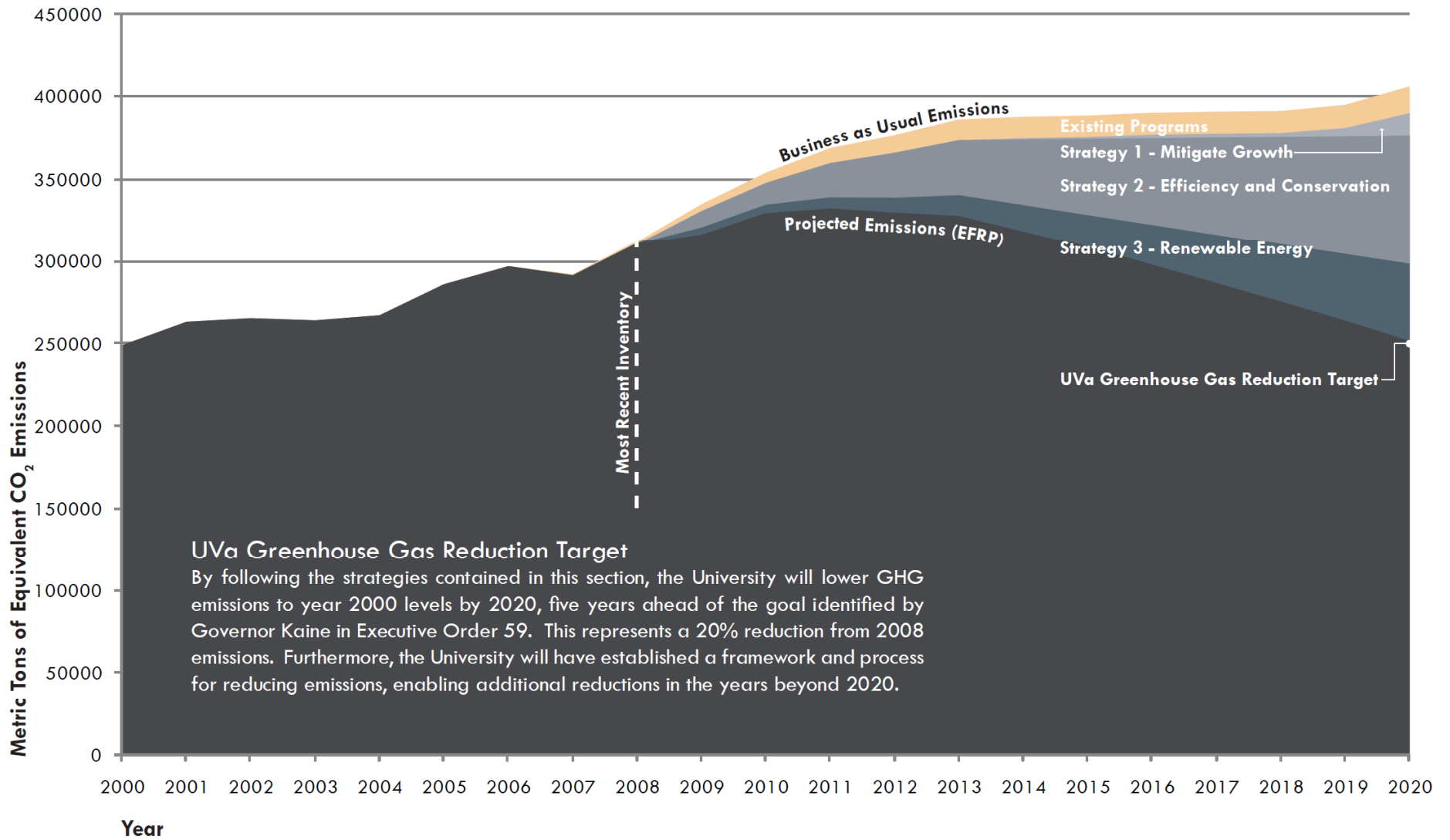


Catalyze Efficiency and Conservation Efforts

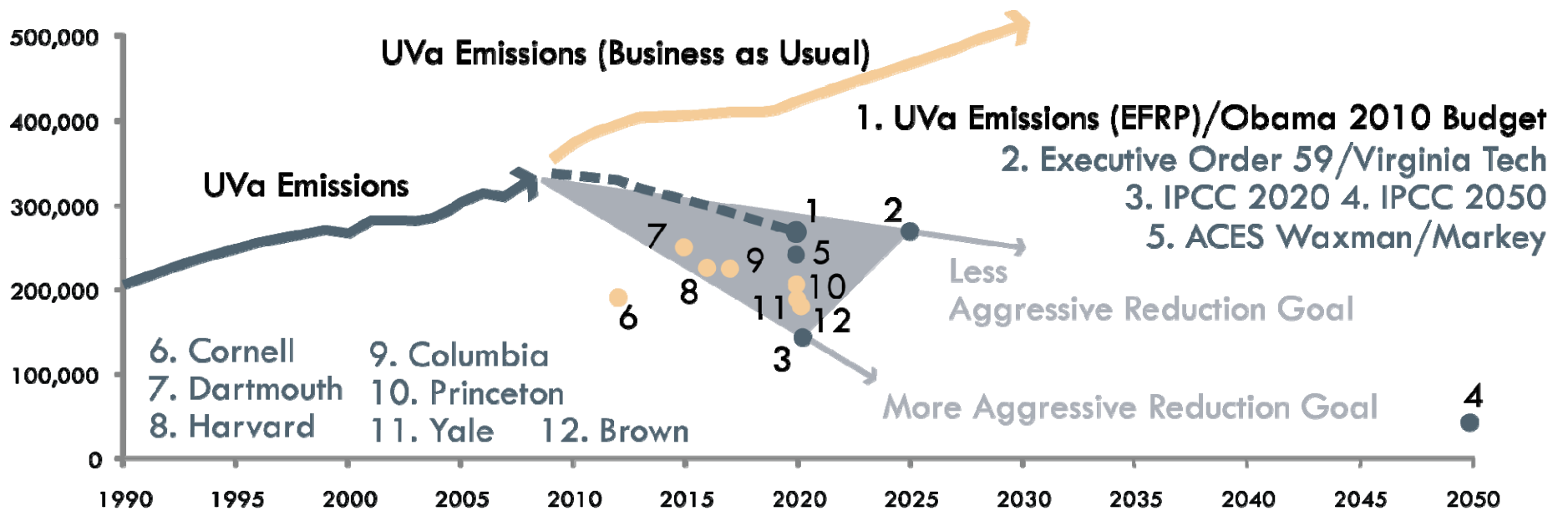


Increase Renewable Energy Generation and Use

Reduction Strategies



GHG Reduction Target



GHG Emissions Targets



Tuttle House
37,800 SF

-266 MTeCO₂



Lile House
28,400 SF

-169 MTeCO₂



Alderman Road V
67,500 SF

+1084 MTeCO₂
(+6750 MTeCO₂)

Difference: + 649 MTeCO₂

Strategy 1 Example

GHG Reduction for Alderman Road V

649 MTeCO₂
(874 MTeCO₂)

Total GHG Emissions from Housing

23,563 MTeCO₂

Percentage Overall Reduction Needed

2.5%
(3.7%)

- **649 MTeCO₂** =



7081 MMBTU Produced/Year

\$2,200,000 Cost

\$134,820 Annual Savings (2009)

16 Year Simple Payback

Strategy 1 Example



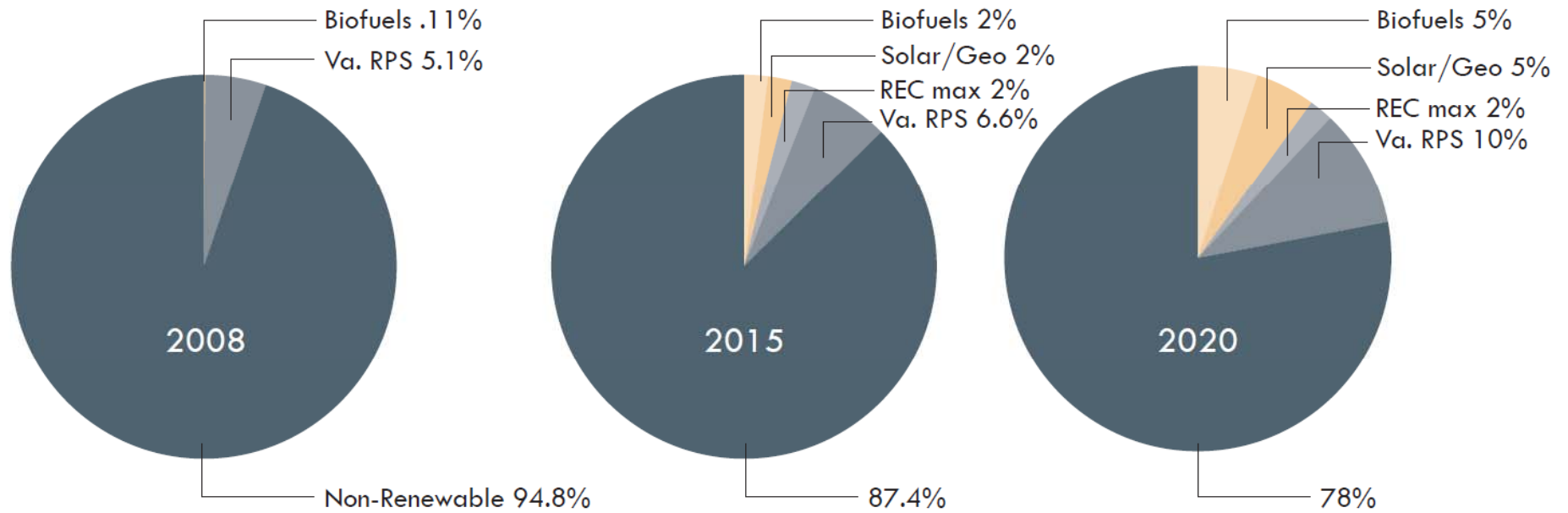
Emmet/Ivy Garage

- CFL lighting retrofit and photocell programming
- Less than 2 year payback

-336.8 MTeCO₂

Strategy 2 Example

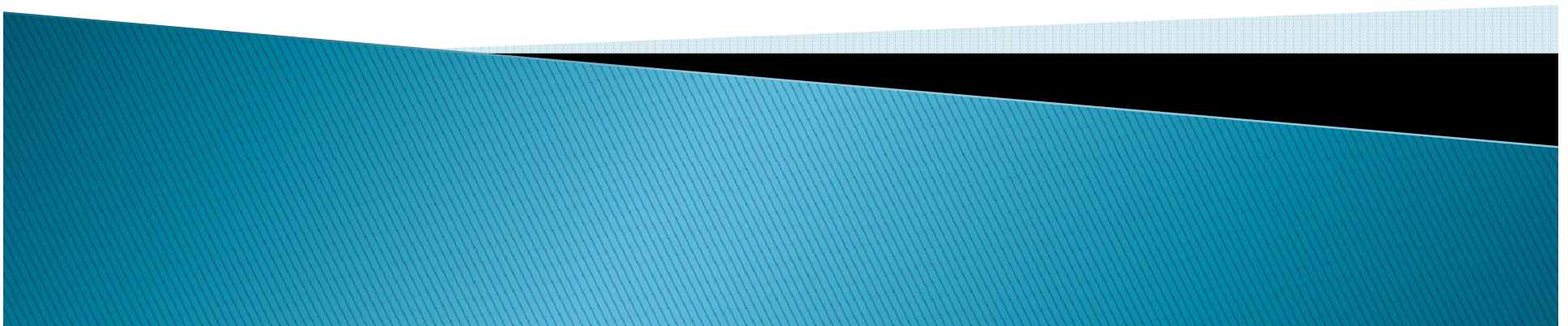
Renewable Energy Targets



UVa Energy & Utilities

Master Planning Council

November 18, 2009

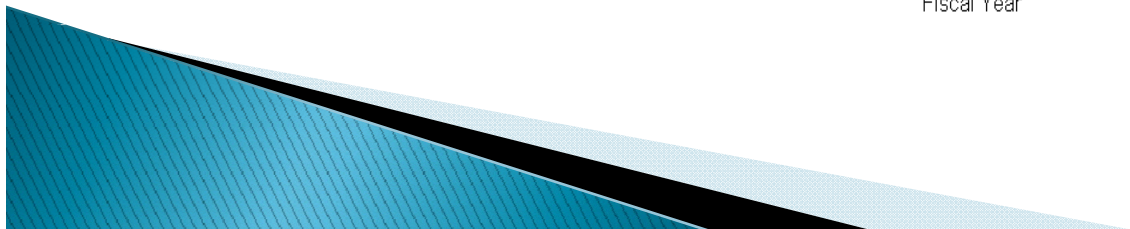
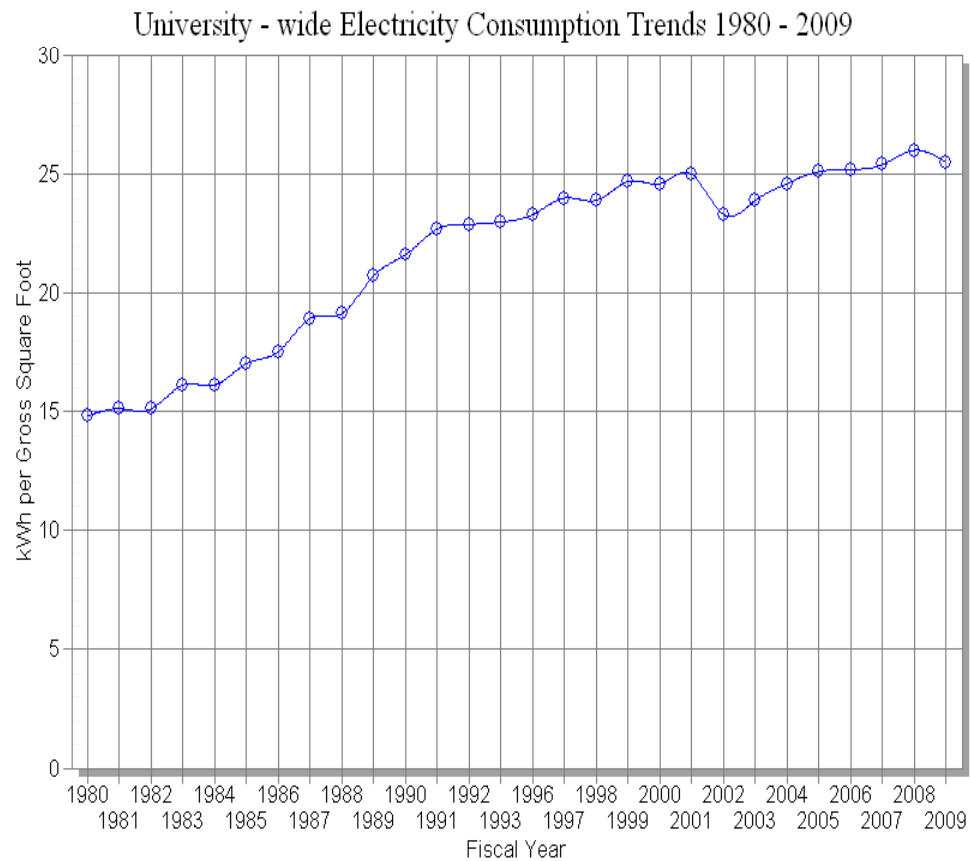


Capital Program

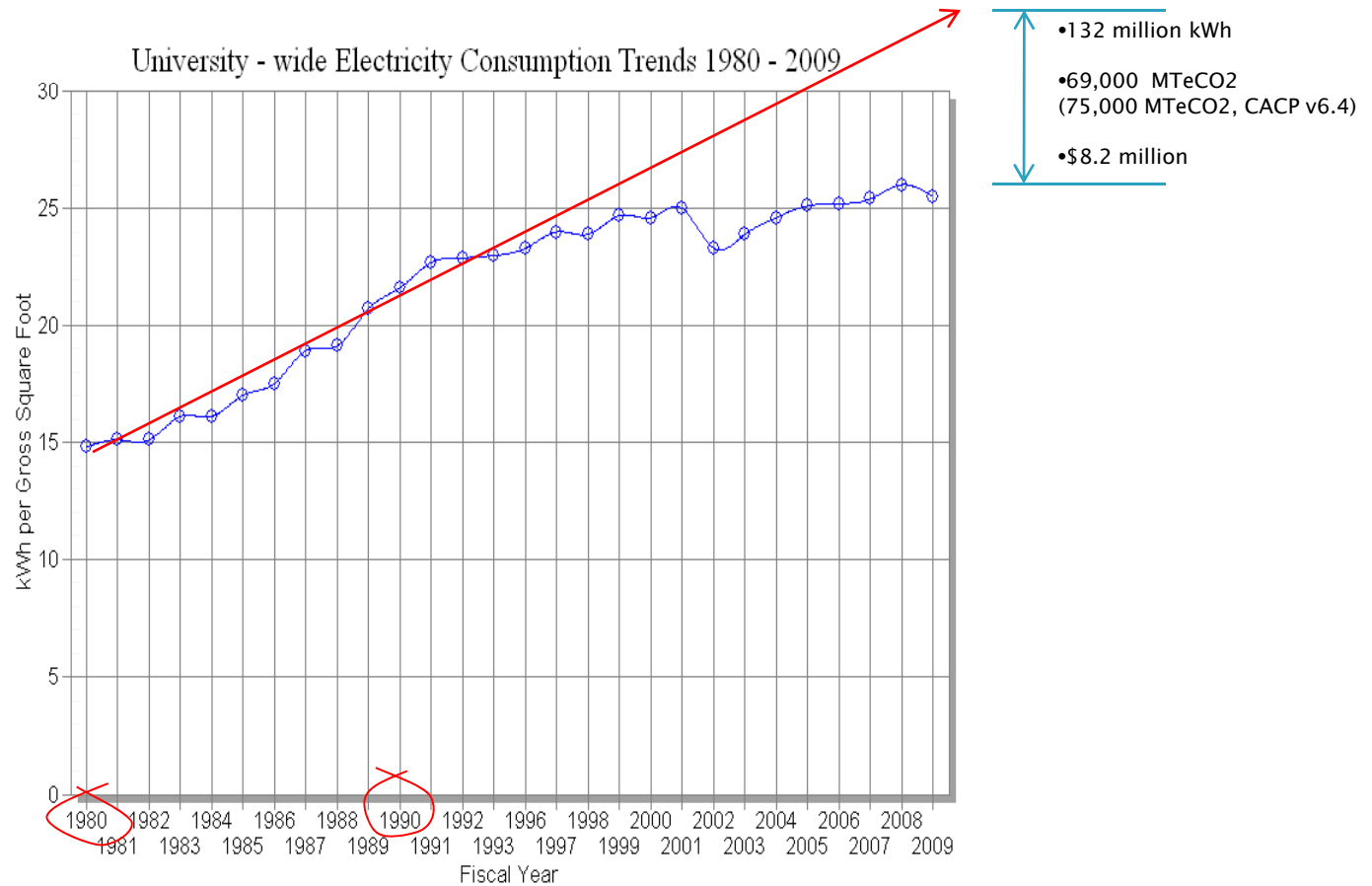
Priority	Project	Average	High	Bien
1	North Chiller Plant Chillers Replacement	\$53,750,000	\$57,340,000	2010-2012
2	North Grounds Boilers & Chillers Replacement	\$19,000,000	\$22,000,000	2010-2012
3	Alderman and Clemons Chillers Replacement	<u>\$12,000,000</u>	<u>\$14,000,000</u>	2010-2012
		\$84,750,000	\$93,340,000	
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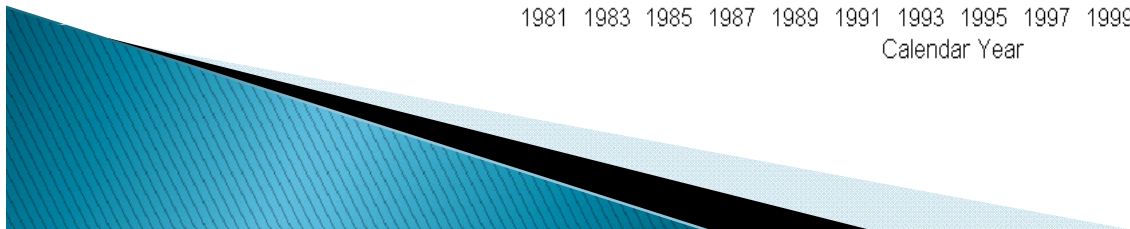
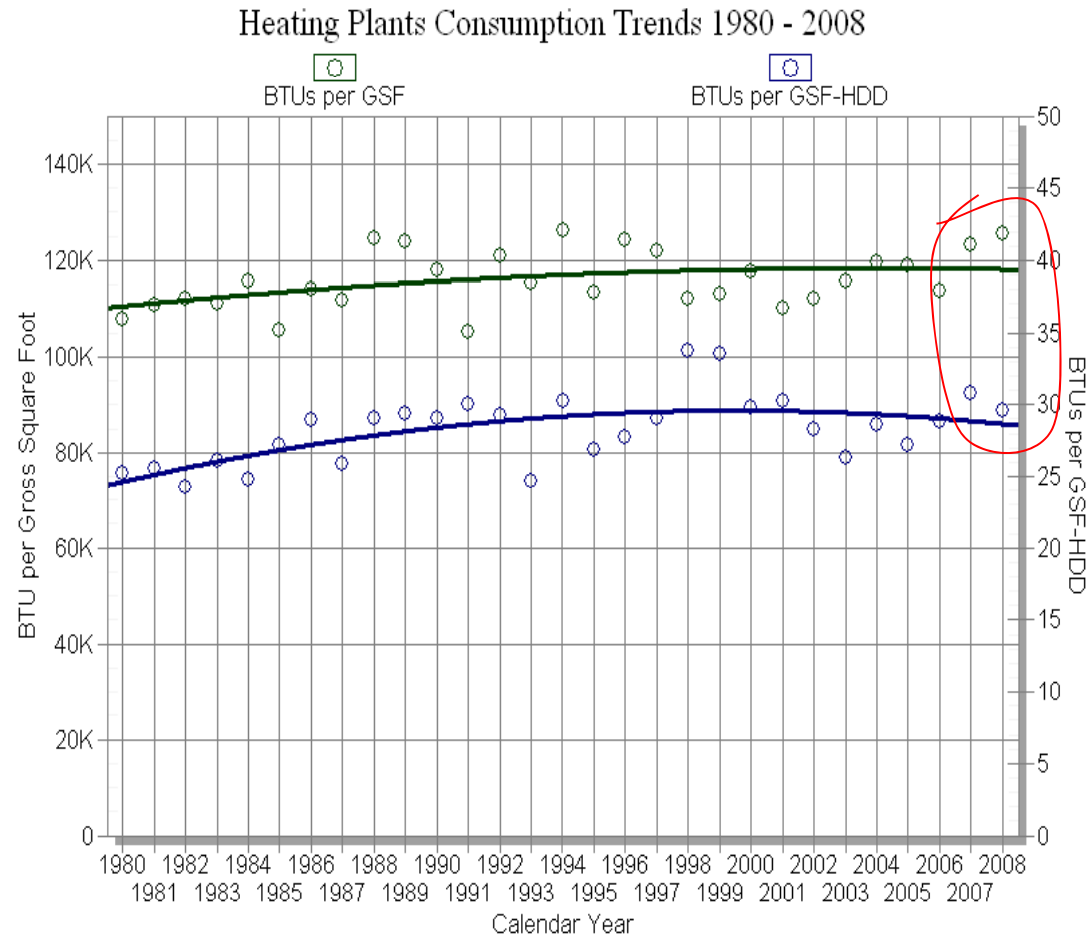
Energy Consumption Trends



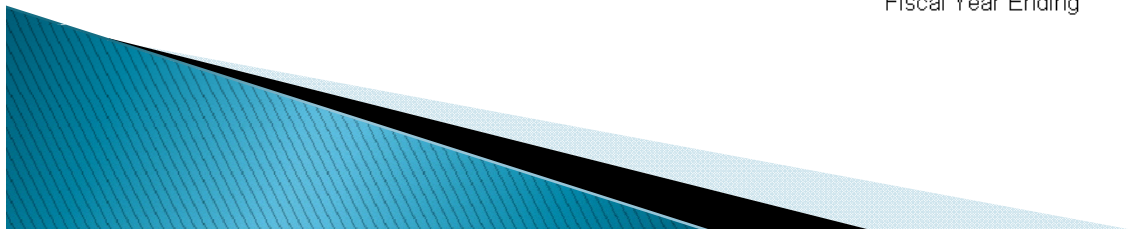
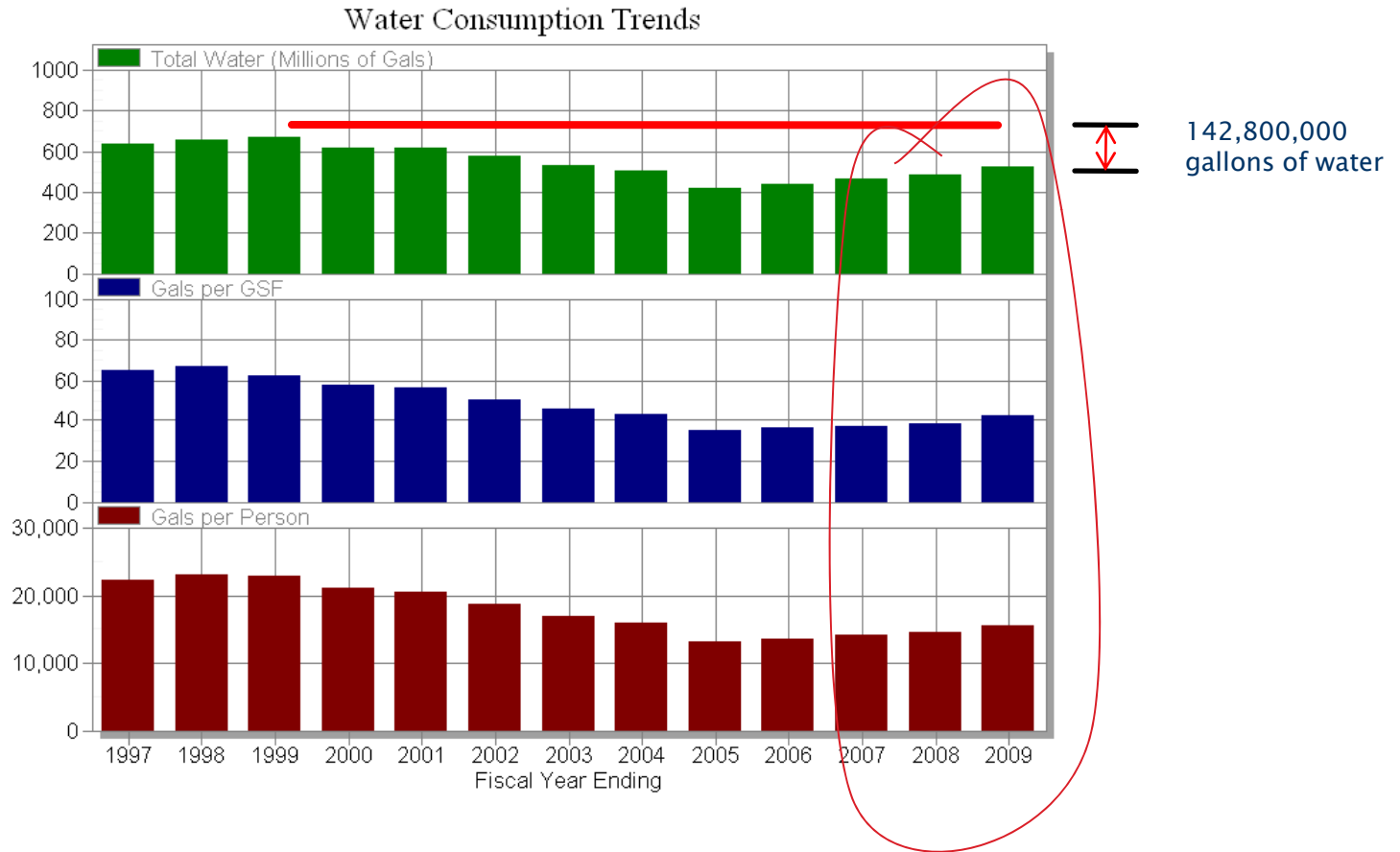
Energy Consumption Trends



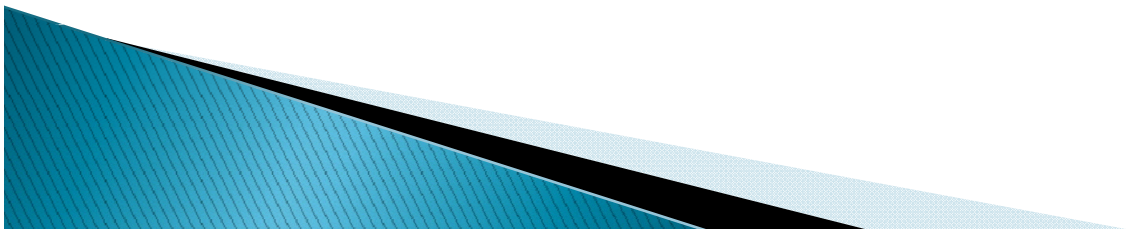
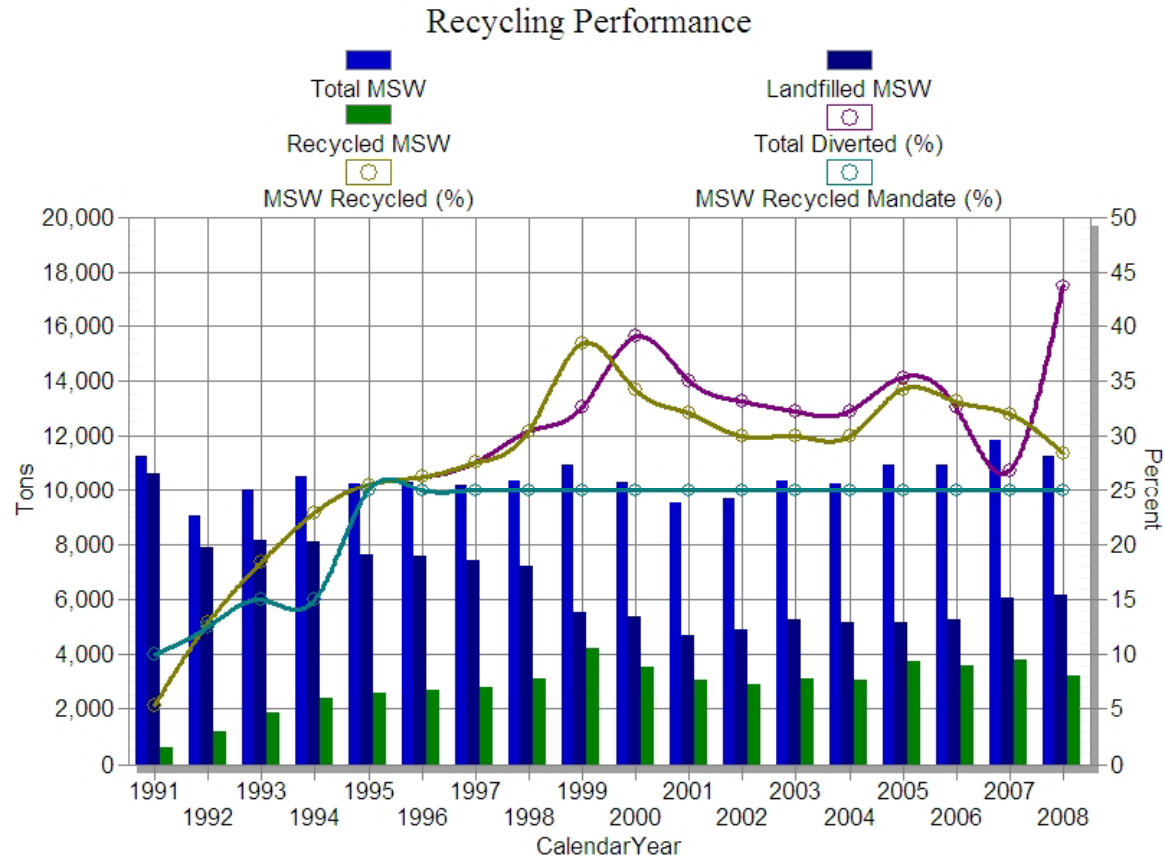
Energy Consumption Trends



Water Consumption Trend



Trash & Recycling Trend



Conservation Accomplishments

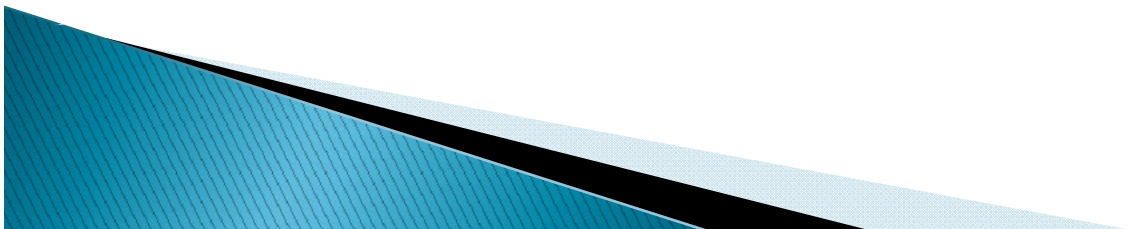
- ▶ Centralized Approach
 - Cooling
 - Heating
 - Electric Demand
- ▶ Energy Management Systems / Controls
- ▶ Lighting
- ▶ Insulation, Steam Traps, Weather Stripping....



Conservation Accomplishments

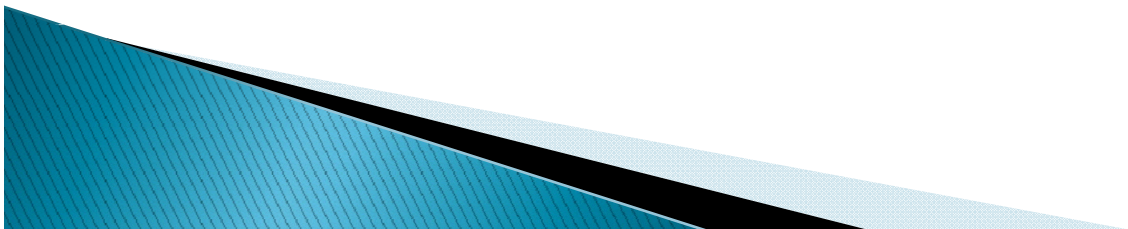
- ▶ Energy Projects (FY09 Alone)
 - \$1.1 million cost avoidance
 - 1500 MTeCO₂

- ▶ MR4 Delta Force Retro-Commissioning
 - Spent = \$434,000 [\$346,000 (DM) + \$88,000 (Energy)]
 - Avoided Cost = \$408,000
 - Simple Payback = 1.06
 - 1281 MTeCO₂



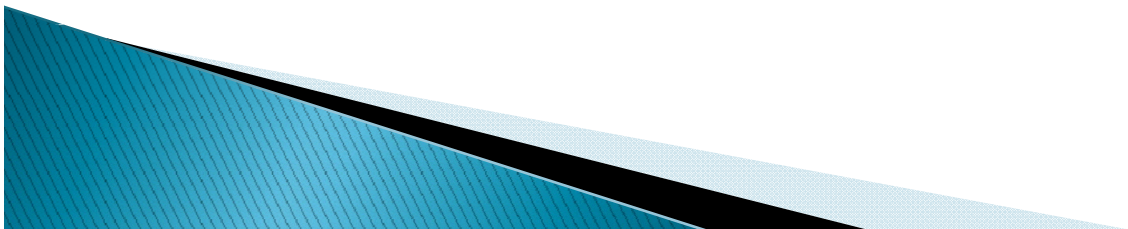
Looking Forward

- ▶ **Delta Force**
 - Jordan Hall Addition
 - Chemistry Building and Addition
 - Multistory Building
 - +14 million GSF of “opportunity”
- ▶ **Many Conservation Initiatives:**
 - Lighting Retrofits, Scheduling & Setbacks, Controls, Insulation, Leaks.....
- ▶ **Communication:**
 - Sustainability Kiosk, Student Staff & Conservation Advocates, Building Sustainability Coordinators, Events...



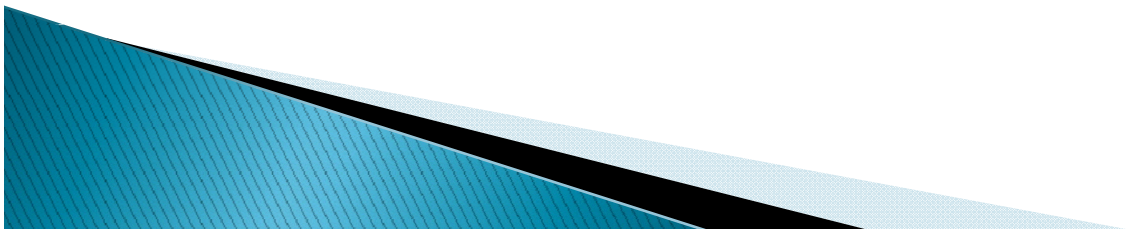
Looking Forward

- ▶ Smart Grid DOE Grant Proposal
 - UMD, Johns Hopkins, Howard, Georgetown, GMU, JMU, UFL, and UVa
 - DVP, BG&E, Pepco
 - Research, Measurement, Demonstration
- ▶ Biomass Energy DMME Grant Proposal
 - Use up to 20% wood pellets



Environmental Footprint

- ▶ Redevelopment / Growth
- ▶ Conservation
- ▶ Renewable Energy, RECs, Carbon Offsets, Premium (Green) Power Purchasing



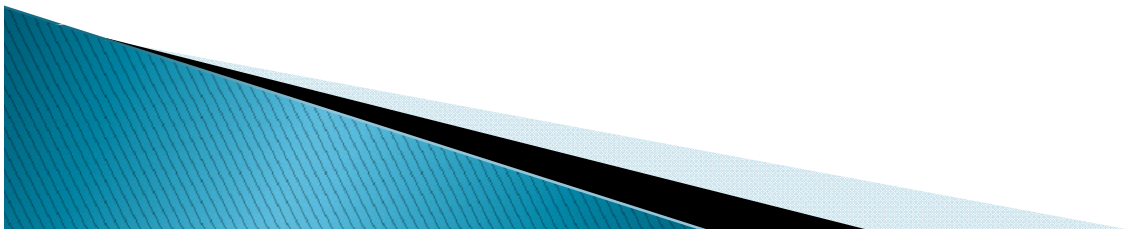
Renewable Energy

- ▶ Biomass
- ▶ Photovoltaic (PV) Electricity
- ▶ Solar Thermal
- ▶ Geothermal
 - Electric Generation
 - Heating & Cooling
- ▶ Wind
- ▶ Other Bio-Energy



Carbon Footprint by Energy Source

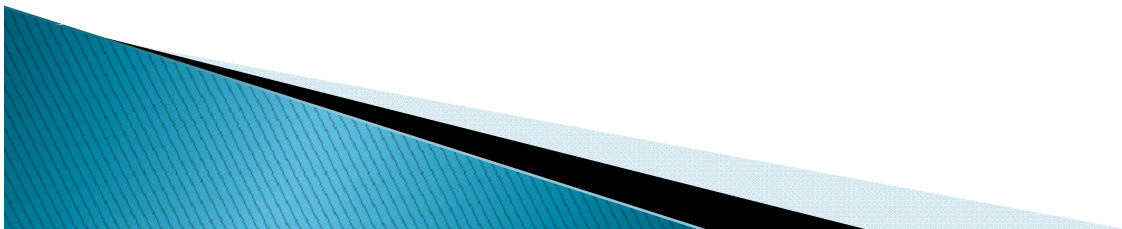
Energy Type	MTeCO2/Unit	Unit
Natural Gas	0.052908	MMBtu
Distillate Oil	0.727996	MMBtu
Coal	1.926778	Ton
Electricity	0.000569	kWh



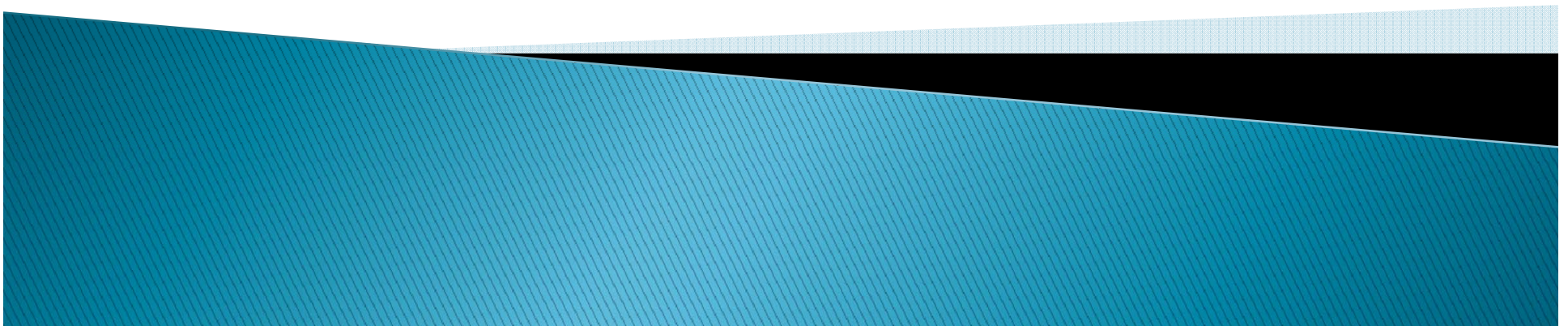
Carbon Footprint by Energy Type

	MTeCO2 per MMBTU	
Chilled Water	0.049758989	Calc
Steam	0.061527856	Calc
Electricity	0.166668862	CACP, V6.4
Coal	0.077077100	CACP + HV Calc
Natural Gas	0.052908294	CACP
Distillate Oil	0.072799623	CACP

Compared to N. Gas	
Natural Gas	Base
Distillate Oil	38%
Coal	46%
Electricity	215%



**If You Had \$1 Million,
How Would You Spend It?**



What Can You Buy For \$1 Million?

Type	Example	Annual MeTCO ₂	Payback
Photovoltaic	150 kW - Area of Newcomb Roof	96	44 Years Compounded at 3%/Year
Conservation	MR4 Type Retro-Commissioning	2950	<2 Years
Re-lamp	270,000 lamps (T8 at 25 W v T8 at 28-32 W [10 hrs/day, 365 days])	2800	3 to 6 Years (3 Years for electricity only. Can likely get price discount on lamps.)
Coal to Natural Gas	Main Heat Plant (Need Gas Pipeline)	3340	Never has a payback AND you need to spend \$1 million every year AND \$25 to \$30 million for pipeline.
1 REC=1 MWh	\$5 to \$50 / REC 20,000 to 200,000 MWh	11,400 to 114,000	Never has a payback AND you need to spend \$1 million every year.

CarbonFootprint Reduction Plan = Energy Reduction Plan

- ▶ Strategically Important
 - Greenhouse Gas Emissions / Carbon Footprint
 - Environmental Impact
 - Manage Cost
 - Manage Risk
 - Students, Faculty, Staff, Public



Capital Program

Priority	Project	Average	High	Bien
1	North Chiller Plant Chillers Replacement	\$53,750,000	\$57,340,000	2010-2012
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