

MIURA

Optimizing Thermal Energy Management

nationalgrid

spirax
/sarco

Johnson
Controls





MIURA

Energy & Environment - Overview

Jason Smith, LEED A.P.

- **The environment & economy are on a crash course with each other that will in the end leave them inseparable**
- **CO₂ is the new currency of this “green” economy**



“Green” is just the name for the future of business as we know it...

RANK	COMPANY	INDUSTRY SECTOR	▲	📄	👤	🌐
1.	Hewlett-Packard → <i>"Strong programs to reduce GHG emissions...."</i>	Technology	100.00	64.80	97.90	88.44
2.	Dell → <i>"Ranks 4th among the top U.S...."</i>	Technology	98.87	67.70	100.00	70.80
3.	Johnson & Johnson → <i>"Its commitment to climate change is..."</i>	Pharmaceuticals	98.56	56.70	98.17	75.88
4.	Intel → <i>"Largest corporate purchaser of renewable energy..."</i>	Technology	95.12	46.70	87.87	81.86
5.	IBM → <i>"Has had formal environmental policies since..."</i>	Technology	94.08	76.90	84.20	77.56
6.	State Street → <i>"In an industry slow to acknowledge..."</i>	Financial Services	93.62	95.00	84.39	70.69
7.	Nike → <i>"Leads its industry in environmental management..."</i>	Consumer Products, Cars	93.28	77.10	78.31	89.90
8.	Bristol-Myers Squibb → <i>"Announced goal to reduce direct and..."</i>	Pharmaceuticals	92.62	27.80	88.52	64.73
9.	Applied Materials → <i>"Semiconductor manufacturer designs its products to..."</i>	Technology	91.79	50.90	89.51	44.51
10.	Starbucks → <i>"Announced commitment in 2008 to source..."</i>	Media, Travel, Leisure	91.63	30.50	82.01	75.42



Nissan Global has added CO₂ to its **QCT**(Quality-Cost-Time) management philosophy & renamed it **QCT-C**(for CO₂reductions)

Sustainability Consortium:

- U.S. companies leading the way by “greening” their operations & supply chain...



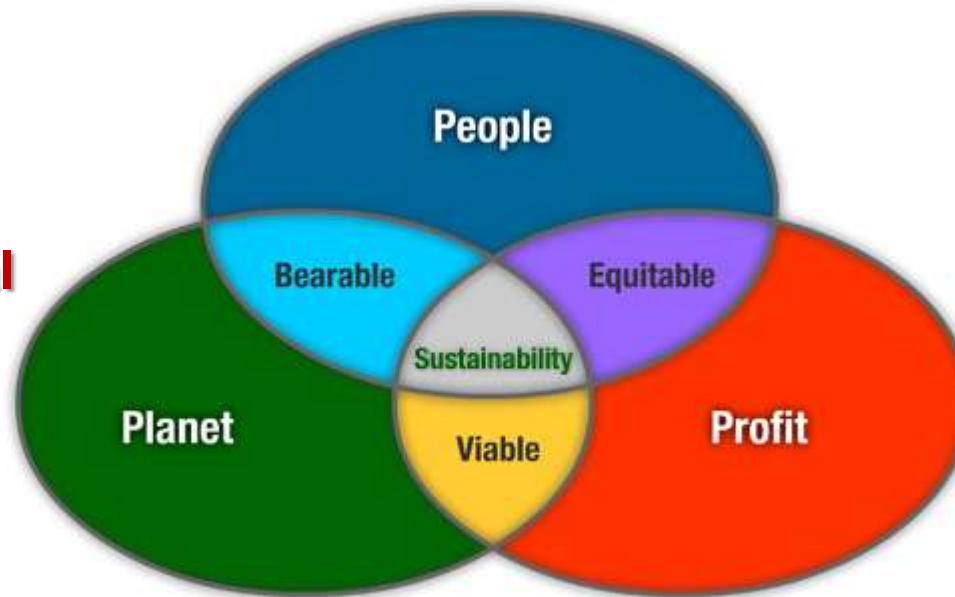
▪ “Triple Bottom Line”:

Social Responsibility

- Extended Product Stewardship
- Online Maintenance System
- Safe & Easy Operation

Environmental Stewardship

- Reduced Fossil Fuels Consumption
- **Reduced GHG Emissions**
- Reduced Water Consumption



Economic Prosperity

- Reduced Fuel Costs
- Reduced Operation Costs
- Increased Operational Efficiency

Sustainability = Awareness: *Key Issues*

■ Energy

- High demand, dwindling “conventional” supply
- Future increased growth & volatility in energy prices
- High U.S. energy intensity = excessive wasted energy



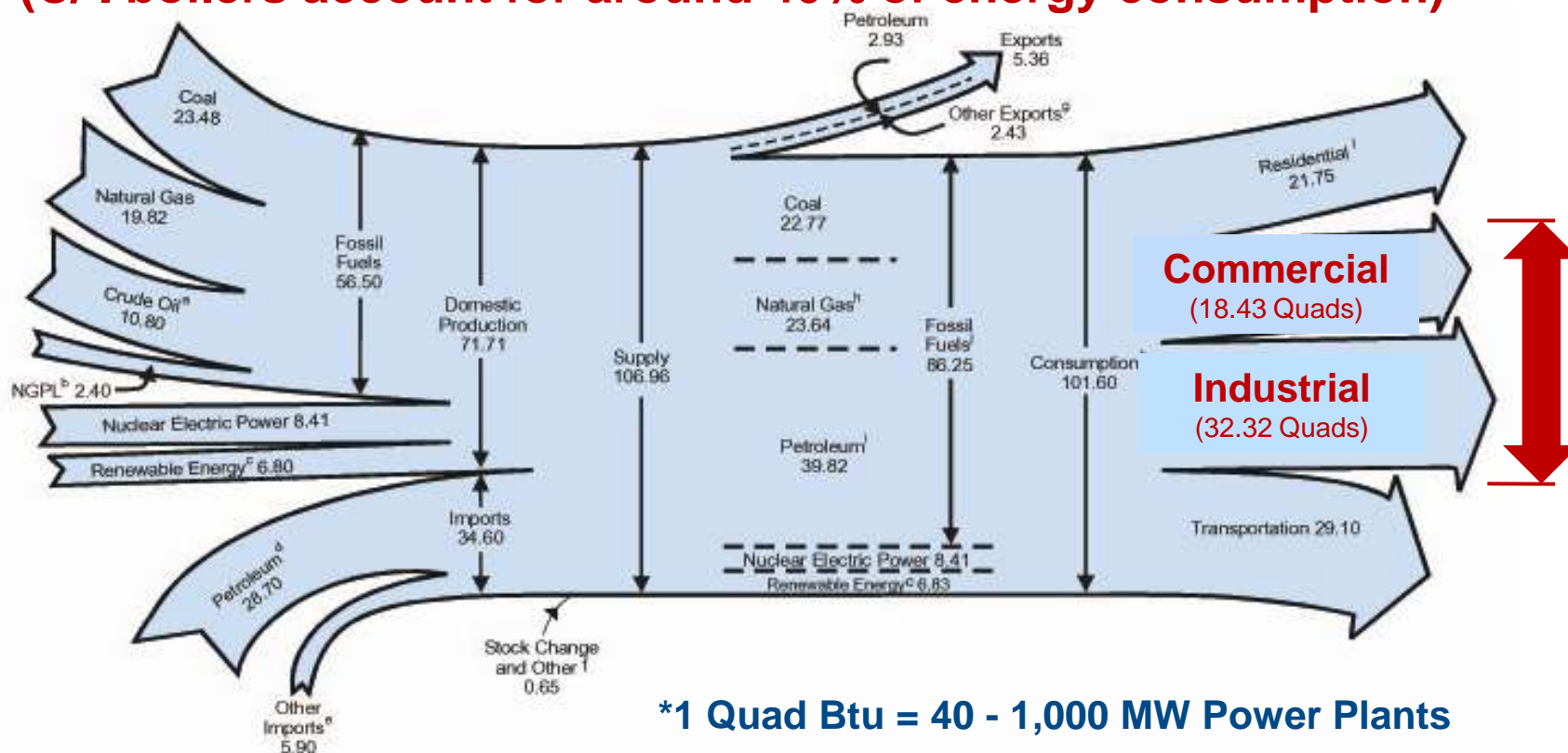
■ Emissions

- Increasing CO₂ emissions & other harmful pollutants
- Concentrations of atmospheric CO₂ approaching global “Tipping Point” (450+ ppm)
- Future environmental regulation & cap/tax on carbon emissions

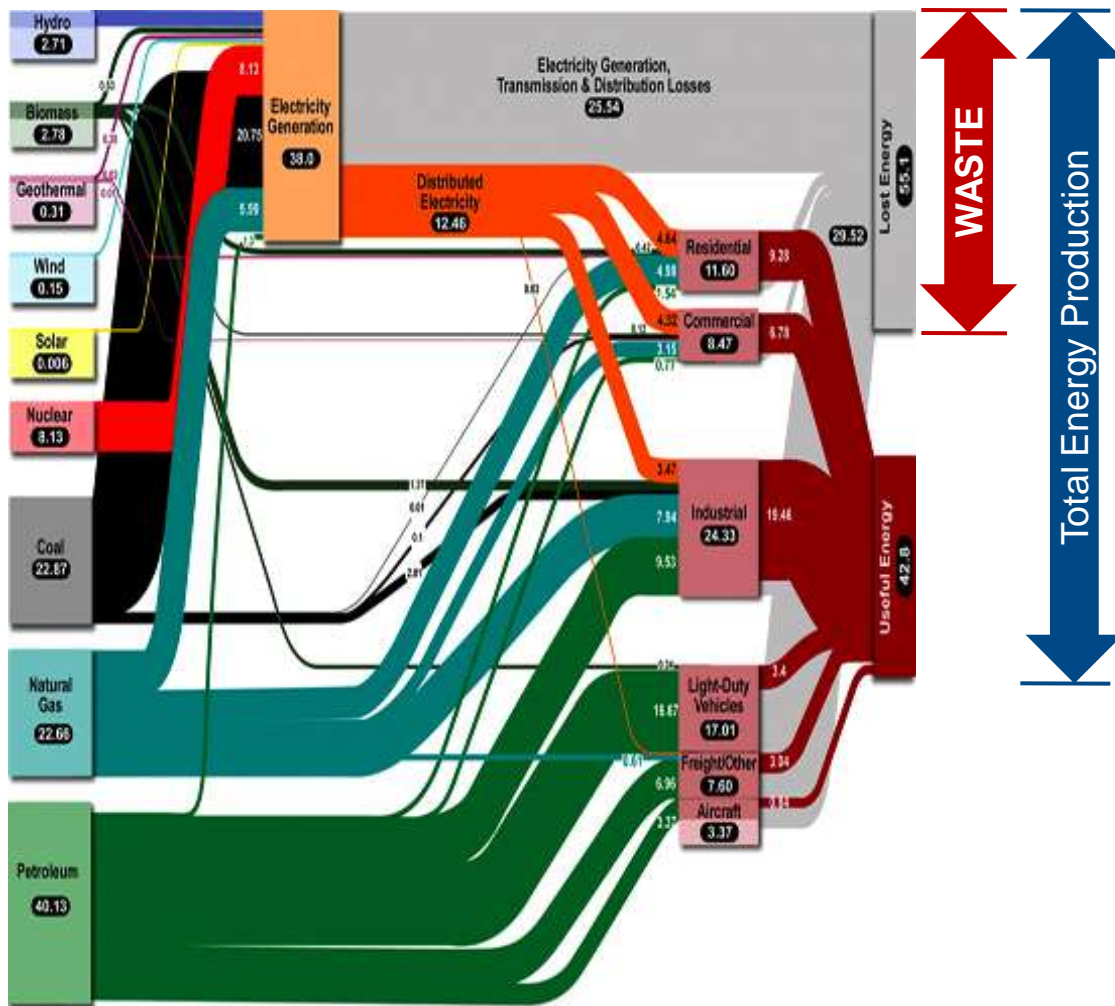
■ Water

- Excessive waste in U.S. water use in all sectors
- Drought conditions persist across the U.S.
- Increasing water demand vs. reduced water supply = projected increased growth & volatility in water costs

- **U. S. Energy Flow – 2006 (Quadrillion Btu's*):**
- **Commercial + Industrial Sectors - 50.75 Quads of Energy OR 50% of all energy use**
- **Fossil Fuels – 86.25 Quads or 85% of all energy consumption (C/ I boilers account for around 40% of energy consumption)**



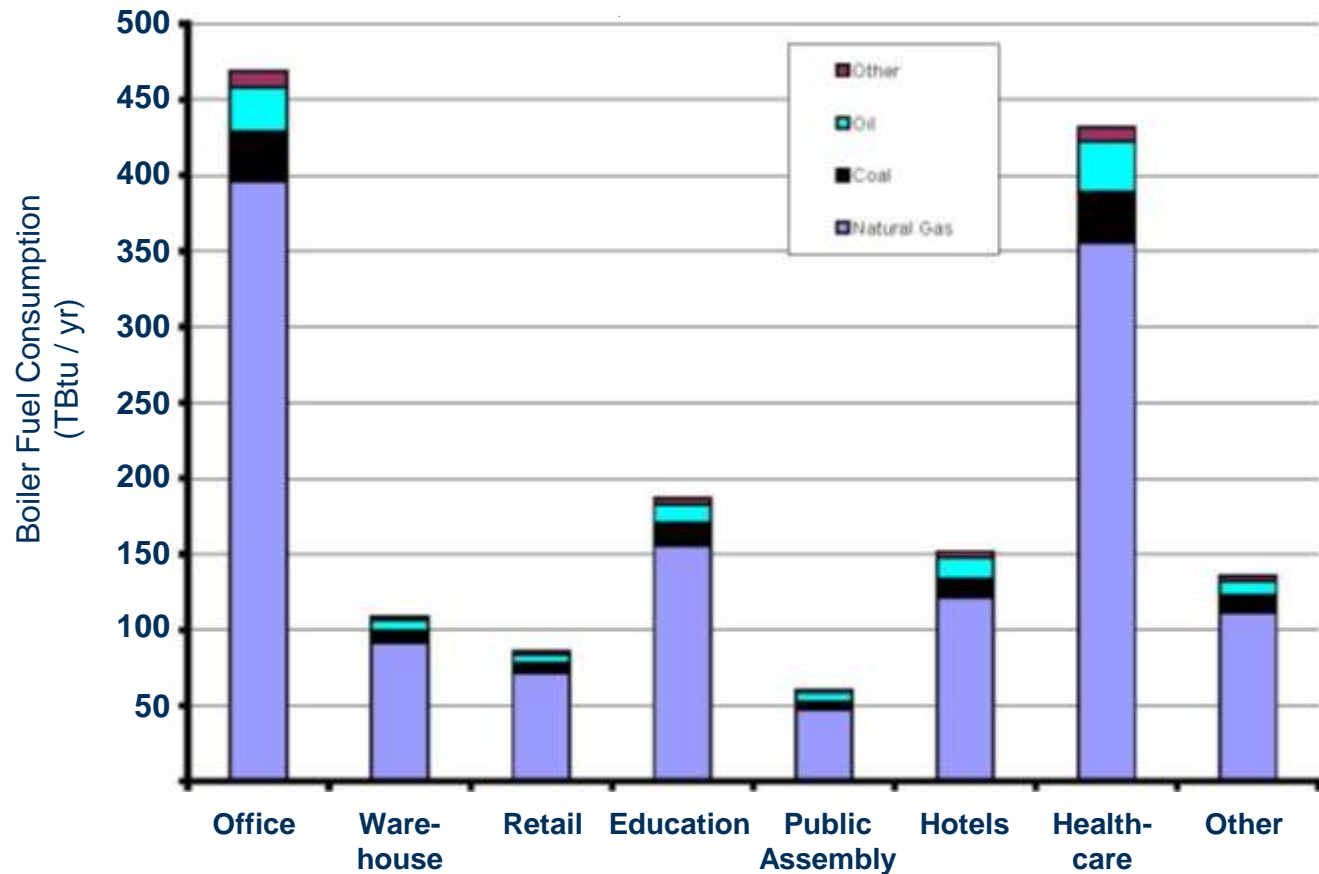
U. S. Energy Flow – 2007 (Quadrillion Btu's):



- Total U.S. Energy Produced ~ 97.9 Quads
- Lost / Wasted Energy – 55.1 Quads of Energy = 56% of total energy input

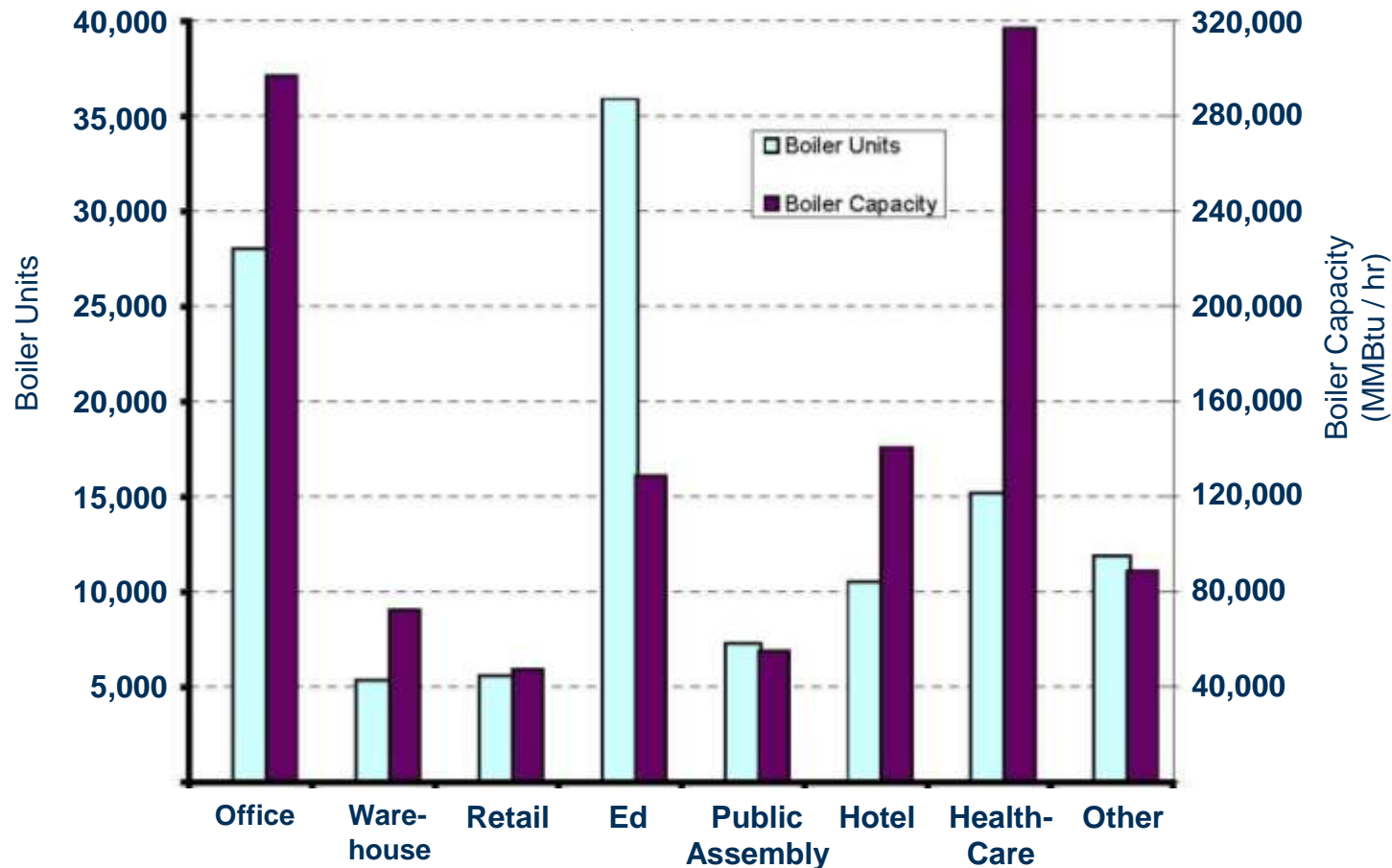
U. S. Boiler Market Survey: *Energy Consumption*

- **U.S. Commercial Boilers – Energy Consumption (2005):** ~ 1.6 Qbtu / yr or nearly 30% of all energy in commercial facilities
- **CO₂ Emissions - Commercial Boilers:** ~ 120+ MtCO₂ / yr



U. S. Boiler Market Survey: *Distribution by Building Type*

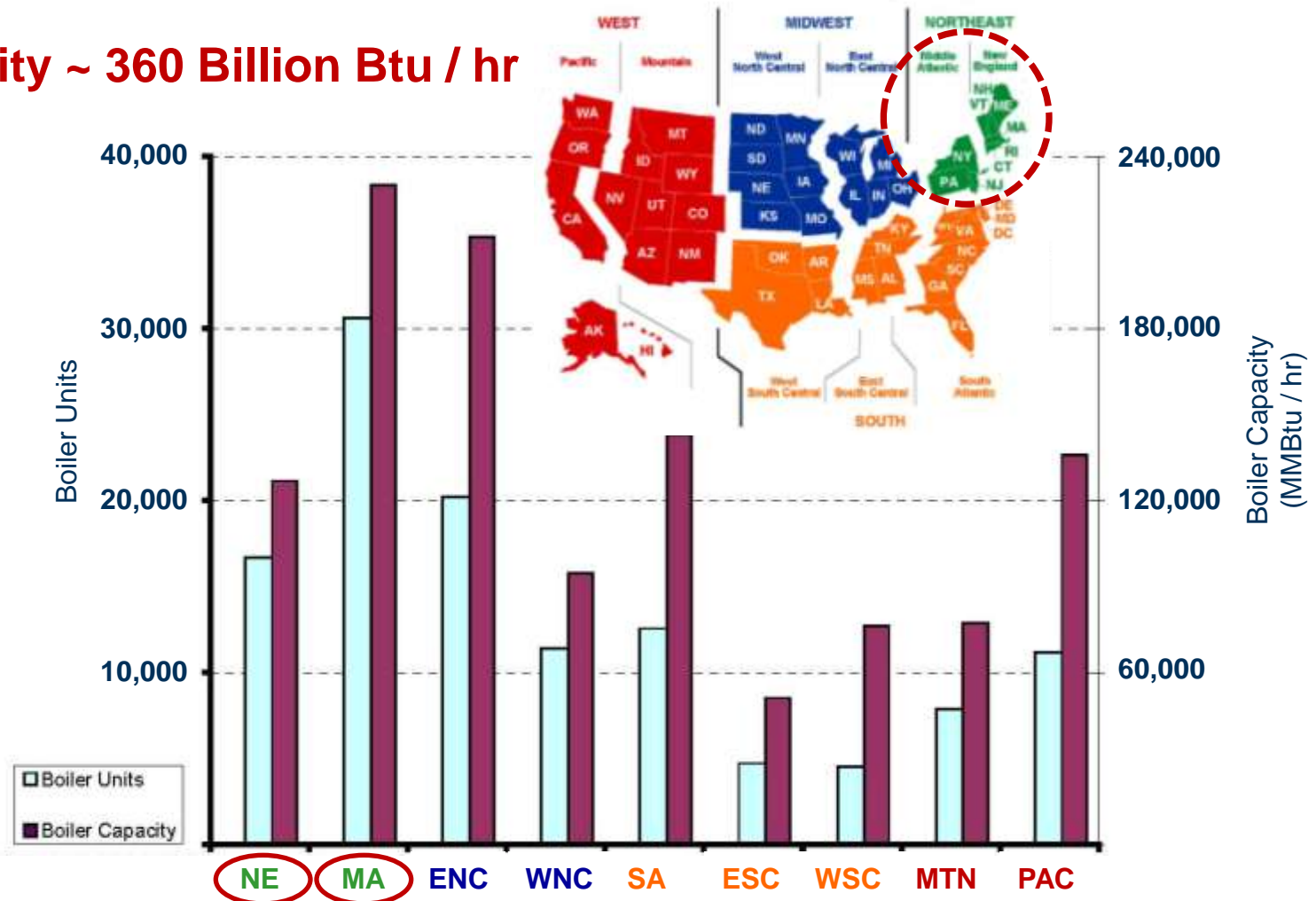
- U.S. Commercial Boilers – Breakdown by Building Type (2005):
- About 67% of commercial boilers & boiler capacity reside in the office, healthcare & education sectors



U. S. Boiler Market Survey: *Distribution by Region*

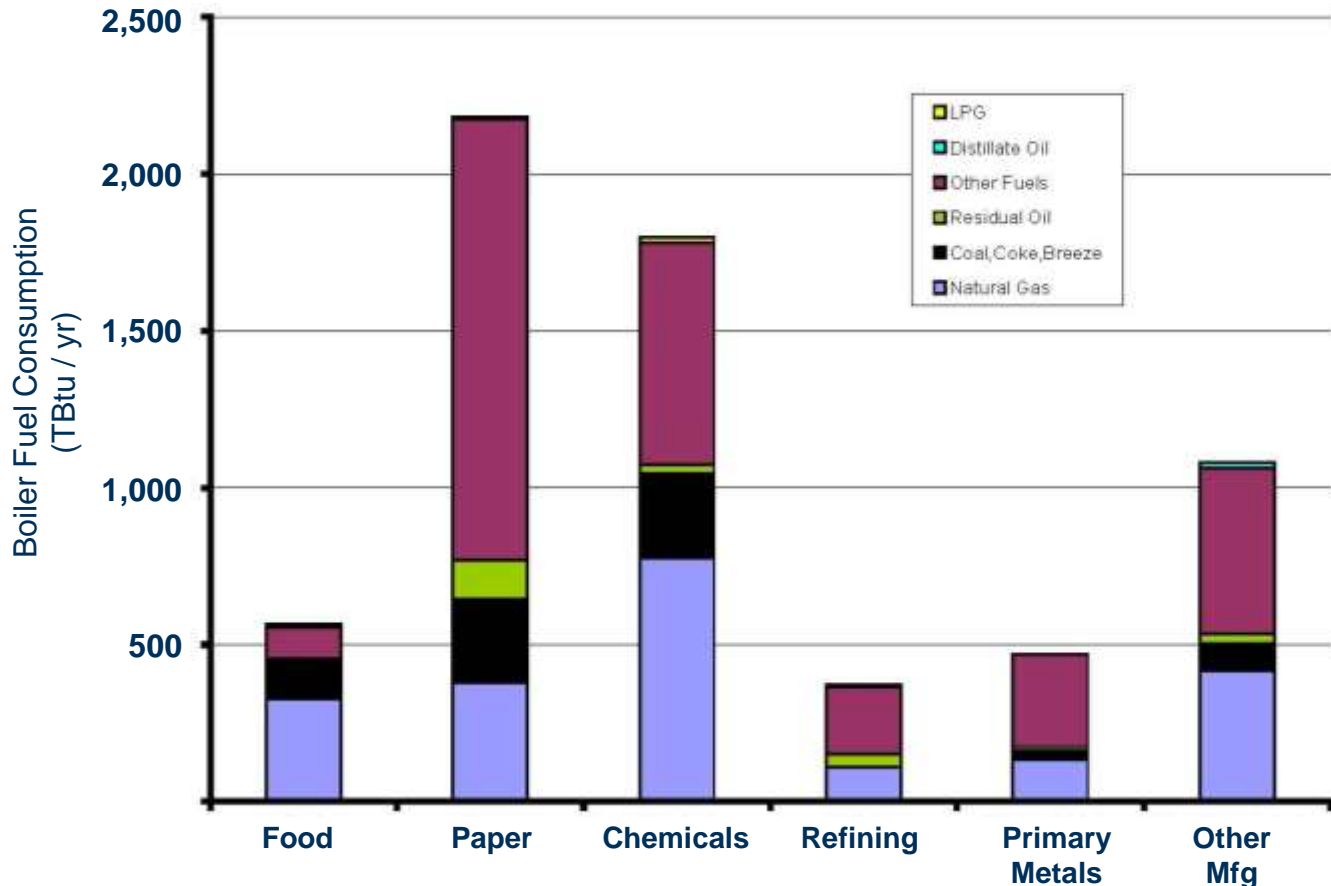
- U.S. Commercial Boilers – Breakdown by Region (2005):

- Northeast:**
Total Capacity ~ 360 Billion Btu / hr



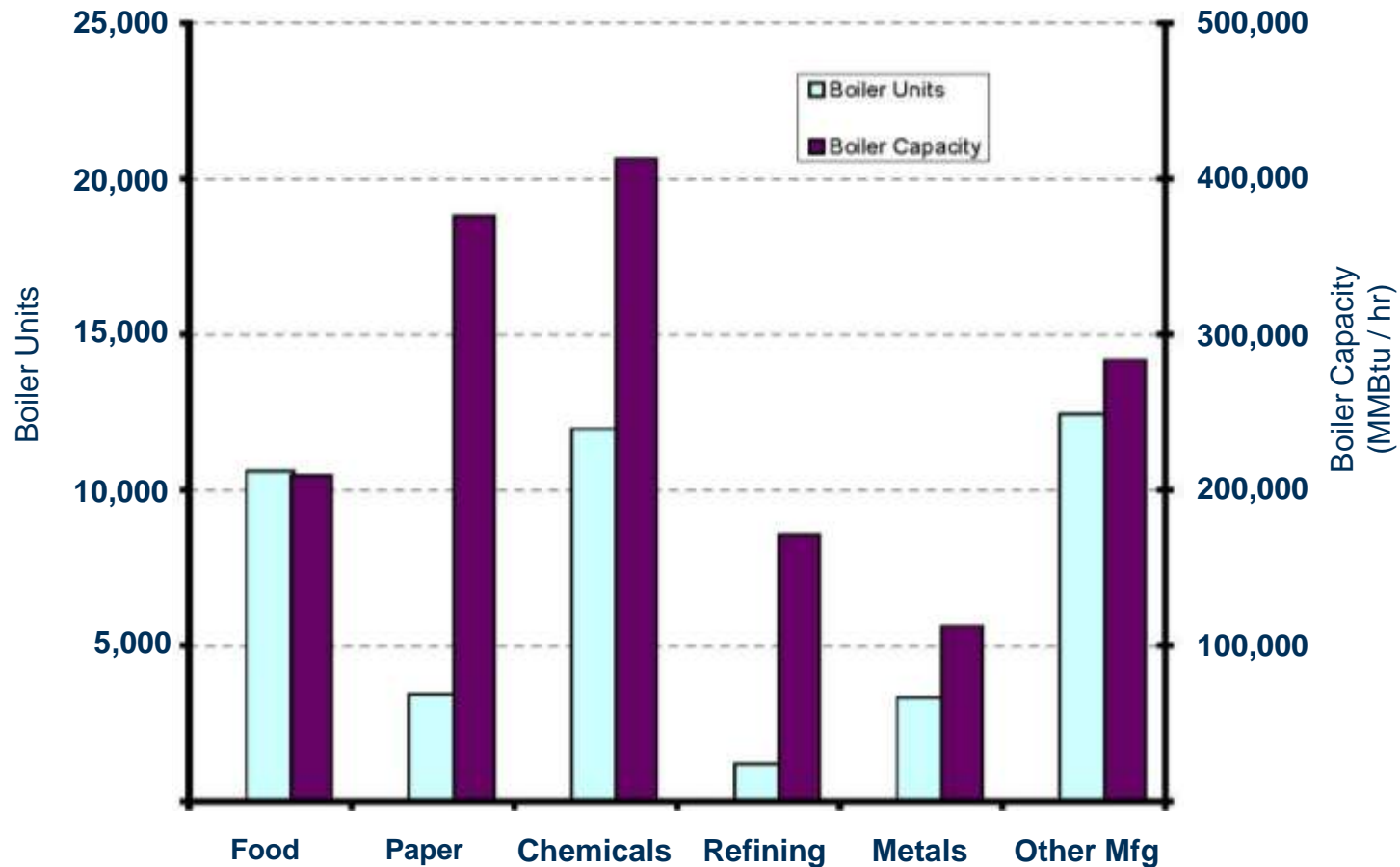
U. S. Boiler Market Survey: *Energy Consumption*

- U.S. Industrial Boilers – Energy Consumption (2005): ~ 6.5 Qbtu / yr or up to 40% of all energy at industrial facilities
- **CO₂ Emissions - Industrial Boilers: ~ 500+ MtCO₂ / yr**



U. S. Boiler Market Survey: *Distribution by Industry*

- U.S. Industrial Boilers – Breakdown by Industry(2005):
- The food, paper, chemical, refining & metals industries account for 71% of boilers & 82% of boiler capacity

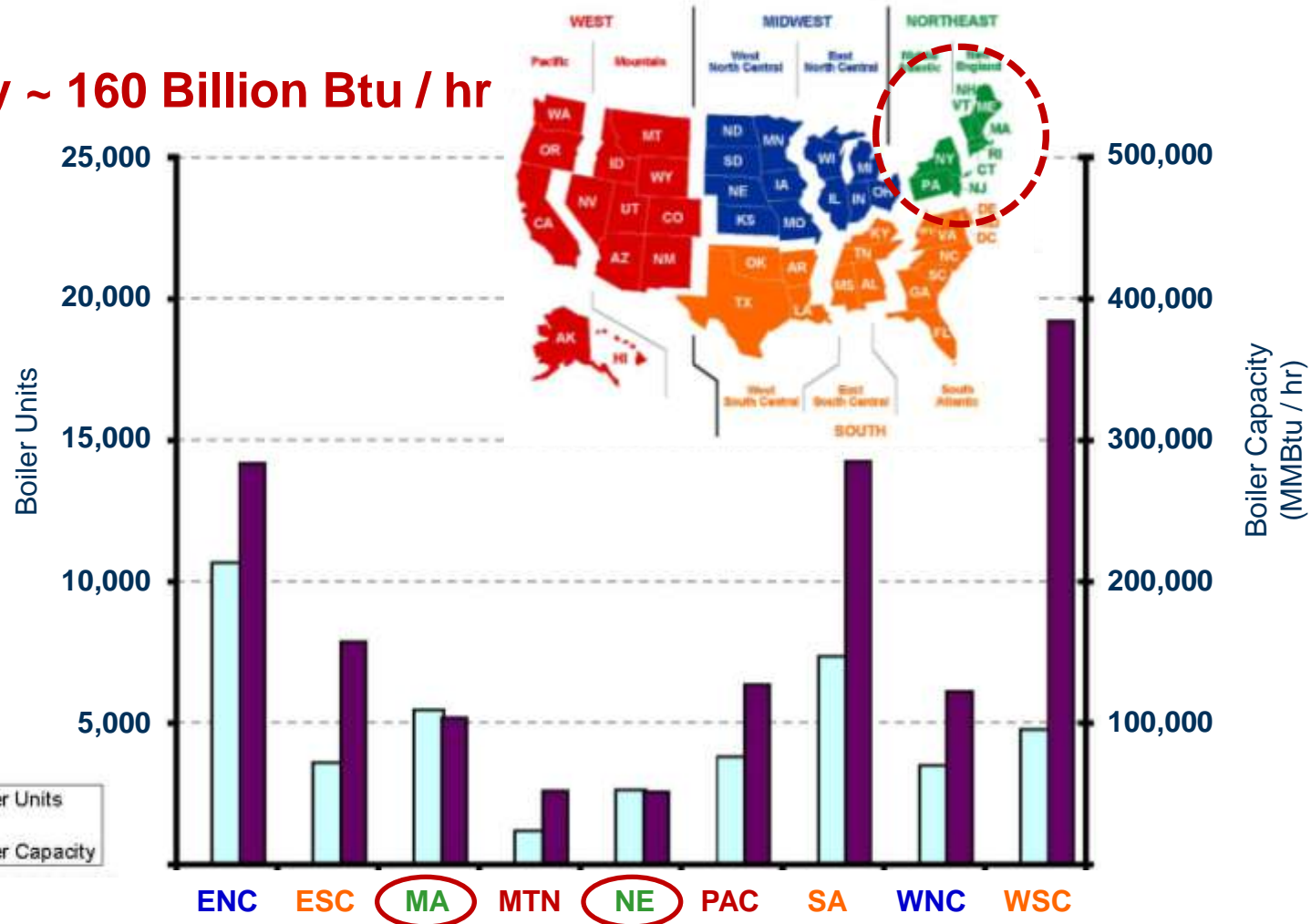


U.S. Boiler Market Survey: Distribution by Region

- U.S. Industrial Boilers – Breakdown by Region (2005):

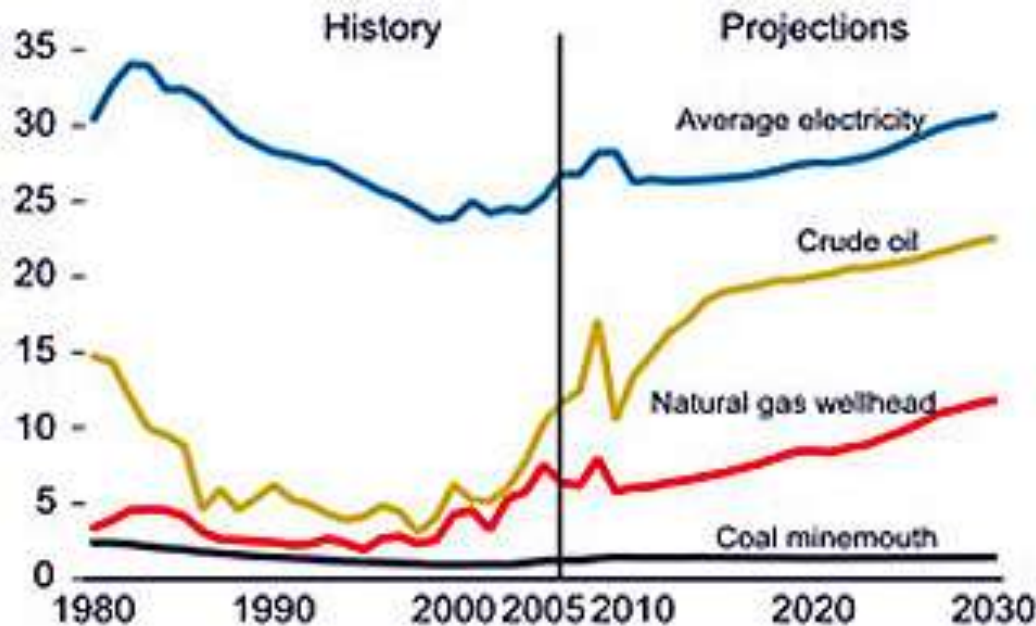
- Northeast:

Total Capacity ~ 160 Billion Btu / hr



U.S. Energy Costs – Historical Trends / Future Projections:

- U.S. energy prices have historically been very low when compared to average global energy prices
- Future projections forecast a steady increase in energy prices in all sectors as demand increases
- **U.S. natural gas prices are projected to increase 60% from 2010 to 2030**

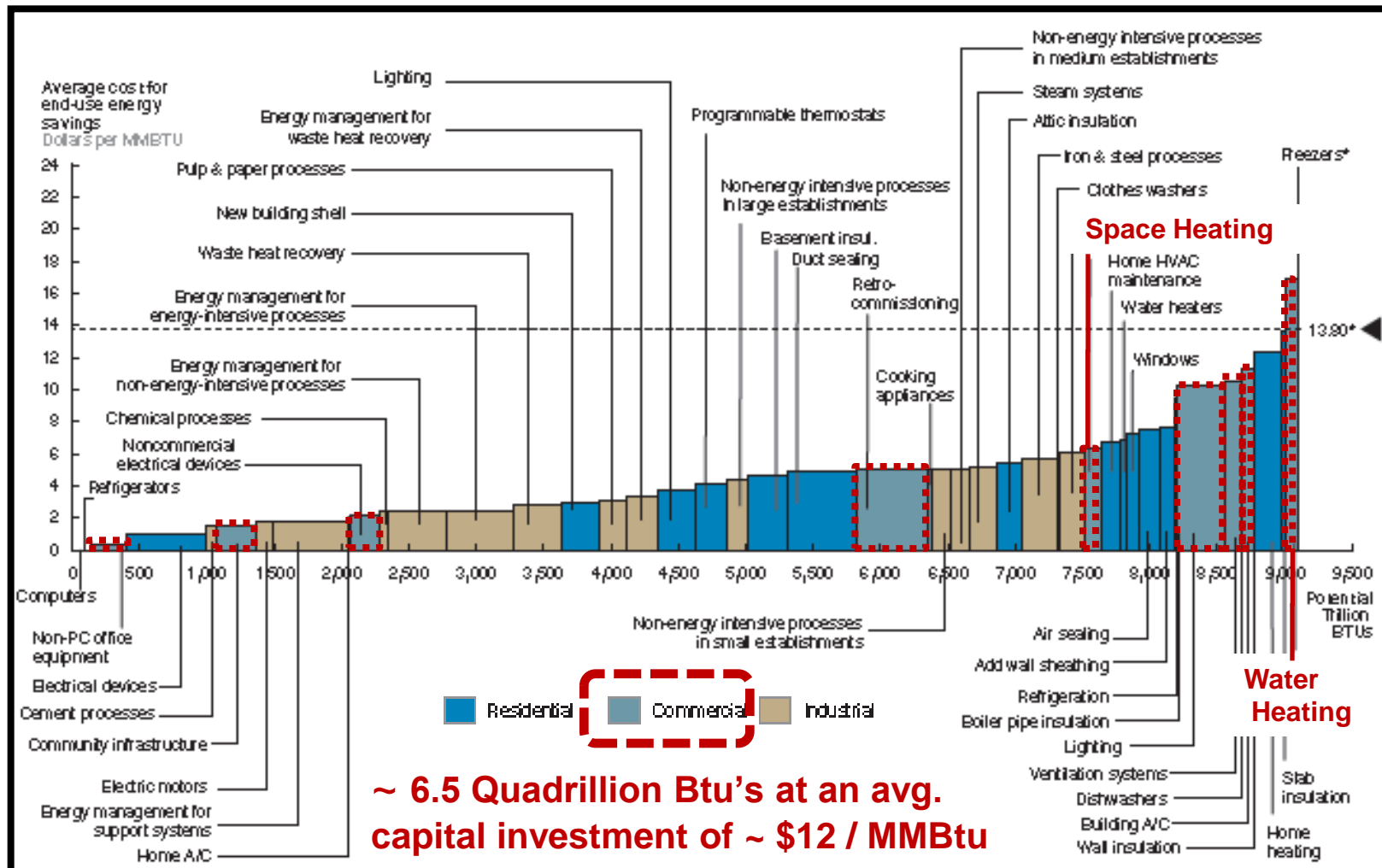


Unlocking U.S. Energy Efficiency

Bang for Buck – Commercial Sector

- 2009 McKinsey EE Report for DOE / EPA:

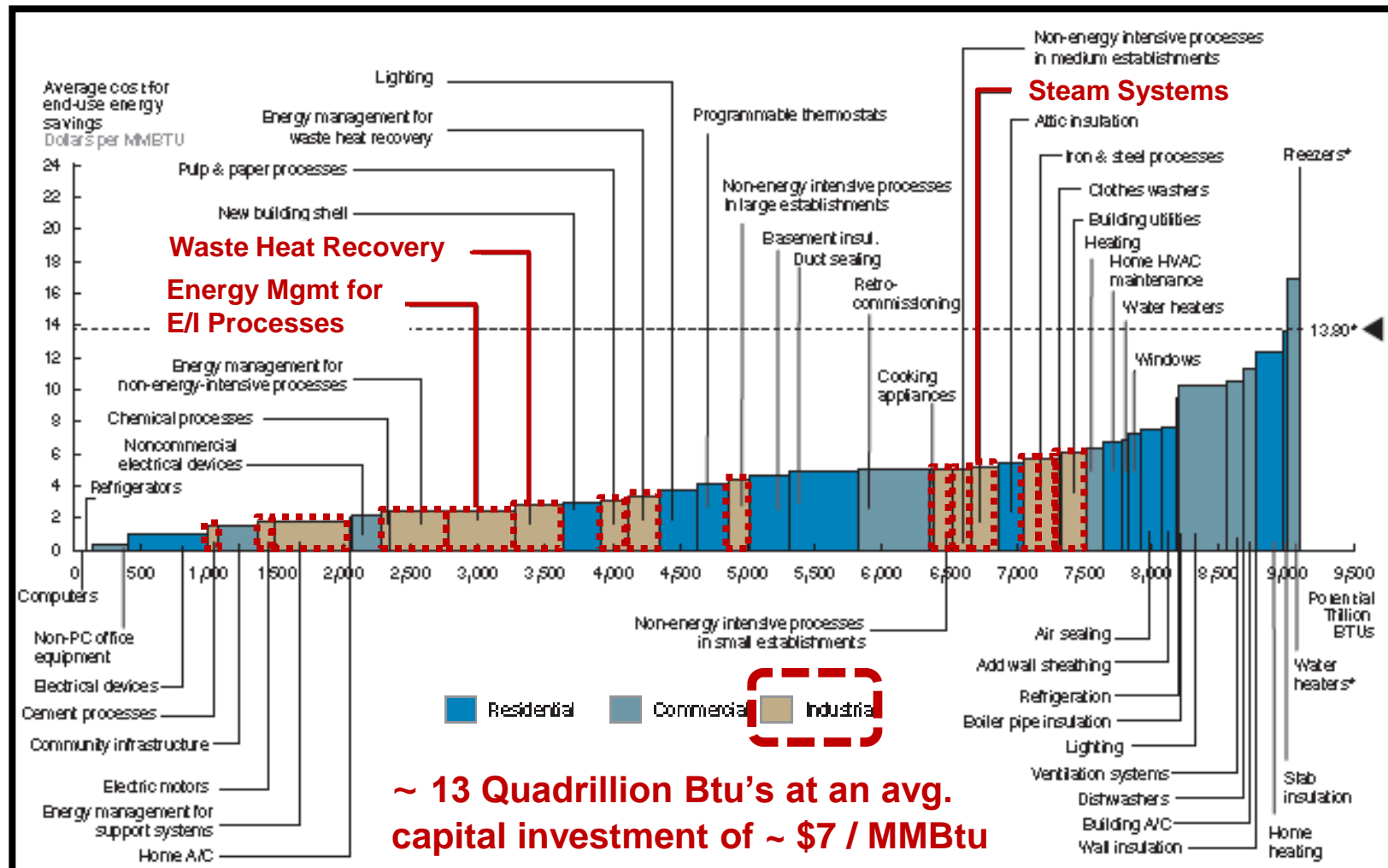
http://www.mckinsey.com/clientservice/electricpowernaturalgas/US_energy_efficiency



Unlocking U.S. Energy Efficiency Bang for Buck – Industrial Sector

■ 2009 McKinsey EE Report for DOE / EPA:

http://www.mckinsey.com/clientservice/electricpowernaturalgas/US_energy_efficiency



Unlocking Energy Efficiency

U.S. Federal Government

- E.O. issued by the President on October 5, 2009
- Focused on leadership in national energy, environmental & economic stewardship within the federal government including:
 - Energy intensity reductions
 - Greenhouse gas reductions
 - Pollution prevention & waste reduction
 - Water efficiency
 - Sustainable buildings initiative
- E.O. targets planning & implementation with measureable improvements by 2020 including:
 - **Energy use reduction equivalent to 656 Tbtu's**
 - **GHG emissions reductions of 28%**



Unlocking Energy Efficiency

U.S. Healthcare Facilities

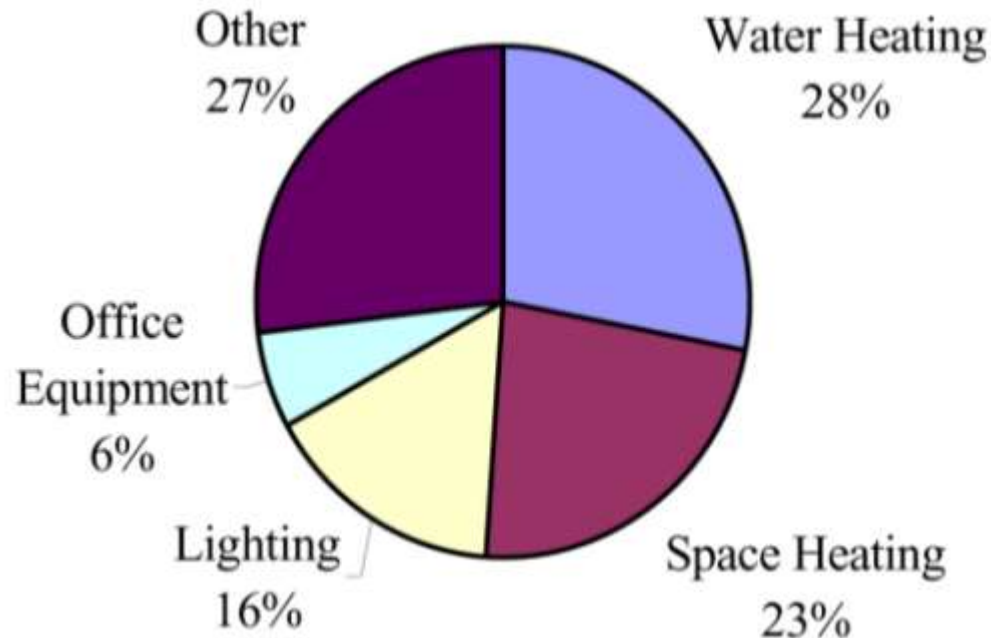
- **ASHE's E²C initiative** – focusing on energy efficiency in healthcare: <http://www.ashe.org/ashe/facilities/e2c/>
- **Energy costs are out of control with 91% of hospitals surveyed reported higher energy costs over the previous year with more than half citing double-digit increases**
- **E²C - Partnership between ASHE and the DOE/EPA via Energy Star Program & Portfolio Manager database**
- **E²C is leading a survey of energy consumption in all ASHE member facilities**
- **E²C provides resources including BEST PRACTICES & case studies about energy efficiency improvements implemented by ASHE members**



Unlocking Energy Efficiency

U.S. Healthcare Facilities

- Energy use in healthcare facilities (EIA CBECS, 2003):
- Space & water heating represent 51% of total energy consumption
- Other thermal energy uses include up to an additional 10% for process uses involved with sterilization, food service, laundry, etc.
- **Thermal energy consumption ~ over 60% of total energy use**



U.S. GHG Emissions: *NOx*

- Map of ozone non-attainment areas in the U.S.:
- Ground level ozone pollution is the primary driver of NOx emissions regulation in the U.S.



Nonattainment areas are indicated by color. When only a portion of a county is shown in color, it indicates that only that part of the county is within a nonattainment area boundary.



U.S. GHG Emissions: **NO_x**

- NO_x is produced when oxygen & nitrogen in air combined at high temperatures during combustion
- NO_x negative impacts on the environment include:
 - **Reacts w/ airborne VOC's in sunlight to form smog**
 - **Reacts w/ water vapor to create acid rain**
 - **Contributes to global warming – nearly 300 times the Global Warming Potential of CO₂**
- NO_x regulations established & enforced via state / local air quality management departments
- NO_x regulations have shown a steady reduction in allowable concentrations via fuel-burning equipment
- New York DEC – In process on reducing NO_x emissions limits for boilers. Compliance plans due Jan. 1, 2012.
On-site compliance with new NO_x emissions – Jan. 1, 2014

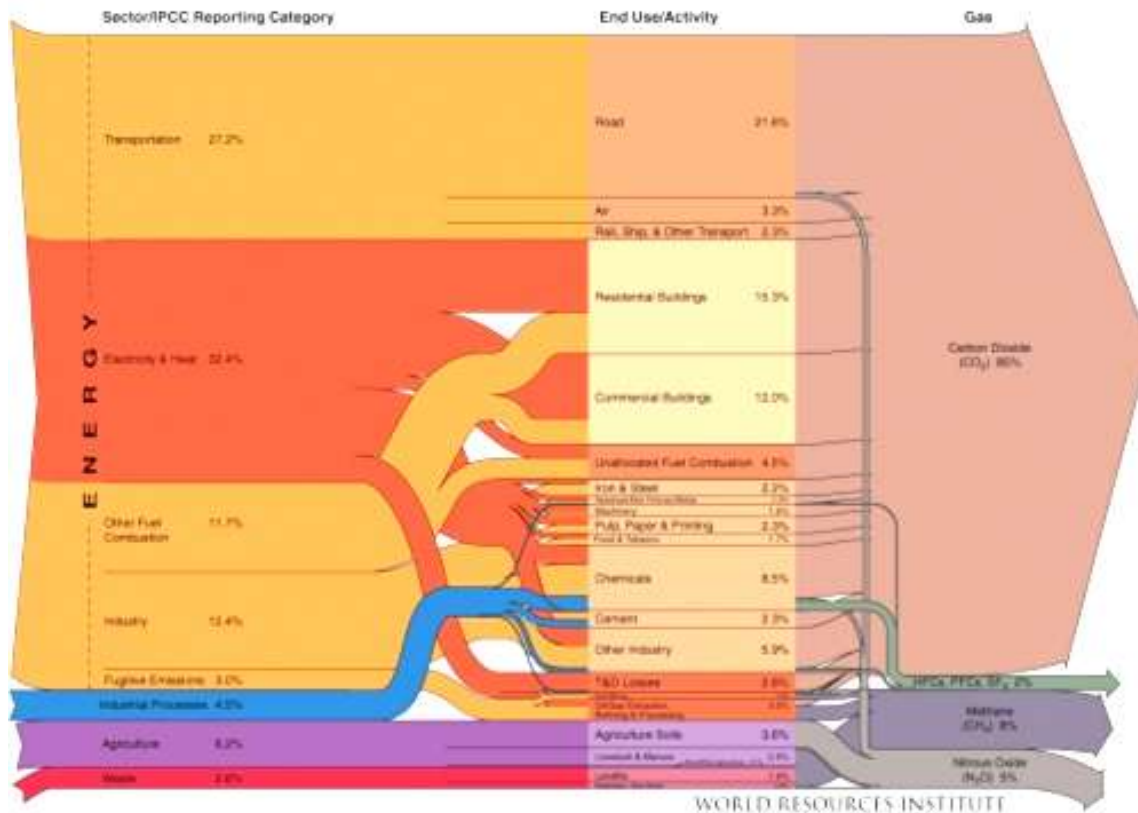


U.S. GHG Emissions:

- U. S. GHG Emissions Flow – 2005 (total mtCO₂e):
- **Commercial + Industrial Sectors ~ 1.4 Billion mtCO₂e, as much as 20% of all U.S. GHG emissions**



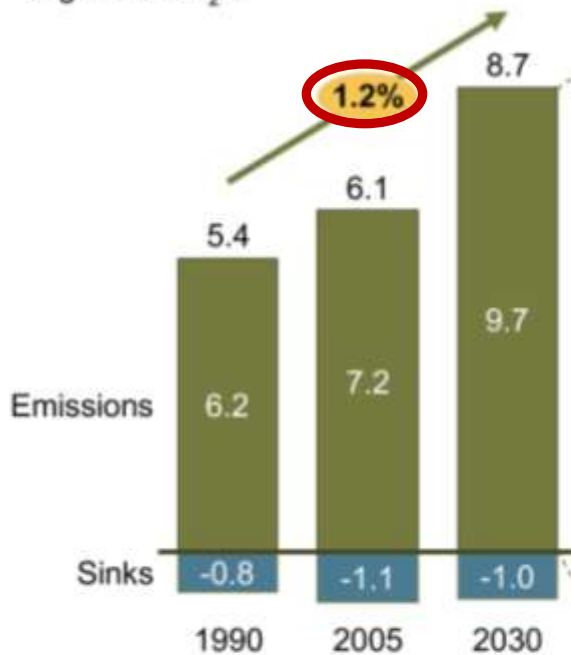
~ 7 Billion mtCO₂e
Total U.S.
GHG Emissions
(2003)



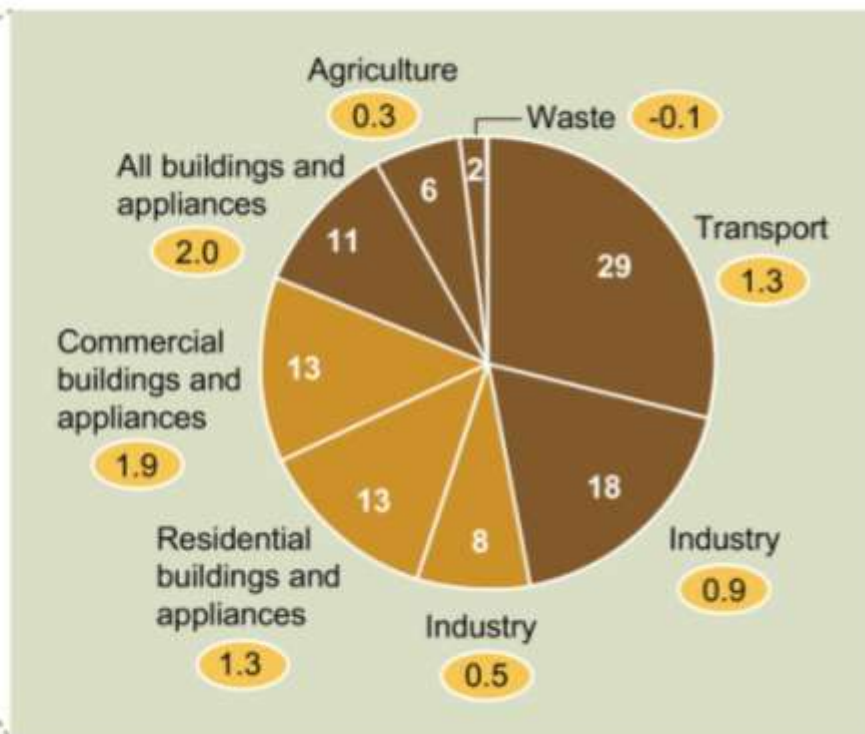
- **U.S. CO₂ Emissions (Gigatons CO₂e) – 1990 - 2030:**
- **U.S. GHG Emissions Projected to Increase 35% over the next 20 years @ 1.2% annual growth**

- Direct emissions from end-user sectors
- Power sector emissions allocated to end users
- % 1990-2030 annual emissions growth rate

Overall GHG emissions – 1990-2030
Gigatons CO₂e



GHG emissions by sector – 2030
Percent

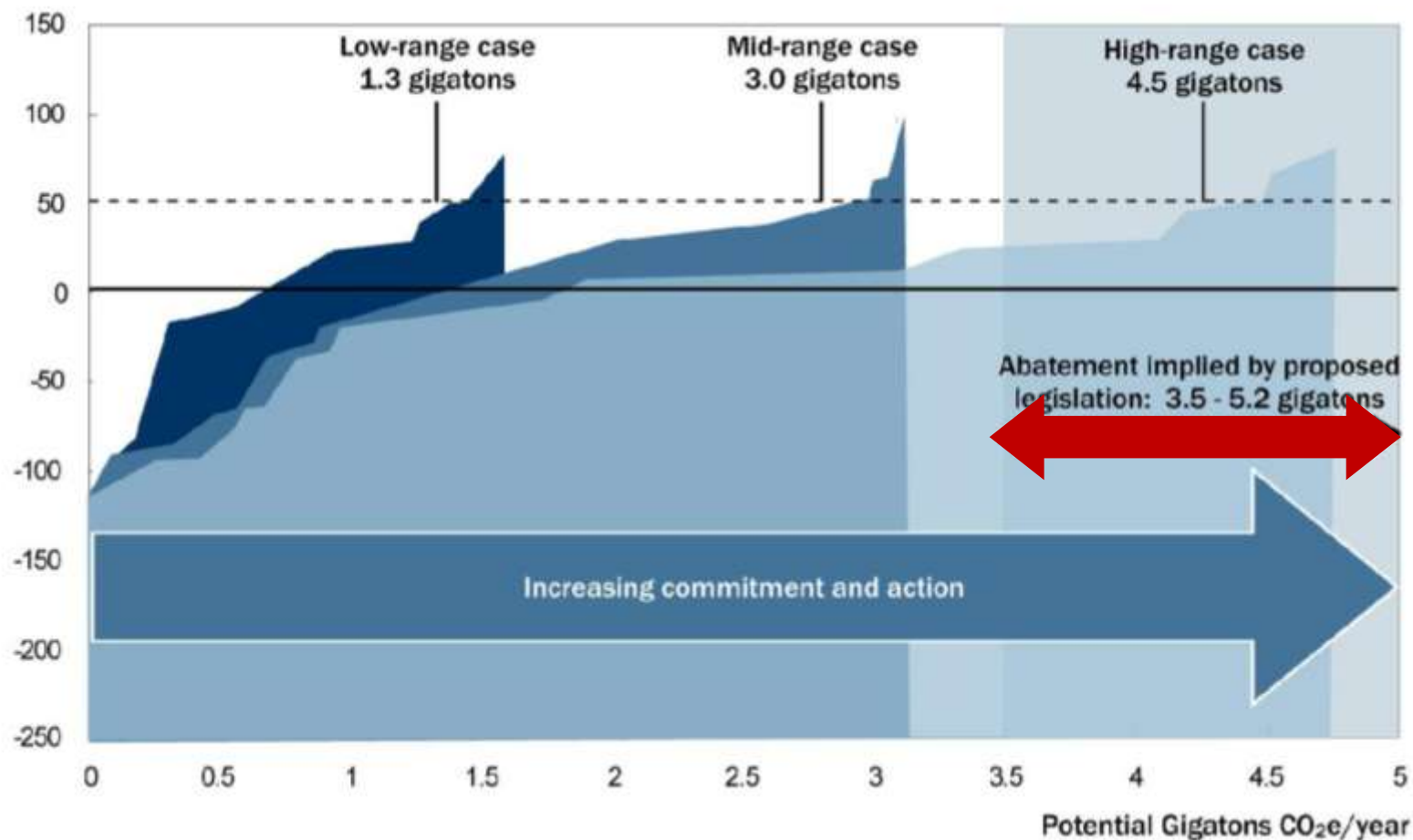


U.S. GHG Reduction Potential

How Much at What Cost?

- U.S. GHG Abatement Potential (Gigatons CO₂e / yr):
- **Current Legislation Targets Reductions of 3.5–5.2 GtCO₂e/yr**

Cost \$(2005 real) ton CO₂e

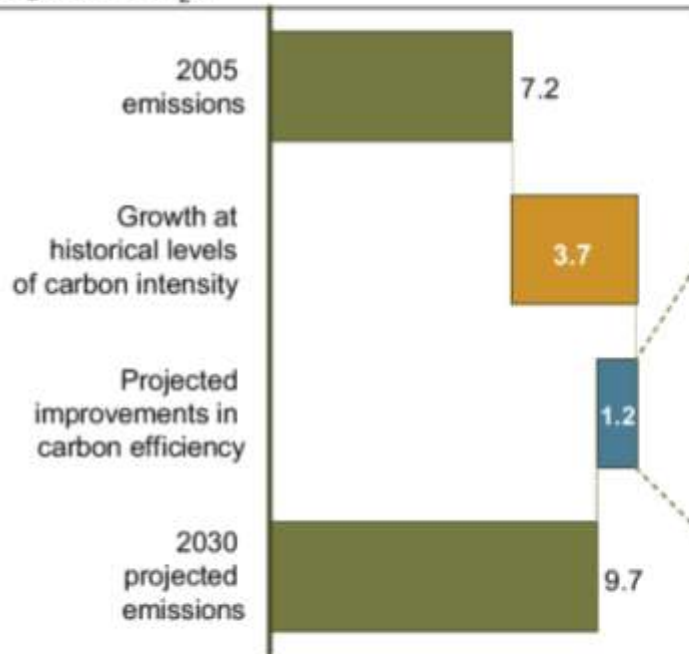


U.S. GHG Reduction Potential

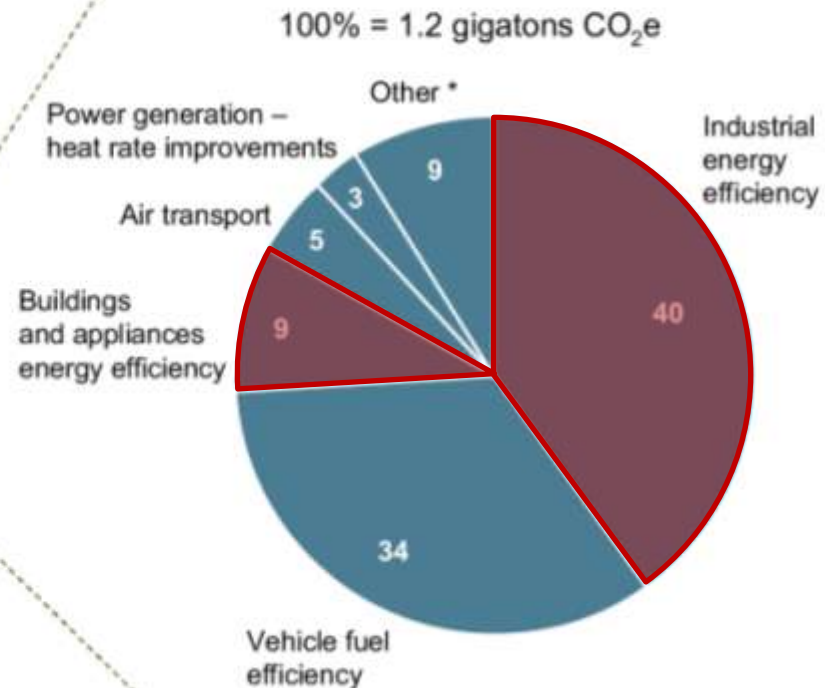
How Much at What Cost?

- U.S. GHG Abatement Potential by Sector (Gigatons CO₂e / yr):
- **Nearly 50% of GHG abatement potential (~ 588 MtCO₂e) in commercial & industrial energy efficiency improvements**

Emissions growth
Gigatons CO₂e



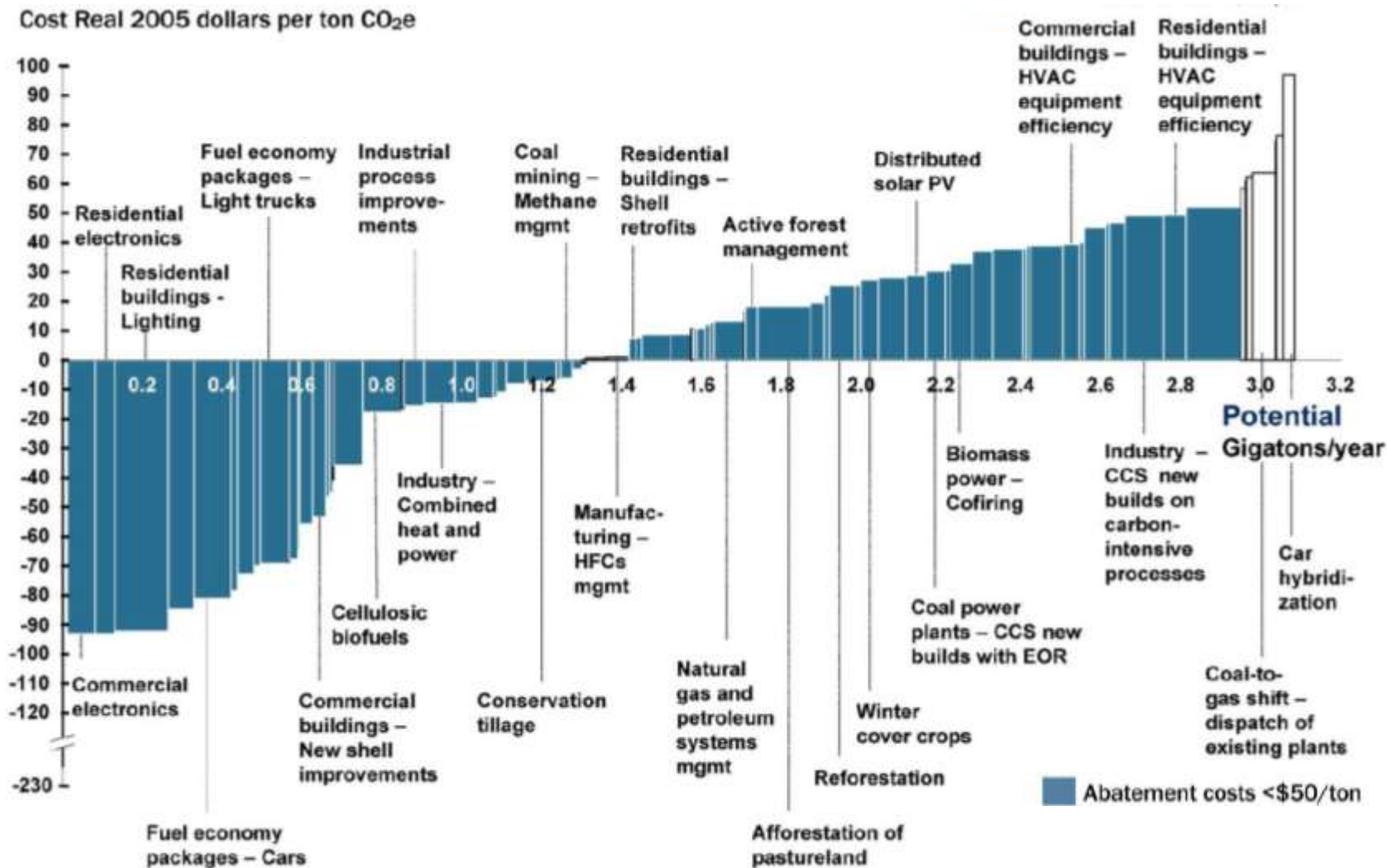
Major sources of improvement
in carbon efficiency
Percent



U.S. GHG Reduction Potential

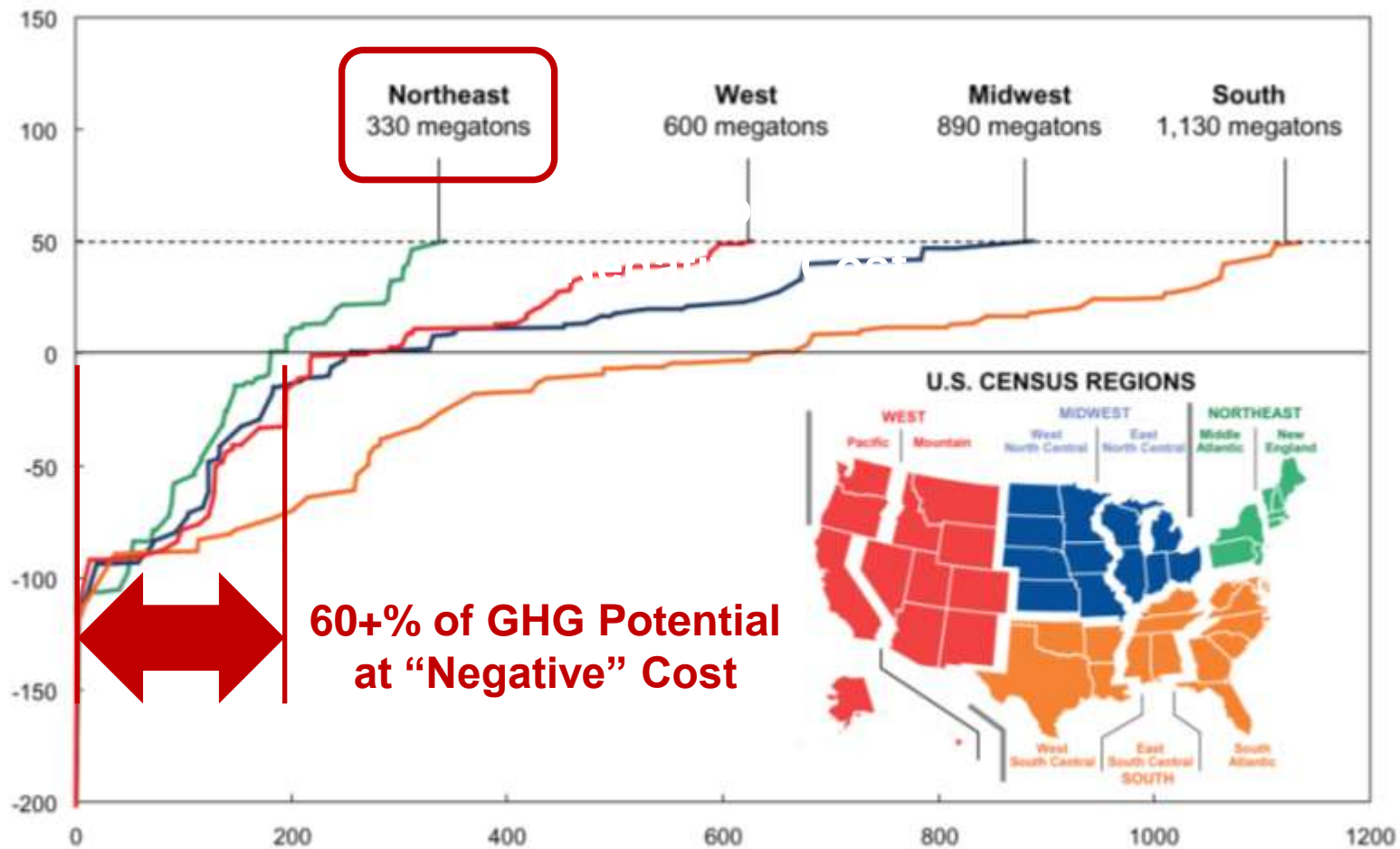
How Much at What Cost?

- 2007 McKinsey GHG Report for DOE / EPA:
<http://www.mckinsey.com/client/service/ccsi/greenhousegas.asp>

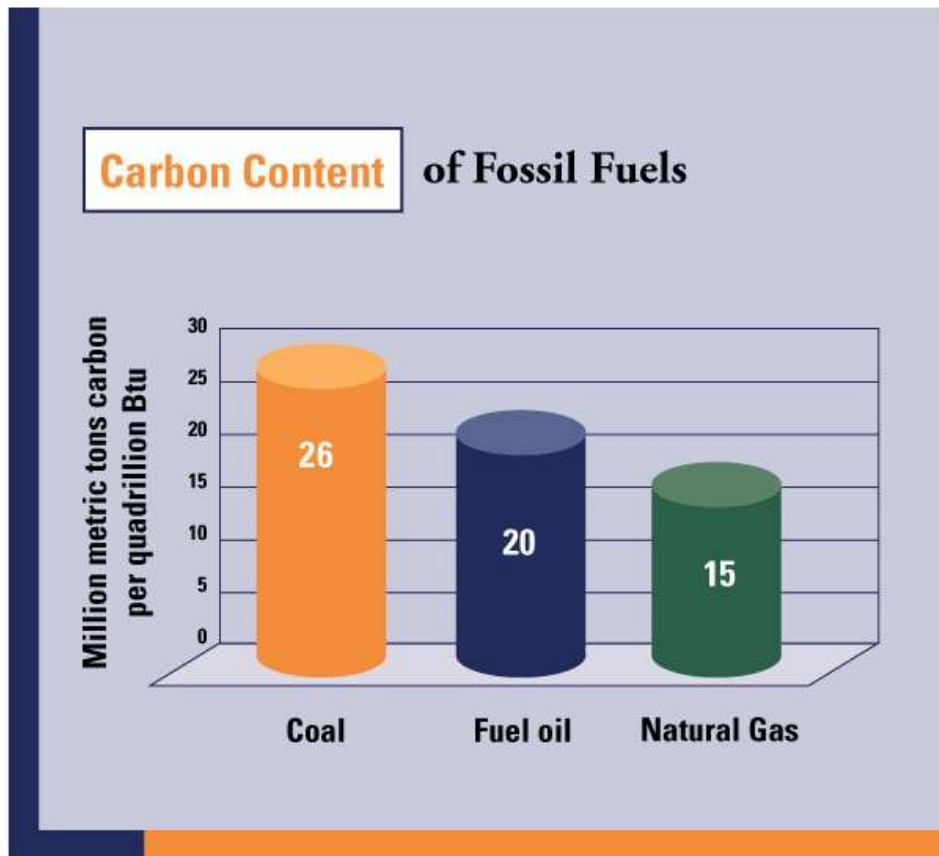


U. S. GHG Reduction Potential: *Distribution by Region*

- U.S. Potential GHG Reductions by Region (2005):
- **Northeast: Total GHG Reductions Potential ~ 330 MtCO₂e**



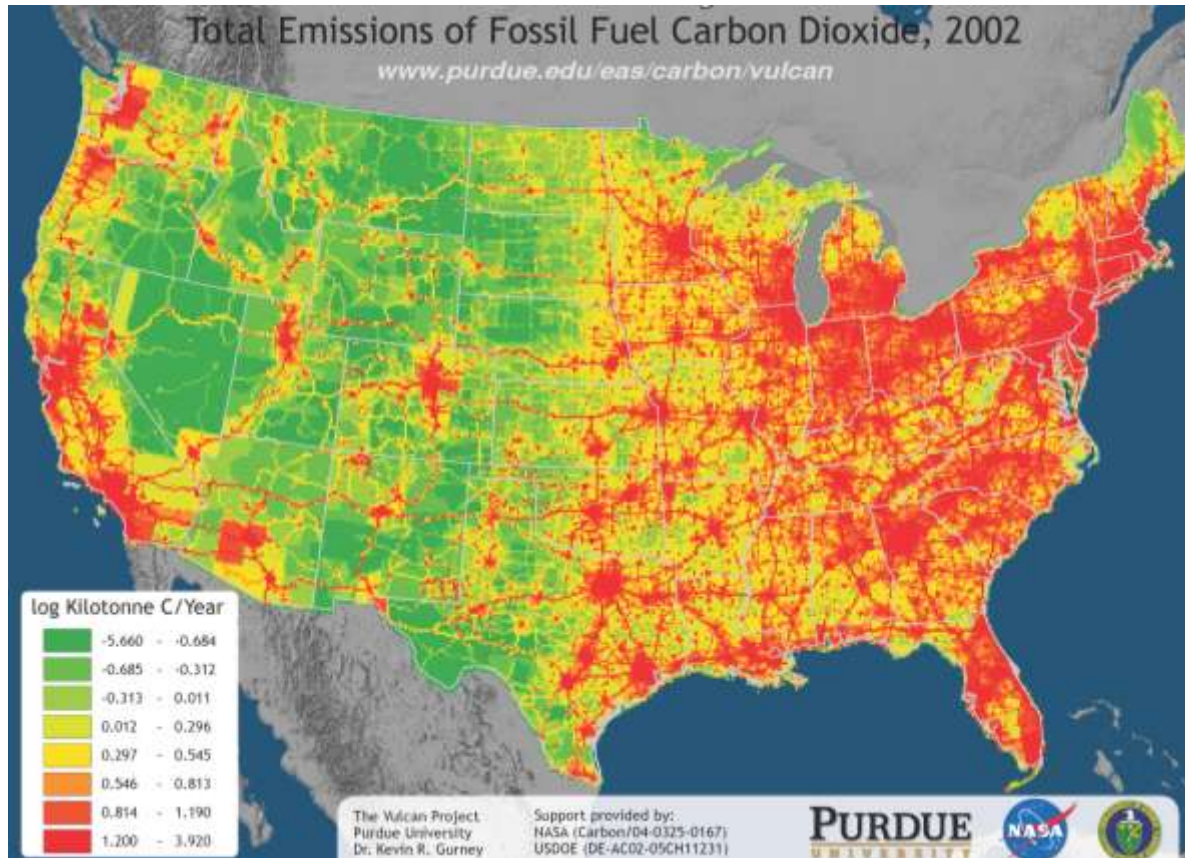
- Comparison of carbon content of major fuels:
- **Coal ~ twice the carbon content of natural gas**



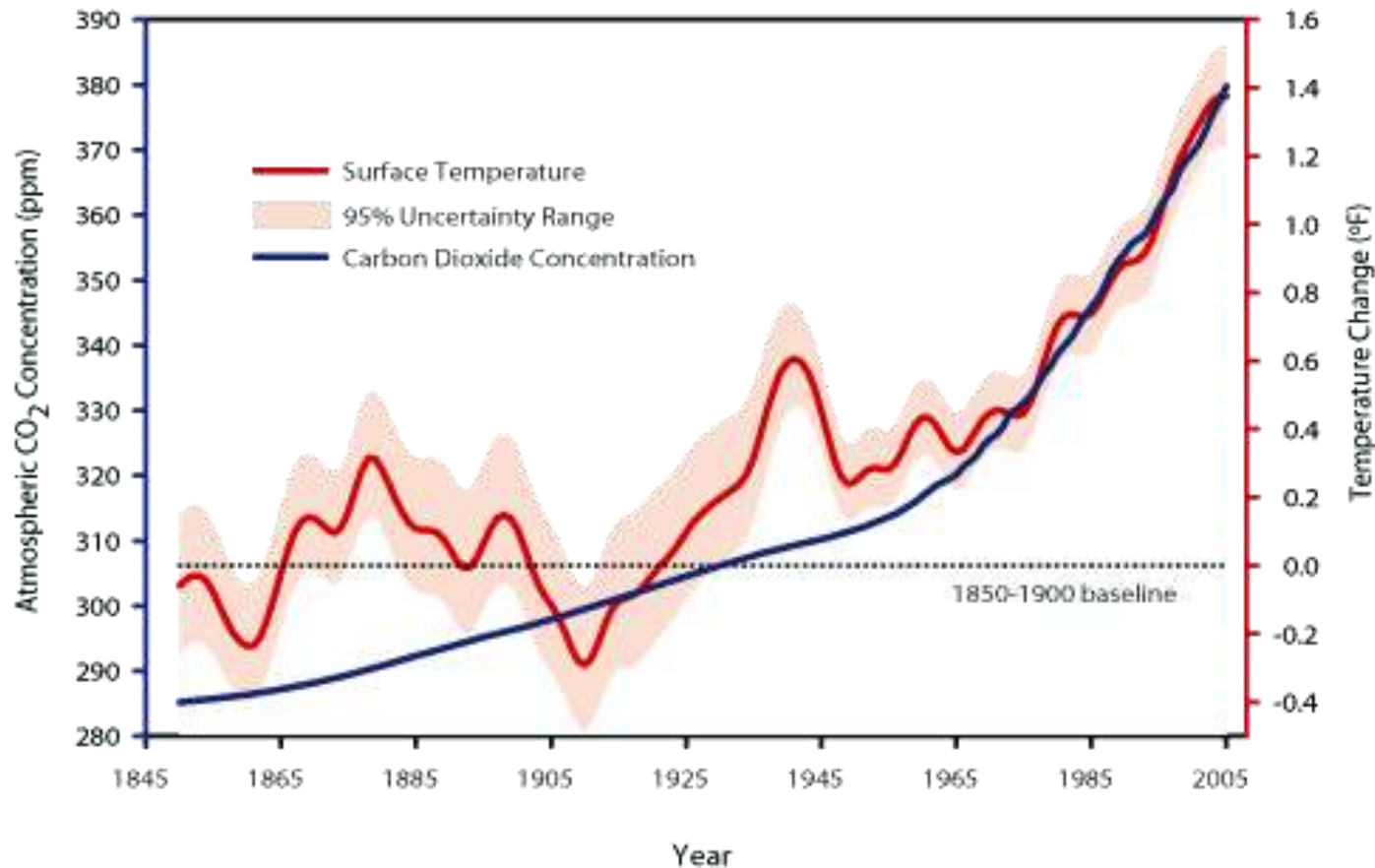
CO₂ Equivalents (lbs/MMBtu)

- **Natural Gas – 117 lbs**
- **Propane – 139 lbs**
- **Distillate Fuels – 162 lbs**
- **Residual Fuels – 174 lbs**
- **Coal (BC) – 205 lbs**
- **Coal (AC) – 227 lbs**

- U.S. CO₂ Emissions Intensity (2002):
- State of New York ~ 251 Million Metric Tons CO₂ (~ 3.5% of the total U.S. inventory of CO₂ emissions)



- Atmospheric CO₂ Levels & Global Surface Temperature – 1845 - 2005:
- Global “Tipping Point” estimated at 450 ppm CO₂



Why Should We Care About CO₂?

- **EPA declares CO₂ a hazard to human health**
 - Potential for EPA to regulate CO₂ emissions like other pollutants (CO, NO_x, etc.) if cap-and-trade fails to reduce emissions
- **Economic value to be placed on CO₂ in the U.S.**
 - Cap-and-trade legislation currently under debate
 - Potential future carbon tax on CO₂ emissions
- **Significant global impacts tied to increasing CO₂**
 - Increase in global temperatures (1°C -3°C+?)
 - Increase in global sea level (3 ft. – 30 ft.?)
 - Quality of life of future generations in jeopardy



- Clean Energy Jobs and American Power Act: Senate Bill currently in progress to respond to climate change & energy security challenges facing the U.S.
- Cap-and-trade system proposed to manage CO₂ emissions in the U.S. in the short-term
- CO₂ – trading at **\$20 / mtCO₂e** at the end of 2009
- CO₂ – expected to be valued at **\$50 / mtCO₂e by 2020** & **\$100 / mtCO₂e by 2050**
- CO₂ offsets currently available in the U.S. of up to **\$5 / mtCO₂e** for CO₂ reduction projects providing a min. of 15,000 metric tons of CO₂ reductions
- It is expected that both cap-and-trade & a carbon tax will be necessary in the future to increase the pace of U.S. CO₂ emissions reductions

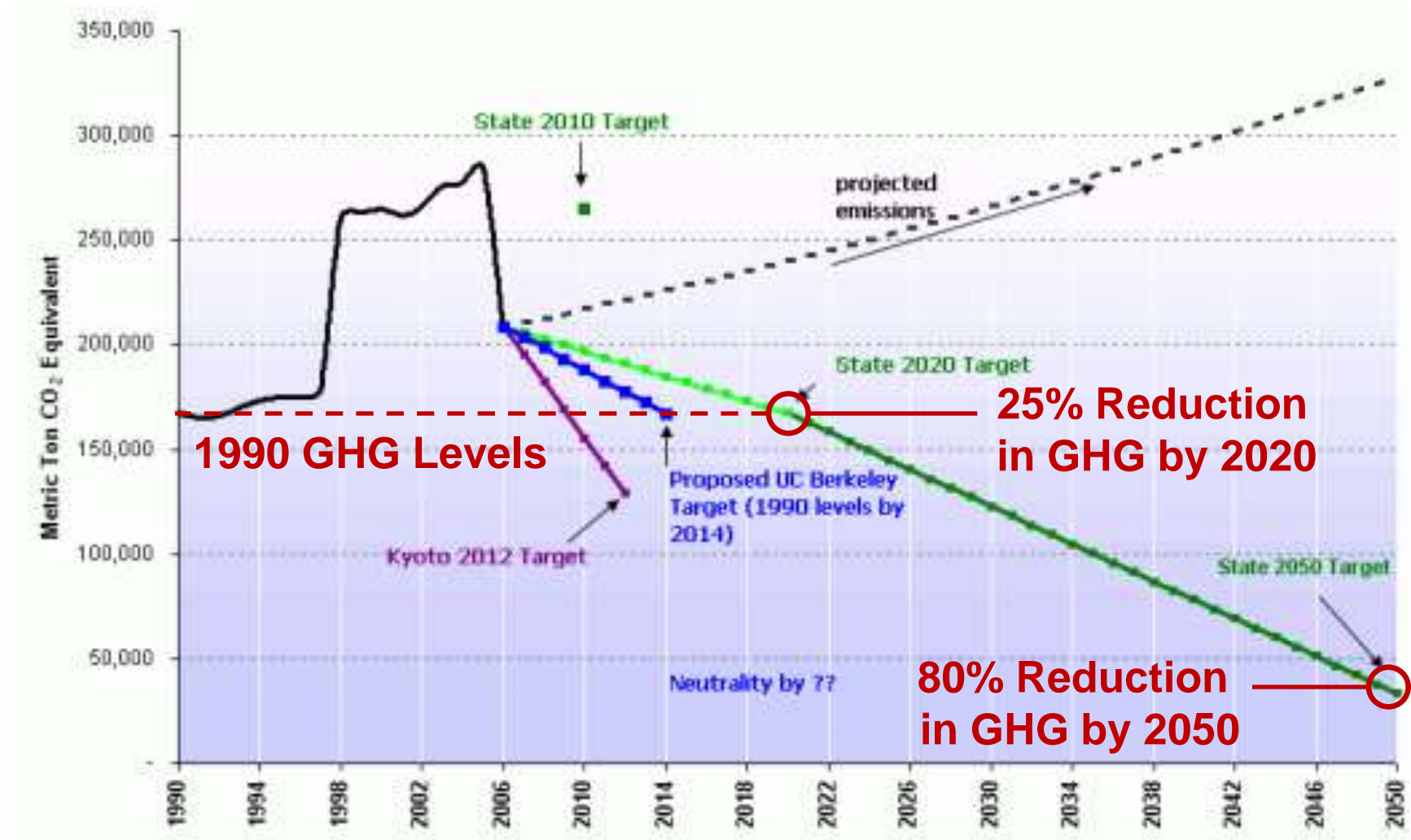


California Emissions *Reaching its “Tipping Point”*

- Learning from LA...



AB 32: GHG emissions reduction targets – 2010 - 2050



Climate Change Commitment *U.S. Colleges & Universities*

- **American College & University Presidents' Climate Commitment:**

<http://www.presidentsclimatecommitment.org/>

- **Over 685 academic institution signatories**

- **Signatories agree to make a commitment to:**

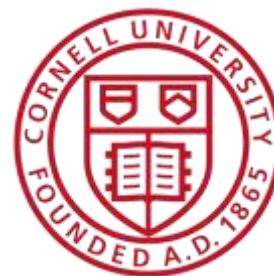
- **Generate a comprehensive inventory of current GHG's & develop a plan to achieve climate neutrality at their campus as soon as possible**
- **Initiate tangible actions to reduce GHG's at their campus in the short term**
- **Make inventory, plan & regular progress reports available to the public to take a leadership role in encouraging action at other institutions**

- **Initiatives target 20% GHG reductions by 2020 & 80% GHG reductions by 2050**



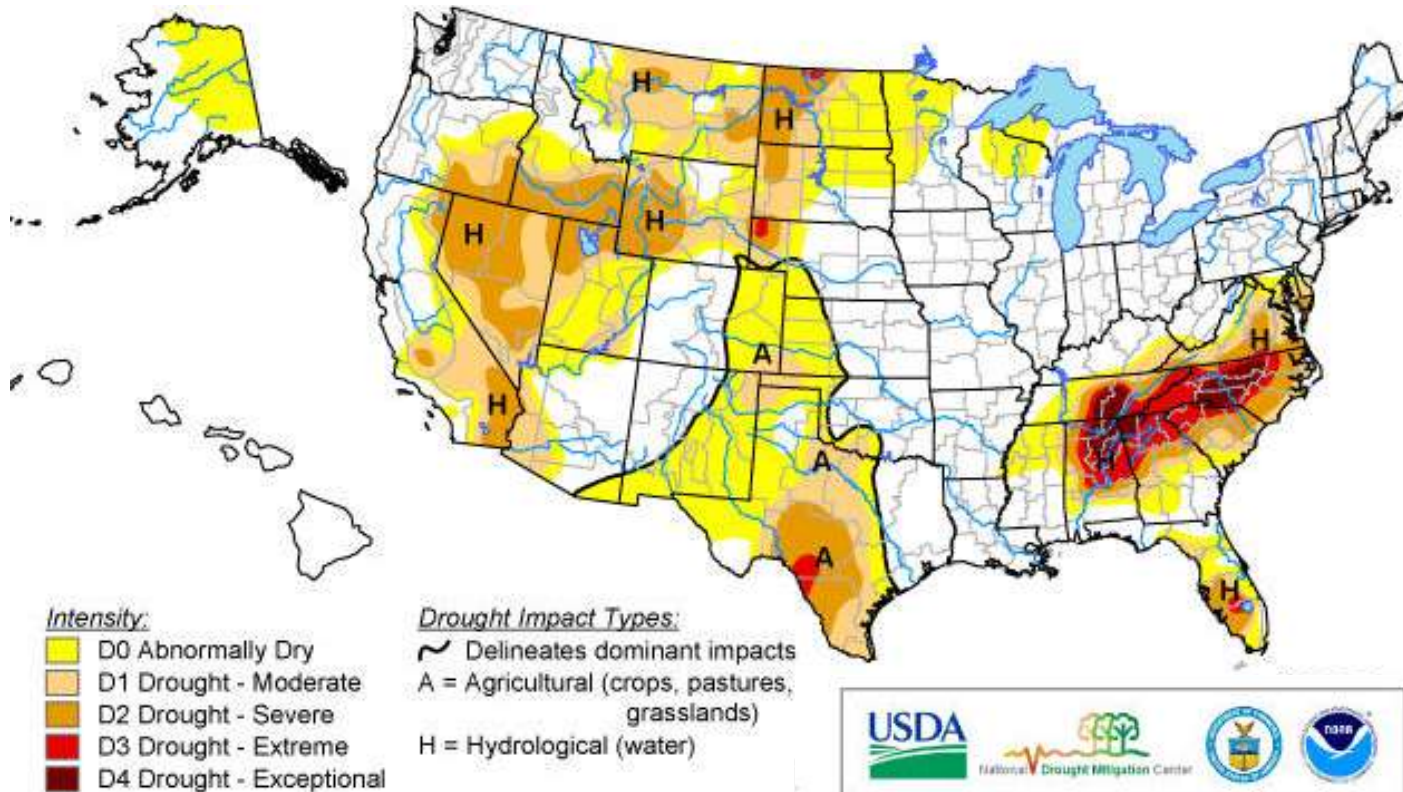
Climate Change Commitment *New York Signatories*

- New York institutions leading the way...



U.S. Survey of Drought Conditions: *Water Supply vs. Demand*

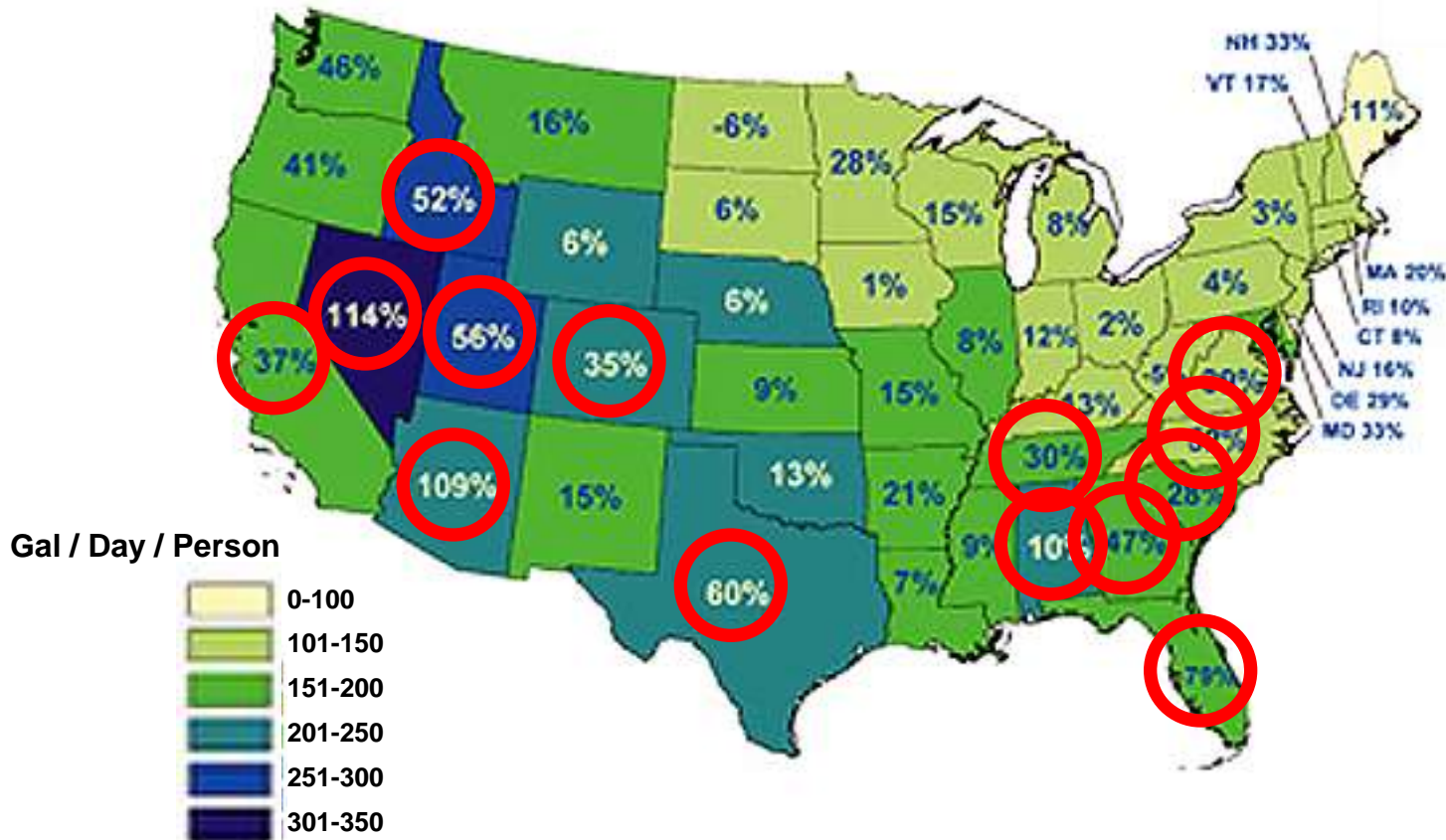
- Drought conditions & severity across the U.S. (2008):
- **“Green” technologies must be utilized to significantly reduce water consumption**



Released Thursday, February 28, 2008
Author: Brad Rippey, U.S. Department of Agriculture

U.S. Survey of Water Consumption: Water Supply vs. Demand

- U.S. per capita water use (gallons per day) 2008 + Projected state-wide population increases (%) by 2030:
- Increased water consumption is at odds with drought conditions in various regional “hot spots”



+7%

\$ H₂O
(annual)



MIURA

Questions:

Jason Smith, LEED A.P.

(770) 916-1695 Office

(678) 939-7630 Cell

jason.smith@miuraboiler.com