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DISTRICT ENERGY AND SUSTAINABILITY

2014 College & University Conference

Positive proof of global warming

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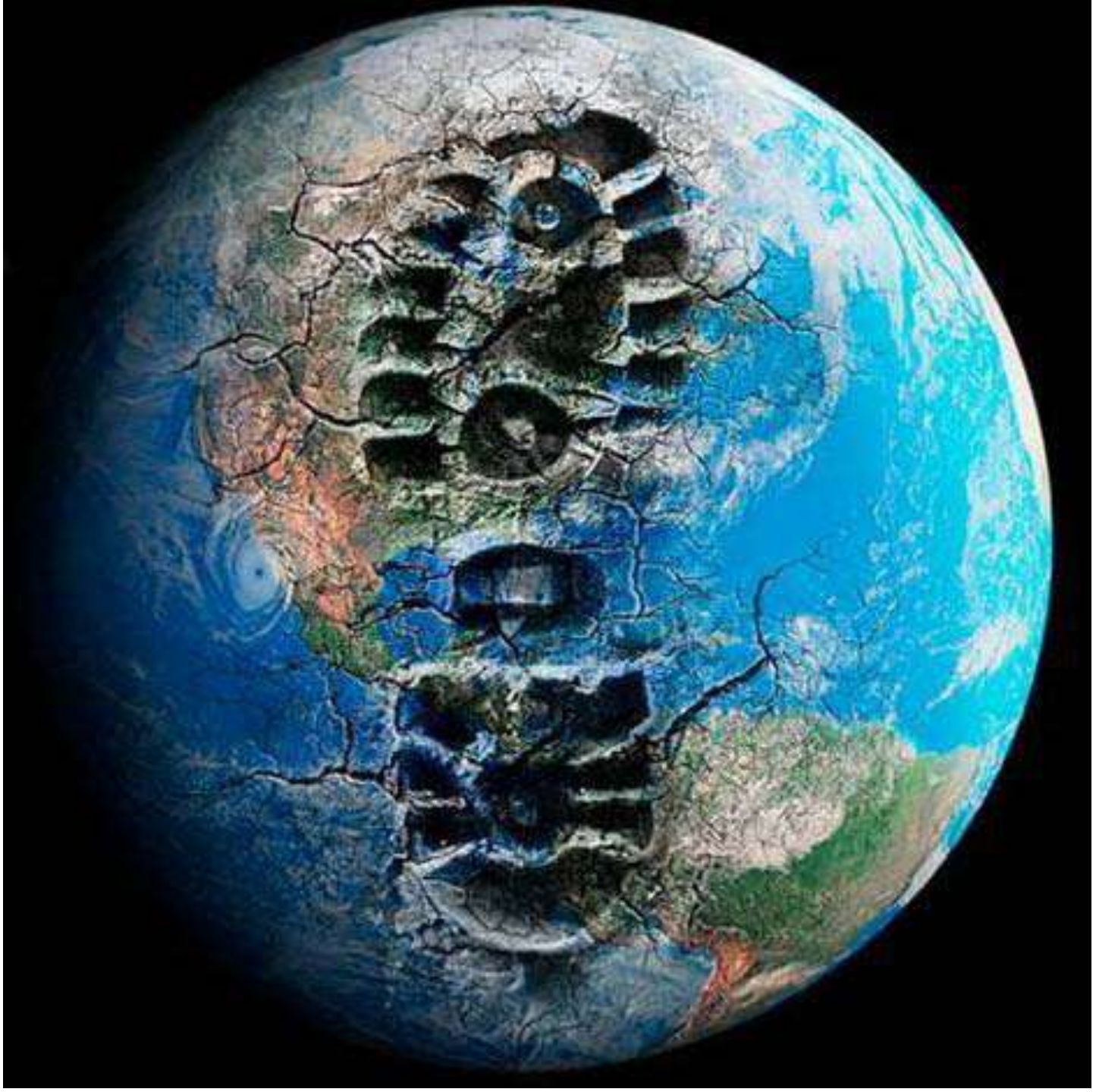


IMPACTS OF U.S. BUILDINGS ON RESOURCES

40% primary energy use*

72% electricity consumption*

39% CO_2 emissions*

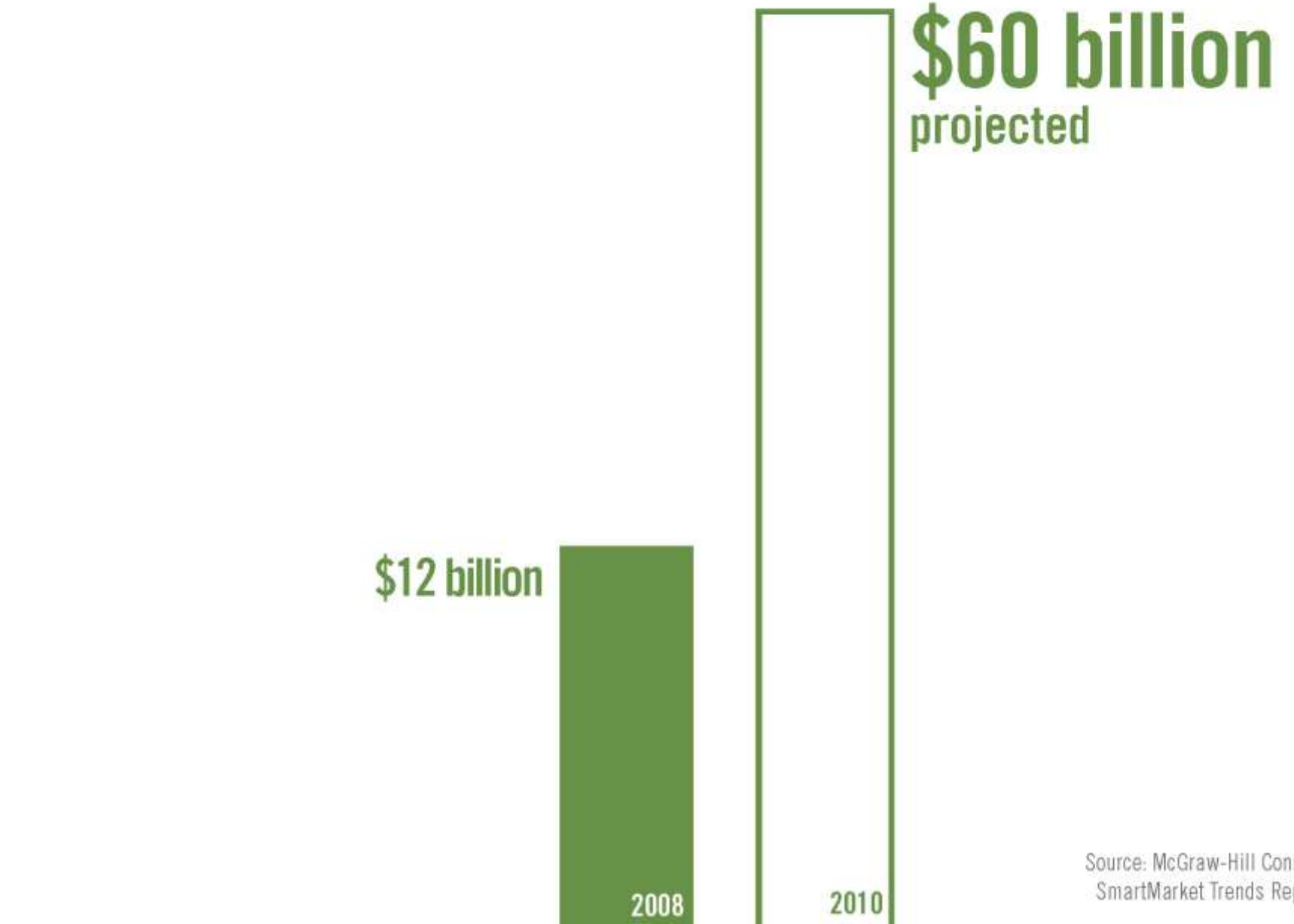
13.6% potable water consumption**

Sources:
*Environmental Information Administration (2008). EIA Annual Energy Outlook.
** U.S. Geological Survey (2000). 2000 data.

Leadership in Energy and Environmental Design

A leading-edge system for certifying the greenest performing buildings in the world

Green Building is in Demand



Source: McGraw-Hill Construction,
SmartMarket Trends Report 2008


U.S. GREEN BUILDING COUNCIL
LEED PLATINUM
2009

Square Footage of Commercial LEED Certified Projects

(Cumulative)

1.4 billion*

© U.S. Green Building Council, 2011

*As of March 2011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What does this mean for me???

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Depends….

- Are your Campus DES Goals and Sustainability Goals aligned?
- Is your product or design limiting the potential of your customers from achieving their goals?

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Traditional Sales

- Savings on Up-Front Capital and On-Going Maintenance Costs
- Saves Valuable Space
- Effective Management Of Cooling and Heating Costs
- Enhanced Reliability

What Matters?

- Your District Energy System's impact on:
  - **Energy**
  - **The Environment**

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Recent History of Sustainable Building's

- ASHRAE 90.1
- ASHRAE 62
- USGBC
- LEED Rating System
- Appendix G
- ASHRAE 189.1

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Recent History of Sustainable Building's

- Version 2.1
- Intro DES Guide
- LEED 2009
- DES Guide Update
- LEED v4

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Recent History of Sustainable Building's

- Building applicants now have the option of using LEED 2009 or LEED v4
- In summer 2015, LEED v4 is the only option

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What's Changed???

- Good News!
  - It is all in the reference guide now.

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What's Changed???

- Good News!
  - Now get credit for water savings with Cooling Towers.

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What's Changed???

- Bad News!
  - Not with District Energy Systems.

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What's Changed???

- Demand Rates Expanded
  - Thermal Storage Benefit still exists

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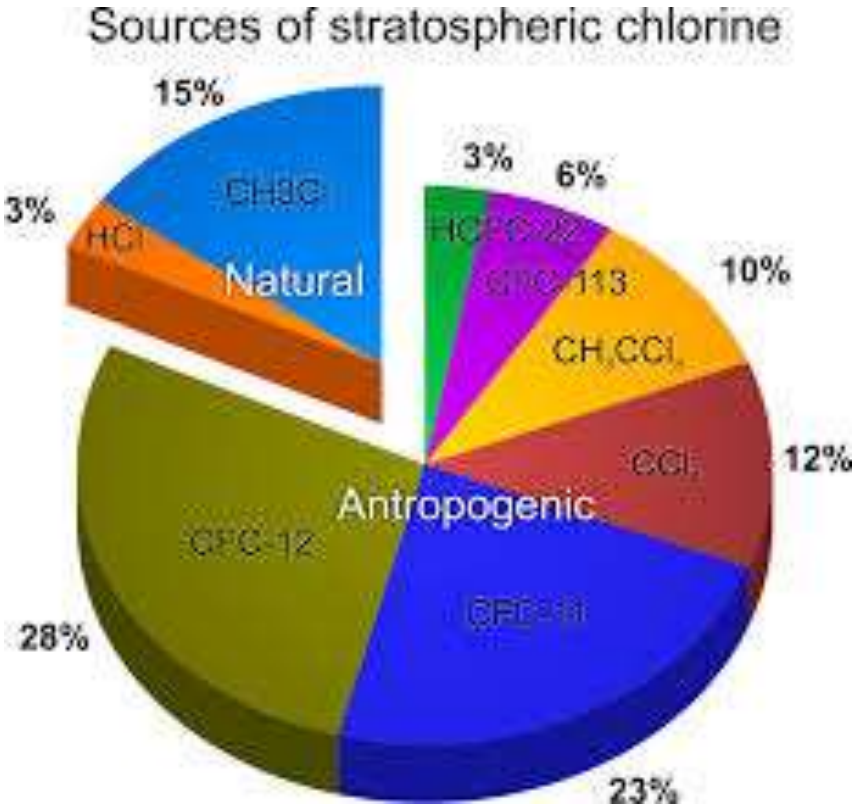
What's Changed???

- CFC's!
  - The option to develop a phase out study has been dropped.



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What's Changed???

- Energy
  - More Options
  - Higher targets

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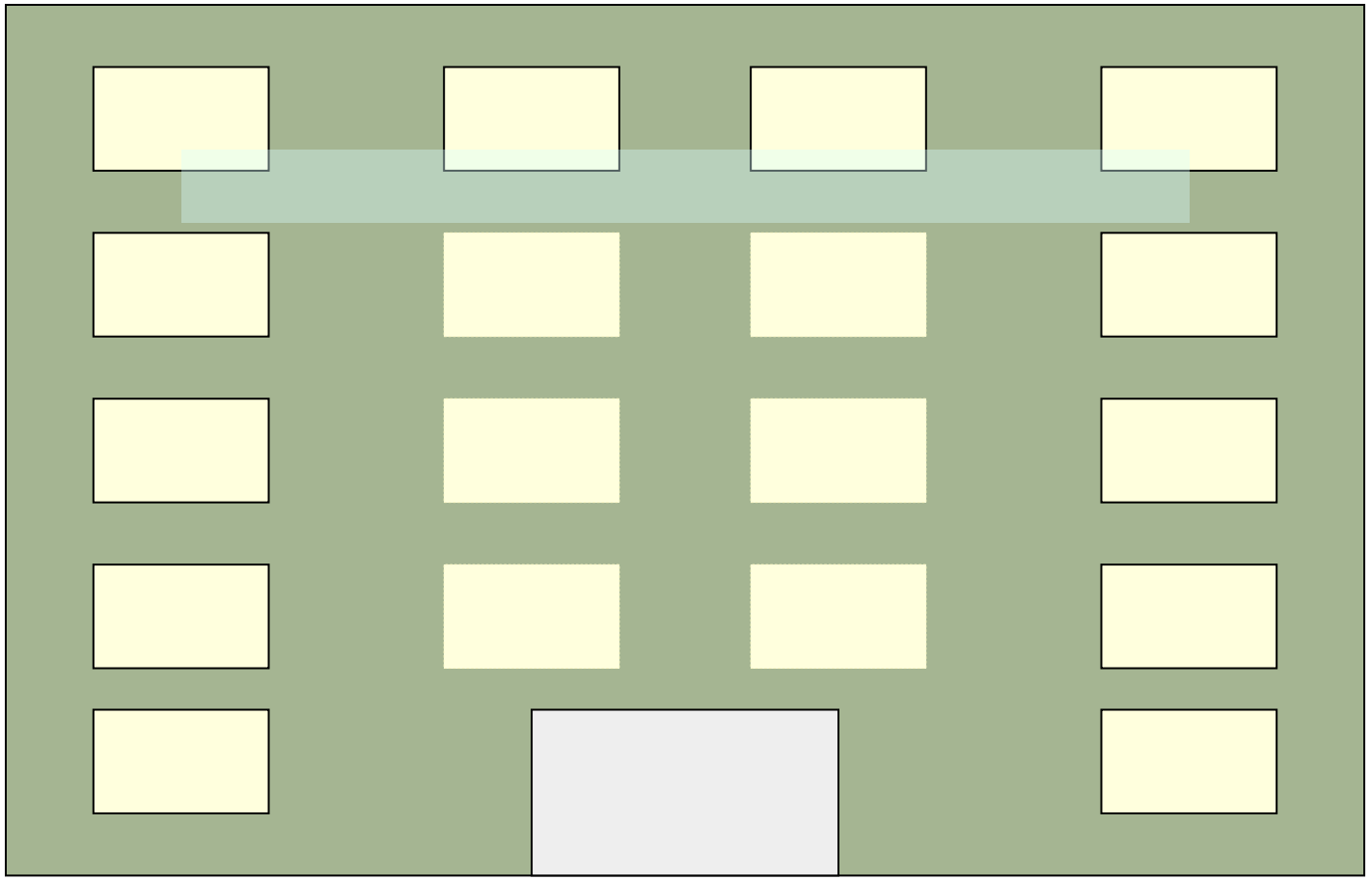
ASHRAE 90.1



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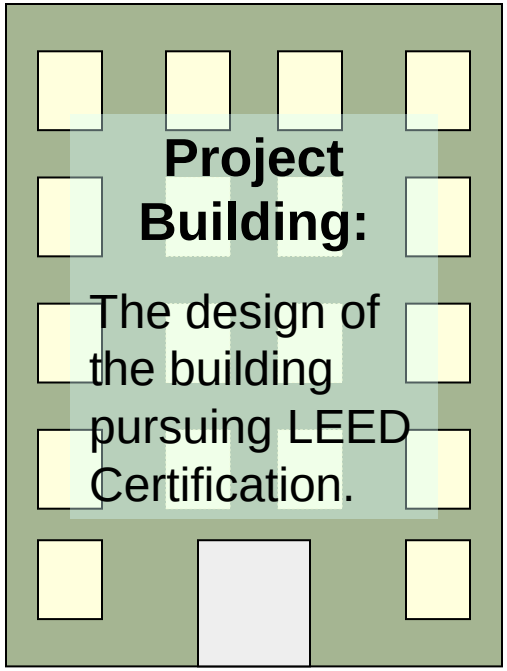
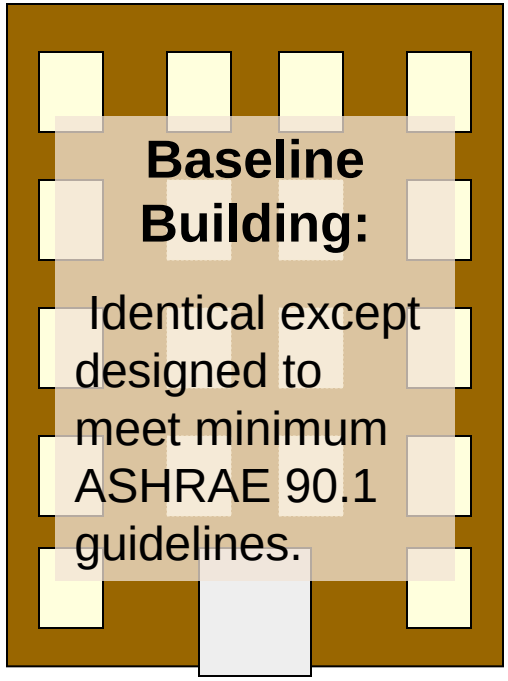
Appendix G





ENERGY USE IN DOLLARS

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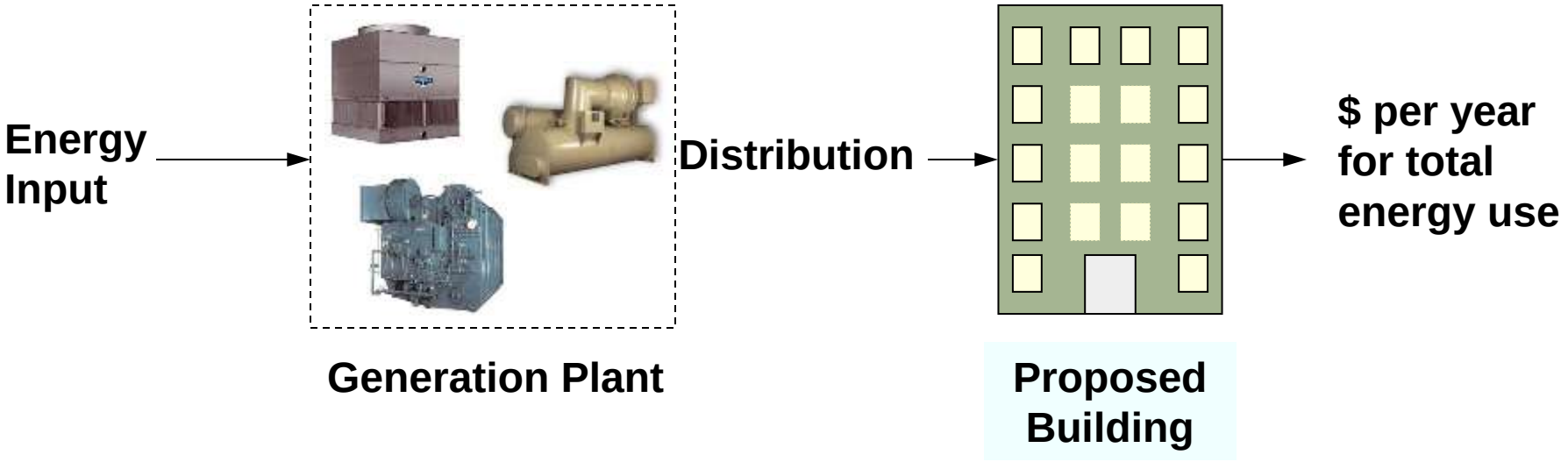
District Energy Analysis



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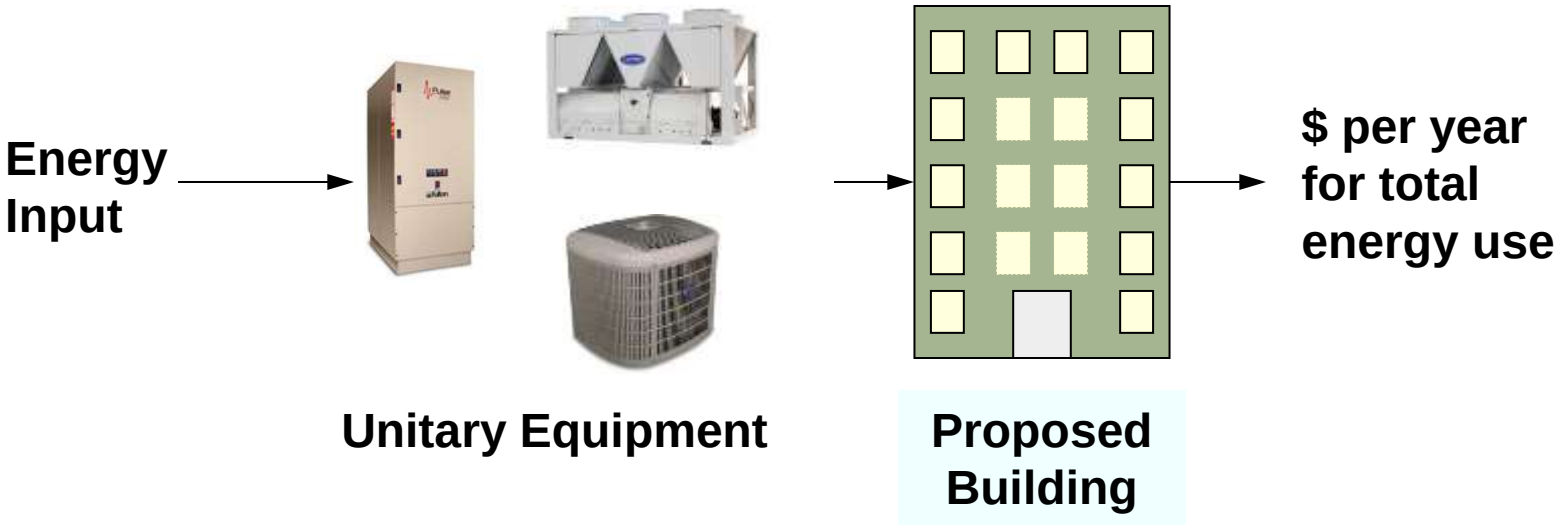
Code Minimum Comparison



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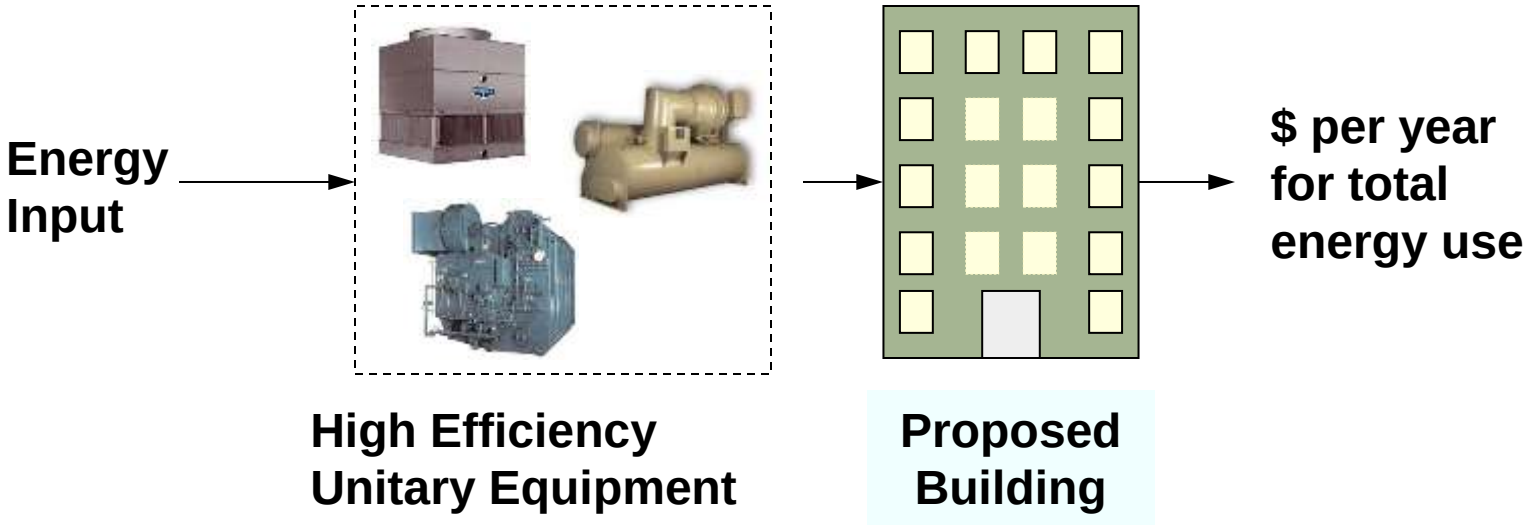
Real Comparison



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LEED Advantages of District Energy Systems

- **Energy Efficiency**
  - Generation Improvements
  - VSDs
  - Innovative Heat Syncs
  - Distribution Efficiency Improvements
  - Thermal Storage

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Combined Heat and Power (CHP) in DES

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Renewable Energy

On-Site Renewable Energy
Credit 2 – Eligible Renewables

- Photovoltaic Systems
- Wind Energy Systems
- Solar Thermal Systems
- Biofuel-Based Electrical
- Geothermal Heating Systems
- Low-impact Hydroelectric
- Wave & Tidal Power
- Landfill Gas

- Untreated Wood Waste
- Agricultural Crops or Waste
- Animal Waste & Other Organic Waste

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On-Site Renewable Energy Credit – Ineligible Systems

- Wood coated with paints, plastics, or formica
- Ground Source Heat Pumps
- Combustion of municipal solid waste
- Forestry biomass waste other than mill residue
- Treated wood

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What's Changed???

- All Bad News!
  - Possible points reduced from seven to three!

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What's the Future Hold for DES???

- More Pressure for Energy Savings!!!
- Need for Innovative District Energy!

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What's Your Organization Done for You?

- Helped write the first three versions of the DES Guideline (NC & EBOM)
- Worked on LEED 2014 Update
- User Guide on IDEA Website
- Education
- ASHRAE 189.1
- Quarterly Column

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What should you do?

- Have a study of your system completed
- Consider adding renewable energy, and CHP to your system
- Change your marketing brochures
- Develop a one stop location for LEED information on your system
- If Energy is a component of your value proposition, have a energy model of your system completed

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What I can't do

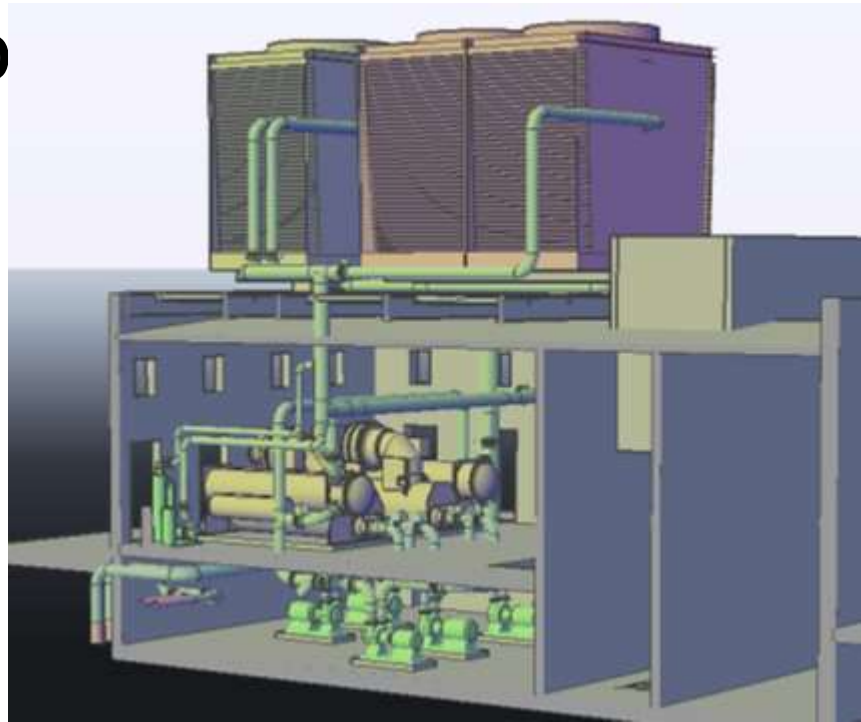
- Figure out how many energy points a building gets from tying into my DES.

What I can do

- Figure out whether the building will get more, less, or the same amount with DES versus alternatives!

Case Study – DES with CHP

- Typical Electric Production = 33% efficiency
- Electrical = 25%
- Steam = 50%
- CHP = 75%



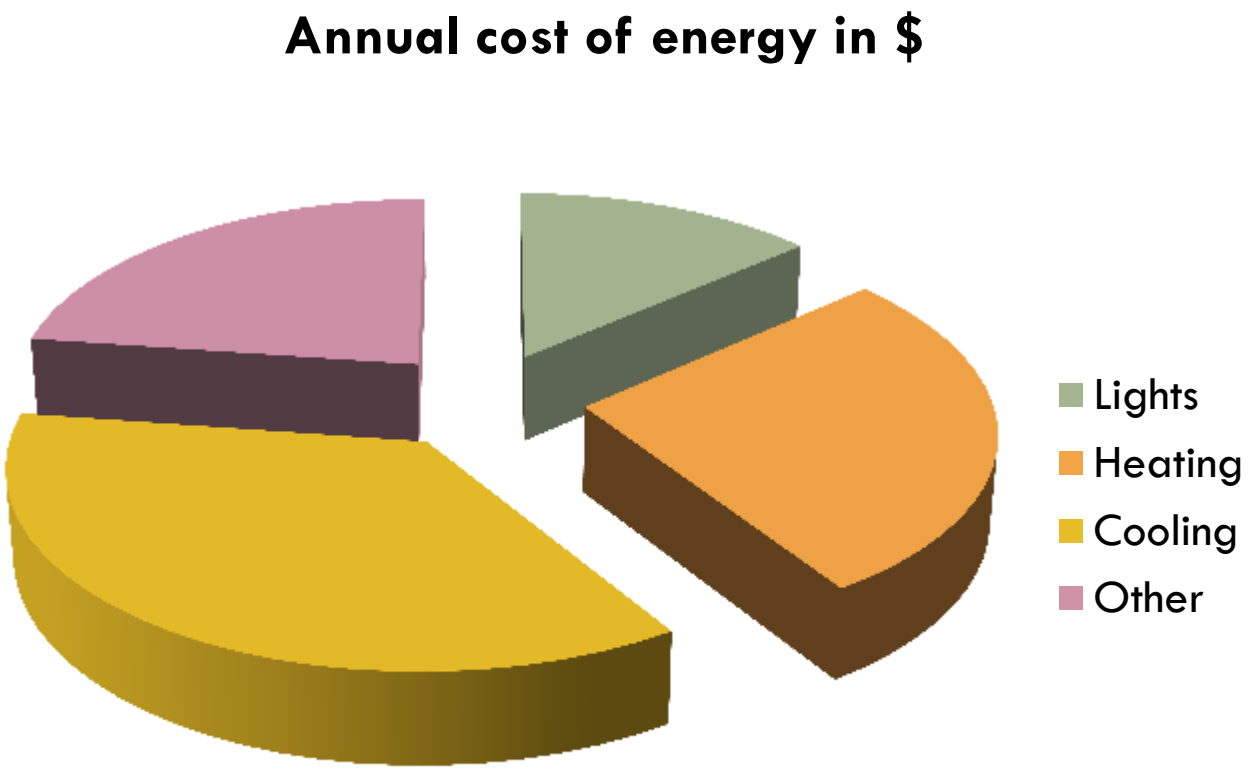
Case Study Numbers

- For every 1 MMBTU of Steam Required, the Plant Uses 2.66 MMBTU's of Natural Gas

Case Study Numbers

- For every 1 MMBTU of Steam Required, the Building receives credit for 0.23 MWh of Free Electricity.

Real Comparison



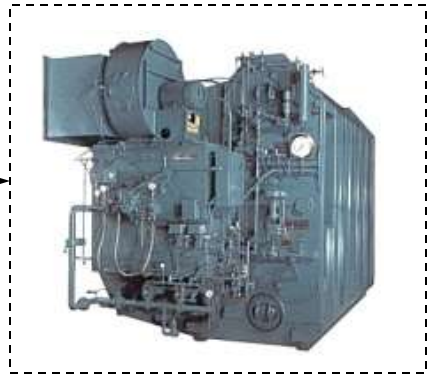
Our Variables

- Natural Gas Costs: $6.30/decatherm
- Electrical Cost = $0.07/KWh
- Blg. Boiler Eff. = 80%

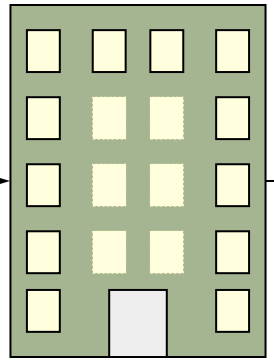
Modeling Methodologies

Annual Heating Input required is 1,000 MMBTU

Energy Input = 2,660 MMBTU



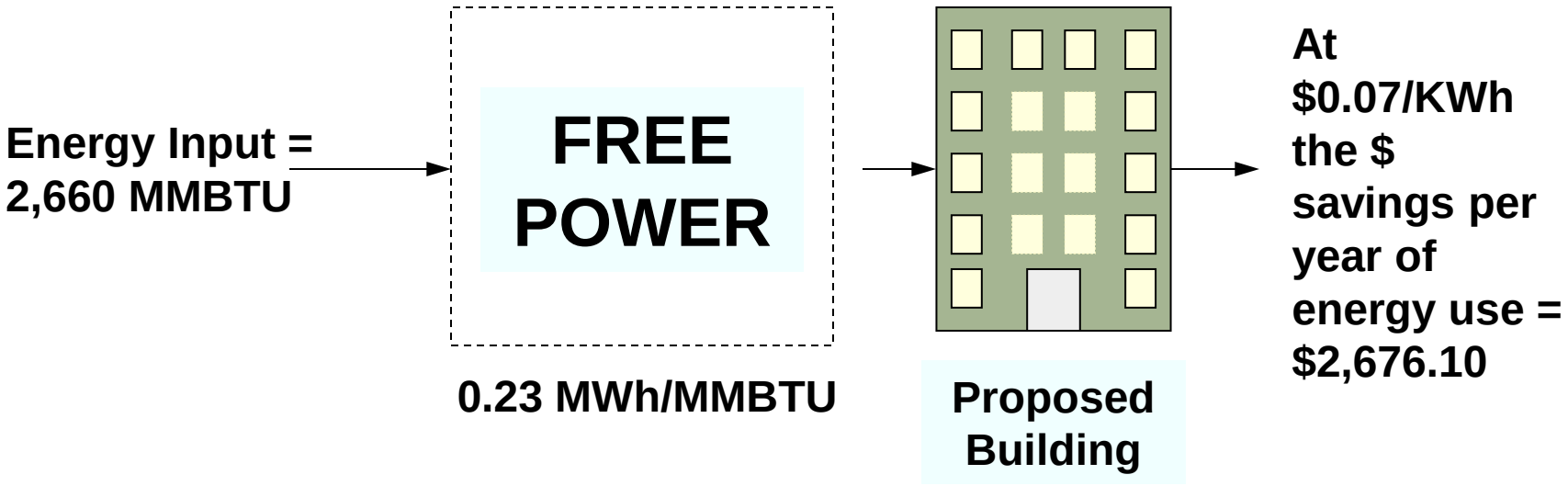
37.6% Boiler Plant



Proposed Building

At $6.30/MMBTU the $ per year for total energy use = $16,760

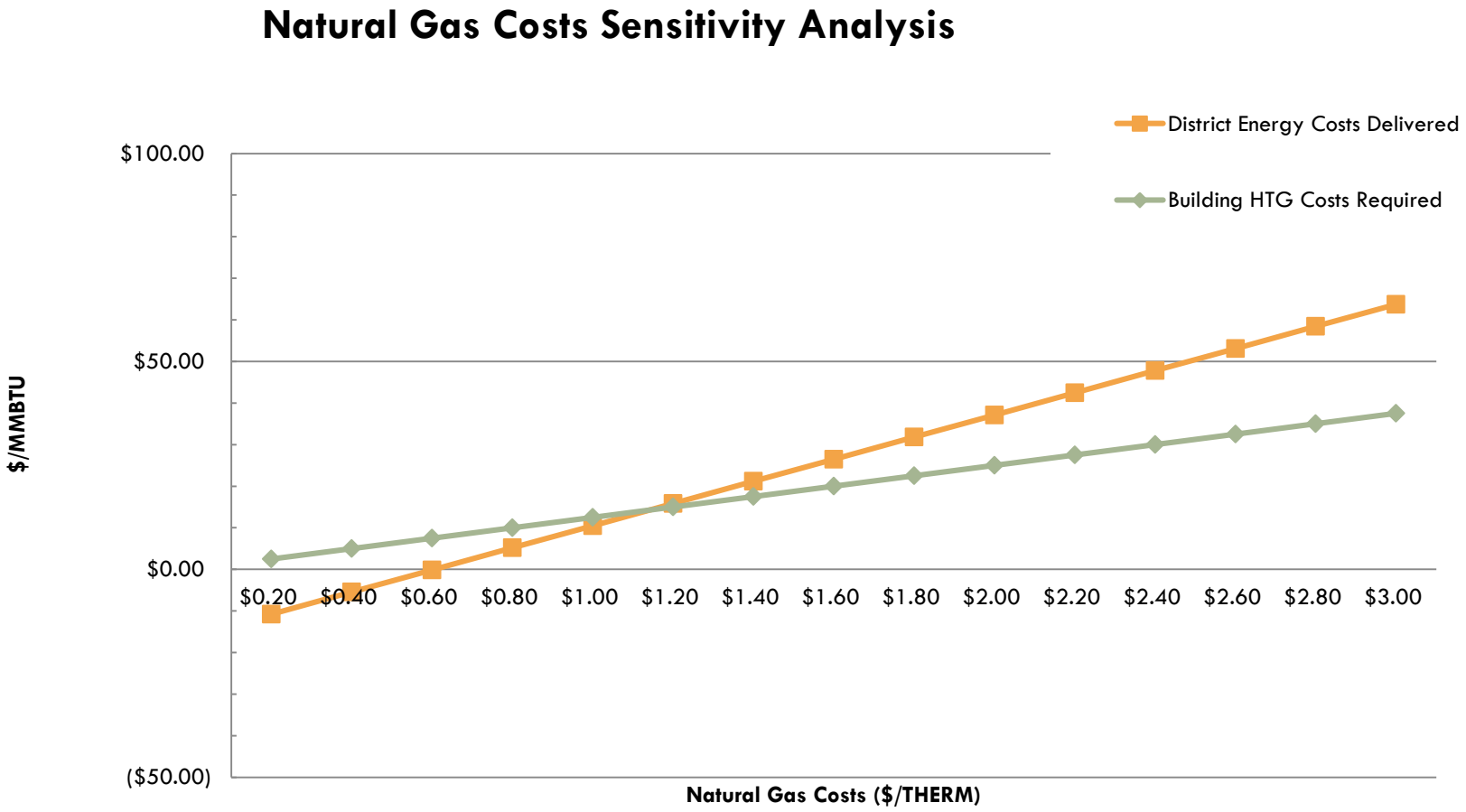
Modeling Methodologies



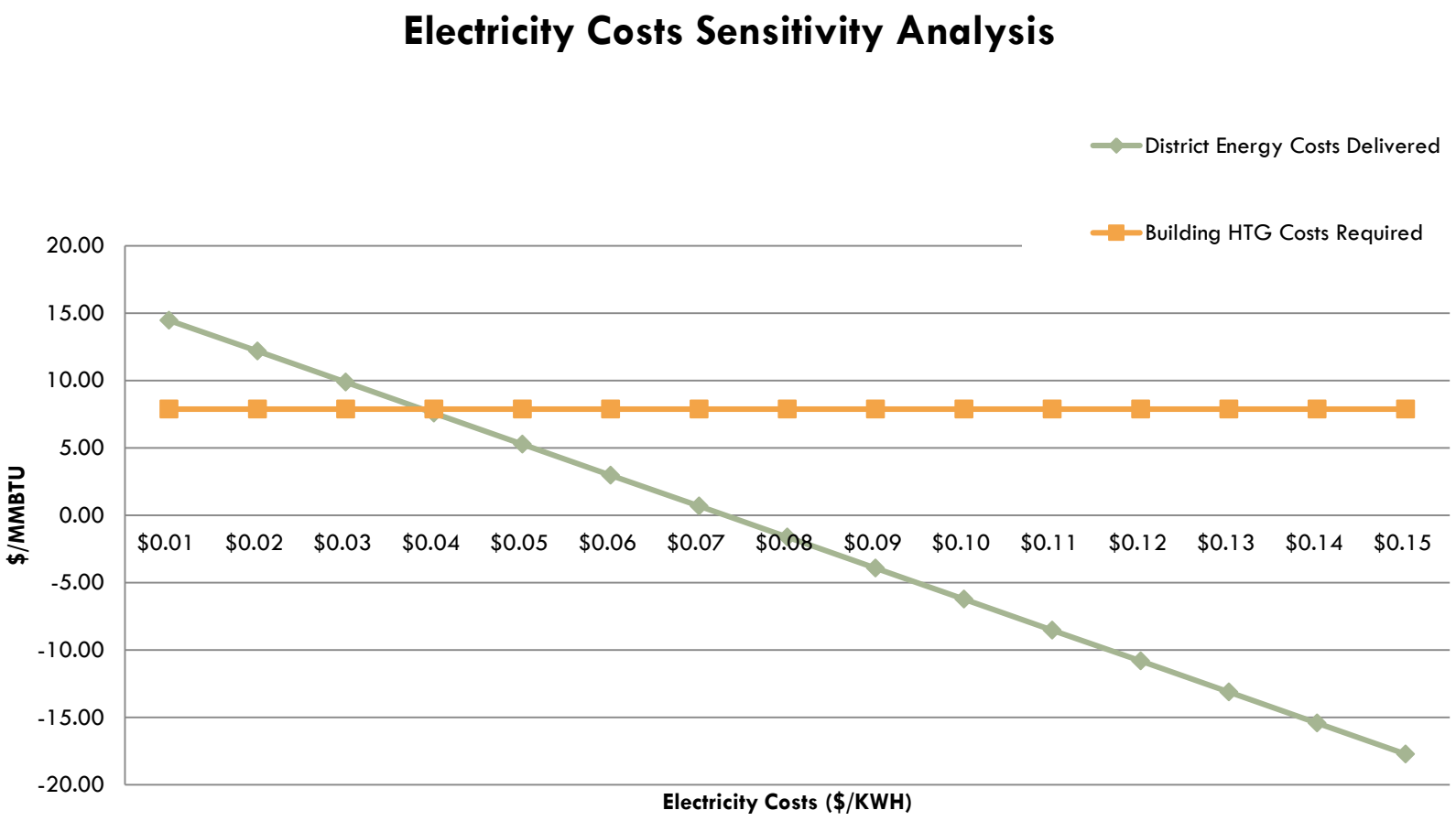
Case Study: How Does DES Compare?

- Cost of Heat = $0.67/MMBTU
- 80% Efficient Building boiler Cost of Heat = $7.88/MMBTU

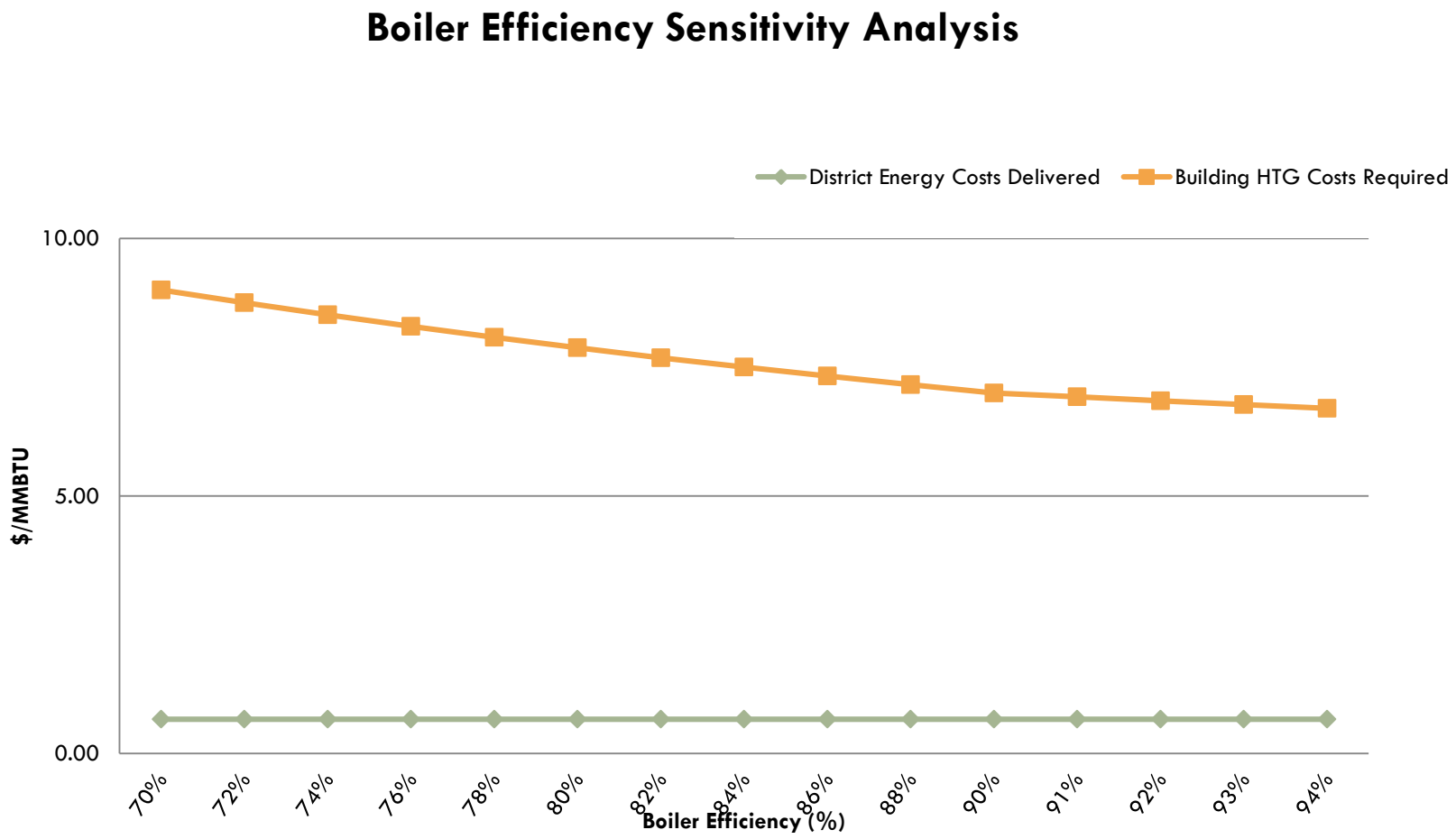
What if Natural Gas Goes Up?



How Low Would Electricity Have to drop?



How efficient would your building boiler have to be?



New Motto from the GA Governor

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Questions

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Closing

- Quarterly Column in *District Energy Magazine*
- tim.griffin@rmf.com
- 919.941.9876

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