

Discussion Topic for  
**3<sup>rd</sup> Energy Workshop**  
Dallas, TX, 24 Jan 2007

**EPAct, ASHRAE 90.1,  
LCCA, DOE ruling, LEED,  
RFPs, Verification**

Jim Martin, Louisville District



# EPAct 2005 Energy Requirement

- Establishes ASHRAE 90.1-2004 as the minimum Energy Std
- If LCC effective, design building to achieve energy consumption levels that are at least 30 percent below ASHRAE Energy Std



# EPAct 2005 Energy Requirement

- Interpretation:

The Government is willing to pay for building features that reduce **consumption** up to 30% so long as these features are LCC effective.



# EPA Act 2005

## Energy Requirement

- NOTE:
  - ASHRAE 90.1 does not define maximum **consumption**.
  - It prescribes building features, and
  - It offers comparative methods based on **cost**, not **consumption**.



# ASHRAE 90.1-2004 Energy Standard for Buildings

- Prescribes minimum requirement for building features:
  - Envelope
  - HVAC
  - Water Heating
  - Power
  - Lighting



# ASHRAE 90.1-2004 Energy Standard for Buildings

- Examples of prescribed requirements:
  - minimum R values
  - maximum glass area
  - minimum HVAC equipment efficiency
  - where and how to use economizers
  - maximum hot water storage tank losses
  - max power circuit voltage drop
  - max lighting power



# ASHRAE 90.1-2004 Energy Standard for Buildings

- Don't like the prescription?
- Have alternates in mind?
- Chapter 11 says that's OK if:
  - Energy **cost** of the alternate design is not greater than that of prescribed (budget) building.
- “Energy Cost Budget Method”



# ASHRAE 90.1-2004

## Energy Standard for Buildings

- Chapter 11 says – no major changes to the HVAC type. For example:
  - If the proposed system is ground coupled heat pump,
  - The budget system must be ground coupled HP or other water cooled condensing.
  - Not air cooled condensing.



# ASHRAE 90.1-2004 Energy Standard for Buildings

- **Appendix G** - quantify energy performance that exceeds the prescribed requirements.
- “Performance Rating Method”



# ASHRAE 90.1-2004 Energy Standard for Buildings

- **Appendix G method** - Not for alternates
- Used to show the percent decrease in energy **cost** from the baseline.
- Baseline HVAC system is defined.



## D.O.E. Ruling (Info not found in EPAAct)

- EPAAct 2005 applies where design begins on or after **January 3, 2007**
- Process loads are not included
- If 30% reduction is not LCC effective, modify the design for less reduction and recalculate the LCC.



# D.O.E. Ruling (Info not found in EPA Act)

- Modifies ASHRAE Appendix G formula
- Percent Improvement is based on **consumption**, not on **cost**.



# D.O.E. Ruling

- Question:

With the focus on energy **consumption**  
and not on energy **cost**,  
does the EPA Act and DOE Ruling  
essentially ignore  
schemes that reduce or shift demand?



# D.O.E. Ruling

- Question:

If schemes that reduce demand are not important, should demand savings be included in the LCCA?



# Life Cycle Cost Analysis

- Consider **BLCC5** (by **N**atl. **I**nst. of **S**tds. and **T**ech.)
- Handles: Milcon, non-Milcon, Energy, non-Energy, FEMP, ECIP, ...energy escalation.
- IAW 10 CFR 436 & OMB Circular A-94.  
(required by the DOE Ruling)
- **Free** download from:
  - [http://www1.eere.energy.gov/femp/information/download\\_blcc.html](http://www1.eere.energy.gov/femp/information/download_blcc.html)



# Life Cycle Cost Analysis

- Define in the RFP:
  - **Study Type** ( MilCon Analysis – Energy )
  - **Discounting Type** ( Mid-year )
  - **Inflation Adj.** ( Constant Dollar – excluding inflation )
  - **Length of Study** ( 25 year )
  - **Energy (fuel) Escalation Rates** ( Commercial \* )
  - **Discount Rate** ( real = 3% \* )
  - \* = updated annually by OMB



# Life Cycle Cost Analysis

- Also define **Utility rates** in the RFP. Examples:
  - **Electrical:**
    - Demand Charge - \$15.19 per kilowatt
    - Energy Charge - \$0.02747 per kilowatt-hour
    - Blended Rate - \$0.0649 per kilowatt-hour (blended annual energy and demand cost)
  - **Natural Gas:**
    - Commodity rate charge - \$8.78 per thousand cubic feet
  - **Water:**
    - Commodity Charge - \$3.00 per thousand gallons
  - **Sewer:**
    - Commodity Charge - \$3.00 per thousand gallons



# LEED-NC

- Leadership for Energy and Environmental Design – New Construction
- Most Credits are 1 point each *except*
- Optimize Energy Performance Credit is 1-10 points



# LEED-NC

(Optimize Energy Performance Credit)

- Based on Energy *Cost* savings
- ASHRAE 90.1-2004 is the baseline
- Use Appendix G method



# LEED-NC

## (Optimize Energy Performance Credit)

- Note: The word “**Optimize**” is a misnomer.
- “**Reduce**” would be a more accurate reflection of this LEED credit goal.
- Optimizing for cost does not enter into the equation here.



# LEED-NC

## (Optimize Energy Performance Credit)

- For New Buildings, reduce energy **cost** by:
  - **10.5%** - Get **1** point
  - **24.5%** - Get **5** points
  - **42.0%** - Get **10** points



# LEED-NC

## (Optimize Energy Performance Credit)

- Note: Previous consumption saving calcs used to satisfy EPA Act requirements are **not useful** to determine points.
- Why?
  - Because this credit is energy **cost** based
  - Because this credit does not allow ignoring process loads



# LEED-NC

(Optimize Energy Performance Credit)

- Good news - Because this credit is energy **cost** based, **demand reducing or shifting** schemes get points.



# RFPs

- If we ask for LCCAs or for LEED certification:
  - Define LCC study years, rates, inflation adj., etc.
  - Give utility rates



# RFPs

- Question:

Is the Offeror who chooses not to do LCCA during the proposal phase taking a risk?

- Answer:

Depends on our capacity to review, investigate, and police contract provisions.



# Verification

- Energy simulation software:
  - used to compare the energy use and costs of alternate HVAC systems so that the best system can be designed.
  - can't accurately predict utility costs because assumptions regarding hours of operation, setpoints, occupancy, process loads, etc. may not be the actual.



# Verification

- Even if simulation software could be used to predict utility costs,
- Verification that a building operates IAW the design would require full time monitoring of the building operation and occupants habits.



# Verification

- LEED-NC credits 1 point for Measurement and Verification:
  - Put in meters and track usage
  - Compare to calculations for misalignments  
(if you put in enough meters.)
  - Look for trends, changes, etc.



# Summary

- Simulation to develop a consumption baseline w/o process loads
- Simulation for proposed design w/o process loads
- Multiple simulations and LCCAs



# Summary

- Simulation with process loads for sizing HVAC equipment and system.
- Simulation for proposed design with process loads and with energy cost including demand saving for LEED points.



# Summary

- Many simulations = increased design time and cost.
- Question:

Is this in keeping with the MilCon Transformation goal of getting facilities constructed quickly?



# Summary

- A simulation calculation is not easily enforceable in an RFP, nor is it fast.
- A **prescription** is easily **enforceable** and fast.
- We need a prescription:
  - Could look like ASHRAE 90.1
  - Except indicating enhancements



*Thank You*

Jim Martin, Louisville District



*US Army Corps of Engineers, Louisville District*