Demand-Limiting Assessment Tool for Small Commercial Buildings

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Outline

- Tool Objectives
- Demonstration
- Current Efforts
- Possible Next Steps
Current Objectives

• Quick assessment tool for potential end users to evaluate
  – demand reduction
  – operating cost savings
  – occupant thermal comfort impacts

• Only allow users to change most important factors
  – Type and size of building
  – Location
  – Utility rates
  – Occupancy schedule
  – Demand-limiting parameters
  – Equipment efficiency

• Potentially useful as a tool for utilities to promote this technology
Small Building Assessment Tool

Demo

Building
- Type: Small Office Building
- Area: 6600 square feet

Equipment
- Type: Roo, Heat
- Efficiency: Low
- Closed Damper Leakage

Base Case
- Setback Thermostat
- Unoccupied Fan Cycling

About

Demand-Limiting Assessment Tool
Release Version 03/2007, Copyright 2007,
Herrick Laboratories, Purdue University.

Note: This tool provides "quick" estimates of peak demand reduction along with cost and comfort impacts associated with a demand-limiting strategy that utilizes adjustment of building zone temperature setpoints within comfort bounds. The results are meant to be representative for a set of predefined prototypical buildings and equipment.
Current Efforts

- Add comfort impacts
- Add on-line reference manual
- Add additional utility rate models
- Get initial feedback on end-user tool
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Possible Next Steps

• Incorporate wider range of building prototypes
• Web-based implementation
• End-user feedback
• Develop alternative tool for utilities and utility program planners
  – Statewide assessments of technology
  – Impact assessments of different utility programs
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Demo

Design Peak Occupancy (100%) 7 per 1000 square feet

Use Default Occupancy Pattern

Hourly Scaling

Monthly Scaling
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Demo

Normal Electric Utility Rates

Season: Summer (on), Winter (off)

Start Date: May 1

On Peak
Start: 12:00 PM
Stop: 6:00 PM

Off Peak
Start: 10:00 PM
Stop: 9:00 AM

Without CPP Program

Energy (kWh)
On Peak: 0.140
Mid Peak: 0.105
Off Peak: 0.075
Rate: $0.150/kWh
Demand (kW)
On Peak: 15.00
Mid Peak: 3.60
Off Peak: 0.00
Rate: $0.075/kW

With CPP Program

Energy (kWh)
On Peak: 0.110
Mid Peak: 0.095
Off Peak: 0.075
Rate: $0.110/kWh
Demand (kW)
On Peak: 15.00
Mid Peak: 3.60
Off Peak: 0.00
Rate: $0.075/kW

CPP Event Electric Energy Changes

CPP Rates?
Yes

Number of Days for CPP Rates: 5

Summer Super Peak
Start: 12:00 PM
Stop: 6:00 PM
Rate: $0.560/kWh

Winter Super Peak
Start: 12:00 PM
Stop: 6:00 PM
Rate: $0.105/kWh

Base Case Selection

- Conventional Control WITHOUT CPP
- Conventional Control WITH CPP
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Demo

Base Case: Conventional Control WITHOUT CPP

Annual Cost Savings

<table>
<thead>
<tr>
<th>Strategy</th>
<th>AC Costs ($/kSft)</th>
<th>Savings (%)</th>
<th>Peak AC Power (W/SqFt)</th>
<th>Peak Dnm. Rdct. (W/SqFt)</th>
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<tr>
<td>Base Case</td>
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Monthly AC Costs Comparison

--- Base Case --- Demand-Limiting --- Cost Savings

Month of Year

January: 25.0
February: 25.0
March: 4.50
April: 9.11
May: 11.76
June: 18.24
July: 16.94
August: 8.01
September: 8.01
October: 8.01
November: 8.01
December: 8.01
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Peak Day Power Comparison

AC Power (W/SqFt)

Hour of Day
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