ENERGY EFFICIENCY FOR THE
HOSPITALITY INDUSTRY

Caribe Hilton - San Juan, Puerto Rico

5/19/10 Session 4 Track A

Energy Management

…By The Numbers

Focusing on ROI results  -  Not Green Washing

THINK ENERGY MANAGEMENT LLC

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THE PLAN - FOR THE NEXT 45 MINUTES

QUESTIONS – Any time (add VALUE to this session)

TOPICS – Open

INTENT – Experience exchange / education
(no products or services promoted)

LOOK FOR -

PRESENTATION – Available via email
(leave a business card)
Hotel Energy Costs = $7.5 B/year

- According to the US E.I.A. program the US hospitality industry spends $7,500,000,000 for energy each year. That is …

  $625 M / Month
  $ 20 M / Day
  $856 K / Hour
  $ 14 K / Minute

- Average energy cost = $2+ / SF

- Average annual energy use = 120 Mbtu /SF
  (vs. coml. bldg. average of = 70 Mbtu /SF)
‘ENERGY BALANCE’ ... VARIES BY CLIMATE

BTUs Per Sq. Ft.
ENERGY USE - ZONES

Zone 1 is less than 2,000 CDD and greater than 7,000 HDD.
Zone 2 is less than 2,000 CDD and 5,500-7,000 HDD.
Zone 3 is less than 2,000 CDD and 4,000-5,499 HDD.
**ZONE 1**

### Electric Intensity (kWh/sqft)

**Lodging**

- **Lighting**: 4.58 (36.1%)
- **Cooling**: 2.60 (20.5%)
- **Heating**: 1.37 (10.8%)
- **Miscellaneous**: 1.24 (9.8%)
- **Ventilation**: 0.96 (7.7%)
- **Refrigeration**: 0.67 (5.3%)
- **Water Heating**: 0.62 (4.9%)
- **Cooking**: 0.39 (3.1%)
- **Office Equip.**: 0.23 (1.8%)

**Total Electric Intensity (kwh/sqft)**: 12.70

**Average Electric Consumption per Establishment (kWh)**: 454,660.00

**Average Enclosed Floorspace per Establishment (ftsq)**: 35,800.00

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### Natural Gas Intensity (kBtu/sqft)

**Lodging**

- **Water Heating**: 27.76 (47.7%)
- **Heating**: 24.85 (42.7%)
- **Cooking**: 4.95 (8.5%)
- **Miscellaneous**: 0.58 (1%)
- **Cooling**: 0.06 (.1%)

**Total Gas Intensity (kBtu/sqft)**: 58.20

**Average Gas Consumption per Establishment (kBtu)**: 2,083,560.00

**Average Enclosed Floorspace per Establishment (ftsq)**: 35,800.00

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**A/C = 20.5%**
A/C = 23.4%

Total Electric Intensity (kWh/sqft): 13.90
Average Electric Consumption per Establishment (kwh): 497,620.00
Average Enclosed Floorspace per Establishment (ftsq): 35,800.00

Total Gas Intensity (kBtu/sqft): 54.80
Average Gas Consumption per Establishment (kBtu): 1,961,840.00
Average Enclosed Floorspace per Establishment (ftsq): 35,800.00
A/C = 29.7%

Electric Intensity (kWh/sqft)
Lodging

- Lighting: 4.74 (29.8%)
- Cooling: 4.72 (29.7%)
- Miscellaneous: 1.53 (9.6%)
- Ventilation: 1.34 (8.4%)
- Heating: 1.00 (6.3%)
- Water Heating: 0.97 (6.1%)
- Refrigeration: 0.83 (5.2%)
- Cooking: 0.48 (3%)
- Office Equip.: 0.30 (1.9%)

Total Electric Intensity (kwh/sqft): 15.90
Average Electric Consumption per Establishment (kwh): 569,220.10
Average Enclosed Floorspace per Establishment (ftsq): 35,800.00

Natural Gas Intensity (kBtu/sqft)
Lodging

- Water Heating: 27.45 (55.8%)
- Heating: 16.88 (34.3%)
- Cooking: 4.33 (8.8%)
- Miscellaneous: 0.44 (.9%)
- Cooling: 0.10 (.2%)

Total Gas Intensity (kBtu/sqft): 49.20
Average Gas Consumption per Establishment (kBtu): 1,761,360.00
Average Enclosed Floorspace per Establishment (ftsq): 35,800.00
A/C = 33.7%
A/C = 41.7%

Electric Intensity (kWh/sqft)
Lodging

- Cooling: 7.73 (41.8%)
- Lighting: 4.83 (26.1%)
- Miscellaneous: 1.61 (8.7%)
- Ventilation: 1.35 (7.3%)
- Water Heating: 1.05 (5.7%)
- Refrigeration: 0.80 (4.3%)
- Cooking: 0.50 (2.7%)
- Heating: 0.33 (1.8%)
- Office Equip.: 0.30 (1.6%)

Total Electric Intensity (kWh/sqft): 18.50
Average Electric Consumption per Establishment (kWh): 662,300.00
Average Enclosed Floorspace per Establishment (ft²): 35,800.00

Natural Gas Intensity (kBtu/sqft)
Lodging

- Water Heating: 27.20 (68%)
- Cooking: 7.84 (19.6%)
- Heating: 4.36 (10.9%)
- Miscellaneous: 0.48 (1.2%)
- Cooling: 0.12 (.3%)

Total Gas Intensity (kBtu/sqft): 40.00
Average Gas Consumption per Establishment (kBtu): 1,432,000.00
Average Enclosed Floorspace per Establishment (ft²): 35,800.00
<table>
<thead>
<tr>
<th>Space Type</th>
<th>Floor Area Percentage</th>
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</thead>
<tbody>
<tr>
<td>Guest rooms</td>
<td>63%</td>
</tr>
<tr>
<td>Corridor</td>
<td>13%</td>
</tr>
<tr>
<td>Lobby/lounge</td>
<td>4%</td>
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<tr>
<td>Stairs</td>
<td>4%</td>
</tr>
<tr>
<td>Storage</td>
<td>3%</td>
</tr>
<tr>
<td>Office/reception</td>
<td>3%</td>
</tr>
<tr>
<td>Meeting room</td>
<td>2%</td>
</tr>
<tr>
<td>Laundry room</td>
<td>2%</td>
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<tr>
<td>Elevator</td>
<td>2%</td>
</tr>
<tr>
<td>Employee lounge</td>
<td>1%</td>
</tr>
<tr>
<td>Restrooms</td>
<td>1%</td>
</tr>
<tr>
<td>Exercise room</td>
<td>1%</td>
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<tr>
<td>Mechanical room</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total floor area</strong></td>
<td><strong>100%</strong></td>
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</table>
LIGHTING

Cost of Light - Hospitality

The greatest potential for cost saving is electric reduction.

Where should I spend my money?

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Labor</td>
<td>8%</td>
</tr>
<tr>
<td>Lamp</td>
<td>4%</td>
</tr>
<tr>
<td>Energy</td>
<td>88%</td>
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</table>

Hospitality Energy Savings

A 200 guest room lodging property can reduce its annual lighting related electricity expenses by as much as 45% through better application solutions.

Maintenance & procurement expenses related to lighting will be reduced ten-fold through incorporating better lighting practices into any Lodging Operation.

These percentages are approximates, and actual costs will vary based upon local electricity and labor rates, nature of the facility, type of lighting installed, etc.
Figure 5.1. Guest Room Interior Lighting Schedule

LOWER ‘OFF PEAK’ RATE … if you have correct meter, rate/contract
# ELECTRICITY RATES

— UNDERSTANDING AND USING THE RATES TO YOUR ADVANTAGE

## TIME OF DAY POWER RATES

Rates Effective April 1, 2010

<table>
<thead>
<tr>
<th>General Service (OGS—1—TOU)</th>
<th>Time Period</th>
<th>Definition</th>
<th>Price per kWh</th>
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</thead>
<tbody>
<tr>
<td>Summer On Peak</td>
<td>July 1 – September 30, from 1:01 p.m. to 6:00 p.m. weekdays.</td>
<td>$0.40304 per kWh</td>
<td></td>
</tr>
<tr>
<td>Summer Mid Peak</td>
<td>July 1 – September 30, from 10:01 a.m. to 1:00 p.m. and 6:01 p.m. to 9 p.m. weekdays.</td>
<td>$0.24448 per kWh</td>
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<tr>
<td>Summer Off Peak</td>
<td>All other hours, from July 1 – September 30.</td>
<td>$0.06816 per kWh</td>
<td></td>
</tr>
<tr>
<td>Winter On Peak</td>
<td>October 1 – June 30, from 5:01 p.m. to 9 p.m. daily.</td>
<td>$0.11611 per kWh</td>
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</tr>
<tr>
<td>Winter Off Peak</td>
<td>All other hours, from October 1 – June 30.</td>
<td>$0.06816 per kWh</td>
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</table>
# ELECTRICITY RATES
– UNDERSTANDING AND USING THE RATES TO YOUR ADVANTAGE

<table>
<thead>
<tr>
<th>BILLING MEASUREMENT</th>
<th>MEANING</th>
<th>COST</th>
<th>$ IMPACT</th>
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<tr>
<td>KWH</td>
<td>Consumption</td>
<td>$ / KWH</td>
<td>_____%</td>
</tr>
<tr>
<td>KW</td>
<td>Peak Demand (load)</td>
<td>$ / KW</td>
<td>_____%</td>
</tr>
<tr>
<td>KW / KVA</td>
<td>Power factor %</td>
<td>$ / KW</td>
<td>_____%</td>
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</tbody>
</table>
## ENERGY USE - LAUNDRY

Table 4.7. Baseline Laundry Equipment Gas Consumption

<table>
<thead>
<tr>
<th>Washer Type</th>
<th>No. of Rooms</th>
<th>Laundry Load lb/room (kg/room)</th>
<th>Water Use per Pound of Laundry</th>
<th>Gas Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total Water gallon/lb (L/kg)</td>
<td>Annual Water Removed lb (kg)</td>
</tr>
<tr>
<td>Standard</td>
<td>77</td>
<td>9 (4.08)</td>
<td>3 (25.03)</td>
<td>221,327 (100,393)</td>
</tr>
</tbody>
</table>
NG Prices will not stay this low (in the long term)
FUEL COSTS ($) - OIL

Weekly Liquid Fuel Prices through April 27, 2010

Source: EIA and Platts

Graph Range: January 2007 through Present
The Good Old Days:
REGULATED UTILITIES

BEFORE: Electricity as a Bundled Product
(before deregulation)

- Single vendor
- Tightly integrated product
- Similar in all states
- Minimal buying decisions
TODAY 50% of the US DE – REGULATED UTILITIES

NOW: Electricity as an Unbundled Product (after deregulation)

- Customer choice
- Complexity
- Differences between States
NATURAL GAS - DEREGULATED

The map illustrates the status of natural gas deregulation across the United States. Different colors and symbols indicate various stages of deregulation:

- **Statewide unbundling - 100% eligibility: Active**
- **Statewide unbundling - 100% eligibility: Inactive/Limited programs**
- **Statewide unbundling - implementation phase:**
  - > 50 percent eligibility
- **Pilot programs/partial unbundling**
- **No unbundling**
- **Pilot Program Discontinued**
ENERGY MANAGEMENT

Supply – Side
• Regulated tariffs
• De-regulated energy commodities
• Energy commodities - price and Ts & Cs
• Seek expert assistance
• Budgeting advice

Demand-Side
• Getting the GM & DOE to support the process near term and long term
• Incentives for DOE for beating YOY energy consumption?
• Better control of employees* & contractors (human behavior)
• Better control of equipment
• Energy efficiency improvements
• Energy Conservation Measures (ECMs)
• Letting DOEs get quotes alone (vs. with expert assistance)

* Policies, procedures, posters in more than one language?
DATA : ‘YOU CANNOT CONTROL WHAT YOU DO NOT MEASURE’

Energy Management – at the portfolio level
- Annual ‘utility spend’ portfolio wide
- Annual utility spend by property
- Monthly summary of utility cost and consumption by property
  (c/o utility exports to Excel, screen captures, fax … or via snail mail)
- Average cost unit energy unit (converted to common standard billing units)
  KWH, Therms, 1000 gallons of water plus other fuels like district energy

• Tracking energy cost ($) and energy consumption (#)

• Internal database - via accounting system(s)

• Actual utility bill database (with details) vs. accounting system dollars

• External database (bill payment, administration and reporting)
  - Third party system - enrollment (and re-direction of utility bills)
  - $8 to $12 / month per utility account (meter)
  - Back-filling the history from utility bills or utility printouts
    (for YOY and YTD report)
  - Process requires time, follow through and patience … to get it right
  - WARNING: ‘Talking to ‘IT’ people’
# MONTHLY ENERGY - DASHBOARD

## Electricity

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</thead>
<tbody>
<tr>
<td>kWhs</td>
<td>891,406</td>
<td>974,699</td>
<td>933,392</td>
<td>881,228</td>
<td>809,270</td>
<td>890,847</td>
<td>398,932</td>
<td>324,562</td>
<td>382,970</td>
<td>161,382</td>
<td>372,652</td>
<td>379,977</td>
<td>2,943,184</td>
<td>$</td>
</tr>
<tr>
<td>% Variance</td>
<td>$21,566</td>
<td>$21,544</td>
<td>$20,177</td>
<td>$20,348</td>
<td>$20,660</td>
<td>$20,704</td>
<td>$20,076</td>
<td>$20,062</td>
<td>$20,357</td>
<td>$20,660</td>
<td>$20,660</td>
<td>$21,054</td>
<td>$21,373</td>
<td>$21,389</td>
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<tr>
<td>kWhs</td>
<td>912,473</td>
<td>998,517</td>
<td>971,687</td>
<td>958,573</td>
<td>870,634</td>
<td>858,890</td>
<td>394,927</td>
<td>324,527</td>
<td>359,649</td>
<td>162,356</td>
<td>345,710</td>
<td>365,552</td>
<td>3,124,214</td>
<td>$</td>
</tr>
<tr>
<td>% Variance</td>
<td>$20,827</td>
<td>$18,829</td>
<td>$18,159</td>
<td>$18,863</td>
<td>$19,154</td>
<td>$19,482</td>
<td>$17,669</td>
<td>$18,553</td>
<td>$18,863</td>
<td>$19,208</td>
<td>$18,363</td>
<td>$17,046</td>
<td>$17,299</td>
<td>$17,500</td>
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## Electricity: In $K

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<tbody>
<tr>
<td>Therm</td>
<td>2,036</td>
<td>1,914</td>
<td>1,939</td>
<td>2,023</td>
<td>2,137</td>
<td>2,317</td>
<td>1,515</td>
<td>1,378</td>
<td>1,490</td>
<td>1,308</td>
<td>1,437</td>
<td>1,570</td>
<td>11,215</td>
<td>$</td>
</tr>
<tr>
<td>% Variance</td>
<td>$247</td>
<td>$178</td>
<td>$228</td>
<td>$263</td>
<td>$184</td>
<td>$223</td>
<td>$250</td>
<td>$312</td>
<td>$318</td>
<td>$263</td>
<td>$248</td>
<td>$212</td>
<td>$11,066</td>
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<td>Therm</td>
<td>2,342</td>
<td>2,093</td>
<td>2,187</td>
<td>2,247</td>
<td>2,316</td>
<td>2,397</td>
<td>1,602</td>
<td>1,497</td>
<td>1,602</td>
<td>1,558</td>
<td>1,666</td>
<td>1,908</td>
<td>13,013</td>
<td>$</td>
</tr>
<tr>
<td>% Variance</td>
<td>$289</td>
<td>$189</td>
<td>$206</td>
<td>$231</td>
<td>$179</td>
<td>$179</td>
<td>$245</td>
<td>$380</td>
<td>$311</td>
<td>$350</td>
<td>$292</td>
<td>$209</td>
<td>$11,066</td>
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## Natural Gas:

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<tr>
<td>Therm</td>
<td>7,394</td>
<td>6,314</td>
<td>5,490</td>
<td>5,233</td>
<td>6,147</td>
<td>7,355</td>
<td>7,463</td>
<td>8,086</td>
<td>7,284</td>
<td>7,562</td>
<td>7,942</td>
<td>8,086</td>
<td>63,215</td>
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<tr>
<td>% Variance</td>
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<td>$1,075</td>
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<td>$1,075</td>
<td>$1,075</td>
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<td>$1,075</td>
<td>$1,075</td>
<td>97,612</td>
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<tr>
<td>Therm</td>
<td>8,862</td>
<td>9,899</td>
<td>10,171</td>
<td>9,704</td>
<td>11,144</td>
<td>8,910</td>
<td>7,968</td>
<td>8,218</td>
<td>8,109</td>
<td>7,940</td>
<td>7,725</td>
<td>7,915</td>
<td>67,024</td>
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<tr>
<td>% Variance</td>
<td>$1,434</td>
<td>$1,541</td>
<td>$1,541</td>
<td>$1,541</td>
<td>$1,541</td>
<td>$1,541</td>
<td>$1,541</td>
<td>$1,541</td>
<td>$1,541</td>
<td>$1,541</td>
<td>$1,541</td>
<td>$1,541</td>
<td>105,304</td>
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## Natural Gas: In $Therm

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<tr>
<td>Therm</td>
<td>$11,975</td>
<td>$12,195</td>
<td>$12,562</td>
<td>$10,917</td>
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<td>$11,725</td>
<td>$11,975</td>
<td>$12,562</td>
<td>$12,245</td>
<td>$11,137</td>
<td>$117,975</td>
<td>$</td>
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<tr>
<td>% Variance</td>
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<td>$2,036</td>
<td>$2,036</td>
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<td>$2,036</td>
<td>$2,036</td>
<td>$2,036</td>
<td>$2,036</td>
<td>$2,036</td>
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<td>$2,036</td>
<td>$2,036</td>
<td>$20,362</td>
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</thead>
<tbody>
<tr>
<td>Therm</td>
<td>$11,865</td>
<td>$12,135</td>
<td>$12,491</td>
<td>$10,845</td>
<td>$12,125</td>
<td>$13,037</td>
<td>$11,017</td>
<td>$11,605</td>
<td>$11,865</td>
<td>$12,491</td>
<td>$12,125</td>
<td>$11,017</td>
<td>$117,017</td>
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<tr>
<td>% Variance</td>
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<td>$1,036</td>
<td>$1,036</td>
<td>$10,362</td>
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## Natural Gas: In $
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<th>NAME</th>
<th>RMS</th>
<th>SQ FT</th>
<th>ENERGY COST</th>
<th>MMBTU</th>
<th>$ / ROOM</th>
<th>COST SQ FT</th>
<th>MMBTU SQ FT</th>
<th>COST PAR</th>
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<td>$0.08</td>
<td>1,822</td>
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</table>
ENERGY MANAGEMENT

Doing nothing … is not an answer

- What the CEO and CFO want to know (the problem)

- What can be done (the solutions)

  • **Understanding the EM opportunities**
  
  • **Trends**: Increasing electricity and natural gas costs for energy commodity and delivery fees in regulated and de-regulated markets

  • **Investments** = ROI, NPV and asset appreciation

  • **Getting capital** (selling the project)

  • **Tracking** and reporting the results
Energy Management
From AUDIT to ACTION

Demand-Side EM – First Step = Energy Audit

- **Level 1 Energy Audits**
  - low cost / no cost ECMs and O&M savings
  - people issues
  - ECMs with ROI

- **Level 2 Energy Audits**
  - specific ECMs, ROI and NPV
  - specifications and bids

- **Level 3 Energy Audits**
  - investment grade

- Use only utility cost savings (hard numbers), real O&M savings (exclude other soft benefits)

- Owner’s role vs. the chain’s DOE or Energy Manager
EM Strategies and Goals

What is your firm’s investment horizon?

- REIT
- Private equity

- Only properties that are long term holds?
- Short payback periods only? (skimming the cream only)
- Longer term perspective?
- ROI and NPV only?
- Asset appreciation!

FUND ONLY THE TOP 3 TO 5 ECMs?

⇒ The best ECMs can pay for the less attractive ECMs
ENERGY MANAGEMENT .... AS AN INVESTMENT

<table>
<thead>
<tr>
<th>Simple Payback Period</th>
<th>Return on Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Year</td>
<td>100% ROI</td>
</tr>
<tr>
<td>2 Years</td>
<td>50% ROI</td>
</tr>
<tr>
<td>3 Years</td>
<td>33% ROI</td>
</tr>
<tr>
<td>4 Years</td>
<td>25% ROI</td>
</tr>
<tr>
<td>5 Years</td>
<td>20% ROI</td>
</tr>
<tr>
<td>6 Years</td>
<td>17% ROI</td>
</tr>
</tbody>
</table>
Demand - Side
(energy) Facts of Life

“You are already paying for the energy management project ... whether it is done or not”

“Self funded energy management projects are paid for with funds normally given away to the utility companies”
DEMAND SIDE EM : PROVEN ECMs

CONTROL WHAT YOU ALREADY OWN!

- Common area HVAC  Scheduling
- Guest Room HVAC  EMS
- Lighting  F&B staff control
- Kitchen  Cooking, defrost, WIF/WIC … SOPs
- Kitchen Exhaust / MUA  VFD control
- Central plant  Chillers, boilers, cooling towers, pumps
- EMS for common area  DDC BAS/EMS with schedules
- EMS for guest rooms  Occupancy based control
- VFDs  Reduce speed 20% = save 50%
- Water conservation  HETs, HEIs, Low flow shower heads
- **Retro Commissioning**  *Large HVAC with DDC controls*

- DSM rebates from utility or state energy office
- **EPACT** of 2005 tax incentives via section 179D (lighting vs. other improvements)
- **DR** = Demand Response in some markets
ECMs

RETROFIT - Lighting  (CFL, Super T8, LED, Induction, controls)

AVOID ‘leading edge’ technology without a proven track record for energy saving results (look for EnergyStar label - on some equipment)

CONSIDER lifecycle cost of high efficiency equipment for new construction and major renovations (i.e. Std. replacement chiller vs. chiller with VFD)

PLANS & Specification  vs.  Design / Build  vs.  Vendors … quoting what they like.

BEST IN CLASS national vendors (w/ national acct prices and project management teams)

INDEPENDENT ROI NUMBERS (not just vendor numbers) Independent advice: such as a Certified Energy Manager (CEM) or registered professional engineer (PE)
**ROI FOR COMMON ECMs**

Based on Average USA Energy Cost

<table>
<thead>
<tr>
<th>ENERGY CONSERVATION MEASURES (ECMS)</th>
<th>PAYBACK PERIOD (YEARS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Management System - new</td>
<td>1 to 4</td>
</tr>
<tr>
<td>High Efficiency Motors &amp; VFDs</td>
<td>1 to 3</td>
</tr>
<tr>
<td>Lighting Fixtures &amp; Ballasts - retrofit</td>
<td>1 to 5</td>
</tr>
<tr>
<td>Steam Trap - replacement / repairs</td>
<td>1 to 5</td>
</tr>
<tr>
<td>Energy Management System - replacement</td>
<td>1 to 6</td>
</tr>
<tr>
<td>Manufacturing Process - heat recovery</td>
<td>2 to 5</td>
</tr>
<tr>
<td>Boiler - replacement</td>
<td>7 to 12</td>
</tr>
<tr>
<td>Chiller - replacement</td>
<td>8 to 12</td>
</tr>
<tr>
<td>Rooftop Unit HVAC - replacement</td>
<td>9 to 15</td>
</tr>
<tr>
<td>Building Insulation</td>
<td>10 to 15</td>
</tr>
<tr>
<td>Roof Insulation</td>
<td>20 to 30</td>
</tr>
<tr>
<td>Windows - replacement</td>
<td>20 to 50</td>
</tr>
</tbody>
</table>

**QUESTION:** Are the TV ads about replacement windows correct?
DSM: Demand Side Management REBATES
from local Utility Companies or your State Energy Office

http://www.dsireusa.org/
Nearly 300 free energy software programs available for download

http://apps1.eere.energy.gov/buildings/tools_directory/doe_sponsored.cfm

DOE Sponsored Tools
The Department of Energy sponsors continued development of a variety of building energy software tools. See the following for more information about software tools now under development:

Whole-Building Energy Performance Simulation

EnergyPlus
A new-generation building energy simulation program from the creators of BLAST and DOE-2.

DOE-2
An hourly, whole-building energy analysis program which calculates energy performance and lifecycle cost of operation. The current version is DOE-2.1E.

Building Design Advisor
Provides building decision-makers with the energy-related information they need beginning in the initial, schematic phases of building design through the detailed specification of building components and systems.

Energy-10
A program for small commercial and residential buildings that integrates daylighting, passive solar heating, and low-energy cooling strategies with energy-efficient envelope design, and mechanical equipment. This allows for detailed simulation and performance analysis.

SPARK
Models complex building envelopes and mechanical systems that are beyond the scope of EnergyPlus and DOE-2. Good for modeling short time-step dynamics. Runs 10-20 times faster than similar programs.

Validation and Testing
BESTEST
Through the National Renewable Energy Laboratory, the Department of Energy has been working with the International Energy Agency Solar Cooling and Heating Programme Implementing Agreement (IEA SHC) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) for more than the last 10 years to develop standard methods of test for building energy analysis computer software.

Standards Compliance
REScheck (formerly MECcheck)
The MECcheck product group makes it fast and easy for designers and builders to determine whether new homes and additions meet the requirements of the Model Energy Codes (MEC) and International Energy Conservation Codes (IECC).

COMCheck-EZ
COMcheck-EZ offers an easy-to-understand process for demonstrating compliance with ASHRAE 90.1-1989 and IECC commercial energy code requirements for envelope, lighting, and mechanical systems.
ENERGY EFFICIENCY
– BEST SOURCE OF ‘NEW’ ENERGY

- Geothermal, Solar, and Wind
- Hydroelectric
- Wood, Waste, and Alcohol
- Nuclear Power
- Coal
- Natural Gas
- Petroleum
- Energy Efficiency and Conservation

Quads (2004)
COST OF ENERGY EFFICIENCY
vs. MAKING MORE ENERGY

Source: Neal Elliott, PhD., ACEEE 2006, EPRI 2006
BOTTOM LINE RESULTS

- Benchmarking  
  (consumption/ SF, Consumption/ Rm., BTUs/SF)
- Measurement & Verification  (M & V)
- Follow-up reporting to Senior Management and investors
- PR benefits  
  (EnergyStar Partner, Green programs  
  … avoid ‘green-washing’)

**EM Process**

- Portfolio level  
  Data!
- Supply Side  
  No capital
- Demand Side  
  Active Energy Management
# ENERGY MANAGEMENT – SUCCESS!

<table>
<thead>
<tr>
<th>APPROACH</th>
<th>FOCUS ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional</td>
<td>Demand-Side</td>
</tr>
<tr>
<td>De Regulation</td>
<td>Supply-Side</td>
</tr>
<tr>
<td>Winning</td>
<td>Supply-Side and Demand-Side</td>
</tr>
</tbody>
</table>
EXAMPLE: A TEM CLIENT

HEI PROPERTIES MAP
Roll over any of the cities to view more details.
Corporate Energy Management Project of the Year
2009 World Energy Engineering Congress

HEI HOTELS & RESORTS
ENERGYSTAR 2010 - PARTNER OF THE YEAR AWARD

HEI HOTELS & RESORTS
Reduced Utility Costs by 24 %!
DIRECTIVE: REDUCE ENERGY COSTS BY 20% THIS YEAR!
Don’t Say it Can’t Be done!
CAP and TRADE TAX (HR 2454)!

- $80 B / yr.? In new taxes *
- $3,000 per family / yr.

* ENERGY TAX INCREASES:
  + $0.025 / KWH
  + $1.50 / MCF
  + $0.28 / Gallon of gasoline

STATUS

PASSED US HOUSE (July 2009)
PROPOSED US SENATE (May 2010)

http://www.rules.house.gov/111/LegText/111_hr2454.pdf

IRS Estimate = +$100B to $200B / yr.
HERE COMES THE UTILITY BILL.
Richard G. Lubinski
CEM, CEA, CDSM, CSDP, CEMSC, BEP
President

Think Energy Management LLC
2925 Circle Drive, Silver Lake, OH  44224-3045
Office  330 - 928 - 7179
Mobile  330 - 283 - 4604
FAX    330 - 928 - 0147
Email:  rick@think–energy.net

www.think–energy.net

The Association of Energy Engineers
www.aeecenter.org
RESOURCES (URLs)

- www.think-energy.net
- http://www.treeo.ufl.edu/greenlodging/