Defining and Managing the Costs and Benefits of Green Buildings

Barbara Van Gee
California Integrated Waste Management Board
California’s Sustainable Building Task Force

Building Confidence: From Sustainable Policy to Practice
University of California, Santa Barbara
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The Costs and Financial Benefits of Green Buildings

A report to California’s Sustainable Building Task Force, a group of over 40 state agencies, with funding from seven.

Drawing on cost data from 33 green building projects and benefits data from over 100 buildings nationwide. Developed in partnership with the Task Force and the USGBC.

Principal Author: Greg Kats, Capital E
Some Assumptions

• 20 year term
• 5% real interest rate
• $150-$250/ft$^2$ building costs
• LEED as a basis
• Consistently conservative assumptions
• Conclusions generally applicable
Average Green Cost Premium vs. Level of Green Certification – 33 buildings US-wide

Average Green Premium vs. Level of Green Certification
(for Offices and Schools)

Level of Green Certification

Average Green Premium (in percent)

- Level 1-Certified (8 bldgs) 0.66%
- Level 2-Silver (18 bldgs) 2.11%
- Level 3-Gold (6 bldgs) 1.82%
- Level 4-Platinum (1 bldgs) 6.50%

Source: USGBC, Capital E Analysis
Reduced Energy Use in US Green Buildings

<table>
<thead>
<tr>
<th></th>
<th>Certified</th>
<th>Silver</th>
<th>Gold</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Efficiency</td>
<td>8%</td>
<td>30%</td>
<td>37%</td>
<td>28%</td>
</tr>
<tr>
<td>On-Site Renewable Energy</td>
<td>0%</td>
<td>0%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>Green Power</td>
<td>10%</td>
<td>0%</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Total</td>
<td>28%</td>
<td>30%</td>
<td>48%</td>
<td>36%</td>
</tr>
</tbody>
</table>

*Source: USGBC data, Capital E Analysis*
# 20-Year NPV of 36% Pollution Reduction for California Buildings (/ft²)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>$5/ton</th>
<th>$10/ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>$0.54</td>
<td>$0.54</td>
</tr>
<tr>
<td>PM10</td>
<td>$0.41</td>
<td>$0.41</td>
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<tr>
<td>SOx</td>
<td>$0.16</td>
<td>$0.16</td>
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<tr>
<td>CO2</td>
<td>$0.07</td>
<td>$0.14</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$1.18</strong></td>
<td><strong>$1.25</strong></td>
</tr>
</tbody>
</table>

*Source: Capital E Analysis*
Costs in California State Employee-Occupied Office Buildings (2002), including for Operations and Maintenance

Capital E Analysis, Source: Real Estate Services Division of Department of General Services
Improved Ventilation Impact of Productivity  (BIDS/Carnegie Mellon)

Case Studies Introducing Improved Ventilation Strategies

(* Performance improvement for specific tasks multiplied by estimated time at tasks)
(** Improved ventilation effectiveness calculated relative to productivity gains from other studies)
Financial Benefits of Green Buildings
Summary of Findings (per ft\(^2\))

<table>
<thead>
<tr>
<th>Category</th>
<th>20-year Net Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Savings</td>
<td>$5.80</td>
</tr>
<tr>
<td>Emissions Savings</td>
<td>$1.20</td>
</tr>
<tr>
<td>Water Savings</td>
<td>$0.50</td>
</tr>
<tr>
<td>Operations and Maintenance Savings</td>
<td>$8.50</td>
</tr>
<tr>
<td>Productivity and Health Value</td>
<td>$36.90 to $55.30</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$52.90 to $71.30</strong></td>
</tr>
<tr>
<td>Average Extra Cost of Building Green</td>
<td>(-3.00 to -$5.00)</td>
</tr>
<tr>
<td><strong>Total 20-year Net Benefit</strong></td>
<td><strong>$50 to $65</strong></td>
</tr>
</tbody>
</table>

*Source: Capital E Analysis*
## The Green Building Insurance Link

<table>
<thead>
<tr>
<th>Energy &amp; Atmosphere</th>
<th>Professional Liability</th>
<th>General Liability</th>
<th>Business Interruption</th>
<th>Property Liability</th>
<th>Health Insurance</th>
<th>Life Insurance</th>
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</thead>
<tbody>
<tr>
<td>Prereq 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Fundamental Building Systems</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
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</tr>
<tr>
<td>Commissioning (Required)</td>
<td></td>
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<td></td>
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<tr>
<td>Prereq 2</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Minimum Energy Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>(Required)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Prereq 3</td>
<td></td>
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<td></td>
<td></td>
<td>+/-</td>
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<tr>
<td>CFC Reduction in HVAC&amp;R Equipment</td>
<td></td>
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<td></td>
<td></td>
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<td>+</td>
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<tr>
<td>(Required)</td>
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<td></td>
</tr>
<tr>
<td>Credit 1.1</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Optimize Energy Performance, 20%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+/-</td>
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<tr>
<td>New / 10% Existing (2 points)</td>
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<tr>
<td>Credit 1.2</td>
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<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Optimize Energy Performance, 30%</td>
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<td></td>
<td></td>
<td>+/-</td>
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<tr>
<td>New / 20% Existing (2 points)</td>
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<tr>
<td>Credit 1.3</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Optimize Energy Performance, 40%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+/-</td>
<td></td>
</tr>
<tr>
<td>New / 30% Existing (2 points)</td>
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<tr>
<td>Credit 1.4</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Optimize Energy Performance, 50%</td>
<td></td>
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<td></td>
<td></td>
<td>+/-</td>
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<tr>
<td>New / 40% Existing (2 points)</td>
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<tr>
<td>Credit 1.5</td>
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<td>+</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Optimize Energy Performance, 60%</td>
<td></td>
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<td></td>
<td></td>
<td>+/-</td>
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<tr>
<td>New / 50% Existing (2 points)</td>
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<tr>
<td>Credit 2.1</td>
<td></td>
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<td></td>
<td>+/-</td>
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</tr>
<tr>
<td>Renewable Energy, 5% (1 point)</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>
Managing the Costs of Green Building
Top 10 List

A report developed through a partnership with California’s Sustainable Building Task Force and Alameda County Waste Management Authority.

Authored By: Kema-Xenergy

www.kemagreen.org
1. Should the project use LEED?

- There is support from senior decision makers.
- LEED can be introduced prior to completing CDs.
- The project scope is significant, including at least finishes and systems.
- The project can meet all of the prerequisites.

*Sometimes certification is not realistic.*
2. Set a clear goal early in the project

- Commit to a reasonable goal before starting DDs.
- Hold firm.
- Reiterate the goal at each meeting.

*Clarity and consistency = cost savings.*
3. Contract for Success

- RFP/RFQ language includes clear LEED requirements.
- Have bidders describe staff experience with green building for project staff.
- Make LEED part of interviews, bidders meetings.
- Consider stipulated sum / “best value” process.

*Don’t minimize the challenge. Treat LEED as a major project element.*
4. Build a good team

- Use strong project managers who can hold requirements.
- Select design teams that have sustainability embedded into their firm’s culture.
- Hire a strong MEP early.
- Designate a high-level LEED point person.

*Think through how decisions will be made.*
5. Get educated & identify resources

- Go beyond LEED accreditation – get further training.
- Seek out good information on:
  - Green materials
  - Advanced energy efficiency systems
  - LEED credit interpretations
  - LEED process and submittal advice

Make research time effective.
6. Fully integrate LEED into project

- Include all stakeholders in design process in meaningful charettes
- Ensure LEED point person has decision-making authority.
- Do not separate out green elements from the “base project.”

Avoid making an artificial target of green elements.
7. Understand commissioning

- Include time for the ME to assist the commissioning agent in their contract.
- When appropriate, use a sampling approach.
- Limit documentation to what is most useful for the owner, maintenance staff and occupants.
- Stay current with USGBC efforts to reduce documentation effort.

*Use commissioning as a tool, not a tax.*
8. Get rebates & incentives

California is rich with green programs:

- Savings by Design [www.savingsbydesign.com](http://www.savingsbydesign.com)
- Solar buy-down [www.consumerenergycenter.org](http://www.consumerenergycenter.org)
- Lightwash [www.lightwash.com](http://www.lightwash.com)
- DSA database:
  [http://www.sustainableschools.dgs.ca.gov/SustainableEschools/financing/incentives.html](http://www.sustainableschools.dgs.ca.gov/SustainableEschools/financing/incentives.html)

Local programs, Foundations & Grants

*Green building is broadly supported – get help.*
9. Help decision makers look good

Garner support by:

– Educating top decision makers with peers
– Giving credit
– Setting reasonable goals and achieving them
– Keeping the projects “mainstream”
– Feeding progress updates to decision makers before distributing

*Top level support helps enforce green goals.*
10. Manage time

Identify a “discovery manager”
– Assigns research topics
– Sets deadlines

Assign LEED credits to individuals
– Create support teams
– Report back to LEED point person

Set clear responsibility and deadlines.
Thank you!

For copies of either report, please see:  
http://www.ciwmb.ca.gov/GreenBuilding/

Questions?

Contact:  
Amanda Eichel  
Office of Assembly Speaker Fabian Nunez  
916.319.3944  
Amanda.eichel@asm.ca.gov

Barbara Van Gee  
California Integrated Waste Management Board  
916.376.6491  
bvangee@ciwmb.ca.gov  
www.ciwmb.ca.gov/GreenBuilding/TaskForce/