FINANCIAL EVALUATION OF ENERGY SAVING PROJECTS: BUILDING THE BUSINESS CASE

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Presented by Robert Greenwald, PEng., MBA
President, Prism Engineering Ltd.
Speaking the Language of the CFO

“The business case for EE is a strong one. The surprise is that more firms are not adopting EE. Why not?

One obstacle appears to be the way in which the case for EE is being communicated. Engineers and operations managers need to better motivate their executive team.

They must speak in the language of the Chief Financial Officer (CFO) and Chief Executive Officer (CEO), citing not just the costs, but the savings, the low financial risk, the decreased waste and the social benefits.”
“Often energy efficiency investment decisions are based on simple financial metrics, such as simple payback, cost relative to budget or the building's pro forma. These analysis methods may be valuable, but they are not broad enough to provide sufficient information for the best decision making… Conversely, when return on investment, risk and time value of money are considered, often energy efficiency upgrades are shown to be very prudent.”

LET'S START WITH UNDERSTANDING BUSINESS CASE APPROVALS
Decision Points

- Pass Operational Review
- Pass Strategic Review
- Pass Financial Review

All leading to…
- The Capital Competition
Typical Questions – Operational

- Is there local support for the technology?
- Is the technology proven?
- What training is required?
- Do we have the internal expertise required?
- What impact will the project have on staffing?
- The are the environmental and safety implications
Typical Questions – Strategic

• How does this project fit with our mission?
• How disruptive will the project be to our operations?
• What is the impact of delaying for 1 year?
• What other options have been considered?
• How does this fit with our current priorities?
Typical Questions – Financial

- Are there hidden or additional costs?
- What are the benefits? Energy Savings?
- How realistic are the costs and savings projections?
- What financial impact will this have on other areas of our organization?
- How do you propose to finance the project?
- How quickly will we see benefits?
Financial Hurdles

“Aside from the easy “low-hanging fruit” many EE projects produce payback periods that are slightly longer than most financial officers prefer. This simple investment criterion takes capital investment proposals off the executive agenda before they even appear.

However, the risks of EE investments, which are lower or non-existent compared to alternative investments, are neither well-quantified nor well-communicated to business leaders.”
The Financial Analysis in a Business Case

• Capital Required
• Cost Savings
• Simple payback
• Net Present Value (NPV)
• Internal rate of return (IRR)
• Sensitivity Analysis
• Impact on O&M (positive or negative)
• GHG credits
• Assumptions
Objectives of Investment Appraisal

• Which investments make the best use of available money?
• Ensure optimum benefits from investment
• Minimize the risk
• A basis for subsequent performance analysis
WHY NOT JUST USE SIMPLE PAYBACK?
Simple Payback...too simple?

Which project would you prefer?
What’s Wrong with Simple Payback?

• Doesn’t take into account
  – Ongoing savings after the payback period
  – The time value of money

• But, it’s a useful preliminary indication of the merits of a project
NEED TO CONSIDER THE TIME VALUE OF MONEY
Time Value of Money

The time value of money needs to be considered as a dollar received *now* is *worth more* than same dollar received *in the future.*
## Time Value of Money - Discount Factors

<table>
<thead>
<tr>
<th>Discount Factors (1/(1 + i)^n)</th>
<th>Year (n)</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tr>
<td><strong>Discount Factor</strong></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>6%</td>
<td>1</td>
<td>0.942</td>
<td>0.888</td>
<td>0.840</td>
<td>0.792</td>
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<td>10%</td>
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<td>0.909</td>
<td>0.826</td>
<td>0.751</td>
<td>0.683</td>
<td>0.620</td>
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<tr>
<td>20%</td>
<td>1</td>
<td>0.833</td>
<td>0.694</td>
<td>0.579</td>
<td>0.482</td>
<td>0.402</td>
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<tr>
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<td>0.456</td>
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<tr>
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<td>0.510</td>
<td>0.364</td>
<td>0.260</td>
<td>0.186</td>
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<td>0.226</td>
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<tr>
<td>50%</td>
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<td>0.444</td>
<td>0.297</td>
<td>0.198</td>
<td>0.132</td>
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</table>
Time Value of Money Example of Discounting

- What if we want to determine how much a $1,000 benefit in 30 years is worth to us today?
  
  - $1000 in “real” dollars (i.e., in dollars with today’s purchasing power)
  - Discount rate is 3%
Economic Analysis Example (continued)

- Present Value or PV tells us how much a future amount is worth today
- Plug values into discounting formula:

\[
PV = \left( \frac{1}{(1 + 0.03)^{30}} \right) \times 1,000_{\text{year 30}}
\]

- Do calculation:

\[
PV = 1,000 \times 0.41199 = 412
\]
Discount Rate Is Important

• Higher the discount rate, the lower the present value of a future dollar
  • At 3%, $1,000 30 years from now is worth only $412 today
  ...it is worth $231 at 5%
  ...but only $57 at 10%
• Discount rate can influence project selection
$10,000 Savings in the Future… How Much in my Pocket Today?

<table>
<thead>
<tr>
<th>Year</th>
<th>Savings</th>
<th>2%</th>
<th>4%</th>
<th>6%</th>
<th>8%</th>
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<td>1</td>
<td>$10,000</td>
<td>$9,803.92</td>
<td>$9,611.69</td>
<td>$9,423.22</td>
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<tr>
<td>2</td>
<td>$10,000</td>
<td>$9,611.69</td>
<td>$9,238.45</td>
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<td>$8,534.90</td>
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<tr>
<td>3</td>
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<td>$9,423.22</td>
<td>$8,879.71</td>
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<td>$7,884.93</td>
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<tr>
<td>4</td>
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<td>$9,238.45</td>
<td>$8,534.90</td>
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<td>$7,284.46</td>
</tr>
<tr>
<td>5</td>
<td>$10,000</td>
<td>$9,057.31</td>
<td>$8,203.48</td>
<td>$7,430.15</td>
<td>$6,729.71</td>
</tr>
<tr>
<td>6</td>
<td>$10,000</td>
<td>$8,879.71</td>
<td>$7,884.93</td>
<td>$7,001.59</td>
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<tr>
<td>7</td>
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<td>$8,705.60</td>
<td>$7,578.75</td>
<td>$6,597.76</td>
<td>$5,743.75</td>
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<td>8</td>
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<td>$8,534.90</td>
<td>$7,284.46</td>
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<td>$5,306.33</td>
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<tr>
<td>9</td>
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<td>$5,858.62</td>
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<td>$5,520.71</td>
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<tr>
<td>11</td>
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<td>$6,468.39</td>
<td>$5,202.29</td>
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<tr>
<td>12</td>
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<td>$5,743.75</td>
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<td>20</td>
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<td>$4,528.90</td>
<td>$3,047.82</td>
<td>$2,051.10</td>
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</table>
HOW TO CALCULATE NPV AND IRR
The Net Present Value (NPV) Approach

- Basic and essential test method to evaluate projects among other available financial tests
- Considers financial impacts not revealed with the payback method
- Considers all relevant elements of projects - all variation of revenues, savings, and costs

Cumulative cash flow shown
Components Required to Calculate NPV

For well-defined design and technology alternatives:

- Total investment costs for each alternative including:
  - Initial investment costs
  - Major equipment residual market value

- All variations of revenues realized as a result of the investment

- All variations of expenses (savings or cost increases)
  - Replacement costs and major maintenance costs
  - OM&R costs including energy, regular and preventive scheduled maintenance
  - Income Taxes (when applicable)
What Costs to Include

- Design, development, and engineering
- Initial capital investment and financing
- Operation, maintenance, and functional use
- Replacement
- Alteration, refurbishing, and improvement
- Salvage and retirement
Financial Criteria Details

- **Discount Rate**
  Use the owner’s after tax weighted average cost of capital; it is specific to the organization and is computed as the average of all current short and long term financing sources.

- **Inflation or Escalation Rate**
  Use cash flows in current dollars (increased by the inflation rate) and apply various inflation rates (could be different for maintenance, fuel, power…).

- **Time Frame**
  Assessed alternatives on the same time frame.

- **Risk**
  Risk is generated by uncertainty. Use sensitivity analysis to compare alternative assumptions for your forecasts.
Calculation Methodology

Computed as:
- Initial Investment
+ Present value (discounted) of the revenue flows
+ Present value of all the savings flows
  (Energy + Maintenance Costs + OM&R)
- Present Value of all the increase in costs flows
  (Energy + Maintenance Costs + OM&R)
+ Present Value of Residual Values

= Net Present Value
**Cash Flow Example**

**Cash Flow Table for Purchase of new Boiler**

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tr>
<td>Capital Expenditure</td>
<td>$100,000</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Expected Savings</td>
<td>$48,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90% on delivery/commissioning, and 10% performance guarantee due at one year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Values in $'000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Costs</td>
<td>(90.0)</td>
<td>(10.0)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Savings</td>
<td>0</td>
<td>24.0</td>
<td>48.0</td>
<td>48.0</td>
<td>48.0</td>
<td>48.0</td>
</tr>
<tr>
<td>Net cash flow</td>
<td>(90.0)</td>
<td>14.0</td>
<td>48.0</td>
<td>48.0</td>
<td>48.0</td>
<td>48.0</td>
</tr>
<tr>
<td>Cumulative Project Value</td>
<td>(90.0)</td>
<td>(76.0)</td>
<td>(28.0)</td>
<td>20.0</td>
<td>68.0</td>
<td>116.0</td>
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</table>
### Net Present Value

#### NPV Calculation

<table>
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<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net cash flow ($000s)</td>
<td>(90.0)</td>
<td>14.0</td>
<td>48.0</td>
<td>48.0</td>
<td>48.0</td>
<td>48.0</td>
</tr>
</tbody>
</table>

The discounted cash flow at 10% can be found as follows:

- **Year 0**: $1 \times (90.0) = (90.0)$
- **Year 1**: $0.909 \times 14.0 = 12.73$
- **Year 2**: $0.826 \times 48.0 = 39.65$
- **Year 3**: $0.751 \times 48.0 = 36.05$
- **Year 4**: $0.683 \times 48.0 = 32.78$
- **Year 5**: $0.620 \times 48.0 = 29.76$

NPV = the sum of all these values = 60.97 (vs. cumulative project value = 116.0)
Net Present Value (NPV)

Cash Flows

Year 0  Year 1  Year 2  Year 3  Year 4  Year 5

($8,000)  $4,000  $6,000  $4,000  $2,000  $0

($10,000)  $6,000  $8,000  $6,000  $4,000  $0

Present Value (Discounted cash flows)

Net Present Value (Aggregate of cash flows discounted to present value)
Why NPV?

A capital expenditure can not only be looked at on a one time basis.

One needs to consider all revenues and expenses related to that decision over the life of the equipment.
Internal Rate of Return (IRR)

The project rate of return that makes the present value of all future cash flows equal to the initial investment value of the project.

Also known as “project yield”.

<table>
<thead>
<tr>
<th>Discount</th>
<th>NPV</th>
<th>IRR</th>
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</thead>
<tbody>
<tr>
<td>10%</td>
<td>$61,048.67</td>
<td>30.37%</td>
</tr>
<tr>
<td>20%</td>
<td>$25,216.05</td>
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<tr>
<td>25%</td>
<td>$11,885.44</td>
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</tr>
<tr>
<td>30%</td>
<td>$753.50</td>
<td></td>
</tr>
<tr>
<td>31%</td>
<td>-$1,250.47</td>
<td></td>
</tr>
<tr>
<td>35%</td>
<td>-$8,627.04</td>
<td></td>
</tr>
</tbody>
</table>
WHAT IS LIFE CYCLE COSTING... 
- and how is it different from NPV
 Basically...  

• Pay now or pay later
Life Cycle Costing (LCC) Defined

• The total discounted dollar cost of owning, operating, maintaining, and disposing of a building or a building system (NIST Handbook 135)

• Life Cycle Costing is a process to determine the sum of all the costs associated with an asset or part thereof, including acquisition, installation, operation, maintenance, refurbishment and disposal costs. It is therefore pivotal to the asset management process. (NSW Government)

• Life Cycle Costing (LCC) is a methodology to evaluate the economic performance of investments in building and building systems. www.lifecycle.org
Applications of LCC

- Asset Management
- Facility Management
- Value Engineering
- Sustainable Design/Integrated Design Process
Some LCC Applications for Sustainable Design

- Analyzing active versus passive system tradeoffs: passive cooling/ventilation
- Daylighting systems versus thermal loads
- Application of renewable energy systems
- Ultra low flow water systems
LCC and NPV...the ABCs

• Both look at the COSTs and financial BENEFITS over the life of the product, installation or project
• Both can be used interchangeably
• LCC is typically used for negative NPV projects (what is the COST over the life)
• NPV is typically used for investments where the benefits are greater than the costs
• Better to have
  – High NPV
  – Low LCC
CASE STUDIES
Options to be Considered

The financial analysis is primarily a way of discriminating between options. It is a ranking tool.

Options to consider are generally:

- New Facility
  - Conventional Design
  - High Energy Efficiency & low GHG’s
- Major Repair
  - Business as usual (ongoing repair)
  - Retrofit for high EE & low GHG’s
BC Housing - Process

By Prism
1. Screening Audit (100 sites)
2. Pilot Detailed Audits and Implementation (13 Sites)
3. Detailed Audits (20 Sites)

By Others
4. Energy Performance Contracts or EPC (> 100 sites)
Pilot Overview

- 5 Directly Managed Sites
- 8 Non-Profit Sites
Typical Measures

- M1  Boiler Replacement: Install High Efficiency Boilers
- M2  Heating Plant Upgrades: Update Burner Controls
- M3  DHW Plant Upgrades including solar heating pilot (1 site)
- M4  Piping Insulation
- M5  Update Controls: Add DDC
- M6  Adjust Setpoints: Outside Air Reset
- M7  Suite Temperature Control: Zone Valves
- M8  Time Schedule Make-Up Air
- M9  Install Low Flow Fixtures
- M10 Building Envelope Improvements: Windows
- M11 Energy Efficient Lighting: Common Areas
- M12 Energy Efficient Lighting: Suites
# Savings and Financial Summary

## 5 Directly Managed Sites

### Energy Savings and Budget Cost By Measures

<table>
<thead>
<tr>
<th>Measure Code</th>
<th>Savings kWh</th>
<th>Savings GJ $</th>
<th>Budget Costs $</th>
<th>Engineering $</th>
<th>Contingency $</th>
<th>Total Costs $</th>
<th>Simple Payback</th>
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</thead>
<tbody>
<tr>
<td>M1</td>
<td>6,713¹</td>
<td>$72,009</td>
<td>572,795</td>
<td>$85,919</td>
<td>$28,640</td>
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<td>9.5</td>
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<tr>
<td>M2</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>M3</td>
<td>572</td>
<td>$6,131</td>
<td>95,296</td>
<td>$7,541</td>
<td>$4,765</td>
<td>$107,602</td>
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<td>M4</td>
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<td>4,708</td>
<td>$706</td>
<td>$235</td>
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<tr>
<td>M5</td>
<td>-</td>
<td>$-</td>
<td>10,700²</td>
<td>$1,605</td>
<td>$535</td>
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<td>$51,336</td>
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<td>M10</td>
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<td>M11</td>
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<td>M12</td>
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<tr>
<td><strong>Summary</strong></td>
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<td>$154,128</td>
<td>$982,293</td>
<td>$49,115</td>
<td>$1,171,998</td>
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Savings and Financial Summary
5 Directly Managed Sites

Energy Savings and Budget Cost By Measures Considering “Incremental Cost and Incentives”

<table>
<thead>
<tr>
<th>Measure Code</th>
<th>Savings kWh</th>
<th>Savings GJ</th>
<th>Incremental Cost</th>
<th>Engineering</th>
<th>Contingency</th>
<th>Total Incremental Costs</th>
<th>Simple Payback</th>
<th>NPV 20 yr</th>
<th>IRR 20 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>6,713</td>
<td>$72,009</td>
<td>$197,969</td>
<td>$34,195</td>
<td>$11,398</td>
<td>$243,563</td>
<td>3.4</td>
<td>$582,379</td>
<td>29.4%</td>
</tr>
<tr>
<td>M2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>($21,528)</td>
<td>2.9%</td>
</tr>
<tr>
<td>M3</td>
<td>572</td>
<td>$6,131</td>
<td>$79,546</td>
<td>$7,541</td>
<td>$4,765</td>
<td>$91,852</td>
<td>15.0</td>
<td>$11,236</td>
<td>25.8%</td>
</tr>
<tr>
<td>M4</td>
<td>137</td>
<td>$1,472</td>
<td>$4,708</td>
<td>$706</td>
<td>$235</td>
<td>$5,650</td>
<td>3.8</td>
<td>($12,840)</td>
<td></td>
</tr>
<tr>
<td>M5</td>
<td></td>
<td>$10,700</td>
<td>$1,605</td>
<td>$535</td>
<td></td>
<td>$12,840</td>
<td></td>
<td>$103,172</td>
<td>26.0%</td>
</tr>
<tr>
<td>M6</td>
<td>1,256</td>
<td>$13,471</td>
<td>$42,780</td>
<td>$6,417</td>
<td>$2,139</td>
<td>$51,336</td>
<td>3.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$22,869</td>
<td>39.7%</td>
</tr>
<tr>
<td>M8</td>
<td>238</td>
<td>$2,554</td>
<td>$5,350</td>
<td>$803</td>
<td>$268</td>
<td>$6,420</td>
<td>2.5</td>
<td>$96,138</td>
<td>23.9%</td>
</tr>
<tr>
<td>M9</td>
<td>1,222</td>
<td>$13,106</td>
<td>$45,154</td>
<td>$6,773</td>
<td>$2,258</td>
<td>$54,185</td>
<td>4.1</td>
<td>$153,137</td>
<td></td>
</tr>
<tr>
<td>M10</td>
<td>1,245</td>
<td>$13,351</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$19,807</td>
<td>8.7%</td>
</tr>
<tr>
<td>M11</td>
<td>169,270</td>
<td>$9,135</td>
<td>$69,795</td>
<td>$11,380</td>
<td>$3,793</td>
<td>$84,968</td>
<td>9.3</td>
<td>$117,443</td>
<td>14.8%</td>
</tr>
<tr>
<td>M12</td>
<td>336,746</td>
<td>$22,899</td>
<td>$119,274</td>
<td>$19,447</td>
<td>$6,482</td>
<td>$145,203</td>
<td>6.3</td>
<td>$1,071,515</td>
<td>21.7%</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
<td><strong>506,016</strong></td>
<td><strong>11,383</strong></td>
<td><strong>$154,128</strong></td>
<td><strong>$88,866</strong></td>
<td><strong>$31,873</strong></td>
<td><strong>$696,016</strong></td>
<td><strong>4.5</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bentall IM - Process

1. Screening Audit - 18 sites
2. Detailed Audits - 7 sites
3. Business Case - 6 sites
4. Implementation - 6 sites
5. Follow up M&V - 4 sites
Typical Measures

- M1 - Install High Efficiency Boilers
- M2 - DHW Plant Retrofit
- M3 - Install Building Automation System
- M4 - Building Envelope Improvements
- M5 - Air Conditioning Chiller Replacement
- M6 - Variable Speed Drives
- M7 - Accurate Suite Temperature Control
- M8 - Energy Efficient Lighting and Controls
- M9 - Building Ventilation Controls
- M10 - Garage Energy Opportunities
- M11 - Indoor Pool Measures
- M12 - Laundry Room Measures
- M13 - Water Conservation
Savings and Financial Summary
Bentall IM

Energy Savings and Budget Cost By Measures Considering "Incremental Cost"

<table>
<thead>
<tr>
<th>Measure</th>
<th>Energy Cost Savings ($)</th>
<th>Capital Cost Estimate ($)</th>
<th>Capital Cost Estimate ($) Credit applied for heating plants</th>
<th>Simple Payback With Credit</th>
<th>NPV 20 yr</th>
<th>irr 20 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Locations</td>
<td>$ 337,000</td>
<td>$ 3,609,000</td>
<td>$ 1,959,000</td>
<td>5.8</td>
<td>$ 1,910,000</td>
<td>16.4%</td>
</tr>
</tbody>
</table>
SENSITIVITY ANALYSIS
Risk and Sensitivity Analysis

Scenarios

- Pessimistic
  - e.g. much higher interest rates
- Realistic
  - Best guess
- Optimistic
  - e.g. much higher energy costs
Sample Building, Vancouver

Scenarios
• 10, 15, 20 year measure life
• 0%, 2%, 4% utility rate escalation
• 4%, 6%, 8% discount rate

Could also consider
• Carbon tax
• Carbon credits
• Maintenance savings
THE IMPACT OF INCENTIVES
Impact of Incentives on the Business Case

- Sample Building
- NRCan $10/GJ (equivalent to $0.036/kWh)
- Terasen Gas estimated at $14,500 based on boiler incentive program
- BC Hydro estimated at $0.10/kWh (varies with measure and program)
## Sample Building, Vancouver

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Capital Costs</th>
<th>Energy Savings</th>
<th>Simple Payback</th>
<th>NPV (20 years, 6%, 2.5% escalation)</th>
<th>IRR (20 years, 2.5% escalation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case</td>
<td>$265,700</td>
<td>$42,746</td>
<td>6.2</td>
<td>$331,616</td>
<td>17.5%</td>
</tr>
<tr>
<td>With Incentives</td>
<td>$190,343</td>
<td>$42,746</td>
<td>4.5</td>
<td>$406,974</td>
<td>24.5%</td>
</tr>
<tr>
<td>Change</td>
<td></td>
<td></td>
<td>-1.7</td>
<td>+$75,358</td>
<td>+7.0%</td>
</tr>
</tbody>
</table>
TOOLS AND CALCULATORS
Sample Spreadsheet Tools

- NRCan (Energy Savings Toolbox)
- DOE (Energy Star Value Calculator)
- The Building Upgrade Value Calculator (BUVC), developed as part of the BOMA Energy Efficiency Program (BEEP), estimates the financial impact of proposed energy efficiency projects.
## EMO Life Cycle Cash Flow Analysis

### Base Financial Case

<table>
<thead>
<tr>
<th>Costs for Period</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Cost</td>
<td>$50,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>$200</td>
<td>$204</td>
<td>$208</td>
<td>$212</td>
<td>$216</td>
<td>$221</td>
<td>$225</td>
<td>$230</td>
<td>$234</td>
<td>$239</td>
</tr>
<tr>
<td>Asset depreciation</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lease costs</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Taxes</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Labour</td>
<td></td>
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<td></td>
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<tr>
<td>Other</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sub-total Costs</strong></td>
<td>$50,200</td>
<td>$204</td>
<td>$208</td>
<td>$212</td>
<td>$216</td>
<td>$221</td>
<td>$225</td>
<td>$230</td>
<td>$234</td>
<td>$239</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Savings for Period</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>$10,500</td>
<td>$10,500</td>
<td>$10,500</td>
<td>$10,500</td>
<td>$10,500</td>
<td>$10,500</td>
<td>$10,500</td>
<td>$10,500</td>
<td>$10,500</td>
<td>$10,500</td>
</tr>
<tr>
<td>Water</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Maintenance</td>
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<tr>
<td>Taxes</td>
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<tr>
<td>Insurance</td>
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<td></td>
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</tr>
<tr>
<td>Labour</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>GHG Factors</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sub-total Savings</strong></td>
<td>$16,035</td>
<td>$16,035</td>
<td>$16,035</td>
<td>$16,035</td>
<td>$16,035</td>
<td>$16,035</td>
<td>$16,035</td>
<td>$16,035</td>
<td>$16,035</td>
<td>$16,035</td>
</tr>
</tbody>
</table>

- **Net Cash Flow**: $(34,165)
- **Net Project Value**: $(34,165)
- **Discounted Cash Flow**: $(34,165)

<table>
<thead>
<tr>
<th>Discount Rate</th>
<th>10.00%</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Discounted Cash Flow</td>
<td>$(34,165)</td>
<td>$14,392</td>
<td>$13,080</td>
<td>$11,888</td>
<td>$10,804</td>
<td>$9,819</td>
<td>$8,924</td>
<td>$8,111</td>
<td>$7,371</td>
<td>$6,699</td>
</tr>
</tbody>
</table>

- **Net Present Value (NPV)**: $63,012
- **Internal Rate of Return (IRR)**: 45%

Download from NRCan, 10 copies today
An Energy Assessment Tool that Incorporates Financial Analysis

- RETScreen® v4
- Download from www.retscreen.net
TRAINING
Online e-Energy Training

www.bomalearning.com

**Investment Appraisal Objectives**

- What are the investment appraisal’s objectives?
- Why do I need a business case?
- As an energy efficiency champion, what can I do to make the case for an energy management project?

**Assessing Costs and Benefits**

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Direct energy savings</td>
<td>• Direct implementation costs</td>
</tr>
<tr>
<td>• Indirect energy savings</td>
<td>• Direct energy costs</td>
</tr>
<tr>
<td>• Comfort/productivity increases</td>
<td>• Indirect energy costs</td>
</tr>
<tr>
<td>• Operating and maintenance cost reductions</td>
<td>• O &amp; M cost increases</td>
</tr>
<tr>
<td>• Environmental impact reduction</td>
<td></td>
</tr>
<tr>
<td>• O &amp; M savings</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY
Getting Approval

• We need to make the business case!

• It is not just our sector...this applies to other industries as well (see Health Care next slide)
Archive

Greening Operations Series: Making the Business Case for Energy Efficiency to your CFO
Feb 20 2009

Topic

Facility managers can position energy as a controllable cost that, when well managed, can produce significant energy savings. In this presentation, you will hear from Skanda Skandaveli, Director of Facilities Management at Lawrence Memorial Hospital, who has effectively made the business case for energy performance investments by positioning energy as an investment-grade opportunity and by making an effective pitch that speaks in executive terms and aligns with the hospital's core mission - patient health.

Points To Include

Sixty-seven percent of healthcare CEOs list financial challenges as their number one concern and 75% of senior decision-makers believe that energy costs are the least controllable business cost. Meanwhile, U.S. hospitals are the second most energy-intensive commercial space type, making the impact of unstable energy prices and of savings from energy efficiency investments particularly significant.

Hospitals nationwide have been able to demonstrate that energy investments can create healthier hospitals - both for the environment and the bottom line. Facility managers can position energy as a controllable cost that, when well managed, can produce significant energy savings. In this presentation, you will hear from Skanda Skandaveli, Director of Facilities Management at Lawrence Memorial Hospital, who has effectively made the business case for energy performance investments by positioning energy as an investment-grade opportunity and by making an effective pitch that speaks in executive terms and aligns with the hospital’s core mission – patient health.
Beyond the Bottom Line

“Corporations face increased pressure to act in an accountable and socially responsible manner. More and more, a firm’s reputation is becoming a discriminating factor for many investors and customers.

In 2002, sustainable development-based investing in Canada accounted for $51.4 billion of assets held in mutual funds. In addition to traditional business fundamentals, these funds consider a firm’s environmental management practices, investments in communities, and shareholder advocacy. They screen for positive as well as negative company practices.”

Issues and Concepts

- Costs and benefits can be valued in dollars
- Project life cycle or system life is basis for comparison
- To be compared, dollars in different years must be “discounted” to their present value amounts
- Various inflation factors can be taken into account
- For each year, the difference between benefit and cost is discounted to the present
- The discounted net (benefit-cost) for all years is summed and compared to the initial investment
Summary

• NPV is an essential tool for decision making about energy management strategies
• NPV must not be used in a static fashion, but as an exploratory tool with sensitivity analysis
• Selection of discount rate and inflation factors is the key to a good NPV analysis
THANK YOU!

Robert Greenwald, P.Eng., MBA, President
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604-205-5500
robert@prismengineering.com