2015 POWER SMART FORUM

GETTING TO ZERO: INNOVATING FOR THE FUTURE

Finding Funds for Energy Efficiency Projects

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Prism ENGINEERING 25 YEARS

saving you energy

Overview

3:30 p.m. – 4:30 p.m., Tuesday, October 27

We know you're busy. That's why this workshop is designed to do the heavy lifting when it comes to getting your energy-efficiency project off the ground. Led by Robert Greenwald from Prism Engineering, the session is based on his years spent helping B.C. commercial energy managers put together successful business cases for energy conservation projects.

Learn how to calculate the value of a project and proven ways to overcome financial barriers that can stall cost-saving initiatives. You can't afford to miss it.

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Agenda

1. Some Context
2. The Business Case
3. Time Value of Money
4. Calculating Financial Value
5. Case study

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The Context

- Budget cutbacks
- No/limited capital
- Other priorities ahead of energy projects
- Deferred maintenance requires more attention

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Challenges

- How can we invest in energy management when there are so many cuts happening in other areas?
- Decision makers don’t see value / “understand” energy management projects

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The Business Case

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Decision Points

- Many steps to getting approval
- Unique to each organization
- Limited resources leads to a “competition”

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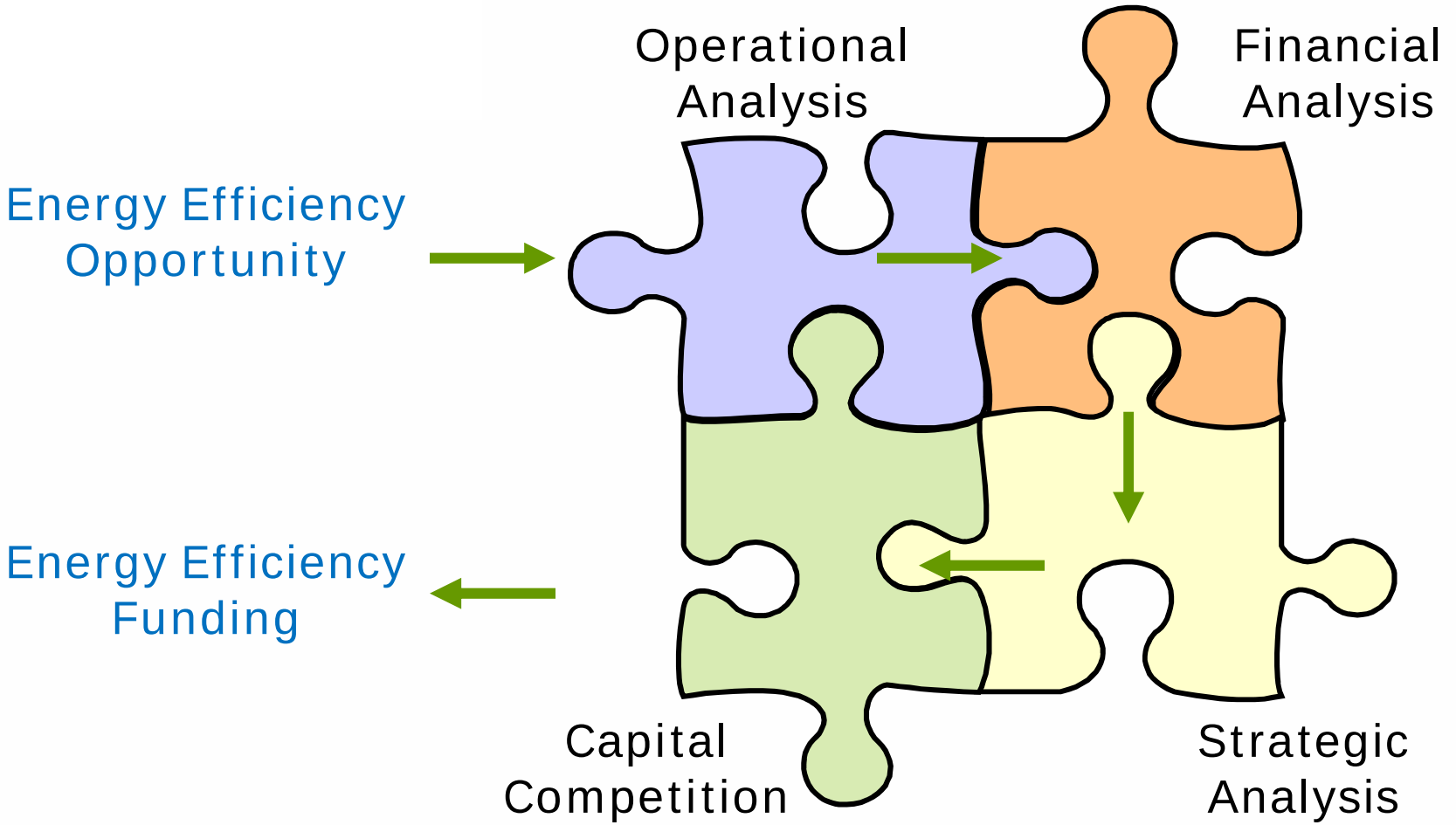
Decision Process



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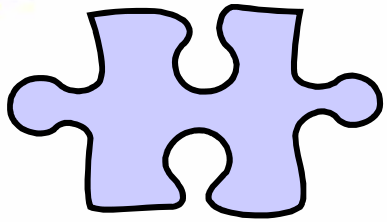
Source: NRCan Energy Efficiency Finance Workshop

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?
- Are there environmental and safety implications?

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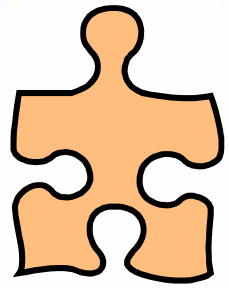
Typical Questions: Financial



- 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?

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Speaking the Language of the CFO

"…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."

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ROI, Risk and Time Value of Money

"…when return on investment, risk and time value of money are considered, often energy efficiency upgrades are shown to be very prudent."

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Financial Hurdles

"…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."

Why Energy Efficiency?

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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?

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The Capital Competition

- Which investments make the best use of available money?
- Ensure optimum benefits from investment
- Minimize the risk
- A basis for subsequent performance analysis

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Outline for the Business Case

- Current situation
- Proposed modifications
- Energy and non-energy benefits
- Financial summary
- Risks
- Implementation plan

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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

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The Pitch

- Know your audience
- Grab their attention early
- Start with key positive points
- Be logical – stay on topic
- Use appropriate data
- End with a follow-up statement

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Financial Analysis:
Time Value of Money

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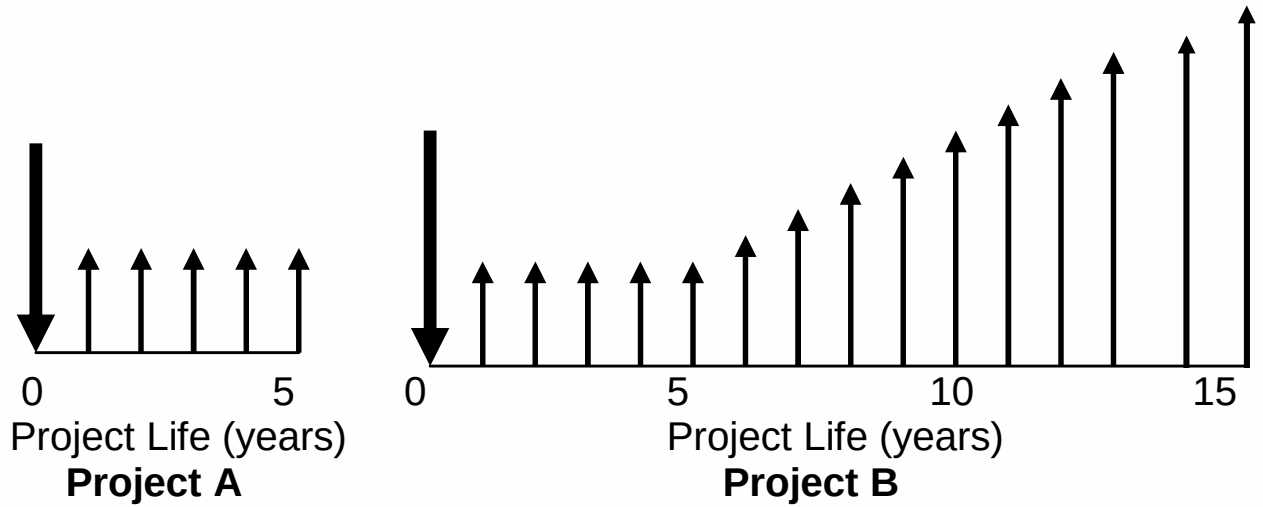
Simple Payback… too simple?



Which project would you prefer?

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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

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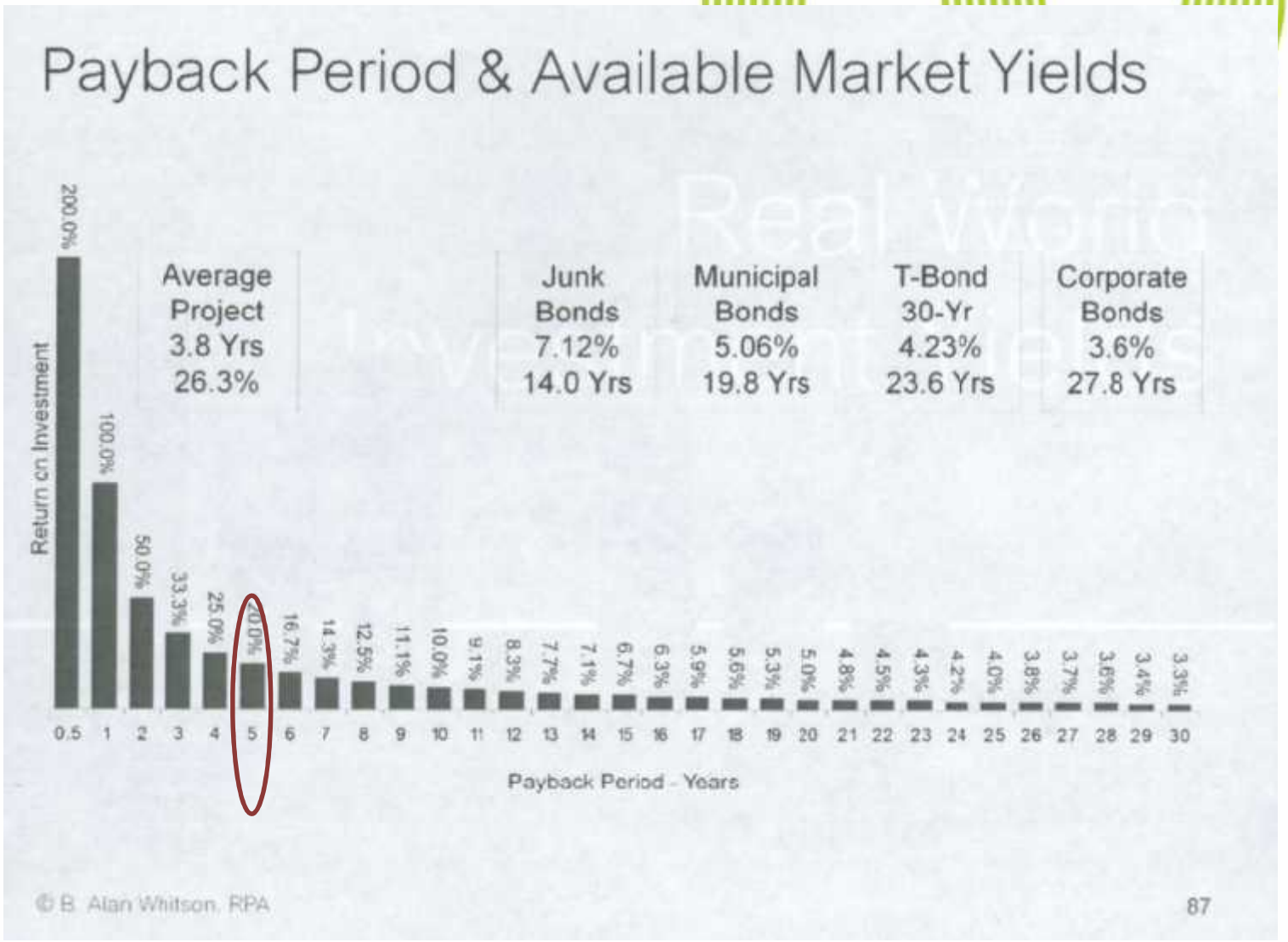

Credit: From Finance 101 for Facility and Property Managers Course presented by Alan Whitson, Oct 30, 2014
Sponsored by: Corporate Realty, Design & Management Institute (www.squarefootage.net)

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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.*

Inflows & Outflows

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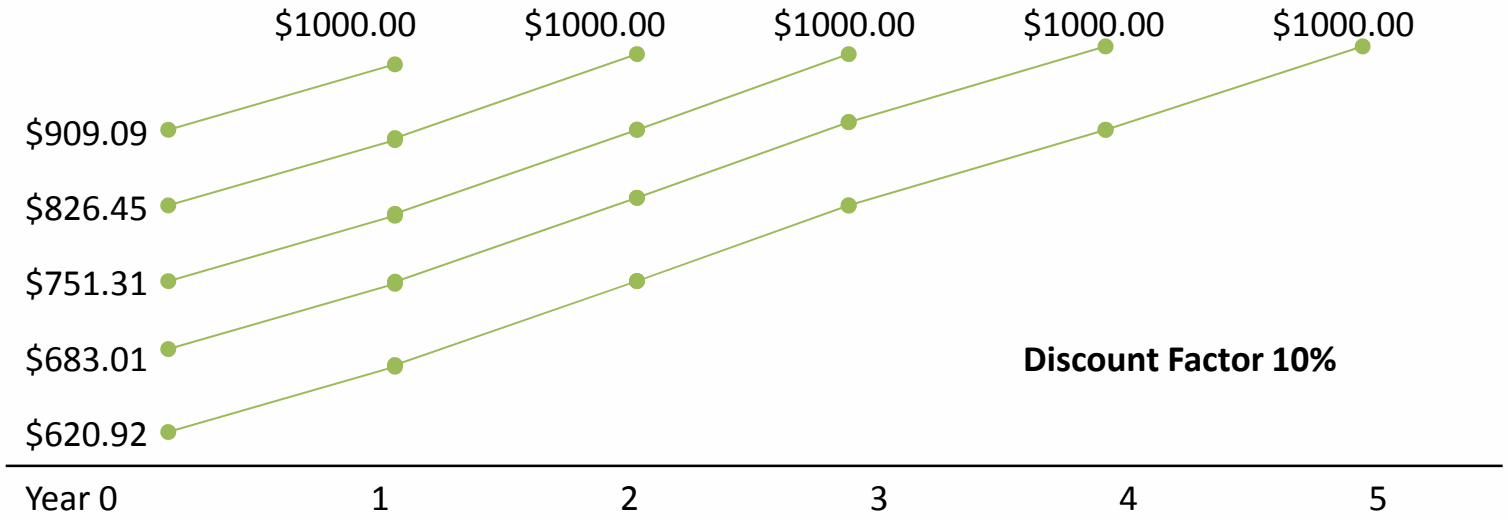
Time Value of Money: Discount Factors

Discount Factors $1/(1+i)^n$						
Year (n)	0	1	2	3	4	5
Discount Factor						
6%	1	0.942	0.888	0.840	0.792	0.747
10%	1	0.909	0.826	0.751	0.683	0.620
20%	1	0.833	0.694	0.579	0.482	0.402
30%	1	0.769	0.591	0.456	0.350	0.270
40%	1	0.714	0.510	0.364	0.260	0.186
45%	1	0.690	0.476	0.328	0.226	0.156
50%	1	0.666	0.444	0.297	0.198	0.132



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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%

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Example (continued)

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

$$PV = \left(\frac{1}{(1 + .03)^{30}} \right) \$1{,}000_{\,year\ 30}$$

- Do calculation:

$$PV = \$1{,}000 \text{ x } 0.41199 = \$412$$

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Discount Rate Is Important

- The 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

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$10,000 Savings in the Future…
How Much in my Pocket Today?

Year	Savings	2%	4%	6%	8%
1	$ 10,000.00	$ 9,803.92	$ 9,611.69	$ 9,423.22	$ 9,238.45
2	$ 10,000.00	$ 9,611.69	$ 9,238.45	$ 8,879.71	$ 8,534.90
3	$ 10,000.00	$ 9,423.22	$ 8,879.71	$ 8,367.55	$ 7,884.93
4	$ 10,000.00	$ 9,238.45	$ 8,534.90	$ 7,884.93	$ 7,284.46
5	$ 10,000.00	$ 9,057.31	$ 8,203.48	$ 7,430.15	$ 6,729.71
6	$ 10,000.00	$ 8,879.71	$ 7,884.93	$ 7,001.59	$ 6,217.21
7	$ 10,000.00	$ 8,705.60	$ 7,578.75	$ 6,597.76	$ 5,743.75
8	$ 10,000.00	$ 8,534.90	$ 7,284.46	$ 6,217.21	$ 5,306.33
9	$ 10,000.00	$ 8,367.55	$ 7,001.59	$ 5,858.62	$ 4,902.23
10	$ 10,000.00	$ 8,203.48	$ 6,729.71	$ 5,520.71	$ 4,528.90
11	$ 10,000.00	$ 8,042.63	$ 6,468.39	$ 5,202.29	$ 4,184.01
12	$ 10,000.00	$ 7,884.93	$ 6,217.21	$ 4,902.23	$ 3,865.38
13	$ 10,000.00	$ 7,730.33	$ 5,975.79	$ 4,619.48	$ 3,571.01
14	$ 10,000.00	$ 7,578.75	$ 5,743.75	$ 4,353.04	$ 3,299.06
15	$ 10,000.00	$ 7,430.15	$ 5,520.71	$ 4,101.97	$ 3,047.82
16	$ 10,000.00	$ 7,284.46	$ 5,306.33	$ 3,865.38	$ 2,815.72
17	$ 10,000.00	$ 7,141.63	$ 5,100.28	$ 3,642.43	$ 2,601.29
18	$ 10,000.00	$ 7,001.59	$ 4,902.23	$ 3,432.34	$ 2,403.19
19	$ 10,000.00	$ 6,864.31	$ 4,711.87	$ 3,234.37	$ 2,220.17
20	$ 10,000.00	$ 6,729.71	$ 4,528.90	$ 3,047.82	$ 2,051.10

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Financial Analysis:
Calculating Financial Value

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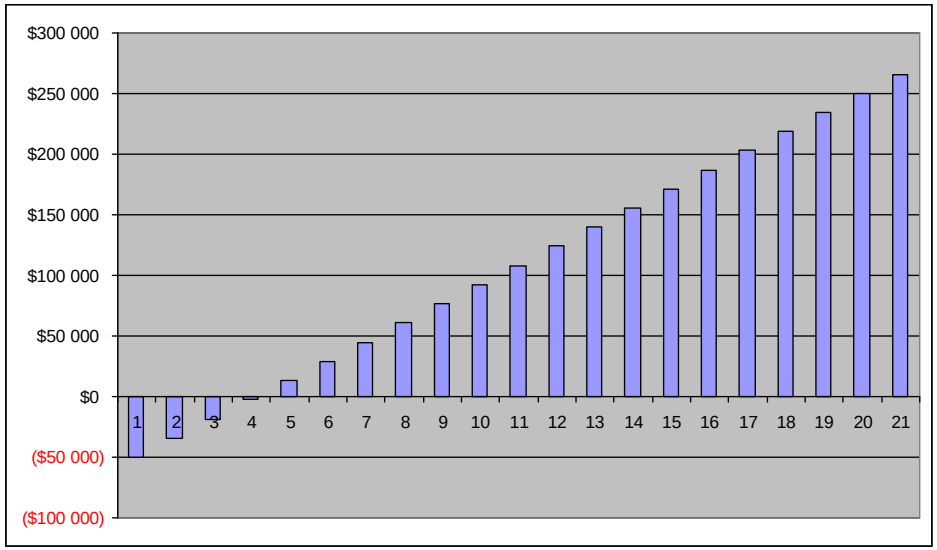
Net Present Value (NPV) Approach

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



Cumulative cash flow shown

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Components Required to Calculate NPV

- Total investment costs for each alternative:
  - Initial investment costs
  - Major equipment residual market value
- All variations of revenues realized as a result of 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)

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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

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Financial Criteria

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

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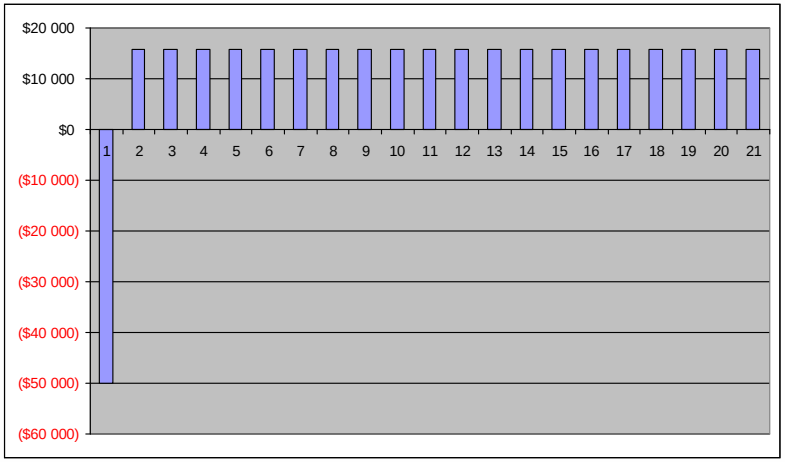
Calculation Methodology



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**

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Cash Flow Example:

Boiler

Cash Flow Table for Purchase of new Boiler						
Capital Expenditure $100,000 Expected Savings $48,000			90% on delivery/commissioning, and 10% performance guarantee due at one year Half in first year, full amount in all remaining years			
(Values in $'000)						
Year	**0**	**1**	**2**	**3**	**4**	**5**
Costs	(90.0)	(10.0)	0	0	0	0
Savings	0	24.0	48.0	48.0	48.0	48.0
Net cash flow	(90.0)	14.0	48.0	48.0	48.0	48.0
Cumulative Project Value	(90.0)	(76.0)	(28.0)	20.0	68.0	116.0

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Net Present Value

NPV Calculation						
Year	0	1	2	3	4	5
Net cash flow ($000s)	(90.0)	14.0	48.0	48.0	48.0	48.0
The discounted cash flow at 10% can be found as follows:						
Year 0	1 x (90.0)	= (90.0)				
Year 1	0.909 x 14.0	= 12.73				
Year 2	0.826 x 48.0	= 39.65				
Year 3	0.751 x 48.0	= 36.05				
Year 4	0.683 x 48.0	= 32.78				
Year 5	0.620 x 48.0	= 29.76				
NPV = the sum of all these values = 60.97 (vs. cumulative project value = 116.0)						

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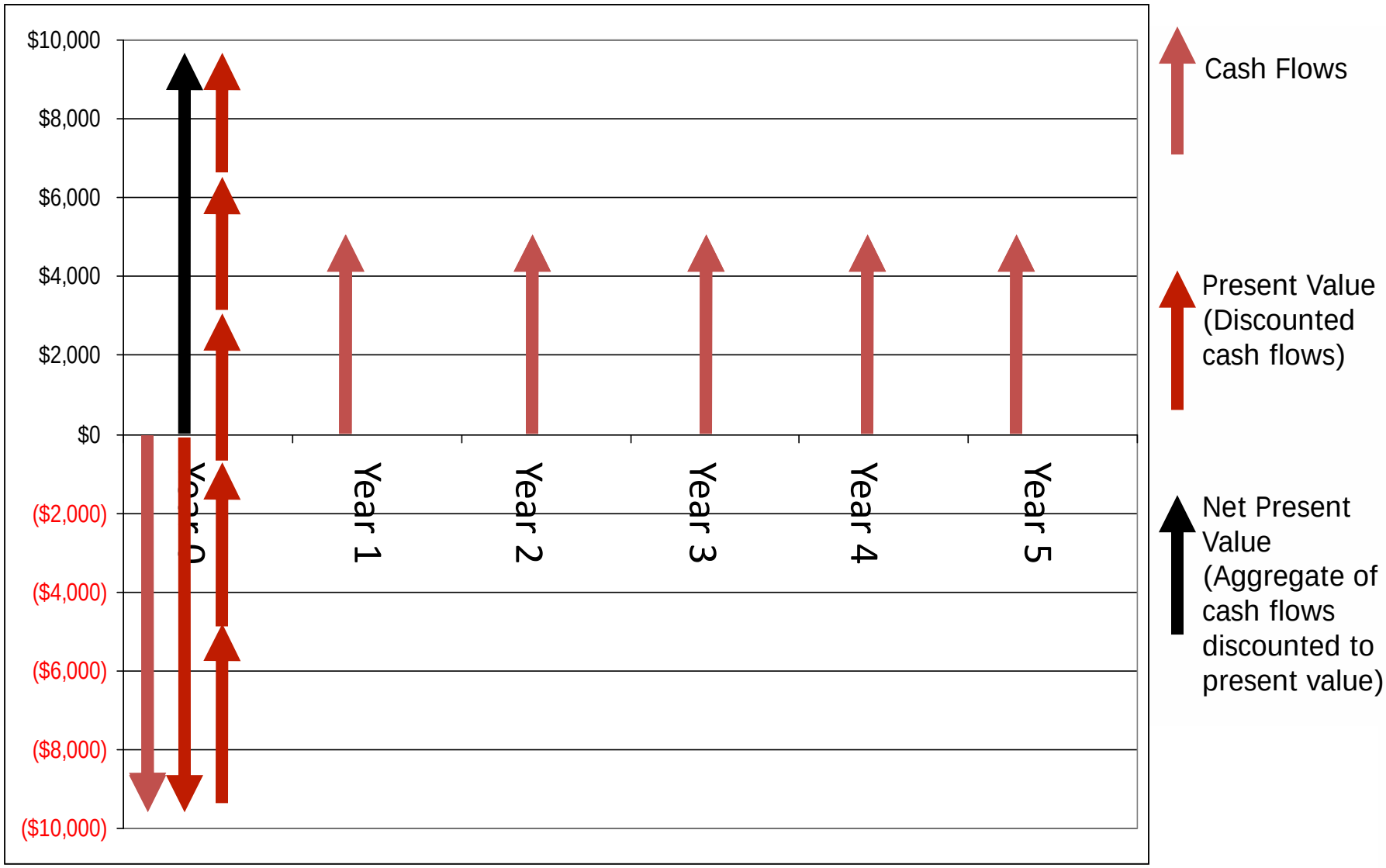
Net Present Value…Are you Ahead?



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.

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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.

Sometimes known as “project yield”.

Discount	NPV	IRR
10%	**$61,049**	**30.4%**
20%	**$25,216**	
25%	**$11,885**	
30%	**$753**	
31%	**-$1,250**	
35%	**-$8,627**	

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Sensitivity Analysis
RETScreen Tool

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Natural Resources Canada | Ressources naturelles Canada

Canada

RETScreen® International

www.retscreen.net

Clean Energy Project Analysis Software

Project information

See project database

Project name	Model National Energy Code for Buildings (MNECB)
Project location	Canada
Prepared for	
Prepared by	
Project type	Energy efficiency measures
Facility type	Commercial
Analysis type	Method 2
Heating value reference	Higher heating value (HHV)
Show settings	☐

Site reference conditions

Select climate data location

Climate data location	London Airport
Show data	☐

Complete Energy Model sheet

RETScreen Energy Efficiency Model

RETScreen Energy Model - Energy efficiency measures project

Fuels & schedules — Show data

Fuel			Fuel type 1	Fuel type 2	Fuel type 3	Fuel type 4	Fuel type 5	Fuel type 6
Fuel type			Electricity	Natural gas - m³				
Fuel consumption - unit			MWh	m³				
Fuel rate - unit			$/kWh	$/m³				
Fuel rate			0.100	0.400				

Schedule	Unit		Schedule 1	Schedule 2	Schedule 3	Schedule 4	Schedule 5	Schedule 6
Description			24/7					
			Occupied	Occupied	Occupied	Occupied	Occupied	Occupied
Temperature - space heating	°C		23.0	21.0				
Temperature - space cooling	°C		23.0	24.0				
				Unoccupied				
Temperature - unoccupied	+/-°C			3.0				
				Occupied				
Occupancy rate - daily			h/d	h/d				
Monday			24	18.0				
Tuesday			24	18.0				
Wednesday			24	18.0				
Thursday			24	18.0				
Friday			24	18.0				
Saturday			24	18.0				
Sunday			24	18.0				
Occupancy rate - annual	h/yr		8,760	6,570				
	%		100%	75%				
Heating/cooling changeover temperature	°C	16.0						
Length of heating season	d	242						
Length of cooling season	d	123						

Facility characteristics — Show data

Show:	Heating	Cooling	Electricity	Incremental initial costs	Fuel cost savings	Incremental O&M savings	Simple payback	Include measure?
Fuel saved	GJ	GJ	GJ	$	$	$	yr	
Heating system								
Boiler	0	-	-	0	0	0	-	
Cooling system								
Air-conditioning	-	0	-	0	0	0	-	
Building envelope								
Appartment building	2,686	0	-	60,000	28,659	0	2.1	
Ventilation								
Lights								
Electrical equipment								
Hot water								
Other								
Total	2,686	0	0	60,000	28,659	0	2.09	

Summary — Show data

	Fuel		Base case		Proposed case		Fuel cost savings	
Fuel type	**Fuel consumption - unit**	**Fuel rate**	**Fuel consumption**	**Fuel cost**	**Fuel consumption**	**Fuel cost**	**Fuel saved**	**Fuel cost savings**
Natural gas	m³	$ 0.400	160,194.2	$ 64,078	88,546.3	$ 35,419	71,647.8	$ 28,659
Total				$ 64,078		$ 35,419		$ 28,659

Project verification **Fuel type**	**Fuel consumption - unit**	**Fuel consumption - historical**	**Fuel consumption Base case**	**Fuel consumption - variance**
Natural gas	m³		160,194.2	

Energy	**Heating GJ**	**Cooling GJ**	**Electricity GJ**	**Total GJ**
Energy - base case	4,204			4,204
Energy - proposed case	2,324			2,324
Energy saved	1,880			1,880
Energy saved - %	44.7%			44.7%

Benchmark		
Energy unit	kWh	
Reference unit	m²	7,500

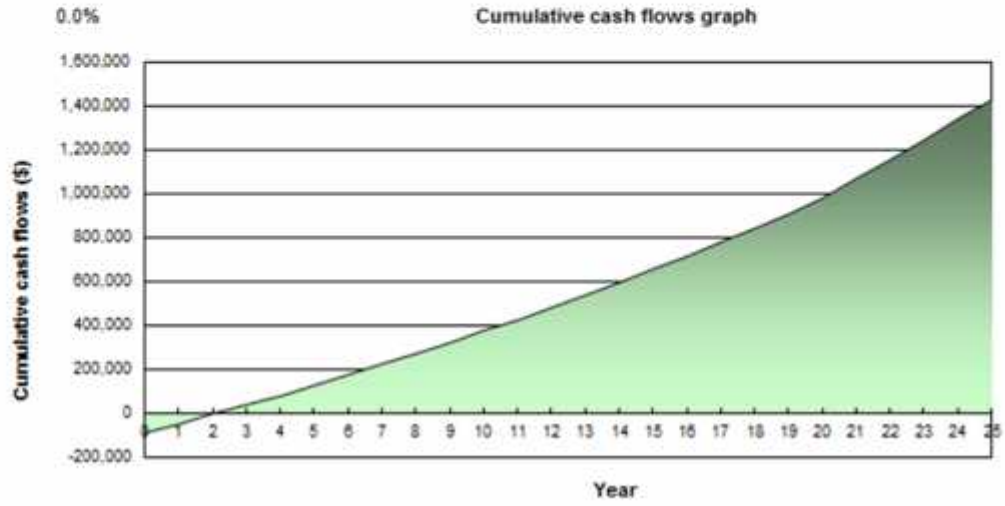
Benchmark Energy	**Heating kWh/m²**	**Cooling kWh/m²**	**Electricity kWh/m²**	**Total kWh/m²**
Energy - base case	155.7			155.7
Energy - proposed case	86.1			86.1
Energy saved	69.6			69.6

- **Base case vs. proposed case**
- **Steps:**
  1. Fuel & schedules
  2. Facility characteristics (energy + costs)
  3. Summary (energy)
  4. Emission analysis
  5. Financial analysis

RETScreen Financial Analysis Summary

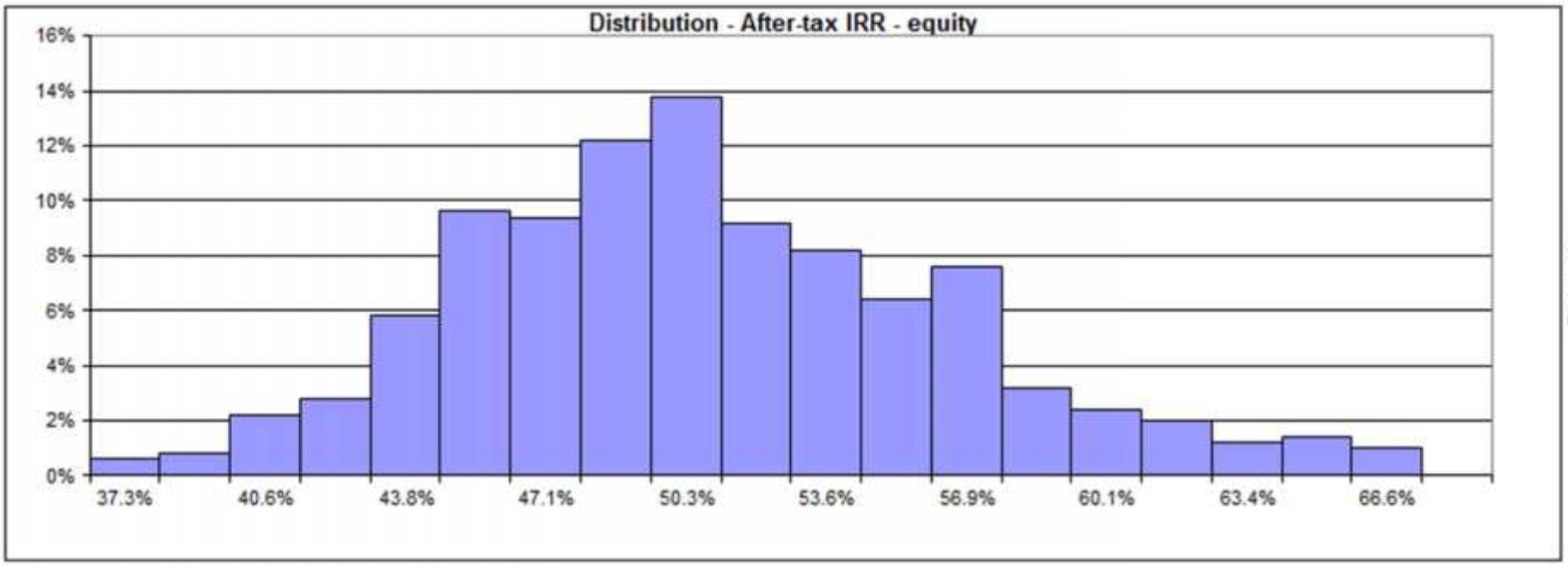
Financial Analysis

Financial parameters			
Inflation rate	%	2.0%	
Project life	yr	25	
Debt ratio	%	70%	
Debt interest rate	%	7.00%	
Debt term	yr	20	
Initial costs			
Energy efficiency measures	$	280,116	100.0%
Other	$		0.0%
Total initial costs	$	280,116	100.0%
Incentives and grants	$		0.0%
Annual costs and debt payments			
O&M (savings) costs	$	-500	
Fuel cost - proposed case	$	59,046	
Debt payments - 20 yrs	$	18,509	
Other	$		
Total annual costs	$	77,054	
Annual savings and income			
Fuel cost - base case	$	116,188	
Other	$		
Total annual savings and income	$	116,188	
Financial viability			
Pre-tax IRR - equity	%	50.8%	
Pre-tax IRR - assets	%	16.7%	
Simple payback	yr	4.9	
Equity payback	yr	2.1	



RETScreen Range of Results for IRR

Median	%	50.3%
Level of risk	%	
Minimum within level of confidence	%	36.5%
Maximum within level of confidence	%	69.1%



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Case Study

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Commercial Energy Managers

- Supporting Energy Managers with their Business Case Development
- Examples:

City of Maple Ridge

- Feedback and ideas on forward looking SEMP

Colliers

- Reviewed methodology for selecting top sites for energy audits
- Reviewed SEMP issues related to multi-building portfolio

Amica

- Created a financial spreadsheet to illustrate the business case for a lighting retrofit
- Supported the Energy Manager's presentation to the CFO and COO about the energy retrofit business case

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Colliers

- Helped the Energy Manager understand the increase in asset value after retrofit with Sr VP
- Created a custom excel business case template for 'selling' the financial case of energy retrofit projects

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Sample Business Case

- General Info (real building and retrofit)
  - 38,000 m^2
  - BC Hydro Customer
  - Lighting Retrofit
    - $165,000 capital costs
    - $25,000 incentive
    - $18,675 annual energy savings
    - $3,500 annual maintenance savings

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Assumptions

- 2% energy cost increase per year
- 2% maintenance cost increase per year
- 6% discount rate
- 10% depreciation rate
- Corporate taxes excluded

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Owner Occupied Building

Use own capital, gets all the energy savings

Simple Payback 6.8 years

Net present value $23,795 (over 10 years)

Net present value $137,471 (over 20 years)

IRR 9.3% (over 10 years)

IRR 15.4% (over 20 years)

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The Tenant Perspective

Over a 10 year lease…

- Pay $0.925 per square foot in energy and maintenance

Or (after retrofit)

- Pay $0.917 per square foot in energy, maintenance and depreciation

Net benefit of nearly $50,000 over lease

Renewed System (less glare) + other benefits

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The Building Owner's Perspective

- Put up the capital but charge a competitive interest rate to the tenant to cover costs
- Keep rents the same for 10 years
- Increase rent by 6 cents/sqft at the end of lease (the same amount as the project savings)
- $22,300 additional rent each year
- At 5% cap rate, increase in BUILDING ASSET VALUE by $445,000

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Making the Sale…
Know Your Audience

Audience		Motivation	
Owner	x	Green Reputation	x
		Increase Asset Value	x
		Easier to Rent (competitive)	x
Asset Manager	x	Mandated	x
		Look Good/Reputation	x
		Increase Asset Value	x
		Bonus Fees	x
Property Manager	X	Mandated	x
		Look Good/Reputation	X
		Bonus Fees	X
Building Operator	x	Mandated	x
		Look Good/Reputation	x
		Easier to do my job	x
		More job satisfaction with new equipment	x

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Summary

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Summary

- Build the VALUE argument (using financial analysis)
- Build the RISK argument
- Connect with other initiatives that have funding secured and aligned with corporate priorities
- **Build the business case showing the appropriate benefits for all decision makers**

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Watch the Savings Grow

A story…

One of my first energy audits

1994 Power Smart Excellence Award

Downtown Vancouver office Building

100,000 square feet, multiple tenants

First exposure to DDC for Operator

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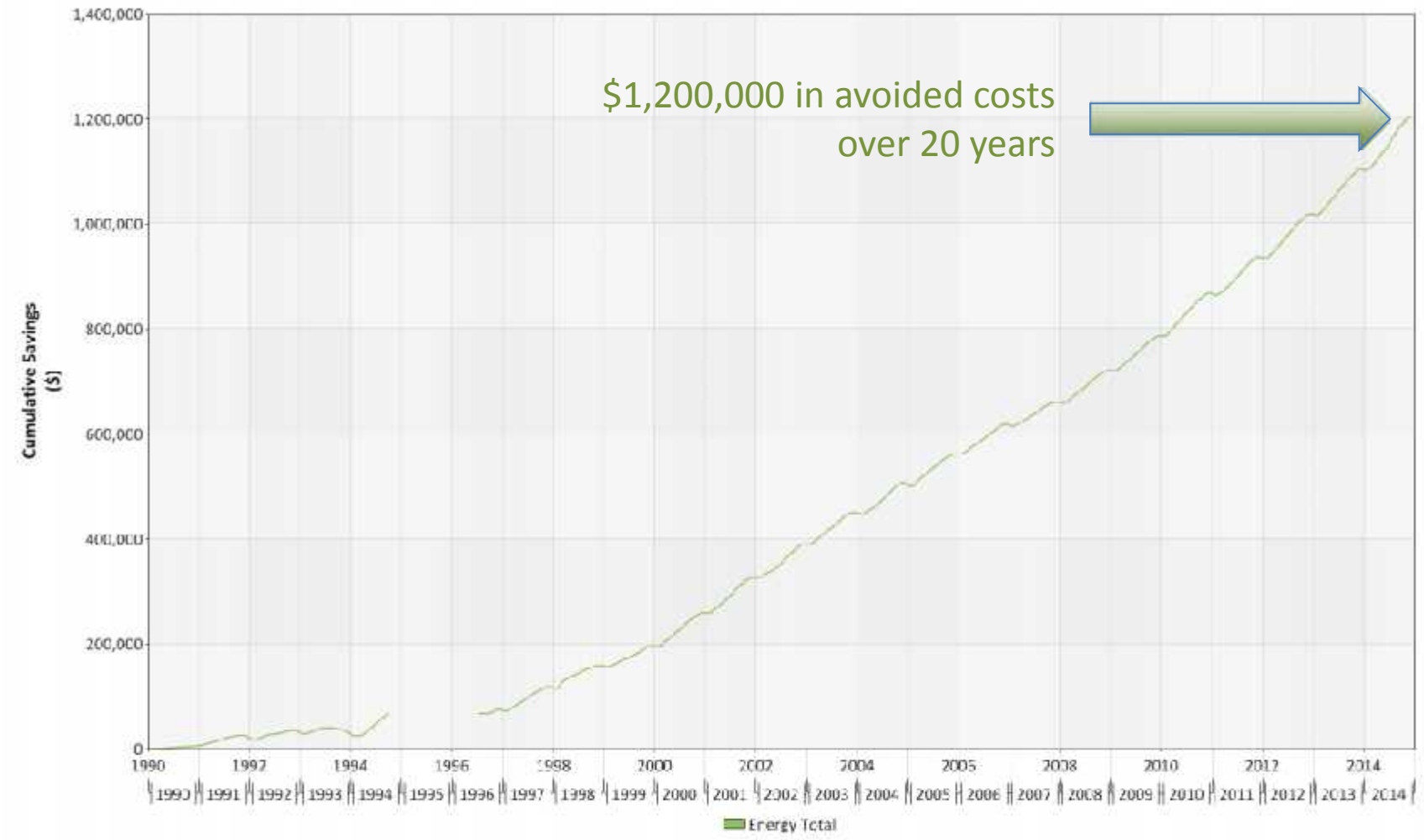
Power of Compounding



based on average rates

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Thank You!

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