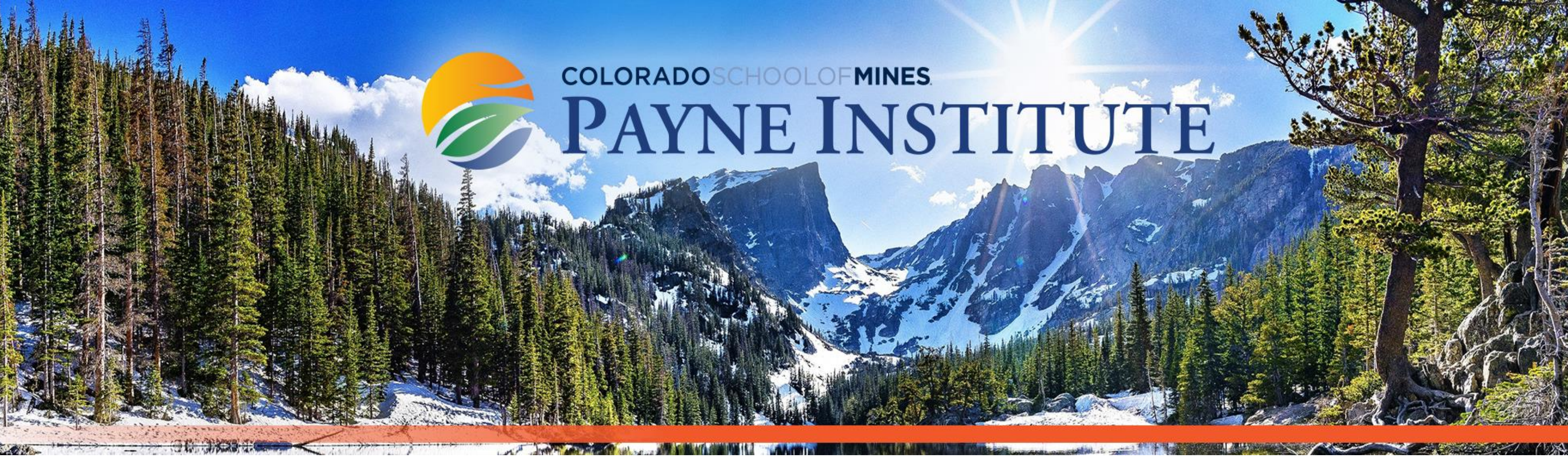

SIMPLE PAYBACK - THE DEATH OF MOST COST-EFFECTIVE CLEAN ENERGY PROJECTS

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Simple Payback for Retirement Planning vs. Energy Planning

How many of you out there reading this article choose your retirement investment options based on the simple payback method? Unless you expect to die in the next year or two (sorry), my guess is that your answer would be "no" - zero people would use this method.

I have asked the same question to audiences at numerous conference presentations and RETScreen training sessions that I have delivered over the past two decades. I have yet to have one person raise their hand to indicate that this is how they make their retirement planning decisions. Yet, when I ask how many people would typically use simple payback to make energy decisions, invariably, more than 50% of the audience reluctantly raise their hands.

This is interesting. In our personal lives, we tend to use reasonably sophisticated decision-making criteria, such as return-on-investment (ROI), to make retirement investment decisions. However, at work many of us seem to default to simple payback as the primary decision-making method for clean energy investments, including energy efficiency, renewable energy and cogeneration projects.

In the example below, the financial viability of an energy efficiency project is assessed using the RETScreen Clean Energy Management Software [1]. This suite of energy efficiency measures for this project has a **simple payback of 8.9 years**. If this project is for an industrial or commercial client, there is very little chance that senior management would approve this investment based on simple payback - it is too long. This would only be possible in an organization that has a longer-term time frame for investments, such as a school board. Yet, this project has a **pre-tax internal rate of return (IRR) on equity of 17.3%**. The exact same project, with a bit of financing, now looks very attractive to the industrial and commercial decision-makers, when using the IRR as the primary decision-making indicator. If simple payback was used as the primary decision criteria, this project would be dead. With a relatively easy step to prepare a proper financial analysis, this project now has a much higher chance of being approved and moving forward to implementation.

Financial viability

Costs | Savings | Revenue

Initial costs			
Incremental initial costs	100%	$	84,774
Total initial costs	**100%**	**$**	**84,774**
Annual costs and debt payments			
O&M costs (savings)		$	-1,175
Fuel cost - proposed case		$	17,118
Debt payments - 15 yrs		$	6,515
Total annual costs		**$**	**22,459**
Annual savings and revenue			
Fuel cost - base case		$	25,481
Total annual savings and revenue		**$**	**25,481**

Financial viability

Pre-tax IRR - equity	%	17.3%
Pre-tax MIRR - equity	%	12.7%
Pre-tax IRR - assets	%	3.9%
Pre-tax MIRR - assets	%	6.1%
Simple payback	yr	8.9
Equity payback	yr	6.7
Net Present Value (NPV)	$	24,186
Annual life cycle savings	$/yr	2,649
Benefit-Cost (B-C) ratio		2
Debt service coverage		1.5
GHG reduction cost	$/t$CO_2$	-92

In fact, there is no single right measure of cost-effectiveness: different decision-makers use different criteria. A cash-strapped enterprise might require a one year simple payback, an investor might seek a return-on-investment in excess of 18%, a company might want a positive net present value at a discount rate of 12%, and a wind developer might desire energy production costs below 5.5 cents per kWh. RETScreen calculates a suite of financial indicators automatically.

Financing Options

Let's further examine the impact of financing. At the same time, we'll further see the pitfalls of one of the most common financial indicators, the simple payback period.

Imagine a large building or plant that consumes 1 million cubic metres of natural gas per year. Gas costs $0.40/m3, so annual fuel costs are $400,000. A proposed efficiency measure with an installed cost of $300,000 reduces gas consumption by 25%, for an annuals savings of $100,000. Energy costs escalate at a rate of 2% per year over the 20-year life of the project. Is the project cost-effective?

This table [2] shows that there is no single right answer: it depends on how the project is financed and the decision-maker's definition of cost-effectiveness.

	Cash	Short term 70% debt 10% for 5 yrs	Long term 70% debt 6% for 15 yrs	Leasing 12% for 5 yrs	Energy Performance Contract* 8% for 7 yrs	Savings account, bonds, stocks
Equity	$300,000	$90,000	$90,000	$0	$0	$300,000
Pre-tax IRR - equity	35.90%	61.20%	91.80%			
Pre-tax IRR - assets	35.90%	24.10%	29.10%	19.80%	12.40%	3% - 15%
Simple payback	3	3	3	3	4.5	
Equity payback	2.9	1.9	1.1	Immediate	Immediate	
Cumulative dividend 3 yrs	$312,200	$146,000	$247,300	$62,500	$52,900	$27,000 to $135,000
Cumulative dividend 20 yrs	$2,478,000	$2,201,000	$2,154,000	$2,062,000	$1,873,000	$180,000 to $900,000

* + 20% cost for verification + 30% cost for risk management

To begin, note that the simple payback period, or number of years before the project's initial cost is recouped through annual savings, is 3 years for this $300,000 investment that saves $100,000 per year. Many companies would consider this too long. But according to the internal rate of return, or true interest yield of the investment over its lifetime, the project is very attractive: the project's IRR falls in the range of 12 to 92%, far better than most savings accounts, stocks or bonds. So simple payback, while essential for cash-strapped organizations, often rejects excellent investment opportunities.

While it does not appear in the simple payback, project financing impacts the IRR. In the column labelled "Cash," the full cost of the project is paid for in equity: that is, no debt is incurred. In the next two columns, 70% of the cost of the project is paid for in debt, and 30%, or $90,000, through equity. As shown by the row "Pre-tax IRR - equity," this greatly improves the profitability of the project, since the proponent's investment is slashed by 70% without any reduction in the fuel cost savings.

Longer-term debt, as seen in the middle column, makes the project more attractive yet, since the proponent achieves better returns earlier in the project.

Some of the impact of financing is captured by the equity payback, which is the time required to recoup the equity investment out of pre-tax cash flows reflecting inflation and debt payments. When equipment is leased or provided by an external company through an energy performance contract, there is no equity investment, and the equity payback is immediate. By this measure, these options are the most attractive of all. Yet the IRR (calculated on the $300,000 of assets) shows that, in fact, purchase of the equipment is more profitable than these options.

Feasibility Analysis Module

The Feasibility Analysis Module in RETScreen Expert, including the Virtual Energy Analyzer, allows professionals and decision-makers to rapidly identify and assess the viability of potential energy efficiency, renewable energy and cogeneration projects around the world.

A five step standard analysis, including energy analysis, cost analysis, emission analysis, financial analysis, and sensitivity/risk analysis facilitates this energy project analysis.

References:

[1] RETScreen Expert software, available at - www.retscreen.net
[2] RETScreen Version 4 training course slides available at archived website - https://web.archive.org/web/20151029080503/http://www.retscreen.net:80/ang/energy_efficiency_projects.php

ABOUT THE AUTHOR

Gregory J. Leng is the creator and director of the RETScreen Clean Energy Management Software at Natural Resources Canada's CanmetENERGY research centre in Varennes, Quebec. The RETScreen Software is the world's leading clean energy decision-support tool and is available in 36 languages covering 2/3 of the Earth's population. RETScreen is used by more than 575,000+ energy professionals and decision-makers in every country, as well as by professors at 1,100+ universities and colleges for teaching and research.

Leng's career is focused on the clean energy market, technology and finance interface and he has been working in the renewable energy and energy efficiency fields since 1987. Prior to joining NRCan, he was based in Hyderabad, India as the India Country Manager (dLA consultant) for the International Fund for Renewable Energy and Energy Efficiency. He obtained a master of science degree from the University of Massachusetts Lowell in energy engineering (solar energy engineering) and a bachelor of commerce degree (marketing and international business) from McGill University.

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