

OCTOBER 10, 2024

Making the Case for Energy Management Projects – Webinar One – Financial Analysis

Stephen Dixon, Knowenergy
Lisa Rae, CIET



Two webinars – two aspects of making the case

- Webinar one: Financial analysis
 - Treating energy efficiency as an investment opportunity
 - Quantifying the financial value
- Webinar two: Building the business case
 - Understanding the decision-making process
 - Considering all the benefits
 - The One-Page Proposal

Workshop goal – two purposes – one path

Overall goal

To provide you with techniques, tools and hands-on experience with building the business case for an energy efficiency investment

External

Selling to your prospect

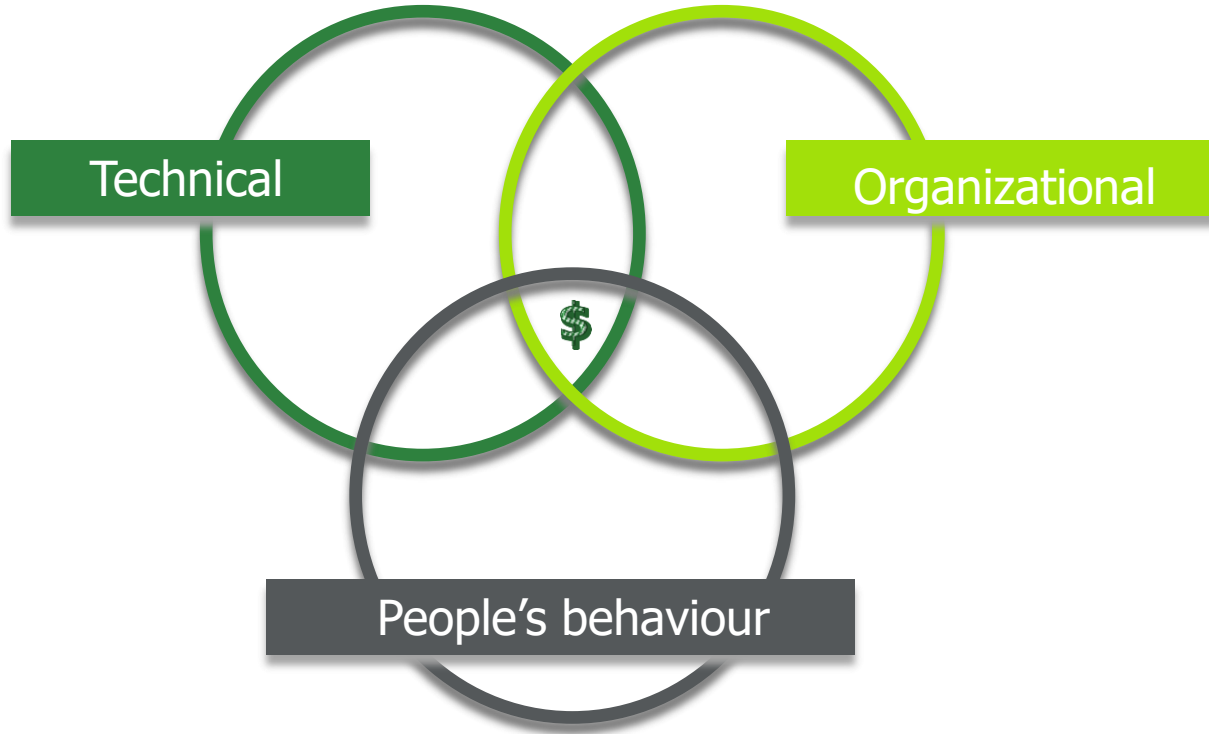
To a customer

Internal

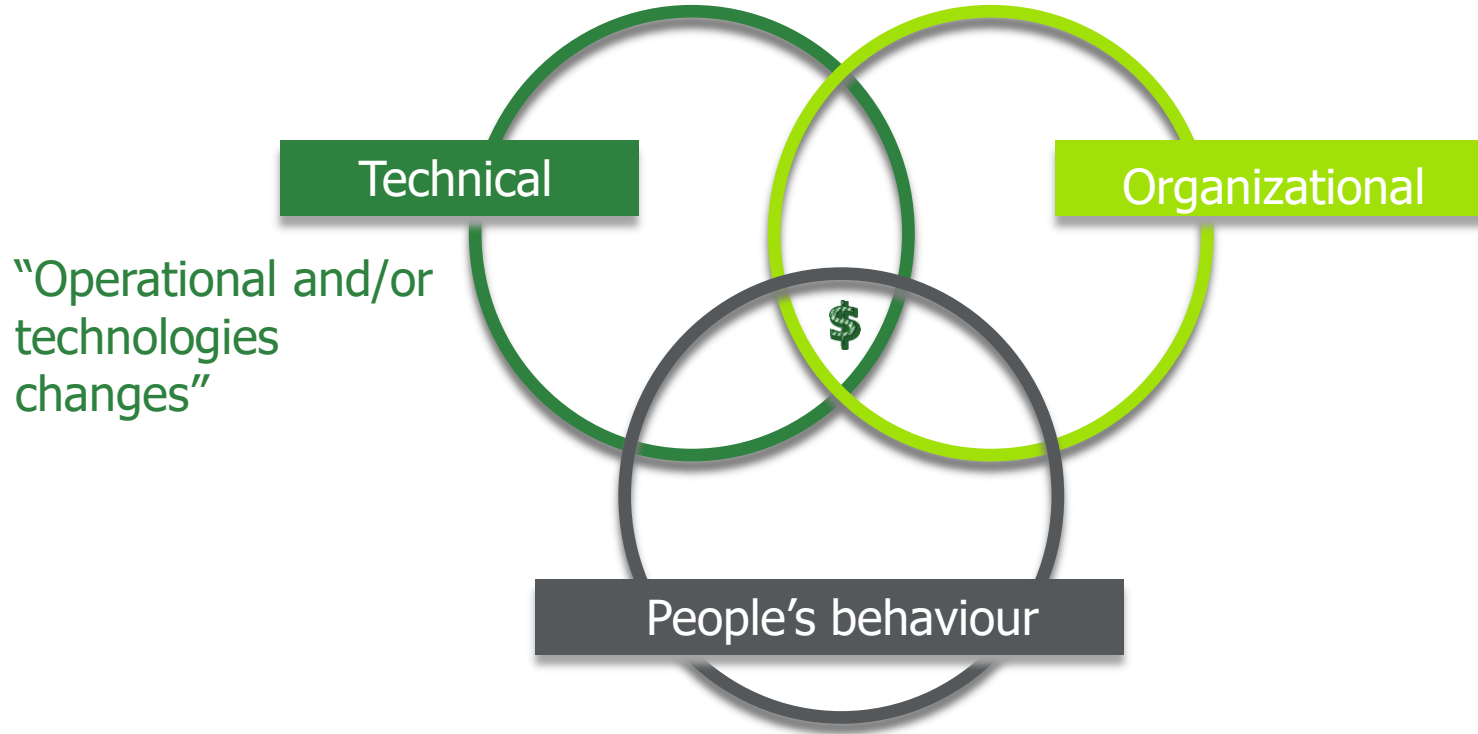
Securing buy-in

From a supporting staff and decision maker

The challenge of energy management



The challenge of energy management (2)



The challenge of energy management (3)



“Awareness, better habits, procedures and feedback”

The challenge of energy management (4)



The challenge of energy management (5)



Energy management benefits

Direct and indirect energy savings

Increase comfort, quality, productivity and safety

Environmental impact reduction

Improved reliability and reduced maintenance



Financial analysis of energy savings – the business case for investment

Business case that gets approved

properly quantifying the energy, cost and carbon benefit

Subscriber: TdS Dixon Inc.

Individual measure - Ventilation	Heating	Cooling	Electricity	Incremental initial costs	Fuel cost savings	Incremental O&M savings	Simple payback	Include measure?
	kWh	kWh	kWh	\$	\$	\$	yr	<input type="checkbox"/>
Fuels & schedules								
Electricity and fuels								
Schedules								
Equipment								
Heating								
Furnace	0			0	0	0		<input checked="" type="checkbox"/>
Cooling								
AC		0		0		0		<input checked="" type="checkbox"/>
Ventilation								
Ventilation	229,436			8,000	5,508	0	1.5	<input checked="" type="checkbox"/>
Electrical equipment								
Exhaust Fan			21,239	0	2,973	0	0.0	<input checked="" type="checkbox"/>
Total	229,436	0	21,239	8,000	8,482	0	0.9	



Photo: https://en.wikipedia.org/wiki/Heating,_ventilation,_and_air_conditioning

Description	Base case				Proposed case			
	System selection	Quantity	Schedule	Flow	System selection	Quantity	Schedule	Flow
Heating	Heating	1	24/7	100,000	Heating	1	12 hours per d	100,000
Heating	Heating	1	24/7	0	Heating	1	6 hours per da	2,500
Heating	Heating	1	24/7	0	Heating	1	6 hours per da	0
Total								
Incremental initial costs - other	\$			8,000				
Incremental initial costs - total	\$			8,000				
Incremental O&M savings	\$							
Heating system		Furnace		Furnace				
Heating	kWh	448,299		251,043				195,256
								43.8%

www.retscreen.net

A simple enough question

An energy project costing \$900
and yielding electricity savings
of \$300 per year

An energy project costing \$1,500
and yielding electricity savings of
\$500 per year

Question:
Which is the better project?

Key parameters

- Capital cost
 - One time or phased (re-fit)
- Savings
 - energy and other
- Time horizon
 - The period over which the project will deliver value
- Discount rate
 - Minimum rate of return required by investor
 - Weighted average cost of capital
 - Higher risk tends to increase discount rate
- Inflation rate
 - Energy and other

Essential formulas

Conventionally future amounts are compared (apples to apples) with Present Value

$$\text{Present Value} = \frac{\text{Future Amount}}{(1 + \text{Discount Rate})^{\text{years}}}$$

Future savings are typically determined by inflating present savings

$$\text{Future Amount} = \text{Present Savings} (1 + \text{Inflation Rate})^{\text{years}}$$

Results formulas

Savings to investment ratio

$$\frac{\text{Sum of the PV of Cash Inflows (Savings)}}{\text{PV of Cash Outflows (Investment)}}$$

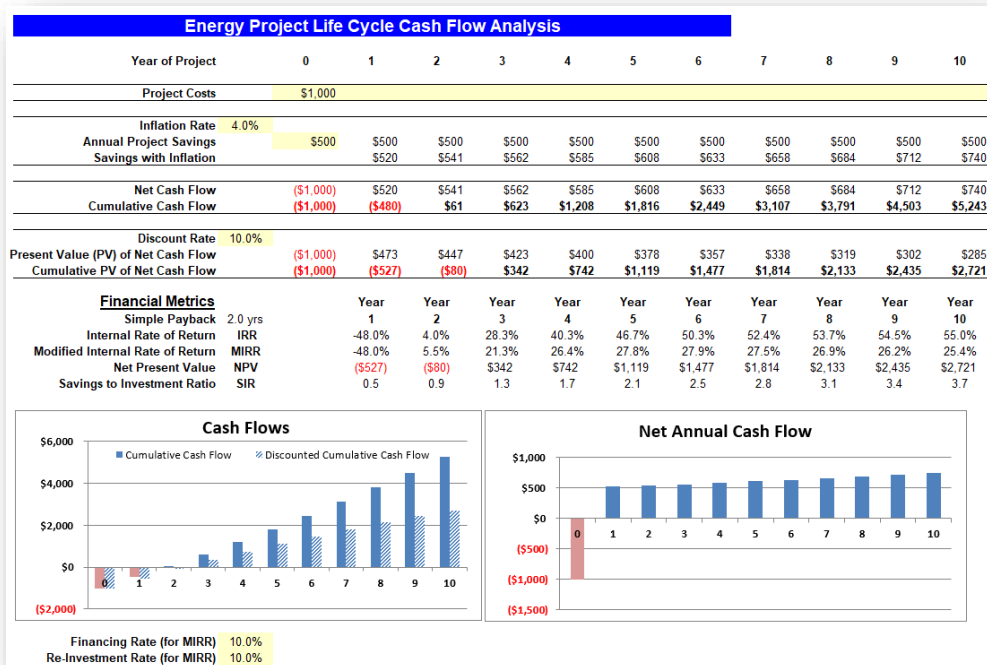
Net present value

$$\begin{aligned} &\text{Sum of the PV of Cash Inflows (Savings)} \\ &- \text{PV of Cash Outflows (Investment)} \end{aligned}$$

Complex formulas (spreadsheet functions)

- Internal Rate of Return (IRR)
 - The discount rate that makes the NPV zero.
 - Assumes cash re-invested at project rate of return – likely high
- Modified Internal Rate of Return (MIRR)
 - Considers both the cost of the investment and the interest received on reinvestment of cash.
 - Assumes a more modest interest on reinvestment
 - A more conservative result.

Let's walkthrough a financial analysis



Costs and savings (inflated)

Year of Project	0	1	2	3
Project Costs	\$1,000			
Inflation Rate	4.0%			
Annual Project Savings		\$500	\$500	\$500

$$\text{Future Amount} = \text{Present Savings} (1 + \text{Inflation Rate})^{\text{years}}$$

Year of Project	0	1	2	3
Project Costs	\$1,000			
Inflation Rate	4.0%			
Annual Project Savings		\$500	\$500	\$500
Savings with Inflation		\$520	\$541	\$562

Present value of net cash-flow

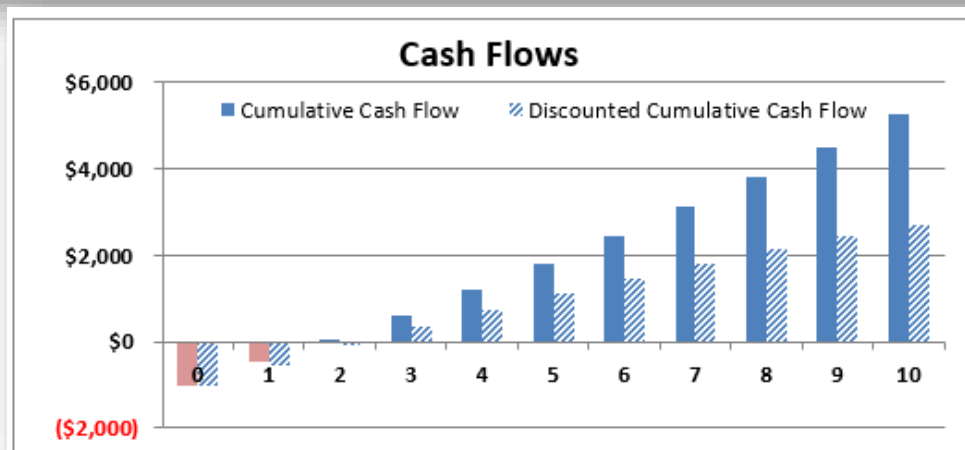
Year of Project	0	1	2	3
Project Costs	\$1,000			
Inflation Rate	4.0%			
Annual Project Savings	\$500	\$500	\$500	\$500
Savings with Inflation		\$520	\$541	\$562
Net Cash Flow	(\$1,000)	\$520	\$541	\$562

$$\text{Present Value} = \frac{\text{Future Amount}}{(1 + \text{Discount Rate})^{\text{years}}}$$

	Discount Rate	10.0%				
Present Value (PV) of Net Cash Flow			(\$1,000)	\$473	\$447	\$423
Cumulative PV of Net Cash Flow			(\$1,000)	(\$527)	(\$80)	\$342

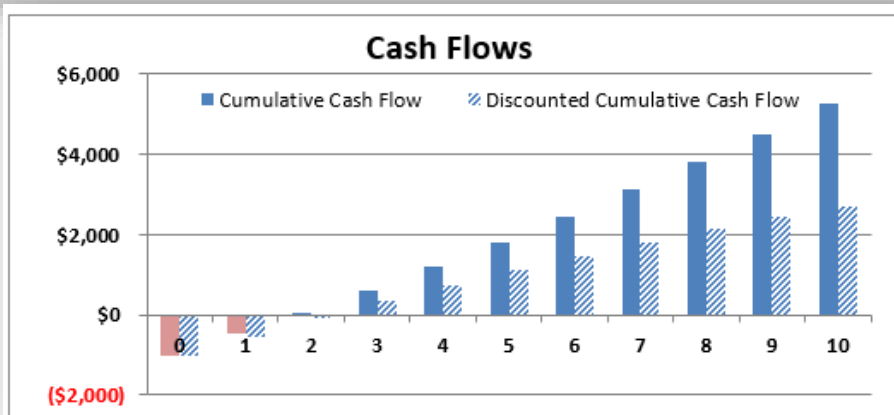
Net present value (cumulative discounted cash-flow)

Cumulative Cash Flow	(\$1,000)	(\$480)	\$61	\$623
Discount Rate	10.0%			
Present Value (PV) of Net Cash Flow	(\$1,000)	\$473	\$447	\$423
Cumulative PV of Net Cash Flow	(\$1,000)	(\$527)	(\$80)	\$342



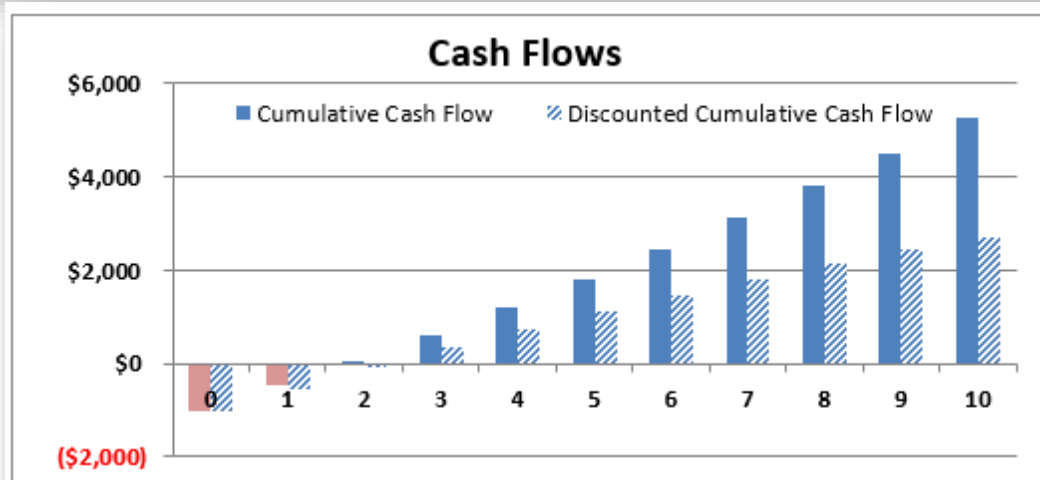
Financial metrics (better and common)

Financial Metrics		Year	Year	Year
Simple Payback	2.0 yrs	1	2	3
Internal Rate of Return	IRR	-48.0%	4.0%	28.3%
Modified Internal Rate of Return	MIRR	-48.0%	5.5%	21.3%
Net Present Value	NPV	(\$527)	(\$80)	\$342
Savings to Investment Ratio	SIR	0.5	0.9	1.3

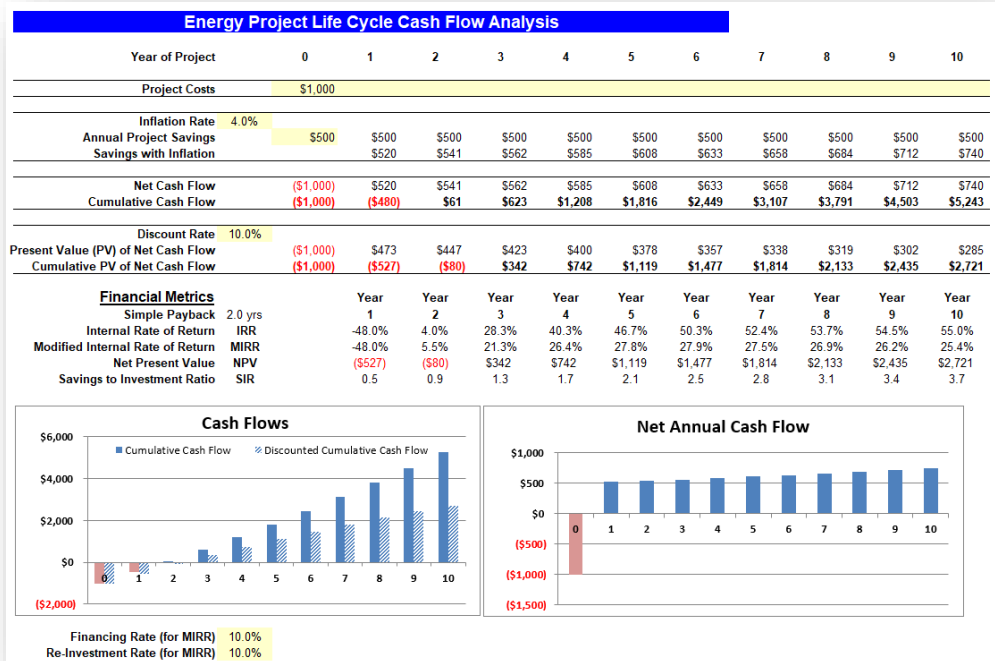


Now let's stretch the horizon!

Financial Metrics		Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
Simple Payback	2.0 yrs	1	2	3	4	5	6	7	8	9	10
Internal Rate of Return	IRR	-48.0%	4.0%	28.3%	40.3%	46.7%	50.3%	52.4%	53.7%	54.5%	55.0%
Modified Internal Rate of Return	MIRR	-48.0%	5.5%	21.3%	26.4%	27.8%	27.9%	27.5%	26.9%	26.2%	25.4%
Net Present Value	NPV	(\$527)	(\$80)	\$342	\$742	\$1,119	\$1,477	\$1,814	\$2,133	\$2,435	\$2,721
Savings to Investment Ratio	SIR	0.5	0.9	1.3	1.7	2.1	2.5	2.8	3.1	3.4	3.7



The whole picture



Entering costs and savings

The screenshot shows the RETScreen software interface with the 'Cost' menu highlighted. The 'Cost' menu options are: Notes Range, Cost allocation, Actual cost, Second currency, and None. The 'Cost allocation' option is selected. The 'Actual cost' option is also visible. The 'Second currency' option is selected. The 'None' option is selected. The 'Product database...' option is visible. The 'Show notes' option is visible.

Step 1 - Analysis level

RETScreen - Cost Analysis

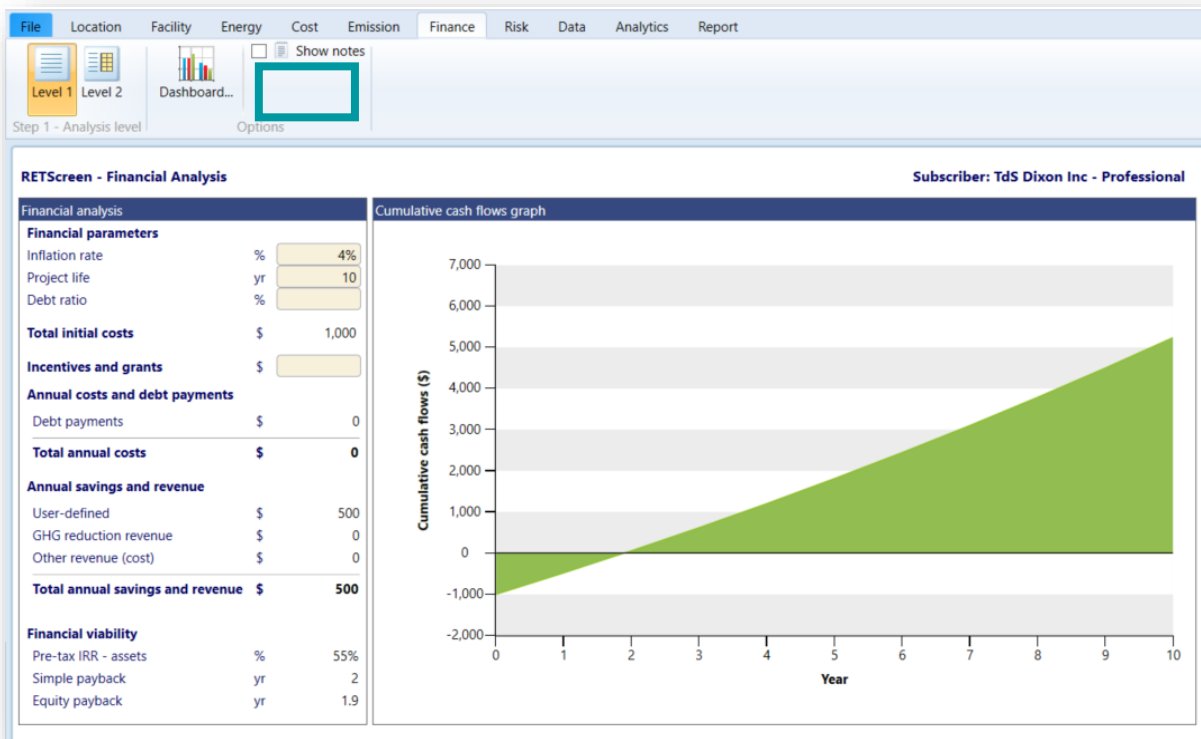
Initial costs (credits)	Unit	Quantity	Unit cost	Amount
Initial cost				\$ -
- User-defined	cost	1	\$ 1,000	1,000
+				
Total initial costs				\$ 1,000

Annual costs (credits)	Unit	Quantity	Unit cost	Amount
O&M costs (savings)	project			\$ -
- User-defined	cost			\$ -
+				
Total annual costs				\$ -

Annual savings	Unit	Quantity	Unit cost	Amount
- User-defined	cost	1	\$ 500	500
+				
Total annual savings				500

Level one: financial analysis

entering values to
match spreadsheet



Level two: financial analysis

entering values to match spreadsheet

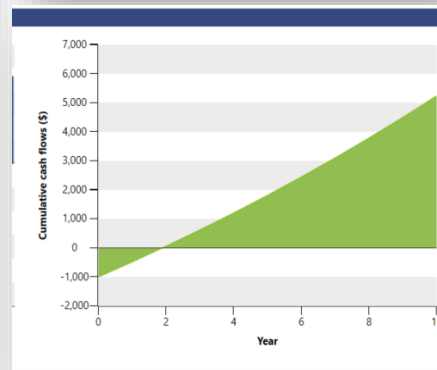
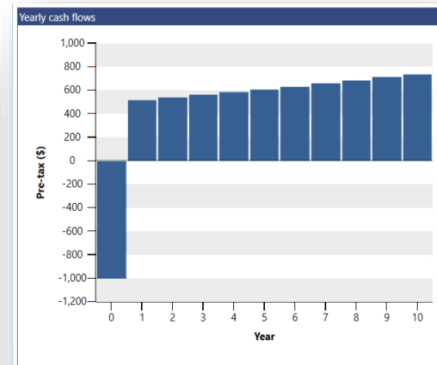
File Location Facility Energy Cost Emission Finance Risk Data Analytics Report

Level 1 Level 2 Dashboard... Show graph Show notes Export to file - Copy - Level 1->2 Options

Step 1 - Analysis level

RETScreen - Financial Analysis Subscriber: TdS Dixon Inc - Professional

Financial parameters			Costs Savings Revenue			Yearly cash flows		
General			Initial costs			Yearly cash flows		
Fuel cost escalation rate		4%	User-defined	100%	\$ 1,000	Year	Pre-tax	Cumulative
Inflation rate	%	4%	Total initial costs	100%	\$ 1,000	#	\$	\$
Discount rate	%	10%	Yearly cash flows - Year 1			0	-1,000	-1,000
Reinvestment rate	%	10%	Annual costs and debt payments			1	520	-480
Project life	yr	10	Total annual costs			2	541	60.80
Finance			Annual savings and revenue			3	562	623
Incentives and grants	\$		Total annual savings and revenue			4	585	1,208
Debt ratio	%	0%	Net yearly cash flow - Year 1			5	608	1,816
Income tax analysis			Financial viability			6	633	2,449
			Pre-tax IRR - equity			7	658	3,107
			Pre-tax MIRR - equity			8	684	3,791
			Pre-tax IRR - assets			9	712	4,503
			Pre-tax MIRR - assets			10	740	5,243
Annual revenue			Simple payback					
GHG reduction revenue			Equity payback					
Gross GHG reduction	tCO ₂ /yr	0	Net Present Value (NPV)			\$ 2,721		
Gross GHG reduction - 10 yrs	tCO ₂	0	Annual life cycle savings			\$/yr 443		
GHG reduction revenue	\$	0	Benefit-Cost (B-C) ratio			3.7		
Other revenue (cost)			Debt service coverage			No debt		
			GHG reduction cost			\$/tCO ₂ No reduction		



Pulling it all together

Using RETScreen's features for carbon

RETScreen Expert - Heat recovery - carbon as carbon tax.retx

File Location Facility Energy Cost Emission Finance Risk Report Custom

Level 1 Level 2 Level 3 Dashboard... Show graph Show GHG equivalence Show notes Help eLearning

Step 1 - Analysis level Options Help

RETScreen - Emission Analysis Subscriber: TdS Dixon Inc - Professional

Emission analysis

GHG emissions

Base case	tCO ₂	10,808	
Proposed case	tCO ₂	10,112	
Gross annual GHG emission reduction	tCO ₂	696	6.4%

Legend
Gross annual GHG emission reduction (6.4%)

696 tCO₂ is equivalent to 127 Cars & light trucks not used

Carbon shadow price | GHG reduction revenue

Carbon shadow price	\$/tCO ₂	80
Carbon shadow price duration	yr	6
Carbon shadow price escalation rate	%	13.4%
Gross annual GHG emission reduction	tCO ₂	696
GHG reduction savings	\$	55,655

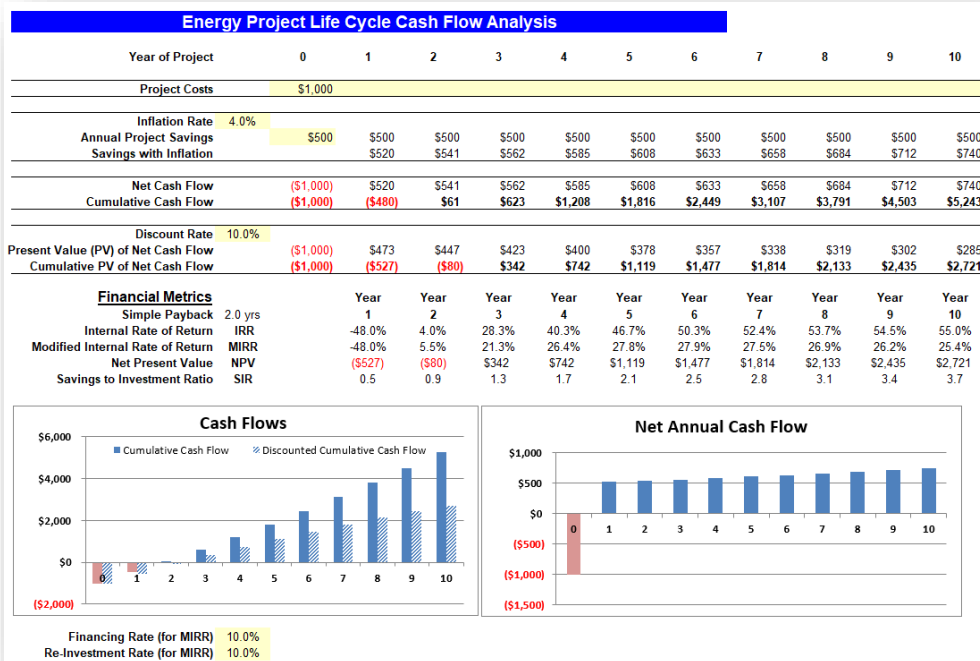
Carbon offsets

Remaining GHG emission reduction required	tCO ₂	10,112
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Notes

	A	B	C	D	E	F
1						
2						
3		Year		2024		
4		Current Carbon Tax	\$	80 /Tonne		
5		Escalation Rate		13.4%		
6		Duration		6 Years		
7		Final Carbon Tax	\$	170		
8		Final Year		2030		
9						
10						

Homework: give it a try!



Stay connected with tools and resources

- Virtual one-on-one coaching: [post-webinar support intake form](#) for tailored support for organizations to manage energy resources effectively
- Monthly bulletin: [sign up](#) to receive monthly training updates on all Save on Energy training and support new tools and resources
- [Live training calendar](#): visit this page to easily register for upcoming events and workshops
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Thank you!

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