NOVEMBER 29, 2024

Energy management and efficient electrification series for Ontario municipalities

Tips, tricks and workarounds: getting your energy projects done

Presented by Stephen Dixon, Andrea Dwight and Christian Tham with special guest Cristina Guido, Town of Caledon

ieso Connecting Today. Powering Tomorrow. | SAVE ON ENERGY POWER WHAT'S NEXT

Overview

1. Introduction
2. Leveraging asset management to complete energy projects
3. Treating energy projects as investments to facilitate adoption
4. Funding energy projects by establishing and drawing from revolving funds
5. Helping municipalities manage energy projects

Speaker presentations

Andrea Dwight,

Blue Sky Energy Engineering

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Knownergy

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Town of Caledon

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LAS

Let’s kick things off!

What are or were some of the top challenges preventing you from getting your energy project done?

On your phone or computer, go to **menti.com** and enter the code:

7669 0776

Or use the QR code:

Leveraging asset management to complete energy projects

Asset management planning

Asset management: a tactical plan for managing an organization's infrastructure and other assets.

Key categories:

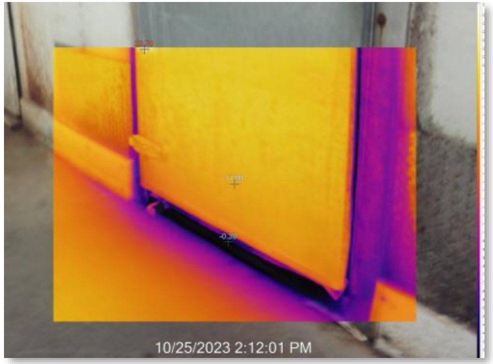
- Inventory and asset categorization
- Condition assessments
- Asset prioritization
- Asset performance management and monitoring
- Life cycle management and replacement strategies

* Image from the Village of Ashcroft

Asset management planning and energy conservation

Both are closely linked:

- Well maintained equipment has a longer life and runs at higher efficiencies
- Submetering programs can identify equipment issues before they become critical
- Thermography used to identify gaps in building envelope, thermal bridging or insulation issues – also helps protect an asset and extend useful life



Energy conservation benefits

- ✓ Lower operational costs
- ✓ Meet regulatory requirements
- ✓ Contribute to sustainability goals

Asset management planning – Asset prioritization

Asset prioritization: Helps organizations allocate resources, control costs and minimize risk. Ranking is based on asset importance.

Typical ranking criteria:

- Asset Condition
- Risk to Community
- Critical Business Function
- Likelihood of Failure
- Service Life

Component Description	Overall Condition	Life Expectancy	Age	Effective Age	Remaining Service Life	Intervention Year	Intervention Type	Immediate Repair	Replacement Cost	Repair Cost
Cast-in-place concrete foundations	Good	60	20	20	40	2061	Repair		$ 550,000.00	$ 30,000.00
Concrete Block	Fair	60	46	46	14	2035	Repair		$ 850,000.00	$ 25,000.00
Cast-in-place concrete slab-on-grade	Good	60	46	46	14	2035	Repair		$ 650,000.00	$ 35,000.00
Ribbed Concrete Slabs	Good	60	46	46	14	2035	Repair		$ 700,000.00	$ 35,000.00
Corrugated Steel Deck	Poor	60	20	20	40	2061	Repair	$ 5,000.00	$ 900,000.00	$ 45,000.00
Precast Concrete Concrete Slabs	Good	60	46	46	14	2035	Repair		$ 400,000.00	$ 20,000.00
Concrete Block Masonry	Fair	30	46	46	0	2021	Repair		$ 850,000.00	$ 15,000.00
Metal Siding	Good	60	46	60	0	2021	Repair		$ 120,000.00	$ 10,000.00
Painting	Good	12	6	6	6	2027	Replace		$ 20,000.00	$ 20,000.00
Sealant	Fair	15	12	10	5	2026	Replace		$ 10,000.00	$ 10,000.00
Curtain Wall	Good	35	20	19	16	2037	Repair		$ 168,300.00	$ 42,075.00
Automatic Sliding Doors	Fair	35	20	20	15	2036	Replace	$ 12,000.00	$ 40,000.00	$ 40,000.00
Hollow Metal Doors	Good	35	46	26	9	2030	Replace		$ 24,000.00	$ 6,000.00
Overhead Doors	Good	25	15	15	10	2031	Replace		$ 15,000.00	$ 15,000.00
Flat Roofing Systems	Poor	20	20	20	0	2021	Replace		$ 400,000.00	$ 400,000.00
Metal Roofing	Good	40	46	27	13	2034	Replace		$ 600,000.00	$ 600,000.00
						2021				

Asset management planning – asset prioritization (Cont'd)

Suggestion:	Have your organization add **Energy Impact** as a prioritization criterion.

For example, high ranking criteria could be:

- Assets uses fossil fuels
- Energy performance is > 20% original manufacturer design
- Assets responsible for > 10% of total facility energy consumption

Energy efficient purchasing guidelines

Suggestion:	Create energy efficiency purchasing guidelines for all large systems or equipment.

- Heating, ventilation, and air conditioning (HVAC): boilers, furnaces, electric unit heaters, heat pumps
- Lighting: outside, inside
- Process equipment: pumps, fans, etc.
- Controls: Building or equipment
- Building envelope: windows, doors, insulation minimums
- Use of fossil fuels

Keep it simple. Pre-approve through leadership team or council.

Asset management – Life cycle management

Large capital energy performance projects: difficult to financially justify

Leverage asset planning process to deliver energy conservation projects (use end of life timing to install high efficiency equipment, renewable technologies or for fuel switching)

Remember: at end of life, you only need to justify the incremental increase in cost between:

$ Base replacement price → New high-efficiency unit price

OR

$ Base replacement price → New technology price

Asset management – life cycle management (Cont'd)

Life cycle costing (LCC): **A method for calculating the total cost of an asset from the time of purchase to its end of life.**

LCC includes:

- Running/maintenance costs (labour and replacement parts)
- Energy consumption costs
- Any financial impacts over the asset lifetime

✓ **Energy efficient systems can have a higher initial cost but can be better investments over the life of the assets due to lower operating costs.**

Rooftop unit (RTU) vs. Air-source heat pump (ASHP)

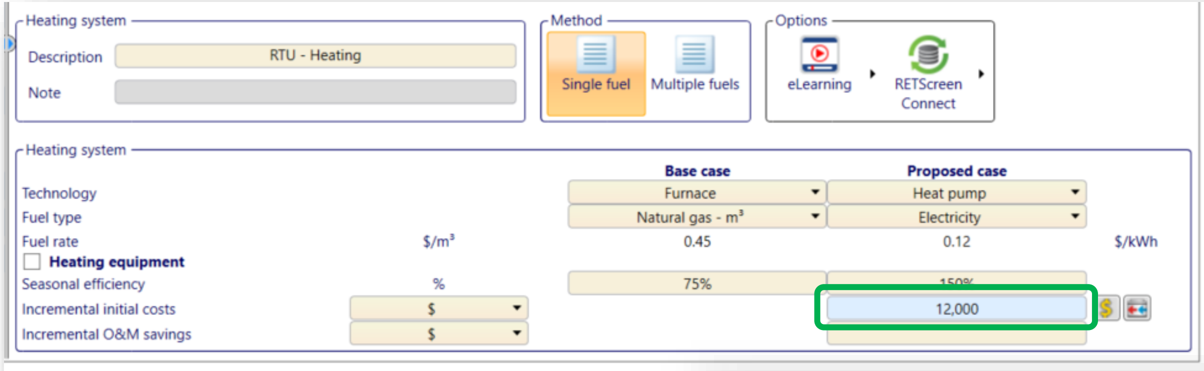
Background

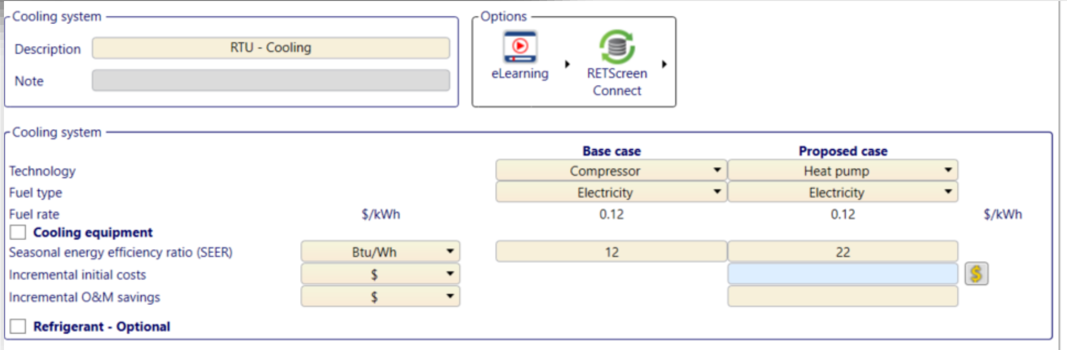
- Rooftop unit (RTU) at end of life serving a community room (2,600 ft^2) in an arena
- Reviewed two options: a high efficiency RTU and an air-source heat pump (ASHP)
- Both cases were analyzed using Life Cycle Costing (LCC)

Capital replacement cost (size ~ 60,000 BTU)

- RTU = **$20,000**
- ASHP = **$32,000**

Using incremental costs to justify efficient replacements





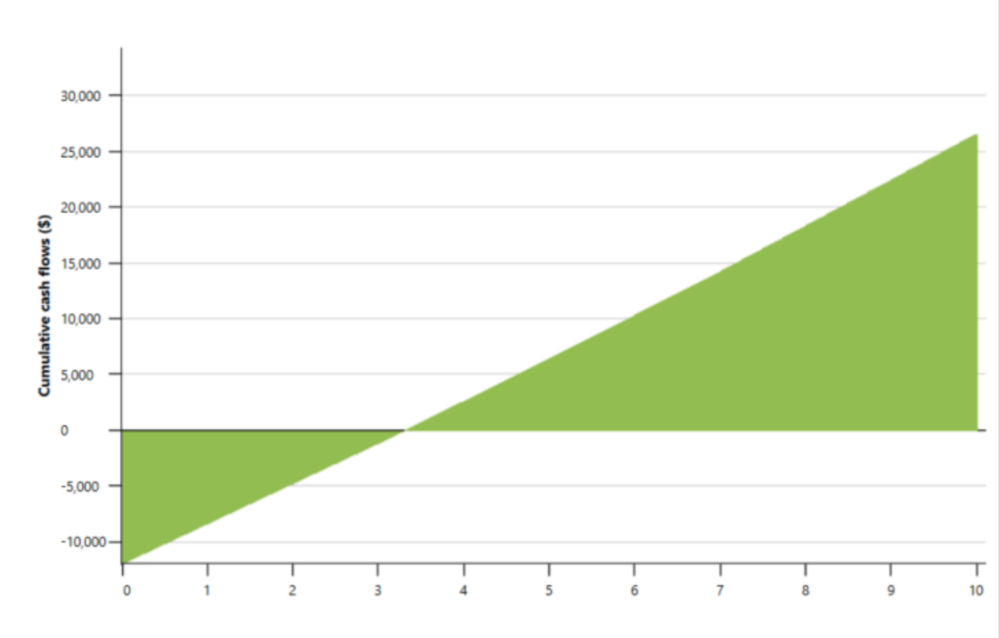
Internal rate of return of 28.5%, 3.3-year payback

RETScreen - Financial Analysis — **Subscriber: TdS Dixon Inc - Professional**

Financial analysis

Financial parameters		
Inflation rate	%	2%
Project life	yr	10
Debt ratio	%	0%
Total initial costs	$	12,000
Incentives and grants	$	
Annual costs and debt payments		
O&M costs (savings)	$	0
Fuel cost - proposed case	$	3,518
Debt payments	$	0
Total annual costs	**$**	**3,518**
Annual savings and revenue		
Fuel cost - base case	$	6,974
GHG reduction savings	$	0
Total annual savings and revenue	**$**	**6,974**
Financial viability		
Pre-tax IRR - assets	%	28.5%
Simple payback	yr	3.5
Equity payback	yr	3.3

Cumulative cash flows graph



Asset management – RTU vs. ASHP

Results:

- ASHP was chosen as the replacement option
- Natural gas was eliminated to lower GHG emissions
- Electricity use was reduced to 1/3 of pre-retrofit levels
- Lower maintenance and labour costs as ASHPs do not have filters to replace

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Getting your project done – general tips

- ✓ Group projects together for approval
  - Can improve financials of projects with lower returns
  - There can be cost efficiencies both with initial capital cost and installation when grouping projects – example: lighting fixture upgrades and occupancy sensors with space thermostats
- ✓ Determine criteria that will help your boss or management say **YES** to your project
  - Not always financial
  - When pitching new projects, link results to specific corporate goals, objectives or targets

Getting your project done – general tips 2

✓ Track savings from energy conservation projects

- Share savings information with management team – take the win
- Create an ongoing list of energy project savings
- Review list of wins with management before pitching new projects

✓ Always check for energy incentive funding

- Save on Energy
- Enbridge Gas
- Federal government programs
- Local distribution companies

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Getting your project done – general tips 3

- ✓ Involve your organization when testing new approaches
  - Builds support and reduces concern from constituents
  - Sweater days or energy conservation day
- ✓ Don't underestimate the power of training staff
  - Builds understanding and support for building upgrades and changes (e.g. controls, ASHPs, LED lighting)
  - Arrange lunch and learns or other training opportunities for staff

Asset management – key takeaways

1. Consider adding **energy impact** as a criterion in risk ranking for condition assessments or asset planning systems
2. Create and preapprove **energy efficiency guidelines** for large capital purchases
3. Use asset management **end of life planning** to upgrade to energy efficient systems as projects are easier to approve
4. Use **life cycle costing**, which includes operational energy costs to compare capital project options

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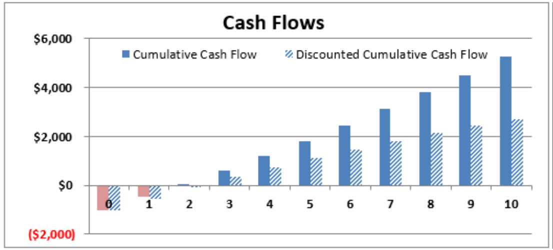
Treating energy projects as investments to facilitate adoption

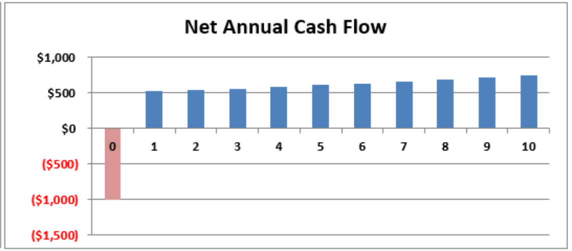
Energy projects are good investments

Energy Project Life Cycle Cash Flow Analysis

Year of Project		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Project Costs		$1,000										
Inflation Rate	4.0%											
Annual Project Savings		$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
Savings with Inflation			$520	$541	$562	$585	$608	$633	$658	$684	$712	$740
Net Cash Flow		($1,000)	$520	$541	$562	$585	$608	$633	$658	$684	$712	$740
Cumulative Cash Flow		**($1,000)**	**($480)**	**$61**	**$623**	**$1,208**	**$1,816**	**$2,449**	**$3,107**	**$3,791**	**$4,503**	**$5,243**
Discount Rate	10.0%											
Present Value (PV) of Net Cash Flow		($1,000)	$473	$447	$423	$400	$378	$357	$338	$319	$302	$285
Cumulative PV of Net Cash Flow		**($1,000)**	**($527)**	**($80)**	**$342**	**$742**	**$1,119**	**$1,477**	**$1,814**	**$2,133**	**$2,435**	**$2,721**

Financial Metrics		**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Simple Payback	2.0 yrs										
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





Financing Rate (for MIRR)	10.0%
Re-Investment Rate (for MIRR)	10.0%

Life cycle costing (LCC) for deeper retrofits and lower carbon

Simple Life Cycle Costing Tool

Other Inflation Rate: 2.0% | Energy Inflation Rate: 4.0% | Discount Rate: 3.0%

Option A - Initial Costs	Cost		0	1	2	3	4	5	6	7	8	9	10	11	12	29	30	Present Value
Normal (OBC 2017 SB-10)	$3,395,500		$3,395,500	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$3,395,500
Energy Costs	Usage	Price	$/yr															
Electricity (kWh)	52,824	$0.18	$9,508	$9,889	$10,284	$10,696	$11,123	$11,568	$12,031	$12,512	$13,013	$13,533	$14,075	$14,638	$15,	$29,653	$30,839	
Natural Gas (m3)	10,059	$0.40	$4,024	$4,185	$4,352	$4,526	$4,707	$4,895	$5,091	$5,295	$5,507	$5,727	$5,956	$6,194	$6,	$12,548	$13,050	
Energy Sub-Total			**$13,532**	**$14,073**	**$14,636**	**$15,222**	**$15,830**	**$16,464**	**$17,122**	**$17,807**	**$18,519**	**$19,260**	**$20,031**	**$20,832**	**$21,**	**$42,201**	**$43,889**	**$473,193**
O&M & Carbon Cost	**Cost**	**Period**	**0**															
O&M Cost	$35,000	1	$35,000	$35,700	$36,414	$37,142	$37,885	$38,643	$39,416	$40,204	$41,008	$41,828	$42,665	$43,518	$44,	$62,155	$63,398	
Carbon Tax (on Nat Gas)	19	Tonnes		$1,230	$1,505	$1,781	$2,056	$2,332	$2,607	$2,883	$3,158	$3,434	$3,710	$3,985	$4,	$8,945	$9,220	
O&M & Carbon Sub-Total			**$35,000**	**$36,930**	**$37,919**	**$38,923**	**$39,941**	**$40,975**	**$42,023**	**$43,087**	**$44,167**	**$45,262**	**$46,374**	**$47,503**	**$48,**	**$71,099**	**$72,618**	**$996,469**
Option A - Total Annual Costs			**$3,395,500**	**$51,003**	**$52,555**	**$54,145**	**$55,772**	**$57,438**	**$59,145**	**$60,894**	**$62,686**	**$64,522**	**$66,405**	**$68,335**	**$70,**	**$113,301**	**$116,507**	**$4,865,162**

Option B - Initial Costs	Cost		0	1	2	3	4	5	6	7	8	9	10	11	12	29	30	Present Value
Net Zero	$4,142,088		$4,142,088	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	$4,142,088
Energy Costs	Usage	Price	$/yr															
Electricity (kWh)	82,820	$0.00	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	
Natural Gas (m3)	0	$0.00	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	
Energy Sub-Total			**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**		**$0**	**$0**	**$0**
O&M & Carbon Cost	**Cost**	**Period**	**0**															
O&M Cost	$70,000	4	$70,000	$0	$0	$0	$75,770	$0	$0	$0	$82,016	$0	$0	$0	$88,	$0	$0	
Carbon Tax (on Nat Gas)	0	Tonnes		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0		$0	$0	
O&M & Carbon Sub-Total			**$70,000**	**$0**	**$0**	**$0**	**$75,770**	**$0**	**$0**	**$0**	**$82,016**	**$0**	**$0**	**$0**	**$88,**	**$0**	**$0**	**$420,460**
Option B - Total Annual Costs			**$4,142,088**	**$0**	**$0**	**$0**	**$75,770**	**$0**	**$0**	**$0**	**$82,016**	**$0**	**$0**	**$0**	**$88,**	**$0**	**$0**	**$4,562,548**
Carbon Tax ($ per Tonne, calculated by formula)				$66	$80	$95	$110	$125	$139	$154	$169	$184	$198	$213	$2	$478	$493	
User Selected Carbon Tax/Price																		
Carbon Price to be used in Calculation ($/Tonne)				**$66**	**$80**	**$95**	**$110**	**$125**	**$139**	**$154**	**$169**	**$184**	**$198**	**$213**	**$2**	**$478**	**$493**	

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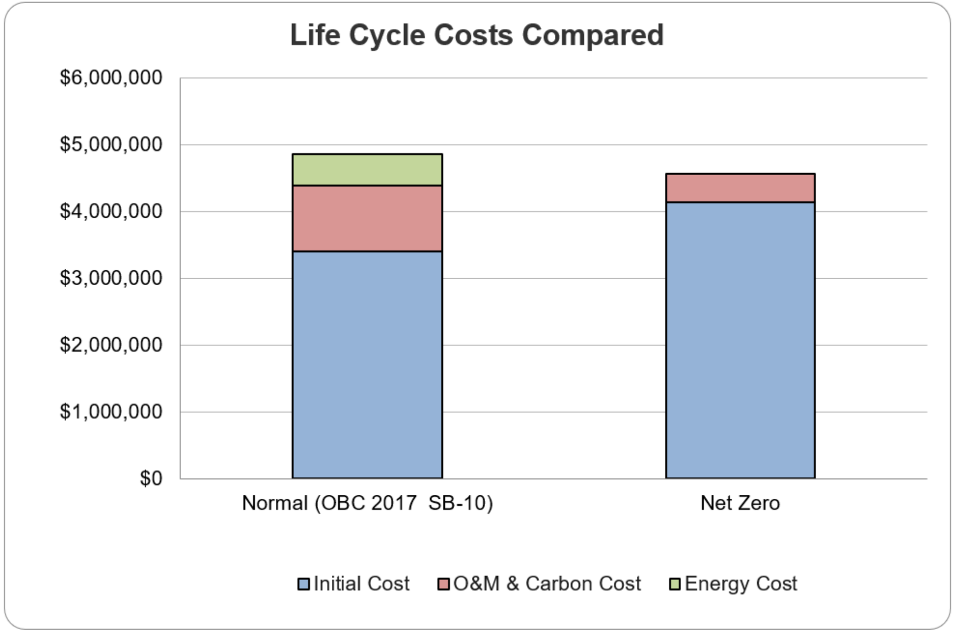
Fire hall - LCC of two options

Life Cycle Costing Summary

	Option A	Option B
	Normal (OBC 2017 SB-10)	Net Zero
Initial Cost	$3,395,500	$4,142,088
O&M & Carbon Cost	$996,469	$420,460
Energy Cost	$473,193	$0
Total Cost	**$4,865,162**	**$4,562,548**

Financial Value Indicators (Option A vs B)

Net Investment	$746,588
Net Present Value	$302,613
Internal Rate of Return	5.4%
Savings to Investment Ratio	1.41
Time Horizon (1-30 years)	30 years



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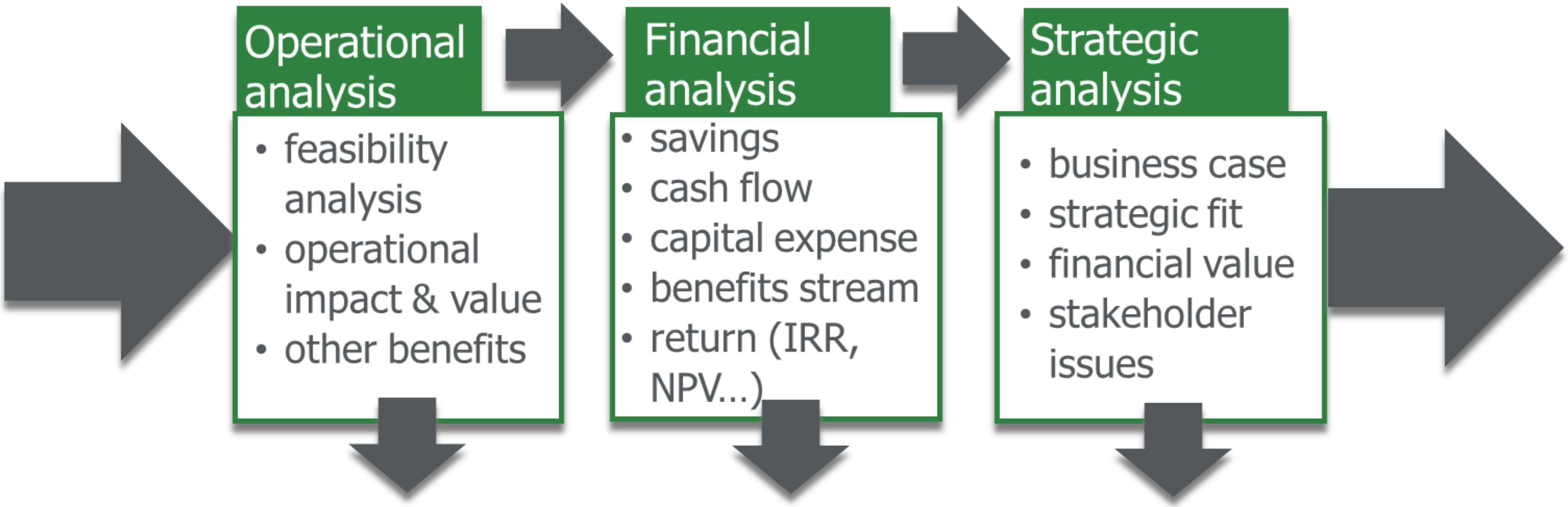
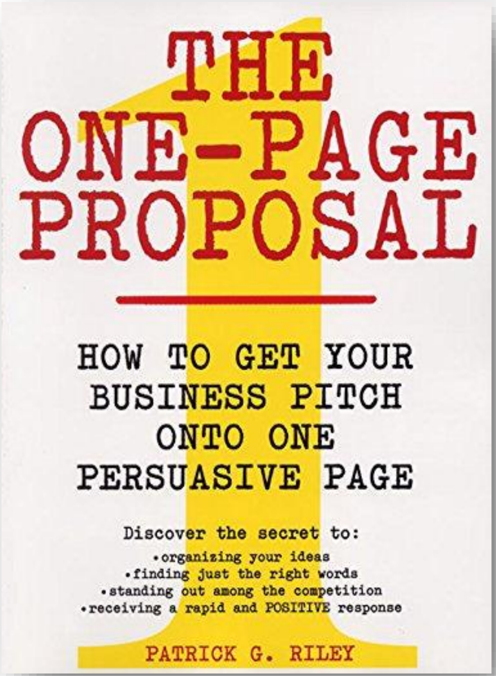
Prepare a robust business case



Use a one-page proposal!



LET'S CLEAR THE AIR

Addressing ventilation fume control needs at University of YourTown

TARGET: Modify laboratory ventilation fan system to meet peak fume-evacuation demands

- Improve working conditions for staff and students
- Extend the useful life of fan motor
- Defer capital investment
- Reduce energy expenses by $31,000 annually
- Attract an up-front incentive equal to the first year of savings.

The University of YourTown is globally recognized as a research powerhouse and leader in research-intensive education.

The limitations of the fume hood exhaust system in the Science Building threatens the University's commitment to providing a healthy and safe workplace. The current fan system does not meet peak fume-evacuation requirements during the day, leading to a build-up of harmful fumes. Researchers and support staff in the department have been asking for transfers out at a higher rate than other buildings.

Implementing a variable speed drive technology on the ventilation will improve the exhaust performance while reducing energy waste during non-peak times. The system can be upgraded with minimal disruption to research productivity over a weekend.

We would be happy to speak with staff to discuss how this system will address their concerns.

FINANCIAL:

Project first cost is estimated at $114,000 after a SaveOnEnergy incentive of $31,000. A 10 year analysis yields a net present value of $130,373 with a savings-to-investment ratio over 2.

Simple Payback	3.2 years	Net Present Value	$130,373
Return on Investment	31%	Savings to Investment Ratio	2.1
Internal Rate of Return	31%	Modified Internal Rate of Return	19%

STATUS:

A pre-qualified $31,000 incentive to implement this project is available from the local electricity distributor.

ACTION:

U of Y to authorize purchase agreement with Vendor to upgrade the lab ventilation system to variable speed drive technology to improve the laboratory fume exhaust.

Funding energy projects by establishing and drawing from revolving funds

Caledon's corporate energy goals

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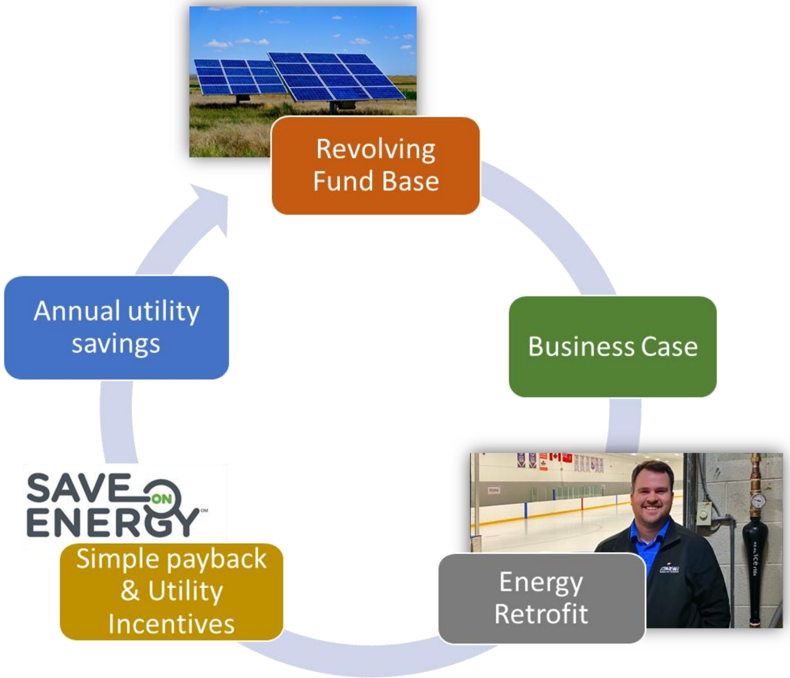
Town of Caledon – energy revolving fund



- Endorsed by council in 2015
- Provides capital for energy retrofits independent of the tax base
- Revenue from the Town's 3 solar microFIT sites provides the base funding for the Fund

23 unique projects

$730,000+ disbursed

1.7M ekWh saved

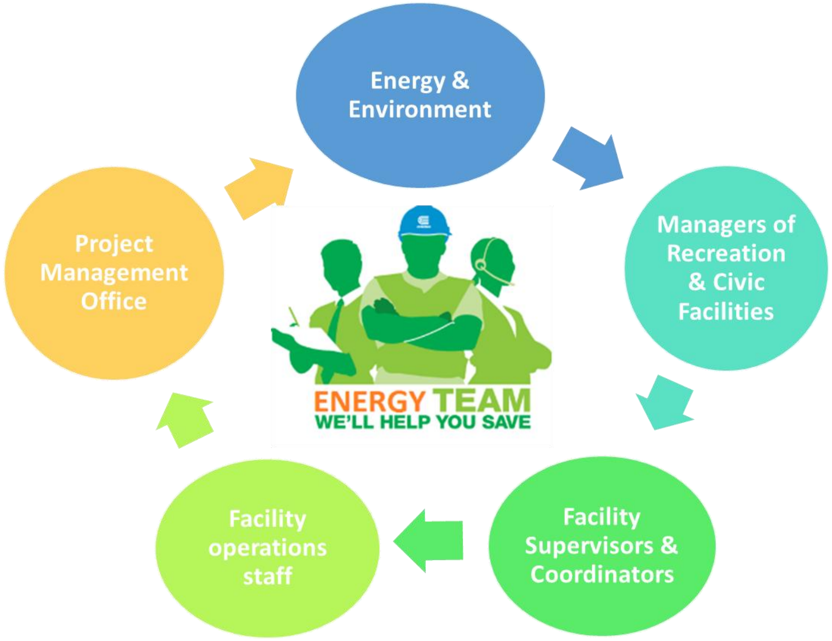
$ 62,000 incentives received

150 tonnes of CO2e avoided

Financial parameters

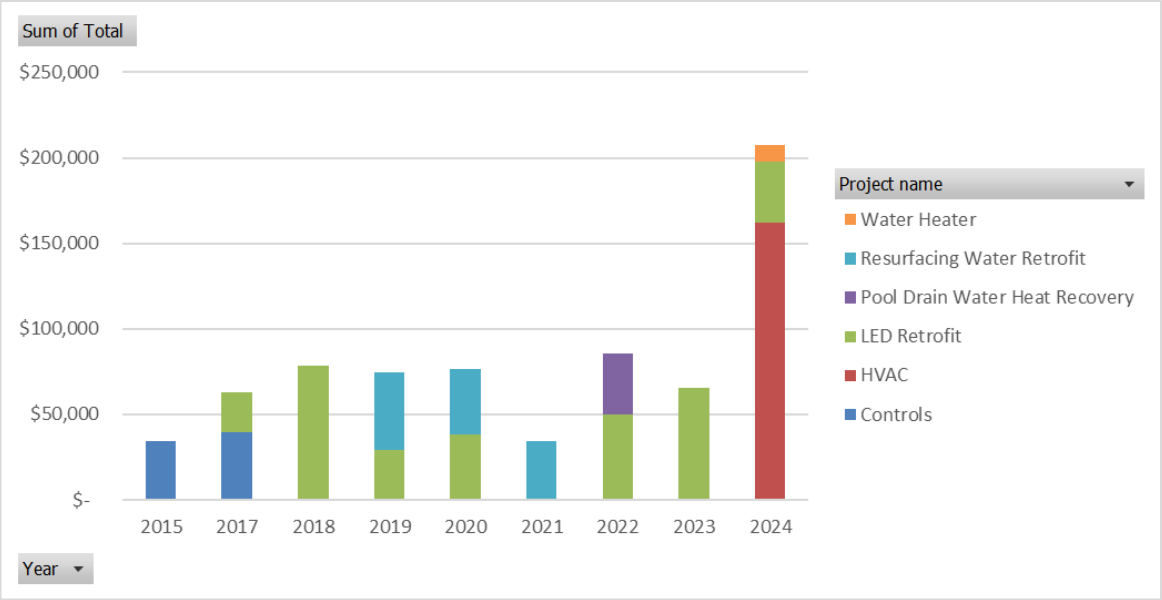
- Funds must not deplete below $50,000
- Projects must demonstrate a simple payback of 10 years or less
- Revolving fund revenue:
  - MicroFIT annual revenues
  - Simple payback payments are diverted back to the fund
  - 25% of projected energy savings will be continually diverted to grow the fund
  - All energy incentives received

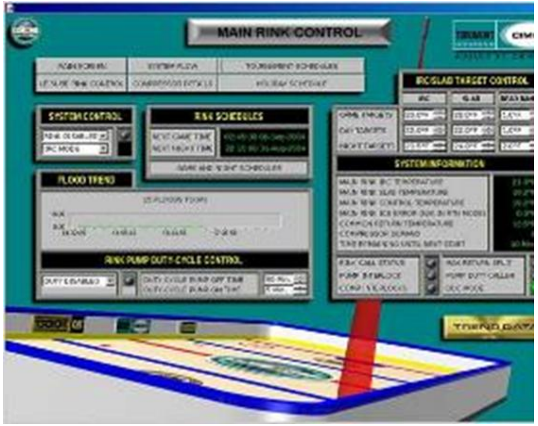
Who’s involved?



- ✓ Governing body of corporate energy goals and targets
- ✓ Responsible for energy conservation within facilities
- ✓ Formalize strategic energy management
- ✓ Recognized for excellence in energy management

Revolving fund projects





Benefits of the revolving fund

- Provides a unique financial tool for the corporate energy team
- Provides an opportunity to trial new technologies
- An alternative funding option if tax base funding cuts are made
- Career and skills development
- Staff buy-in and motivation
- Communicate success back to council and senior leadership
- **Recognition is important!**

Helping municipalities manage energy projects

LAS end-to-end solutions

The Township of Unity

Energy conservation challenges

- Capacity constraints
- Procurement and approvals
- Competing priorities

Source: Wikipedia

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Unity’s pool lighting dilemma

- Main pool in community
- Operates 16 hours/day, seven days/week

Lighting upgrade failure!

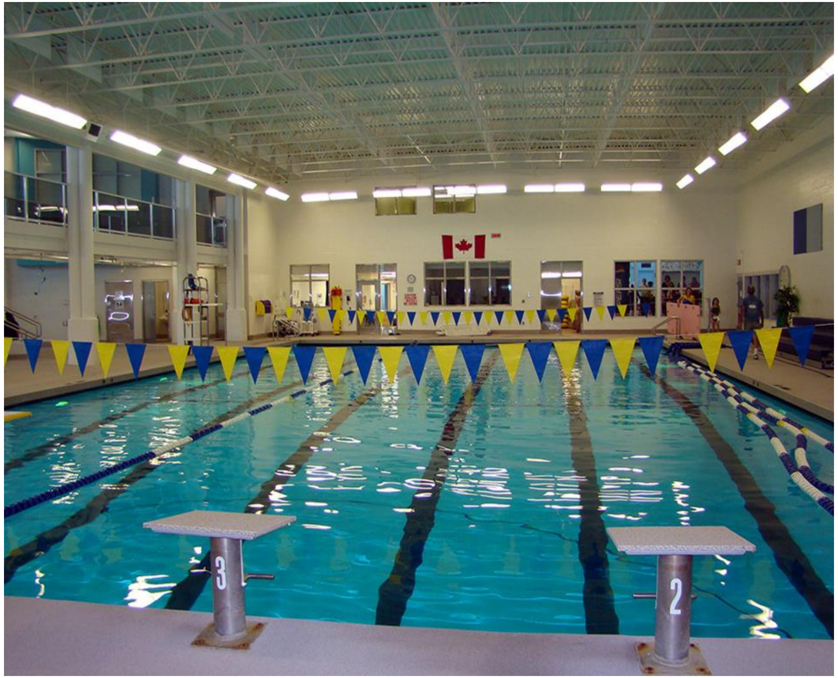
- Excessive glare
- Failing fixtures
- Increased risk to Unity
- URGENT SITUATION!

Source: www.trainingpeaks.com

Unity’s pool lighting solution

- Requirements
- Increase safety of pool environment
- Reduce glare and improve light levels
- Lower costs

- Turnkey solution
- analysis → design → supply/installation → commissioning and incentives

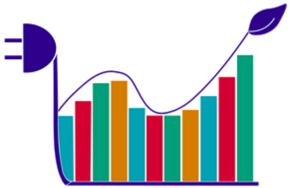


LAS AMO Business Services **Energy Planning Tool**

CONTACT US LOG IN

Track, report and manage your energy conservation efforts with ease

Our secure portal keeps everything energy related in one convenient place.
Build your culture of conservation through energy awareness.

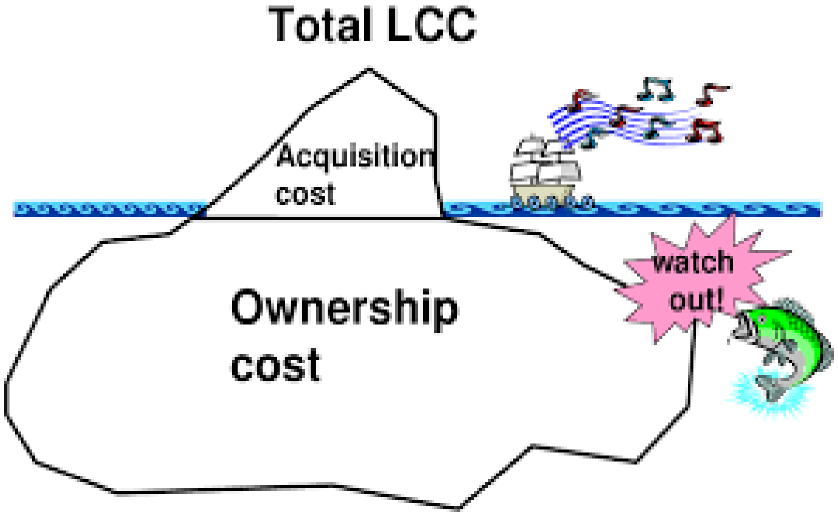


Track your utilities for easy incorporation into internal and annual reporting under O.Reg 507/18

Monitor your energy related projects to increase sustainability and cut energy costs.

Create a detailed 5-Year Conservation and Demand Management Plan outlining your goals and achievements.

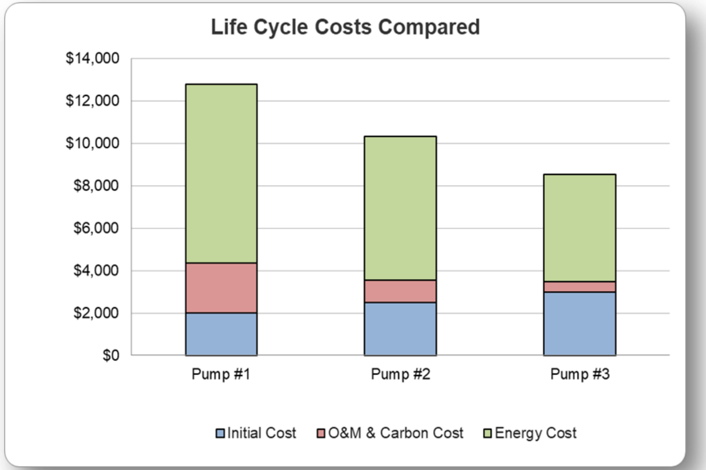
Engaging in energy workshops



Kawauchi, Y. & Rausand, M. (1999). Life Cycle Cost Analysis in Oil Chemical Process Industries

Positioning a pump project

- **Option A**
  - Initial Cost = $2,000
  - Maintenance Cost of $500 every 2 years
  - Annual energy consumption of 5,000 kWh/yr
- **Option B**
  - Initial Cost = $2,500
  - Maintenance Cost of $375 every 3 years
  - Annual energy consumption of 4,000 kWh/yr
- **Option C**
  - Initial Cost = $3,000
  - Maintenance Cost of $250 every 4 years
  - Annual energy consumption of 3,000 kWh/yr



Building on other’s success

Source: www.middlesexcentre.ca

Multiple resources available

- **Find multiple types of resources on the SaveonEnergy website**: https://saveonenergy.ca/Training-and-Support

Webinars	Fact sheets	Measurement and verification templates	Practical guides

- **Sign up for one-on-one coaching:** Post-webinar support intake form

➢ Coaching sessions conducted virtually by phone, video calls and email

➢ Designed for organizations seeking guidance

Thanks for the opportunity to be of service!

"The help desk is now open!"

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Thank You

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