Using RETScreen for your Green and Inclusive Community Buildings Application



Version Date – July 2024







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1.1 What is RETScreen?

RETScreen is a Clean Energy Management Software system for energy efficiency, renewable energy and cogeneration (Power | Heating | Cooling) project feasibility analysis as well as ongoing energy performance analysis. RETScreen Expert is developed by Natural Resources Canada, part of the Government of Canada.

1.2 Using RETScreen for the Green and Inclusive Community Buildings Program

The Green and Inclusive Community Buildings (GICB) program is a national merit-based program with the objective of improving the availability and condition of community buildings in Canadian communities experiencing higher needs.

In this program, you will use RETScreen Expert to estimate the fuel savings and greenhouse gas (GHG) emission reductions for your proposed project. RETScreen's feasibility analysis will help you calculate these values.

This short guide will show you the quickest and easiest way to do this so that you can answer questions 27, 28 & 29 in the application.

1.3 Getting started

If you have not already watched the introductory videos, please do so now. The links are provided in Appendix A. For those unfamiliar with RETScreen, the first three links will be particularly helpful. These videos are specifically tailored to building energy retrofits.

- 1. Download and install the RETScreen Expert software.
 - a. You can download or update RETScreen from our website here.
- 2. Get the RETScreen software key from the GICB application portal.
 - a. RETScreen software key is available on the application portal at the Green and Inclusive Community Buildings program website.
 - b. Save the software key in a known location on your computer
 - c. Double-click on the software key and follow the directions in the application package to activate the Professional mode of RETScreen.
- 3. Everything is now set for you to proceed with your energy analysis in RETScreen for your project. Refer to Section 2 below for more details.
- 4. After completing your energy analysis, save the project in RETScreen Expert and take note of where you save the .retx file.
- 5. Follow the steps in the image below to get the answers to questions 27 and 28. Record these numbers for your reference.
 - a. When submitting your application, use the two numbers recorded for energy and GHG from the previous step to answer questions 27 and 28. Use the saved file for uploading in Question 29.

IMPORTANT: Please only submit the .retx file that you saved in Step 4, not a pdf or scanned print out of your project.



IMPORTANT— For buildings with Previous or Planned Expansions and Add-Ons

Even if your building has changed over the years, you can still use RETScreen for your energy analysis. The base case is your building as it stands before your application to the Green and Inclusive Community Buildings program. This base case would include all the previous expansions and add-ons.

If you are planning an expansion as part of the retrofit, you can still use RETScreen for your energy analysis. The base case would reflect the building's current condition, including any planned expansions built according to the building code or standard construction practices. The proposed case for the planned expansion would encompass any features beyond regular construction practices. ¹

For example, if standard construction practices require installing double-glazed windows, that serves as the base case. Opting for triple-glazed windows would be the proposed case, with the incremental initial costs reflecting the difference in costs between triple and double-glazed windows. If the building adheres to standard construction practices, the proposed case would be the same as the base case and the incremental costs would be zero.

¹ The same approach applies to buildings being repurposed (e.g., buildings previously abandoned or serving different purposes). In these cases, the base case would represent the entire repurposed building as it would be if built or renovated according to the building code and operated under normal conditions, while the proposed case would cover any features beyond the code requirements.

2 STEP-BY-STEP ENERGY MODEL IN RETSCREEN

2.1 How to use RETScreen Expert for your energy analysis

It is recommended to use the Virtual Energy Analyzer (VEA) to start a new project in RETScreen. The VEA will create a new project adapted to the selected location. This tool can be accessed by clicking on the icon shown in the image below:

RETScreen Expert				– a ×
File Ressources natural	es Natural Plesources			Language * Share * Subscribe ") * (* 🚽 🖬 🙆
Canas	RETSCIECN' [Expert Clean Energy Mai	nagement Software - Version 9.1		Canada
Mome -	Getting started - Options	Workflow - Per facility	Facility type - Examples	Integrated features
Image: Construction Image: Constructi	Virtual energy analyzer Analysis type - Blank project Image: Spec - Blank project	Start A August and the second	Power plants. Power 1 Heating Coding Power 1 Sorage Off-grid Red property: Power 1 Sorage Off-grid Power 1 Sorage Off-grid	Provide the second s
RETScreen Expert - Profes	sional - 9.1.0.98	© Minister of Natural Resources Canada 1997-2024.		NRCan/CanmetENERGY/Varennes

A new window will appear, prompting you to provide some details about your facility.



You will need to:

- a. Select the location of your facility using the map or use the search tool to enter the exact location.
- b. The facility type.
- c. The specific type of the building.
- d. The description of the building.

In our example, we'll use a community center, but you should select the archetype that best matches your facility. Browse through the lists to find the most suitable archetype. We will select:

- Facility type: "Commercial/Institutional"
- Type: "Public building"
- Description: "Community centre"

NOTE:

Select Feasibility | Emission | Target - 30-40% if your target emissions savings is 60% or below. Select Feasibility | Emission | Target - 80-90% if your target emissions savings is above 60%.

Archetypical	facilities	
Facility type	Commercial/Institutional	Lake Superior
Туре	Public building	-
Description	Community centre	
1	Feasibility Energy Target - 30-40%	LiAnse
Site referen	Arena - curling	Marquette
Select facility	Community centre	Ottawa National Forest
Search - Fo	Convention centre	1 miles
	Feasibility Emission Target - 80-90%	
St Cloud	Arena - curling Arena - hockey & skating Community centre Convention centre	Wausau 🛒

2.2 Location Worksheet

After completing each section in this window, the next step is to run the tool by clicking on "Calculate". button.

The software will load an archetype of the selected facility type automatically, serving as your starting point for analysis. You will still need to adjust specific values according to your actual building and project requirements.

Start by completing each worksheet, going left to right, top to bottom to review the information. Start at Location to make sure the project location is correct.



2.3 Facility Worksheet

Next, go to the Facility worksheet and start filling in the information on the top half of the worksheet (*Facility information* box). You should type in the name of the project, the contact information and even upload a photo of the building if you wish.

RETScreen Expert		
File Location Facility	Energy Cost Emission Finance Risk	Report Custom
Benchmark Feasibility Step 1 - Analysis	immance All Level 1 Level 2 Hide benchmark	Show meter information Options
RETScreen - Facility		Subscriber: CanmetEnergy - Varennes - Employee Use Only
Facility Information		
Facility type	Commercial/Institutional	· ·
Туре	Public building	
Description	Community centre - Feasibility Emission large	
Prepared for	Prepared for	
Prepared by	Prepared by	
Facility name	Archetype	
Address	Address	
City/Municipality	City	
Province/State	Province/State	
Country	Canada	·
	L	Elevation
L		

The only other information required in this worksheet is the facility size (Facility Size – Actual). All other fields in the Benchmark section can be left empty or with the default values. You are not required to fill out the rest of this worksheet.

RETScreen Expert			
File Location Facility Ene	ergy Cost Emission Finance R	isk Report Custom	
Benchmark Feasibility Performa Step 1 - Analysis type	e Step 2 - Benchmark	Show meter information Benchmark database	☐ ⑤ Show notes ☑ ▲ Show image Select image. Options → Adjust image → ↓ Keep aspect ratio Help ↓ Help ↓ Help ↓ Help
RETScreen - Facility			Subscriber: CanmetEnergy - Varennes - Employee Use Only
Facility information			
Facility type Type Description	Commercial/Institutional Public building Community centre - Feasibility Emission	• • Target - 80-90%	
Prepared for	Prepared for	-	
Prepared by	Prepared by	a	
Facility name	Archetype	a	
Address	Address		
City/Municipality	Ottawa		
Province/State	ON		
Country	Canada	•	
			Elevation
Benchmark - Commercial/Institutiona	al - Public building		
Facility size - Actual	2,250	m ² 💌 🚺	
Facility size - Archetype	2,250	m²	
V 🍪 Fuel consumption			
Energy use intensity			Plan
Energy unit	kWh 🔻		Base case
Reference unit	m²		
-			500
Benchmark	272	kWh/m ²	
Minimum (Typical)	182	kWh/m*	400 -
Maximum (Typical)	370	j kwn/m² .₽	
Benchmark Minimum (Typical) Maximum (Typical)	272 182 370	kWh/m² kWh/m² kWh/m²	400 -

2.4 Energy Worksheet

Next, on the Energy worksheet, you'll find different building components that make up the energy model. You can review and adjust each component to align with your project. Below is an image displaying the facility archetype loaded from the VEA.

RETScreen Expert	_									
File Location Facility Ener	rgy Cost Emissio	on Finance Risk I	Report Custom							
Electricity Scheduler	* 2	λο 🙇 🕻					SH	iow notes iow image	🛐 Exp	oort to file
and fuels	Cooling Energy	• • sto	rage • measure?	ISON Dashbu	ard End-use	Update	Copy	base <-> propos	ed •	
Step 1 - Fuels & schedules Step 2 - Ec	quipment Step 3 - End	-use Step 4 - Optimize su	ipply Step 5 - Summa	ry I			Options			
RETScreen - Energy Model						Subsc	riber: CanmetEne	ergy - Varennes	- Employe	e Use Only
Commercial/Institutional - Community	y centre - Feasibility En	ergy Target - 30-40% - Publi	ic building							
 Fuels & schedules 		Channe All	_ Heating	Cooling	Electricity	Incremental	Fuel cost savings	Incremental	Simple	Include
Electricity and fuels	(Fuel saved	v kwh v	kWb.	kWb	initial costs	¢	O&M savings	payback	measure?
Schedules		Hasting		KIIII	KIIII	, , , , , , , , , , , , , , , , , , ,	,	,	y	
🕑 Equipment		Space beating	0			0	0	0		1
🔺 💧 Heating		Domestic hot water	0			0	0	0		v
Space heating		Cooling				Ů	, , , , , , , , , , , , , , , , , , ,	ÿ		
Domestic hot water		Air conditioning		0		0	0	0		✓
🔺 🗱 Cooling		Puilding envelope								
Air conditioning		Building envelope	89 108	3 1 1 8		3 100	6 354	0	0.5	2
🕑 End-use		Ventilation	05,100	5,110		5,100	0,004	Ū	0.5	
A A Building envelope	^	Zone - East	174,178	4,215		17,908	12,072	0	1.5	<
Building envelope		Zone - West	212,885	5,152		19,452	14,754	0	1.3	~
🔗 Roof - Concrete		Gymnasium	106,442	2,576		13,908	7,377	0	1.9	~
🔗 Walls - Cement stucco		Lights								
Ventilation		Office			2,837	1,280	525	0	2.4	\checkmark
Zone - East		Meeting room			3,989	4,050	738	0	5.5	\checkmark
Zone - West		Library			2,978	1,200	551	62	2.0	\checkmark
Gymnasium	~	Lobby			1,915	600	354	31	1.6	\checkmark
Ontimize supply		Cafeteria			1,092	320	202	17	1.5	✓
optimize supply		Kitchen			766	240	142	12	1.6	~
4 👧 Heating		Washroom			766	540	142	12	3.5	~
Solar water heater		Dressing room			1,744	1,080	323	24	3.1	✓
A 7 Power		Gymnasium			5,248	2,960	9/1	0	3.0	✓
Photovoltaic - 37 kW		Fitness center			1,276	400	230	21	1.0	~
Summary		Sign Evit			3 10 2	240	200	12	2.0	×
include measure?		Exterior - Facade			1.051	980	104	90	3.7	×
崎 Comparison		Exterior - Parking			6.877	3 031	1272	30	2.3	
		Exterior - Sign			263	344	48.6	82	2.6	v
		Electrical equipment								

IMPORTANT— Modeling the Whole Building

Even if your project affects only a portion or certain components of your building, you must model the entire building. This includes sections where the proposed case will remain the same as the base case. This requirement ensures that interactive effects, such as the impact of lighting measures on HVAC energy usage, are considered in the analysis. Additionally, since the results need to be reported as a percentage of savings relative to the building's total energy consumption, all end-users must be accounted for in the model.

Base Case and Proposed Case

In each of the individual forms in the Energy model, you will enter the information about the various building characteristics, for both the base case and the proposed case. You click in the ribbon to add a new end-use energy component you want to describe (e.g. Building envelope, Ventilation, Lights, etc.).

RETScreen Expert								
File Location Facility	Energy	Cost Emission	Finance	Rick	Report	Custom		
Electricity Schedules	ating Coolir	ng Energy	Heating	Power	Energy storage •	Include measure?	Comparison	Dashboard E
Step 1 - Fuels & schedules Step RETScreen - Energy Model	 ☐ Buildin ✓ Ventila ♥ Lights ♥ Electri 	ng envelope ation cal equipment	Step 4	Optimize	e supply	Step 5 -	Summary	
Fuels & schedules Electricity and fuels Schedules	Commercial/Institutional - Com O Electrical equippment Fuels & schedules I Hot water Electricity and fuels P Pumps Fans		eating syste escription	m ———		Not applic	able	
Equipment A A Heating	Motor Proces	rs N ss electricity	lote					
Space heating Domestic hot water Not applicable	Procest Image: Weat of the second sec	ss steam I losses Te recovery Fu	eating syste chnology iel type	m ———				
Air conditioning	Comp	ressed air Fu eration Se	iel rate] Heating e asonal effici	quipmen ency	ıt		:	\$/m³ %
Cafeteria Miscellaneous Standby losses		In	cremental O	8tM savin	gs			\$ •

Or you can click on an existing component in the list on the left of the screen to access the data entry forms.

The toolbar at the top of the Energy worksheet shows the main steps to follow. Always start from left to right, top to bottom to build your project or adapt the loaded archetype to your project.



In these forms, you enter information about the base case and the proposed case, including any proposed case end-use energy efficiency measures.

Optional: You can also enter the Incremental initial costs and Incremental O&M savings associated with the proposed case end-use energy efficiency measures if desired. However, please note that providing cost or financial information in your RETScreen model is not a requirement for the GICB program application. While financial analysis can be performed in RETScreen to assess your project's viability, it is not mandatory for the program. All cost cells in the various sections of the Energy worksheet can either be left blank or filled with the default values.

For complex projects, you might want to use more than one form to describe each major building zone or each separate energy efficiency measure, etc. You also enter key information about each form in the Description data entry cell at the top of each form. For example, this might be the name of the building zone (e.g. gymnasium, office, etc.). Or it might describe the energy efficiency measures under consideration (e.g. low-flow faucets, drainwater heat recovery, etc.).

Within some of the forms you can select more than one *Method or Level* to perform the calculations. When more than one method or level is available, you select the type of method or level by clicking on the appropriate button at the top of each form. The method or level chosen will typically depend on the availability of input data and the stage of project development (e.g. pre-feasibility vs. feasibility study).

RETScreen Expert					
File Location Facility Energy Cost Emis	ion Finance Risk Rep	oort Custom			
🖌 📥 🗮 🛛 🛕 继 🛛 👍	- 🖌 🚣 🚘	. 51	AS 1. 🥰	🗛 📝 🛃 🖬 Sł	now notes
		<u> </u>		SI 🔍 🔳 🖬 SI	now image
and fuels	 Heating Power Energy storage 	e • measure?	Comparison Dashboard End-us	e larget Scaling - Notes 🦣 Copy Update	base <-> proposed \cdot
Step 1 - Fuels & schedules Step 2 - Equipment Step 3 - En	d-use Step 4 - Optimize suppl	ly Step 5	- Summary	Options	
RETScreen - Energy Model			Subscr	iber: CanmetEnergy - Varennes - Er	nployee Use Only
Commented the discole Comments and the Comments					
Commercial/Institutional - Community centre - Feasibility E	hergy larget - 30-40% - Public b	ouliaing			
Fuels & schedules	Ventilation		Met	hod Options	
Electricity and fuels	Description	Zone - \	West		()
🐻 Schedules			Me	thod 1 Method 2 elearning	RETScreen
 Equipment 	Note Linked to: Heati	ing system + Coo	oling system + Motors - Fans	······································	Connect
A heating					
Space heating	Ventilation - Method 1				
Domestic hot water			Base case	Proposed case	Energy saved
Not applicable	Schedule	1/	Base case	Proposed case •	{
🔺 👾 Cooling	Flow Each air	L/S •	2,200	2,200	{
Air conditioning	Fresh air	76	100%	100%	{
End-use	System relied		Heating & cooling	Heating & cooling	{
Zana West	Fan control		Schedule	Schedule V	
Gumpsium	Ventilation control		Schedule	Schedule T	
	Intake air damner leakage		Medium	Tight T	
a 🖞 Lights	intake an damper leakage		wiedluffi	- ingin	{

Step 1 - Fuels & Schedules

This section has two different subsections:

1. *Electricity and fuel*: you enter the fuels and rates (optional) for the base case and the proposed case.

RETScreen Expert									
File Location Facility	Energy Co	st Emission	Finance	Risk Repor	t Custom				
Electricity Schedules He Step 1 - Fuels & schedules Step	eating Cooling p 2 - Equipment	Energy Step 3 - End-use	Heating Step 4 - 0	Power Energy storage	Include Comp measure? Step 5 - Summ	arison Dashboard	End-use Targe	t Scaling - N Update	Iotes Copy Options
RETScreen - Energy Model						Subscriber: Canme	etEnergy - Vare	nnes - Employ	yee Use Only
Commercial/Institutional - Con Fuels & schedules Electricity and fuels Schedules Schedules Environment	nmunity centre - F	easibility Energy	Target - 30- ptions Ptions	40% - Public buil	ding				
 Equipment Equipment Provide the equipment Space heating Domestic hot water Not applicable R Cooling Air conditioning 		r Fi	uels	t	Nati	ural gas - m ^a \$/m ^a 0.689	•		
End-use Zone - West Gymnasium		(((((((((((((((((((Heating va ectricity —	alue & fuel rate					
 ights Office Meeting room Library Lobby Cafeteria 			Type Description Rate - unit Rate - annual		Electricity Electricit \$/k 0.	rate - annual y - kWh • Wh • 185	s 🗱		

These fuels will be available in each one of the next steps.

2. Schedules: The software needs the operating hours for your building. These schedules will be used for the building envelopes and ventilation systems.

		0.1 0 1	<u> </u>		
File Location Facility	Energy Cost Emission Finance	Risk Report	Custom		
	🛛 💥 👍 🔥	🏡 🔜	E 🏄	📊 📢 🤃	A Show nd
Electricity Schedules Heat	ing Cooling Epergy Heating	Power Energy	Include Comparison	Dashboard End-use Targe	✓ Image: Scaling - Notes
and fuels	The stand of the s	 storage • 	measure?	Dashboard End asc large	Update Update
Step 1 - Fuels & schedules Step 2	- Equipment Step 3 - End-use Step 4 - (Optimize supply	Step 5 - Summary		Options
RETScreen - Energy Model			S	ubscriber: CanmetEnergy -	Varennes - Employee Use Only
Commercial/Institutional - Comm	unity centre - Feasibility Energy Target - 30-	40% - Public buildi	na		
Fuels & schedules					
Filer fricting and files					
igo schedules	eLearning RETScreen				
 Equipment 	Connect				
🔺 👌 Heating	<u></u>				
Space heating	Schedules				
Domestic hot water	Description		24/7	Base case	Proposed case +
🔺 🗱 Cooling	Occupied				
Air conditioning	Temperature - space heating	°C 🕶	22	23	21
End-use	Temperature - space cooling	°C 🗕	24	23	24
Zone - West	Unoccupied				
Gymnasium	Temperature - space heating	°C 🔻		20	18
🔺 🌷 Lights	lemperature - space cooling	°C ▼		25	26
Office	Occupancy rate - daily				
Meeting room	Monday	h/d	24	20	18
Library	Wednesday	n/a	24	20	10
Lobby	Thursday	h/d	24	20	10
Cafeteria	Friday	h/d	24	20	18
Ontimize supply	Saturday	h/d	24	20	18
opunize supply	Sunday	h/d	24	20	18
4 🎨 Heating	Occupancy rate - annual	h/yr	8,760	7,300	6,570
Solar water heater		%	100%	83.3%	75%
A 7G Power					
Photovoltaic - 3/ kW	Heating/cooling changeover temperature	• °C •	17		
 Summary 	Length of heating season	d	251		
Include measure?	Length of cooling season	d	114		
🍪 Comparison				-	•

Step 2 - Equipment

In this section, you enter the information about the heating system and cooling system equipment, for the base case and the proposed case.

RETScreen Expert							
File Location Facility	Energy Cost Emission	Finance Risk	Report Custom				
Electricity Schedules and fuels Step 1 - Fuels & schedules Step 2	ing Cooling 2 - Equipment Step 3 - End-	Heating Power Step 4 - Optimize	Energy torage • Include supply Step 5 -	Comparison Summary	Target Scaling Update. Op	Show i Show i Show i Notes Get Copy base itions	notes mage e <-> proposed •
RETScreen - Energy Model				Su	bscriber: Canme	tEnergy - Varennes - E	mployee Use Only
Commercial/Institutional - Comm	unity centre - Feasibility Ene	gy Target - 30-40% - Ρι	ıblic building				
 Fuels & schedules 	Heating system			Method	Options ——		
 Electricity and fuels Schedules Equipment 	Description Note	Space heating inked to: Ventilation + M	otors - Fans	Single fuel Multiple fuels	eLearning	RETScreen Connect	
🔺 💧 Heating	L				C		
Space heating	Heating system			Race race		Proposed case	
Domestic hot water	Technology			Heating system	•	Heating system	•
a 🗱 Cooling	Fuel type			Electricity	•	Electricity	•
Air conditioning	Fuel rate		\$/kWh	0.185		0.185	\$/kWh
 End-use 	Heating equipment				Y		
Zone - West ^	Seasonal efficiency		%	100%		200%	
Gymnasium	Incremental initial costs		S	<u> </u>			5
🔺 🏺 Lights	Incremental O&M savings		S	-			

Click in the ribbon on the equipment you want to describe (e.g. Boiler, Heat pump, Compressor, etc.) to access the data entry forms.



In the heating system forms, you will:

- select the technology, entered in "Heating system, Boiler, Furnace, or Heat pump etc. as applicable"
- enter the seasonal efficiency, and
- (optional) enter the cost of this new equipment, if any.

RETScreen Expert	
File Location Facility E	nergy Cost Emission Finance Risk Report Custom
Electricity Schedules Heatin	Image: Weight of the state
and fuels • Step 1 - Fuels & schedules Step 2 -	
RETScreen - Energy Model Commercial/Institutional - Commu	Subscriber: CanmetEnergy - Varennes - Employee Use Only
 Fuels & schedules 	Cheating system Coptions
 Electricity and fuels Schedules Equipment 	Description Space heating Click Kote Linked to: Ventilation + Motors - Fans Single fuel Multiple fuels RETScreen + Connect
Heating Space heating	
Domestic hot water	Base case Proposed case Technology Heating system Fuel type Electricity
Air conditioning	Fuel rate \$/kWh 0.105 0.185 \$/kWh Heating equipment
Zone - West ^ Gymnasium	Seasonal efficiency % 100% 200% Incremental initial costs S • Optional \$
🔺 🏺 Lights	Incremental O&M savings S Optional

In the cooling system forms, you will:

- select the technology, entered in "Cooling system, Compressor, Absorption, or Heat pump etc. as applicable"
- enter the Coefficient of Performance (COP) and
- (optional) enter the cost of this new equipment, if any.

A DETS groop Export					
KEIScreen Expert					
File Location Facility	Energy Cost Emission Finance Risk	Report Custom			
Electricity Schedules and fuels Step 1 - Fuels & schedules Step 2	- Equipment Step 3 - End-use Step 4 - Optimi	Energy storage • ize supply	n Dashboard End-use Target	Scaling - Notes Update Options	e proposed •
RETScreen - Energy Model			Subscriber:	CanmetEnergy - Varennes - Empl	oyee Use Only
Commercial/Institutional - Commu	unity centre - Feasibility Energy Target - 30-40% -	Public building			
 Fuels & schedules 	Cooling system	Optio	ons		
Electricity and fuels	Description Air condition	ing	o , 💿 ,		
 Equipment 	Note Linked to: Ventilation +	Motors - Fans	arning REIScreen Connect		
A beating Space heating	Cooling system		Bara cara	Proposed case	
Domestic hot water	Technology		Absorption V	Heat pump	1
🔺 🐳 Cooling 🗡	Fuel type	-	Electricity 🔻	Electricity T	1
Air conditioning	Fuel rate	\$/kWh	0.19	0.19	\$/kWh
End-use	Cooling equipment	···			
Zone - West	Coefficient of performance - seasonal	kW/kW 🔻	0.7	3.2]
Gymnasium	Incremental initial costs	s –		Optional	\$
🔺 🖗 Lights	Incremental O&M savings	s 🔻		Optional	
Office	Refrigerant - Optional				
Meeting room					

Step 3 - End-use

In this section, you enter information about the facility characteristics for both the base case and the proposed case. Click on the end use category you wish to describe from the list on the left side of the screen (e.g., Building envelope, Ventilation, Lights, etc.) to access the forms.

RETScreen Expert				
File Location Facility Energy Cost 6	Emission Finance Risk Report Custom			Language *
Dectricity Schedules and fuels Step 1 - Fuels & schedules Step 2 - Equipment Step 3	Image: Starp of the starp Image: Starp of the starp Starp of the starp Starp of the starp Starp of the starp Starp of the starp	Comparison Deshboard End-use Target Scaling Update	Show notes Show notes Show image Copy base <-> proposed = Cons	elep elearning Steps
RETScreen - Energy Model			Subscriber: CanmetENERGY - Varennes - Rf	TScreen Casual Only - Seulement
Commercial/Institutional - Public building				
Fuels & schedules & Bactricity and fuels District energy - Chilled water Schedules	Description Select level 1 or l Description based on how mu Note available to you	evel 2 Ich data is	Options eLearning RETSoreen Connect	
Equipment	- Uniter Arrist 2			
A Heating Boiler Boiler Gooling Cooling system	Ugtrs - Lever 2 I Illumination level - calculator Lamp & foture type	Base case	Proposed case Light emitting diode (L)	Energy saved
End-use	Efficiency In/W Electricity load per lamp W	Edit the data wi	th information specific to	vour
 Building envelope 	Number of lamps per future	facility Do the	ame for other end uses i	ncluding
Building envelope	Miscellaneous losses W	the envelope v	antilation electrical equir	mont
a 🔋 Lights	Electricity load per foture W	the envelope, v	entilation, electrical equip	Jinent,
Meeting room	Number of lamps - total	not water, etc.,	so that the model reflects	syour
4 🚱 Fans	Operating hours h/w	own facility.	30	
Fans	Costing method		Level 1	•
 Optimize supply 	Incremental Initial costs 5 Incremental OBM savinos		1280	
Summary	Number of units	1	1	
include measure?	Electricity kWh	• 4 539	1 702	2 837
40 Comparison	L			62.5%
	(impact			
	Space cooling impact	100% •		
	Space heating impact	100% •		
		-]

In these forms, you enter information about the base case and the proposed case of your facility.

You can add any necessary building components that are not included in the archetype using the drop-down list shown in the image below.

DETScroop Export								
File Location Facility	Energy Cost	Emission	Finance	Risk	Report	Custom		
Electricity Schedules	ating Cooling	Energy	Heating	Power	Energy storage •	Include measure?	Comparison	Dashboard 6
RETScreen - Energy Model Commercial/Institutional - Com	 Building envel Ventilation Lights Electrical equi Hot water 	pment agy	Target - 30	-40% - P	ublic buildir	ng	Summary	
Electricity and fuels	Pumps Pans Motors	D N	eating system Description Note			Not appli	cable	
 Heating Space heating Domestic hot water 	 Process electric Process heat Process steam 	city (eating system	m ———]
Not applicable Cooling Air conditioning	 Steam losses Heat recovery Compressed a 	ir Fu	chnology iel type iel rate] Heating e	quipmer	ıt		:	\$/m³
Cafeteria Miscellaneous	 Wetrigeration Other 	Se In In	asonal effici cremental in cremental O	ency itial costs &M savin	gs			% <u>\$</u> \$
Standby losses								

The end-use elements are described in "Introduction to Energy Efficiency Project Feasibility Analysis with RETScreen Expert." You will find the link to the video in Appendix A.

Information — N Adding notes is strongly e nformation to the reviewe Energy worksheet, in the	ote Section ncouraged to document the er. These notes can be added 'Note" section.	model and provide ad at the bottom of each	ditional page of the
Internet for the second se	Intervential Contains and the second	Language Captor Control Control Contr	Subsorbe "" " " " "

Step 4 - Optimize Supply

This section allows you to input details about renewable heating or power systems to optimize energy supply for the proposed case. For instance, you can incorporate solar energy, wind turbines, or other green power sources into your project.

File Location Fac	ility Energy (Cost E	mission	Fina	nce	Risk	Repo	ort Cu	stom
Electricity Schedules and fuels	Heating Cooling	En t Step 3	ergy - End-use	200	Heating	Power	ply	Include measure Step 5	Comparison
RETScreen - Energy M	odel			+	Wind tu Green r	urbine			
Reforeen energy m				•	Oreen p	bower	1		
RETScreen Expert - Apart	ment - High-rise.retx ity Energy Co	ost Em	ission	Finan	ce f	Risk I	Report	Custo	om Adr
RETScreen Expert - Apart File Location Facil Electricity Schedules and fuels	ment - High-rise.retx ity Energy Co Meating Cooling	ost Em	nission	Finan	ce F eating	Risk I Power	Report	Custo	om Comparison

Step 5 - Include Measure Page

As you build your energy model on the *Energy* worksheet in RETScreen, the Include measure? page will display a row for each of the energy measures.

Since, you've used an archetype to start your project, go through each to change the values to more accurately reflect your project.

If a particular building component isn't used in your project, you can delete it by right clicking on that component in the left menu and select delete.

ommercial/institutio	nai - Community centre - Feasi	pliny En	ergy larget - 30-40% - Public building
Fuels & schedul	es		Heating system
Ilectricity and ₩ Schedules	fuels	(Description Not applica
Equipment			Note
 Heating Space heating Domestic hot 	water		Heating system
Not applicable		- I	Fuel type
 Air conditionir 	Move to top Move up		Fuel rate
End-use	 Move down 		Seasonal efficiency
Onice	Move to bottom	~	Incremental initial costs
Cafeteria Miscellaneous	🛋 Rename		Incremental O&M savings
Standby losse	Duplicate		
4773	(Dalata		

You can add new components by using the menu at the top.

🚷 RETScreen Expert									
File Location Facility	Energy	Cost	Emission	Finance	Risk	Report	Custom		
Electricity Schedules and fuels	ating Coo	ling	Energy	Heating	Power	Energy storage •	Include measure?	Comparison	Dashboard I
RETScreen - Energy Model	Vent	ding envel tilation ts	ope use	Step 4	- Optimiz	e supply	Step 5 - 3	summary	1
Commercial/Institutional - Com Fuels & schedules	C Elect	trical equi water	pment ergy rH	Target - 3(eating syste	0-40% - F m ———	Public buildir	ng]
Electricity and fuels	Fans	ors	D	escription			Not applica	able	
Equipment Heating	 Proc Proc Proc 	ess electri ess heat	icity	eating syste					
Space heating Domestic hot water	他 Proc에 Stea	ess steam m losses	Te	chnology					
Air conditioning	 ♦) Heat → Corr 	t recovery pressed a	ir Fu	el type el rate] Heating e	quipme	nt			\$/m³
End-use Gafateria	RefrOther	igeration er	Se	asonal effici cremental in	ency itial cost	5			% \$
Miscellaneous Standby losses			Ind	cremental O	&M savir	ngs			\$ •

When your energy model is complete, the rightmost column called Include measure? gives you the opportunity to include (checked) or exclude (unchecked) each.

You can indicate the inclusion of each energy efficiency measure by checking the corresponding boxes. To include all measures automatically, check the box beneath the Include

measure? title at the top of the section. Keep in mind, not checking the box means the proposed case is considered equal to the base case.

RETScreen Expert																	
ile Location Facility E	nergy	Cost En	nission	Finance	Risk	Report	Custo	om									
Schedules and fuels p 1 - Fuels & schedules	g Coolin - Equipme	ng Enderne	ergy End-use	Heating Step 4	Power - Optimiz	Energy storage • ze supply	Inclue measu Step	de Comparis rre? p 5 - Summary	son y	Dashboa	ard End-use	Target So U	caling - pdate	Notes Copy	how notes how image / base <-> propo	sed ▼	oort to file
RETScreen - Energy Model													Subsc	riber: CanmetEn	ergy - Varenne	s - Employe	e Use Oi
Commercial/Institutional - Commu	nity centr	e - Feasibility	Energy	Target - 3	0-40% - 1	Public buildin	g										
Fuels & schedules												Increm	ental		Incremental	Simple	Inclue
Electricity and fuels			💧 Sh	iow: All			•	Heating	Coo	oling	Electricity	initial o	osts	Fuel cost savings	O&M savings	payback	measu
Schedules			E	uel saved			•	kWh 🔻	k	Wh	kWh	\$		S	S	yr	
Equipment			н	eating													
			S	pace heatin	9			0					0	0	C)	1
Heating			1	Oomestic ho	t water			0					0	0	C)	v
Space heating			1	lot applicab	le			0					0	0	C)	-
Domestic not water			C	ooling													
A Casting			4	Air condition	ing					0			0	0	C)	
Air conditioning			B	uilding env	elope												
Air conditioning			E	uilding env	elope			91,310	2,	776			3,100	6,433	C	0.5	-
b) End-use			V	entilation													
Cafeteria			^ Z	lone - East				174,778	4,	196			17,908	12,107	C) 1.5	
Miscellaneous			Z	Cone - West				213,618	5,	128			19,452	14,798	C) 1.3	~
Standby losses			0	Symnasium				106,809	2,	564			13,908	7,399	0) 1.9	✓
🔺 🎳 Hot water			G	ghts													
Hot water				Office							2,837		1,280	525	C	2.4	✓
Motors				Aeeting roo	m						3,989		4,050	738	C) 5.5	⊻
Fans			L L	ibrary							0		0	0	C)	
Elevator			~	obby							1 000		220	0	17		
Optimize supply				Galeria Galeria							766		320	202	17	1.5	
A A Heating				Vachroom							766		540	142	12	25	
Solar water heater				vasilioom	-						1744		1 080	323	24	3.5	
A 20 Power				Symnasium							5 248		2 960	971		3.0	
Photovoltaic - 37 kW			F	itness cente	r						1.276		400	236	21	1.6	
 Cummuni 			0	Corridor Sta	airway						596		240	110	12	2.0	~
Summary			s	ign - Exit							2,102		688	389	96	1.4	~
Include measure?			E	xterior - Fac	ade						1,051		980	194	73	3.7	~
🔮 Comparison			6	xterior - Par	king						6,877		3,031	1,272	30	2.3	-
			- E	xterior - Sig	n						263		344	48.6	82	2.6	1
			E	ectrical equ	ipment												
			0	Office							2,698		0	499	C) Immediate	✓
			0	afeteria							6,504		600	1,203	75	0.5	~
			N N	Aiscellaneou	15						0		0	0	C)	~
			S	tandby loss	es						1,314		200	243	C	0.8	~
			H	ot water													
				lot water				10,150					2,345	658	1,406	5 1.1	1
			N	lotors												. I	
			_ F	ans							6,847		0	1,267	0) immediate	✓

Step 6 – Comparison Page

The *Comparison* page summarizes key information for the base case and proposed case facilities, including detailed information for each fuel type used, as well as fuel consumption and annual energy use information for heating, cooling and electricity.

Once your model is complete, you need to enter your building's annual energy consumption for each energy source in the "Fuel consumption – historical" cell. This allows you to compare the modelled consumption estimated by RETScreen in the base case ("Fuel consumption – base case") with the actual consumption of your building using the "Fuel consumption – variance". This comparison helps ensure that no major errors were made while modelling the base case facility.

Note that for the program reviewers to consider your model complete and accurate, **the variance for each energy source must be below 30%**.

RETScreen Expert									
Location Facility Energy Cost Image: Cost of the state of the st	Emission Finance Risk Energy p 3 - End-use Step 4 - Optimi	Report Custon Energy storage - ze supply	Comparison D 5 - Summary	ashboard End-use T	arget Scaling - No Update	V I Show note	ts øøAs ge > proposed ▼	fired fuel Pelp	eLearning Step
ETScreen - Energy Model						Subsc	riber: CanmetEner	rgy - Varennes - Em	ployee Use Or
ommercial/Institutional - Community centre - Feasi	ibility Emission Target - 80-90%	- Public building							
Fuels & schedules	- Summary - Electricity	and fuels							
Electricity and fuels	(D)	Fuel	type	Base	case	Proposed	case	Savin	as
Schedules	Ĩ		Fuel consumption						
	Fuel type	Fuel rate	unit	Fuel consumption	Fuel cost	Fuel consumption	Fuel cost	Fuel saved	Saving
Equipment	Natural gas	\$ 0.689	m ³	100,501	\$ 69,246	7,052	\$ 4,859	93,450	\$ 64,38
🛚 📥 Heating	Electricity	\$ 0.185	kWh	196,621	\$ 36,375	181,559	\$ 33,588	15,062	\$ 2,786
Space heating Domestic hot water	Total				\$ 105,620		\$ 38,447		\$ 67,173
End-use	Fuel type Natural gas	m ³	historical 102,564	Base case 100,501 105,621	-2%				
Building envelope Proof - Concrete Walls - Cement stucco Control - Concrete Control - Control - Contro	Savings	kWh Heating	Cooling	Electricity	8% Total	Plan	Variance		
Zone - East	Fuel consumption	kwn •	kWh	kWh	kWh	kWh	%		
Zone - West	Base case	1,068,107	36,832	159,789	1,264,728	1,264,728	0%		
Gymnasium	Proposed case	152,856	12,584	91,066	256,505	256,505	0%		
Optimize supply	Fuel saved	915,251	24,248	68,723	1,008,223	1,008,223	0%		
Solar water heater	Genchmark	85.7%	65.8%	43%	19.1%	19.1%			
Power Photovoltaic - 15 kW (10% of roof) Offsite renewables	Energy unit Reference unit	kWh • m² •	2,250	# #					
Summary	Benchmark Fuel consumption	Heating kWh/m ²	Cooling kWh/m ²	Electricity kWh/m ²	Total kWh/m²				
A Comparison	Base case	475	16.4	71	562				
Companiadi	Proposed case	67.9	5.6	40.5	114				
	rioposed case								

In the example above, the community center had a total electricity consumption of **182,012 kWh** and a total natural gas consumption of **102,564 cubic meters** in 2023. Compared to these values, the base case consumption estimated by RETScreen was 2% lower for electricity and 8% higher for natural gas, indicating that the model is comprehensive and accurately reflects the building's current conditions.

🛈 Information — Justifying High Variance and Lack of Historical Data

In some cases, there may be valid reasons for the variance between the actual and modelled base case consumptions to exceed 30%. For example, if the building is being expanded or repurposed or if it was previously abandoned or underused, the modelled consumption is expected to differ from the actual historical consumption. Additionally, in scenarios such as repurposed buildings, historical consumption data may not be available, making comparison impossible.

In these special cases, you should add a note in the "Comparison" section to justify either the high variance or the absence of historical consumption.

2.5 Emission Worksheet

The Emission worksheet summarizes the estimated GHG emission reductions based on the data entered in the previous worksheets. For the GICB application, **this worksheet should not be modified.** The default *Level 1* GHG emission factors should be used, as RETScreen automatically selects the appropriate provincial GHG emission factors based on the facility's location set in the *Location* worksheet.

File Location Facility Energy	Cost Emission	Finance Ri	isk Report	Custom	
Level 1 Level 2 Level 3 Step 1 - Analysis level	 High Show graph Show GHG ec Show notes Options 	guivalence Pelp	eLearning Help		
RETScreen - Emission Analysis				Subscriber: C	anmetEnergy - Varennes - Employee Use Only
Base case electricity system (Baseline) Country - region	Fuel type	GHG emission factor (excl. T&D) tCO₂/MWh ▼	T&D losses %	GHG emission factor tCO2/MWh	
Canada - Ontario	All types 🔻	0.027	7.0%	0.029	
GHG emissions	*60	107			
Base case	tCO ₂	197			
Proposed case	tCO ₂	<u> </u>	96.8%		
200 - 150 - 0 - Base case		I Proposed case		100	
Legend Gross annual GHG emission reduction ((96.8%)			191	tCO2 is equivalent to 35 Cars & light trucks not used

To start using the software, we recommend you watch some of our tutorials. You will find the links here below:

Overview of RETScreen Expert Platform

https://www.youtube.com/watch?v=kcu2iSYJu0A

Introduction to Energy Efficiency Project Feasibility Analysis with RETScreen Expert

https://www.youtube.com/playlist?list=PLoj8AlvsTZVGNVyD4uLAUOIG6f0NdvR-M

Step-by-Step Energy Audits & Individual Energy Efficiency Measures with RETScreen Expert

https://www.youtube.com/playlist?list=PLoj8AlvsTZVEDq1utl6HI8h-sWfnhSLdg

Step-by-Step Solar Thermal Project Feasibility Analysis with RETScreen Expert:

https://www.youtube.com/playlist?list=PLoj8AlvsTZVHxd3ou1UpD7FRLFtWgY3ky

Step-by-Step Photovoltaic Power Project Feasibility Analysis with RETScreen Expert

https://www.youtube.com/playlist?list=PLoj8AlvsTZVErnRhJsOzkSd6UrLVLn0NL

Step-by-Step Wind Power Project Feasibility Analysis with RETScreen Expert

https://www.youtube.com/playlist?list=PLoj8AlvsTZVFrhTYoyQVRgEaPNHTI_4Vj

APPENDIX B — CASE STUDIES

Within the software, you can find several examples to explore. These can be accessed in the *File* worksheet under the Home section.



To access examples, select "Case studies/Templates" and find pre-loaded projects in the software. Click on the hyperlink (blue text) in the left column to open the help manual for each specific example and learn more about it.

RETScreen Expert												
File Location Faci	lity Energy Co	ost Emissio	n Finance	Risk Report	Custom							
Ressources naturelles Canada	s Natural Resources Canada											
Expert Clean Energy Management Software - Version 9.1												
🧖 Home	Open - Options											
Open	Virtual energy	My files	My por	rtfolio My temp	lates Case studi	es/						
Close	analyzer				Template	3						
Settings	Analysis type											
🚺 Help		Search	Tomolotoo									
Subscribe	P	Assignment	Analysis type I	Facility type	Type	Description	Country	City				
100	Feasibility	Case Study	Feasibility	Individual measure	Electrical equipme	Lights/Water heater	South Africa	Alberton				
Save		Case Study	Feasibility	Individual measure	Solar air heater	Industrial	Korea, Rep. of (South)	SEONGBUKGU				
Sava Ar	hai	Case Study	Feasibility	Individual measure	Solar air heater	Institutional - Federal research centre	Canada	Varennes				
Dave As	Performance	Case Study	Feasibility	Individual measure	Solar air heater	Institutional - Sewage treatment plant	Canada	Cold Lake				
		Case Study	Feasibility	Individual measure	Solar air heater	Agricultural - Piggery	Canada	South Durham				
U Exit		Case Study	Feasibility	Individual measure	Solar air heater	Commercial - Warehouse	United States of America	Littleton				
		Case Study	Feasibility	Individual measure	Solar water heater	Apartment building	Canada	Longueuil				
	All	Case Study	Feasibility	Individual measure	Solar water heater	Apartment building	France	Bourg-lès-Valence				
		Case Study	Feasibility	Individual measure	Solar water heater	Aquaculture	Canada	Comox Valley				
		Case Study	Feasibility	Individual measure	Solar water heater	Capital cost incentive - Policy	United States of America	Concord				
		Case Study	Feasibility	Individual measure	Solar water heater	Hotel/Motel	Canada	Saint-Côme				
		Case Study	Feasibility	Individual measure	Solar water heater	Hotel/Motel	India	Chennai				
		Case Study	Feasibility	Individual measure	Solar water heater	House	Canada	North Vancouver				
		Case Study	Feasibility	Individual measure	Solar water heater	Swimming pool - Indoor - Alberta	Canada	Okotoks				
		Case Study	Feasibility	Individual measure	Solar water heater	Swimming pool - Indoor - British Columbia	Canada	Lillooet				
		Case Study	Feasibility	Individual measure	Solar water heater	Swimming pool - Indoor - Ontario	Canada	Kitchener				
		Case Study	Feasibility	Individual measure	Solar water heater	Swimming pool - Indoor - Quebec	Canada	Montreal				
		Case Study	Feasibility	Individual measure	Ventilation	Library	Canada	Montreal				
		Case Study	Feasibility	Individual measure	Solar air heater	Industrial	Canada	Dorval				