

# Using RETScreen Expert for Natural Gas Heating to Electric ASHP Conversion Analysis – A Toolkit

Overview & Guidance

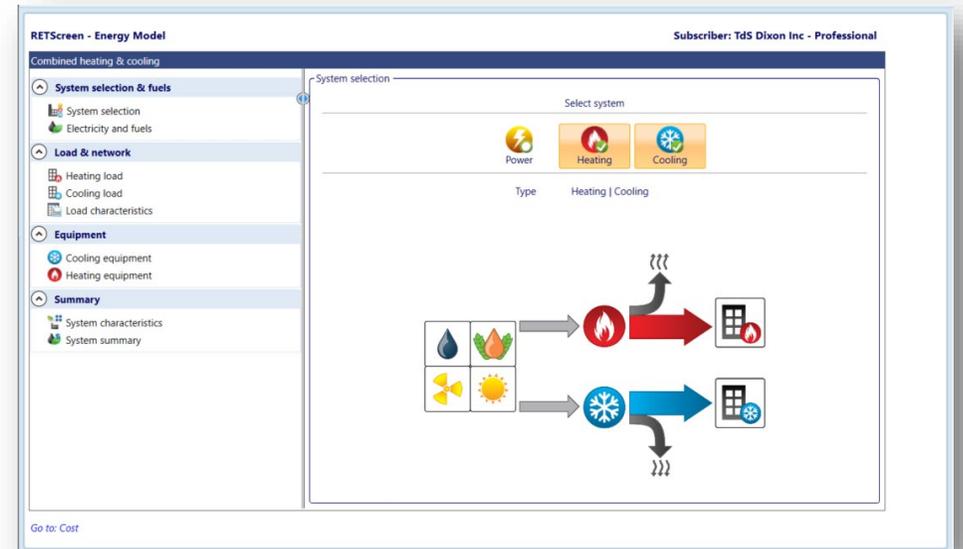
# Toolkit Approach

- This toolkit is built upon the feasibility models of the RETScreen Expert analysis software and thereby relies upon the user to possessing RETScreen navigation and feasibility modelling skills.
- Guidance is provided for two situations:
  1. Whole facility where historical data is available for electricity and natural gas with a heating/cooling consumption breakdown by end-use and an estimate of efficiency improvement measures.
  2. For a partial facility or whole facility where historical data is available for electricity and natural gas but there is no breakdown by end-use for heating/cooling or efficiency measures. In this case we present a building (energy) model to represent a base case buildings fuel consumption, a breakdown by end use and efficiency measures to represent a proposed case.
- For both cases, a heating/cooling (load) model to analyze the conversion of the building with efficiency measures heated with gas to a building heated with an ASHP.
  - Building archetypes, from the Virtual Energy Analyzer, for three building types, are used to represent an existing building and as a source of data to populate and calibrate a Power/Heating/Cooling model.
- The Power/Heating/Cooling model is then used to size a heat pump systems and determine energy cost and carbon reductions thereby facilitating an informed decision to convert to air source heat pumps (ASHPs).

# What's in the Toolkit?

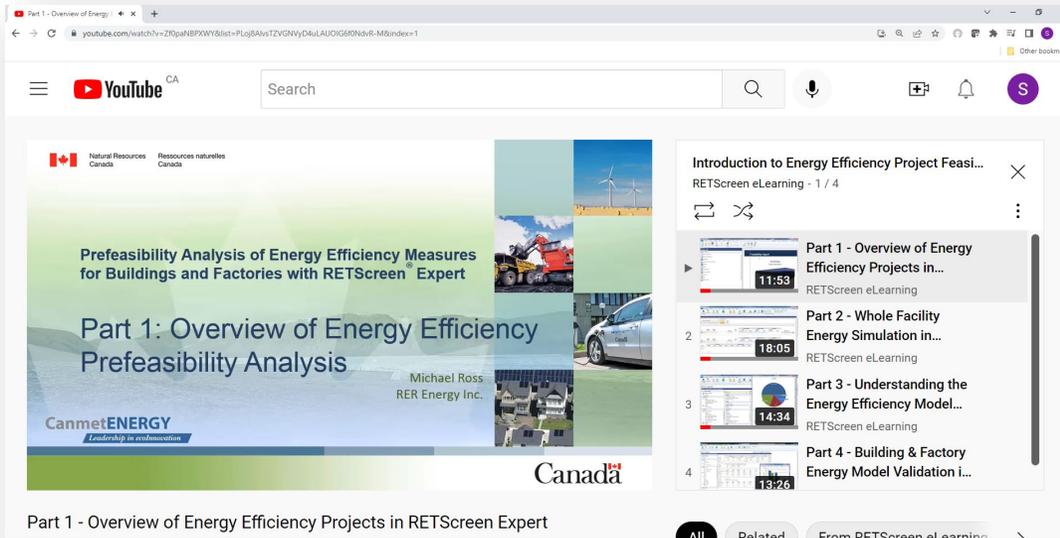
- RETScreen Expert whole building model templates using building archtypes from the RETScreen Expert Virtual Energy Analyzer:
  - Small Office (600m<sup>2</sup>) (*.retx file name required*)
  - Laboratory (2250m<sup>2</sup>) (*.retx file name required*)
  - Fire Station (600 m<sup>2</sup>) (*.retx file name required*)
- RETScreen Expert Heating/Cooling model templates – created based upon the archetypical buildings with conversion from natural gas to ASHPs:
  - Small Office (600m<sup>2</sup>) (*.retx file name required*)
  - Laboratory (2250m<sup>2</sup>) (*.retx file name required*)
  - Fire Station (600 m<sup>2</sup>) (*.retx file name required*)
- Overview & Guidance (this document)
- Toolkit Checklist
- RETScreen Expert Help
  - [https://www.youtube.com/channel/UCyFMjG\\_OXXGtRVnsiTim0IQ](https://www.youtube.com/channel/UCyFMjG_OXXGtRVnsiTim0IQ)

Component	Heating kWh	Cooling kWh	Electricity kWh	Incremental initial costs \$	Fuel cost savings \$	Incremental O&M savings \$	Simple payback yr	Include measure?
<b>Heating</b>								
Space heating				0	8,285	0	Immediate	<input checked="" type="checkbox"/>
Water heater				0	0	0		<input checked="" type="checkbox"/>
<b>Cooling</b>								
Air conditioning				0	445	0	Immediate	<input checked="" type="checkbox"/>
<b>Building envelope</b>								
Building envelope	62,651	65,509		100	373	0	0.3	<input checked="" type="checkbox"/>
<b>Ventilation</b>								
Zone - 1 - Office	22,748	3,459		14,032	446	0	31.5	<input checked="" type="checkbox"/>
Zone - 2 - Office	31,736	4,826		17,350	622	0	27.9	<input checked="" type="checkbox"/>
Zone - 3 - Office	18,255	2,776		11,700	358	0	32.7	<input checked="" type="checkbox"/>
Zone - 4 - Office	27,242	4,143		15,848	534	0	29.7	<input checked="" type="checkbox"/>
Zone - 5, 6, 7 - Laboratory	1,061,595	161,434		112,500	26,525	0	4.2	<input checked="" type="checkbox"/>
<b>Lights</b>								
Office   Meeting room			13,403	3,360	670	0	5.0	<input checked="" type="checkbox"/>
Laboratory			31,202	6,400	1,844	325	3.0	<input checked="" type="checkbox"/>
Laboratory   Task lighting			2,127	1,200	106	0	11.3	<input checked="" type="checkbox"/>
Lobby   Cafeteria   Corridor			6,028	1,360	301	63	3.7	<input checked="" type="checkbox"/>
Sign - Exit			4,906	1,375	420	193	2.2	<input checked="" type="checkbox"/>
Exterior - Facade   Parking			14,104	4,244	963	42	4.2	<input checked="" type="checkbox"/>
Exterior - Sign			473	156	15.8	31	3.3	<input checked="" type="checkbox"/>
<b>Electrical equipment</b>								
Office			23,709	0	254	0	Immediate	<input checked="" type="checkbox"/>
Laboratory			34,493	0	0	0		<input checked="" type="checkbox"/>
Cafeteria			11,222	2,100	702	75	2.7	<input checked="" type="checkbox"/>
Standby losses			17,520	1,000	876	0	1.1	<input checked="" type="checkbox"/>
<b>Hot water</b>								
Hot water	9,935			2,100	112	1,092	1.7	<input checked="" type="checkbox"/>
Laboratory	9,935			0	0	0		<input checked="" type="checkbox"/>



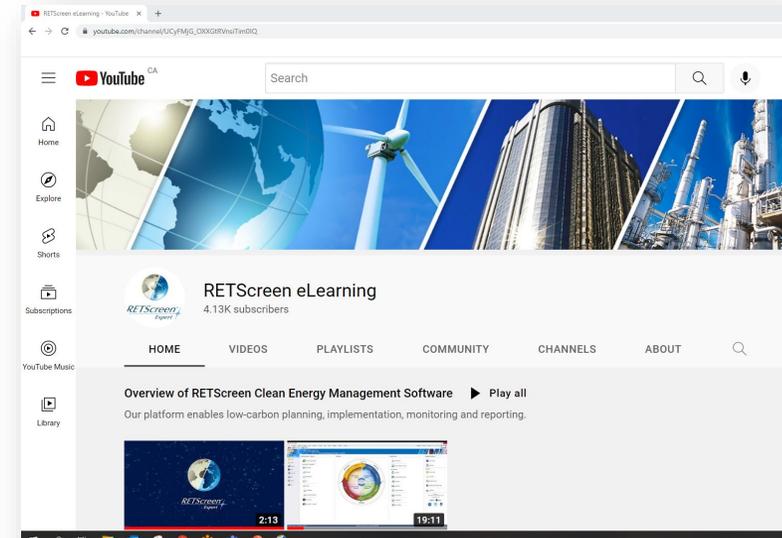
# HELP with RETScreen Use and Navigation

## Creating RETScreen Expert Whole Building Modelling



<https://www.youtube.com/watch?v=Zf0paNBPXWY&list=PLoj8AlvsTZVGNVyD4uLAUOIG6f0Ndvr-M>

## RETScreen Expert eLearning Channel



[https://www.youtube.com/channel/UCyFMjG\\_OXXGtRVnsiTim0IQ](https://www.youtube.com/channel/UCyFMjG_OXXGtRVnsiTim0IQ)

# Two Paths

## 1. Whole Facility (with historical gas & electricity data)

Basic Site Data  
(an energy audit could be source)

RETScreen Export Heat/Cool/Power Model

Carbon & Financial Case

Historical Data  
Floor Area  
Heat/Cool Load (W/m<sup>2</sup>)  
Heat/Cool Efficiency

Single building - space heating

**Base case heating system**

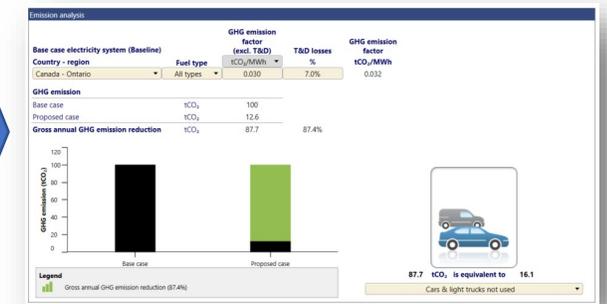
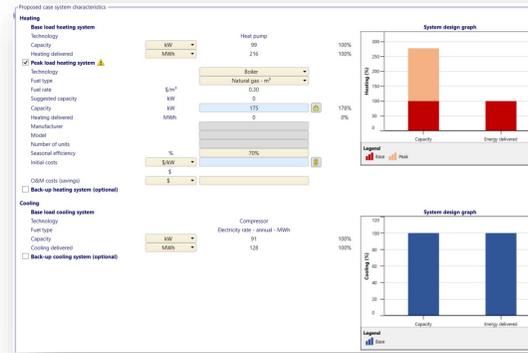
Heated floor area for building	m <sup>2</sup>	4,500
Fuel type	Natural gas - m <sup>3</sup>	70%
Seasonal efficiency	%	

**Heating load calculation**

Heating load for building	W/m <sup>2</sup>	39
Domestic hot water heating base demand	%	4%
Total heating	kWh	385,220
Total peak heating load	kW	176
Fuel consumption - annual	m <sup>3</sup>	51,781
Fuel rate	\$/m <sup>3</sup>	0.30
Fuel cost	\$	15,534

**Proposed case energy efficiency measures**

End-use energy efficiency measures	%	43.9%
End-use energy efficiency measures cost	\$	
Net peak heating load	kW	98.5
Net heating	kWh	216,109



## 2. Partial Facility (or whole facility with no historical data)

RETScreen (Whole/Partial) Building Model

RETScreen Export Heat/Cool/Power Model

Carbon & Financial Case

Commercial/Institutional - Office - Medium - Office building

Category	Energy - base case	Heating	Cooling	Electricity	Incremental initial costs	Fuel cost savings	Incremental O&M savings	Simple payback	Include measure?
	kWh	MWh	MWh	MWh	\$	\$	\$	yr	
<b>Heating</b>									
Space heating									
Domestic hot water									
<b>Cooling</b>									
Air conditioning									
<b>Heat loss</b>									
Office - Air Sealing	115,663	104,654							
<b>Weatherization</b>									
Office 25% DCV & 30% Heat Recovery	107,759	41,209							
Office - Air Sealing	34,522	11,422							
Weatherstrips 25% DCV	2,216	139							
<b>Lights</b>									
Office	10,910								
California	1,549								
Sign - Exit	964								
California 25% DCV	4,205								
Emergency - Parking	2,343								
Emergency - Facade	901								
Emergency - Doors	901								
<b>Electrical equipment</b>									
Office	18,633								
Server room	11,140								
<b>Hot water</b>									
Hot water	24,663								
<b>Pumps</b>									
Heating/Cooling - Circulating pump		25,448							
Domestic hot water - Circulating pump		2,656							
<b>Ramp</b>									
Office	68,283								
California	6,059								
Weatherstrips	1,548								
<b>Motors</b>									
Electrician	1,516								
<b>Total</b>	<b>385,143</b>	<b>119,995</b>	<b>291,581</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	

Single building - space heating

**Base case heating system**

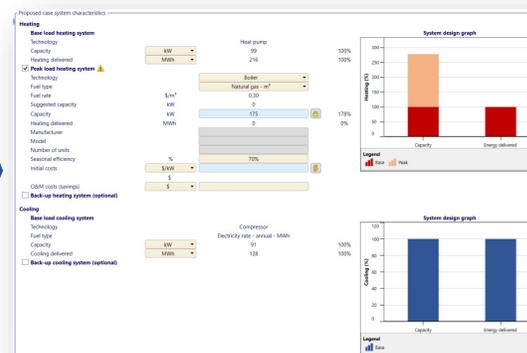
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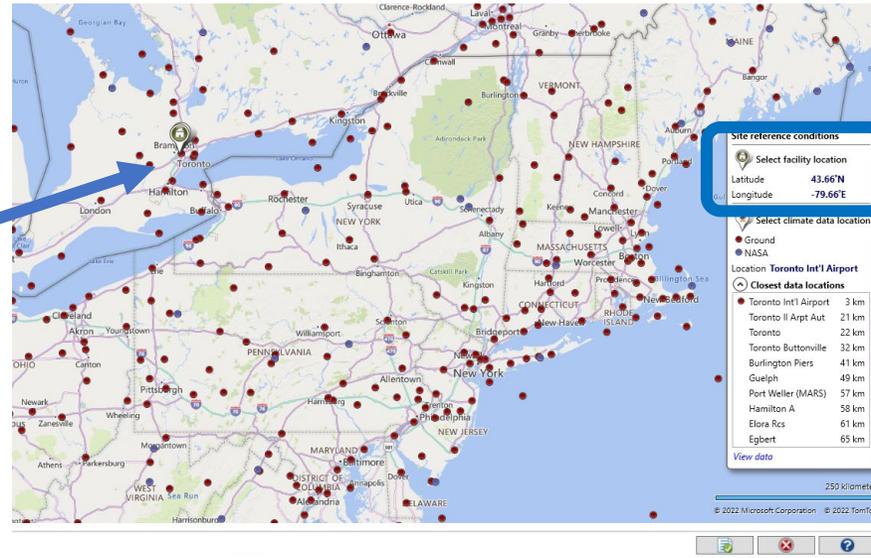
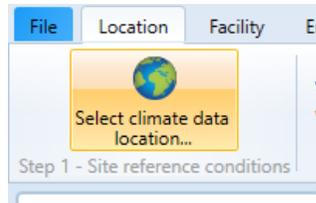


# Method 1: Whole Facility

From historical data possibly supported by an energy audit providing an end-use breakdown and efficiency measures.

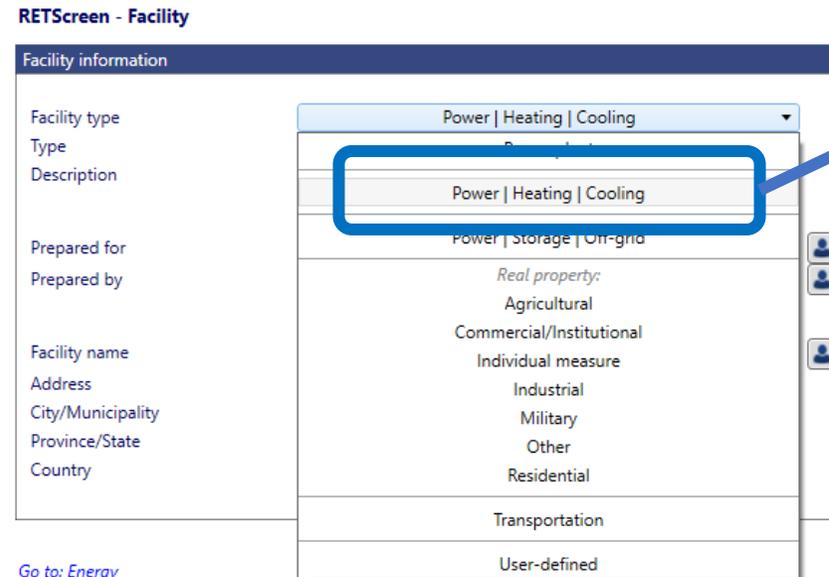
# Getting into RETScreen Power/Heating Cooling Model and Setting Location

- Open Retscreen Expert and Navigate to the Location tab across the top bar
- Default location for template files are in Toronto, if a different location is required click 'select climate data location...' button and select building location



Next step

- Note: if location is energy rates and fuels select may need to be changed to match building location
- To setup Retscreen's power/heating/cooling model, navigate to the Facility page and under 'facility type' select 'Power/ Heating/ Cooling' and proceed to Energy tab to begin analysis



# Calibrate Power Model

- Select Heating and Cooling for 'system selection' (not power) and set fuel rates
- Navigate to 'Load & network' section and proceed to populate building data



- Populate the base case system with correct floor area and equipment efficiency (green box)
- Calibrate the heating and cooling models to the heating and cooling values calculated from historical data – for example from an existing energy audit. (use help section for guidance based on design temperature on location tab)
- Determine % hot water usage for heating and non weather cooling load % based historical consumption and demand data. (see excel template)
- Populate 'end-use energy efficiency measures' based on projects in the building if necessary

Single building - space cooling

**Base case cooling system**

Cooled floor area for building  m<sup>2</sup>

Fuel type  Electricity rate - annual

**Adjust W/m<sup>2</sup> to calibrate**

Cooling load for building  W/m<sup>2</sup>

Non-weather dependent cooling  W/m<sup>2</sup>

Total cooling  kWh

Total peak cooling load  kW

Fuel consumption - annual  MWh

Fuel rate  \$/kWh

Fuel cost  \$

**Proposed case energy efficiency measures**

End-use energy efficiency measures

End-use energy efficiency measures cost

Net peak cooling load  kW

Net cooling  kWh

Single building - space heating

**Base case heating system**

Heated floor area for building  m<sup>2</sup>

Fuel type  Natural gas - m<sup>3</sup>

Seasonal efficiency  70%

**Adjust W/m<sup>2</sup> to calibrate**

**Heating load calculation**

Heating load for building  W/m<sup>2</sup>

Domestic hot water heating base demand  %

Total heating  MWh

Total peak heating load  kW

Fuel consumption - annual  m<sup>3</sup>

Fuel rate  \$/m<sup>3</sup>

Fuel cost  \$

**Proposed case energy efficiency measures**

End-use energy efficiency measures  45%

End-use energy efficiency measures cost

Net peak heating load  kW

Net heating  MWh

Next step

# Calibration continued...

Proposed case load characteristics

Month	Cooling system load kW	Heating net average load kW	Heat for cooling kW	Heating system load kW
January	0.07	8.6	0	8.6
February	0.07	7.2	0	7.2
March	0.07	5.2	0	5.2
April	0.07	3	0	3
May	1.5	1.3	0	1.3
June	3.7	0.09	0	0.09
July	4.9	0.09	0	0.09
August	4.5	0.09	0	0.09
September	2.7	0.54	0	0.54
October	0.07	2.3	0	2.3
November	0.07	3.9	0	3.9
December	0.07	6.2	0	6.2
Peak load - annual	8.1	13.9	0	13.9

**Proposed case load and energy**

System peak load	kW	<b>Heating</b> 13.9	<b>Cooling</b> 8.1
System energy	MWh	29.5	14

- Once Base case system have been defined and efficiency measures accounted for, jump to 'Load characteristics'
- On this page you will see the 'Proposed Case load characteristics' that are used to determine the proposed case systems
- Record these numbers for further inputs

# Use Proposed Heat/Cool Loads to Model 100% Heat Pump System

- ‘Size’ the proposed case system appropriately based on previously calculated capacities for both heating and cooling
- Use the RETScreen Database to find a system, but be careful heating and cooling system are not linked
- In Demo models, capacity in proposed case matches calculated values simply for demo purposes, exact sizing will be based on systems available to meet the building needs
- Costing For new systems will need to be calculated by user

Proposed case cooling system

<b>Base load cooling system</b>	
Technology	Compressor
Fuel type	Natural gas - m <sup>3</sup>
Fuel rate	0.20
Capacity	kW 8.1 100%
Manufacturer	
Model	
Number of units	
Coefficient of performance - seasonal	kW/kW 3.2 100%
Cooling delivered	kWh 13,966
Initial costs	\$/kW
O&M costs (savings)	\$
<input type="checkbox"/> Peak load cooling system	

Fuel selection

Fuel type	Electricity rate - annual
Fuel rate	\$/MWh 100
<b>Heat pump</b>	
Capacity	kW 13.9 100%
Manufacturer	
Model	
Number of units	
Seasonal efficiency	% 200% 100%
Heating delivered	kWh 29,451
Fuel required	GJ/h 0.03
Initial costs	\$
O&M costs (savings)	\$/kW-year

**Proposed case electric load (demand) for heat pump system at proposed COP!**

# Peak Load System & Fraction (%) of Heat Delivered

Proposed case system characteristics

**Heating**

**Base load heating system**

Technology: Heat pump  
 Capacity: 14 kW  
 Heating delivered: 20.5 MWh

**Peak load heating system**

Technology: Furnace  
 Fuel type: Natural gas - m<sup>3</sup>  
 Fuel rate: 0.30 \$/m<sup>3</sup>  
 Suggested capacity: 0 kW  
 Capacity: 0 kW  
 Heating delivered: 0 MWh  
 Manufacturer: [blank]  
 Model: [blank]  
 Number of units: [blank]  
 Seasonal efficiency: 70%  
 Initial costs: [blank] \$/kW  
 O&M costs (savings): [blank] \$

**Back-up heating system (optional)**

**Cooling**

**Base load cooling system**

Technology: Compressor  
 Fuel type: Natural gas - m<sup>3</sup>  
 Capacity: 8 kW  
 Cooling delivered: 14 MWh

**Back-up cooling system (optional)**

**System design graph (Heating)**

Category	Base (%)	Peak (%)
Capacity	100	100
Energy delivered	100	100

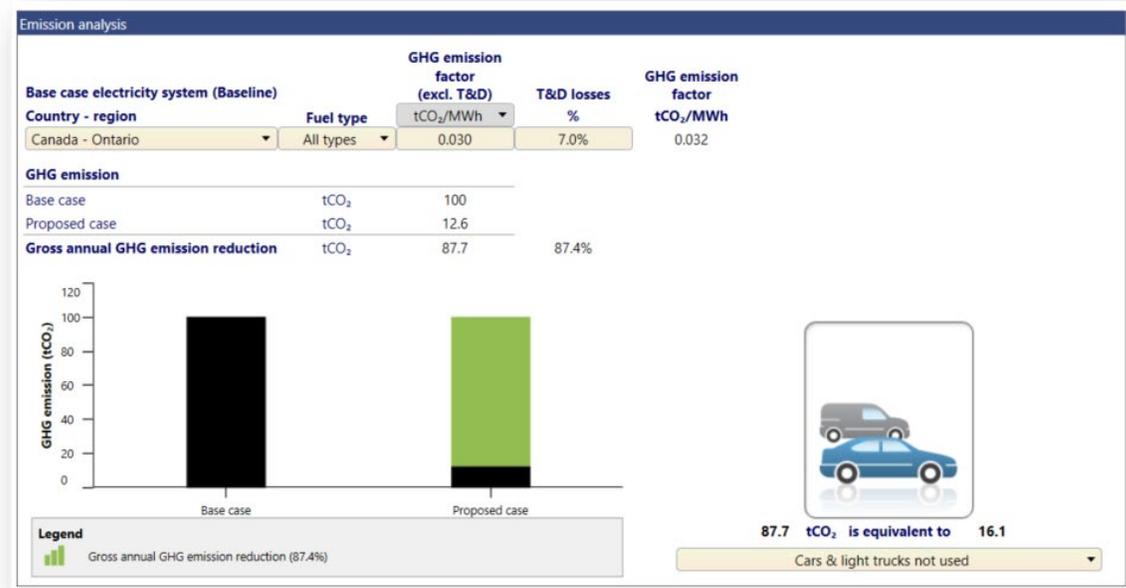
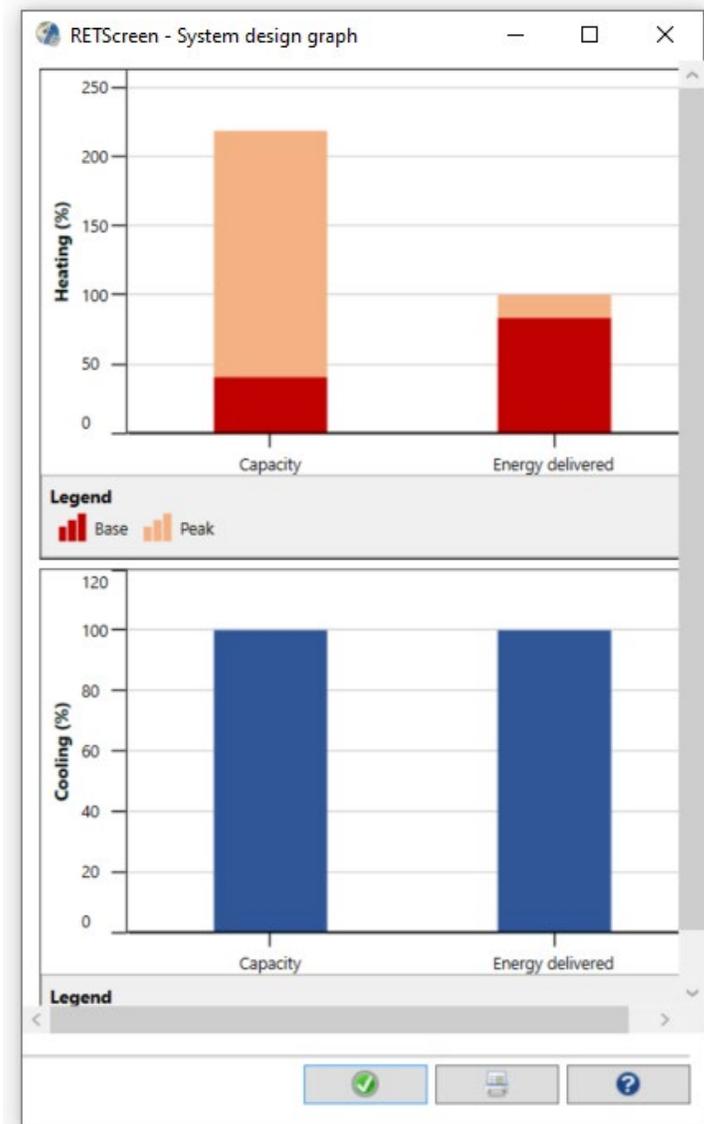
**System design graph (Cooling)**

Category	Base (%)
Capacity	100
Energy delivered	100

Leave Base case heating system (gas) as peak load system unless otherwise stated.

- ‘Size’ the proposed case system appropriately based on previously calculated capacities for both heating and cooling
- Use the RETScreen Database to find a system, but be careful heating and cooling system are not linked
- In Demo models, capacity in proposed case matches calculated values simply for demo purposes, exact sizing will be based on systems available to meet the building needs

# Fraction (%) of Heat Delivered versus Carbon Reduction



- In some cases the energy delivered may not meet the needs of the building, therefore a gas backup system may be required for peak load heating, rather than installing a larger system...
- We can see carbon reduction is still likely to be very high vs the cost of putting the larger peaking system, which could be costly

# Method 2: Partial Facility or No Historical Data/End-Use Breakdown

Using RETScreen Expert Building Model Data

# Use Energy Model: Heating, Cooling & Electricity & Interactions

Commercial/Institutional - Office - Small - Office building

Fuels & schedules: Electricity and fuels, Schedules  
 Equipment: Heating (Space heating, Domestic hot water), Cooling (Air conditioning), End-use (Building envelope, Ventilation, Lights), Optimize supply (Heating, Power), Summary (Include measure?, Comparison)

Category	Sub-category	Heating kWh	Cooling kWh	Electricity kWh	Incremental initial costs \$	Fuel cost savings \$	Incremental O&M savings \$	Simple payback yr	Include measure?
<b>Heating</b>									
	Space heating				0	0	0		<input checked="" type="checkbox"/>
	Domestic hot water				0	0	0		<input checked="" type="checkbox"/>
<b>Cooling</b>									
	Air conditioning				0	0	0		<input checked="" type="checkbox"/>
<b>Building envelope</b>									
	Office	23,187	18,172		3,850	486	0	7.9	<input checked="" type="checkbox"/>
<b>Ventilation</b>									
	Office	26,796	9,133		14,400	904	0	15.9	<input checked="" type="checkbox"/>
	Washroom	1,117	381		600	1.9	0	313.7	<input checked="" type="checkbox"/>
<b>Lights</b>									
	Office			11,615	7,575	584	90.7	11.2	<input checked="" type="checkbox"/>
	Cafeteria			619	429	34.9	6.4	10.4	<input checked="" type="checkbox"/>
	Sign - Exit			193	46	14	28	1.1	<input checked="" type="checkbox"/>
	Exterior - Parking			1,402	850	102	-5	8.8	<input checked="" type="checkbox"/>
	Exterior - Facade			2,575	1,910	135	85	8.7	<input checked="" type="checkbox"/>
	Exterior - Doors			1,104	820	57.8	35	8.8	<input checked="" type="checkbox"/>
<b>Electrical equipment</b>									
	Office			12,148	1,520	545	25	2.7	<input checked="" type="checkbox"/>
	Server room			2,628	0	0	0		<input checked="" type="checkbox"/>
<b>Hot water</b>									
	Hot water	2,782			1,890	21	60	23.3	<input checked="" type="checkbox"/>
<b>Fans</b>									
	Office			10,367	200	203	0	1.0	<input checked="" type="checkbox"/>
	Washroom			516	0	0	0		<input checked="" type="checkbox"/>
<b>Heating</b>									
	Solar water heater	0			0	0	0		<input type="checkbox"/>
<b>Power</b>									
	Photovoltaic - 24 kW				0	0	0		<input type="checkbox"/>
<b>Total</b>		<b>53,882</b>	<b>27,686</b>	<b>43,167</b>	<b>34,090</b>	<b>3,088</b>	<b>325</b>	<b>10.0</b>	

- Start with RETScreen ArcheType Building (virtual Energy Analyzer) similar to your building supplied with tool
- OR Build an Energy Model of your building based on current building characteristics
- Use data From include measure screen to determine Heating and cooling consumption
- Ensure you are viewing 'Energy – base case'

# Use Energy Model: Determine Efficiency reduction %

- In "Comparison" section determine Fuel saved %

Summary - Electricity and fuels								
Fuel type	Fuel type		Base case		Proposed case		Savings	
	Fuel rate	Fuel consumption - unit	Fuel consumption	Fuel cost	Fuel consumption	Fuel cost	Fuel saved	Savings
Natural gas	\$ 0.30	m <sup>3</sup>	7,196	\$ 2,159	3,918	\$ 1,175	3,278	\$ 983
Electricity	\$ 0.10	kWh	51,819	\$ 5,182	30,770	\$ 3,077	21,049	\$ 2,105
<b>Total</b>				<b>\$ 7,341</b>		<b>\$ 4,252</b>		<b>\$ 3,088</b>

Project verification				
Fuel type	Fuel consumption - unit	Fuel consumption - historical	Fuel consumption - Base case	Fuel consumption - variance
Natural gas	m <sup>3</sup>		7,196	
Electricity	kWh		51,819	

Savings						
Fuel consumption	Heating kWh	Cooling kWh	Electricity kWh	Total kWh	Plan kWh	Variance %
Base case	76,477	8,652	43,167	128,296	142,017	-9.7%
Proposed case	41,639	4,357	26,413	72,409	80,407	-9.9%
Fuel saved	34,838	4,295	16,754	55,887	61,610	-9.3%
Fuel saved - %	45.6%	49.6%	38.8%	43.6%	43.4%	



# Calibration continued...

Proposed case load characteristics

Month	Cooling system load kW	Heating net average load kW	Heat for cooling kW	Heating system load kW
January	0.07	8.6	0	8.6
February	0.07	7.2	0	7.2
March	0.07	5.2	0	5.2
April	0.07	3	0	3
May	1.5	1.3	0	1.3
June	3.7	0.09	0	0.09
July	4.9	0.09	0	0.09
August	4.5	0.09	0	0.09
September	2.7	0.54	0	0.54
October	0.07	2.3	0	2.3
November	0.07	3.9	0	3.9
December	0.07	6.2	0	6.2
Peak load - annual	8.1	13.9	0	13.9

**Proposed case load and energy**

System peak load	<input type="text" value="kW"/>	<b>Heating</b> 13.9	<b>Cooling</b> 8.1
System energy	<input type="text" value="MWh"/>	29.5	14

- Once Base case system have been defined and efficiency measures accounted for, jump to 'Load characteristics'
- On this page you will see the 'Proposed Case load characteristics' that are used to determine the proposed case systems
- Record these numbers for further inputs

# Use Proposed Heat/Cool Loads to Model 100% Heat Pump System

- ‘Size’ the proposed case system appropriately based on previously calculated capacities for both heating and cooling
- Use the RETScreen Database to find a system, but be careful heating and cooling system are not linked
- In Demo models, capacity in proposed case matches calculated values simply for demo purposes, exact sizing will be based on systems available to meet the building needs

Proposed case cooling system

<b>Base load cooling system</b>			
Technology	Compressor		
Fuel type	Natural gas - m <sup>3</sup>		
Fuel rate	0.20		
Capacity	kW	8.1	100%
Manufacturer			
Model			
Number of units			
Coefficient of performance - seasonal	kW/kW	3.2	
Cooling delivered	kWh	13,966	100%
Initial costs	\$/kW		
	\$		
O&M costs (savings)	\$		
<input type="checkbox"/> Peak load cooling system			

Fuel selection

Fuel type	Electricity rate - annual		
Fuel rate	\$/MWh	100	
<b>Heat pump</b>			
Capacity	kW	13.9	100%
Manufacturer			
Model			
Number of units			
Seasonal efficiency	%	200%	
Heating delivered	kWh	29,451	100%
Fuel required	GJ/h	0.03	
Initial costs	\$		
O&M costs (savings)	\$/kW-year		
	\$		

**Proposed case electric load (demand) for heat pump system at proposed COP!**

# Peak Load System & Fraction (%) of Heat Delivered

Proposed case system characteristics

**Heating**

Base load heating system

Technology: Heat pump  
Capacity: 14 kW  
Heating delivered: 20.5 MWh

Peak load heating system ⚠

Technology: Furnace  
Fuel type: Natural gas - m<sup>3</sup>  
Fuel rate: 0.30 \$/m<sup>3</sup>  
Suggested capacity: 0 kW  
Capacity: 0 kW  
Heating delivered: 0 MWh  
Manufacturer: [blank]  
Model: [blank]  
Number of units: [blank]  
Seasonal efficiency: 70%  
Initial costs: [blank] \$/kW  
O&M costs (savings): [blank] \$

Back-up heating system (optional)

**Cooling**

Base load cooling system

Technology: Compressor  
Fuel type: Natural gas - m<sup>3</sup>  
Capacity: 8 kW  
Cooling delivered: 14 MWh

Back-up cooling system (optional)

**System design graph (Heating)**

Category	Base (%)	Peak (%)
Capacity	100	100
Energy delivered	100	100

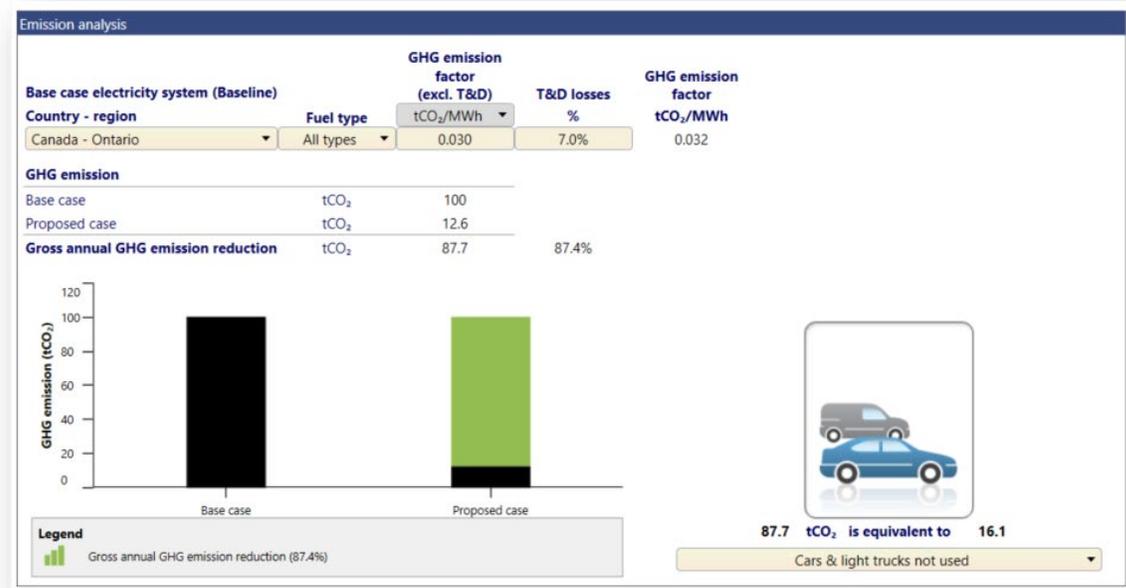
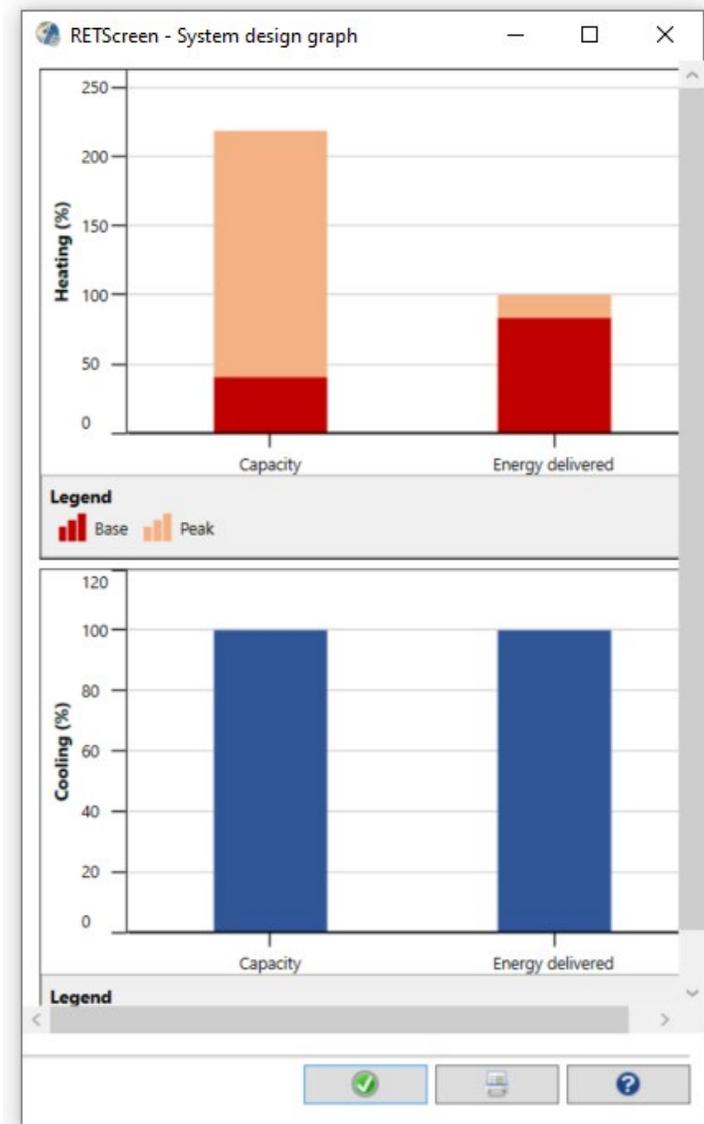
**System design graph (Cooling)**

Category	Base (%)
Capacity	100
Energy delivered	100

**Leave Base case heating system (gas) as peak load system unless otherwise stated.**

- ‘Size’ the proposed case system appropriately based on previously calculated capacities for both heating and cooling
- Use the RETScreen Database to find a system, but be careful heating and cooling system are not linked
- In Demo models, capacity in proposed case matches calculated values simply for demo purposes, exact sizing will be based on systems available to meet the building needs

# Fraction (%) of Heat Delivered versus Carbon Reduction



- In some cases the energy delivered may not meet the needs of the building, therefore a gas backup system may be required for peak load heating, rather than installing a larger system...
- We can see carbon reduction is still likely to be very high vs the cost of putting the larger peaking system, which could be costly

# Reference for the Heating Cooling Load Model

- Click HELP and select Engineering e-Textbook
- Select Combined Heat & Power...  
...chapter
- Model is detailed in Section 2.1 (heating) & 2.2 (cooling)

The image displays three overlapping screenshots of the RETScreen Expert software interface, illustrating the steps to access the Heating Cooling Load Model. The top screenshot shows the 'Help' menu highlighted in the left sidebar, with the 'Engineering e-Textbook' option selected. The middle screenshot shows the 'Engineering e-textbook' page with the 'Combined Heat & Power (Cogeneration or Power | Heating | Cooling) - e-Textbook chapter' link highlighted. The bottom screenshot shows the 'RETScreen - Combined Heat & Power (Cogeneration or Power | Heating | Cooling) - e-Textbook chapter' page with the '2.1 Heating Project Load and Energy Calculation' section highlighted, and its sub-sections listed below.

RETScreen Expert - FH No 10.ret

File Location Facility Energy Cost Emission Finance Risk Data Analytics Report Custom

Resources naturelles Canada Natural Resources Canada

RETScreen Expert Clean Energy Management Software - Version 8.1

About RETScreen

RETScreen Expert, an advanced premium version of the software, is available in Viewer mode completely free-of-charge.

RETScreen Update  
Click to check for updates now.

Version: 8.1.2.77 b58953  
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Unique ID: 30-23-67-37-52  
Subscriber: T  
Expiration: O

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To continue offering tools free-of-charge, RETScreen International needs to keep its download, online registration and for software installation problems. For most other

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Combined Heat & Power (Cogeneration or Power | Heating | Cooling) - e-Textbook chapter

Note that the RETScreen Engineering e-textbook, including the Combined Heat & Power (Cogeneration or Power | Heating | Cooling) - e-Textbook chapter, was prepared for RETScreen Version 3. However, the basic underlying

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2.1 Heating Project Load and Energy Calculation

2.1.1 Site climatic conditions

2.1.2 Equivalent degree-days for hot water heating

2.1.3 Calculation of peak heating load

2.1.4 Heating load duration curve

2.1.5 Monthly average load and peak load period

2.1.6 Process heat

2.1.7 Equivalent full load hours

2.1.8 Energy efficiency measures

# Efficient Electrification RETScreen Expert Checklist

<b>General:</b>	
<ul style="list-style-type: none"><li>○ Location</li><li>○ Facility Size</li></ul>	
<b>Feasibility Model:</b>	<b>Heating and Cooling Model:</b>
<ul style="list-style-type: none"><li>○ Fuel Price<ul style="list-style-type: none"><li>○ Electricity</li><li>○ Gas</li><li>○ Other</li></ul></li><li>○ Equipment Base case efficiency<ul style="list-style-type: none"><li>○ Heating</li><li>○ Cooling</li></ul></li><li>○ Include measure -Energy – base case<ul style="list-style-type: none"><li>○ Heating energy</li><li>○ Cooling Energy</li><li>○ Hot water Energy</li></ul></li><li>○ Comparison<ul style="list-style-type: none"><li>○ Heating Fuel Saved</li><li>○ Cooling Fuel Saved</li></ul></li></ul>	<ul style="list-style-type: none"><li>○ System Selection</li><li>○ Fuel Price<ul style="list-style-type: none"><li>○ Electricity</li><li>○ Gas</li><li>○ Other</li></ul></li><li>○ Equipment Base case efficiency<ul style="list-style-type: none"><li>○ Heating</li><li>○ Cooling</li></ul></li><li>○ Equipment Proposed case efficiency<ul style="list-style-type: none"><li>○ Heating</li><li>○ Cooling</li></ul></li><li>○ Heating Load (W/m<sup>2</sup>)</li><li>○ Cooling Load (W/m<sup>2</sup>)</li><li>○ Domestic Hot Water percentage</li><li>○ Heating Fuel Saved</li><li>○ Cooling Fuel Saved</li><li>○ Proposed Case Heating Capacity</li><li>○ Proposed Case Cooling Capacity</li><li>○ Equipment Proposed case efficiency<ul style="list-style-type: none"><li>○ Heating</li><li>○ Cooling</li></ul></li><li>○ Peak Load System</li><li>○ Costing</li></ul>