

your community your energy your plan

# Community Energy Profile Report





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# Introduction and Acknowledgements

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Our community

Our community produced this energy profile to understand how we use energy right now. We need to understand this to begin to make a plan for a better, cleaner energy future.

Our Community Energy Profile includes:

- A poster that shows a summary of the Energy Profile
- This report that explains some details of the poster

We thank the following people who helped create the Energy Profile:

- 
- 
- 
- 

To find out more about our community's energy planning process, please contact:

**ENERGY HELP**

For your home. For your business. For your community.

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T 867 920 3333  
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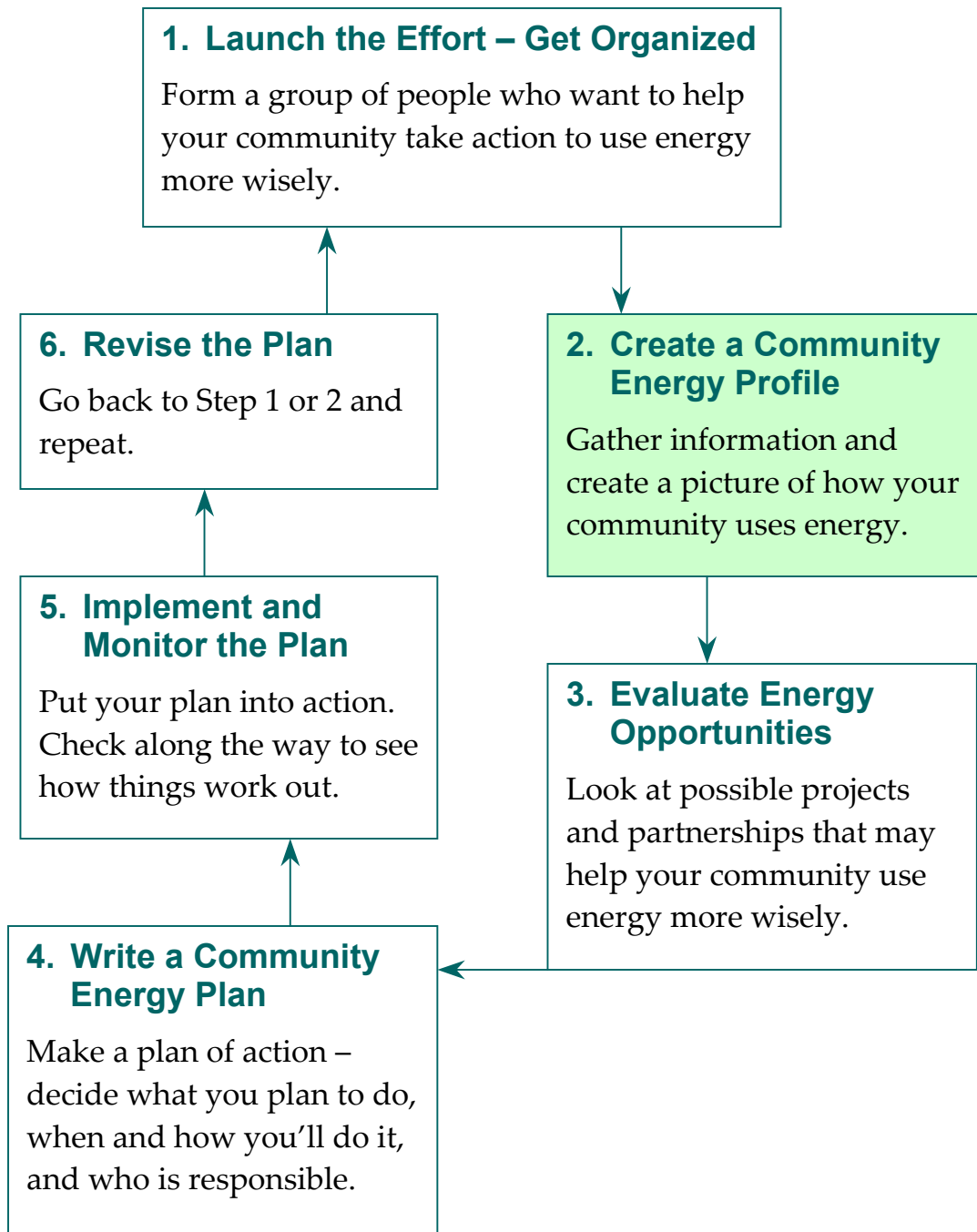
ARCTIC ENERGY  
ALLIANCE

The Arctic Energy Alliance produced the template for the energy profile report with the help of Mary McCreddie, NWT Literacy Council.

# What is a community energy profile?

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The Community Energy Profile is step 2 of the 6-step energy planning process.



A Community Energy Profile describes:

- The different fuels a community uses to produce energy.
- How much money a community spends on energy.
- How much greenhouse gases each fuel produces.
- How much energy a community uses in homes, other community buildings, and for transport within the community.
- Some basic ideas a community can explore to use less energy, produce less greenhouse gases, and save money.

The Energy Profile does not include energy related to air and truck transport that bring goods into the community.

A Community Energy Profile shows how a community uses energy for a certain year. It contains basic information that is easy to find and easy to find again in the future. The community can use an Energy Profile to keep track of how they use energy over time, if they gather the same information at regular time periods, such as every year or two.

## **Why create a community energy profile?**

Communities develop an energy profile to learn how they use energy right now. They need this information to begin the energy planning process so they can develop a more effective community energy plan, to meet the needs of the community.

People can use the energy profile to:

- Help people understand how their community uses energy.
- Raise awareness in local schools, and among elders and other people in the community about community energy use.

- Focus their work to develop realistic goals for their Community Energy Plan.
- Measure changes in how the community uses energy.
- Check their progress in reaching their vision and general targets.

## How does an energy profile measure energy?

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The Community Energy Profile measures energy with units called mega joules or MJ and giga joules or GJ.

- One MJ equals the amount of energy it takes to boil 2 ½ litres of water.
- 1000 MJ = 1 GJ

The Community Energy Profile measures energy based on different fuels a community uses to produce energy. The Energy Profile shows how much fuel the community uses for a year. The information comes from the businesses and government agencies that provide the fuel to a community.

Business and government may provide information about fuels in units such as litres for gasoline or diesel, kilowatt hours for electricity, and cords for firewood. The energy profile converts all these units to MJ and GJ so we can directly compare different kinds of energy.

# How does the energy profile measure greenhouse gas emissions?

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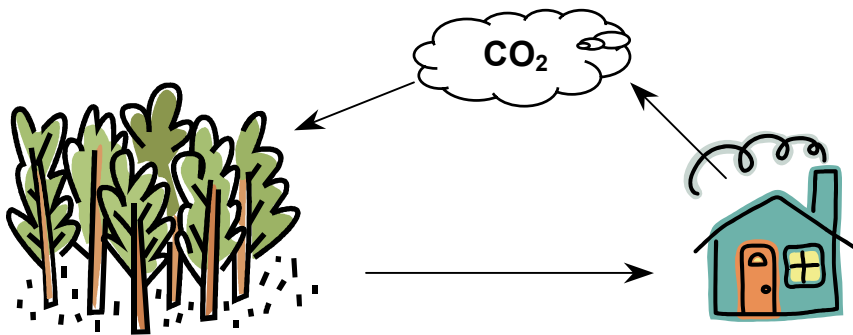
The Community Energy Profile measures greenhouse gas emissions as carbon dioxide equivalent (CO<sub>2</sub> EQ). Carbon dioxide is the most common greenhouse gas and we use it to show overall greenhouse gas emissions.

Each fuel has a standard formula to calculate greenhouse gases as CO<sub>2</sub> EQ. The energy profile uses this formula to calculate greenhouse gases for each fuel or energy.

## Energy Fact

A large pickup truck that uses 80 litres of gasoline per week produces 10 Tonnes of CO<sub>2</sub> EQ per year – enough to fill 10 two-storey, three-bedroom houses.

The Energy Profile shows that wood has no greenhouse gas emissions. We count no greenhouse gases from wood because trees absorb carbon dioxide when they grow. This balances the greenhouse gases that wood produces when it burns.





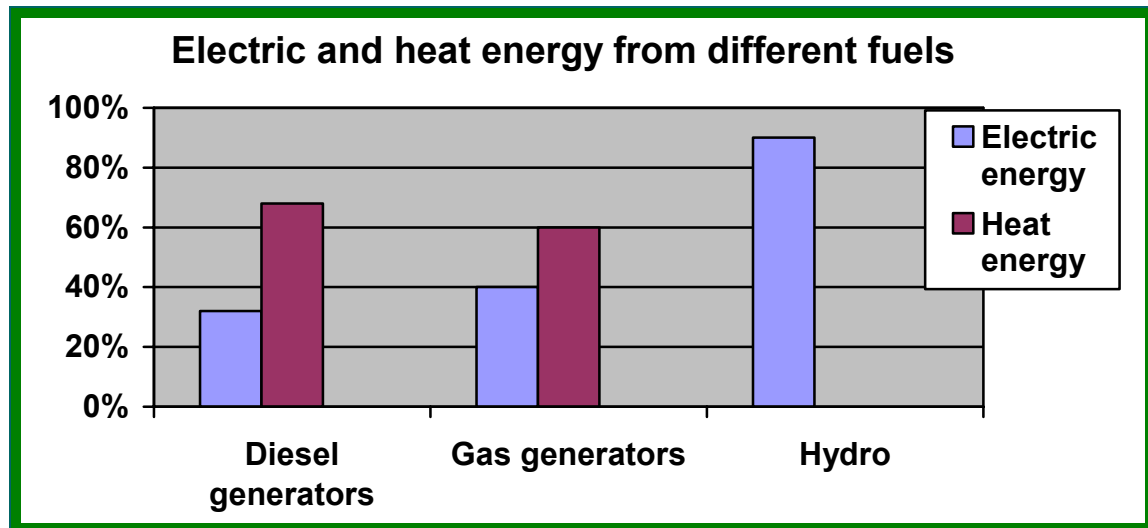
## How do we produce electricity?

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The NWT Power Corporation produces electricity with diesel generators, gas generators, and hydro projects.

Diesel generators burn diesel fuel and produce about 32% electric energy and 68% heat energy. Gas generators burn natural gas and produce about 40% electric energy and 60% heat energy. Right now most communities don't use the heat from diesel and gas generators. The heat is wasted. Communities could capture this heat and use it, not waste it.

Hydro projects use energy from moving water to produce electricity. Most hydro projects capture about 90% of the energy from the moving water. The other 10% stays with the water. Hydro projects don't produce heat energy like diesel and gas generators.



Diesel and gas generators produce much more greenhouse gases than hydro.

# Community Energy Profile Poster

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# Community Energy Profile Summary

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The table and chart in this section show the information on the poster. The chart on the next page shows how much energy we get from each type of fuel and the percent of total cost and total greenhouse gas emissions for each type of fuel.

**Community:**

**Year:**

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**Location:**

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**Population:**

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**Transport access:**

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**Energy fuel**

**Source of information**

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**Total energy used in MJ:**

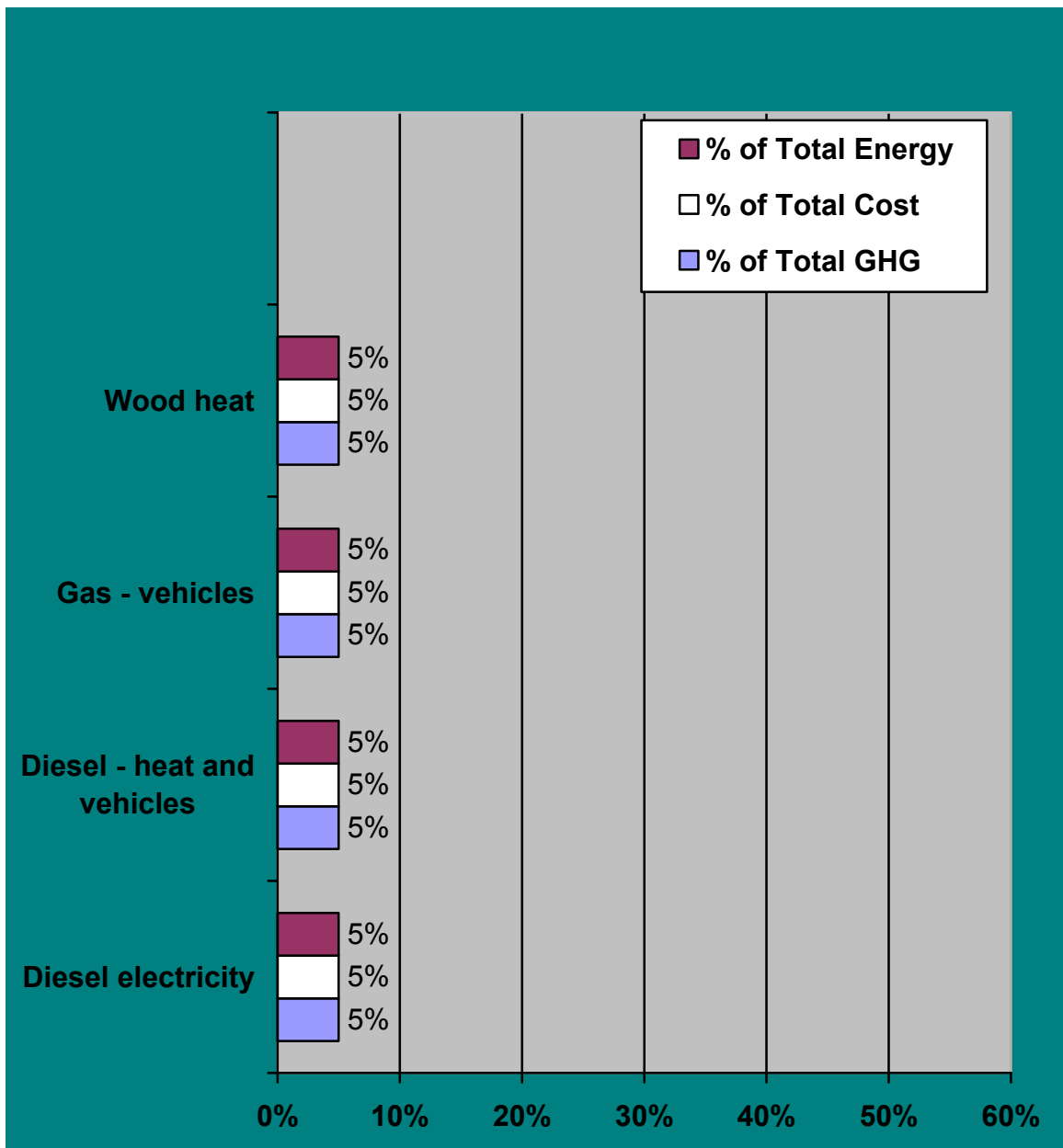
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**Total cost: \$**

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**Total greenhouse gas emissions in Tonnes CO<sub>2</sub>EQ:**

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# How much energy does our community use?

Community:

Year:

Population:

Transport access:

Electricity source:

Fuel	Amount	Energy	% Total
	litres	MJ	%
	litres	MJ	%
	litres	MJ	%
	cords	MJ	%
<b>Total</b>		<b>MJ</b>	<b>100%</b>
Total per person		<b>MJ</b>	



# How much does our energy cost?

Community:

Year:

Population:

Transport access:

Electricity source:

Fuel	Amount	% Total Cost
	\$	%
	\$	%
	\$	%
	\$	%
<b>Total</b>	\$	<b>100%</b>
Total per person	\$	



# How much greenhouse gas emissions does our community produce?

Community:

Year:

Population:

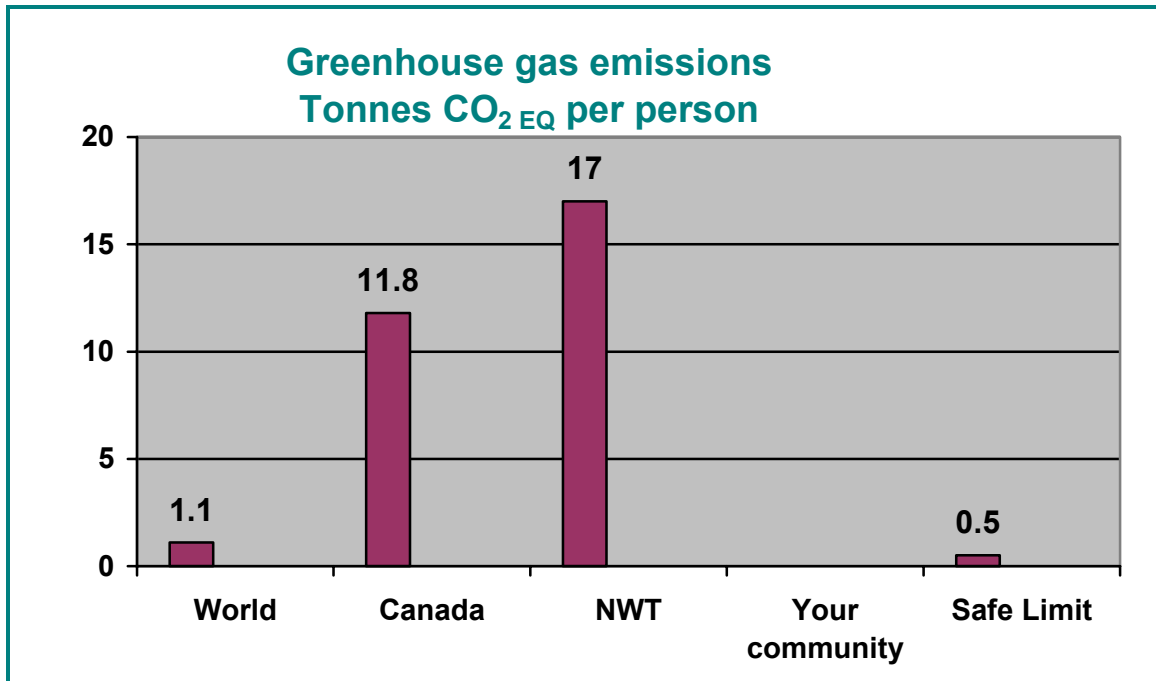
Transport access:

Electricity source:

Fuel	Tonnes CO <sub>2</sub> EQ	% Total CO <sub>2</sub> EQ
	Tonnes CO <sub>2</sub> EQ	% CO <sub>2</sub> EQ
	Tonnes CO <sub>2</sub> EQ	% CO <sub>2</sub> EQ
	Tonnes CO <sub>2</sub> EQ	% CO <sub>2</sub> EQ
	Tonnes CO <sub>2</sub> EQ	% CO <sub>2</sub> EQ
Total	Tonnes CO <sub>2</sub> EQ	100% CO <sub>2</sub> EQ
Total per person	Tonnes CO <sub>2</sub> EQ	



The chart below compares community greenhouse gas emissions with national and international greenhouse gas emissions. We were careful to compare only emissions from community energy-related activities.



Smaller NWT communities generally produce less greenhouse gases because they have little or no industry. Their local transport also produces less greenhouse gases than larger communities, with fewer roads within the community and possibly no all-season road access.

Greenhouse gas emissions cause the earth to get warmer and change the weather and climate. The safe limit for greenhouse gas emissions is 0.5 Tonnes of CO<sub>2</sub>EQ each per year, based on a world population of 6 billion people.

For more information on greenhouse gases or climate change, call the Arctic Energy Alliance or visit [www.climatechange.gc.ca](http://www.climatechange.gc.ca).



## Where does our community use energy?

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The table below shows how much energy our community uses in each of these areas of life.

- Homes
- Other community buildings such as schools, offices, or the health centre; and businesses such as stores or the coffee shop
- Transportation such as trucks, cars, skidoos, boats, ATVs

We estimated energy use based on local data and experience.

### Where does our community use energy?

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	Homes	Other Buildings	Transport
Diesel electricity			
Diesel for heating and vehicles			
Gasoline for vehicles			
Wood for heat			

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## Homes

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Our community uses energy at home to:

- Cook food
- Wash dishes
- Provide light
- Heat the house
- Heat hot water to shower and bath
- Pump water
- Wash and dry clothes
- Watch TV and listen to music
- Use a microwave, refrigerator, freezer
- Use a computer, a drill or saw, a sewing machine, or other electric tools

## Community buildings and businesses

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Our community uses energy in community buildings to:

- Heat the building
- Heat and pump water
- Provide light
- Operate tools and machines

## Transport

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Our community uses energy in transport to:

- Go to work or school
- Visit friends and family
- Go shopping
- Go hunting or fishing
- Travel on the land
- Go camping
- Enjoy recreation



# Five alternative sources of energy

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When we decide to use energy more wisely, we can choose one of two main ways to change things:

- i) Change where energy comes from - replace imported, non-renewable sources of energy with local, renewable sources.
- ii) Change how we use energy - use energy more efficiently – use less energy and save money.

Use the ideas in this section to help decide what energy sources your community wants to learn about, to help develop goals for the energy plan.

This section focuses on five possible alternative sources of energy:

- 1) Solar energy
- 2) 'Run-of-river' hydro
- 3) Wind energy
- 4) Efficient wood heat
- 5) Waste heat from diesel generators

People will always need and use energy. We live in the north. We need heat and light for our homes and other buildings in winter. Our modern world depends on electricity for many things besides light.

## Energy Fact

If we replace diesel electricity with renewable energy, we can reduce greenhouse gas emissions by 2.3 Tonnes CO<sub>2</sub> EQ for each kilowatt-hour of electricity.



Where can we get clean energy?

## Solar Water Heating

### How it works

- Put solar panels in a place where they get lots of sunlight
- The sun heats water as it flows through tubes in the solar panels
- Heated water goes to your hot water tank – for showers, baths, and dishes



**Elders building, WhaTi**

### Benefits

- Use less polluting energy to make hot water
- Pay less to make hot water
- Produce no greenhouse gas emissions from solar panels
- Easily maintain the solar panels

### Limits

- Days with no sunlight produce no hot water
- High cost to buy – but it pays off after a few years
- Solar panels won't make all the hot water a northern building needs.

### Energy Fact

A solar water heater can reduce annual energy costs and greenhouse gas emissions by about 30%.



Where can we get clean energy?

## Solar Air Heating

### How it works

- Put a solar wall – a dark metal wall with small holes in it – on the sunny side of a building
- The wall heats the air, as the air enters the building



Recreation building, Fort Smith

### Benefits

- Use less polluting energy to heat the building
- Pay little to operate a solar wall
- Produce no greenhouse gas emissions from a solar wall
- Easily maintain a solar wall

### Limits

- Days with no sunlight produce no warm air
- High cost to buy – but it pays off after a few years
- A solar wall won't provide all the heat a northern building needs



Where can we get clean energy?

## Solar Electricity

### How it works

- Put solar panels in a place where they get lots of sunlight
- Solar panels change sunlight into electricity – at any temperature
- Also called photovoltaics or PV



**Nunavut Arctic College, Iqaluit**

### Benefits

- Use less polluting energy to make electricity
- Pay little to operate PV panels
- Produce no greenhouse gas emissions from PV panels
- Easily maintain PV panels

### Limits

- Days with no sunlight produce no electricity
- High cost to buy – but it pays off after a few years
- PV won't make all the electricity a northern building needs in winter

### Energy Fact

If we replace diesel electricity with renewable energy, we can reduce greenhouse gas emissions by 2.3 Tonnes CO<sub>2</sub> EQ for each kilowatt-hour of electricity.





Where can we get clean energy?

## Passive Solar Heating

### How it works

- Build homes and other buildings with windows facing south, to catch the most sunlight
- Sunlight enters the building through windows and heats the air, without any technology



Homes in Peanawayuk, Ontario

### Benefits

- Use less polluting energy to heat your house – also provides lots of light
- Pay nothing for passive solar heating
- Produce no greenhouse gas emissions with passive solar heating

### Limits

- Days with no sunlight produce no heat
- Windows provide much less insulation than walls – even good windows
- Windows – especially good windows - cost money.

### Energy Fact

Passive solar heating can provide up to half the heat energy that a building needs, even in the north.



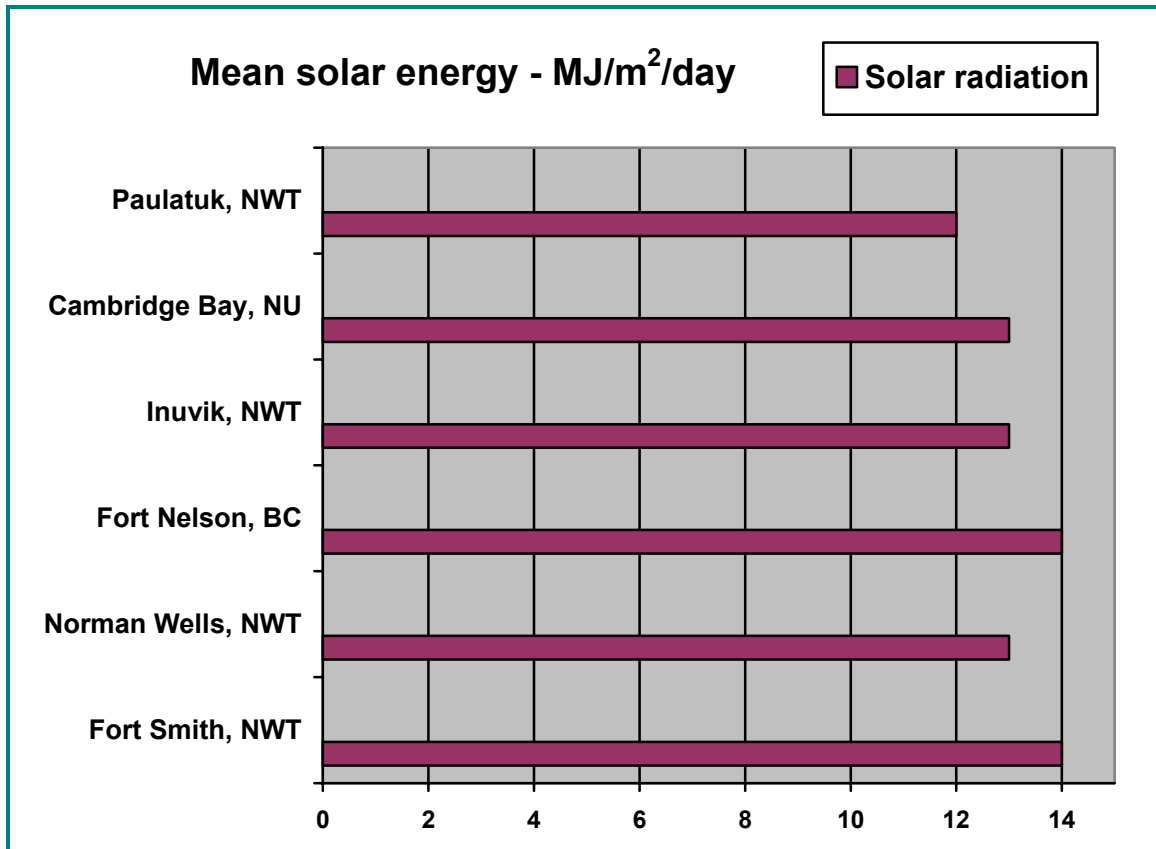
## Assess the potential for solar energy in your community

Natural Resources Canada has a database that shows solar energy for different communities. The database includes information about solar energy for the following northern communities:

- Fort Smith, NWT
- Norman Wells, NWT
- Fort Nelson, BC
- Inuvik, NWT
- Cambridge Bay, NU
- Paulatuk, NWT

Every community has some potential to use solar energy. We know that a few homes and other buildings in Wha ti, Fort Smith, and Yellowknife have solar systems that produce heat and electricity for at least part of the year.

This chart shows solar energy for the northern communities in the Natural Resources Canada database. It shows solar energy as mega joules of energy from the sun on a square metre of a solar collector per day. Mean solar energy is the mid point between the maximum and minimum amount of solar energy.



Solar potential depends a lot on exact location. Other factors that affect the potential for solar energy include things such as the cost of other fuels or technology, and access to people with the knowledge to install and maintain the solar technology.



## Where can we get clean energy?

### Run-of-river Hydro

#### How it works

- Use moving water or a waterfall to make electricity, without a dam or flooding
- Water gathers in a pipe at the top of a waterfall
- Water gathers energy as it goes down the pipe to a turbine
- The turbine turns a generator, that makes electricity



**Possible hydro site near WhaTi**

#### Benefits

- Use less polluting energy to produce electricity
- Works very well if you have a good site
- Produce no greenhouse gas emissions from a run-of-river hydro system

#### Limits

- Need a good location close to the community, and lots of time and effort to build a run-of-river hydro system
- Community needs to watch and maintain the system
- High cost to buy the system – but it pays off after a few years
- The community might not get all the electricity they need from a run-of-river hydro system

The potential for a run-of-river hydro project depends a lot on the height and the flow of the river or stream. Other factors are also important:

- The cost of other fuels or technology,
- The distance from the community to the river, and
- Access to people with the knowledge to install and maintain a run-of-river system.

Natural Resources Canada produces a booklet called **Micro-Hydropower Systems - A Buyer's Guide**. This booklet gives the basics of how a small hydro system works for an individual home. This is different than a run-of-river system big enough for a community. But communities may find the booklet helpful to learn some of the basics about small hydro systems.

Would run-of-river hydro work in your community?

The Arctic Energy Alliance can help the energy planning committee understand how much electricity could come from these sites, how much it would cost, and what the next steps would be to start the project. This could be part of your community's energy plan.

The Arctic Energy Alliance can help your community to do a study to help find out the economic potential for a run-of-river system.



Where can we get clean energy?

## Wind Turbines

### How it works

- Use a wind turbine to make electricity
- The wind turns the turbine's blades
- The blades turn a generator, that makes electricity

### Benefits

- Use less polluting energy to produce electricity
- Works very well if you have a good site
- Pay little to operate the wind turbines
- Produce no greenhouse gas emissions

### Limits

- Need a good, windy site close to the community
- Community needs to maintain the system
- High cost to buy the turbines – but it pays off after a few years
- The community probably won't get all the electricity they need from wind turbines



**Wind turbine  
Rankin Inlet**



**Wind farm in Ramea, Newfoundland**

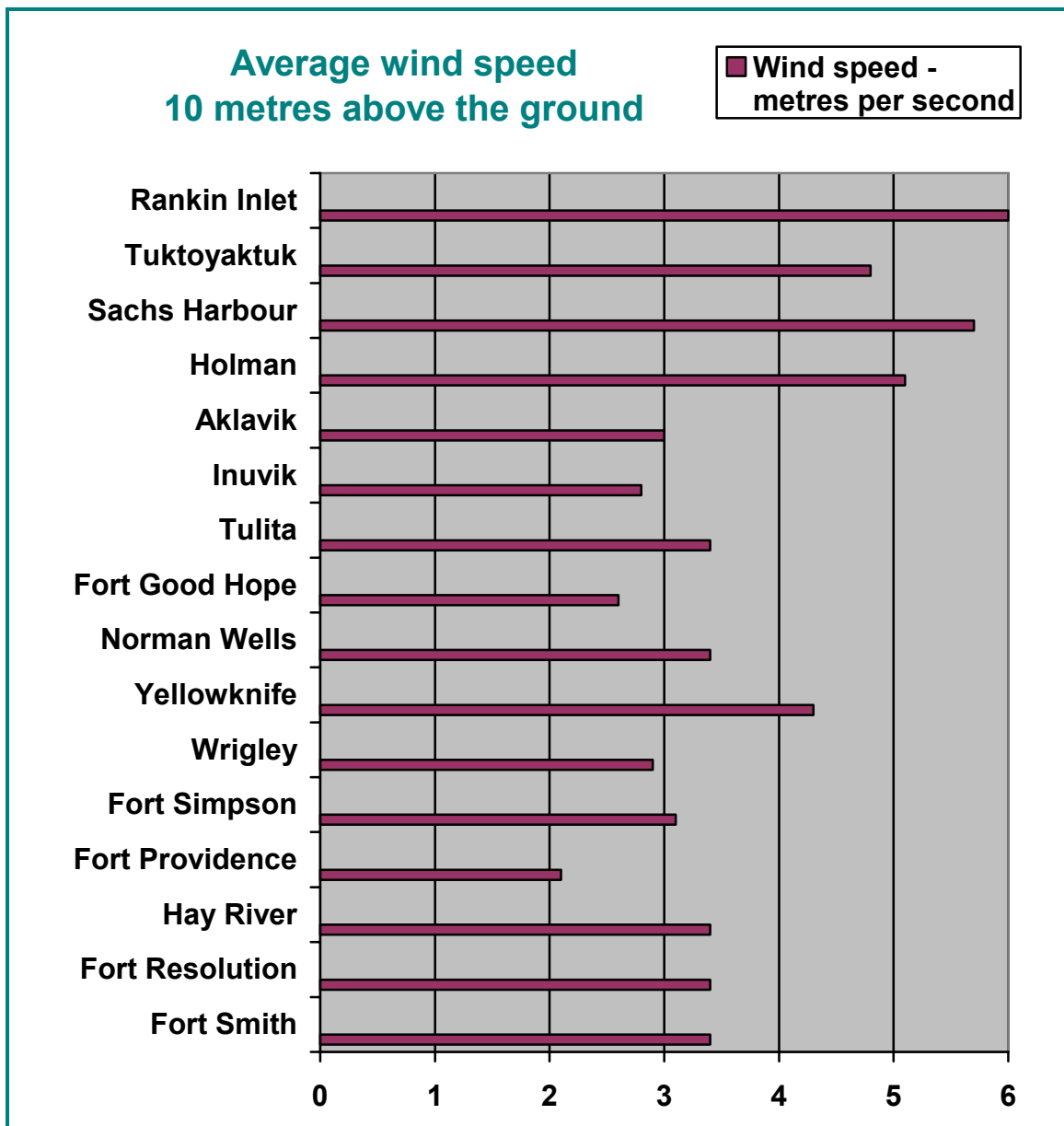
A community may have a local feature such as a hill where the wind blows steadily. To know if it windy enough, you must measure it for at least 1 year in exactly the same place where the wind turbine would be. The potential for wind energy depends on how close that windy place is to the community. A community with a wind energy system must also have access to people who can install and repair the wind turbines.

Natural Resources Canada has a database that shows wind speed in NWT communities. The database uses information from these 15 communities:

- |                   |                   |               |
|-------------------|-------------------|---------------|
| ▪ Fort Smith      | ▪ Fort Resolution | ▪ Hay River   |
| ▪ Fort Providence | ▪ Fort Simpson    | ▪ Wrigley     |
| ▪ Yellowknife     | ▪ Norman Wells    | ▪ Tulita      |
| ▪ Fort Good Hope  | ▪ Inuvik          | ▪ Aklavik     |
| ▪ Holman          | ▪ Sachs Harbour   | ▪ Tuktoyaktuk |

The chart on the next page shows wind speed for the communities in this list. It shows average wind speed, over 30 years, in metres per second at 10 metres above the ground.

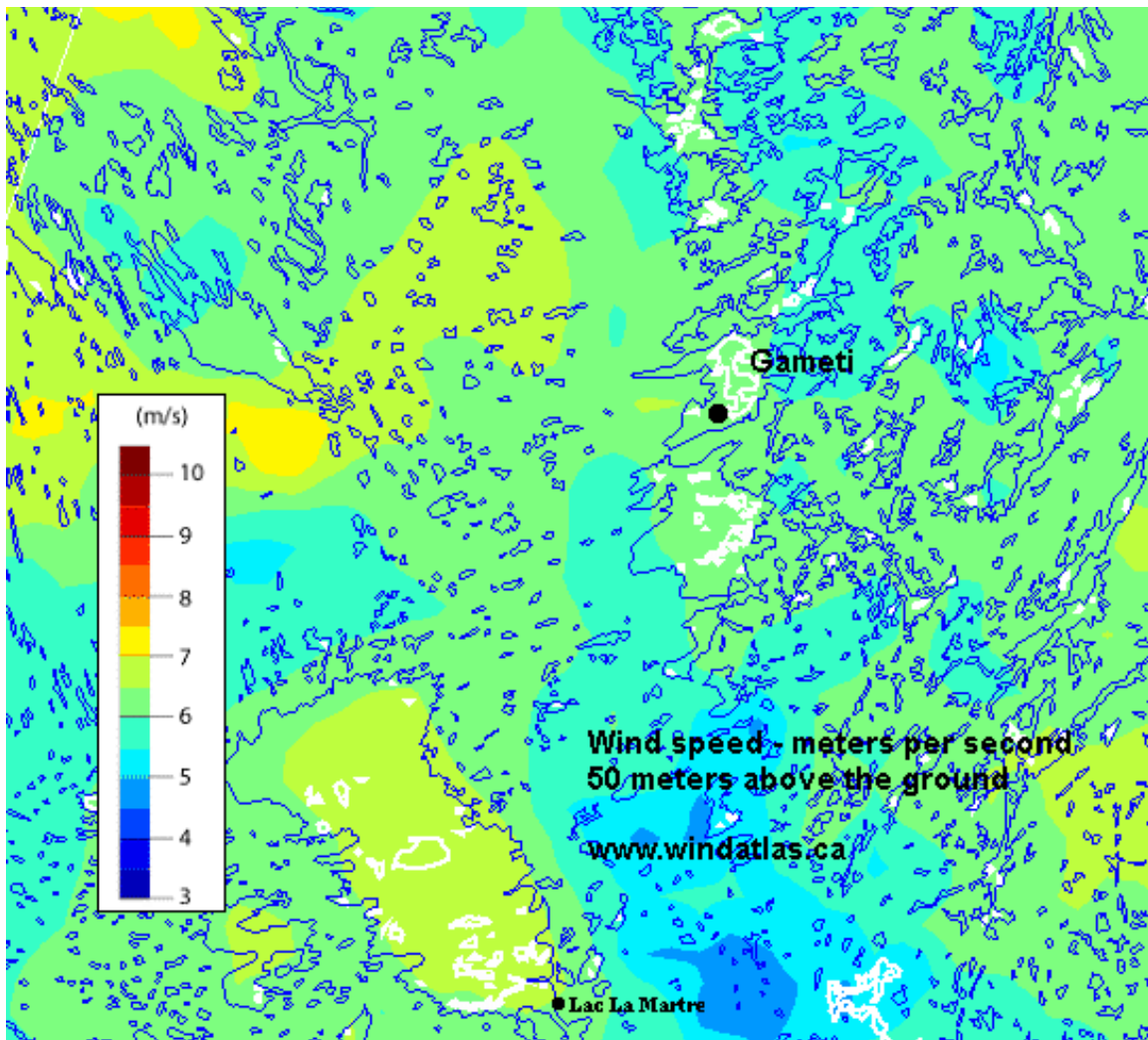
We include Rankin Inlet in the chart to compare average wind speeds in NWT communities with a community that has working wind turbines.



Information in this chart comes from data collected at an airport or other fixed location that may have low elevation. Communities need to collect local data to accurately measure wind speed.

## Community wind map

The Canadian Wind Energy Atlas has maps that show wind speed for all of Canada. The following map from the Atlas shows the wind speed for your community, 50 metres above the ground.



Natural Resources Canada has a helpful booklet about wind energy called “Stand-Alone Wind Energy Systems”. Contact them or the Arctic Energy Alliance for a copy. This Guide can help communities decide if wind energy is a good option to consider.





## Where can we get clean energy? **Efficient Wood Stoves**

### How it works

- Use an EPA approved wood stove that burns wood longer, cleaner, and more completely
- Try a pellet stove, if you have access to the special pellets fuel it needs



### Benefits

- Use less wood to heat your home
- Use less polluting energy to heat your home
- Produce less wood smoke
- Produce less greenhouse gas emissions

### Limits

- Need to harvest wood or buy wood or pellets – may not be available everywhere
- To harvest wood forever, we need to manage forests so we always have trees to cut for fuel
- High cost to buy a good wood stove – but it pays off after a few years



**Pellet stove and pellets**





Where can we get clean energy?

## Cogeneration

### How it works

- Build a system to capture waste heat from a generator and pipe it to another building, to heat that building



Snowshoe Inn, Fort Providence

### Benefits

- Use less polluting energy to provide heat
- Save money – and don't waste heat energy
- Produce less greenhouse gas emissions

### Limits

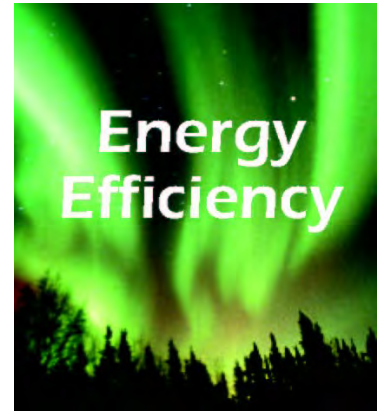
- Hard to convert some existing engines to cogeneration
- High cost to buy the system – but it pays off after a few years

## Energy Facts

- A diesel generator produces about 32% electricity and 68% heat – **the heat is often wasted.**
- In Gameti, the waste heat from the generator has enough energy to heat more than half the homes and buildings that use heating oil.

## **Five ways to use less energy**

Use the information in this section to help decide what ideas your community wants to explore, to develop goals for the community energy plan.



This section focuses on the top five ways to use less energy:

- 1) Develop everyday habits that save energy
- 2) Use Energy Star products
- 3) Use energy efficient vehicles
- 4) Build new buildings that save energy
- 5) Renovate older buildings so they use less energy

When people use less energy they:

- ✓ Save money
- ✓ Save energy
- ✓ Reduce greenhouse gas emissions



## How can we use less energy?

### Develop energy efficient habits

#### How it works

- Learn about and do everyday things that save energy
- Choose to walk or bike, not drive
- Turn off lights, TV, vehicle, and water tap when not in use
- Use a timer to turn things off and on – coffee maker, vehicle plug-in, furnace
- Use energy efficient things, such as compact fluorescent bulbs
- Use a clothesline, not a dryer
- Get your furnace serviced every year
- Keep homes and buildings in good repair



#### Benefits

- Use less energy and save money
- Pay little or nothing
- Help reduce greenhouse gas emissions

#### Limits

- Hard to change old habits
- People may lack information
- Stores may not carry products





## How can we use less energy? Use Energy Star products

### How it works

- Look for the Energy Star symbol – it shows products that use less energy
- Buy things that have the Energy Star symbol
- Replace things that use lots of energy with energy-efficient things

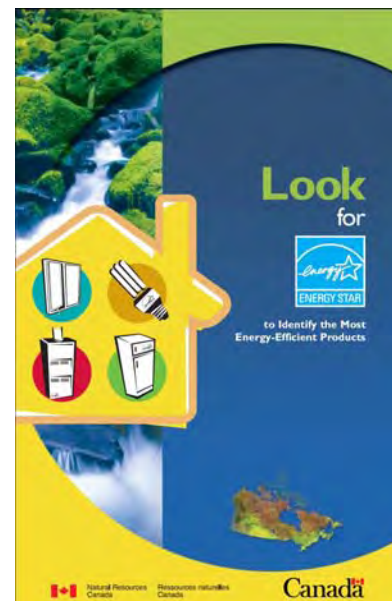


### Benefits

- Use less energy
- Pay less to operate things
- Help reduce greenhouse gas emissions

### Limits

- High cost to buy, but it pays off after a few years
- Stores may not carry Energy Star Products







## How can we use less energy? Use Energy-efficient vehicles

### How it works

- Buy a vehicle that gets good gas mileage
- Buy a smaller, lighter vehicle or hybrid vehicle
- But a 4-stroke motor – they use less fuel




### Benefits

- Use less polluting energy
- Pay less to buy and operate a smaller, energy-efficient vehicle
- Help reduce greenhouse gas emissions



### Limits

- Local mechanics may not know how to fix a hybrid
- Smaller vehicles have less space

	Toyota Prius	Gas mileage - highway	Annual fuel cost	Annual CO2
HYBRID		4.0 L/100 km or 71 mi/gal	\$820	1968 kg
DIESEL		6.2 L/100 km or 46 mi/gal	\$1100	2970 kg
HYBRID		6.6 L/100 km or 43 mi/gal	\$1360	3264 kg
2X4		9.9 L/100 km or 29 mi/gal	\$1740	4276 kg
4X4		16.7 L/100 km or 17 mi/gal	\$2940	7056 kg
		not recommended - for comparison only		
A hybrid uses new motor and battery technology that uses less energy				

### Energy Fact

A small pickup truck uses 1/3 less fuel than a large one.



## How can we use less energy?

### **Build new buildings that save energy**

#### How it works

- Build new buildings with good insulation and windows, energy-saving heating, appliances, lights, etc.
- Apply the highest energy-saving standards to build new buildings. The best standard for houses is EGH-80 and for other buildings LEED or CBIP.

#### Benefits

- Use less polluting energy
- Pay less to build it right the first time
- Pay less to operate an energy-efficient building
- Help reduce greenhouse gas emissions

#### Limits

- People may pay about 10% higher construction costs – but it pays off after a few years



**Energy efficient homes in Whitehorse, Yukon**



How can we use less energy?

## Renovate older buildings so they use less energy

### How it works

- Do an energy audit – find out how your building uses energy and what you can change to save energy
- Fix up your home or building so it uses less energy

### Benefits

- Use less polluting energy
- Pay less to operate the building
- Help reduce greenhouse gas emissions

### Limits

- People may pay lots to renovate – but it pays off after a few years

