Climate Emergency:
Evaluating Renewable Energy Options

Three key questions on reducing NWT Greenhouse Gas emissions

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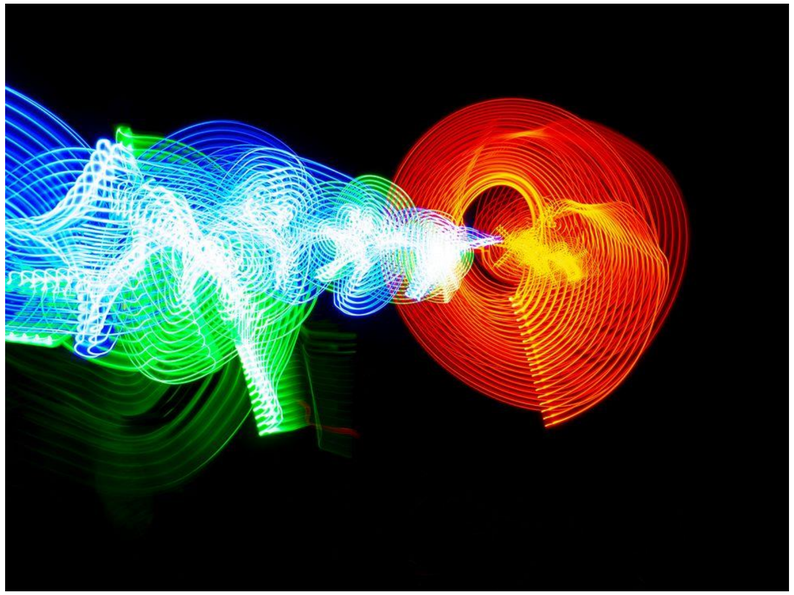
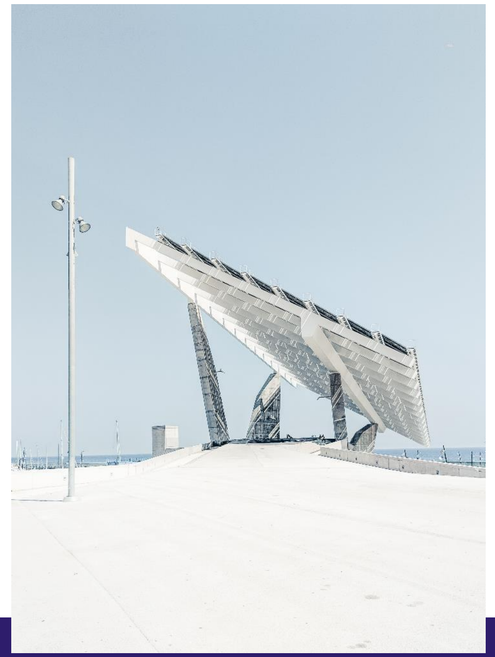
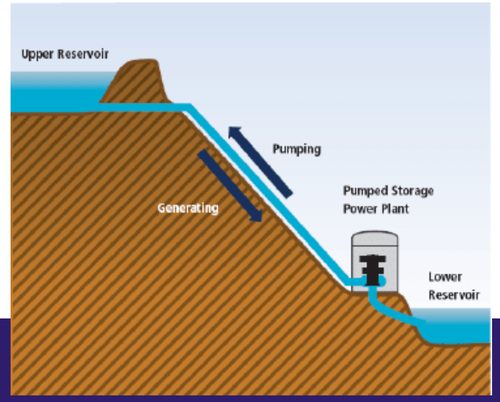
image Cabin Radio/Ollie Williams





Lots of options!

What makes sense *for us?*



The three most important questions are:

1) What **percentage of territorial emissions** is this applicable to?

2) What is the estimated total emissions' reduction this could achieve **by 2030?**

3) What is the **lifecycle cost** per lifecycle ton of emissions saved?

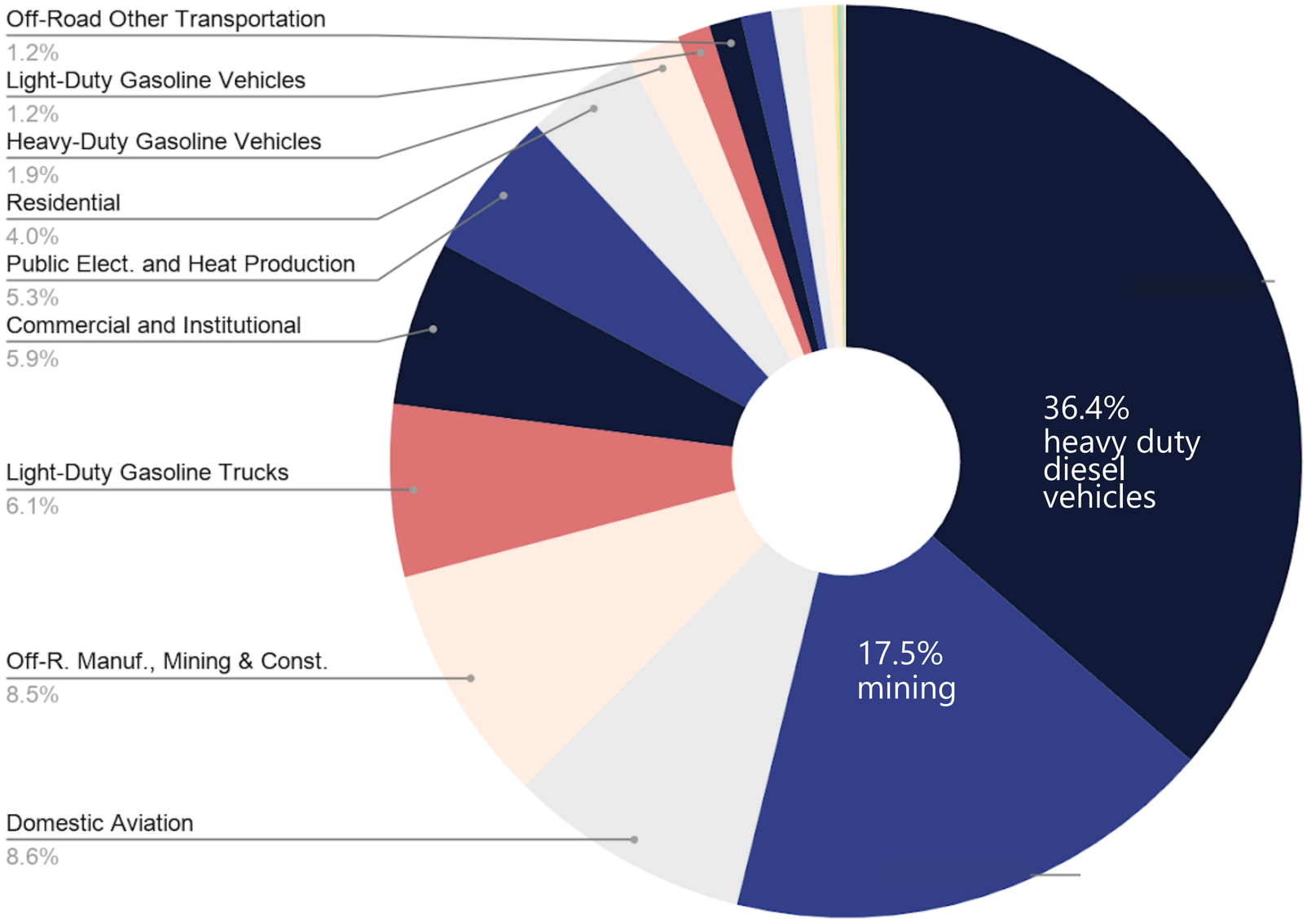
Solutions that offer the best performance deserve the most support.

Question 1:

What percentage of territorial emissions is this applicable to?

Address **major sources** to provide greater value.

NWT 2017
GHG emissions inventory



25%

to communities

image Cameron Wilkinson

75%

to mines and transportation

image Canadian Press

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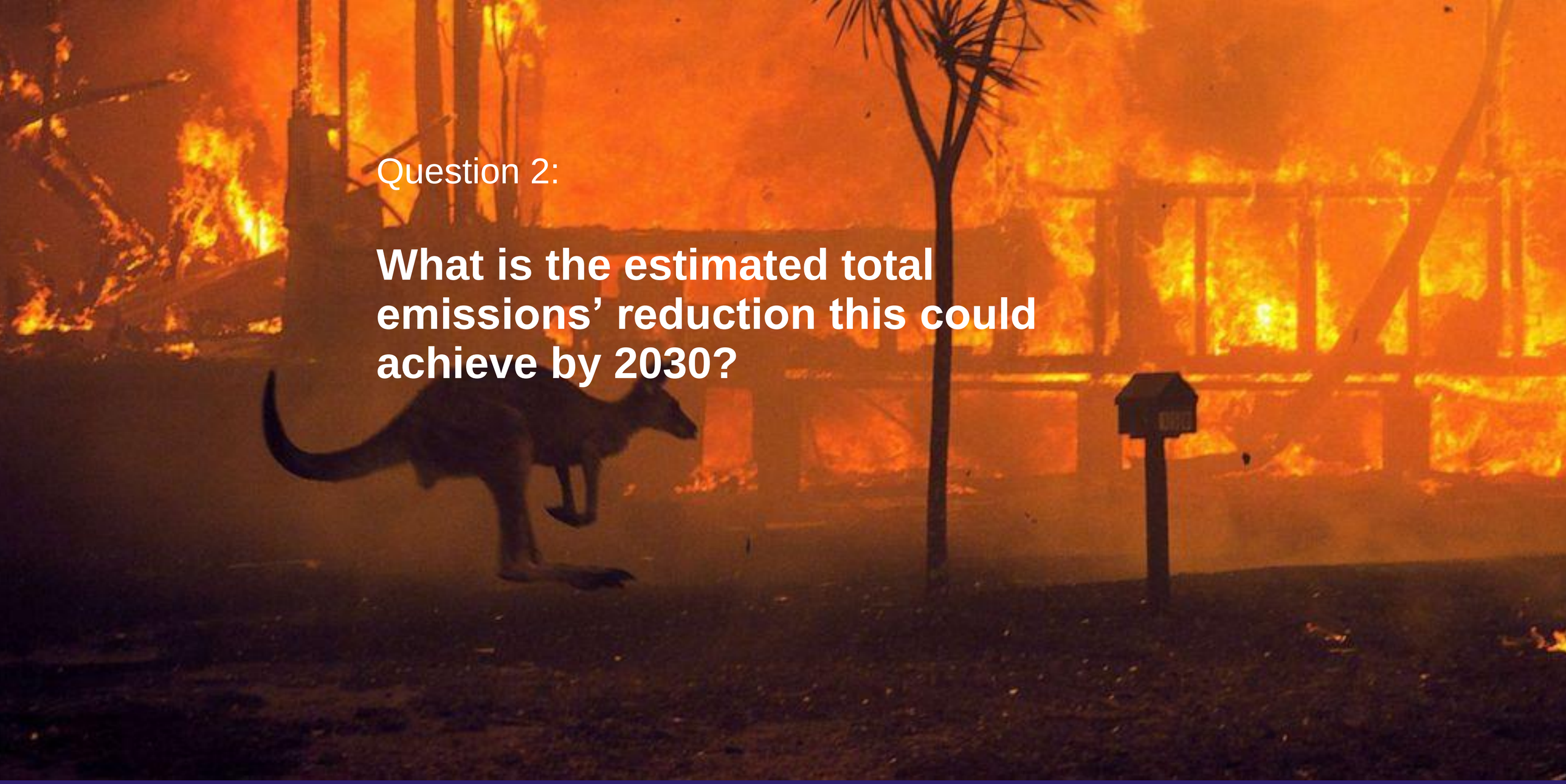
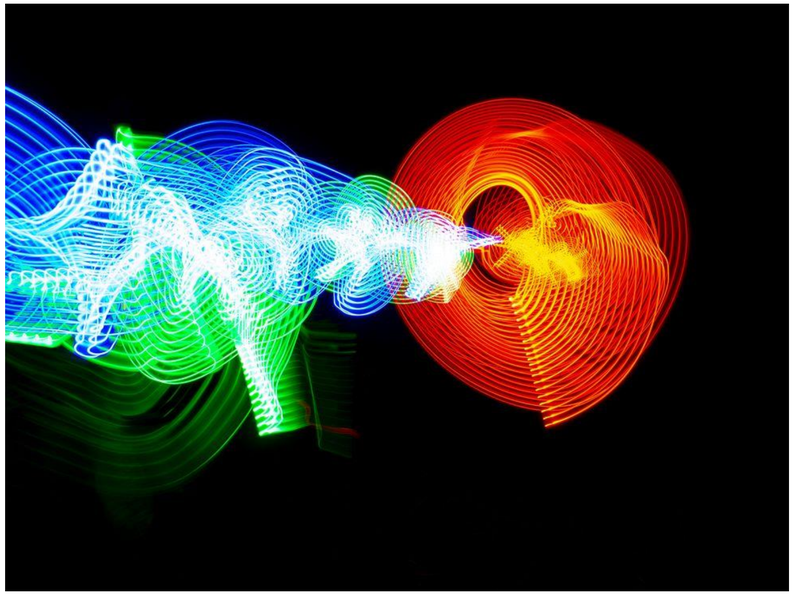
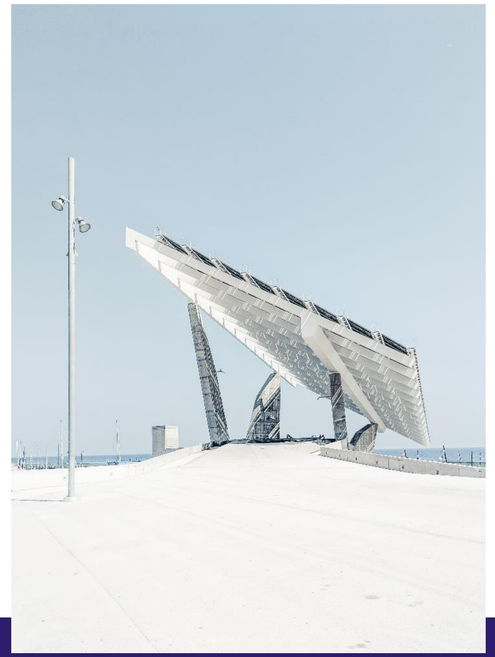


Question 2:

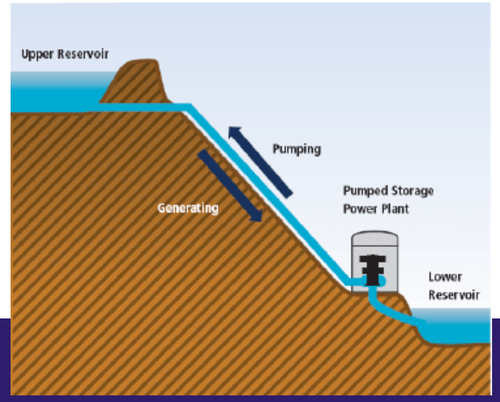
What is the estimated total emissions' reduction this could achieve by 2030?





Is the technology available now?

Real reductions now are better than promised reductions later.



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Question 3:

What is the lifecycle cost per lifecycle ton of emissions saved?

This is the most complicated of the questions.

Consider the cost associated with all stages of a project's lifecycle

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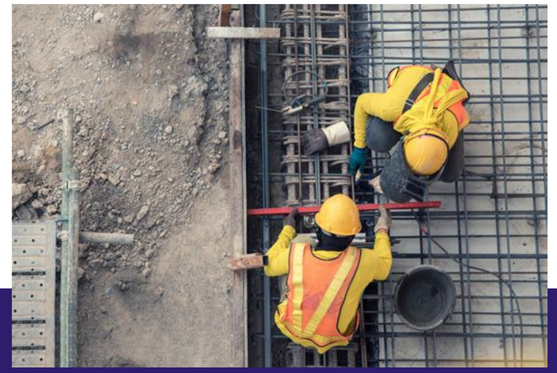
- Planning

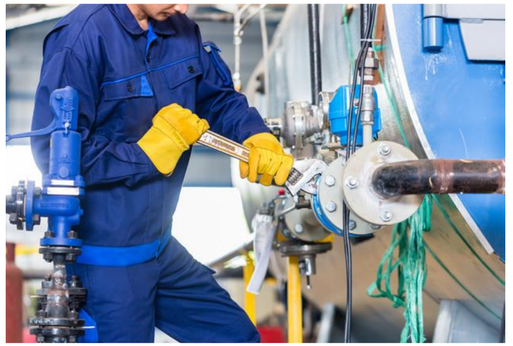
- Design

- Construction

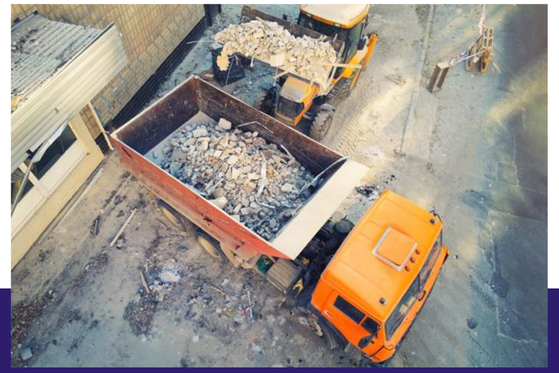


- Operations
- Maintenance

- Refurbishment



- Disposal



Full life-cycle costs give **“apples to apples” comparisons** between technologies that operate on different scales (length of operation, amount of energy produced, etc.)

$$\frac{\underset{\$}{\text{Planning}} + \underset{\$}{\text{Design}} + \underset{\$}{\text{Construction}} + \underset{\$}{\text{Operation}} + \underset{\$}{\text{Maintenance}} + \underset{\$}{\text{Refurbishment}} + \underset{\$}{\text{Disposal}}}{\text{Lifecycle Total Emissions Saved}} = \frac{\$}{t\ CO_2e}$$

Comparing technologies this way ensures our dollars go as far as they can in accomplishing emission reductions *now*

Renewable Diesel

$$\frac{\underset{\$0}{\text{Planning}} + \underset{\$0}{\text{Design}} + \underset{\$0}{\text{Construction}} + \underset{\$0.32/L}{\text{Operation}} + \underset{\$0}{\text{Maintenance}} + \underset{\$0}{\text{Refurbishment}} + \underset{\$0}{\text{Disposal}}}{2.7 \text{ kg } CO_2e \text{ /L}} = \frac{\$116}{t\ CO_2e}$$

Taltson Expansion + Powerline to North Slave

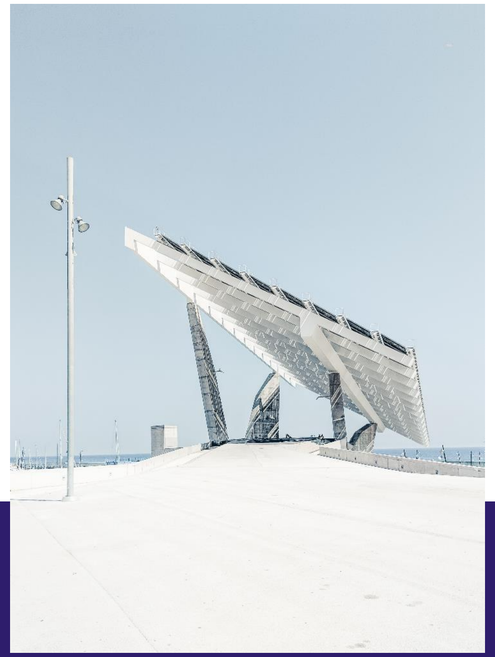
$$\frac{\text{Planning}_{\text{millions}} + \text{Design}_{?} + \text{Construction}_{\$1{,}900\text{M}} + \text{Operation}_{32\text{M/year}^*} + \text{Maintenance} + \text{Refurbishment}_{?} + \text{Disposal}}{227\ \text{kt}\ CO_2e\ /\ \text{year}} = \frac{\textbf{\$296}}{t\ CO_2e}$$

*Assuming 60 year life, <u>including</u> estimated revenue

Answering questions 1 and 2 first can save a lot of time and expense!

1) What **percentage of territorial emissions** is this applicable to?

2) What is the estimated total emissions' reduction this could achieve **by 2030?**

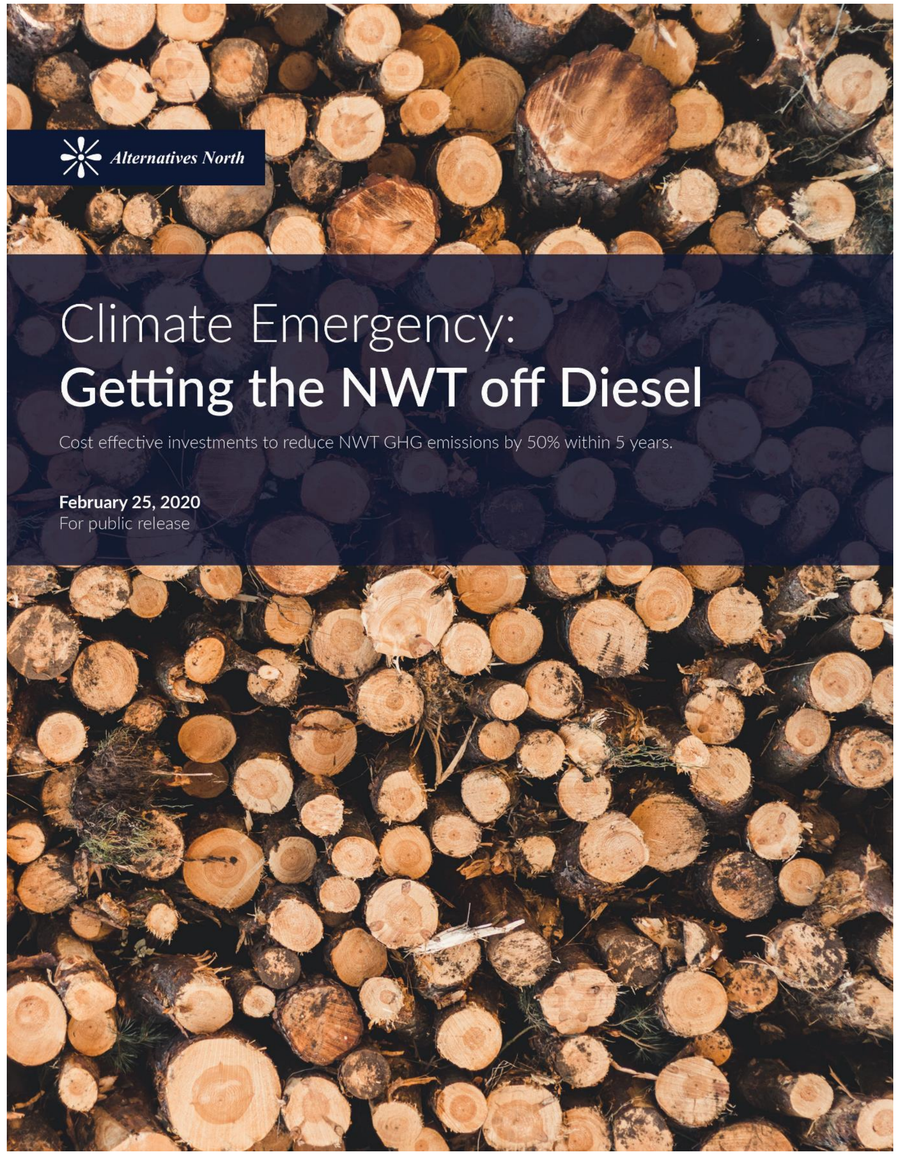


Community electricity only 5% of our emissions….so not where we need to spend our resources *right now*

Governments haven't been asking these **three questions**.

Alternatives North did a report on various renewable energy options the GNWT has been using/considering to help us focus on what can be done now

It's an emergency



> full report

alternativesnorth.ca

Authors

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Formatting, graphic design

William Gagnon

GHG Emissions equivalent in diesel

450 million litres

7,200 double tankers of diesel

image flaticon, freepik

7200 double tankers

Alternatives North

 x 3600

50% reduction

>the 3 Q’s help identify low-hanging fruits

to reduce emissions by 3600 double tankers

- renewable diesel

Replacing petrodiesel (vehicles) & heating oil with renewable diesel: a type of diesel made from plant oil, animal fat, algae, etc.

Renewable diesel and biodiesel are NOT the same

Biodiesel created from various fats (plant or animal waste). **Renewable diesel** production can include fats and biomass (e.g., crop residues, wood, crops). For both, algae grown from sewage can be used.

Different processes = different chemistry

Renewable Diesel: Compatible with existing infrastructures

- can be distributed to existing fuel supply systems
- acceptable in existing diesel engines
- suitable for the north

Biodiesel: Not suitable for cold environments

- not usually intended to replace diesel, but as a fuel to blend (at 5 to 20 percent) with diesel
- prone to contents separation, sludginess, and increased emissions (including NOx) during cold weather

http://www.advancedbiofuelsusa.info/wp-content/uploads/2011/03/11-0307-Biodiesel-vs-Renewable_Final-_3_-JJY-formatting-FINAL.pdf

- Q1: yes, it directly reduces GHG emissions from our largest sources (mining/transportation)

- Q2: yes, it is available now….*an NWT solution*

- Q3: performs well in overall cost per ton: **$116/** t CO_2e

$65 M per year to get down to same price as regular diesel (cost differential between petrodiesel and renewable diesel)

reduction potential

3600+ x

Taltson hydro expansion

- Taltson dam near 60th parallel

- Replacing diesel generators at current and future mines in the Slave Geological Province with hydro power from an expanded Taltson Hydro system.

- Would need to build a power line under Great Slave Lake, and then out to the future mines

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❌ Taltson hydro expansion

Q1: Partly available. Dam is built, but would need **expansion plus** the power line under Great Slave Lake

Q2: No. Would not be ready by 2030

Q3: LIFE CYCLE CONCERNS!

- ❌ much more expensive than renewable diesel
- ❌ revenue will not cover line maintenance
- ❌ Might use all funding without solving problem…

reduction potential

1600 x 🚚

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• biomass district heating & combined heat & power

- Beyond personal pellet stoves/single building boilers (AEA)
- Replacing heating oil with large wood biomass boilers that pipe heat to lots of buildings
- Boilers could accept wood chips and cord wood (not just pellets)
- Replacing heating oil with waste heat from diesel generators

- Q1: Partial target….communities aren’t the big emitters

- Q2: Technology available and used now; district beginning

- Q3:
  - lots of co-ordination
  - Invest $140M up front
  - Earn $80M over 20 years (reduce heating bills by 20%)

reduction potential

400+ x🚛

image @ Andrew Robinson

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Not the only questions!

More **social and environmental justice** points to consider in full evaluations in fuller analyses

- Biodiversity loss or restoration
- Human health
- Cultural suitability
- Equitable employment
- Will $ stay in the NWT?

Summary of Pathways

The following table summarizes all technical, economic, and social factors of the examined pathways.

Option	Potential Impact (kt)	Technical Viability	Capital Cost	20 year Investment/ Income	NWT Human Health	NWT Employment	NWT Self-Sufficiency	Average Annual $/t over 20 years
Carbon Offsets	● 600+	●[1]	-	● -$300M	-	●[3]	●[3]	● -$25/t
Renewable Diesel	● 600+	●[2]	-	● -$1,394M	-	●[3]	●[3]	● -$116/t
Biomass District Heating	● 64	●	$126M	● $79M	-	●	-	● $62/t
Diesel Co-Generation	● 4	●	$16.3M	● $7.8M	●	●	●	● $98/t
15MW Biomass CHP	● 73+	●	$135M	● -$589M	-	●	-	● -$403/t
Transmission line – existing Taltson across Lake to future North Slave Mines	● 89	●	$900M	● -$1,226M	●	●	-	● -$689/t
Taltson Hydro expansion, Transmission across lake and on to Ekati, Future Mines and Fort Providence	● 227	●	$2,120M	● -$2,782M	●	●	-	● -$613/t
As above w/ Electric Vehicles	● 244	●	$2,223M	● -$2,779M	●	-	-	● -$569/t
10 Community Solar PV projects w. Batteries or variable speed generators	● 2.1	●	$33M	● -$24.4M	●	●	●	● -$580/t
4 community Wind Power projects	● 6	●	$35.5M	● -$17.8M	●	●	●	● -$147/t
Diavik 9.2 MW Wind Power	● 12	●	$33M	● $67M	●	●	●	● $280/t

1 existing large-scale market
2 proven in cold climate outside NWT
3 indirectly

Legend
- ● The project is in the public interest as it creates revenues compared to status quo.
- ● The project represents the first two lowest cost options (initial, or annual) to cumulatively achieve 50% GHG reduction (600kt).
- ● The project does not represent the lowest cost option.

The Federal Government says we are in a Climate Emergency

And….that Indigenous communities need to be off **petrodiesel ….**BUT….***without recognizing*** that this is highly unlikely …. Communities still need heat and power!

Northern communities need to be on **renewable diesel** instead of **petrodiesel**

This is a northern solution (not a Canadian one)

Renewable diesel needs

- to be on the radar of governments and communities
- to have trials project to reduce ‘fear of unknown’
- to be funded to relieve cost differential

INDIVIDUAL ACTIONS

> ask the 3 questions

www.alternativesnorth.ca

www.ecologynorth.ca

Renewable energy primer

> buy carbon offsets

Gold Standard

> advocate for renewable diesel

and buy it once available in the NWT


There is
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Pla B
#SCHOO
STRIKE
CLIMAT
Your
Mistakes
=
MY
Future
STRIKE 4
CLIMATE
ARE
FUTURE
MATTER
EVERYDAY
is
EARTH DAY
IT'S NOT
O.K. TO
POISON
MY
KIDS