



Clean Energy

Powering the North and driving climate solutions

By Sarah Sibley

Photo by Alex Maltais, Solvest

Looking back, 2020 exposed many global vulnerabilities, from the COVID-19 pandemic, to international economic shutdowns, to systemic discrimination and inequities. Underlying and underscoring these fault lines: the ongoing climate crisis and the imperative of international cooperation and collaboration.

In the wake of devastating wildfires that raged in Australia and the U.S., and growing evidence of an alarming rate of Arctic warming, 2020 also brought home the stark implications of climate change across the globe and to Canada's North in particular.

Indigenous governments signaled to the rest of the world the high stakes of inaction. In Old Crow, the Vuntut Gwitchin Council declared a climate emergency in May 2019. Five months later, the Yukon's territorial government made a similar declaration. Meanwhile, other levels of government, elsewhere in the North and around the world, are expressing the growing and dire need to protect the environment at all cost. Globally, through a conduit of international declarations, climate activism, research programs, and government funding, momentum is growing for countries to reduce their environmental-footprint and make better use of sustainable resources and renewable energy.



SDG # 7 : Clean Energy SDG # 13 : Climate Action

The United Nations Sustainable Development Goal (SDG) #7 identified the importance and need for affordable and clean energy for all, while SDG 13 calls for urgent action to combat climate change and its impacts. For more information on the United Nations Sustainable Development Goals (UN SDGs), visit www.un.org/sustainabledevelopment



YukonU.ca/innovation/SocialEnterprise

An ambitious agenda

The United Nations Sustainable Development Goal 7 identified the importance and need for affordable and clean energy for all, while Goal 13 calls for urgent action to combat climate change and its impacts. This agenda is ambitious, with many political, scientific, technological and social barriers to overcome.

In September 2020, the Government of Yukon committed to Our Clean Future: a Yukon strategy for climate change, energy, and a green economy. The strategy aims to reduce the territory's dependency on fossil fuels by 2030 and implement "reliable, affordable, and renewable energy to continue to power our lives, our work and our economy," seemingly aligning itself with the United Nations' SDGs.

"Our vision is to come together as leaders to address climate change by building thriving, resilient communities powered by renewable energy and supported by a sustainable green economy that protects and restores our natural environment," the document states.

The majority of greenhouse gas emissions in Yukon come from transportation, heating, and electricity generation, with transportation creating about 61 percent of the territory's total emissions. The same data suggest Yukon's greenhouse gas emissions increased almost 12 percent between 2009 and 2017, hitting their highest peak in 2011. In 2015, Yukon was spending upwards of \$200 million a year on fossil fuels, according to a study of Yukon's fuel supply chain done by Benjamin Ryan, now Air North's chief commercial officer.

Yukon, like Nunavut and the Northwest Territories, faces particular energy security challenges because its electricity grid is not connected to nearby jurisdictions. Electricity cannot be purchased from neighbours; Yukon must generate enough for its own needs, but not too much. Some Yukon communities experience this even more acutely: they are not connected to any other communities and must produce all their own power.

In 2019, 84 percent of the electricity generated by Yukon Energy was from renewable sources. While the Yukon integrated grid is primarily powered by hydroelectricity, other communities rely on diesel-powered microgrids and off-grid areas depend on household-scale generators. Even on the grid, the Territory still relies on fossil fuels, such as its liquefied natural gas generating station, when demand is peaking and homes need a backup source of power, or when renewable sources are unavailable.

To help meet this need, Yukon Energy rents portable diesel generators to ensure it can provide power in an emergency and during increased demand for energy for heating. For the 2020-2021 winter, the corporation is renting 17 portable generators, seven more than last year because, "Yukoners are using more electricity than ever before, and more sources of dependable electricity are needed at the flip of a switch in winter." The cost of doing so is approximately \$4.1 million. Though Yukon Energy plans to introduce new renewable electricity projects in the next 10 years to curb the use of fossil fuels, these generators may still be used for winters to come to fill the gap until a more permanent solution is created.



Tombstone Park

**Transportation
accounts for
about 61% of
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The federal government has invested millions of dollars into communities in Yukon to help implement clean technology projects. Though many energy projects are run by public utilities, entrepreneurs across the territory are also playing a role, finding innovative ways to move the energy sector into sometimes uncharted areas that will produce clean technology for Yukoners to utilize in their everyday lives and, at the same time, help educate them about why shifts in this sector are vital.

Future Proof My Building

Shane Wolffe has spent many years cultivating a passion for studying and implementing eco-friendly alternatives for buildings in Canada. His business is called Future Proof My Building, where he works to consult, recommission, and evaluate buildings across Yukon to make sure equipment is working properly and uses energy efficiently.

Wolffe says making buildings sustainable and energy efficient is extremely important, especially considering that structures and homes in the North need different considerations than ones in other parts of Canada, which he says was often not considered in their design.

"If it's cold out, you wear a winter jacket, you don't wear a spring jacket. But we've been building homes as if they're spring jackets, like we're living in the South ... we shouldn't be following the same building standards they have in Toronto, but they did that for a very, very long time."

Wolffe analyzes buildings, looking at how components operate and how they use energy. His audits lead to recommendations about potential upgrades that could make buildings more energy efficient. "You don't know the state of these buildings until you get into them and actually start testing them, so recommissioning and energy auditing is a huge opportunity," he says.

Wolffe also curates a website that brings together services and products that will help people learn how to make their homes more sustainable and be able to browse all the options in one spot. "The idea behind it was that I would have a database of all the people who do these obscure services, like myself, and then all of these new and cutting-edge products to bring them together."

"I started doing research and realized that buildings are the single biggest energy users, and they can be actually built to produce more than they consume. They're everywhere where people are...I just decided we need to take all the people who do this work and create an army of the problem solvers, the "future proofers" and make it easier for people implement these things."

Wolffe is creating a passive solar air heating system (shown above) with money he won as a Yukon Innovation Prize finalist. The innovation reduces energy consumption of heat recovery ventilation units (HRVs). It acts as a greenhouse to warm air before it enters the building. Passive solutions like this help reduce electricity demand - a key factor in Yukon's energy security, sustainability, and price.



Shane Wolffe

“There’s so much opportunity in the North,” says Danny Guhl, business development manager of Solvest. The company, founded in 2015, focuses on creating solar energy systems for the Yukon and other remote locations and is leading the way for clean energy solutions in the North. Solvest works on both residential and commercial projects that allow people to tap into solar power to reduce fossil fuel energy consumption.

“The price of solar, the modules, the equipment, they’ve all come down so much and that makes it really economically feasible to do this in communities north of 60,” says Guhl.

The company has taken on Yukon’s biggest solar energy project to date: a solar farm that will strive to see a total of 153 homes powered off of 4,000 solar panels. The panels will be located about 20 minutes outside of Whitehorse and span over approximately 2.6 hectares.

Solvest is expecting to break ground in spring and the company hopes to see it operational before the end of 2021. Guhl says the company has already completed a similar project with Fish River Cree Nation in Manitoba.

“We have such longer summer days. In the spring, summer, the fall, that renewable energy, especially photovoltaic solar, is a real affordable option up here. The great thing about something like solar is there’s no moving parts. It can just sit there and produce energy when the sun is shining,” says Guhl.

One person’s trash is an entrepreneur’s treasure

While Solvest works to harness energy from the sun, another Yukon entrepreneur believes there’s an abundance of energy to be found in the Whitehorse Copper Belt.

The Whitehorse Copper Mine closed in 1982, leaving behind tons of untouched remnants, byproducts that remain from the process of extracting the copper. Adam Greetham, president of Groundtrax Environmental Services Inc, says the old mine site is rife with minerals that could be used to help power the territory for years to come. A bonus? It would produce clean energy that could be reused as a way to help replace fossil fuel usage in the territory.

Greetham is attempting to turn the mine tailings into energy by burning the high-grade magnetite iron ore powder. He says with the advancement of technologies, metal powders are becoming a feasible and green fuel source, adding that Whitehorse has one of the largest reserves of these powders that is already crushed up in the copper mine.



**Solar equipment
is becoming
more affordable.
With long days in
spring, summer,
and fall, Solvest's
Danny Guhl sees
it as an viable
clean option
for the North.**

“The advantages from the waste minerals from former milling operations at Whitehorse Copper was the production of ultra-high grade iron ore that’s in a powdered form,” he says.



“With renewable energy that iron powder provides, it’s rechargeable, renewable, and almost an infinite supply of clean energy.”

Adam Greetham, President, Groundtrax Environmental Services Inc.

A Dutch brewery has seen successes with this clean, recyclable energy source and currently uses it to power its operations. McGill University has also been trying to determine how feasible this energy form may be through researching the clean technologies it would use and trying to build prototypes.

“They inject air into the air stream and then, much like sandblasting, there’s fine powder that goes into the airstream. It goes up through the flame to ignite it and it burns like a torch, extremely hot,” Greetham says.

The process involves separating the minerals to get the pure magnetite, then preparing the powder to be burned and using an applicator, like hydrogen or electricity.

“Much like when you recharge a battery to be used again, you apply the electricity to recharge the iron powder to be used again,” says Greetham.

He believes this method would also pair well with other renewable energy sources. Using the example of solar energy, Greetham says the powder could be burnt over and over again to be reused and solar could help to recharge it.

Greetham says he has faced challenges trying to move forward with this project, but he hopes if all goes to plan, it could be operating as an energy source within three to four years. He says there’s a steep curve in learning how to use the new technology and also in trying to explain to different levels of government the minerals can be extracted and used to create green technologies and energy,

“You’ve got to fight for what’s right, and so I kept fighting for it,” says Greetham.

Greetham acquired complete ownership of the site in 2015 and, pending city approval, he plans on extracting the magnetite iron ore, in addition to the other byproducts found in the old copper mine, concentrating it, and hoping to make it available for research and development initiatives.

Serving the “Arctic niche”

Stefan Weissenberg takes yet another approach to turning old into new.

He founded a clean technology research and development nonprofit corporation called Hydrocube.org, which aims to inform Northerners about clean energy, reduce greenhouse gas emissions, as well as look into innovative solutions for the North.

Weissenberg is currently creating a snowmobile engine powered by deep fryers, with cooking oil as the main fuel source. He says the vehicle will be a biodiesel-electric hybrid that has an electric battery that “works really well in the cold and in the Arctic.”



“I’m working on the first prototype, which will run on biodiesel, or essentially, it’s going to be modified to run on just straight vegetable oil,” he says.

“The advantage of going with an electric is basically the biodiesel is charging the battery. The other advantage of dealing with electric is you can use the electric vehicle as a portable generator.”

He hopes to be able to adapt the snowmobile to run on hydrogen fuel, once there is more infrastructure to do so. He thinks hydrogen is the “fuel of the future,” but says it may take some time before it is used widely and there is currently not enough emphasis on investing in the technology within the territory.

According to a framework released by Natural Resources Canada in December 2020, called: Hydrogen Strategy for Canada, Canada has a target of becoming a global leader in hydrogen technologies. Canada does already produce some 3 million tonnes of hydrogen annually from steam-methane reforming – one way of producing hydrogen. The framework says additional work must be done to create more hydrogen through other means, stating Canada has opportunities to capitalize on hydrogen produced from water - which would see a process using renewable electricity to help create it – and also by fossil fuels, with measures in place to help minimize carbon emissions.

Weissenberg says he strives to help the “Arctic niche” because communities in the Yukon are “underserved” when it comes to energy-efficient solutions they can adapt to their lives. He says products from southern Canada don’t consider how products work in different climates or how they might meet the needs of Northerners.

“Nobody’s building something for the Arctic trappers, for the people who have a subsistence lifestyle or who want to live that way. So, I set out to design something that’s different.”

says Stefan Weissenberg, Founder of Hydrocube.org

Weissenberg says the lack of energy literacy in Canada is a barrier that is keeping the industry from reaching its full potential.

“People want change, I believe that. People want a solution to local air pollution; they want to do something about climate change,” he says. “They don’t know about all these renewable technologies that can help them, whether it’s solar, wind, biomass, geothermal, or hydroelectric ... and then there’s also storage.”



Accessing information and technology can be difficult at times, as some companies want to protect the investments they've made in research and development. That can make it difficult for the general public to access some of the technology, according to Weissenberg.

Mosquito Jet Boats Ltd.

Peter Jacobs - who runs Mosquito Jet Boats with his wife, Tracey - spends his time in his Whitehorse shop crafting mini jet boats that can be adapted to different needs so users can have a smaller, fuel efficient watercraft that gets them where they need to go.

Jacobs says the smaller boats, which end up being more environmentally friendly, could potentially reduce fuel emissions by "up to 50 percent" of that of a regular jet boat.

Jacobs aimed to create a completely electric jet boat by the summer of 2021. Though the COVID-19 pandemic and struggles finding eco-friendly mechanical equipment have delayed him, he is still working on the prototype and says he is not giving up on his goal.

"What we've done is made a little boat and try to have all the amenities of a big boat. Our goal was fuel economy ... The people who see the merit in it are buying them faster than we can build them. It does come down to fuel burn, because if you're burning less fuel, you don't have to carry as much to go the same distance," he said.

Jacobs is also in the early stages of exploring the potential of electric batteries and charging stations - a project that earned him a small grant as a winner of the Yukon Innovation Prize. He says the main barrier is getting information and gaining access to technology that won't harm the environment if they have to be disposed or come into direct contact with water and ecosystems. Lithium batteries contain poisonous elements that could potentially contaminate lakes and river their ecosystems.

"It made me think that an electric boat is going to need other safety measures than just what a gasoline powered one will need," says Jacobs.

"It definitely is the way of the future. If you can just plug in your boat and go, most people boating only go for two to three hours. So, a battery-powered boat would be ideal. It's just the challenges of charging and whatever you have to do for the batteries."

Weissenberg also believes it's important that people learn how to install and maintain their own eco-friendly alternatives, which is why, in the near future, he hopes to be able to go into communities across Yukon and host workshops to teach these skills.

"We're dealing with climate change, but we're also dealing with inequalities. A lot of people I know in the Yukon want to do it themselves and also they don't have the money to do everything by getting someone in to do it all the time. It's extremely expensive to get people out to the communities, if you can get them at all."



"The goal is to enable individuals to understand and make choices about their energy use in a way that is sustainable, and also in a way that helps them, that is affordable."

Stefan Weissenberg, Founder of Hydrocube.org

With ambitious goals set to help bring clean, affordable and reliable energy to Yukon by 2030, green technologies are spearheading changes to energy infrastructure the territory will hopefully see over the next decade.

With the potential to see new technologies introduced in the territory, progress towards the 2030 Sustainable Development Goal on energy and Yukon's own territorial plan could impact the way people produce, consume, and pay for energy.

Living sustainably off the land and ensuring generations to come can prosper is a common concern in the North, and a turn to ecofriendly practices could result in a Yukon that sees these ideals come to the forefront of its climate activism and recovery.



About the writer

Sarah Sibley is a journalist and audio storyteller based in Yellowknife, Northwest Territories, where she works for CabinRadio as a reporter. She previously worked for Capital Current and Charlatan Publications, both in Ottawa. Sarah graduated from Carleton University, with a double major in Journalism and Law, Digital Communications and Media/Multimedia.

About the editor

Kanina Holmes is a Whitehorse-based journalist, editor, professor, and entrepreneur. She is the founder and creative lead of Stories North, a journalism education business responding to the Truth and Reconciliation Commission (TRC) by equipping journalism students with the skills to respectfully share stories from the North. Learn more at storiesnorth.com

#YukonBusinessesForGood

About this storytelling series

#YukonBusinessesForGood stories highlight some of the many Yukon businesses who create benefits for their communities and environment. The stories show how business can play a positive role in addressing shared values that have long been held by many Yukoners and now form the United Nations Sustainable Development Goals (UN SDGs): global priorities from 2015 to 2030 for 192 countries, including Canada.

This series also showcases young writers in Canada's North and provides them paid experience as they begin journalism careers, thanks to funding from Employment and Social Development Canada (ESDC).

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