



Yukon Biomass Energy Strategy

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Executive Summary

Supplying and consuming energy for heating has significant social, economic and environmental implications. Nearly \$60 million per year is spent in Yukon on fuel and electricity to generate heat. About 75% (approximately \$50 million) of this is spent on imported fossil fuels. Burning fossil fuels is expensive, drains money from Yukon's economy and has both local and global environment impacts.

The intent of this strategy is to reduce Yukon's dependence on imported fossil fuels by optimizing the use of Yukon-harvested wood to meet the territory's heating needs using modern biomass energy systems.

There are many advantages to adopting biomass energy systems in Yukon. A transition to a biomass economy has the potential to reduce heating costs for Yukoners, create new jobs in the local forest and heating industries, reduce greenhouse gas (GHG) emissions, and move the territory towards sustainable renewable energy and greater energy self-sufficiency.

Other northern jurisdictions have already made significant advances in using modern biomass energy systems, including Alaska, Northwest Territories and many northern European nations.

There are many challenges involved in developing a healthy biomass energy industry in Yukon. Old inefficient woodstoves will need to be replaced with modern, efficient and clean burning appliances. The local heating industry will require new expertise and infrastructure to adapt to modern wood heat systems. Harvesting local fuelwood will need to be managed to ensure that it is done on a sustainable basis and in a socially and environmentally acceptable manner. New biomass energy systems will need to be subject to standards that ensure air emissions do not pose a risk to human health or the environment.

This strategy identifies six key action areas that are essential for the successful development of biomass energy in Yukon:

1. Commit to using biomass energy in government infrastructure.
2. Develop regulations, policies and programs for biomass energy industry, as required.
3. Manage biomass facility emissions to protect public/environmental health and safety.
4. Facilitate private sector development in biomass energy.
5. Manage and regulate Yukon forests sustainably.
6. Ensure biomass fuel security and quality.

1 Introduction

Supplying and consuming energy for heating has significant social, economic and environmental implications.

In Yukon, approximately \$60 million per year is spent on fuel and electricity to generate heat. More than 80% (\$50 million) of this is spent on imported fossil fuels. This high dependence on imported fossil fuels for heat is costly. It drains money from the territory's local economy. It also contributes significantly to our greenhouse gas (GHG) emissions.

Many countries and communities in the north are making changes to reduce dependence on fossil fuels for energy. They are turning to a fuel source which is cheaper, more locally available, renewable, and emits less GHG emissions. That fuel source is biomass, or wood and wood products.

To meet this shift, modern advanced biomass energy systems are developing rapidly world-wide. These systems are clean, automated and economical. They use fuels that are manufactured to strict quality standards to ensure efficient and optimal operation, and can be used to generate heat and/or electricity.

Many other northern jurisdictions have already made significant investments in these systems. By the end of 2013, the Government of the Northwest Territories installed 14 modern biomass heating systems in public buildings. By doing this, the government was able to reduce its consumption of heating oil by six million litres, reduce its GHG emissions by approximately 15,000 tonnes¹, and significantly reduce its heating costs.

¹ Government of Northwest Territories, April 2012. Annual Report 2011: Public Works and Services Energy Conservation Projects.

Many Alaskan public and private buildings are converting to biomass heating with a growing biomass industry being created in that state, including the development of an advanced pellet manufacturing sector. Some northern European countries are meeting over 20% of their heat and power needs with biomass.

Advanced biomass energy systems for heat are viable for Yukon. There are already many on the market and by increasing the use of these systems, Yukoners could save money, support local economic opportunities for the forest and heating industries, reduce GHG emissions, and become more energy self-sufficient.

This strategy outlines an approach for the expansion of biomass energy use in Yukon. It discusses the challenges and benefits of using biomass energy, identifies goals and principles for its use and proposes actions for developing and promoting this form of heat in the territory. While the Yukon government does support the (eventual) use of biomass for electricity production, the primary focus of this strategy is to optimize the use of wood for heat, using modern systems that are clean, efficient and economical.

1.1 What is biomass energy?

Biomass energy is derived from organic matter, including wood, agricultural products, organic wastes, municipal solid waste and other living cell materials. Globally, many different organic materials are being used as feedstock for biomass energy but in Yukon, the primary biomass resource available is wood. Wood-based biomass is the primary focus of this strategy. While modern systems do burn cord wood, it is not as efficient a feed stock as wood chips or pellets. This strategy is therefore focused on the use of wood chips and pellets.

1.2 Linkage to Yukon's Energy Strategy and Climate Change Action Plan

This Biomass Energy Strategy is a commitment of the 2009 [Energy Strategy for Yukon](#), which supports replacing fossil fuels with cleaner renewable energy sources wherever possible.

In particular, the Energy Strategy commits to:

- Increasing renewable energy supply in Yukon by 20% by 2020;
- Investing in research and development of renewable energy technology;
- Demonstrating leadership in developing renewable energy infrastructure;
- Developing a wood-based bioenergy industry in Yukon; and
- Encouraging cost-effective, small-scale renewable energy production to foster innovation and diversity in Yukon’s electrical supply.

The Biomass Energy Strategy is also consistent with the Yukon government’s 2009 Climate Change Action Plan which recognizes that burning wood efficiently for heat produces less GHG emissions than burning oil. Burning wood is considered to be carbon neutral if done cleanly and sustainably (which includes ensuring the regeneration of harvested biomass). Specifically, the plan commits to: “reducing our GHG emissions through reducing our use of fossil fuels” and “supporting the use of wood energy for residential and institutional heating”.

1.3 Linkage to the Final Agreements

Chapter 17 of the First Nation Final Agreements commits Government of Yukon to working with Yukon First Nations to manage the territory’s forest resources sustainably. Chapter 17 provides guidance on:

- The development of regional Forest Resource Management Plans;
- The role of Renewable Resources Councils in managing forest resources;
- Granting access to forest resources; and
- Protecting the economic development opportunities of First Nations where forest resources are concerned. Creating economic development opportunities for Yukon First Nations is also a Yukon government commitment in Chapter 22 of the Final Agreements.

Implementation of the Biomass Energy Strategy will be consistent with the commitments of Yukon government in Chapter 17 of the Final Agreements.

Specifically, the harvesting of biomass for energy production in Yukon will conform to the provisions established in the Forest Resource Management Plans. Granting access to forest resources will also be subject to established forest management principles for the region in question. Ensuring adequate forest regeneration will remain a priority of the Forest Management Branch.

1.4 Linkage to the *Forest Resources Act* and YESAA

The *Forest Resources Act* promotes the sustainable use of forest resources for the benefit of current and future generations, by providing regulatory and management tools that will ensure that the environmental, economic, social, and cultural interests of all users of Yukon's forests are considered.

The *Forest Resources Act*, along with Chapter 17 of Yukon First Nation Final Agreements, sets out the process to complete forest resources management plans. These regional plans are completed with First Nations and the public for the collaborative and integrated management of forests.

The plans consider multiple (timber and non-timber) forest values and identify acceptable harvest levels, to ensure maintenance of important forest values and long-term sustainability, thereby ensuring regional goals are acknowledged. These plans have been completed for the Teslin, Haines Junction and Dawson forest regions.

Wood is made available under the *Forest Resources Act* through the preparation of timber harvest plans, either within a regional planning area (see above) or outside of it. Until such time as regional management plans are in place, harvest levels in each forest region are capped by regulation. And in the absence of these regional plans, the timber harvest plans must contain considerations for sustainable use, management of non-timber forest values, and other considerations brought forward from Chapter 17 of First Nations final agreements. Timber harvest plans can be and are developed in every region in the territory.

All timber harvesting above a certain threshold is assessed under the Yukon *Environmental and Socioeconomic Assessment Act*, which further ensures that harvesting is done on a sustainable basis and is subject to public review and input.

1.5 Yukon's wood resources potential

Yukon has a long history of using wood as a source of energy. The steamboats that plied Yukon's rivers 50-100 years ago were all powered with wood. Today, many Yukon people heat their homes with woodstoves, especially in communities where fuelwood is accessible.

Approximately 13,000 cords (30,000 m³) of wood are harvested annually in Yukon to heat homes and buildings. This accounts for approximately 17% of Yukon's total consumption of energy for heat. Most cordwood in the territory is currently harvested in the Haines Junction area from beetle-killed trees and trucked to the Whitehorse area, which accounts for approximately 75% of the territory's total heat demand.

There is potential to use local wood for sustainable and renewable energy (i.e. biomass) in Yukon.

As of 2015, less than one quarter of the forested area of Yukon has been subject to the regional management planning process. Only 0.1% of the entire forested land base (38 million ha) has been dedicated to harvest, so far. The actual level of forest harvest in the territory is below the regulated allowable harvest level set for each region.

Opportunities for harvest exist in the availability of salvage wood from burned areas, areas which have been subject to insect infestations, sawmill wastes and areas which are cleared or thinned due to new developments or FireSmart® activities. (An average of 112,000 hectares of forest is consumed every year in the territory by forest fires. This represents nearly 200 times more wood than is currently harvested for energy use in the territory.)

Increases in harvest intensity would be managed through tools provided under the *Forest Resources Act*. Even a small increase in biomass production in Yukon can have a significant effect on our greenhouse gas emissions, by reducing our transport and use of fossil fuels.

Industry can lead the development of new harvest areas through timber harvest planning, with assistance from government to ensure sustainability requirements are met. Government, as the regulator, ensures that timber harvest plans include required information and embrace commitments from higher level plans. This information is then translated into permit terms and conditions, and industry standards and guidelines. Compliance and enforcement provisions in the *Forest Resources Act* provide regulators with the ability to ensure sustainability requirements are met.

1.6 Modern biomass energy systems

The use of wood for heat and power is increasing world-wide. Wood pellets and chips are being used in both small-scale and large-scale systems, including district heat and combined heat and power systems.

The biomass energy systems available today bear little resemblance to the traditional wood stoves many Yukon residents are familiar with. Old stoves, outdoor boilers, and other forms of biomass burners can be inefficient and can produce significant amounts of particulate matter. **These are NOT the systems being discussed when biomass energy systems are referenced in this strategy.**

The modern biomass systems referenced in this strategy are efficient, and are clean burning. These newer, large-scale systems are automated with bulk fuel delivery, automated fuel feeds, controlled combustion, and advanced air emission controls. Many can also be controlled and monitored remotely. These systems conform to the strict air quality and emissions standards of the jurisdictions in which they have been installed.

The Whitehorse Correctional Centre (2012) has a modern biomass boiler that burns wood pellets. The pellets are supplied in volume by tractor trailer from British Columbia, approximately 40 tonnes per B-train load. The pellets are stored on-site in a silo and fed automatically to the boiler. The boiler is monitored and controlled by a web-based system.

1.7 Yukon's air quality

In October 2012, Yukon government agreed to implement a Canada-wide Air Quality Management System (AQMS). AQMS is a comprehensive approach for improving air quality throughout Canada, based on the delineation of air zones. Air zones are a place-based approach to manage local air quality. One of the goals of Yukon's ambient air monitoring program is to determine when the Canadian ambient air quality standards, another component of AQMS, have been exceeded. Yukon has only one air zone for which data is collected at the Whitehorse National Air Pollution Surveillance station. The *Yukon Air Zones Options for Air Zone Delineation* report² recommends establishing additional air zones in the territory.

2 Purpose and principles

The purpose of this strategy is to promote and optimize the use of Yukon wood resources for the production of heat and power in Yukon, using modern, efficient, safe and clean technologies. The immediate focus is on using wood products for heat.

There are a number of principles that must be considered in the development of a biomass industry in Yukon.

These principles are reflected in the actions presented in section 4.

² *Yukon Air Zones Options For Air Zone Delineation*, AMEC Environment & Infrastructure, March 2014 #EE36066

- **Leadership:** the Yukon government needs to lead the way in building our technical understanding of biomass systems, through research and project implementation.
- **Working in partnerships:** the Yukon government must work in partnership with other governments, energy providers, public utilities, research institutions and the private sector to develop a strong biomass energy sector.
- **Reliable and advanced technology:** Biomass energy development must be based on technologies that have proven to be reliable, safe, clean, and easy to use.
- **Public/environmental health and safety:** Air emissions from biomass energy systems and the surrounding ambient air quality must be monitored to ensure that emissions from biomass burning do not exceed national or local environmental or public health standards.
- **Secure and high-quality fuel supply:** Successful biomass energy development requires a secure supply of high-quality fuels.
- **Cost effectiveness:** Yukon biomass energy systems must help Yukon people reduce heating costs.
- **Energy self-sufficiency:** Yukon biomass energy systems should use Yukon's biomass resources to reduce Yukoners' vulnerability to imported fossil fuel prices and supply.
- **Sustainable forest resource use:** The wood needed to support biomass energy must be managed and harvested according to principles of sustainability, as per the *Forest Resources Act*.

- **Support for Yukon jobs:** Using Yukon’s wood fuel products for biomass should enhance job opportunities in Yukon’s forest and heating industries.
- **Reduction of GHG emissions:** Yukon biomass energy systems must be designed and maintained to emit less GHG emissions than comparable fossil fuel energy systems.

3 Background

3.1 Energy consumption for heat in Yukon

Space heating is a significant sector of Yukon’s economy. Figure 1 illustrates the relative proportions of the different types of energy used for heat in Yukon. Figure 2 identifies the amounts and costs associated with each type of energy.

As noted in Figure 1, heating oil and propane supply approximately 75% of the heat used in Yukon and account for about 82% of the territorial cost of fuel for heat. All fossil fuels consumed in Yukon are imported.

In Yukon’s climate, demand for heat peaks in winter when hydro facilities are already operating at full capacity. When demand exceeds the hydro capacity, diesel generators are used to meet the increased demand. This additional fossil fuel consumption contributes to the costs and GHG emissions associated with using electricity for heat.

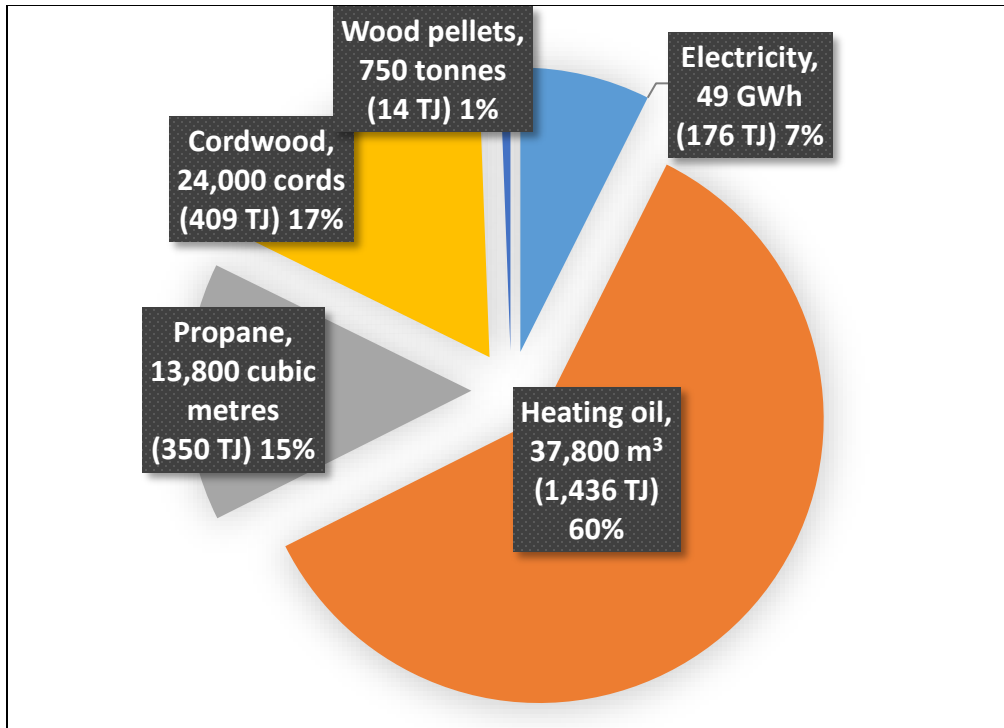


Figure 1: Estimated total breakdown of energy use for heat in Yukon

Source: Yukon government's Energy Branch, 2012.

3.2 Advantages of biomass energy

There are many benefits to using biomass for energy. These include reducing energy costs, minimizing GHG emissions, improving energy self-sufficiency, and developing new economic opportunities for the forestry sector. Biomass is also a renewable resource and safe to transport.

3.2.1 Energy costs

Wood has the potential to be the most cost effective heating fuel. Figure 2 identifies the estimated costs of different heating fuels in Yukon in dollars per gigajoule of heat. Heating with cordwood, bulk pellets or chips can be half the cost of heating with fossil fuels or electricity.

Although the cost of installing a biomass system is normally higher than the cost of installing an oil system, with a relatively short payback period, the lower cost of wood fuel makes up for the higher installation cost and results in significantly lower heating costs in the long-term.

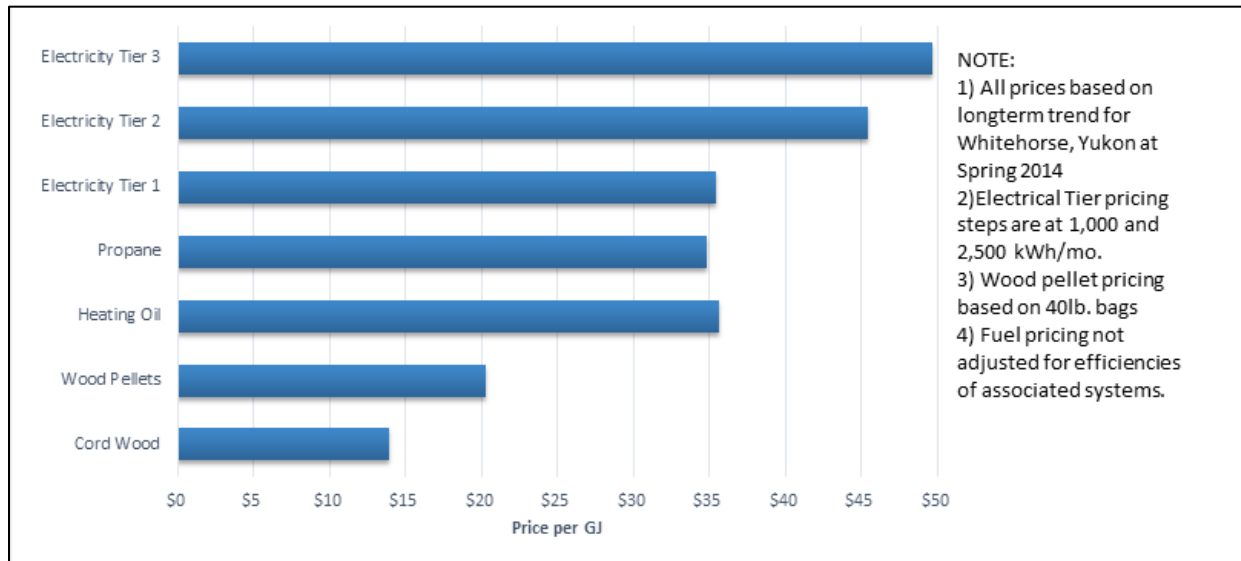


Figure 2: Relative Net Cost of Heat Options 2010 (includes O & M) in \$/GJ

Source: Yukon government’s Energy Branch, 2014.

The favourable economics of using wood heat will likely continue. Prices for fossil fuels have been shown to be unstable and can increase quickly. Most long-term industry projections anticipate that prices for wood fuels will be more stable and less expensive than fossil fuels.

3.2.2 Greenhouse gas emissions

Replacing oil heat with wood heat reduces GHG emissions. Burning one litre of heating oil or propane emits approximately 2.8 kilograms of CO₂ (equivalent) into the atmosphere. In 2009, approximately 40 million litres of heating oil and 8.75 million litres of propane were burned for heat in Yukon. This resulted in 136,500 metric tonnes of GHG emissions (Yukon government’s Climate Change Secretariat, 2012).

By contrast, if managed well, wood heat is considered to be nearly carbon neutral. When wood is used to generate heat or electricity, carbon is released into the atmosphere by burning the wood, which creates a 'carbon debt'. If forests are regenerated so that an equivalent amount of carbon is absorbed (i.e. removed) from the atmosphere by growing new trees, the carbon debt is repaid.

Harvesting, transporting and processing wood also results in GHG emissions, but the total amount emitted through activities associated with biomass heating is far less than that associated with the equivalent activities related to fossil fuel heating.

3.2.3 Energy self-sufficiency for Yukon

Harvesting wood for heat will help increase energy self-sufficiency in Yukon. Currently, approximately 75% of the heat generated in Yukon depends on imported fossil fuels. This leaves Yukon consumers highly vulnerable to disruptions in fuel supplies or price increases. By contrast, wood is a local resource that is managed and controlled in Yukon. Most Yukon settlements have available fuel wood sources or waste wood within moderate transportation distance (i.e. between 80 and 200 km).

The capability of a Yukon community to benefit from a biomass industry will depend on its capacity to participate in a biomass economy, the proximity and cost of transporting biomass resources, and its ability to access financial and natural capital. Not all communities will have the same capability to undertake biomass energy projects.

3.2.4 Local forest industry development

Heating with wood will help develop and diversify Yukon's economy. On average, for every dollar spent on imported fossil fuels, approximately 60% of it leaves the territory to purchase the fuel wholesale from southern distributors. Still more money leaves to pay for the equipment and fuel needed to transport the fuel to Yukon customers. Only a small portion of the total cost of fossil fuels stays in the territory to support wages for local fuel retailers and distributors.

By contrast, for every dollar spent on wood fuel in Yukon, most of it stays in the territory to support local wages and wood fuel contractors. Only a small portion leaves the territory for equipment purchase and fuel.

A recent study³ concluded that there is significant potential to replace oil for heat with modern wood burning appliances. Given our high annual expenditures for oil heat in the north, even a modest switch from fossil fuels to biomass would result in significant new opportunities for Yukon's forest industry. Offsetting oil purchases from outside the territory by increasing use of local wood for heat, supports forest industry growth and keeps dollars in Yukon.

3.2.5 Renewable energy

Wood is an energy source that is both renewable and locally available. The *Forest Resources Act* ensures the planning required for appropriate forest regeneration, making the use of biomass carbon neutral. In designing biomass energy projects that rely on local timber harvest, it will be critical to scale projects such that their fuel needs can be met within the harvest levels identified in forest management plans. In cases where there is insufficient local supply to meet the project demand, options for importing wood fuel can be considered.

3.2.6 Fuel safety

Wood fuels are safe to handle, transport and store. Wood is solid and non-toxic. If it spills, it is easy to clean up. Wood fuels do not seep into the ground, present a health hazard or damage the environment. Wood is safer than fossil fuels, which can become hazardous to people and the environment.

³ ICF Marbek, Yukon Electricity Conservation and Demand Management Potential Review: Customer-Side Renewable and Alternative Energy, January 2012).

3.3 Challenges of developing a biomass energy supply

Yukon's forest managers' challenge will be to identify areas for timber harvest. There are many required steps in forest resource management planning and involve many stakeholders, who are willing to accept industrial forestry activities.

Private sector biomass industry developers could ensure that they have access to sustainable timber harvesting tenures by meeting the requirements of the *Forest Resources Act* and regulation, participating in the planning processes, adhering to standards and guidelines, and operating within their permit terms and conditions.

There are also challenges to using biomass for heat or energy, including air quality management (both source emissions and surrounding ambient air quality), fuel security and quality, and heating industry transition.

3.3.1 Air quality

When wood burns, the main products are carbon dioxide, water vapour and mineral ash. Wood burning can also produce smoke consisting of a mix of pollutants, including fine and coarse particulate matter, carbon monoxide, nitrogen oxides, volatile organic compounds and toxins.

Wood smoke is a sign of inefficient or poor combustion. Smoke is most frequently associated with poor quality appliances, poor burning practices and/or poor quality fuel. Some Yukon communities have air quality problems due to wood smoke from inefficient burning practices. Health Canada and others report that wood smoke has been correlated with impacts to human health.

Modern biomass heating appliances are designed to control emissions so that they do not pose a risk to human health or the environment. Even with these controls, however, the potential for harmful emissions will increase if there are poor operating and maintenance practices, or when inconsistent fuels (lower quality or higher moisture) are used.

In using wood for energy, strict measures need to be taken to ensure that air emissions do not pose a risk to public or environmental health. The installation of these systems can be regulated so that only modern appliances with strict emission controls are used. Periodic source emission tests should also be conducted to verify performance. Wood fuels must be high-quality with density and moisture consistency, with controls for oxygen and temperature, so they burn efficiently and ultimately, cleanly. All systems must be installed, operated and maintained properly to ensure safe and efficient operation.

Project locations must also be considered. Some valleys in Yukon have a history of wood smoke problems due to air temperature inversions. These areas may require specific measures when considering biomass energy projects. The number and density of multiple biomass projects within an area also needs to be considered. Increasing the number of wood-burning appliances in an area will increase the potential for air quality concerns, even with high-quality fuels, appliances and appropriate operations and maintenance practices.

To address these concerns, the development, amendment, implementation and enforcement of related air emissions regulations, standards, best management practices, as well as source emissions and ambient air quality monitoring are required. This will help to ensure air quality and health standards are maintained for both individual and multiple projects.

3.3.2 Heating industry transition

Currently, Yukon's heating industry is focused on fossil fuels. Only around 17% of the territory's heat is provided through wood. Most of this is with cordwood burned in traditional woodstoves. Only a very small amount of our wood heat is provided through modern pellet or chip systems. At the present time, there is limited local expertise or infrastructure in place to support modern biomass energy development in the territory.

To facilitate a shift to biomass energy systems, businesses that install and service heating installations will need to acquire new expertise, contacts, supply chains and equipment. Businesses that supply heating fuels will need to develop new supply sources, infrastructure and distribution networks.

4 Framework for action

This strategy proposes six key action areas. Each action area has a number of considerations and objectives. The proposed actions are:

4.1 Commit to Using Biomass Energy in Government Infrastructure:

A secure long-term demand for biomass energy and biomass fuels will be needed before local businesses will be able to invest and participate in a biomass energy industry.

Government will:

Conduct biomass energy feasibility assessments for appropriate government projects that require new or upgraded heating systems. The Yukon government will identify and select candidate projects that have potential for biomass heating and will complete two pilot projects. This includes examining district heat options as well as individual building heat options. This also includes examining different business and financing models for project implementation, and partnerships with the private sector.

4.2 Develop Regulations, Policies and Programs for Biomass Energy Industry:

Where appropriate, the Yukon government will develop policies, standards, guidelines and programs to promote and manage the use of efficient, clean and safe biomass appliances and fuels.

Government will:

- a. Enhance the Yukon government's residential biomass heating incentive program by revising existing program offerings and providing new ones;
- b. Work with communities to identify and, if possible, resolve issues limiting their capability to benefit from biomass projects.
- c. Develop regulations as needed for technical specifications and project requirements to ensure that biomass energy development is advanced, safe and efficient, and does not pose a risk to human health or the environment; and
- d. Find opportunities to develop education and programming that provide information, training, and technical assistance to support biomass energy development in the territory.

4.3 Manage Air Quality to Protect Public and Environmental Health and Safety:

Biomass energy development in the territory must take into account the Yukon government's commitment to protect public and environmental health.

Government will:

- a. As needed, develop policies and/or regulations that will require all of the Yukon government biomass energy systems to be designed, installed, operated, maintained and monitored to ensure that they are safe, secure, and do not pose a risk to human health or the environment. This includes both inside and outside the building they are located in. Regular emission testing by the system owner will need to be conducted to ensure emission controls are performing to specifications and are not exceeding established standards.
- b. Where biomass facilities are proposed, ensure that there is a good understanding of background pollution levels which will enable the assessment of cumulative effects of emissions from existing and new biomass facilities.

- c. Continue to support AQMS and investigate the need for additional ambient air quality monitoring infrastructure and resources required. Identify current background levels of particulate pollution, and the impact of new biomass facilities in order to determine the overall impact of increased biomass use.

4.4 Facilitate Private Sector Development in Biomass Energy:

Private sector expertise, involvement and infrastructure will be essential to developing, supplying and servicing biomass energy projects in the territory.

Government will:

- a. Work with other governments and the public and private sectors to share information and coordinate efforts to promoting biomass energy projects. This may include support for feasibility studies, biomass energy programs, policy development and educational campaigns.
- b. Work with the private sector to investigate and, if possible mitigate, the insurance implications of biomass heating systems for commercial buildings.
- c. Work with energy providers and public utilities to coordinate biomass energy projects, including district heating systems.
- d. Support pilot studies and demonstration projects to investigate the development of combined heat and power projects and the potential of using willow as a biomass fuel source.
- e. Work with the private sector and industry organizations to develop consistent technical standards for the industry, achieve an integrated supply chain, identify training needs, develop technical expertise and identify needs for business assistance.

- f. Work with training and research institutions to develop expertise, share information and deliver training programs.

4.5 Regulate Sustainable Forest Use:

Yukon's forest industry has access to sustainable timber tenures. The *Forest Resources Act* planning requirements ensure a sustainable forest management framework is available for harvesting in Yukon.

Government will:

- a. Continue working with First Nations, communities, industry, interest groups and the public to develop forest resources management plans that can embrace biomass harvest opportunities throughout the territory;
- b. Provide services to industry and First Nations in support of biomass development projects (including resource inventory), in addition to fostering regional economic development and partnership opportunities;
- c. Include bioenergy in annual allowable cut determinations, once forest resource management plans are approved;
- d. Working with industry, investigate the opportunities for timber tenure security that could support a bioenergy heating sector (i.e. during the *Forest Resources Act* five-year review).
- e. Continue to explore wood supply opportunities from the harvest of salvage and waste wood for biomass operations, including cut timber from land and road right-of-way clearing or forest thinning projects, and sawmill wastes.

- f. Work with private sector proponents to manage their expectations and communicate the requirements of the *Forest Resources Act*, ensuring that projects that rely on local timber harvests are scaled so that they can operate successfully within regulated harvest levels;
- g. Support pilot studies and demonstration projects to educate and encourage the use of locally processed wood fuel products;
- h. In support of increased biomass opportunities, develop standards and guidelines for harvesting woody biomass, best management practices, monitoring protocols and research sites; and
- i. Continue to develop a silviculture program to ensure adequate forest regeneration.

4.6 Ensure Biomass Fuel Security and Quality:

Ensuring a secure supply of high-quality fuel is essential to developing a biomass energy industry. The fuel supply chain will need to be developed in partnership with wood fuel producers, suppliers and distributors.

Government will:

- a. Establish, promote and implement fuel quality standards in the wood fuel supply chain;
- b. Establish industry-wide standards if/and as necessary for the transportation, storage and distribution of wood fuels;
- c. Assist in business planning for infrastructure to transport, store and distribute wood fuels; and
- d. Assist in establishing and promoting wood fuel systems that are automated, reliable and easy to use, so they can compete with fossil fuels in terms of convenience.

5 Conclusion

Biomass energy for heat is a cost-effective and environmentally sustainable solution for heating in the territory. Expanding biomass energy use helps to support numerous the Yukon government commitments and objectives, including expanding renewable energy development, reducing GHG emissions, promoting local economic opportunities in the forest and heating industries and enhancing local energy security and self-sufficiency.

The benefits of using biomass for heat contribute to a clear economic argument for switching from fossil fuels to wood for heat. They also contribute to meeting our commitment to reducing GHG emissions.

By meeting the challenges of switching from fossil fuels to wood for heat, the actions in this strategy create a clear path to achieving a strong, economically viable, safe and clean biomass energy industry for Yukon.